OPERATING INSTRUCTIONS

VMS4x0 Contour Verification
Track and trace systems

EN

Sensor Intelligence.

Contents

Contents

1 About these operating instructions

Please read through this chapter carefully before you use the documentation and work with the VMS4x0 Contour Verification measurement system.

1.1 Purpose of this document

These operating instructions are designed to give **technical personnel** instructions on the safe mounting, configuration, electrical installation, commissioning, operation, and maintenance of the VMS4x0 Contour Verification measurement system.

1.2 Target group

These operating instructions are intended for people who install, connect, commission, operate and service the VMS4x0 Contour Verification measurement system.

Tasks	Target group
Mounting, electrical installation, maintenance, and replacement of system components	Qualified personnel, such as service technicians or industrial electricians
Commissioning and configuration	Qualified personnel, such as technicians or engineers
Operation of the conveying system	Personnel qualified in running and operating the conveying system

Tab. 1 Target group

1.3 Information depth

Note These operating instructions contain information about the VMS4x0 Contour Verification measurement system on the following topics:

- System description
- Mounting
- Electrical installation
- Commissioning and standard configuration
- Maintenance
- Fault diagnosis and troubleshooting
- Technical data and dimensional drawings

When planning and using measurement systems such as the VMS4x0 Contour Verification, technical skills are required that are not covered by this document.

The official and legal regulations for operating the VMS4x0 Contour Verification measurement system must always be complied with.

The SOPAS configuration software is used to configure (parameterize) the measurement system for the respective application on site.

Additional information on the VMS systems is available from the SICK AG and online at www.sick.com.

1.4 Abbreviations used

CAN	Controller Area Network = standardized fieldbus system that uses a message-based data exchange protocol
FTP	File Transfer Protocol
HTML	Hypertext Markup Language = page description language in the Internet
LED	Light emitting diode
LMS	Laser measurement sensor = laser scanner from SICK AG
MSC	Modular System Controller (MSC800)
SD	Secure Digital Card = digital, replaceable memory card
SOPAS-ET	SICK OPEN PORTAL for APPLICATION and SYSTEMS Engineering Tool = software for configuring the SICK devices
VMC	Volume Measurement Controller from SICK AG
VMS	Volume Measurement System from SICK AG

1.5 Symbols used

Recommendation

Recommendations are designed to assist you in the decision-making process with respect to the use of a certain function or technical measure.

Note

Notes provide information about the features of a device, application tips, or other useful information.

1. / 2. ...

Instructions that must be carried out in the described order are referred to as step-by-step instructions and are indicated by numbered lists. Carefully read and follow the instructions for action.

➢

Instructions for taking action are indicated by an arrow. Carefully read and follow the instructions for action.

Software notes indicate where to make the appropriate settings in the SOPAS configuration software.

● ☀, ○

LED symbols describe the status of a diagnostics LED. Examples:

● The LED is illuminated continuously.

☀ The LED is flashing.

○ The LED is off.

2 Safety

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

➢ Please read this chapter carefully before you begin working with VMS4x0 Contour Verification.

2.1 Qualified safety personnel

The VMS4x0 Contour Verification measurement system must only be mounted, commissioned, and maintained by adequately qualified personnel.

The following qualifications are necessary for the various tasks:

Tasks	**Qualification**
Mounting and maintenance	• Practical technical training • Knowledge of the current safety regulations in the workplace
Electrical installation and device replacement	• Practical electrical training • Knowledge of current electrical safety regulations • Knowledge of device control and operation in the particular application concerned (e.g., conveying system, mounting system, crane)
Commissioning, operation, and configuration	• Knowledge concerning device control and operation in the particular application concerned (e.g., conveying system, mounting system, crane, etc.) • Knowledge concerning the software and hardware environment of the particular application concerned (e.g., conveying system, mounting system, crane etc.) • Basic knowledge of the Windows operating system used • Basic knowledge of data transmission • Basic knowledge of the design and setup (addressing) of Ethernet connections when connecting the MSC800 to the network • Basic knowledge of how to use an HTML browser (e.g. Internet Explorer) to access the online help

Tab. 2 Qualified safety personnel

2.2 Applications of the system

The VMS4x0 Contour Verification measurement system is used for automatic deformation detection of cubic boxes on flat conveying systems. Both dents and bulges on flat areas and edges are detected.

