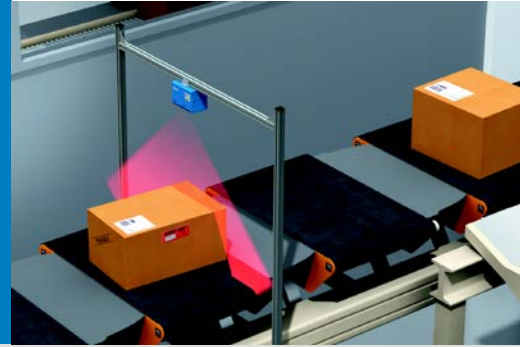


VMS410/VMS510
Track and trace systems



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1 About these operating instructions

Please read through this chapter carefully, before you use the documentation and work with the VMS410/510 measurement system.

1.1 Described software version

Software/Tool	Function	Status
VMD410-1000	Firmware	From V 2.00
VMD510-1000	Firmware	From V 2.00
Description of VMD410 device	Device-specific software module for SOPAS	From V 01.02.00
Description of VMD510 device	Device-specific software module for SOPAS	From V 01.02.00
SOPAS	Configuration software	From V 2.12

Tab. 1 Described software version

1.2 Purpose of this document

These operating instructions guide **technical personnel** in the safe mounting, configuration, electrical installation, commissioning, operation, and maintenance of the VMS410/510 volume measurement system.

1.3 Target group

These operating instructions are intended for people who install, connect, commission, operate and maintain the VMS410/510 volume measurement system.

1.4 Information depth

Note These operating instructions contain information about the following topics relating to the VMS410/510 volume measurement system:

- Product description
- Mounting
- Electrical installation
- Commissioning and configuration
- Maintenance
- Fault diagnosis and troubleshooting
- Technical data and dimensional drawings
- Ordering information
- Conformity and approval

Furthermore, when planning and using measurement systems such as VMS410/510, technical expertise is required, which is not covered in this document.

Official and legal regulations for operating the VMS410/510 volume measurement system must always be complied with.




The SOPAS configuration software is used to configure (parameterize) the measurement system for the respective application on site. Operating the software is described in chapter **6.2 Configuration and adjustment**.

Note Please also refer to the VMS information on the Internet at www.sick.com.

1.5 Abbreviations used

BCC	Block Character Check
CAN	Controller Area Network = Standardized field bus system that uses a message-based data exchange protocol
CCD	Charge-coupled Device, CCD camera = line scan camera, e.g. for reading bar codes
CS	Checksum
EEPROM	Electrically Erasable Programmable Read-only Memory = electrically erasable and programmable non-volatile memory
HTML	Hypertext Markup Language = page description language in the Internet
LED	Light emitting diode
RAM	Random Access Memory = direct-access volatile memory
RIS	Reflectivity Information System = remission information system
ROM	Read-only Memory (non-volatile)
SOPAS	SICK OPEN PORTAL for APPLICATION and SYSTEMS Engineering Tool = Software for configuring the VMS
SST	Interface
VMD	Volume Measurement Device = scanner head
VMS	Volume Measurement System from SICK AG

1.6 Symbols used

Reference	Bold text indicates a cross-reference to in-depth information.
Recommendation	Recommendations are designed to assist you in the decision-making process with respect to the use of a certain function or technical measure.
Note	Notes provide information about the features of a device or application.
Definition	Explanations convey background knowledge about technical concepts.
MENU OPTION	This font indicates a term in the SOPAS user interface.
1. / 2. Step-by-step	Instructions that must be carried out in the described order are referred to as step-by-step instructions and are indicated by numbered lists. Carefully read and follow the instructions for action.
➤ Take action	Instructions for taking action are indicated by an arrow. Carefully read and follow the instructions for action.
	This symbol includes a reference to additional documentation available.
 WARNING	Warning A warning indicates a specific or potential hazard. This is to protect you against accidents and protect devices from damage. Carefully read and follow the warnings.
	Software notes indicate where to make the appropriate settings in the SOPAS configuration software.

2 Safety

This chapter concerns your own safety and the safety of the system operator.

- Please read through this chapter carefully before you use the documentation or work with the VMS or with a conveying system equipped with a VMS.

2.1 Qualified safety personnel

The VMS410/510 volume measurement system must only be mounted, commissioned, and maintained by adequately qualified personnel.

The following qualifications are necessary for the various tasks:

2.1.1 Mounting and maintenance

- Practical technical training
- Knowledge of the current safety regulations in the workplace

2.1.2 Electrical installation and replacement of system components

- Practical electrical training
- Knowledge of current electrical safety regulations
- Knowledge of device control and operation in the particular application concerned (e.g., conveying line)

2.1.3 Commissioning, operation, and configuration

- Knowledge of the mechanical and electrical parameters of the conveying line and properties of the conveying system that relate to control and operation
- Basic knowledge of the Windows operating system used
- Basic knowledge of data transmission
- Basic knowledge of the design and setup (addressing) of Ethernet connections when connecting the MSC800 to the network
- Basic knowledge of how to use an HTML browser (e.g., Internet Explorer) to access the online help

2.2 Applications of the device

The VMS volume measurement system is intended exclusively for use in industrial environments. Radio interference may result when used in residential areas.

It measures cuboid objects on flat conveyor systems.

- The VMS410 determines the length, width and height and can calculate the volume of the smallest box that fully encloses the object (box volume) from these values.
- The VMS510 determines the length, width and height.

The relevant system outputs this information via a data interface to a client-side computer for further processing.

2.3 Intended use

The VMS410/510 volume measurement system may only be used as described in section **2.2 Applications of the device**. It may only be used by qualified personnel in the environment in which it was mounted and initially commissioned by qualified safety personnel in accordance with these operating instructions.

The equipment may be operated in an industrial environment.

The VMS410/510 volume measurement system must not be used outdoors or in an explosion-protected environment.

Radio interference may result when used in residential areas.

If used in any other way or if alterations are made to the system or the devices are opened – including in the context of mounting and installation – this will void any warranty claims directed to SICK AG.

2.4 General safety notes and protective measures



WARNING

Safety notes

Observe the following points to ensure the intended and safe use of the volume measurement system VMS.

- The notes in these operating instructions (e.g., regarding use, mounting, installation, or integration into the machine controller) must be observed.
- The national and international legal specifications apply to the installation and use of the system, to its commissioning, and to recurring technical inspections, in particular:
 - The accident prevention regulations and work safety regulations
 - Any other relevant safety regulations
- The manufacturer and user of the system are responsible for coordinating and complying with all applicable safety specifications and regulations in cooperation with the relevant authorities.
- The checks must be carried out by qualified safety personnel or specially qualified and authorized personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.
- These operating instructions must be made available to the operator of the system. The system operator must be instructed by qualified safety personnel and must read the operating instructions.



WARNING

Risk of injury due to components tipping over

If mounting rails have been upended, it is possible they could tip over during mounting.

- Do **not** perform mounting work alone unless it is absolutely safe to do so.
- Where applicable, ask a second person to assist you with the component replacement process.
- Wear safety shoes.



WARNING

Risk of injury due to electrical current

The VMS volume measurement system is connected to a 24 V DC voltage.

- Only authorized personnel are allowed to perform electrical installation work.
- The power supply must be disconnected when attaching and detaching electrical connections.
- Select and implement wire cross-sections and their correct fuse protection in accordance with the applicable standards.
- Observe the up-to-date safety regulations when working on electrical systems.



WARNING

Damage to the eye by laser beam

The VMS410/510 volume measurement system works with a red, class-2 laser. When exposed to the laser beam for longer periods of time, the retina of the eye may be damaged.

The laser output aperture is the front screen of the VMD.

Caution: Improper use of the VMD can lead to hazardous radiation exposure and breach of the laser class.

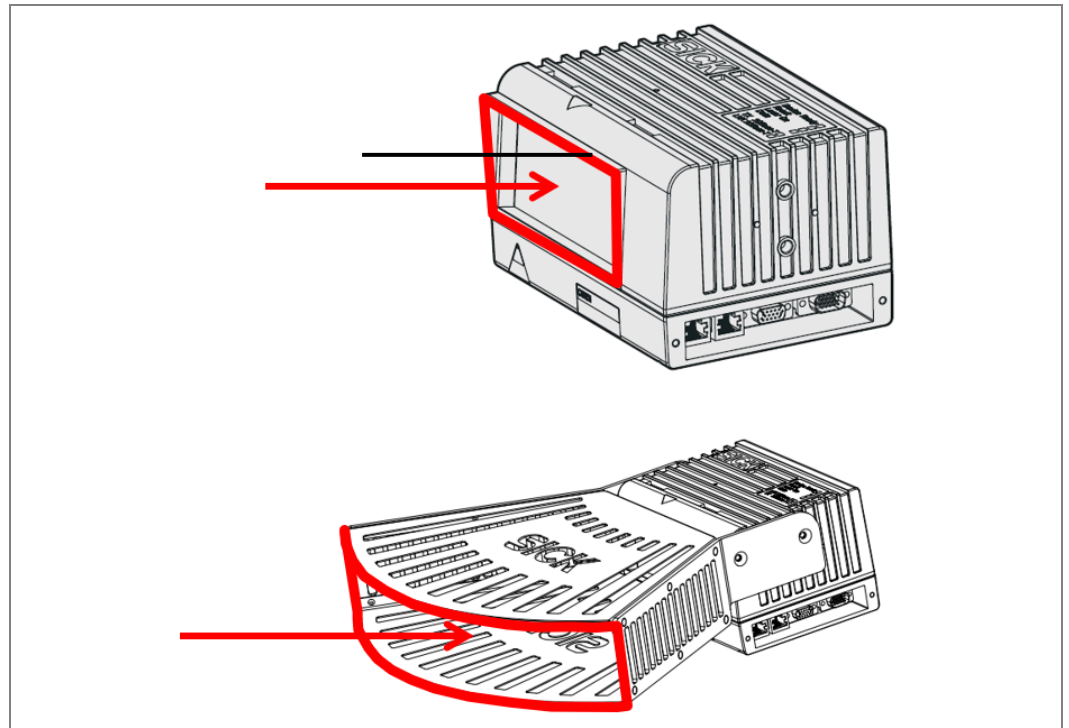


Fig. 1: VMD laser output aperture with and without optics cover

- Never look directly into the beam path (similar to sunlight).
- Never point the laser beam at people.
- When mounting and adjusting the VMD, beware of reflections of the laser beam off reflective surfaces.
- Do not open the housing. (Opening does not interrupt the switching on of the laser diode by the reading pulse).
- Observe the applicable laser safety regulations according to the latest version of IEC 60825-1:2014.
- It is not permitted to remove the protective cover that may be attached to the VMD head. This could cause damage to the eye by laser beams.



Fig. 2: Warning label for laser protective cover

Laser power

The laser operates at a wavelength $\lambda = 650$ nm (visible red light). The output power of the laser beam is max. 7.4 mW at the laser output aperture.

The emitted radiation is harmless to human skin.

The VMD conforms to laser class 2 in accordance with IEC 60825-1:2014 (for publication date, refer to laser warning label on device). This ensures compliance with 21 CFR 1040.10 and 1040.11 except for the tolerance according to Laser Notice No. 50 of June 24, 2007.

Regular maintenance is not necessary to ensure compliance with Laser Class 2.

Improper use of the VMD can lead to hazardous radiation exposure and breach of the laser class.

Important During operation, the trigger is used to initially switch the 2 D laser scanner on with the switch-on signal and switch it off again with the switch-off signal.

The 2 D laser scanner is switched on constantly during free-running output of measured values.

Laser warning labels

A number of laser warning labels and laser warning symbols are to be found on the VMS410/510 volume measurement system.

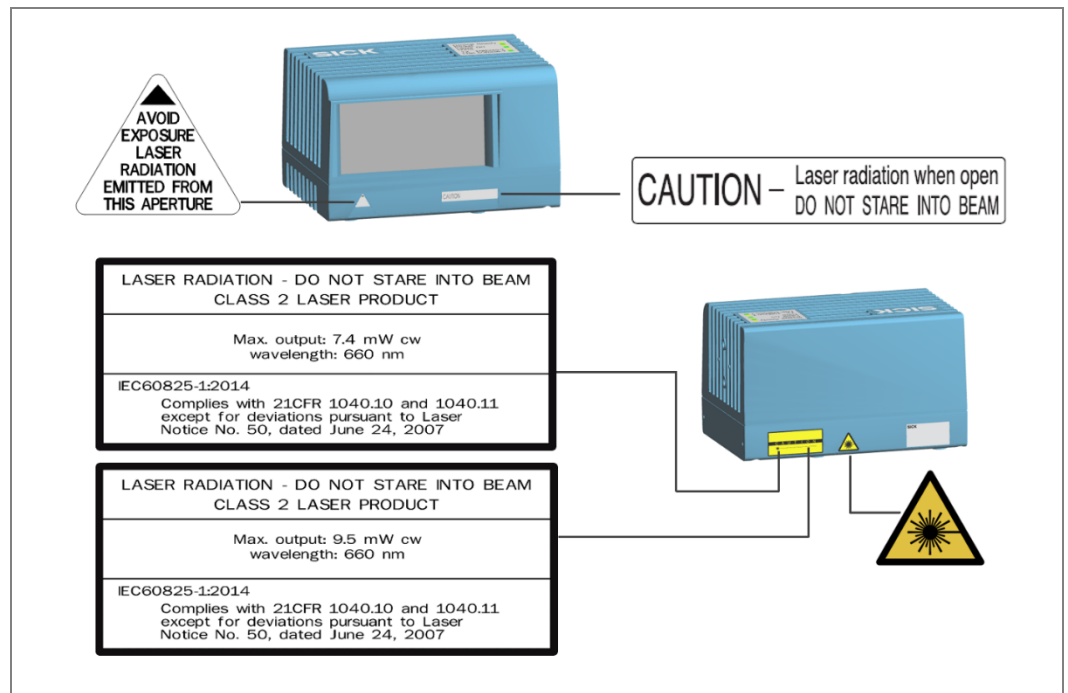


Fig. 3: Laser warning labels attached to the VMS

Translation of the English warning on the VMS

LASER RADIATION – NEVER LOOK INTO THE BEAM

CLASS 2 laser PRODUCT

Maximum output power: 7.4 / 9.5 mW peak, average < 1.0 mW

Wavelength: 650 nm – 670 nm, pulse duration: <1<200 μs

IEC 60825-1:2014

This ensures compliance with 21 CFR 1040.10 and 1040.11 except for the tolerances according to Laser Notice No. 50 of June 24, 2007.

- Notes**
- Before commissioning, the English laser warning label “LASER RADIATION – DO NOT STARE INTO BEAM” is to be replaced with a laser warning label in a language that the operators of the system understand. Laser warning labels in German/English and French/English are included in the scope of delivery. The laser warning labels “CAUTION ...” and “AVOID EXPOSURE LASER ...” are to be left in English.
 - If the laser warning labels are covered when the VMS volume measurement system is built into a system/paneling, further warning labels (not included with delivery) must be attached next to the outlet opening for the laser beam on the system/on the paneling!
 - The VMS automatically monitors beam generation and automatically shuts down the laser diode in the event of irregularities. If this happens, the red LED lights up and the scanner does not send any more measured values.
 - Regular maintenance is not necessary to ensure compliance with Laser Class 2.

2.5 Protecting the environment

The VMS volume measurement system has been designed to minimize its impact on the environment. It consumes very little energy.

Always act in an environmentally responsible manner at work. For this reason, please note the following information regarding disposal.

2.5.1 Power consumption

The VMS volume measurement system has a maximum power consumption of 25 W.

2.5.2 Disposal after final decommissioning

- Always dispose of unusable or irreparable devices in an environmentally safe manner in accordance with the relevant national waste disposal regulations.
- Dispose of all electronic assemblies as hazardous waste. The electronic assemblies are easy to dismantle.

Also see chapter **7.3 Disposal**.

Note SICK AG does not take back devices that are unusable or irreparable.

3 Product description

This chapter provides information on the special features of the VMS volume measurement system. It describes the construction and operating principle of the device, in particular the various operating modes.

Note Always read this chapter before you mount, install, and commission the device.

3.1 Scope of delivery

The delivery of the VMS volume measurement system includes:

- A VMD volume measurement device
- A mounting adapter for mounting and adjusting the VMD, triaxial
- A CD-ROM that includes the following:
 - SOPAS configuration software
 - “VMS volume measurement system” operating instructions in German and English in PDF format
 - Free software “Adobe Acrobat® Reader™” for reading PDF files

3.2 Specific features

- Non-contact, active measurement method
- Volume measurement of cuboid objects
- Works with a very wide range of surface structures and on various flat conveyor systems
- Flexible system configurations
- Calculation of the volume of the smallest box that fully encloses the object (box volume)

Operating condition 1

	Length	Width	Height
Object dimension (max.)	≤ 2,600 mm	≤1,000 mm	≤1,000 mm
Object dimension (min.)	≥ 50 mm	≥ 50 mm	≥ 50 mm
Scale interval (d)	5 mm	5 mm	5 mm
v: 0.1 m/s to 1.2 m/s			

Tab. 2 Specification of measuring range and measurement accuracy (operating condition 1)

Operating condition 2

	Length	Width	Height
Object dimension (max.)	≤ 2,600 mm	≤1,000 mm	≤1,000 mm
Object dimension (min.)	≥ 100 mm	≥ 100 mm	≥ 50 mm
Scale interval (d)	10 mm	10 mm	5 mm
v: 0.1 m/s to 2.0 m/s			

Tab. 3 Specification of measuring range and measurement accuracy (operating condition 2)

Operating condition 3

	Length	Width	Height
Object dimension (max.)	≤ 2,600 mm	≤1,000 mm	≤1,000 mm
Object dimension (min.)	≥ 100 mm	≥ 100 mm	≥ 100 mm
Scale interval (d)	10 mm	10 mm	10 mm
v: 0.1 m/s to 2.0 m/s			

Tab. 4 Specification of measuring range and measurement accuracy (operating condition 3)

VMS510 volume measurement system

Certified according to the Measuring Instruments Directive specified in chapter **10.6**

Compliance with EU Directives.

