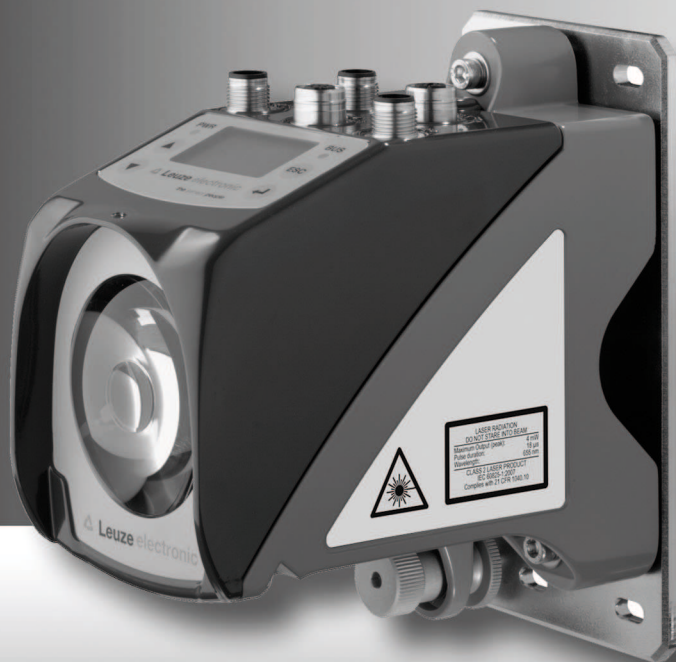


the sensor people

AMS 304*i*

Optical Laser Measurement System
PROFIBUS / SSI



en 03-2014/12 50113335
We reserve the right to
make technical changes

© 2014

Leuze electronic GmbH + Co. KG

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The main menus

```
AMS 304i 120
Leuze electronic
  GmbH & Co. KG
SW: V 1.3.0 HW:1
SN: -----
```



```
Network information
Address: ---
Baud rate: --- kbit/s
```



```
IO1 LSR PLB 98
IO2 TMP ATT PB
ERR SSI

+ 87.000m
```



```
Parameter
Parameter handline
PROFIBUS
SSI
Position value
I/O
```



```
Language selection
o Deutsch
● English
o Español
o Français
o Italiano
```



```
Service
Status messages
Diagnostics
Expanded diagnostics
```

Device buttons:

-  Navigate upward/laterally
-  Navigate downward/laterally
-  ESCAPE leave
-  ENTER confirm

Input of values

```
100
<-0123456789 save
Standard ---- Unit
126 | |
```

-  Delete character
-  Enter digit
- save +  Save input

Device information - main menu

This menu item contains detailed information on

- Device model,
- Manufacturer,
- Software and hardware version,
- Serial number.

No entries can be made via the display.

Network information - main menu

Explanations of address and baud rate.

No entries can be made via the display.

Status- and measurement data - main menu

- Display of status-, warning-, and error messages.
- Status overview of the switching inputs/outputs.
- Bar graph for the reception level.
- Activated interface.
- Measurement value.

No entries can be made via the display.

See "Indicators in the display" on page 39.

Parameter - main menu

Configuration for PROFIBUS is carried out via the modules of the GSD file.

Language selection - main menu

- Selection of the display language.

See "Language selection menu" on page 48.

Service - main menu

- Display of status messages.
- Display of diagnostic data.

No entries can be made via the display.

See "Service menu" on page 49.

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1 General information

1.1 Explanation of symbols

The symbols used in this operating manual are explained below.



Attention!

This symbol precedes text messages which must strictly be observed. Failure to comply with this information results in injuries to personnel or damage to the equipment.



Attention Laser!

This symbol warns of possible danger caused by hazardous laser radiation.



Notice!

This symbol indicates text passages containing important information.

1.2 Declaration of conformity

The AMS 304*i* absolute measuring optical laser measurement system was designed and manufactured in accordance with applicable European directives and standards.

The AMS series is "UL LISTED" according to American and Canadian safety standards and fulfills the requirements of Underwriter Laboratories Inc. (UL).



Notice!

The Declaration of Conformity for these devices can be requested from the manufacturer.













The manufacturer of the product, Leuze electronic GmbH + Co. KG in D-73277 Owen/Teck, possesses a certified quality assurance system in accordance with ISO 9001.



1.3 Description of functions AMS 304*i*

The AMS 304*i* optical laser measurement system calculates distances to fixed as well as moving system parts. The distance to be measured is calculated according to the principle of the propagation time of radiated light. Here, the light emitted by the laser diode is reflected by a reflector onto the receiving element of the laser measurement system. The AMS 304*i* uses the "propagation time" of the light to calculate the distance to the reflector. The high absolute measurement accuracy of the laser measurement system and the fast integration time are designed for position control applications.

With the AMS 3xx*i* product series, Leuze electronic makes available a range of internationally relevant interfaces. Note that each interface version listed below corresponds to a different AMS 3xx*i* model.

| | | |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------|
|  |  | AMS 304<i>i</i> |
|  | | AMS 348<i>i</i> |
|  | | AMS 355<i>i</i> |
|  | | AMS 358<i>i</i> |
|  | | AMS 335<i>i</i> |
|  | | AMS 338<i>i</i> |
|  | | AMS 308<i>i</i> |
|  | | AMS 384<i>i</i> |
|  | | AMS 301<i>i</i> |
|  |  | AMS 300<i>i</i> |

2 Safety

This sensor was developed, manufactured and tested in line with the applicable safety standards. It corresponds to the state of the art.

2.1 Intended use

The AMS is an absolute measuring optical laser measurement system which allows distance measurement of up to 300m against a reflector.

Areas of application

The AMS is designed for the following areas of application:

- Positioning of automated, moving plant components
- Travel and lifting axes of high-bay storage devices
- Repositioning units
- Gantry crane bridges and their trolleys
- Lifts
- Electroplating plants



CAUTION

Observe intended use!

↪ Only operate the device in accordance with its intended use. The protection of personnel and the device cannot be guaranteed if the device is operated in a manner not complying with its intended use.

Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use.

↪ Read the technical description before commissioning the device. Knowledge of this technical description is an element of proper use.

NOTICE

Comply with conditions and regulations!

↪ Observe the locally applicable legal regulations and the rules of the employer's liability insurance association.



Attention

For UL applications, use is permitted exclusively in Class 2 circuits according to NEC (National Electric Code).

2.2 Foreseeable misuse

Any use other than that defined under "Intended use" or which goes beyond that use is considered improper use.

In particular, use of the device is not permitted in the following cases:

- Rooms with explosive atmospheres
- Circuits relevant to safety
- For medicinal purposes

NOTICE

Do not modify or otherwise interfere with the device.

- ↳ Do not carry out modifications or otherwise interfere with the device.
The device must not be tampered with and must not be changed in any way.
The device must not be opened. There are no user-serviceable parts inside.
Repairs must only be performed by Leuze electronic GmbH + Co. KG.

2.3 Competent persons

Connection, mounting, commissioning and adjustment of the device must only be carried out by competent persons.

Prerequisites for competent persons:

- They have a suitable technical education.
- They are familiar with the rules and regulations for occupational safety and safety at work.
- They are familiar with the technical description of the device.
- They have been instructed by the responsible person on the mounting and operation of the device.

Certified electricians

Electrical work must be carried out by a certified electrician.

Due to their technical training, knowledge and experience as well as their familiarity with relevant standards and regulations, certified electricians are able to perform work on electrical systems and independently detect possible dangers.

In Germany, certified electricians must fulfill the requirements of accident-prevention regulations BGV A3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Disclaimer

Leuze electronic GmbH + Co. KG is not liable in the following cases:

- The device is not being used properly.
- Reasonably foreseeable misuse is not taken into account.
- Mounting and electrical connection are not properly performed.
- Changes (e.g., constructional) are made to the device.

2.5 Laser safety notices



ATTENTION LASER RADIATION – LASER CLASS 2

Never look directly into the beam!

The device satisfies the requirements of IEC 60825-1:2007 (EN 60825-1:2007) safety regulations for a product in **laser class 2** as well as the U.S. 21 CFR 1040.10 regulations with deviations corresponding to "Laser Notice No. 50" from June 24th, 2007.

- ⚠ Never look directly into the laser beam or in the direction of reflecting laser beams.
If you look into the beam path over a longer time period, there is a risk of injury to the retina.
- ⚠ Do not point the laser beam of the device at persons!
- ⚠ Interrupt the laser beam using a non-transparent, non-reflective object if the laser beam is accidentally directed towards a person.
- ⚠ When mounting and aligning the device, avoid reflections of the laser beam off reflective surfaces!
- ⚠ CAUTION! The use of operating or adjusting devices other than those specified here or carrying out of differing procedures may lead to dangerous exposure to radiation.
- ⚠ Adhere to the applicable legal and local regulations regarding protection from laser beams.
- ⚠ The device must not be tampered with and must not be changed in any way.
There are no user-serviceable parts inside the device.
Repairs must only be performed by Leuze electronic GmbH + Co. KG.

NOTICE**Affix laser information and warning signs!**

Laser information and warning signs are attached to the device (see figure 2.1):

In addition, self-adhesive laser warning and information signs (stick-on labels) are supplied in several languages (see figure 2.2).

↪ Affix the laser information sheet to the device in the language appropriate for the place of use.

When using the device in the US, use the stick-on label with the "Complies with 21 CFR 1040.10" notice.

↪ Affix the laser information and warning signs near the device if no signs are attached to the device (e.g., because the device is too small) or if the attached laser information and warning signs are concealed due to the installation position.

Affix the laser information and warning signs so that they are legible without exposing the reader to the laser radiation of the device or other optical radiation.

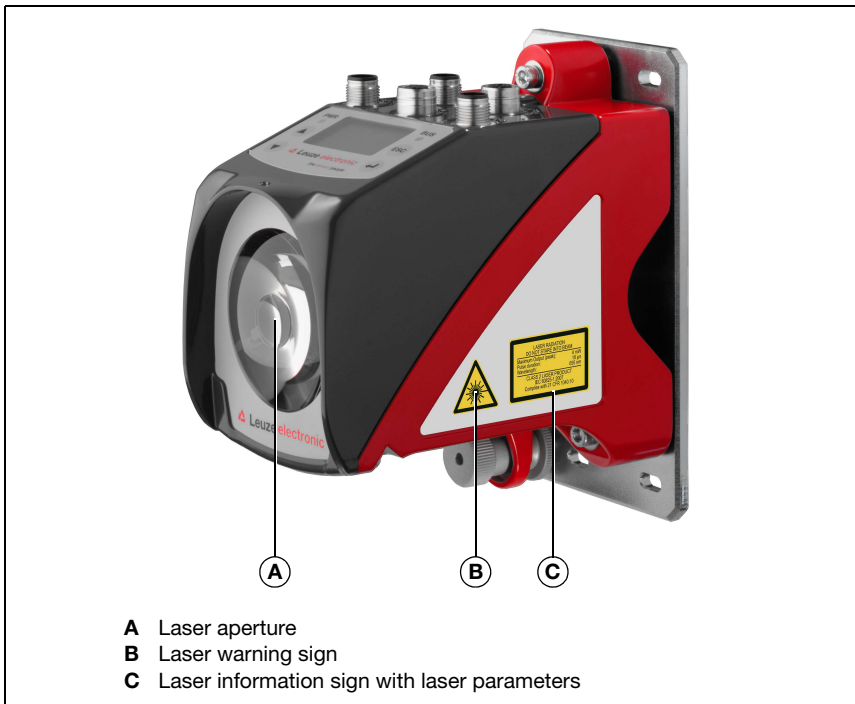


Figure 2.1: Laser apertures, laser warning signs

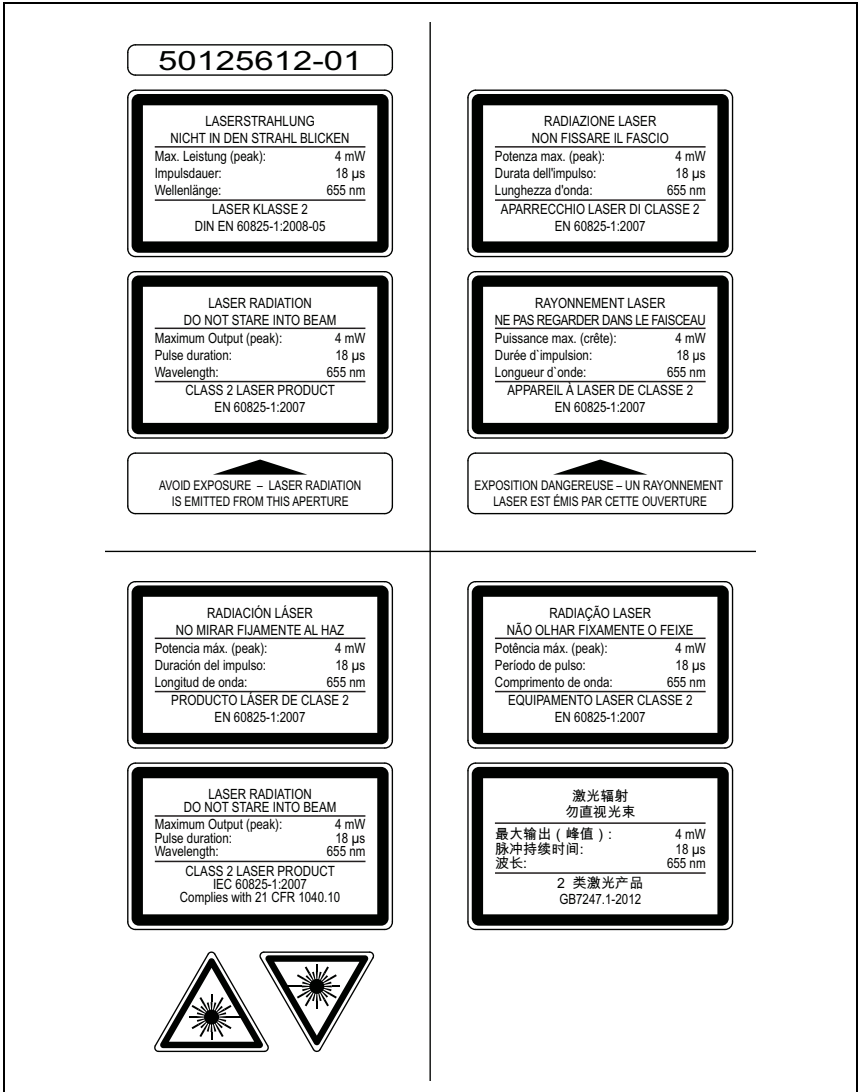


Figure 2.2: Laser warning and information signs – supplied stick-on labels

3 Fast commissioning / operating principle

**Notice!**

Below, you will find a **short description for the initial commissioning** of the AMS 304*i*. Detailed explanations for the listed points can be found throughout the handbook.

3.1 Mounting the AMS 304*i*

The AMS 304*i* and the corresponding reflector are mounted on two mutually opposing, plane-parallel, flat walls.

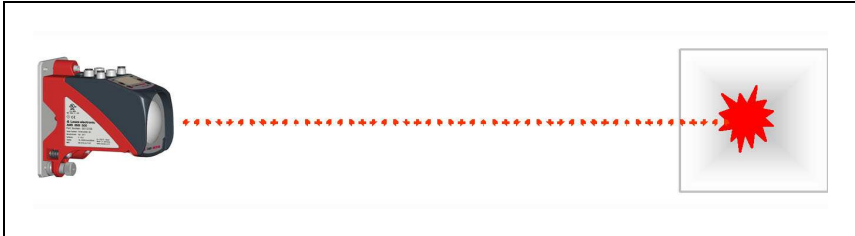


Figure 3.1: Schematic illustration of mounting

**Attention!**

For error-free position measurement, there must be an unobstructed line-of-sight between the AMS 304*i* and the reflector.

3.1.1 Mounting the device

The laser is mounted on a vertical wall using 4 screws (M5).

Alignment is performed using 2 adjustment screws. Adjust so that the laser light spot is positioned at the center of the reflector. The alignment is to be secured with the knurled nut and locked with the M5 nut.

Further information can be found in chapter 5.2 and chapter 5.3.

3.1.2 Mounting the reflector

The reflector is mounted on a vertical wall with 4 screws (M5). The reflector is angled using the included shims. Incline the reflector by approx. 1°.

Detailed information can be found in chapter 6.4.



3.2 Connecting the voltage supply

The laser measurement system is connected using M12 connectors. The voltage supply is connected via the PWR M12 connection.

Detailed information can be found in chapter 7.

3.3 Display

Once the laser measurement system is supplied with voltage, the device status as well as the measured position values can be read on the display. The display automatically switches to the display of the measurement values.

Use the up/down buttons   to the left of the display to read and change a wide range of data and parameters.

Depending on connected interface, the network address or IP addresses must be configured via the display.

Detailed information can be found in chapter 8.

3.4 AMS 304*i* on the PROFIBUS

Install the GSD file associated with the AMS 304*i* in the PROFIBUS Manager of your control. Activate the desired modules (at least one module).

Store the slave address for the AMS 304*i* in the PROFIBUS manager. Ensure that the address is the same as the address configured in the device.

Detailed information can be found in chapter 9.

4 Specifications

4.1 Specifications of the laser measurement system

4.1.1 General specifications AMS 304*i*

| Measurement data | AMS 304 <i>i</i> 40 (H) | AMS 304 <i>i</i> 120 (H) | AMS 304 <i>i</i> 200 (H) | AMS 304 <i>i</i> 300 (H) |
|---------------------------------------|-------------------------|------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------|
| Measurement range | 0.2 ... 40m | 0.2 ... 120m | 0.2 ... 200m | 0.2 ... 300m |
| Accuracy | ± 2mm | ± 2mm | ± 3mm | ± 5mm |
| Consistency ¹⁾ | 0.3mm | 0.5mm | 0.7mm | 1.0mm |
| Light spot diameter | ≤ 40mm | ≤ 100mm | ≤ 150mm | ≤ 225mm |
| Measurement value output | | | 1.7ms | |
| Integration time | | | 8ms | |
| Resolution | | adjustable, see chapter of the individual interfaces | | |
| Temperature drift | | | ≤ 0.1 mm/K | |
| Ambient temperature sensitivity | | | 1 ppm/K | |
| Air pressure sensitivity | | | 0.3 ppm/hPa | |
| Traverse rate | | | ≤ 10m/s | |
| Electrical data | | | | |
| Supply voltage V_{in} ²⁾ | | | 18 ... 30VDC | |
| Current consumption | | | without device heating: ≤ 250mA / 24VDC with device heating: ≤ 500mA / 24VDC | |
| Optical data | | | | |
| Transmitter | | laser diode, red light, wavelength 650 ... 690nm | | |
| Laser class | | 2 acc. to EN 60825-1, CDRH | | |
| Interfaces | | | | |
| PROFIBUS DP to V, V1 | | | ≤ 12Mbit/s | |
| SSI clock rate | | | 50kHz ... 800kHz | |
| Operating and display elements | | | | |
| Keyboard | | | 4 buttons | |
| Display | | monochromatic graphical display, 128 x 64 pixels | | |
| LED | | 2 LEDs, two-colored | | |

Inputs/outputs

| | |
|----------|-------------------------------------|
| Quantity | 2, programmable |
| Input | protected against polarity reversal |
| Output | max. 60 mA, short-circuit proof |

Mechanical data

| | |
|------------------|--------------------------------------|
| Housing | cast zinc and aluminum |
| Optics | glass |
| Weight | approx. 2.45 kg |
| Protection class | IP 65 acc. to EN 60529 ³⁾ |

Environmental conditions

| | |
|------------------------|----------------------------------------|
| Operating temperature | |
| without device heating | -5 °C ... +50 °C |
| with device heating | -30 °C ... +50 °C ⁴⁾ |
| Storage temperature | -30 °C ... +70 °C |
| Air humidity | max. 90% rel. humidity, non-condensing |

Mechanical/electrical loading capacity

| | |
|------------|-----------------------------------------------------|
| Vibrations | acc. to EN 60068-2-6 |
| Noise | acc. to EN 60060-2-64 |
| Shock | acc. to EN 60068-2-27 |
| EMC | acc. to EN 61000-6-2 and EN 61000-6-4 ⁵⁾ |

- 1) Statistical error: 1 sigma; minimum switch-on time: 2 min.
- 2) For UL applications: only for use in "Class 2" circuits acc. to NEC.
- 3) With screwed-on M12 plugs or mounted caps.
- 4) With devices with heating, the switch on/off area of the internal heating can be extended to prevent condensation from forming. A 100% prevention of the formation of condensation cannot be guaranteed due to the limited heating capacity of the AMS 304*i*.
- 5) This is a Class A product. In a domestic environment this product may cause radio interference, in which case the operator may be required to take adequate measures.



The AMS 304*i* is designed in accordance with safety class III for supply with PELV (protective extra-low voltage).