While the box is transported on the conveyor belt, laser scanners calculate the distances to the measuring points of the object being transported. An encoder signal provides the transport speed of the belt and, in turn, the position of the object on the belt.

The calculated distances are transferred to the evaluation unit. This calculates a three-dimensional object from the measured data and determines the length, width, and height (volume measurement).

At the same time, the evaluation unit determines the damages to the box based on the dimensions. To do so, the smallest enveloping cuboid is calculated and compared with the raw data (contour detection). The dimensions of the deformation result from the distance values from the calculated and ideal contour. You can set the accuracy of the deformation detection using parameters.

If the deformation is above the tolerance range, a respective error code is output via the central control unit to a downstream host computer for further processing.

Customized extensions such as identification systems and weighing systems can be easily integrated. They enable full status control, thereby improving process transparency.

2.3 Intended use

The VMS4x0 Contour Verification measurement system may only be used as described in section **2.2 Applications of the system**. It may only be used by qualified personnel in the environment in which it was mounted and initially commissioned by qualified safety personnel in accordance with these operating instructions.

Operation is allowed in an industrial environment, particularly in high-rise warehouses. The system can be used for the deformation detection of boxes and packages and their release from the conveying systems before they are forwarded to downstream systems such as storage and retrieval systems.

This ensures interference-free operation of automated systems such as conveying and sorter systems or storage and retrieval systems and reduces downtimes.

The VMS4x0 Contour Verification measurement system must not be used outdoors or in an explosion-protected environment.

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

2.4 General safety notes and protective measures

2.4.1 Safety notes and symbols

The following safety and hazard symbols are used for your own protection, for the protection of third parties, and for the protection of the machine. You must therefore observe these symbols at all times.

HAZARD

Denotes an immediate hazard that may result in severe to fatal injuries.

The symbol shown on the left-hand side of the note refers to the type of hazard in question (the example here shows a risk of injury resulting from electrical current).

WARNING

Denotes a potentially dangerous situation that may result in severe to fatal injuries.

The symbol shown on the left-hand side of the note refers to the type of hazard in question (the example here shows a risk of injury resulting from falling components).

CAUTION

Caution note

Denotes a potentially dangerous situation that may result in minor personal injury or possible material damage.

The symbol shown on the left-hand side of the note refers to the type of hazard in question (the example here shows a risk of damage to the eye by laser beams).

NOTE

Denotes a potential risk of damage or functional impairment of the device or the devices connected to it.

This symbol refers to supplementary technical documentation.

2.4.2 General safety notes

General, recognized safety-related rules and regulations were taken into account in the design and manufacture of the measurement system. However, risks for the user resulting from the measurement system cannot be completely ruled out. The safety notes below must therefore be observed.

WARNING

Safety notes

Observe the following to ensure the safe use of the system as intended.

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

WARNING

The system is not a safety device for human protection and it therefore does not comply with any safety standards. For safety applications, please contact SICK AG.

WARNING

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

2.4.3 Potential sources of danger

The measurement system has been designed in a way that allows for safe operation. Protective devices reduce potential risks to the maximum possible extent. However, a certain level of risk will always remain.

Awareness of potential sources of danger in the measurement system will help you to work in a safer manner and thus prevent accidents.

To avoid risks, please also observe the special warnings in each of the individual chapters.

Risks during transport and mounting

WARNING

Risk of injury due to components tipping over

If profiles of the mounting frame have been upended, they could possibly tip over during disassembly.

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

WARNING

Risk of injury due to falling components

The controller cabinet weighs approx. 20 kg.

- Do not do mounting work alone.
- Have a second person hold the components during mounting.

Risks during electrical installation

HAZARD

Risk of injury due to electrical current

The central control unit of the system is connected to the voltage supply (100 V ... 264 V AC / 50 Hz ... 60 Hz).

- Standard safety requirements must be met when working on electrical systems.
- The power supply must be disconnected when attaching and detaching electrical connections.
- Select and implement wire cross-sections and their correct fuse protection in accordance with the applicable standards.

HAZARD

Risk of injury and damage caused by electrical current

Improper handling of live devices may lead to severe personal injury or death by electric shock.

- Electrical installation and maintenance work must always be carried out by personnel authorized to do so.
- Do not touch any live parts.