3.3 Operating principle of the device

3.3.1 Operating principle of the VMS

Determining distance data

The VMD is installed above the conveyor system and scans the surface of the conveyor system and that of the transported objects without contact. The VMD does not require any reflectors or position marks to do this. This is an active system with a red light laser. It is not necessary to illuminate the objects. The VMD operates according to the principle of phase displacement (continuous wave).

The VMS volume measurement system measures cuboid objects on flat conveyor systems. The VMS carries out non-contact determination of the object's box volume from the length, width and height.

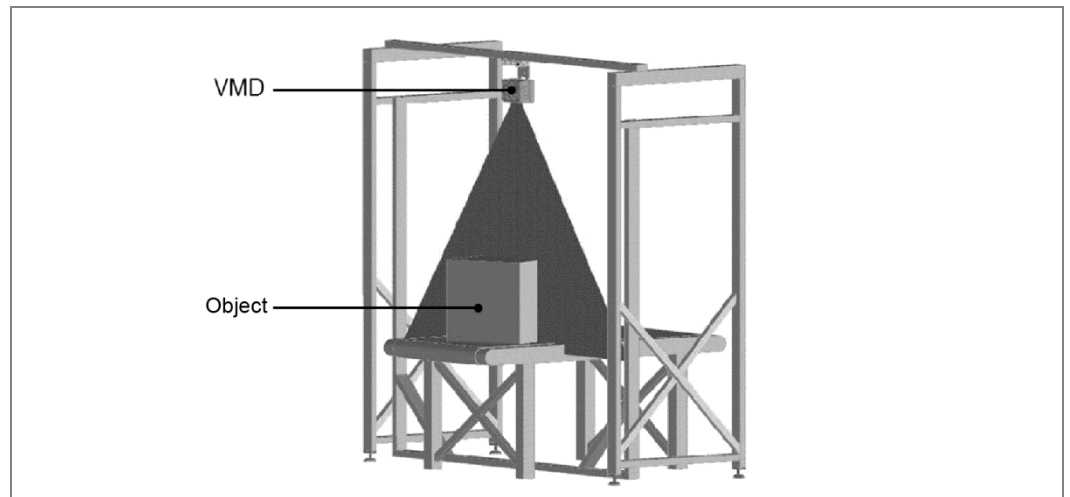


Fig. 4: Sketch of the VMS with frame above a conveyor system

Speed

The speed of the object is constantly configured or can be determined using an optional incremental encoder.

Resulting volume

The information about the three-dimensional object is available after collecting the distance data and calculation using the speed.

- The VMS410 determines the length, width and height and can calculate the volume of the smallest box that fully encloses the object (box volume) from these values.
- The VMS510 determines the length, width and height.

The data is made available for further processing via the interfaces of the VMS.

3.3.2 Measuring modes

The VMS can work either **triggered** or **free-running**.

Free-running mode

In free-running mode, the VMS detects the objects to be measured itself. The measurement starts when an object enters the scanning line and ends when the object leaves the scanning line. A minimum object gap ① must be kept between the objects.

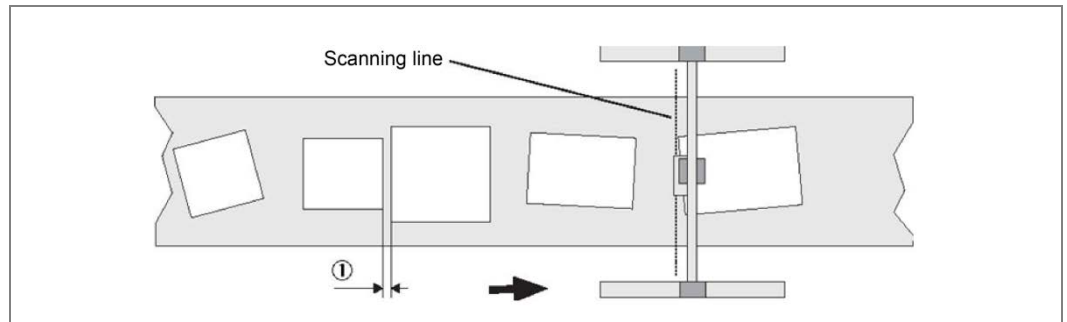


Fig. 5: Free-running mode

Triggered measurement with reading interval

During triggered measurement, the start or the end of the measurement are determined by a reading interval.

In contrast with free-running measurement, it is of no consequence whether an object is entering the scanning line or leaving it. Between the start and end of the measurement, there is also no distinction made between a number of objects. Rather, precisely one measurement is carried out.



PROJECT TREE, VMDX10_XX00, PARAMETER, DIGITAL INPUTS/TRIGGERS, TRIGGERING THE MEASUREMENT and READING INTERVAL sections

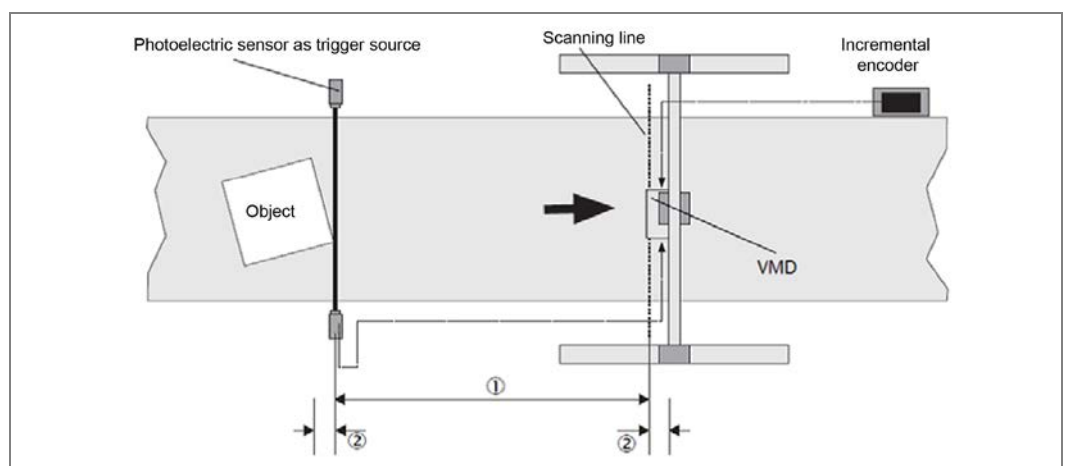


Fig. 6: Triggered measurement

The reading interval, during which the VMS measures, is defined by a trigger source, a path delay ① and an expansion path ②.

Digital inputs are available as a trigger source or software triggers can be used via telegrams.

In the example, the object initializes the measurement by entering the photoelectric sensor (trigger source). After the path delay distance (defined in SOPAS) has been traveled ①, the VMS starts the measurement.

An expansion path, likewise defined in SOPAS, extends the reading interval at the start and at the end ②. This allows the realization of a tolerance for example.

Path-controlled triggering

An incremental encoder must be attached and configured for the path-controlled triggering described. It is used to determine the path traveled by an object from the belt speed. Different conveyor speeds or a stop of the conveyor system do not need to be taken into account for path-controlled triggering. The measurement begins or ends once a defined path distance has been traveled.



Alternatively, it is also possible to configure the triggering in a time-controlled manner in SOPAS:

PROJECT TREE, VMDX10_XX00, PARAMETER, DIGITAL INPUTS/TRIGGERS, GENERAL SETTINGS section

Laser control

Note

The laser diode remains switched off during active laser control, if no objects are being transported on the conveyor system. The service life of the system is increased as a result.

The laser remains switched on constantly if there is no laser control. This negatively influences the system's service life.



PROJECT TREE, VMDX10_XX00, PARAMETER, DIGITAL INPUTS/TRIGGERS, LASER CONTROL section

During active laser control, the switching on of the laser is controlled by the configured reading interval or independently by its own source.

- Controlled by the reading interval

The laser is controlled by the start or stop source configured in the READING INTERVAL section (see **Triggered measurement with reading interval**).

- Depending on the source

The laser is controlled by the source configured in SOPAS. The control is independent of the settings made in the Reading interval section.

A photoelectric sensor is also attached to the VMS as a trigger, for example. If an object passes the photoelectric sensor, the laser is switched on.

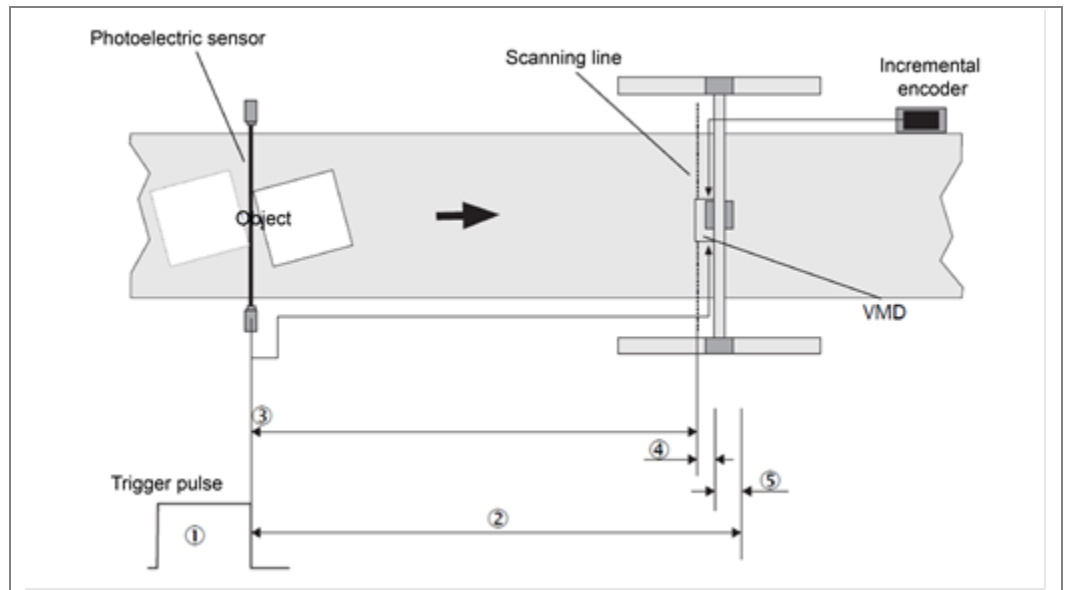


Fig. 7: Laser switch-off distance

When the rear edge of the object leaves the photoelectric sensor (trigger switches off) ①, the VMS starts to calculate the object's path from the photoelectric sensor. To do this, an incremental encoder must be attached, which is used to determine the speed of the conveyor system (see **10.4.2 General accessories**).

A laser switch-off distance ② is configured in SOPAS. This is formed by adding the distance of the photoelectric sensor from the scanning line ③, the defined minimum object gap (default is 30 mm) ④ and a safety supplement (200 mm recommended) ⑤.

As soon as the VMS has calculated that the object has been transported through the scanning line of the VMS on the basis of the incremental encoder pulses, it switches its laser off.

If another object has passed the photoelectric sensor in the meantime, path calculation is zeroed by the triggering and started for the new object. So the lasers **remain switched on** if a number of objects are transported one after the other. Each object is measured individually.

You can also input a laser switch-off delay. If the conveyor system should stop after the trigger pulse for operational reasons or due to a fault, the laser diode is switched off after the configured laser switch-off delay.

3.3.3 Evaluation of the RIS values

To refine the measurement result, the VMS can also evaluate the measured objects' RIS values in addition to the distance values. The measurement result is improved and the evaluation becomes more stable as a result.

You must adapt the RIS evaluation parameters in SOPAS in accordance with the conveyor surface, its composition and status.

PROJECT TREE, VMDX10_XX00, PARAMETERS, MEASUREMENT ALGORITHMS, RIS EVALUATION

3.3.4 Focusing the camera

The VMS410/510 can work in an overall system for volume measurement and package identification. The overall system consists of the VMS, the camera system and a modular system controller (MSC) for preparing and forwarding the data to a host.

The VMS measures objects on a conveyor system and transmits the coordinates and the trigger data to the camera system via the CAN interface. The CCD cameras are focused based on this data.



The camera focus function must be configured in SOPAS.

PROJECT TREE, VMDX10_XX00, PARAMETERS, CAMERA FOCUS SETTINGS

If you do not use the camera focusing function, you must deactivate it.

Incremental settings

The VMS needs the speed of the conveyor system in order to calculate a three-dimensional volume from the measured two-dimensional data. Either the pulses from an incremental encoder can be accepted for this, or a constant speed can be used as a basis for the calculation.

Note In the VMS510T, the incremental encoder, which is available as an accessory, must be used (see chapter **10.4.2 General accessories**) in order to achieve MID/OIML conformity. We recommend that this incremental encoder also be used in the VMS410.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INCREMENT CONFIGURATION/SYNC.

System increment

The encoder, which the VMS needs for volume calculation, is relatively sensitive. Devices that are attached to the VMS via a CAN bus and likewise use data from the encoder often cannot work with such fine data. This is why a system increment can be calculated from the pulses of the encoder and output via the CAN interface (see also chapter **3.8.4 CAN interface**).

- You can determine the system increment resolution using a splitter.
- Using an output splitter, you can also determine the output interval of the system increment.

3.4 Project planning

The VMS' maximum working range is 3 m. The minimum distance between the zero point of the VMS measurement and the measuring object is 700 mm. The zero point is marked both on the top and the bottom of the housing. The working area of the VMS covers an angle of 70°.

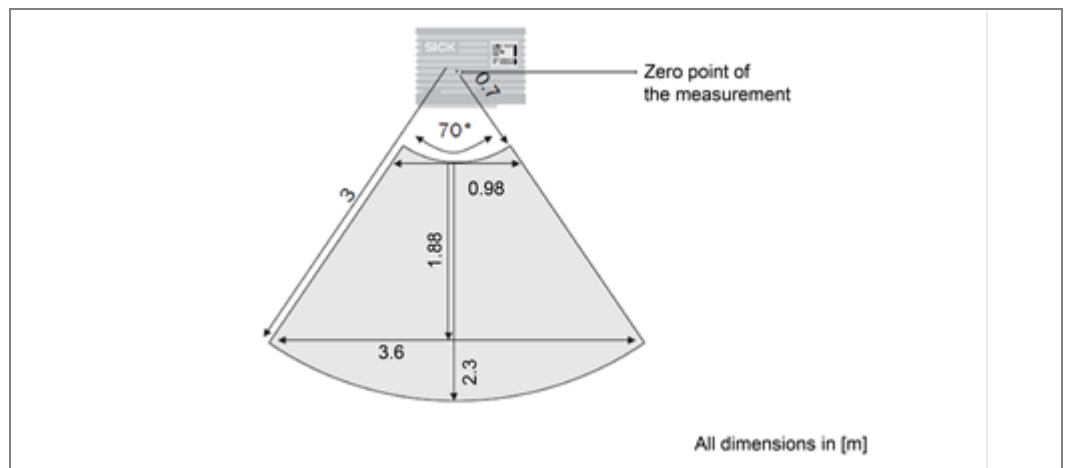


Fig. 8: Working area of the VMS volume measurement system

3.4.1 System requirements for the VMS volume measurement system

To operate the VMS volume measurement system, the following are required:

- Operating voltages VMD: 24 V DC \pm 15% in accordance with IEC 364-4-41 (protective extra-low voltage), max. output 25 W
- Data interface: RS-232, RS-422 or Ethernet

3.4.2 Conveyor system requirements

- The conveyor system must work with a constant conveyor speed or an incremental encoder with a resolution of at least 0.2 mm/increment must be installed.
- The conveyor speed must not exceed 2.0 m/s for the VMS510.
- The objects can be moved on a conveyor system with a flat conveyor surface. If the objects rotate, vibrate, roll, or slip on the conveyor system and on uneven conveying surfaces, the accuracy may be reduced and the data acquisition of the VMD may be impaired.

Note In the VMS510, the incremental encoder, which is available as an accessory, must be used (see chapter **10.4.2 General accessories**) in order to achieve MID/OIML conformity. We recommend that this incremental encoder also be used in the VMS410.

3.4.3 Object requirements

The minimum and maximum dimensions of the objects are summarized in the following table.

Operating condition 1

Object dimensions	Minimum value	Maximum value
Along the conveying direction	≥ 50 mm	≤ 2,600 mm
Transversely to the conveying direction	≥ 50 mm	≤ 1,000 mm
Height above the conveyor system	≥ 50 mm	≤ 1,000 mm

Tab. 5 Minimum and maximum dimensions of the objects (operating condition 1)

Operating condition 2

Object dimensions	Minimum value	Maximum value
Along the conveying direction	≥ 100 mm	≤ 2,600 mm
Transversely to the conveying direction	≥ 100 mm	≤ 1,000 mm
Height above the conveyor system	≥ 50 mm	≤ 1,000 mm

Tab. 6 Minimum and maximum dimensions of the objects (operating condition 2)

Operating condition 3

Object dimensions	Minimum value	Maximum value
Along the conveying direction	≥ 100 mm	≤ 2,600 mm
Transversely to the conveying direction	≥ 100 mm	≤ 1,000 mm
Height above the conveyor system	≥ 100 mm	≤ 1,000 mm

Tab. 7 Minimum and maximum dimensions of the objects (operating condition 3)

Note In order to comply with the certified scale values for the VMS510, requirements are placed on the objects in accordance with the conveyor speed (see chapter **3.5 Calibration capability of the VMS510**).

