Translation of original operating instructions

AMS 158i

Optical laser measurement system – EtherNet/IP



The Sensor People

We reserve the right to make technical changes
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1 About this document

Used symbols and signal words

Tab. 1.1: Warning symbols and signal words

	Symbol indicating dangers to persons
	Symbol indicating dangers from harmful laser radiation
	Symbol indicating possible property damage
NOTE	Signal word for property damage Indicates dangers that may result in property damage if the measures for danger avoidance are not followed.
ATTENTION LASER RADIATION	Signal word for dangers from harmful laser radiation
CAUTION	Signal word for minor injuries Indicates dangers that may result in minor injury if the measures for danger avoidance are not followed.
WARNING	Signal word for serious injury Indicates dangers that may result in severe or fatal injury if the measures for danger avoidance are not followed.

Tab. 1.2: Other symbols

	Symbol for tips Text passages with this symbol provide you with further information.
	Symbol for action steps Text passages with this symbol instruct you to perform actions.
	Symbol for action results Text passages with this symbol describe the result of the preceding action.

Tab. 1.3: Terms and abbreviations

CFR	Code of Federal Regulations
FE	Functional earth
FW	Firmware
HW	Hardware
IO or I/O	Input/Output
IP	Internet Protocol
LED	Light emitting diode
MAC	Media Access Control
NEC	National Electric Code
NTP	Network Time Protocol
PELV	Protective Extra-Low Voltage
TCP	Transmission Control Protocol
USB	Universal Serial Bus
UL	Underwriters Laboratories

2 Safety

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

2.1 Intended use

The AMS 100i optical laser measurement system is an absolute measuring optical laser measurement system for distance measurement up to 200 m against a reflector.

Areas of application

The AMS 100i is designed for the following areas of application:

- Positioning of automated, moving plant components
- Travel and lifting axes of stacker cranes
- Repositioning units
- Gantry crane bridges and their trolleys
- Elevators
- Electroplating plants

CAUTION

Observe intended use!

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

- Only operate the device in accordance with its intended use.
- Leuze electronic GmbH + Co. KG is not liable for damages caused by improper use.
- Read these operating instructions before commissioning the device. Knowledge of the operating instructions is an element of proper use.

CAUTION

UL applications!

For UL applications, the device must be powered by a PS2 in accordance with EN / IEC / UL 62368-1 or an LPS in accordance with EN / IEC / UL 60950-1 or NEC Class 2.

NOTICE

Comply with conditions and regulations!

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

2.2 Foreseeable misuse

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

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

- in rooms with explosive atmospheres
- in circuits which are relevant to safety
- for medical purposes

	NOTICE
	**Do not modify or otherwise interfere with the device!** ↳ Do not carry out modifications or otherwise interfere with the device. The device must not be tampered with and must not be changed in any way. ↳ The device must not be opened. There are no user-serviceable parts inside. Opening the device voids the warranty. Warranted features cannot be guaranteed after the device has been opened. ↳ Repairs must only be performed by Leuze electronic GmbH + Co. KG.

2.3 Competent persons

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

Prerequisites for competent persons:

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

Certified electricians

Electrical work must be carried out by a certified electrician.

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

In Germany, certified electricians must fulfill the requirements of accident-prevention regulations DGUV (German Social Accident Insurance) provision 3 (e.g. electrician foreman). In other countries, there are respective regulations that must be observed.

2.4 Disclaimer

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

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

2.5 Laser safety notices

ATTENTION

LASER RADIATION – CLASS 2 LASER PRODUCT

Do not stare into beam!

The device satisfies the requirements of IEC/EN 60825-1:2014 safety regulations for a product of **laser class 2** and complies with 21 CFR 1040.10 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

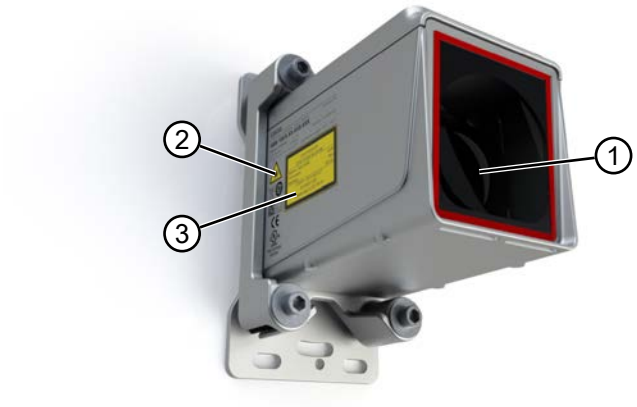
- Never look directly into the laser beam or in the direction of reflected laser beams!
  If you look into the beam path over a longer time period, there is a risk of injury to the retina.
- Do not point the laser beam of the device at persons!
- Interrupt the laser beam using a non-transparent, non-reflective object if the laser beam is accidentally directed towards a person.
- When mounting and aligning the device, avoid reflections of the laser beam off reflective surfaces!
- CAUTION! Use of controls or adjustments or performance of procedures other than specified herein may result in hazardous light exposure.
- Observe the applicable statutory and local laser protection regulations.
- The device must not be tampered with and must not be changed in any way.
  There are no user-serviceable parts inside the device.
  Repairs must only be performed by Leuze electronic GmbH + Co. KG.

NOTICE

Affix laser information and warning signs!

Laser information and warning signs attached to the device. Also included with the device are self-adhesive laser warning and laser information signs (stick-on labels) in multiple languages.

- Affix the laser information sheet to the device in the language appropriate for the place of use.
  When using the device in the US, use the stick-on label with the "Complies with 21 CFR 1040.10" notice.
- Affix the laser information and warning signs near the device if no signs are attached to the device (e.g. because the device is too small) or if the attached laser information and warning signs are concealed due to the installation position.
  Affix the laser information and warning signs so that they are legible without exposing the reader to the laser radiation of the device or other optical radiation.



1 Laser aperture
2 Laser warning sign
3 Laser information sign with laser parameters

Fig. 2.1: Laser aperture, laser warning signs



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

2.6 Cybersecurity

Guarding against cybersecurity threats requires the operating company to have a comprehensive cybersecurity concept, which must be continuously reviewed and maintained. A suitable concept consists of organizational, technical, procedural, electronic and physical defense levels and takes into account appropriate measures for the different types of risk. The measures implemented in this product can only help guard against cybersecurity threats if the product is used as part of such a concept.

Physical access control

The operating company must ensure that physical access to the absolute measuring system is restricted exclusively to authorized personnel.

Network segmentation

The absolute measurement system should only be operated on a network that is protected against unauthorized access. The operating company's network should therefore be segmented into different zones. Each environment has a subnet. Internal communication is only permitted on the basis of a predefined network policy based on an approval list. Information on the correct zoning of industrial automation networks can be found, for example, in the IEC 62443 series of standards.

Activating access protection for the webConfig tool

When using the webConfig tool's web-based user interface, it should be protected against unauthorized access by means of a user role to prevent unintentional or accidental misuse. For further information, see chapter 8.3 "Short description of the webConfig tool".

Network services

The device uses several network services for operation. Information on the factory default settings when using the device can be found in the following table.

Tab. 2.1: Standard device settings for the network services

Service / Protocol	Physical connection	Port	Encrypted	Default status	Description
WebConfig tool	XF1 IN XF0 Service	80	No	Activated	Diagnosis and firmware update
EtherNet/IP	XF1 IN	Various	No	Activated	Configuration and data exchange
Telnet server	XF0 Service	23 / TCP	No	Activated	Device diagnosis

3 Fast commissioning

Below you will find a short description for the initial commissioning of the AMS 100i. Detailed explanations for all listed points can be found throughout these operating instructions.

3.1 Mounting

Depending on the purchased model, the AMS 100i can be mounted in various ways (see chapter 13 "Order guide and accessories"):

- with pre-mounted alignment unit (BTA)
- with adapter plate (BT)
- with the threaded holes in the housing (without accessories)

The AMS 100i 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 between the AMS 100i and the reflector.

Mounting the device

Mounting with pre-mounted alignment unit (BTA):

- Secure the alignment unit together with mounted laser using four M5 screws.
- Align the laser using the two adjustment screws on the alignment unit. Adjust so that the laser light spot is positioned at the center of the reflector.

If the sensor was purchased without pre-mounted alignment unit (BTA),

- first mount either the adapter plate (BT) or one of the accessory parts to the sensor or
- secure the sensor directly using the threaded holes provided in the housing.

For further information, see chapter 5.2 "Mounting the device".

Mounting the reflector

- Secure the reflector with four M5 screws.
- Tilt the reflector by approx. 1° using the enclosed spacer sleeves.

For further information, see chapter 5.3 "Mounting the reflector".

3.2 Connecting voltage supply

- Connect the AMS100i via the M12 connection XD1 PWR.

For further information, see chapter 6 "Electrical connection".

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.

Navigate using the [DOWN]/[ENTER] buttons to read off and change the data and parameters.

For further information, see chapter 4.2.2 "Display".

3.4 EtherNet/IP interface

For more information on installing the EtherNet/IP interface see chapter 7 "Starting up – Ethernet/IP interface".

4 Device description

4.1 Operating principle

The AMS 100i 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 100i calculates the distance to the reflector using phase-correlated time-of-flight measurement. The high absolute measurement accuracy of the laser measurement system and the fast response time are designed for position control applications.

4.2 Indicators and operational controls

4.2.1 LED status indicators

PWR LED

Tab. 4.1: PWR indicators

Color	State	Description
	Off	Device OFF, no supply voltage
Green	Flashing	• No measurement value output • Voltage connected • Self test running • Initialization running • Parameter download running • Boot process running
Green	Continuous light	• Device ok • Measurement value output • Self test successfully finished • Device monitoring active
Red	Flashing	• Device OK but warning message (ATT, TMP, LSR) set in display • Light beam interruption • Plausibility error (PLB)
Red	Continuous light	• No measurement value output, details see chapter 4.2.2 "Display" • The device is booting up (the NET LED also lights up red)
Orange	Continuous light	• Parameter enable active • No data on the host interface

NET LED

Tab. 4.2: NET indicators

Color	State	Description
	Off	No supply voltage (Power)
Green	Continuous light	Connection to and communication with the controller
Green	Flashing	EtherNet/IP interface is being initialized
Red	Continuous light	• The device is booting up (PWR LED also lights up RED) • Bus error, network error • No communication established to the controller (“no data exchange”)

Color	State	Description
Red	Flashing	• Bus error, communication error • Parameterization or configuration failed ("parameter failure") • IO error • No data exchange

4.2.2 Display

Status and warning messages are shown in the display only if status changes or faults occur at the device.

Example:



Fig. 4.1: Example of status and warning message

Tab. 4.3: Status and warning messages in the display

Display	Type of message	Meaning
1	Input 1 or output 1 active	Function depending on configuration
2	Input 2 or output 2 active	Function depending on configuration
LSR	Laser pre-failure message warning	Laser diode old, device still functional, exchange or have repaired.
TMP	Temperature monitoring warning	Permissible internal device temperature exceeded / not met
PLB	Plausibility error	Implausible measurement value. Possible cause: • Light beam interruption • Measurement range exceeded • Permissible internal device temperature exceeded • Traverse rate > 10 m/s Depending on the configuration, either zero or the last valid measurement value is output at the interfaces.
ATT	Reception signal warning	Laser exit 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.

Position value

The measured position value is displayed in the configured unit of measurement.

+87.000 m	With the metric setting, the measurement value is always displayed in meters to three decimal places.
+87.0 in	With the inch setting, the measurement value is always displayed in inches to one decimal place.

4.2.3 Control buttons

Tab. 4.4: Control buttons

▼	DOWN	Navigate downward/sideways
↵	ENTER	Confirm/enter value, change menu levels

Navigating within the menus

- Use the [DOWN] button to select the menus within a menu level.
- Use the [ENTER] button to activate the selected menu item.

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

Setting values

If a value can be entered, the display will look like the example below:

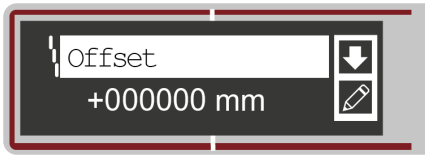


Fig. 4.2: Example of value entry

- Set the desired value using the [DOWN] button. If you have entered an incorrect digit, press the [DOWN] button until the desired digit appears again.
- Save the set value by pressing the [ENTER] button.
- With multi-digit numbers, after entering a digit press the [ENTER] button to move to the next digit on the right.

Selecting options

If an option can be selected, the display will look like the example below:



Fig. 4.3: Example of option selection

- Select the desired option using the [DOWN] button.
- Activate the option by pressing the [ENTER] button.

4.3 Menus

	NOTICE
	Terms may be shown in abbreviated form on the display. To improve readability, the terms are written in full below.

4.3.1 Menu structure

Main menu (Level 1)

- Device information, see chapter 4.3.2 "Device information menu"
- Parameter, Parameter menu
- Language selection, see chapter 4.3.4 "Language selection menu"
- Diagnosis, see chapter 4.3.5 "Diagnosis menu"

4.3.2 Device information menu

Tab. 4.5: Device information menu

Level 1	Level 2	Level 3	Level 4	Level 5
Device information	Product name			
	Part no.			
	Serial No.			
	HW revision			
	FW revision			

4.3.3 Parameter menu

Tab. 4.6: Parameter menu

Level 2	Level 3	Level 4	Level 5
Parameter handling	Parameter enable		
	Password	Activate password	
		Password entry	
	Parameters to default		
Position value	Unit		
	Counting direction		
	Offset		
	Preset		
	Error delay		
	Position value in the case of error		
	Filter type		
I/O	I/O 1	Port configuration	
		Switching input	Function
			Activation
		Switching output	Function
			Activation
	I/O 2	Port configuration	
		Switching input	Function
			Activation
		Switching output	Function
			Activation
	Limit values	Max. velocity	Activation
			Max. velocity

Level 2	Level 3	Level 4	Level 5
Limit values	Upper position limit 1	Activation	
		Value entry	
	Lower position limit 1	Activation	
		Value entry	
	Upper position limit 2	Activation	
		Value entry	
	Lower position limit 2	Activation	
		Value entry	
	Maximum velocity	Activation	
		Value entry	
Other	Display dimming	10 minutes	
		OFF	
	Heating control (For heater)	Standard (10°C – 15°C)	
		Extended (30°C – 35°C)	
	Service Ethernet IP	IP address	
		Port address	
	NTP server	IP address	

Parameter handling

Tab. 4.7: Submenu *Parameter handling*

Level 3	Level 4	Selection/configuration options Description	Standard
Parameter enable		**Lock and enable parameter entry** ON/OFF The standard setting (OFF) prevents unintended parameter changes. With parameter enable activated (ON), the display is inverted. In this state, it is possible to change parameters manually.	OFF
Password	Activate password	**Set up password** ON/OFF To enter a password, parameter enable must be activated. If a password is assigned, changes can only be made after the password is entered. The master password 507 overrides the individually set password.	OFF
	Enter password	Setting a 4-digit numerical password. After confirming the password, the entered password will be censored with “000” for privacy reasons.	
Parameters to default		**Reset device to default settings** Pressing the [ENTER] button after selecting the menu item *Parameters to default* resets all parameters to their standard settings without any further security prompts. In this case, English is selected as the display language.	

Position value

Tab. 4.8: Submenu *Position value*

Level 3	Selection/configuration options Description	Standard
Unit	Metric/Inch Specifies the units of the measured distances. The set values for preset, offset and velocity value are not automatically converted when the unit is changed. Before changing the unit, check these values and adjust if necessary.	Metric
Counting 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 "Position resolution" and is entered in mm or in/100. The offset value is effective immediately after entry. If the preset value is activated, this has priority over the offset. Preset and offset are not offset against each other.	Maximum configurable value: ±200,000 mm ±800,000 in/100
Preset	The preset value is accepted by means of teach pulse. The teach pulse can be placed on a hardware input of the M12 PWR connector. The hardware input must be appropriately configured, see chapter 7.5 "Class 103: switching inputs/outputs".	Maximum configurable value: ±200,000 mm ±800,000 in/100
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
Filter type	Normal/High/Low/AVG comp Choosing the right filter type can improve measurement accuracy at extreme traverse rates (both positive and negative) and reduce measurement value noise. Standard – suitable for use in all areas High – for very high traverse rates Low – for very low traverse rates AVG comp – Compatibility mode	Normal

I/O

Tab. 4.9: Submenu *I/O 1 settings*

Level 3	Level 4	Level 5	Selection/configuration options 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/teach preset/laser ON/OFF	No function
		Activation	Low active/High active	Low active
	Switching output	Function	Pos. Limit 1 / Pos. Limit 2 velocity/intensity (ATT) / Temperature (TMP) / Laser (LSR) / Plausibility (PLB) / Hardware (ERR) In the case of multiple entries, the individual functions are processed in an OR function.	Plausibility (PLB) Hardware (ERR)
		Activation	Low active/High active	Low active

Tab. 4.10: Submenu *I/O 2 settings*

Level 3	Level 4	Level 5	Selection/configuration options Description	Standard
I/O 2	Port configuration		Input/Output Defines whether I/O 2 functions as an output or input.	Output
	Switching input	Function	No function/teach preset/laser ON/OFF	No function
		Activation	Low active/High active	Low active
	Switching output	Function	Pos. Limit 1 / Pos. Limit 2 velocity/intensity (ATT) / Temperature (TMP) / Laser (LSR) / Plausibility (PLB) / Hardware (ERR) In the case of multiple entries, the individual functions are processed in an OR function.	Intensity (ATT) Temperature (TMP) Laser (LSR)
		Activation	Low active/High active	Low active

Tab. 4.11: Submenu *Limit values*

Level 3	Level 4	Level 5	Selection/configuration options Description	Standard
Limit values	Top pos. Limit 1	Activation	ON / OFF	OFF
		Value entry	Adjustable value: ± xxxxxx [mm]	
	Bottom pos. Limit 1	Activation	ON / OFF	OFF
		Value entry	Adjustable value: ± xxxxxx [mm]	
	Top pos. Limit 2	Activation	ON / OFF	OFF
		Value entry	Adjustable value: ± xxxxxx [mm]	
	Bottom pos. Limit 2	Activation	ON / OFF	OFF
		Value entry	Adjustable value: ± xxxxxx [mm]	
	Max. velocity	Activation	ON / OFF	OFF
		Max. velocity	Max. configurable value: 15,000 mm/s (60,000 in/100s)	

Other

Tab. 4.12: Submenu *Other*

Level 3	Level 4	Selection/configuration options Description	Standard
Display dimming		10 minutes/OFF The display illumination is dimmed after 5 minutes and switched off after 10 minutes. If the *OFF* parameter is selected, dimming is permanently deactivated, i.e. the measurement value is always displayed.	10 min
Heating control (For heaters)	Standard (10°C – 15°C)	Defines a switch-on/off range for the heating.	Standard
	Extended (30°C – 35°C)	Extends the switch-on/off range of the heating.	
Service Ethernet IP	IP address	The service interface is available for Leuze-internal purposes only.	192.168.60.101
	Port address	The service interface is available for Leuze-internal purposes only.	7070
NTP server	IP address	Using this IP address, the AMS clock can be synchronized with the network. Note: Only adjustable via the Service port	Default IP address 0.0.0.0, port 123

4.3.4 Language selection menu

The AMS 100i is delivered from the factory with the display preset to English.

