

Translation of original operating instructions

AMS 138i

Optical laser measurement system – EtherCAT



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1	About this document	6
2	Safety	8
2.1	Intended use	8
2.2	Foreseeable misuse	8
2.3	Competent persons	9
2.4	Disclaimer	9
2.5	Laser safety notices	10
2.6	Cybersecurity	12
3	Fast commissioning	13
3.1	Mounting	13
3.2	Connecting voltage supply	13
3.3	Display	13
3.4	EtherCAT interface	13
4	Device description	14
4.1	Operating principle	14
4.2	Indicators and operational controls	14
4.2.1	LED status indicators	14
4.2.2	Display	15
4.2.3	Control buttons	16
4.3	Menus	16
4.3.1	Menu structure	16
4.3.2	Device information menu	17
4.3.3	Parameter menu	17
4.3.4	Language selection menu	21
4.3.5	Diagnosis menu	22
4.3.6	Operation examples	22
4.4	Reflectors	24
4.4.1	Description of the reflective tape	24
4.4.2	Overview of reflective tapes	24
4.4.3	Selecting reflector size	25
5	Mounting	26
5.1	Transport and storage	26
5.2	Mounting the device	26
5.2.1	Mounting with pre-mounted alignment unit (BTA)	27
5.2.2	Mounting with adapter plate (BT)	27
5.2.3	Mounting without accessories	28
5.2.4	Parallel mounting	28
5.2.5	Parallel mounting of and DDLS optical data transmission	30
5.2.6	Mounting with laser beam deflector units	30
5.3	Mounting the reflector	31
5.3.1	Pitch of the reflector	32
6	Electrical connection	35
6.1	PWR – voltage supply / switching input/output	35
6.2	EtherCAT	36
6.3	Service	36
7	Commissioning – EtherCAT interface	37
7.1	EtherCAT fieldbus	37
7.2	EtherCAT topology	37

7.3	EtherCAT wiring	38
7.4	Cable lengths and shielding	38
7.5	Starting up the device in the EtherCAT system	38
7.5.1	CANopen over EtherCAT – CoE	39
7.5.2	Device profile	39
7.5.3	Device description file	39
7.6	Object index	40
7.7	Communication objects	40
7.7.1	Object 0x1000 device type	40
7.7.2	Object 0x1018 identity object	41
7.8	Process data objects	43
7.8.1	Objekt 0x1A00 – TxPDO 1	43
7.8.2	Objekt 0x1A02 – TxPDO 3	46
7.8.3	Object 0x1C00 – Sync Manager communication type	48
7.8.4	Object 0x1C12 – Sync Manager 2 PDO assignment	50
7.8.5	Object 0x1C13 – Sync Manager 3 PDO assignment	51
7.8.6	Object 0x1C32 – Sync Manager 2 Parameter	52
7.8.7	Object 0x1C33 – Sync Manager 3 Parameter	54
7.9	Device-specific objects	56
7.9.1	Object 0x2000 – Position value	56
7.9.2	Object 0x2001 – Static preset	59
7.9.3	Object 0x2010 – Position limit value 1	60
7.9.4	Object 0x2011 – Position limit value 2	61
7.9.5	Object 0x2020 – Velocity	62
7.9.6	Object 0x2021 – Velocity limit value 1	63
7.9.7	Object 0x2022 – Velocity limit value 2	65
7.9.8	Object 0x2026 – Velocity status	67
7.9.9	Object 0x2050 – I/O 1 input/output	69
7.9.10	Object 0x2051 – I/O 2 input/output	71
7.9.11	Object 0x2060 – Status and control	74
7.9.12	Object 0x2070 – Behavior of the AMS 138i in case of failure	77
7.9.13	Object 0x2300 – Other	79
7.9.14	Objekt 0x2301 – Condition monitoring	80
7.10	AMS 138i objects from the DS406 encoder profile	81
7.10.1	Object 0x6000 – Operating parameters	81
7.10.2	Object 0x6004 – Position value	82
7.10.3	Object 0x6500 – Display of operating status from object 6000	82
7.10.4	Object 6501 – Measurement value resolution	82
8	Starting up the device – webConfig tool	84
8.1	System requirements	84
8.2	Start webConfig tool	84
8.3	Short description of the webConfig tool	85
8.3.1	Switching operating mode	85
8.3.2	Menu overview	86
9	Care, maintenance and disposal	87
10	Diagnostics and troubleshooting	88
10.1	Status messages	88
10.2	LED indicators	88
10.3	Display messages	89
11	Service and support	90
12	Technical data	91
12.1	Optical laser measurement system	91

12.2	Reflective tapes	93
12.2.1	Self-adhesive reflective tape	93
12.2.2	Reflective tape on carrier plate.....	93
12.2.3	Reflective tape with heating.....	93
12.3	Dimensioned drawings.....	94
13	Order guide and accessories.....	101
13.1	Part number code	101
13.2	AMS 138i type overview	101
13.3	Accessories – Mounting	102
13.4	Accessories – Reflective tapes	102
13.5	Accessories – connection technology.....	102
14	EC Declaration of Conformity	103
15	Licenses.....	104

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.
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

AL Event	Application layer event
CFR	Code of Federal Regulations
CoE	CANopen over EtherCAT
EoE	Ethernet over EtherCAT
ESI file	Device description file for EtherNet/IP devices (electronic data sheet)
ETG	EtherCAT Technology Group
FE	Functional earth
FW	Firmware
HW	Hardware
IO or I/O	Input/Output
IP	Internet Protocol
LED	Light emitting diode
LPS	Overvoltage protection / lightning protection system
NEC	National Electric Code

NTP	Network Time Protocol
PDO	Process data object
PELV	Protective Extra-Low Voltage
PS2	Power Source Class 2
SM Event	Sync Manager Event
SW	Software
TCP	Transmission Control Protocol
USB	Universal Serial Bus
UL	Underwriters Laboratories
XML	Extensible Markup Language

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

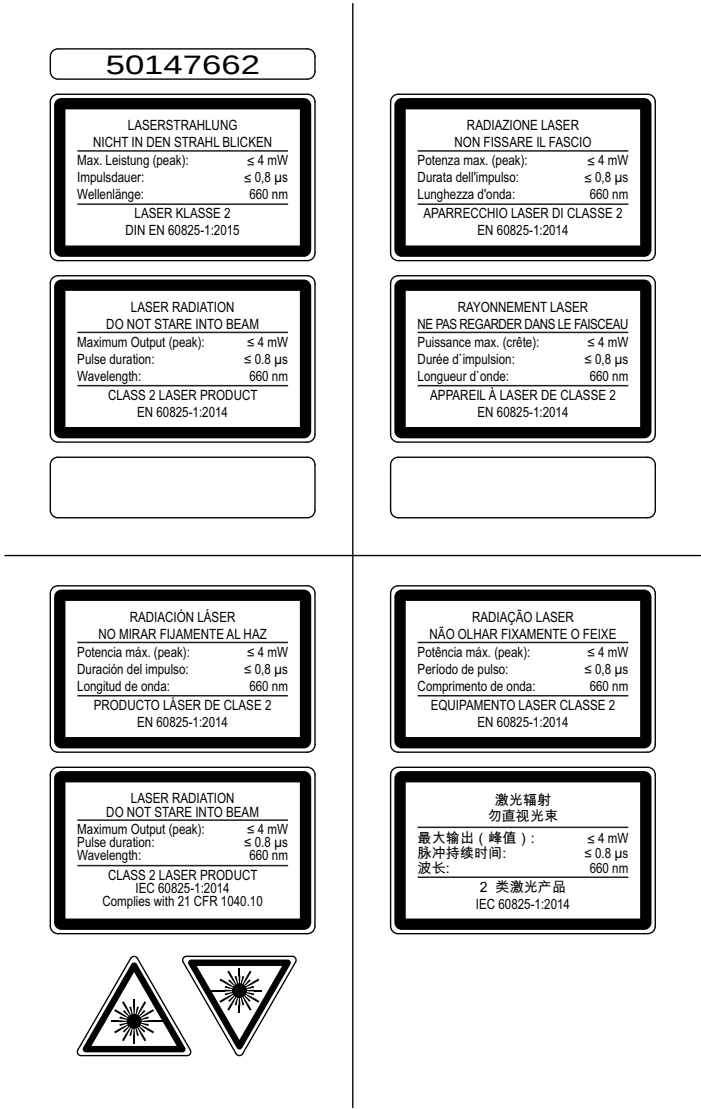


Fig. 2.2: Laser warning and information signs – supplied stick-on labels

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
EtherCAT	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 EtherCAT interface

For more information on installing the EtherCAT interface see chapter 7 "Commissioning – EtherCAT 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	EtherCAT 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, see chapter 4.3.3 "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 failure		
	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	
Other	Maximum velocity	Activation	
		Value entry	
	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 <i>Parameters to default</i> 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 7.2 "EtherCAT topology"	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 failure" parameter or the last valid position value for the configured error delay time.	ON/100 ms
Position value in the case of failure	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: $\pm$ xxxxxx [mm]	
	Bottom pos. Limit 1	Activation	ON / OFF	OFF
		Value entry	Adjustable value: $\pm$ xxxxxx [mm]	
	Top pos. Limit 2	Activation	ON / OFF	OFF
		Value entry	Adjustable value: $\pm$ xxxxxx [mm]	
	Bottom pos. Limit 2	Activation	ON / OFF	OFF
		Value entry	Adjustable value: $\pm$ xxxxxx [mm]	
	Max. velocity	Activation	ON / OFF	OFF
		Max. velocity	Max. configurable value: 15,000 mm/s (60,000 in/100s)	

OtherTab. 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 <i>OFF</i> 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

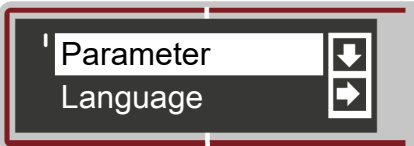
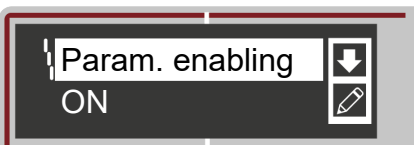
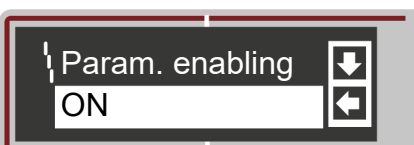
Two menu lines, one on top of the other, are always shown in the display.

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 <i>Parameter</i> .
	Press the [ENTER] key to access the menu <i>Parameter</i> .
	Use the [DOWN] button to select the menu item <i>Parameter handling</i> .
	Press the [ENTER] key to access the menu <i>Parameter handling</i> .
	In the <i>Parameter handling</i> menu, use the [DOWN] button to select the menu item <i>Parameter enable</i> .
	Press the [ENTER] key to access the menu <i>Parameter enable</i> .
	In the <i>Parameter enable</i> menu, use the [DOWN] button to select the menu item <i>ON</i> .
	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 138i is interrupted. The extended networking via BUS OUT is retained.

Parameters set via the display are overwritten during operation of the AMS 138i on EtherCAT by the parameters defined in the EtherCAT-specific objects if they are included in the "Start-up Parameters."

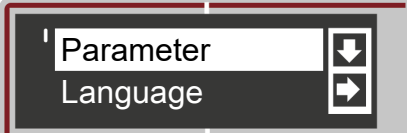
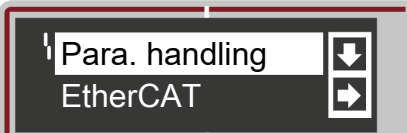
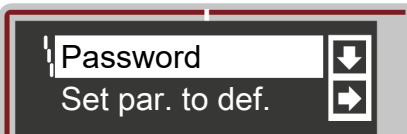
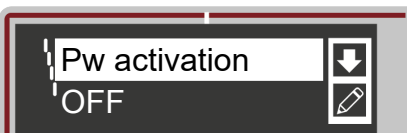
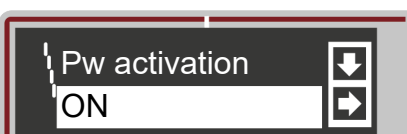
Changes to the EtherCat parameters via display entry have immediate effect.

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 <i>Parameter</i> . Press the [ENTER] key to access the menu <i>Parameter</i> .
	Use the [DOWN] button to select the menu item <i>Parameter handling</i> . Press the [ENTER] key to access the menu <i>Parameter handling</i> .
	In the <i>Parameter handling</i> menu, use the [DOWN] button to select the menu item <i>Password</i> . Press the [ENTER] key to access the menu <i>Password</i> .
	In the <i>Password</i> menu, use the [DOWN] button to select the menu item <i>Activate password</i> . Press the [ENTER] key to access the menu Password activation.
	In the <i>Activate password</i> menu, use the [DOWN] button to select the menu item <i>OFF</i> . Press the [ENTER] button to set password activation to <i>ON</i> .
	In the <i>Password</i> menu, use the [DOWN] button to select the menu item <i>Password entry</i> . 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 138i 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 138i 40	40	200x200 mm	REF 4-A-150x150 ¹ Reflective tape 200x200-S Reflective tape 200x200-M Reflective tape 200x200-H REF 4-A-300x300 ¹	50141015 50104361 50104364 50115020 50141014
AMS 138i 120	120	500x500 mm	Reflective tape 500x500-S Reflective tape 500x500-M Reflective tape 500x500-H	50104362 50104365 50115021
AMS 138i 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 138i type overview".

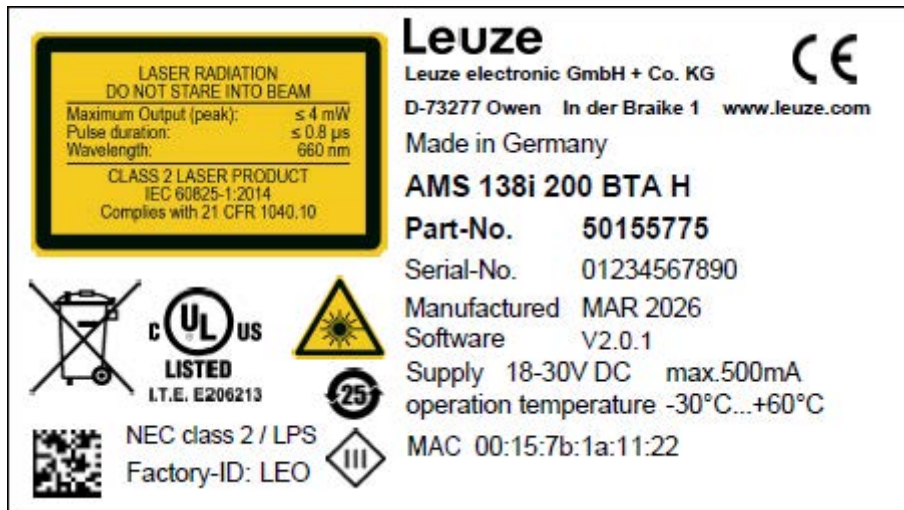


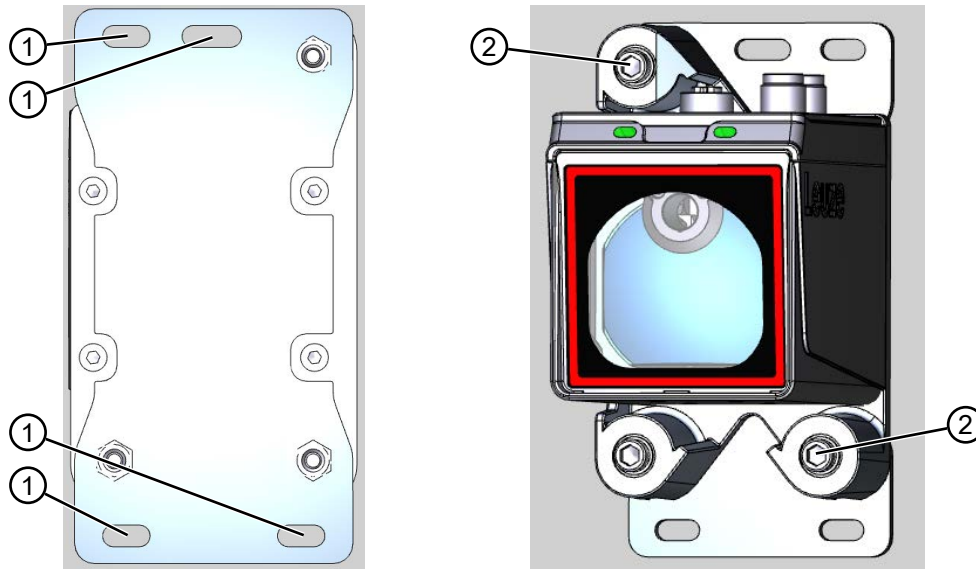
Fig. 5.1: AMS 138i name plate

- ↪ 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

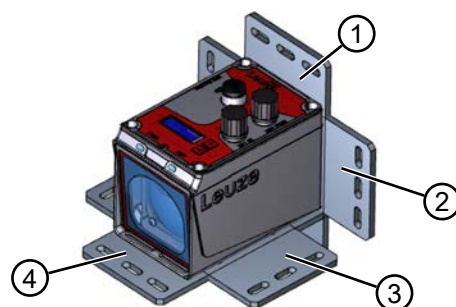
- ↳ Mount using four M5 screws.
- ↳ Guide the four M5 screws through the slotted holes of the alignment unit (1) and through the component to which the AMS 100i is to be attached.
- ↳ Secure the screws with a lock washer to protect against loosening caused by vibrations.