4.1.2 Dimensioned drawing AMS 304*i*

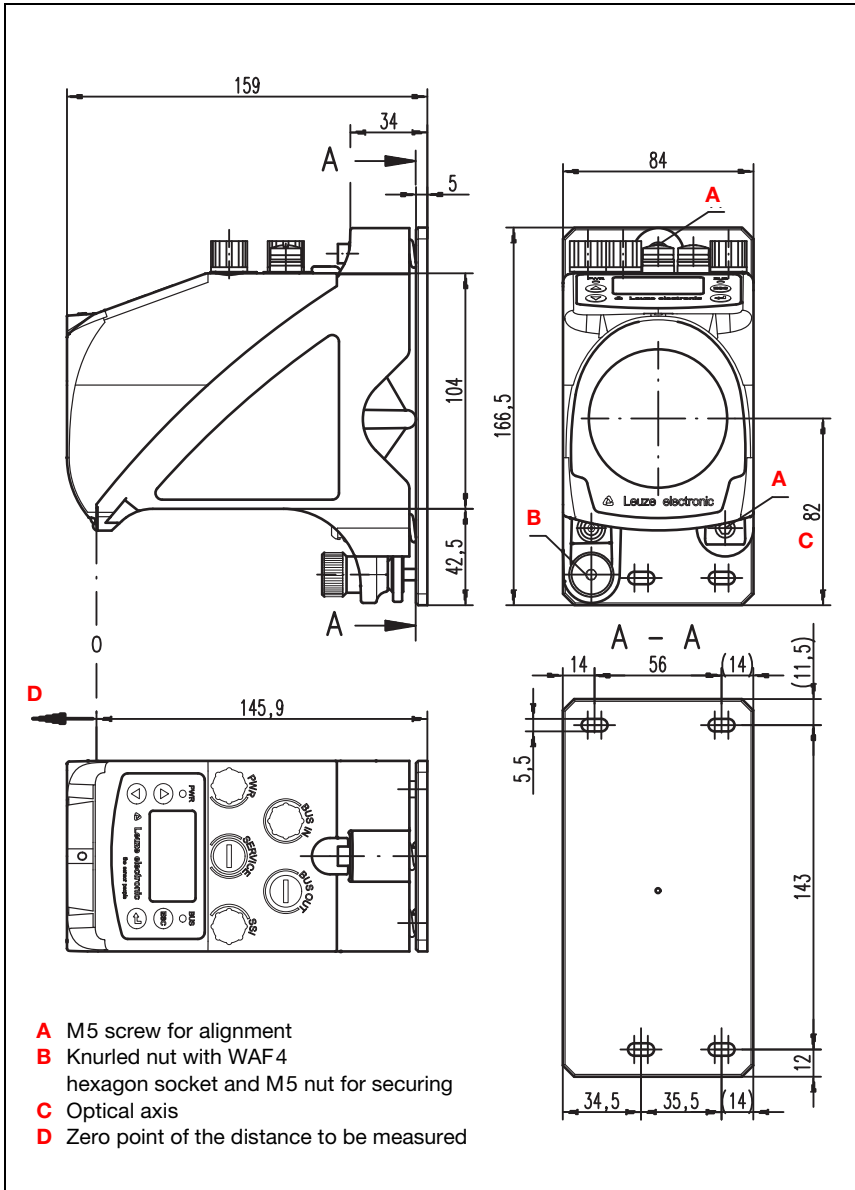


Figure 4.1: Dimensioned drawing AMS 304*i*

4.1.3 Type overview AMS 304*i*

AMS 304*i* (PROFIBUS)

| Type designation | Description | Part no. |
|------------------------|-------------------------------------------------------------------|----------|
| AMS 304 <i>i</i> 40 | 40 m operating range, PROFIBUS/SSI interface | 50113677 |
| AMS 304 <i>i</i> 120 | 120 m operating range, PROFIBUS/SSI interface | 50113678 |
| AMS 304 <i>i</i> 200 | 200 m operating range, PROFIBUS/SSI interface | 50113679 |
| AMS 304 <i>i</i> 300 | 300 m operating range, PROFIBUS/SSI interface | 50113680 |
| AMS 304 <i>i</i> 40 H | 40 m operating range, PROFIBUS/SSI interface, integrated heating | 50113681 |
| AMS 304 <i>i</i> 120 H | 120 m operating range, PROFIBUS/SSI interface, integrated heating | 50113682 |
| AMS 304 <i>i</i> 200 H | 200 m operating range, PROFIBUS/SSI interface, integrated heating | 50113683 |
| AMS 304 <i>i</i> 300 H | 300 m operating range, PROFIBUS/SSI interface, integrated heating | 50113684 |

Table 4.1: Type overview AMS 304*i*

5 Installation and mounting

5.1 Storage, transportation



Attention!

When transporting or storing, package the device so that it is protected against collision and humidity. Optimum protection is achieved when using the original packaging. Heed the required environmental conditions specified in the technical data.

Unpacking

- ✎ Check the packaging for any damage. If damage is found, notify the post office or shipping agent as well as the supplier.
- ✎ Check the delivery contents using your order and the delivery papers:
 - Delivered quantity
 - Device type and model as indicated on the nameplate
 - Brief manual

The name plate provides information as to what AMS 304*i* type your device is. For specific information, please refer to chapter 12.2.

Name plates

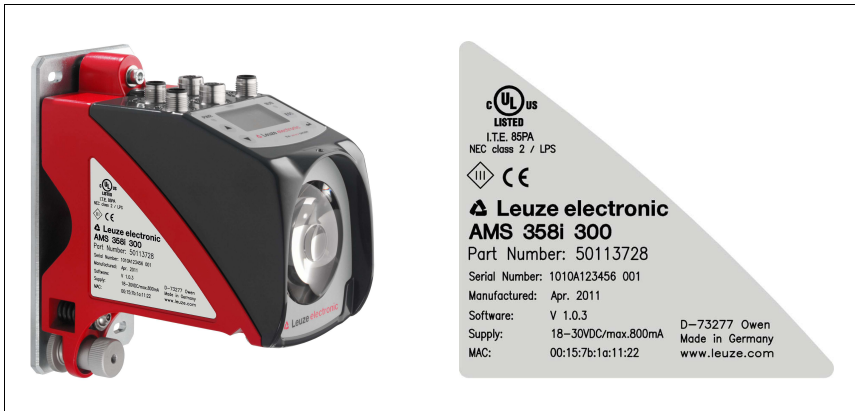


Figure 5.1: Device name plate using the AMS 300*i* as an example



Notice!

Please note that the shown name plate is for illustration purposes only; the contents do not correspond to the original.

- ✎ Save the original packaging for later storage or shipping.

If you have any questions concerning your shipment, please contact your supplier or your local Leuze electronic sales office.

↳ Observe the applicable local regulations when disposing of the packaging materials.

5.2 Mounting the AMS 304*i*

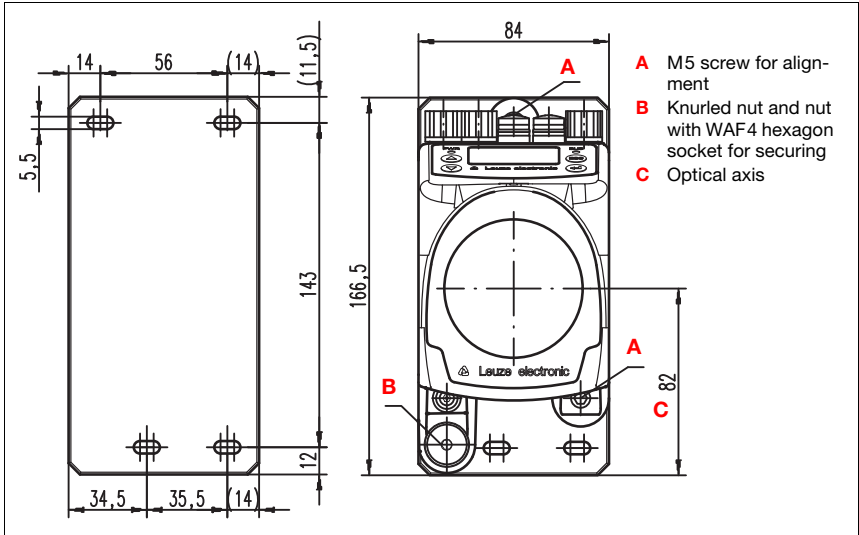


Figure 5.2: Mounting the device

The AMS 304*i* and the corresponding reflector are mounted on two mutually opposing, plane-parallel, flat walls or system parts. For error-free position measurement, there must be an unobstructed line-of-sight connection between the AMS 304*i* and the reflector.

Use M5 screws to fasten the laser measurement system. Secure the screws with a toothed lock washer to protect against loosening caused by vibrations.

Aligning the laser light spot in the center of the reflector

The laser light spot has to be aligned so that it always hits the center of the opposing reflector, both at close range as well as at the maximum measurement distance. **To align, use the two M5 Allen screws** ("A" in figure 5.2). When aligning please ensure that the knurled nut and the lock nut ("B" in figure 5.2) are opened wide.



Attention!

To prevent the laser measurement system from moving out of alignment during continuous operation, subsequently hand-tighten the knurled nut and counterlock with the nut with WAF4 hexagon socket ("B" in figure 5.2). Knurled nut and nut must not be tightened until alignment has been completed.



Attention!

The device must not be opened. Failure to comply will render the guarantee void. Warranted features cannot be guaranteed after the device has been opened.

5.2.1 Optional mounting bracket

A mounting bracket for mounting the AMS 304*i* on a flat, horizontal surface is available as an optional accessory.

Type designation: MW OMS/AMS 01

Part no.: 50107255

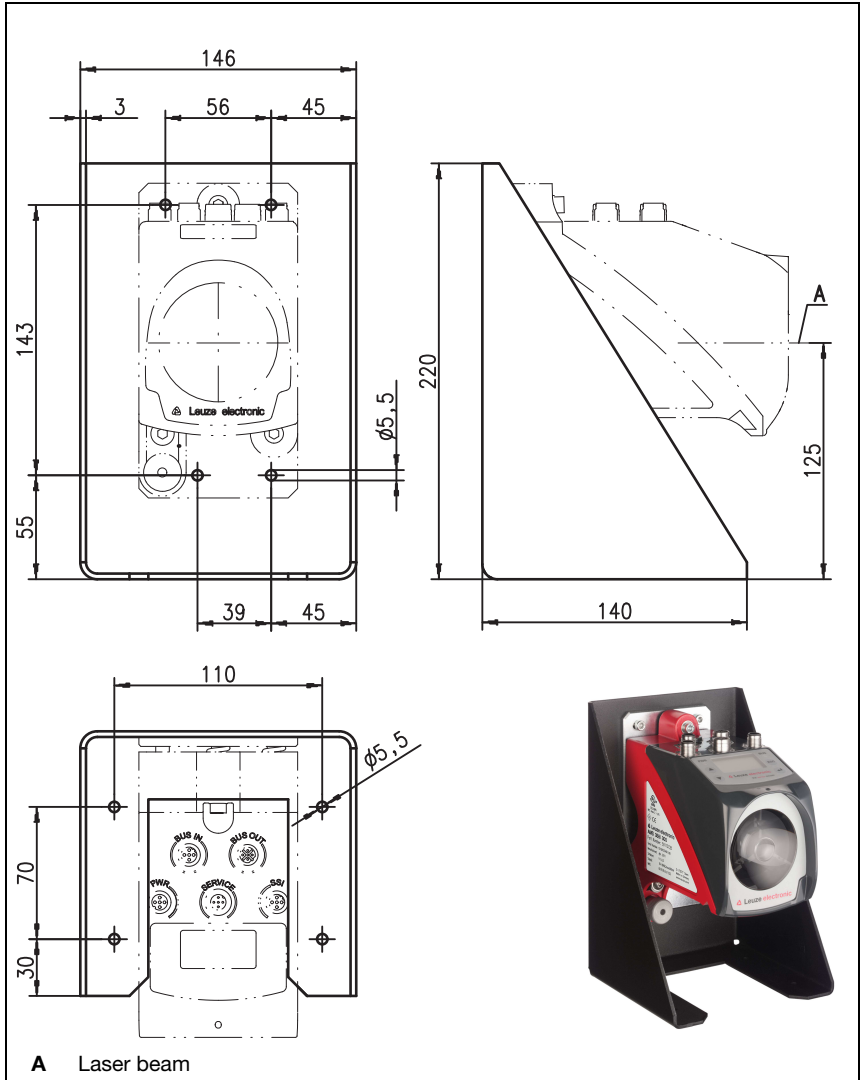


Figure 5.3: Optional mounting bracket

5.2.2 Parallel mounting of the AMS 304*i*

Definition of the term "parallel spacing"

As shown in figure 5.4, dimension X describes the "parallel spacing" of the inner edges of the two laser light spots on the reflector.

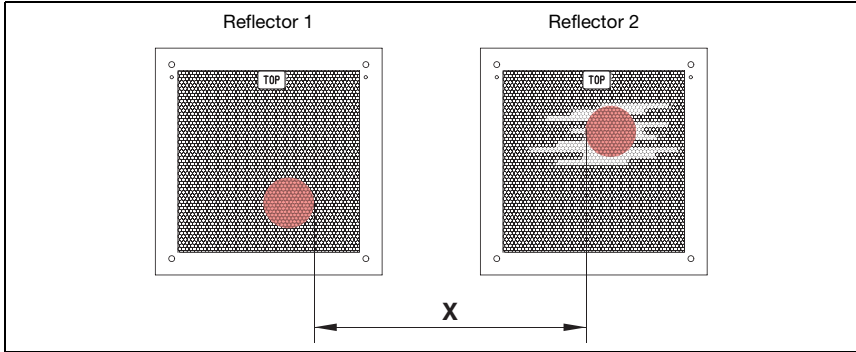


Figure 5.4: Minimum parallel spacing X between adjacent AMS 304*i*

The diameter of the light spot increases with distance.

| | AMS 304 <i>i</i> 40 (H) | AMS 304 <i>i</i> 120 (H) | AMS 304 <i>i</i> 200 (H) | AMS 304 <i>i</i> 300 (H) |
|---------------------------|-------------------------|--------------------------|--------------------------|--------------------------|
| Max. measurement distance | 40m | 120m | 200m | 300m |
| Light spot diameter | ≤ 40mm | ≤ 100mm | ≤ 150mm | ≤ 225mm |

Thus, the center-to-center spacing of the two AMS 304*i* devices with respect to one another can be calculated as a function of the maximum measurement distance.

To define the minimum parallel spacing between two AMS 304*i*, it is necessary to distinguish between three different arrangements of AMS 304*i* and reflectors.

The AMS 304*i* are mounted stationary and in parallel on one plane. Both reflectors move independently of one another at different distances to the AMS 304*i*.

Minimum parallel spacing X of the two laser light spots:
 $X = 100\text{mm} + (\text{max. measurement distance in mm} \times 0.01)$

The AMS 304*i* are mounted stationary and in parallel on one plane. Both reflectors move in parallel at the same distance to the AMS 304*i*.

- Measurement distance **up to 120m**: minimum parallel spacing **X ≥ 600mm**
- Measurement distance **up to 200m**: minimum parallel spacing **X ≥ 750mm**
- Measurement distance **up to 300m**: minimum parallel spacing **X ≥ 750mm**

The reflectors are mounted stationary and in parallel on one plane.

Both AMS 304*i* move independently of one another at different or the same distances to the reflectors.

Measurement distance **up to 120m**: minimum parallel spacing **X ≥ 600mm**

Measurement distance **up to 200m**: minimum parallel spacing **X ≥ 750mm**

Measurement distance **up to 300m**: minimum parallel spacing **X ≥ 750mm**



Notice!

*Please note that when the AMS 304*i* are mounted in a mobile manner, travel tolerances could cause the two laser light spots to move towards each other.*

*Take the travel tolerances of the vehicle into account when defining the parallel spacing of adjacent AMS 304*i*.*

5.2.3 Parallel mounting of AMS 304*i* and DDLS optical data transmission

The optical data transceivers of the DDLS series and the AMS 304*i* do not interfere with one another. Depending on the size of the used reflector, the DDLS can be mounted with a minimum parallel spacing of 100mm to the AMS 304*i*. The parallel spacing is independent of the distance.

5.3 Mounting the AMS 304*i* with laser beam deflector unit

General information

The two available deflector units are used for the 90° deflection of the laser beam, see "Accessory deflector unit" on page 105.



Attention!

The deflector units are designed for a maximum range of 40m. Longer distances on request.

5.3.1 Mounting the laser beam deflector unit With integrated mounting bracket

The AMS 304*i* is screwed onto the mechanism of the US AMS 01 deflector unit. The mirror can be mounted for three deflection directions:

1. Upward beam deflection
2. Beam deflection to the left
3. Beam deflection to the right

The deflector unit is mounted on plane-parallel, flat walls or plant components. For error-free position measurement, there must be an interruption-free line-of-sight between the AMS 304*i*... and the deflection mirror as well as between the mirror and the reflector.

Use the M5 screws to mount the deflector unit. Secure the screws with a toothed lock washer to protect against loosening caused by vibrations.

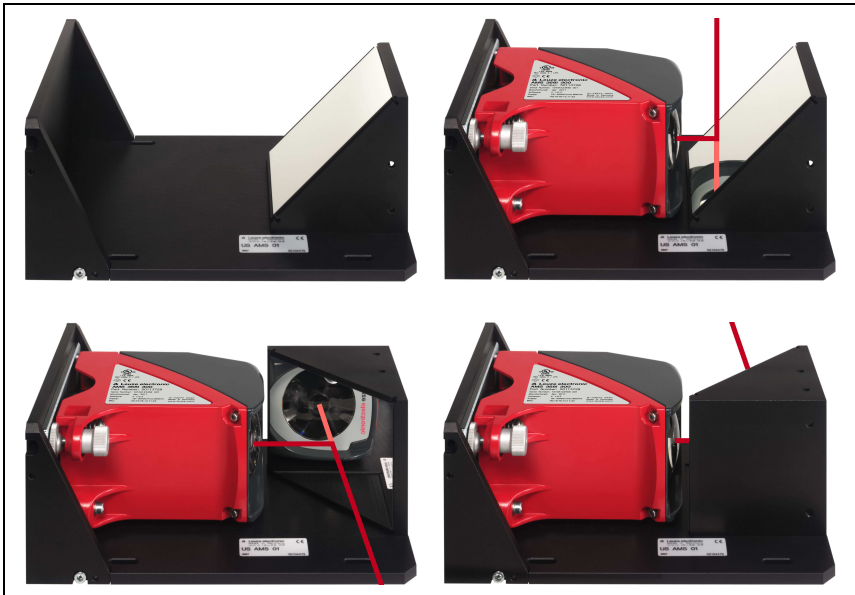


Figure 5.5: Mounting variants of the US AMS 01 laser beam deflector unit

5.3.3 Mounting the US 1 OMS deflector unit without mounting bracket

The US 1 OMS deflector unit and the AMS 304*i* are mounted separately.



Notice!

When mounting, make certain that the laser light spot of the AMS 304*i* is aligned in the center of the deflection mirror.

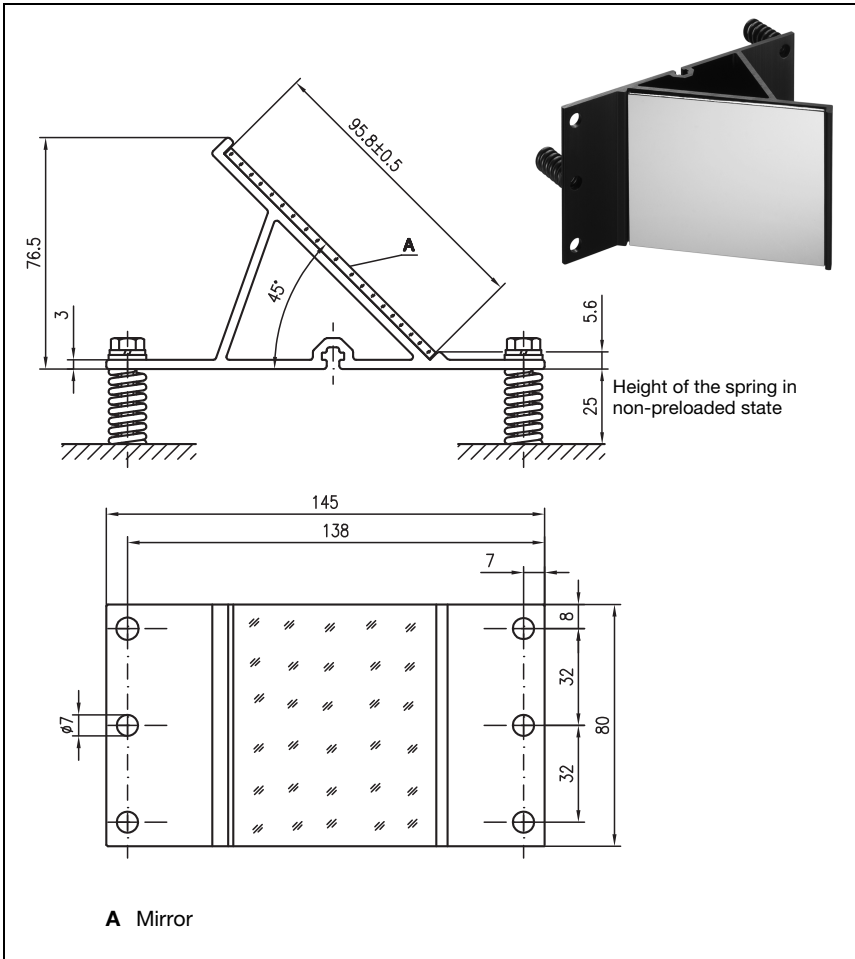


Figure 5.7: Photo and dimensioned drawing of the US 1 OMS deflector unit

Alignment of the laser light spot on the reflector is performed as described in chapter 5.2.

6 Reflectors

6.1 General information

The AMS 304*i* measures distances against a reflective tape specified by Leuze electronic. All provided specifications for the AMS 304*i*, such as the operating range or accuracy, can only be achieved with the reflective tape specified by Leuze electronic.

The reflective tapes are available as adhesive tapes, affixed to a metal plate and with an integrated heater especially for use at low temperatures. Reflective tapes with heating have the designation "**Reflective tape ...x...-H**", where "**H**" is an abbreviation for the heating variant.

