OPERATING INSTRUCTIONS

AHS/AHM36 SAE J1939
AHS/AHM36 SAE J1939 Inox

Absolute encoder

SICK
Sensor Intelligence.

Described product

AHS/AHM36 SAE J1939
AHS/AHM36 SAE J1939 Inox

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

SAE J1939

CE UKCA

Contents

1 About this document

Please read this chapter carefully before working with this documentation and the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder.

1.1 Scope

NOTE

These operating instructions apply to the absolute encoders AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox with the following type designations:

- Singleturn Encoder Basic = AHS36B-xxJx004096
- Multiturn Encoder Basic = AHM36B-xxJx012x12
- Singleturn Encoder Advanced = AHS36A-xxJx016384
- Multiturn Encoder Advanced = AHM36A-xxJx014x12
- Singleturn Encoder Inox = AHS36I-xxJx016384
- Multiturn Encoder Inox = AHM36I-xxJx014x12

1.2 Function of this document

These operating instructions are designed to address the technical personnel of the machine manufacturer or the machine operator in regards to correct configuration, electrical installation, commissioning, operation and maintenance of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder.

1.3 Target group

The operating instructions are addressed at the planners, developers and operators of systems in which one or more AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder are to be integrated. They also address people who initialize the use of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox or who are in charge of servicing and maintaining the device.

These instructions are written for trained persons who are responsible for the installation, mounting and operation of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox in an industrial environment.

1.4 Information depth

These operating instructions contain information on the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder on the following subjects:

- product features
- electrical installation
- commissioning and configuration
- fault diagnosis and troubleshooting
- conformity

These operating instructions do not contain any information on the mounting of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox. You will find this information in the mounting instructions included with the device.

They also do not contain any information on technical specifications, dimensional drawings, ordering information or accessories. You will find this information in the product information for the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox.

Planning and using measurement systems such as the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox also requires specific technical skills beyond the information in the operating instructions and mounting instructions. The information required to acquire these specific skills is not contained in this document.

When operating the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox, the national, local and statutory rules and regulations must be observed.

1.5 Symbols used

NOTE
Refer to notes for special features of the device.

LED symbols describe the state of a diagnostics LED. Examples:

- The LED is illuminated constantly.
- The LED flashes evenly.
- The LED flashes with a short duty cycle.
- The LED is off.

▶ Take action ...

Instructions for taking action are shown by an arrow. Read carefully and follow the instructions for action.

CAUTION
Warning!
A warning notice indicates an actual or potential risk or health hazard. They are designed to help you to prevent accidents.
Read carefully and follow the warning notices.

2 Safety information

This chapter deals with your own safety and the safety of the equipment operators.

- ▶ Please read this chapter carefully before working with the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox or with the machine or system in which the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox is used.

2.1 General safety notes and protective measures

CAUTION

Please observe the following procedures in order to ensure the correct and safe use of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox**!**

The encoder is to be installed and maintained by trained and qualified personnel with knowledge of electronics, precision mechanics and control system programming. It is necessary to comply with the related standards covering the technical safety stipulations.

All safety regulations are to be met by all persons who are installing, operating or maintaining the device:

- The operating instructions must always be available and must always be followed.
- Unqualified personnel are not allowed to be present in the vicinity of the system during installation and maintenance.
- The system is to be installed in accordance with the applicable safety stipulations and the mounting instructions.
- All work safety regulations of the applicable countries are to be followed during installation.
- Failure to follow all applicable health and work safety regulations may result in injury or damage to the system.
- The current and voltage sources in the encoder are designed in accordance with all applicable technical regulations.

2.2 Intended use

The AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder is a measuring device that is manufactured in accordance with recognized industrial regulations and meets the quality requirements as per ISO 9001:2008 as well as those of an environment management system as per ISO 14001:2009.

An encoder is a device for mounting that cannot be used independent of its foreseen function. For this reason an encoder is not equipped with immediate safe devices.

Measures for the safety of persons and systems must be provided by the constructor of the system as per statutory regulations.

Due to its design, the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox can only be operated within an SAE J1939 network. It is necessary to comply with the SAE J1939 specifications and guidelines for setting up a SAE J1939 network.

In case of any other usage or modifications to the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox, e.g. opening the housing during mounting and electrical installation, or in case of modifications to the SICK software, any claims against SICK AG under warranty will be rendered void.

2.3 Authorized personnel

The AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder must only be installed, commissioned and serviced by authorized personnel.

NOTE
Repairs to the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox are only allowed to be undertaken by trained and authorized service personnel from SICK AG.