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)

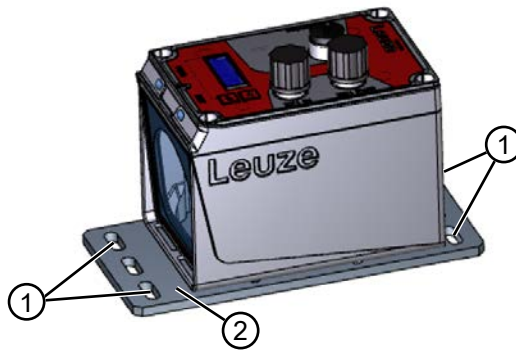


- 1 Mounting option 1
- 3 Mounting option 3

- 2 Mounting option 2
- 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 laser 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.

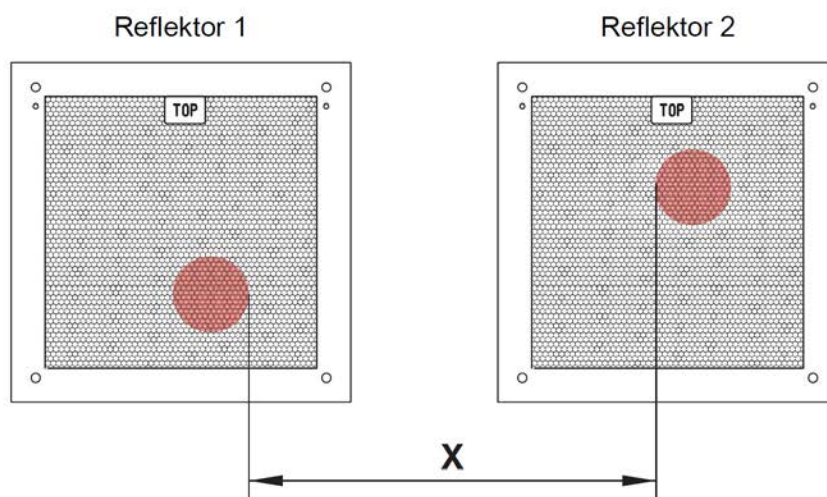


Fig. 5.5: Laser light spots parallel spacing

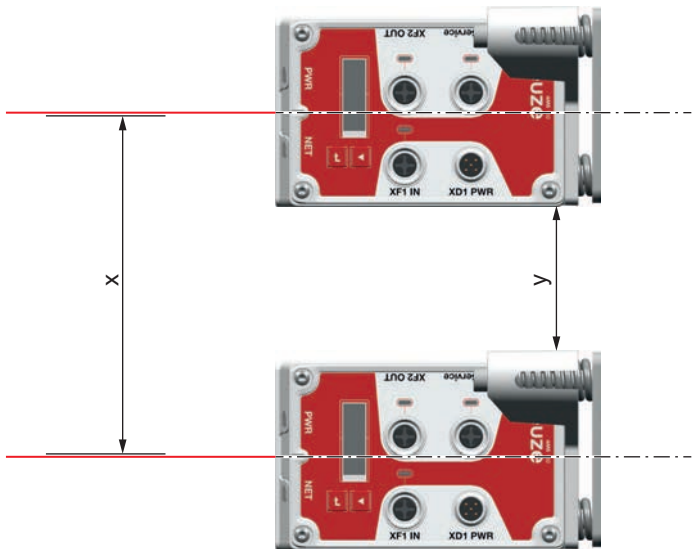


Fig. 5.6: Parallel mounting
The diameter of the light spot increases with distance.

	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:

$X = 100 \text{ mm} + (\text{max. measurement distance in mm} \times 0.01)$

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..

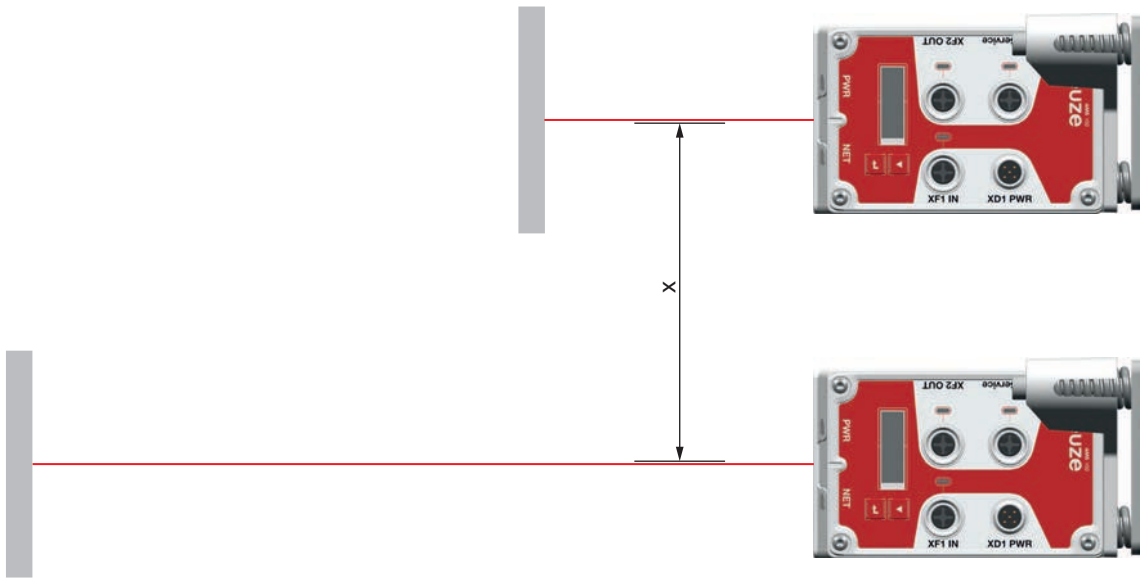


Fig. 5.7: Parallel mounting with moving reflectors

- 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.

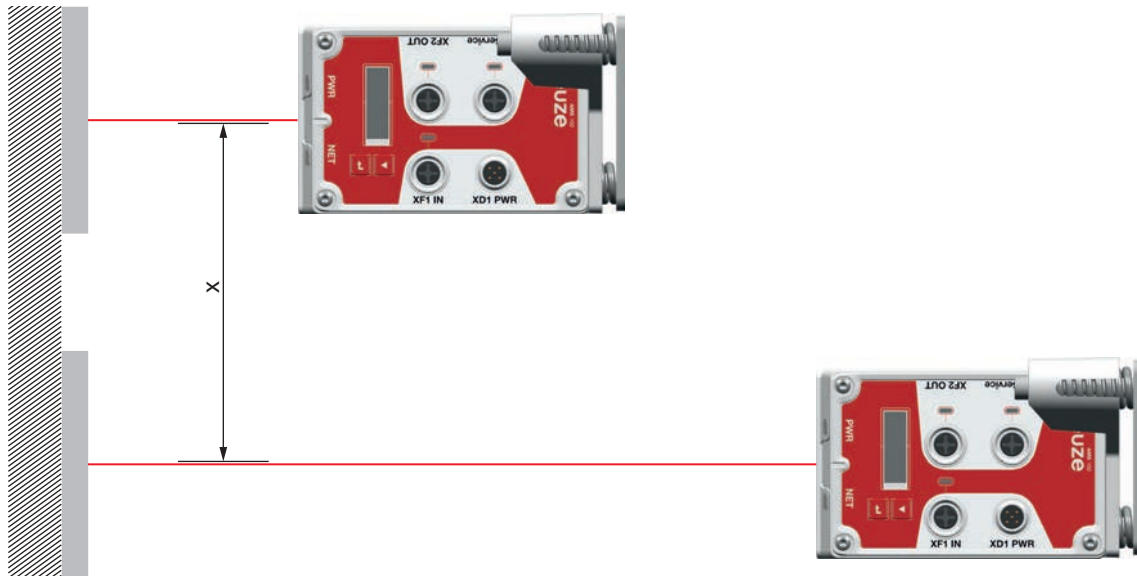


Fig. 5.8: Parallel mounting with moving AMS 100i units

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

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

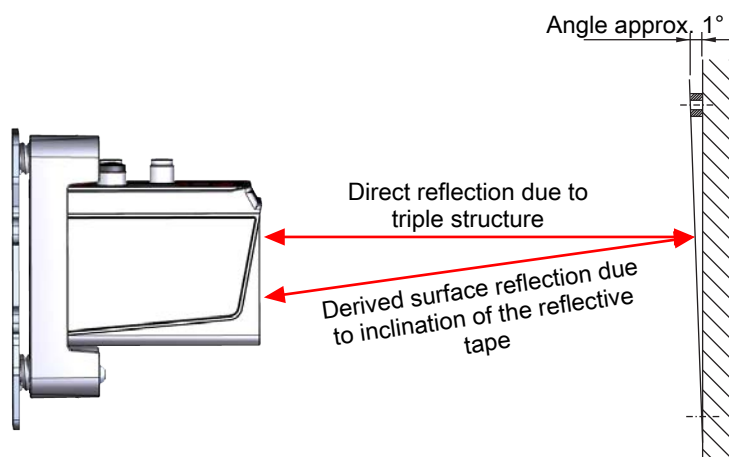


Fig. 5.10: Mounting the reflector

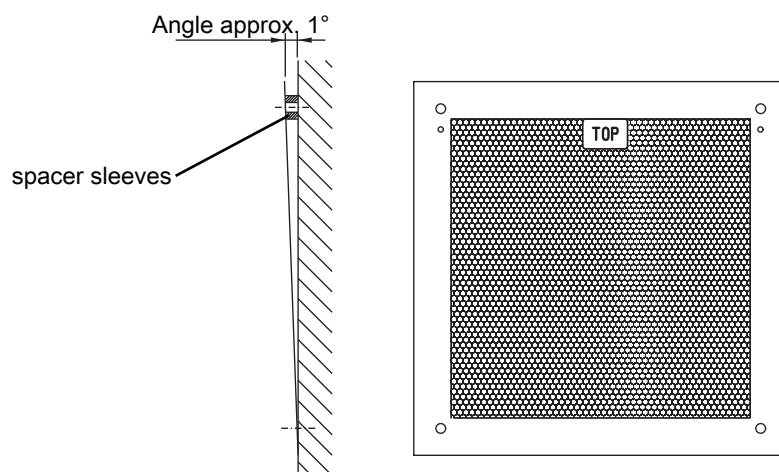


Fig. 5.11: Pitch of the reflector

Pitch of reflective tapes ...-H

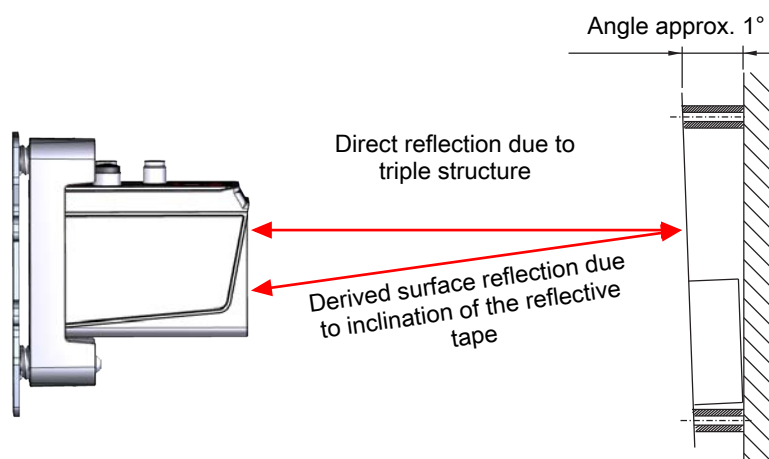


Fig. 5.12: Mounting of heated reflectors

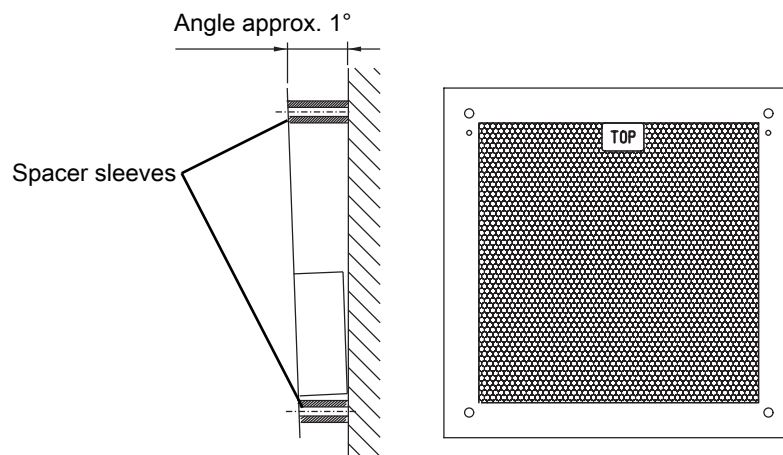


Fig. 5.13: Pitch of the heated reflector

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

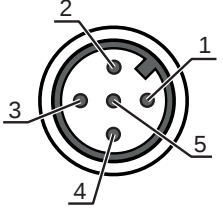
Fig. 6.1: AMS connections

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

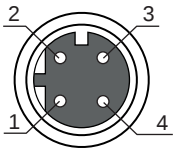
Tab. 6.1: PWR pin assignment

	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)

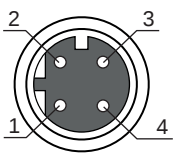
6.2 EtherCAT

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

Tab. 6.2: EtherCAT BUS IN 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)

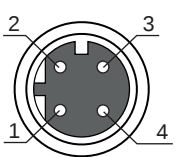
Tab. 6.3: EtherCAT BUS OUT pin assignment

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

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 Commissioning – EtherCAT interface

7.1 EtherCAT fieldbus

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

EtherCAT standards:

- IEC 61158: Industrial communication networks – Fieldbuses (protocols and services)
- IEC 61784-2: Industrial communication networks – Profiles (communication profiles for specific device classes)

All EtherCAT-specific communication mechanisms are described in detail in the standards mentioned above. The technical description will describe parts of the IEC standard if this assists general understanding.

7.2 EtherCAT topology

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

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

From an Ethernet point of view, an EtherCAT bus segment is a single, large Ethernet participant which sends and receives Ethernet telegrams. Within the participant, however, there is a multitude of EtherCAT slaves rather than one single Ethernet controller.