The reflective tapes/reflectors must be ordered separately. The choice of size is left to the user. In chapter 6.3, recommendations on reflector size are provided as a function of the distance that is to be measured. In any case, the user must check to determine whether the recommendation is suitable for the respective application.

6.2 Description of the reflective tape

The reflective tape consists of a white, microprism-based reflective material. The microprisms are protected with a highly transparent, hard protective layer.

Under certain circumstances, the protective layer may lead to surface reflections. The surface reflections can be directed past the AMS 304*i* by positioning the reflective tape at a slight incline. The inclination of the reflective tape/reflectors is described in chapter 6.4.2. The required pitch can be found in table 6.1 "Reflector pitch resulting from spacer sleeves" on page 36.

The reflective tapes are provided with a protective foil that can easily be pulled off. This must be removed from the reflector before the complete system is put into operation.

6.2.1 Specifications of the self-adhesive foil

| | Part | | |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
| Type designation | Reflective tape 200x200-S | Reflective tape 500x500-S | Reflective tape 914x914-S |
| Part no. | 50104361 | 50104362 | 50108988 |
| Foil size | 200x200mm | 500x500mm | 914x914mm |
| Recommended application temperature for adhesive tape | +5 °C ... +25 °C | | |
| Temperature resistance, affixed | -40 °C ... +80 °C | | |
| Mounting surface | The mounting surface must be clean, dry and free of grease. | | |
| Cutting the tape | Cut with a sharp tool, always on the side of the prism structure. | | |
| Cleaning | Do not use any agents that act with a grinding effect. A conventional household detergent can be used as a cleaning agent. Rinse with clear water and dry the surface. | | |
| Storing the foil | Store in a cool and dry place. | | |

6.2.2 Specifications of the reflective tape on a metal plate

The reflective tape is affixed to a metal plate. Included with the metal plate are spacers for positioning at an incline - for avoiding surface reflections - (see chapter 6.4.2 "Mounting the reflector").

| | Part | | |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
| Type designation | Reflective tape 200x200-M | Reflective tape 500x500-M | Reflective tape 914x914-M |
| Part no. | 50104364 | 50104365 | 50104366 |
| Foil size | 200x200mm | 500x500mm | 914x914mm |
| Outer dimensions of the metal plate | 250x250mm | 550x550mm | 964x964mm |
| Weight | 0.8 kg | 4 kg | 25 kg |
| Cleaning | Do not use any agents that act with a grinding effect. A conventional household detergent can be used as a cleaning agent. Rinse with clear water and dry the surface. | | |
| Storing the reflector | Store in a cool and dry place. | | |

6.2.3 Dimensioned drawing of reflective tape on a metal plate

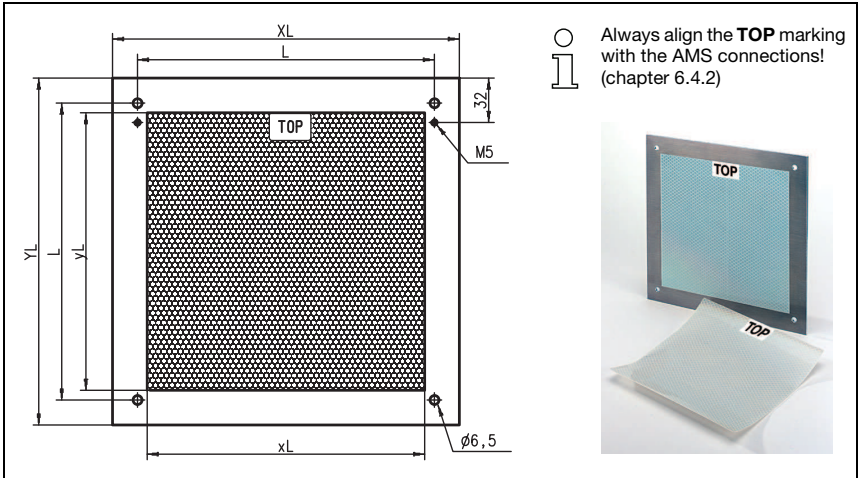


Figure 6.1: Dimensioned drawing of reflectors

| Part | Reflective tape (mm) | | Reflector plate (mm) | | |
|---------------------------|----------------------|-----|----------------------|-----|-----|
| | xL | yL | XL | YL | L |
| Reflective tape 200x200-M | 200 | 200 | 250 | 250 | 214 |
| Reflective tape 500x500-M | 500 | 500 | 550 | 550 | 514 |
| Reflective tape 914x914-M | 914 | 914 | 964 | 964 | 928 |

6.2.4 Specifications of heated reflectors

The reflective tape is affixed to a heated, thermally insulated base. The insulation results in a very high energetic efficiency.

Only the reflective tape is kept at the specified temperature by the integrated heater. Through the insulation on the back, the generated heat cannot be transferred via the steel construction. Energy costs are greatly reduced in the case of continuous heating.

| Type designation | Part | | |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------|
| | Reflective tape 200x200-H | Reflective tape 500x500-H | Reflective tape 914x914-H |
| Part no. | 50115020 | 50115021 | 50115022 |
| Voltage supply | 230VAC | | |
| Power | 100W | 600W | 1800W |
| Current consumption | ~ 0.5A | ~ 3A | ~ 8A |
| Length of the supply line | 2 m | | |
| Size of the reflective tape | 200x200mm | 500x500mm | 914x914mm |
| Outer dimensions of the base material | 250x250mm | 550x550mm | 964x964mm |
| Weight | 0.5kg | 2.5kg | 12kg |
| Temperature control | Controlled heating with the following switch-on and switch-off temperatures, measured at the reflector surface. | | |
| Switch-on temperature | ~ 5°C | | |
| Switch-off temperature | ~ 20°C | | |
| Operating temperature | -30°C ... +70°C | | |
| Storage temperature | -40°C ... +80°C | | |
| Air humidity | Max. 90%, non-condensing. | | |
| Cleaning | Do not use any agents that act with a grinding effect. A conventional household detergent can be used as a cleaning agent. Rinse with clear water and dry the surface. | | |
| Storing the reflector | Store in a cool and dry place. | | |

6.2.5 Dimensioned drawing of heated reflectors

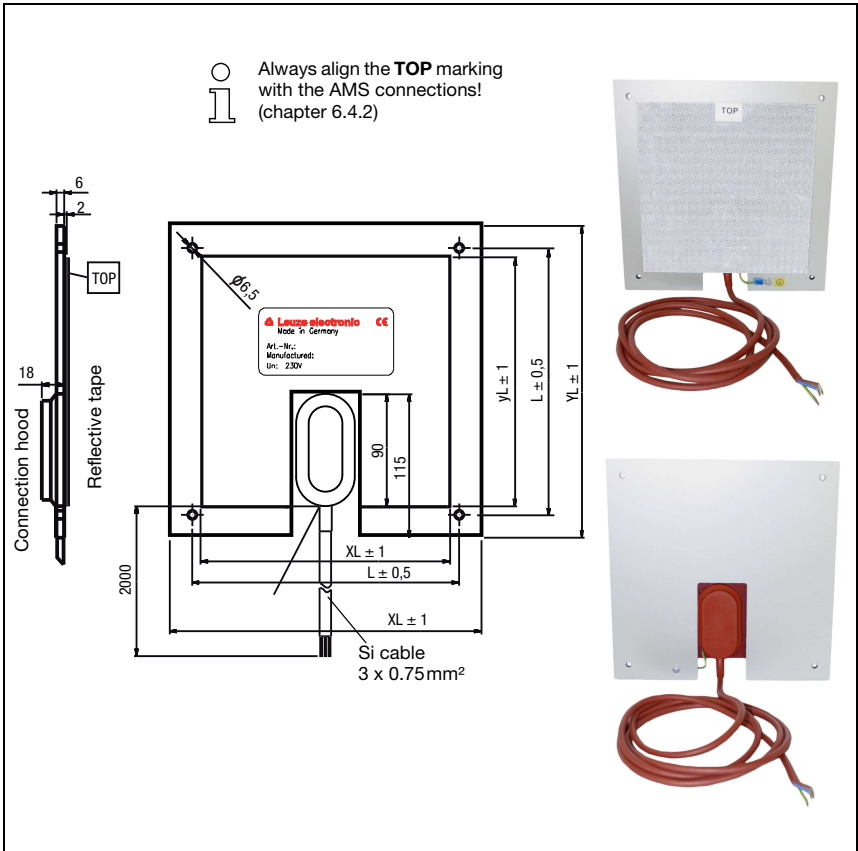


Figure 6.2: Dimensioned drawing of heated reflectors

| Part | Reflective tape (mm) | | Insulated base plate (mm) | | |
|---------------------------|----------------------|-----|---------------------------|-----|-----|
| | xL | yL | XL | YL | L |
| Reflective tape 200x200-H | 200 | 200 | 250 | 250 | 214 |
| Reflective tape 500x500-H | 500 | 500 | 550 | 550 | 514 |
| Reflective tape 914x914-H | 914 | 914 | 964 | 964 | 928 |

6.3 Selecting reflector sizes

Depending on system design, the reflector can be mounted so that it travels on the vehicle or it can be mounted at a fixed location.



Attention!

The reflector sizes shown below are a recommendation from Leuze electronic for on-vehicle mounting of the AMS 304*i*. For stationary mounting of the AMS 304*i*, a smaller reflector is generally sufficient for all measurement distances.

On the basis of the system planning and design, always check whether mechanical travel tolerances may require the use of a reflector larger than that which is recommended. This applies, in particular, when the laser measurement system is mounted on a vehicle. During travel, the laser beam must reach the reflector without interruption. For on-vehicle mounting of the AMS 304*i*, the reflector size must accommodate any travel tolerances that may arise and the associated "wandering" of the light spot on the reflector.

Overview of reflector types

| Recommended reflector sizes | | | |
|------------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| AMS 304 <i>i</i> selection (Operating range in m) | Recommended reflector size (H x W) | Type designation ...-S = Self-adhesive ...-M = metal plate ...-H = heating | Part no. |
| AMS 304 <i>i</i> 40 (max. 40m) | 200x200mm | Reflective tape 200x200-S Reflective tape 200x200-M Reflective tape 200x200-H | 50104361 50104364 50115020 |
| AMS 304 <i>i</i> 120 (max. 120m) | 500x500mm | Reflective tape 500x500-S Reflective tape 500x500-M Reflective tape 500x500-H | 50104362 50104365 50115021 |
| AMS 304 <i>i</i> 200 (max. 200m) | 749x914mm 914x914mm | Reflective tape 749x914-S Reflective tape 914x914-M Reflective tape 914x914-S Reflective tape 914x914-H | 50104363 50104366 50108988 50115022 |
| AMS 304 <i>i</i> 300 (max. 300m) | 749x914mm 914x914mm | Reflective tape 749x914-S Reflective tape 914x914-M Reflective tape 914x914-S Reflective tape 914x914-H | 50104363 50104366 50108988 50115022 |

6.4 Mounting the reflector

6.4.1 General information

Self-adhesive reflective tapes

The reflective tapes of the "Reflective tape ...x...-S" self-adhesive series must be affixed to a flat, clean and grease-free surface. We recommend using a separate metal plate, which is to be provided on-site.

As described in table 6.1, the reflective tape must be angled.

Reflective tapes on metal

The reflective tapes of the "Reflective tape ...x...-M" series are provided with corresponding mounting holes. Spacer sleeves are provided in the packet for achieving the necessary pitch angle. For further information see table 6.1.

Heated reflectors

The reflective tapes of the "Reflective tape ...x...-H" series are provided with corresponding mounting holes. Due to the voltage supply affixed on the rear, the reflector cannot be mounted flat. Included in the package are four distance sleeves in two different lengths. Use the distance sleeves to achieve a base separation to the wall as well as the necessary pitch for avoiding surface reflection. For further information see table 6.1.

The reflector is provided with a 2m-long connection cable for supplying with 230VAC. Connect the cable to the closest power outlet. Observe the current consumptions listed in the specifications.



Attention!

Connection work must be carried out by a certified electrician.

6.4.2 Mounting the reflector

The combination of laser measurement system and reflective tape/reflector is mounted so that the laser light spot hits the tape as centered as possible and without interruption.

For this purpose, use the alignment elements provided on the AMS 304*i*... (see chapter 5.2 "Mounting the AMS 304*i*"). If necessary, remove the protective foil from the reflector.



Attention!

The "TOP" label mounted on the reflectors should be aligned the same as the connections of the AMS 304*i*.

Example:

*If the AMS 304*i* is mounted so that the M12 connections are on the top, the "TOP" label of the reflector is also on the top. If the AMS 304*i* is mounted so that the M12 connections are on the side, the "TOP" label of the reflector is also on the side.*



Notice!

The reflector must be angled. To do this, use the spacer sleeves. Angle the reflectors so that the **surface reflections of the foil seal are deflected to the left, right or upwards**, chapter 6.4.3 gives the correct pitch with respect to the reflector size and, thus, the length of the spacers.

Reflective tapes ...-S and ...-M

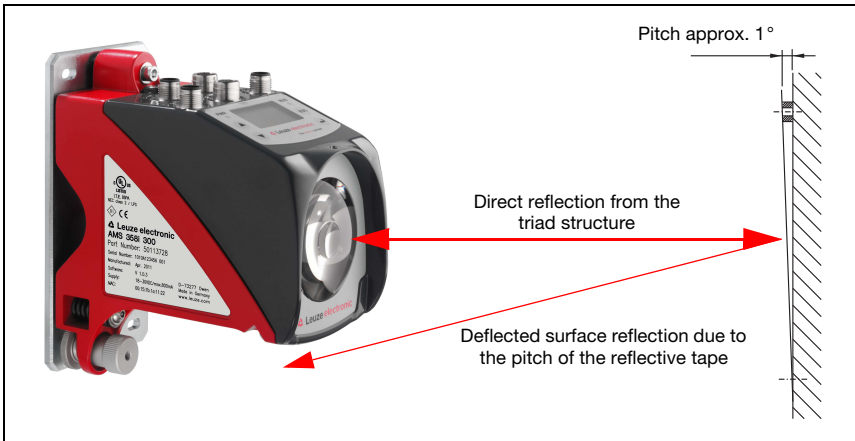


Figure 6.3: Reflector mounting

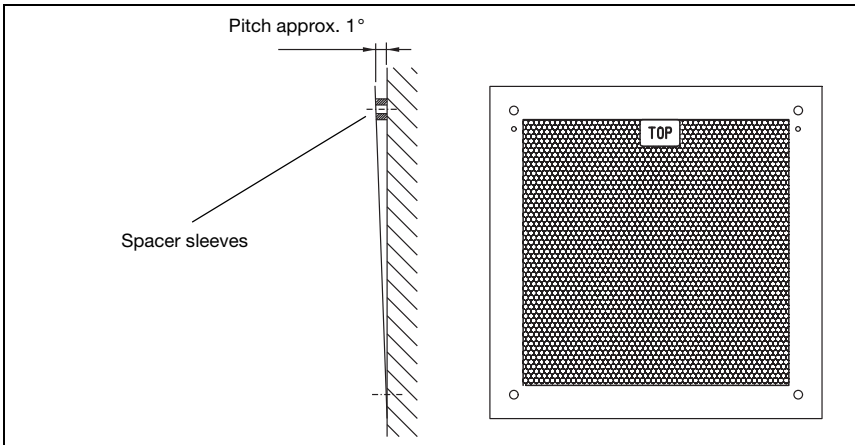


Figure 6.4: Pitch of the reflector

Reflective tapes ...-H

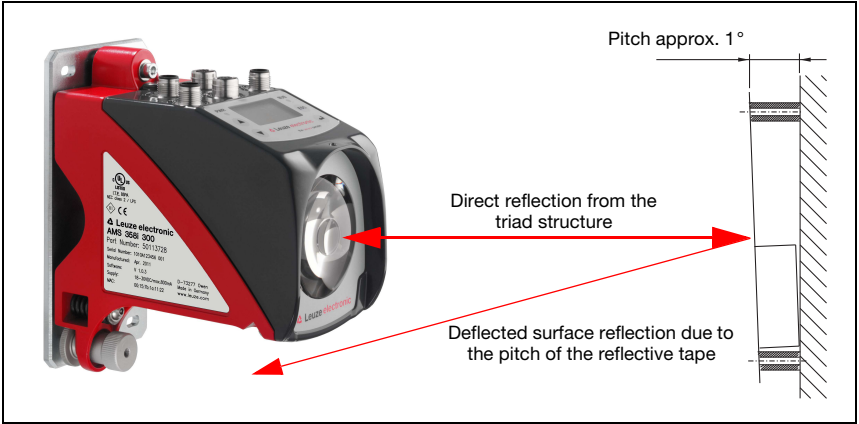


Figure 6.5: Mounting of heated reflectors

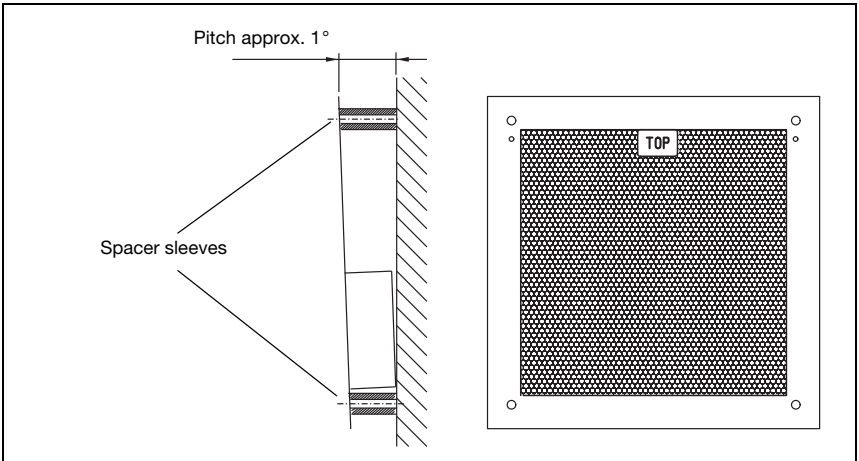


Figure 6.6: Pitch of the heated reflector

6.4.3 Table of reflector pitches

| Reflector type | Pitch resulting from spacer sleeves ¹⁾ | |
|--------------------------------------------------------|---------------------------------------------------|-----------|
| Reflective tape 200x200-S Reflective tape 200x200-M | 2 x 5 mm | |
| Reflective tape 200x200-H | 2 x 15 mm | 2 x 20 mm |
| Reflective tape 500x500-S Reflective tape 500x500-M | 2 x 10 mm | |
| Reflective tape 500x500-H | 2 x 15 mm | 2 x 25 mm |
| Reflective tape 749x914-S | 2 x 20 mm | |
| Reflective tape 914x914-S Reflective tape 914x914-M | 2 x 20 mm | |
| Reflective tape 914x914-H | 2 x 15 mm | 2 x 35 mm |

1) Spacer sleeves are included in the delivery contents of reflective tape ...-M and ...-H

Table 6.1: Reflector pitch resulting from spacer sleeves



Notice!

Reliable function of the AMS 304*i* and, thus, max. operating range and accuracy can only be achieved with the reflective tape specified by Leuze electronic. No function can be guaranteed if other reflectors are used!

7 Electrical connection

The AMS 304*i* laser measurement systems are connected using variously coded M12 connectors. This ensures unique connection assignments.



Notice!

The corresponding mating connectors and ready-made cables are available as accessories for all cables. For further information, see chapter 12 "Type overview and accessories".



Figure 7.1: Connections of the AMS 304*i*

7.1 Safety notices for the electrical connection



Attention!

Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.

The device may only be connected by a qualified electrician.

Ensure that the functional earth (FE) is connected correctly. Unimpaired operation is only guaranteed when the functional earth is connected properly.

If faults cannot be corrected, the device should be removed from operation and protected against possible use.



Attention!

For UL applications, use is permitted exclusively in Class 2 circuits according to NEC (National Electric Code).



The laser measurement systems are designed in accordance with safety class III for supply by PELV (protective extra-low voltage with reliable disconnection).



Notice!

Protection class IP65 is achieved only if the connectors and caps are screwed into place!

Described in detail in the following are the individual connections and pin assignments.

7.2 PWR – voltage supply / switching input/output

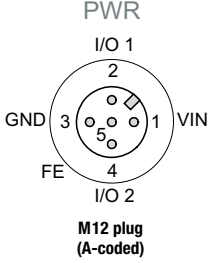
| PWR (5-pin plug, A-coded) | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|----------------------------------------|
|  <p>PWR</p> <p>I/O 1</p> <p>2</p> <p>GND 3</p> <p>FE</p> <p>4</p> <p>I/O 2</p> <p>M12 plug (A-coded)</p> | Pin | Name | Remark |
| | 1 | VIN | Positive supply voltage +18 ... +30VDC |
| | 2 | I/O 1 | Switching input/output 1 |
| | 3 | GND | Negative supply voltage 0VDC |
| | 4 | I/O 2 | Switching input/output 2 |
| | 5 | FE | Functional earth |
| | Thread | FE | Functional earth (housing) |

Table 7.1: Pin assignment PWR

Further information on configuring the input/output can be found in chapter 8 and chapter 9.