- In the event of danger, immediately disconnect the system from the power supply.
- Always use original fuses with the specified current rating.
- The controller cabinet must be securely closed during operation.
- Report any damaged cables to the maintenance team without delay.

⚠ WARNING

Risk of tripping due to cables! Risk of damage to cables!

Exposed cables on the floor in areas used by people can pose a risk.

- Lay all cables so that there is no risk of tripping and all cables are protected against damage.

Danger due to laser light

⚠ WARNING

Damage to the eye by laser beam

The laser scanner works with a red, Class 2 laser. When exposed to the laser beam for longer periods of time, the retina of the eye may be damaged.

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

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

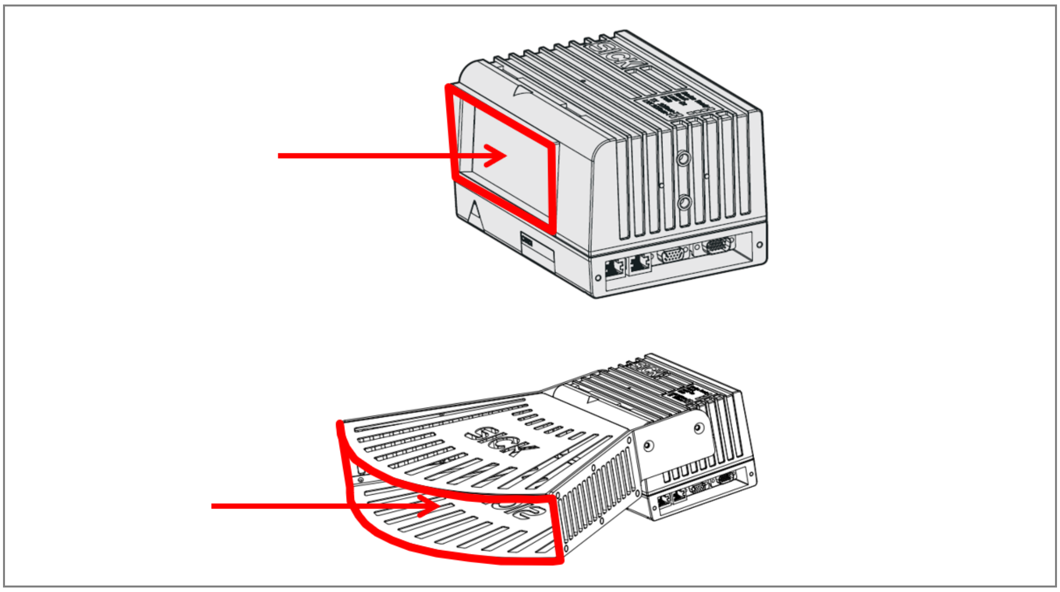


Fig. 1: VMD laser output aperture with and without optics cover

- Never look directly into the beam path (similar to sunlight).
- Never point the laser beam of the device at people.
- When mounting and aligning the devices, pay attention to reflections of the laser beam off reflective surfaces.
- Do not open the housing. (Opening does not interrupt the switching on of the laser diode by the reading pulse).

- Observe the applicable laser safety regulations according to the latest version of IEC 60825-1:2014.
- It is not permitted to remove the protective cover that may be attached to the VMD head. This could cause damage to the eye by laser beams.

Fig. 2: Warning label for laser protective cover

Laser power

The laser scanner operates at a wavelength of λ = 650 nm (visible red light). The output power of the laser beam is max. 7.4 mW or max. 9.5 mW at the laser output aperture.

The emitted radiation is harmless to human skin.

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

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

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

Important All laser scanners are continuously switched on in measurement mode.

Laser warning labels

The laser warning labels are located on the respective devices.

