VMS420/VMS520
Volume Measurement System

The benchmark for reliable object dimensioning

SICK
Sensor Intelligence.

Software versions described

Software/tool	Function	Status
VMD420-2000	Firmware VMD420	V 2.0 or higher
VMD520-2000	Firmware VMD520	V 2.0 or higher
Device description VMD420	Device specific software module for SOPAS	V 01.02.00 or higher
Device description VMD520	Device specific software module for SOPAS	V 01.02.00 or higher
SOPAS	Configuration software	V 02.12 or higher

ATTENTION

The VMS volume measurement system is intended exclusively for use in industrial environments. When used in residential areas, the device can cause radio interference.

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Version of the operating instructions

The newest version of these operating instructions can be obtained as PDF at **www.sick.com**.

Getting started ...

- **Delivery**

  – *Section 3.1 "Delivery" on page 18*

- **WARNING!**

  – *Chapter 2 "For your safety" on page 13*

- **Mounting and adjusting the device**

  – *Chapter 4 "Mounting" on page 34*

- **Connecting the device electrically**

  – *Chapter 5 "Electrical installation" on page 39*

- **Familiarisation with the device and its functions in general**

  – *Chapter 3 "Product description" on page 18*

  – *Chapter 10 "Technical specifications" on page 57*

- **Setting the device up for measurement**

  – *Chapter 7 "Configuration and adjustment" on page 46*

- **Help with resolving problems**

  – *Chapter 9 "Troubleshooting" on page 56*

- **Where is what?**

  – *"Table of contents" on page 5*

Installation steps (overview)

1. Check delivery for completeness.

2. Mount the VMD over the conveyor system.

3. Connect the VMD to the voltage supply.

4. Switch on PC and start Windows (minimum requirement: Windows 98).

5. Install enclosed SOPAS configuration software from CD-ROM on PC.

6. Connect the PC to the VMD using the Ethernet interface.

7. Start the SOPAS configuration software user interface and add a new project.

ATTENTION

Don't switch off the voltage supply during configuration!

Switching off the voltage supply during configuration causes all parameters already configured in the VMD to be lost.

8. Configuration of the scan assistant (SCAN ASSISTANT file card, CONFIGURATION button). Enter the IP address for the VMD and check setting for the CoLa dialect.

9. Scan for devices connected (SCAN ASSISTANT file card, SCAN button) and add the VMD to the SOPAS project tree.

10. From the EXTRAS menu select the LOGIN DEVICE command and log in to the system as AUTHORISED CLIENT using the password "client".

11. Deactivate preset laser control settings during adjustment (PROJECT TREE, VMDX20_XX00, PARAMETER, DIGITAL INPUTS/TRIGGER, area LASER CONTROL).

12. Adjust the two VMDs such that the beam is normally incident on the conveyor system.

13. Configure the position of the VMDs with the aid of the installation setup (VMDX20_XX00 menu, COMMISSIONING, START INSTALLATION SETUP).

14. Configure the VMD with the aid of the options on the PROJECT TREE, VMDX20_XX00, PARAMETER for the desired application.

15. Checking the measurement area of the system (PROJECT TREE, VMDX20_XX00, MONITOR).

16. Reactivate the laser control (PROJECT TREE, VMDX20_XX00, PARAMETER, DIGITAL INPUTS/TRIGGER, area LASER CONTROL).

17. Test the configuration under real conditions.

Recommendation

Use the graphic scan view in SOPAS to verify the generated measured values and to verify the measurement area online. During this process, note that the monitor cannot display the data in real-time and therefore does not display all measured values.

18. If necessary, correct and optimise the parameters set.

19. Save parameter record as a configuration file (extension "*.spr") (menu PROJECT, SAVE PROJECT AS).

20. Save parameter set permanently to the VMD (menu VMDX20_XX00, PARAMETER, SAVE PERMANENT). The parameter set is then saved on the EEPROM.

21. The VMS420/520 is ready for use with the application-specific configuration.

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Abbreviations

BCC	Block Character Check
CAN	Controller Area Network = standardised fieldbus system with message-based protocol for exchanging data
CS	Checksum
EEPROM	Electrically Erasable Programmable Read-only Memory
HTML	Hypertext Markup Language = page description language on the Internet
LED	Light Emitting Diode
RAM	Random Access Memory = volatile memory with direct access
RIS	Remission Information System
ROM	Read-only memory (permanent)
SOPAS	SICK OPEN PORTAL for APPLICATION and SYSTEMS Engineering Tool = configuration software for the configuration of the VMS
SST	Interface
VMD	Volume Measurement Device = scanner head
VMS	Volume Measurement System = SICK AG volume measurement system

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Tables

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Figures

1   About this document

Please read this chapter carefully before working with this documentation and the VMS420/520 volume measurement system.

1.1   Function of this document

These operating instructions are designed to address **the technical personnel** in regards to safe mounting, configuration, electrical installation, commissioning, operation and maintenance of the VMS volume measurement system.

1.2   Target group

The intended audience for this document is people in the following positions:

1.2.1   Mounting, electrical installation, maintenance and replacement

Factory electricians and service engineers

1.2.2   Commissioning, operation and configuration

Technicians and engineers

1.3   Depth of information

Note   The VMS420 as well as the VMS520 will be referred to as "VMS" in the following.

These operating instructions contain the following information on the VMS:

- mounting
- electrical installation
- commissioning and configuration
- maintenance
- fault, error diagnosis and troubleshooting
- ordering information
- conformity and approval

Planning and using measurement systems such as the VMS also require specific technical skills which are not detailed in this documentation.

The VMS is configured on-site for the related application using the SOPAS configuration software. How to use the software is described in .

When operating the VMS volume measurement system, the national, local and statutory rules and regulations must be observed.

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

1.4   Symbology used

Reference	Text in italics indicates a reference to more detailed information.
Recommendation	Recommendations are designed to give you assistance in the decision-making process with respect to a certain function or a technical measure.
Note	Refer to notes for special features of the device.
Explanation	Explanations provide background knowledge on technical relationships.
MENU COMMAND	This typeface indicates a term in the SOPAS user interface.
Terminal output	This typeface indicates messages that the VMS outputs via its terminal interface.
➢ **Take action ...**	Instructions for taking action are shown by an arrow. Read carefully and follow the instructions for action.

This symbol refers to additionally available documentation.

Warning!

A warning indicates an actual or potential hazard. They are designed to help you to prevent accidents and to protect the device from being damaged.

ATTENTION   Read carefully and follow the warning notices!

Software notes show you where the related setting can be made in the SOPAS configuration software.

2 For your safety

This chapter deals with your own safety and the safety of the equipment operators.

➢ Please read this chapter carefully before working with the VMS or with the conveyor system equipped with the VMS.

2.1 Authorised personnel

The VMS volume measurement system must be installed, commissioned and serviced only by adequately qualified personnel.

The following qualifications are necessary for the various tasks:

2.1.1 Mounting and maintenance

- basic technical training
- knowledge of the current safety regulations in the workplace

2.1.2 Electrical installation and replacement

- practical electrical training
- knowledge of current electrical safety regulations
- knowledge on the use and operation of devices in the related application (e.g. conveyors)

2.1.3 Commissioning, operation and configuration

- knowledge on the use and operation of devices in the related application (e.g. conveyors)
- knowledge on the software and hardware environment in the related application (e.g. conveyors)
- basic knowledge of the Windows operating system
- basic knowledge of the usage of an HTML browser (e.g. Internet Explorer)
- basic knowledge of data transmission

2.2 Applications of the device

The VMS volume measurement system is intended exclusively for use in industrial environments. When used in residential areas, the device can cause radio interference.

The VMS measures objects of almost any shape on flat conveyor systems.

- The VMS420 determines length, width and height, and calculates from this information the volume of the smallest enclosing cuboid, the box volume.
- The VMS520 determines length, width and height.

This information is passed by the related system over a data interface to the customer's computer for further processing.

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2.3   Correct use

The VMS volume measurement system must be used only as defined in *Section 2.2 "Applications of the device" on page 13*. It is only allowed to be used by qualified personnel and only in industrial environments on the conveyor system on which it has been installed and initially commissioned by specialist personnel in accordance with these operating instructions.

If the device is used for any other purpose, opened or modified in any way — also during mounting and installation — any warranty claim against SICK AG shall become void.

2.4   General safety notes and protective measures

ATTENTION

Safety notes

Please observe the following items in order to ensure the correct and safe use of the VMS volume measurement system.

- The notices in these operating instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.

- National/international rules and regulations apply to the installation, commissioning, use and periodic technical inspections of the volume measurement system, in particular:
    – work safety regulations/safety rules
    – other relevant health and safety regulations

- Manufacturers and users of the system are responsible for obtaining and observing all applicable safety regulations and rules.

- The tests must be carried out by specialist personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.

- The operating instructions must be made available to the operator of the system where the VMS volume measurement system is fitted. The operator of the system is to be instructed in the use of the device by specialist personnel and must be instructed to read the operating instructions.

ATTENTION

Risk of injury from electrical power!

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

➢ Observe the current safety regulations when working on electrical systems.

ATTENTION

The VMS volume measurement system is intended exclusively for use in industrial environments. When used in residential areas, the device can cause radio interference.

⚠ **WARNING**

Damage to the eye from laser radiation!

The VMS uses a red laser of class 2. On extended beam exposure, the retina in the eye may be damaged.

The entire front screen serves as the laser output opening.

Warning — inappropriate use of the VMS can result in hazardous exposure to radiation and the laser class may be exceeded.

➢ Never look directly into the beam (similar to sunlight).

➢ Do not point the device laser beam at people.

➢ During mounting and adjustment of the VMS, pay attention to possible reflections of the laser beam on reflective surfaces.

➢ Do not open the housing. (Opening the housing does not interrupt the power to the laser diode during the read cycle.)

➢ Observe the latest valid version of the laser safety regulations.

Laser output opening

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

Laser output opening
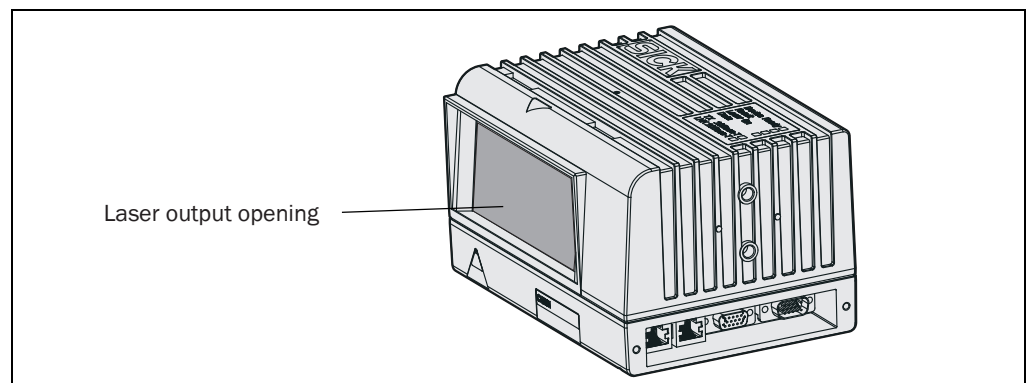
Fig. 1:   Laser output opening

Laser power

The laser operates at a wavelength λ = 650 nm (visible red light). The output power of the laser beam of the VMS at the laser output opening is max. 10 mW.

The radiation emitted is not harmful to the skin.

The VMS corresponds to laser class 2 as per EN 60825-1 (for publication date see laser warning label on the device). Complies with 21 CFR 1040.10 with the exception of the deviations as per Laser Notice No. 50, July 26, 2001.

Note   When operated with trigger, the laser diode is only switched on when the power on signal is present and is switched off again with the shut down signal. For continuous data output the laser diode is continuously switched on.

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Laser warning label

On the VMS420/520 volume measurement system are several laser warning labels and laser warning symbols (*Fig. 2*).
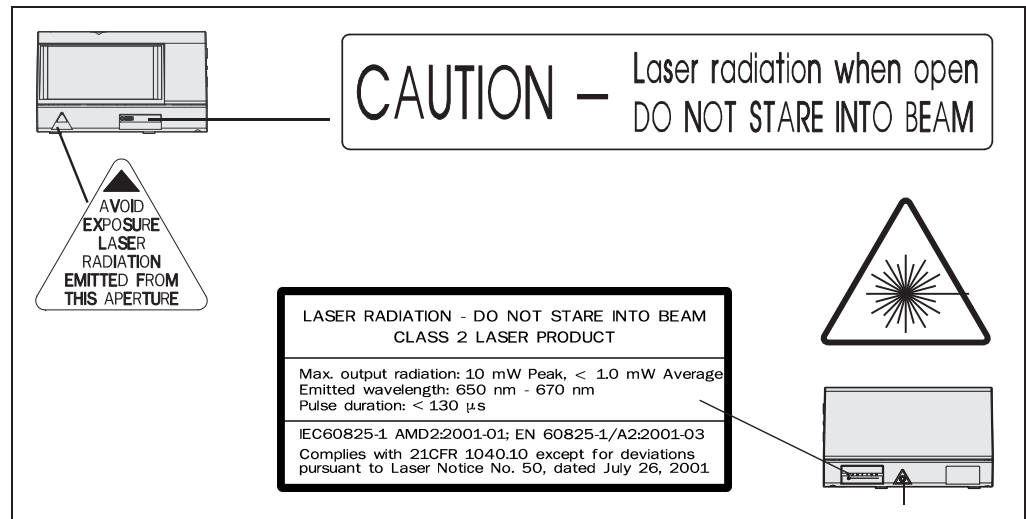
Fig. 2:   Laser warning labels on the VMS

Notes
- Prior to commissioning, the warning label in English on the device "LASER LIGHT - DO NOT STARE INTO BEAM" is to be replaced with a laser warning label in a language understood by the operators of the system. Laser warning labels in German/English and French/English are in the delivery. Leave the "CAUTION ..." and "AVOID EXPOSURE LASER ..." laser warning labels in English.

- If the VMS volume measurement system is installed in a system/a panel mounting such that the laser warning labels are covered, further warning labels (not in the delivery) are to be affixed beside the outlet aperture for the laser beam on the system/on the trim panel!

- The VMS automatically monitors the beam generation and automatically shuts down the generation of the beam in case of irregularities. In this case the red LED lights up and the scanner transmits no more measured values.

- No regular maintenance is necessary to ensure the retention of the laser class 2.

2.5   Quick stop and Quick restart

2.5.1   Switch off VMS

➢   Switch off the voltage supply for the VMS or disconnect the supply cable.

The VMS retains parameters stored in the internal, non-volatile memory. Measured values on the interface are lost.

2.5.2   Switch VMS back on

➢   Switch on the voltage supply for the VMS or reconnect the supply cable.

The VMS re-commences operation with the parameters last saved.

2.6   Environmental protection

The VMS volume measurement system has been designed to minimise environmental impact. It uses only a minimum of power.

While working, always act in an environmentally responsible manner. For this reason please note the following information on disposal.

2.6.1   Power consumption

The VMS consumes max. 50 W of power with both VMD.

2.6.2   Disposal after final de-commissioning

➢ Always dispose of unserviceable or irreparable devices in compliance with local/ national rules and regulations on waste disposal.

➢ Dispose of all electronic assemblies as hazardous waste. The electronic assemblies are straightforward to dismantle.

On this topic see *Section 8.2 "Disposal" on page 55*.

Note   SICK AG does not accept any devices returned that have become unusable or are irreparable.

3　Product description

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

Note　Please read this chapter before mounting, installing and commissioning the device.

3.1　Delivery

The VMS volume measurement system as delivered comprises:

- two VMD volume measurement devices
- two mounting kits for the adjustment of the VMD, in two axes
- a connection cable for the connection of the two VMD volume measurement devices
- a CD-ROM containing the following:
  - SOPAS configuration software
  - "VMS Volume Measurement System" operating instructions in German and English as PDF file
  - the freely available "Adobe Acrobat® Reader™" software for reading PDF files

3.2　Special features

- non-contact, active measurement technique
- measuring the length, width and height of cuboid objects
- measuring the length, width and height of objects of almost any shape
- works with a very wide range of surface structures and on various flat conveyor systems
- flexible system configurations
- calculation of the smallest enclosing cuboid (box volume)
- calculation of the real volume

VMS420/VMS520 volume measurement system

- scale interval d ≥ 5 mm (≥ 0.2 in) (in industrial environments, without effect of contamination, vibration, extremely low object remission, without slip between object and conveyor system or high temperature drift)
- data processing and data output in real-time (at a conveyor system velocity of up to 3 m/s (590.55 ft/min))

VMS520 volume measurement system

Measurement system certified in accordance with the Measuring Instruments Directive 2004/22/EC (MID) and in accordance with OIML R129 with measured values that can be standardized (see *Fig. 30 on page 79* and *Fig. 31 on page 80*).

3.3   Operating principle of the device

3.3.1   Device components

The VMS volume measurement system comprises the following components:

- two VMD volume measurement devices
- two mounting kits for VMD
- connection cable for connecting the VMD

The components of the VMS volume measurement system are shown graphically in *Fig. 3*.

