A3M60 Basic

PROFIBUS Absolute Encoder

GB

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Contents

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1 About this document

Please read this chapter carefully before working with this documentation and the A3M60 Basic PROFIBUS Absolute Encoder.

1.1 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 mounting, configuration, electrical installation, commissioning, operation and maintenance of the A3M60 Basic PROFIBUS Absolute Encoder.

1.2 Target group

The operating instructions are addressed at the *planers*, *developers* and *operators* of systems in which one or more A3M60 Basic PROFIBUS Absolute Encoders are to be integrated. They also address people who initialize the use of the A3M60 Basic 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 A3M60 Basic in an industrial environment.

1.3 Information depth

These operating instructions contain information on the A3M60 Basic PROFIBUS Absolute Encoder on the following subjects:

- electrical installation
- part numbers
- putting into operation and configuration
- conformity and approval
- fault diagnosis and troubleshooting

The operating instructions do not contain any information on the mounting of the A3M60 Basic. You will find this information in the mounting instructions included with the device.

Planning and using measurement systems such as the A3M60 Basic also require specific technical skills beyond the information in the operating instructions and mounting instructions which are not provided in this document.

When operating the A3M60 Basic, the national, local and statutory rules and regulations must be observed.

Further information

PROFIBUS Nutzerorganisation e.V. (PNO), Haid-und-Neu-Str. 7, D-76131 Karlsruhe
Web: www.profibus.com

Further literature and guidelines:

- PROFIBUS DP specification
- Guideline for PROFIBUS DP/FMS (V1.0), Order No. 2.112
- PROFIBUS RS-485-IS User and Installation Guideline. (V1.1), Order No. 2.262
- Profile for PROFIBUS DP-V0 Encoders (V1.1), Order No. 3.062
- M. Popp, PROFIBUS DP/DPV1, (Huethig, 2000), ISBN 3-7785-2781-9
- The New Rapid Way to PROFIBUS DP (2002), Order No. 4.072
- PROFIBUS System Description (Vers. 10/2002), Order No. 4.002

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1.4   Scope

These operating instructions are original operating instructions.

Note These operating instructions apply to the A3M60 Basic PROFIBUS Absolute Encoders with the type identifier A3M60B-xxx.

1.5   Abbreviations used

DP Decentralized Periphery

EEPROM Electrically Erasable Programmable Read-only Memory

FRAM Ferroelectric Random Access Memory

GSD Generic Station Description file = The characteristic communication features of a PROFIBUS device are described in the form of an electronic device data sheet.

IO Input and Output Data

LSW Least Significant Word

MSW Most Significant Word

PAW Peripherie Ausgangswort = peripheral output word

PEW Peripherie Eingangswort = peripheral input word

1.6   Symbols used

Note Refer to notes for special features of the device.

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

WARNING

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 On safety

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

➢ Please read this chapter carefully before working with the A3M60 Basic or the machine or system in which the A3M60 Basic is used.

2.1 Authorized personnel

The A3M60 Basic PROFIBUS Absolute Encoder must only be installed, commissioned and serviced by authorized personnel.

Note   Repairs to the A3M60 Basic are only allowed to be undertaken by trained and authorized service personnel from SICK STEGMANN GmbH.

The following qualifications are necessary for the various tasks:

Tab. 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 decentralized peripheral systems on the PROFIBUS DP • Knowledge of the usage of automation software (e.g. SIMATIC Manager)

2.2 Correct use

The A3M60 Basic PROFIBUS Absolute Encoder is a measuring device that is manufactured in accordance with recognized industrial regulations and that meets the quality requirements in accordance with ISO 9001.

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.

The A3M60 Basic is only allowed to be operated in a PROFIBUS DP network as per its purpose defined by its design. It is necessary to comply with the PROFIBUS DP specifications and guidelines for setting up a PROFIBUS DP network.

In case of any other usage as well as in case of modifications to the A3M60 Basic, e.g. due to opening the housing during mounting and electrical installation, or to the SICK software, any claims against SICK STEGMANN GmbH under the warranty will be rendered void.

2.3   General safety notes and protective measures

WARNING

Please observe the following procedures in order to ensure the correct and safe use of the A3M60 Basic.

The encoders are 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.

The safety regulations are to be met by all persons who are tasked with the installation, the operation or the maintenance of 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.
- The system is to be installed in accordance with the applicable safety stipulations and the mounting instructions.
- The work safety regulations published by the Berufsgenossenschaften (trade associations) and specialist associations in the related country are to be followed during installation.
- Failure to follow the applicable health and safety regulations may result in injury or damage to the system.
- The current sources and voltage sources in the encoders are designed as per the applicable technical regulations.

2.4   Environmental protection

Please note the following information on disposal.

Tab. 2: Disposal of the assemblies

Assembly	Material	Disposal
Packaging	Cardboard	Waste paper
Shaft	Stainless steel	Scrap metal
Flange	Aluminium	Scrap metal
Electronic assemblies	Various	Hazardous waste

3   Product description

This chapter provides information on the special features and properties of the A3M60 Basic PROFIBUS Absolute Encoder. It describes the construction and the operating principle of the device.

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

3.1   Special features

The A3M60 Basic is a PROFIBUS Absolute Encoder in 60 mm design. The highest reliability is achieved by means of electro-sensitive, magnetic scanning. The high resolution Hall sensor combines a magnetic sensor with the high resolution that otherwise only optical sensors achieve.

Due to direct multiturn technology with a small number of moving parts, long and trouble-free operation is ensured.

The following properties characterize the A3M60 Basic:

- communication modules for position value and preset or position value, time stamp, speed and preset
- output of the position value with a resolution of 26 bits
- total resolution (measuring range) maximum 67,108,864 steps
- resolution per revolution maximum 8,192 steps
- total resolution and resolution per turn can be scaled
- PROFIBUS DP interface
- The encoder is a slave with cyclic data transmission (DP-V0).

3.2   Operating principle of the encoder

The sensor system in the A3M60 Basic PROFIBUS Absolute Encoder is based on absolute acquisition of revolutions without an external supply and without a battery.

The A3M60 Basic acquires the position of rotating axes and outputs the position in the form of a unique digital numeric value. The A3M60 Basic can be used as a singleturn encoder or multiturn encoder.

Singleturn technology with Hall sensor

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

A high resolution Hall sensor supplies analog data to the microcontroller for the calculation of the absolute position within a revolution.

Multiturn technology with the aid of Wiegand wire technology

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

- A magnet is mechanically attached to the encoder shaft.
- The rotating magnet generates a step change in the magnetic field in the Wiegand wire.
- This step change in the magnetic field generates a voltage pulse in the surrounding coil.
- The voltage pulse supplies a FRAM counter with energy.
- The turns are counted.