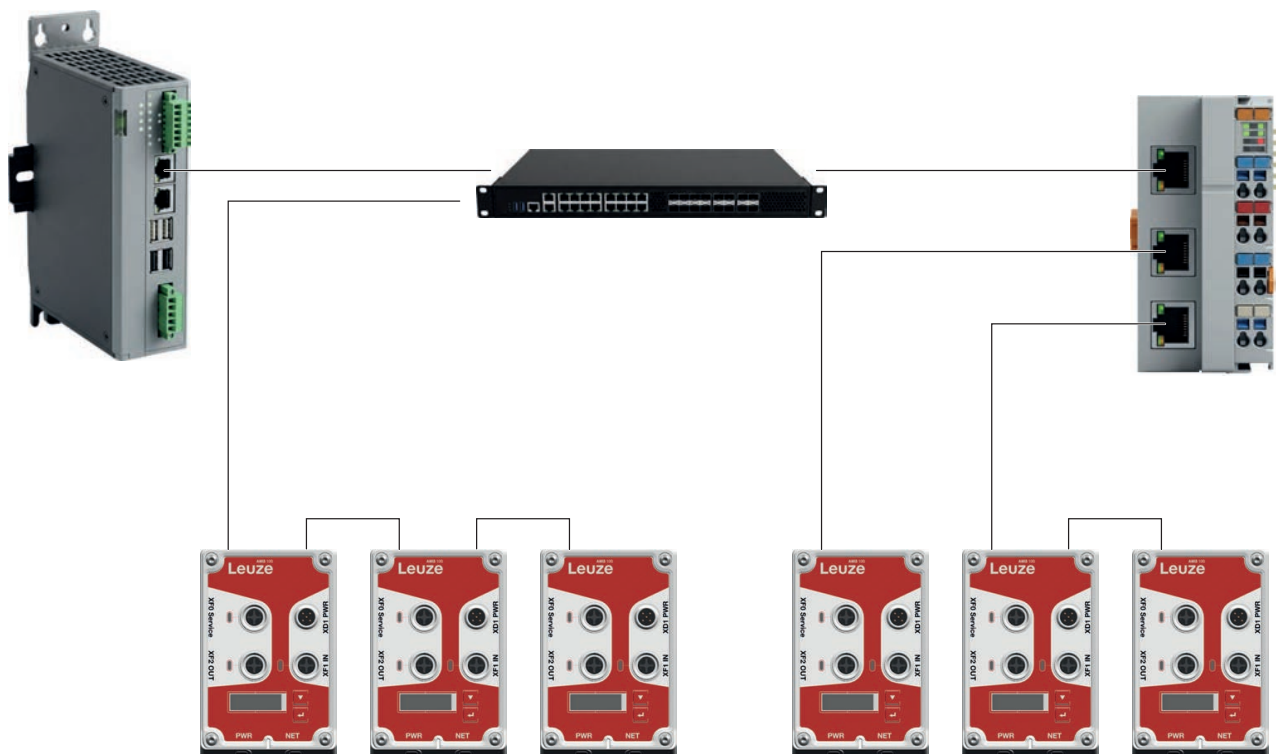


Fig. 7.1: EtherCAT topology example

Each participating device is automatically assigned its address by a DHCP server. For “Ethernet over EtherCAT” (EoE) communication, each device can be assigned the respective network address via the webConfig tool.

7.3 EtherCAT wiring

The standard connection uses D-coded M12 connectors, see chapter 6 "Electrical connection".

NOTICE	
	Strictly observe during EtherCAT wiring! ↳ Use the preassembled cables from Leuze (see chapter 13.5 "Accessories – connection technology") or the recommended connectors/sockets. ↳ Always use a Cat 5 Ethernet connection cable for the wiring. ↳ If standard network cables are not used, you can use cables that you assemble yourself (see chapter 13.5 "Accessories – connection technology").

7.4 Cable lengths and shielding

↳ Observe the maximum cable lengths and shielding.

Tab. 7.1: Cable lengths and shielding

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

7.5 Starting up the device in the EtherCAT system

During startup, the device passes through various states:

INIT

Device is being initialized. No cyclic or acyclic communication between the master and device is possible. The EtherCAT master transitions the device to the *OPERATIONAL* state step by step.

When the state changes from *INIT* to *PRE-OPERATIONAL* TwinCAT or the master writes the so-called EtherCAT address (= station address) to the corresponding register of the EtherCAT slave controller (in this case: AMS 138i). This EtherCAT address is typically specified in relation to the position, i.e., the master's address is 1000, the first slave's address is 1001, etc. This is also called the auto-increment method.

PRE-OPERATIONAL

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

SAFE-OPERATIONAL

The "Start Input Update" command sets the device to the *SAFE-OPERATIONAL* state. In this state, the device processes input process data (= PLC output data/AMS 138i transmit data). The master generates output data, but input data is not taken into account. I.e., when in the *SAFE-OPERATIONAL* state, the device does not provide any output data (= PLC input data). Mailbox communication is possible.

OPERATIONAL

The "Start Output Update" command sets the device to the *OPERATIONAL* state. In this state, the device provides valid input data. The master supplies valid output data. After the device has detected the data received via the process data service, the state transition is confirmed by the device. If the output data could not be activated, the device remains in the *SAFE-OPERATIONAL* state and displays an error message.

7.5.1 CANopen over EtherCAT – CoE

EtherCAT makes the following communication mechanisms available:

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

NOTICE



Note the following:

- ↳ SDO access to the online dictionary is provided via CoE (CANopen over EtherCAT) mailbox services.
- ↳ PDO services via CoE mailboxes are not supported.
- ↳ Master and slave must be located in the same EtherCAT network.

NOTICE



Second Station Address (Configured Station Alias)

The Second Station Address is set by the EtherCAT master. The address is assigned in the configuration software (e.g., TwinCAT).

You can view the address in the webConfig tool and on the device's display, but you cannot change any settings.

7.5.2 Device profile

The device profile describes the application parameters and the functional behavior of the AMS 138i. For EtherCAT, one does not specify individual device profiles for device classes. Instead, simple interfaces for existing device profiles are provided.

The AMS 138i supports the "Device Profile for Encoder" DS 406 known from CANopen.

7.5.3 Device description file

For EtherCAT, all process data and parameters are described in objects. The compilation of all process data and parameters – the object directory – is stored in an EtherCAT description file (ESI file; EtherCAT Slave Information).

This ESI file contains all objects with index, subindex, name, data type, data access as well as the value range with minimum, maximum and default value. The complete functionality of the device is described with the ESI file. It is possible to adapt the communication between the device and the control via these objects.

For the AMS 138i, an ESI file is created and made available via the webConfig tool and the Leuze website. The ESI file is used for the device description in the configuration tool, e.g., TwinCAT, and is created according to the current ESI specification to ensure problem-free interpretation.

- **ESI file: AMS138i.xml** on the device's product page on the Leuze website www.leuze.com under the *Downloadstab*.
- **Vendor ID** from Leuze for the AMS 138i: 121h = 289d

7.6 Object index

AMS 138i object directory overview

All process data and parameters are stored as objects in the AMS 138i. The AMS 138i's object directory is the compilation of all process data and parameters of the AMS.

The following overview table shows the communication objects supported by the AMS 138i.

Object index [Hex]	Object name	Object area
0x1000	Device type	Communication objects
0x1018	Identity object	Communication objects
0x1A00	TxPDO 1	Process data objects
0x1A02	TxPDO3	Process data objects
0x1C00	Sync Manager communication type	Process data objects
0x1C12	Sync Manager 2 PDO assignment	Process data objects
0x1C13	Sync Manager 3 PDO assignment	Process data objects
0x1C32	Sync Manager 2 Parameter	Process data objects
0x1C33	Sync Manager 3 Parameter	Process data objects
0x2000	Position value	Device-specific objects
0x2001	Static preset	Device-specific objects
0x2010	Position limit value 1	Device-specific objects
0x2011	Position limit value 2	Device-specific objects
0x2020	Velocity	Device-specific objects
0x2021	Velocity limit value 1	Device-specific objects
0x2022	Velocity limit value 2	Device-specific objects
0x2026	Velocity status	Device-specific objects
0x2050	I/O 1 input/output	Device-specific objects
0x2051	I/O 2 input/output	Device-specific objects
0x2060	Status and control	Device-specific objects
0x2070	Error handling procedures	Device-specific objects
0x2300	Other	Device-specific objects
0x2301	Condition monitoring	Device-specific objects
0x6000	Operating parameters	Encoder-specific objects
0x6004	Position value	Encoder-specific objects
0x6500	Object 6000 operating status	Encoder-specific objects
0x6501	Measurement value resolution	Encoder-specific objects

7.7 Communication objects

7.7.1 Object 0x1000 device type

Object index: 0x1000

Tab. 7.2: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Device type	UINT32	4	R	--	--	0x00080196

Object description**Device profile**

The classification 196h = 406d describes the profile of an encoder and is taken from CANopen specification DS406 Class 1. The AMS 138i is therefore integrated into the profile definition of an encoder.

The object addresses greater than 6000h describe the specified encoder functions.

Encoder

The classification 8h = 8d describes the AMS 138i as an absolute, linear encoder that is described in specification DS406.

7.7.2 Object 0x1018 identity object

Object index: 0x1000

Tab. 7.3: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Identity object	IDENTITY	18	R	--	--	--
0x0000	Number of entries	UINT8	1	R	0x00	0x04	0x04
0x0001	Vendor ID	UINT32	4	R	--	--	0x00000121
0x0002	Product code	UINT32	4	R	--	--	0x00000000
0x0003	Revision number	UINT32	4	R	--	--	0x00000000
0x0004	Serial number	UINT32	4	R	--	--	0x00000000

Tab. 7.4: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2	Vendor ID (high byte)							
	3	Vendor ID							
	4	Vendor ID							
	5	Vendor ID (low byte)							
0x0002	6	Product code (high byte)							
	7	Product code							
	8	Product code							
	9	Product code (low byte)							
0x0003	10	Revision number (high byte)							
	11	Revision number							
	12	Revision number							
	13	Revision number (low byte)							
0x0004	14	Serial number (high byte)							
	15	Serial number							
	16	Serial number							
	17	Serial number (low byte)							

Object description

This object contains the current firmware version (slave device software version) as a readable string. The AMS 138i transmits the current software version as a string. Only read access is permitted for the EtherCAT master.

NOTICE

The firmware can be updated via the webConfig tool or via EoE.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Vendor ID

Subitem index: 0x0001

Subitem description

The Vendor ID is transmitted as a 32-bit value (UNIT32/DWORD).

For Leuze, the value is: **0x00000121**

Subitem 0x0002 – product code

Subitem index: 0x0002

Subitem description

The product code is transmitted as a 32-bit value (UNIT32/DWORD).

For the AMS 138i, the value is: **25**

Subitem 0x0003 – Revision number

Subitem index: 0x0003

Subitem description

The revision number is transmitted as a 32-bit value (UNIT32/DWORD).

For the AMS 138i, the value is: **1**

Subitem 0x0004 – Serial number

Subitem index: 0x0004

Subitem description

The serial number is transferred as a 32-bit value (UNIT32/DWORD).

Since the Leuze serial number has more than 10 digits, it is converted to a 32-bit value.

The characters up to the last ten digits of the serial number are used; i.e., special characters and letters are ignored.

1: If no serial number is specified.

7.8 Process data objects

7.8.1 Objekt 0x1A00 – TxPDO 1

Object index: 0x1A00

Tab. 7.5: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	TxPDO 1	PDO_MAP-PING	54	R	--	--	--
0x0000	Number of objects in this PDO	UINT8	1	R	0x00	0x0D	0x0D
0x0001	Position value	UINT32	4	R	--	--	0x60040020
0x0002	Hardware error	UINT32	4	R	--	--	0x20600120
0x0003	Lower position limit value 1	UINT32	4	R	--	--	0x20600220
0x0004	Upper position limit value 1	UINT32	4	R	--	--	0x20600320
0x0005	Lower position limit value 2	UINT32	4	R	--	--	0x20600420
0x0006	Upper position limit value 2	UINT32	4	R	--	--	0x20600520
0x0007	Laser status	UINT32	4	R	--	--	0x20600620
0x0008	Preset status	UINT32	4	R	--	--	0x20600720
0x0009	Preset teach toggle	UINT32	4	R	--	--	0x20600820
0x000A	Intensity (ATT)	UINT32	4	R	--	--	0x20600920
0x000B	Temperature (TMP)	UINT32	4	R	--	--	0x20600A20
0x000C	Laser (LSR)	UINT32	4	R	--	--	0x20600B20
0x000D	Plausibility	UINT32	4	R	--	--	0x20600C20

Tab. 7.6: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of objects in this PDO							
0x0001	2	Position value (high byte)							
	3	Position value							
	4	Position value							
	5	Position value (low byte)							
0x0002	6	Hardware error (high byte)							
	7	Hardware error							
	8	Hardware error							
	9	Hardware error (low byte)							
0x0003	10	Lower position limit value 1 (high byte)							
	11	Lower position limit value 1							
	12	Lower position limit value 1							
	13	Lower position limit value 1 (low byte)							

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0004	14	Upper position limit value 1 (high byte)							
	15	Upper position limit value 1							
	16	Upper position limit value 1							
	17	Upper position limit value 1 (low byte)							
0x0005	18	Lower position limit value 2 (high byte)							
	19	Lower position limit value 2							
	20	Lower position limit value 2							
	21	Lower position limit value 2 (low byte)							
0x0006	22	Upper position limit value 2 (high byte)							
	23	Upper position limit value 2							
	24	Upper position limit value 2							
	25	Upper position limit value 2 (low byte)							
0x0007	26	Laser status (high byte)							
	27	Laser status							
	28	Laser status							
	29	Laser status (low byte)							
0x0008	30	Preset status (high byte)							
	31	Preset status							
	32	Preset status							
	33	Preset status (low byte)							
0x0009	34	Preset teach toggle (high byte)							
	35	Preset teach toggle							
	36	Preset teach toggle							
	37	Preset teach toggle (low byte)							
0x000A	38	Intensity (ATT) (high byte)							
	39	Intensity (ATT)							
	40	Intensity (ATT)							
	41	Intensity (ATT) (low byte)							
0x000B	42	Temperature (TMP) (high byte)							
	43	Temperature (TMP)							
	44	Temperature (TMP)							
	45	Temperature (TMP) (low byte)							
0x000C	46	Laser (LSR) (high byte)							
	47	Laser (LSR)							
	48	Laser (LSR)							
	49	Laser (LSR) (low byte)							
0x000D	50	Plausibility (high byte)							
	51	Plausibility							
	52	Plausibility							
	53	Plausibility (low byte)							

Object description

The “Transmit” PDO mapping object assigns input data from the device to the controller (EtherCAT master).

