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## CAN SAE J1939

### 1 Support

If you have any questions, please contact our product support at support@novotechnik.de.  
 User manuals for previous software versions are available on request.

### 2 J1939 Frame Description

#### 2.1 Structure of the J1939 PGN and the 29-bit CAN Identifier

The J1939 interface uses the 29 bits extended CAN-ID according to ISO 11898.

	<b>PF</b>	<b>GE</b>	<b>18-bit PGN</b>							
PDU1 (specific)	< 240	0	17	16	15	8	7	0		
PDU2 (global)	>= 240	0 - 255	E D P	D P	PDU Format (PF)			Group Extension (GE)		
<b>29-bit CAN-ID</b>										
	28	26	25	24	23	16	15	8	7	0
Priority			E D P	D P	PDU Format			PDU Specific (PS)		Source Address

**PDU1:** PS = Destination Address

	<b>29-bit CAN-ID</b>									
	28	26	25	24	23	16	15	8	7	0
Priority			E D P	D P	PDU Format			PDU Specific Destination Address		Source Address

**PDU2:** PS = Group Extension

	<b>29-bit CAN-ID</b>									
	28	26	25	24	23	16	15	8	7	0
Priority			E D P	D P	PDU Format			PDU Specific Group Extension		Source Address

The identifier contains the following general information:

Name	Priority	Extended data page (EDP)	Data page (DP)	PDU format	PDU specific (Destination address <b>DA</b> )	Source address <b>SA</b> * (necessary)
Length	3 bits	1 bit	1 bit	8 bits	8 bits	8 bits
Description	Message latency for transmission, 0=high ... 7=low			To determine PGN	PDU Format < 240: destination address PDU Format ≥ 240: group extension	Unique address of transmitting unit
Value	0x18			0xFF	0xAA	0x80 (default) 0x80...0xF7 128....247 dec

# Note: In case of configuration, the sensor receives data. Therefore, in the identifier the sensor address (0x80...0xF7) must then be used as destination address (DA) and the source address (SA) is the address of the transmitting unit (e.g. master)

The entire frame format PDU contains the identifier (29 bits) and the data section (8 byte):

Identifier					Data Bytes (0 ...64 bits)							
Priority	PGN (18 bits)			Source address <b>SA</b>	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
	Data page	PDU format	Destination address <b>DA</b>									

### 3 Address Claiming (ACL)

Dynamic address claiming is supported. The sensor starts the claiming with the default source address 128 dec = 0x80.

If an address conflict with a higher prior source address occurs, the network management will increase the source address automatically by 1 until 247 is reached. If no free source address is available, the sensor will use address 254 and does not actively send data onto the bus, it can only be addressed using broadcast messages. The new claimed address is used temporary only. After power on, the default source address is 128 dec = 0x80 again. If the start address has been changed compared to the default value (e.g. 0x82 instead of 0x80, according to chapter **Fehler! Verweisquelle konnte nicht gefunden werden**. Set start address), dynamic address claiming begins at this start address.

For use in networks with fixed address assignment, the dynamic address claiming can be deactivated and the start address can be changed by the user with the command "set start address" to the desired source address (128 ... 247, see chapter 5.2 Configuration Data).

The new start address remains even after power off if using the command "Store PGN Configuration".

### 4 Device Name / Name Field

Data in the Name field is not changeable by the user.

Name	Value [dec]	Description
Arbitrary address capable	1 / 0	1 = Yes, 0 = No
Industry Group	0	Global
Vehicle System Instance	0	
Vehicle System	127	Non specific
Reserved	0	
Function	255	Non specific
Function Instance	0	
ECU Instance	0	
Manufacturer	851	Manufacturer ID
Identity Number	> 0	Unique No.

### 5 PGN Default Definitions

#### 5.1 Process Data - Message Content PGN 65450 (0x18FFAA80)

After the sensor has claimed a source address, the measured position values will be sent automatically with a "Proprietary B" PGN message. It is also possible to request the process data message (Configuration PGN and Reponse PGN see chapter 5.2 and 6).

The process data message PGN 65450 contains the process data Rotary Position (P), Velocity (V), Status, Message Counter and Checksum.

