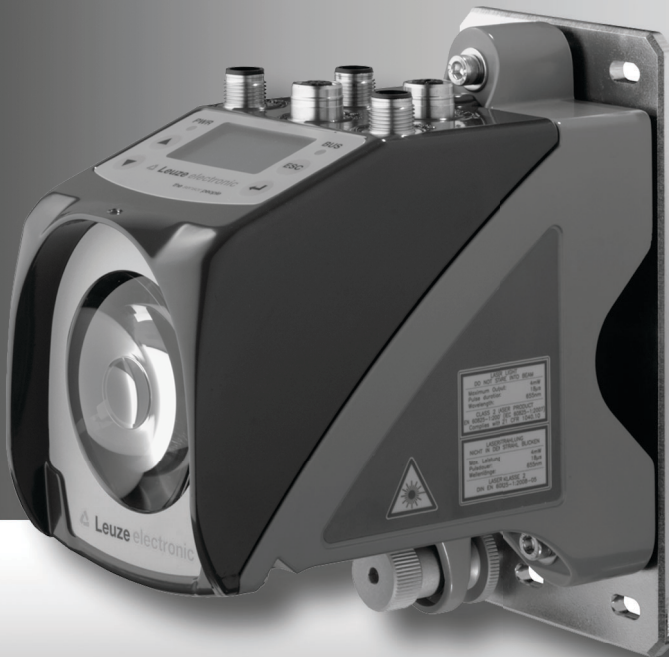


the sensor people

AMS 338*i*
Optical Laser Measurement System
EtherCAT



en_01-2010/11 501133361

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Great Colus Technology Co., Ltd.
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Fax Int. + 886 2 2985 33-73

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SV Altera OOO
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Fax Int. + 38 044 4961818

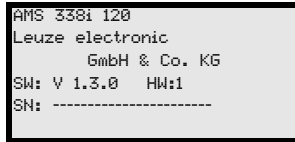
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Fax Int. + 1 248 486-6699

ZA (South Africa)

Countapulse Controls (PTY) Ltd.
Tel. Int. + 27 116 1575-56
Fax Int. + 27 116 1575-13

The main menus

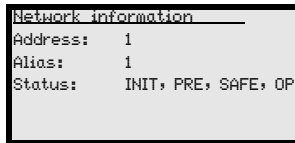


Device information - main menu

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

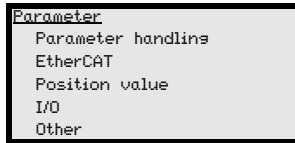
Explanations of address, alias, status.
No entries can be made via the display.



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.

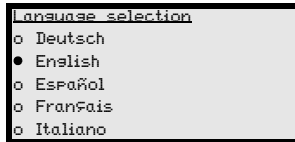
No entries can be made via the display.
See "Indicators in the display" on page 36.



Parameter - main menu

- Configuration of the AMS.

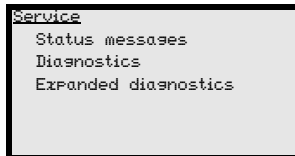
See "Parameter menu" on page 42.



Language selection - main menu

- Selection of the display language.

See "Language selection menu" on page 45.



Service - main menu

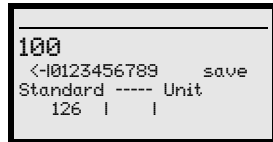
- Display of status messages.
- Display of diagnostic data.

No entries can be made via the display.
See "Service menu" on page 46.

Device buttons:

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

Input of values



-  Delete character
-  Enter digit
-  Save input

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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 338*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.















EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

1.3 Description of functions AMS 338*i*

The AMS 338*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 338*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 notices

2.1 General safety notices

Documentation

All entries in this technical description must be heeded, in particular those in section "Safety notices". Keep this technical description in a safe place. It should be available at all times.

Safety regulations

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

Repair

Repairs must only be carried out by the manufacturer or an authorized representative.

2.2 Safety standards

The devices of the series AMS 338*i* were developed, manufactured and tested in accordance with the applicable safety standards. They correspond to the state of the art.

2.3 Intended use

The AMS 338*i*... device series is an absolute measuring system based on laser technology. The devices use a visible optical laser to measure distances of up to 300m contactlessly. The laser is designed so that distance measurements are made against a reflector.



Attention!

The protection of personnel and the device is guaranteed only if the device is operated in a manner corresponding to its intended use.

Areas of application

The AMS 338*i*... is suitable for the following areas of application:

- Distance measurements for determining the position of automated, moving plant components such as:
 - Travel and lifting axes of high-bay storage devices
 - Gantry crane bridges and their trolleys
 - Repositioning units
 - Lifts
 - Electroplating plants

2.4 Working safely

**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.

Safety regulations

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

**Attention!**

The AMS 338i... is not a safety module acc. to EU machinery directives.

Qualified personnel

Mounting, commissioning and maintenance of the device must only be carried out by qualified personnel. Electrical work must be carried out by a certified electrician.

**Attention, laser radiation!**

The AMS 338i operates with a red light laser of class 2 acc. to EN 60825-1. If you look into the beam path over a longer time period, the retina of your eye may be damaged!

Never look directly into the beam path!

Do not point the laser beam of the AMS 338i at persons!

When mounting and aligning the AMS 338i, avoid reflections of the laser beam off of reflective surfaces!

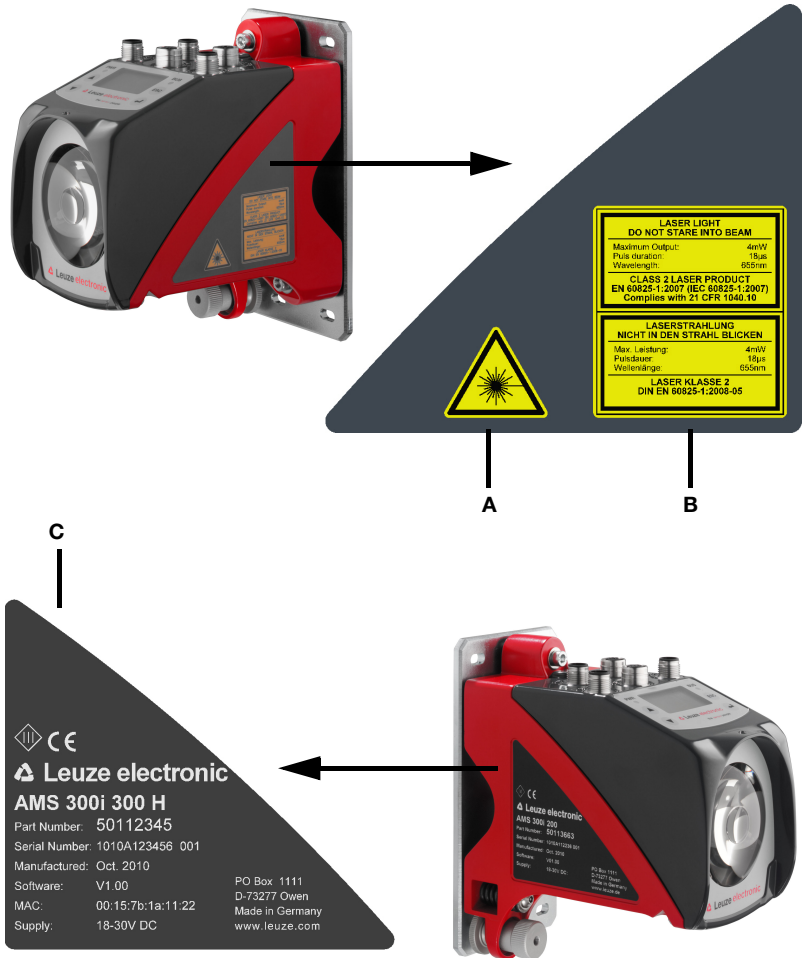
Heed the laser safety regulations according to DIN EN 60825-1 in their most current version! The output power of the laser beam at the reading window is at most 4.0mW acc. to EN 60825-1. The average laser power is less than 1mW in accordance with laser class 2 as well as CDRH class 2.

The AMS 338i uses a laser diode with low power in the visible red light range with an emitted wavelength of 650 ... 690nm.

**Attention!**

CAUTION! The use of operating and adjusting devices other than those specified here or carrying out of differing procedures may lead to dangerous exposure to radiation.

The housing of the AMS 338*i* has been provided with the following labeling:



- A** Hazard warning & logotype
- B** Warning and certification plate
- C** Name plate with part no., version no., date of manufacture and serial no.
 For EtherNet-based devices, the MAC ID is specified on the name plate.
 Please note that the shown name plate is for illustration purposes only; the contents do not correspond to the original.

Figure 2.1: Location of the name plate on the AMS 338*i*

3 Fast commissioning / operating principle

**Notice!**

Below, you will find a **short description for the initial commissioning** of the AMS 338*i*. Detailed explanations for the listed points can be found throughout the handbook.

3.1 Mounting the AMS 338*i*

The AMS 338*i* and the corresponding reflector are mounted on two mutually opposing, plane-parallel, flat walls.

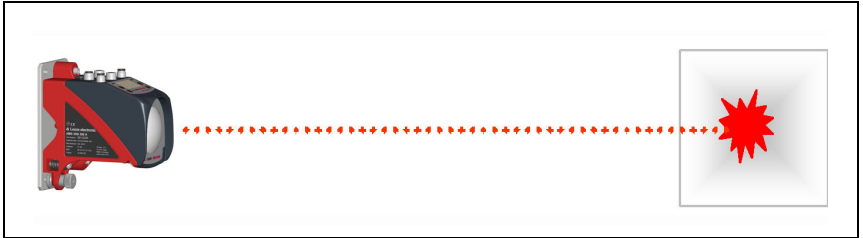


Figure 3.1: Schematic illustration of mounting

**Attention!**

For error-free position measurement, there must be an unobstructed line-of-sight between the AMS 338*i* and the reflector.

3.1.1 Mounting the device

The laser is mounted 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 using 4 screws (M5). The reflector is angled using the spacer sleeves included. 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 (18 ... 30VDC). 2 freely programmable switching inputs/outputs for individual adaptation to the respective application are also available here.

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.

Detailed information can be found in chapter 8.

3.4 AMS 338*i* on the EtherCat

Detailed information can be found in chapter 9.

4 Specifications

4.1 Specifications of the laser measurement system

4.1.1 General specifications AMS 338*i*

| Measurement data | AMS 338 <i>i</i> 40 (H) | AMS 338 <i>i</i> 120 (H) | AMS 338 <i>i</i> 200 (H) | AMS 338 <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 | 1.7 ms | | | |
| Integration time | 8 ms | | | |
| Resolution | adjustable, see chapter of the individual interfaces | | | |
| Temperature drift | ≤ 0.1 mm/K | | | |
| Ambient temperature sensitivity | 1 ppm/K | | | |
| Air pressure sensitivity | 0.3ppm/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 | | | |
| Laser life expectancy ³⁾ | average temperature / year | | | 50 °C: 23.000h 25 °C: 60.000h 20 °C: 75.000h 10 °C: 120.000h |
| Interfaces | | | | |
| Interface type | EtherCAT | | | |
| Baud rate | 100Mbit/s | | | |
| Vendor ID | 0x121 _h or 289 _{Dec} | | | |
| Device type | 0x00080196 _h (absolute linear encoder) | | | |
| Operating and display elements | | | | |
| Keyboard | 4 buttons | | | |
| Display | monochromatic graphical display, 128 x 64 pixels | | | |
| LED | 4 LEDs, 2 of which are used to display the EtherCAT connection | | | |

Inputs/outputs

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

Mechanical data

| | |
|------------------|--------------------------------------|
| Housing | cast zinc and aluminum |
| Optics | glass |
| Weight | approx. 2.45kg |
| Protection class | IP 65 acc. to EN 60529 ⁴⁾ |

Environmental conditions

| | |
|------------------------|--|
| Operating temperature | |
| without device heating | -5°C ... +50°C |
| with device heating | -30°C ... +50°C ⁵⁾ |
| 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 ⁶⁾ |

- 1) Statistical error: 1 sigma; minimum switch-on time: 2min.
- 2) For UL applications: only for use in "Class 2" circuits acc. to NEC.
- 3) Switching off the laser diode during system downtime can considerably extend the life expectancy of the device. The laser life expectancy is calculated using a failure rate of 1%.
- 4) With screwed-on M12 plugs or mounted caps.
- 5) 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 338*i*.
- 6) 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.