7.3 PROFIBUS BUS IN

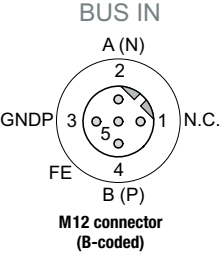
| BUS IN (5-pin plug, B-coded) | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|----------------------------------|
|  <p>BUS IN</p> <p>A (N)</p> <p>2</p> <p>GNDP 3</p> <p>FE</p> <p>4</p> <p>B (P)</p> <p>M12 connector (B-coded)</p> | Pin | Name | Remark |
| | 1 | NC | Not used |
| | 2 | A (N) | Receive/transmit data A-line (N) |
| | 3 | GNDP | Data reference potential |
| | 4 | B (P) | Receive/transmit data B-line (P) |
| | 5 | SHIELD | Shield or functional earth |
| | Thread | FE | Functional earth (housing) |

Table 7.2: Pin assignments for BUS IN

7.4 PROFIBUS BUS OUT

| BUS OUT (5-pin socket, B-coded) | | | |
|---------------------------------|--------|--------|----------------------------------|
| BUS OUT | Pin | Name | Remark |
| <p>M12 socket (B-coded)</p> | 1 | VP | Supply voltage +5V (termination) |
| | 2 | A (N) | Receive/transmit data A-line (N) |
| | 3 | GNDP | Data reference potential |
| | 4 | B (P) | Receive/transmit data B-line (P) |
| | 5 | SHIELD | Shield or functional earth |
| | Thread | FE | Functional earth (housing) |

Table 7.3: Pin assignment BUS OUT

7.5 SSI

| SSI (5-pin plug, B-coded) | | | |
|--------------------------------|--------|-------|-------------------------------------------------|
| SSI | Pin | Name | Remark |
| <p>M12 connector (B-coded)</p> | 1 | DATA+ | + Data line SSI (output) |
| | 2 | DATA- | - Data line SSI (output) |
| | 3 | CLK+ | + Clock line SSI (input electrically insulated) |
| | 4 | CLK- | - Clock line SSI (input electrically insulated) |
| | 5 | FE | Functional earth |
| | Thread | FE | Functional earth (housing) |

Table 7.4: SSI pin assignment

7.6 Service

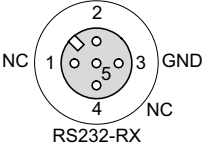
| Service (5-pin socket, A-coded) | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|----------|---------------------------------------|
|  <p> SERVICE RS232-TX 2 NC 1 3 GND 4 NC RS232-RX M12 socket (A-coded) </p> | Pin | Name | Remark |
| | 1 | NC | Not used |
| | 2 | RS232-TX | Transmission line RS 232/service data |
| | 3 | GND | Voltage supply 0VDC |
| | 4 | RS232-RX | Receiving line RS 232/service data |
| | 5 | NC | Not used |
| | Thread | FE | Functional earth (housing) |

Table 7.5: Service pin assignments



Notice!

The service interface is designed only for use by Leuze electronic!

8 Display and control panel AMS 304i

8.1 Structure of the control panel

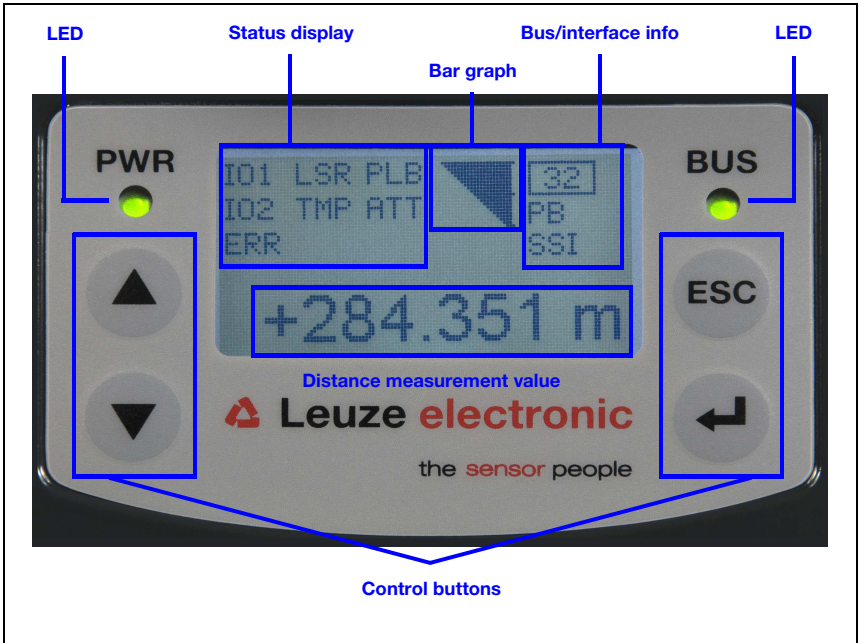


Figure 8.1: Structure of the control panel using the AMS 304i PROFIBUS device variant as an example



Notice!

The figure is for illustration purposes only and does not correspond to AMS 304i with respect to bus/interface info.

8.2 Status display and operation

8.2.1 Indicators in the display

Status and warning messages in the display

- IO1 **Input 1 or output 1 active:**
Function depending on configuration. See also module 4/5.
- IO2 **Input 2 or output 2 active:**
Function depending on configuration. See also module 4/5

- LSR **Warning - laser prefailure message:**
Laser diode old, device still functional, exchange or have repaired.
- TMP **Warning - temperature monitoring:**
Permissible internal device temperature exceeded / not met.
- PLB **Plausibility error:**
Implausible measurement value. Possible causes: light beam interruption, outside of measurement range, permissible internal device temperature considerably exceeded or traverse rate >10m/s.
Depending on the configuration, either zero or the last valid measurement value is output at the interfaces.
- ATT **Warning received signal:**
Laser outlet window or reflector soiled or fogged by rain, water vapor or fog. Clean or dry surfaces.
- ERR **Internal hardware error:**
The device must be sent in for inspection.

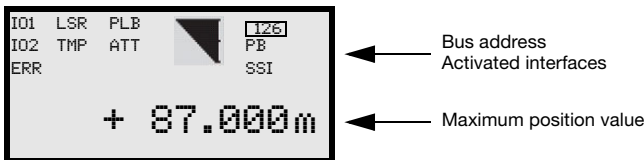
Bar graph



Indicates the **strength of the received laser light**.
The center bar represents the **ATT** warning threshold. The distance value remains valid and is output at the interfaces.
If no bar graph is available, the **PLB** status information appears at the same time. The measurement value has thus been assessed as being implausible. Depending on the configuration, either zero or the last valid measurement value is output at the interfaces.

Interface info

The bus address set (in figure "126") as well as the "PB" identifier displays an activated PROFIBUS interface. The abbreviation "SSI" stands for an activated SSI interface.



Maximum position value

The measured position value is displayed in the configured unit of measurement.
+87.000m With the **metric** setting, the measurement value is always displayed in meters with **three decimal places**.
+87.0in With the **inch** setting, the measurement value is always displayed in inches with **one decimal place**.

8.2.2 LED status displays

PWR LED

PWR



Off

Device OFF

- No supply voltage

PWR



Flashing green

Power LED flashes green

- No measurement value output
- Voltage connected
- Self test running
- Initialization running
- Parameter download running
- Boot process running

PWR



Green continuous light

Power LED green

- AMS 304*i* ok
- Measurement value output
- Self test successfully finished
- Device monitoring active

PWR



Red flashing

Power LED flashes red

- Device ok but warning message (ATT, TMP, LSR) set in display
- Light beam interruption
- Plausibility error (PLB)

PWR



Red continuous light

Power LED red

- No measurement value output; for details, see Display

PWR



Orange continuous light

Power LED orange

- Parameter enable active
- No data on the host interface

BUS LED

BUS



Off

BUS LED off

- No supply voltage (Power)
- PROFIBUS deactivated? - SSI interface active!

BUS



Green continuous light

BUS LED green

- AMS 304*i* PROFIBUS communication active, bus ok

BUS



Flashing green

BUS LED flashes green

- AMS 304*i* not on the bus

BUS



Flashing red

BUS LED flashes red

- configuration failed ("parameter failure")
- DP error
- No data exchange

BUS



Red continuous light

BUS LED red

- Bus failure, no DP protocol established to the master ("no data exchange")

-

8.2.3 Control buttons



Up

Navigate upward/laterally.



Down

Navigate downward/laterally.



ESC


Exit menu item.




ENTER

Confirm/enter value, change menu levels.

Navigating within the menus

The menus within a level are selected with the up/down buttons  .

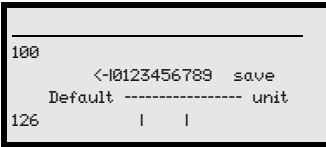
The selected menu item is activated with the enter button .

Press the ESC button  to move up one menu level.

When one of the buttons is actuated, the display illumination is activated for 10min.

Setting values

If input of a value is possible, the display looks like this:



+ Delete character

+ Enter digit

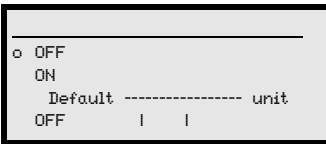
save + Save

Use the and buttons to set the desired value. An accidental, incorrect entry can be corrected by selecting <-l and then pressing .

Then use the buttons to select Save and save the set value by pressing .

Selecting options

If options can be selected, the display looks like this:

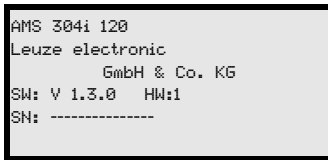


Select the desired option with the buttons. Activate the option by pressing .

8.3 Menu description

8.3.1 The main menus

After voltage has been applied to the laser, device information is displayed for several seconds. The display then shows the measurement window with all status information.

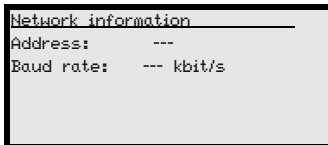


Device information - main menu

This menu item contains detailed information on

- Device model,
- Manufacturer,
- Software and hardware version,
- Serial number.

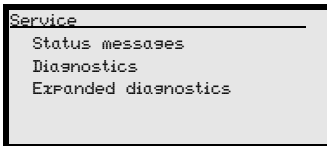
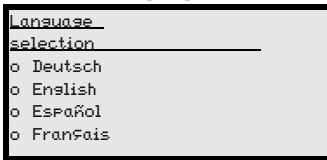
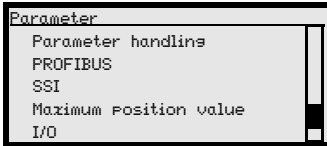
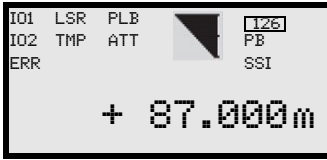
No entries can be made via the display.



Network information - main menu

• Explanations of address and baud rate.

No entries can be made via the display.



Status and measurement data - main menu

- Display of status-, warning-, and error messages
- Status overview of the switching inputs/outputs.
- Bar graph for the reception level.
- Link.
- Measurement value.

No entries can be made via the display.
See "Indicators in the display" on page 41.

Parameter - main menu

- Configuration of the AMS.
- See "Parameter menu" on page 46.

Language selection - main menu

- Selection of the display language.
- See "Language selection menu" on page 50.

Service - main menu

- Display of status messages.
 - Display of diagnostic data.
- No entries can be made via the display.
See "Service menu" on page 51.



Notice!

The rear cover of this manual includes a *fold-out page* with the complete *menu structure*. It describes the menu items in brief.

8.3.2 Parameter menu

Parameter handling submenu


The following functions can be called up in the `Parameter handling` submenu:

- Lock and enable parameter entry
- Set up a password
- Reset the AMS 304*i* to default settings.

Table 8.1: Parameter handling submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|--------------------|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Parameter enabling | | | ON / OFF The standard setting (OFF) prevents unintended parameter changes. With parameter enabling activated (ON), the display is inverted. In this state, it is possible to change parameters manually. | OFF |

Table 8.1: Parameter handling submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|-----------------------|-------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Password | Activate password | | ON / OFF To enter a password, parameter enabling must be activated. If a password is assigned, changes to the AMS 304i can only be made after the password is entered. The master password 2301 bridges the individually set password. | OFF |
| | Password entry | | Configuration option of a four-digit numerical password | |
| Parameters to default | | | By pressing the enter button  after selecting Parameters to default, all parameters are reset to their standard settings without any further security prompts. In this case, English is selected as the display language. | |

Additional important information on parameter handling can be found at the end of the chapter.

PROFIBUS submenu

Table 8.2: PROFIBUS submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|------------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Activation | | | ON / OFF Activates or deactivates the AMS 304i as a PROFIBUS participant. | ON |
| Address | | | Value from 0 to 126 The PROFIBUS permits an address range from 0 to 126. Address 126 must not be used for data communication. It may only be used temporarily for commissioning. The default address is 126. The address must be assigned separately for each AMS 304i. | 126 |

SSI submenu

Table 8.3: SSI submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|---------------------|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| Activation | | | ON / OFF Activates or deactivates the AMS 304i as an SSI participant. | ON |
| Coding | | | Binary/gray Specifies the output format of the measurement value. | Gray |
| Number of data bits | | | 24-bit/25-bit/26-bit The measurement value can be displayed on the SSI interface in this data width. | 24 bit |
| SSI resolution | | | 0.001 mm / 0.01 mm / 0.1 mm / 1 mm / 10 mm / free resolution The measurement value can be displayed in these resolutions. The value of the free resolution is determined in the "Position value" submenu in the "Value of free resolution" parameter. | 0.1 mm |

Table 8.3: SSI submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|--------------------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Error bit | | | ON/OFF This parameter determines whether an error bit is also attached to the "number of data bits". The error bit is the LSB and is not converted in the case of gray representation of the measurement value. | ON |
| Error bit function | | | The error bit can be set with the following status messages: Overflow / intensity (ATT) / temperature (TMP) / laser (LSR) / plausibility (PLB) / hardware (ERR) In the case of multiple namings, the individual states in the error bit are processed in an OR function. | Plausibility (PLB) Hardware (ERR) |
| Update rate | | | 1.7 / 0.2ms | 1,7 |
| Clock frequency | | | 50 - 79kHz / 80 - 800kHz Selection of the clock frequency. | 80 - 800kHz |

Position value submenu

Table 8.4: Position value submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|-------------------------------------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Measurement unit | | | Metric/Inch Specifies the units of the measured distances | Metric |
| Count direction | | | Positive/Negative Positive: The measurement value begins at 0 and increases with increasing distance. Negative: The measurement value begins at 0 and decreases with increasing distance. Negative distance values may need to be compensated with an offset or preset. | Positive |
| Offset | | | Output value=measurement value+offset. The resolution of the offset value is independent of the selected "Resolution position" and is entered in mm or inch/100. The offset value is effective immediately following entry. If the preset value is activated, this has priority over the offset. Preset and offset are not offset against each other. | 0mm |
| Preset | | | The preset value is accepted by means of teach pulse. The teach pulse can be applied to a hardware input of the M 12 PWR connector. The hardware input must be appropriately configured. See also configuration of the I/Os. | 0mm |
| Free resolution value | | | The measurement value can be resolved in increments of 1/1000 within the 5 ... 50000 value range. If, e.g., a resolution of 0.875 mm per digit is required, the parameter is set to 875. In the activated interface, the measurement value display must also be set to "free resolution" ("SSI resolution" parameter). | 1000 |
| Error delay | | | ON / OFF Specifies whether, in the event of an error, the position value immediately outputs the value of the "Position value in the case of error" parameter or the last valid position value for the configured error delay time. | ON/100 ms |
| Position value in the case of error | | | Last valid value / zero Specifies which position value is output after the error delay time elapses. | Zero |

I/O submenu

Table 8.5: I/O submenu

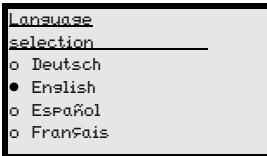
| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|--------------|--------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| I/O 1 | Port configuration | | Input/Output Defines whether I/O 1 functions as an output or input. | Output |
| | Switching input | Function | No function/preset teach/laser ON/OFF | No function |
| | | Activation | Low active/High active | Low active |
| | Switching output | Function | Pos. limit value 1 / Pos. limit value 2 / Velocity / Intensity (ATT) / Temp. (TMP) / Laser (LSR) / Plausibility (PLB) / Hardware (ERR) The individual functions are "ORed" on the selected switching output. | Plausibility (PLB), hardware (ERR) |
| Activation | | Low active/High active | Low active | |
| I/O 2 | Port configuration | | Input/Output Defines whether I/O 2 functions as an output or input. | Output |
| | Switching input | Function | No function/preset teach/laser ON/OFF | No function |
| | | Activation | Low active/High active | Low active |
| | Switching output | Function | Pos. limit value 1 / Pos. limit value 2 / Velocity / Intensity (ATT) / Temp. (TMP) / Laser (LSR) / Plausibility (PLB) / Hardware (ERR) The individual functions are "ORed" on the selected switching output. | Intensity (ATT), Temp. (TMP), Laser (LSR) |
| Activation | | Low active/High active | Low active | |
| Limit values | Upper pos. limit 1 | Activation | ON / OFF | OFF |
| | | Limit value input | Value input in mm or inch/100 | 0 |
| | Lower pos. limit 1 | Activation | ON / OFF | OFF |
| | | Limit value input | Value input in mm or inch/100 | 0 |
| | Upper pos. limit 2 | Activation | ON / OFF | OFF |
| | | Limit value input | Value input in mm or inch/100 | 0 |
| | Lower pos. limit 2 | Activation | ON / OFF | OFF |
| | | Limit value input | Value input in mm or inch/100 | 0 |
| | Max. velocity | Activation | ON / OFF | OFF |
| | | Max. velocity | Value input in mm/s or inch/100s | 0 |

Other submenu

Table 8.6: Other submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|----------------------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Heating control | | | Standard (10°C ... 15°C)/Extended (30°C ... 35°) Defines a switch-on/switch-off range for the heating control. The extended switch-on/switch-off range for heating may provide relief in the event of condensation problems. There is no guarantee that no condensation will occur on the optics in the extended switch-on/switch-off range due to the limited heating capacity. This parameter is available as standard, but functions only for devices with integrated heating (AMS 304 <i>i</i> ... H). | Standard |
| Display illumination | | | 10 minutes/ON Display illumination is switched off after 10 minutes or, if the parameter is set to "ON", illumination is always on. | 10 min. |
| Display contrast | | | Weak/Medium/Strong The display contrast may change at extreme temperature values. The contrast can subsequently be adapted using the three levels. | Medium |
| Service RS232 | Baud rate | | 57.6kbit/s / 115.2kbit/s The service interface is only available to Leuze internally. | 115.2kbit/s |
| | Format | | 8,e,1 / 8,n,1 The service interface is only available to Leuze internally. | 8,n,1 |

8.3.3 Language selection menu



There are 5 display languages available:

- German
- English
- Spanish
- French
- Italian

The AMS 304*i* is delivered from the factory with the display preset to English.

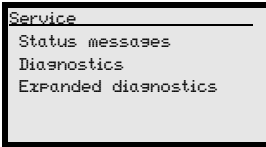


Notice!

When operating the AMS 304*i* on the PROFIBUS, the language configured in the GSD file is used in the display.

To change the language, no password needs to be entered nor must password enabling be activated. The display language is a passive operational control and is, thus, not a function parameter, per se.

8.3.4 Service menu



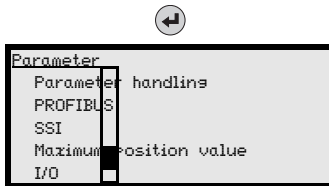
A more detailed description of the individual functions can be found in chapter 11.

8.4 Operation

Described here is an operating process using parameter enabling as an example.

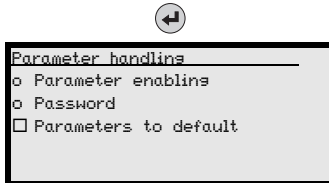
Parameter enabling

During normal operation parameters can only be viewed. If parameters are to be changed, the ON menu item in the Parameter -> Parameter handling -> Parameter enable menu must be activated. To do this, proceed as follows:



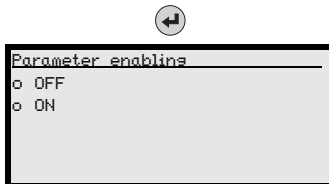
In the main menu, press the enter button to enter the Parameter menu.

Use the buttons to select the Parameter handling menu item.



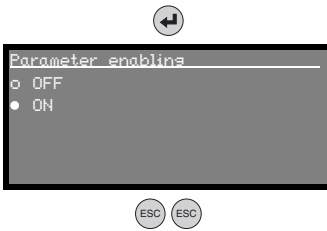
Press the enter button to enter the Parameter handling menu.

In the Parameter handling menu, use the buttons to select the Parameter enabling menu item.



Press the enter button to enter the Parameter enabling menu.

In the Parameter enabling menu, use the buttons to select the ON menu item.



Press the enter button to switch on parameter enabling.

The PWR LED illuminates orange; the display is inverted. You can now set the individual parameters on the display.

Press the ESC button twice to return to the Parameter menu.



Viewing and editing parameters

As long as parameter enabling is activated, the entire AMS 304i display is inverted.

As long as parameter enabling is activated, communication between control and AMS 304i is interrupted. The continued networking via BUS OUT is retained.



Notice!

If a password was stored, parameter enabling is not possible until this password is entered, see "Password for parameter enabling" below.



Notice!

Parameters which are defined in a GSD file have priority. After deactivation of parameter enabling on the AMS 304i, the parameter defined in the control are reactivated. The address setting is not overwritten.

For the SSI interface, the communication between the control and the AMS 304i is also active the case of parameter enabling.



Notice!

Changes to the SSI parameters via display entry have immediate effect.

Password for parameter enabling

Parameter entry on the AMS 304i can be protected with a password. With the AMS 304i, the password is determined via the PROFIBUS GSD file. Thus, the password cannot be changed by means of display entry.

To activate parameter enabling via the display (e.g., for changing an address), the password defined in the GSD file must be entered. If parameter enabling has been activated after successfully entering the password, parameters can temporarily be changed via the display.