5 display languages are available:

- English
- German
- French
- Italian
- Spanish

To change the language, no password needs to be entered and parameter enable does not need to be activated. The display language is a passive operational control and not a function parameter.

4.3.5 Diagnosis menu

A detailed description of the individual functions can be found in see chapter 10 "Diagnostics and troubleshooting".

4.3.6 Operation examples

Structure of menu items in display

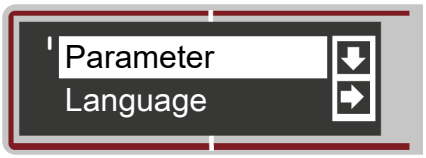
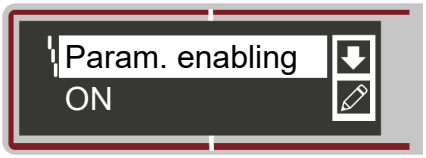
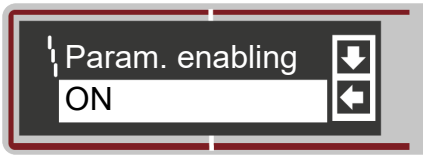
Two menu lines, one on top of the other, are always shown in the display.

Device information				
Network information				
Status and measurement data				
Parameter	Parameter handling	Parameter enable		
Language selection		Password	Activate password	…
Service		Parameters to default	Password entry	…

Parameter enable

During normal operation parameters can be viewed only. If you want to change any parameters, you must select the menu item *ON* in the menu **Parameters > Parameter handling > Parameter enable** . To do this, proceed as follows.

Tab. 4.13: Operating example for "parameter enable"

	In the main menu, use the [DOWN] button to select the menu item *Parameter* . Press the [ENTER] key to access the menu *Parameter* .
	Use the [DOWN] button to select the menu item *Parameter handling* . Press the [ENTER] key to access the menu *Parameter handling* .
	In the *Parameter handling* menu, use the [DOWN] button to select the menu item *Parameter enable* . Press the [ENTER] key to access the menu *Parameter enable* .
	In the *Parameter enable* menu, use the [DOWN] button to select the menu item *ON* . Press the [ENTER] button to activate parameter enable.

NOTICE

As long as parameter enable is active, the entire AMS 100i display is inverted.

If a password was stored, parameter enable is not possible until this password is entered; see the example below.

As long as parameter enable is active, communication between control and AMS 158i is interrupted. The extended networking via BUS OUT is retained.

Parameters set via the display are overwritten during operation of the AMS 158i on EtherCAT/IP by the parameters defined in the EtherCAT/IP-specific objects if they are included in the “Start-up Parameters.”

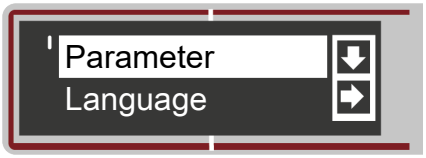
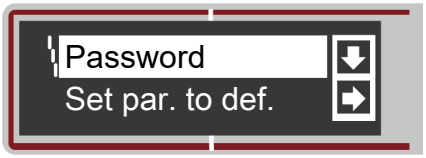
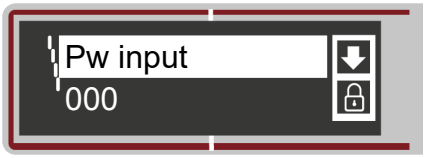
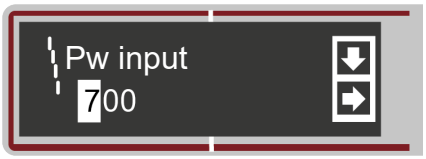
Changes to the EtherCat/IP parameters via display entry have immediate effect.

Password for parameter enable

Parameter entry on the AMS 100i can be protected with a password.

If a password is assigned, parameter enable must be activated using the password. If parameter enable has been activated after successfully entering the password, parameters can be changed via the display.

Tab. 4.14: Operating example for "password for parameter enable"

	In the main menu, use the [DOWN] button to select the menu item *Parameter* . Press the [ENTER] key to access the menu *Parameter* .
	Use the [DOWN] button to select the menu item *Parameter handling* . Press the [ENTER] key to access the menu *Parameter handling* .
	In the *Parameter handling* menu, use the [DOWN] button to select the menu item *Password* . Press the [ENTER] key to access the menu *Password* .
	In the *Password* menu, use the [DOWN] button to select the menu item *Activate password* . Press the [ENTER] key to access the menu Password activation.
	In the *Activate password* menu, use the [DOWN] button to select the menu item *OFF* . Press the [ENTER] button to set password activation to *ON* .
	In the *Password* menu, use the [DOWN] button to select the menu item *Password entry* . Press the [ENTER] key to access the menu *Password entry* .
	Now enter the password (digits), see chapter 4.2.3 "Control buttons" Press the [ENTER] button to confirm the value input.
	Exit the menu by pressing the [DOWN] button or wait until the AMS displays the measurement screen again.
	The next time you try to make a selection using the control buttons, you will now be prompted to enter the password to allow you to make entries.

NOTICE	
	The AMS 158i can be enabled at any time using the master password 507.

4.4 Reflectors

4.4.1 Description of the reflective tape

The AMS 100i measures distances against a reflective tape specified by Leuze. All technical data given for the AMS 100i, such as the operating range or accuracy, can only be achieved with the reflective tape specified by Leuze.

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

Under certain circumstances, the protective layer can cause surface reflections. The surface reflections can be directed past the AMS 100i by positioning the reflective tape at a slight incline. How to mount the reflective tape/reflectors is described in these operating instructions (see chapter 5.3 "Mounting the reflector").

A commercially available household detergent can be used for cleaning. Rinse with clear water and dry the surface. Do not use any abrasive agents.

Store reflective tapes in a cool and dry place.

4.4.2 Overview of reflective tapes

The reflective tapes/reflectors must be ordered separately, see chapter 13.4 "Accessories – Reflective tapes".

- Self-adhesive reflective tape
  - The reflective tape (…x…-**S**) must be bonded to a separate carrier plate (not included in the scope of delivery).
  - Technical data: see chapter 12.2.1 "Self-adhesive reflective tape"
- Reflective tape on carrier plate
  - The reflective tape (…x…-**M**) is affixed to a carrier plate.
  - Technical data: see chapter 12.2.2 "Reflective tape on carrier plate"
- Reflective tape with heating
  - The reflective tape (…x…-**H**) is affixed to a heated, thermally insulated carrier. The insulation results in a very high energetic efficiency. Only the reflective tape is kept at the specified temperature by the integrated heater. The insulation on the back prevents the generated heat from being dissipated via the steel construction. Energy costs are greatly reduced in the case of continuous heating.
  - Technical data: see chapter 12.2.3 "Reflective tape with heating"

4.4.3 Selecting reflector size

Depending on the system dimensions, the reflector can be mounted so that it moves with the vehicle or it can be mounted at a fixed location.

The choice of size is left to the user. In each case, the user must check whether the recommended reflector size is suitable for the respective application.

Tab. 4.15: Recommended reflector size

Device type	Operating range [m]	Recommended reflector size (H x W)	Type of reflective tape …-S (self-adhesive) …-M (carrier plate) …-H (heating)	Part no.
AMS 158i 40	40	200x200 mm	REF 4-A-150x150[1]	50141015
			Reflective tape 200x200-S	50104361
			Reflective tape 200x200-M	50104364
			Reflective tape 200x200-H	50115020
			REF 4-A-300x300[1]	50141014
AMS 158i 120	120	500x500 mm	Reflective tape 500x500-S	50104362
			Reflective tape 500x500-M	50104365
			Reflective tape 500x500-H	50115021

Device type	Operating range [m]	Recommended reflector size (H x W)	Type of reflective tape …-S (self-adhesive) …-M (carrier plate) …-H (heating)	Part no.
AMS 158i 200	200	749 x 914 mm 914x914 mm	Reflective tape 749x914 – S Reflective tape 914x914 – M Reflective tape 914x914 – S Reflective tape 914x914 – H	50104363 50104366 50108988 50115022

[1] For landside mounting

	NOTICE
	The recommended reflector sizes apply to on-vehicle mounting of the AMS 100i. For stationary mounting of the AMS 100i, a smaller reflector is generally sufficient for all measurement distances. For this reason, two smaller reflector sizes are available in the self-adhesive model “-S,” see chapter 13.4 "Accessories – Reflective tapes". During system planning and design, always check whether mechanical travel tolerances 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 unobstructed. For on-vehicle mounting of the AMS 100i, the reflector size must accommodate any travel tolerances that may arise and the associated "wandering" of the light spot on the reflector.

5 Mounting

5.1 Transport and storage

NOTICE
↳ Package the device for transport and storage in such a way that is protected against shock and humidity. Optimum protection is achieved when using the original packaging. ↳ Ensure compliance with the approved environmental conditions listed in the specifications.

Unpacking

↳ Check the packaging content 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 name plate
- Package insert

The name plate indicates your device's AMS 100i type, see chapter 13.2 "AMS 158i type overview".

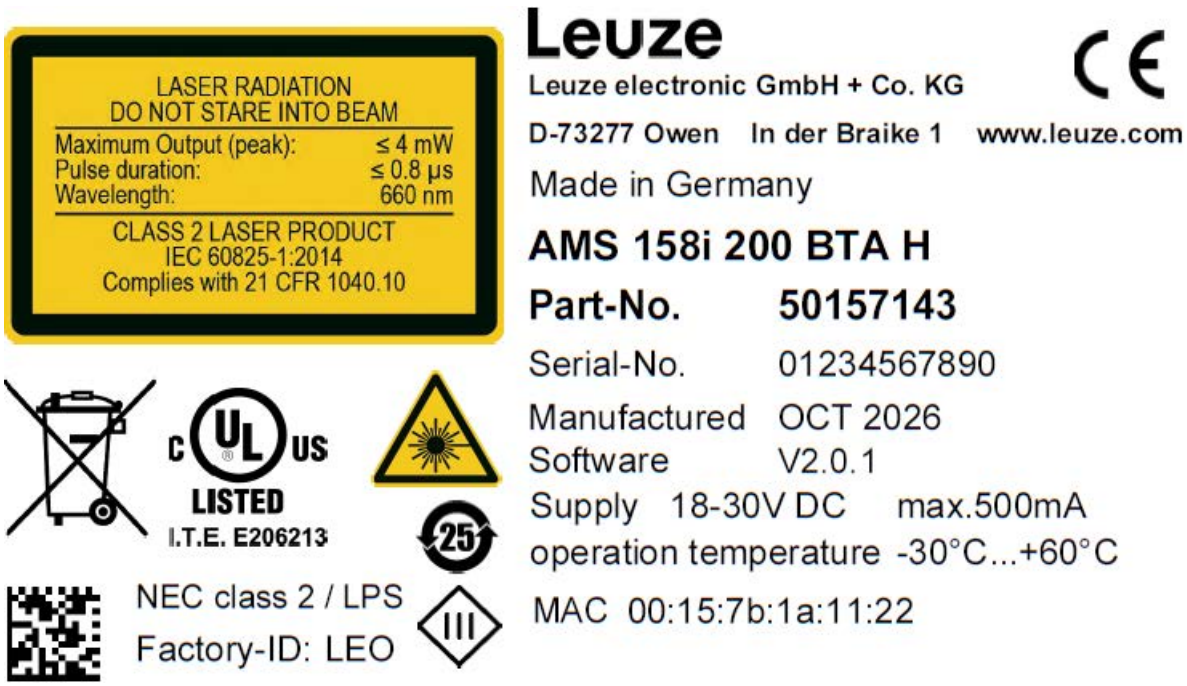


Fig. 5.1: AMS 158i name plate

↳ Save the original packaging for later storage or shipping.

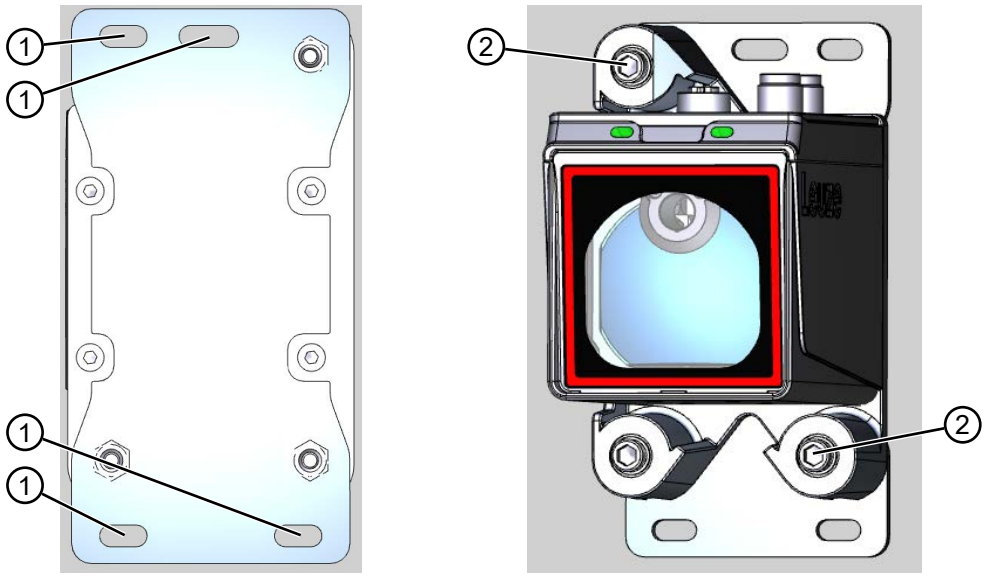
↳ If you have questions, please contact your supplier or Leuze customer service.

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

5.2 Mounting the device

The AMS 100i 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 between the AMS 100i and the reflector.

5.2.1 Mounting with pre-mounted alignment unit (BTA)



1 Slotted holes for mounting
2 Adjustment screws with hexagon socket WAF4

Fig. 5.2: Mounting with pre-mounted alignment unit

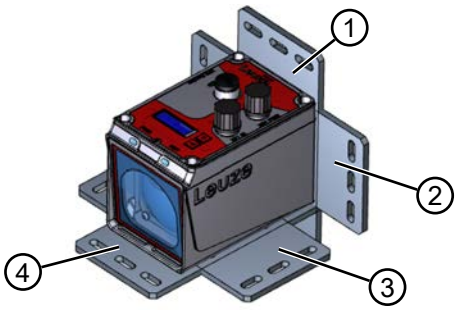
- Mount using four M5 screws.
- Guide the four M5 screws through the slotted holes of the alignment unit (1) and through the component to which the AMS 100i is to be attached.
- Secure the screws with a lock washer to protect against loosening caused by vibrations.

Aligning laser light spot

- Undo the adjustment screws WAF4 (2) a few turns.
- Align the laser light spot so that it always hits the center of the opposing reflector, both at close range as well as at the maximum measurement distance.
- Tighten the adjustment screws WAF4 (2).

To ensure that the light spot on the reflector does not move over the reflector across the entire measurement distance, the reflector and AMS should be installed vertically. If the light spot does not move during the process, i.e. when the distance changes, then installation is vertical.

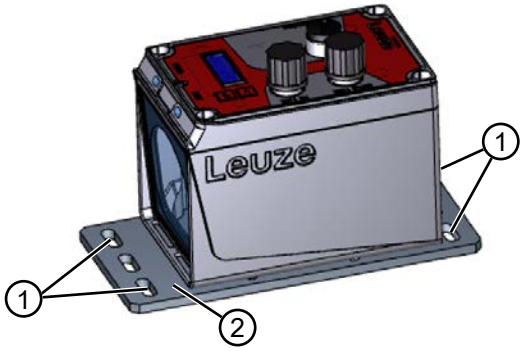
5.2.2 Mounting with adapter plate (BT)



1 Mounting option 1
2 Mounting option 2
3 Mounting option 3
4 Mounting option 4

Fig. 5.3: Mounting options with adapter plate

- Position the adapter plate using one of the various options (1-4).
- Guide four screws (M4) from the rear side through the holes in the adapter plate.
- Screw the four screws (M4) into the internally threaded holes in the AMS 100i housing.



1 Slotted holes for mounting
2 Adapter plate (BT)

Fig. 5.4: Mounting example with adapter plate (BT)

- Guide four screws (M5) through the slotted holes (1) of the adapter plate (2) and through the component to which the AMS 100i is to be attached.
- Secure the screws with lock washers and nuts.

Aligning laser light spot

To ensure that the light spot on the reflector does not move over the reflector across the entire measurement distance, the reflector and AMS should be installed vertically. If the light spot does not move during the process, i.e. when the distance changes, then installation is vertical.

5.2.3 Mounting without accessories

- Mount using the four screws (M4).
- Guide the four screws (M4) from the rear side through the component to which the AMS 100i is to be secured.
- Screw the screws (M4) into the internally threaded holes of the AMS 100i housing.

Aligning laser light spot

To ensure that the light spot on the reflector does not move over the reflector across the entire measurement distance, the reflector and AMS should be installed vertically. If the light spot does not move during the process, i.e. when the distance changes, then installation is vertical.

5.2.4 Parallel mounting

Definition of the term "parallel spacing"

The dimension X describes the “parallel spacing” of the inner edges of the two laser light spots on the reflector.