4.1.2 Dimensioned drawing AMS 338*i*

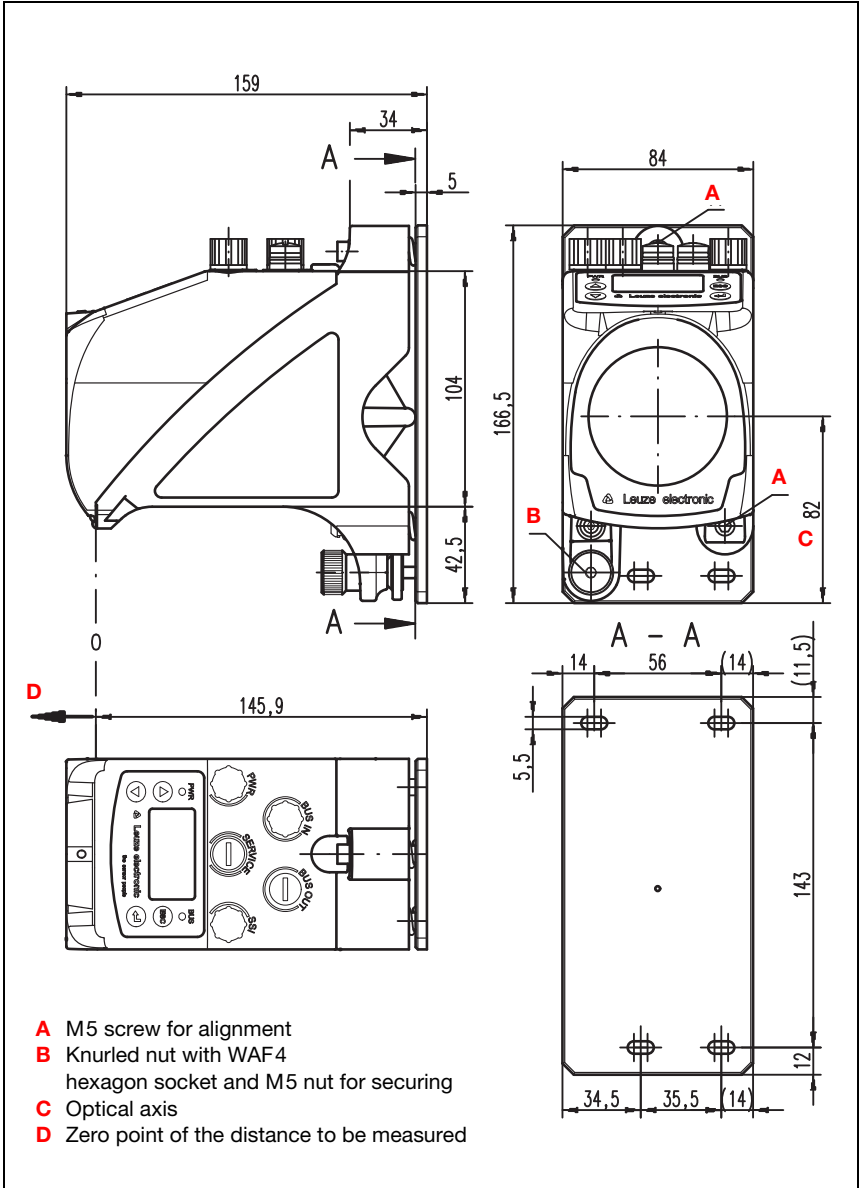


Figure 4.1: Dimensioned drawing AMS 338*i*

4.1.3 Type overview AMS 338*i*

AMS 338*i* (EtherCAT)

| Type designation | Description | Part no. |
|-------------------------|--|----------|
| AMS 338 <i>i</i> /40 | 40m operating range, EtherCAT interface | 50113701 |
| AMS 338 <i>i</i> /120 | 120m operating range, EtherCAT interface | 50113702 |
| AMS 338 <i>i</i> /200 | 200m operating range, EtherCAT interface | 50113703 |
| AMS 338 <i>i</i> /300 | 300m operating range, EtherCAT interface | 50113704 |
| AMS 338 <i>i</i> /40 H | 40m operating range, EtherCAT interface, integrated heating | 50113705 |
| AMS 338 <i>i</i> /120 H | 120m operating range, EtherCAT interface, integrated heating | 50113706 |
| AMS 338 <i>i</i> /200 H | 200m operating range, EtherCAT interface, integrated heating | 50113707 |
| AMS 338 <i>i</i> /300 H | 300m operating range, EtherCAT interface, integrated heating | 50113708 |

Table 4.1: Type overview AMS 338*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 338*i* type your device is. For specific information, please refer to chapter 11.1.1.

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 338*i*

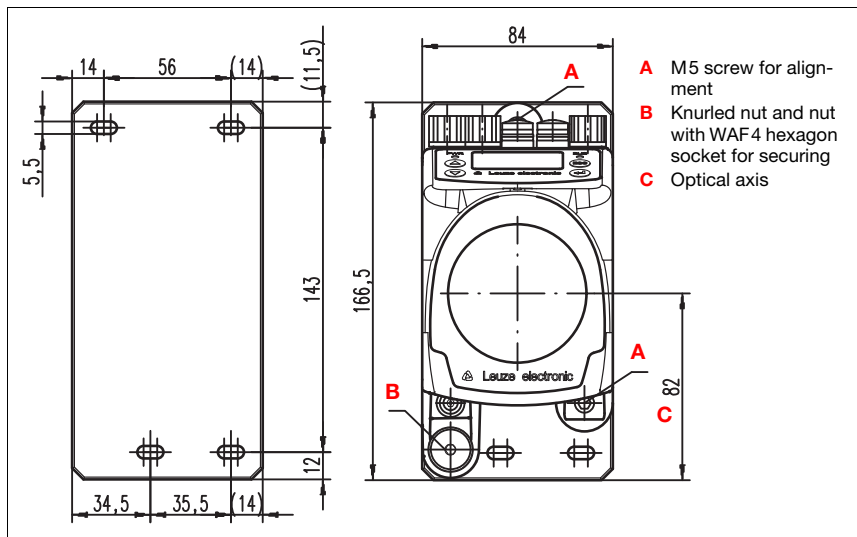


Figure 5.2: Mounting the device

The AMS 338*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 338*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 338*i* on a flat, horizontal surface is available as an optional accessory.

Type designation: MW OMS/AMS 01

Part no.: 50107255

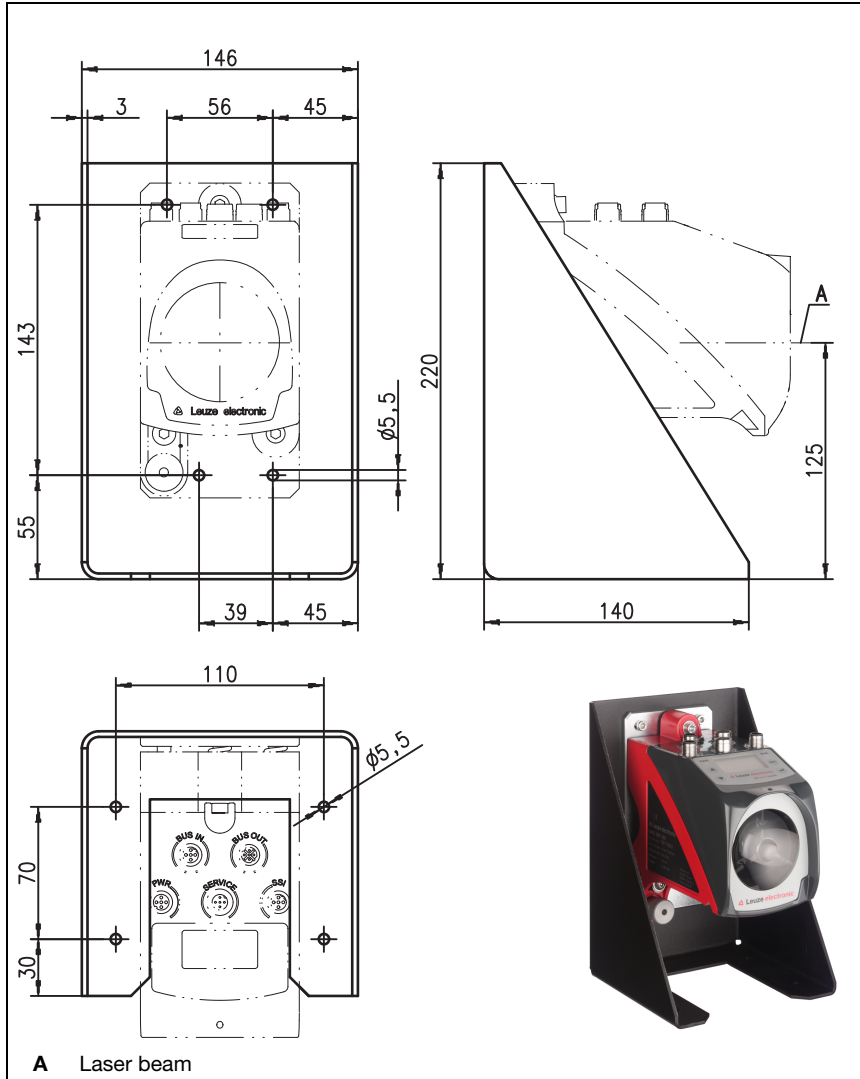


Figure 5.3: Optional mounting bracket

5.2.2 Mounting distances

Minimum parallel spacing between adjacent AMS 338*i*

The smallest-possible parallel spacing between adjacent AMS 338*i* is determined by the maximum measured distance as well as by the properties of the reflector. To prevent adjacent devices from interfering with each other the parallel distance of the laser light spots on the reflector is crucial.

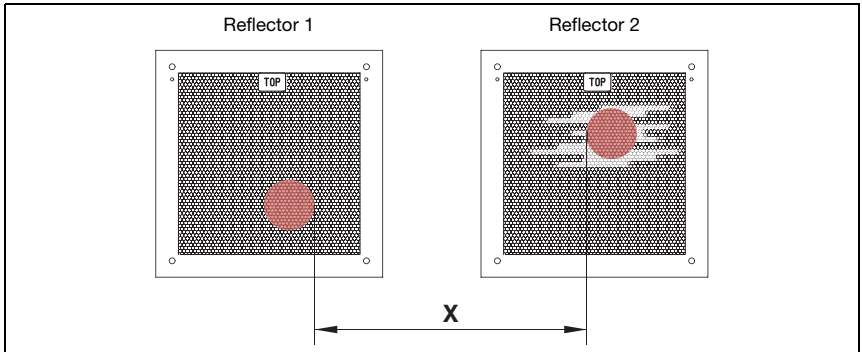


Figure 5.4: Minimum parallel spacing X between adjacent AMS 338*i*

Min. parallel spacing of laser light spot $X = 100\text{mm} + (\text{max. measurement distance in mm} \times 0.01)$.



Notice!

Please note that travel tolerances could cause the two laser light spots to move towards each other.

If both AMS 338*i* are optically separated from one another, e.g., if installed in different shelf alleys, the parallel spacing can be selected smaller, as there is no mutual interference in this case.

Minimum distance to an adjacent DDLS 200 optical data transmission device

The optical data transceivers of the DDLS 200 series and the AMS 338*i* do not mutually interfere with one another. Depending on the size of the used reflector, the optical data transceiver can be mounted with a minimum mounting spacing of 100mm to the AMS 338*i*. The mounting spacing is independent of the distance.

5.3 Mounting the AMS 338*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 82.



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 338*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 338*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

5.3.2 Dimensioned drawing of US AMS 01 deflector unit

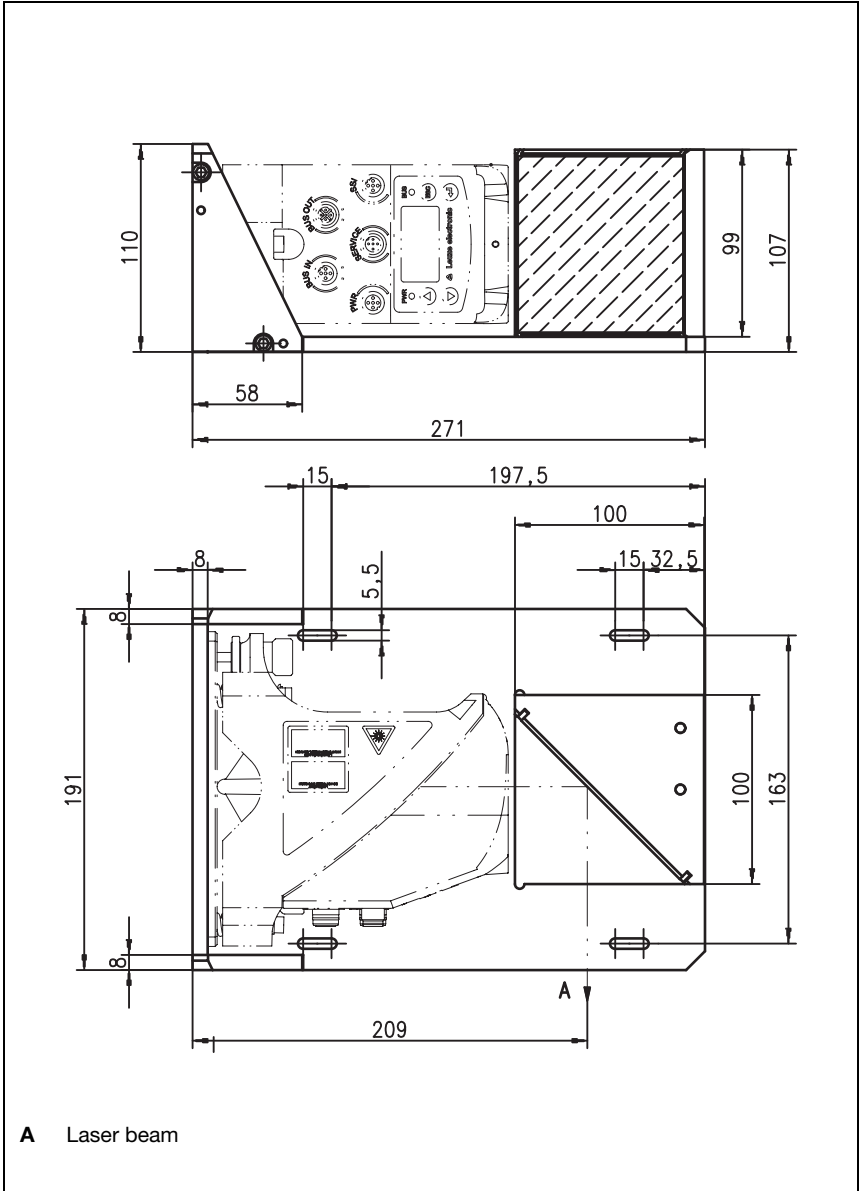


Figure 5.6: Dimensioned drawing of US AMS 01 deflector unit

5.3.3 Mounting the US 1 OMS deflector unit without mounting bracket

The US 1 OMS deflector unit and the AMS 338*i* are mounted separately.