Data								
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
						Bit 3...0		Bit 7...4
Multiturn Position (32 bits)				Velocity (16 bits)		Status (8 bits)	Checksum (4 bits)	Message Counter (4 bits)

#### 5.1.1 Definition of the Signals (SLOT)

Position values<sup>#</sup>:

Data length                    32 bits (signed value)  
 Resolution                      Range/Resolution 360°/16 bits = 360°/65535  
 Range                            0° ... 15840° <sup>#2</sup>  
 Offset                            0°  
 Transfer Function              Position [°] = (Multiturn Position - Offset Position) \* Resolution

<sup>#</sup> Note:                    In case of a permanently reverse polarity of the supply voltage  $U_b$  and GND, the position values may be within the valid range, but they do not correspond to the current position!

<sup>#2</sup> Note:                    15840° := 360° x 44 turns

Velocity values:  
 Data length 16 bits (signed value)  
 Resolution 1 LSB = 0,1°/s  
 Range 0 ... 546 rpm  
 Transfer Function Velocity [rpm] = (Velocity data \* Resolution) / 6

**5.1.2 Definition of the Status Byte**

PGN 65450 – Status Byte							
Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8
Position overflow: Out of Range+ <b>Error</b>	Position underflow: Out of Range- <b>Error</b>	n.d.	Speed limit overflow <b>Error</b>	Position overflow: Out of Range+ <b>Warning</b>	Position underflow: Out of Range- <b>Warning</b>	Measurement failed <b>Error</b>	Internal System/ Frontend <b>Error</b>
0x01	0x02		0x08	0x10	0x20	0x40	0x80

\* n.d. := Not defined

**5.2 Configuration Data - Parameter Mode PGN 61184 (0x18EF80AA)**

The reading and writing of parameters and the triggering of defined actions is done by Configuration PGN 61184 = 0xEF00 with destination address (DA) and source address (SA). Each successful configuration operation is answered with an ACK response.

**5.3 Configuration (Byte0 = 0x01)**

Setting	Description	Value	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5 <sup>#2</sup>	Byte 6 <sup>#2</sup>	Byte 7
Offset Position	Position offset x positive values, A new written offset will be valid immediately.	0x000000* ≤ 0x2BFFFF	0x01 <sup>#</sup>	0x00*   0xFF	0x00*   0xFF	0x00*   0x2B	0x00			
Filter average	Quantifier for filter first-order (position and speed calculation) 0: filter off (2^0) quantifying over 2^n values (n= 1 ... 7) A new written filter value will be valid immediately.	Filter 0* Filter 1 Filter 2 Filter 3 Filter 4 Filter 5 Filter 6 Filter 7	0x01 <sup>#</sup>					0x00* 0x01 0x02 0x03 0x04 0x05 0x06 0x07		
Counting direction	Switch of counting direction. The counting direction clockwise (cw) or counterclockwise (ccw) defines whether the signal values are rising or falling when sensor shaft or position marker is rotated cw (view on the position marker or shaft). 0x00: CW 0x08: CCW A new written value will be valid immediately.	cw* ccw	0x01 <sup>#</sup>					0x00* 0x08		
Arbitrary address capable	0x00: Dynamic address claiming 0x10: Dynamic address claiming deactivated, fixed source address has to be set ("set start address") A new written value is not effective before reboot!	Add.claiming on* Add.claiming off	0x01 <sup>#</sup>						0x00* 0x10	
Baudrate [kBaud]	Transmission rate 0x00: 250 kBaud 0x08: 500 kBaud A new written baud rate is not effective before reboot!	250kBaud* 500kBaud	0x01 <sup>#</sup>						0x00* 0x08	
Transmit cycle		1 ms 10 ms 25 ms 50 ms* 100 ms 500 ms 1.000 ms 10.000 ms	0x01 <sup>#</sup>						0x00 0x01 0x02 0x03* 0x04 0x05 0x06 0x07	
Set start address	Address claiming: desired start address can be set.	0x80 ... 0xF7	0x01 <sup>#</sup>							0x80   0xF7

- \* Note: Default value
- # Note: Take notice that configuration mode is only reached, if Byte 0 = 0x01!
- #2 Note: Byte 5 and byte 6 of the configuration parameters are bit-encoded!