3.3   Integration in the PROFIBUS

The A3M60 Basic is a PROFIBUS peripheral device and is integrated in the PROFIBUS as a slave.

The A3M60 Basic complies with the requirements for the PROFIBUS-DP protocol V0 as per EN 50 170-2 and the requirements for the encoder profile version 1.1 class 1 and class 2.

Version DP-V0 of the A3M60 Basic communicates using cyclic data exchange with the master.

The encoder is an input/output device. This means that the encoder uses data from the master on the bus (output data) and also produces data for the bus itself (input data).

3.3.1   RS-485 interface

PROFIBUS DP and therefore also the A3M60 Basic use RS-485 for the transmission technology. The cabling is twisted pair. The transmission speed can be selected in the bus system in the range between 9.6 kbit/s and 12 Mbit/s, the A3M60 Basic automatically adjusts to suit.

The following cable lengths can be realized as a function of the transmission speed:

Tab. 3: Realizable cable lengths for the RS-485 interface

Baud rate [kbit/s]	9.6	19.2	93.75	187.5	500	1500	12000
Cable length [m]	1200	1200	1000	1000	400	200	100

Note   Up to 32 stations (masters or slaves) can be connected together in a segment. With more than 32 stations, repeaters (line amplifiers) must be used to connect the individual bus segments.

3.3.2   GSD file

Common configuration tools (e.g. STEP7 for SIMATIC) require a GSD file to integrate the device into the network.

The GSD file STEG0CA7.gsd for the A3M60 Basic is available at www.sick.com for download.

3.4   Communication message

Depending on the communication module selected, the following information can be configured as process data:

3.4.1   Message IO-04

- input (slave to PLC): position
- output (PLC to slave): preset value

Tab. 4: Input data in the message IO-04

Data word	1	2
Value	Position MSW[1]	Position LSW[2]

Tab. 5: Output data in the message IO-04

Data word	1	2
Value	Preset MSW[1]	Preset LSW[2]

3.4.2   Message IO-08

- input (slave to PLC): position, velocity, time stamp
- output (PLC to slave): preset value

Tab. 6: Input data in the message IO-08

Data word	1	2	3	4
Value	Position MSW	Position LSW	Velocity	Time stamp

Tab. 7: Output data in the message IO-08

Data word	1	2	3	4
Value	Preset MSW	Preset LSW	not used	not used

3.4.3   Position

The position is output in message IO-04 or IO-08 as an input to the PLC.

The position is stated in steps. The value is output in two data words (4 bytes). The value range is always between 00000000 … 03FFFFFFh. The top limit is defined using the configurable parameter **Total Measuring Range** (see section 3.5 "Functions for which parameters can be set" on page 13).

⚠

WARNING

Evaluate bit 31 of the input data using your control system to detect serious errors!

If, in the case of serious error, it cannot be ensured the position output is correct, this situation is indicated by setting the most significant bit 31. The position value is then outside the valid range and can be identified as clearly erroneous (see section 5.3.2 "Diagnostics message" on page 22).

[1]   Most significant word.
[2]   Least significant word.

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3.4.4   Preset

The preset value is applied in message IO-04 or IO-08 as an output from the PLC.

With the aid of a preset value the encoder can be set to any position within the measuring range. The value is transmitted in two data words (4 bytes) in the output data.

The preset value is activated by setting bit 31. The current position value is only set to the preset value if bit 31 was set to "0" in the previous cycle, i.e. on a transition from "0" to "1".

Example of setting the preset value

Tab. 8: Example of setting the preset value

Data word		1	2
Step 1			
Input	**Hex**	0000	00AA
	Bin	0000000000000000	0000000010101010
	Dec		170
Comment: The encoder outputs the current position (00AAh) as **Input**.			
Output	**Hex**	0000	FFFF
	Bin	0000000000000000	1111111111111111
	Dec		65535
Comment: Bit 31 of the **output** is 0, the preset value (FFFFh) is not applied. The encoder therefore continues to output the measured position 00AAh in step 2 that follows.			
Step 2			
Input	**Hex**	0000	00AA
	Bin	0000000000000000	0000000010101010
	Dec		170
Output	**Hex**	8000	FFFF
	Bin	**1**000000000000000	1111111111111111
	Dec		2147549183 (= 2^{31}+65535)
Comment: Bit 31 of the **output** changes to 1, the preset (FFFFh) is applied and output in step 3 as **input**.			
Step 3			
Input	**Hex**	0000	**FFFF**
	Bin	0000000000000000	1111111111111111
	Dec		65535
Output	**Hex**	0000	FFFF
	Bin	0000000000000000	1111111111111111
	Dec		65535

⚠ WARNING

Immediately after triggering the preset function, check whether there is a hazard from the machine or system in which the encoder is integrated!

The preset function results in a change in the position value output by the encoder. This change could cause an unexpected movement that may result in a hazard for persons or damage to the system or other items.

3.4.5 Speed and time stamp

The speed and time stamp are output in message IO-08 as input to the PLC.

The speed is stated in revolutions per minute (rpm). The value is given in a data word (2 bytes) and has a sign, i.e. negative values for reducing position values (e.g. FF.FEh = –2).

The calculation is made using a moving average filter over 200 position values. The integration time is 1 s, the update interval is 5 ms.

The time stamp is incremented in steps of 1 s. The value is given in a data word (2 bytes). After each power-up the time stamp is reset to zero.

3.5 Functions for which parameters can be set

The A3M60 Basic is configured using the configuration tool for a PLC (e.g. STEP7 for SIMATIC).

3.5.1 Code sequence

The code sequence defines the direction of rotation, viewed on the shaft, in which the position value increases.

• clockwise = increasing position value on clockwise rotation of the shaft
• counterclockwise = increasing position value on counter clockwise rotation of the shaft

3.5.2 Class 2 functionality

The class 2 functionality is activated from the factory. This parameter permits or prevents changes to the following parameters:

code sequence, scaling and implementation of a preset

3.5.3 Scaling

Scaling makes it possible to scale the resolution per revolution and the total resolution.

Note   Only if the parameter **Scaling** is configured to **Enable** are the values entered for the resolution and total resolution applied.

3.5.4 Resolution per revolution

The resolution is max. 8,192 steps per revolution. The resolution can be scaled from 1 … 8,192 as an integer.