Notice!

When mounting, make certain that the laser light spot of the AMS 338*i* is aligned in the center of the deflection mirror.

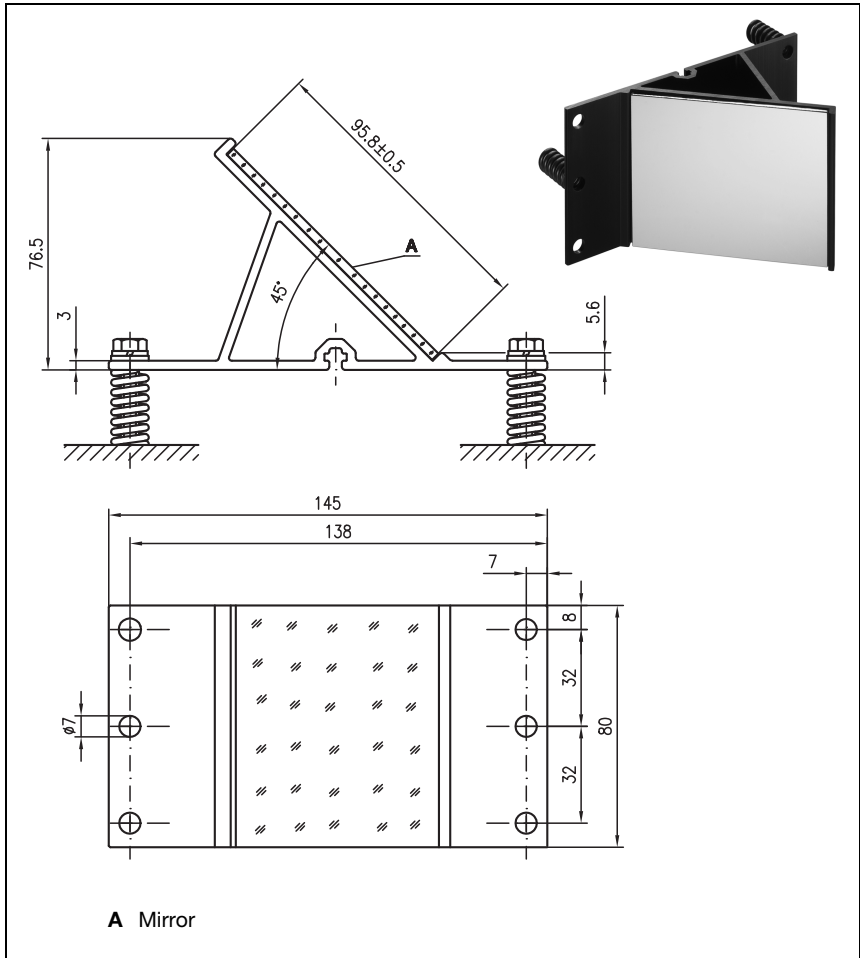


Figure 5.7: Photo and dimensioned drawing of the US 1 OMS deflector unit

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 338*i* measures distances against a reflective tape specified by Leuze electronic. All provided specifications for the AMS 338*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 338*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 32.

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

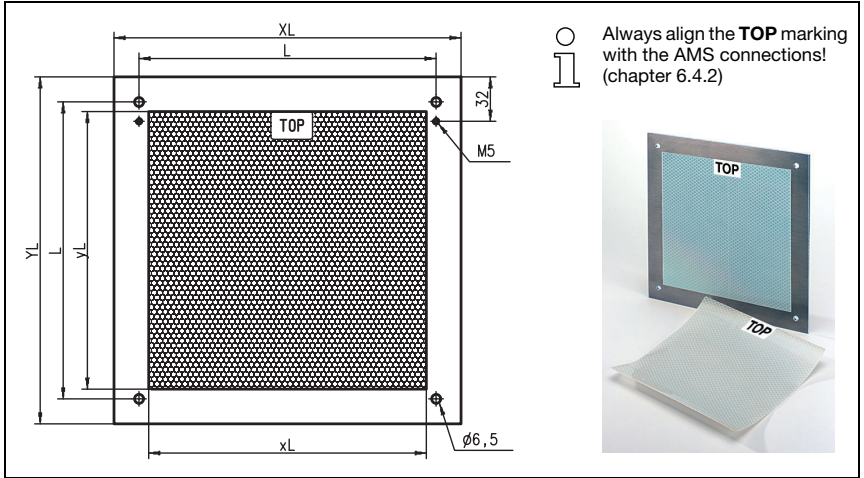


Figure 6.1: Dimensioned drawing of reflectors

| 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.

| | Part | | |
|---------------------------------------|--|------------------------------|------------------------------|
| Type designation | Reflective tape 200x200-H | Reflective tape 500x500-H | Reflective tape 914x914-H |
| Part no. | 50115020 | 50115021 | 50115022 |
| Voltage supply | 230VAC | | |
| Power | 100W | 150W | 500W |
| Current consumption | ~ 0.5A | ~ 1A | ~ 2.5A |
| 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

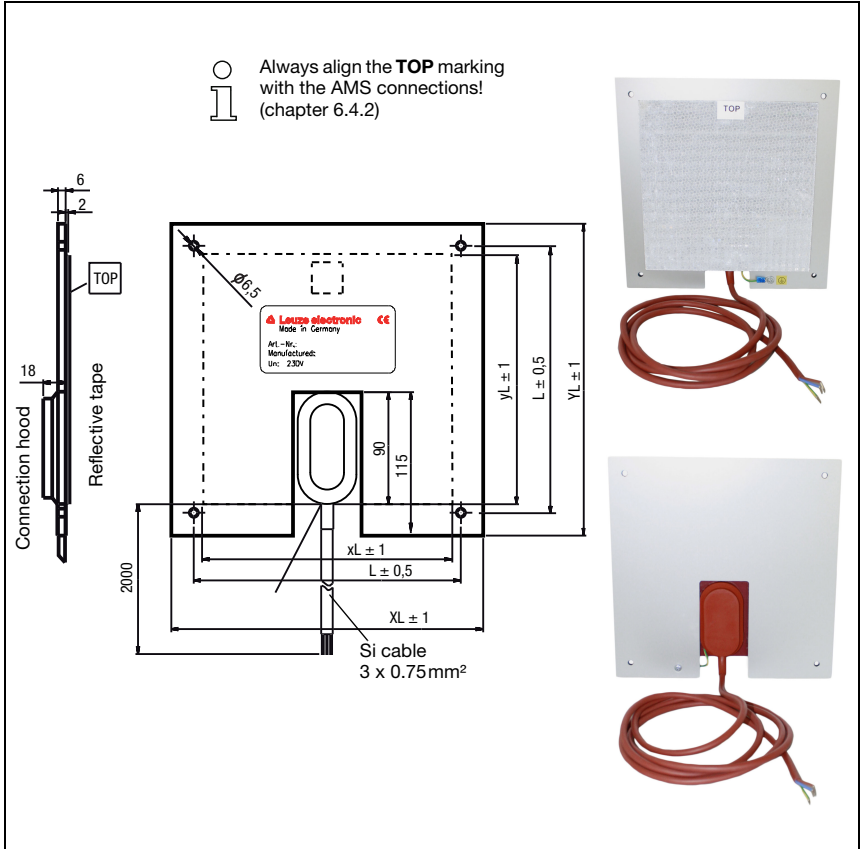


Figure 6.2: Dimensioned drawing of heated reflectors

| 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 338*i*. For stationary mounting of the AMS 338*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 338*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 338 <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 338 <i>i</i> 40 (max. 40m) | 200x200mm | Reflective tape 200x200-S | 50104361 |
| | | Reflective tape 200x200-M | 50104364 |
| | | Reflective tape 200x200-H | 50115020 |
| AMS 338 <i>i</i> 120 (max. 120m) | 500x500mm | Reflective tape 500x500-S | 50104362 |
| | | Reflective tape 500x500-M | 50104365 |
| | | Reflective tape 500x500-H | 50115021 |
| AMS 338 <i>i</i> 200 (max. 200m) | 749x914mm 914x914mm | Reflective tape 749x914-S | 50104363 |
| | | Reflective tape 914x914-M | 50104366 |
| | | Reflective tape 914x914-S | 50108988 |
| | | Reflective tape 914x914-H | 50115022 |
| AMS 338 <i>i</i> 300 (max. 300m) | 749x914mm 914x914mm | Reflective tape 749x914-S | 50104363 |
| | | Reflective tape 914x914-M | 50104366 |
| | | Reflective tape 914x914-S | 50108988 |
| | | Reflective tape 914x914-H | 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 338*i*... (see chapter 5.2 "Mounting the AMS 338*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 338*i*.

Example:

*If the AMS 338*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 338*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. Avoid a downward pitch**, as additional reflections may occur on the running rails. 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

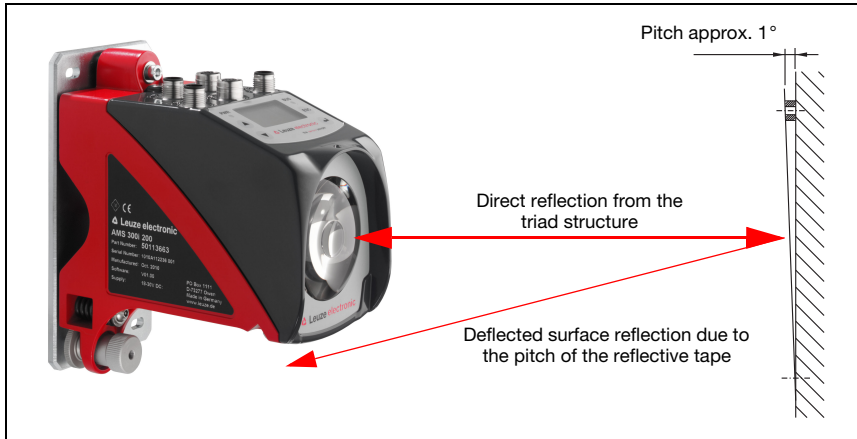


Figure 6.3: Reflector mounting

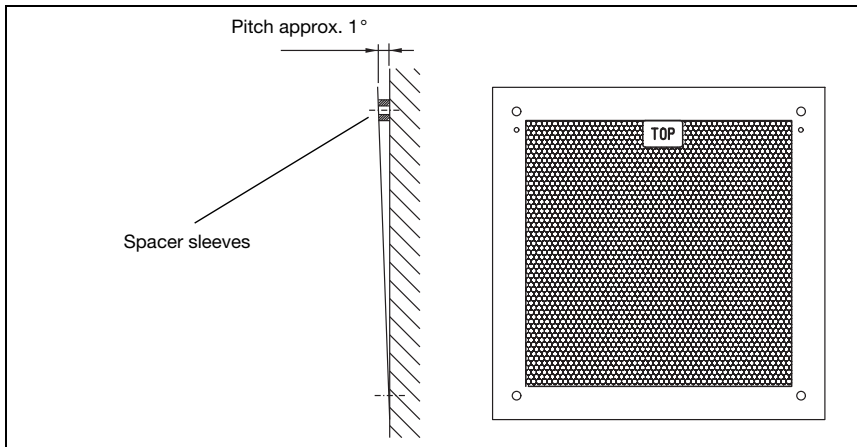


Figure 6.4: Pitch of the reflector

Reflective tapes ...-H

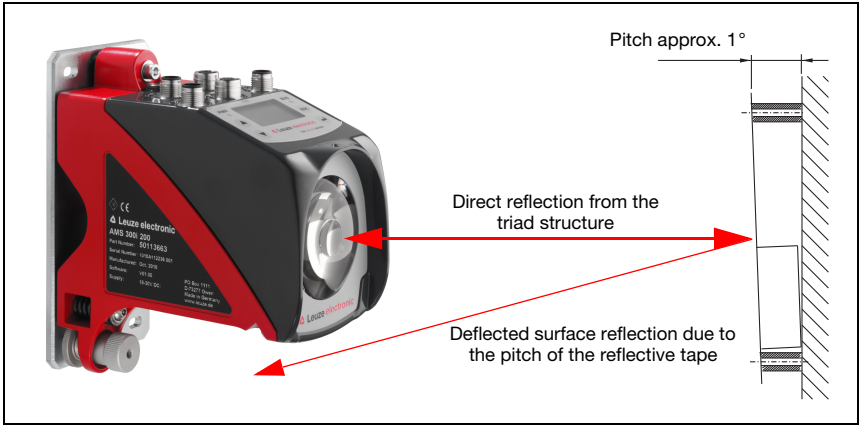


Figure 6.5: Mounting of heated reflectors

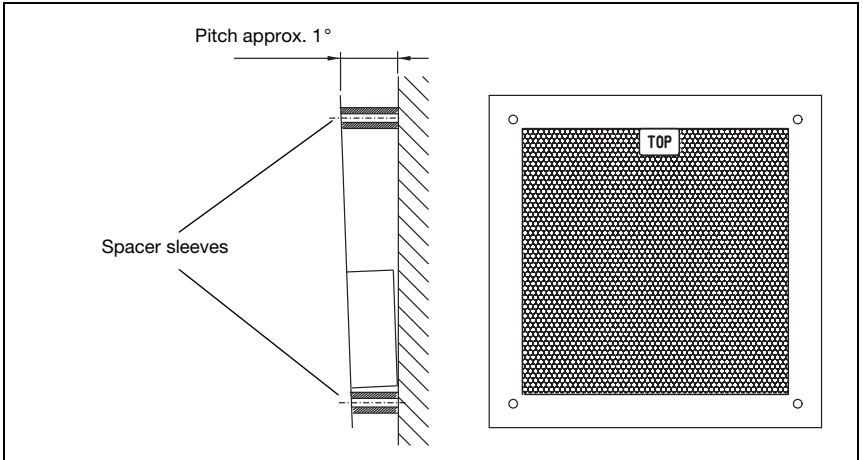


Figure 6.6: Pitch of the heated reflector

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 338*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 338*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 11 "Type overview and accessories".