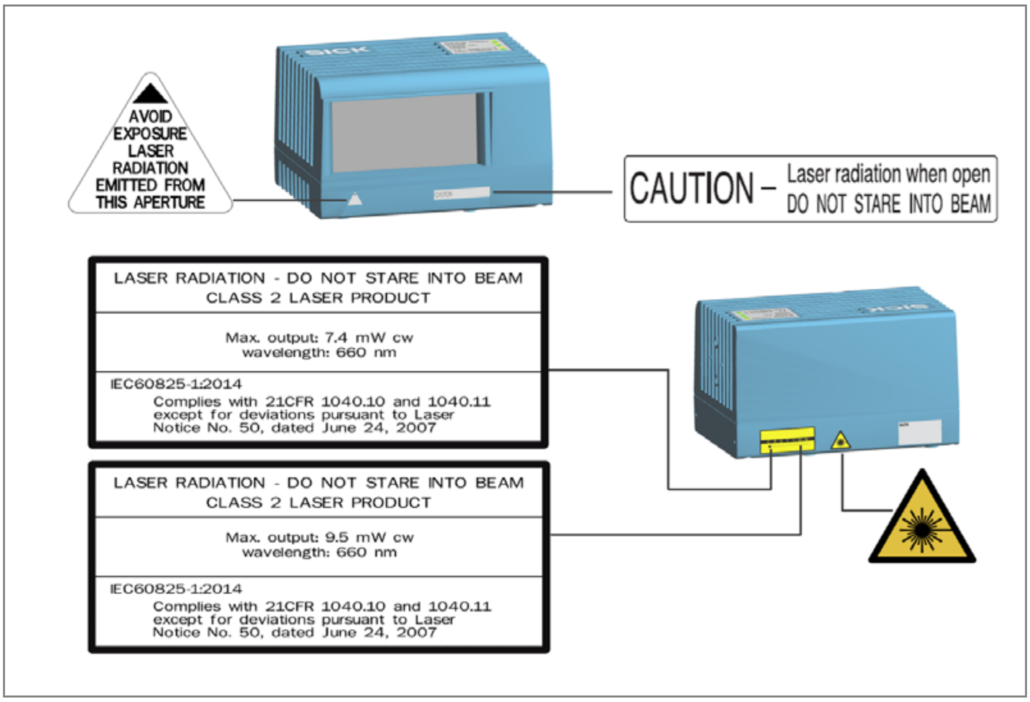


Fig. 3: Laser warning labels

English warning on the VMS

LASER RADIATION – NEVER LOOK INTO THE BEAM

CLASS 2 laser PRODUCT

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

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

IEC 60825-1:2014

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

Notes

The laser warning information must be written in a language understood by the operators of the system into which the volume measurement device is incorporated.

The scope of delivery also includes a set of self-adhesive laser warning labels in German/US English and French/US English.

➢ If necessary, exchange the laser warning label on the device before commissioning.

➢ If the devices are installed in a system/casing so that the laser warning labels are covered, other warning labels (not included with delivery) must be attached to the system/casing next to the outlet opening.

➢ SICK sensors feature monitoring circuits which automatically shut down the laser diode in the event of irregularities. In such cases, the red LED on the device illuminates.

Risks during commissioning and configuration

WARNING

Risk resulting from incorrect commissioning and configuration

Do not commission without testing by qualified personnel!

Before you operate the system or a device for the first time, you must have it checked and approved by qualified safety personnel.

NOTE

Do not switch off the voltage supply during the configuration!

If you switch off the voltage supply during the configuration, you will lose all parameters that have already been configured.

Risks during maintenance and repair work

HAZARD

Disconnect the power to the system

- Make sure the power supply for the entire system is disconnected throughout the entire time that you are carrying out maintenance and repair work.

HAZARD

Risk of injury due to electrical current

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

NOTE

Claims under the warranty rendered void

Do not open the device housing. The devices are sealed.

If the device is opened, any warranty claims against SICK AG will be void.

Dangers in the event of faults

WARNING

Danger due to malfunction!

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

- Immediately put the machine/system out of operation if you cannot clearly identify or allocate the fault and if you cannot safely remedy the fault.

2.4.4 Operating entity responsibilities

The operating entity or system manufacturer must execute the electrical installation in compliance with the respective provisions of the local EVU as well as applicable standards.

2.5 Protecting the environment

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

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

Disposal after final decommissioning

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

See also section **7.4 Disposal**.

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

3 System description

This chapter provides information on the special properties of the measurement system. It describes the design and operating principle of the system solution.

NOTE

VMS4x0 as two, three and four head solution

The VMS4x0 Contour Verification is described in these operating instructions with its basic equipment with four measurement heads. Note that other mechanical structures may exist depending on the installation situation of the measurement heads.

VMS4x0 Contour Verification is available as a two or three head system on request.

For deviations from the basic system described here, proceed in accordance with the project-specific documents included in the scope of delivery.