Subitem 0x0000 – Number of objects in this PDO

Subitem index: 0x0000

Subitem 0x0001 – Position value

Subitem index: 0x0001

Subitem description

Assigned to object index 0x6004

Subitem 0x0002 – Hardware error

Subitem index: 0x0002

Subitem description

Assigned to object index 0x2060, subindex 0x01

Subitem 0x0003 Lower position limit value 1

Subitem index: 0x0003

Subitem description

Assigned to object index 0x2060, subindex 0x02

Subitem 0x0004 Upper position limit value 1

Subitem index: 0x0004

Subitem description

Assigned to object index 0x2060, subindex 0x03

Subitem 0x0005 Lower position limit value 2

Subitem index: 0x0005

Subitem description

Assigned to object index 0x2060, subindex 0x04

Subitem 0x0006 Upper position limit value 2

Subitem index: 0x0006

Subitem description

Assigned to object index 0x2060, subindex 0x05

Subitem 0x0007 – Laser status

Subitem index: 0x0007

Subitem description

Assigned to object index 0x2060, subindex 0x06

Subitem 0x0008 – Preset status

Subitem index: 0x0008

Subitem description

Assigned to object index 0x2060, subindex 0x07

Subitem 0x0009 – Preset teach toggle

Subitem index: 0x0009

Subitem description

Assigned to object index 0x2060, subindex 0x08

Subitem 0x000A – Intensity (ATT)

Subitem index: 0x000A

Subitem description

Assigned to object index 0x2060, subindex 0x09

Subitem 0x000B – Temperature (TMP)

Subitem index: 0x000B

Subitem description

Assigned to object index 0x2060, subindex 0x0A

Subitem 0x000C – Laser (LSR)

Subitem index: 0x000C

Subitem description

Assigned to object index 0x2060, subindex 0x0B

Subitem 0x000D – Plausibility

Subitem index: 0x000D

Subitem description

Assigned to object index 0x2060, subindex 0x0C

7.8.2 Objekt 0x1A02 – TxPDO 3

Object index: 0x1A02

Tab. 7.7: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	TxPDO 3	PDO_MAPPING	34	R	--	--	--
0x0000	Number of objects in this PDO	UINT8	1	R	0x00	0x08	0x08
0x0001	Speed value	UINT32	4	R	--	--	0x20200420
0x0002	Velocity measurement value error	UINT32	4	R	--	--	0x20260120
0x0003	Velocity direction status	UINT32	4	R	--	--	0x20260220
0x0004	Speed of movement status (pos./neg. direction)	UINT32	4	R	--	--	0x20260320
0x0005	Velocity limit value status 1	UINT32	4	R	--	--	0x20260420
0x0006	Velocity limit value status 2	UINT32	4	R	--	--	0x20260520
0x0007	Velocity comparison – limit value 1	UINT32	4	R	--	--	0x20260620
0x0008	Velocity comparison – limit value 2	UINT32	4	R	--	--	0x20260720

Tab. 7.8: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of objects in this PDO							

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0001	2	Velocity value (high byte)							
	3	Speed value							
	4	Speed value							
	5	Velocity value (low byte)							
0x0002	6	Velocity measurement value error (high byte)							
	7	Velocity measurement value error							
	8	Velocity measurement value error							
	9	Velocity measurement value error (low byte)							
0x0003	10	Velocity direction status (high byte)							
	11	Velocity direction status							
	12	Velocity direction status							
	13	Velocity direction status (low byte)							
0x0004	14	Velocity direction status (pos./neg. direction) (high byte)							
	15	Velocity direction status (pos./neg. direction)							
	16	Velocity direction status (pos./neg. direction)							
	17	Velocity direction status (pos./neg. direction) (low byte)							
0x0005	18	Velocity limit value status 1 (high byte)							
	19	Velocity limit value status 1							
	20	Velocity limit value status 1							
	21	Velocity limit value status 1 (low byte)							
0x0006	22	Velocity limit value status 2 (high byte)							
	23	Velocity limit value status 2							
	24	Velocity limit value status 2							
	25	Velocity limit value status 2 (low byte)							
0x0007	26	Velocity comparison – limit value 1 (high byte)							
	27	Velocity comparison – limit value 1							
	28	Velocity comparison – limit value 1							
	29	Velocity comparison – limit value 1 (low byte)							
0x0008	30	Velocity comparison – limit value 2 (high byte)							
	31	Velocity comparison – limit value 2							
	32	Velocity comparison – limit value 2							
	33	Velocity comparison – limit value 2 (low byte)							

Object description

The “Transmit” PDO mapping object assigns input data from the device to the controller (EtherCAT master).

Subitem 0x0000 – Number of objects in this PDO

Subitem index: 0x0000

Subitem 0x0001 – Velocity value

Subitem index: 0x0001

Subitem description

Assigned to object index 0x2020, subindex 0x03

Subitem 0x0002 – Velocity measurement value error

Subitem index: 0x0002

Subitem description

Assigned to object index 0x2026, subindex 0x01

Subitem 0x0003 – Velocity direction status

Subitem index: 0x0003

Subitem description

Assigned to object index 0x2026, subindex 0x02

Subitem 0x0004 – Velocity direction status (pos./neg. direction)

Subitem index: 0x0004

Subitem description

Assigned to object index 0x2026, subindex 0x03

Subitem 0x0005 – Velocity limit value status 1

Subitem index: 0x0005

Subitem description

Assigned to object index 0x2026, subindex 0x04

Subitem 0x0006 – Velocity limit value status 2

Subitem index: 0x0006

Subitem description

Assigned to object index 0x2026, subindex 0x05

Subitem 0x0007 – Velocity comparison – limit value 1

Subitem index: 0x0007

Subitem description

Assigned to object index 0x2026, subindex 0x06

Subitem 0x0008 – Velocity comparison – limit value 2

Subitem index: 0x0008

Subitem description

Assigned to object index 0x2026, subindex 0x07

7.8.3 Object 0x1C00 – Sync Manager communication type

Object index: 0x1C00

Tab. 7.9: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Sync Manager communication type	RECORD	6	R	--	--	--
0x0000	Number of entries	UINT8	1	R	0	4	4
0x0001	Communication type Sync Manager 0	UINT8	1	R	--	--	1

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
0x0002	Communication type Sync Manager 1	UINT8	1	R	--	--	2
0x0003	Communication type Sync Manager 2	UINT8	1	R	--	--	3
0x0004	Communication type Sync Manager 3	UINT8	1	R	--	--	4

Tab. 7.10: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2	Communication type Sync Manager 0							
0x0002	3	Communication type Sync Manager 1							
0x0003	4	Communication type Sync Manager 2							
0x0004	5	Communication type Sync Manager 3							

Object description

This object defines which Sync Manager uses which data channel.

Note from the ETG specification:

The Sync Manager communication type is described as follows:

- Communication type Sync Manager 0: 1 Receive Mailbox (EtherCAT master to EtherCAT slave)
- Communication type Sync Manager 1: 2 Send Mailbox (EtherCAT master to EtherCAT slave)
- Communication type Sync Manager 2: 3 Process data output (EtherCAT master to EtherCAT slave)
- Communication type Sync Manager 3: 4 Process data input (EtherCAT slave to EtherCAT master)

If mailbox is not supported, the object is used as follows:

Communication type Sync Manager 0: 3 Process data output (EtherCAT master to EtherCAT slave)

Communication type Sync Manager 1: 4 Process data input (EtherCAT slave to EtherCAT master)

Subitem 0x0000 – Number of objects in this PDO

Subitem index: 0x0000

Subitem 0x0001 – Communication type Sync Manager 0

Subitem index: 0x0001

0: not used

1: Receive Mailbox (master to slave)

2: Send mailbox (slave to master)

3: Process data output (master to slave)

4: Process data input (slave to master)

Subitem 0x0002 – Communication type Sync Manager 1

Subitem index: 0x0002

0: not used

1: Receive Mailbox (master to slave)

2: Send Mailbox (slave to master)

3: Process data output (master to slave)

4: Process data input (slave to master)

Subitem 0x0003 – Communication type Sync Manager 2

Subitem index: 0x0003

0: not used

1: Receive Mailbox (master to slave)

2: Send mailbox (slave to master)

3: Process data output (master to slave)

4: Process data input (slave to master)

Subitem 0x0004 – Communication type Sync Manager 3

Subitem index: 0x0004

0: not used

1: Receive Mailbox (master to slave)

2: Send mailbox (slave to master)

3: Process data output (master to slave)

4: Process data input (slave to master)

7.8.4 Object 0x1C12 – Sync Manager 2 PDO assignment

Object index: 0x1C12

Tab. 7.11: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Sync Manager 2 PDO task	RECORD	4	R	--	--	--
0x0000	Number of entries	UINT8	1	RW	0x00	0x01	0x01
0x0001	PDO assignment object index of the assigned PDO	UINT16	2	RW	0x1600	0x1607	0x1602

Tab. 7.12: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2	PDO assignment object index of the assigned PDO (high byte)							
	3	PDO assignment object index of the assigned PDO (low byte)							

Object description:

This object defines the receive PDO objects assigned to Sync Manager 2 and enables the assignment of 1 Receive-PDO.

NOTICE	
	ETG specification Sub-objects are writable if variable PDO assignment is supported.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem description

Number of assigned RxPDOs.

Writable only in the *PRE-OPERATIONAL* state.

Subitem 0x0001 – PDO assignment object index of the assigned PDO

Subitem index: 0x0001

Subitem description

Assigned PDO:

0x1600: RxPDO 1

0x1601: RxPDO 2

...

Writable only in the *PRE-OPERATIONAL* state.

7.8.5 Object 0x1C13 – Sync Manager 3 PDO assignment

Object index: 0x1C13

Tab. 7.13: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Sync Manager 3 PDO task	RECORD	4	R	--	--	--
0x0000	Number of entries	UINT8	1	R	0x00	0x01	0x01
0x0001	PDO assignment object index of the assigned PDO	UINT16	2	R	0x1A00	0x1A07	0x1A02

Tab. 7.14: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2	PDO assignment object index of the assigned PDO (high byte)							
	3	PDO assignment object index of the assigned PDO (low byte)							

Object description:

This object defines the receive PDO objects assigned to Sync Manager 3 and allows for the assignment of 1 Receive-PDO.

NOTICE	
	ETG specification Sub-objects are writable if variable PDO assignment is supported.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem description

Number of assigned TxPDOs.

Writable only in the *PRE-OPERATIONAL* state.

Subitem 0x0001 – PDO assignment object index of the assigned PDO

Subitem index: 0x0001

Subitem description

Assigned PDO:

0x1A00: TxPDO 1

0x1A01: TxPDO 2

...

Writable only in the *PRE-OPERATIONAL* state.**7.8.6 Object 0x1C32 – Sync Manager 2 Parameter****Object index:** 0x1C32

Tab. 7.15: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Sync Manager 2 Parameter	RECORD	62	R	--	--	--
0x0000	Number of synchronization parameters	UINT8	1	R	--	--	32
0x0001	Synchronization type	UINT16	2	RW	--	--	1
0x0002	Cycle time	UINT32	4	RW	--	--	0
0x0004	Supported synchronization types	UINT16	2	R	--	--	6
0x0005	Minimum cycle time	UINT32	4	R	--	--	1000000
0x000B	SM event missed	UINT16	2	R	--	--	0
0x000C	Cycle time too short	UINT16	2	R	--	--	0
0x0020	Sync error	BOOL	1	R	--	--	0

Tab. 7.16: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of synchronization parameters							
0x0001	2	Synchronization type (high byte)							
	3	Synchronization type (low byte)							
0x0002	4	Cycle time (high byte)							
	5	Cycle time							
	6	Cycle time							
	7	Cycle time (low byte)							
0x0004	12	Supported synchronization types (high byte)							
	13	Supported synchronization types (low byte)							
0x0005	14	Minimum cycle time (high byte)							
	15	Minimum cycle time							
	16	Minimum cycle time							
	17	Minimum cycle time (low byte)							
0x000B	36	SM event missed (high byte)							
	37	SM event missed (low byte)							
0x000C	38	Cycle time too short (high byte)							
	39	Cycle time too short (low byte)							

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0020	60								Sync error

Object description:

This object defines the parameters associated with Sync Manager 2.

The object, or the individual subindices, can be read from the EtherCAT master and supply the specified values. The corresponding writable values (RW) can be written.

Subitem 0x0000 – Number of synchronization parameters

Subitem index: 0x0000

Subitem 0x0001 – Synchronization type

Subitem index: 0x0001

Subitem description

Current Sync Manager 2 synchronization type:

0: not synchronized

1: Synchronized – synchronized with AL Event on this Sync Manager (SM2)

3: DC Sync0 – synchronized with AL Event Sync0

32: DC Sync1 – synchronized with the AL Event from SM0

33: SyncSM0 – synchronized with the AL Event from SM1

...

63: SyncSM31 – synchronized with AL Event Sync0

Subitem 0x0002 – Cycle time

Subitem index: 0x0002

Subitem description

Defines the time between two events in [ns].

Subitem 0x0004 – Supported synchronization types

Subitem index: 0x0004

Tab. 7.17: Subitem signal overview table

Signal address	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
0x0004	Supported synchronization types	UINT16	2	R	--	--	6
0.1	Synchronous	BOOL	1	--	0	1	1
0.2	DC Sync0	BOOL	1	--	0	1	1
0.3	DC Sync1	BOOL	1	--	0	1	0

Tab. 7.18: Signal overview table

0x0004	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	0					DC Sync1	DC Sync0	Synchronous	

Subitem description

Provides supported synchronization types for Sync Manager 2:

Bit 0 = 0

Bit 1 = **1: Synchronous** – Synchronization with AL Event on this Sync Manager (SM2) is supported

Bit 2 = **1: DC Sync0** – Synchronization with AL Event Sync0 **is supported**

Bit 3 = **0: DC Sync1** – Synchronizes with AL Event Sync1 **is not supported**

Signal – Synchronous

This bit determines whether synchronization with AL Event is supported by this Sync Manager.

0: Is not supported

1: Is supported

Signal – DC Sync0

This bit determines whether synchronization with AL Event is supported via Sync0.

0: Is not supported

1: Is supported

Signal – DC Sync1

This bit determines whether synchronization with the AL Event is supported via Sync1.

0: Is not supported

1: Is supported

Subitem 0x0005 – Minimum cycle time

Subitem index: 0x0005

Subitem description specifies the minimum time between two events in [ns].

Subitem 0x000B – SM Event missed

Subitem index: 0x000B

Subitem description: SM Event missed

Subitem 0x000C – Cycle time too short

Subitem index: 0x000C

Subitem description Cycle time too short

Subitem 0x0020 – Sync error

Subitem index: 0x0020

Subitem description synchronization error

7.8.7 Object 0x1C33 – Sync Manager 3 Parameter

Object index: 0x1C33

Tab. 7.19: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Sync Manager 3 Parameter	RECORD	62	R	--	--	--
0x0000	Number of synchronization parameters	UINT8	1	R	--	--	32
0x0001	Synchronization type	UINT16	2	RW	--	--	1
0x0002	Cycle time	UINT32	4	RW	--	--	0
0x0004	Supported synchronization types	UINT16	2	R	--	--	6
0x0005	Minimum cycle time	UINT32	4	R	--	--	1000000
0x000B	SM event missed	UINT16	2	R	--	--	0
0x000C	Cycle time too short	UINT16	2	R	--	--	0

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
0x0020	Sync error	BOOL	1	R	--	--	0

Tab. 7.20: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of synchronization parameters							
0x0001	2	Synchronization type (high byte)							
	3	Synchronization type (low byte)							
0x0002	4	Cycle time (high byte)							
	5	Cycle time							
	6	Cycle time							
	7	Cycle time (low byte)							
0x0004	12	Supported synchronization types (high byte)							
	13	Supported synchronization types (low byte)							
0x0005	14	Minimum cycle time (high byte)							
	15	Minimum cycle time							
	16	Minimum cycle time							
	17	Minimum cycle time (low byte)							
0x000B	36	SM event missed (high byte)							
	37	SM event missed (low byte)							
0x000C	38	Cycle time too short (high byte)							
	39	Cycle time too short (low byte)							
0x0020	60								Sync error

Object description:

This object defines the parameters associated with Sync Manager 3.

The object, or the individual subindices, can be read from the EtherCAT master and supply the specified values. The corresponding writable values (RW) can be written.

Subitem 0x0000 – Number of synchronization parameters

Subitem index: 0x0000

Subitem 0x0001 – Synchronization type

Subitem index: 0x0001

Subitem description

Current Sync Manager 3 synchronization type:

0: Not synchronized

1: Synchronized – synchronized with AL Event on this Sync Manager (SM3)

2: DC Sync0 – synchronized with AL Event Sync0

3: DC Sync0 — synchronized with AL Event Sync1

32: DC Sync1 – synchronized with the AL Event from SM0

33: SyncSM0 – synchronized with the AL Event from SM1

...

63: SyncSM31 – synchronized with AL Event from SM31

Subitem 0x0002 – Cycle time**Subitem index:** 0x0002**Subitem description**

Defines the time between two events in [ns].