3.4.4 Mounting requirements

The VMD must be mounted as follows:

- Stable above the conveyor system (weight of the VMD: Approx. 2.3 kg, excluding mounting adapter)
- Shock- and vibration-free

Recommendation

It is possible to mount the mounting adapter easily onto an 80 mm item aluminum profile. The mounting adapter is adapted to these profiles (see chapter **9.2.2 VMD mounting adapter dimensional drawing**).

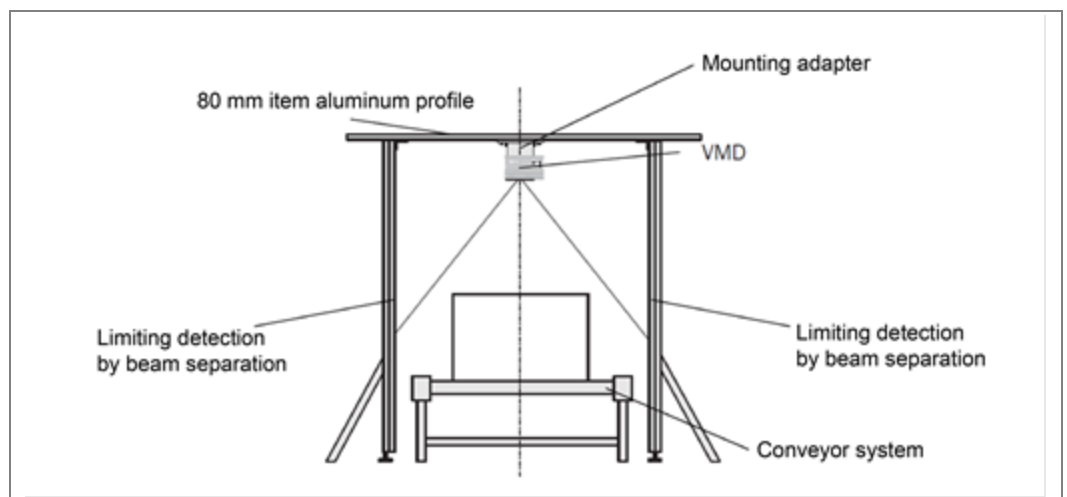


Fig. 9: Diagram of VMS installation above a conveyor system

To achieve an optimal measurement result, the following points should be observed.

- Typical vertical space requirement for the VMD installation: Approximately 700 mm above the tallest object
- The VMD must have a clear view of the conveyor system.
- The laser beams of the VMD should not reach beyond the application space, so that people or goods, which are being transported on an adjacent conveyor system, are not detected (limiting detection by beam separation).
- The maximum detection must be limited to the working range of three meters, as measuring inaccuracies may otherwise result.
- Sufficient distance of the VMD from curves, induction lines, start/stop areas, areas with upward and downward inclines, and breaks in the conveyor system.

Minimum distance between upper edge of the object and the zero point of the measurement

This minimum distance between the upper edge of the object and the zero point of the measurement depends on the width of the conveyor system.

A [mm]	500 ... 900	1000	1,100	1200	1300	1400	1500
B [mm]	700	750	800	875	950	1025	1,100
C [mm]	Max. 1,000 mm						

Tab. 8 Minimum distance between upper edge of the object and the zero point of the measurement

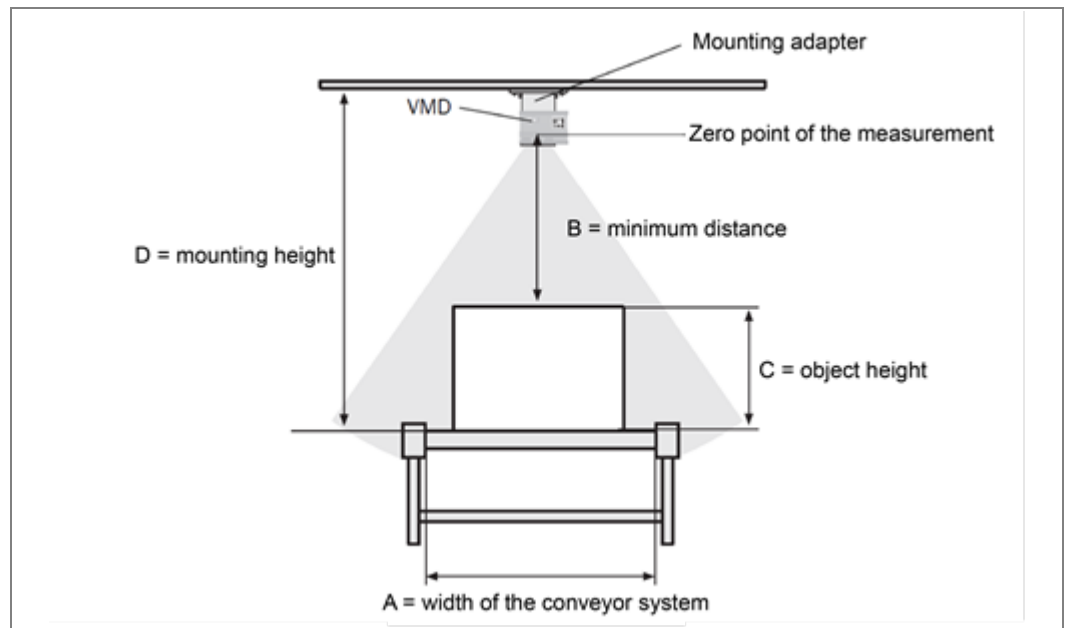


Fig. 10: Mounting height diagram

Mounting height above the conveyor system

The mounting height above the conveyor system is dependent on the maximum object height and the minimum distance to be kept between the upper edge of the object and the zero point of the measurement.

The mounting height is determined as follows:

Mounting height $D = B + C + 195 \text{ mm}$ (height of mounting adapter)

3.5 Calibration capability of the VMS510

The VMS510 was tested in accordance with the Measuring Instruments Directive specified in chapter 10.6.

The following values were certified by the metrological tests for the measurement of cuboid, non-reflective, and non-transparent objects.

For conveyor speeds between 0.1 m/s and 1.2 m/s maximum:

Object dimensions	Minimum value	Maximum value	Achievable scale interval d
Along the conveying direction	≥ 50 mm	≤ 2,600 mm	5 mm
Transversely to the conveying direction	≥ 50 mm	≤ 1,000 mm	5 mm
Height above the conveyor system	≥ 50 mm	≤ 1,000 mm	5 mm

Tab. 9 Certified, measurable object dimensions at a conveyor speed of 1.2 m/s

For conveyor speeds between 0.1 m/s and 2.0 m/s maximum:

Object dimensions	Minimum value	Maximum value	Achievable scale interval d
Along the conveying direction	≥ 100 mm	≤ 2,600 mm	10 mm
Transversely to the conveying direction	≥ 100 mm	≤ 1,000 mm	10 mm
Height above the conveyor system	≥ 50 mm / ≥ 100 mm	≤ 1,000 mm	5 mm / 10 mm

Tab. 10 Certified, measurable object dimensions at a conveyor speed of 2 m/s

A maximum of 960 objects per minute can be measured. The ambient operating temperature must be between 0 and 40 °C.

- Notes**
- Observe the relevant applicable national law when using the VMS510 in calibratable applications. SICK can help you with this in an advisory capacity, if requested. This is not a substitute for legal advice, however.
 - After a thorough check, the scale values for length, width and height must be determined for the application. These scale values must be entered such that they cannot be altered in row **d** on the certification label included with delivery (see the following figure). The certification label must be attached to the system such that it can be seen by the operator and associated with the volume measurement system.

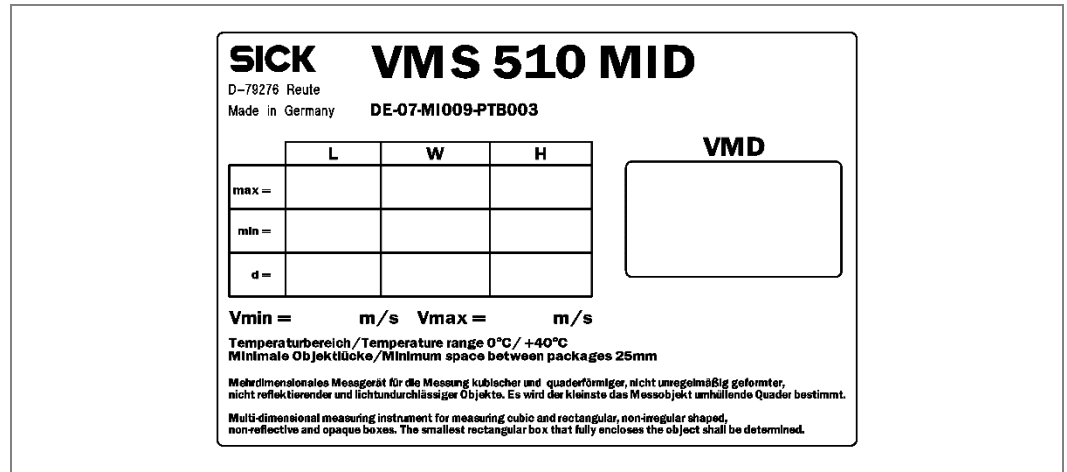


Fig. 11: Certification label to be attached for the VMS510 (example figure)

The calibration capability of the VMS510 can be used as follows:

- Check what steps are required for calibration according to the applicable national laws. SICK can help you with this in an advisory capacity, if requested. This is not a substitute for legal advice, however.
- To provide protection against tampering, we suggest applying seals and lead seals to defined locations on the VMS510 and any accessories that you may have. The operator must agree these suggestions with the relevant national testing body. Take note, even when planning your application, that calibration seals can be applied to the VMD510 after mounting and calibration.

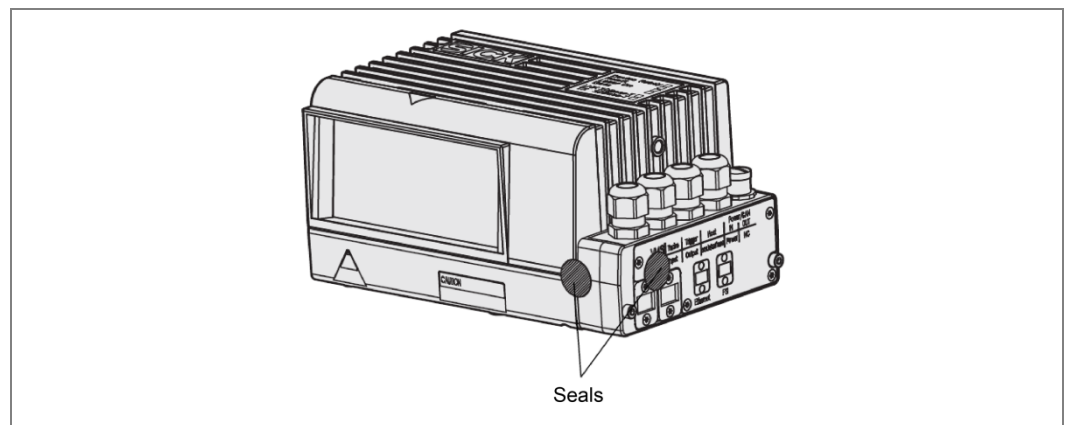


Fig. 12: Possible locations for applying seals on the VMD510

3.6 VMS scale values

The following scale values apply for object remissions from 10 to 200% and for recommended add-ons in accordance with SICK documentation. Restricted ranges for object remissions and object sizes allow greater accuracy. Glossy surfaces, shadowed areas of the objects and other influences may reduce accuracy.



The scale values that can actually be achieved or used must be determined and input into SOPAS during the calibration of the VMS510 or during the commissioning of the VMS410:

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES

The scale values are output in the basic measured data telegram 2 along with the length, width and height (see chapter **10.3.3 Basic measured data telegram 2 (metric values)**). You can also configure the user-defined measured data telegram so that it is used to output the scale values (see section **User-defined output format** in chapter **3.8.2 Host interface**). Also, the length, width and height of an object can be rounded to the scale values (see section **Rounding the measurement results** in chapter **3.8.2 Host interface**).

3.7 Status indicators

Six LEDs on the VMS volume measurement system give a visual indication of the operational status and any errors that occur.

LED	Indicator	Function
Device Ready	green	Lights up after switching on if initialization and self-test were successful Device is ready
	red	Error during initialization or self-test
Result	green	Measurement condition fulfilled
Laser on	green	Laser diode on
Data	green	Flickers when the VMS is transmitting data to the computer on the host interface
LNK 10 Base-T	green	10 BASE-T: Ethernet contacted
TX 10 Base-T	green	10 BASE-T: Flickers when the VMS is transmitting data to the computer on the Ethernet interface

Tab. 11 Meaning of the LEDs

3.8 Data interface specification

The VMS has four different interfaces for the configuration and the transmission of measured values:

- You can configure the VMS with the help of SOPAS via the host interface, the terminal interface and the Ethernet interface.
- The VMS sends out the measured data in the form of telegrams via the host interface.
- In parallel with this, diagnostic data for a remote diagnostic tool (RDT) can be output via the terminal interface.
- The CAN interface is required to send the focusing data to the camera system when using the camera focus function.

3.8.1 Terminal interface

The terminal interface allows both the configuration of the VMS and the output of measured values. However, it is primarily intended for ensuring a secure data connection for the configuration (even if the host interface is operating at the same time). For this reason, the following interface parameters cannot be changed:

- 9,600 baud
- 8 data bits
- 1 stop bit
- No parity bit

Chapter **5.3.4 'Serial' connection** contains a description of the electrical interface.

3.8.2 Host interface

The host interface allows both the configuration of the VMS and the output of measured values.



You can configure the pins 6 to 9 either as RS-232 or as RS-422:

PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, SERIAL HOST INTERFACE section, HARDWARE option

The interface parameters are freely configurable. The factory setting for the host interface is configured as follows:

- RS-232
- 9,600 baud
- 8 data bits
- 1 stop bit
- No parity bit

Note The interface parameter of the host interface can only be configured using the terminal interface or the Ethernet interface. Chapter **5.3.4 'Serial' connection** contains a description of the electrical interface.

Frame and coding for the telegrams

The VMS communicates with the connected application with the aid of telegrams.



You can configure the framing for the host interface in SOPAS:

PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, SERIAL HOST INTERFACE section

For example, you can use two stop bytes (to end telegrams with CR/LF for example) or you can insert a block check byte before or after the stop byte.

Telegrams on the host interface

	Frame	Telegram	Frame
Designation	STX	Useful data (see chapter 10.2)	ETX
Length (byte)	1	≤ 2,498	1 or 2
Description	Start of text character	ASCII-coded. This length depends on the previous send telegram.	End of text character

Tab. 12 Framing the telegrams on the host interface

Output unit



You can determine in SOPAS whether the data contained in the measured data telegrams are output as metric values or in inches:

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES

Rounding the measurement results



The measurement results are output as specified, accurate to 1 mm or to 1/100 inch. However, you can also round to the scale values on the VMS (see chapter **3.6 VMS scale values**):

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES

	Example 1	Example 2
Scale interval	5 mm	10 mm
Measured object length	56 mm	56 mm
Object length output	55 mm	60 mm

Tab. 13 Example of rounded measurement results

Output time



You can define in SOPAS when a measured data telegram is output:

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, OUTPUT CONTROL

- As soon as possible after leaving the scanning line ①
- After a certain distance from X position in relation to the rear edge of an object ②
- After a certain distance from X position in relation to the leading edge of an object ③

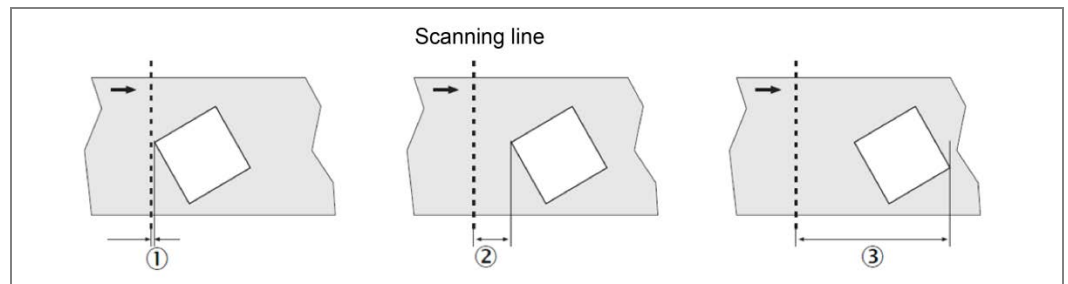


Fig. 13: Output time diagram

Note If you choose the option IN RELATION TO THE LEADING EDGE, you must make sure the distance entered is larger than the longest object to be measured. If an object reaches the distance entered, but has not yet left the scanning line (i.e. is still being measured), then a measured data telegram is not sent out yet. In such a case, this takes place only after the object has left the scanning line, – i.e. “as soon as possible”.