Figure 7.1: Connections of the AMS 338*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

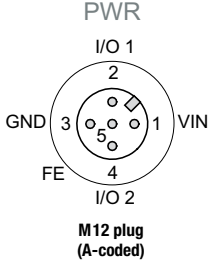
| PWR (5-pin plug, A-coded) | | | |
|--|--------|-------|--|
|  <p>PWR I/O 1 2 3 4 5 GND FE I/O 2 VIN M12 plug (A-coded)</p> | Pin | Name | Remark |
| | 1 | VIN | Positive supply voltage +18 ... +30VDC |
| | 2 | I/O 1 | Switching input/output 1 |
| | 3 | GND | Negative supply voltage 0VDC |
| | 4 | I/O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

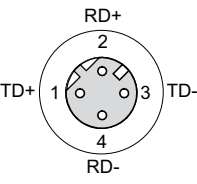
| BUS IN (4-pin socket, D-coded) | | | |
|---|-----|----------------------------|-----------------|
|  <p>BUS IN RD+ 2 1 3 4 RD- TD+ TD- M12 socket (D-coded)</p> | Pin | Name | Remark |
| | 1 | TD+ | Transmit Data + |
| | 2 | RD+ | Receive Data + |
| | 3 | TD- | Transmit Data - |
| | 4 | RD- | Receive Data - |
| Thread | FE | Functional earth (housing) | |

Table 7.2: Pin assignments for BUS IN

7.4 EtherCAT BUS OUT

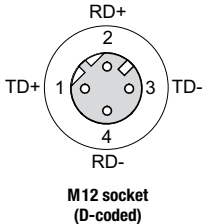
| BUS OUT (4-pin socket, D-coded) | | | |
|---|--------|------|----------------------------|
| BUS OUT | Pin | Name | Remark |
|  <p>M12 socket (D-coded)</p> | 1 | TD+ | Transmit Data + |
| | 2 | RD+ | Receive Data + |
| | 3 | TD- | Transmit Data - |
| | 4 | RD- | Receive Data - |
| | Thread | FE | Functional earth (housing) |

Table 7.3: Pin assignment BUS OUT

7.5 Service

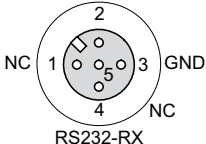
| Service (5-pin socket, A-coded) | | | |
|---|--------|----------|---------------------------------------|
| SERVICE | Pin | Name | Remark |
|  <p>M12 socket (A-coded)</p> | 1 | NC | Not used |
| | 2 | RS232-TX | Transmission line RS 232/service data |
| | 3 | GND | Voltage supply 0VDC |
| | 4 | RS232-RX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

Table 7.4: Service pin assignments



Notice!

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

8 Display and control panel AMS 338i

8.1 Structure of the control panel

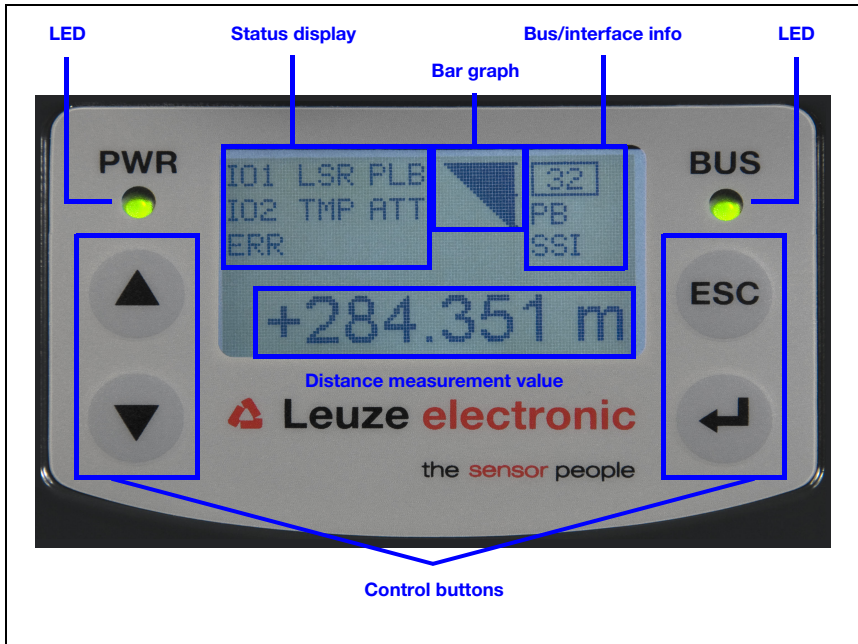


Figure 8.1: Structure of the control panel using the AMS 304i PROFIBUS device variant as an example



Notice!

The figure is for illustration purposes only and does not correspond to AMS 338i 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

- I01 **Input 1 or output 1 active:**
Function depending on configuration.
- I02 **Input 2 or output 2 active:**
Function depending on configuration.

- 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.

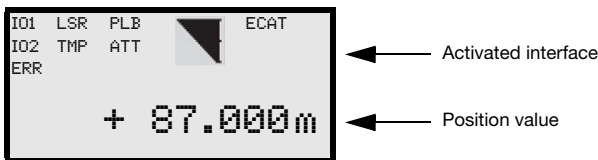
Bar graph



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 abbreviation "ECAT" indicates an activated EtherCAT interface.



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
- Boot process running

PWR



Green continuous light

Power LED green

- AMS 338*i* ok
- Measurement value output
- Self test successfully finished
- Device monitoring active

PWR



Flashing red

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 voltage supply
- Bus ok



Flashing green

BUS LED flashes green

- "PRE-OPERATIONAL" state
- "SAFE-OPERATIONAL" state



Green continuous light

BUS LED green

- "OPERATIONAL" state



Flashing green/red

BUS LED flashes green/red

- Bus error
- Time out
- Process Data Watchdog Timeout



Flashing red

BUS LED flashes red

- Invalid configuration

LINK LED for BUS IN and BUS OUT

A green/yellow multicolor LED below the BUS IN and BUS OUT connectors indicates the EtherCAT connection status.



Green continuous light

LINK LED off

- The link exists, the hardware connection to the next connected participant is OK.







Flashing yellow



LINK LED flashes yellow


- Data is exchanged with the connected participants.


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  .

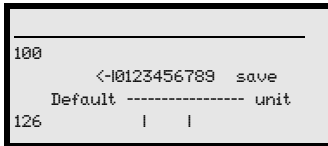
The selected menu item is activated with the enter button .






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:



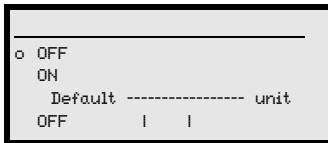
-  +  Delete character
-  +  Enter digit
- save** +  Save




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:

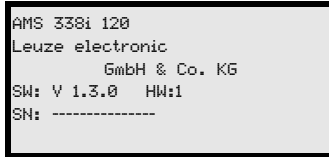


Select the desired option with the   buttons. Activate the option by pressing .

8.3 Menu description

8.3.1 The main menus

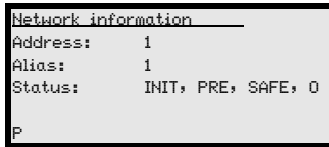
After voltage has been applied to the laser, device information is displayed for several seconds. The display then shows the measurement window with all status information.



Device information - main menu

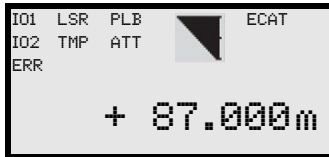
- This menu item contains detailed information on
 - Device model,
 - Manufacturer,
 - Software and hardware version,
 - Serial number.

No entries can be made via the display.



Network information - main menu

- Explanations of address, alias, status.
- No entries can be made via the display.

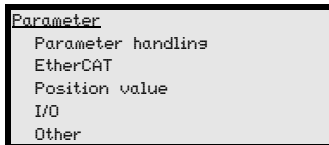


Status and measurement data - main menu

- 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 36..



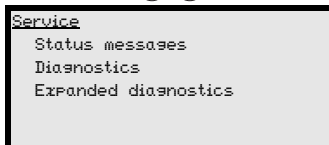
Parameter - main menu

- Configuration of the AMS.
- See "Parameter menu" on page 42.



Language selection - main menu

- Selection of the display language.
- See "Language selection menu" on page 45.



Service - main menu

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

No entries can be made via the display.

See "Service menu" on page 46.



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 338i 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 |
| Password | Activate password | | ON / OFF To enter a password, parameter enabling must be activated. If a password is assigned, changes to the AMS 338i 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.

EtherCAT submenu

Table 8.2: EtherCAT submenu

| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|-------------------------|---------|---------|---|----------|
| Activation | | | ON / OFF | ON |
| Address (station alias) | | | Configuration option 0 - 65535 | 0 |



Note regarding the second station address - in short SSA- (formerly station alias)

The SSA is a freely configurable position-independent address which is often used for the so-called hot connect. The values range from 0 to 65535. The SSA is persistently stored on the AMS 338i and is available after the next boot-up. A second option is to write the SSA to the Eeprom and the associated ESC register via the master (typically TwinCAT). In this

case, too, the SSA is persistently stored in the AMS 338i. The master (TwinCAT) can determine whether it wants to use the EtherCAT address (auto-increment address) or the SSA to address the AMS. For SSA, the position-dependent EtherCAT address is also set to the value of the SSA. Otherwise, the auto-increment address is entered into the ESC register which contains the EtherCAT address. The EtherCAT address is not stored in persistence memory, but written into the respective register by the master when the status changes from INIT to PREOP.

Position value submenu



Notice!

All parameters mentioned must be entered via startup parameters of the control software (TwinCAT). If parameters from the position value submenu are changed via the display, these are overwritten via the startup sequence created in the control with the values stored there.

Table 8.3: 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 M12 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 0.875mm per digit is required, the parameter is set to 875. | 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 8.4: I/O submenu

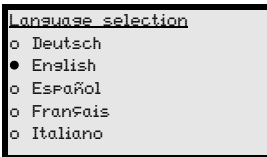
| Level 3 | Level 4 | Level 5 | Selection/configuration option Description | Standard |
|------------------|--------------------|--------------------|---|--|
| I/O 1 | Port configuration | | Input/Output Defines whether I/O 1 functions as an output or input. | Output |
| | Switching input | Function | 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. |
| 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 |
| | 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 |

Other submenu

Table 8.5: 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 338i... 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 338i is delivered from the factory with the display preset to English.

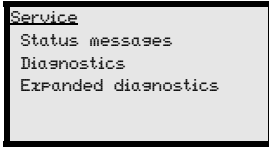


Notice!

When operating the AMS 338i on the EtherCAT, the language configured 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



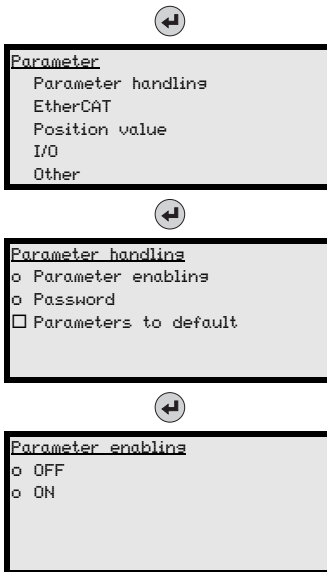
A more detailed description of the individual functions can be found in chapter 10.

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.

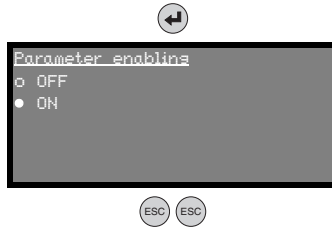
Use the   buttons to select the Parameter handling menu item.

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 338i display is inverted.

As long as parameter enabling is activated, communication between control and AMS 338i 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.

Password for parameter enabling

Parameter entry on the AMS 338i can be protected with a password. The password can be changed via the CoE online dictionary, object 0x2300_h, sub-index 0x05_h.

For parameter enable via the display, the password must be entered. If parameter enabling has been activated after successfully entering the password, parameters can temporarily be changed via the display.

After parameter enable has been deactivated, all changes made at the display are overwritten by the CoE online dictionary, object 0x2300_h, sub-index 0x05_h (see above). If a new password has been assigned, this, too, is overwritten by the password defined in the online dictionary.



Notice!

The **master password 2301** can enable the AMS 338i at any time.

9 EtherCAT interface

9.1 General information on EtherCAT

EtherCAT is an Ethernet-based fieldbus initialized by Beckhoff. The EtherCAT Technology Group (ETG) is the official standardization partner of the IEC working groups.