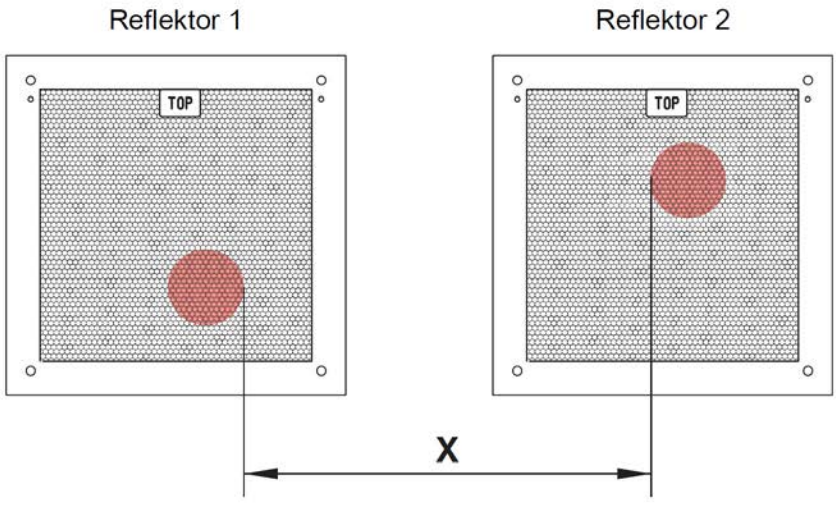


Fig. 5.5: Laser light spots parallel spacing

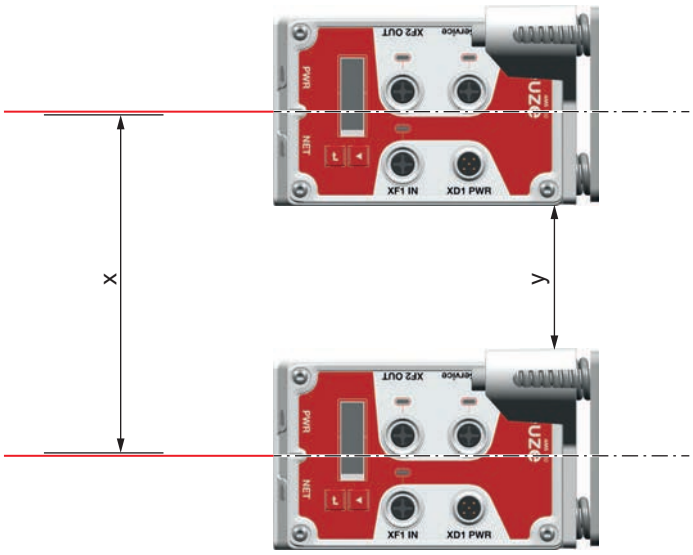


Fig. 5.6: Parallel mounting

The diameter of the light spot increases with distance.

	AMS 100i
Max. measurement distance	200 m
Light spot diameter	≤ 160 mm

Thus, the center-to-center spacing of the two AMS 100i devices with respect to one another can be calculated as a function of the maximum measurement distance.

The minimum parallel spacing X between the two laser spots is always calculated using the following formula:

X = 100 mm + (max. measurement distance in mm x 0.01)

To define the minimum parallel spacing between two AMS 100i devices, it is necessary to distinguish between three different arrangements of AMS 100i and reflectors.

- The AMS 100i are mounted stationary and in parallel on one plane.
  Both reflectors move independently of one another at different distances to the AMS 100i.
- The AMS 100i are mounted stationary and in parallel on one plane.
  Both reflectors move in parallel at the same distance to the AMS 100i..

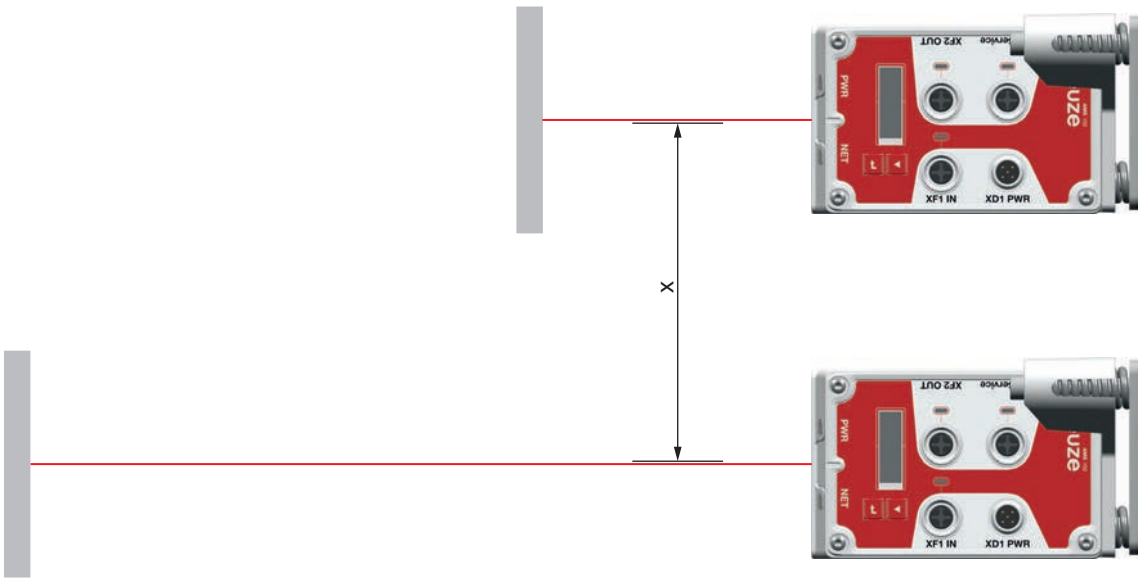


Fig. 5.7: Parallel mounting with moving reflectors

- The reflectors are mounted stationary and in parallel on one plane.
  Both AMS 100i move independently of one another at different or the same distances to the reflectors.

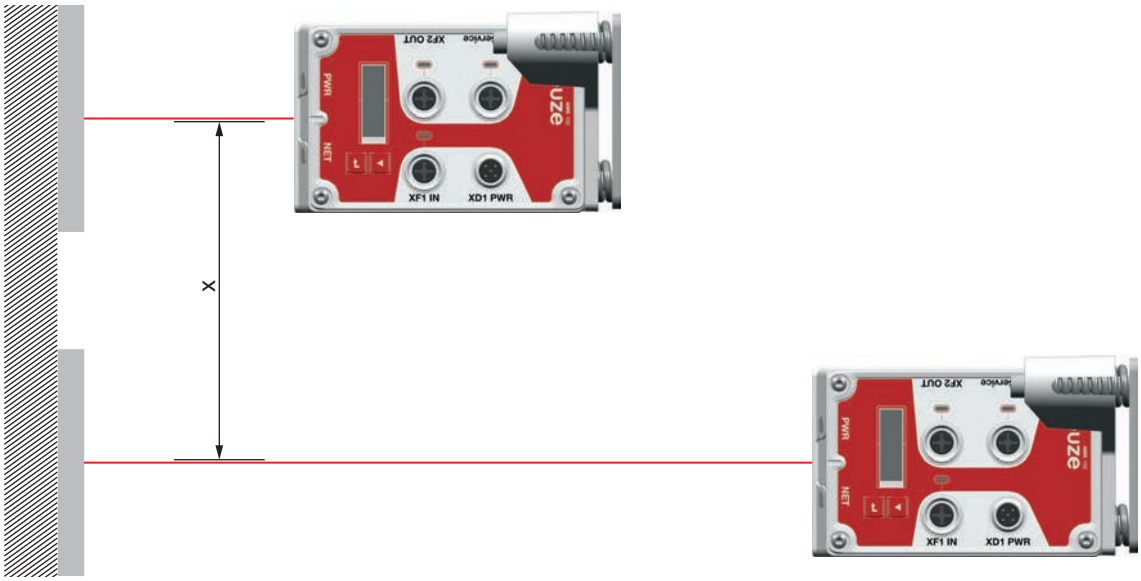


Fig. 5.8: Parallel mounting with moving AMS 100i units

NOTICE
Note that when the AMS 100i units are mounted in a mobile manner, travel tolerances could cause the two laser light spots to move towards each other. ↳ Take the travel tolerances of the vehicle into account when defining the parallel spacing of adjacent AMS 100i units.

5.2.5 Parallel mounting of and DDLS optical data transmission

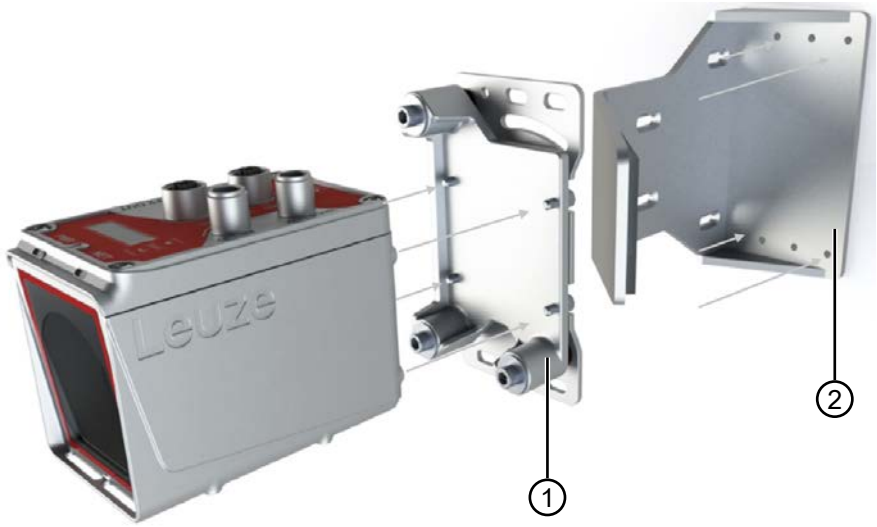
The optical data transceivers of the DDLS series and the AMS 158i do not interfere with one another. Depending on the size of the reflector used, the DDLS can be mounted with a minimum parallel spacing of 100 mm to the AMS 158i. The parallel spacing is independent of the distance.

5.2.6 Mounting with laser beam deflector units

The two available deflector units are used for the 90° deflection of the laser beam, see chapter 13.3 "Accessories – Mounting".

NOTICE
The deflector units are designed for a maximum operating range of 40 m. Longer distances can be achieved by independently optimizing the mechanical conditions.

Mounting of deflector unit with integrated mounting bracket



1 Pre-mounted alignment unit BTA
2 Deflector unit US AMS 02

Fig. 5.9: Mounting with laser beam deflector unit

✓ To use the US AMS 02 deflector unit, an AMS 1xxi BTA must be used, i.e., one equipped with the BTA alignment device (see chapter 12.3 "Dimensioned drawings").

↳ Use the four M5 screws to mount the deflector unit.

↳ Screw the AMS 100i together with the pre-mounted alignment unit (1) to the US AMS 02 deflector unit (2).

↳ Secure the screws with a lock washer to protect against loosening caused by vibrations.

The AMS 100i can be mounted in the deflector unit in two directions so that the cables lead off in the preferred direction.

In addition, the deflector unit can be mounted either underneath or on the rear side.

If deflection to the left or right is required, the entire deflector unit can be mounted accordingly.

The deflector unit is mounted on plane-parallel, flat walls or system parts. For error-free position measurement, there must be an unobstructed line-of-sight between the AMS 100i and the deflecting mirror as well as between the deflecting mirror and the reflector.

Mounting of deflector unit without mounting bracket

The US 1 OMS deflector unit and the AMS 100i are mounted separately.

↳ When mounting, make certain that the laser light spot of the AMS 100i is aligned with the center of the deflecting mirror.

To align the laser light spot with the reflector see chapter 5.2 "Mounting the device".

5.3 Mounting the reflector

The reflective tapes have a protective film that is easy to peel off.

↳ Remove the protective film before putting the overall system into operation.

Self-adhesive reflective tape

↳ Bond the self-adhesive reflective tapes of the "Reflective tape …x…-**S**" series to a flat, clean and grease-free surface. It is recommended to use a separate carrier plate (not included in the scope of delivery).

↳ Using a sharp tool, cut the tape along the side of the prism structure.

↳ Tilt the reflective tape; see chapter 5.3.1 "Pitch of the reflector".

Reflective tape on carrier plate

The reflective tapes of the "Reflective tape …x…-**M**" series have corresponding mounting holes.

Spacer sleeves are provided to enable mounting at the necessary pitch angle, see chapter 5.3.1 "Pitch of the reflector".

Reflective tape with heating

The reflective tapes of the "Reflective tape …x…-**H**" series have corresponding mounting holes.

Due to the voltage supply affixed on the rear, the reflector cannot be mounted flat. Four spacer sleeves in two different lengths are supplied. Use the spacer sleeves to ensure separation from the wall as well as to provide the necessary pitch for avoiding surface reflection see chapter 5.3.1 "Pitch of the reflector".

WARNING

Electrical work!

Electrical work must be carried out by a certified electrician.

- Connect the cable to the nearest power distribution point.
- Observe the current consumptions listed in the technical data, see chapter 12.2.3 "Reflective tape with heating".

5.3.1 Pitch of the reflector

- Connect the voltage supply of the AMS 100i.
- Mount the combination consisting of laser measurement system and reflective tape/reflector so that the laser light spot hits the film as centered as possible and without obstruction.
- To do so, use the mounting and adjustment options provided on the AMS 100i (see chapter 5.2 "Mounting the device").

NOTICE

The reflector must be positioned at an angle. Use the spacer sleeves for this purpose.

The correct pitch is given in the table "Reflector pitch".

Tab. 5.1: Reflector pitch

Reflector type	Pitch using spacer sleeves	
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

The spacer sleeves are included in the scope of delivery of reflective tapes …-M and …-H.

NOTICE

Reliable operation, the max. operating range and accuracy of the AMS 100i can only be achieved with the reflective tape specified by Leuze. Correct operation cannot be guaranteed if other reflectors are used.

Pitch of reflective tapes …-S and …-M

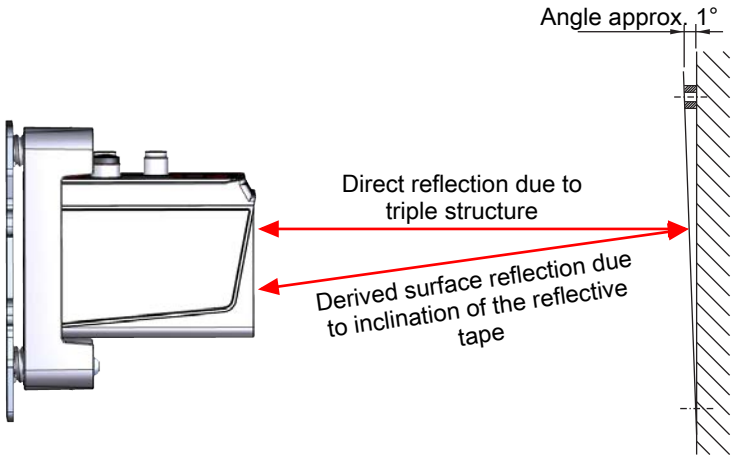


Fig. 5.10: Mounting the reflector

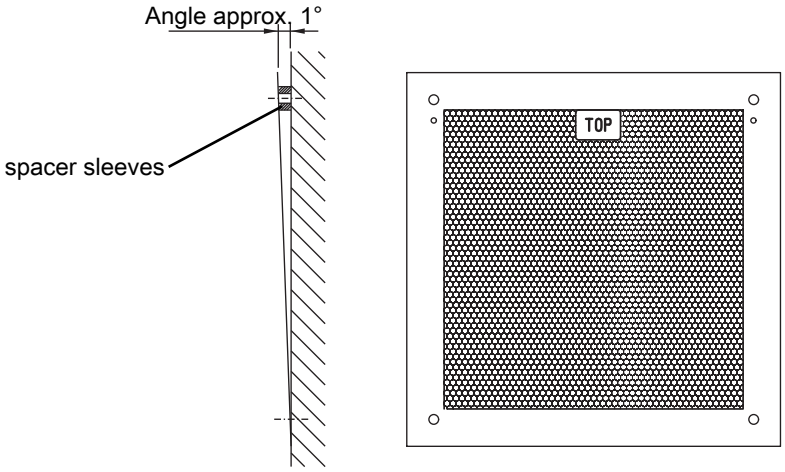


Fig. 5.11: Pitch of the reflector

Pitch of reflective tapes …-H

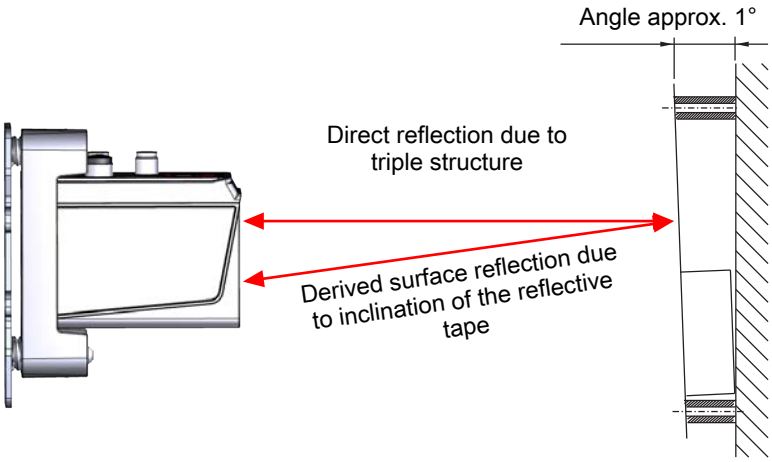


Fig. 5.12: Mounting of heated reflectors

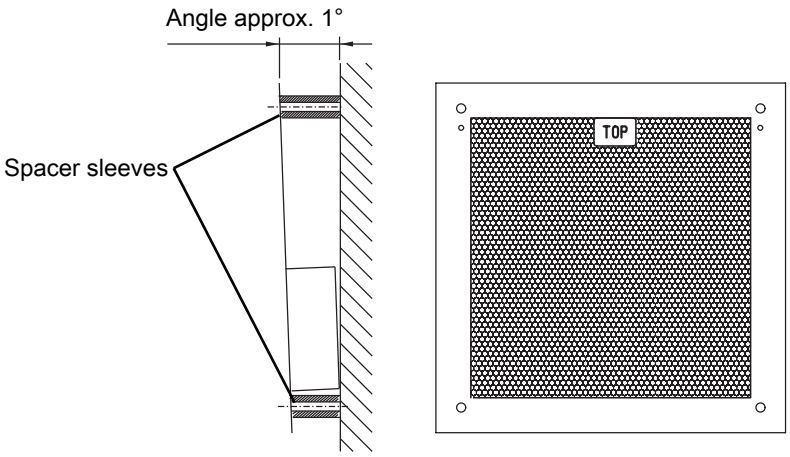


Fig. 5.13: Pitch of the heated reflector

6 Electrical connection

CAUTION

- Before connecting the device, be sure that the supply voltage agrees with the value printed on the name plate.
- Only allow competent persons to perform the electrical connection.
- Ensure that the functional earth (FE) is connected correctly. Fault-free operation is only guaranteed if the functional earth is connected properly.
- If faults cannot be rectified, take the device out of operation. Protect the device from accidentally being started.