3.5.5 Total resolution/measuring range

The total resolution, that is the measuring range of the A3M60 Basic is max. 67,108,864 steps. The total resolution must be 2^n times the resolution per revolution.
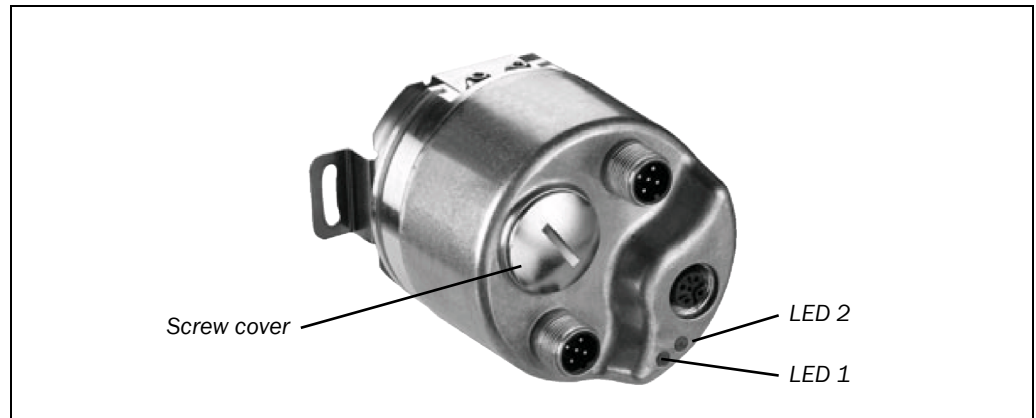
Tab. 9: Examples for total resolution

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

3.6   Controls and status indicators

The A3M60 Basic PROFIBUS Absolute Encoder has two LEDs that indicate the operational status.

Fig. 1: Position of the LEDs

Tab. 10: Meaning of the LEDs

LED 1 PROFIBUS communication		LED 2 Encoder diagnostics	
Display	**Description**	**Display**	**Description**
● Green	No error	● Green	No error
☀ Red/green	Erroneous initialization or undervoltage	☀ Red/green	Erroneous initialization or undervoltage
● Orange	Erroneous parameter, no data exchange	● Orange	Internal sensor error
● Red	Connection error, no data exchange		

There are the following controls under the screw cover:

- rotary switch for the addressing (address 1–125)
- preset pushbutton
- DIP switch for the bus termination (termination)

Fig. 2: Position of the controls

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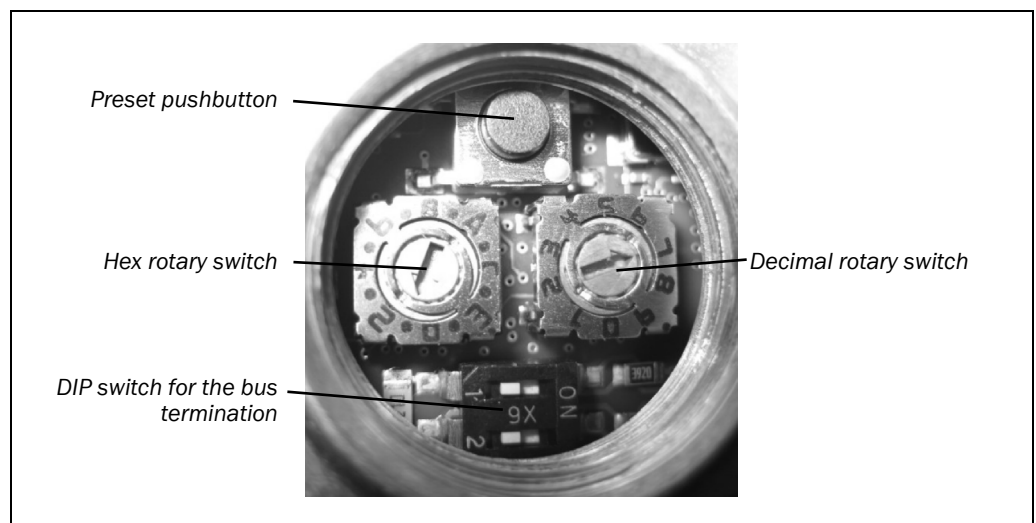
4 Commissioning

This chapter provides information on the electrical installation, configuration and commissioning of the A3M60 Basic PROFIBUS Absolute Encoder.

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

4.1 Mounting

See the mounting instructions included with the A3M60 Basic.

4.2   Electrical installation

WARNING

**Switch the power 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 connection plugs and sockets (see section 7.2 "Accessories" on page 28)

4.2.1   Connections of the A3M60 Basic

Fig. 3: Connections of the A3M60 Basic

Voltage supply plug   PROFIBUS IN M12 × 5, plug   PROFIBUS OUT M12 × 5, socket
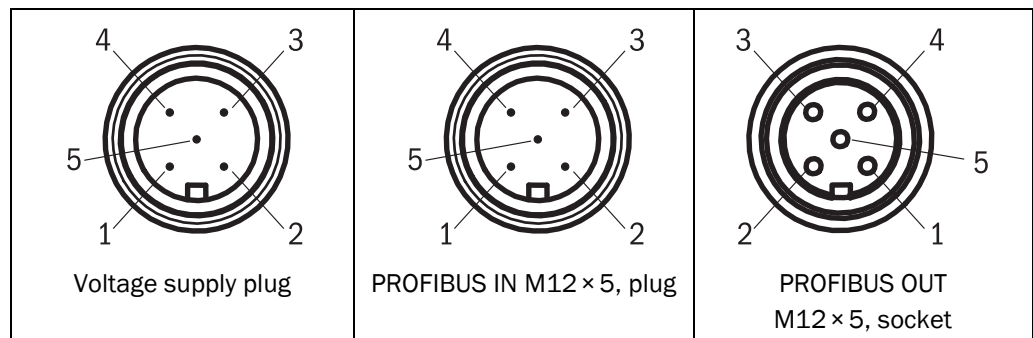
Tab. 11: Pin assignment for the connection of the voltage supply

Pin	Signal	Core color[3]	Function
1	V_S	Brown	Supply voltage 10 V … 32 V DC
2	–	White	Do not use
3	GND	Blue	0 V DC (ground)
4	–	Black	Do not use
5	–	Grey	Not assigned

Tab. 12: Pin assignment for the connection PROFIBUS IN

Pin	Signal	Core color[3]	Function
1	–	–	Not assigned
2	A	Green	A-wire PROFIBUS DP
3	–	–	Not assigned
4	B	Red	B-wire PROFIBUS DP
5	Screen	–	Housing

Tab. 13: Pin assignment for the connection PROFIBUS OUT

Pin	Signal	Core color[3]	Function
1	–	–	Not assigned
2	A	Green	A-wire PROFIBUS DP
3	0 V DC	–	Ground
4	B	Red	B-wire PROFIBUS DP
5	Screen	–	Housing

Notes   ➢ **Connect the screen to the encoder's housing!**

➢ Pay attention to the maximum cable lengths (see Tab. 3 on page 10).