The following qualifications are necessary for the various tasks:

Table 1: Authorized personnel

Activity	Qualification
Mounting	• Basic technical training • Knowledge of the current safety regulations in the workplace
Electrical installation and replacement	• Practical electrical training • Knowledge of current electrical safety regulations • Knowledge on the use and operation of devices in the related application (e.g. industrial robots, storage and conveyor technology)
Commissioning, operation and configuration	• Knowledge on the current safety regulations and the use and operation of devices in the related application • Knowledge of automation systems • Knowledge of SAE J1939 • Knowledge of automation software

2.4 Environmental protection

Please note the following information on disposal.

Table 2: Disposal of the assemblies

Assembly	Material	Disposal
Packaging	Cardboard	Waste paper
Shaft	Stainless steel	Scrap metal
Flange	Aluminium / Stainless steel	Scrap metal
Housing	Aluminium die cast with Zinc nickel coating / stainless steel	Scrap metal
Electronic assemblies	Various	Electronic waste

3 Product description

This chapter provides information on the special features and properties of the Absolute encoder AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox. It describes the construction and the operating principle of the device.

- ▶ Please read this chapter before mounting, installing and commissioning the device.

3.1 Specific features

With male connector

With cable

Table 3: Special features of the encoder variants

Features	Singleturn Encoder Basic	Multiturn Encoder Basic	Singleturn Encoder Advanced	Multiturn Encoder Advanced	Singleturn Encoder Inox	Multiturn Encoder Inox
SAE J1939 interface	■	■	■	■	■	■
12 bit singleturn resolution (1 to 4,096 steps)	■	■	-	-	-	-
14 bit singleturn resolution (1 to 16,384 steps)	-	-	■	■	■	■
12 bit multiturn resolution (1 to 4,096 revolutions)	-	■	-	■	-	■
24 bit total resolution	-	■	-	-	-	-
26 bit total resolution	-	-	-	■	-	■
Absolute encoder in 36 mm design	■	■	■	■	■	■
Non-contact, magnetic scanning	■	■	■	■	■	■
Flexible Cable connection/ M12 male connector	■	■	■	■	■	■
Numerous mechanical adaptation possibilities	■	■	■	■	■	■
Compact design	■	■	■	■	■	■

Features	Singleturn Encoder Basic	Multiturn Encoder Basic	Singleturn Encoder Advanced	Multiturn Encoder Advanced	Singleturn Encoder Inox	Multiturn Encoder Inox
Face mount flange, servo flange, blind hollow shaft	■	■	■	■	■	■
Stainless steel version	-	-	-	-	■	■
IP69K enclosure rating	-	-	-	-	■	■
Programming / configuration via SICK Handheld Programming Tool PGT-12-Pro	■	■	■	■	■	■

3.2 Operating principle of the encoder

The sensing system in the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox is based on absolute acquisition of revolutions without an external voltage supply or battery. As a consequence the encoder can immediately output its absolute position again after switching off and switching back on.

The AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox acquires the position of rotating axes and outputs the position in the form of a unique digital numeric value. The highest reliability is achieved by means of electrosensitive, magnetic scanning.

The AHS36 is a singleturn encoder.

Singleturn encoders are used if absolute acquisition of the rotation of a shaft is required.

The AHM36 is a multiturn encoder.

Multiturn encoders are used if more than one shaft revolution must be acquired absolutely.

3.2.1 Scaleable resolution

The resolution per revolution and the total resolution can be scaled and adapted to the related application.

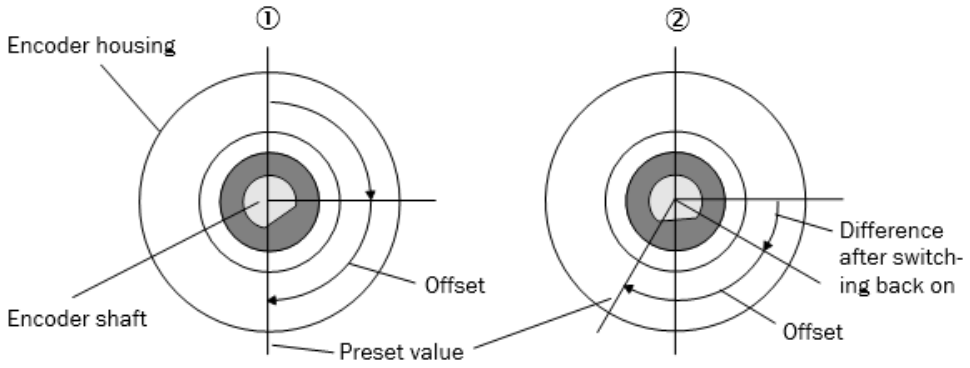
The resolution per revolution can be scaled in integers from 1 ... 4,096 (Basic) or from 1 ... 16,384 (Advanced / Inox).