User-defined output format



You can define a custom measured data telegram for measured data output using the host interface:

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, OUTPUT FORMAT

For example, in this measured data telegram you can select and insert fixed strings, variables (such as object length or width), change the variables' attributes or insert and define conditions.

3.8.3 Ethernet interface

The Ethernet interface has a data transmission rate of 10 Mbaud (10 Base-T). The interface is designed as a TCP/IP peer-to-peer interface. Only half-duplex is supported. Make sure that your application's connection is configured to half-duplex.

The factory setting for the Ethernet interface is as follows:

- IP-ADDRESS: 192.168.0.1
- SUBNET MASK: 255.255.255.0
- TCP/IP PORT: 2111
- COLA PROTOCOL: COLA ASCII



If necessary, you must adjust the TCP/IP configuration of the Ethernet interface, so that a connected PC (client) can communicate with the VMS via Ethernet:

PROJECT TREE, VMDX10_XX00, INTERFACES, ETHERNET, ETHERNET section

Chapter **5.3.1 'Ethernet' connection** contains a description of the electrical interface.

3.8.4 CAN interface

The VMS has a CAN interface, which can be used to connect it to a CAN bus.

For data communication via CAN (Controller Area Network), you must

- set the appropriate operating mode for the CAN bus on the VMS.
- configure identical data transmission rates on all of the bus' devices.
- assign a unique device number from 1 to 63 for each device on the CAN bus.



PROJECT TREE, VMDX10_XX00, INTERFACES, CAN, CAN section

Chapter **5.3.4 'Serial' connection** contains a description of the electrical interface.

4 Mounting

4.1 Overview of the mounting steps

- Mount the mounting adapter for the VMD.
- Mount the VMD on the mounting adapter.
- Limit the detection by beam separation.

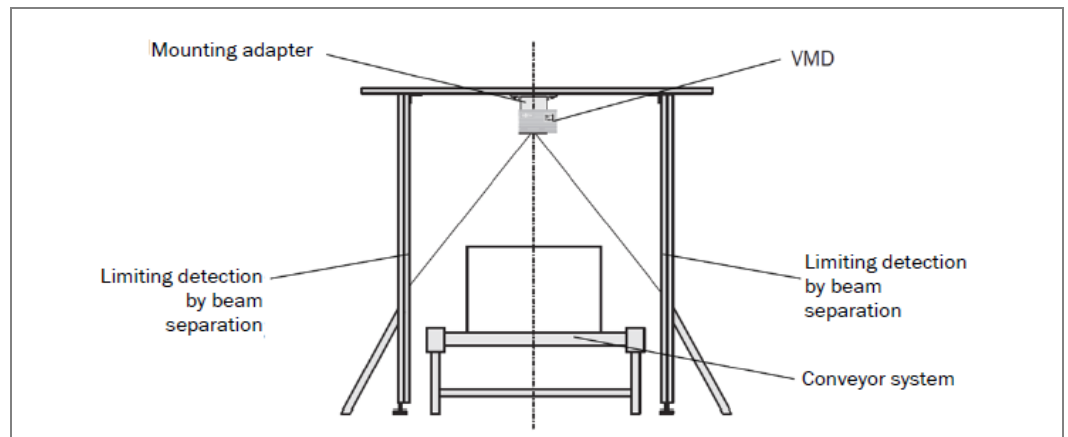


Fig. 14: Diagram of VMD mounting above a conveyor system

4.2 Preparation for mounting

- A VMD weighs approx. 2.3 kg excluding mounting adapter.

4.2.1 Getting the components to be mounted ready

- VMD volume measurement device
- Mounting adapter for the VMD

4.2.2 Lay out the material ready

The following material is required for the mounting adapter and for the VMD:

- M6 screws for mounting the mounting adapter on the frame or on another device (the mounting adapter has eight D6.6 holes)
- Three M8 × 12 screws with washers for mounting the VMS on the mounting adapter (included with delivery)
- Tool

4.2.3 Mounting accessories

A mounting adapter for mounting the VMD is included with the delivery. This can be finely adjusted triaxially.

Recommendation

It is possible to mount the mounting adapter easily onto an 80 mm item aluminum profile. The mounting adapter is adapted to these profiles.

The dimensional drawing for the mounting adapter can be found in chapter **9.2.2 VMD mounting adapter dimensional drawing**.

4.3 Mounting the VMD

1. Mount the mounting adapter on the framework at the position provided using four M8 screws ①.

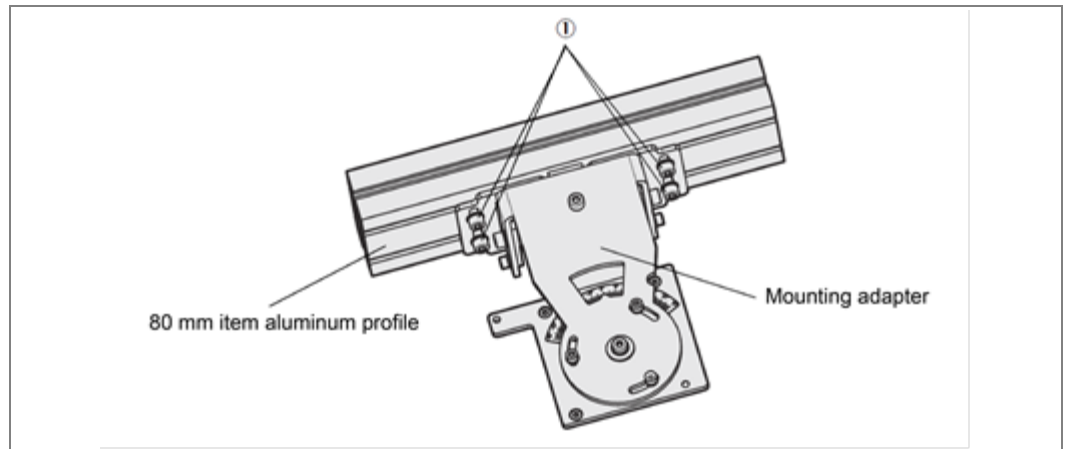


Fig. 15: Mounting the VMD above a conveyor system (1)

2. Insert the VMD into the locating pins ② provided on the mounting adapter and mount using three M6 screws ③.

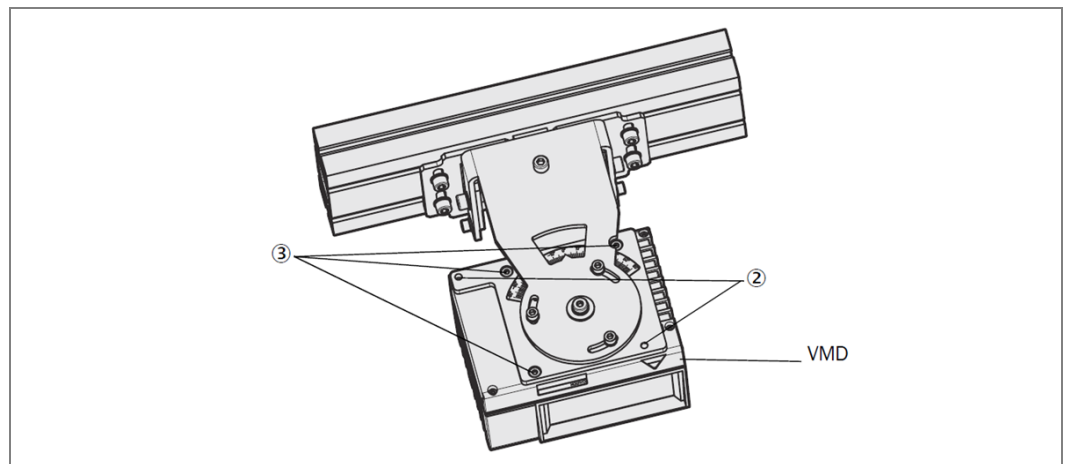


Fig. 16: Mounting the VMD above a conveyor system (2)

4.4 Dismantling the system

1. Switch off the supply voltage.
2. Disconnect connection cables.
3. Remove the VMD from the mounting adapter above the conveyor system.

Note On final decommissioning, please observe the requirements for environmentally sound disposal in chapter **2.5.2 Disposal after final decommissioning**.

5 Electrical installation



WARNING

Disconnect the power to the system

The system could inadvertently start while you are connecting the devices.

- Make sure that the entire system is disconnected from the power supply during the electrical installation work.



WARNING

Risk of injury due to electrical current

Only a qualified electrician or trained person working under the guidance and supervision of a qualified electrician is permitted to work on electrical systems or equipment, and they must comply with the electrical regulations.

Note The VMS volume measurement system satisfies the requirements of Class A (industrial environment) of the generic EMC standard.

It may cause radio interference in a residential area. In this case, the injured party can request that the operator carries out appropriate interference suppression measures.

5.1 Overview of the Installation Steps

- Set up the power supply for the VMD.
- Connect a PC to the VMD's terminal interface.

5.2 Electrical

Inside the electrical connections, the VMS has interfaces for communicating externally and connections for external sensors.

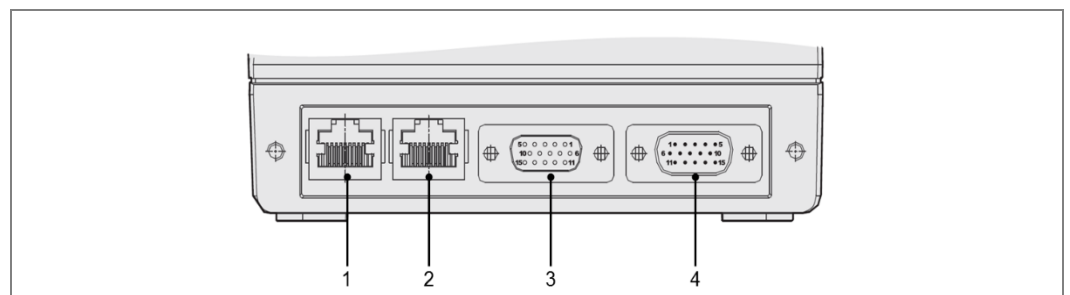


Fig. 17: Location of the electrical connections on the VMS

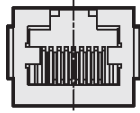
No.	Connection	Design	Function
1	Ethernet	RJ-45	TCP/IP communication, exchange of telegrams
2	System	RJ-45	Not used
3	I/O	D-Sub	Connecting external sensors, supply voltage
4	Serial	D-Sub	TCP/IP communication, exchange of telegrams, supply voltage

Tab. 14 Function of the electrical connections on the VMS

5.3 Pin assignment for the connections

5.3.1 'Ethernet' connection

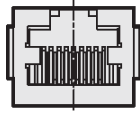
A standard cat. 5 crossover cable is suitable for connecting the VMS.

	Pin	Signal	Function
	1	TPOP	Ethernet interface
	2	TPON	Ethernet interface
	3	TPIP	Ethernet interface
	4	Not connected	-
	5	Not connected	-
	6	TPIN	Ethernet interface
	7	Not connected	-
	8	Not connected	-

Tab. 15: Pin assignment for the 'Ethernet' connection

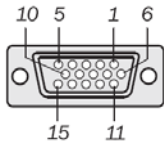
5.3.2 'System' connection

The "System" connection on the VMS is not used. The individual connections must not be assigned.

	Pin	Signal	Function
	1	Reserved	Must not be assigned!
	2	Reserved	Must not be assigned!
	3	Reserved	Must not be assigned!
	4	Not connected	-
	5	Not connected	-
	6	Reserved	Must not be assigned!
	7	Not connected	-
	8	Not connected	-

Tab. 16: Pin assignment for the 'System' connection

5.3.3 'I/O' connection

	Pin	Signal	Function
	1	Vs	VMD supply voltage
	2	IN3	Digital input 3 (trigger)
	3	IN1	Digital input 1 (trigger)
	4	Reserved	Must not be assigned!
	5	GND	VMD ground
	6	IN2	Digital input 2 (incremental encoder)
	7	IN4	Digital input 4 (incremental encoder)
	8	Reserved	Must not be assigned!
	9	SENS_GND	Ground for digital inputs
	10	Reserved	Must not be assigned!
	11	Reserved	Must not be assigned!
	12	Reserved	Must not be assigned!
	13	Reserved	Must not be assigned!
	14	Reserved	Must not be assigned!
	15	Reserved	Must not be assigned!
Housing	-	Shield/ground	

Tab. 17 Pin assignment for the 'I/O' connection

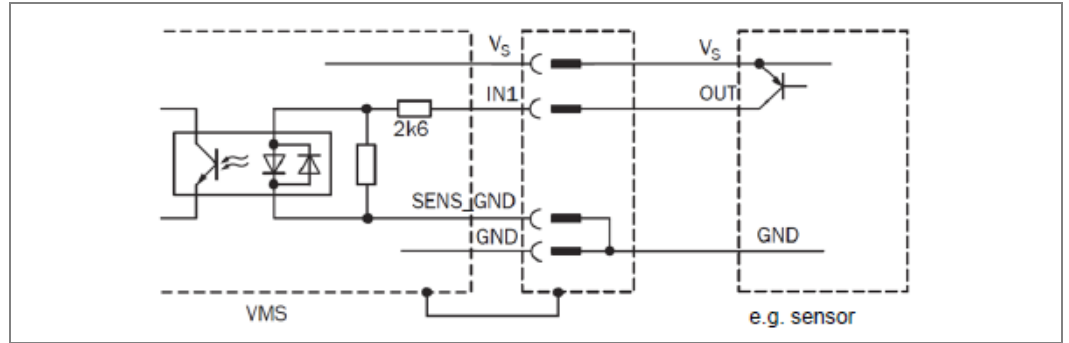


Fig. 18: Wiring for the digital inputs

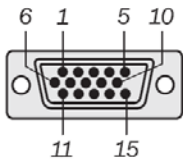
5.3.4 'Serial' connection



You can configure the pins 6 to 9 either as RS-232 or as RS-422.

PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, SERIAL HOST INTERFACE section, HARDWARE option

Pin	Signal	Function	
1	VS	VMD supply voltage	
2	RS232	RxD_TRM	Terminal interface (receiver)
3		TxD_TRM	Terminal interface (sender)
4	Not connected		-
5	GND		VMD ground
6	RS-232	Not connected	RD+ (HST)
7		RxD (HST)	
8		Not connected	TD+ (HST)
9		TxD (HST)	
10	CAN_H		CAN interface 1 (IN/OUT)
11	Not connected		-
12	CAN_H_2		CAN interface 2 (IN/OUT)
13	CAN_L_2		CAN interface 2 (IN/OUT)
14	Not connected		-
15	CAN_L		CAN interface 1 (IN/OUT)
Housing	-		Shield/ground



Tab. 18: Pin assignment for the 'serial' connection

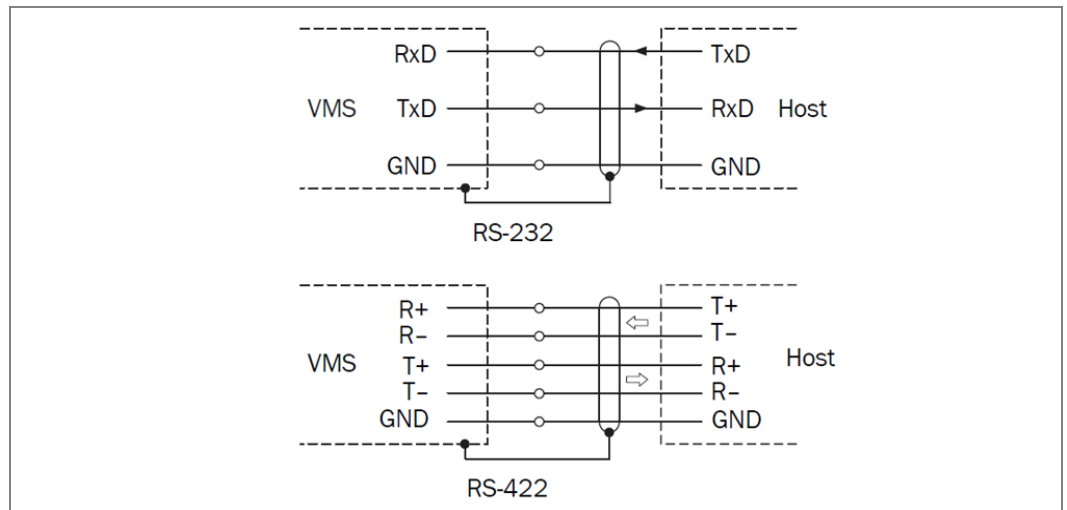


Fig. 19: Wiring for RS-232 or RS-422

5.4 Connection via the male connector cover

The VMS can also be connected via male connector covers. The enclosure rating IP 65 is achieved by the covering of the VMS' electrical connections ensured in this way (see chapter **10.4.4 Male connector cover sets**).