CAUTION

UL applications!

For UL applications, the device must be powered by a PS2 in accordance with EN / IEC / UL 62368-1 or an LPS in accordance with EN / IEC / UL 60950-1 or NEC Class 2.

NOTICE

Protective Extra Low Voltage (PELV)!

The device is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).

NOTICE

Degree of protection IP65

Degree of protection IP65 is achieved only if the connectors are screwed into place and caps installed.

The AMS 100i is connected using variously coded M12 connectors.



1 XD1 PWR – voltage supply / switching input/output
2 XF1 BUS IN
3 XF2 BUS OUT
4 XF0 Service

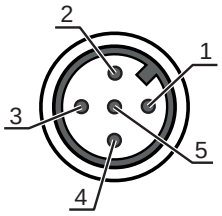
Fig. 6.1: AMS connections

The corresponding mating connectors and preassembled cables are available as accessories for all connections, see chapter 13.5 "Accessories – connection technology".

6.1 PWR – voltage supply / switching input/output

M12 connector, 5-pin, male, A-coded

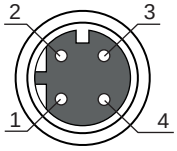
Tab. 6.1: PWR pin assignment

	Pin	Designation	Assignment
	1	VIN	Positive supply voltage +18 – +30 V DC
	2	I/O 1	Switching input/output 1
	3	GNDIN	Negative supply voltage 0 V DC
	4	I/O 2	Switching input/output 2
	5	FE	Functional earth
	Thread	FE	Functional earth (housing)

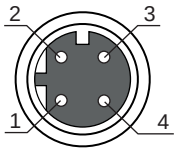
6.2 BUS IN / BUS OUT

M12 connector, 4-pin, female, D-coded

Tab. 6.2: Pin assignment XF1 BUS IN

	Pin	Designation	Assignment
	1	TD +	Transmit Data +
	2	RD +	Receive Data +
	3	TD -	Transmit Data -
	4	RD -	Receive Data -
	Thread	FE	Functional earth (housing)

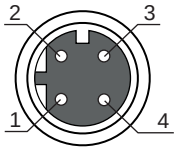
Tab. 6.3: Pin assignment XF2 BUS OUT

	Pin	Designation	Assignment
	1	TD +	Transmit Data +
	2	RD +	Receive Data +
	3	TD -	Transmit Data -
	4	RD -	Receive Data -
	Thread	FE	Functional earth (housing)

6.3 Service

M12 connection, 4-pin, female, D-coded

Tab. 6.4: Service pin assignment

	Pin	Designation	Assignment
	1	TD +	Transmit Data +
	2	RD +	Receive Data +
	3	TD -	Transmit Data -
	4	RD -	Receive Data -
	Thread	FE	Functional earth (housing)

NOTICE

The service interface is designed only for use by Leuze.

7 Starting up – Ethernet/IP interface

7.1 EIP profile classes overview

Tab. 7.1: Classes and instances

Class ID	Class name	Instance ID	Instance name
1	Class 1 Identity object	1	Instance 1
4	Class 4 assembly	1	Instance 1 position
4	Class 4 assembly	3	Instance 3 position value + speed
4	Class 4 assembly	100	Instance 100 position value + status
4	Class 4 assembly	101	Instance 101 velocity value + status
4	Class 4 assembly	103	Instance 103 condition monitoring
4	Class 4 assembly	120	Instance 120 preset value + control
4	Class 4 assembly	190	Instance 190 configuration
35	Class 35 Position sensor object	0	Instance 0
35	Class 35 Position sensor object	1	Instance 1
100	Class 100 display configuration	1	Instance 1
103	Class 103 switching inputs/outputs	1	Instance 1
103	Class 103 switching inputs/outputs	2	Instance 2
104	Class 104 Error handling procedures	1	Instance 1
105	Class 105 Velocity monitoring	1	Instance 1
105	Class 105 Velocity monitoring	2	Instance 2
106	Class 106 condition monitoring	1	Instance 1
107	Class 107 position monitoring	1	Instance 1
107	Class 107 position monitoring	2	Instance 2

7.2 Class 1: Identity object

Class ID: 1 (0x0001)

Service:

- Get_Attribute_Single

Tab. 7.2: Class 1 Identity object

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
1	1	1	Vendor ID	16	UINT	524	0	0	Get

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
		2	Device type	16	UINT	34	0	0	Get
		3	Product Code	16	UINT	25	0	0	Get
		4	Revision		STRUCT of	0	0	0	Get
		5	Status	16	WORD	0	0	0	Get
		6	Serial number	32	UDINT	-	-	-	Get
		7	Product name	[8]	SHORT_ STRING	0	0	0	Get
		8	Status	8	USINT	0	0	0	Get

Description

In the event of a device exchange in the system, the main revision number should not be monitored. The main version number describes the firmware version of the AMS 158i software within the EDS file/object 1. This may have changed during a device exchange.

Otherwise, the sensor would send an error message after a device exchange.

Attribute 1: Vendor ID

The Vendor ID is assigned by the ODVA and, for Leuze electronic Gmbh + Co. KG, is **524**.

Attribute 2: device type

The AMS 158i is defined by Leuze as an encoder. According to ODVA, the AMS 158i is assigned the number:

34 = 0x22 = AMS 158i

Attribute 3: product code

The product code is an identifier assigned by Leuze that has no further impact on other objects.

25 = AMS 158i

Attribute 4: revision

Version number of the identity object

Tab. 7.3: Attribute 4 revision

Path			Desig-nation	Size in bit	Data type	Stan-dard (dec)	Min. value	Max. value	Access
Cl.	Inst.	Attr.							
1	1	4	Major	8	USINT	1	1	127	Get
			Minor	8	USINT	1	1	255	Get

Note from the ODVA specification:

The supplier should raise a major revision if there is a significant change to the product's "fit, form or function." Any changes that affect the configuration options available to the user (and thus the electronic data sheet) require a major revision.

A minor revision is typically used to identify changes in a product that do not affect users' configuration decisions. For example, trouble shooting, changes to hardware components, labeling, etc. Changes within the scope of minor revisions are not used by a configuration tool to match a device with an electronic data sheet.

Tab. 7.4: Attribute 4 revision

Attr.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	0	Major							
	1	Minor							

Attribute 5: status

Description

Basic and high-level monitoring of the device, network and configuration. The entries are described by the sensor.

Tab. 7.5: Attribute 5 status

Path			Designation	Size in bit	Data type	Standard (dec)	Min. value	Max. value	Access
Cl.	Inst.	Attr.							
1	**1**	**5**	Owned	1	BOOL	0	0	1	Get
			Reserve B0.1	1	BOOL	0	0	1	Get
			Config-ured	1	BOOL	0	0	1	Get
			Reserve B0.3	1	BOOL	0	0	1	Get
			Ex-tended device status	4x1	BOOL	0	0	1	Get
			Minor re-cover-able fault	1	BOOL	0	0	1	Get
			Minor unrecov-erable fault	1	BOOL	0	0	1	Get
			Major re-cover-able fault	1	BOOL	0	0	1	Get
			Major unrecov-erable fault	1	BOOL	0	0	1	Get
			Re-serve B1	4x1	BOOL	0	0	1	Get

Signal: owned

Note from the ODVA specification:

TRUE indicates that the device (or an object within the device) has an owner. Typically, this is because the device is an endpoint of an I/O connection to a standalone resource within the device, such as output data. A resource can also be assigned via explicit messages.

The mere presence of an I/O connection does not indicate an ownership relationship, such as one that might exist via a CIP router.

Signal: reserve B0.1

Reserve

Signal: configured

Note from the ODVA specification:

TRUE indicates that the device's application has been configured to be different from the default "out-of-the-box" setting. This does not include the configuration of communication.

Signal: reserve B0.3

Reserve

Signal: extended device status

Note from the ODVA specification:

Manufacturer-specific or as defined in the table below. The EDS should indicate whether the device instance (1) follows a manufacturer-specific definition for these bits by using the DeviceStatusAssembly.

There is no mechanism to list the manufacturer-specific usage of these values in the EDS file for instances greater than one (1).

Tab. 7.6: EDS file instances

Value.	Description
0	Self test or unknown
1	Firmware update in progress
2	At least one faulty I/O connection
3	No I/O connections were established
4	Poor non-volatile connection
5	Major fault – either bit 10 or bit 11 in the status 5 attribute is true (1)
6	At least one I/O connection is active
7	At least one I/O connection established; all are in standby operating mode
8	The status attribute does not apply to this instance. Valid only for instances greater than one (1).
9	Reserved
10-15	Manufacturer specific

Signal: minor recoverable fault

Note from the ODVA specification:

TRUE indicates that the device has detected a problem with itself that is considered repairable. The problem does not cause the device to enter any of the faulty states. See section see chapter 7.6 "Class 104: error handling procedures".

Signal: minor unrecoverable fault

Note from the ODVA specification:

TRUE indicates that the device has detected a problem with itself that is considered unrecoverable. The problem does not cause the device to enter any of the faulty states. See section see chapter 7.6 "Class 104: error handling procedures".

Signal: major recoverable fault

Note from the ODVA specification:

TRUE indicates that the device has detected a problem with itself, which caused the device to enter the "Major Recoverable Fault" state. See section see chapter 7.6 "Class 104: error handling procedures".

Signal: major unrecoverable fault

Note from the ODVA specification:

TRUE indicates that the device has detected a problem with itself, which caused the device to enter the "Major Unrecoverable Fault" state. See section see chapter 7.6 "Class 104: error handling procedures".

Signal: reserve B1

Reserve

Tab. 7.7: Attribute 5 status

Attr.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5	0	Advanced device status				Reserve B0.3	Config-ured	Reserve B0.1	Owned
	1	Reserve B1				Major unrecov-erable fault	Major re-cover-able fault	Minor unrecov-erable fault	Minor re-cover-able fault

Attribute 6: serial number

Description

For use in Ethernet, the serial number is converted in accordance with CIP. CIP describes a special format for the serial number. After conversion to a CIP code, the serial number remains unique as before, but its resolution no longer matches the serial number on the name plate.

Attribute 7: product name

Description

This attribute contains the product's short designation. Devices with the same product code may have different product names.

Attribute 8: status

Description

This attribute contains information about the current status of the AMS 158i.

7.3 Class 35: position sensor object

Class ID: 35 (0x0023)

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.8: Class 35 Position sensor object

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
35	**0**	**1**	Position sensor revision	16	UINT	2	2	2	Get
35	**1**	**10**	Position value	32	DINT	0	-999999	999999	Get
		11	Sensor type	16	UINT	8	--	--	Get
		12	Counting direction	1	BOOL	0	0	1	Set
		15	Position format	16	ENGU-NIT	8707	--	--	Set
		24	Speed value	32	DINT	0	-999999	999999	Get
		25	Velocity format	16	ENGU-NIT	11016	--	--	Set
		26	Free ve-locity resolu-tion	32	UDINT	1000	5	50000	Set

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
		41	Operating status – counting direction	1	BOOL	0	0	1	Get
		44	Alarms	16	WORD	0	0	8195	Get
		45	Supported alarms	16	WORD	8195	--	--	Get
		46	Alarm flag	1	BOOL	0	0	1	Get
		47	Warnings	16	WORD	0	0	57344	Get
		48	Supported warnings	16	WORD	57344	--	--	Get
		49	Warning	1	BOOL	0	0	1	Get
		50	Operating time	32	UDINT	0	0	400000000	Get
		100	Preset value	32	DINT	0	-999999	999999	Set
		101	Preset settings	2x1	BOOL	0	0	2	Set
		102	Preset status	1	BOOL	0	0	1	Get
		103	Preset toggle	1	BOOL	0	0	1	Get
		105	Direction of movement	1	BOOL	0	0	1	Get
		106	Movement status	1	BOOL	0	0	1	Get
		107	Filter type	8	BYTE	0	0	3	Set
		108	Offset value	32	DINT	0	-999999	999999	Set
		109	Laser diode status	1	BOOL	0	0	1	Get
		110	Laser diode control	1	BOOL	0	0	1	Set
		111	Velocity message	8	BYTE	3	0	5	Set

Description

Service:

- Get_Attribute_Single
- Set_Attribute_Single

In the CIP network specifications, the function of object class 35 (0x23) is defined as the “position sensor object”. The position sensor object describes the functions of an absolute measuring encoder. As defined in the CIP specification, the attributes with addresses 1 to 99 are functionally predetermined. From this address range, the AMS 158i uses only those attributes that are functionally mapped in the AMS. The address range ≥ 100 is manufacturer-specific.

Instance 0

Attribute 1: position sensor revision

Description

Position sensor revision

Instance 1

Attribute 10: position value

Description

Read position values.

NOTICE
Negative values are shown in two's complement.

Attribute 11: sensor type

Description

Specifies the encoder with the identifier defined via CIP **8** as an absolute measuring linear encoder.

Attribute 12: counting direction

Description

Defines whether the measured distance value increases as the distance increases (positive counting direction) or decreases as the distance decreases (negative counting direction).

0: positive counting direction

1: negative counting direction

NOTICE
This parameter is stored in **non-volatile memory,** so that the value remains persistent after the device is restarted.

Attribute 15: position format

Description

ENGUNIT configures the position format as well as the resolution. The EDS file provides the following parameters.

Tab. 7.9: Attribute 15 position format

Dec.	Hex.	Unit
8706	0x2202	Centimeter [cm]
8707	**0x2203**	**Millimeter [mm]**
8708	0x2204	Micrometer [µm]
2049	0x0801	Tenth of a millimeter [1/10 mm]

Dec.	Hex.	Unit
2050	0x0802	Hundredth of a millimeter [1/100 mm]
2051	0x0803	Hundredth of an inch [1/100 inch] = 0.01 inch
2052	0x0804	Tenth of an inch [10×(1/100 inch)] = 0.1 inch
2053	0x0805	One-thousandth of an inch [0.1×(1/100 inch)] = 0.001 inch
2054	0x0806	Ten-thousandth of an inch [0.01×(1/100 inch)] = 0.0001 inch
2055	0x0807	One-hundred-thousandth of an inch [0.001×(1/100 inch)] = 0.00001 inch

NOTICE

If the position format is changed from metric to inch, the velocity format is internally changed automatically to hundredths of inch per second. If the position format is changed from inch to metric, the velocity format is internally changed automatically to millimeters per second.

NOTICE

This parameter is stored in **non-volatile memory,** so that the value remains persistent after the device is restarted.

Attribute 24: velocity value description

Reading out velocity value.

NOTICE

Negative values are shown in two's complement.

Attribute 25: velocity format

Description

Configures both the velocity format and the resolution.

The EDS file provides the following parameters:

Tab. 7.10: Attribute 25 velocity format

Dec.	Hex.	Unit
11008	0x2B00	Meter per second [m/s]
11009	0x2B01	Centimeter per second [cm/s]
11016	**0x2B08**	**Millimeter per second [mm/s]**
2065	0x0811	Decimeter per second [dm/s]
2066	0x0812	One-hundredth of an inch per second [1×(1/100 inch)/s] = 0.01 inch/s
2067	0x0813	Tenth of an inch per second [10×(1/100 inch)/s] = 0.1 inch/s

Dec.	Hex.	Unit
11015	0x2B07	Inch per second [100×(1/100 inch)/s] = 1 inch/s
2068	0x0814	Ten inches per second [1000×(1/100) / s] = 10 inches/s

NOTICE
If the velocity format is changed from metric to inch, the position format is internally changed automatically to hundredths of inch. If the velocity format is changed from inch to metric, the position format is internally changed automatically to millimeters.

NOTICE
This parameter is stored in **non-volatile memory,** so that the value remains persistent after the device is restarted.

Attribute 26: free velocity resolution

Description

Since the free resolution option is not available in the velocity format 25 attribute, this attribute corresponds to the selected format and returns the resolution value in mm/100/s or inches/1000/s. Writing this attribute has no effect; it only saves the value and returns it when it is read.

NOTICE
This parameter is stored in **non-volatile memory,** so that the value remains persistent after the device is restarted.

Attribute 41: operating status – counting direction

Description

Attribute 41 is the AMS 158i's response to the counting direction configured in attribute 12.

The counting direction is output in bit 0.

0: positive counting direction

1: negative counting direction

Bits 1 to 7 are irrelevant and have a status of 0.

Attribute 44: alarm description

Status messages generated by the AMS 158i **PLB** (plausibility error) and **ERR** (hardware error) are entered in bit 0 and bit 1.

The CIP specification distinguishes between alarms and warnings.

The following applies to alarm bit values:

0: no alarm

1: alarm

Tab. 7.11: Attribute 44 alarm description

Path			Designation	Drill bit size	Data type	Sta n-dar d (dec)	Min. value	Maximum value	Cross-ref-erences
Cl.	Inst.	Attr.							
34	**1**	**44**	Plausibility (PLB)	1	BOOL	0	0	1	Get
			Hardware (ERR)	1	BOOL	0	0	1	Get
			Reserved B0	6x1	BOOL	0	0	0	Get
			Reserved B1	4x1	BOOL	0	0	0	Get
			Manufacturer-specific (bit 12)	1	BOOL	0	0	0	Get
			Velocity mea-surement error (VME)	1	BOOL	0	0	1	Get
			Manufacturer-specific (bit 14 - 15)	2x1	BOOL	0	0	0	Get

Signal – plausibility (PLB)

PLB – position error (position and velocity)

Signals that no valid measurement value can be ascertained.

0: Measurement value valid

1: Measurement value invalid

Signal – hardware (ERR)

ERR – diagnostic error (hardware error): indicates a hardware error.

0: OK

1: hardware defect

Signal – reserved B0

Reserved by ODVA CIP.

Signal – reserved B1

Reserved by ODVA CIP.

Signal – manufacturer-specific (bit 12)

Manufacturer-specific.

Signal - velocity measurement error (VME)

VME – velocity measurement error: this signal is manufacturer-specific.

0: value valid

1: value invalid

Signal: manufacturer-specific (bit 14–15)

Manufacturer-specific.

Tab. 7.12: Attribute 44 alarm description

Ass.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
44	**0**	Reserved B0						Hard-ware (ERR)	Plausibil-ity (PLB)

Ass.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	1	Manufacturer-specific (bit 14 - 15)		Velocity measurement error (VME)	Manufacturer-specific (bit 12)	Reserved B1			

Attribute 45: supported alarms

Description

Attribute 45 specifies which alarms defined by the position sensor object are supported by the AMS 158i.