Subitem 0x0004 – Supported synchronization types**Subitem index:** 0x0004**Subitem description**

Provides supported synchronization types for Sync Manager 3:

Bit 0 = 0

Bit 1 = **1: Synchronous** – Synchronization with AL Event on this Sync Manager (SM3) **is supported**Bit 2 = **1: DC Sync0** – Synchronization with AL Event Sync0 **is supported**Bit 3 = **0: DC Sync1** – Synchronizes with AL Event Sync1 **is not supported****Subitem 0x0005 – Minimum cycle time****Subitem index:** 0x0005**Subitem description**

Returns the minimum time between two events in [ns].

Subitem 0x000B – SM Event missed**Subitem index:** 0x000B**Subitem description**

SM event missed

Subitem 0x000C – Cycle time too short**Subitem index:** 0x000C**Subitem description**

Cycle time too short

Subitem 0x0020 – Sync error**Subitem index:** 0x0020**Subitem description**

Synchronization error

7.9 Device-specific objects**7.9.1 Object 0x2000 – Position value****Object index:** 0x2000

Tab. 7.21: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Position value	RECORD	8	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	6	6
0x0001	Sign	BIT1	1	RW	0	1	0
0x0002	Unit	BIT1	1	RW	0	1	0
0x0003	Resolution	BIT3	3	RW	1	5	4
0x0004	Counting direction	BIT1	1	RW	0	1	0
0x0005	Offset	INT32	4	RW	-999999	999999	0
0x0006	Filter type	BIT3	3	RW	0	3	0

Tab. 7.22: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001 0x0002 0x0003 0x0004	2			Counting direction	Resolution			On	Sign
0x0005	3	Offset (high byte)							
	4	Offset							
	5	Offset							
	6	Offset (low byte)							
0x0006	7						Filter type		

Object description:

The position value object describes the following entries:

- Sign for negative position values
- Unit of the position value, metric or inch
- Resolution of the position value
- Counting direction of the position value
- Possible offset value
- Possible filter type

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Sign

Subitem index: 0x0001

Subitem description

Output mode of the sign

The sign affects the position and velocity signals.

0: Two's complement

1: Sign + magnitude

Subitem 0x0002 – Unit

Subitem index: 0x0002

Subitem description

Unit selection.

This parameter applies to all values with units. The parameter applies to all interfaces.

0: Metric – mm

1: Imperial – in/100

Subitem 0x0003 – Resolution

Subitem index: 0x0003

Subitem description

Resolution in mm or in/100, depending on the selected unit.

This parameter affects only the EtherCAT output value.

001 = 1: 0.001

010 = 2: 0.01

011 = 3: 0.1

100 = 4: 1

101 = 5: 10

The resolution has no effect on the following values.

- Position limit values
- Static preset
- Offset

NOTICE



Encoder specification DS406 specifies that the counting direction can be set in object 6000 bit 3. Object 2000 subindex 04 and object 6000 bit 3 overwrite each other.

The counting direction changes the sign during velocity measurement.

No negative position values can be transmitted on the EtherCAT interface. In this case, the value 0 is output on the EtherCAT interface.

✎ Select a suitable offset so that only positive values are transmitted.

Subitem 0x0004 – Counting direction

Subitem index: 0x0003

Subitem description

This parameter defines the counting direction for the position and velocity values.

0: Positive

1: Negative

Positive counting direction: The value increases positively from zero as the distance to the sensor increases. Negative counting direction: The value decreases (enters the negative range) from zero as the distance to the sensor increases.

NOTICE



Encoder specification DS406 specifies that the counting direction can be set in object 6000 bit 3. Object 2000 subindex 04 and object 6000 bit 3 overwrite each other.

The counting direction changes the sign during velocity measurement.

No negative position values can be transmitted on the EtherCAT interface. In this case, the value 0 is output on the EtherCAT interface.

✎ Select a suitable offset so that only positive values are transmitted.

Subitem 0x0005 – Offset

Subitem index: 0x0005

Subitem description

This parameter contains the offset value in mm or in/100 for calculating the position value.

Output value = measurement value + offset

The parameter applies to all interfaces.

NOTICE



If the preset is activated, this has priority over the offset. Preset and offset are not offset against each other.

The resolution of the offset value is independent of the resolution selected in module 1. The entered offset applies immediately without any further release.

Subitem 0x0006 – Filter type

Sets a filter type for post-processing measured values.

The type of filter used can optimize repeatability in the application.

000 = 0: Normal

001 = 1: High

010 = 2: Slow

011 = 3: Compatibility mode

NOTICE



With filters 0, 1, and 2, there is no dynamic measurement error (contouring error).
The dynamic measurement error must only be taken into account when the filter setting is 011: Compatibility Mode with AMS 300.

7.9.2 Object 0x2001 – Static preset

Object index: 0x2001

Tab. 7.23: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Static preset	RECORD	7	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	2	2
0x0001	Preset value	INT32	4	RW	-999999	999999	0
0x0002	Preset settings	BIT2	2	RW	0	2	0

Tab. 7.24: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2	Preset value (high byte)							
	3	Preset value							
	4	Preset value							
	5	Preset value (low byte)							
0x0002	6							Preset settings	

Object description:

The static preset value is a parameter that is no longer changed after the system has been handed over to the end operating company. It is configured during commissioning and then remains unchanged. A preset value can be entered in the object. The preset value is activated by “Preset teach” and deactivated with “Preset reset”. After the preset teach cycle, the current position value is compared to the configured preset value. After a preset reset, the original measurement value is displayed.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Preset value

Subitem index: 0x0001

Subitem description

Preset value in mm or in/100

The value is accepted during a corresponding teach event (see Output data).

The resolution of the preset value is independent of the resolution selected in the position value object.

Subitem 0x0002 – Preset settings

Subitem index: 0x0002

Subitem description

1: Preset teach

2: Preset reset

7.9.3 Object 0x2010 – Position limit value 1

Object index: 0x2010

Tab. 7.25: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Position limit value 1	RECORD	11	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	3	3
0x0001	Release of position limit value 1	BIT1	1	RW	0	1	0
0x0002	Lower position limit 1	INT32	4	RW	-999999	999999	0
0x0003	Upper position limit 1	INT32	4	RW	-999999	999999	0

Tab. 7.26: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2								Release position limit value 1
0x0002	3	Lower position limit 1 (high byte)							
	4	Lower position limit 1							
	5	Lower position limit 1							
	6	Lower position limit 1 (low byte)							
0x0003	7	Upper position limit 1 (high byte)							
	8	Upper position limit 1							
	9	Upper position limit 1							
	10	Upper position limit 1 (low byte)							

Object description:

The "Position limit value range 1" object defines a distance range with lower and upper limit. If the measured value is outside the configured range, the corresponding status bits are set in the objects 0x2050, 0x2051 und 0x2060.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Release position limit value 1

Subitem index: 0x0001

Subitem description

This sub-object is used to activate or deactivate limit values.

0: Deactivated

1: Activated

Subitem 0x0002 – Lower position limit 1

Subitem index: 0x0002

Subitem description

Specifies the lower position limit in mm or in/100.

The resolution of the preset value is independent of the resolution selected in the object *Position value*.

Subitem 0x0003 – Upper position limit 2

Subitem index: 0x0003

Subitem description

Specifies the upper position limit in mm or in/100.

The resolution of the preset value is independent of the resolution selected in the object *Position value*.

7.9.4 Object 0x2011 – Position limit value 2

Object index: 0x2011

Tab. 7.27: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Position limit value 2	RECORD	11	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	3	3
0x0001	Release of position limit value 2	BIT1	1	RW	0	1	0
0x0002	Lower position limit 2	INT32	4	RW	-999999	999999	0
0x0003	Upper position limit 2	INT32	4	RW	-999999	999999	0

Tab. 7.28: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2								Release of position limit value 2
0x0002	3	Lower position limit 2 (high byte)							
	4	Lower position limit 2							
	5	Lower position limit 2							
	6	Lower position limit 2 (low byte)							
0x0003	7	Upper position limit 2 (high byte)							
	8	Upper position limit 2							
	9	Upper position limit 2							
	10	Upper position limit 2 (low byte)							

Object description:

The “Position limit value range 2” object defines a distance range with lower and upper limit. If the measured value is outside the configured range, the corresponding status bits are set in the objects 0x2050, 0x2051 und 0x2060.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Release position limit value 2**Subitem index:** 0x0001**Subitem description**

This sub-object is used to activate or deactivate limit values.

0: Deactivated

1: Activated

Subitem 0x0002 – Lower position limit 2**Subitem index:** 0x0002**Subitem description**

Specifies the lower position limit in mm or in/100.

The resolution of the preset value is independent of the resolution selected in the object *Position value*.

Subitem 0x0003 – Upper position limit 2**Subitem index:** 0x0003**Subitem description**

Specifies the upper position limit in mm or in/100.

The resolution of the preset value is independent of the resolution selected in the object *Position value*.

7.9.5 Object 0x2020 – Velocity**Object index:** 0x2020

Tab. 7.29: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Velocity	RECORD	7	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	3	3
0x0001	Velocity resolution	BIT3	3	RW	1	4	1
0x0002	Averaging	BIT3	3	RW	0	5	3
0x0003	Speed value	INT32	4	R	-999999	999999	0

Tab. 7.30: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001 0x0002	2			Averaging			Velocity resolution		
0x0003	3	Velocity value (high byte)							
	4	Speed value							
	5	Velocity value							
	6	Velocity value (low byte)							

Object description:

Outputs the current velocity with the configured resolution. The unit (metric or inch) is set in object 2000 subindex 02 and also applies to the velocity. If no change is made in object 2000 subindex 02, the AMS 138i uses the default setting "metric".

The sign of the velocity is dependent on the counting direction in object 2000 subindex 04.

In the default setting, a positive velocity is output when the reflector moves away from the AMS 138i. When the reflector moves toward the AMS 138i, negative velocities are output. If the “negative” counting direction is configured in object 2000 subindex 04, the velocity sign is reversed.

The response time for the velocity averages all calculated velocity values over the set time to form one velocity value. This averaged velocity value is output via the interface.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Velocity resolution

Subitem index: 0x0001

Subitem description

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

1: 1

2: 10

3: 100

4: 1000

Subitem 0x0002 – Averaging

Subitem index: 0x0002

Subitem description

The parameter specifies the response time (averaging time) of the calculated velocity values.

You can find the device’s averaging time in the technical data.

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

Subitem 0x0003 – Velocity value

Subitem index: 0x0003

Subitem description

The velocity is mapped to process data object 0x1A02.

7.9.6 Object 0x2021 – Velocity limit value 1

Object index: 0x2021

Tab. 7.31: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Velocity limit value 1	RECORD	15	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	7	7
0x0001	Switching type	BIT1	1	RW	0	1	0
0x0002	Direction selection	BIT1	1	RW	0	1	0
0x0003	Velocity monitoring	BIT1	1	RW	0	1	0

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
0x0004	Limit value check	UINT16	2	RW	0	20000	0
0x0005	Limit value 1 hysteresis	UINT16	2	RW	0	20000	100
0x0006	Monitoring as of position start	INT32	4	RW	-999999	999999	0
0x0007	Monitoring up to position end	INT32	4	RW	-999999	999999	0

Tab. 7.32: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001 0x0002 0x0003	2						Velocity monitoring	Direction selection	Switching type
0x0004	3	Limit value check (high byte)							
	4	Limit value check (low byte)							
0x0005	5	Limit value 1 hysteresis (high byte)							
	6	Limit value 1 hysteresis (low byte)							
0x0006	7	Monitoring as of position start (high byte)							
	8	Monitoring as of position start							
	9	Monitoring as of position start							
	10	Monitoring as of position start (low byte)							
0x0007	11	Monitoring up to position end (high byte)							
	12	Monitoring up to position end							
	13	Monitoring up to position end							
	14	Monitoring up to position end (low byte)							

Object description:

Objects 2021 and 2022 enable comparison of the velocity currently measured by the AMS 138i, with a limit value stored in the respective object.

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

If a direction-dependent limit value check is activated via the Direction selection parameter, the values of position start and position end also define the direction.

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

If the check is independent of direction, the order of position start and position end is irrelevant. Depending on the selected switching type, if the value is above or below the defined limits, the limit value status in object 2026 is set and, if configured, the switching output is set via object 2050 or 2051.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Switching type**Subitem index:** 0x0001**Subitem description**

Switching type

0: Velocity above upper limit

1: Velocity below lower limit

Subitem 0x0002 – Direction selection**Subitem index:** 0x0002**Subitem description**

Direction selection

0: Velocity monitoring not direction-dependent

1: Velocity monitoring direction-dependent

Subitem 0x0003 – Velocity monitoring**Subitem index:** 0x0003**Subitem description**

Velocity monitoring

0: Deactivated

1: Activated

Subitem 0x0004 – Limit value check**Subitem index:** 0x0004**Subitem 0x0005 – Limit value 1 hysteresis****Subitem index:** 0x0005**Subitem 0x0006 – Monitoring as of position start****Subitem index:** 0x0006**Subitem 0x0007 – Monitoring up to position end****Subitem index:** 0x0007**7.9.7 Object 0x2022 – Velocity limit value 2****Object index:** 0x2022

Tab. 7.33: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Velocity limit value 2	RECORD	15	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	7	7
0x0001	Switching type	BIT1	1	RW	0	1	0
0x0002	Direction selection	BIT1	1	RW	0	1	0
0x0003	Velocity monitoring	BIT1	1	RW	0	1	0
0x0004	Limit value check	UINT16	2	RW	0	20000	0
0x0005	Limit value 2 hysteresis	UINT16	2	RW	0	20000	100
0x0006	Monitoring as of position start	INT32	4	RW	-999999	999999	0
0x0007	Monitoring up to position end	INT32	4	RW	-999999	999999	0

Tab. 7.34: Subitem overview table

Subitm. Index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001 0x0002 0x0003	2						Velocity monitoring	Direction selection	Switching type
0x0004	3	Limit value check (high byte)							
	4	Limit value check (low byte)							
0x0005	5	Limit value 2 hysteresis (high byte)							
	6	Limit value 2 hysteresis (low byte)							
0x0006	7	Monitoring as of position start (high byte)							
	8	Monitoring as of position start							
	9	Monitoring as of position start							
	10	Monitoring as of position start (low byte)							
0x0007	11	Monitoring up to position end (high byte)							
	12	Monitoring up to position end							
	13	Monitoring up to position end							
	14	Monitoring up to position end (low byte)							

Object description:

Objects 2021 and 2022 enable comparison of the velocity currently measured by the AMS 138i, with a limit value stored in the respective object.

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

If a direction-dependent limit value check is activated via the Direction selection parameter, the values of position start and position end also define the direction.