2 VMD volume measurement devices

Connection cable (for communication between master and slave)

2 mounting kits for VMD comprising: Mounting bracket Mounting block
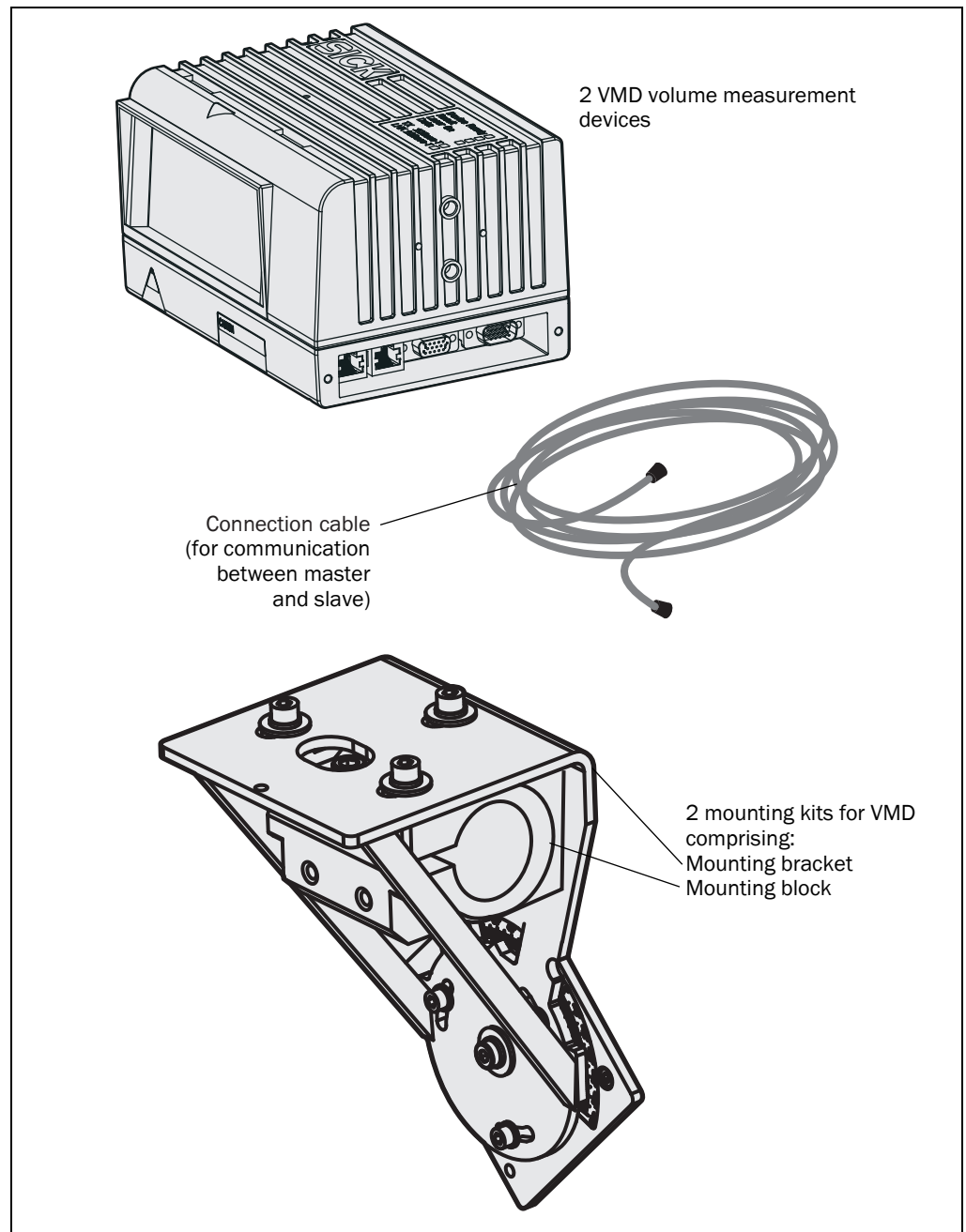
Fig. 3:   Device components of the VMS volume measuring system

Note   You will find the data sheet in *Section 10.1 "Data sheet VMS420/520 volume measurement system" on page 57*. You will find dimensional drawings in *Section 10.2 "Dimensional drawings" on page 58*.

3.3.2   Operating principle VMS

Determining the distance data

The VMS comprises two VMD. These are installed over the conveyor system and opto-electronically scan the surface of the conveyor system and the objects transported. The system does not require any reflectors or position markers. This is an active system with a red laser; it is not necessary to illuminate the objects. The VMS uses the principle of phase shift (continuous wave).

The VMS volume measurement system measures cuboid objects and objects with almost any shape on flat conveyor systems. The VMS opto-electronically determines the real volume of the object as well as length, width, height and volume of the smallest enclosing cuboid.
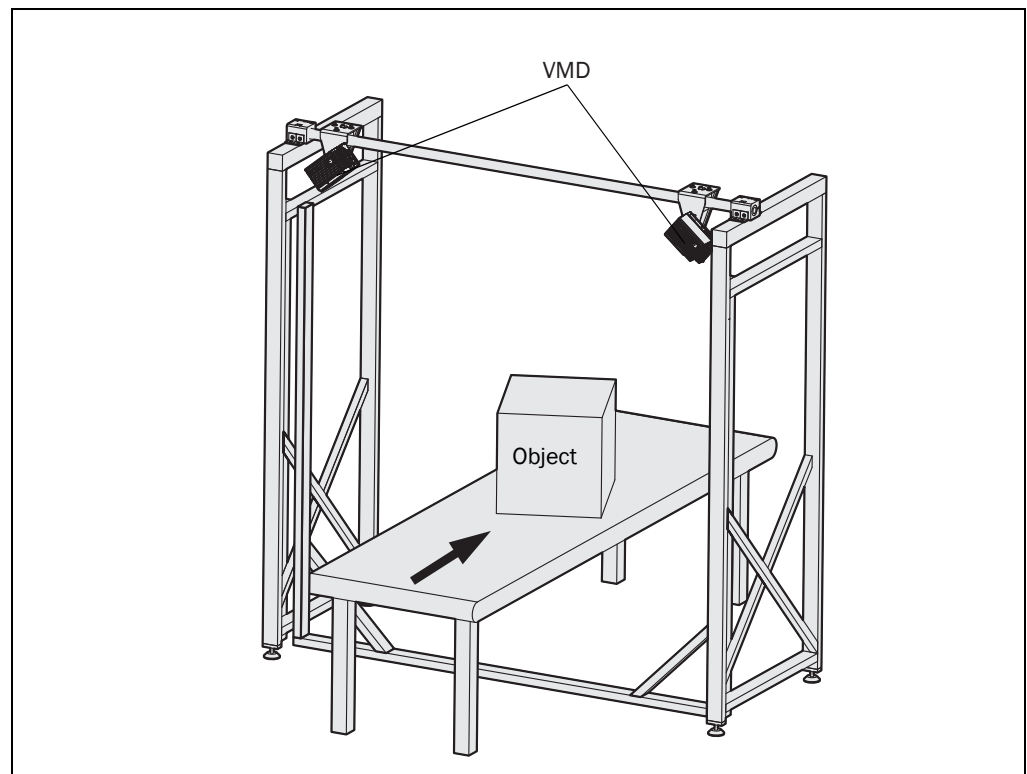
Fig. 4:   Illustration of a VMS with frame above a conveyor system

Velocity

The velocity of the object is constantly set in the parameters, or can be determined using an optional incremental encoder.

Resulting volume

The information on the three-dimensional object is available after the acquisition of the distance data and calculation using the velocity.

- The VMS420 determines length, width and height, and calculates from this information the volume of the smallest enclosing cuboid, the box volume.
- The VMS520 determines length, width and height.

The data are available for further processing on the interfaces of the VMS.

3.3.3   Measuring modes

The VMS can either operate with a **Trigger** or **Free running**.

Free running mode

In the free running mode the VMS automatically detects the objects to be detected. The measurement starts when an object enters the scan line and ends when the object leaves the scan line. There must be a minimum gap ① between objects.
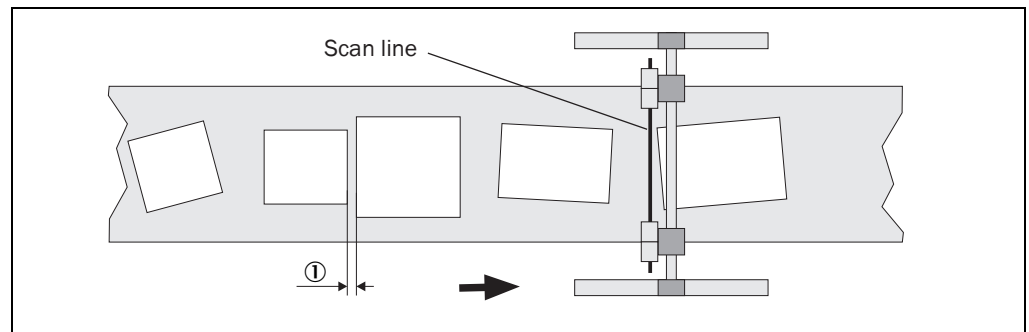
Fig. 5:   Free running mode

Triggered measurement with gate

With the triggered measurement the start and end of the measurement is defined by a so-called gate.

Unlike the free running measurement, it is does not matter whether an object enters or leaves the scan line. There is also no differentiation between multiple objects between the start and end of the measurement, instead just one measurement is made.

PROJECT TREE, VMDX20_XX00, PARAMETER, DIGITAL INPUTS/TRIGGER, areas TRIGGER SETTINGS and GATE SETTINGS
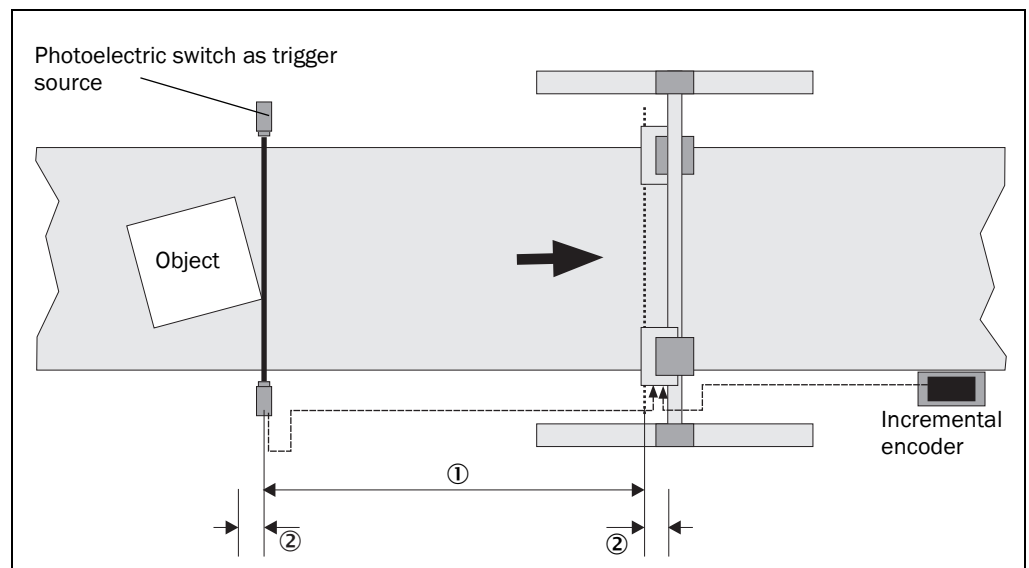
Fig. 6:   Triggered measurement

The gate in which VMS measures is defined by a trigger source, a distance delay ① and an expansion distance ②.

Digital inputs are available as the trigger source, or software triggers based on messages can be used.

In the example, the object initialises the measurement by entering the photoelectric switch (trigger source). Once the distance defined by the distance delay (defined in SOPAS) has been covered ①, the VMS starts the measurement.

An expansion distance, also defined in SOPAS, expands the gate at the start and end ②. In this way, e.g. a tolerance can be realised.

Track controlled triggering

For the track controlled triggering described in *Fig. 6* an incremental encoder must be connected and configured. Using this encoder the distance covered by an object is determined from the conveyor velocity. With track controlled triggering it is not necessary to take into account different conveyor velocities or a conveyor system stop. The measurement starts and stops after a defined distance has been covered.

As an alternative, time-controlled triggering can also be configured in SOPAS: PROJECT TREE, VMDX20_XX00, PARAMETER, DIGITAL INPUTS/TRIGGER, area COMMON SETTINGS

Laser control

Note   With laser control active, the laser diode remains switched off if no objects are transported on the conveyor system. This increases the service life of the system. Without laser control, the laser remains on all the time. This has a negative effect upon the service life of the system.

PROJECT TREE, VMDX20_XX00, PARAMETER, DIGITAL INPUTS/TRIGGER, area LASER CONTROL

With laser control active, the switching on of the laser is controlled by the gate configured or is controlled independently by a dedicated source.

- controlled by the gate
  The laser is controlled by the start and stop trigger source configured in the GATE SETTINGS area (see *"Triggered measurement with gate" on page 21*).

- depending on source
  The laser is controlled by the source configured in SOPAS. The control is independent of the settings made in the Gate settings area.

Note   On the VMD slave always configure the laser control as DEPENDING ON SOURCE... and as the source select SOFTWARE TRIGGER.

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A photoelectric switch can be connected to the VMD master as a trigger for this purpose. If an object passes through the photoelectric switch, the laser is switched on.
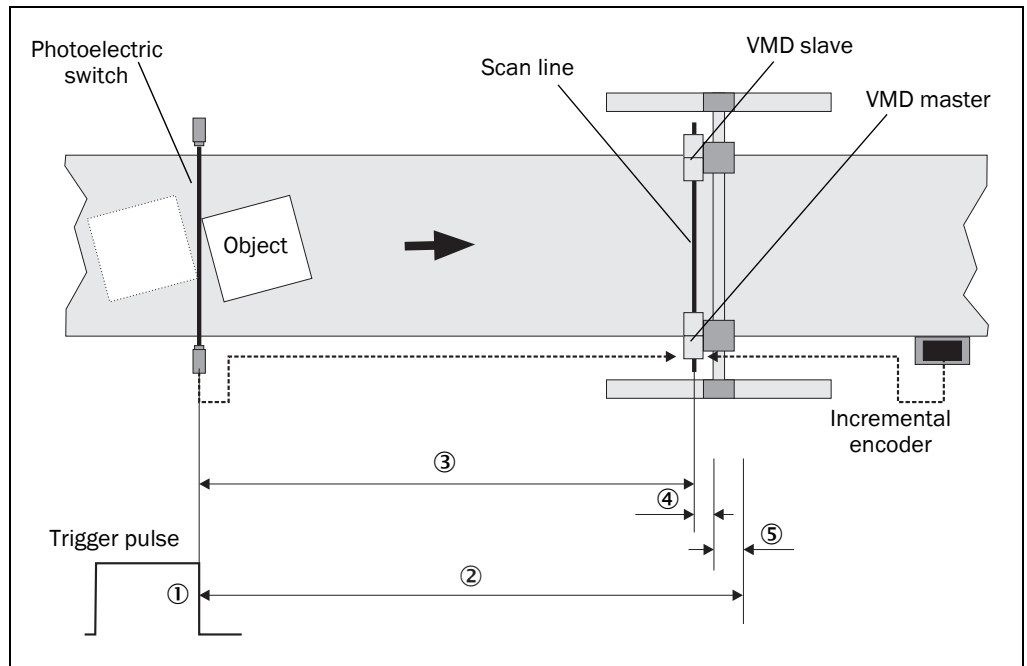
Fig. 7:   Laser off distance

When the rear edge of the object passes through the photoelectric switch (trigger is deactivated) ①, the VMS starts to calculate the path of the object starting from the photoelectric switch. For this purpose, an incremental encoder must be connected which can be used to determine the velocity of the conveyor system (see *11.4.2 "Accessories/ spare parts" on page 74*).

A laser off distance ② is configured in SOPAS (see *Fig. 7*). This distance is formed from the addition of the distance from the photoelectric switch to the scan line ③, the defined minimum object gap (default 30 mm (1.81 in)) ④ and a safety supplement (200 mm (7.87 in) recommended) ⑤.

As soon as the VMS has calculated that the object has passed through the scan line of the VMS (based on the incremental encoder pulses), it switches off its lasers.

If another object has passed through the photoelectric switch in the meantime, the distance calculation is reset to zero and initiated for the new object. The lasers therefore **remain switched on** if several objects are transported sequentially. Each object is measured individually.

In addition, a laser timeout can be configured. If the conveyor system stops automatically following a trigger pulse or due to a fault, the laser diodes are deactivated after the configured laser timeout has elapsed.

3.3.4   Evaluation of the RIS values

To increase the accuracy of the measured result, the VMS can also evaluate the RIS values for the objects measured in addition to the distance values. As a consequence the measured result and the evaluation will be more stable.

Depending on the transporting surface, its properties and condition, you may need to adjust the parameters for the RIS evaluation in SOPAS: PROJECT TREE, VMDX20_XX00, PARAMETER, ALGORITHM SETTINGS, RIS EVALUATION

3.3.5 Camera focusing

The VMS420/520 is able to function in an overall system for volume measurement and package identification. The overall system comprises the VMS, the camera system and a modular system controller (MSC) for processing the data and sending the data to a host.

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

You must configure the camera focus function in SOPAS: PROJECT TREE, VMDX20_XX00, PARAMETER, CAMERA FOCUS SETTINGS

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

3.3.6 Increment settings

To calculate a three-dimensional volume from the two-dimensional data measured, the VMS requires the velocity of the conveyor system. For this purpose either the pulses from an incremental encoder can be used, or a constant velocity can be used as the basis for the calculation.

Note Use incremental encoder (available as an accessory) for VMS520 (see *11.4.2 "Accessories/spare parts" on page 74*) to achieve OIML conformity. We also recommend that the same incremental encoder be used for VMS420.

PROJECT TREE, VMDX20_XX00, PARAMETER, INCREMENT CONFIG./SYNC.