The following alarms are supported by the AMS 158i:

- **Bit 0:** 1 - PLB
- **Bit 1:** 1 - ERR
- **Bit 2 to 11:** 0 - reserved by ODVA
- **Bit 12 to 15:** 0 – reserved (manufacturer-specific)
- **Bit 13:** 1 (VME; velocity/velocity)

Note from the ODVA specification:

This attribute contains information about the alarms supported by the position sensor object.

This attribute is required if the *"Alarms 44" attribute* is implemented.

Attribute 46: alarm flag

Description

This attribute evaluates the alarms specified in attribute 44 using an OR operation to generate a collective alarm.

Alarm flag = PLB | ERR | TEMP | VME

Note from the ODVA specification:

Indicates that an alarm error has occurred. This attribute is the logical OR of all alarm bits in the *"Alarms 44" attribute*. This attribute is required if the *"Alarms 44" attribute* is implemented.

Attribute 47: warnings

Description

According to the CIP specification, warning messages are messages that signal exceedance of internal limit values, but do not lead to incorrect measurement values.

The AMS 158i outputs the ATT, LSR and TMP status messages as warnings.

An area is reserved in the CIP specification for device-specific data (bits 13 to 15) for this purpose.

Tab. 7.13: Attribute 47 warnings

Ass.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
44	**0**	Reserved B0						Hardware (ERR)	Plausibility (PLB)
	1	Manufacturer-specific (bit 14 - 15)		Velocity measurement error (VME)	Manufacturer-specific (bit 12)	Reserved B1			

Attribute 45: supported alarms

Description

Attribute 45 specifies which alarms defined by the position sensor object are supported by the AMS 158i.

The following alarms are supported by the AMS 158i:

Bit 0: 1 - PLB

Bit 1: 1 - ERR

Bit 2 to 11: 0 - reserved by ODVA

Bit 12 to 15: 0 – reserved (manufacturer-specific)

Bit 13: 1 (VME; velocity/velocity)

Note from the ODVA specification:

This attribute contains information about the alarms supported by the position sensor object.

This attribute is required if the attribute “Alarms 44” is implemented.

Attribute 46: alarm flag

Description

This attribute evaluates the alarms specified in attribute 44 using an OR operation to generate a collective alarm.

Alarm flag = PLB | ERR | TEMP | VME

Note from the ODVA specification:

Indicates that an alarm error has occurred. This attribute is the logical OR of all alarm bits in attribute “Alarms 44”. This attribute is required if the attribute “Alarms 44” is implemented.

Attribute 47: warnings

Description

According to the CIP specification, warning messages are messages that signal exceedance of internal limit values, but do not lead to incorrect measurement values.

The AMS 158i outputs the ATT, LSR and TMP status messages as warnings.

An area is reserved in the CIP specification for device-specific data (bits 13 to 15) for this purpose.

Tab. 7.14: Attribute 47 warnings

Path			Designation	Drill bit size	Data type	Standard (dec)	Min. value	Maximum value	Cross-references
Cl.	Inst.	Attr.							
35	**1**	**47**	Reserved B0	8	BYTE	0	0	0	Get
			Reserved B1	5x1	BOOL	0	0	0	Get
			Temperature (TMP)	1	BOOL	0	0	1	Get
			Laser (LSR)	1	BOOL	0	0	1	Get
			Intensity (ATT)	1	BOOL	0	0	1	Get

Signal – reserved B1

Reserved by ODVA CIP.

Signal – temperature (TMP)

TMP – temperature warning

Indicates that the temperature is no longer within the specified temperature range.

0: OK

1: Temperature warning

Signal – laser (LSR)

LSR – laser warning

0: OK

1: exceeded

Signal – intensity (ATT)

ATT – intensity warning

0: OK

1: exceeded

Tab. 7.15: Attribute 47 warnings

Ass.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
47	**0**	Reserved B0							
	1	Intensity (ATT)	Laser (LSR)	Temper-ature (TMP)	Reserved B1				

Attribute 48: supported warnings

Description

Attribute 48 specifies which warnings specified by the position sensor object are supported by the AMS 158i. The following alarms are supported by the AMS 158i:

Bit 13 = 1: TMP-Warning supported

Bit 14 = 1: LSR-Warning supported

Bit 15 = 1: ATT-warning supported

Attribute 49: warning

Description

This attribute evaluates the warnings specified in attribute 47 using an OR function to generate a collective alarm.

Warning = TMP | LSR | ATT

Attribute 50: operation time

Description

As long as the AMS 158i is connected to power, the value is increased in 1/10-hour increments. The value cannot be reset.

Attribute 100: preset value

Description

The attribute enables the current position value to be set to a desired position value.

Attribute 101: preset settings

Description

0: No function

1: preset teach

2: Preset reset

Attribute 102: preset status

Description

The attribute indicates whether the preset function is activated.

0: preset inactive

1: Preset active

Attribute 103: preset toggle

Description

This attribute is toggled after the preset value is activated.

	NOTICE
	Activation of the preset value via attribute 101.

Attribute 105: direction of movement

Description

When the speed is nonzero, this attribute specifies the direction of movement.

0: positive direction of movement

1: negative direction of movement

The definition of the direction of movement depends on Class 35, Instance 1, Attribute 12:

- Positive counting direction: the measured values increase as the reflector moves away from the AMS 158i. In this case, the positive direction of movement is 0 in attribute 105.
- Negative counting direction: measurement values decrease as the reflector moves away from the AMS 158i. In this case, the positive direction of movement is 1 in attribute 105.

Attribute 106: movement status

Description

The attribute indicates whether, based on the value, a movement > 100mm/s is registered.

0: no movement detected

1: movement detected

Attribute 107: filter type Description

This attribute specifies a filter type for post-processing measured values.

000 = 0: Normal

001 = 1: High Speed

010 = 2: low speed

011 = 3: average value (compatibility mode)

Attribute 108: offset value

Description

Measured value at the interface = measured distance + offset.

The attribute sets an offset relative to the measured value in the AMS 158i.

The offset takes effect immediately after the instruction “set attribute single class1 instance1 attribute 108” has been executed.

	NOTICE
	If the preset value is enabled, it takes precedence over the offset. Preset and offset are not offset against each other.

Attribute 109: laser diode status

Description

The attribute signals the status of the laser diode.

0: laser diode ON

1: laser diode OFF

Attribute 110: laser diode control

Description

This attribute is used to switch the laser on and off.

0: laser diode OFF

1: laser diode ON

Attribute 111: average velocity

Description

Configures the average velocity. This parameter specifies the average time, in measurement cycle times, for the calculated velocity values. The device’s cycle time can be found in the manual or on the data sheet under “Technical Data”. The EDS file provides the following parameters:

000 = 0: 1 cycle time
001 = 1: 2 cycle time
010 = 2: 4 cycle time
011 = 3: 8 cycle time
100 = 4: 16 cycle time
101 = 5: 32 cycle time

7.4 Class 100: display configuration

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.16: Class 100 display configuration

Path			Designation	Drill bit size	Data type	Standard (dec)	Min. value	Maximum value	Access
Cl.	Inst.	Attr.							
100	**1**	**1**	Language selection	8	BYTE	1	1	5	Set
		2	Password protection	1	BOOL	0	0	1	Set
		3	Password	16	UINT	0	0	999	Set
		4	Display dimming	1	BOOL	1	0	1	Set
		5	Heating control	1	BOOL	0	0	1	Set

Attribute 1: language selection

Description

This attribute is used to configure the displayed language.

The following table contains information on the available languages.

1: English

2: German

3: Italian

4: Spanish

5: French

Attribute 2: password protection

Description

This attribute enables password protection.

0: password protection disabled

1: password protection enabled

Attribute 3: password

Description

The attribute specifies the password.

The password protection attribute (attribute 2) must be activated.

Value range for the password: 000–999.

Attribute 4: display dimming

Description

This attribute determines the time until the display dims.

0: Always on

1: dim after 10 minutes

Attribute 5: heating control

Description

This attribute is used to enable advanced heating control.

0: standard (10… 15 degrees Celsius)

1: extended (30... 35 degrees Celsius)

7.5 Class 103: switching inputs/outputs

Class ID: 103 (0x0067)

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.17: Class 103 switching inputs/outputs

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
103	**1**	**1**	Function of I/O (input/ output)	1	BOOL	1	0	1	Set
uf		**2**	Activa-tion (high-ac-tive/low-active)	1	BOOL	1	0	1	Set
		3	Output function	16	WORD	192	0	511	Set
		4	Input function	8	BYTE	0	0	2	Set
		5	Status (input/ output)	1	BOOL	0	0	1	Get
		6	Output activa-tion	1	BOOL	0	0	1	Set
103	**2**	**1**	Function of I/O (input/ output)	1	BOOL	1	0	1	Set

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
		2	Activa-tion (high-ac-tive/low-active)	1	BOOL	1	0	1	Set
		3	Output function	1	BOOL	1	0	1	Set
		4	Input function	16	WORD	56	0	511	Set
		5	Status (input/ output)	8	BYTE	0	0	2	Set
		6	Output activa-tion	1	BOOL	0	0	1	Get

Instance 1

Attribute 1: I/O (input/output) function

Description

Attribute description for cases where attribute 1 in instance 1 or 2 is selected as a switching input.

This attribute defines whether the function of PIN 2 on the M12 power connection is an input or output.

0: input

1: output

Attribute 2: activation (high-active/low-active)

Description

Activation for input:

The switching input of the AMS 158i is edge-triggered.

0: the switching input responds to a falling edge (transition from logical 1 to 0)

1: the switching input responds to a rising edge (transition from logical 0 to 1)

Activation for output:

This attribute defines the level of the output when the “Output” event occurs.

0: Low-active: from logical 1 to logical 0 when the “Output” event occurs (see Attribute 3)

1: High active: from logical 0 to logical 1 when the “Output” event occurs (see Attribute 3)

Attribute 3: output function

Description

This attribute defines which event triggers the output activation. The individual functions are OR-linked.

Bit 0: Position limit value 1 violated

Bit 1: Position limit value 2 violated

Bit 2: Velocity limit value violated

Bit 3: Intensity (ATT)

Bit 4: Temperature (TMP)

Bit 5: Laser (LSR)

Bit 6: Plausibility (PLB) -> active by default for IO1

Bit 7: Hardware (ERR) -> active by default for IO1

Bit 8: Dynamic output

Bit 9 - Bit 15

For instance 1, attribute 3 is specified by default as 192 d / 00 C0 h / 0000 0000 1100 0000 b. This means that an edge change, as defined in attribute 2, occurs at the output (PIN 2) when the ERR or PLB message is generated.

For instance 2, attribute 3 is specified by default as 56 d / 00 38 h / 0000 0000 0011 1000 b. This means that an edge change, as defined in attribute 2, occurs at the output (PIN 4) when the LSR, TMP or ATT message is generated.

Tab. 7.18: Attribute 3 output function

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
103	**1**	**3**	Position limit value 1 violated	1	BOOL	0	0	1	Set
			Position limit value 2 violated	1	BOOL	0	0	1	Set
			Velocity limit value vi-olated	1	BOOL	0	0	1	Set
			Intensity (ATT)	1	BOOL	0	0	1	Set
			Temper-ature (TMP)	1	BOOL	0	0	1	Set
			Laser (LSR)	1	BOOL	0	0	1	Set
			Plausibil-ity (PLB)	1	BOOL	1	0	1	Set
			Hard-ware (ERR)	1	BOOL	1	0	1	Set
			Dynamic output	1	BOOL	0	0	1	Set
			Re-served	7x1	BOOL	0	0	0	Set

Signal – position limit value 1 violated

0: Inactive

1: activated

Signal – position limit value 2 violated

0: Inactive

1: activated

Signal – velocity limit value violated

0: Inactive

1: activated

Signal – intensity (ATT)

0: Inactive

1: activated

Signal – temperature (TMP)

0: Inactive

1: activated

Signal – laser (LSR)

0: Inactive

1: activated

Signal – plausibility (PLB)

0: Inactive

1: activated

Signal – hardware (ERR)

0: Inactive

1: activated

Signal – dynamic output

0: Inactive

1: activated

Tab. 7.19: Attribute 3 output function

Attr.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3	**0**	Hard-ware (ERR)	Plausibil-ity (PLB)	Laser (LSR)	Temper-ature (TMP)	Intensity (ATT)	Velocity limit value vi-olated	Position limit value 2 violated	Position limit value 1 violated
	1	Reserved							Dynamic output

Attribute 4: input function description

000 = 0: No function

001 = 1: preset teach

010 = 2: laser off, laser diode turned off

Tab. 7.20: Attribute 4 input function description

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
103	**1**	**4**	Preset teach	1	BOOL	0	0	1	Set
			Laser ON/OFF	1	BOOL	0	0	1	Set
			Re-serve B0	6x1	BOOL	0	0	0	Set

Signal – preset teach

Bit 0: Preset teach

The switching input reacts to the edge set in attribute 2.

The preset value is adopted at the point where the switching input detects an edge change according to attribute 2.

Signal – laser ON/OFF

Bit 1: Laser ON/OFF

The switching input reacts to the edge set in attribute 2. The laser is turned OFF when the switching input detects an edge change as described in attribute 2. If an opposite edge is detected at the switching input, the laser is switched ON again.

Tab. 7.21: Attribute 4 input function description

Attr.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	**0**	Reserve B0						Laser ON/OFF	Preset teach

Attribute 5: status (input/output)

Description

0: the output function is not active. No event from attribute 3 is active.

1: the output function is active. At least one event from attribute 3 is activated.

Attribute 6 – output activation

Description

With dynamic output, the hardware outputs (PIN 2/PIN 4) can be configured using the control software. Activation is controlled via bit 8.

0: dynamic output active

1: the hardware outputs are set as defined in attribute 2.

The dynamic configuration of the outputs is performed using 256 d

(256 = excluding status messages from bit 7 to bit 2).

Instance 2

Attribute 1: I/O (input/output) function

Description

Attribute description for cases where attribute 1 in instance 1 or 2 is selected as a switching input.

This attribute defines whether the function of PIN2 on the M12 power connection is an input or an output.

0: input

1: output

Attribute 2: activation (high-active/low-active)

Description

Activation for inputs:

The switching input of the AMS 158i is edge-triggered.

0: the switching input responds to a falling edge (transition from logical 1 to 0)

1: the switching input responds to a rising edge (transition from logical 0 to 1)

Activation for output:

This attribute defines the level of the output when the “Output” event occurs.

0: Low-active: from logical 1 to logical 0 when the “Output” event occurs (see Attribute 3)

1: High active: from logical 0 to logical 1 when the “Output” event occurs (see Attribute 3)

Attribute 3: output function

Description

This attribute defines which event triggers the output activation.

The individual functions are OR-linked.

Bit 0: Position limit value 1 violated

Bit 1: Position limit value 2 violated

Bit 2: Velocity limit value violated

Bit 3: Intensity (ATT) -> active by default for IO2

Bit 4: Temperature (TMP) -> active by default for IO2

Bit 5: Laser (LSR) -> active by default for IO2

Bit 6: Plausibility (PLB)

Bit 7: Hardware (ERR)

Bit 8: Dynamic output

Bit 9 - Bit 15

For instance 1, attribute 3 is specified by default as 192 d / 00 C0 h / 0000 0000 1100 0000 b. This means that an edge change, as defined in attribute 2, occurs at the output (PIN 2) when the ERR or PLB message is generated.

For instance 2, attribute 3 is specified by default as 56 d / 00 38 h / 0000 0000 0011 1000b. This means that an edge change, as defined in attribute 2, occurs at the output (PIN 4) when the LSR, TMP or ATT message is generated.

Tab. 7.22: Attribute 3 output function

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
103	**2**	**3**	Position limit value 1 violated	1	BOOL	0	0	1	Set
			Position limit value 2 violated	1	BOOL	0	0	1	Set
			Velocity limit value violated	1	BOOL	0	0	1	Set
			Intensity (ATT)	1	BOOL	1	0	1	Set
			Temperature (TMP)	1	BOOL	1	0	1	Set
			Laser (LSR)	1	BOOL	1	0	1	Set
			Plausibility (PLB)	1	BOOL	0	0	1	Set
			Hardware (ERR)	1	BOOL	0	0	1	Set
			Dynamic output	1	BOOL	0	0	1	Set
			Reserved	7x1	BOOL	0	0	0	Set

Signal – position limit value 1 violated

0: Inactive

1: activated

Signal – position limit value 2 violated

0: Inactive

1: activated

Signal – velocity limit value violated

0: Inactive

1: activated

Signal – intensity (ATT)

0: Inactive

1: activated

Signal – temperature (TMP)

0: Inactive

1: activated

Signal – laser (LSR)

0: Inactive

1: activated

Signal – plausibility (PLB)

0: Inactive

1: activated

Signal – hardware (ERR)

0: Inactive

1: activated

Signal – dynamic output

0: Inactive

1: activated

Tab. 7.23: Attribute 3 output function

Attr.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3	**0**	Hard-ware (ERR)	Plausibil-ity (PLB)	Laser (LSR)	Temper-ature (TMP)	Intensity (ATT)	Velocity limit value vi-olated	Position limit value 2 violated	Position limit value 1 violated
	1	Reserved							Dynamic output

Attribute 4: input function description

000 = 0: No function

001 = 1: preset teach

010 = 2: laser off, laser diode turned off

Tab. 7.24: Attribute 4 input function description

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
103	**2**	**4**	Preset teach	1	BOOL	0	0	1	Set
			Laser ON/OFF	1	BOOL	0	0	1	Set
			Re-serve B0	6x1	BOOL	0	0	0	Set

Signal – preset teach

Bit 0: Preset teach

The switching input reacts to the edge set in attribute 2.

The preset value is adopted at the point where the switching input detects an edge change according to attribute 2.

Signal – laser ON/OFF

Bit 1: Laser ON/OFF

The switching input reacts to the edge set in attribute 2. The laser is turned OFF when the switching input detects an edge change as described in attribute 2. If an opposite edge is detected at the switching input, the laser is switched ON again.

Tab. 7.25: Attribute 4 input function description

Attr.	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4	**0**	Reserve B0						Laser ON/OFF	Preset teach

Attribute 5: status (input/output)

Description

0: the output function is not active. No event from attribute 3 is active.

1: the output function is active. At least one event from attribute 3 is activated.

Attribute 6: output activation

Description

With dynamic output, the hardware outputs (PIN 2/PIN 4) can be configured using the control software. Activation is controlled via bit 8.