[3]   On the usage of pre-assembled cables.

4.3 Settings on the hardware

There are the following controls for making settings under the screw cover:
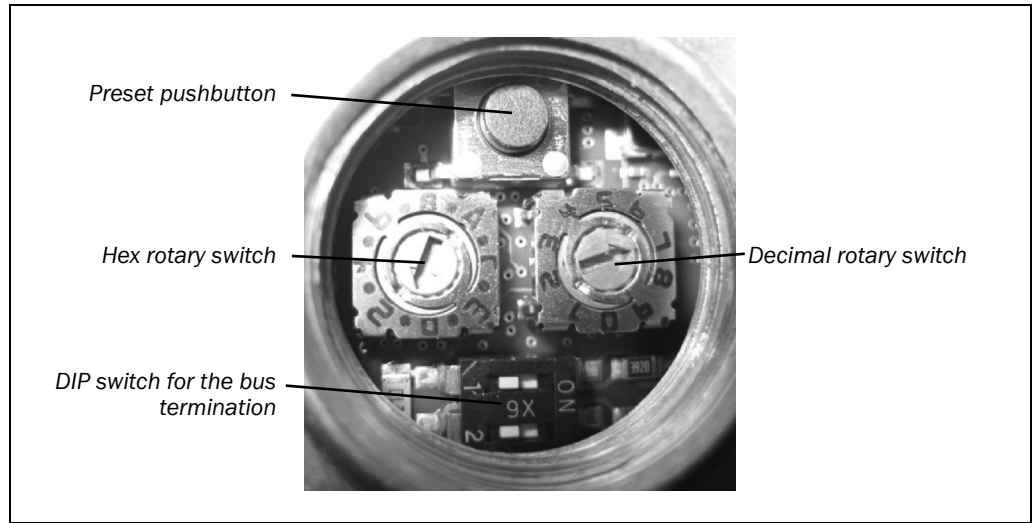
- DIP switch for the bus termination (termination)
- rotary switch for the addressing (address 1–125)
- preset pushbutton

➢ Open the screw cover using a screwdriver for slot-head screws with a blade width of min. 15.0 mm.

The A3M60 Basic is supplied with the following pre-settings:

- termination = OFF
- address on the PROFIBUS = 2

Fig. 4: Settings on the hardware

4.3.1 Bus termination

At the start and end of each segment, the bus must be terminated using a terminator. The A3M60 Basic PROFIBUS Absolute Encoder contains a bus termination that can be enabled.

The bus can be terminated using the DIP switches.

➢ To terminate the bus, set both DIP switches to ON.

➢ Alternatively you can use an external terminator (see section 7.2 "Accessories" on page 28).

4.3.2 Addressing

Each device in the bus segment must have a unique address. Each address is only allowed to occur once in the bus segment. The A3M60 Basic PROFIBUS Absolute Encoder is preset to the address 2 from the factory. The highest address that is allowed to be set is 125.

To set the address use the hex rotary switch and the decimal rotary switch.

➢ Set the decades for the address using the hex rotary switch.

➢ Set the units for the address using the decimal rotary switch.

Examples

Tab. 14: Examples for setting the PROFIBUS address

Address	Hex rotary switch	Decimal rotary switch
17	1	7
123	C (corresponds to decimal 12)	3

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4.3.3   Preset

The encoder is set to a pre-defined value by pressing the pushbutton. The value pre-defined from the factory is zero (0).

The function is used for electronic adjustment during commissioning to allocate a specific position value to a mechanical position of the shaft encoder (see also section 3.4.4 on page 12).

⚠️ **After triggering the preset function, check whether there is a hazard from the machine or system in which the encoder is integrated!**

WARNING

The preset function results in a change in the position value output by the encoder. This change could cause an unexpected movement that may result in a hazard for persons or damage to the system or other items.
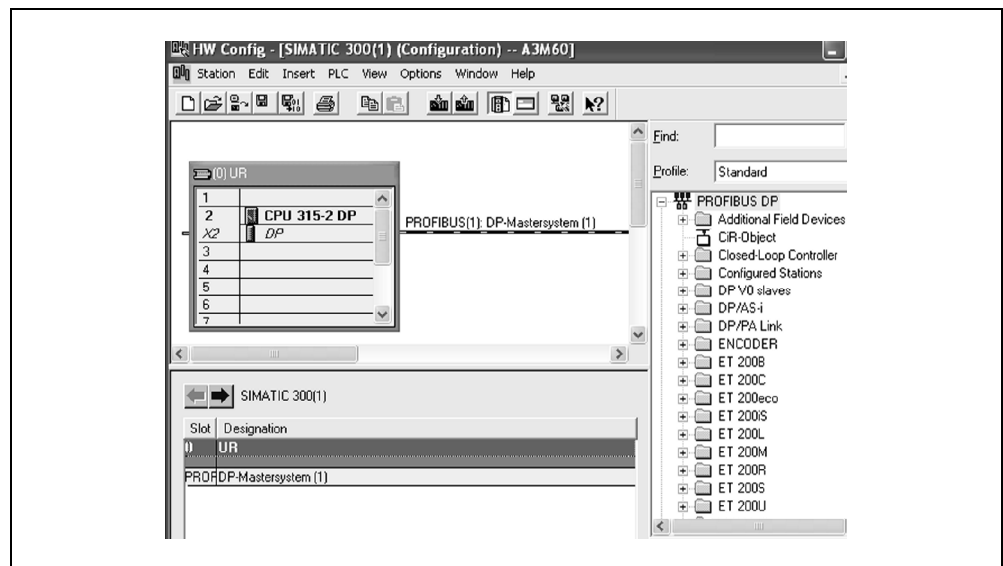
4.4   Configuration

Note   All software instructions refer to the STEP7 configuration tool for the SIMATIC.

4.4.1   Loading GSD file (once only)

➢ Open the hardware manager for your PLC.