System increment

The resolution of the encoder that the VMS needs for the volume calculation is relatively fine. Devices that are connected to the VMS over a CAN bus and that also use the data from the encoder are often not able to utilise these fine data. For this reason a so-called system increment can be calculated from the pulses from the encoder and output on the CAN interface (see also *3.7.4 "CAN interface" on page 33*).

- You define the system increment resolution using a divisor.
- With an system increment output divisor you can also define the output interval for the system increment.

3.4 Planning

The maximum working range of the VMD is 3 m (9.84 ft). The minimum distance between the zero point of the VMS measurement and the object to be measured is 700 mm (27.56 in). The zero point is marked both on the top of the housing and on the underside of the housing (see *Fig. 25 on page 58*). The working area of the VMD covers an angle of 70° (*Fig. 8*).

All dimensions in m (ft)
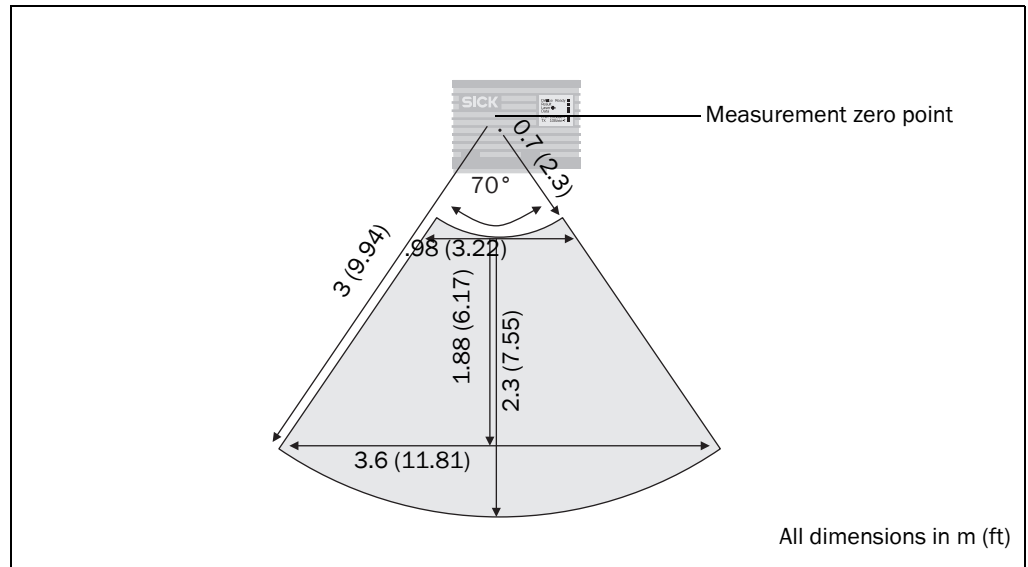
Fig. 8:   Principle of operation of the VMS volume measurement system

3.4.1 System requirements for the VMS volume measurement system

For the operation of the VMS volume measurement system the following are required:

• operating voltages:
  VMD: DC 24 V ± 15% in compliance with IEC 364-4-41 (protective extra-low voltage), output max. 25 W

• data interface RS-232, RS-422 or Ethernet

3.4.2 Requirements on the conveyor system

The conveyor system must have a constant conveyor velocity or an incremental encoder with a resolution of at least 0.2 mm/inc (0.008 in/inc) must be installed.

Notes
• The conveyor velocity is allowed to be a maximum of 3 m/s (590.55 ft/min).

• Use the incremental encoder available as an accessory (see *11.4.2 "Accessories/spare parts" on page 74*) for VMS520 to achieve MID or OIML conformity. We recommend using this incremental encoder also for the VMS420.

• The objects can be moved on a conveyor system with a flat transporting surface. Rotation, vibration, swaying and slipping of the objects on the conveyor system and uneven transporting surfaces can reduce the accuracy and degrade the acquisition of data by the VMD.

3.4.3   Object specifications

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

Object dimensions	Minimum value	Maximum value
Longitudinal to the transporting direction	50 mm (1.97 in)	2000 mm (78.74 in)
Transverse to the transporting direction	50 mm (1.97 in)	1000 mm (39.37 in)
Height above the conveyor system	50 mm (1.97 in)	1600 mm (62.99 in)

Tab. 1:   Minimum and maximum object dimensions

Note   The smallest segments of a measurable object must be larger than 100 mm × 100 mm × 100 mm (3.94 in × 3.94 in × 3.94 in). If this is the case, they can be included in the measurement. For this reason, the tips of pointed objects may not be included in the measurement result.

Objects which do not comply with this requirement must be inspected separately by the tester, operator and/or system integrator.

3.4.4   Mounting requirements

The VMDs must be mounted as follows:

- securely above the conveyor system (weight of each VMD: approx. 2.3 kg (5.07 lb) without mounting kit)

- without vibration or oscillations

- on the left and right above the conveyor system

Recommendation   To achieve a high measuring accuracy, use the mounting kits supplied and the hollow shaft available as an accessory for mounting (see *"General accessories" on page 74*).
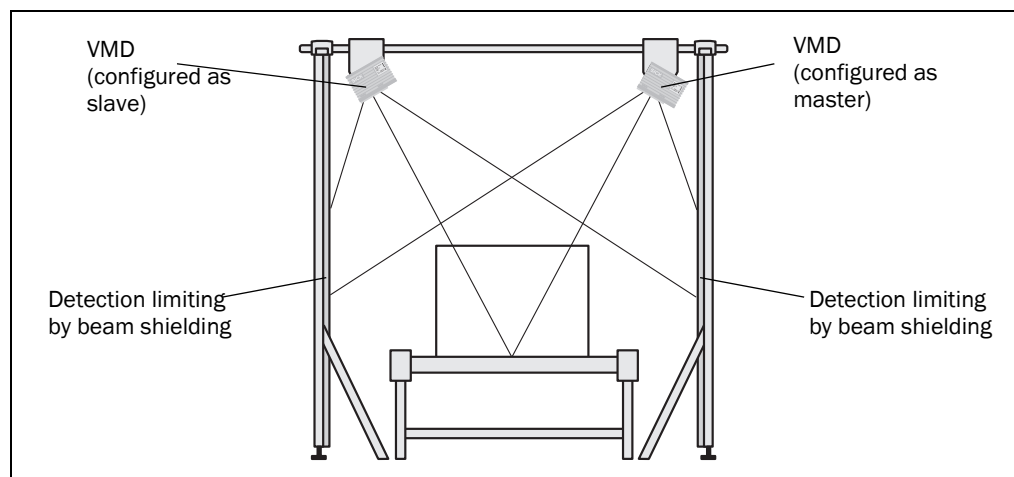
Fig. 9:   Illustration of a VMD installation above a conveyor system

To obtain an optimal measurement result, the following points should be noted:

- typical space required for the VMD installation above: around 700 mm (27.56 in) above the highest object

- The VMD must have a clear view of the conveyor system.

- The laser beams of the VMD should not reach beyond the application area so that persons or items transported on neighbouring conveyor systems are not detected (detection limiting by beam shielding).

- The maximum detection must be limited to the working range of three metres as otherwise measuring inaccuracies can occur.

- Adequate distance of both VMD from bends, induction lines, start-stop areas, inclined areas and separators on the conveyor system

3.5   Standardisation of the VMS520

The VMS520 has been tested and certified by the accredited certification institute NMi, Nederlands Meetinstituut in accordance with the Measuring Instruments Directive 2004/ 22/EC (MID) and in accordance with the requirements in OIML R129, edition 2000 (see *Fig. 30 on page 79* and *Fig. 31 on page 80*). Copies of the certificates are available on request from SICK.

By means of the metrological tests, the following points were certified for the measurement of cuboid and irregular shaped objects that are not highly reflective or transparent:

Object dimensions	Minimum value	Maximum value	Achievable scale interval d
Longitudinal to the transporting direction	50 mm (1.97 in)	2000 mm (78.74 in)	$\geq$ 5 mm ($\geq$ 0.2 in)
Transverse to the transporting direction	50 mm (1.97 in)	1000 mm (39.37 in)	$\geq$ 5 mm ($\geq$ 0.2 in)
Height above the conveyor system	50 mm (1.97 in)	1600 mm (62.99 in)	$\geq$ 5 mm ($\geq$ 0.2 in)

Tab. 2:   Certified, measurable object dimensions

The conveyor velocity is allowed to be a maximum of 3 m/s. A maximum of 960 objects per minute can be measured. The operating temperature must be between 0 and 40 °C (32 and 104 °F).

Notes
- Due to the certification of the VMS520 with a scale interval of d $\geq$ 5 mm ($\geq$ 0.2 in), all higher scale intervals such as d $\geq$ 10 mm ($\geq$ 0.39 in) are also covered.

- When using the VMS520 in standardized applications, observe the relevant national law. SICK can provide advice on this topic if required. However this advice is no substitute for legal advice.

- Only in optimal applications, without effect of contamination, vibration, at extremely low object remission, without slip between object and conveyor system or high temperature drift, a scale interval d $\geq$ 5 mm ($\geq$ 0.2 in) is possible in industrial environments! For this reason an application must be checked by SICK before a binding statement on a scale interval can be made.

- After a thorough application check, scale intervals for length, width and height must be fixed. These scale intervals must be entered on the certification label included (see *Fig. 10*) in the "d>=" line in permanent ink. The certification label must be fitted to the system such that it can be seen by the operator and can be allocated to the volume measurement system.
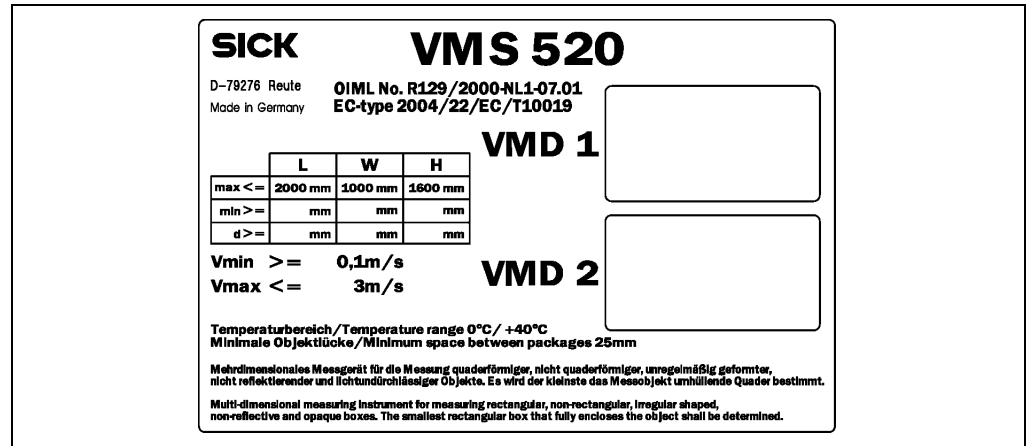
Fig. 10:   Certification label for the VMS520

How to use the standardisation of the VMS520:

➢ Check national laws and regulations to ascertain the steps required for standardisation. SICK can provide advice on this topic if required. However this advice is no substitute for legal advice.

➢ We suggest that you attach seals to specified parts of the VMS520 and any existing accessories to protect against manipulation. The operator must discuss and agree these suggestions with the corresponding national testing authority. Ensure even when planning your application that standardisation seals can be fitted to the VMD520 after installation and standardisation.
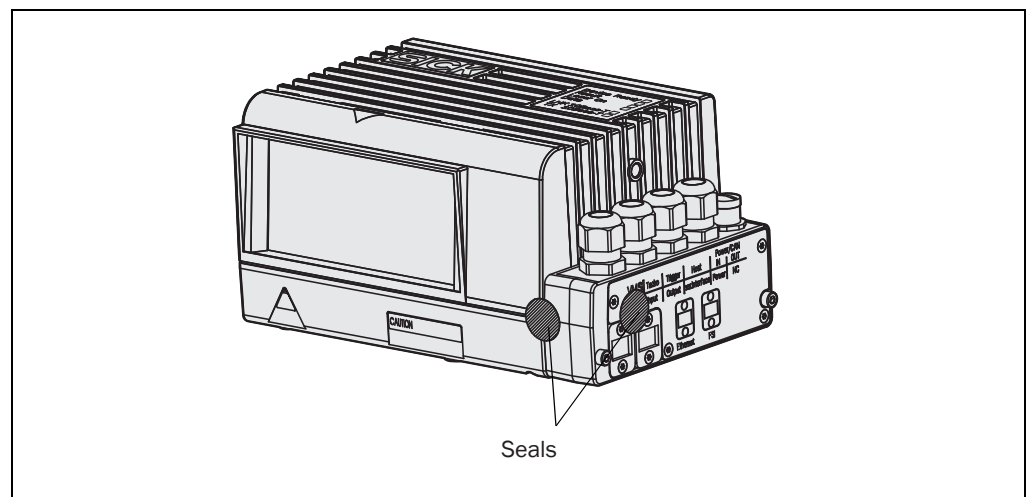
Seals

Fig. 11:   Possible places where the seals could be attached to the VMD520

3.6 Scale intervals of the VMS

The following scale intervals apply for object remissions of 10 to 200% and for recommended structures as per the SICK documentation. Restricted ranges for object remission and object size enable higher accuracy to be achieved. Glossy surfaces, shadowed areas of the objects and other effects can reduce the accuracy.

The following table shows typical scale intervals[1]:

Ambient conditions	Scale interval
Velocity 3 m/s (590.55 ft/min) in normal industrial environments	d ≥ 10 mm (≥ 0.39 in)
Velocity 3 m/s (590.55 ft/min) in optimal applications, without effect of contamination, vibration, at extremely low object remission, without slip between object and conveyor system or high temperature drift	d ≥ 5 mm (≥ 0.2 in)

Tab. 3:   Typical scale intervals

3.6.1 Dynamic scale intervals

The VMS has different scale intervals depending on the velocity of the conveyor system. In principle the following applies:

- The lower the velocity, the finer the scale intervals.
- The higher the velocity, the coarser the scale intervals.

The actual scale intervals that can be achieved and used must be determined during the standardisation or the VMS520 or during the commissioning of the VMS420 and entered in SOPAS: PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS

The scale intervals are output in basic measured data message 2 (see *11.3.3 on page 67*) in addition to the length, width and height of an object. In addition, you can configure the user defined measured data message such that the scale intervals are output using the message (see *"User defined output format" on page 32*). Also the length, width and height of an object can be rounded to the scale intervals (see *"Rounding for dimension results" on page 32*).

1)   The application must be checked by SICK before a binding statement on a scale interval can be made.

3.7 Status indicators

Six LEDs on the VMS volume measurement system provide a visual indication of the operating state and any errors that have occurred.

LED	Display	Function
Device Ready	Green	Illuminates after power on when initialisation and self-testing have been completed successfully. Device ready for operation
	Red	Error during initialisation or self test
Result	Green	Measurement condition met
Laser On	Green	Laser diode on
Data	Green	Flashes when the VMS is transmitting data to the computer over the host interface
LNK 10Base-T	Green	10BASE-T: Ethernet link
TX 10Base-T	Green	10BASE-T: Flashes when the VMS is transmitting data to the computer over the Ethernet interface

Tab. 4: Significance of the LEDs

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

- You can set the VMS parameters with SOPAS using the host interface, the terminal interface and the Ethernet interface.

- The VMS outputs the measured data in the form of messages on the host interface.

- In parallel, diagnostic data for a Remote Diagnostic Tool (RDT) can be output on the terminal interface.

3.7.1 Terminal interface

The terminal interface allows the configuration of the VMS as well as the output of measured values. However, this feature is primarily intended to provide a reliable data connection for configuration (also with simultaneous operation of the host interface). Therefore, the following interface parameters cannot be changed:

- 9 600 Baud

- 8 data bits

- 1 stop bit

- no parity

You will find a description of the electrical interface in *Section 5.3.4 ""Serial" connection" on page 42*.

3.7.2 Host interface

The host interface allows the configuration of the VMS as well as the output of measured values.

You can choose whether to configure the pins 6 to 9 as RS-232 or as RS-422: PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area SERIAL HOST INTERFACE, option HARDWARE

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

- RS-232
- 9 600 Baud
- 8 data bits
- 1 stop bit
- no parity

Note The interface parameters for the host interface can be configured only using the terminal interface or the Ethernet interface.

You will find a description of the electrical interface in *Section 5.3.4 ""Serial" connection" on page 42*.

Frame and coding for the messages

The VMS uses messages to communicate with the connected application.

The frame for the host interface can be configured in SOPAS: PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area SERIAL HOST INTERFACE

In this way, you can use two stop bytes, for example (e.g. to terminate messages with CR/LF), or insert a block check byte before or after the stop byte.