### 5.3.1 Definition of the configuration parameters

Preset [°]:  
 Data length 32 bits (unsigned value)  
 Resolution Range/Resolution 360°/16 bits = 360°/65535  
 Range 0° ... 15840° #  
 Transfer Function Preset [°] = (Offset Position \* Resolution)

# Note: 15840° := 360° x 44 turns

### 5.3.2 Example: Read Configuration Data

Request: DA = 0x80; SA = 0x20 ; General settings = Default

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	0x80	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x01	0x80	0x00	0x00	0x00	0x00	0x00	0x03	0x80

### 5.3.3 Example: Set Baudrate to 500 kBaud

Request: DA = 0x80; SA = 0x20 ; General settings = Default

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x01	0x00	0x00	0x00	0x00	0x00	0x00	<b>0x08</b>	0x80

**Note:** The settings will only take effect after a device reboot!

Response:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Store PGN Configuration:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	<b>0x01</b>	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Device Reboot:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	<b>0x04</b>	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

### 5.3.4 Example: Set Transmit Cycle to 100 ms

Request: DA = 0x80; SA = 0x20 ; General settings = Default

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>61184</b> 18EF0820h	Tx	8 Bytes	0x01	0x00	0x00	0x00	0x00	0x00	0x00	<b>0x04</b>	0x80

Response:

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

### 5.3.5 Example: Set Multiple Configurations

Setting of preset, direction, address claiming, baudrate, source address in one configuration.

Settings:

Setting	Value	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Offset	+90°		0x00	0x40					
Filter average	Filter 4						0x04		
Counting direction	ccw						0x08		
Add. Claiming	off							0x10	
Baudrate	500 kBaud							0x08	
Transmit Cycle	500 ms							0x05	
Source address	0x80								0x80

Request: DA = 0x80; SA = 0x20; Preset = 90°, Filter average = Filter 4, Direction = ccw, Address claiming = off, Baudrate = 500 kBaud, Transmit cycle = 100ms, Source address = 0x80

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>61184</b> 18EF8020h	Tx	8 Bytes	<b>0x01</b>	<b>0xFF</b>	<b>0xFF</b>	<b>0xFF</b>	<b>0x3F</b>	<b>0x0C</b>	<b>0x1D</b>	<b>0x80</b>

Response:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00



Important Note:

- To write parameters, the 8 data bytes must contain the complete configuration (Byte 0 to Byte 7).
- Newly written parameters are stored non volatile with the defined action "Store PGN Configuration" (see 5.4 Trigger flags).
- If a newly written parameter only becomes effective after reboot, sensor reboot must be carried out with defined action "Sensor reboot" (see 5.4 Trigger flags)

### 5.4 Trigger flags (Byte0 = 0x00)

To trigger a defined action, the 8 data bytes have to contain the following trigger flags in Byte1:

Setting	Description	Byte 0	Byte 1	Byte 2 ... Byte 7
Store PGN Configuration	Non-volatile storage of new configuration	0x00	0x01	0x00
Reset of Status Bits		0x00	0x02	0x00
Sensor reboot	like Power OFF/ON, wait 200 ms until further actions	0x00	0x04	0x00
Factory Reset	Reset to default configuration	0x00	0x08	0x00
Position Error Reset (after overtravelling)	Precondition: The sensor is turned back into the measurement range The front end of the device is reset to delete the errors - 0x7FFFFFF8 Out of Range (+) or - 0x80AA0008 Out of Range (-). A Frontend Error in Sensor Status (bit 7) is set.	0x00	0x20	0x00
Read Temperature / Supply Voltage / Time Counter	Actual internal temperature, actual supply voltage, actual operating time (response see 0)	0x00	0x40	0x00
Read Configuration PGN		0x00	0x80	0x00



Important Note:

- Only one trigger flag can be set in each operation! If more than one trigger flag is set, there is no action executed.
- If the trigger flag "Read Configuration PGN" is set, it is answered by the PGN Response "Configuration"