3.1 Scope of delivery

The VMS4x0 Contour Verification measurement system includes the following components in the basic equipment version:

Frame (optional)

- Aluminum profiles for setting up the frame (application-specific as per the order)
- Universal connection kits and mounting brackets 40 x 40 mm for screwing the profiles together
- Cable channels for mounting on sides of profiles
- Mounting kits for all system components

System components

- Controller cabinet with VMC800, MSC800, power supply module, and Ethernet switch
- 4 VMD500 volume measurement devices with modular hood, also with laser protective cover if necessary
- DFV60 measuring wheel encoder
- WL18 photoelectric retro-reflective sensor

Cables for connecting the devices

- 2 CAN cables (purple) for connecting the VMD devices to one another
- 1 CAN Only cable for connecting the VMD devices to one another
- 1 CAN cable with plug connector and open end for connecting to the CAN bus and the voltage supply in the MSC800.
- 1 24 V Only cable for separate connection to the power supply of the MSC800
- 1 Y-distribution for connecting the 24 V Only and the CAN Only cable to the VMD
- 1 terminator
- 2 FSI cables for synchronization of the opposing VMD devices
- 4 Ethernet cables for connecting the VMD devices to the Ethernet switch
- 1 incremental cable (black) with open end for connecting the master sensor to the MSC800 logic unit

- 1 connecting cable for measuring wheel encoder – screened (black with green male connector)
- 1 connecting cable for photoelectric retro-reflective sensor – not screened (black with green male connector)

System calibration accessories (optional)

- SICK reference box (order no. SICK PN 4040035)

A CD-ROM with the following content:

- SOPAS configuration software
- **VMS4x0 Contour Verification** operating instructions in German and English as a PDF
- Free software Adobe Acrobat Reader for reading PDF files

NOTE

➢ It is recommended that you carefully check for and report transport damage of any kind as soon as possible after receiving the system.

➢ Also verify that the delivery includes all components listed on the delivery note.

3.2 Specific features

3.2.1 The system components

The VMS4x0 Contour Verification volume measurement system consists of four VMD500 volume measurement devices, the controller cabinet with the MSC800 control unit and the VMC800 volume measurement controller, a measuring wheel encoder, and a photoelectric retro-reflective sensor.

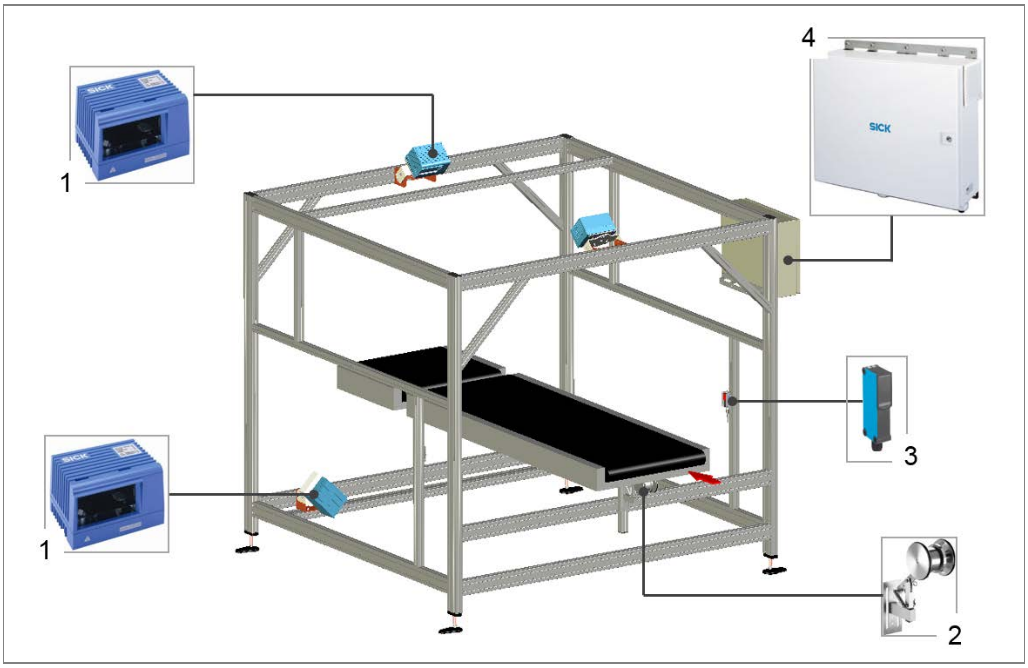


Fig. 4: VMS4x0 Contour Verification system components

All system components are mounted on a frame according to the technical drawing. To facilitate mounting of the components on the customer conveying system, aluminum profiles for constructing the frame, universal connection kits as well as mounting brackets 40 x 40 mm for screwing the profiles together can be included in delivery.