EtherCAT has been an IEC standard since 2005.

- IEC 61158: protocols and services
- IEC 61784-2: communication profiles for the specific device classes

All EtherCAT-specific communication mechanisms are explained in detail in the standards mentioned. The technical description of the AMS 338*i* will describe parts of the IEC standard, if this serves basic understanding.

9.2 EtherCAT topology

EtherCAT permits a wide range of topologies such as line, tree, ring, star and their combinations. The bus or line structure known from the fieldbuses is thus also available for EtherCAT.

Telegrams are transmitted on one line pair in the "processing direction" from the master to the slave. The EtherCAT device processes the frames only in this direction and sends them to the subsequent device until the telegram has passed through all devices. The last device returns the telegram on the second line pair in the cable in "forward direction" back to the master. Here, EtherCAT always forms a logical ring structure independent of the topology installed.

From the Ethernet perspective, an EtherCAT bus segment is nothing but a single, large Ethernet participant which receives and transmits Ethernet telegrams. However, there are many EtherCAT slaves within the "participant", not just a single Ethernet controller with downstream y-processor.

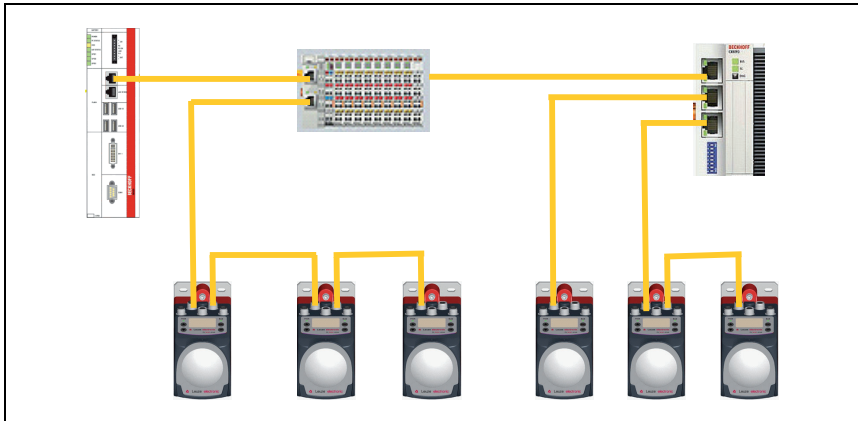


Figure 9.1: Topology example

9.3 EtherCAT – General information on wiring

The wiring uses the Industrial Ethernet fieldbus cable common in industry. For the AMS 338*i*, the EtherCAT connection is made via D-coded M12 connectors. A Cat. 5 Ethernet cable should be used for wiring.

Leuze electronic offers cables ready-made and featuring a D-coded M12 connector on one end and an open cable end at the other.

For further information, see chapter 7 "Electrical connection" and see chapter 11.3.5 "Accessory ready-made cables for EtherCAT".

The individual AMS 338*i* devices in a line topology are connected to each other using the "KB ET - ... - SSA" cable with ready-made D-coded M12 connectors on both ends, see table "Order codes for EtherCAT connection cables" on page 85.

For unavailable cable lengths, you can configure your cables yourself. For this purpose, Leuze electronic offers a D-coded M12 connector for Bus IN and Bus OUT. When doing so, make certain that you connect **TD+** on the M12 connector with **RD+** on the RJ-45 connector and **TD-** on the M12 connector with **RD-** on the RJ-45 connector, respectively, etc.

For the connection technology transition from M12 to RJ45, a "KDS ET M12 / RJ 45 W - 4P" adapter is available.

9.4 EtherCAT – Cable lengths and shielding

↳ Observe the following maximum cable lengths and shielding types:

| Connection | Interface | Max. cable length | Shielding |
|--|-----------|--|---------------------|
| AMS – host | EtherCAT | 100 m | Absolutely required |
| Network from the first AMS to the last AMS | EtherCAT | The maximum segment length must not exceed 100 m for 100Base-TX Twisted Pair (min. Cat. 5) | Absolutely required |

Table 9.1: Cable lengths and shielding

9.5 EtherCAT electrical connection

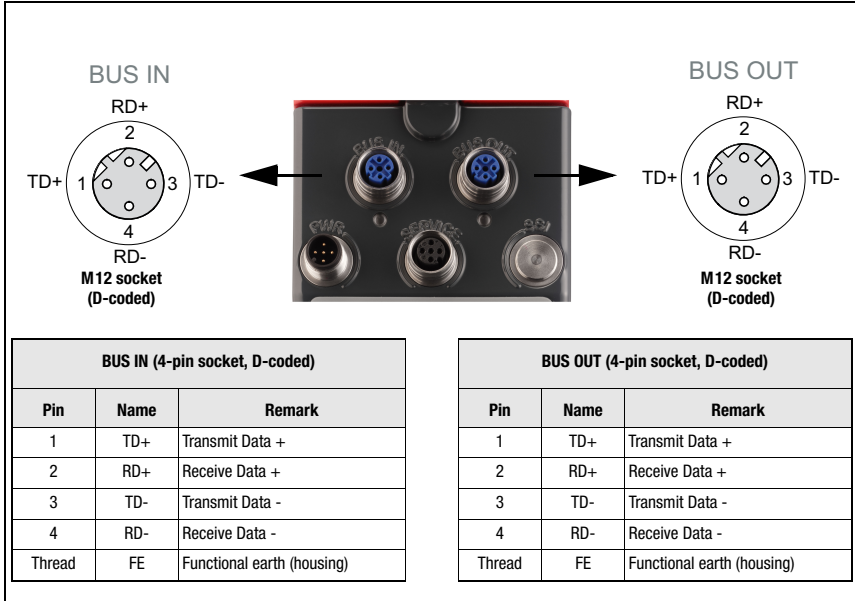


Figure 9.2: EtherCAT - electrical connection



Notice!

For contacting **BUS IN** and **BUS OUT**, we recommend our ready-made EtherCAT cable (see chapter 11.3.5 "Accessory ready-made cables for EtherCAT").

To establish an EtherCAT network, the AMS 338*i* provides a receiving bus labeled BUS IN on the device, and a forwarding bus labeled BUS OUT. The AMS 338*i* can be connected to BUS OUT or to BUS IN using a stub cable.

↳ For the connection of two AMS 338*i*, the "KB ET - ... - SSA" ready-made cables are preferred, see table 11.3.5 "Accessory ready-made cables for EtherCAT" on page 84.

If you use user-configurable cables, note the following:



Notice!

The entire connection cable must be shielded. The shielding connection must be at the same potential on both ends of the data line. This prevents potential compensating currents over the shield and possible interference coupling by compensating currents. The signal lines must be stranded in pairs.

Use CAT 5 cable for the connection.

**Notice!**

For the AMS 338*i* as standalone device or as the last participant in a linear topology, termination on the BUS OUT socket is not mandatory!

9.6 Starting the AMS 338*i* on the EtherCAT

INIT

The AMS 338*i* initializes itself. No direct communication between the master and AMS 338*i* is possible. The EtherCAT master will transit the AMS 338*i* step by step into the "operational" state.

In the status change from "INIT" to "PREOP", the TwinCAT or master writes the so-called EtherCAT address (=station address) to the respective register of the EtherCAT slave controller (here: AMS 338*i*). This EtherCAT address is typically specified in relation to the position, i.e., the master's address is 1000, the first slave's address is 1001, etc. This is also called the auto-increment method.

PRE-OPERATIONAL

The master and the AMS 338*i* exchange application-specific initializations and device-specific parameters. In the PRE-OPERATIONAL state, configuration is initially possible via SDOs only.

SAFE-OPERATIONAL

The "start input update" command puts the measurement system into the save-operational state. The master produces output data, but input data are not considered. This means the AMS 338*i* does not return output data (=PLC input data) in SAFEOP. The AMS does not process input process data (=PLC output data). Mailbox communication via CoE services is possible.

OPERATIONAL

The "start output update" command puts the measurement system into OPERATIONAL state. In this state, the AMS 338*i* supplies valid input data and the master valid output data. After the AMS 338*i* has detected the data received via the process data service, the state transition is confirmed by the AMS 338*i*. If the activation of the output data was not possible, the measurement system remains in the SAFE OPERATIONAL state and outputs an error message.

9.7 CANopen over EtherCAT

EtherCAT provides the communication mechanisms described below. In this context, the SDO accesses to the online dictionary via CoE (CANopen over EtherCAT) are carried out via mailbox services. PDO services via CoE mailboxes are not supported.

- Object index
- PDO, process data object
- SDO, service data object
- NMT, network management

Master and slave must be located in the same EtherCAT network.

9.7.1 Device profile

The device profile describes the application parameters and the functional behavior of the AMS 338*i*. For EtherCAT, one does not specify individual device profiles for device classes. Instead, simple interfaces for existing device profiles are provided.

The AMS 338*i* supports the DS406 "device profile for encoder" already known from CANopen.

9.7.2 Device description file

For the user, the object directory of the AMS 338*i* is stored in a so-called ESI file (EtherCAT slave information).

The ESI file contains all objects with index, sub-index, name, data type, default value, minimum and maximum, and access privileges.

The ESI file describes the entire functionality of the AMS 338*i*.

The ESI file has the name AMS 338*i*.xml and is available for download on the Leuze home page.

Vendor ID for the AMS 338*i*

The Vendor ID assigned by Leuze electronic for the AMS 338*i* is 121_h = 289_d

9.7.3 Object index

Overview: EtherCAT-specific object area of the AMS 338i

All process data and parameters are stored as objects in the AMS 338i. The object directory of the AMS 338i is the compilation of all process data and parameters of the AMS.

The following overview table shows the specific communication objects supported by the AMS 338i.

| Object address in hex | EtherCAT-specific object area |
|-----------------------|---|
| 1000 | Device type |
| 1001 | Error register |
| 1018 | Identity object (contains general information regarding the device) |
| 1A00 | TPDO 1 position value and status synchronous |
| 1A02 | TPDO 3 velocity value and status synchronous |

Overview: manufacturer-specific object area of the AMS 338i

| Object address in hex | AMS 338i-specific object area |
|-----------------------|---------------------------------|
| 2000 | Maximum position value |
| 2001 | Static preset |
| 2002 | Dynamic preset |
| 2010 | Position limit value 1 |
| 2011 | Position limit value 2 |
| 2020 | Velocity |
| 2021 | Velocity limit value 1 |
| 2022 | Velocity limit value 2 |
| 2023 | Velocity limit value 3 |
| 2024 | Velocity limit value 4 |
| 2025 | Velocity limit value dynamic |
| 2026 | Velocity status |
| 2050 | I/O 1 |
| 2051 | I/O 2 |
| 2060 | Status and control laser ON/OFF |
| 2070 | Error handling procedures |
| 2300 | Other |

Overview: encoder-specific object area of the AMS 338i (DS406)

| Object address in hex | Objects of the AMS 338i from the DS406 class 1 encoder profile |
|-----------------------|--|
| 6000 | Operating parameters |
| 6004 | Maximum position value |
| 6500 | Operating status |
| 6501 | Resolution measurement value |

9.7.4 Detailed description of EtherCAT-specific object area

9.7.4.1 Object 1000_h Device type

The object describes the AMS 338*i* device type.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-------------|-----------|--------|-------------|---------|------------|--|
| | | | | | Minimum | Maximum | Default | |
| 1000 | -- | Device type | u32 | ro | -- | -- | 00080196 h | Device profile 196 _h Encoder type 8 _h |

Object data structure

| Byte | Bit | | | | | | | | Remark |
|------|------------------|---|---|---|---|---|---|---|------------------------------------|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0 | 196 _h | | | | | | | | Device profile (196 _h) |
| 1 | | | | | | | | | |
| 2 | 8 _h | | | | | | | | |
| 3 | | | | | | | | | Encoder type (8 _h) |

Device profile

The classification 196_h = 406_d describes the profile of an encoder and is adopted from the CANopen specification DS406 class 1. Accordingly, the AMS 338*i* is integrated into the profile definition of an encoder.

The object addresses above 6000_h describe the specified encoder functions.

Encoder

The 8_h = 8_d classification describes the AMS 338*i* as an absolute linear encoder as described in the DS406 specification.

9.7.4.2 Object 1018_h Identity object

This object contains general specifications about the AMS 338*i*.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-----------|-----------|--------|-------------|---------|------------------|------------------------|
| | | | | | Minimum | Maximum | Default | |
| 1018 | 01 | Vendor ID | u 32 | ro | -- | -- | 121 _h | Manufacturer ID number |

The Vendor ID assigned by Leuze electronic for the AMS 338*i* is 121_h = 289_d

9.7.5 Process data objects

The AMS 338*i* provides two process data objects (PDOs). The PDOs describe which of the objects are mapped (integrated) into the PDO.