Messages on the host interface

	Frame	**Message**	**Frame**
Code	STX	Data (see *11.2*)	CR/LF
Length (byte)	1	≤2498	1 or 2
Description	Start of text character	ASCII coded. The length is dependent on the previous send message.	End of text character

Tab. 5: Frame for the messages on the host interface

Output unit

In SOPAS you can define whether the data are output in the measured data message as metric values or in inches: PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS

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Rounding for dimension results

The measured results are output to 1 mm or 1/100 inch depending on the settings. However, you can also output rounded to the scale intervals for the VMS (see *3.6.1 on page 29*): PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS

	Example 1	**Example 2**
Scale interval	5 mm (0.2 in)	10 mm (0.39 in)
Measured object length	56 mm (2.2 in)	56 mm (2.2 in)
Output object length	55 mm (2.17 in)	60 mm (2.36 in)

Tab. 6:   Example rounded measured results

Output timing

In SOPAS you can define when a measured data message is output: PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, OUTPUT CONTROL

- as soon as possible after leaving the scan line ①

- after a specific distance from the X position referred to the rear edge of an object ②

- after a specific distance from the X position referred to the front edge of an object ③
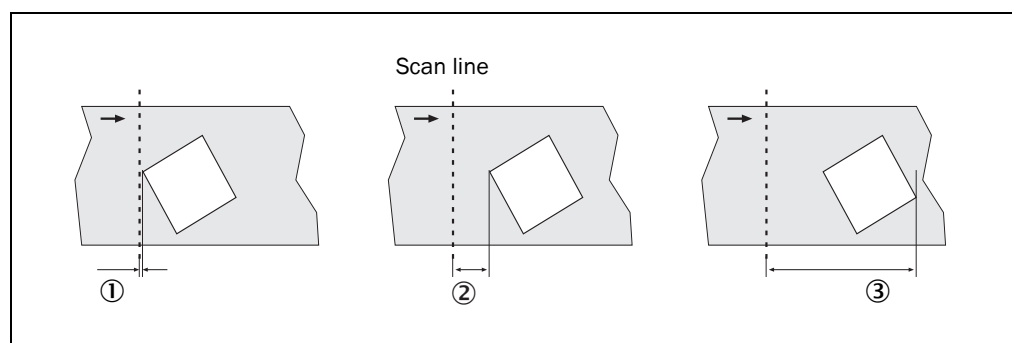
Fig. 12:   Output timing diagram

Note   If you select the RELATED TO LEADING EDGE option, you must ensure that the distance entered is greater than the longest object to be measured.
When an object reaches the distance entered, but has not yet left the scan line (that is it is still being measured), no measured data message is output. The message will be output in this case only after the object has left the scan line — that is "as soon as possible".

User defined output format

You can define a custom measured data message for measured data output on the host interface: PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, OUTPUT FORMAT

In this measured data message you can, for instance, enter fixed strings, select and insert variables (such as object length or width), change and define the attributes of the variables or conditions.

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3.7.3   Ethernet interface

The Ethernet interface has a data transmission rate of 10 MBaud (10BaseT). The interface is a TCP/IP peer to peer interface. Only half duplex is supported. Please ensure that the interface of your application is set 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, adjust the TCP/IP configuration for the Ethernet interface to enable a connected PC (client) to communicate with the VMS via Ethernet: PROJECT TREE, VMDX20_XX00, INTERFACES, ETHERNET, area ETHERNET

You will find a description of the electrical interface in .

3.7.4   CAN interface

The VMS has a CAN interface with which it can be connected to a CAN bus.

For data communication using CAN (Controller Area Network) you must …

- set the correct operating mode for the CAN bus on the VMS.
- set identical baud rate parameters on all devices on the bus.
- assign a unique device number from 1 to 63 to each device on the CAN bus.

PROJECT TREE, VMDX20_XX00, INTERFACES, CAN, area CAN

You will find a description of the electrical interface in .

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4   Mounting

4.1   Overview of the mounting steps

- If necessary: Mount frame in the required area on the conveyor system.

- Definition of the VMD master and the VMD slave

Note   As a rule the VMD positioned on the right in the transporting direction is defined as the master, the VMD positioned on the left as the slave. For this reason, the interfaces of the master point to the bottom and the interfaces of the slave point to the top.

- Mount the mounting kits for VMD (master and slave) on a hollow shaft.

- Mount hollow shaft for example on a frame with the aid of two mounting blocks (see *"General accessories" on page 74*).

Note   The hollow shaft must be mounted at an exact right angle to the conveyor system to avoid negatively affecting the adjustment.

- Mount the VMD master on the mounting kit.

- Connect the VMD master to the supply voltage and adjust.

- Mount the VMD slave on the mounting kit.

- Connect the VMD slave to the voltage supply and adjust.

- Detection limiting by beam shielding.
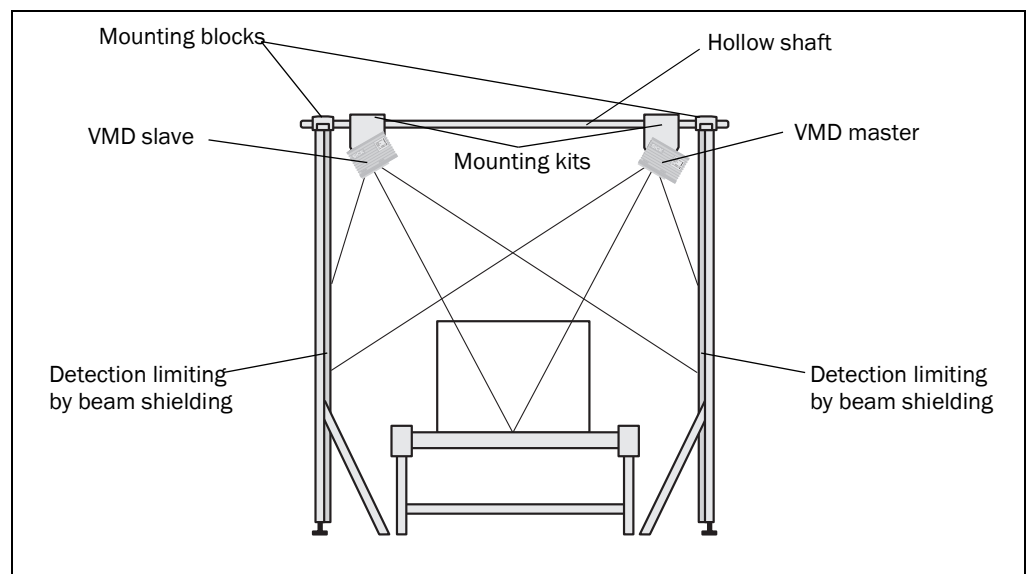
Fig. 13:   Illustration of a VMD installation above a conveyor system

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4.2 Preparations for mounting

A VMD weighs approx. 2.3 kg (5.07 lb), the hollow shaft weights approx. 20 kg (44.09 lb).

Note The mounting, adjustment and standardisation of a VMS520 for a scale interval of d ≥ 5 mm (≥ 0.2 in) requires an increased amount of effort. Please take this aspect into account in your planning! We recommend that the standardisation is prepared and supported by SICK.

4.2.1 Components to be mounted

* two VMD volume measurement devices
* two mounting kits for VMD
* connection cable (for communication between master and slave)

4.2.2 Necessary accessories

The following accessories are required for the mounting kit and for the VMD:

* hollow shaft (see *"General accessories" on page 74*)
  Always use a hollow shaft for mounting the VMD. You will find a dimensional drawing of the hollow shaft in *Section 10.2.4 "Dimensional drawing hollow shaft for mounting the VMS" on page 60*.
* mounting block set for mounting the hollow shaft on the frame (see *"General accessories" on page 74*)
* three M8×12 (0.47 in) screws with washers for mounting the mounting block to the mounting bracket (included with delivery)
* three M8×12 (0.47 in) screws with washers for fastening the VMD to the mounting kit (included with delivery)

4.2.3 Necessary tools

* plumb line
* carpenter's square
* 10 m (32.81 ft) of white adhesive tape
* felt-tip pen (the colour should be quite different from that of the transporting surface)
* spirit level, for inclined conveyor system with angle
* tape measure (up to 3000 mm (118.11 in))
* test object (see *"General accessories" on page 74*)
* tool set
  – allen screw set
  for mounting of the plug cover:
  – TORX screwdriver, T10
  – precision screwdriver

4.2.4   Mounting accessories

Two mounting kits are supplied for mounting the two VMD. These can be finely adjusted in three axes. The mounting kit comprises a mounting bracket and a mounting block.

Screws for fastening the mounting block and for the adjustment of the angle α

Mounting bracket

Mounting block

Adjustment of the angle β via the rotation of the hollow shaft

Adjusting screws for the adjustment of the angle γ
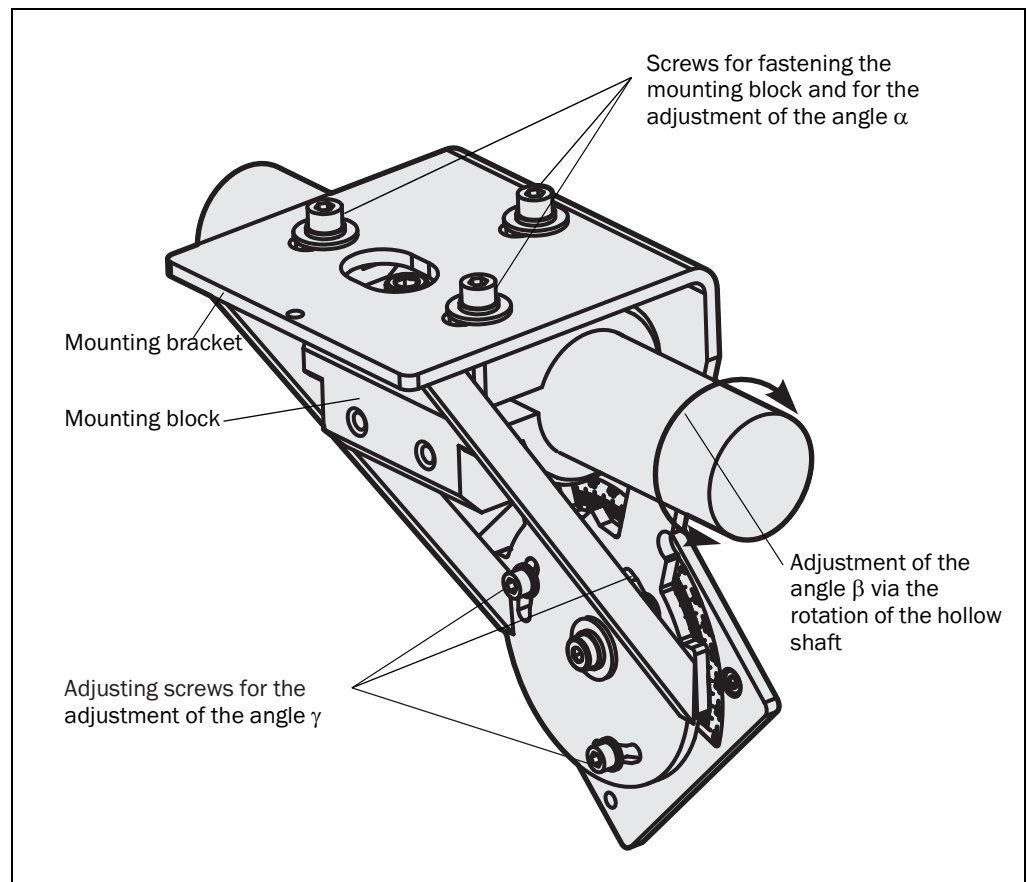
Fig. 14:   Mounting kit for VMD

Note   You will find the dimensional drawings for the mounting kit in:

4.3 Mounting the VMD

1. Mount the mounting block in the defined position on the mounting bracket using three M8 ① screws.

2. Loosen M10 ⑨ fixing screw slightly and tighten setscrew ② so that the sleeve of the mounting block opens a little and the hollow shaft can be fitted ③.

3. Fit mounting kit to the hollow shaft. Loosen setscrew ② slightly so that mounting kit cannot slide off the hollow shaft.

4. Repeat steps 1 to 3 for the second mounting kit.

5. For both mounting kits, adjust the angle required for your application using the scale ④ of the mounting bracket.

Note   The angle is application-specific and can be calculated for you by SICK.

6. On both mounting kits, tighten screws ⑤ and screw ⑥.
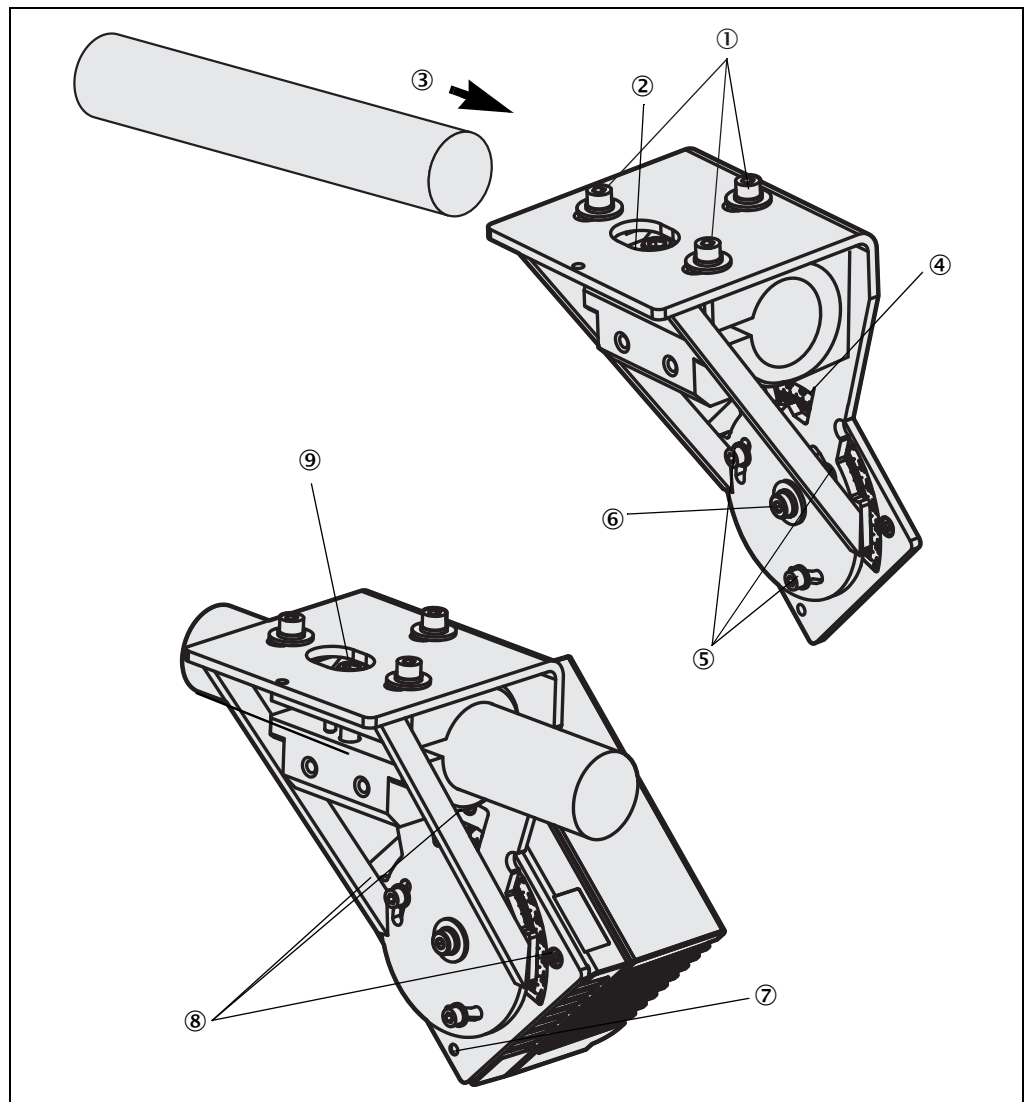
Fig. 15:   Mounting and adjustment of the VMD

7. Fit the VMD master and the VMD slave in the lugs ⑦ fitted to the mounting kit and fasten with three screws M6 ⑧.

8. Install hollow shaft for instance on a frame over the conveyor system.

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4.4   Dismounting the system

1.   Switch off supply voltage.

2.   Remove the connection cables.

3.   Remove the VMD from the mounting kits above the conveyor system.

Note   On final decommissioning, please observe the disposal requirements in *Section 2.6.2 "Disposal after final de-commissioning" on page 17* for environmentally correct disposal.

5 Electrical installation

<table>
<tr><td>⚠
ATTENTION</td><td>**Switch the entire machine/system offline!**
The machine/system could inadvertently start up while you are connecting the devices.
➢ Ensure that the entire machine/system is disconnected during the electrical installation.</td></tr>
</table>

Note The VMS volume measurement system complies with the requirements in the standard on the radiated emissions as defined for class A (industrial environment). It may cause radio interference in residential areas. If radio interference occurs, the person(s) affected may demand that the operator take appropriate action for suppressing interference.

5.1 Overview of the installation steps

- Connect supply voltage to the VMD.
- Connect PC to the terminal interface of the VMD.

5.2 Electrical connections and cables

In the electrical connections, the VMS has interfaces for communication between master and slave as well as interfaces to the exterior.
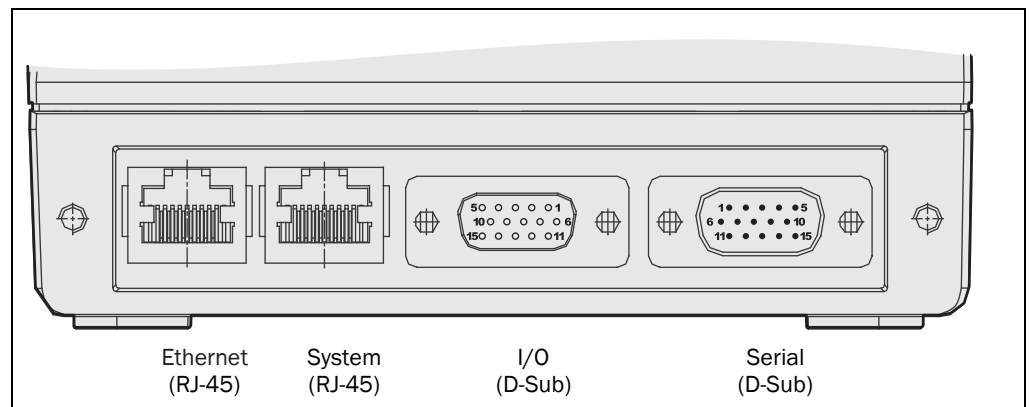
Fig. 16: Position of the electric connections of the VMS
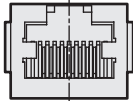
Connection	Type	Function
Ethernet	RJ-45	TCP/IP communication, exchange of messages
System	RJ-45	Synchronisation master/slave
I/O	D-Sub	Connection of external sensors, supply voltage
Serial	D-Sub	Serial communication, exchange of messages, supply voltage

Tab. 7: Function of the electric connections of the VMS

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5.3   Pin assignment of the connections

5.3.1   "Ethernet" connection
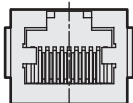
The VMS can be connected with a commercially available Cat. 5 crossover cable.