0: dynamic output active

1: the hardware outputs are set as defined in attribute 2

The dynamic configuration of the outputs is performed using 256 d

(256 = excluding status messages from bit 7 to bit 2).

7.6 Class 104: error handling procedures

Class ID: 104 (0x0068)

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.26: Class 104 Error handling procedures

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
104	**1**	**1**	Position value in the case of error	1	BOOL	1	0	1	Set

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
		2	Position status error delay	1	BOOL	1	0	1	Set
		3	Error delay (position)	1	BOOL	1	0	1	Set
		4	Error delay time (position)	16	UINT	100	100	1000	Set
		5	Velocity value in the case of error	1	BOOL	1	0	1	Set
		6	Velocity status error delay	1	BOOL	1	0	1	Set
		7	Error delay (velocity)	1	BOOL	1	0	1	Set
		8	Error delay time (velocity)	16	UINT	100	100	1000	Set

Attribute 1: position value in case of error

Description

The attribute specifies which position is transferred, in the event of an error, after the "Position value error delay time" has elapsed.

0: Last valid value

1: value 0

Attribute 2: position status error delay

Description

This attribute specifies whether the PLB status bit (unlikely measurement value) is set immediately or after the “position error delay time” has elapsed.

0: PLB status bit is set immediately

1: the PLB status bit is set after the delay

Attribute 3: error delay (position)

Description

The attribute specifies whether, in the event of an error, the position value outputs the value of attribute 1 immediately (0 or last valid value) or outputs the last valid position value for the configured error delay time (attribute 4).

0: error delay deactivated

1: error delay activated

Attribute 4: error delay time (position)

Description

Errors that occur are suppressed for the configured time. If a valid position value cannot be determined within the configured time, the last valid position value is output. If the error still persists after the time has elapsed, the value configured in the “Position value in case of error” attribute (attribute 1) is output. The error delay time is specified in milliseconds [ms] and must be between 100 and 1000.

Attribute 5: velocity value in case of error

Description

The attribute specifies which velocity is transferred, in the event of an error, after the "Error delay (position)" has elapsed.

0: Last valid value

1: value 0

Attribute 6: velocity status error delay

Description

This attribute specifies whether the VME status bit is set immediately or after the “Velocity error delay time” has elapsed.

0: VME status bit is set immediately

1: VME status bit is set after the delay

Attribute 7: error delay (velocity)

Description

This attribute specifies whether, in the event of an error, the velocity value immediately outputs the value of attribute 1 (0 or the last valid value) or outputs the last valid velocity value for the configured error delay time (attribute 8).

0: error delay deactivated

1: error delay activated

Attribute 8: error delay time (velocity)

Description

Errors that occur are suppressed for the configured time. If no valid velocity value can be determined during the configured time, the last valid velocity value is output. If the error persists after the time has elapsed, the value configured in the “Velocity value in case of error” attribute (attribute 1) is output. The error delay time is specified in milliseconds [ms] and must be between 100 and 1000.

7.7 Class 105: velocity monitoring

Class ID: 105 (0x0069)

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.27: Class 105 Velocity monitoring

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
105	**1**	**1**	Enable	1	BOOL	0	0	1	Set

Path			Name	Size in bit	Data type	Stan-dard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
		2	Switch-ing type	1	BOOL	0	0	1	Set
		3	Direction selection	1	BOOL	0	0	1	Set
		4	Velocity limit value	16	UINT	0	0	20000	Set
		5	Velocity hystere-sis	16	UINT	100	0	1000	Set
		6	Limit value range start	32	DINT	0	-999999	999999	Set
		7	Limit value range end	32	DINT	0	-999999	999999	Set
		8	Status limit value	1	BOOL	0	0	1	Get
		9	Limit value compari-son	1	BOOL	0	0	1	Get
105	**2**	**1**	Enable	1	BOOL	0	0	1	Set
		2	Switch-ing type	1	BOOL	0	0	1	Set
		3	Direction selection	1	BOOL	0	0	1	Set
		4	Velocity limit value	16	UINT	0	0	20000	Set
		5	Velocity hystere-sis	16	UINT	100	0	1000	Set
		6	Limit value range start	32	DINT	0	-999999	999999	Set
		7	Limit value range end	32	DINT	0	-999999	999999	Set
		8	Status limit value	1	BOOL	0	0	1	Get
		9	Limit value Compari-son	1	BOOL	0	0	1	Get

Instance 1

Attribute 1: enable

Description

The attribute activates the respective velocity monitoring.

0: deactivated

1: activated

Attribute 2: switching type

Description

The attribute specifies whether a check should be performed to see if the velocity limit value has been exceeded or fallen short of (attribute 3 and 4).

0: check for value greater than limit

1: check for value less than limit

Attribute 3: direction selection

Description

The attribute specifies whether the velocity check is to be performed direction-dependent or direction-independent.

If a direction-dependent limit value check is activated via attribute 2, the values of range start and range end define the direction. The check is always performed from range start to range end.

For example, if the range start is “5500” and the range end is “5000”, the direction-dependent check is performed only in the direction from “5500” to “5000”. The limit value is not active in the opposite direction.

If the check is independent of direction, the order of range start and range end is irrelevant.

If the value exceeds or falls below the limit, depending on the switching type selected, the limit value status (attribute 7) and, if applicable, the output via Class 103, Instance 1 or 2, Attribute 3 (depending on the switching type selected) are set.

0: direction independent

1: direction dependent

Attribute 4: velocity limit value

Description

The limit value configured in attribute 4 is compared with the measured ACTUAL velocity. The input is specified in mm/s or inches/100 seconds

Attribute 5: velocity hysteresis

Description

Attribute 5 describes the switching hysteresis for the value entered in attribute 4 to prevent signal bouncing. The input is entered in mm/s or inches/100 seconds.

Attribute 6: limit value range start

Description

The limit value is monitored beginning at this position. The value is specified in mm or inch/100.

If the values for range start and range end are identical, velocity monitoring is active over the entire traversing range.

Attribute 7: limit value range end

Description

The limit value is monitored up to this position. The value is specified in mm or inch/100.

If the values for range start and range end are identical, velocity monitoring is active over the entire traversing range.

Attribute 8: limit value status description

The attribute signals that the configured limit values have been exceeded.

0: limit values observed

1: limit values exceeded

Attribute 9: limit value comparison

Description

The attribute indicates whether the respective velocity limit value is compared with the configured limit value.

0: Comparison not active

1: Comparison active

Instance 2

Attribute 1: enable

Description

The attribute activates the respective velocity monitoring.

0: deactivated

1: activated

Attribute 2: switching type

Description

The attribute specifies whether a check should be performed to see if the velocity limit value has been exceeded or fallen short of (attribute 3 and 4).

0: check for value greater than limit

1: check for value less than limit

Attribute 3: direction selection

Description

The attribute specifies whether the velocity check is to be performed direction-dependent or direction-independent. If a direction-dependent limit value check is activated via attribute 2, the values of range start and range end define the direction. The check is always performed from range start to range end.

For example, if the range start is “5500” and the range end is “5000”, the direction-dependent check is performed only in the direction from “5500” to “5000”. The limit value is not active in the opposite direction. If the check is independent of direction, the order of range start and range end is irrelevant. If the value exceeds or falls below the limit, depending on the switching type selected, the limit value status (attribute 7) and, if applicable, the output via Class 103, Instance 1 or 2, Attribute 3 (depending on the switching type selected) are set.

0: direction independent

1: direction dependent

Attribute 4: velocity limit value

Description

The limit value configured in attribute 4 is compared with the measured ACTUAL velocity. The input is specified in mm/s or inches/100 seconds

Attribute 5: velocity hysteresis

Description

Attribute 5 describes the switching hysteresis for the value entered in attribute 4 to prevent signal bouncing. The input is entered in mm/s or inches/100 seconds.

Attribute 6: limit value range start

Description

The limit value is monitored beginning at this position. The value is specified in mm or inch/100.

If the values for range start and range end are identical, velocity monitoring is active over the entire traversing range.

Attribute 7: limit value range end

Description

The limit value is monitored up to this position. The value is specified in mm or inch/100.

If the values for range start and range end are identical, velocity monitoring is active over the entire traversing range.

Attribute 8: limit value status description

The attribute signals that the configured limit values have been exceeded.

0: limit values observed

1: limit values exceeded

Attribute 9: limit value comparison

Description

The attribute indicates whether the respective velocity limit value is compared with the configured limit value.

0: Comparison not active

1: Comparison active

7.8 Class 106: condition monitoring

Class ID: 106 (0x006A)

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.28: Class 106 condition monitoring

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
106	**1**	**1**	Device operation time	32	UDINT	0	0	400000000	Get
		2	Actual device temperature	16	INT	0	-32768	32767	Get

This class contains the device status display, as well as control bits for cancelling an error or for setting the AMS 158i to the standby operating mode.

Attribute 1: device operation time

Description

This attribute represents the device's current operation time.

Attribute 2: actual device temperature

Description

This feature indicates the current temperature of the device.

7.9 Class 107: position monitoring

Class ID: 107 (0x006B)

Service:

- Get_Attribute_Single
- Set_Attribute_Single

Tab. 7.29: Class 107 position monitoring

Path			Name	Size in bit	Data type	Standard (dec)	Min.	Max.	Access
Cl.	Inst.	Attr.							
107	**1**	**1**	Enable of position limit value 1	1	BOOL	0	0	1	Set
		2	Lower position limit value 1	32	DINT	0	-999999	999999	Set
		3	Upper position limit value 1	32	DINT	0	-999999	999999	Set
		4	Status lower position limit value 1	1	BOOL	0	0	1	Get
		5	Status upper position limit value 1	1	BOOL	0	0	1	Get
107	**2**	**1**	Enable of position limit value 2	1	BOOL	0	0	1	Set
		2	Lower position limit value 2	32	DINT	0	-999999	999999	Set
		3	Upper position limit value 2	32	DINT	0	-999999	999999	Set
		4	Status lower position limit value 2	1	BOOL	0	0	1	Get
		5	Status upper position limit value 2	1	BOOL	0	0	1	Get

Instance 1

Attribute 1: enable of position limit value 1

Description

This attribute activates the respective velocity monitoring.

0: deactivated

1: activated

Attribute 2: lower position limit value 1

Description

Lower position limit value. When this value has been reached, *Attribute 6* is set to 1.

Attribute 3: upper position limit value 1

Description

Upper position limit value. When this value has been reached, *Attribute 7* is set to 1.

Attribute 4: status lower position limit value 1

Description

This attribute signals that the configured limit values have been exceeded.

0: limit values observed

1: limit values exceeded

Attribute 5: status upper position limit value 1 Description

This attribute signals that the configured limit values have been exceeded.

0: limit values observed

1: limit values exceeded

Instance 2

Attribute 1: enable of position limit value 2 Description

This attribute activates the respective velocity monitoring.

0: deactivated

1: activated

Attribute 2 – lower position limit value 2 Description

Lower position limit value. When this value has been reached, *Attribute 6* is set to 1.

Attribute 3: upper position limit value 2

Description

Upper position limit value. When this value has been reached, *Attribute 7* is set to 1.

Attribute 4: status lower position limit value 2 Description

This attribute signals that the configured limit values have been exceeded.

0: limit values observed

1: limit values exceeded

Attribute 5: status upper position limit value 2 Description

This attribute signals that the configured limit values have been exceeded.

0: limit values observed

1: limit values exceeded

8 Starting up the device – webConfig tool

With the Leuze webConfig tool, a web-technology based, graphical user interface is available for AMS configuration and diagnosis.

The webConfig tool can be run on any Internet-ready PC. The webConfig tool uses HTTP as communication protocol and the client-side restriction to standard technologies (HTML, JavaScript and AJAX) that are supported by modern browsers.

NOTICE

Configuration changes via the webConfig tool have no effect in EtherNet/IP!

- Perform the basic configuration **always** via the EDS file (see chapter 7 "Starting up – EtherNet/IP interface").
  In process operation, only the parameters in the EtherNet/IP modules set via the EDS file or the EtherNet/IP default presets are in effect.
  If you switch the AMS to the *Service* operating mode using the webConfig tool, the AMS will be disconnected from EtherNet/IP. All parameters set via the EDS file initially remain in effect.

NOTICE

The webConfig tool is offered in the following languages:

German, English, Chinese, Italian, Spanish, French, Portuguese, Korean

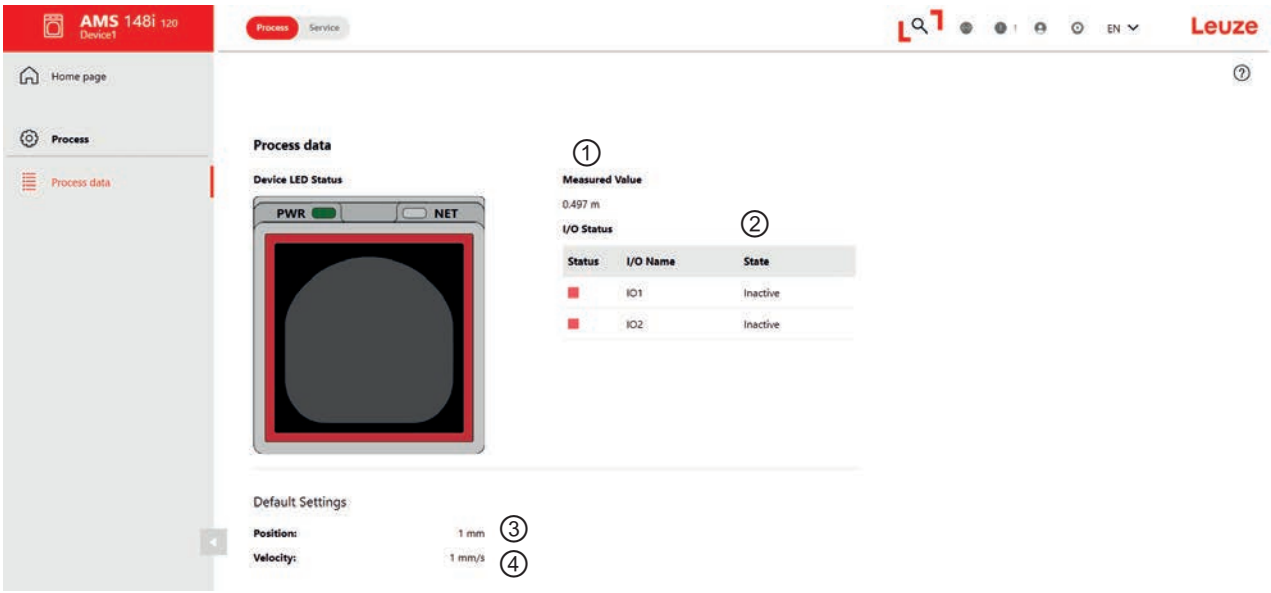
8.1 System requirements

8.2 Start webConfig tool

NOTICE

The webConfig tool is only accessible on the AMS 158i via the Service port.

- Connect the supply voltage to the AMS.
- Connect the AMS service interface to the PC.
  The connection to the AMS service interface is made via the PC's RJ45 Ethernet interface. Use an Ethernet cable with a D-coded M12 connector and an RJ45 connector.
  An Ethernet adapter also allows you to use the USB interface on the PC. To do this, use a standard cable with a Type A USB connector and a D-coded M12 Ethernet connector.
- Start the webConfig tool using your PC's Internet browser with IP address: **http://192.168.60.101**. This is the Leuze standard service address for communication with absolute measuring systems.
- ⇨ The webConfig start page appears on your PC.



1 Current measurement value
2 I/O state 1/2
3 Position value resolution
4 Velocity value resolution

Fig. 8.1: webConfig tool start page (example)

NOTICE

The webConfig tool always starts in *Process* mode after startup.

8.3 Short description of the webConfig tool

The menus and dialog boxes of the webConfig tool are intuitive to operate and provide texts and tool tips. The start page of the webConfig tool displays the current process information.

8.3.1 Switching operating mode

You can use the webConfig tool to switch between the following operating modes:

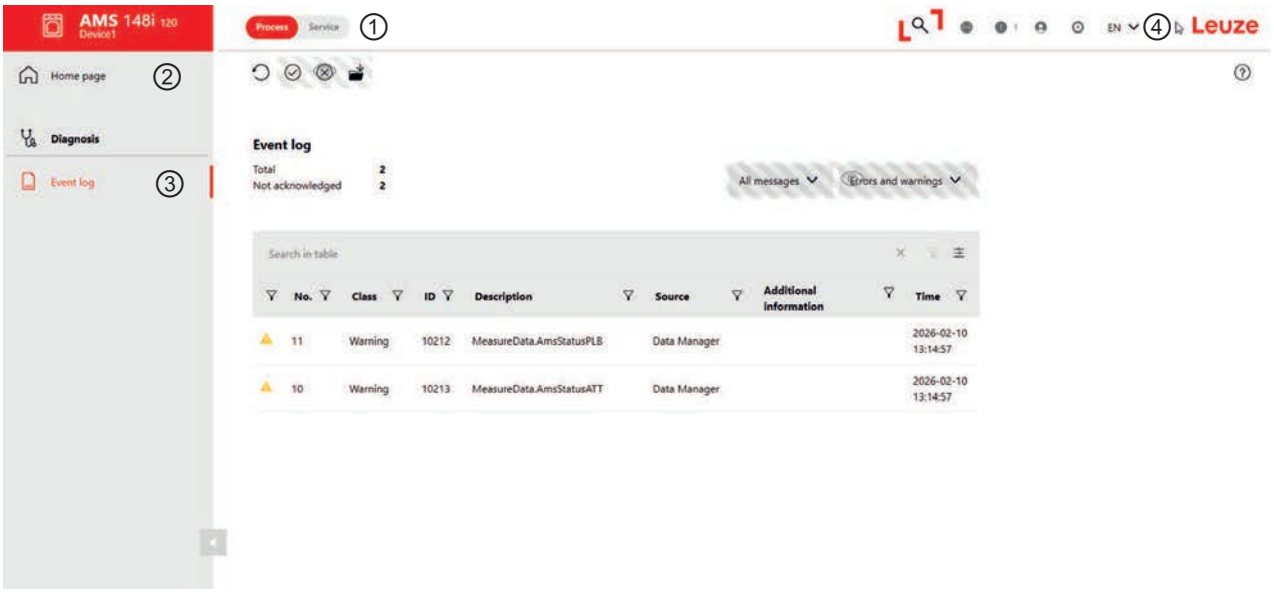
Process

- The device is connected to the control or to the PC.
- Process communication with the control is active and position values are provided via the interfaces.
- The switching inputs/outputs are activated.
- Allows read-only access to the process data and diagnosis registers.