9.7.5.3 Object 1A00_h TPDO1

Transmission of position and status.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|------------------------|-----------|--------|-------------|---------|------------|---------------------------------|
| | | | | | Minimum | Maximum | Default | |
| 1A00 | 01 | Maximum position value | u 32 | ro | -- | -- | 6004 00 20 | Position value from object 6004 |
| | 02 | Position value status | u 32 | ro | -- | -- | 2060 01 20 | Status from object 2060 |

Data structure TPDO1 for the transfer of the position values and the position status

| Byte | Bit | | | | | | | | Remark |
|------|-----|---|---|---|---|---|---|-----|--|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0 | | | | | | | | LSB | Position values see object description 6004 _h |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | MSB | | | | | | | | |
| 4 | | | | | | | | | Status see object description 2060 _h sub-index 01 |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |

9.7.5.4 Object 1A02_h TPDO3

Transmission of velocity and status.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-----------------------|-----------|--------|-------------|---------|------------|--|
| | | | | | Minimum | Maximum | Default | |
| 1A02 | 01 | Velocity value | int 32 | ro | -- | -- | 2020 04 20 | Velocity value from object 2020 sub-index 04 |
| | 02 | Status velocity value | u 16 | ro | -- | -- | 2026 00 10 | Status from object 2026 |

Data structure TPDO3 for the transfer of the velocity values and the velocity status

| Byte | Bit | | | | | | | | Remark |
|------|-----|---|---|---|---|---|---|-----|--|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0 | | | | | | | | LSB | Velocity value see object description 2020 _h sub-index 04 |

| Byte | Bit | | | | | | | | Remark |
|------|-----|---|---|---|---|---|---|---|--|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 1 | MSB | | | | | | | | Status see object description 2026 _h |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |

9.7.6 AMS 338*i*-specific object area

9.7.6.1 Object 2000_h Position value

The object position value describes the following entries:

- Sign for negative position values
- Unit of the position value: metric or inch
- Resolution of the position value
- Counting direction of the position value
- A possible offset value
- Value for the free resolution

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-----------------------|-----------|--------|-------------|---------|---------|---|
| | | | | | Minimum | Maximum | Default | |
| 2000 | 01 | Sign | u 8 | rw | 0 | 1 | 0 | 0 = two's complement 1 = sign + quantity |
| | 02 | Measurement unit | u 8 | rw | 0 | 1 | 0 | 0 = metric 1 = inch (in) |
| | 03 | Resolution | u 8 | rw | 0 | 6 | 4 | Value 1 = 0.001 Value 2 = 0.01 Value 3 = 0.1 Value 4 = 1 Value 5 = 10 Value 6 = free resolution |
| | 04 | Count direction | u 8 | rw | 0 | 1 | 0 | 0 = positive 1 = negative for further remarks, see below |
| | 05 | Offset value | int 32 | rw | -999999 | 999999 | 0 | see remarks below |
| | 06 | Free resolution value | u 16 | rw | 5 | 50000 | 1000 | see remarks below |

Sub-index 03 resolution

The resolution in mm or inch/100, in accordance with the unit selected.

The value for the free resolution must be set in sub-index 06.

Sub-index 04 counting direction

Attention!



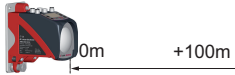
The DS406 encoder specification prescribes that the counting direction can be set in object 6000 bit 3. Object 2000 sub-index 04 and object 6000 bit 3 overwrite each other.

The count direction changes the sign during velocity measurement.

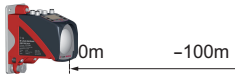
For the EtherCAT interface, no negative position values can be transferred. In this case, the value 0 is output at the EtherCAT interface.

A suitable offset is to be selected so that only positive values are transferred.

Counting direction positive:



Counting direction negative:



Sub-index 05 offset value

The offset value in mm or inch/100, in accordance with the unit selected.

Output value = measurement value+offset.

If the preset value has been activated by a corresponding trigger signal, the preset value has priority over the offset value.

Preset value and offset value are not offset against each other. The resolution of the offset value is independent of the position value resolution selected. The offset value is active immediately without any further release.

Sub-index 06 free resolution

Free resolution in mm/1000 or inch/100000, in accordance with the unit selected.

The "free resolution" parameters from sub-index 03 and the "value free resolution" from sub-index 06 are mutually dependent. The value of the free resolution is multiplied by mm/1000 or inch/100000 in accordance with the unit selected. The multiplication product is then the free resolution that has been set.

9.7.6.2 Object 2001_h Static preset value

The static preset value is a parameter that is not changed after the handover of the system to the end user. It is configured during commissioning and remains unchanged thereafter.

A preset value can be entered into the object. The preset value is activated with "preset teach" and deactivated with "preset reset". After preset teach, the current position value is offset against the configured preset value. After preset reset, the original measurement value is displayed.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|---------------------|-----------|--------|-------------|---------|---------|--|
| | | | | | Minimum | Maximum | Default | |
| 2001 | 01 | Preset value static | int 32 | rw | -999999 | 999999 | 0 | Preset value, in mm or in/100 depending on the unit selected |
| | 02 | Preset settings | u 8 | rw | 0 | 2 | 0 | Value 1 = preset teach Value 2 = preset reset |

9.7.6.3 Object 2002_h Dynamic preset value

The dynamic preset value can be adapted permanently via the control.

The dynamic preset value is activated with "preset teach" and deactivated with "preset reset". After preset teach, the current position value is offset against the configured preset value. After preset reset, the original measurement value is displayed.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|---------------------|-----------|--------|-------------|---------|---------|--|
| | | | | | Minimum | Maximum | Default | |
| 2002 | 01 | Preset value static | int 32 | rw | -999999 | 999999 | 0 | Preset value, in mm or in/100 depending on the unit selected |
| | 02 | Preset settings | u 8 | rw | 0 | 2 | 0 | Value 1 = preset teach Value 2 = preset reset |

9.7.6.4 Object 2010_h, Position limit value range 1

The position limit value range 1 object defines a distance range with lower and upper limits. If the measured value lies outside the configured range, the corresponding status bits are set in objects 2050_h, 2051_h and 2060_h.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-------------------------------|-----------|--------|-------------|---------|---------|---|
| | | | | | Minimum | Maximum | Default | |
| 2010 | 01 | Enable position limit value 1 | u8 | rw | 0 | 1 | 0 | 0 = deactivated 1 = activated |
| | 02 | Lower position limit value 1 | int 32 | rw | -999999 | 999999 | 0 | see remarks below |
| | 03 | Upper position limit value 1 | int 32 | rw | -999999 | 999999 | 0 | see remarks below |

Sub-index 02 / Sub-index 03

The lower and upper position limit values are entered in mm or inch/100 according to the unit selected.

9.7.6.5 Object 2011_h, Position limit value range 2

The position limit value range 2 object defines a distance range with lower and upper limits. If the measured value lies outside the configured range, the corresponding status bits are set in objects 2050_h, 2051_h and 2060_h.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-------------------------------|-----------|--------|-------------|---------|---------|---|
| | | | | | Minimum | Maximum | Default | |
| 2011 | 01 | Enable position limit value 2 | u8 | rw | 0 | 1 | 0 | 0 = deactivated 1 = activated |
| | 02 | Lower position limit value 2 | int 32 | rw | -999999 | 999999 | 0 | see remarks below |
| | 03 | Upper position limit value 2 | int 32 | rw | -999999 | 999999 | 0 | see remarks below |

Sub-index 02 / Sub-index 03

The lower and upper position limit values are entered in mm or inch/100 according to the unit selected.

9.7.6.6 Object 2020_n Velocity

Outputs the current velocity with the configured resolution. The unit (metric or inch) is set in object 2000 sub-index 02 and also applies to the velocity. If no change is made in object 2000 sub-index 02, the AMS 338*i* uses the metric default setting.

The sign of the velocity is dependent on the count direction in object 2000 sub-index 04. In the default setting a positive velocity is output when the reflector moves away from the AMS 338*i*. When the reflector moves towards the AMS 338*i*, negative velocities are output. If the "negative" count direction is configured in object 2000 sub-index 04, the velocity signs are reversed.

The integration time for the velocity averages all velocity values calculated during the selected period to yield a velocity value. This average velocity value is output via the interface.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|---------------------------|-----------|--------|-------------|---------|---------|---|
| | | | | | Minimum | Maximum | Default | |
| 2020 | 01 | Velocity resolution | u8 | rw | 1 | 5 | 1 | Value 1: = 1 Value 2: = 10 Value 3: = 100 Value 4: = 1000 Value 5 = free resolution |
| | 02 | Integration time velocity | u8 | rw | 0 | 6 | 3 | Unit ms Value 0: = 2 Value 1: = 4 Value 2: = 8 Value 3: = 16 Value 4: = 32 Value 5: = 64 Value 6: = 128 |
| | 03 | Free resolution velocity | u16 | rw | 5 | 50000 | 1000 | The configured value is multiplied by mm/1000/s or in/100000/s. |
| | 04 | Velocity value | int 32 | ro | -999999 | 999999 | -- | see below |

The velocity value is mapped into process data objects 1A02_n and 1A03_n.

Sub-index 01

The current velocity output occurs with the configured resolution. The unit (metric or inch) is set in object 2000 sub-index 02 and also applies to the velocity.

9.7.6.7 Object 2021_h Configuration velocity monitoring 1

Objects 2021_h to 2024_h permit the comparison between the current velocity as measured by the AMS 338*i* and a limit stored in the respective object.

Notice regarding velocity monitoring 1 - 4 and dynamic velocity monitoring

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 position start and position end also define the direction. The check is always performed from position start to position end. For example, if the position start is "5500" and the position 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 position start and position end is irrelevant. Depending on the selected switching mode, if the value is above or below the defined limits, the limit value status in object 2026_h is set and, if configured, the switching output is set via object 2050_h or 2051_h.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|--------------------------------------|-----------|--------|-------------|---------|---------|--------------------|
| | | | | | Minimum | Maximum | Default | |
| 2021 | 01 | Limit value check | u8 | rw | 0 | 7 | 0 | see below |
| | 02 | Velocity limit value 1 | u16 | rw | 0 | 20000 | 0 | mm/s or (in/100)/s |
| | 03 | Hysteresis of velocity limit value 1 | u16 | rw | 0 | 20000 | 100 | mm/s or (in/100)/s |
| | 04 | Monitoring from position start | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |
| | 05 | Monitoring to position end | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |

Sub-index 01

Bit 0: switching mode

- 0 = upon exceeding the velocity limit
- 1 = upon falling below the velocity limit

Bit 1: direction selection

- 0 = direction independent velocity monitoring
- 1 = direction dependent velocity monitoring

Bit 2: velocity monitoring

- 0 = activated
- 1 = deactivated

Bit 3 - Bit 7: reserve

9.7.6.8 Object 2022_h Configuration velocity monitoring 2

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|--------------------------------------|-----------|--------|-------------|---------|---------|--------------------|
| | | | | | Minimum | Maximum | Default | |
| 2022 | 01 | Limit value check | u 8 | rw | 0 | 7 | 0 | see below |
| | 02 | Velocity limit value 1 | u 16 | rw | 0 | 20000 | 0 | mm/s or (in/100)/s |
| | 03 | Hysteresis of velocity limit value 1 | u 16 | rw | 0 | 20000 | 100 | mm/s or (in/100)/s |
| | 04 | Monitoring from position start | i 32 | rw | -999999 | 999999 | 0 | mm or in/100 |
| | 05 | Monitoring to position end | i 32 | rw | -999999 | 999999 | 0 | mm or in/100 |

Sub-index 01

Bit 0: switching mode

- 0 = upon exceeding the velocity limit
- 1 = upon falling below the velocity limit

Bit 1: direction selection

- 0 = direction independent velocity monitoring
- 1 = direction dependent velocity monitoring

Bit 2: velocity monitoring

- 0 = activated
- 1 = deactivated

Bit 3 - Bit 7: reserve

9.7.6.9 Object 2023_n Configuration velocity monitoring 3

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|--------------------------------------|-----------|--------|-------------|---------|---------|---------------------|
| | | | | | Minimum | Maximum | Default | |
| 2023 | 01 | Limit value check | u 8 | rw | 0 | 7 | 0 | see below |
| | 02 | Velocity limit value 1 | u 16 | rw | 0 | 20000 | 0 | mm/s or (in/100)/s |
| | 03 | Hysteresis of velocity limit value 1 | u 16 | rw | 0 | 20000 | 100 | mm/s or (in/100)/s. |
| | 04 | Monitoring from position start | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |
| | 05 | Monitoring to position end | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |

Sub-index 01

Bit 0: switching mode

0 = upon exceeding the velocity limit

1 = upon falling below the velocity limit

Bit 1: direction selection

0 = direction independent velocity monitoring

1 = direction dependent velocity monitoring

Bit 2: velocity monitoring

0 = activated

1 = deactivated

Bit 3 - Bit 7: reserve

9.7.6.10 Object 2024_h Configuration velocity monitoring 4

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|--------------------------------------|-----------|--------|-------------|---------|---------|---------------------|
| | | | | | Minimum | Maximum | Default | |
| 2024 | 01 | Limit value check | u 8 | rw | 0 | 7 | 0 | see below |
| | 02 | Velocity limit value 1 | u 16 | rw | 0 | 20000 | 0 | mm/s or (in/100)/s |
| | 03 | Hysteresis of velocity limit value 1 | u 16 | rw | 0 | 20000 | 100 | mm/s or (in/100)/s. |
| | 04 | Monitoring from position start | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |
| | 05 | Monitoring to position end | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |

Sub-index 01

Bit 0: switching mode

0 = upon exceeding the velocity limit

1 = upon falling below the velocity limit

Bit 1: direction selection

0 = direction independent velocity monitoring

1 = direction dependent velocity monitoring

Bit 2: velocity monitoring

0 = activated

1 = deactivated

Bit 3 - Bit 7: reserve

9.7.6.11 Object 2025_n Configuration dynamic velocity monitoring

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|--------------------------------------|-----------|--------|-------------|---------|---------|---------------------|
| | | | | | Minimum | Maximum | Default | |
| 2025 | 01 | Limit value check | u 8 | rw | 0 | 7 | 0 | see below |
| | 02 | Velocity limit value 1 | u 16 | rw | 0 | 20000 | 0 | mm/s or (in/100)/s |
| | 03 | Hysteresis of velocity limit value 1 | u 16 | rw | 0 | 20000 | 100 | mm/s or (in/100)/s. |
| | 04 | Monitoring from position start | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |
| | 05 | Monitoring to position end | int 32 | rw | -999999 | 999999 | 0 | mm or in/100 |