After parameter enabling is deactivated, all changes made on the display are overwritten by the GSD file. Even a possibly newly assigned password. Only a changed address remains unchanged after entry via the display.



Notice!

*The **master password 2301** can enable the AMS 304i at any time.*

9 PROFIBUS interface

9.1 General information on PROFIBUS

The AMS 304*i* is designed as a PROFIBUS DP device for cyclical (V0) as well as acyclic (V1) data exchange.

For this purpose the functionality of the laser is defined via GSD parameter sets. The max. baud rate of the data to be transferred is 12 Mbit/s.

The PROFIBUS interface can be used parallel to the SSI interface. PROFIBUS and SSI interfaces are activated by default.



Notice!

The PROFIBUS interface can be activated/deactivated via the display. To activate / deactivate the interface, parameter enabling must be activated (see chapter 8.3.2). The respectively active interface is shown in the display; when PROFIBUS is activated, the address set is visible in the display.

9.2 PROFIBUS electrical connection

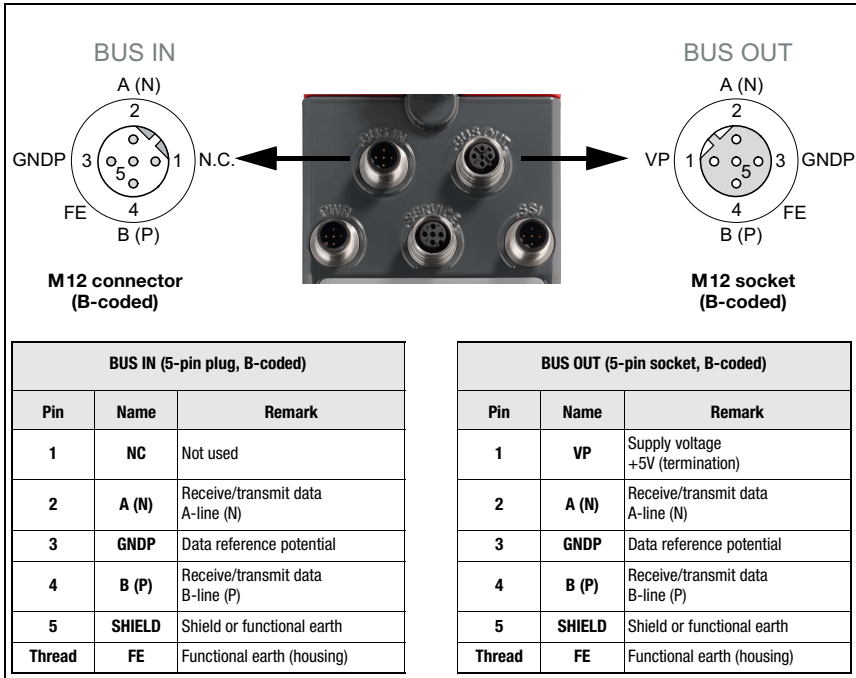


Figure 9.1: PROFIBUS - Electrical connection



Notice!

For contacting **BUS IN** and **BUS OUT**, we recommend our ready-made PROFIBUS cable (see chapter 12.4.6 "Accessory ready-made cables for PROFIBUS").



Attention!

The laser measurement system can be used to branch out the PROFIBUS network. The **continuing network** is connected via **BUS OUT**.

If the laser measurement system is the last subscriber in the network, the **BUS OUT** connection must be connected to a terminator plug, see "Accessory terminating resistor" on page 106..

9.3 PROFIBUS address entry



Notice!

Basic operation of the control panel/display is described in chapter 8.2. To set the address parameter enabling must be activated. The display is inverted.



Attention!

The laser measurement system is deactivated on the PROFIBUS when parameter enabling is activated via the display. The device is reactivated on the PROFIBUS after parameter enabling is exited.

9.3.1 Entering the PROFIBUS addresses via the display

To do this proceed as follows:

- ↳ *Activate parameter enabling.*
- ↳ *Select the PROFIBUS submenu.*
- ↳ *Select the address menu item [].*
- ↳ *Enter the PROFIBUS address of the laser measurement system; set to a value between 1 and 126 (default: 126).*
- ↳ *Deactivate parameter enabling.*

9.4 PROFIBUS GSD file

9.4.1 General information on the GSD file

If the AMS 304*i* is operated in a PROFIBUS network, configuration must be performed exclusively via the PROFIBUS. The functionality of the laser measurement system is defined via modules. The parameters and their functions are structured in the GSD file using module. A user-specific configuration tool is used during PLC program creation to integrate the required modules and configure them appropriately for the measurement application.

During operation of the laser measurement system on the PROFIBUS all parameters are set to default values. If these parameters are not changed by the user, the device functions using the default settings supplied by Leuze electronic. For the default settings of the device please refer to the following module descriptions.



Notice!

*At least one module in the GSD file must be activated in the configuration tool for the control, usually the **Position value module**.*



Notice!

Some controls make available a so-called "universal module". This module must not be activated for the AMS 304*i*.



Attention!

The AMS 304*i* makes available a PROFIBUS and an SSI interface. Both interfaces can be operated in parallel. If the AMS 304*i* is operated via the PROFIBUS, the SSI parameters must also be changed via the PROFIBUS SSI module if they differ from the default settings.

SSI parameters which are only changed via the display are overwritten by the PROFIBUS manager with the SSI (default) values stored in the GSD file.



Notice!

For test purposes parameters can be changed via the display on a laser measurement system operated on the PROFIBUS. As soon as parameter enabling is activated on the display, the device is deactivated on the PROFIBUS. All parameters set via PROFIBUS modules remain effective. Parameter changes can now be made via the display for test purposes. If parameter enabling is deactivated via the display, only the parameters set in the PROFIBUS modules and the PROFIBUS default settings are in effect.

Parameter changes made via the display are no longer in effect on the PROFIBUS!



Attention!

The laser measurement system does not permanently store parameters changed via the PROFIBUS. Following Power OFF/ON the currently configured parameters are downloaded by the PROFIBUS manager. If no PROFIBUS manager is available following Power OFF/ON, the parameters set on the display apply.



Notice!

All input and output modules described in this documentation are described **from the controller's perspective**:

Described inputs (I) are inputs of the control.

Described outputs (O) are outputs of the control.

Described parameters (P) are parameters of the GSD file in the control.



Notice!

The current GSD file for the AMS 304*i* can be found on our homepage under **www.leuze.com**

9.4.2 Overview of the GSD modules

| Module | Module name | Module contents (P) = Parameter, (O) = Output, (I) = Input |
|----------------|---------------------------|---------------------------------------------------------------|
| M1 page 60 | Position value | (I) Position value |
| | | (P) Sign |
| | | (P) Unit |
| | | (P) Resolution |
| | | (P) Count direction |
| | | (P) Offset |
| M2 page 62 | Static preset | (P) Preset value |
| | | (O) Preset teach |
| | | (O) Preset reset |
| M3 page 63 | Dynamic preset | (O) Preset value |
| | | (O) Preset teach |
| | | (O) Preset reset |
| M4 page 64 | I/O 1 | (P) Output or input defined |
| | | (P) Level/edge input/output |
| | | (P) Function for output wiring |
| | | (P) Function for input wiring |
| | | (I) Signal level input/output |
| | | (O) Output activated |
| M5 page 67 | I/O 2 | (P) Output or input defined |
| | | (P) Level/edge input/output |
| | | (P) Function for output wiring |
| | | (P) Function for input wiring |
| | | (I) Signal level input/output |
| | | (O) Output activated |
| M6 page 70 | Status and control | (I) Diagnosis and status of AMS 304 <i>i</i> |
| | | (O) Laser control ON/OFF |
| M7 page 72 | Position limit value 1 | (P) Upper and lower position limit value |
| M8 page 73 | Position limit value 2 | (P) Upper and lower position limit value |
| M9 page 74 | Error handling procedures | (P) Position value in case of error |
| | | (P) Position error message delay ON/OFF |
| | | (P) Position error message delay |
| | | (P) Velocity value in case of error |
| | | (P) Velocity error message delay ON/OFF |
| | | (P) Velocity error message delay |
| M10 page 76 | Velocity | (I) Velocity value |
| | | (P) Velocity value resolution |
| | | (P) Velocity integration time |

| | | |
|-----------------------|---------------------------------------------|-------------------------------------------|
| M11 page 78 | Velocity limit value 1 | (P) Monitoring for over/under values |
| | | (P) Monitoring direction dependent yes/no |
| | | (P) Velocity limit value 1 |
| | | (P) Hysteresis of velocity limit value |
| | | (P) Start of velocity monitoring range |
| | | (P) End of velocity monitoring range |
| M12 page 80 | Velocity limit value 2 | (P) Monitoring for over/under values |
| | | (P) Monitoring direction dependent yes/no |
| | | (P) Velocity limit value 2 |
| | | (P) Hysteresis of velocity limit value |
| | | (P) Start of velocity monitoring range |
| | | (P) End of velocity monitoring range |
| M13 page 82 | Velocity limit value 3 | (P) Monitoring for over/under values |
| | | (P) Monitoring direction dependent yes/no |
| | | (P) Velocity limit value 3 |
| | | (P) Hysteresis of velocity limit value |
| | | (P) Start of velocity monitoring range |
| | | (P) End of velocity monitoring range |
| M14 page 84 | Velocity limit value 4 | (P) Monitoring for over/under values |
| | | (P) Monitoring direction dependent yes/no |
| | | (P) Velocity limit value 4 |
| | | (P) Hysteresis of velocity limit value |
| | | (P) Start of velocity monitoring range |
| | | (P) End of velocity monitoring range |
| M15 page 86 | Velocity Limit value Dynamic | (O) Release/lock limit value control |
| | | (P) Monitoring for over/under values |
| | | (P) Monitoring direction dependent yes/no |
| | | (O) Dynamic velocity limit value |
| | | (O) Hysteresis of velocity limit value |
| | | (O) Start of velocity monitoring range |
| | | (O) End of velocity monitoring range |
| M16 page 87 | Velocity status | (I) Status of velocity monitoring |
| M17 page 89 | SSI interface | (P) Gray/Binary coding |
| | | (P) Number of data bits |
| | | (P) Resolution |
| | | (P) Update rate |
| | | (P) Function of the error bit |
| M18 page 92 | Other | (P) Display language selection |
| | | (P) Display illumination |
| | | (P) Display contrast |
| | | (P) Activate/inhibit password |
| | | (P) Password |
| | | (P) Heating control |
| M19 | – | – |
| M20 page 94 | Free resolution | (P) Position resolution |
| | | (P) Velocity resolution |

Table 9.1: Overview of the GSD modules

9.4.3 Detail description of the modules

**Note!**

In the following detailed descriptions of the modules you will find in the last column of the tables **cross references (CR) to parameters and input/output data of other modules** which are directly related to the described parameter. These cross references must absolutely be observed during configuration.

The individual **modules** are numbered from **1 ... 20**.

The **parameters and input/output data** within a module are from **a ... z**.

Example:

The **a preset** parameter in module 2 becomes active only when the preset teach occurs via module 2.b, 4.d or 5.d.

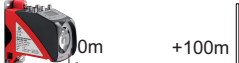
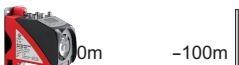
9.4.3.2 Module 1: Position value

Description

Outputs the current position value.

The parameters for sign, unit, resolution, count direction and offset remain adjustable.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value range | Default | Unit | | CR to module |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|---------------------------------------------------------------------------------------------------|----------|-------|--------|--------------|
| | | | | | | metr. | Inch | |
| a Sign | Output mode of the sign. Sign affects position and velocity output. | 0.0 | Bit | 0: two's complement 1: sign + quantity | 0 | - | | - |
| b Measurement unit | Selection of the measurement unit ¹⁾ . The parameter applies to all values with measurement units. The parameter applies to all interfaces. | 0.1 | Bit | 0: metric 1: inch (in) | 0 | - | | - |
| c Resolution | Resolution of the position value applies only to the PROFIBUS output. The resolution does not apply to: - Static preset - Dynamic preset - Offset The SSI interface has a separate parameter for the resolution. | 0.2 ... 0.4 | Bit | 001=1: 0.001 010=2: 0.01 011=3: 0.1 100=4: 1 101=5: 10 110= free resolution | 4 | mm | in/100 | 19a |
| d Count direction | Count direction positive:  Counting direction negative:  The parameter applies to all interfaces. The count direction changes the sign during velocity measurement. For the SSI interface, no negative position values can be transferred. In this case, the value 0 is output at the SSI interface. A suitable offset is to be selected so that only positive values are transferred. | 0.5 | Bit | 0: positive 1: negative | 0 | - | | - |
| e Offset | Output value=measurement value+offset. The parameter applies to all interfaces. Attention: If the preset is activated, it has priority over the offset. Preset and offset are not offset against each other. The resolution of the offset value is independent of the resolution selected in module 1. The entered offset applies immediately without any further release. | 1 - 4 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |

Parameter length: 6 bytes

1) see following notice!



Notice!

If the **unit of measurement is changed from metric to inch** (or vice versa), **previously entered numerical values** (e.g. for offset, preset, limit values etc.) **are not automatically converted**. This must be performed manually!

Example:

Preset = 10000mm -> Change from metric to inch -> Preset = 10000 inch/100

Hex coding of the "position value" parameter

The value listed in this table shows the hex coding of the default settings:

| | | |
|----------------|-----------------------------------------------|-------------|
| Module address | Sign Unit Resolution Count direction | Offset |
| 01 | 10 | 00 00 00 00 |

Input data

| Input data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|-----------------------------------------|---------------------------------|------------|----------------|---------------------|---------|--------|------|--------------|
| | | | | | | metr. | Inch | |
| f Position value | Output of the current position. | 0 | sign 32 bit | -999999 ... +999999 | - | scaled | | 9a |
| Input data length: 4 bytes consistently | | | | | | | | |

Output data

no

9.4.3.3 Module 2: Static preset

Description

With this module, a preset value can be specified. The specified preset value becomes active in the position in which preset teaching is performed.



Notice!

In the event of a device change the preset value is retained in the PROFIBUS manager. The activation of the preset value (preset teach) at the intended position must, however, be performed again.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------|---------------------|---------|-------|--------|----------------|
| | | | | | | metr. | Inch | |
| a Preset | Preset value. The value is accepted during a corresponding teach event (see output data). The parameter applies to all interfaces. The resolution of the preset value is independent of the resolution selected in module 1. | 0 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | 2b 4d 5d |
| Parameter length: 4 bytes | | | | | | | | |

Hex coding of the "preset value" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Preset value |
|----------------|--------------|
| 02 | 00 00 00 00 |

Input data

no

Output data

| Output data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------|------------------------------|------------|-----------|------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| b Preset teach | Read in the preset value. | 0.0 | Bit | 0→1 Preset teach | – | – | – | 4d 5d |
| c Preset reset | Preset value is deactivated. | 0.1 | Bit | 0→1 Preset teach | – | – | – | 4d 5d |
| Output data length: 1 byte | | | | | | | | |

9.4.3.4 Module 3: Dynamic preset

Description

With this module, a preset value can be specified. The specified preset value becomes active in the position in which preset teaching is performed. The preset value can be adjusted within the control to meet plant requirements without intervening in the static parameter structure.

Parameters

no

Input data

no

Output data

| Output data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------|---------------------|---------|-------|--------|----------------|
| | | | | | | metr. | Inch | |
| a Preset teach | Read in the preset value. | 0.0 | Bit | 0→1 Preset teach | – | – | | 4d 5d |
| b Preset reset | Preset value is deactivated. Output value=measurement value+offset. | 0.1 | Bit | 0→1 Preset teach | – | – | | 4d 5d |
| c Preset | The value is accepted during a corresponding teach event, The output data apply to all interfaces. The resolution of the preset value is independent of the resolution selected in module 1. | 1 | sign 32 bit | -999999 ... +999999 | – | mm | in/100 | 3a 4d 5d |
| Output data length: 5 bytes | | | | | | | | |

9.4.3.5 Module 4: I/O 1 Input/Output

Description

The module defines the mode of operation of the digital input/output I/O 1.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|----------------------------------------------------------------------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| a Function | The parameter defines whether I/O 1 functions as an input or as an output. | 0.0 | Bit | 0: Input 1: Output | 1 | – | | 4cd |
| b Activation | The parameter defines the level of the output when the "output" event is received. If I/O 1 is configured as an input, the response is edge-controlled. | 0.1 | Bit | 0: Low 1-0 transition 1: High 0-1 transition | 0 | – | | – |
| c Output | The parameter defines which event triggers activation of the output. The individual functions are OR -linked to one another. | | | | | – | | 4a |
| | Position limit value 1 If the position value lies outside of configured limit range 1, the output is set. | 1.0 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Position limit value 2 If the position value lies outside of configured limit range 2, the output is set. | 1.1 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Velocity limit value If the velocity value lies outside of the configured values, the output is set. Monitoring from modules 11 to 15 is OR -linked. | 1.2 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Intensity (ATT) If the intensity of the received signal is less than the warning threshold, the output is set. | 1.3 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Temperature (TMP) If the internal device temperature exceeds the set limit value, the output is set. | 1.4 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Laser (LSR) Laser prefailure message. | 1.5 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Plausibility (PLB) If implausible measurement values are diagnosed, the output is set. | 1.6 | Bit | 0 = OFF 1 = ON | 1 | – | | |
| c Output | Hardware (ERR) If a hardware error is diagnosed, the output is set. | 1.7 | Bit | 0 = OFF 1 = ON | 1 | – | | 4a |
| | Pseudodynamic output If bit 0.0 is set in the output data, the output is set. | 2.0 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| d Input | Preset The HW input is used as preset teach input (valid for static or dynamic preset). Laser The HW input is used as laser OFF. | 3.0 ... 3.2 | unsign 8 bit | 000 = HW input no function 001 = HW input as preset teach function 010 = HW input as laser OFF function | 000 | – | | 4a |
| Parameter length: 4 bytes | | | | | | | | |

Hex coding of the "I/O 1 input/output" parameter

The value listed in this table shows the hex coding of the default settings:

| | | | |
|----------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Module address | Function Activation | Position limit value 1 Position limit value 2 Velocity limit value Intensity (ATT) Temperature (TMP) Laser (LSF) Plausibility (PLB) Hardware (ERR) Pseudodynamic output | Input Preset / Laser |
| 04 | 01 | 00 C0 | 00 |



Notice!

Behavior of the AMS 304*i* on Laser ON/OFF:

If the laser light spot is positioned on the reflector when the laser diode is switched on, the AMS 304*i* returns valid measurement values after approx. 330ms.

If the laser light spot is **not** positioned on the reflector when the laser diode is switched on, the AMS 304*i* cannot calculate any distance values. If the laser beam hits the reflector at a later point in time while switched-on, the AMS 304*i* 200 returns valid measurement values after the following time span:

$t = (\text{measurement distance} / 20\text{m}) \text{ sec.}$

Example: Corridor change of a high-bay storage device during which the laser diode is not switched off while travelling around curves.
 Measurement distance 100m → t = 5sec., measurement distance 200m → t = 10sec.

Input data

| Input data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|--------------------------------------|------------|-----------|----------------------------------------------------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| e State | Signal state of the input or output. | 0.0 | Bit | 0: Input/Output at signal level not active 1: Input/Output at signal level active | – | – | – | – |
| Input data length: 1 byte | | | | | | | | |

Output data

| Output data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|----------------------------------------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| f State | The output can be activated/deactivated with this bit. The corresponding release is performed in module 4, output parameter bit 2.0. | 0.0 | Bit | 0: Output at signal level not active 1: Output at signal level active | – | – | – | 4c |
| Output data length: 1 byte | | | | | | | | |

9.4.3.6 Module 5: I/O 2 Input/Output

Description

The module defines the mode of operation of the digital input/output I/O 2.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|-----------------------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| a Function | The parameter defines whether I/O 2 functions as an input or as an output. | 0.0 | Bit | 0: Input 1: Output | 1 | – | | 5cd |
| b Activation | The parameter defines the level of the output when the "output" event is received. If I/O 2 is configured as an input, the response is edge-controlled. | 0.1 | Bit | 0: Low 1-0 transition 1: High 0-1 transition | 0 | – | | – |
| c Output | The parameter defines which event triggers activation of the output. The individual functions are OR-linked to one another. | | | | | – | | 5a |
| | Position limit value 1 If the position value lies outside of configured limit range 1, the output is set. | 1.0 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Position limit value 2 If the position value lies outside of configured limit range 2, the output is set. | 1.1 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Velocity limit value If the velocity value lies outside of the configured values, the output is set. Monitoring from modules 11 to 15 is OR-linked. | 1.2 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| | Intensity (ATT) If the intensity of the received signal is less than the warning threshold, the output is set. | 1.3 | Bit | 0 = OFF 1 = ON | 1 | – | | |
| | Temperature (TMP) If the internal device temperature exceeds the set limit value, the output is set. | 1.4 | Bit | 0 = OFF 1 = ON | 1 | – | | |
| | Laser (LSR) Laser prefailure message. | 1.5 | Bit | 0 = OFF 1 = ON | 1 | – | | |
| | Plausibility (PLB) If implausible measurement values are diagnosed, the output is set. | 1.6 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| c Output | Hardware (ERR) If a hardware error is diagnosed, the output is set. | 1.7 | Bit | 0 = OFF 1 = ON | 0 | – | | 5a |
| | Pseudodynamic output If bit 0.0 is set in the output data, the output is set. | 2.1 | Bit | 0 = OFF 1 = ON | 0 | – | | |
| d Input | Preset The HW input is used as preset teach input (valid for static or dynamic preset). | 3.0 ... | unsign 8 bit | 000 = HW input no function 001 = HW input as preset teach function | 000 | – | | 5a |
| | Laser The HW input is used as laser OFF. | 3.2 | | 010 = HW input as laser OFF function | | | | |
| Parameter length: 4 bytes | | | | | | | | |

Hex coding of the "I/O 2 input/output" parameter

The value listed in this table shows the hex coding of the default settings:

| | | | |
|----------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| Module address | Function Activation | Position limit value 1 Position limit value 2 Velocity limit value Intensity (ATT) Temperature (TMP) Laser (LSR) Plausibility (PLB) Hardware (ERR) Pseudodynamic output | Input Preset / Laser |
| 05 | 01 | 00 38 | 00 |



Notice!