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

If the check is independent of direction, the order of position start and position end is irrelevant. Depending on the selected switching type, if the value is above or below the defined limits, the limit value status in object 2026 is set and, if configured, the switching output is set via object 2050 or 2051.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Switching type

Subitem index: 0x0001

Subitem description

Switching type

0: Velocity above upper limit

1: Velocity below lower limit

Subitem 0x0002 – Direction selection

Subitem index: 0x0002

Subitem description

Direction selection

0: Velocity monitoring not direction-dependent

1: Velocity monitoring direction-dependent

Subitem 0x0003 – Velocity monitoring**Subitem index:** 0x0003**Subitem description**

Velocity monitoring

0: Deactivated

1: Activated

Subitem 0x0004 – Limit value check**Subitem index:** 0x0004**Subitem 0x0005 – Limit value 2 hysteresis****Subitem index:** 0x0005**Subitem 0x0006 – Monitoring as of position start****Subitem index:** 0x0006**Subitem 0x0007 – Monitoring up to position end****Subitem index:** 0x0007**7.9.8 Object 0x2026 – Velocity status****Object index:** 0x2026

Tab. 7.35: Object and subitem overview table

Subitem index		Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Velocity status	RECORD	3	R	--	--	--
0x0000	Number of entries	UINT8	1	R	0	7	7
0x0001	Velocity measurement error	BIT1	1	R	0	1	--
0x0002	Movement status	BIT1	1	R	0	1	--
0x0003	Movement status (pos./neg. direction)	BIT1	1	R	0	1	--
0x0004	Velocity limit value status 1	BIT1	1	R	0	1	--
0x0005	Velocity limit value status 2	BIT1	1	R	0	1	--
0x0006	Velocity comparison limit value 1	BIT1	1	R	0	1	--
0x0007	Velocity comparison limit value 2	BIT1	1	R	0	1	--

Tab. 7.36: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0001	2		Velocity comparison limit value 2	Velocity comparison limit value 1	Velocity limit value status 2	Velocity limit value status 1	Movement status (pos./neg. direction)	Movement status	Velocity measurement error
0x0002									
0x0003									
0x0004									
0x0005									
0x0006									
0x0007									

Object description:

This module provides the EtherCAT master with various status information relating to velocity measurement.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Velocity measurement error

Subitem index: 0x0001

Subitem description

0: OK

1: Error

Subitem 0x0002 – Movement status

Subitem index: 0x0002

Subitem description

0: No movement

1: Movement

Subitem 0x0003 – Movement status (pos./neg. direction)

Subitem index: 0x0003

Subitem description

0: Positive direction

1: Negative direction

Subitem 0x0004 – Velocity limit value 1

Subitem index: 0x0004

Subitem description

0: Limit value observed

1: Limit value violated

Subitem 0x0005 – Velocity limit value status 2

Subitem index: 0x0005

Subitem description

0: Limit value observed

1: Limit value violated

Subitem 0x0006 – Velocity comparison – limit value 1

Subitem index: 0x0006

Subitem description

0: Comparison not active

1: Comparison active

Subitem 0x0007 – Velocity comparison – limit value 2**Subitem index:** 0x0007**Subitem description**

0: Comparison not active

1: Comparison active

7.9.9 Object 0x2050 – I/O 1 input/output**Object index:** 0x2050

Tab. 7.37: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	I/O 1 input/output	RECORD	6	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	11	11
0x0001	Function	BIT1	1	RW	0	1	1
0x0002	Activation	BIT1	1	RW	0	1	0
0x0003	Position limit value 1	BIT1	1	RW	0	1	0
0x0004	Position limit value 2	BIT1	1	RW	0	1	0
0x0005	Velocity limit value	BIT1	1	RW	0	1	0
0x0006	Intensity (ATT)	BIT1	1	RW	0	1	0
0x0007	Temperature (TMP)	BIT1	1	RW	0	1	0
0x0008	Laser (LSR)	BIT1	1	RW	0	1	0
0x0009	Plausibility (PLB)	BIT1	1	RW	0	1	1
0x000A	Hardware (ERR)	BIT1	1	RW	0	1	1
0x000B	Input control	BIT2	2	RW	0	2	0

Tab. 7.38: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2							Activa- tion	Function
0x0002									
0x0003	3	Hard- ware (ERR)	Plausibil- ity (PLB)	Laser (LSR)	Temper- ature (TMP)	Intensity (ATT)	Velocity limit value	Position limit value 2	Position limit value 1
0x0004									
0x0005									
0x0006									
0x0007									
0x0008									
0x0009									
0x000A									
0x000B	5							Input control	

Object description:The module defines the mode of operation of the digital input/output **I/O 1**.

The parameters set in bytes 1 and 2 define which event triggers the output data. The individual functions are OR-linked.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Function

Subitem index: 0x0001

Subitem description

Bit 0: This parameter defines whether I/O 1 functions as an input or an output.

0: Input

1: Output

Subitem 0x0002 – Activation

Subitem index: 0x0002

Subitem description

Bit 1: This parameter defines the threshold at which the event is triggered at the output.

If I/O 1 is defined as input (see bit 0):

0 = 1 - 0 transition

1 = 0 - 1 transition

If I/O 1 is defined as output (see bit 0):

0 = Low active (the output is set to 0 if the event occurs)

1 = high active (the output is set to 1 if the event occurs)

Subitem 0x0003 – Position limit value 1

Subitem index: 0x0003

Subitem description

Bit 8: Position limit value 1

0: OFF

1: ON

Subitem 0x0004 – Position limit value 2

Subitem index: 0x0004

Subitem description

Bit 9: Position limit value 2

0: OFF

1: ON

Subitem 0x0005 – Velocity limit value

Subitem index: 0x0005

Subitem description

Bit 10: Velocity limit value

0: OFF

1: ON

Subitem 0x0006 – Intensity (ATT)

Subitem index: 0x0006

Subitem description

Bit 11: Intensity (ATT)

0: OFF

1: ON

Subitem 0x0007 – Temperature (TMP)**Subitem index:** 0x0007**Subitem description**

Bit 12: Temperature

0: OFF**1: ON****Subitem 0x0008 – Laser (LSR)****Subitem index:** 0x0008**Subitem description**

Bit 13: Laser

0: OFF**1: ON****Subitem 0x0009 – Plausibility (PLB)****Subitem index:** 0x0009**Subitem description**

Bit 14: Plausibility

0: OFF**1: ON****Subitem 0x000A – Hardware (ERR)****Subitem index:** 0x000A**Subitem description**

Bit 15: Hardware

0: OFF**1: ON****Subitem 0x00B – Input control****Subitem index:** 0x0009**Subitem description**

Bits 24–26: Input control

000 = 0: No function

001 = 1: Preset teach, applies to static preset

010 = 2: Laser OFF; laser diode is switched off

7.9.10 Object 0x2051 – I/O 2 input/output**Object index:** 0x2051

Tab. 7.39: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	I/O 2 input/output	RECORD	6	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	11	11
0x0001	Function	BIT1	1	RW	0	1	1
0x0002	Activation	BIT1	1	RW	0	1	0
0x0003	Position limit value 1	BIT1	1	RW	0	1	0
0x0004	Position limit value 2	BIT1	1	RW	0	1	0

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
0x0005	Velocity limit value	BIT1	1	RW	0	1	0
0x0006	Intensity (ATT)	BIT1	1	RW	0	1	0
0x0007	Temperature (TMP)	BIT1		RW	0	1	0
0x0008	Laser (LSR)	BIT1	1	RW	0	1	0
0x0009	Plausibility (PLB)	BIT1	1	RW	0	1	1
0x000A	Hardware (ERR)	BIT1	1	RW	0	1	1
0x000B	Input control	BIT2	2	RW	0	2	0

Tab. 7.40: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001 0x0002	2							Activa- tion	Function
0x0003 0x0004 0x0005 0x0006 0x0007 0x0008 0x0009 0x000A	3	Hard- ware (ERR)	Plausibil- ity (PLB)	Laser (LSR)	Temper- ature (TMP)	Intensity (ATT)	Velocity limit value	Position limit value 2	Position limit value 1
0x000B	5							Input control	

Object description:

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

The parameters set in bytes 1 and 2 define which event triggers the output data. The individual functions are OR-linked.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Function

Subitem index: 0x0001

Subitem description

Bit 0: This parameter defines whether I/O 2 functions as an input or an output.

0: Input

1: Output

Subitem 0x0002 – Activation

Subitem index: 0x0002

Subitem description

Bit 1: This parameter defines the threshold at which the event is triggered at the output.

If I/O 1 is defined as input (see bit 0):

0 = 1 - 0 transition

1 = 0 - 1 transition

If I/O 1 is defined as output (see bit 0):

0 = Low active (the output is set to 0 if the event occurs)

1 = high active (the output is set to 1 if the event occurs)

Subitem 0x0003 – Position limit value 1

Subitem index: 0x0003

Subitem description

Bit 8: Position limit value 1

0: OFF

1: ON

Subitem 0x0004 – Position limit value 2

Subitem index: 0x0004

Subitem description

Bit 9: Position limit value 2

0: OFF

1: ON

Subitem 0x0005 – Velocity limit value

Subitem index: 0x0005

Subitem description

Bit 10: Velocity limit value

0: OFF

1: ON

Subitem 0x0006 – Intensity (ATT)

Subitem index: 0x0006

Subitem description

Bit 11: Intensity (ATT)

0: OFF

1: ON

Subitem 0x0007 – Temperature (TMP)

Subitem index: 0x0007

Subitem description

Bit 12: Temperature

0: OFF

1: ON

Subitem 0x0008 – Laser (LSR)

Subitem index: 0x0008

Subitem description

Bit 13: Laser

0: OFF

1: ON

Subitem 0x0009 – Plausibility (PLB)

Subitem index: 0x0009

Subitem description

Bit 14: Plausibility

0: OFF

1: ON

Subitem 0x000A – Hardware (ERR)**Subitem index:** 0x000A**Subitem description**

Bit 15: Hardware

0: OFF

1: ON

Subitem 0x00B – Input control**Subitem index:** 0x0009**Subitem description**

Bits 24–26: Input control

000 = 0: No function

001 = 1: Preset teach, applies to static preset

010 = 2: Laser OFF; laser diode is switched off

7.9.11 Object 0x2060 – Status and control**Object index:** 0x2060

Tab. 7.41: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Status and control	RECORD	6	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	13	13
0x0001	Hardware error	BIT1	1	R	0	1	--
0x0002	Lower position limit 1	BIT1	1	R	0	1	--
0x0003	Upper position limit 1	BIT1	1	R	0	1	--
0x0004	Lower position limit 2	BIT1	1	R	0	1	--
0x0005	Upper position limit 2	BIT1	1 b	R	0	1	--
0x0006	Laser status	BIT1	1	R	0	1	--
0x0007	Preset status	BIT1	1	R	0	1	--
0x0008	Preset teach toggle	BIT1	1	R	0	1	--
0x0009	Intensity (ATT)	BIT1	1	R	0	1	--
0x000A	Temperature (TMP)	BIT1	1	R	0	1	--
0x000B	Laser (LSR)	BIT1	1	R	0	1	--
0x000C	Plausibility (PLB)	BIT1	1	R	0	1	--
0x000D	Laser ON/OFF	BIT1	1	RW	0	1	0

Tab. 7.42: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0001 0x0002 0x0003 0x0004 0x0005	2	Upper position limit 2	Lower position limit 2	Upper position limit 1	Lower position limit 1				Hardware error
0x0006 0x0007 0x0008 0x0009 0x000A 0x000B 0x000C	3		Plausibility (PLB)	Laser (LSR)	Temperature (TMP)	Intensity (ATT)	Preset teach toggle	Preset status	Laser status
0x000D	4								Laser ON/OFF

Object description:

This object provides the following status messages from the AMS 138i in subindex 0x01–0x0C.

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

In subindex 0x0D, the laser diode can be switched OFF/ON.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Hardware error

Subitem index: 0x0001

Subitem description

Bit 0: Hardware error (ERR).

0: OK

1: Error

Subitem 0x0002 – Lower position limit 1 monitoring

Subitem index: 0x0002

Subitem description

Bit 4: Monitoring of lower position limit value 1

0: OK

1: Value less than limit

Subitem 0x0003 – Upper position limit 1 monitoring**Subitem index:** 0x0003**Subitem description**

Bit 5: Monitoring of upper position limit value 1

0: OK

1: Value greater than limit

Subitem 0x0004 – Lower position limit 2 monitoring**Subitem index:** 0x0004**Subitem description**

Bit 6: Monitoring of lower position limit value 2

0: OK

1: Value less than limit

Subitem 0x0005 – Monitoring of upper position limit value 2**Subitem index:** 0x0005**Subitem description**

Bit 7: Monitoring of upper position limit value 2

0: OK

1: Value greater than limit

Subitem 0x0006 – Laser status**Subitem index:** 0x0006**Subitem description**

Bit 8: Laser status

0: OK

1: Laser OFF

Subitem 0x0007 – Preset status**Subitem index:** 0x0007**Subitem description**

Bit 9: Preset status

0: OK

1: Laser OFF

Subitem 0x0008 – Preset teach toggle**Subitem index:** 0x0008**Subitem description**

Bit 10: Preset teach (toggle bit)

This bit is toggled each time a preset value is taught in

Subitem 0x0009 – Intensity (ATT)**Subitem index:** 0x0009**Subitem description**

Bit 13: Intensity (ATT)

0: OK

1: Warning

Subitem 0x000A – Temperature (TMP)**Subitem index:** 0x000A**Subitem description**

Bit 14: Temperature (TMP)

0: OK

1:Warning

Subitem 0x000B – Laser (LSR)

Subitem index: 0x000B

Subitem description

Bit 15: Laser (LSR)

0: OK

1:Warning

Subitem 0x000C – Plausibility (PLB)

Subitem index: 0x000C

Subitem description

Bit 16: Plausibility (PLB)

0: OK

1: Error

Subitem 0x000D – Laser ON/OFF

Subitem index: 0x000D

Subitem description

0: Laser ON

1: Laser OFF

7.9.12 Object 0x2070 – Behavior of the AMS 138i in case of failure

Object index: 0x2070

Tab. 7.43: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Error handling procedures	RECORD	8	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	8	8
0x0001	Position value in the case of failure	BIT1	1	RW	0	1	1
0x0002	Suppress position status	BIT1	1	RW	0	1	1
0x0003	Error delay (position)	BIT1	1	RW	0	1	1
0x0004	Error delay time (position)	UINT16	2	RW	100	1000	100
0x0005	Velocity value in the case of failure	BIT1	1	RW	0	1	1
0x0006	Suppress velocity status	BIT1	1	RW	0	1	1
0x0007	Error delay (velocity)	BIT1	1	RW	0	1	1
0x0008	Error delay time (velocity)	UINT16	2	RW	200	1000	200

Tab. 7.44: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001 0x0002 0x0003	2					Error delay (position)	Suppress position status		Position value in the case of failure
0x0004	3	Error delay time (position) (high byte)							
	4	Error delay time (position) (low byte)							
0x0005 0x0006 0x0007	5					Error delay (velocity)	Suppress velocity status		Velocity value in the case of failure
0x0008	6	Error delay time (velocity) (high byte)							
	7	Error delay time (velocity) (low byte)							

Object description:

Behavior of the AMS 138i in case of failure

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Position value in case of failure

Subitem index: 0x0001

Subitem description

Bit 0: Position value in case of failure

0: Last valid value

1: Zero

Subitem 0x0002 – Suppress position status

Subitem index: 0x0002

Subitem description

Bit 2: Suppress position status

0: OFF

1: ON

Subitem 0x0003 – Error delay (position)

Subitem index: 0x0003

Subitem description

Bit 3: Error delay (position)

0: OFF

1: ON

Subitem 0x0004 – Error delay time (position)

Subitem index: 0x0004

Subitem 0x0005 – Velocity value in case of failure

Subitem index: 0x0005

Subitem description

Bit 0: Velocity value in case of failure

0: Last valid value

1: Zero**Subitem 0x0006 – Suppress velocity status****Subitem index:** 0x0006**Subitem description**

Bit 2: Suppress velocity status

0: OFF

1: ON**Subitem 0x0007 – Error delay (velocity)****Subitem index:** 0x0007**Subitem description**

Bit 3: Error delay (velocity)

0: OFF

1: ON**Subitem 0x0008 – Error delay time (velocity)****Subitem index:** 0x0008**7.9.13 Object 0x2300 – Other****Object index:** 0x2300

Tab. 7.45: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Other	RECORD	6	RW	--	--	--
0x0000	Number of entries	UINT8	1	R	0	5	5
0x0001	Display language selection	BIT3	3	RW	0	4	0
0x0002	Display illumination	BIT1	1	RW	0	1	1
0x0003	Password protection	BIT1	1	RW	0	1	0
0x0004	Password	UINT16	2	RW	0	999	0
0x0005	Heating control	BIT1	1	RW	0	1	0

Tab. 7.46: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0			
0x0000	0	Number of entries										
0x0001 0x0002 0x0003	2				Pass- word protec- tion	Display illumina- tion	Display language selection					
0x0004	3	Password (high byte)										
	4	Password (low byte)										
0x0005	5								Heating control			

Object description:

NOTICE	
	Password activation must be set to ON.
	Subindex 05 is available as standard, but functions only for devices with integrated heating (AMS 138i...H).