Fig. 5: Hardware manager in the SIMATIC

➢ Install the GSD file STEG0CA7.gsd for the A3M60 Basic using the **Options** menu, **Install GSD file...** command.
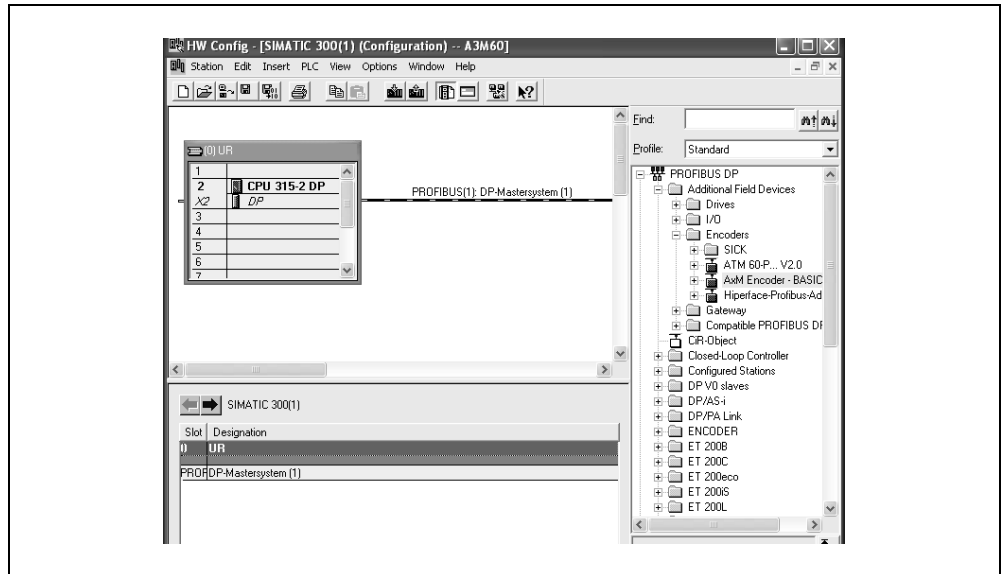You will find the GSD file on the Internet at www.sick.com.

The A3M60 Basic appears in **Additional Field Devices**.

4.4.2   Loading encoders into the hardware configuration window

➢ In **Additional Field Devices** open the folder **Encoders**.

Fig. 6: A3M60 Basic in
Additional Field Devices

➢ Drag the icon for the AxM Encoder X.XX to the PROFIBUS DP master system using drag and drop.

A window opens where you can enter the address of the A3M60 Basic on the PROFIBUS.

4.4.3   Loading communication module into the slot

Two communication modules are allocated to the AxM Encoder Basic X.XX (see section 3.4 on page 11).

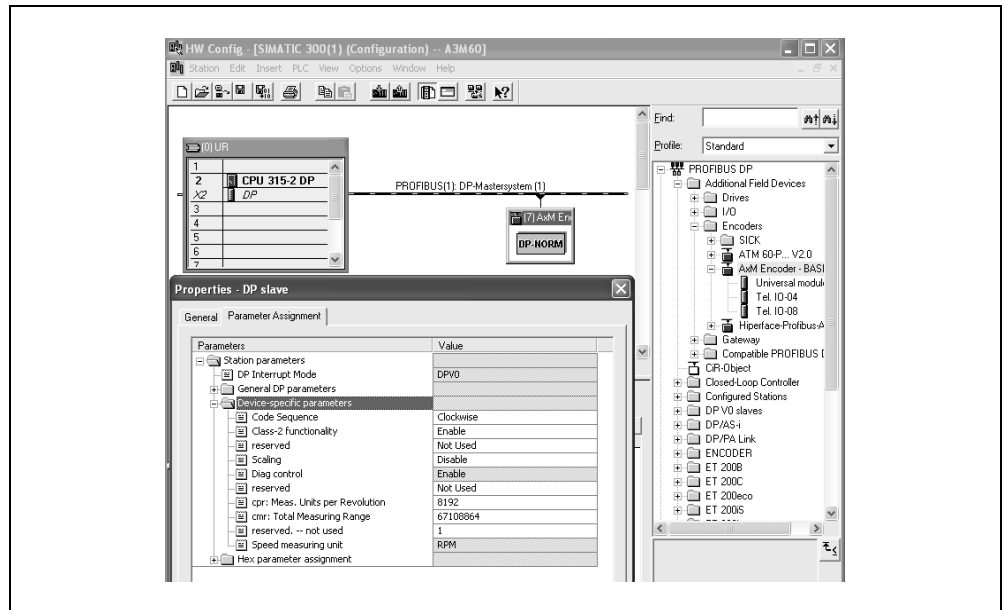➢ Drag the communication module Tel.IO-04 or Tel.IO-08 to the slot for the encoder.

Fig. 7: Communication
module on the slot for the
encoder
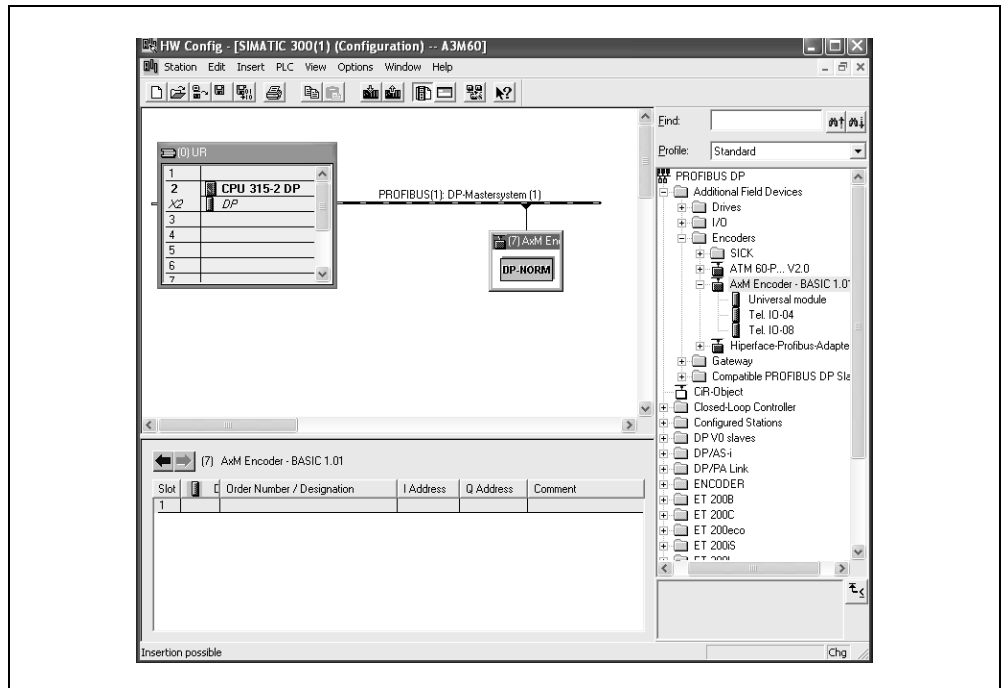
4.4.4   Configuring the A3M60 Basic

➢ Double-click the encoder icon.

The **Properties** window is opened.

➢ Select the **Parameter Assignment** tab.