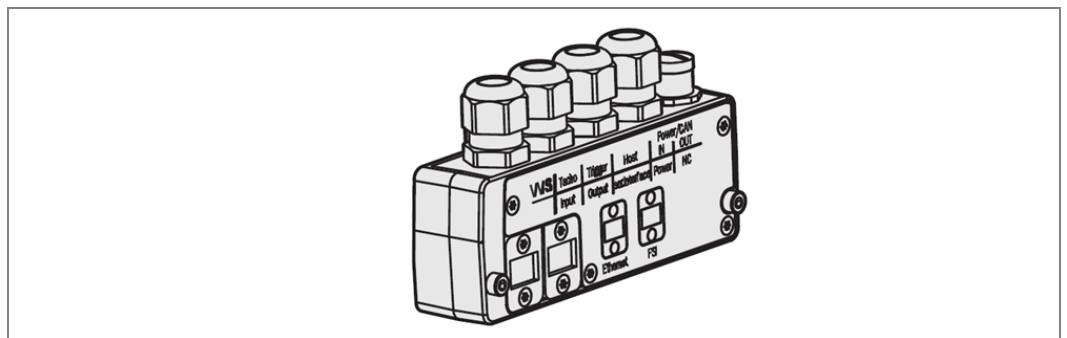


Fig. 20: Example of a male connector cover

The male connector covers contain a parameter memory and consequently allow a simple exchange of a VMS. The configuration is stored in the male connector cover and transferred after the exchange to the newly connected VMS.

- Notes**
- The parameter memory function is deactivated in the factory settings.
 - The parameter set stored in the parameter memory always overwrites the VMS configuration. An already configured device can be reset to factory settings using a brand new male connector cover.
 - Special Ethernet cables are required for connecting the male connector cover (see chapter **10.4.5 Accessories for male connector covers**).



You can find a detailed description of the electrical connections for the male connector cover in the document 8010817 – “Male connector covers for volume measurement system VMS4xx/5 xx and laser measurement system LMS400”.

5.5 Performing the Electrical Installation

5.5.1 Overview of the connection steps

- Connecting the voltage supply.
- Connect the host interface.
- Connect the PC (connect the terminal interface).

5.5.2 Auxiliary equipment

- Tool
- Digital measuring device (current/voltage measurement)

5.5.3 Connecting voltage supply

Note You can feed the supply voltage either to the 'I/O' connection or to the 'serial' connection.

1. Make sure that the power supply is switched off.
2. Connect the 24 V 'supply voltage' input on the VMS to the corresponding connection on the power supply using a cable.

5.5.4 Connecting the PC

The VMD is operated and configured using the SOPAS configuration software.

1. Switch off the PC and the power supply.
2. Connect the PC and the Ethernet interface on the VMD using a cat. 5+ crossover cable.
3. Switch on the PC and the power supply.
4. Carry out configuration (see chapter **6.2 Configuration and adjustment** ff.).

6 Commissioning



WARNING

Do not commission without testing by qualified safety personnel!

Before you commission the volume measurement system for the first time, you must have it checked and approved by qualified safety personnel. Observe the notes provided in Chapter 2 **Safety**.

Overview of the steps for commissioning

- Mount the VMS in the ordered version (see chapter 4 **Mounting**).
- Carry out the electrical installation (see chapter 5 **Electrical installation**).
- Configure and adjust the VMS using the SOPAS configuration software (see chapter 6 **Commissioning**).

Note The RS-232 and RS-422 host interfaces cannot be used simultaneously during operation.

6.1 Quick Stop and Quick Restart

6.1.1 Switching off the VMS

- Switch off the power supply for the VMS or detach the supply cable.

The VMS retains permanently stored parameters in the internal memory. Measured values at the interface are lost.

6.1.2 Switching on the VMS again

- Switch on the power supply for the VMS or reconnect the supply cable.

The VMS restarts operation with the last saved parameters.

6.2 Configuration and adjustment

The VMS volume measurement system is adapted to the measuring conditions on site. This enables measurement, analysis, and output properties to be configured as required. The SOPAS configuration software supplied makes interactive configuration possible. You can use this software to configure and test the measuring properties, analysis behavior, and output properties of the system as required.



Help on using the program user interface, as well as for the individual options can be found in SOPAS:

- HELP menu, HELP: Detailed online help for the program user interface and individual options
- HELP window (bottom left in the program user interface): Context sensitive help for the currently active dialog

- Tool tips: Move the mouse pointer over an input field. A short text (tool tip) with information about valid entries appears.

Note Software access to the VMS is password protected. The default password for the maintenance technician is **main**. The password **client** is preset for authorized clients. After configuring the device successfully, you must change the password so that it can fulfill its protective function.

6.3 Preparing the configuration and adjustment

For the configuration and adjustment of the VMS volume measurement system, you will need:

- SOPAS configuration software on CD-ROM
- PC/Notebook with Windows 2000/XP/Vista/7 or subsequent versions and a serial interface (RS-232). PC/Notebook not included with delivery
- A standard cat. 5 crossover cable for connecting the PC and VMS
- Plumb line
- Try square
- Tape measure (up to 3,000 mm)
- Test object (see chapter **10.4.2 General accessories**)
- Felt tip pen (color should be clearly distinct from the color of the conveyor surface)
- Tool
- White adhesive tape for black conveyor surfaces

The configuration and adjustment is prepared as follows:

1. Make sure that the VMD is correctly mounted and connected to the electricity.
2. Install the SOPAS configuration software included in the delivery using the CD-ROM.
3. Connect the PC using the Ethernet interface on the VMD.



4. Start SOPAS and create a new project.
5. Configure the Scanning Assistant (SCANNING ASSISTANT tab CONFIGURATION button).

Note Check whether the CoLa dialect is set to AUTOMATIC DETECTION and enter the IP address for the VMD (see chapter **3.8.3 Ethernet interface**).

6. Then scan for connected devices (SCANNING ASSISTANT tab, SCAN button) and add the VMD to the SOPAS project tree.
7. Log into the device as an AUTHORIZED CLIENT (EXTRAS menu, LOG INTO DEVICE, factory-set password is **client**).
8. In PROJECT TREE, VMDX10_XX00, PARAMETERS open the device page DIGITAL INPUTS/TRIGGERS and choose the option OFF in the LASER CONTROL field.

This switches on the VMS laser permanently. The VMS scanning line can then be seen and this allows the VMS to be adjusted.

6.4 Mechanically adjusting the VMD

The VMD's mounting adapter can be finely adjusted triaxially.

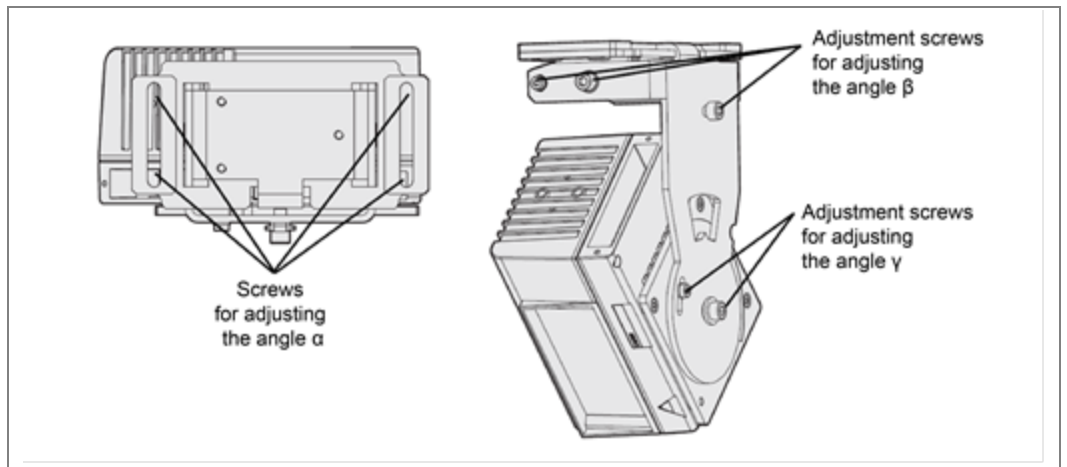


Fig. 21: Mounting adapter for the VMD

6.4.1 Adjustment above a conveyor system

Adjust the mounting adapter so that the center point of the sensor is located precisely above the center of the conveyor system. A plumb line, which is attached to the adjustment screw for adjusting the γ angle, is helpful.

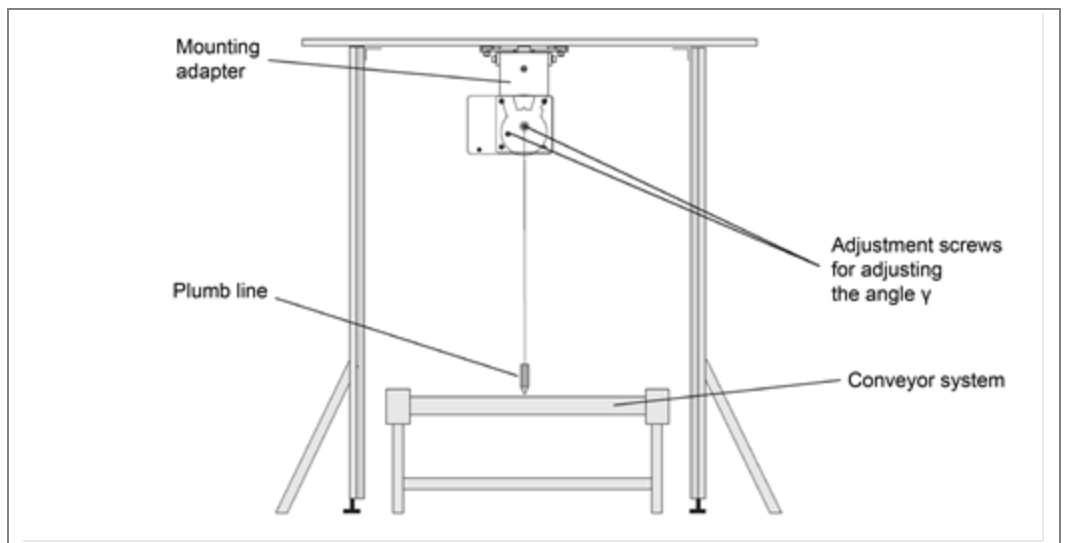


Fig. 22: Adjustment above a conveyor system

6.4.2 Adjustment of the γ angle

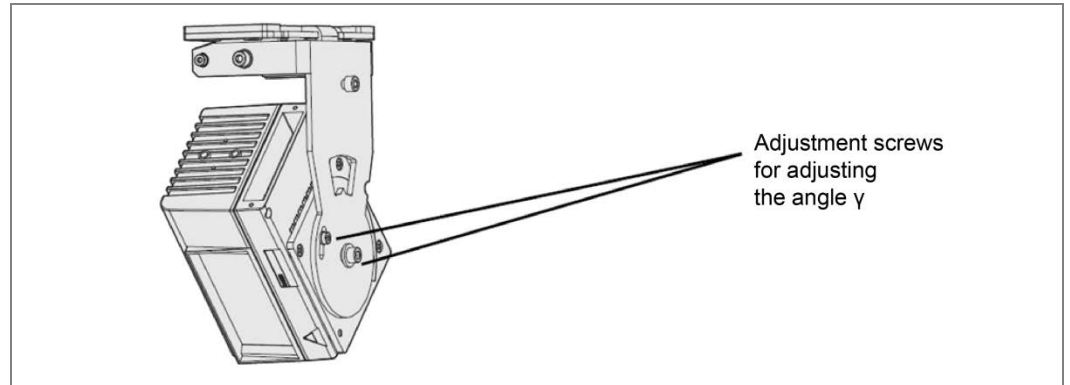


Fig. 23: Adjustment of the γ angle

1. Loosen the adjustment screws on the mounting adapter for adjusting the γ angle.
2. Set the γ angle to 0° .
3. Tighten the two adjustment screws again.

6.4.3 Adjustment of the β angle

1. Place a try square onto the conveyor system right at the outside. The scanning line must be visible on the vertical arm of the try square.
2. Loosen the two M8 screws and the two M6 screws ①.
3. Use the adjustment screw ② to adjust the VMD so that the scanning line meets the conveyor system at right angles.
4. Tighten the M8 and M6 screws ① again.

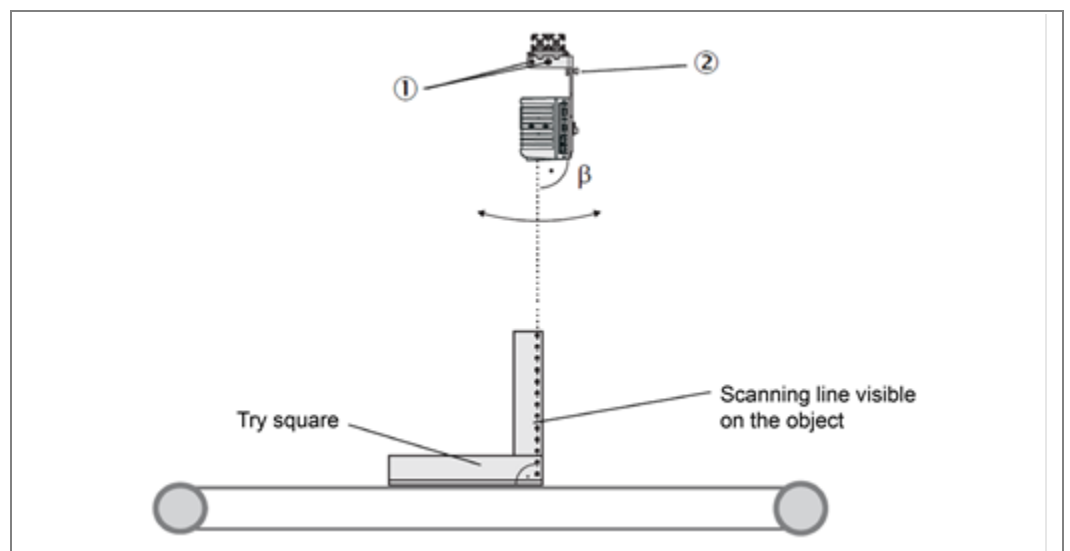


Fig. 24: Adjustment of the β angle

6.4.4 Adjustment of the α angle

- Draw a line in the conveying direction using a felt tip pen. To do this, start the conveyor system and hold the felt tip pen on the moving surface.
- Loosen the four screws ① on the mounting kit.

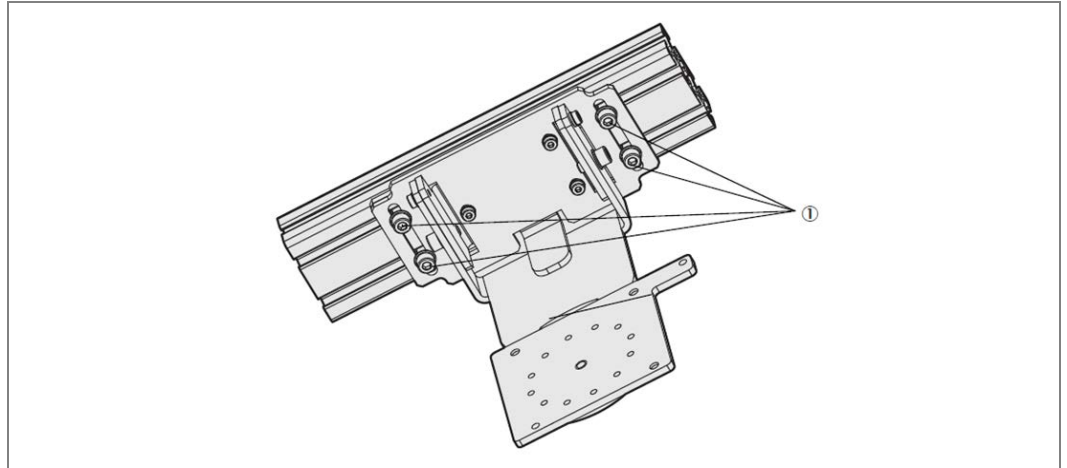


Fig. 25: Screws on the mounting adapter for adjusting the α angle

- Align the scanning line of the VMD at right angles to the line on the conveyor system. A try square, which is placed on the line on the conveyor system, is helpful for doing this.

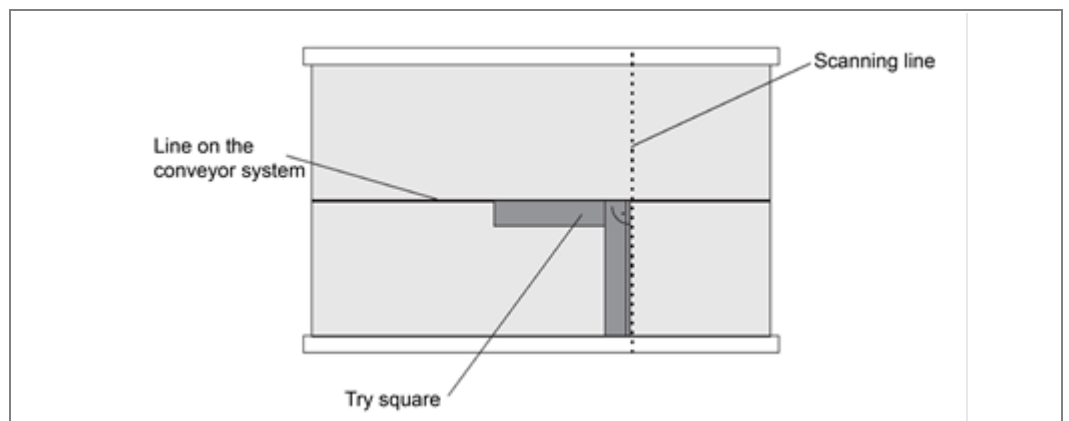


Fig. 26: Adjustment of the α angle

- Tighten the four screws ① again.

6.5 Determine the coordinates and the angle γ using the installation setup.

Installation setup is available for configuring the position of the VMD. You will find detailed instructions on every step of commissioning in this assistant.