**5.4.1 Example: Factory Reset**

Request: DA = 0x80; SA = 0x20; Transmit Cycle = 1 s; Baudrate = 500 kBaud

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	<b>0x08</b>	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Store PGN Configuration:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	<b>0x01</b>	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Device Reboot:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	<b>0x04</b>	0x00	0x00	0x00	0x00	0x00	0x00

**Note:** In case the baudrate is set to 500 kBaud, a device reboot is necessary to complete the factory reset!

Response:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Read Configuration Data

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>61184</b> 18EF8020h	Tx	8 Bytes	0x00	0x80	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65452</b> 18FFAC80h	Rx	8 Bytes	0x01	0x00	0x00	0x00	0x00	0x00	0x03	0x80

**6 Response PGN 65452 (0x18FFAC80)**

Each configuration operation is answered with a ACK response or with the requested data (actual used configuration) by Response PGN 65452 = 0xFFAC (8 bytes).

Acknowledge ACK	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x18FFAC80	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

If a configuration was not successfully received or processed, a NACK response is sent by Response PGN 65452 = 0xFFAC (8 bytes)

No Acknowledge NACK	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
0x18FFAC80	0xFF	0x00	0x00	0x00	0x00	0x00	0x00	0x00

### 6.1 Read Temperatur / Supply Voltage / Time Counter Response Frame

	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Bit	7 0	7 0	3 0	7 4	7 0	7 0	7 0	7 0
PV	Mux	Temperature [°C] with [°C] = LSB * 0.1°C	Supply Voltage [V] with [V] = LSB * 0.1 V	Online Time Counter				

## 7 Request Commands

In the sensor, requests are implemented for Name Identification, Process Data Message, Software Identification (firmware version) and Component Identification (serial number).

**DA:** Destination Adress

**SA:** Source Address

### 7.1 Name Identification

Request: 0x18EA80AA DA = 0x80, SA = 0xAA:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>59904</b> 0x18EA80AA	Tx	8 Bytes	0x00	0x80	0x00	0x00	0x00	0x00	0x00	0x00

Response: 0x18EEFF80

PGN CAN-ID	Read/ Transmit	Size	Data								
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	
<b>60928</b> 0x18EEFF80	Rx	8 Bytes	Identity number (21 Bits) 0x00...1FFFFFF				Manufacturer Code (11 Bits) 0x00...0x7FF				

Byte 4			Byte 5		
7	3	2	7	0	0
Function Instance (5 Bits) 0x00...0x1F		ECU Instance (3 Bits) 0x00...0x7	Function (8 Bits) 0x00...0xFF		

Byte 6			Byte 7			
7	1	0	7	6	4	3
Vehicle System (7 Bits) 0x00...0x7F			A	Industry Group (3 Bits) 0x00...0x7	Vehicle System Instance (4 Bits) 0x00...0xF	

#### 7.1.1 Example: Read Name Identification

Request: DA = 0x80; SA = 0x20; General settings = Default

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>59904</b> 18EA8020h	Tx	8 Bytes	0x00	0x80	0x00	0x00	0x00	0x00	0x00	0x00

Response:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>60928</b> 18EEFF80h	Rx	8 Bytes	0x01	0x80	0x00	0x00	0x00	0x00	0x03	0x80

**Note:** Values of Byte [0..7] may vary depending of the device!

### 7.2 Process Data Message

Request 0x18EA80AA DA = 0x80, SA = 0xAA:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>59904</b> 0x18EA80AA	Tx	3 Bytes	0xAA	0xFF	0x00	X*	X	X	X	X

\* X := Don't care

Response: 0x18FEDA80

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65450</b> 0x18EA80	Rx	8 Bytes	Multiturn Position (32 Bits) 0x00...0x002BFFFF				Velocity (16 Bits) 0x00...0xFFFF		Status (8 Bits) 0x00...0xFF	

Byte 7			
3	0	7	4
Checksum (4 Bits) 0x0...0xF		Message Counter (4 Bits) 0x0...0xF	

**7.3 Software Identification**

Request 0x18EA80AA, DA = 0x80, SA = 0xAA:

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>59904</b> 0x18EA80AA	Tx	3 Bytes	0xDA	0xFE	0x00	X*	X	X	X	X