Sub-index 01

Bit 0: switching mode

0 = upon exceeding the velocity limit

1 = upon falling below the velocity limit

Bit 1: direction selection

0 = direction independent velocity monitoring

1 = direction dependent velocity monitoring

Bit 2: velocity monitoring

0 = activated

1 = deactivated

Bit 3 - Bit 7: reserve

9.7.6.12 Object 2026_n Velocity status

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-----------------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 2026 | -- | Velocity status | u 32 | ro | -- | -- | -- | see below |

Bit 0: velocity measurement error

0 = OK

1 = error

Bit 1: movement status

0 = no movement

1 = movement

Bit 2: movement status

- 0 = positive direction
- 1 = negative direction

Bit 3: velocity limit value status 1

- 0 = limit value maintained
- 1 = limit value violated

Bit 4: velocity limit value status 2

- 0 = limit value maintained
- 1 = limit value violated

Bit 5: velocity limit value status 3

- 0 = limit value maintained
- 1 = limit value violated

Bit 6: velocity limit value status 4

- 0 = limit value maintained
- 1 = limit value violated

Bit 7: velocity limit value status dynamic

- 0 = limit value maintained
- 1 = limit value violated

Bit 8: velocity comparison limit value 1

- 0 = comparison inactive
- 1 = comparison active

Bit 9: velocity comparison limit value 2

- 0 = comparison inactive
- 1 = comparison active

Bit 10: velocity comparison limit value 3

- 0 = comparison inactive
- 1 = comparison active

Bit 11: velocity comparison limit value 4

- 0 = comparison inactive
- 1 = comparison active

Bit 12: velocity comparison limit value dynamic

- 0 = comparison inactive
- 1 = comparison active

9.7.6.13 Object 2050_n Configuration I/O 1

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 2050 | -- | I/O1 | u 32 | rw | -- | -- | -- | see below |

The settings in "bold" correspond to the default settings.

Bit 0: function of the I/O 1 connection at PWR M12

- 0 = input
- 1 = output**

Bit 1: activation

- 0 = 1 - 0 transition**
- 1 = 0 - 1 transition

Bit 2 - Bit 7: reserve

- 0 = reserve**
- 1 = NC

Bit 8: position limit value 1



Notice!

Bit 8 to bit 23 set the output via an "OR" logic.

If the position value lies outside of configured limit value 1, the output is set.

- 0 = OFF**
- 1 = ON

Bit 9: position limit value 2

If the position value lies outside of configured limit value 2, the output is set.

- 0 = OFF**
- 1 = ON

Bit 10: velocity limit value

If the velocity value lies outside of the configured values, the output is set. Monitoring from objects 2021h to 2025h is "OR" linked to this bit.

- 0 = OFF**
- 1 = ON

Bit 11: intensity monitoring (ATT)

If the intensity of the received signal falls below the predefined limit value, the output is set.

0 = OFF

1 = ON

Bit 12: temperature monitoring (ATT)

If the internal device temperature lies outside the predefined limit values, the output is set.

0 = OFF

1 = ON

Bit 13: laser prefailure monitoring (LSR)

If the laser power falls below the predefined limit value, the output is set.

0 = OFF

1 = ON

Bit 14: plausibility monitoring (PLB)

If implausible measurement values are diagnosed, the output is set.

0 = OFF

1 = ON

Bit 15: hardware error (ERR)

If a hardware error is diagnosed, the output is set.

0 = OFF

1 = ON

Bit 16: reserve**Bit 17: velocity comparison limit value dynamic**

0 = comparison inactive

1 = comparison active

Bit 18 - Bit 23: reserve

0 = reserve

1 = NC

Bit 24 - Bit 26: function of the I/O 1, if this has been defined as an input

Value 000 = no function

Value 001 = preset teach, valid for static (object 2001) and dynamic (object 2002)
preset

Value 010 = laser OFF. Laser diode is switched off

Bit 27 - Bit 31: reserve

0 = reserve

1 = NC

9.7.6.14 Object 2051_h Configuration I/O 2

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 2051 | -- | I/O2 | u32 | rw | -- | -- | -- | see below |

The settings in "bold" correspond to the default settings.

Bit 0: function of the I/O 2 connection at PWR M12

- 0 = input
- 1 = output**

Bit 1: activation

- 0 = 1 - 0 transition**
- 1 = 0 - 1 transition

Bit 2 - Bit 7: reserve

- 0 = reserve**
- 1 = NC

Bit 8: position limit value 1



Notice!

Bit 8 to bit 23 set the output via an "OR" logic.

If the position value lies outside of configured limit value 1, the output is set.

- 0 = OFF**
- 1 = ON

Bit 9: position limit value 2

If the position value lies outside of configured limit value 2, the output is set.

- 0 = OFF**
- 1 = ON

Bit 10: velocity limit value

If the velocity value lies outside of the configured values, the output is set. The monitoring from objects 2021_h to 2025_h are "OR" linked to this bit.

- 0 = OFF**
- 1 = ON

Bit 11: intensity monitoring (ATT)

If the intensity of the received signal falls below the predefined limit value, the output is set.

- 0 = OFF
- 1 = ON**

Bit 12: temperature monitoring (TMP)

If the internal device temperature lies outside the predefined limit values, the output is set.

0 = OFF

1 = ON

Bit 13: laser prefailure monitoring (LSR)

If the laser power falls below the predefined limit value, the output is set.

0 = OFF

1 = ON

Bit 14: plausibility monitoring (PLB)

If implausible measurement values are diagnosed, the output is set.

0 = OFF

1 = ON

Bit 15: hardware error (ERR)

If a hardware error is diagnosed, the output is set.

0 = OFF

1 = ON

Bit 16: reserve**Bit 17: velocity comparison limit value dynamic**

0 = comparison inactive

1 = comparison active

Bit 18 - Bit 23: reserve

0 = reserve

1 = NC

Bit 24 - Bit 26: function of the I/O 2, if this has been defined as an input

Value 000 = no function

Value 001 = preset teach, valid for static (object 2001) and dynamic (object 2002)
preset

Value 010 = laser OFF. Laser diode is switched off

Bit 27 - Bit 31: reserve

0 = reserve

1 = NC

9.7.6.15 Object 2060h Status of the AMS 338i

In sub-index 01, the object provides the following status messages of the AMS 338i.

- Laser status ON/OFF
- Preset status ON/OFF
- Preset teach activated/not activated
- Monitoring lower position limit value 1
- Monitoring upper position limit value 1
- Monitoring lower position limit value 2
- Monitoring upper position limit value 2
- Intensity (ATT)
- Temperature (TMP)
- Laser (LSR)
- Plausibility (PLB)

In sub-index 02, the laser diode can be switched OFF/ON.

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-----------------|-----------|--------|-------------|---------|---------|-------------------------------|
| | | | | | Minimum | Maximum | Default | |
| 2060 | 01 | Status | u32 | ro | -- | -- | -- | see below |
| | 02 | Laser ON/OFF | u8 | rw | 0 | 1 | 0 | 0 = laser ON 1 = laser OFF |

Explanations on sub-index 01

Bit 0: hardware error (ERR)

- 0 = OK
- 1 = hardware error (ERR)

Bit 1 - Bit 3: reserve activation

- 0 = reserve
- 1 = NC

Bit 4: monitoring lower position value 1

- 0 = OK
- 1 = value less than limit

Bit 5: monitoring upper position value 1

- 0 = OK
- 1 = value exceeded

Bit 6: monitoring lower position value 2

- 0 = OK
- 1 = value less than limit

Bit 7: monitoring upper position value 2

- 0 = OK
- 1 = value exceeded

Bit 8: laser status

- 0 = OK
- 1 = laser OFF

Bit 9: preset status

- 0 = preset inactive
- 1 = preset active

Bit 10: preset teach (toogle bit)

This bit toggles on each teach event of a preset value

Bit 11 - Bit 12: reserve

- 0 = reserve
- 1 = NC

Bit 13: intensity (ATT)

If the intensity of the received signal falls below the predefined limit value, the warning is set.

- 0 = OK
- 1 = warning

Bit 14: temperature (TMP)

If the internal device temperature lies outside the predefined limit values, the warning is set.

- 0 = OK
- 1 = warning

Bit 15: laser (LSR)

If the laser power falls below the predefined limit value, the warning is set.

- 0 = OK
- 1 = warning

Bit 16: plausibility (PLB)

If implausible measurement values are diagnosed, the error is set.

- 0 = OK
- 1 = error

Bit 17 - Bit 31: reserve

- 0 = reserve
- 1 = NC

9.7.6.16 Object 2070_n, Behavior of the AMS 338*i* in the case of error

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|---|-----------|--------|-------------|---------|---------|----------------------------------|
| | | | | | Minimum | Maximum | Default | |
| 2070 | 01 | Behavior of position value in case of failure | u8 | rw | 0 | 13 | 13 | see below |
| | 02 | Delay of position value in case of failure | u16 | rw | 100 | 1000 | 100 | Delay of the error message in ms |
| | 03 | Behavior of velocity value in case of failure | u8 | rw | 0 | 13 | 13 | see below |
| | 04 | Delay of velocity value in case of failure | u16 | rw | 200 | 1000 | 200 | Delay of the error message in ms |

Explanation on sub-index 01

Bit 0: position value in the case of error

0 = last valid value

1 = zero

Bit 1: static 0

Bit 2: suppress position state

0 = OFF

1 = ON

Bit 3: error delay position

0 = OFF

1 = ON

Explanation on sub-index 03

Bit 0: velocity value in the case of error

0 = last valid value

1 = zero

Bit 1: static 0

Bit 2: suppress velocity state

0 = OFF

1 = ON

Bit 3: error delay velocity

0 = OFF

1 = ON

9.7.6.17 Object 2300_h Other

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-------------------------------|-----------|--------|-------------|---------|---------|--|
| | | | | | Minimum | Maximum | Default | |
| 2300 | 01 | Display language selection | u8 | rw | 0 | 4 | 0 | 0 = English 1 = German 2 = Italian 3 = Spanish 4 = French |
| | 02 | Illumination duration display | u8 | rw | 0 | 1 | 0 | 0 = off after 10min. 1 = always on |
| | 03 | Display contrast | u8 | rw | 0 | 2 | 1 | 0 = low 1 = medium 2 = high |
| | 04 | Password activation | u8 | rw | 0 | 1 | 0 | 0 = OFF 1 = ON |
| | 05 | Password | u16 | rw | 0000 | 9999 | 0000 | Setting of a 4-digit password |
| | 06 | Heating control | u8 | rw | 0 | 1 | 0 | see below |



Notice!

Password activation must be set to ON.

Explanation on sub-index 06 "heating control"

0 = Standard (10°C ... 15°C)

1 = Extended (30°C ... 35°C)



Notice!

The sub-index 06 is available as standard, but functions only for devices with integrated heating (AMS 338*i* ... H).

Sub-index 06 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.

9.7.7 Objects of the AMS 338*i* from the DS406 class 1 encoder profile

The AMS 338*i* adopts the profile from CANopen. The profile puts prescribed characteristics of the participant on defined object addresses.

The AMS 338*i* communicates according to the specifications in profile "DS406" class 1.

For class 1, it is mandatory to describe the following objects.

9.7.7.1 Object 6000_h Operating parameters

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|----------------------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 6000 | -- | Operating parameters | u16 | rw | -- | -- | -- | see below |

Bit 0 - Bit 2

not used

Bit 3: counting direction

0 = positive - the measurement value increases with increasing distance.

1 = negative - the measurement value decreases with increasing distance.

Bit 4 - Bit 15: reserve

9.7.7.2 Object 6004_h Position value

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|------------------------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 6004 | -- | Maximum position value | int 32 | ro | -999999 | 999999 | -- | see below |

Object 6004_h contains the position value for process data objects (PDOs) 1A00_h (TPDO1))

| Byte | Bit | | | | | | | | Remark |
|------|-----|---|---|---|---|---|---|-----|------------------------|
| | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | |
| 0 | | | | | | | | LSB | Maximum position value |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | MSB | | | | | | | | |

9.7.7.3 Object 6500_h display of operating status from object 6000

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|----------------------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 6500 | -- | Operating parameters | u16 | ro | -- | -- | -- | see below |

Bit 0 - Bit 2

not used

Bit 3: counting direction

0 = positive - the measurement value increases with increasing distance.

1 = negative - the measurement value decreases with increasing distance.

Bit 4 - Bit 15: reserve

9.7.7.4 Object 6501_h Measurement step

| Index (hex) | Sub-index (hex) | Name | Data type | Access | Value range | | | Remark |
|----------------|--------------------|-------------------|-----------|--------|-------------|---------|---------|-----------|
| | | | | | Minimum | Maximum | Default | |
| 6501 | -- | Measurement steps | u32 | ro | -- | -- | -- | see below |

The resolution set in object 2000_h sub-index 03 is specified in multiples of 0.001 μm (1nm) in object 6501.