Note The VMD must be able to scan the conveyor surface so as to allow the installation setup to work. Stick a black surface along the scanning line, e.g. using white adhesive tape.

6.5.1 Specifying the γ angle and the Y and Z coordinates



- Start the setup in the menu VMDX10_XX00, COMMISSIONING, START INSTALLATION SETUP.
- Input the parameters GAMMA, Y COORDINATE AND Z COORDINATE (see the figure that follows). It is sufficient to enter rough values here. The setup determines the accurate parameters in the following steps.

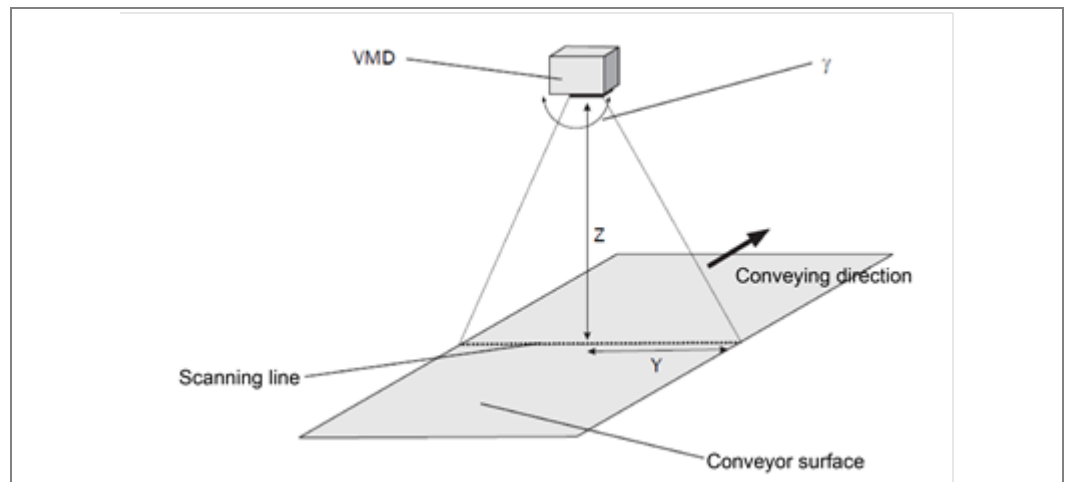


Fig. 27: γ angle and Y coordinate and Z coordinate

6.5.2 Detecting the conveyor surface

In the next step, the setup scans the surrounding contour and shows the scanning line it has seen. However, it cannot yet identify which part of the scanning line corresponds to the conveyor surface.

Therefore, you determine the position of the conveyor surface with the aid of marks.

➤ Position two markers (M1 and M2) using the right mouse button.

Note Make sure that the markers are as close as possible to the right and left edges of the conveyor system.

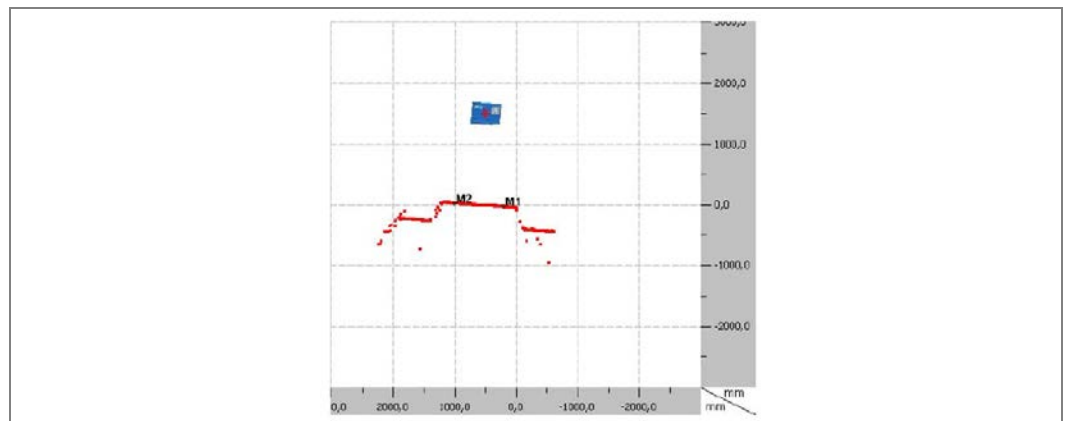


Fig. 28: Example of a scanned conveyor system (1)

➤ Click CALCULATE in the setup. The γ angle and the Z coordinate are calculated and the scanning line is drawn in horizontally in the image.

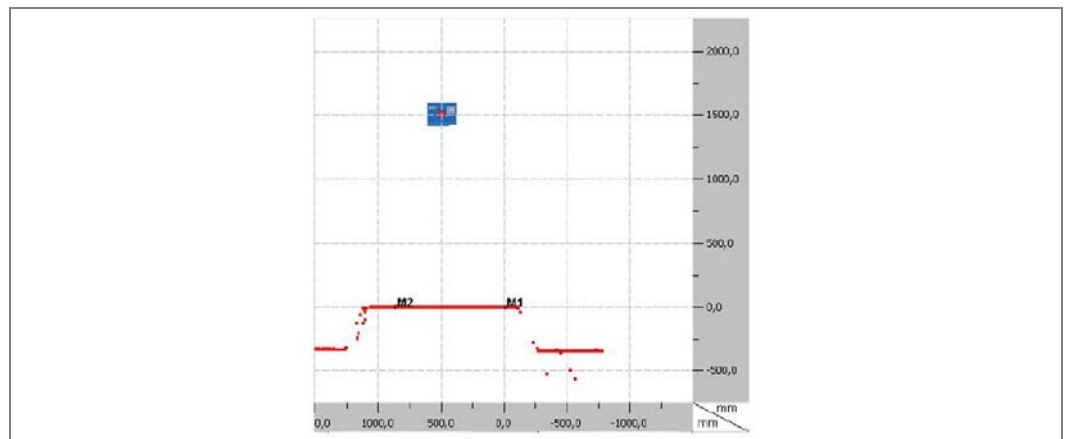


Fig. 29: Example of a scanned conveyor system (2)

6.5.3 Detecting the Y coordinate

- Place the test object upright on the left side of the conveyor surface.

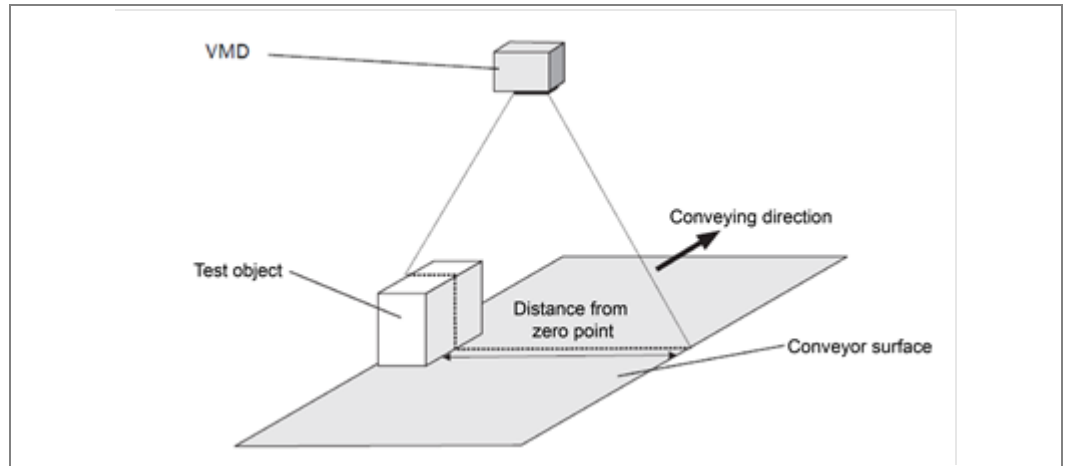


Fig. 30: Input the distance from the zero point

- In the next step in the setup, input the DISTANCE FROM THE ZERO POINT, the OBJECT WIDTH and the OBJECT HEIGHT.

Note The test object has the dimensions 202 x 302 x 402 mm (see chapter **10.4.2 General accessories**). You must measure the distance from the zero point.

The setup scans the surrounding contour and shows the scanning line it has seen. However, it cannot yet identify which part of the scanning line corresponds to the test object.

- Determine which part of the surrounding contour corresponds to the right side of the object on the scanning line. To do this, input two markers using the right mouse button.

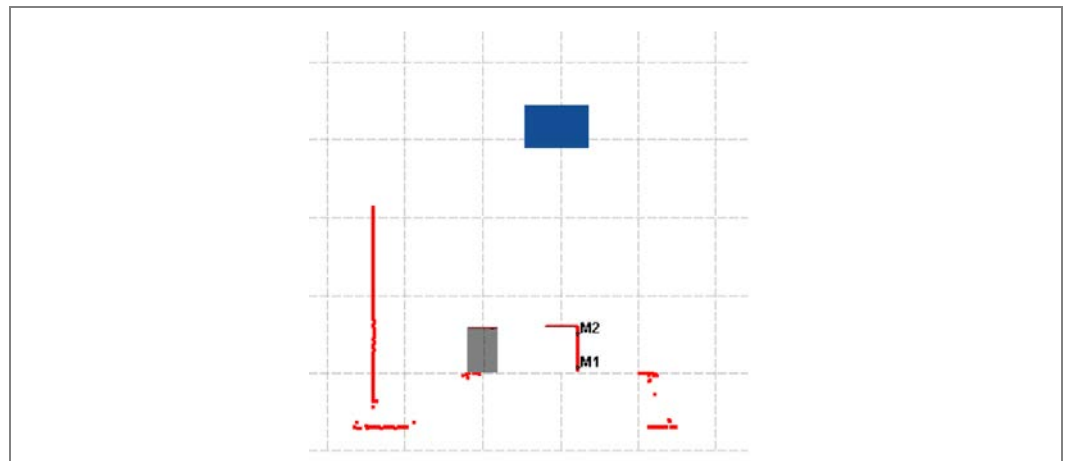


Fig. 31: Scanned test object (1)

➤ Click CALCULATE in the setup.

The setup then surrounds the test object with the scanning line and calculates the distance of the VMD from the zero point and therefore its Y coordinate.

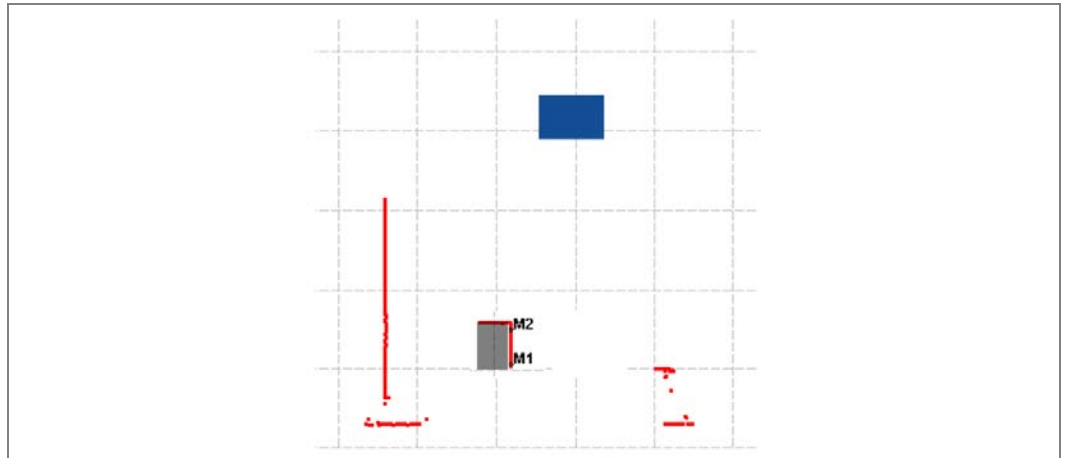


Fig. 32: Scanned test object (2)

6.5.4 Accepting the parameters

To finish, the setup displays the new parameters. If you accept these, they are saved in the device.

Note The values are not displayed in the SOPAS user interface yet under PARAMETERS, POSITION.



This only occurs after the data is uploaded from the device.

COMMUNICATION menu, UPLOAD ALL PARAMETERS FROM THE DEVICE command

6.6 Determining the scanning settings, encoder settings, and the measured data telegram in SOPAS

A few more settings are needed in SOPAS to configure the VMS so that it is fundamentally ready for operation.

6.6.1 Configuring the scanning settings



PROJECT TREE, VMDX10_XX00, PARAMETERS, BASIC PARAMETERS

➤ Define the following parameters in the SCANNING SETTINGS, SCANNING AREA section:

- START ANGLE: 55°
- ANGULAR RANGE: 70°

➤ Call up the SCANNING FREQUENCY SETUP in the CURRENT DEVICE PARAMETERS section.

➤ Choose the option FREQUENCY under SETTING TYPE and input 270 Hz.

➤ In the next step, choose a setting with an angular resolution of at least 0.25°.

6.6.2 Encoder settings



➤ Select the type of encoder that is connected and configure its resolution.

PROJECT TREE, VMDX10_XX00, PARAMETERS, INCREMENT CONFIGURATION/SYNC., INCREMENT section

6.6.3 Measured data telegram



➤ Choose which measured data telegram should be output via the host interface (see chapter **10.3 Measured data telegrams reference**).

PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section

6.7 Test of the configuration

Use the graphical representation in the SOPAS monitor to verify the generated measured values and the measuring range online. Please note that the monitor cannot show the data in real time and therefore does not visualize all measured values.

6.7.1 Displaying the measurement results

In the measurement results display, when the VMS application is started, the measured values for the VMS are displayed to you as they are output in the measured data telegram.



VMDX10_XX00, MONITOR, DISPLAYING THE MEASUREMENT RESULTS

6.7.2 VMS result list

When the VMS application is started, the last ten measurement results from the VMD are displayed in a table in the RESULT LIST section.



VMDX10_XX00, MONITOR, DISPLAYING THE RESULT LIST

6.7.3 Noise statistics

Depending on the wear, surface condition, etc., the conveying surface generates a noise within the measurement when crossing the scanning line. In order to determine the trigger threshold for object detection, it is helpful to determine the intensity of the noise.

To this end, the noise statistics make it possible to scan parts of the conveyor surface or the entire conveyor surface and to display the noise.



PROJECT TREE, VMDX10_XX00, MONITOR, DISPLAYING THE NOISE STATISTICS

6.7.4 Scan display

Using the graphical scan display in SOPAS, you can verify the measuring range of a VMD and the measured values online.



VMDX10_XX00, MONITOR, SCAN DISPLAY

6.7.5 3 D object display

The 3 D object display visualizes the measured objects on the conveyor system.

➤ Use the display, e.g. when setting up the system or for control during continuous operation.



VMDX10_XX00, MONITOR, 3 D OBJECT DISPLAY

7 Maintenance

7.1 Maintenance during operation

The VMS volume measurement system works maintenance-free except for the care measures mentioned below. Maintenance is not necessary to ensure compliance with laser class 2.

Recommendation To achieve the full optical output of the VMS, the front screens and any additional front screens should regularly be checked for contamination. This is especially true in harsh operating environments (dust, abrasion, humidity, fingerprints).

The following maintenance work must be carried out at the specified time intervals:

Device	Maintenance task	Interval *	Carried out by
VMD	Clean the front screen	1 x/month	Trained personnel
General	Visually inspect the electrical cabling and wiring for damage	1 x/year	Specialist
	Check the measurement accuracy	1 x/year	Specialist
	Carry out a functional test with a reference object	Whenever the system is started	Trained personnel
* The intervals depend on the ambient conditions and degree of contamination. In addition, the intervals must be defined according to how significant they are for the customer process.			

Tab. 19: Maintenance intervals



WARNING

Damage to the eye by laser beam

The VMS410/510 volume measurement system works with a red, class-2 laser. When exposed to the laser beam for longer periods of time, the retina of the eye may be damaged.

The laser output aperture is the front screen of the VMD.

Caution: Incorrect use of the VMS may lead to dangerous radiation exposure and exceeding the laser class.

- Never look directly into the beam path (similar to sunlight).
- Never point the laser beam at people.
- When mounting and adjusting the LMS400, beware of reflections of the laser beam off reflective surfaces.
- Do not open the housing. (Opening does not interrupt the switching on of the laser diode by the reading pulse).
- Observe the applicable laser safety regulations according to the latest version of IEC 60825-1:2014.
- It is not permitted to remove the protective cover that may be attached to the VMD head. This could cause damage to the eye by laser beams.



Fig. 33: Warning label for laser protective cover

Clean the front screen.



WARNING

Damage to the front screen

The front screen is made of glass. The optical output is weakened by scratches and streaks on the front screen.

- Do not use aggressive cleaning agents.
- Do not use abrasive cleaning agents.
- Avoid scratching and chafing motion on the front screen.

Contamination on the front screen of the VMD can cause incorrect measurements.

- Get rid of any contamination on the front screen to avoid incorrect measurements.
- Use a clean, soft brush to remove dust from the front screen.
- Then wipe the front screen with a clean, damp cloth.

Note Static charges cause dust particles to stick to the front screen. You can reduce this effect by using a SICK anti-static plastic cleaner (part number 5600006) and a SICK lens cloth (part number 4003353).

7.2 Replacing components



WARNING

Disconnect the power to the system

- Make sure the power supply for the entire system is disconnected throughout the entire time that you are replacing devices.



WARNING

Risk of injury due to electrical current

Only a qualified electrician or trained person working under the guidance and supervision of a qualified electrician is permitted to work on electrical systems or equipment, and they must comply with the electrical regulations.