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

Tab. 8:   Pin assignment of the "Ethernet" connection

5.3.2   "System" connection
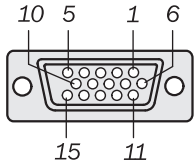
Via the "System" connection master and slave of a VMS are synchronised. For the connection of master and slave a standard Cat. 5 crossover cable is suitable.

Pin	Signal	Function
1	FSIOP	Synchronisation master/slave
2	FSION	Synchronisation master/slave
3	FSIIP	Synchronisation master/slave
4	Not assigned	–
5	Not assigned	–
6	FSIIN	Synchronisation master/slave
7	Not assigned	–
8	Not assigned	–

Tab. 9:   Pin assignment of the "System" connection

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5.3.3 "I/O" connection

Pin	Signal	Function
1	V_S	Supply voltage VMD
2	IN3	Digital input 3 (trigger)
3	IN1	Digital input 1 (trigger)
4	Reserved	Do not use!
5	GND	Ground VMD
6	IN2	Digital input 2 (encoder)
7	IN4	Digital input 4 (encoder)
8	Reserved	Do not use!
9	SENS_GND	Ground Digital Inputs
10	Reserved	Do not use!
11	Reserved	Do not use!
12	Reserved	Do not use!
13	Reserved	Do not use!
14	Reserved	Do not use!
15	Reserved	Do not use!
Housing	–	Screen/earth

Tab. 10:   Pin assignment of the "I/O" connection
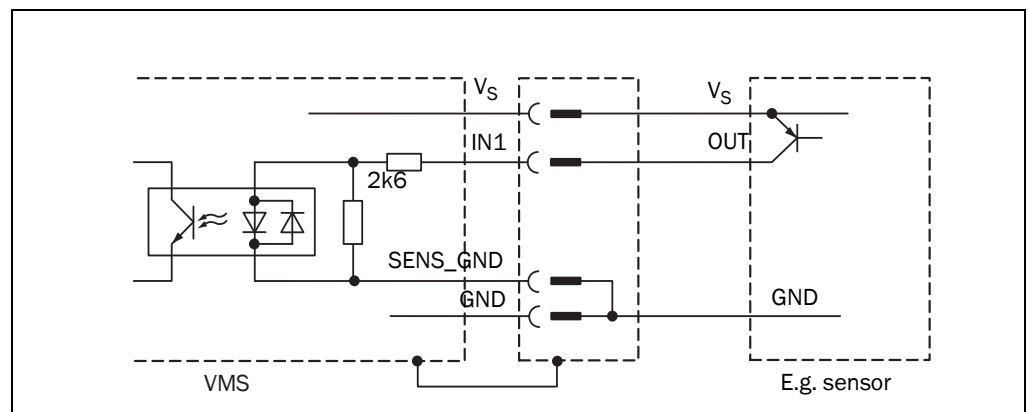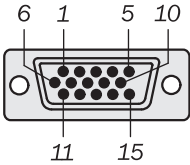
Fig. 17:   Wiring of the digital input

5.3.4   "Serial" connection

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

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area SERIAL HOST INTERFACE, option HARDWARE

Pin	Signal			Function
1	V_S			Supply voltage VMD
2	RS-232	RxD_TRM		Terminal interface (receiver)
3		TxD_TRM		Terminal interface (sender)
4	Not assigned			–
5	GND			Ground VMD
6	RS-232	Not assigned	RS-422	RD+ (HST)	Host interface (receiver)
7		RxD (HST)		RD– (HST)	
8		Not assigned		TD+ (HST)	Host interface (sender)
9		TxD (HST)		TD– (HST)	
10	CAN_H			CAN interface 1 (IN/OUT)
11	Not assigned			–
12	CAN_H_2			CAN interface 2 (IN/OUT)
13	CAN_L_2			CAN interface 2 (IN/OUT)
14	Not assigned			–
15	CAN_L			CAN interface 1 (IN/OUT)
Housing	–			Screen/earth

Tab. 11:   Pin assignment of the "Serial" connection
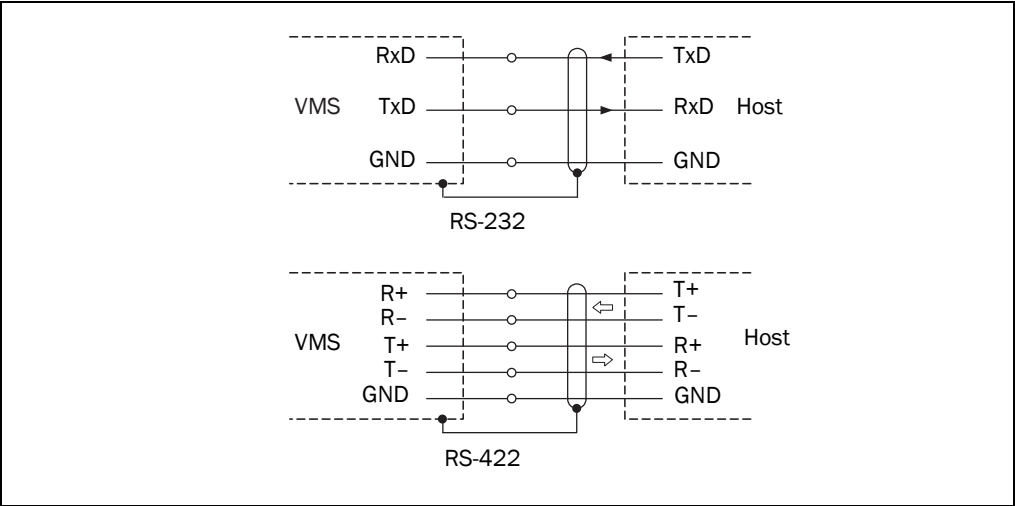
Fig. 18:   Wiring of the RS-232 or RS-422

5.4   Connection via the plug cover

The VMS can also be connected using plug covers. Since the plug covers cover the electrical connections of the VMS, IP 65 degree of protection is achieved (see *"Plug cover sets" on page 75*).
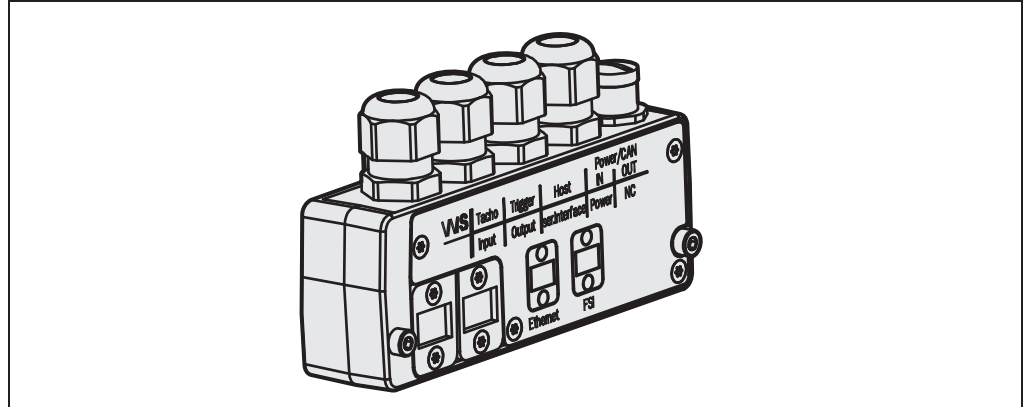
Fig. 19:   Example of a plug cover

The plug covers contain a parameter memory. This allows the VMS to be replaced easily. The configuration is stored in the plug cover and transmitted to the newly connected VMS after replacement.

Notes
- The parameter memory function is disabled in the default delivery status.
- The parameter set stored in the parameter memory always overwrites the configuration of the VMS. An already configured device, for example, is reset to factory settings by a new plug cover.
- Special Ethernet cables are required to connect the plug cover (see *"Accessories for plug covers" on page 75*).

A detailed description of the electrical connections of the plug cover can be found in Document 8010817 — "Plug Covers for VMS4xx/5xx Volume Measurement System and LMS400 Laser Measurement System".

5.5   Performing electrical installation

5.5.1   Overview of the connection steps

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

5.5.2   Equipment

- tool set
- digital multimeter (current/voltage measurement)

5.5.3   Connecting the voltage supply

Note   You can connect the supply voltage alternatively at the "I/O" connection or the "Serial" connection.

1. Ensure that the supply voltage is switched off.
2. Connect the "Supply voltage" 24 V input on the VMS to the corresponding connection on the voltage supply using a cable.

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5.5.4   Connecting the PC

Both VMD are operated and configured using the SOPAS configuration software.

1. Switch off PC and supply voltage.

2. Connect the PC and the terminal interface of the VMD using a 3 core RS-232 data cable (null modem cable).

3. Switch on the PC and the supply voltage.

4. Configure (see *Chapter 7 "Configuration and adjustment" on page 46*).

6   Commissioning

> ⚠️ **ATTENTION**
>
> **Commissioning requires a thorough check by qualified personnel!**
>
> Before you operate a system equipped with the VMS volume measurement system for the first time, make sure that the system is first checked and released by qualified personnel. On this issue, observe the notes in *Chapter 2 "For your safety" on page 13*.

Overview of the commissioning steps

➢ Mount and adjust the VMS as per the version ordered (see *Chapter 4 "Mounting" on page 34*).

➢ Performing electrical installation (see *Chapter 5 "Electrical installation" on page 39*).

➢ Configure the VMS using the SOPAS configuration software (see *Chapter 7 "Configuration and adjustment" on page 46*).

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

7   Configuration and adjustment

The VMS volume measurement system is adapted to the on-site measurement situation by means of the configuration. In this way parameters can be set to suit the characteristics of the measurement, analysis and output.

The interactive configuration is carried out using the provided SOPAS configuration software. Using this software, you can configure and test the measurement properties, the analysis behaviour and the output properties of the system as required.

Help for the program user interface as well as for the different options can be found in SOPAS:

- Menu HELP, HELP: Comprehensive online help for the program interface and the different options

- HELP window (on the bottom left in the program user interface): Context sensitive help for the activated dialog area

- 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 user level "maintenance personnel" is "main" and for the user level "authorised client" it is "client". Following completion of the configuration, you should change the password so that it can perform its protective function.

7.1   Preparing the configuration and adjustment

To configure and adjust the VMS volume measurement system, you need:

- SOPAS configuration software on CD-ROM

- PC/notebook with Windows 98/NT 4.0/2000/XP and a serial interface (RS-232). PC/notebook not included

- a commercial quality cat. 5 cross-over cable for connecting the PC and VMS

- plumb line

- carpenter's square

- tape measure (up to 3000 mm (118.11 in))

- test object (see *"General accessories" on page 74*)

- felt-tip pen (the colour should be quite different from that of the transporting surface)

- tool set

- white adhesive tape for black transporting surfaces

How to prepare the configuration and adjustment:

1. Ensure that the VMD has been correctly mounted and that the electrical connections are also correct.

2. Install the provided SOPAS configuration software from CD-ROM.

3. Connect the PC with the Ethernet interface of the VMD.

4. Start SOPAS and add a new project.

5. Configure the Scan assistant (SCAN ASSISTANT file card CONFIGURATION button).

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Note Check whether the CoLa dialect is set to AUTO DETECT and enter the IP address for the VMD (see *3.7.3 "Ethernet interface" on page 33*).

6. Then scan for devices connected (SCAN ASSISTANT file card, SCAN button) and add the VMD to the SOPAS project tree.

7. Log in to the VMD Master as AUTHORISED CLIENT (EXTRAS menu, LOG IN TO DEVICE, default password "client").

8. In the PROJECT TREE, VMDX20_XX00, PARAMETER, open the DIGITAL INPUTS/TRIGGER device page and in the LASER CONTROL field select the OFF option.

   This switches the lasers of the VMS420/520 permanently on; the scan line of the VMS is now visible and the VMS can be adjusted.

7.2   Adjustment of the VMD

Note For adjustment see *Fig. 15 on page 37*.

7.2.1   Adjustment of the angle α

1. Use a felt-tip pen to draw a line in the transporting direction. For this purpose start the conveyor system and hold the felt-tip pen over the moving surface.

2. Loosen the three screws ① of the mounting kit.

3. Align the scan line of the VMD master at a right angle with the line on the conveyor system.

4. Tighten the three screws ① of the mounting kit again.

5. Repeat the adjustment steps for the VMD slave.

7.2.2   Adjustment of the angle β

1. Put the test object (see *"General accessories" on page 74*) with the unmarked side onto the conveyor system.

2. Screw in setscrew ② slightly so that the sleeve on the mounting block opens a little and the mounting kit on the hollow shaft can be moved.

3. Rotate mounting kit on hollow shaft until scan line and adjustment line on test object are parallel to each other.

4. Unscrew setscrew ② slightly and tighten fastening screw M10 ⑨ and thus set the position and the vertical alignment of the VMD.

5. For vertical adjustment of the VMD slave, rotate its mounting kit on the hollow shaft until the scan lines of master and slave correspond.

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7.2.3   Adjustment of the angle γ

1. Loosen screws ⑤ and screw ⑥ for both mounting kits (master and slave).

2. Adjust the angle γ so that both VMDs can completely scan the largest possible object.
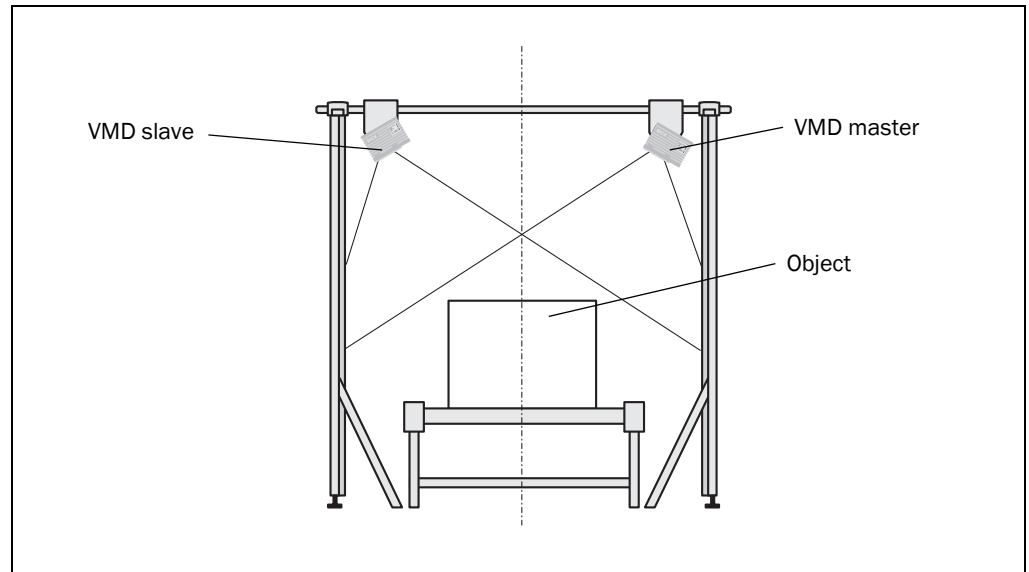
Fig. 20:   Illustration of a VMD installation above a conveyor system

3. For both mounting kits (master and slave), tighten screws ⑤ and screw ⑥ again.

7.2.4   Checking the evenness of the coverage of the scan lines on both VMD

1. Place highest object to be measured or appropriate test object on the conveyor system and check evenness of coverage of both scan lines.

2. If necessary, re-adjust VMD.

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7.3 Define the coordinates and the angle γ using the installation setup

There is an installation setup for the configuration of the position of the VMD. You will find detailed step-by-step instructions on commissioning in the assistant.

Note To be able to use the installation setup, the VMD must be able to scan the transporting surface. Apply, for example, a piece of white tape along the scan line on a black surface.

7.3.1 Defining the angle γ, the Y and the Z coordinates

➢ Start the assistant on the VMDX20_XX00 menu, COMMISSIONING, START INSTALLATION SETUP.