*Fig. 8: **Parameter Assignment** tab*

The A3M60 Basic is supplied with the following parameters:

• code sequence clockwise

• class 2 functionality = activated

• no scaling

• resolution per revolution = 8,192

• total resolution = 67,108,864

Code sequence

➢ Configure the **Code Sequence** parameter to **Clockwise** or **Counterclockwise.**

Scaling

➢ Configure the **Scaling** parameter to the value **Enable** if you want to configure a lower resolution.

➢ Using the **Measuring Units per Revolution** parameter configure the resolution per revolution.

➢ Using the **Total Measuring Range** parameter configure the total resolution.

Compiling

➢ Compile the data and load the data into the control system.

The new values are applied.

Both LEDs on the A3M60 Basic illuminate green.

4.4.5   Checking preset value

If you transmit a preset value to the A3M60 Basic, then in the **Monitor/Modify Variables** dialog box for the STEP7 you can see the PEW (peripheral input word) and PAW (peripheral output word).

Fig. 9: Preset step 1

00000024h is transmitted from the encoder to the PLC as the position.

00000010h is transmitted from the PLC to the encoder as the preset.

Bit 31 is set to 0, as a result the preset value is not applied.

Fig. 10: Preset step 2

80000010h is transmitted from the PLC to the encoder as the preset.

Bit 31 is set to 1, i.e. a transition from 0 to 1 occurs, the preset value 10h is applied.

Fig. 11: Preset step 3

00000010h is transmitted from the encoder to the PLC as the position.

4.5   Test notes

⚠️ WARNING

Commissioning requires a thorough check by authorized personnel!

Before you operate a system equipped with the A3M60 Basic for the first time, make sure that the system is first checked and released by authorized personnel. Please read the notes in chapter 2 "On safety" on page 7.

5   Fault diagnosis

This chapter describes how to identify and remedy errors and malfunctions during the operation of the A3M60 Basic PROFIBUS Absolute Encoder.

5.1   In the event of faults or errors

⚠
WARNING

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.

5.2   SICK STEGMANN support

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

5.3   Diagnostics

5.3.1   Error and status indications on the LEDs

See section 3.6 "Controls and status indicators" on page 14.

5.3.2   Diagnostics message

PROFIBUS provides diagnostics features that help you to locate a problem if the cause of the error is unclear or if there are availability problems.

The diagnostics on the A3M60 Basic are based on the **channel-related diagnostics model**. The diagnostics comprise three bytes per error that occurs.

Tab. 15: Structure of the diagnostics message

Message part	Value	Description
Byte 1	81h (fixed)	Header
Byte 2	40h (fixed)	Channel specification
Byte 3	30h	Max. velocity exceeded
	36h	Position error
	38h	Memory error

Note   If, for example, a second error occurs at the same time, the entire three bytes are transmitted again for this second error, i.e. the total length is then six bytes.

5.3.3   IO message in case of an error

If, in case of a serious error, a correct position calculation cannot be ensured, the output of the position within the process data is blocked and instead an error code output. These manufacturer-specific error codes are outside the valid value range and permit a detailed error analysis.

Tab. 16: Contents of the diagnostics message

Error code		Diagnostics message in octet 3	Description
Dec	**Hex**		
–12	FF.FF.FF.F4	Memory error 38h	Forbidden parameter in the µC-Flash
–11	FF.FF.FF.F5	Position error 36h	Erroneous communication with FRAM (Wiegand IC)
–10	FF.FF.FF.F6	Position error 36h	Synchronization error on shut down
–8	FF.FF.FF.F8	Position error 36h	Synchronization error on switch on
–5	FF.FF.FF.FB	Position error 36h	Analog signals out of tolerance (vector length)
–4	FF.FF.FF.FC	Position error 36h Memory error 38h	Erroneous communication with EEPROM
–3	FF.FF.FF.FD	Position error 36h	Analog signals out of tolerance (amplitude)
–16	FF.FF.FF.F0	Position and/or memory error	Occurrence of several errors simultaneously

⚠️ WARNING

Evaluate bit 31 of the input data using your control system to detect serious errors!

If, in the case of serious error, it cannot be ensured the position output is correct, this situation is indicated by setting the most significant bit 31. The position value is then outside the valid range and can be identified as clearly erroneous (see section 5.3.2 "Diagnostics message" on page 22).

6 Technical specifications

6.1 Data sheet

Tab. 17: Data sheet A3M60 Basic

Mechanical data

	Minimum	Typical	Maximum
Shaft designs			
Clamping flange	10 × 19 mm		
Servo flange	6 × 10 mm		
Hollow shaft	8, 10, 12, 15 mm		
Weight		0.280 kg	
Material			
Shaft	Stainless steel		
Flange	Aluminium		
Housing	Aluminium		
Operating speed			6,000 min^{-1}
Shock resistance	60 g/6 ms (EN 60 028-2-27)		
Sinusoidal vibration	30 g, 10 … 2000 Hz (EN 60 068-2-6)		
Permissible shaft load			
Radial			80 N
Axial			40 N
Permissible shaft movement on the drive element			
Radial (static/dynamic)			±0.3 mm/ ±0.1 mm
Axial (static/dynamic)			±0.5 mm/ ±0.2 mm
Bearing service life [revolutions]	3×10^9		
Angular acceleration			5×10^5 rad/s²

	Minimum	Typical	Maximum

Electrical data

	Minimum	Typical	Maximum
Operating voltage	10 V		30 V
Power consumption			1.5 W
Resolution			
Per revolution			8,192
Revolutions, total			8,192
Repeat accuracy		±0.25 °	
Error limit		±0.5°	
PROFIBUS			
Protocol	DP-V0 (EN 50 170-2)		
Interface	RS-485		
Transmission speed			12 MBaud
Programmable parameters	Resolution, direction of rotation		

General data

|	Minimum	Typical	Maximum
Enclosure rating			
Housing	IP 67 (EN 60 529)		
Shaft	IP 65 (EN 60 529)		
Operating temperature range	–10°C		+70°C
Storage temperature range	–40°C		+100 °C max. 24 h
Permissible relative humidity			95 %