Explanation regarding subindex 05 Heating control

0: Standard (10°C – 15°C)

1 = Extended (30°C – 35°C)

Subindex 05 defines a switch-on/switch-off range for the heating control. The extended switch-on/switch-off range for heating may provide a remedy in the event of condensation problems. Due to the limited heating capacity, it cannot be guaranteed that no condensation will form on the optics in the extended switch-on/switch-off range.

Subitem 0x0000 – Number of entries

Subitem index: 0x0000

Subitem 0x0001 – Display language selection

Subitem index: 0x0001

Subitem description

0: English

1: German

2 = Italian

3: Spanish

4: French

Subitem 0x0002 – Display illumination

Subitem index: 0x0002

Subitem description

0: Always on

1: Off after 10 min

Subitem 0x0003 – Password protection

Subitem index: 0x0003

Subitem description

0: OFF

1: ON

Subitem 0x0004 – Password

Subitem index: 0x0004

Subitem 0x0005 – Heating control

Subitem index: 0x0005

Subitem description

0: Standard (10°C – 15°C)

1 = Extended (30°C – 35°C)

7.9.14 Objekt 0x2301 – Condition monitoring

Object index: 0x2300

Tab. 7.47: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Condition monitoring	RECORD	8	R	--	--	--
0x0000	Number of entries	UINT8	1	R	0	4	4
0x0001	Operating time [s]	UINT32	4	R	--	--	--
0x0002	Temperature	INT16	2	R	--	--	--

Tab. 7.48: Subitem overview table

Subitem index	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x0000	0	Number of entries							
0x0001	2	Operating time [s] (high byte)							
	3	Operating time [s]							
	4	Operating time [s]							
	5	Operating time [s] (low byte)							
0x0002	6	Temperature (high byte)							
	7	Temperature (low byte)							

Subitem 0x0000 – Number of entries**Subitem index:** 0x0000**Subitem 0x0001 – Operating time****Subitem index:** 0x0001**Subitem description**

Indicates the device's operating time in seconds.

Subitem 0x0002 – Temperature**Subitem index:** 0x0002**Subitem description**

Displays the device's temperature.

7.10 AMS 138i objects from the DS406 encoder profile**7.10.1 Object 0x6000 – Operating parameters****Object index:** 0x6000

Tab. 7.49: Object and subitem overview table

Signal address	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Operating parameters	BITARR16	2	RW	--	--	--
0.3	Counting direction	BIT1	1	--	0	1	0

Tab. 7.50: Subitem overview table

Signal address	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	0					Counting direction			

Object description:

The AMS 138i uses the CANopen profile. The profile allocates specified properties of the participant to defined object addresses.

The AMS 138i communicates in accordance with the specifications in the profile “DS406”.

Signal – Counting direction

Bit 3: Counting direction

0: Positive - The measurement value increases with increasing distance.

1: Negative - The measurement value decreases with decreasing distance.

7.10.2 Object 0x6004 – Position value

Object index: 0x6004

Tab. 7.51: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Position value	INT32	4	R	-999999	999999	--

Object description:

Object 6004h contains the position value for process data objects 0x1A00 (TPDO1).

7.10.3 Object 0x6500 – Display of operating status from object 6000

Object index: 0x6500

Tab. 7.52: Object and subitem overview table

Signal address	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Display of operating status from object 6000	BITARR16	2	R	--	--	--
0.3	Counting direction	BIT1	1	--	0	1	0

Tab. 7.53: Subitem overview table

Signal address	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	0					Counting direction			

Object description:

The AMS 138i uses the CANopen profile. The profile allocates specified properties of the participant to defined object addresses.

The AMS 138i communicates in accordance with the specifications in the profile “DS406”.

7.10.4 Object 6501 – Measurement value resolution

Object index: 0x6004

Tab. 7.54: Object and subitem overview table

Subitem index	Name	Data type	Length [bit]	Access	Min. value	Max. value	Default value
--	Measuring value resolution	UINT32	4	R	--	--	--

Object description:

The resolution set in object 2000 subindex 03 is specified in object 6501 as a multiple of 0.001 µm (1 nm).

The resolution of object 0x2000 subindex 03:

001 = 1: 0.001 -> 1,000 for object 6501

010 = 2: 0.01 -> 10,000 for object 6501

011 = 3: 0.1 -> 100,000 for object 6501

100 = 4: 1 -> 1,000,000 for object 6501

101 = 5: 10 -> 10,000,000 for object 6501

Example:

If the default resolution of 1 mm is set in object 0x2000, the resolution is converted to the value 1,000,000 for object 6501 ($1,000,000 \times 1/1,000,000 = 1$).

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 EtherCAT!

- ↳ You should **always** carry out the basic configuration via the ESI file (see chapter 7.5.3 "Device description file").
- In process operation, only the parameters in the EtherCAT modules set via the ESI file or the EtherCAT 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 EtherCAT. All parameters set via the ESI 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

Tab. 8.1: System requirements for the webConfig tool

Monitor	Min. resolution: 1280 x 800 pixels or higher
Internet browser	Recommended is a current version of: • Mozilla Firefox • Google Chrome • Microsoft Edge Note: Other Internet browsers are possible but have not been tested with the current device firmware.

NOTICE



- ↳ Regularly update the operating system and the Internet browser.
- ↳ Install the current Windows Service Packs.

Clear browser history

The cache of the Internet browser is to be cleared if different device types or devices with different firmware were connected to the webConfig tool.

- ↳ Delete cookies and temporary Internet and website data from browser history before starting the webConfig tool.

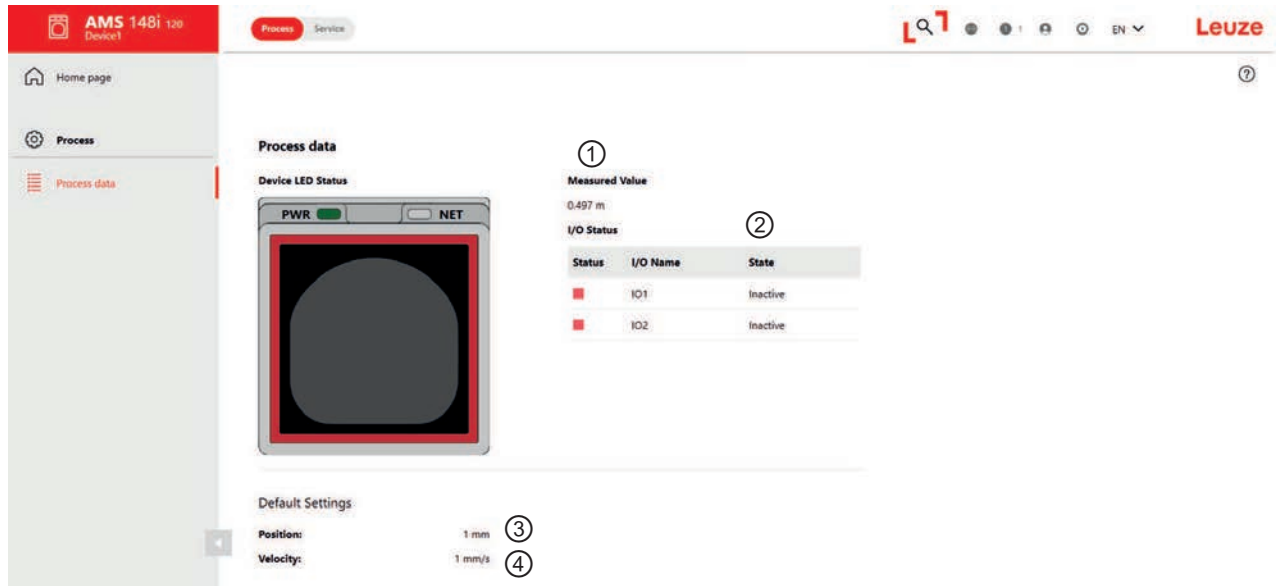
8.2 Start webConfig tool

NOTICE



The webConfig tool is only accessible on the AMS 138i 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

NOTICE	
	The webConfig tool always starts in <i>Process</i> 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:

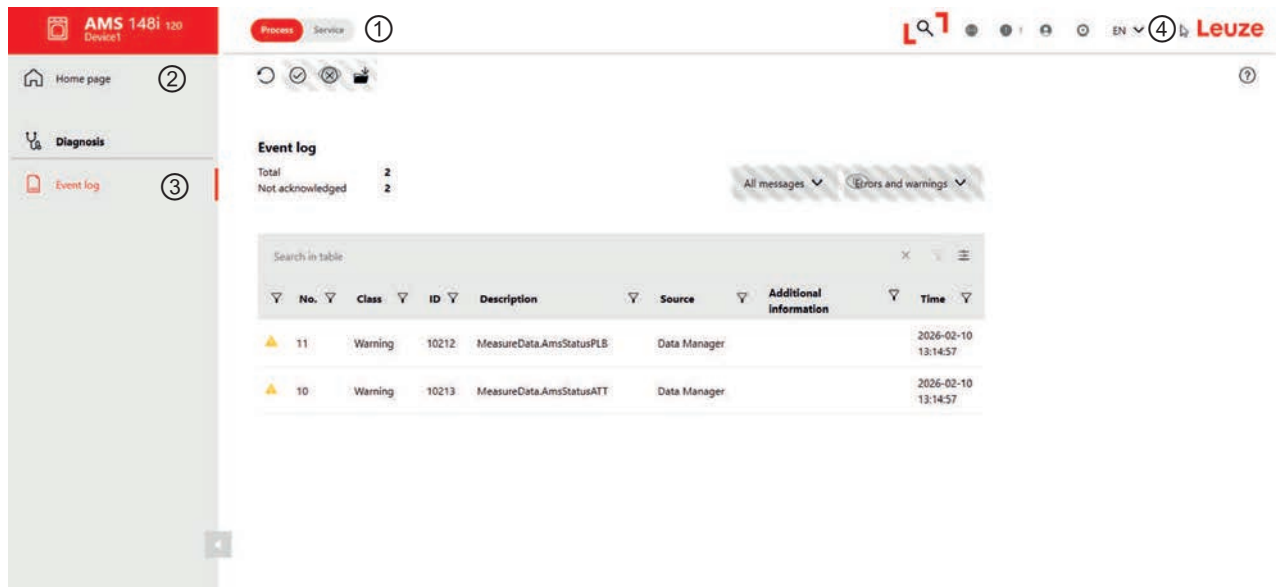
Process

- 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.

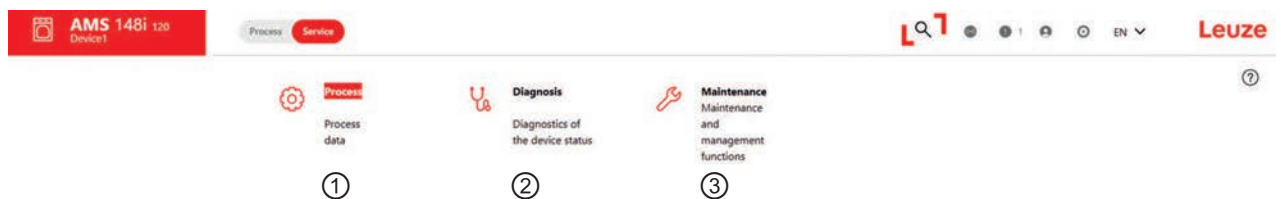


Fig. 8.3: webConfig menu overview

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 138i 40	AMS 138i 120	AMS 138i 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 "Commissioning – Ether-CAT 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	EtherCAT 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
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