The total resolution of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox must be 2^n times the resolution per revolution. This restriction is not relevant if the round axis functionality is activated.

3.2.2 Preset function

The position value for an encoder can be set with the aid of a preset value. I.e. the encoder can be set to any position within the measuring range. In this way, e.g., the encoder's zero position can be adjusted to the machine's zero point.

On switching off the encoder, the offset, the difference between the real position value and the value defined by the preset, is saved. On switching back on the new preset value is formed from the new real position value and the offset. Even if the position of encoder changes while it is switched off, this procedure ensures the correct position value is still output.



① on switching off

② on switching back on

3.3 Controls and status indicators

The AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder has one status LED.

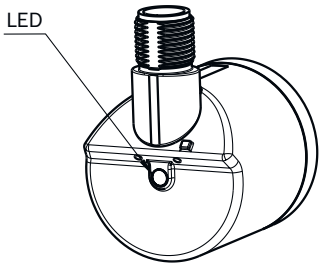


Figure 1: Position of the LED

The LED is multicolored. see table 20, page 28 shows the meaning of the signals.

4 Integration in a SAE J1939 network

4.1 Parameterizable functions

The AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox are configured by means of various parameters.

The most important parameters for parameterizing the functions are shown below.

CAUTION
When parameterizing the encoder, make sure that there are no persons in the hazardous area of a system!

All parameter changes directly affect the operation of the encoder. The position value can therefore change during parameterization, e.g., if a preset is executed or the scaling is changed. This could cause an unexpected movement that could endanger people or damage the system or other objects.

4.1.1 Scaling parameters

Scaling

This parameter enables the resolution per revolution or the total resolution to be scaled.

Code sequence

The code sequence determines in which direction of rotation the position value increases when viewed in the direction of the shaft.

- Clockwise (cw) = increasing position value when the shaft rotates clockwise
- Counterclockwise (ccw) = increasing position value when the shaft rotates counterclockwise

The resolution of the AHS/AHM36 SAE J1939 Basic is max. 4,096 steps per revolution. The resolution is scalable in whole number increments from 1 ... 4,096.

The resolution of the AHS/AHM36 SAE J1939 Advanced / Inox is max. 16,384 steps per revolution. The resolution is scalable in whole number increments from 1 ... 16,384.

The total resolution, i.e., the measuring range of the AHM36 SAE J1939 Basic, is max. 16,777,216 steps. The total resolution of the AHM36 SAE J1939 Advanced / Inox is max. 67,108,864 steps.

The total resolution must be 2^n times the resolution per revolution.

Table 4: Examples for total resolution

Resolution per revolution	n	Total resolution
1,000	3	8,000
8,179	5	261,728
2,048	11	4,194,304

4.1.2 Preset function

The preset function can be used to set the position value of the encoder. I. e. the encoder can be set to any position within the measuring range.

NOTE
The preset value must be within the configured measuring range.

CAUTION

Before triggering the preset function, check whether there is any danger from the machine or system in which the encoder is integrated!

The preset function leads to a change of the position value output by the encoder. This could cause an unexpected movement that could endanger people or damage the system or other objects.

4.1.3 Speed measurement

Possible units are:

- cps = counts per second
- cp10 ms = counts per 10 ms
- cp100 ms = counts per 100 ms
- rpm = revolutions per minute
- rps = revolutions per second

The factory setting is rpm.

NOTE

The unit of speed should be selected so that the maximum speed value occurring in the application can be represented in the selected PGN. (TxPGN1 only 2 bytes for speed)

5 SAE J1939 interface

This section contains general information about using the CAN protocol with extended 29-bit CAN identifiers. This 29-bit CAN frame format is the only format allowed for J1939 CAN messages. Standard 11-bit CAN frames can, however, also be used in the network.

5.1 Protocol data unit

The protocol data unit (PDU) provides a framework for organizing the information essential to each CAN data frame sent. The extended CAN data frame used for the SAE J1939 protocol is divided into seven fields. The 29-bit identifier is composed of six fields.

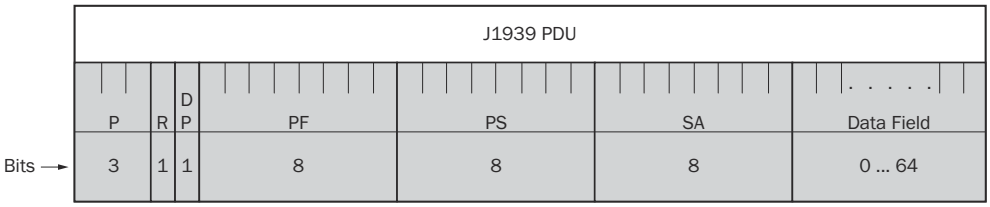


Figure 2: Definition of the extended CAN data frame (29-bit identifier + data field)

Components of the 29-bit identifier

P – Priority

These three bits are used to optimize message latency for transmission (3 bits).