➢ Enter the GAMMA, Y COORDINATE AND Z COORDINATE parameters for the VMD master and the VMD slave (see *Fig. 21*). A rough entry is adequate. The assistant will determine the exact parameters during the subsequent steps.
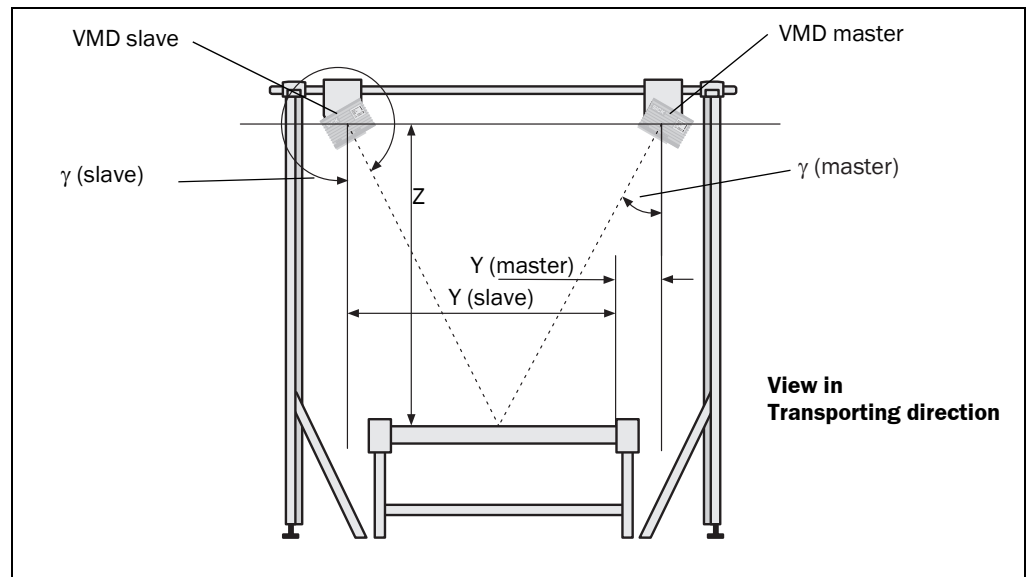
Fig. 21:   Angle γ and Y coordinate and Z coordinate

7.3.2 Defining the transporting surface

In the next step the assistant scans the surrounding contour for the VMD master and displays the scan line seen. However, the assistant cannot yet identify which part of the scan line corresponds to the transporting surface.

You therefore define the position of the transporting surface by marking it.

➢ Position two marks using the right mouse button (M1 and M2). Ensure that the marks are as close as possible to the right and left edge of the conveyor system (see *Fig. 22* ①).
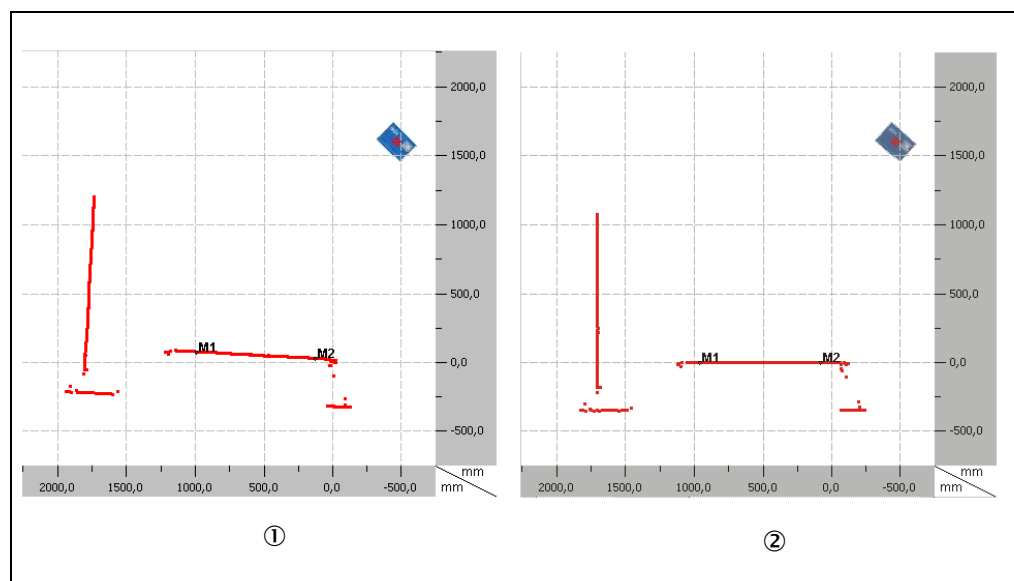
Fig. 22:   Example scanned conveyor system

➢ In the assistant, click CALCULATE.
The angle γ and the Z coordinate are calculated and the scan line drawn horizontally in the diagram (see *Fig. 22* ②).

➢ Proceed to the next step in the assistant and perform the process for the VMD slave.

7.3.3   Defining the Y coordinate

➢ Place the test object on end in the middle of the transporting surface.
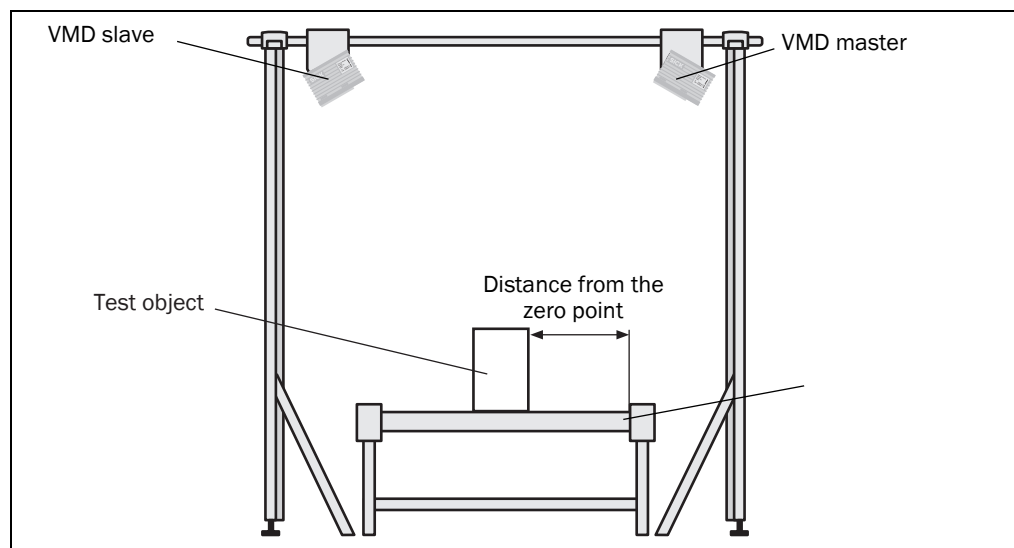
Fig. 23:   Entry of the distance from the zero point

In the next step in the assistant enter the DISTANCE FROM THE ZERO POINT, the WIDTH OF OBJECT and HEIGHT OF OBJECT.

Note The test object is 200 mm (7.87 in) wide and 300 mm (11.81 in) high. You must measure the distance from the zero point.

The assistant scans the surrounding contour and displays the scan line seen. However, the assistant cannot identify which part of the scan line corresponds to the test object.

➢ Define on the scan line which part of the surrounding contour on the right side corresponds to the object. For this purpose position two marks using the right mouse button (see *Fig. 24*).
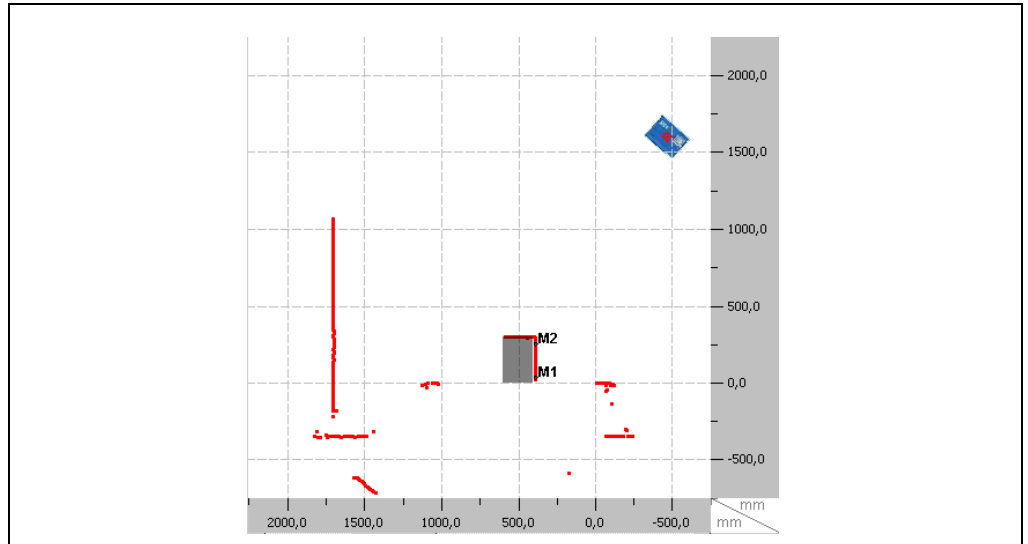
Fig. 24:   Example scanned test object

➢ In the assistant, click CALCULATE.
The assistant calculates the distance of the VMD from the zero point and as a result its Y coordinate.

➢ Proceed to the next step in the assistant and perform the process for the VMD slave.

7.3.4   Applying the parameters

Finally the assistant displays the new parameters for the VMD master and the VMD slave. Once you have applied these data, they are saved in the devices.

Note   The values are not yet displayed on the SOPAS user interface in PARAMETER, POSITION. The values are only displayed after the data have been uploaded from the device.

COMMUNICATION menu, UPLOAD ALL PARAMETERS FROM DEVICE

7.4   Defining the remaining parameters in SOPAS

To configure the VMS ready for use, a few settings are required in SOPAS.

7.4.1   Configuring the VMD (master) using SOPAS

1. PROJECT TREE, VMDX20_XX00, PARAMETER, POSITION, define the following parameters:

    Area MEASUREMENT AREA

    – LEFT BORDER: Width of the conveyor system

    – TOP BORDER: Max. object height + approx. 50 mm (1.97 in)

    – RIGHT BORDER: Approx. 30 mm (1.18 in)

    – BOTTOM BORDER: Approx. –50 mm (–1.97 in)

2. PROJECT TREE, VMDX20_XX00, PARAMETER, ALGORITHM SETTINGS, activate VMD MASTER option.

3. PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE. Select which measured data message is to be output over the host interface (*11.3 "Measured data message reference" on page 65*).

4. PROJECT TREE, VMDX20_XX00, PARAMETER, BASIC PARAMETERS, define the following parameters:

   Area SCAN SETTINGS, SCAN AREA

   – STARTING ANGLE: 55°

   – ANGULAR RANGE: 70°

   Open the CURRENT DEVICE PARAMETERS area, SCAN FREQUENCY ASSISTANT and select under MODE the FREQUENCY option.

   Enter 370 Hz and in the next step select a setting with an angular resolution of at least 0.25°.

5. PROJECT TREE, VMDX20_XX00, PARAMETER, INCREMENT CONFIG./SYNC., area SYNCHRONISATION MASTER/SLAVE

   – TYPE: MASTERSYNC

   – PHASE [°]: 30

6. PROJECT TREE, VMDX20_XX00, PARAMETER, INCREMENT CONFIG./SYNC., area INCREMENT SETTINGS. Select and configure the type of encoder connected.

7. PROJECT TREE, VMDX20_XX00, PARAMETER, DIGITAL INPUTS/TRIGGER, define parameters according to the chosen application.

8. PROJECT TREE, VMDX20_XX00, PARAMETER, OBJECT SIZE SETTINGS, enter object dimensions according to the selected application.

7.4.2   VMD slave

Make adjustments as per *Section 7.4.1 "Configuring the VMD (master) using SOPAS" on page 51*, with following differences:

1. PROJECT TREE, VMDX20_XX00, PARAMETER, INCREMENT CONFIG./SYNC., area SYNCHRONISATION MASTER/SLAVE

   Area SYNCHRONISATION

   – TYPE: SLAVESYNC

   – PHASE [°]: 0

7.5   Testing of the configuration

Use the graphic view in the SOPAS monitor to verify the generated measured values and to verify the measurement area online. During this process, note that the monitor cannot display the data in real-time and therefore does not display all measured values.

7.5.1   Display of the measurement results

With the VMS application started the VMS measured values are displayed in the measurement results display as they are output in the measured data message. VMDX20_XX00, MONITOR, DISPLAY OF THE MEASUREMENT RESULTS

7.5.2   VMS results list

With the VMS application started, the last ten measured results from the VMD are displayed in a table in the VMS RESULT LIST area.
VMDX20_XX00, MONITOR, DISPLAY OF THE RESULTS LIST

7.5.3   Noise statistics

Depending on wear, surface finish, etc., the transporting surface will generate noise in the measurement on crossing the scan line. To determine a trigger threshold for object detection, it is helpful to determine the magnitude of the noise.

The noise statistics makes it possible to scan parts of the transporting surface or the entire transporting surface and to record the noise.
PROJECT TREE, VMDX20_XX00, MONITOR, VIEW NOISE STATISTICS

7.5.4   Scan view

With the aid of the graphic scan view in SOPAS you verify the measurement area for a VMD and the measured values online.
VMDX20_XX00, MONITOR, SCAN VIEW

7.5.5   3D object view

The 3D object view shows the objects measured on the conveyor system. Use the view, e.g. when setting up the system or for checks when it is in operation.
VMDX20_XX00, MONITOR, 3D OBJECT VIEW

8   Maintenance

8.1   Maintenance during operation

The VMS volume measurement system is maintenance-free apart from the maintenance measures listed below. No maintenance is necessary to ensure the retention of laser class 2 (complies with 21 CFR 1040.10 with the exception of the deviations as per Laser Notice No. 50, July 26, 2001).

Recommendation   To obtain the full optical performance of the VMS, the front screens and any additional front screens should be regularly checked for contamination. This applies particularly in harsh operating environments (dust, powder, moisture, finger marks).

WARNING

Damage to the eye from laser radiation!

The VMS uses a red laser of class 2. On extended beam exposure, the retina in the eye may be damaged.

The entire front screen serves as the laser output opening.

Warning — inappropriate use of the VMS can result in hazardous exposure to radiation and the laser class may be exceeded.

➢   Never look directly into the beam (similar to sunlight).

➢   Do not point the device laser beam at people.

➢   During mounting and adjustment of the VMS, pay attention to possible reflections of the laser beam on reflective surfaces.

➢   Do not open the housing. (Opening the housing does not interrupt the power to the laser diode during the read cycle.)

➢   Observe the latest valid version of the laser safety regulations.

ATTENTION

Front screen damaged!

The front screen is made of glass. The optical power is reduced by scratches and smearing on the front screen.

➢   Do not use aggressive detergents.

➢   Do not use abrasive cleaning agents.

➢   Avoid scratching and scouring movements on the front screen.

Note   Static charges cause dust particles to be attracted to the front screen. You can prevent this effect by using the antistatic plastic cleaner (SICK Part No. 5600006) and the SICK lens cloth (Part No. 4003353).

How to clean the front screen and/or the additional front screen (optional extra):

➢   Use a clean and soft brush to remove dust from the front screen.

➢   Then wipe the front screen with a clean and damp cloth.

8.2 Disposal

After de-commissioning, dispose of unusable or irreparable devices in an environmentally correct manner:

1. Observe national waste disposal regulations.
2. Dismantle the housing of the VMS.
3. Remove electronics assemblies.
4. Remove glass window of the laser output opening and send for glass recycling.
5. Send chassis and cover for die-cast aluminium recycling.
6. Dispose of all electronic assemblies as hazardous waste.

SICK AG does not accept any devices returned that have become unusable or are irreparable.

8.3 Replacement of a system or replacement of components

If the system or individual components are replaced, proceed as follows:

1. Switch off the voltage supply for the VMD and undo the connection.
2. Remove the connection cables from the VMD.
3. Undo the three screws M6 (see *Fig. 14 on page 36*) and replace the VMD.
4. Mounting and adjusting a replacement device (see *Chapter 4 "Mounting" on page 34*).
5. Configuring a replacement device (see *Chapter 7 "Configuration and adjustment" on page 46*).

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9   Troubleshooting

This chapter describes how to identify and rectify errors and malfunctions of the VMS volume measurement system.

9.1   In the event of faults or errors

Cease operation if the cause of the malfunction has not been clearly identified!

Stop the machine/system if you cannot clearly identify or allocate the error and if you cannot safely rectify the malfunction.

9.2   Error on beam generation

The VMS automatically monitors the beam generation and automatically shuts down the generation of the beam in case of irregularities. In this case:

*   The LED "Device Ready" turns red.

*   The scanner transmits no more measured values.

To cancel error status:

➢   Switch the VMS off and back on again.

➢   If the error is still present when the device is switched on again, check the device status with the aid of SOPAS (see *9.3.1*). If errors are listed there, please contact SICK service.

9.3   Detailed error analysis

9.3.1   Query system status

The VMS saves errors internally in a logfile. You can display this logfile using SOPAS:

➢   Connect SOPAS to the device.

PROJECT TREE, VMDX20_XX00, SERVICE, SYSTEM STATUS, areas OPERATING DATA and SYSTEM STATUS

Notes   *   The SYSTEM STATUS log is retained also after the device is switched off and on again.

*   The VMS differentiates between four error types: "Information", "Warning", "Error" and "Serious error". For each error type, the system saves only the last five occurrences.

9.3.2   Logging data during operation

In the SOPAS configuration software, menu TOOLS, the DATA RECORDER is available. In this way you can specifically log and analyse data in certain memory areas in the VMS during operation.