If the system or individual components need to be replaced, proceed as follows:

1. Switch off the power supply for the VMD and detach the connection.
2. Remove the connection cables from the VMD.
3. Loosen three M6 screws (see chapter **4.3 Mounting the VMD**) and replace the VMD.
4. Mount and adjust the replacement device (see chapter **4 Mounting**).
5. Configure the replacement device (see chapters **6.2 Configuration and adjustment ff.**).

Notes Repairs to VMS volume measurement system components may only be performed by qualified and authorized service personnel from SICK AG.

7.3 Disposal

Unusable or irreparable devices must be dismantled and disposed of in an environmentally safe manner in accordance with the relevant national waste disposal regulations. SICK AG is not currently able to take back devices that are irreparable or can no longer be used.

1. Dismantle the VMD housing.
2. Remove the electronic modules.
3. Remove the laser output aperture and send it for glass recycling.
4. Send the chassis and cover for die cast aluminum recycling.
5. Dispose of electronic components as hazardous waste.

8 Fault diagnosis

This chapter describes how to identify and remedy VMS volume measurement system faults.

8.1 Response to faults



WARNING

Cease operation if the cause of the fault has not been clearly identified

Immediately stop machine operation if you cannot clearly identify the fault and if you cannot safely remedy the problem.

8.2 SICK support

If you cannot remedy a fault with the help of the information provided in this chapter, please contact your respective SICK subsidiary.

8.3 Component fault indicators

The VMS automatically monitors beam generation and automatically shuts it down in the event of irregularities. In such cases, the following will occur:

- The **Device Ready** LED lights up red.
- The scanner no longer sends any measured values.

LED	Color	Meaning
Device Ready	Red	Fault during initialization or self-test or occurrence of errors during operation.

Tab. 20: LED display in the event of a fault in the VMD

To delete the fault status, proceed as follows:

- Switch off the VMS and turn it on again.
- If the fault persists after being switched on again or occurs again, then check the device status using SOPAS. If faults are listed there, please contact SICK Service.

8.4 Detailed fault analysis

The VMS saves faults that have occurred in a log. You can display this log using SOPAS.



➤ Connect SOPAS to the device.

PROJECT TREE, VMDX10_XX00, SERVICE, SYSTEM STATUS, OPERATING DATA and SYSTEM STATUS sections

8.4.1 The status log

- The status log is retained even after switching the device off and on again.
- The system distinguishes between four types of fault:
 - Information
 - Warning
 - Fault
 - Critical fault

The system saves only the last five entries for each fault type.

Note Please contact SICK support for a more detailed analysis of the fault situation.

8.4.2 Log data during continuous operation also

In the SOPAS configuration software, the DATA RECORDER is available in the EXTRAS menu. You can use this to also log and analyze certain memory areas of the VMS in a targeted fashion during continuous operation.

9 Technical Data

9.1 VMS410/510 volume measurement system data sheet

Type	VMS410	VMS510
Carried out by	One-scanner solution	
Laser output aperture	On the front	
Laser diode (wavelength)	Visible light ($\lambda = 650 \text{ nm}$)	
Laser power	Max. 7.4 mW / 9.5 mW	
Laser class of the device	2	
Usable aperture angle	Max. 70°	
Detectable object shape	Cuboid objects	
Max. object size (L × W × H)	2,600 mm × 1,000 mm × 1,000 mm	
Min. object size (L × W × H) (Operating condition 1) at v = 0.1 m/s to 1.2 m/s	50 mm × 50 mm × 50 mm	
Min. object size (L × W × H) (Operating condition 2) at v = 0.1 m/s to 2 m/s	100 mm × 100 mm × 50 mm	
Min. object size (L × W × H) (Operating condition 3) at v = 0.1 m/s to 2 m/s	100 mm × 100 mm × 100 mm	
Certified scale value d (L × W × H) (Operating condition 1) at v = 0.1 m/s to 1.2 m/s	5 mm × 5 mm × 5 mm	
Certified scale value d (L × W × H) (Operating condition 2) at v = 0.1 m/s to 2 m/s	10 mm × 10 mm × 5 mm	
Certified scale value d (L × W × H) (Operating condition 3) at v = 0.1 m/s to 2 m/s	10 mm × 10 mm × 10 mm	
Object remission	10 to 200%	
Min. object gap during free-running measurement during triggered measurement	25 mm 50 mm	
Max. conveyor speed v	2.0 m/s	
Optical indicators	6 LEDs	
Host interfaces	RS-232 or RS-422, data output format can be set	
Output data	Maximum dimensions (length, width, height) Box volumes Real volumes	Maximum dimensions (length, width, height)
Supply voltage /power consumption	24 V DC $\pm 15\%$ /max. 25 W	
Housing	Die-cast aluminum	
Enclosure rating/protection class	IP 20 (in accordance with DIN 40050); with IP 65 male connector cover	
EMC test	In accordance with EN 6100062:2001, EN 6100064:2001	
Thorough vibration/shock check	In accordance with EN 6006826, 27, 29, 64	
Weight	Approx. 2.3 kg	
Temperature (operation/storage)	0 °C ... +40 °C / -20 °C ... +70 °C	

Tab. 21: LED display in the event of a fault in the VMS

9.2 Dimensional drawings

9.2.1 Dimensional drawing of the VMD volume measurement system

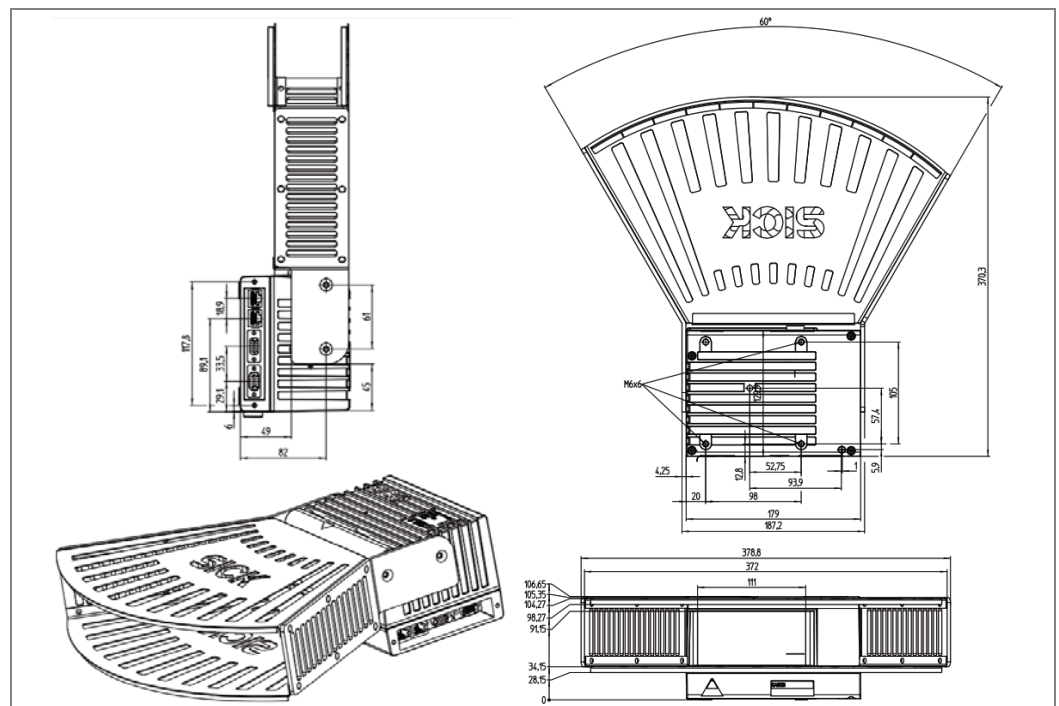
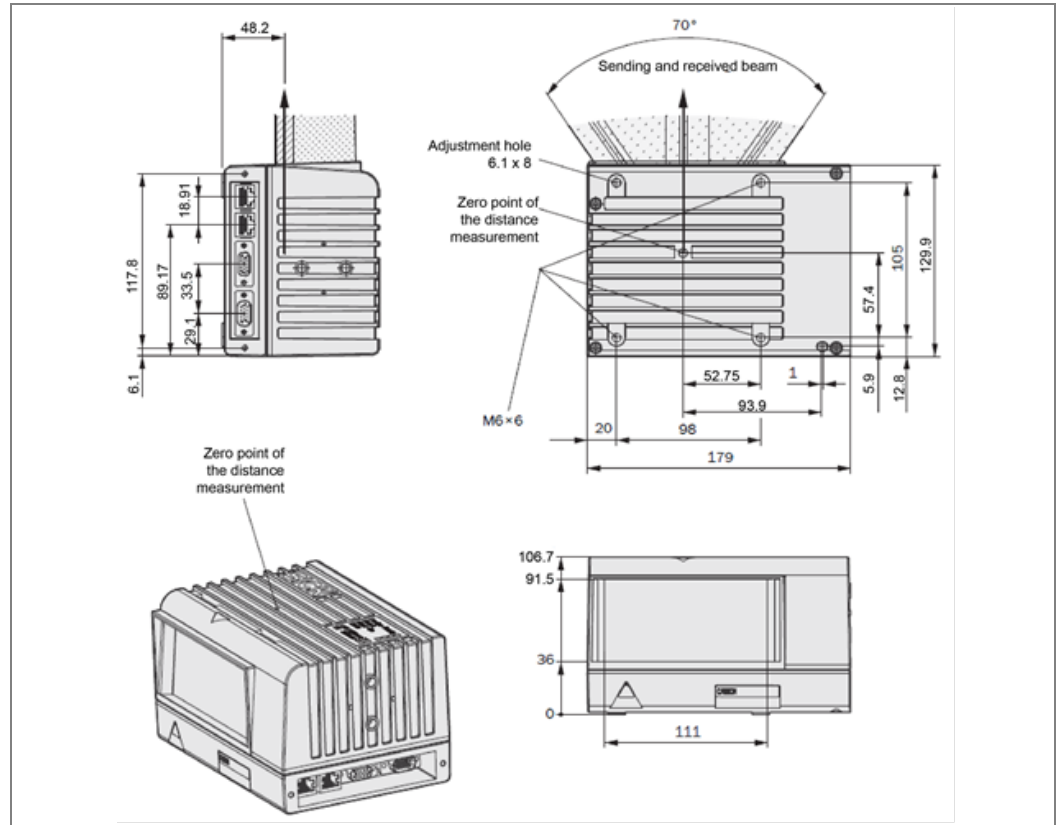


Fig. 34: Dimensional drawing of VMD with and without optics cover

9.2.2 VMD mounting adapter dimensional drawing

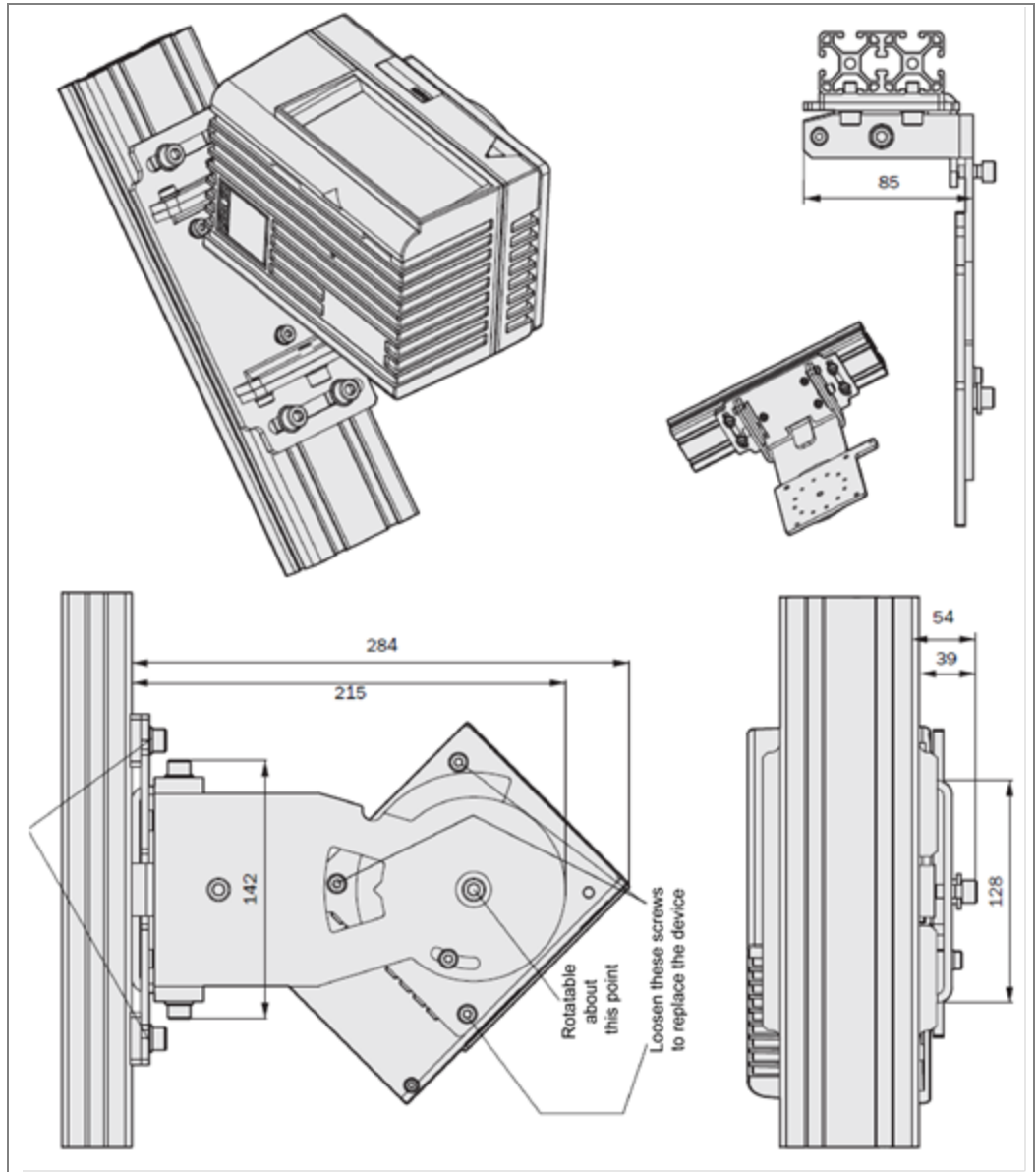


Fig. 35: VMD mounting adapter dimensional drawing

10 Appendix

10.1 Overview of the appendices

The appendix contains the following supplements and additions:

- Telegram reference
- Ordering information
- Glossary
- Compliance with EU Directives
- Figures and tables

10.2 Control telegrams reference

Notation

The individual telegram sections must each be separated by a semicolon (ASCII code 59, hex 3 B).

All examples used in the following telegram lists refer to the CoLaA protocol.

Syntax errors

If the VMS detects an error in the syntax when receiving a telegram, it sends back an error telegram with an error code.

Telegram structure: **sFA** error code

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Syntax or logic error	string	3	sFA
Error code	Contains the error's type (see the following table)	string	4	FF00h ... FFFFh
Telegram syntax I: Syntax or logic errors				

Error code	Possible cause	Corrective measure
FF79h	Unknown name	The method or parameter name is unknown, check for typing errors.
FFC8h FFC9h	User level too low	A higher user level is required for access to the method or the parameter – change to the user level specified.
FF??h	General syntax error	Check telegram syntax: Command type, command, number and value range of parameters

Tab. 22: Syntax or logic error

10.2.1 Object start

The VMS generates this telegram as soon as the object enters into the scanning line (see chapter **3.3.2 Measuring modes**). You must activate the telegram in SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, ACTIVATE OBJECT START TELEGRAM option

Telegram structure: **2 B**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Signals the start of the object	string	2	2 B
Telegram syntax II: Start of object				

10.2.2 Object end

The VMS generates this telegram as soon as the object leaves the scanning line (see chapter **3.3.2 Measuring modes**). You must activate the telegram in SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, ACTIVATE OBJECT START TELEGRAM option

Telegram structure: **2 E**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Signals the end of the object	string	2	2 E
Telegram syntax III: End of the object				

10.2.3 Heartbeat

The VMS generates this telegram after an interval, which can be set and during which objects may not be measured. As a result, even during idling, the application also gets the option to cyclically check the device status. You must activate the telegram in SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, ACTIVATE HEARTBEAT TELEGRAM option

Telegram structure: **HH**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Heartbeat is output at an interval set in SOPAS	string	2	2 HH
Telegram syntax IV: Heartbeat				

10.2.4 Standby

The telegram sends the VMS into standby mode.

Request

Telegram structure: **2 I**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Place the VMS in the 'idle/standby' mode	string	2	2 I
Telegram syntax V: 'Standby' request				

Reply

Telegram structure: **2 I**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	VMS in 'idle/standby' mode	string	2	2 I
Telegram syntax VI: Response to 'standby' request				

Example Request: 2 I
Response: 2 I

10.2.5 Measurement mode

The telegram sends the VMS into measuring mode.

Note After switching on the VMS, it is not necessary to transfer the telegram to the VMS. The system enters measuring mode independently and signals this by outputting the value 201.