R – Reserved

Value is always 0 (1 bit).

DP – Data Page

Value is always 0 (1 bit).

PF – PDU Format

This field is used to specify the parameter group number (PGN). Parameter group numbers identify or label information that require one or more CAN data frames to transmit them. The PDU format is the mid-byte of the parameter group number. see figure 3, page 15

PS – PDU Specific

This field depends on the value of PDU Format, and contains either a destination address or a group extension, depending on PDU Format. If the value of the PDU Format field is less than 240, the PDU Specific field contains a destination address. If the value of the PDU Format field is between 240 and 255, the PDU Specific field contains a group extension value. PDU2 format messages are global messages.

Table 5: PDU definition

	PDU Format field	PDU Specific field
PDU1 format	0 - 239	Destination address
PDU2 format	240 - 255	Group extension

Specific Destination Address (DA)

This field defines the specific address to which the message is being sent. All other destinations should ignore this message. In the case of the global destination address (255), all devices are required to listen and respond as message recipients.

Group Extension (GE)

The Group Extension field provides 4,069 parameter groups per page.

Source Address (SA)

There should only be one device on the network with a given source address. The Source Address field therefore ensures the CAN identifier is unique, as required by CAN.

Data field

The J1939 protocol data unit (PDU) can contain up to 8 bytes, as per the definition of the CAN data frame.

5.2 Parameter group number

The PGN uniquely identifies the parameter group (PG) that is being transmitted in the message. Every PG (grouping of specific parameters) has its own specific definition comprising the assignment of each parameter within an 8-byte data field (size in bytes, location of the LSB), and the transmission rate and priority of the message.

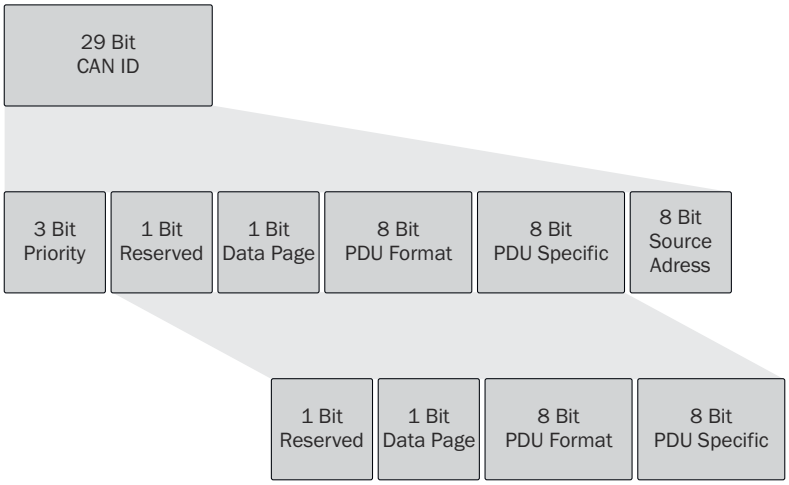


Figure 3: Parameter group number

Generally speaking, a distinction can be made between messages that are exchanged between two nodes by direct addressing (PDU format 1), and broadcast messages that are send to all nodes on the bus (PDU format 2).

The PDU format values 00h to EFh are reserved for point-to-point messages; the PGN also contains the destination address. Broadcast messages are sent with PDU format values from F0h to FFh. The Group Extension field increases the number of available broadcast messages. The encoder uses broadcast messages with PDU format 2 to send the process data. Direct addressing in PDU format 1 using the Proprietary A PGN is supported for configuration.

5.3 Device name and address

With the factory settings, the encoder starts with the address 224d (E0h). Dynamic address allocation is supported. At startup the encoder sends a suitable address claim telegram with the address used. This message contains the 64-bit device name by means of which the sensor can be uniquely identified. The priority on the bus is also determined based on the name.

The 64-bit device name contains the following fields:

- Arbitrary Address Capable, support for dynamic address allocation (1 bit)
- Industry Group (3 bits)
- Vehicle System Instance (4 bits)
- Vehicle System (7 bits)
- Function (8 bits)
- Function Instance (5 bits)
- ECU Instance (3 bits)
- Manufacturer Code (11 bits)
- Identity Number (21 bits)

The Manufacturer Code represents the manufacturer identification SICK AG (value 885 decimal).
The Identity Number corresponds to the J1939 serial number of the encoder.

The following fields of the device name are predefined as factory defaults:

- Manufacturer Code: 885 (SICK AG)
- Identity Number: J1939 serial number of the sensor
- Industry Group: 0
- Vehicle System: 0
- Function: 142 (Rotation Sensor)

The remaining ranges can be modified by the user via the configuration protocol (see "Sensor configuration").