10 Technical specifications

10.1 Data sheet VMS420/520 volume measurement system

Type	VMS420	VMS520
Version	2 scanner solution	
Detectable object shape	Almost any, dimensions of objects must be min. 50 mm × 50 mm × 50 mm (1.97 in × 1.97 in × 1.97 in)	
Laser output opening	On front	
Useful field of view	Max. 70°	
Laser diode (wavelength)	Visible light (λ = 650 nm)	
Laser power	Max. 10 mW	
Laser class of the device	2 (Complies with 21 CFR 1040.10 with the exception of the deviations as per Laser Notice No. 50, July 26, 2001)	
Max. object size (L × W× H)	2000 mm × 1000 mm × 1600 mm (78.74 in × 39.37 in × 62.99 in)	
Certified scale interval d	≥5 mm[1] (≥0.2 in)	
Object remission	10 to 200%	
Min. gaps between objects at v = 2 m/s (393.7 ft/min)	25 mm (0.98 in)	
Max. conveyor velocity	3 m/s (590.55 ft/min)	
Optical indicators	6 LEDs per VMD	
Host interface	RS-232 or RS-422, data output format can be adjusted	
Output data	• maximum dimensions (length, width, height) • box volume • real volume	• maximum dimensions (length, width, height)
Operating voltage/power consumption	DC 24 V ± 15%/max. 50 W	
Housing	Aluminium die-cast	
Enclosure rating/protection class	IP 20 (according to DIN 40050); with plug cover IP 65	
EMC test	In compliance with EN 61000-6-2:2001, EN 61000-6-4:2001	
Vibration/shock test	In compliance with EN 60068-2-6, -27, -29, -64	
Weight	Approx. 2.3 kg (5.07 lb) per VMD	
Temperature (operation/storage)	0...+40 °C/−20...+70 °C (32...104 °F/−4...158 °F)	

Tab. 12: VMS data sheet

[1] Only in optimal applications, without effect of contamination, vibration, at extremely low object remission, without slip between object and conveyor system or high temperature drift, a scale interval d = 5 mm (0.2 in) is possible in industrial environments! For this reason the application must be checked by SICK before a statement can be made on a scale interval d = 5 mm (0.2 in) in the related application.

10.2   Dimensional drawings

10.2.1   Dimensional drawing VMD volume measurement device
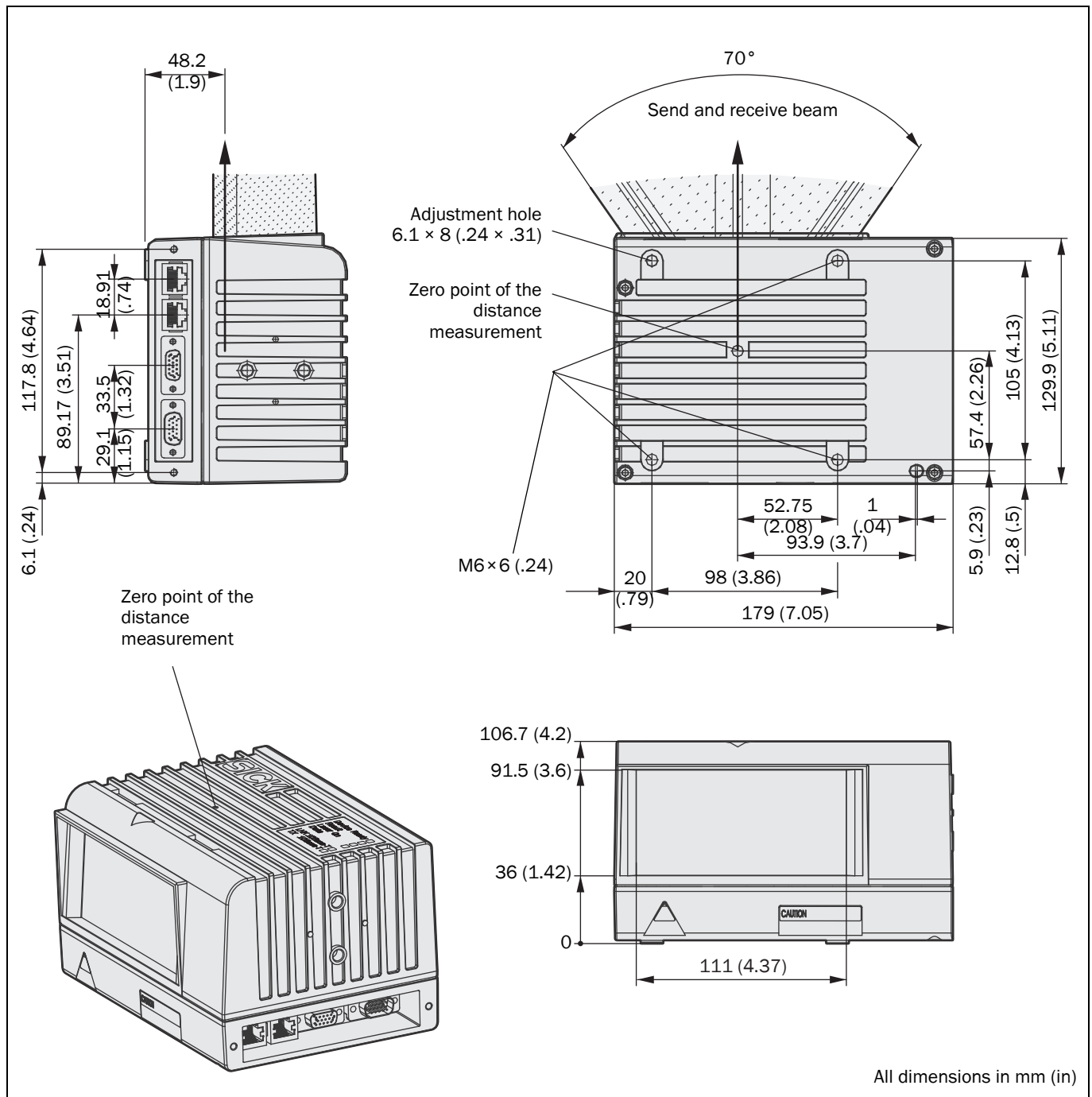
Fig. 25:   Dimensional drawing VMD

10.2.2 Dimensional drawing mounting kit mounting bracket
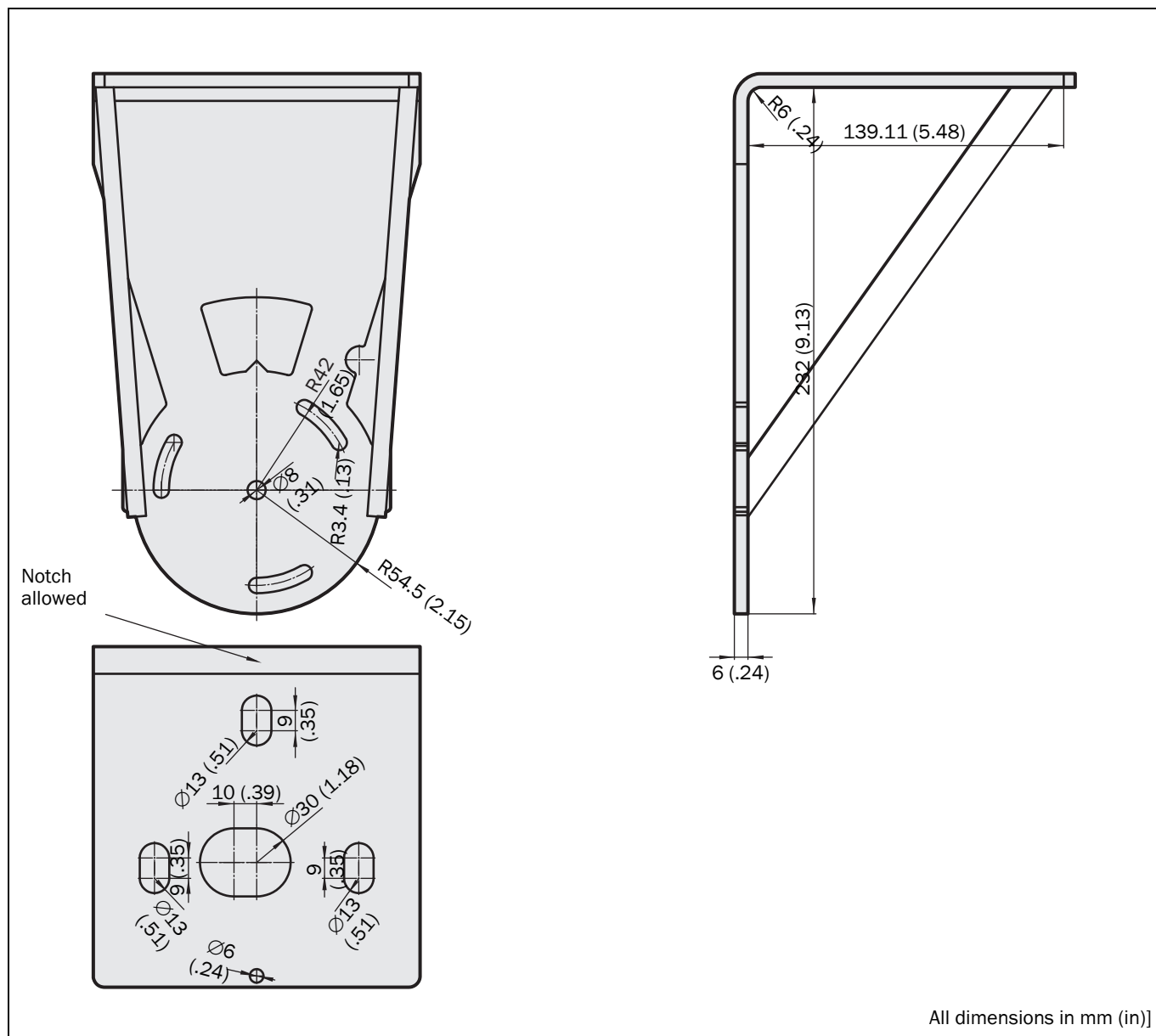
Fig. 26: Dimensional drawing mounting kit mounting bracket

10.2.3 Dimensional drawing mounting kit mounting block
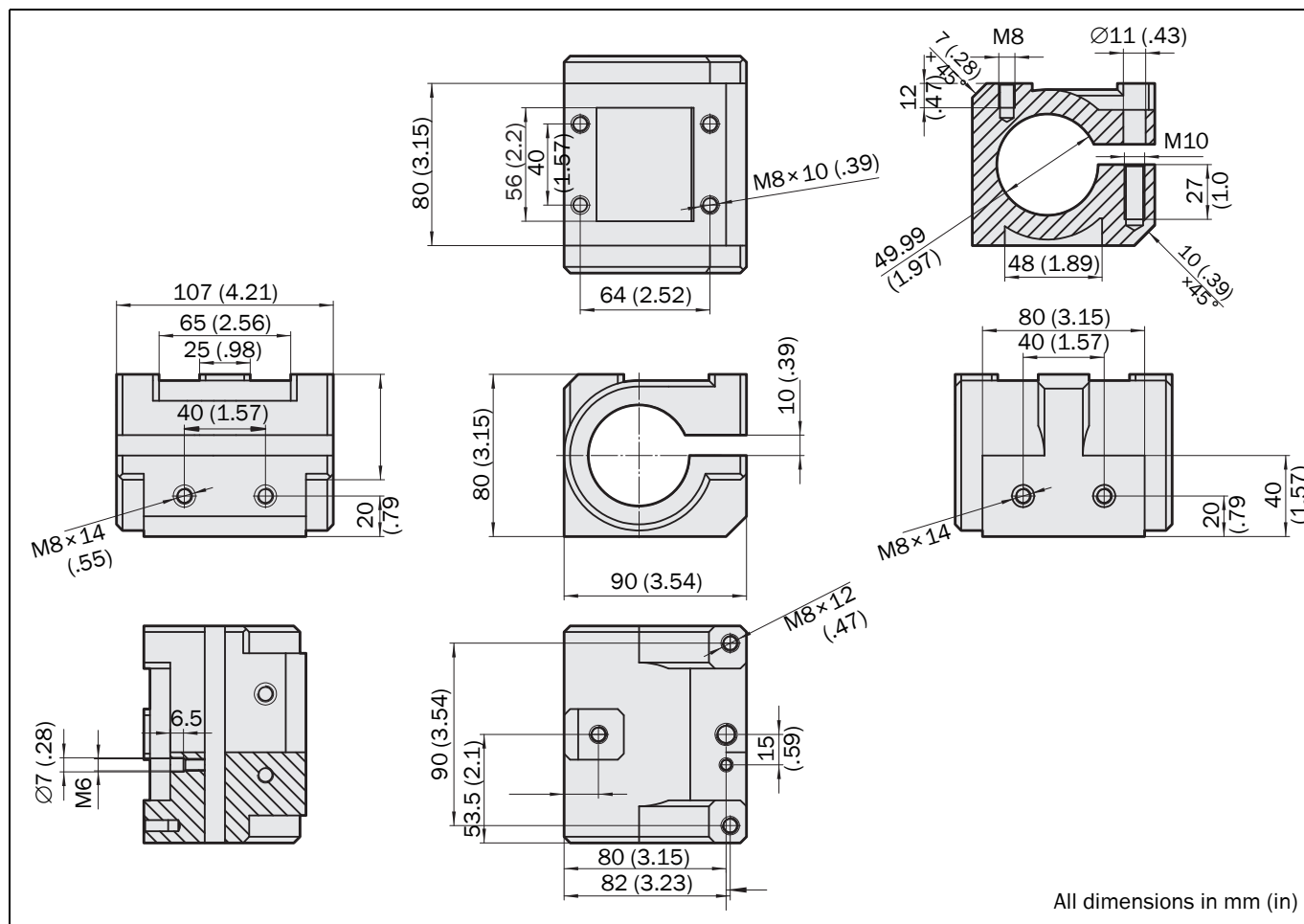
Fig. 27: Dimensional drawing mounting kit mounting block

10.2.4 Dimensional drawing hollow shaft for mounting the VMS
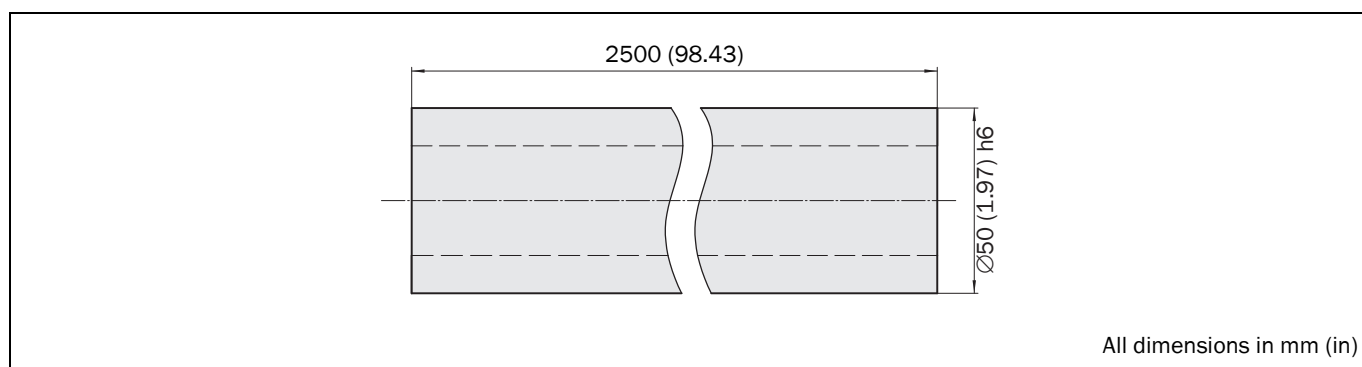
Fig. 28: Dimensional drawing hollow shaft for mounting the VMS

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11   Annex

11.1   Overview of the annexes

The annex contains the following supplementary information:

- message reference
- ordering information
- glossary
- illustration containing the EU Declaration of Conformity
- illustration of the OIML conformity certificate
- illustration of the test certificate issued by the National Metrology Institute (Physikalisch-Technische Bundesanstalt)

11.2   Control messages reference

Notation

The individual message sections are each to be separated by a space (ASCII code 59, hex. 3B).

All the examples used in the following message lists refer to the CoLa A protocol.

Syntax error

If the VMS detects an error in the syntax of a received message, it outputs an error message with an error code.

Message structure: **sFA** ErrorCode

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Syntax error or logical error	string	3	**sFA**
Error code	Contains the error type (see *Tab. 13*)	string	4	**FF00h** ... **FFFFh**

Message syntax I: Syntax error or logical error

Error code	Possible cause	Solution
FF79h	Unknown name	The procedure or parameter name used is unknown. Check for spelling mistakes.
FFC8h FFC9h	User level too low	A higher user level is required to access the procedure or parameter. Change to required user level.
FF??h	General syntax error	Check message syntax: Type of command, command, parameter number and value range

Tab. 13:   Syntax error or logical errors

11.2.1　Object start

The VMS generates this message when an object enters the scan line (see *Fig. 5 on page 21*). You must activate the message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, option ENABLE OBJECT START MESSAGE

Message structure:　　　**2B**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Indicates the object start	string	2	**2B**

Message syntax II:　　　Object start

11.2.2　Object end

The VMS generates this message when an object leaves the scan line (see *Fig. 5 on page 21*). You must activate the message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, option ENABLE OBJECT START MESSAGE

Message structure:　　　**2E**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Indicates the object end	string	2	**2E**

Message syntax III:　　　Object end

11.2.3　Heartbeat

The VMS generates this message after a configurable interval has elapsed during which no object was measured. In this way, the connected application can cyclically check the device status even if it is idle. You must activate the message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, option ENABLE HEARTBEAT MESSAGE

Message structure:　　　**HH**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	A heartbeat is output according to the interval set in SOPAS.	string	2	**HH**

Message syntax IV:　　　Heartbeat

11.2.4   Stand-by

This message puts the VMS into stand-by mode.