Request

Telegram structure: **20**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Place VMS in measuring mode	string	2	20
Telegram syntax VII: 'Measuring mode' request				

Confirmation

Telegram structure: **20**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	VMS is placed in measuring mode	string	2	20
Telegram syntax VIII: Confirmation of the 'measuring mode' request				

Reply

Telegram structure: **201**

Telegram part	Description	Variable type	Length (byte)	Value range
Command type	Approx. 120 seconds after receiving the request or 180 seconds after switching on, the VMS is in measuring mode	string	3	201
Telegram syntax IX: Response to the 'measuring mode' request				

Example Request: 20
Confirmation: 20
Response: 201

10.3 Measured data telegrams reference

10.3.1 Basic measured data telegram (metric values)



You can choose the basic measured data telegram within SOPAS.

PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;SerialNumberMaster; SerialNumberSlave;Index;MeasurementStatus;CS
---------------------	---

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	M for metric in mm	string	1	M metric values
Length	Longest side of the smallest box that fully encloses the object in mm	string	4	0000 9999
Width	Width of the smallest box that fully encloses the object in mm	string	4	0000 9999
Height	Height of the smallest box that fully encloses the object in mm	string	4	0000 9999
SerialNumberMaster	Outputs the serial number of the VMD	string	8	00000000 99990000
SerialNumberSlave	Always outputs 00000000	string	8	00000000
Index	Telegram counter initialized with 1	string	4	0000 9999
MeasurementStatus	0 = OK	string	4	0000 9999
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax X: Basic measured data telegram (metric values)

Example

Output	DI;M;0500;0400;0350;03404711;00000000;0123;0000;AC34
--------	--

10.3.2 Basic measured data telegram (values in inches)

You can choose the basic measured data telegram within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI;Unit;Length;Width;Height;SerialNumberMaster;
---------------------	--

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	I for values in inches	string	1	I values in inches
Length	Longest side of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Width	Width of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Height	Height of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
SerialNumberMaster	Outputs the serial number of the VMD	string	8	00000000 99990000
SerialNumberSlave	Always outputs 00000000	string	8	00000000
Index	Telegram counter initialized with 1	string	4	0000 9999
MeasurementStatus	0 = OK	string	4	0000 9999
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XI: Basic measured data telegram (values in inches)

Example

Output	DI;l;00500;00400;00350;03404711;00000000;0123;0000;AC34
--------	--

10.3.3 Basic measured data telegram 2 (metric values)

You can choose the basic measured data telegram 2 within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;ScaleValueLength; ScaleValueWidth;ScaleValueHeight;SerialNumberMaster; SerialNumberSlave1;SerialNumberSlave2; SerialNumberSlave3;Index;MeasurementStatus;CS
---------------------	--

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	M for metric in mm	string	1	M metric values
Length	Longest side of the smallest box that fully encloses the object in mm	string	4	0000 9999
Width	Width of the smallest box that fully encloses the object in mm	string	4	0000 9999
Height	Height of the smallest box that fully encloses the object in mm	string	4	0000 9999
ScaleValueLength	Scale values of length, width and height in mm	string	4	0000 9999
ScaleValueWidth	The relevant value depends on the values defined in SOPAS and the	string	4	0000 9999
ScaleValueHeight	Speed of the conveyor system.	string	4	0000 9999
SerialNumberMaster	Outputs the serial number of the VMD master	string	8	00000000 99990000
SerialNumberSlave1	Always outputs 00000000	string	8	00000000 99990000
SerialNumberSlave2	Always outputs 00000000	string	8	00000000 99990000
SerialNumberSlave3	Always outputs 00000000	string	8	00000000 99990000
Index	Telegram counter initialized with 1	string	4	0000 9999
MeasurementStatus	0 = OK	string	4	0000 9999
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XII: Basic measured data telegram 2 (metric values)

Example

Output	DI ;M;0500;0400;0350;0010;0010;0005;03404711;00000000; 00000000;00000000;0123;0000;AC34
--------	---

10.3.4 Basic measured data telegram 2 (values in inches)

You can choose the basic measured data telegram 2 within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;ScaleValueLength;ScaleValueWidth;ScaleValueHeight;SerialNumberMaster;SerialNumberSlave1;SerialNumberSlave2;SerialNumberSlave3;Index;MeasurementStatus;CS
---------------------	--

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	l for values in inches	string	1	l values in inches
Length	Longest side of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Width	Width of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Height	Height of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
ScaleValueLength	Scale values of length, width and height in inch/100	string	4	0000 9999
ScaleValueWidth	The relevant value depends on the values defined in SOPAS and the	string	4	0000 9999
ScaleValueHeight	Speed of the conveyor system.	string	4	0000 9999
SerialNumberMaster	Outputs the serial number of the VMD master	string	8	00000000 99990000
SerialNumberSlave1	Always outputs 00000000	string	8	00000000 99990000
SerialNumberSlave2	Always outputs 00000000	string	8	00000000 99990000
SerialNumberSlave3	Always outputs 00000000	string	8	00000000 99990000
Index	Telegram counter initialized with 1	string	4	0000 9999
MeasurementStatus	0 = OK	string	4	0000 9999
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XIII: Basic measured data telegram 2 (values in inches)

Example

Output	DI;l;00500;00400;00350;0400;0400;0200;03404711;00000000;00000000;00000000;0123;0000;AC34
--------	--

10.3.5 Extended measured data telegram (metric values)

You can choose the extended measured data telegram within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;BoxVolume;RealVolume;Angle;MeasurementStatus;Index;CS
---------------------	---

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	M for metric in mm	string	1	M metric values
Length	Longest side of the smallest box that fully encloses the object in mm	string	4	0000 9999
Width	Width of the smallest box that fully encloses the object in mm	string	4	0000 9999
Height	Height of the smallest box that fully encloses the object in mm	string	4	0000 9999
BoxVolume	Box volume of the smallest box that fully encloses the object in cm ³	string	7	0000000 9999999
RealVolume	Same value as box volume	string	7	0000000 9999999
Angle	Angle of the smallest box that fully encloses the object in 1/10 degree	string	4	±000 ±999
MeasurementStatus	0 = OK	string	4	0000 9999
Index	Telegram counter initialized with 1	string	4	0000 9999
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XIV: Extended measured data telegram (metric values)

Example

Output	DI ;M;0500;0400;0350;0070000;0070000;+433;0000;0123;AC34
--------	---

10.3.6 Extended measured data telegram (values in inches)

You can choose the extended measured data telegram within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;Volume;RealVolume;Angle; MeasurementStatus;Index;CS
---------------------	---

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	I for values in inches	string	1	I values in inches
Length	Longest side of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Width	Width of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Height	Height of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
BoxVolume	Box volume of the smallest box that fully encloses the object in inch ³ /10	string	7	0000000 9999999
RealVolume	Real volume of the smallest box that fully encloses the object in inch ³ /10	string	7	0000000 9999999
Angle	Angle of the smallest box that fully encloses the object in 1/10 degree	string	4	±000 ±999
MeasurementStatus	0 = OK	string	4	0000 9999
Index	Telegram counter initialized with 1	string	4	0000 9999
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XV: Extended measured data telegram (values in inches)

Example

Output	DI;I;00500;00400;00350;0070000;0070000;+433;0000;0123;AC34
--------	--

10.3.7 Extended measured data telegram 2 (metric values)

You can choose the extended measured data telegram within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;Angle;Index;MeasurementStatus;MeasurementStatus2;CS
---------------------	---

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	M for metric in mm	string	1	M metric values
Length	Longest side of the smallest box that fully encloses the object in mm	string	4	0000 9999
Width	Width of the smallest box that fully encloses the object in mm	string	4	0000 9999
Height	Height of the smallest box that fully encloses the object in mm	string	4	0000 9999
Angle	Angle of the smallest box that fully encloses the object in 1/10 degree	string	4	±000 ±999
Index	Telegram counter initialized with 1	string	4	0000 9999
MeasurementStatus	0 = OK	string	4	0000 9999
MeasurementStatus2	0 = OK	string	8	00000000 99990000
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XVI: Extended measured data telegram 2 (metric values)

Example

Output	DI;M;0500;0400;0350;+433;0123;0000;00000000;AC34
--------	--

10.3.8 Extended measured data telegram 2 (values in inches)

You can choose the extended measured data telegram within SOPAS.



PROJECT TREE, VMDX10_XX00, PARAMETERS, INTERFACES, HOST, OUTPUT VIA HOST INTERFACE section, MEASURED DATA TELEGRAM selection field

PROJECT TREE, VMDX10_XX00, PARAMETERS, DATA PROCESSING, UNIT/SCALE VALUES, UNIT/ROUNDING section, UNIT selection field

Telegram structure:	DI ;Unit;Length;Width;Height;Angle;Index;MeasurementStatus;MeasurementStatus2;CS
---------------------	---

Telegram part	Description	Variable type	Length (byte)	Value range
Command	Start of measured data output	string	2	DI
Unit	I for values in inches	string	1	I values in inches
Length	Longest side of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Width	Width of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Height	Height of the smallest box that fully encloses the object in inch/100	string	5	00000 99999
Angle	Angle of the smallest box that fully encloses the object in 1/10 degree	string	4	±000 ±999
Index	Telegram counter initialized with 1	string	4	0000 9999
MeasurementStatus	0 = OK	string	4	0000 9999
MeasurementStatus2	0 = OK	string	8	00000000 99990000
CS	Checksum of the above-described commands in accordance with CRC 16	string	4	0000 h FFFFh

Telegram syntax XVII: Extended measured data telegram 2 (values in inches)

Example

Output	DI;l;00500;00400;00350;+433;0123;0000;00000000;AC34
--------	---

10.4 Ordering information

10.4.1 Available systems

Part number	Device type	Designation
1025985	VMS410	Volume measurement system
1043950	VMS510 MID	OIML and MID-certified volume measurement system with calibratable measured values
1048289	VMS510 MID-e	OIML and MID-certified volume measurement system with calibratable measured values for cubic singulated and non-singulated objects.

Tab. 23: Available systems

10.4.2 General accessories

Part number	Device type	Designation
2039457	Incremental encoder	0.2 mm/increment Resolution
2034693	Photoelectric sensor set	WL18 with holder, open cable end
4040035	Test object	202 × 302 × 402 mm test object, indispensable for commissioning

Tab. 24: General accessories

10.4.3 Interface sets

Part number	Device type	Designation
2034148	CDM interface set	1 CDM490-0001 2 cables, male/female connector, 10 m 1 mounting material (sliding nuts, screws)
2034151	CDM/CMP interface set	1 CDM490-0001 1 CMP490 2 cables, male/female connector, 10 m 1 mounting material (sliding nuts, screws)

Tab. 25: Interface sets

10.4.4 Male connector cover sets

Part number	Device type	Designation
2030439	Male connector cover set, M screw fittings	1 male connector cover, M screw fittings
2034152	Male connector cover set, M12 screw fittings	1 male connector cover, M12 screw fittings 1 power connection cable, CAN, 3 m 1 male connector for trigger and tachometer 1 female cable connector for "Host" connection 1 cable, female connector stripped, 10 m
2034153	Male connector cover set, cables (3 m) with CDM	1 male connector cover with cable 2 × 3 m 1 CDM490-0001 1 mounting material (sliding nuts, screws)
2034154	Male connector cover set, cables (3 m) with CDM + voltage supply	1 male connector cover, with cable, 3 m 1 CDM490-0001 1 CMP490 1 mounting material (sliding nuts, screws)

Tab. 26: Male connector cover sets

10.4.5 Accessories for male connector covers

Part number	Device type	Designation
2031372	Communication cable	1 communication cable for terminal interface in the male connector cover, 3 m
2030467	Cat. 5 patch cable	10 m cat. 5 patch cable with RJ-45 male connectors, which fulfill the IP 65 enclosure rating
2030465	Cat. 5 cable	10 m cat. 5 patch cable with one RJ-45 male connector, which fulfills the IP 65 enclosure rating, and one open cable end

Tab. 27: Accessories for male connector covers

10.4.6 Measuring head spare parts

Part number	Device type	Designation
1027887	VMD410-1000	Volume measurement device
1027888	VMD510-1000	Volume measurement device, calibratable
2030421	Mounting adapter	For mounting onto an 80 mm item aluminum profile

Tab. 28: Measuring head spare parts

10.5 Glossary

Note For other terms, see also the online help for the SOPAS configuration software.

Aperture angle α

Angle, within the bounds of which, the laser beam is deflected by the polygon mirror wheel. A v-shaped area, in which the objects to be measured must be located, is created radially in front of the laser output aperture in the scanning direction.

Box volumes

The VMS determines the length, width and height of an object and calculates the volume of the smallest box that fully encloses the object (the box volume) from these data.

Download

Process of transmitting the parameter set, which was modified offline using the SOPAS configuration software, from the PC to the VMD. SOPAS either always transmits a complete copy to the working memory (RAM) of the VMD, (COMMUNICATION menu, DOWNLOAD ALL PARAMETERS TO DEVICE) or only the parameters that have just been edited, using the context menu called using the right mouse button (COMMUNICATION menu, DOWNLOAD CHANGED PARAMETERS TO DEVICE). The parameter set is permanently saved in the EEPROM of the VMD using the menu VMDX10_XX00, PARAMETERS, SAVE PERMANENTLY.

Functional interfaces

Switching inputs and outputs of the VMS.

Host interface

Main data interface for the VMS with configurable data output format. Among other things, this is used for outputting the measurement result in the form of a telegram to the host/the programmable logic controller. It is used to integrate the VMS into the SICK network. Can be electrically connected as RS-232 or RS-422. Makes various transmission protocols available.

Line scanner

Scanner, which deflects its focused laser beam very fast with the aid of a polygon mirror wheel with axially parallel mirrors. As a result, it generates a light spot in the measuring plane, which runs repeatedly on a straight line (row) and is visible to the human eye owing to the relative inactivity as a “resting” scanning line.

Parameter set

Data set, using which the implemented functions are initialized and activated in the VMD. This is transmitted from VMD to SOPAS or vice versa using UPLOAD or DOWNLOAD.

RIS

Remission information system: The RIS value corresponds to the remission value without the use of the scaling factor. It reproduces the reflectivity of the object at the point of measurement determined by the system in percent. A small RIS value indicates a low reflectivity (generally a dark object).

Scanning line

See line scanner.

SOPAS

Configuration software, can be run on Windows 2000/XP/Vista/7 or subsequent versions. Used for offline configuration (adaptation to the reading situation on site) and online operation of the VMS in the dialog box.

SOPAS setup help

Online help, which assists with the use of the SOPAS configuration software. The functions of the VMS parameters are explained and the relevant set of values is specified in the help. Runs in an HTML browser, e.g. Internet Explorer or in I-ViewPro (attached) and can be called up from SOPAS setup.

Terminal interface

Auxiliary data interface (RS-232) of the VMS with a fixed data output format. It can always be used to gain access to the VMD using the SOPAS configuration software. Among other things, it is used for outputting system and error messages.

Upload

Process of transmitting the parameter set from VMS to the PC and into the SOPAS configuration software. Parameter values are displayed in the index cards in the configuration software. This is a requirement if you wish to modify the current parameter set.

10.6 Compliance with EU Directives

EU declaration of conformity (extract)

The undersigned, who represents the manufacturer below, hereby declares that the product complies with the regulations of the EU directive(s) below (including all relevant changes), and that it is based on the relevant standards and/or technical specifications.

Complete EU declaration of conformity for download

You can call up the EU declaration of conformity and the current operating instructions for the protective device by entering the item number in the search field at www.sick.com (item number: see the type label entry in the **Ident. no.** field).

After standardization, the system's declaration of conformity is explained according to the following directive:

- Measuring Instruments Directive: 2014/32/EU (2016-04-20)

The customer receives the certificate after standardization.

10.7 Figures and tables

10.7.1 List of tables

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Australia

Phone +61 3 9457 0600
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Austria

Phone +43 22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg

Phone +32 2 466 55 66
E-Mail info@sick.be

Brazil

Phone +55 11 3215-4900
E-Mail marketing@sick.com.br

Canada

Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic

Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile

Phone +56 2 2274 7430
E-Mail info@schadler.com

China

Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark

Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland

Phone +358-9-2515 800
E-Mail sick@sick.fi

France

Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany

Phone +49 211 5301-301
E-Mail info@sick.de

Hong Kong

Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary

Phone +36 1 371 2680
E-Mail office@sick.hu

India

Phone +91 22 4033 8333
E-Mail info@sick-india.com

Israel

Phone +972 4 6881000
E-Mail info@sick-sensors.com

Italy

Phone +39 02 274341
E-Mail info@sick.it

Japan

Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia

Phone +6 03 8080 7425
E-Mail enquiry.my@sick.com

Mexico

Phone +52 472 748 9451
E-Mail mario.garcia@sick.com

Netherlands

Phone +31 30 2044 000
E-Mail info@sick.nl

New Zealand

Phone +64 9 415 0459
0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway

Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland

Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania

Phone +40 356 171 120
E-Mail office@sick.ro

Russia

Phone +7 495 775 05 30
E-Mail info@sick.ru

Singapore

Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia

Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia

Phone +386 591 788 49
E-Mail office@sick.si

South Africa

Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea

Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain

Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden

Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland

Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan

Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand

Phone +66 2645 0009
E-Mail Ronnie.Lim@sick.com

Turkey

Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates

Phone +971 4 88 65 878
E-Mail info@sick.ae

United Kingdom

Phone +44 1727 831121
E-Mail info@sick.co.uk

USA

Phone +1 800 325 7425
E-Mail info@sick.com

Vietnam

Phone +84 945452999
E-Mail Ngo.Duy.Linh@sick.com

Further locations at www.sick.com