Behavior of the AMS 304*i* on Laser ON/OFF:

If the laser light spot is positioned on the reflector when the laser diode is switched on, the AMS 304*i* returns valid measurement values after approx. 330ms.

If the laser light spot is **not** positioned on the reflector when the laser diode is switched on, the AMS 304*i* cannot calculate any distance values. If the laser beam hits the reflector at a later point in time while switched-on, the AMS 304*i* returns valid measurement values after the following time span:

$$t = (\text{measurement distance} / 20\text{m}) \text{ sec.}$$

Example: Corridor change of a high-bay storage device during which the laser diode is not switched off while travelling around curves.
 Measurement distance 100m → t = 5sec., measurement distance 200m → t = 10sec.

Input data

| Input data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|--------------------------------------|------------|-----------|----------------------------------------------------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| e State | Signal state of the input or output. | 0.0 | Bit | 0: Input/Output at signal level not active 1: Input/Output at signal level active | – | – | – | – |
| Input data length: 1 byte | | | | | | | | |

Output data

| Output data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|----------------------------------------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| f State | The output can be activated/deactivated with this bit. The corresponding release is performed in module 5, output parameter bit 2.1. | 0.0 | Bit | 0: Output at signal level not active 1: Output at signal level active | – | – | – | 5c |
| Output data length: 1 byte | | | | | | | | |

9.4.3.7 Module 6: Status and control

Description

The module supplies various AMS 304*i* status information to the PROFIBUS master. The laser can be controlled via the master's output data.

Parameters

no

Input data

| Input data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|-------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| a Laser status | Signals the laser status. | 1.0 | Bit | 0: Laser ON 1: Laser OFF | – | – | | – |
| b Preset status | Status of the preset value. | 1.1 | Bit | 0: Preset not active 1: Preset active | – | – | | – |
| c Preset teach | This bit toggles on each teach event of a preset value. | 1.2 | Bit | 0 or 1 | – | – | | – |
| d Overflow | The output value has exceeded the maximum value which can be represented by the SSI interface. In the event of an overflow the SSI interface data are set to 0xFF. | 1.3 | Bit | 0: OK 1: Overflow | – | – | | – |
| e Intensity (ATT) | If the intensity of the received signal is less than the warning threshold, the status bit is set. | 1.4 | Bit | 0: OK 1: Warning | – | – | | – |
| f Temperature (TMP) | If the internal device temperature exceeds or drops below the set limit value, the status bit is set. | 1.5 | Bit | 0: OK 1: Temperature above/below limit | – | – | | – |
| g Laser (LSR) | Laser prefailure message. | 1.6 | Bit | 0: OK 1: Laser warning | – | – | | – |
| h Plausibility (PLB) | If implausible measurement values are diagnosed, the status bit is set. | 1.7 | Bit | 0: OK 1: Implausible measurement value | – | – | | – |
| i Hardware (ERR) | If a hardware error is diagnosed, the status bit is set. | 0.0 | Bit | 0: OK 1: Hardware error | – | – | | – |
| j Lower position limit value 1 | Signals that the value is less than lower limit value 1. | 0.4 | Bit | 0: OK 1: Value less than limit | – | – | | – |
| k Upper position limit value 1 | Signals that the value is greater than upper limit value 1. | 0.5 | Bit | 0: OK 1: Value greater than limit | – | – | | – |

| | | | | | | | |
|-------------------------------------------------|-------------------------------------------------------------|-----|-----|--------------------------------------|---|---|---|
| l Lower position limit value 2 | Signals that the value is less than lower limit value 2. | 0.6 | Bit | 0: OK 1: Value less than limit | - | - | - |
| m Upper position limit value 2 | Signals that the value is greater than upper limit value 2. | 0.7 | Bit | 0: OK 1: Value greater than limit | - | - | - |

Input data length: 2 bytes

Output data

| Output data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|--------------------------|---------------------|------------|-----------|-----------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| n Laser | Controls the laser. | 0.0 | Bit | 0: Laser ON 1: Laser OFF | - | - | - | - |

Output data length: 2 bytes

9.4.3.8 Module 7: Position limit value range 1

Description

The position limit value range 1 parameter defines a distance range with lower and upper limits. If the measured value lies outside of the configured range, the corresponding bit is set in module 6 or, if configured, an output is set.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|-------------------------------------|------------|----------------|---------------------|---------|-------|--------|--------------|
| | | | | | | metr. | Inch | |
| a Lower pos. limit 1 | Specifies the lower position limit. | 0...3 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |
| b Upper pos. limit 1 | Specifies the upper position limit. | 4...7 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |
| Parameter length: 8 bytes | | | | | | | | |

Hex code of the "position limit value range 1" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Lower pos. limit 1 | Upper pos. limit 1 |
|----------------|--------------------|--------------------|
| 07 | 00 00 00 00 | 00 00 00 00 |

Input data

no

Output data

no

9.4.3.9 Module 8: Position limit value range 2

Description

The position limit value range 2 parameter defines a distance range with lower and upper limits. If the measured value lies outside of the configured range, the corresponding bit is set in module 6 or, if configured, an output is set.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|------------------------------------|-------------------------------------|------------|-------------|---------------------|---------|-------|--------|--------------|
| | | | | | | metr. | Inch | |
| ^a Lower pos. limit 2 | Specifies the lower position limit. | 0...3 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |
| ^b Upper pos. limit 2 | Specifies the upper position limit. | 4...7 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |
| Parameter length: 8 bytes | | | | | | | | |

Hex code of the "position limit value range 2" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Lower pos. limit 2 | Upper pos. limit 2 |
|----------------|--------------------|--------------------|
| 08 | 00 00 00 00 | 00 00 00 00 |

Input data

no

Output data

no

9.4.3.10 Module 9: Error handling procedures

Description

The module makes parameters available to handle any errors should they occur.

In the event of a temporary error in the value/velocity calculation (e.g. plausibility error caused by light beam interruption) the laser measurement system transmits the last valid measurement value for a length of time xx which is to be configured.

If the configured time is exceeded, the error display or the faulty measurement value output is activated.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|---------------------------------------|------------|-------|--------|--------------|
| | | | | | | metr. | Inch | |
| a Position value in the case of error | Specifies which position value is to be output in the event of an error after the position suppression time has elapsed. | 0.0 | Bit | 0: Last valid value 1: Zero | 1 | mm | in/100 | – |
| | No function. | 0.1 | Bit | Always 0 | 0 | – | – | – |
| b Suppress position status | Specifies whether the PLB status bit is set immediately in the event of an error or if it is suppressed for the configured position suppression time. | 0.2 | Bit | 0: OFF 1: ON | 1 | – | – | – |
| c Error delay (position) | Specifies in the event of an error whether the position value immediately outputs the value of the "position value in the case of error" parameter or outputs the last valid position value for the duration of the configured "error delay time". | 0.3 | Bit | 0: OFF 1: ON | 1 | – | – | – |
| d Error delay time (position) | Errors which occur are suppressed for the configured time. If no valid position value can be ascertained during the configured time, the last valid position value is output. If the error persists after the time elapses, the value stored in the "position value in the case of error" parameter is output. | 1...2 | unsign 16 bit | 100 ... 1000 | 100 | ms | – | – |
| e Velocity in the case of error | Specifies which velocity is to be output in the event of an error after the velocity suppression time has elapsed. | 3.0 | Bit | 0: Last valid value 1: Zero | 1 | – | – | – |
| | No function. | 3.1 | Bit | Always 0 | 0 | – | – | – |
| f Suppress velocity status | Specifies whether the PLB status bit is set immediately in the event of an error or if it is suppressed for the configured velocity suppression time. | 3.2 | Bit | 0: OFF 1: ON | 1 | – | – | – |

| | | | | | | | |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------|-----------------|-----|----|---|
| g Error delay (velocity) | Specifies in the event of an error whether the velocity immediately outputs the value of the "velocity in the case of error" parameter or outputs the last valid velocity for the duration of the configured "error delay time". | 3.3 | Bit | 0: OFF 1: ON | 1 | - | - |
| h Error delay time (velocity) | Errors which occur are suppressed for the configured time. If no velocity position value can be ascertained during the configured time, the last valid velocity value is output. If the error persists after the time elapses, the value stored in the "velocity in the case of error" parameter is output. | 4...5 | unsign 16 bit | 200 ... 1000 | 200 | ms | - |
| Parameter length: 6 bytes | | | | | | | |

Hex code of the "Error handling procedures" parameter (position and velocity)

The value listed in this table shows the hex coding of the default settings:

| | | | | |
|-----------------------|----------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------|
| Module address | Position value in the case of error Suppress position status Error delay (position) | Position suppression time | Velocity output in the case of error Suppress velocity status Error delay (velocity) | Velocity suppression time |
| 09 | C0 | 00 64 | C0 | 00 C8 |

Input data

no

Output data

no

9.4.3.11 Module 10: Velocity

Description

Outputs the current velocity with the configured resolution. The unit (metric or inch) is set in module 1 (position value) and also applies to the velocity. If module 1 is not configured, the AMS 304*i* operates with the default unit (metric).

The sign of the velocity is dependent on the count direction in module 1d.

In the default setting a positive velocity is output when the reflector moves away from the AMS 304*i*. When the reflector moves towards the AMS 304*i*, negative velocities are output. If the "negative" count direction is configured in module 1, the velocity signs are reversed.

Measurement value preparation averages all velocity values calculated during the selected period to yield a velocity value.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|--------------------------------------------------------------------------------------------------|-------------------|-----------|-----------------------------------------------------------------------------------------------------|----------|-------|--------------------|--------------|
| | | | | | | metr. | Inch | |
| a Velocity resolution | The parameter specifies the resolution for the velocity value. | 0.0 ... 0.2 | Bit | 001=1: 1 010=2: 10 011=3: 100 100=4: 1000 101=5: free resolution | 1 | mm/s | (in/ 100) /s | 20 |
| b Average | The parameter specifies the integration time (averaging time) of the calculated velocity values. | 0.3 ... 0.5 | Bit | 000=0: 2 001=1: 4 010=2: 8 011=3: 16 100=4: 32 101=5: 64 110=6: 128 | 3 | ms | | – |
| Parameter length: 2 bytes | | | | | | | | |

Hex coding of the "velocity" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Velocity resolution Average |
|----------------|--------------------------------|
| 0A | 00 19 |

Input data

| Input data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|------------------------------------------------|-------------------|------------|----------------|---------------------|---------|--------|------|--------------|
| | | | | | | metr. | Inch | |
| C Velocity | Current velocity. | 0 | sign 32 bit | -999999 ... +999999 | 0 | scaled | | - |
| Input data length: 4 bytes consistently | | | | | | | | |

Output data

no

9.4.3.12 Module 11: Static velocity limit value 1

Description

The **static velocity limit value 1** function compares the current velocity with a velocity stored in the configuration. This occurs in the configured range, which is defined by **range start** and **range end**.



Notice!

If **range start** and **range end** are identical, velocity monitoring is not activated.

If a direction-dependent limit value check is activated via the **direction selection** parameter, the values of **range start** and **range end** also define the direction. The check is always performed from **range start** to **range end**. For example, if the range start is "5500" and the range end is "5000", the direction-dependent check is only performed in the direction from "5500" to "5000". The limit value is not active in the opposite direction.

If the check is independent of direction, the order of **range start** and **range end** is irrelevant. Depending on the selected **switching mode**, if the value is above or below the defined limits, the limit value status in module 16 is set and, if configured, the output is appropriately set via module 4 or 5.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------|------------------|----------------------------------------------------------------|------------|-------|--------------------|--------------|
| | | | | | | metr. | Inch | |
| a Switching mode | Condition for the "velocity limit value 1" signal, which applies to the output (module 4/5) and the status bit (module 16). | 0.0 | Bit | 0: Value greater than limit 1: Value less than limit | 0 | – | | – |
| b Direction selection | Selection of direction-dependent or direction-independent limit value checking. | 0.1 | Bit | 0: Direction independent 1: Direction dependent | 0 | – | | – |
| c Velocity limit value 1 | Limit value is compared to the current velocity. | 1...2 | unsign 16 bit | 0 ... 20000 | 0 | mm/s | (in/ 100) /s | 16d |
| d Velocity hysteresis 1 | Relative shift to prevent signal bouncing. | 3...4 | unsign 16 bit | 0 ... 20000 | 100 | mm/s | (in/ 100) /s | – |
| e Limit value 1 range start | The velocity limit value is monitored beginning at this position. | 5...8 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/ 100 | – |
| f Limit value 1 range end | The velocity limit value is monitored up to this position. | 9 ... 12 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/ 100 | – |
| Parameter length: 13 bytes | | | | | | | | |

Hex code of the "static velocity limit value 1" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Switching mode Direction selection | Velocity limit value 1 | Velocity hysteresis 1 | Limit value 1 range start | Limit value 1 range end |
|----------------|---------------------------------------|------------------------|-----------------------|---------------------------|-------------------------|
| 0B | 00 | 00 00 | 00 64 | 00 00 00 00 | 00 00 00 00 |

Input data

no

Output data

no

9.4.3.13 Module 12: Static velocity limit value 2

Description

The **static velocity limit value 2** function compares the current velocity with a velocity stored in the configuration. This occurs in the configured range, which is defined by **range start** and **range end**.



Notice!

If **range start** and **range end** are identical, velocity monitoring is not activated.

If a direction-dependent limit value check is activated via the **direction selection** parameter, the values of **range start** and **range end** also define the direction. The check is always performed from **range start** to **range end**. For example, if the range start is "5500" and the range end is "5000", the direction-dependent check is only performed in the direction from "5500" to "5000". The limit value is not active in the opposite direction.

If the check is independent of direction, the order of **range start** and **range end** is irrelevant. Depending on the selected **switching mode**, if the value is above or below the defined limits, the limit value status in module 16 is set and, if configured, the output is appropriately set via module 4 or 5.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------|------------------|----------------------------------------------------------------|------------|-------|--------------------|--------------|
| | | | | | | metr. | Inch | |
| a Switching mode | Condition for the "velocity limit value 2" signal, which applies to the output (module 4/5) and the status bit (module 16). | 0.0 | Bit | 0: Value greater than limit 1: Value less than limit | 0 | - | | - |
| b Direction selection | Selection of direction-dependent or direction-independent limit value checking. | 0.1 | Bit | 0: Direction independent 1: Direction dependent | 0 | - | | - |
| c Velocity limit value 2 | Limit value is compared to the current velocity. | 1...2 | unsign 16 bit | 0 ... 20000 | 0 | mm/s | (in/ 100) /s | 16e |
| d Velocity hysteresis 2 | Relative shift to prevent signal bouncing. | 3...4 | unsign 16 bit | 0 ... 20000 | 100 | mm/s | (in/ 100) /s | - |
| e Limit value 2 range start | The velocity limit value is monitored beginning at this position. | 5...8 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |
| f Limit value 2 range end | The velocity limit value is monitored up to this position. | 9 ... 12 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | - |
| Parameter length: 13 bytes | | | | | | | | |

Hex code of the "static velocity limit value 2" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Switching mode Direction selection | Velocity limit value 2 | Velocity hysteresis 2 | Limit value 2 range start | Limit value 2 range end |
|----------------|---------------------------------------|------------------------|-----------------------|---------------------------|-------------------------|
| 0C | 00 | 00 00 | 00 64 | 00 00 00 00 | 00 00 00 00 |

Input data

no

Output data

no

9.4.3.14 Module 13: Static velocity limit value 3

Description

The **static velocity limit value 3** function compares the current velocity with a velocity stored in the configuration. This occurs in the configured range, which is defined by **range start** and **range end**.



Notice!

If **range start** and **range end** are identical, velocity monitoring is not activated.

If a direction-dependent limit value check is activated via the **direction selection** parameter, the values of **range start** and **range end** also define the direction. The check is always performed from **range start** to **range end**. For example, if the range start is "5500" and the range end is "5000", the direction-dependent check is only performed in the direction from "5500" to "5000". The limit value is not active in the opposite direction.

If the check is independent of direction, the order of **range start** and **range end** is irrelevant. Depending on the selected **switching mode**, if the value is above or below the defined limits, the limit value status in module 16 is set and, if configured, the output is appropriately set via module 4 or 5.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------|---------------|-----------------------------------------------------------------------|------------|-------|--------------|--------------|
| | | | | | | metr. | Inch | |
| a Switching mode | Condition for the "velocity limit value 3" signal, which applies to the output (module 4/5) and the status bit (module 16). | 0.0 | Bit | 0: Value greater than limit 1: Value less than limit | 0 | – | | – |
| b Direction selection | Selection of direction-dependent or direction-independent limit value checking. | 0.1 | Bit | 0: Direction independent 1: Direction dependent | 0 | – | | – |
| c Velocity limit value 3 | Limit value is compared to the current velocity. | 1...2 | unsign 16 bit | 0 ... 20000 | 0 | mm/s | (in/ 100) /s | 16f |
| d Velocity hysteresis 3 | Relative shift to prevent signal bouncing. | 3...4 | unsign 16 bit | 0 ... 20000 | 100 | mm/s | (in/ 100) /s | – |
| e Limit value 3 range start | The velocity limit value is monitored beginning at this position. | 5...8 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/ 100 | – |
| f Limit value 3 range end | The velocity limit value is monitored up to this position. | 9 ... 12 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/ 100 | – |
| Parameter length: 13 bytes | | | | | | | | |

Hex code of the "static velocity limit value 3" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Switching mode Direction selection | Velocity limit value 3 | Velocity hysteresis 3 | Limit value 3 range start | Limit value 3 range end |
|----------------|---------------------------------------|------------------------|-----------------------|---------------------------|-------------------------|
| 0D | 00 | 00 00 | 00 64 | 00 00 00 00 | 00 00 00 00 |

Input data

no

Output data

no

9.4.3.15 Module 14: Static velocity limit value 4

Description

The **static velocity limit value 4** function compares the current velocity with a velocity stored in the configuration. This occurs in the configured range, which is defined by **range start** and **range end**.



Notice!

If **range start** and **range end** are identical, velocity monitoring is not activated.

If a direction-dependent limit value check is activated via the **direction selection** parameter, the values of **range start** and **range end** also define the direction. The check is always performed from **range start** to **range end**. For example, if the range start is "5500" and the range end is "5000", the direction-dependent check is only performed in the direction from "5500" to "5000". The limit value is not active in the opposite direction.

If the check is independent of direction, the order of **range start** and **range end** is irrelevant. Depending on the selected **switching mode**, if the value is above or below the defined limits, the limit value status in module 16 is set and, if configured, the output is appropriately set via module 4 or 5.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------|------------------|----------------------------------------------------------------|------------|-------|--------------------|--------------|
| | | | | | | metr. | Inch | |
| a Switching mode | Condition for the "velocity limit value 4" signal, which applies to the output (module 4/5) and the status bit (module 16). | 0.0 | Bit | 0: Value greater than limit 1: Value less than limit | 0 | – | | – |
| b Direction selection | Selection of direction-dependent or direction-independent limit value checking. | 0.1 | Bit | 0: Direction independent 1: Direction dependent | 0 | – | | – |
| c Velocity limit value 4 | Limit value is compared to the current velocity. | 1...2 | unsign 16 bit | 0 ... 20000 | 0 | mm/s | (in/ 100) /s | 16 g |
| d Velocity hysteresis 4 | Relative shift to prevent signal bouncing. | 3...4 | unsign 16 bit | 0 ... 20000 | 100 | mm/s | (in/ 100) /s | – |
| e Limit value 4 range start | The velocity limit value is monitored beginning at this position. | 5...8 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | – |
| f Limit value 4 range end | The velocity limit value is monitored up to this position. | 9 ... 12 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | – |
| Parameter length: 13 bytes | | | | | | | | |

Hex code of the "static velocity limit value 4" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Switching mode Direction selection | Velocity limit value 4 | Velocity hysteresis 4 | Limit value 4 range start | Limit value 4 range end |
|----------------|---------------------------------------|------------------------|-----------------------|---------------------------|-------------------------|
| 0E | 00 | 00 00 | 00 64 | 00 00 00 00 | 00 00 00 00 |

Input data

no

Output data

no

9.4.3.16 Module 15: Dynamic velocity limit value

Description

The **dynamic velocity limit value** compares the current velocity with a stored velocity within the defined range. If the value is above or below the limit value, the dynamic limit value status in module 16 is set and, if configured, the output is appropriately set. **Limit value, hysteresis, range start** and **range end** are transferred with the output data of this module by the PROFIBUS master. The transferred values are activated by **Bit 0.0**, i.e. if this bit is set, the AMS 304*i* compares the current velocity with the new limit value conditions.



Notice!

If **range start** and **range end** are identical, velocity monitoring is not activated.