5.4 Process data (transmit PGNs)

The device supports 3 different parameter groups (TxPGNs):

- TxPGN1 65504 (FFE0h): Position (4 bytes), speed (2 bytes), status (2 bytes)
- TxPGN2 65505 (FFE1h): Position (4 bytes), temperature (2 bytes), status (2 bytes)
- TxPGN3 65506 (FFE2h): Speed (4 bytes), temperature (2 bytes), status (2 bytes)

Activation/deactivation of sending, the cycle time, and the priority of messages can be set using configuration messages. By default, TxPGNs 65504 (FFE0) are activated with a cycle time of 10 ms.

Table 6: Overview of transmit PGNs

PGN	FFE0 (default)	FFE1	FFE2
Byte 1	Position	Position	Speed (32 bit)
Byte 2	Position	Position	Speed (32 bit)
Byte 3	Position	Position	Speed (32 bit)
Byte 4	Position	Position	Speed (32 bit)
Byte 5	Speed (16 bit)	Temperature	Temperature
Byte 6	Speed (16 bit)	Temperature	Temperature
Byte 7	Status	Status	Status
Byte 8	Status	Status	Status

5.4.1 Position

Table 7: Position

Name	Access	Data type	Designation Description	Data values
Position	R	UINT-32	Current position value	Depending on the selected resolution (parameter index 130 and 131)

5.4.2 Speed

Table 8: Speed

Name	Access	Data type	Designation Description	Data values
Speed	R	INT-16 / INT-32	Current speed value	Depending on the selected speed format (parameter index 132)

Depending on the selected speed format and the speed occurring in the application, the appropriate data type (INT-16 or INT-32) must be selected for the output of the speed value.

5.4.3 Temperature

Table 9: Temperature

Name	Access	Data type	Designation Description	Data values
Temperature	R	INT-16	Temperature Value Operating temperature in °C[1]	-40 ... +100 °C

1 May deviate from ambient temperature by up to 15 °C, depending on approach and encoder speed.

5.4.4 Status

Table 10: Status

Bit	Description
15	Memory error: Invalid EEPROM checksum on initialization
14	Reserved

Bit	Description
13	Error of the Sync multi counter: • Speed exceeds the upper limit of 12,500 rpm or • Number of current errors on the calculation of the singleturn position above the limit of 10 errors
12	Reserved
11	Position error: Invalid or no synchronization from the singleturn counter to the multiturn counter
10	Positionsfehler: Singleturn position incorrect
9	Position error: Error on the calculation of the vector length $Sin^2 + Cos^2$ in the multiturn stage
8	Position error: Error on the calculation of the vector length $Sin^2 + Cos^2$ in the singleturn stage
7	Position and memory error: Invalid communication with the I^2C device in the main module
6	Position error: Error on the calculation of the amplitude values Sin + Cos in the singleturn stage
5	Warning in relation to the speed: Current measured value outside of the minimum or maximum limit
4	Position error: Error on the calculation of the amplitude values, Sin + Cos in the multiturn stage
3	Warning in relation to the supply voltage: Current measured value outside of the minimum or maximum limit
2	Reserved
1	Warning in relation to the temperature: Current measured value outside of the minimum or maximum limit
0	Warning: General start-up error at power-on

5.4.5 Change of the Group Extension

The Group Extension, or the Least Significant Byte of the three PGNs can be changed to avoid PGNs with the same designation in the network.

PGN0: Parameter index 139

PGN1: Parameter index 142

PGN2: Parameter index 146

5.5 Sensor configuration

Proprietary A PGN 61184 (point-to-point) is used to configure the sensor. The structure of the data part of the message is as follows:

Table 11: Structure of the Data Part of the Message

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5 - 8
Message ID see "Message ID", page 19	Parameter index see "Parameter index", page 20	Parameter length see "Parameter length", page 20	Error code see "Error code", page 21	Parameter value see "Parameter value", page 21

5.5.1 Message ID

The relevant action is defined via the message ID:
If the parameter is one, a read command was requested, if however the parameter is two, the received data is written to the encoder.

Table 12: Message ID

Value	Meaning
0	Parameter data
1	Read parameters
2	Write the parameters

Read parameter

The counterpart CA reads a parameter from the encoder CA.

Request from counterpart CA

If the counterpart wants to read a parameter from the encoder, the message ID must have the value one. In this case the counterpart CA sends the following message to the encoder, e.g., read counting direction.