Example:


If the default resolution in object 2000_h is set to 1mm, the resolution for object 6501 is converted to value 1 000 000. (1 000 000 x 1/1 000 000 = 1)




10 Diagnostics and troubleshooting


10.1 Service and diagnostics in the display of the AMS 338*i*

In the main menu of the AMS 338*i*, expanded "Diagnostics" can be called up under the Service heading.

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

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 sublevel to the next-higher menu item by pressing the ESC button .

10.1.1 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.

```
Status messages
1: - / - / -
2: - / - / -
3: - / - / -
```

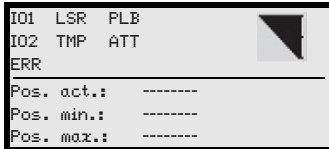
The status messages within the ring memory are selected with the up/down buttons  . Use the enter button  to call up detailed information about the respective status message that includes the following details:



- Type:** Designates the message type **I** = info; **W** = warning, **E** = error.
- No:** Internal numbering
- Ref.:** Plain-text explanation of the displayed status
- Time:** Time stamp in the hh.mm format. The displayed time is added to the time since the last power ON. Power OFF clears the time stamp.

10.1.2 Diagnostics

The diagnostics function is activated by selecting the `Diagnostics` menu item. The ESC button  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 338*i*.

10.1.3 Expanded diagnostics

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

10.2 General causes of errors

LINK LED for BUS IN and BUS OUT

A green/yellow multicolor LED below the BUS IN and BUS OUT connectors indicates the EtherCAT connection status.



Green continuous light

Power LINK green

- The link exists, the hardware connection to the next connected participant is OK.



Flashing yellow

LINK LED flashes yellow

- Data is exchanged with the connected participants.

10.2.1 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 10.1: General causes of errors

10.3 Interface errors

10.3.1 BUS LED

For further information on the LED status displays, see chapter 8.2.2 "LED status displays".

| Error | Possible error cause | Measure |
|-----------------------------|--|-----------------------|
| BUS LED "OFF" | Power off on AMS 338 <i>i</i> | Check supply voltage. |
| BUS-LED "flashes red" | Invalid configuration | -- |
| Bus LED "flashes green/red" | Bus error Time out Process Data Watchdog Timeout | -- |

Table 10.2: Bus error

10.4 Status display in the display of the AMS 338*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 < 10 m/s? |
| | Measurement range for maximum distance exceeded | Restrict traversing path or select AMS with larger measurement range. |
| | Velocity greater than 10 m/s | Reduce velocity. |
| ATT (insufficient received signal level) | Ambient temperature far outside of the permissible range (TMP display; PLB) | Select AMS with heating or ensure cooling. |
| | 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 10 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

11 Type overview and accessories

11.1 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 = | 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

11.1.1 Type overview AMS 338*i* (EtherCAT)

| Type designation | Description | Part no. |
|-----------------------|--|----------|
| AMS 338/40 | 40m operating range, EtherCAT interface | 50113701 |
| AMS 338 <i>i</i> /120 | 120m operating range, EtherCAT interface | 50113702 |
| AMS 338/200 | 200m operating range, EtherCAT interface | 50113703 |
| AMS 338/300 | 300m operating range, EtherCAT interface | 50113704 |
| AMS 338/40 H | 40m operating range, EtherCAT interface, integrated heating | 50113705 |
| AMS 338/120 H | 120m operating range, EtherCAT interface, integrated heating | 50113706 |
| AMS 338/200 H | 200m operating range, EtherCAT interface, integrated heating | 50113707 |
| AMS 338/300 H | 300m operating range, EtherCAT interface, integrated heating | 50113708 |

Table 11.1: Type overview AMS 338*i*

11.2 Overview of reflector types

| Type designation | Description | Part no. |
|---------------------------|--|----------|
| Reflective tape 200x200-S | Reflective tape, 200x200 mm, self-adhesive | 50104361 |
| Reflective tape 500x500-S | Reflective tape, 500x500 mm, self-adhesive | 50104362 |
| Reflective tape 914x914-S | Reflective tape, 914x914 mm, self-adhesive | 50108988 |
| Reflective tape 200x200-M | Reflective tape, 200x200 mm, affixed to aluminum plate | 50104364 |
| Reflective tape 500x500-M | Reflective tape, 500x500 mm, affixed to aluminum plate | 50104365 |
| Reflective tape 914x914-M | Reflective tape, 914x914 mm, 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 11.2: Overview of reflector types

11.3 Accessories

11.3.1 Accessory mounting bracket

| Type designation | Description | Part no. |
|------------------|---|----------|
| MW OMS/AMS 01 | Mounting bracket for mounting the AMS 338 <i>i</i> to horizontal surfaces | 50107255 |

Table 11.3: Accessory mounting bracket

11.3.2 Accessory deflector unit

| Type designation | Description | Part no. |
|------------------|---|----------|
| US AMS 01 | Deflector unit with integrated mounting bracket for the AMS 338 <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 11.4: Accessory deflector unit

11.3.3 Accessory M12 connector

| Type designation | Description | Part no. |
|------------------------|---|----------|
| S-M12A-ET | M12 connector, EtherNet, D-coded, BUS IN, BUS OUT | 50112155 |
| KDS ET M12/RJ45 W - 4P | Converter from M12 D-coded to RJ45 socket | 50109832 |
| KD 095-5A | M12 connector, A-coded socket, Power (PWR) | 50020501 |

Table 11.5: Accessory M12 connector

11.3.4 Accessory ready-made cables for voltage supply

Contact assignment/wire color of PWR connection cable

| PWR connection cable (5-pin socket, A-coded) | | | |
|--|--------|-------|--------------|
| <p>M12 socket (A-coded)</p> | 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

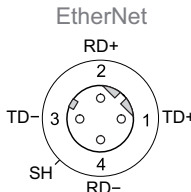
| Type designation | Description | Part no. |
|---------------------|--|----------|
| K-D M12A-5P-5m-PVC | M12 socket, A-coded, axial plug outlet, open cable end, cable length 5m | 50104557 |
| K-D M12A-5P-10m-PVC | M12 socket, A-coded, axial plug outlet, open cable end, cable length 10m | 50104559 |

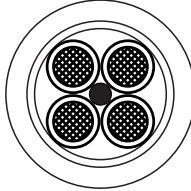
11.3.5 Accessory ready-made cables for EtherCAT

General

- Cable **KB ET...** for connecting to PROFINET via M12 connector
- Standard cable available in lengths from 2 ... 30m
- Special cables on request.

Contact assignments M12 EtherCAT connection cable KB ET ...-SA

| M12 EtherCAT connection cable (4-pin connector, D-coded, on both sides) | | | |
|--|-------------|------|------------|
| EtherNet | Pin | Name | Core color |
|  <p>M12 connector (D-coded)</p> | 1 | TD+ | yellow |
| | 2 | RD+ | white |
| | 3 | TD- | orange |
| | 4 | RD- | blue |
| | SH (thread) | FE | bare |



Core colors

WH
YE
BU
OG

Conductor class: VDE 0295, EN 60228, IEC 60228 (Class 5)

Accessories M12 EtherCAT connection cable, open cable end

Cable designation: KB ET - - SA

Accessories EtherCAT connection cable with both-sided D-coded M12 connector

Cable designation: KB ET - - SSA, cable assignment 1:1, not crossed

Accessory EtherCAT connection cable, M12-/RJ45

Cable designation: KB ET - - SA-RJ45



Notice for connecting the EtherCAT interface!

The entire connection cable must be shielded. The shielding connection must be at the same potential on both ends of the data line. This prevents potential compensating currents over the shield and possible interference coupling by compensating currents. The signal lines must be stranded in pairs.
Use CAT 5 cable for the connection.

Specifications of the EtherCAT connection cable

Operating temperature range in rest state: -50°C ... +80°C
 in motion: -25°C ... +80°C
 in motion: -25°C ... +60°C (when used with drag chains)

Material cable sheath: PUR (green), wire insulation: PE foam, free of halogens, silicone and PVC

Bending radius > 65 mm, suitable for drag chains
Bending cycles > 10⁶, perm. acceleration < 5m/s²

Order codes for EtherCAT connection cables

| Type designation | Description | Part no. |
|---|---|----------|
| M12 plug for BUS IN, axial connector, open cable end | | |
| KB ET - 1000 - SA | Cable length 1 m | 50106738 |
| KB ET - 2000 - SA | Cable length 2 m | 50106739 |
| KB ET - 5000 - SA | Cable length 5 m | 50106740 |
| KB ET - 10000 - SA | Cable length 10 m | 50106741 |
| KB ET - 15000 - SA | Cable length 15 m | 50106742 |
| KB ET - 20000 - SA | Cable length 20 m | 50106743 |
| KB ET - 25000 - SA | Cable length 25 m | 50106745 |
| KB ET - 30000 - SA | Cable length 30 m | 50106746 |
| M12 plug for BUS IN to RJ-45 connector | | |
| KB ET - 1000 - SA-RJ45 | Cable length 1 m, cable 1:1, not crossed | 50109879 |
| KB ET - 2000 - SA-RJ45 | Cable length 2 m, cable 1:1, not crossed | 50109880 |
| KB ET - 5000 - SA-RJ45 | Cable length 5 m, cable 1:1, not crossed | 50109881 |
| KB ET - 10000 - SA-RJ45 | Cable length 10 m, cable 1:1, not crossed | 50109882 |
| KB ET - 15000 - SA-RJ45 | Cable length 15 m, cable 1:1, not crossed | 50109883 |
| KB ET - 20000 - SA-RJ45 | Cable length 20 m, cable 1:1, not crossed | 50109884 |
| KB ET - 25000 - SA-RJ45 | Cable length 25 m, cable 1:1, not crossed | 50109885 |
| KB ET - 30000 - SA-RJ45 | Cable length 30 m, cable 1:1, not crossed | 50109886 |
| M12 plug + M12 plug for BUS OUT to BUS IN | | |
| KB ET - 1000 - SSA | Cable length 1 m, cable 1:1, not crossed | 50106898 |
| KB ET - 2000 - SSA | Cable length 2 m, cable 1:1, not crossed | 50106899 |
| KB ET - 5000 - SSA | Cable length 5 m, cable 1:1, not crossed | 50106900 |
| KB ET - 10000 - SSA | Cable length 10 m, cable 1:1, not crossed | 50106901 |
| KB ET - 15000 - SSA | Cable length 15 m, cable 1:1, not crossed | 50106902 |
| KB ET - 20000 - SSA | Cable length 20 m, cable 1:1, not crossed | 50106903 |
| KB ET - 25000 - SSA | Cable length 25 m, cable 1:1, not crossed | 50106904 |
| KB ET - 30000 - SSA | Cable length 30 m, cable 1:1, not crossed | 50106905 |

12 Maintenance

12.1 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.


12.2 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.

12.3 Disassembling, packing, disposing

Repacking

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

Note!

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

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|---------------------------------------|---|---|---|--|--|-------------------------|---------|
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| | | ↔ Parameters to default | | All parameters are reset to their factory settings | | | |
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| | ↔ Maximum position value | ↔ | ↔ Address (station alias) | | | | |
| | | | ↔ Measurement unit | | | Metric/Inch | page 43 |
| | | | ↔ Count direction | | | Positive/Negative | |
| | | | ↔ Offset | | | Value input: | |
| | | | ↔ Preset | | | Value input | |
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| ↔ Position value in the case of error | | | | | Last valid value / zero | | |
| ↔ Free resolution value | | | 5 ... 50000 | | | | |
| ↔ I/O | ↔ I/O 1 | ↔ Port configuration | ↔ Switching input | ↔ Function | No function/preset teach/laser ON/OFF | page 44 | |
| | | | | ↔ Activation | Low active/High active | | |
| | | | ↔ Switching output | ↔ Function | Pos. limit value 1 / Pos. limit value 2 / Velocity / 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 | | | |
| | ↔ Limit values | ↔ Upper pos. limit 1 | ↔ Switching output | ↔ Function | Pos. limit value 1 / Pos. limit value 2 / Velocity / Intensity (ATT) / Temp. (TMP) / Laser (LSR) / Plausibility (PLB) / Hardware (ERR) | | |
| | | | | ↔ Activation | Low active/High active | | |
| | | ↔ Lower pos. limit 1 | ↔ Upper pos. limit 1 | ↔ Activation | ON / OFF | | |
| | | | | ↔ Limit value input | Value input in mm or inch/100 | | |
| | | ↔ Upper pos. limit 2 | ↔ Lower pos. limit 1 | ↔ Activation | ON / OFF | | |
| | | | | ↔ Limit value input | Value input in mm or inch/100 | | |
| | ↔ Lower pos. limit 2 | ↔ Upper pos. limit 2 | ↔ Activation | ON / OFF | | | |
| | | | ↔ Limit value input | Value input in mm or inch/100 | | | |

| | | | | | |
|--------------------|----------------------|--------------------|---|---|---------|
| | Other | Heating control | | Standard/extended (10°C ... 15°C/30°C ... 35°C) | page 45 |
| | | Display background | | 10 minutes/ON | |
| | | Display contrast | | Weak/Medium/Strong | |
| | | Service RS232 | Baud rate | 57.6kbit/s / 115.2kbit/s | |
| | | | Format | 8,e,1 / 8,n,1 | |
| Language selection | | | Deutsch / English / Español / Français / Italiano | page 45 | |
| Service | Status messages | | Number of readings, reading gates, reading rate / non-reading rate etc. | page 46 | |
| | Diagnostics | | Exclusively for service purposes by Leuze electronic | | |
| | Expanded diagnostics | | Exclusively for service purposes by Leuze electronic | | |