Service

- The *Service* operating mode enables read and write access to all registers.
- The process communication to the control is interrupted and no position values are provided via the interfaces.
- The switching inputs/outputs are deactivated.

Located in the top left of every page of the webConfig tool is a software switch for changing the operating mode (Process – Service).



1 Switching between the process and service operating modes
2 Main menu
3 Diagnosis menu structure
4 Language switching

Fig. 8.2: webConfig tool overview

8.3.2 Menu overview

The [Home page] button displays the webConfig tool's menu overview.

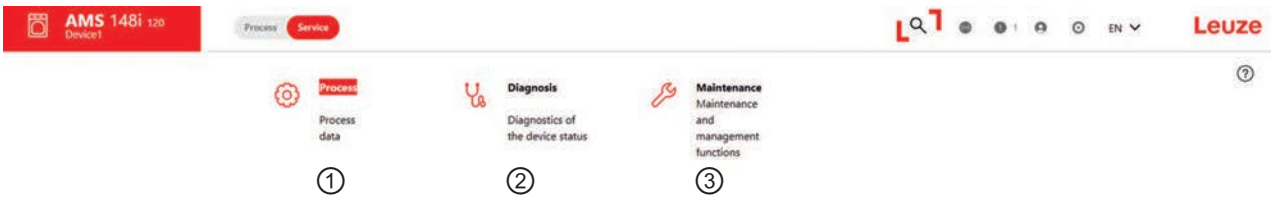


Fig. 8.3: webConfig menu overview

1. **Process**
   - Information on the current measurement value
   - Information about switching inputs and outputs
2. **Diagnosis**
   - Event logging of info, warnings and errors
3. **Maintenance**
   - User management
   - Backup/Restore
   - Firmware update
   - System clock

9 Care, maintenance and disposal

Cleaning

If there is dust on the device or the warning message ATT is issued:

- Clean the device with a soft cloth; use a cleaning agent (commercially available glass cleaner) if necessary.
- Also check the reflector for possible contamination.

	NOTICE
	**Do not use aggressive cleaning agents!** Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device. The use of such solvents can dull the reflector, the housing window and the display.

Maintenance

The device does not normally require any maintenance by the operating company.

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

- For repairs, contact your responsible Leuze subsidiary or Leuze customer service (see chapter 11 "Service and support").

Disposing

	NOTICE
	For disposal observe the applicable national regulations regarding electronic components.

10 Diagnostics and troubleshooting

10.1 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.

Example:



Fig. 10.1: Example of status message

Structure of status messages

n: Type/No./1

n	Memory position in the ring memory
Type	Type of message: I = info, W = warning, E = error, F = severe system error
No.	Internal error detection
1	Frequency of the event (always "1" because no summation occurs)

Select the status messages in the ring memory using the [DOWN] button. Use the [ENTER] button to call up detailed information about the respective status message:

Type: type of message + internal counter

UID: Leuze-internal message encoding

ID: description of the message

Info: not currently used

Within the detailed information, press the [ENTER] button again to activate an action menu with the following functions:

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

10.2 LED indicators

Tab. 10.1: PWR LED

PWR indicator LED	Possible error cause	Measure
OFF	No supply voltage connected	Check supply voltage
	Hardware error	Send in device
Flashes red	Light beam interruption	Check alignment
	Plausibility error	Traverse rate > 10 m/s Additional measures see chapter 10.3 "Display messages"
Red, continuous light	Hardware error	For error description, see display, It may be necessary to send in the device

Tab. 10.2: NET LED

NET indicator LED	Possible error cause	Measure
OFF	No supply voltage connected	Check supply voltage
	Incorrect wiring	Check wiring

10.3 Display messages

Tab. 10.3: Warning messages in display

Display	Error no.	Possible error message	Measure
PLB (implausible measurement values)	10212	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
		Ambient temperature far outside permissible range (TMP display; PLB)	Provide cooling
ATT (insufficient received signal level)	10213	Reflector soiled	Clean reflector
		Glass lens of the AMS soiled	Clean glass lens
		Performance reduction due to snow, rain, fog, condensing vapor or heavily polluted air (oil mist, dust)	Optimize usage conditions
		Laser spot only partially on reflector	Check alignment
		Protective film on reflector	Remove protective film from reflector
TMP (operating temperature outside of specification)	10210	Ambient temperatures outside specified range	In cold temperatures, an AMS with heating may help. If temperatures are too high, provide cooling or change mounting location.
LSR (laser diode warning)	10211	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

11 Service and support

Service hotline

You can find the contact information for the hotline in your country on our website **www.leuze.com** under **Contact & Support**.

Repair service and returns

Defective devices are repaired in our service centers competently and quickly. We offer you an extensive service packet to keep any system downtimes to a minimum. Our service center requires the following information:

- Your customer number
- Product description or part description
- Serial number or batch number
- Reason for requesting support together with a description

Please register the merchandise concerned. Simply register return of the merchandise on our website **www.leuze.com** under **Contact & Support > Repair Service & Returns**.

To ensure quick and easy processing of your request, we will send you a returns order with the returns address in digital form.

What to do should servicing be required?

	NOTICE
	**Please use this chapter as a master copy should servicing be required!** ↳ Enter the contact information and fax this form together with your service order to the fax number given below.

Customer data (please complete)

Device type:	
Serial number:	
Firmware:	
Display messages	
Status of LEDs:	
Error description:	
Company:	
Contact person/department:	
Phone (direct dial):	
Fax:	
Street/No:	
ZIP code/City:	
Country:	

Leuze Service fax number:

+49 7021 573 - 199

12 Technical data

12.1 Optical laser measurement system

Tab. 12.1: Characteristic parameters

MTTF	27 years (at 25 °C)

Tab. 12.2: Measurement data

	AMS 158i 40	**AMS 158i 120**	**AMS 158i 200**
Measurement range	0.1 – 40 m	0.1 – 120 m	0.1 – 200 m
Accuracy	±2 mm	±2 mm	±3 mm
Reproducibility (1 sigma; typical values for standard filter types)	0.2 mm	0.2 mm	0.25 mm
Light spot diameter	≤ 40 mm	≤ 100 mm	≤ 160 mm
Output time	1 ms		
Response time (compatibility mode)	8 ms		
Resolution	Adjustable, see chapter 7 "Starting up – Ethernet/IP interface"		
Temperature drift	≤ 1 mm/10 K		
Ambient temperature sensitivity	1 ppm/K		
Air pressure sensitivity	0.3 ppm/hPa		
Traverse rate	≤ 10 m/s		
Boot time	20 s		
Operating temperature for devices with integrated heating	-30°C – +60°C		

Tab. 12.3: Optical data

Light source	Laser, red
Laser class	2 (acc. to IEC 60825-1:2014)
Wavelength	660 nm
Impulse duration	≤ 0.8 µs
Max. output power (peak)	4 mW

Tab. 12.4: Electrical data

Supply voltage	18 – 30 V DC
Current consumption	≤ 250 mA/24 V DC
Heater current consumption	≤ 500 mA/24 V DC
VDE protection class	III

CAUTION

UL applications!

For UL applications, the device must be powered by a PS2 in accordance with EN / IEC / UL 62368-1 or an LPS in accordance with EN / IEC / UL 60950-1 or NEC Class 2.

NOTICE
Protective Extra Low Voltage (PELV)! The device is designed in accordance with protection class III for supply with PELV (Protective Extra-Low Voltage).

Tab. 12.5: EtherCAT interface

Interface type	EtherNet/IP with integrated switch for BUS IN and BUS OUT
Switching inputs/switching outputs • Quantity • Input • Output	 • 2 • BUS IN • BUS OUT

Tab. 12.6: Controls and indicators

Operational controls	Membrane keyboard, 2 buttons
Display	LC display, 128x32 pixels
LED	2 LEDs, two-colored

Tab. 12.7: Mechanical data

Housing	Diecast aluminum
Optics cover	Glass
Weight	Approx. 1 kg
Degree of protection	IP65 (acc. to EN 60529) with screwed-on M12 connectors or mounted caps

Tab. 12.8: Environmental data

Ambient temperature • Operation • Storage	 -5°C – +60°C -30°C – +70°C
Relative air humidity	Max. 90%, non-condensing
Vibration	IEC 60068-2-6, test Fc
Shock	IEC 60068-2-27, test Ea
Noise	IEC 60068-2-64
Electromagnetic compatibility	EN 61000-6-2 EN 61000-6-4

12.2 Reflective tapes

12.2.1 Self-adhesive reflective tape

Tab. 12.9: Technical data of self-adhesive reflective tape

Feature	Reflective tape 200x200-S	Reflective tape 500x500-S	Reflective tape 914x914-S	REF 4-A-150x150	REF 4-A-300x300
Part no.	50104361	50104362	50108988	50141015	50141014
Film size	200x200 mm	500x500 mm	914x914 mm	150x150 mm	300x300 mm

Feature	Reflective tape 200x200-S	Reflective tape 500x500-S	Reflective tape 914x914-S	REF 4-A-150x150	REF 4-A-300x300
Recommended application temperature for adhesive tape	+5 °C … +25 °C				
Temperature resistance, affixed	-40 °C … +80 °C				

12.2.2 Reflective tape on carrier plate

Tab. 12.10: Technical data of reflective tape on carrier plate

Feature	Reflective tape 200x200-M	Reflective tape 500x500-M	Reflective tape 914x914-M
Part no.	50104364	50104365	50104366
Film size	200x200 mm	500x500 mm	914x914 mm
Outer dimensions of carrier plate	250x250 mm	550x550 mm	964x964 mm
Weight	0.8 kg	4 kg	25 kg

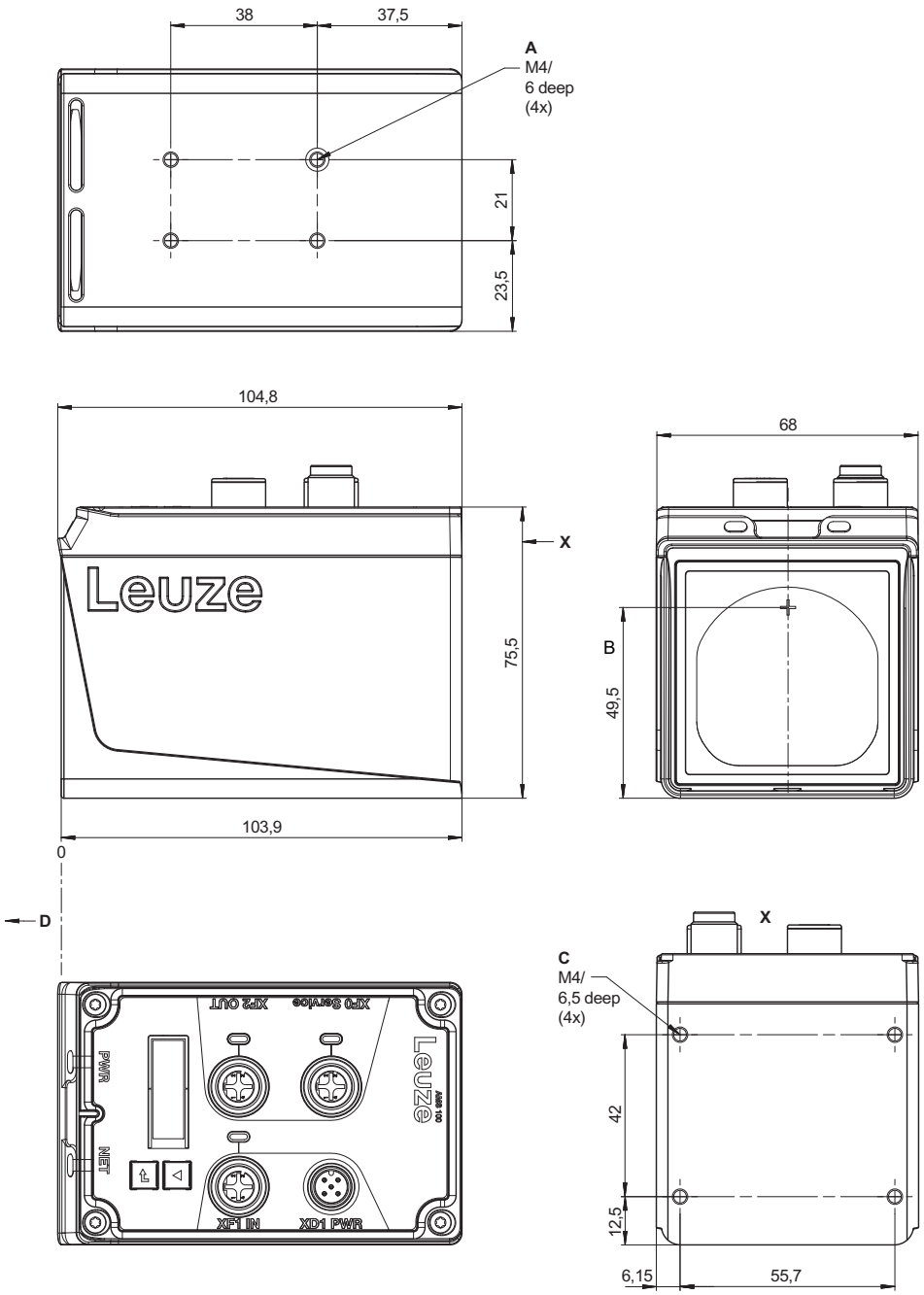
12.2.3 Reflective tape with heating

Tab. 12.11: Technical data of reflective tape with heating

Feature	Reflective tape 200x200-H	Reflective tape 500x500-H	Reflective tape 914x914-H
Part no.	50115020	50115021	50115022
Voltage supply	230 V AC		
Power	100 W	600 W	1800 W
Current consumption	~ 0.5 A	~ 3 A	~ 8 A
Length of supply line	2 m		
Size of reflective tape	200x200 mm	500x500 mm	914x914 mm
Outer dimensions of base material	250x250 mm	550x550 mm	964x964 mm
Weight	0.5 kg	4.4 kg	13.7 kg
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		

12.3 Dimensioned drawings

Optical laser measurement system AMS 158i



All dimensions in mm

A Mounting variant: Bottom of the device

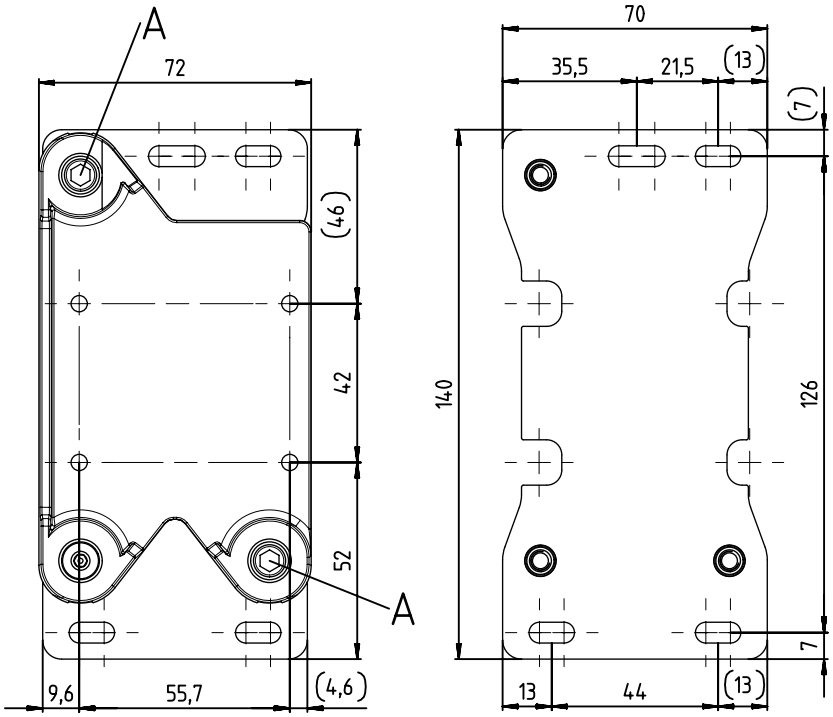
B Optical axis

C Mounting options for the BTA alignment unit

D Zero point of the distance to be measured

Fig. 12.1: Optical laser measurement system AMS 158i

Alignment unit BTA 0100M or BTA 0100 M.5

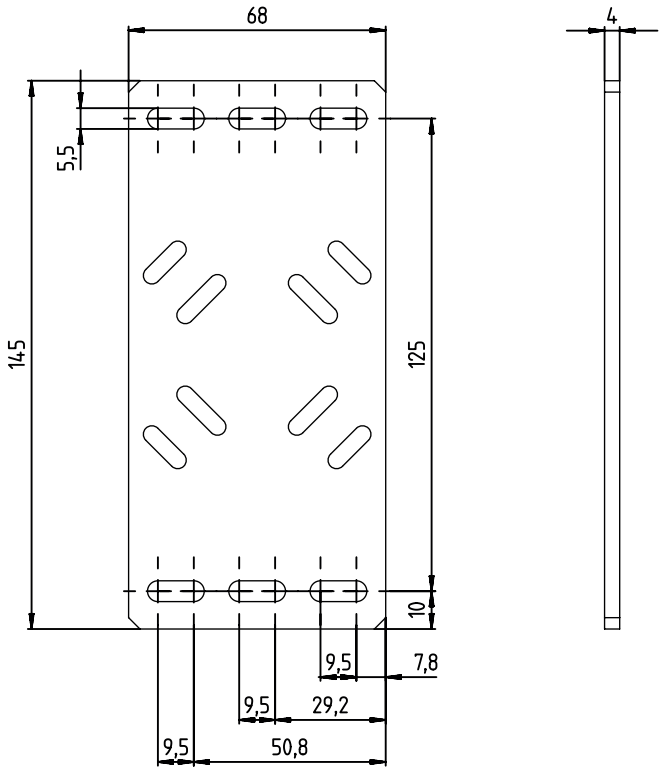


All dimensions in mm

A Adjustment screws with hexagon socket WAF4

Fig. 12.2: Alignment unit BTA 0100M (aluminum/steel) or BTA 0100 M.5 (stainless steel)