29-bit identifier						Data field							
Priority	R	DP	PDU	DestAdr Enc-Adr.	SourAdr Counter- part Adr.	Mes.ID	Param-Idx	Param-Lngt	Err-code	D5	D6	D7	D8
7	0	0	**239**			1	129	1	0	0	0	0	0

Response from encoder CA

A successful encoder response to the counterpart CA read request shows, for example, that the actual counting direction is cw (clockwise).

29-bit identifier						Data field							
Priority	R	DP	PDU	Counter-part Adr	SourAdr Enc Adr.	Mes.ID	Param-Idx	Param-Lngt	Err-code	D5	D6	D7	D8
7	0	0	**239**			0	129	1	0	0	0	0	0

Write parameter

The counterpart CA changes a parameter within the encoder CA.

Request from counterpart CA

If the counterpart wants to change the encoder parameters, the message ID must have the value two. In this case the counterpart CA sends the following message to the encoder, for example to change the counting direction to ccw (counterclockwise).

29-bit identifier						Data field							
Priority	R	DP	PDU	DestAdr Enc-Adr.	SourAdr Counter- part Adr.	Mes.ID	Param-Idx	Param-Lngt	Err-code	D5	D6	D7	D8
7	0	0	**239**			2	129	1	0	1	0	0	0

Response from the encoder CA

A successful encoder response to the counterpart CA write request shows, for example, that the actual counting direction was set to ccw.

29-bit identifier						Data field							
Pri-ority	R	DP	PDU	DestAdr Coun-ter- part Adr	SourAdr Enc-Adr	Mes.ID	Param-Idx	Param-Lngt	Err-code	D5	D6	D7	D8
7	0	0	**239**			0	129	1	0	1	0	0	0

A failed encoder response to a counterpart CA write request shows, for example, that parameter index 136 is not supported, as indicated by error code 01.

29-bit identifier						Data field							
Pri-ority	R	DP	PDU	DestAdr Coun-ter- part Adr	SourAdr Enc-Adr	Mes.ID	Param-Idx	Param-Lngt	Err-code	D5	D6	D7	D8
7	0	0	**239**			0	136	1	1	1	0	0	0

5.5.2 Parameter index

The parameter index defines which parameter is addressed, e.g., index 129 as the parameter for the counting direction. All parameters are listed in the Parameter value section see "Parameter value", page 21.

5.5.3 Parameter length

The parameter length specifies the number of parameter value data. All parameters are listed in the Parameter value section see "Parameter value", page 21.

5.5.4 Error code

The error code is only relevant if the relevant telegram is sent by the encoder (message ID is 0). The error code signals the success of the write command within the response message. The remote CA receives a response to a write command and also to a read command. If the value within the error code segment is not zero, the previous command was not executed successfully.

Table 13: Error code

Value (hex)	Meaning
00	Successful
01	Parameter not available
02	Parameter length incorrect
03	Parameter value too high/low
04	Parameter value not supported
05	An attempt was made to read a "write-only" parameter
06	An attempt was made to write a "read-only" parameter
07	Message ID is not supported
FF	Unknown error

5.5.5 Parameter value

The parameter value contains the parameter user data. The data appears left-aligned and little endian.

The encoder is configured via the Configuration PGN EF00. The following parameters can be read and/or written via this.

Table 14: Parameter value

8 data byte		Access ro = read only rw = read / write wo = write only	Parameter description	Default value
Byte 2	Byte 3			
Parameter index	Parameter length			
0	UINT8	ro	Firmware version major/minor/sub	e.g., 110
1	UINT32	ro	Firmware version sub/sub	e.g., 132R
2	UINT16	ro	Serial number YYWW (e.g., 2118 = year 2021, calendar week 18)	
3	UINT32	ro	Serial number NNNN (consecutive number, e.g., 0112)	
4	UINT16	ro	StatusFlagA	00
5	UINT32	ro	Vendor ID	885
6	UINT32	ro	Product ID	AHS36B: 0x7721; AHM36B: 0x7722; AHS36A: 0x7723; AHM36A: 0x7724; AHS36I: 0x7725; AHM36I: 0x7726
7	UINT16	rw	Baud rate (125, 250 and 500 kbit/s)	250
8	UINT8	rw	Industry group	3
9	UINT8	ro	Vehicle system	0
10	UINT8	ro	Function	142
106	UINT8	ro	Product ID 7-digit art.-no. (the complete product ID can be read using an offset value (byte5))	
107	UINT8	ro	Product name (AHx36x-xxJxxxxx) (the complete product name can be read using an offset value (byte5))	
128	UINT32	ro	Total measuring range modified	AHS36B: 4.096; AHM36B: 16.777.216; AHS36A: 16.384; AHM36A: 67.108.864; AHS36I: 16.384; AHM36I: 67.108.864
129	UNIT8	rw	Counting direction (0 = clockwise = cw; 1 = counterclockwise = ccw)	cw
130	UINT32	rw	Steps per revolution	AHS36B: 4.096; AHM36B: 4.096; AHS36A: 16.384; AHM36A: 16.384; AHS36I: 16.384; AHM36I: 16.384
131	UINT32	wo	Total measuring range	AHS36B: 4.096; AHM36B: 16.777.216; AHS36A: 16.384; AHM36A: 67.108.864; AHS36I: 16.384; AHM36I: 67.108.864