The measuring range of the volume measurement devices is limited to the dimensions of the conveying system. Additional glare protection on the frame ensures that objects located outside of the measuring range are not taken into account when calculating the measured values.

1 – VMD500 volume measurement devices

The volume measurement devices detect deformation on **six package** sides (top, front, rear and bottom sides as well as right and left sides).

Two VMD devices are mounted below the conveyor belt. The laser scanner beam is guided through the joint of two conveyor belts. They detect the bottom as well as the right and left side of the object. Two VMD devices are mounted above the conveyor belt. They detect the top as well as the front and rear side.

The VMD devices function according to the principle of phase shift (continuous wave). There is a phase difference between the transmitter and receiver beams resulting from the run time of the light and the wavelength used. This phase difference is converted into frequency. The volume measurement device uses this frequency to determine the distance of the object from the measurement sensor.

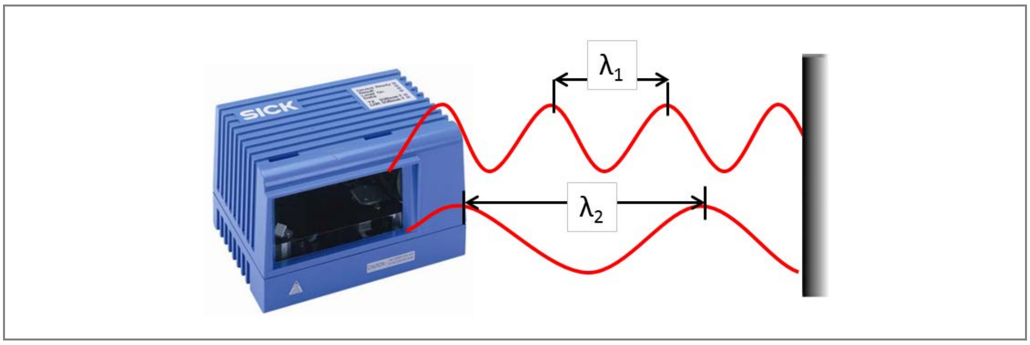


Fig. 5: Functioning of the volume measurement device

2 – Measuring wheel encoder

The measuring wheel encoder below the conveyor belt provides the exact position of the object on the belt once it has passed through the photoelectric sensor.

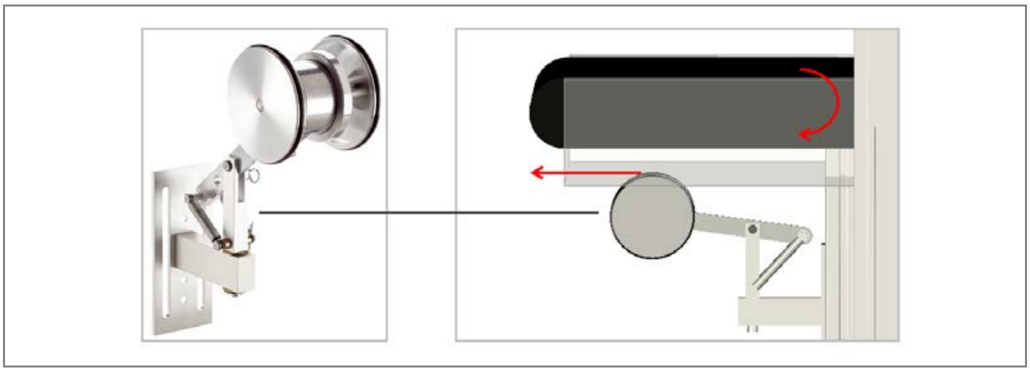


Fig. 6: Measuring wheel encoder

As part of this process, the measuring wheel encoder sends two incremental signals to the controller – there is a 90-degree phase shift between the signals. Based on these signals, it is possible to determine the speed and position of the object directly on the belt.

Measurement is performed directly on the running surface of the belt using a precise measuring wheel, which is mounted on a spring-loaded arm.