Request

Message structure: **2I**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Set the VMS to the "Idle/stand-by" state	string	2	**2I**

Message syntax V: "Stand-by" request

Answer

Message structure: **2I**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	VMS in the "Idle/stand-by" state	string	2	**2I**

Message syntax VI: Answer to the "Stand-by" request

Example

Request: 2I

Answer: 2I

11.2.5   Measuring mode

This message puts the VMS into measuring mode.

Note   It is not necessary to send this message to the VMS when the VMS is powered up. The system enters measuring mode automatically and signals this by outputting the value "201".

Request

Message structure: **20**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	Set the VMS to the measuring mode	string	2	**20**

Message syntax VII: "Measuring mode" request

Operation

Message structure: **20**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	The VMS is set to the measuring mode	string	2	**20**

Message syntax VIII: Confirmation of the "Measuring mode" request

Answer

Message structure: **201**

Message part	Description	Variable type	Length (byte)	Value range
Type of command	The VMS enters measuring mode approx. 120 seconds after receiving the request or 180 seconds after being switched on	string	3	**201**

Message syntax IX: Answer to the "Measuring mode" request

Example

Request: 20

Confirmation: 20

Answer: 201

11.2.6   Status query

Request

Message	Description
2 ? S F	Requests from the VMS a status code comprising three digits.

Tab. 14:   Request message "Status query"

Answer

Message part	Description
2 S F	Requests from the VMS a status code comprising three digits.
CS_1	
CS_2	Three-character status code
CS_3	

Tab. 15:   Answer message to the "Status query" request

11.3   Measured data message reference

11.3.1   Basic measured data message (metric values)

You can select the basic measured data message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;SerialNumberMaster;
SerialNumberSlave;Index;Measurement status;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	M for metric in mm	string	1	**M** Metric values
Length	Longest side of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Width	Width of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Height	Height of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
SerialNumberMaster	Outputs the serial number of the VMD Master	string	8	**00000000** **99990000**
SerialNumberSlave	Outputs the serial number of the VMD Slave	string	8	**00000000** **99990000**
Index	Message counter initialised with 1	string	4	**0000** **9999**
Measurement status	0 = OK	string	4	**0000** **9999**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax X: Basic measured data message (metric values)

Example

Output: DI;M;0500;0400;0350;03404711;03404712;0123;0000;AC34

11.3.2 Basic measured data message (values in inch)

You can select the basic measured data message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;SerialNumberMaster; SerialNumberSlave;Index;Measurement status;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	I for inch values	string	1	**I** Values in inch
Length	Longest side of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Width	Width of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Height	Height of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
SerialNumberMaster	Outputs the serial number of the VMD Master	string	8	**00000000** **99990000**
SerialNumberSlave	Outputs the serial number of the VMD Slave	string	8	**00000000** **99990000**
Index	Message counter initialised with 1	string	4	**0000** **9999**
Measurement status	0 = OK	string	4	**0000** **9999**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XI: Basic measured data message (values in inch)

Example

Output: DI;I;00500;00400;00350;03404711;03404712;0123;0000;AC34

11.3.3   Basic measured data message 2 (metric values)

You can select the basic measured data message 2 in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;ScaleIntervalLength; ScaleValueWidth;ScaleIntervalHeight;SerialNumberMaster; SerialNumberSlave1;SerialNumberSlave2; SerialNumberSlave3;Index;MeasurementStatus;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	M for metric in mm	string	1	**M** Metric values
Length	Longest side of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Width	Width of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Height	Height of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
ScaleIntervalLength	Scale intervals for length, width and height in mm	string	4	**0000** **9999**
ScaleValueWidth	The related value is dependent on the values defined in SOPAS and the velocity of the conveyor system.	string	4	**0000** **9999**
ScaleIntervalHeight		string	4	**0000** **9999**
SerialNumberMaster	Outputs the serial number of the VMD Master	string	8	**00000000** **99990000**
SerialNumberSlave1	Outputs the serial number of the 1st VMD Slave	string	8	**00000000** **99990000**
SerialNumberSlave2	Outputs always 00000000	string	8	**00000000** **99990000**
SerialNumberSlave3	Outputs always 00000000	string	8	**00000000** **99990000**
Index	Message counter initialised with 1	string	4	**0000** **9999**
Measurement status	0 = OK	string	4	**0000** **9999**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XII: Basic measured data message 2 (metric values)

Example

Output: DI;M;0500;0400;0350;0010;0010;0005;03404711;03404712;
                           00000000;0000000;0123;0000;AC34

11.3.4   Basic measured data message 2 (values in inch)

You can select the basic measured data message 2 in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;ScaleIntervalLength;
                           ScaleValueWidth;ScaleIntervalHeight;SerialNumberMaster;
                           SerialNumberSlave1;SerialNumberSlave2;
                           SerialNumberSlave3;Index;MeasurementStatus;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	I for inch values	string	1	**I** Values in inch
Length	Longest side of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Width	Width of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Height	Height of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
ScaleIntervalLength	Scale intervals for length, width and height in inch/100	string	4	**0000** **9999**
ScaleValueWidth	The related value is dependent on the values defined in SOPAS and the velocity of the conveyor system.	string	4	**0000** **9999**
ScaleIntervalHeight		string	4	**0000** **9999**
SerialNumberMaster	Outputs the serial number of the VMD Master	string	8	**00000000** **99990000**
SerialNumberSlave1	Outputs the serial number of the first VMD Slave	string	8	**00000000** **99990000**
SerialNumberSlave2	Outputs always 00000000	string	8	**00000000** **99990000**
SerialNumberSlave3	Outputs always 00000000	string	8	**00000000** **99990000**

Message syntax XIII: Basic measured data message 2 (values in inch)

VMS420/520

Message part	Description	Variable type	Length (byte)	Value range
Index	Message counter initialised with 1	string	4	**0000** **9999**
Measurement status	0 = OK	string	4	**0000** **9999**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XIII: Basic measured data message 2 (values in inch)

Example

Output: DI;I;00500;00400;00350;0400;0400;0200;
03404711;03404712;00000000;0000000;0123;0000;AC34

11.3.5 Extended measured data message (metric values)

You can select the extended measured data message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;BoxVolume;RealVolume; Angle; Measurement status;Index;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	M for metric in mm	string	1	**M** Metric values
Length	Longest side of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Width	Width of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Height	Height of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
BoxVolume	Box volume of the smallest enclosing cuboid in cm^3	string	7	**0000000** **9999999**
RealVolume	Real volume of the measured object in cm^3	string	7	**0000000** **9999999**
Angle	Angle of the smallest enclosing cuboid in 1/10 degrees	string	4	**±000** **±999**
Measurement status	0 = OK	string	4	**0000** **9999**
Index	Message counter initialised with 1	string	4	**0000** **9999**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XIV: Extended measured data message (metric values)

Example

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

11.3.6 Extended measured data message (values in inch)

You can select the extended measured data message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;Volume;RealVolume;Angle; Measurement status;Index;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	I for inch values	string	1	**I** Values in inch
Length	Longest side of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Width	Width of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Height	Height of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
BoxVolume	Box volume of the smallest enclosing cuboid in inch^3/10	string	7	**0000000** **9999999**
RealVolume	Real volume of the measured object in inch^3/10	string	7	**0000000** **9999999**
Angle	Angle of the smallest enclosing cuboid in 1/10 degrees	string	4	**±000** **±999**
Measurement status	0 = OK	string	4	**0000** **9999**
Index	Message counter initialised with 1	string	4	**0000** **9999**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XV: Extended measured data message (values in inch)

Example

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

11.3.7   Extended measured data message 2 (metric values)

You can select the extended measured data message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;Angle;Index;Measurement status; Measurement status2;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	M for metric in mm	string	1	**M** Metric values
Length	Longest side of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Width	Width of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Height	Height of the smallest enclosing cuboid in mm	string	4	**0000** **9999**
Angle	Angle of the smallest enclosing cuboid in 1/10 degrees	string	4	**±000** **±999**
Index	Message counter initialised with 1	string	4	**0000** **9999**
Measurement status	0 = OK	string	4	**0000** **9999**
Measurement status2	0 = OK	string	8	**00000000** **99990000**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XVI: Extended measured data message 2 (metric values)

Example

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

11.3.8 Extended measured data message 2 (values in inch)

You can select the extended measured data message in SOPAS.

PROJECT TREE, VMDX20_XX00, PARAMETER, INTERFACES, HOST, area OUTPUT VIA HOST INTERFACE, selection field MEASURED DATA MESSAGE

PROJECT TREE, VMDX20_XX00, PARAMETER, DATA PROCESSING, UNIT/SCALE INTERVALS, area UNIT/ROUNDING, selection field UNIT

Message structure: **DI;**Unit;Length;Width;Height;Angle;Index;Measurement status;
Measurement status2;CS

Message part	Description	Variable type	Length (byte)	Value range
Command	Start of the measured data output	string	2	**DI**
Unit	I for inch values	string	1	**I** Values in inch
Length	Longest side of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Width	Width of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Height	Height of the smallest enclosing cuboid in inch/100	string	5	**00000** **99999**
Angle	Angle of the smallest enclosing cuboid in 1/10 degrees	string	4	**±000** **±999**
Index	Message counter initialised with 1	string	4	**0000** **9999**
Measurement status	0 = OK	string	4	**0000** **9999**
Measurement status2	0 = OK	string	8	**00000000** **99990000**
CS	Checksum for the commands described above to CRC 16	string	4	**0000h** **FFFFh**

Message syntax XVII: Extended measured data message 2 (values in inch)

Example

Output: DI;I;00500;00400;00350;+433;0123;0000;00000000;AC34

11.4   Ordering information

11.4.1   Available systems

11.4.2   Accessories/spare parts

Part number	Device type	Code
1041964	VMS420-2000	Volume measurement system
1041965	VMS520-2000	MID and OIML-certified volume measurement system with measured values that can be standardized

Tab. 16:   Available systems

General accessories

Part number	Part	Description
4039783	Hollow shaft	Length 2.5 m (8.2 ft), d = 50 mm (1.97 in), h6 surface, hardened and ground, weight approx. 20 kg (44.09 lb)
2030886	Mounting block set	For mounting the hollow shaft on the frame
2039457	Incremental encoder	0.2 mm/inc (0.008 in/inc) resolution
2034693	Photoelectric switches set	WL18 with fixing bracket, flying lead
4040035	Test object	Test object 202 × 302 × 402 mm³ (7.95 × 11.89 × 15.83 in³), imperative for commissioning

Tab. 17:   General accessories

Interface sets

Part number	Part	Description
2031362	Interface set CDM	2 CDM490-0001 3 cables, plug/socket, 10 m (32.81 ft) 1 set of hardware (sliding nuts, screws)
2031363	Interface set CDM/ CMP	2 CDM490-0001 2 CMP490 3 cables, plug/socket, 10 m (32.81 ft) 1 set of hardware (sliding nuts, screws)

Tab. 18:   Interface sets

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Plug cover sets

Part number	Part	Description
2031364	Plug cover set M-fitting	1 plug cover M-fitting, master 1 plug cover slave 1 connection cable Power, CAN, 3 m (9.84 ft) 1 FSI cable for plug covers
2031365	Plug cover set M12 plug	1 plug cover M12-fitting, master 1 plug cover slave 1 connection cable Power, CAN, 3 m (9.84 ft) 1 FSI cable for plug covers 2 plugs for trigger and encoder 1 socket for the connection "Host" 1 cable, socket with insulation stripped, 10 m (32.81 ft)
2031366	Plug cover set cables (3 m (9.84 ft))	1 plug cover, master, 3 m (9.84 ft) 1 plug cover, slave, 3 m (9.84 ft) 1 FSI cable for plug covers 2 CDM490-0001 1 set of hardware (sliding nuts, screws)
2031399	Plug cover set cables (3 m (9.84 ft)) + voltage supply	1 plug cover, master, with cable, 3 m (9.84 ft) 1 plug cover, slave, with cable, 3 m (9.84 ft) 1 FSI cable for plug covers 2 CDM490-0001 2 CMP490 1 set of hardware (sliding nuts, screws)

Tab. 19:   Plug cover sets

Accessories for plug covers

Part number	Part	Description
2031372	Communication cable	1 communication cable (3 m (9.84 ft)) to the terminal interface in the plug cover with M-fitting, 3 m (9.84 ft)

Tab. 20:   Accessories for plug covers

Spare parts measuring head

Part number	Part	Description
1041723	VMD420-2000	Cannot be standardized
1041724	VMD500-2000	Can be standardized

Tab. 21:   Spare parts measuring head

11.5   Glossary

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

Download

Transmission of the parameter set that has been modified offline in the SOPAS configuration software from the PC to the VMD. SOPAS transmits either always a complete copy to the memory (RAM) in the VMD (menu COMMUNICATION, DOWNLOAD ALL PARAMETERS TO DEVICE) or only the parameter that has just been edited with the aid of the context menu opened using the right mouse button (menu COMMUNICATION, DOWNLOAD MODIFIED PARAMETERS TO DEVICE). With menu VMDX20_XX00, PARAMETER, SAVE PERMANENT, the parameter set is saved permanently in the EEPROM of the VMD.

Field of view α

Angle that defines the limits to which the laser beam is deflected by the polygon mirror wheel. A v-shaped area is formed radially in the scan direction in front of the laser output opening; this area must contain the objects to be measured.

Function interfaces

Switching inputs and outputs of the VMS.

Host interface

Primary data interface of the VMS with data output format that can be configured. Is used, among other tasks, for the output of the measuring result in message format to the host/ the PLC. Used to integrate the VMS in the SICK network. Can be connected electrically as RS-232 or RS-422. Provides various transmission protocols.

Line scanner

Scanner that very rapidly deflects its focused laser beam with the aid of a polygon mirror wheel with mirrors parallel to the axis. In this way the scanner generates a dot of light in the measuring plane that repeatedly runs along a straight line and appears to be a "stationary" scan line due to the relative slow response of the human eye.

Master/slave configuration

Special arrangement and connection of two VMD volume measurement devices.

Parameter set

Data set using which the functions implemented in the VMD are initialised and activated. Is transmitted from the VMD to SOPAS and in the reverse direction using UPLOAD or DOWNLOAD respectively.

RIS

Remission Information System: The RIS value corresponds to the remission value without application of the scaling factor. It states the reflectivity of the object at the measurement point in percent determined by the system. A small RIS value signifies a low reflectivity (as a rule a dark object).

Scan line

See line scanner.

SOPAS

Configuration software, can be used with Windows 98/NT 4.0/2000/XP. Used for the offline configuration (adaptation to the read situation on-site) and the online operation of the VMS in the dialog box.

SOPAS setup help

Online Help that supports the usage of the SOPAS configuration software. The functions of the parameters for the VMS are explained in the Help and the related value ranges given. Can be used with an HTML browser, e.g. Internet Explorer or I-ViewPro as supplied and can be opened from SOPAS setup.

Terminal interface

Auxiliary data interface (RS-232) on the VMS with fixed data output format. Using this interface it is always possible to access the VMS using the SOPAS configuration software. Is used, among other tasks, for the output of system messages and error messages.

Upload

Transmission of the parameter set from the VMS to the PC into the SOPAS configuration software. The values for the parameters are displayed on the file cards of the configuration software. Prerequisite for the modification of the current parameter set.

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11.6   Illustration containing the EC Declaration of Conformity

Fig. 29 shows page 1 of the EC Declaration of Conformity (size reduced). The full EC Declaration of Conformity is available on request.

Fig. 29:Illustration containing the EC Declaration of Conformity

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11.7   Illustration of the MID conformity certificate
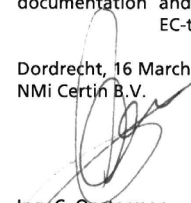
EC-type examination certificate

Number **T10019** revision 0
Project number 607413
Page 1 of 1

Issued by   NMi Certin B.V.
                   Hugo de Grootplein 1
                   3314 EG Dordrecht
                   The Netherlands

                   Notified Body number 0122

In accordance   The Metrologiewet (Stb. 2006, 137) as Dutch implementation of Directive 2004/22/EC
with   on measuring instruments (MID).

Manufacturer   SICK AG.
                   Nimburger Strasse 11
                   D-79276 Reute
                   Germany

In respect of   A model of a **multi-dimensional measuring instrument** for measuring
                   rectangular, non-rectangular, non-irregular shaped, non reflective and opaque boxes.
                   Type   :   VMS 520

Characteristics   Mechanical environment class M3
                   Electromagnetic environment class E2
                   Temperature range -10 °C / +40 °C

                   In the description number T10019 revision 0 further characteristics are described.

Valid until   16 March 2017

Description and   The instrument is described in the description number T10019 revision 0
documentation   and documented in the documentation folder T10019-1, appertaining to this
                   EC-type examination certificate.

Dordrecht, 16 March 2007
NMi Certin B.V.

Ing. C. Oosterman
Manager Product Certification

NMi Certin BV
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Form. 525

Parties concerned can lodge objection against this decision, within six weeks after the date of submission, to the general manager of NMi (see "Regulation objection and appeal against decisions of NMi")

This document is issued under the provision that no liability is accepted and that the applicant shall indemnify third-party liability.

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INSPECTION
RvA I 122

Fig. 30:   Illustration of the MID conformity certificate

Note   When using the VMS520 in standardized applications, observe the relevant national law.
           SICK can provide advice on this topic if required. However this advice is no substitute for
           legal advice.

11.8   Illustration of the OIML conformity certificate

Fig. 31:   Illustration of the OIML conformity certificate

Note   When using the VMS520 in standardized applications, observe the relevant national law. SICK can provide advice on this topic if required. However this advice is no substitute for legal advice.

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