8 data byte		Access ro = read only rw = read / write wo = write only	Parameter description	Default value
Byte 2	Byte 3			
Parameter index	Parameter length			
132	UINT32	rw	Speed format (counts per second cps = 0; counts per 100 ms cp100 ms = 1; counts per 10 ms cp10 ms = 2; rounds per minute rpm = 3; rounds per second rps = 4)	3
133	UINT32	rw	T1 Update Time in MS Update time in ms (AHS36: 1 ... 2 ms, AHM36: 1 ... 50 ms)	2
134	UINT32	rw	T2 Integration Time Integration cycle dependent on T1 (T2 = 1 ... 200) The speed is calculated from the average of several measurements. The integration cycle T2 specifies the number of values from which the average is calculated. The update time T1 indicates the time interval between the individual measurements. Example: If T1 = 2 ms and T2 = 200, then the speed is calculated from the last 0.4 s.	200
135	UINT8	rw	Function instance 0 ... 31	0
136	UINT8	rw	ECU instance 0 ... 7	0
137	UINT32	rw	PDU time PGN0 (0xFFE0): 0: deactivated 10 ... 10,000 ms	10
138	UINT8	rw	Prio PGN0 (0xFFE0) 0 ... 7	3
139	UINT8	rw	Group extension / Least significant byte of PGN 0 0x00 ... 0xFF (default 0xE0)	0xE0
140	UINT32	rw	PDU time PGN1 (0xFFE1): 0: deactivated 10 ... 10,000 ms	0
141	UINT8	rw	Prio PGN1 (0xFFE1) 0...7	3
142	UINT8	rw	Group extension / Least significant byte of PGN 1 0x00...0xFF (default 0xE1)	0xE1
144	UINT32	rw	PDU time PGN2 (0xFFE2) 0: deactivated 10 ... 10,000 ms	0
145	UINT8	rw	Prio PGN2 (0xFFE2) 0 ... 7	3
146	UINT8	rw	Group extension / Least significant byte of PGN 2 0x00...0xFF (default 0xE2)	0xE2
147	UINT8	rw	Vehicle System Instance	0
148	UINT8	rw	Arbitrary address capable bit (AACB) see Interface Application	1
149	UINT8	rw	Encoder address see Interface Application	0xE0
200	UINT32	wo	PresetValue SetPreset	-

8 data byte		Access ro = read only rw = read / write wo = write only	Parameter description	Default value
Byte 2	Byte 3			
Parameter index	Parameter length			
254	UINT8	wo	Power cycle - Start of a power cycle for the encoder reset	-
255	UINT8	wo	Factory Reset - Resets the encoder to factory settings	-

5.5.6 Examples of parameter changes

5.5.6.1 Set preset value - set encoder to position value 0

Table 15: Set encoder to position value 0

8 data byte								Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
Message ID	Param-Idx	Param-Lgth	Error code	Param-Val[0]	Param-Val[1]	Param-Val[2]	Param-Val[3]	
02	C8 (200 dec)	UINT32	00	00	00	00	00	Set preset value
00	C8 (200 dec)	UINT32	00	00	00	00	00	Read preset value

5.5.6.2 Change resolution - steps per revolution

Table 16: Change resolution - steps per revolution

8 data byte								Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
Message ID	Param-Idx	Param-Lgth	Error code	Param-Val[0]	Param-Val[1]	Param-Val[2]	Param-Val[3]	
1	82 (130 dec)	UINT32	00	00	00	00	00	Read steps per revolution
00	82 (130 dec)	UINT32	00	00	10	00	00	Steps per revolution result = 4,096
2	82 (130 dec)	UINT32	00	00	08	00	00	Change steps per revolution to 2,048
00	82 (130 dec)	UINT32	00	00	08	00	00	Steps per revolution result = 2,048

5.5.6.3 Change resolution - total measuring range

Table 17: Change resolution - total measuring range

8 data byte								Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
Message ID	Param-Idx	Param-Lgth	Error code	Param-Val[0]	Param-Val[1]	Param-Val[2]	Param-Val[3]	
1	83 (131 dec)	UINT32	00	00	00	00	00	Read total measuring range
00	83 (131 dec)	UINT32	00	00	00	00	01	Total measuring range result = 16.777,216
2	83 (131 dec)	UINT32	00	00	00	80	00	Change total measuring range to 8.388,608

8 data byte								Description
Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	
Message ID	Param-Idx	Param-Lgth	Error code	Param-Val[0]	Param-Val[1]	Param-Val[2]	Param-Val[3]	
00	83 (131 dec)	UINT32	00	00	00	80	00	Total measuring range result = 8.388,608

6 Commissioning

This chapter provides information on the electrical installation, configuration and commissioning of the Absolute encoder AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox.