6.2   Dimensional drawings

6.2.1   A3M60 Basic with hollow shaft

Fig. 12: A3M60 Basic with hollow shaft
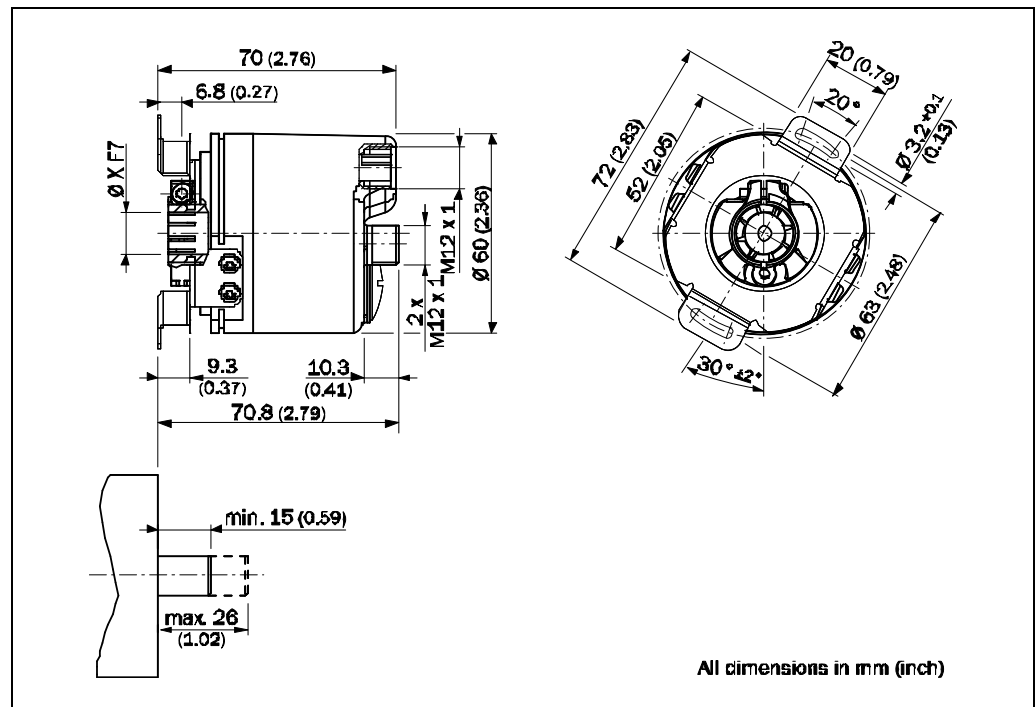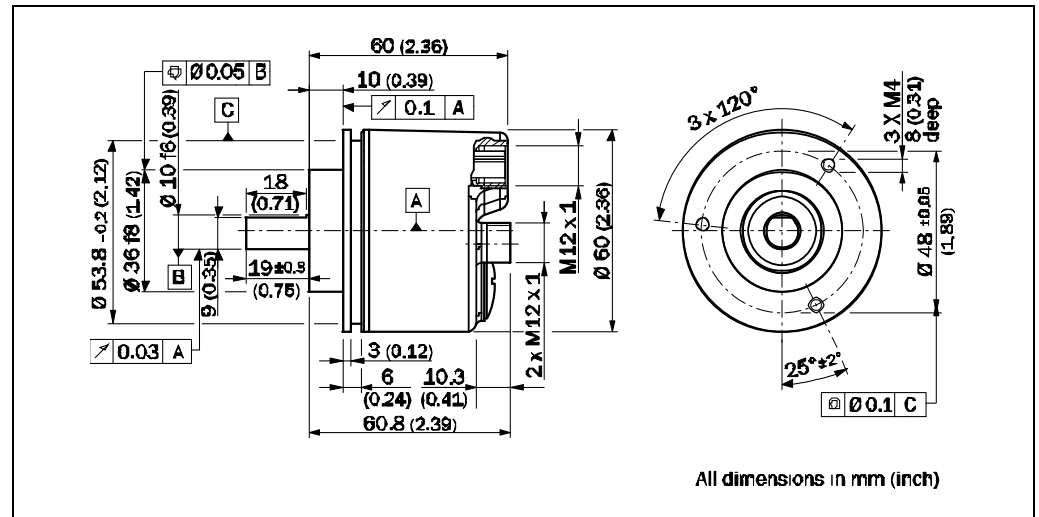

6.2.2   A3M60 Basic with servo flange

Fig. 13: A3M60 Basic with servo flange

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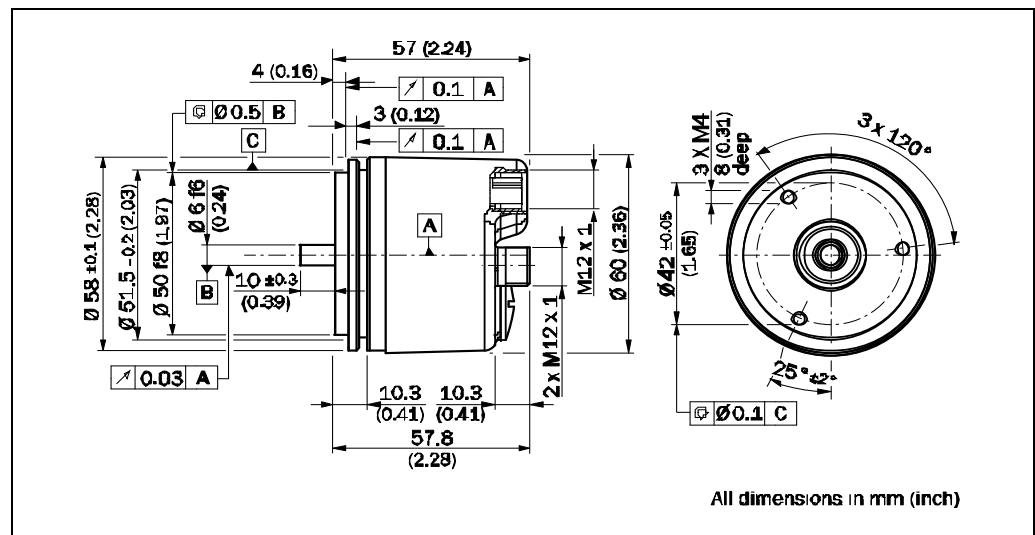
6.2.3 A3M60 Basic with clamping flange

Fig. 14: A3M60 Basic with clamping flange

All dimensions in mm (inch)

7 Ordering information

7.1 Types available

Tab. 18: Types available

Type	Description	Part number
A3M60B-BBPB013X13	Hollow shaft, ⌀ 8 mm	1051016
A3M60B-BDPB013X13	Hollow shaft, ⌀ 10 mm	1038824
A3M60B-BEPB013X13	Hollow shaft, ⌀ 12 mm	1038825
A3M60B-BHPB013X13	Hollow shaft, ⌀ 15 mm	1051017
A3M60B-S1PB013X13	Servo flange, 6 × 10 mm	1051018
A3M60B-S4PB013X13	Clamping flange, 10 × 19 mm	1038826