Parameters

no

Input data

no

Output data

| Output data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|--------------------------------------------------|---------------------------------------------------------------------------------|----------------|------------------|---------------------------------------------------------|----------|-------|--------------------|--------------|
| | | | | | | metr. | Inch | |
| a Limit value control | Controls internal processing of the transferred dynamic limit value parameters. | 0.0 | Bit | 0: Do not process 1: Process parameter | – | – | | – |
| b Switching mode | Condition for the signal change of the output/status bit. | 0.1 | Bit | 0: Value greater than limit 1: Value less than limit | – | – | | – |
| c Direction selection | Selection of direction-dependent or direction-independent limit value checking. | 0.2 | Bit | 0: Direction independent 1: Direction dependent | – | – | | – |
| d Velocity limit value | Limit value is compared to the current velocity. | 1...2 | unsign 16 bit | 0 ... +20000 | – | mm/s | (in/ 100) /s | 16 h |
| e Velocity hysteresis | Relative shift to prevent signal bouncing. | 3...4 | unsign 16 bit | 0 ... +20000 | – | mm/s | (in/ 100) /s | – |
| f Limit value range start | The velocity limit value is monitored beginning at this position. | 5...8 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | – |
| g Limit value range end | The velocity limit value is monitored up to this position. | 9 ... 12 | sign 32 bit | -999999 ... +999999 | 0 | mm | in/100 | – |
| Output data length: 13 bytes consistently | | | | | | | | |

9.4.3.17 Module 16: Velocity status

Description

This module supplies the PROFIBUS master with various status information for velocity measurement.

Parameters

no

Input data

| Input data | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|-------------------------------------------------|--------------------------------------------------------------------------|------------|-----------|------------------------------------------------------|---------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| a Velocity measurement error | Signals that no valid velocity could be ascertained. | 1.0 | Bit | 0: OK 1: Error | – | – | – | – |
| b Movement status | Signals whether a movement >0.1 m/s is currently being detected. | 1.1 | Bit | 0: No movement 1: Movement | – | – | – | – |
| c Movement direction | When the movement status is activated, this bit indicates the direction. | 1.2 | Bit | 0: Positive direction 1: Negative direction | – | – | – | – |
| d Velocity limit value status 1 | Signals that limit value 1 has been exceeded. | 1.3 | Bit | 0: Limit value maintained 1: Limit value violated | – | – | – | 11c |
| e Velocity limit value status 2 | Signals that limit value 2 has been exceeded. | 1.4 | Bit | 0: Limit value maintained 1: Limit value violated | – | – | – | 12c |
| f Velocity limit value status 3 | Signals that limit value 3 has been exceeded. | 1.5 | Bit | 0: Limit value maintained 1: Limit value violated | – | – | – | 13c |
| g Velocity limit value status 4 | Signals that limit value 4 has been exceeded. | 1.6 | Bit | 0: Limit value maintained 1: Limit value violated | – | – | – | 14c |
| h Dynamic velocity limit value status | Signals that the dynamic limit value has been exceeded. | 1.7 | Bit | 0: Limit value maintained 1: Limit value violated | – | – | – | 15bd |
| i Velocity comparison limit value 1 | Signals whether the current velocity is compared with this limit value. | 0.3 | Bit | 0: Comparison not active 1: Comparison active | – | – | – | – |
| j Velocity comparison limit value 2 | Signals whether the current velocity is compared with this limit value. | 0.4 | Bit | 0: Comparison not active 1: Comparison active | – | – | – | – |
| k Velocity comparison limit value 3 | Signals whether the current velocity is compared with this limit value. | 0.5 | Bit | 0: Comparison not active 1: Comparison active | – | – | – | – |

| | | | | | | | |
|-------------------------------------------------------|--------------------------------------------------------------------------------|------------|------------|----------------------------------------------------------|----------|----------|----------|
| <p>l Velocity comparison limit value 4</p> | <p>Signals whether the current velocity is compared with this limit value.</p> | <p>0.6</p> | <p>Bit</p> | <p>0: Comparison not active 1: Comparison active</p> | <p>–</p> | <p>–</p> | <p>–</p> |
| <p>m Dynamic velocity comparison</p> | <p>Signals whether the current velocity is compared with this limit value.</p> | <p>0.7</p> | <p>Bit</p> | <p>0: Comparison not active 1: Comparison active</p> | <p>–</p> | <p>–</p> | <p>–</p> |
| <p>Input data length: 2 bytes</p> | | | | | | | |

Output data

no

9.4.3.18 Module 17: SSI interface

Description

The module defines the parameters for the SSI interface.



Attention!

The SSI interface can only represent positive distance values. If negative output values are ascertained due to the offset or count direction, a zero value is output at the SSI interface! In the event of a number overflow, all data bits are set to "1".

The **unit**, **offset** and **count direction** parameters of module 1 also apply to the SSI interface.



Notice!

If the SSI interface is not configured via module 17 (SSI interface) in PROFIBUS operation, the SSI interface is deactivated.

If the SSI interface is operated without PROFIBUS (PROFIBUS OFF/SSI ON), configuration is performed via the display.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------|-----------------------------------------------------------------------------------------------------|----------|-------|--------|-----------------|
| | | | | | | metr. | Inch | |
| a Coding | The parameter defines the coding of the SSI data. | 0.0 | Bit | 0: Binary 1: Gray | 1 | - | | - |
| b Mode | The parameter defines the number of data bits. | 0.1 ... 0.2 | Bit | 00=0: 24Bit 01=1: 25Bit 10=2: 26Bit | 0 | - | | - |
| c Resolution | The parameter defines the resolution of the SSI position value. | 0.3 ... 0.5 | Bit | 001=1: 0.001 010=2: 0.01 011=3: 0.1 100=4: 1 101=5: 10 110=6: free resolution | 3 | mm | in/100 | 1b 6d 19a |
| d Update rate | The parameter defines the update rate of the measurement values at the SSI interface. The measurement value is updated independent of the clock frequency. | 0.6 | Bit | 0: 1.7ms 1: 0.2ms | 0 | ms | | - |
| e Clock frequency | | 0.7 | Bit | 0: 80kHz - 800kHz monoflop time 20us 1: 50kHz - 79 kHz monoflop time 30us | 0 | | | |
| f Error bit Attention! The attached error bit always has the following significance: 0: No error 1: Error | Error bit off/on The parameter defines the meaning of the error bit. If the error bit = OFF , no bit is attached to the data. The remaining bits 1 to 6 activate the various events which apply to the error bit. The bits are OR -linked to each other. | 1.0 | Bit | 0: OFF 1: ON | 1 | - | | - |
| | Overflow Output value exceeds the maximum value which can be represented. In the event of an overflow, all data bits are set to 1. | 1.1 | Bit | 0: OFF 1: ON | 0 | - | | - |
| | Intensity (ATT) If the intensity of the received signal is less than the warning threshold, the bit is set. | 1.2 | Bit | 0: OFF 1: ON | 0 | - | | - |
| | Temperature (TMP) Maximum internal device temperature exceeded. | 1.3 | Bit | 0: OFF 1: ON | 0 | - | | - |
| | Laser (LSR) Laser prefailure message. | 1.4 | Bit | 0: OFF 1: ON | 0 | - | | - |
| | Plausibility (PLB) Plausibility error. | 1.5 | Bit | 0: OFF 1: ON | 1 | - | | - |
| | Hardware (ERR) Hardware error. | 1.6 | Bit | 0: OFF 1: ON | 1 | - | | - |
| Parameter length: 2 bytes | | | | | | | | |

Hex coding of the "SSI interface" parameter

The value listed in this table shows the hex coding of the default settings:

| | | |
|----------------|------------------------------------|------------|
| Module address | Coding Mode Resolution Update rate | Error bits |
| 11 | 19 | 61 |

Input data

no

Output data

no



Notice!

Resolution and maximum position value which can be represented:

| SSI setting | Max. distance which can be represented Metric | Max. distance which can be represented Inches (in) | |
|--------------------------|--------------------------------------------------|-------------------------------------------------------|-----------|
| 24-bit; resolution 0.1 | 1,677 m | 16,777 in | ≈ 426 m |
| 24-bit; resolution 0.01 | 167 m | 1,677 in | ≈ 42 m |
| 24-bit; resolution 0.001 | 16 m | 167 in | ≈ 4 m |
| 25-bit; resolution 0.1 | 3,355 m | 33,554 in | ≈ 852 m |
| 25-bit; resolution 0.01 | 335 m | 3,355 in | ≈ 85 m |
| 25-bit; resolution 0.001 | 33 m | 335 in | ≈ 8 m |
| 26-bit; resolution 0.1 | 6,710 m | 67,108 in | ≈ 1,704 m |
| 26-bit; resolution 0.01 | 671 m | 6,710 in | ≈ 170 m |
| 26-bit; resolution 0.001 | 67 m | 671 in | ≈ 17 m |

Figure 9.19: SSI interface - resolution and maximum position value which can be represented

9.4.3.20 Module 18: module for display language, illumination and contrast, password, heating control

Description

Parameters for general operation are set in this module.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------|---------------------------------------------------------------------------------------------|-------------|-------|------|--------------|
| | | | | | | metr. | Inch | |
| a Language selection | Language selection for the display. A language which was selected via the display is overwritten by this parameter. | 0.0 ... 0.2 | Bit | 000=0: English 001=1: German 010=2: Italian 011=3: Spanish 100=4: French | 0 | – | – | – |
| b Display illumination | Off after 10 min. or always on. | 0.3 | Bit | 0: Off after 10 min. 1: Always on | 0 | – | – | – |
| c Display contrast | Contrast setting of the display. The contrast changes under extreme ambient temperatures and can be adjusted with this parameter. | 0.4 ... 0.5 | Bit | 000=0: Weak 001=1: Medium 010=2: Strong | 1 | – | – | – |
| d Password protection | Password protection on/off. | 0.7 | Bit | 0: OFF 1: ON | 0 | – | – | – |
| e Password | Specifies the password. Password protection must be on. | 1...2 | unsign 16 bit | 0000 ... 9999 | 0000 | – | – | – |
| f Heating control | Defines a switch-on/switch-off range for the heating control. The extended switch-on/switch-off range for heating may provide relief in the event of condensation problems. There is no guarantee that no condensation will occur on the optics in the extended switch-on/switch-off range due to the limited heating capacity. This parameter is available as standard, but functions only for devices with integrated heating (AMS 304 <i>i</i> ... H). | 3.0 | Bit | 0 = Standard (10°C ... 15°C) 1 = Extended (30°C ... 35°C) | 0 | – | – | – |
| Parameter length: 4 bytes | | | | | | | | |

Hex coding of the "other" parameter

The value listed in this table shows the hex coding of the default settings:

| Module address | Language Display illumination Display contrast Password protection | Password |
|----------------|-----------------------------------------------------------------------------|----------|
| 12 | 10 | 00 |

Input data

no

Output data

no

9.4.3.21 Module 20: free resolution

Description

Free resolution is used when the resolutions set in the standard are not appropriate. If a free resolution is used, it must be activated in module 10a.

Module 10a and module 1c must be set to configure the free resolution.

Parameters

| Parameter | Description | Rel. addr. | Data type | Value | Default | Unit | | CR to module |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|-------------|---------|-------------------------|-------------------------|--------------|
| | | | | | | metr. | Inch | |
| a Free resolution position | This module allows the output measurement values for position and velocity to be freely scaled. | 0 ... 1 | unsign 16 bit | 5 ... 50000 | 1000 | mm/10 ³ | in/10 ⁵ | 1c |
| b Free resolution velocity | The parameters apply to all interfaces for which the "free resolution" resolution was selected. The internal measurement value is multiplied by the set value on the basis of (mm/1000). Example: Value "3000" means that in the event of a change in the measurement value by 3 mm, the position value in the binary code changes by binary 1. Due to the free resolution in the example, an internal measurement value of 3333 mm gives an output value of "1111". The resolution of the "Offset", "Preset" and "Limit values" parameters is not affected by free resolution. | 2 ... 3 | unsign 16 bit | 5 ... 50000 | 1000 | (mm/10 ³)/s | (in/10 ⁵)/s | 10a |
| Parameter length: 4 bytes | | | | | | | | |

10 SSI

10.1 Principle functionality of the SSI interface

Data communication of the SSI interface is based on differential transmission as used for RS 422 interfaces. Transmission of the position value, beginning with the MSB (most significant bit), is thus synchronised with a clock cycle (CLOCK) specified by the control.

In the quiescent state both the clock line as well as the data line are at HIGH level. At the first HIGH-LOW edge (point ① in figure 10.1) the data in the internal register are stored. Thus it is ensured that the data cannot change during serial transmission.

When the next clock signal change from LOW to HIGH level (point ② in figure 10.1) occurs transmission of the position value begins with the most significant bit (MSB). With each successive change of the clock signal from LOW to HIGH level the next least-significant bit is transmitted on the data line. After the least significant bit (LSB) has been output, the clock signal switches from LOW to HIGH for one last time and the data line switches to LOW level (end of transmission).

A monoflop retriggered by the clock signal determines the time span before the SSI interface can be called for the next transmission. This results in the minimum pause time between two successive clock cycles. If time $t_m = 20\mu\text{s}$ has elapsed, the data line is returned to the quiescent level (HIGH) (point ③ in figure 10.1). This signals completed data communication and that the device is again ready for transmission.

**Notice!**

If the off-cycle of data transmission is interrupted for longer than $t_m = 20\mu\text{s}$, the next cycle will begin with a completely new transmission cycle with a newly calculated value.

If a new transmission cycle is started before time t_m has elapsed, the previous value is output again.

**Attention!**

The SSI interface can only represent positive distance values. If negative output values are ascertained due to the offset or count direction, a zero value is output at the SSI interface! In the event of a number overflow, all data bits are set to "1".

10.1.1 SSI sequence diagram

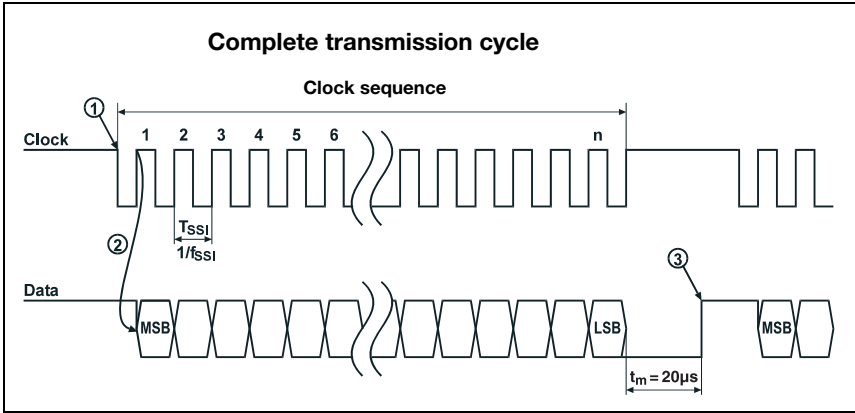


Figure 10.1: SSI data transmission sequence diagram



Notice!

In the default setting the **LSB** bit is the error bit.



Attention!

Significance of the error bit:

By default a 25th error bit (LSB) is appended to the 24-bit measurement value. The error bit is not included in the Gray coding of the measurement value. The error bit is 1 = active, 0 = not active.



Notice!

The data can be read out with a clock rate between 80kHz and 800kHz.



Attention!

Updating the measurement values on the SSI interface of the AMS 304i:

The measurement value on the SSI interface of the AMS 304i is updated every 1.7ms (default) independent of the clock frequency. The update rate on the interface can be reduced to 0.2ms via the display under the SSI menu item or in PROFIBUS module 17. The shorter update rate is only valid for the SSI interface and has no influence on the PROFIBUS DP interface.

10.1.2 Cable length as a function of the data rate

Only shielded and twisted pair lines (pin 1 with 2 and pin 3 with 4) are permitted as data lines for the SSI interface (see chapter 10.2 "SSI - Electrical connection").

↳ The shielding must be connected at both ends.

↳ Do not lay the cable parallel to power cables.

The maximum possible cable length is dependent on the cable used and the clock rate:

| Data rate | 80 kBit/s | 100 kBit/s | 200 kBit/s | 300 kBit/s | 400 kBit/s | 500 kBit/s | 1,000 kBit/s |
|-----------------------------|-----------|------------|------------|------------|------------|------------|--------------|
| Max. cable length (typical) | 500m | 400m | 200m | 100m | 50m | 25m | 10m |

Table 10.1: Max. cable length as a function of the clock rate

10.2 SSI - Electrical connection

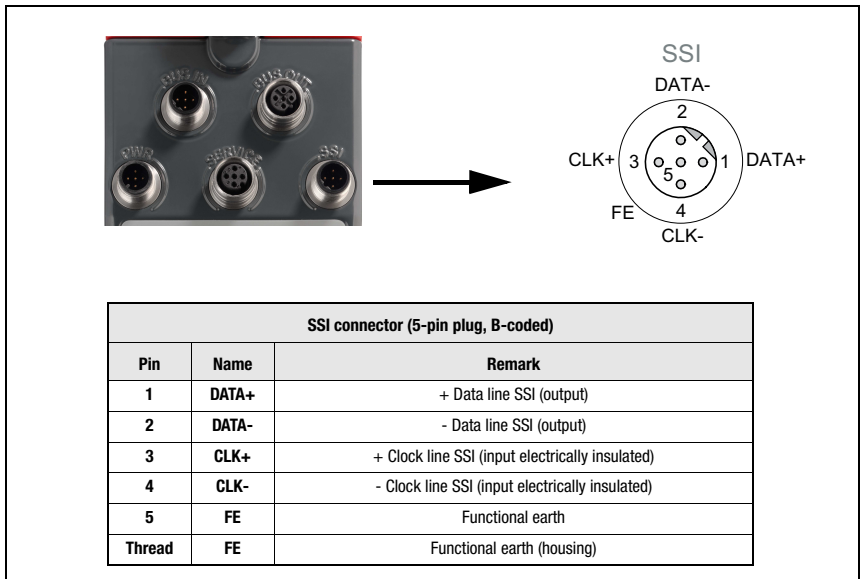


Figure 10.2: SSI - electrical connection



Notice!

To connect the SSI interface we recommend our ready-made SSI cables, see "PROFIBUS and SSI connection cable order codes" on page 108.

10.3 General Information to the AMS 304*i* parameters



Attention!

Using the PROFIBUS and SSI interface simultaneously:

The SSI interface settings are performed by the PROFIBUS. If settings which differ from the default settings for the parameters, are to be used, they must be configured via module 17 (SSI interface).

Using the SSI interface without PROFIBUS:

For this operating mode deactivate the PROFIBUS via the display (PROFIBUS = OFF).

Default parameters are stored in the laser measurement system for the sole use of the SSI interface. The preset default parameters can be changed at any time via the display.

This also applies when using parameters which do not relate directly to the SSI interface (for example: I/O 1 or I/O 2, position value or others).

The SSI interface remains active even during parameter enabling. Changes to parameters have an immediate effect.

10.4 Default settings of the SSI interface

| Default parameters which apply only to the SSI interface. | |
|-----------------------------------------------------------|-----------------------------------------------------------------------------|
| SSI activation | ON |
| Measurement value coding | Gray |
| Transmission mode | 24-bit measurement value + 1-bit error (error: 1 = active), error bit = LSB |
| Resolution | 0.1 mm |
| Default error bit | Plausibility error or hardware error |
| Update rate | 1,7 ms |
| Default parameters which apply to both PROFIBUS and SSI. | |
| Measurement unit | Metric |
| Count direction | Positive (the SSI interface cannot represent negative values) |
| I/O 1 | Output – plausibility error or hardware error |
| I/O 2 | Output – temperature error, intensity error or laser prefailure message |
| Static preset | +000.000 |
| Dynamic preset | +000.000 |
| Position limit value range 1 | Lower limit and upper limit: both 0 |
| Position limit value range 2 | Lower limit and upper limit: both 0 |
| Error handling procedures | Position output: 0 |
| | Suppress position status: active |
| | Position suppression time: 100 ms |
| Display language | English |
| Display illumination | OFF after 10 min. |
| Display contrast | Medium |
| Password protection | Off |
| Password | 0000 |

Table 10.2: Default settings of the SSI interface

10.4.1 Changing the SSI settings via the display

**Notice!**

For basic operation of the display please refer to chapter 8.2.3.

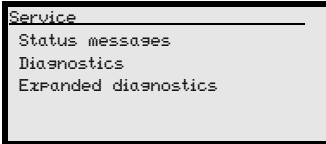
In order to change the parameters please activate parameter enabling.

The SSI interface remains active even during parameter enabling. Changes to parameters have an immediate effect.

11 Diagnostics and troubleshooting

11.1 Service and diagnostics in the display of the AMS 304*i*

In the main menu of the AMS 304*i*, expanded "Diagnostics" can be called up under the Service heading.



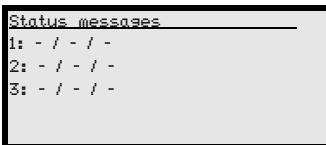
From the Service main menu, press the enter button (↵) to access the underlying menu level.

Use the up/down buttons (▲ ▼) to select the corresponding menu item in the selected level; use the enter button (↵) to activate the selection.

Return from any sub-level to the next-higher menu item by pressing the ESC button (⏏).

11.1.1 Status messages

The status messages are written in a ring memory with 25 positions. The ring memory is organized according to the FIFO principle. No separate activation is necessary for storing the status messages. Power OFF clears the ring memory.



Basic representation of the status messages

n: Type / No. / 1

Meaning:

n: memory position in the ring memory

Type: type of message:

I = info, **W** = warning, **E** = error, **F** = severe system error

No: internal error detection

1: frequency of the event (always "1", since no summation occurs)

The status messages within the ring memory are selected with the up/down buttons (▲ ▼). The enter button (↵) can be used to call up **detailed information** on the corresponding status messages with the following details:

Detailed information about a status message

- Type:** type of message + internal counter
- UID:** Leuze internal coding of the message
- ID:** description of the message
- Info:** not currently used

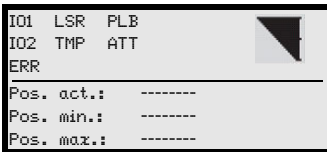
Within the detailed information, the enter button (↵) can be pressed again to activate an **action menu** with the following functions:

- Acknowledge message
- Delete message
- Acknowledge all
- Delete all

11.1.2 Diagnostics

The diagnostics function is activated by selecting the `Diagnostics` menu item. The ESC button (ESC) deactivates the diagnostics function and clears the contents of the recordings.