- Please read this chapter before mounting, installing and commissioning the device.

6.1 Electrical installation

CAUTION
Switch the voltage supply off!

The machine/system could unintentionally start up while you are connecting the devices.

- Ensure that the entire machine/system is disconnected during the electrical installation.

For the electrical installation you will need male and female connectors (see product information for the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox).

6.1.1 Connecting the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox

The M12 male connector of the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox is located at the rear of the device. It is designed to be rotatable. This allows it to be used either angled upwards, to the left or to the right, or (as shown) axially to the rear. The cable can also be aligned as required by the application.

With male connector

With cable

The connection of the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox is either implemented as a male connector, M12, 5-pin or as a cable connection with flying leads.

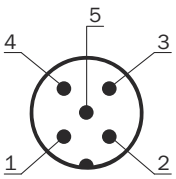


Figure 4: Male connector of the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox

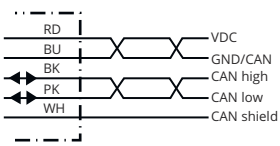


Figure 5: Cable connection of the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox

Table 18: PIN and wire allocation

PIN Male connector	Wire colors Cable connection	Signal	Function
1	White	Shield	Shield
2	Red	VDC	Encoder supply voltage 10 ... 30 VDC
3	Blue	GND/CAN GND	0 V (GND)
4	Black	CAN HIGH	CAN signal
5	Pink	CAN LOW	CAN signal
Housing		-	Shield

Table 19: Maximum length of the stub cable

Baud rate	Length of a single stub cable	Total length of all stub cables
500 kbit/s	< 5 m	< 25 m
250 kbit/s	< 10 m	< 50 m
125 kbit/s	< 20 m	< 100 m

6.1.2 Delivery state

The AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox are supplied with the following parameters:

- Code sequence = cw, clockwise
- Scaling = none
- Resolution per revolution AHx36 Basic = 4,096
- Resolution per revolution AHx36 Advanced / Inox = 16,384
- Total resolution AHS36 Basic = 4,096
- Total resolution AHM36 Basic = 16,777,216
- Total resolution AHS36 Advanced / Inox = 16,384
- Total resolution AHM36 Advanced / Inox = 67,108,864
- Preset value = 0
- Unit of speed measurement = rpm

6.1.3 Checks before initial commissioning

CAUTION
Do not commission without an inspection by an authorized person!
Before you start up a system equipped with the AHS/AHM36 SAE J1939 and AHS/AHM36 SAE J1939 Inox for the first time, it must be checked and approved by authorized personnel. Note the instructions relating to this in “For safety”, page 9.

7 Fault diagnosis

This chapter describes how to identify and rectify errors and malfunctions of the AHS/AHM36 SAE J1939 und AHS/AHM36 SAE J1939 Inox Absolute encoder.

7.1 In the event of faults or errors

CAUTION
Cease operation if the cause of the malfunction has not been clearly identified!
Stop the machine if you cannot clearly identify or allocate the error and if you cannot safely rectify the malfunction.

7.2 Support

If you cannot remedy an error with the help of the information provided in this chapter, please contact your local SICK subsidiary.

7.3 Error and status indications on the LED

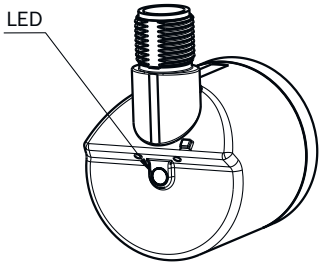


Figure 6: Position of the LED

7.3.1 Meaning of LED indicators

The LED indicates the status of the SAE J1939 stack and errors on the CAN bus.

Table 20: Meaning of LED indicators

Display		Description
Status indicator		
☼	Green	Status SAE J1939 Stack = Stopped
☼	Green	Status SAE J1939 Stack = Pre-Operational
●	Green	Status SAE J1939 Stack = Operational
Fault indicators		
○	Off	No supply voltage
●	Red	BUS OFF - The SAE J1939 client is disconnected from the bus
☼	Red	Invalid configuration
☼	Red	Warning Limit reached. (Counter of the internal CAN controller has reached the warning level for error frames)

8 Annex

8.1 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

8.1.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

8.1.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

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