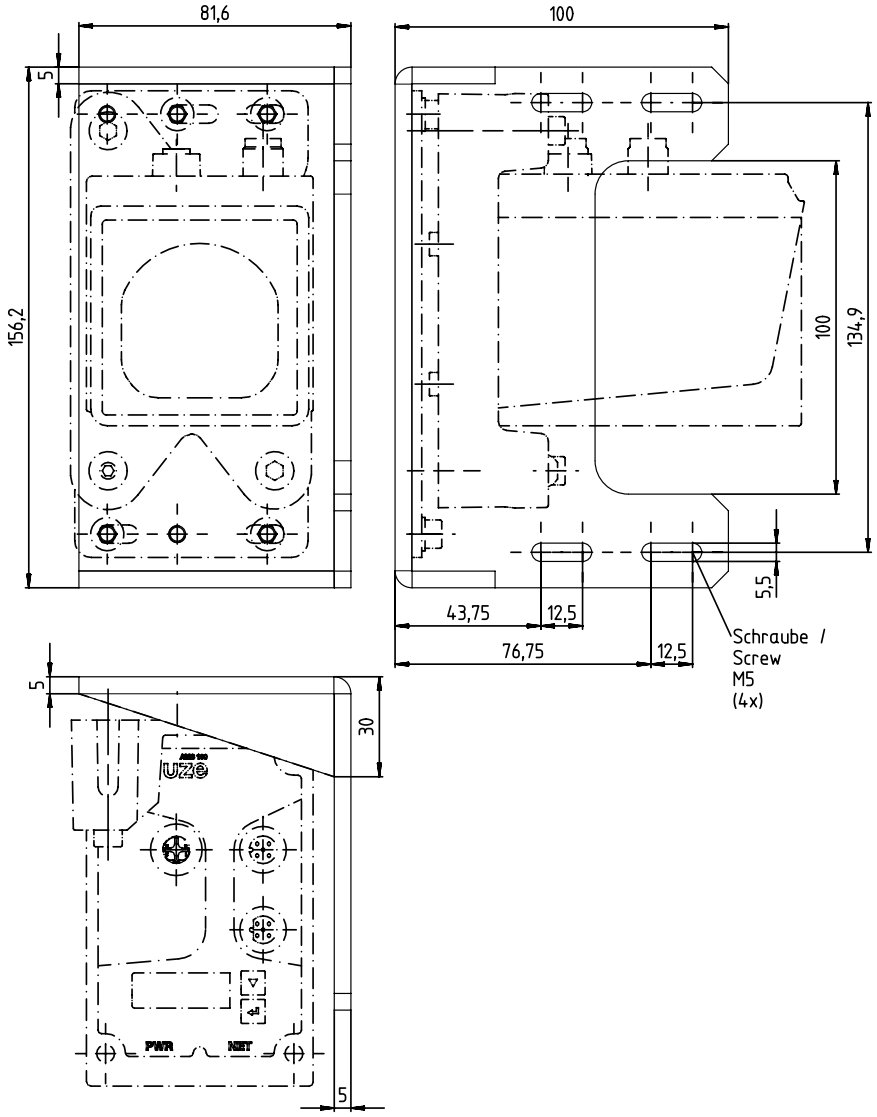
Adapter plate BT 0100M



All dimensions in mm

Fig. 12.3: Mounting device BT 0100M for mounting without an alignment unit

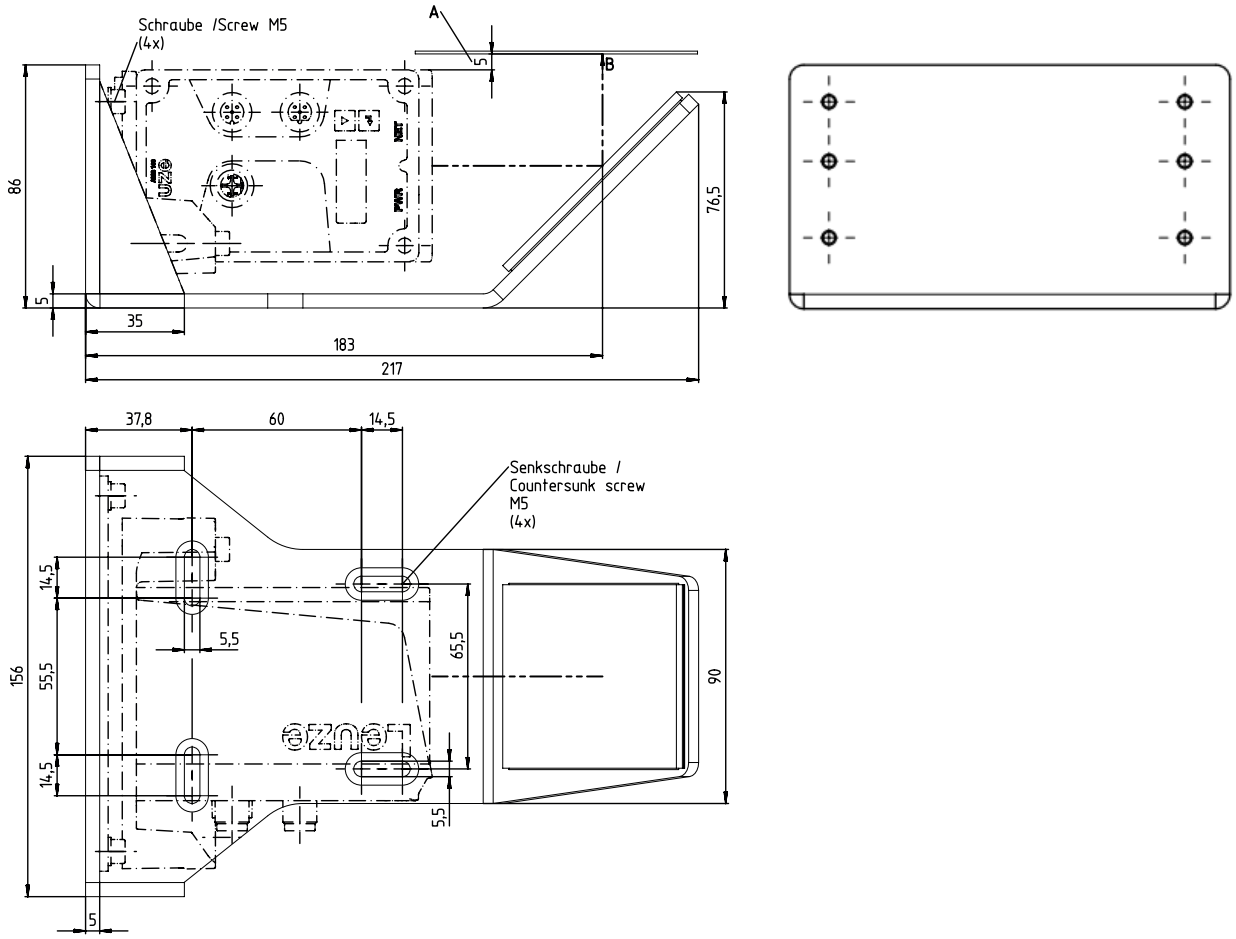
Floor holder BT 0100M-F



All dimensions in mm

Fig. 12.4: Mounting device BT 0100M-F for floor mounting or horizontal surfaces

Deflector unit US AMS 02



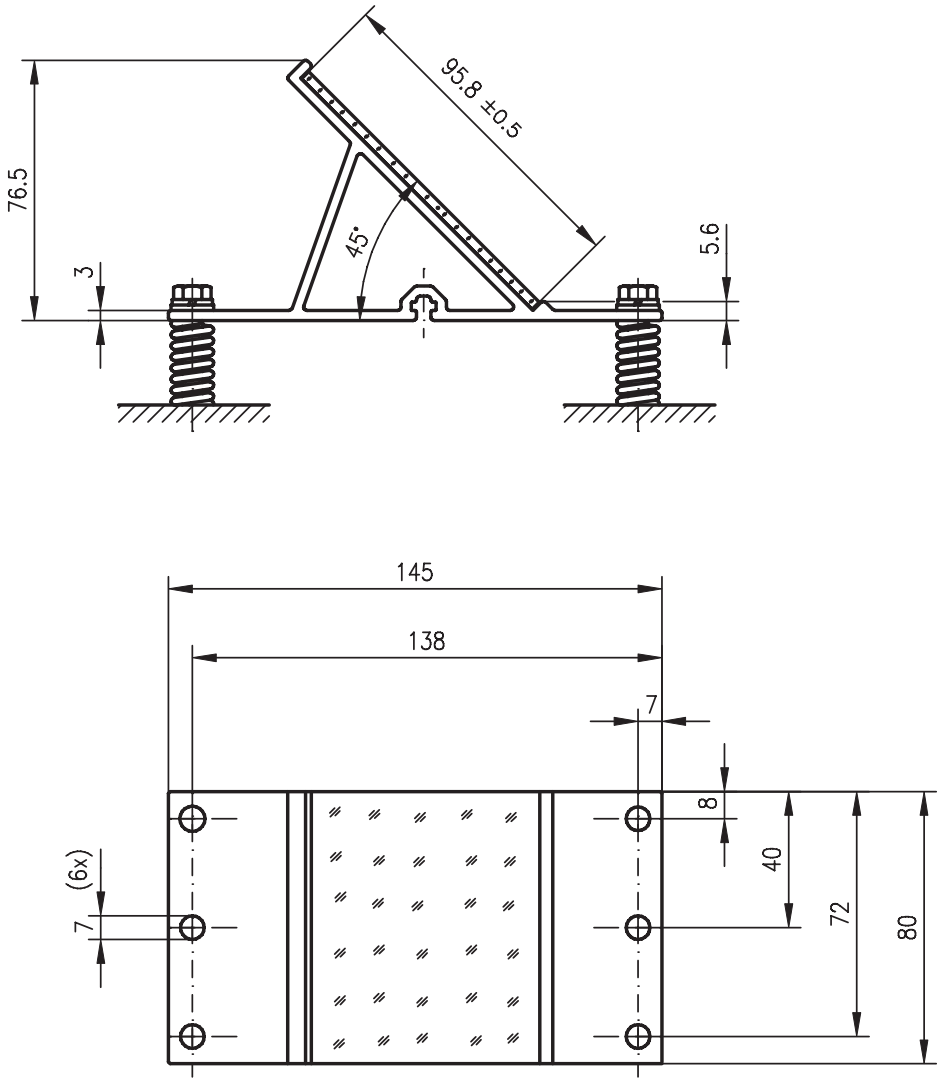
All dimensions in mm

A Minimum distance from the reflector

B Optical axis

Fig. 12.5: Deflecting mirror US AMS 02 – For use with AMS 1xxi … BTA

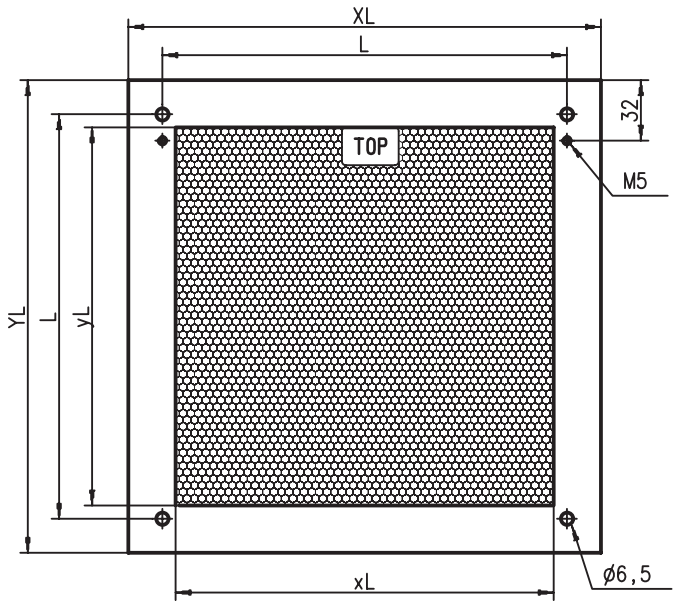
Deflector unit US 1 OMS



All dimensions in mm

Fig. 12.6: Deflecting mirror US 1 OMS without mounting bracket for simple 90° deflection of laser beam

Reflector



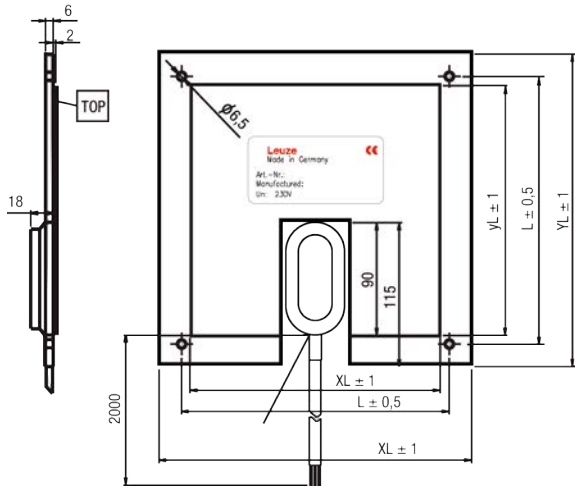
All dimensions in mm

Fig. 12.7: Reflective tape …-M on carrier plate

Tab. 12.12: Dimensions of reflective tape on carrier plate

Article	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

Heated reflector



All dimensions in mm

Fig. 12.8: Reflective tape …-H

Tab. 12.13: Dimensions of heated reflectors

Article	Reflective tape [mm]		Insulated carrier 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

13 Order guide and accessories

13.1 Part number code

AMS 1xxi yyy zzz

AMS	Optical laser measurement system (absolute measurement system)
1	Series: AMS 100i
xx	Interface: 07: SSI 08: Ethernet TCP/IP 38: EtherCAT 48: PROFINET 58: EtherNet/IP
i	i: Integrated fieldbus technology
yyy	Operating range: 40: max. operating range in m 120: max. operating range in m 200: max. operating range in m
zzz	Mounting accessories: see chapter 13.3 "Accessories – Mounting"

NOTICE

A list with all available device types can be found on the Leuze website **www.leuze.com**.

13.2 AMS 158i type overview

Tab. 13.1: AMS 158i

Type designation	Description	Part no.
AMS 158i 40	40 m operating range, EtherNet/IP interface	50157136
AMS 158i 120	120 m operating range, EtherNet/IP interface	50157137
AMS 158i 200	200 m operating range, EtherNet/IP interface	50157141
AMS 158i 40 BTA	40 m operating range, EtherNet/IP interface, pre-mounted alignment unit	50157133
AMS 158i 120 BTA	120 m operating range, EtherNet/IP interface, pre-mounted alignment unit	50157132
AMS 158i 200 BTA	200 m operating range, EtherNet/IP interface, pre-mounted alignment unit	50157140
AMS 158i 40 H	40 m operating range, EtherNet/IP interface, integrated heating	50157138
AMS 158i 120 H	120 m operating range, EtherNet/IP interface, integrated heating	50157139
AMS 158i 200 H	200 m operating range, EtherNet/IP interface, integrated heating	50157142
AMS 158i 40 BTA H	40 m operating range, EtherNet/IP interface, pre-mounted alignment unit, integrated heating	50157134

Type designation	Description	Part no.
AMS 158i 120 BTA H	120 m operating range, EtherNet/IP interface, pre-mounted alignment unit, integrated heating	50157135
AMS 158i 200 BTA H	100 m operating range, EtherNet/IP interface, pre-mounted alignment unit, integrated heating	50157143

13.3 Accessories – Mounting

Tab. 13.2: Mounting

Type designation	Description	Part no.
US AMS 02	Deflecting mirror for 90° deflection of the laser beam, for use with AMS 1xxi … BTA	50144969
US 1 OMS	Deflector unit without mounting bracket for simple 90° deflection of laser beam	50035630
BTA 0100 M	Alignment unit	50144385
BTA 0100 M.5	Stainless steel alignment unit	50151594
BT 0100 M	Adapter plate for mounting without alignment unit	50144968
BT 0100M-F	Mounting plate for floor assembly and/or horizontal surfaces	50144970

13.4 Accessories – Reflective tapes

Tab. 13.3: Overview of reflective tape types

Type designation	Description	Part no.
REF 4-A-150x150	Self-adhesive reflective tape, 150 x 150 mm	50141015
Reflective tape 200x200-S	Self-adhesive reflective tape, 200 x 200 mm	50104361
REF 4-A-300x300	Self-adhesive reflective tape, 300 x 300 mm	50141014
Reflective tape 500x500-S	Self-adhesive reflective tape, 500 x 500 mm	50104362
Reflective tape 749x914 – S	Self-adhesive reflective tape, 749 x 914 mm	50104363
Reflective tape 914x914-S	Self-adhesive reflective tape, 914 x 914 mm	50108988
Reflective tape 200x200-M	Reflective tape on carrier plate, 200 x 200 mm	50104364
Reflective tape 500x500-M	Reflective tape on carrier plate, 500 x 500 mm	50104365
Reflective tape 914x914-M	Reflective tape on carrier plate, 914 x 914 mm	50104366
Reflective tape 200x200-H	Reflective tape on heated carrier plate, 200 x 200 mm	50115020
Reflective tape 500x500-H	Reflective tape on heated carrier plate, 500 x 500 mm	50115021
Reflective tape 914x914-H	Reflective tape on heated carrier plate, 914 x 914 mm	50115022

13.5 Accessories – connection technology

Tab. 13.4: Connection cables

Type designation	Description	Part no.
KS ET-M12-4A-P7-050	Connection cable, length 5 m, shielded	50135074
KS ET-M12-4A-P7-100	Connection cable, length 10 m, shielded	50135075
KS ET-M12-4A-P7-150	Connection cable, length 15 m, shielded	50135076
KS ET-M12-4A-P7-300	Connection cable, length 30 m, shielded	50135077
KD U-M12-5A-V1-020	Connection cable, length 2 m, unshielded	50132077
KD U-M12-5A-V1-050	Connection cable, length 5 m, unshielded	50132079
KD U-M12-5A-V1-100	Connection cable, length 10 m, unshielded	50132080

14 EC Declaration of Conformity

The optical laser measurement systems of the AMS 100i series have been developed and manufactured in accordance with the applicable European standards and directives.

	NOTICE
	You can download the EC Declaration of Conformity from the Leuze website. ↳ Call up the Leuze website: *www.leuze.com*. ↳ Enter the type designation or part number of the device as the search term. The article number can be found on the name plate of the device under the entry “Part. No.”. ↳ The documents can be found on the product page for the device under the *Downloads* tab.

15 Licenses

The service interface can be accessed via a web browser using the IP address 192.168.60.101, either through the webConfig tool or after connecting an Ethernet cable.

↳ To do this, go to Settings and open the *Licenses*tab.

The license texts for the software packages can then be selected via the drop-down menu.

We can provide you with the source code of these software components on a data carrier/by download if you submit a request to our customer support within three years of distribution of the product at the following address:

Service center

Leuze electronic GmbH + Co. KG

In der Braike 1

D-73277 Owen / Germany

AMS 100i source code