7.2 Accessories

7.2.1 Voltage supply

Tab. 19: Voltage supply

Type	Description	Part number
DOS-1204-G	M12 cable socket, 4-pin, straight, screened	6007302
DOL-1205-G05MAC	Cable socket M12, 5-pin, straight, assembled with cable 5 × 0.34 mm², screened, 5 m long	6036384
DOL-1205-G10MAC	Cable socket M12, 5-pin, straight, assembled with cable 5 × 0.34 mm², screened, 10 m long	6036385
DOL-1205-G20MAC	Cable socket M12, 5-pin, straight, assembled with cable 5 × 0.34 mm², screened, 20 m long	6036386
DOS-1204-W	M12 cable socket, 4-pin, angled, A-coded	6007303
DOL-1202-W05MC	M12 cable socket, 5-pin, angled, A-coded, assembled 5 m	6042067
DOL-1202-W10MC	Supply voltage, M12 cable socket, 5-pin, angled, A-coded, assembled 10 m	6042068

7.2.2 PROFIBUS IN

Tab. 20: PROFIBUS IN

Type	Description	Part number
DOS-1205-GQ	PROFIBUS IN M12 cable socket, 5-pin, straight, screened, B-coded	6021353
DOL-1205-G05MQ	PROFIBUS IN M12 cable socket, 5-pin, straight, assembled with 2-core bus cable, 2 × 0.22 mm², screened, B-coded, 5 m long	6026006
DOL-1205-G10MQ	PROFIBUS IN M12 cable socket, 5-pin, straight, assembled with 2-core bus cable, 2 × 0.22 mm², screened, B-coded, 10 m long	6026008
DOS-1205-WQ	PROFIBUS IN M12 cable socket, 5-pin, angled, B-coded	6041429
DOL-1205-W05MQ	PROFIBUS IN M12 cable socket, 5-pin, angled, B-coded, assembled 5 m	6041423
DOL-1205-W10MQ	PROFIBUS IN M12 cable socket, 5-pin, angled, B-coded, assembled 10 m	6041425

7.2.3 PROFIBUS OUT

Tab. 21: PROFIBUS OUT

Type	Description	Part number
STE-1205-GQ	PROFIBUS IN M12 cable socket, 5-pin, straight, screened, B-coded	6021354
STL-1205-G05MQ	PROFIBUS OUT M12 cable plug, 5-pin, straight, assembled with 2-core cable, 2 × 0.22 mm², screened, B-coded, 5 m long	6026005
STL-1205-G10MQ	PROFIBUS OUT M12 cable plug, 5-pin, straight, assembled with 2-core cable, 2 × 0.22 mm², screened, B-coded, 10 m long	6026007
STE-1205-WQ	PROFIBUS OUT M12 cable plug, 5-pin, angled, B-coded	6041428
STL-1205-W05MQ	PROFIBUS OUT M12 cable plug, 5-pin, angled, B-coded, assembled 5 m	6041426
STL-1205-W10MQ	PROFIBUS OUT M12 cable plug, 5-pin, angled, B-coded, assembled 10 m	6041427

7.2.4　PROFIBUS accessories

Tab. 22: PROFIBUS accessories

Type	Description	Part number
LTG-2102-MW	Bus cable, 2-core, by the meter, 2 × 0.22 mm², screened	6021355
PRE-STE-END	PROFIBUS terminator	6021156

7.2.5　Shaft couplings

Tab. 23: Shaft couplings

Type	Shaft diameter	Part number
Shaft coupling bellows, max. radial shaft offset ±0.3 mm, axial shaft offset 0.4 mm, angle ±4°, torsional stiffness 120 Nm/rad, bellows made of stainless steel, hub made of aluminum		
KUP-0606-B	6 mm to 6 mm	5312981
KUP-0610-B	6 mm to 10 mm	5312982
KUP-1010-B	10 mm to 10 mm	5312983
KUP-1012-B	10 mm to 12 mm	5312984
Shaft coupling spring disk, max. radial shaft offset ±0.3 mm, axial shaft offset 0.4 mm, angle ±2.5°, torsional stiffness 50 Nm/rad, flange made of aluminum, spring disk made of plastic, glass-fiber reinforced		
KUP-0610-F	6 mm to 10 mm	5312985
KUP-1010-F	10 mm to 10 mm	5312986

7.2.6 Mechanical adapters

Type	Description	Part number
BEF-FA-036-050	Flange adapter made of aluminum for clamping flange with centering collar 36 mm, adaptations to 50 mm servo flange	2029160
BEF-FA-036-060REC	Flange adapter made of aluminum for clamping flange with centering collar 36 mm, adaptations to square mounting plate 60 mm	2029162
BEF-FA-036-060RSA	Flange adapter made of aluminum for clamping flange with centering collar 36 mm, adaptations to square mounting plate 60 mm with shock absorber	2029163
BEF-FA-036-063REC	Flange adapter made of aluminum for clamping flange with centering collar 36 mm, adaptations to square mounting plate 63 mm	2034225
BEF-MG-50	Mounting cover incl. mounting kit for encoders with servo flange with centering collar 50 mm	5312987
BEF-WF-36	Mounting cover incl. mounting kit for encoders with clamping flange with centering collar 36 mm	2029164
BEF-WG-SF050	Servo clamp half shell, set (contents 2 pieces) for servo flanges with centering collar 50 mm	2029165
BEF-WK-SF	Servo clamp short, set (contents 3 pieces) for servo flanges	2029166
BEF-FA-B12-010	Bearing block for absorbing larger radial and axial shaft loads	2042728
Measuring wheels for encoder shafts with diameter 10 mm, plastic coating (Hytrel), wheel body plastic with aluminum hub		
BEF-MR-010020	Circumference 0.2 m, surface finish smooth	5312988
BEF-MR-010020G	Circumference 0.2 m, surface finish grooved	5318678
BEF-MR-010050	Circumference 0.5 m, surface finish smooth	5312989
BEF-MR-010030	Circumference 0.3 m, surface finish O-ring	2049278

8   Annex

8.1   EC declaration of conformity

Fig. 15: EC declaration of conformity

SICK|STEGMANN

EC Declaration of conformity

en

Ident-No. : 9155929

The undersigned, representing the following manufacturer

SICK Stegmann GmbH
Dürrheimer Straße 36
78166 Donaueschingen
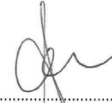**Germany**

herewith declares that the product

A3M60B-..P.......

is in conformity with the provisions of the following EC directive(s) (including all applicable amendments), and that the standards and/or technical specifications referenced overleaf have been applied.

Donaueschingen,   2010-04-01

....
ppa. Trevor Stewart
(Manager Research & Development)

....
Josef Siraky
(Manager Director)

Note   You can obtain the complete EC declaration of conformity via the SICK homepage on the Internet at www.sick.com.

8.2 List of tables

8.3 List of illustrations

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