The recorded diagnostic data are displayed in 2 fields. In the upper half of the display, status messages of the AMS and the bar graph are displayed. The lower half contains information that assists in a Leuze-internal evaluation.



Use the up/down buttons (▲ ▼) to scroll in the bottom half between various displays. The contents of the scrollable pages are intended solely for Leuze for internal evaluation.

The diagnostics have no influence on the communication to the host interface and can be activated during operation of the AMS 304*i*.

11.1.3 Expanded diagnostics

The `Expanded diagnostics` menu item is used for Leuze-internal evaluation.

11.2 General causes of errors

11.2.1 Power LED

See also chapter 8.2.2.

| Error | Possible error cause | Measure |
|-----------------------|-----------------------------|--------------------------------------------------------------------------------|
| PWR LED "OFF" | No supply voltage connected | Check supply voltage. |
| | Hardware error | Send in device. |
| PWR-LED "flashes red" | Light beam interruption | Check alignment. |
| | Plausibility error | Traverse rate >10m/s. |
| PWR-LED "static red" | Hardware error | For error description, see display, It may be necessary to send in the device. |

Table 11.1: General causes of errors

11.3 Interface errors

11.3.1 BUS LED

| Error | Possible error cause | Measure |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BUS LED "OFF" (no communication via PROFIBUS) | No supply voltage connected | Check supply voltage. |
| | Incorrect wiring. | Check wiring. |
| | Wrong termination | Check termination. |
| | Incorrect PROFIBUS address | Check PROFIBUS address. |
| | PROFIBUS deactivated | Activate PROFIBUS in the AMS 304 <i>i</i> . |
| | Configuration error | Check configuration. |
| BUS-LED "flashes red" | Communication error: configuration failed ("parameter failure") DP Error: no data exchange | <ul style="list-style-type: none"> • Check configuration. • Carry out a reset on the control. |
| BUS-LED "red" (sporadic error at the PROFIBUS) | Incorrect wiring. | Check wiring. |
| | Wrong termination | Check termination. |
| | Effects due to EMC. | <ul style="list-style-type: none"> • Check shielding. • Check grounding concept and connection to FE. • Avoid EMC coupling caused by power cables laid parallel to device lines. |
| | Overall network expansion exceeded. | Check max. network expansion as a function of the baud rate set. |

Table 11.2: Bus error

11.4 Status display in the display of the AMS 304*i*

| Display | Possible error cause | Measure |
|-----------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------|
| PLB (implausible measurement values) | Laser beam interruption | Laser spot must always be incident on the reflector. |
| | Laser spot outside of reflector | Traverse rate < 10m/s? |
| | Measurement range for maximum distance exceeded | Restrict traversing path or select AMS with larger measurement range. |
| | Velocity greater than 10m/s | Reduce velocity. |
| | Ambient temperature far outside of the permissible range (TMP display; PLB) | Select AMS with heating or ensure cooling. |

| Display | Possible error cause | Measure |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ATT (insufficient received signal level) | Reflector soiled | Clean reflector or glass lens. |
| | Glass lens of the AMS soiled | |
| | Performance reduction due to snow, rain, fog, condensing vapor, or heavily polluted air (oil mist, dust) | Optimize usage conditions. |
| | Laser spot only partially on the reflector | Check alignment. |
| | Protective foil on the reflector | Remove protective foil from reflector. |
| TMP (operating temperature outside of specification) | Ambient temperatures outside of the specified range | In case of low temperatures, remedy may be an AMS with heating. If temperatures are too high, provide cooling or change mounting location. |
| LSR Laser diode warning | Laser diode prefailure message | Send in device at next possible opportunity to have laser diode replaced. Have replacement device ready. |
| ERR Hardware error. | Indicates an uncorrectable error in the hardware | Send in device for repair. |



Notice!

Please use **chapter 11 as a master copy** should servicing be required.

Cross the items in the "Measures" column which you have already examined, fill out the following address field and fax the pages together with your service contract to the fax number listed below.

Customer data (please complete)

| | |
|--------------------------------------|--|
| Device type: | |
| Company: | |
| Contact partner / department: | |
| Phone (direct): | |
| Fax: | |
| Street / No: | |
| ZIP code/City: | |
| Country: | |

Leuze Service fax number:

+49 7021 573 - 199

12 Type overview and accessories

12.1 Type key

AMS 3xx *i* **yyy** H

| | | |
|------------------|------------|--------------------------------|
| Heating option | H = | With heating |
| Sensing distance | 40 | Max. operating range in m |
| | 120 | Max. operating range in m |
| | 200 | Max. operating range in m |
| | 300 | Max. operating range in m |
| | <i>i</i> = | Integrated fieldbus technology |
| Interface | 00 | RS 422/RS 232 |
| | 01 | RS 485 |
| | 04 | PROFIBUS DP / SSI |
| | 08 | TCP/IP |
| | 35 | CANopen |
| | 38 | EtherCAT |
| | 48 | PROFINET RT |
| | 55 | DeviceNet |
| | 58 | Ethernet/IP |
| 84 | Interbus | |

AMS Absolute Measuring System

12.2 Type overview AMS 304*i* (PROFIBUS)

| Type designation | Description | Part no. |
|------------------------|------------------------------------------------------------------|----------|
| AMS 304 <i>i</i> 40 | 40m operating range, PROFIBUS/SSI interface | 50113677 |
| AMS 304 <i>i</i> 120 | 120m operating range, PROFIBUS/SSI interface | 50113678 |
| AMS 304 <i>i</i> 200 | 200m operating range, PROFIBUS/SSI interface | 50113679 |
| AMS 304 <i>i</i> 300 | 300m operating range, PROFIBUS/SSI interface | 50113680 |
| AMS 304 <i>i</i> 40 H | 40m operating range, PROFIBUS/SSI interface, integrated heating | 50113681 |
| AMS 304 <i>i</i> 120 H | 120m operating range, PROFIBUS/SSI interface, integrated heating | 50113682 |
| AMS 304 <i>i</i> 200 H | 200m operating range, PROFIBUS/SSI interface, integrated heating | 50113683 |
| AMS 304 <i>i</i> 300 H | 300m operating range, PROFIBUS/SSI interface, integrated heating | 50113684 |

Table 12.1: Type overview AMS 304*i*

12.3 Overview of reflector types

| Type designation | Description | Part no. |
|---------------------------|-------------------------------------------------------|----------|
| Reflective tape 200x200-S | Reflective tape, 200x200mm, self-adhesive | 50104361 |
| Reflective tape 500x500-S | Reflective tape, 500x500mm, self-adhesive | 50104362 |
| Reflective tape 914x914-S | Reflective tape, 914x914mm, self-adhesive | 50108988 |
| Reflective tape 200x200-M | Reflective tape, 200x200mm, affixed to aluminum plate | 50104364 |
| Reflective tape 500x500-M | Reflective tape, 500x500mm, affixed to aluminum plate | 50104365 |
| Reflective tape 914x914-M | Reflective tape, 914x914mm, affixed to aluminum plate | 50104366 |
| Reflective tape 200x200-H | Heated reflective tape, 200 x 200 mm | 50115020 |
| Reflective tape 500x500-H | Heated reflective tape, 500 x 500 mm | 50115021 |
| Reflective tape 914x914-H | Heated reflective tape, 914 x 914 mm | 50115022 |

Table 12.2: Overview of reflector types

12.4 Accessories

12.4.1 Accessory mounting bracket

| Type designation | Description | Part no. |
|------------------|---------------------------------------------------------------------------|----------|
| MW OMS/AMS 01 | Mounting bracket for mounting the AMS 304 <i>i</i> to horizontal surfaces | 50107255 |

Table 12.3: Accessory mounting bracket

12.4.2 Accessory deflector unit

| Type designation | Description | Part no. |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------|
| US AMS 01 | Deflector unit with integrated mounting bracket for the AMS 304 <i>i</i> . Variable 90° deflection of the laser beam in various directions | 50104479 |
| US 1 OMS | Deflector unit without mounting bracket for simple 90° deflection of the laser beam | 50035630 |

Table 12.4: Accessory deflector unit

12.4.3 Accessory M12 connector

| Type designation | Description | Part no. |
|------------------|--------------------------------------------|----------|
| KD 02-5-BA | M12 connector, B-coded socket, BUS IN | 50038538 |
| KD 02-5-SA | M12 connector, B-coded plug, BUS OUT; SSI | 50038537 |
| KD 095-5A | M12 connector, A-coded socket, Power (PWR) | 50020501 |

Table 12.5: Accessory M12 connector

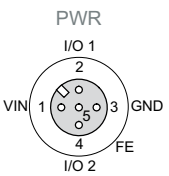
12.4.4 Accessory terminating resistor

| Type designation | Description | Part no. |
|------------------|-----------------------------------------------|----------|
| TS 02-4-SA | M12 terminating resistor for PROFIBUS BUS OUT | 50038539 |

Table 12.6: Accessory terminating resistor

12.4.5 Accessory ready-made cables for voltage supply

Contact assignment/wire color of PWR connection cable

| PWR connection cable (5-pin socket, A-coded) | | | |
|-----------------------------------------------------------------------------------|--------|-------|--------------|
|  | Pin | Name | Core color |
| | 1 | VIN | brown |
| | 2 | I/O 1 | white |
| | 3 | GND | blue |
| | 4 | I/O 2 | black |
| | 5 | FE | gray |
| | Thread | FE | bare |

Specifications of the cables for voltage supply

Operating temperature range in rest state: -30°C ... +70°C
 in motion: -5°C ... +70°C

Material sheathing: PVC

Bending radius > 50mm

Order codes of the cables for voltage supply

| Type designation | Description | Part no. |
|---------------------|--------------------------------------------------------------------------|----------|
| K-D M12A-5P-5m-PVC | M12 socket, A-coded, axial plug outlet, open cable end, cable length 5m | 50104557 |
| K-D M12A-5P-10m-PVC | M12 socket, A-coded, axial plug outlet, open cable end, cable length 10m | 50104559 |

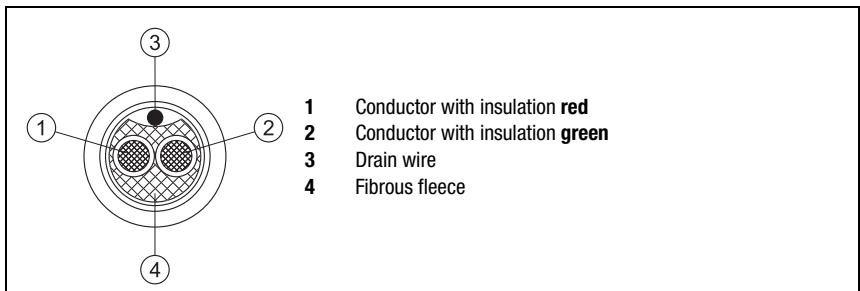
12.4.6 Accessory ready-made cables for PROFIBUS

General

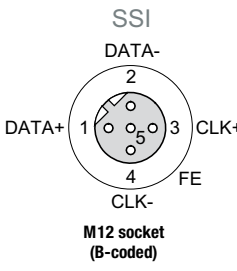
- Cable **KB PB...** for connecting to the BUS IN/BUS OUT M12 connector
- **KB SSI...** cable for connecting to the SSI M12 connector
- Standard cables available in lengths from 2 ... 30m
- Special cables on request.

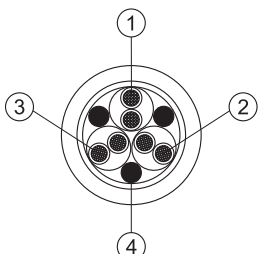
Contact assignments of PROFIBUS connection cable

| PROFIBUS connection cable (5-pin socket/connector, B-coded, 2-pin cable) | | | |
|--------------------------------------------------------------------------|--------|-------|----------------------------|
| | Pin | Name | Core color |
| <p>M12 socket (B-coded)</p> | 1 | NC | - |
| | 2 | A (N) | green |
| | 3 | NC | - |
| | 4 | B (P) | red |
| | 5 | NC | - |
| | Thread | FE | Functional earth (housing) |
| <p>M12 connector (B-coded)</p> | | | |



Contact assignments of SSI connection cable

| SSI/IBS connection cable (5-pin socket, B-coded) | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|---------------|
| | Pin | Name | Core color |
|  <p>SSI DATA- 2 DATA+ 1 3 CLK+ 4 FE CLK- M12 socket (B-coded)</p> | 1 | DATA+ | yellow |
| | 2 | DATA- | green |
| | 3 | CLK+ | gray |
| | 4 | CLK- | pink |
| | 5 | FE | brown |
| | Thread | FE | bare |



- 1** Conductor pair with **white/brown** insulation
- 2** Conductor pair with **green/yellow** insulation
- 3** Conductor pair with **gray/pink** insulation
- 4** Filler (polyester threads)

All conductor pairs stranded,
colors in accordance with DIN 47100

Technical data of PROFIBUS and SSI connection cable

Operating temperature range in rest state: -40°C ... +80°C
in motion: -5°C ... +80°C

Material the lines comply with the PROFIBUS requirements,
free of halogens, silicone and PVC

Bending radius > 80mm, suitable for drag chains

PROFIBUS and SSI connection cable order codes

| Type designation | Remark | Part no. |
|------------------|--------------------------------------------------------------------------|----------|
| KB PB-2000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 2m | 50104181 |
| KB PB-5000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 5m | 50104180 |
| KB PB-10000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 10m | 50104179 |
| KB PB-15000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 15m | 50104178 |

| Type designation | Remark | Part no. |
|--------------------|------------------------------------------------------------------------------------------|----------|
| KB PB-20000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 20m | 50104177 |
| KB PB-25000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 25m | 50104176 |
| KB PB-30000-BA | M12 socket for BUS IN, axial connector, open cable end, cable length 30m | 50104175 |
| KB PB-2000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 2m | 50104188 |
| KB PB-5000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 5m | 50104187 |
| KB PB-10000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 10m | 50104186 |
| KB PB-15000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 15m | 50104185 |
| KB PB-20000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 20m | 50104184 |
| KB PB-25000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 25m | 50104183 |
| KB PB-30000-SA | M12 plug for BUS OUT, axial connector, open cable end, cable length 30m | 50104182 |
| KB PB-1000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 1m | 50104096 |
| KB PB-2000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 2m | 50104097 |
| KB PB-5000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 5m | 50104098 |
| KB PB-10000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 10m | 50104099 |
| KB PB-15000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 15m | 50104100 |
| KB PB-20000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 20m | 50104101 |
| KB PB-25000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 25m | 50104174 |
| KB PB-30000-SBA | M12 plug + M12 socket for PROFIBUS, axial connectors, cable length 30m | 50104173 |
| KB SSI/BS-2000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 2m | 50104172 |
| KB SSI/BS-5000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 5m | 50104171 |
| KB SSI/BS-10000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 10m | 50104170 |
| KB SSI/BS-15000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 15m | 50104169 |
| KB SSI/BS-20000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 20m | 50104168 |
| KB SSI/BS-25000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 25m | 50108447 |
| KB SSI/BS-30000-BA | M12 socket, B-coded, for SSI/Interbus, axial connector, open cable end, cable length 30m | 50108446 |

13 Maintenance

13.1 General maintenance information

With normal use, the laser measurement system does not require any maintenance by the operator.

Cleaning

In the event of dust build-up or if the (ATT) warning message is displayed, clean the device with a soft cloth; use a cleaning agent (commercially available glass cleaner) if necessary. Also check the reflector for possible soiling.



Attention!

Do not use solvents and cleaning agents containing acetone. Use of such solvents could blur the reflector, the housing window and the display.


13.2 Repairs, servicing



Attention!

Access to or changes on the device, except where expressly described in this operating manual, are not authorized. The device must not be opened. Failure to comply will render the guarantee void. Warranted features cannot be guaranteed after the device has been opened.

Repairs to the device must only be carried out by the manufacturer.

 *Contact your Leuze distributor or service organization should repairs be required. The addresses can be found on the inside of the cover and on the back.*



Notice!

When sending the laser measurement systems to Leuze electronic for repair, please provide an accurate description of the error.

13.3 Disassembling, packing, disposing

Repacking

For later reuse, the device is to be packed so that it is protected.

Notice!

Electrical scrap is a special waste product! Observe the locally applicable regulations regarding disposal of the product.

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|------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|---------|
| Device information | | | | | | page 43 | |
| Network information | | | | | | page 43 | |
| Status- and measurement data | | | | | | page 43 | |
| Parameter | ↔ Parameter handling | ↔ Parameter enabling | | | ON / OFF | page 44 | |
| | | ↔ Password | ↔ Activate password | | ON / OFF | | |
| | | | ↔ Password entry | | Configuration option of a four-digit numerical password | | |
| | | ↔ Parameters to default | | | All parameters are reset to their factory settings | | |
| | ↔ PROFIBUS | ↔ Activation | | | ON / OFF | page 45 | |
| | | ↔ Address | | | Address of the AMS 304i, 0 ... 126 | | |
| | ↔ SSI | ↔ Activation | | | | ON / OFF | page 45 |
| | | ↔ Coding | | | | Binary/gray | |
| | | ↔ Number of data bits | | | | 24-bit/25-bit/26-bit | |
| | | ↔ SSI resolution | | | | 0.001 mm / 0.01 mm / 0.1 mm / 1 mm / 10 mm / free resolution | |
| | | ↔ Error bit | | | | ON / OFF | |
| | | ↔ Error bit function | | | | Overflow, intensity (ATT) temp. (TMP) laser (LSR) plausibility (PLB) hardware (ERR) | |
| | | ↔ Update rate | | | | 1.7 ms / 0.2 ms | |
| | | ↔ Clock frequency | | | | 80kHz - 800kHz, 20us / 50kHz - 79kHz, monoflop time 30us | |
| | ↔ Maximum position value | ↔ Measurement unit | | | | Metric/Inch | page 46 |
| | | ↔ Count direction | | | | Positive/Negative | |
| | | ↔ Offset | | | | Value input: | |
| | | ↔ Preset | | | | Value input | |
| | | ↔ Error delay | | | | ON / OFF | |
| | | ↔ Position value in the case of error | | | | Last valid value / zero | |
| ↔ Free resolution value | | | | | 5 ... 50000 | | |
| | | | | | | | |
| ↔ I/O | ↔ I/O 1 | ↔ Port configuration | | | Input/Output | page 46 | |
| | | ↔ Switching input | ↔ Function | | No function/preset teach/laser ON/OFF | | |
| | | | ↔ Activation | | Low active/High active | | |
| | | ↔ Switching output | ↔ Function | | Pos. limit value 1 / pos. limit value 2 / speed / intensity (ATT) / temp. (TMP) / laser (LSR) / plausibility (PLB) / hardware (ERR) | | |
| | | | ↔ Activation | | Low active/High active | | |
| | | | | | | | |
| | ↔ I/O 2 | ↔ Port configuration | | | | Input/Output | |
| | | ↔ Switching input | ↔ Function | | | No function/preset teach/laser ON/OFF | |
| | | | ↔ Activation | | | Low active/High active | |
| | | ↔ Switching output | ↔ Function | | | Pos. limit value 1 / pos. limit value 2 / speed / intensity (ATT) / temp. (TMP) / laser (LSR) / plausibility (PLB) / hardware (ERR) | |
| | | ↔ Activation | | | Low active/High active | | |

| | | | | | | | | |
|---|--------------------|--------------|----------------------|--------------------|-----------|-------------------------|------------------------------------------------------|---------|
| | ↔ | Limit values | ↔ | Upper pos. limit 1 | ↔ | Activation | ON / OFF | |
| | | | | | ↔ | Limit value input | Value input in mm or inch/100 | |
| | | | ↔ | Lower pos. limit 1 | ↔ | Activation | ON / OFF | |
| | | | | | ↔ | Limit value input | Value input in mm or inch/100 | |
| | | | ↔ | Upper pos. limit 2 | ↔ | Activation | ON / OFF | |
| | | | | | ↔ | Limit value input | Value input in mm or inch/100 | |
| | | | ↔ | Lower pos. limit 2 | ↔ | Pos limit value active. | ON / OFF | |
| | | | | | ↔ | Maximum position value | Value input in mm or inch/100 | |
| | | | ↔ | Max. velocity | ↔ | Activation | ON / OFF | |
| | | | | | ↔ | Max. velocity | Value input in mm/s or inch/100s | |
| ↔ | Other | ↔ | Heating control | | | | Standard/extended (10°C ... 15°C/30°C ... 35°C) | page 48 |
| | | ↔ | Display background | | | | 10 minutes/ON | |
| | | ↔ | Display contrast | | | | Weak/Medium/Strong | |
| | | ↔ | Service RS232 | ↔ | Baud rate | | 57.6 kbit/s / 115.2 kbit/s | |
| | | | | ↔ | Format | | 8,e,1 / 8,n,1 | |
| ↔ | Language selection | | | | | | Deutsch / English / Español / Français / Italiano | page 48 |
| ↔ | Service | ↔ | Status messages | | | | | page 49 |
| | | ↔ | Diagnostics | | | | Exclusively for service purposes by Leuze electronic | |
| | | ↔ | Expanded diagnostics | | | | Exclusively for service purposes by Leuze electronic | |