\* X := Don't care

Response: 0x18FED80

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65242</b> 0x18FEDA80	Rx	8 Bytes	Major Byte (8 Bits) 0x00...0xFF	Minor Byte (8 Bits) 0x00...0xFF	Patch Word (16 Bits) 0x00...0xFFFF	Configuration 0: = 'PV' (8 Bits) 0x00...0xFF	Device-ID (16 Bits) 0x00...0xFFFF	-	-	-

Device-ID:

0x0C1D: MC1-2800 series,

0x0C39: MZ1-2200 series

0x0C20: MB1-3600 series

**7.4 Component (Serial Number) Identification**

Request 0x18EA80AA, DA = 0x80, SA = 0xAA

PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>59904</b> 0x18EA80AA	Tx	3 Bytes	0xEB	0xFE	0x00	X	X	X	X	X

\* X := Don't care

Response: 0x18FEEB80


PGN CAN-ID	Read/ Transmit	Size	Data							
			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65259</b> 0x18FEEB80	Rx	8 Bytes	Serial Number (32 Bits) see product label, "B/N XXXXXX/YYY" (6+3 characters)				X	X	X	-

**8 Diagnosis**

**8.1 Process Data in Error Case**

PGN CAN-ID	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
<b>65450</b> 0x18FFAA80								
Position underflow Out of Range+ <b>Error</b>	0xF8	0xFF	0xFF	0x7F	X	X	0x01	X
Position underflow Out of Range- <b>Error</b>	0x08	0x00	0x00	0x80	X	X	0x02	X
Speed limit overflow <b>Error</b>	0x00	0x00	0x00	0x00	0x00	0x00	0x08	X
Position overflow Out of Range+ <b>Warning</b>	0xF8	0xFF	0xFF	0x7F	X	X	0x10	X
Position overflow Out of Range- <b>Warning</b>	0x08	0x00	0x00	0x80	X	X	0x20	X
Measurement failed <b>Error</b>	0x7F	0xFF	0xFF	0xFC	X	X	0x40	X
Internal System / Frontend <b>Error</b>	0x7F	0xFF	0xFF	0xFC	X	X	0x80	X

A flag is set if an error or warning has occurred since the last reboot or flag reset.

 **Caution:**  
 Please be aware that the error flags are once set, they are not being reset automatically !

\* X := Don't care

Position value in case of error: 0x7FFFFFFC  
 Position value in case of position overflow: 0x7FFFFFF8  
 Position value in case of position underflow: 0x80000008  
 Velocity value in case of error: 0

## 8.2 Sensor Status

A flag is set if an error or warning has occurred since the last reboot or flag reset.



Caution: please be aware that the error flags are once set, they are not being reset automatically !

**Single output (see 5.1: PV):** the sensor status is flagged in byte 6.

If a Position Error Reset is triggered, a Frontend Error (bit 7) is set.

If the speed is higher than allowed according to the data sheet, the speed limit overflow (bit 3) is set.

## 8.3 Checksum (CS) and Message Counter

The message PGN 65450 contains the message counter. An additional checksum is formed in the last data Byte. The checksum contains the message counter, so the checksum changes even though the message signals are unchanged. The message counter ranges from 0 to 15.

Checksum according to SPN4207:

$CS = \text{Sum}(\text{Byte}0.. \text{Byte}6 + \text{Message Counter} + \text{message ID})$

$CS = (((CS \gg 6) \& 0x03) + (CS \gg 3) + CS) \& 0x07$

## 9 Network Termination

Models with internal 120 Ω network termination resistor inside the sensor are available on request.

## 10 Abbreviations

ACL	Address Claiming
ACK	Acknowledgement
CAN	Controller Area Network
Ch	Channel
CS	Checksum
DA	Destination Address
NACK	No Acknowledge/Negative Acknowledgement
P	Position
PD	Process Data
PDU	Process Data Unit
PG	Parameter Group
PGN	Parameter Group Number
rw	Read Write
ro	Read only
SLOT	Scaling, Limit, Offset and Transfer Function
SA	Source address
V	Velocity

## 11 Document Changes

Revision	Changes	Date	Who
V00	First edition	18.07.25	VM/mm