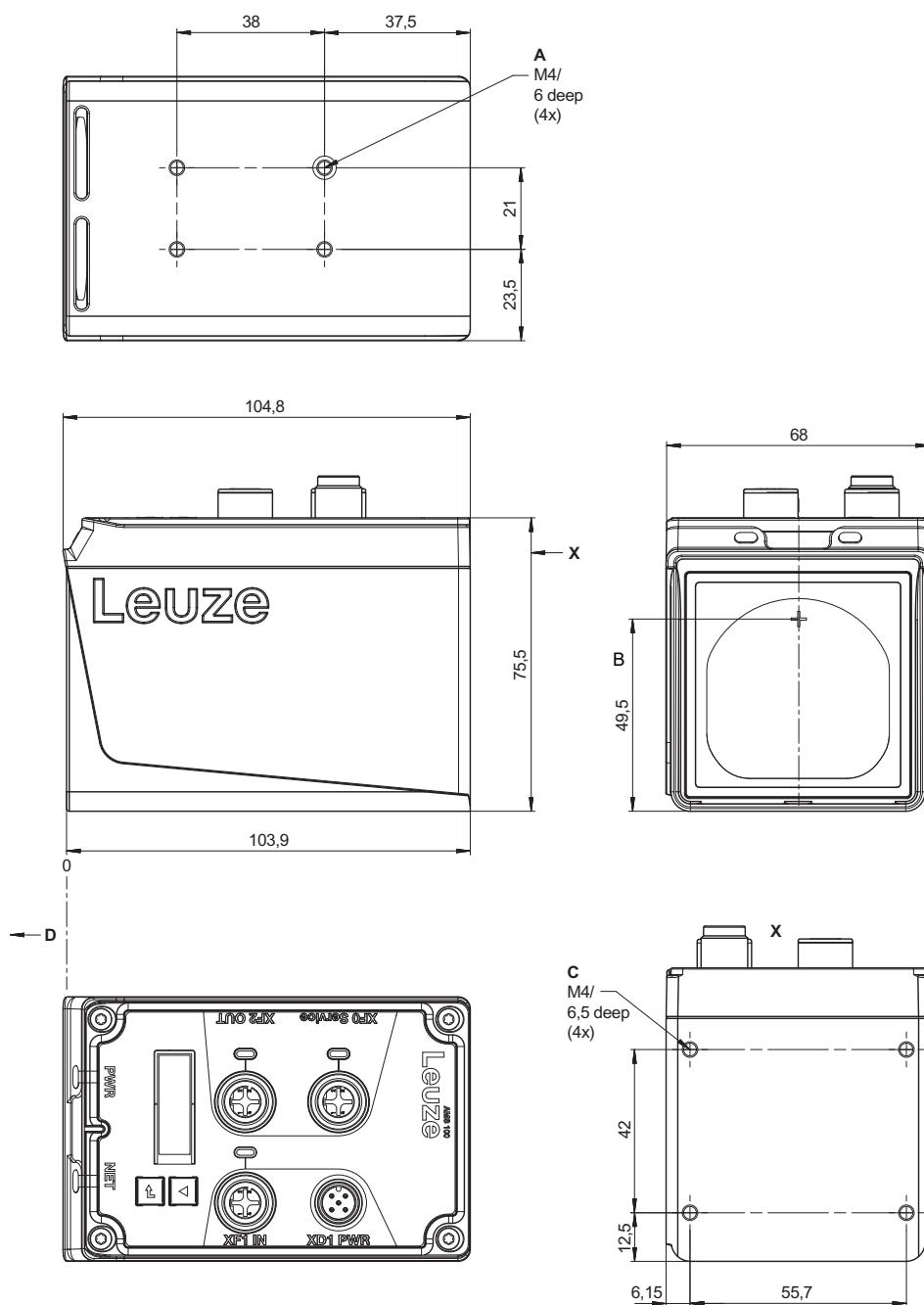
12.2.3 Reflective tape with heating

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 138i

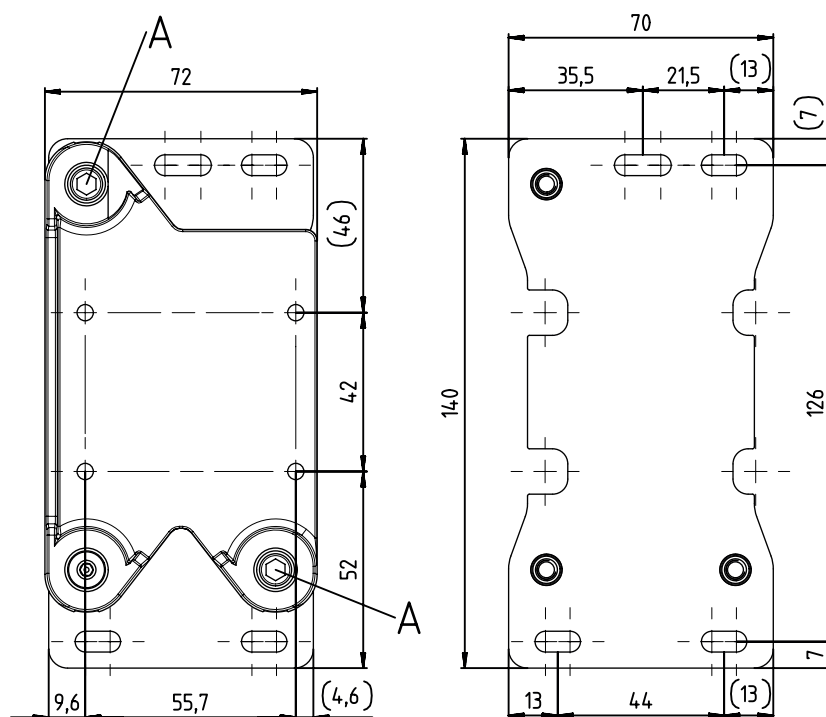


All dimensions in mm

- 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 138i

Alignment unit BTA 0100M or BTA 0100 M.5

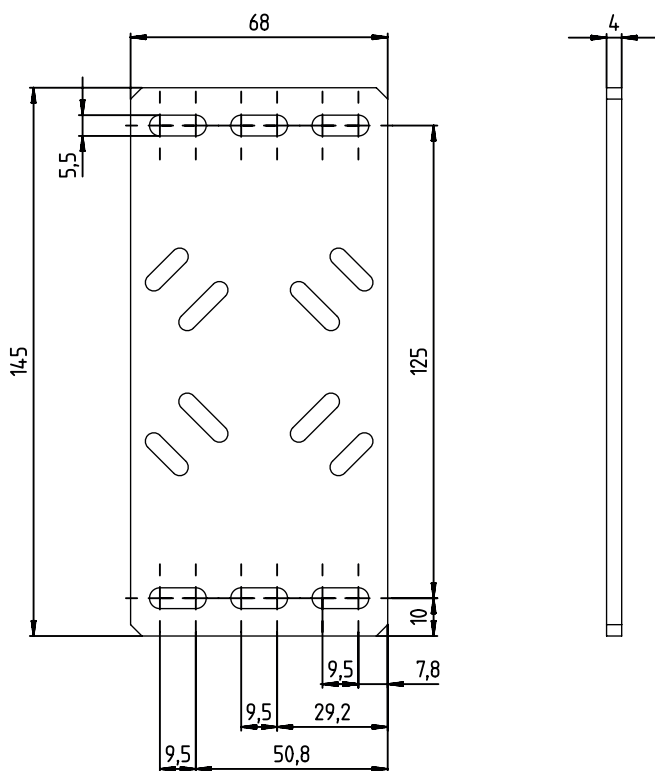


All dimensions in mm

A Adjustment screws with hexagon socket WAF4

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

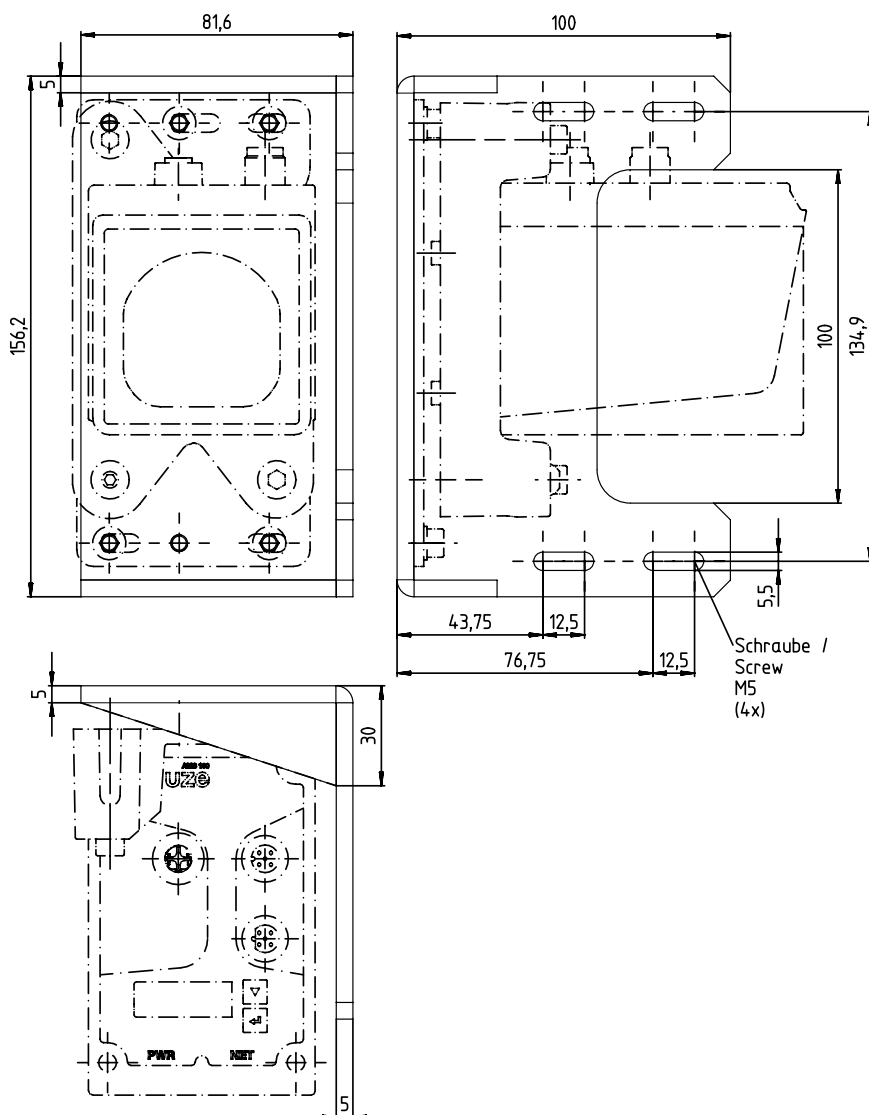
Adapter plate BT 0100M



All dimensions in mm

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

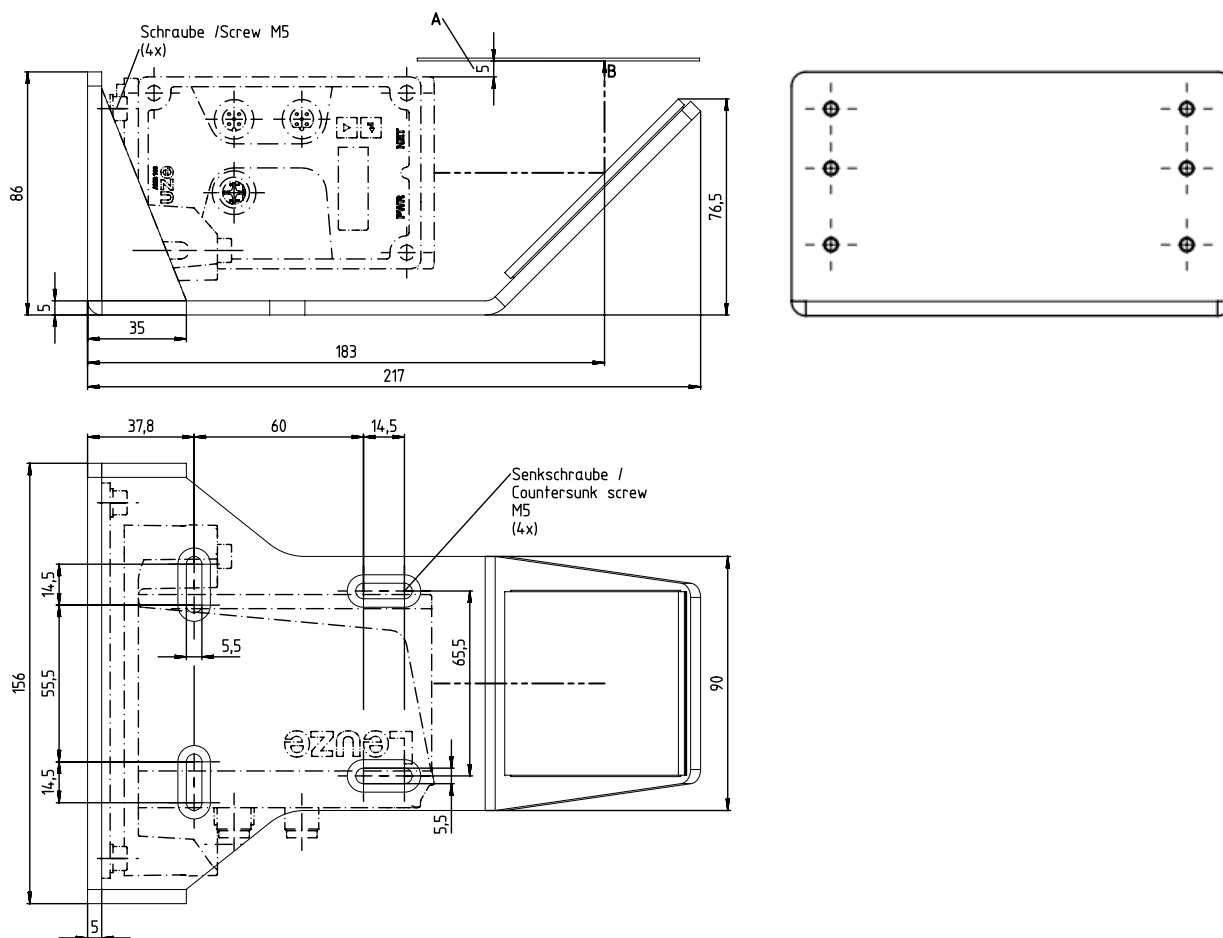
Floor holder BT 0100M-F



All dimensions in mm

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

Deflector unit US AMS 02



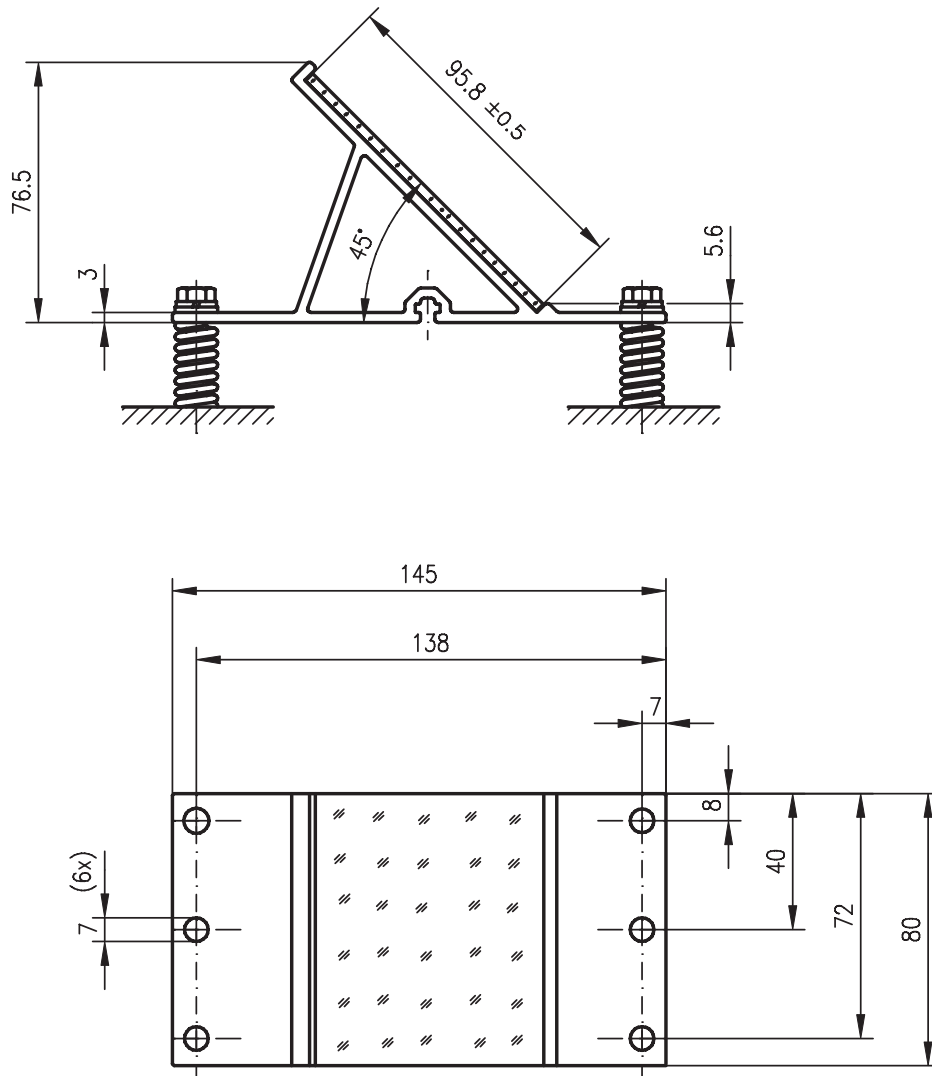
All dimensions in mm

A Minimum distance from the reflector

B Optical axis

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

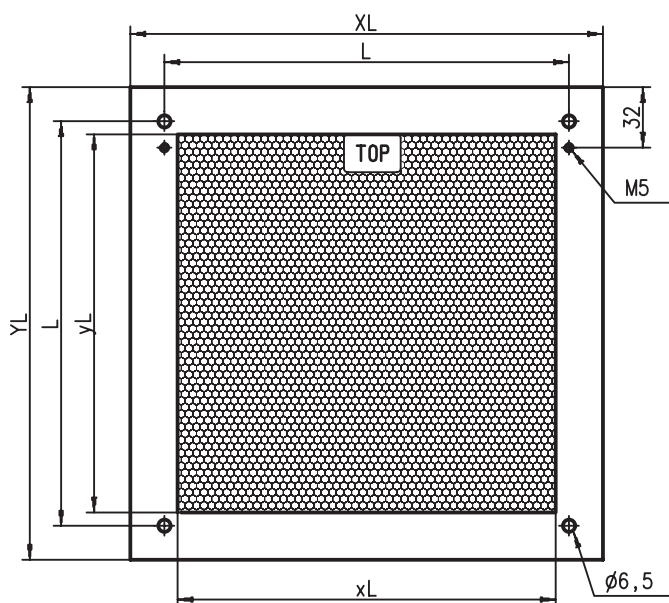
Deflector unit US 1 OMS



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

[illegible]

Fig. 12.8: Reflective tape ...-H

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
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 138i type overview

Tab. 13.1: AMS 138i

Type designation	Description	Part no.
AMS 138i 40	40 m operating range, EtherCAT interface	50155768
AMS 138i 120	120 m operating range, EtherCAT interface	50155765
AMS 138i 200	200 m operating range, EtherCAT interface	50155772
AMS 138i 40 BTA	40 m operating range, EtherCAT interface, pre-mounted alignment unit	50155770
AMS 138i 120 BTA	120 m operating range, EtherCAT interface, pre-mounted alignment unit	50155764
AMS 138i 200 BTA	200 m operating range, EtherCAT interface, pre-mounted alignment unit	50155774
AMS 138i 40 H	40 m operating range, EtherCAT interface, integrated heating	50155769
AMS 138i 120 H	120 m operating range, EtherCAT interface, integrated heating	50155766
AMS 138i 200 H	200 m operating range, EtherCAT interface, integrated heating	50155773
AMS 138i 40 BTA H	40 m operating range, EtherCAT interface, pre-mounted alignment unit, integrated heating	50155771
AMS 138i 120 BTA H	120 m operating range, EtherCAT interface, pre-mounted alignment unit, integrated heating	50155767
AMS 138i 200 BTA H	100 m operating range, EtherCAT interface, pre-mounted alignment unit, integrated heating	50155775

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 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 <i>Downloads</i> 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 *License*stab.

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