3 – Photoelectric retro-reflective sensor

A photoelectric retro-reflective sensor is used as trigger. The emitted light is reflected back by a reflector. The sender and receiver are located in a single housing, where they are arranged parallel to one another.

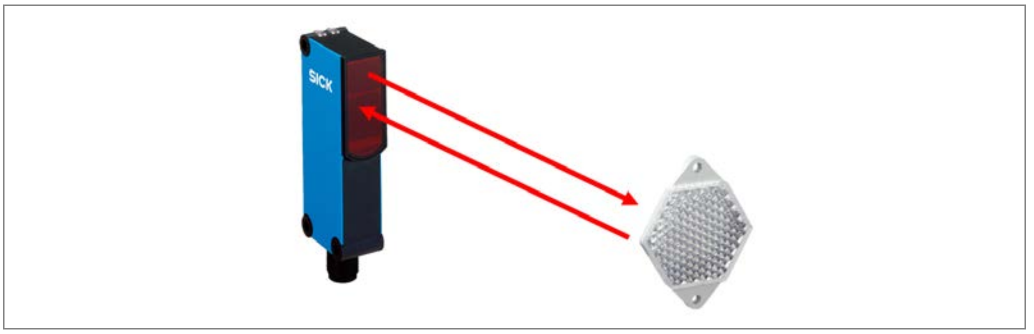


Fig. 7: Photoelectric retro-reflective sensor with reflector

The photoelectric sensor activates the VMD devices and provides information about when exactly an object enters the measurement system via the CAN bus. The MSC800 requires this information, together with the signals from the measuring wheel encoder, to identify the exact position of the object on the belt.

Alternatively, the system can be triggered via the **PLC** of the conveying system.

4 - Controller cabinet with MSC800, VMC800 and Ethernet switch

The controller cabinet contains the VMC800 volume measurement controller (1), the MSC800 controller (2) and the Ethernet switch (3).

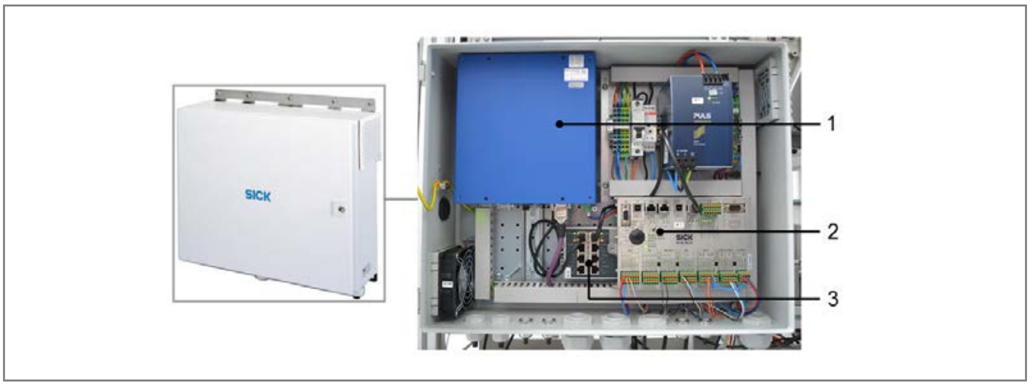


Fig. 8: Controller cabinet MSC800 with VMC800 and Ethernet switch

The volume measurement controller calculates the relevant object dimensions from the distance data of the VMD and, based on this data, determines whether deformation exists or not.

The MSC800 outputs the measurement results to the superior system control. The data is delivered via a customer-specific interface.

The Ethernet switch connects the system components and allows configuration of the system on the configuration PC.

Supplementary system components

In principle, the VMS4x0 Contour Verification measurement system can also incorporate SICK **bar code scanners** or **scales**.

- **Bar code scanners**

  SICK bar code scanners allow the automatic identification of the object via its bar code, thereby accelerating process automation.

- **Scales**

  The in-motion scales determine the weight of the passing box. The weight, together with the bar code and the calculated volume, are transmitted for the purpose of controlling the goods and material flow.

3.2.2 Operating principle of the measurement system

As soon as an object passes the trigger line with the leading edge, the VMS4x0 is activated. The VMD devices establish a measuring field and perform non-contact scanning of the conveying surface and the transported objects. The system does not require any reflectors or position marks to do this. It is an active system featuring a red light laser.

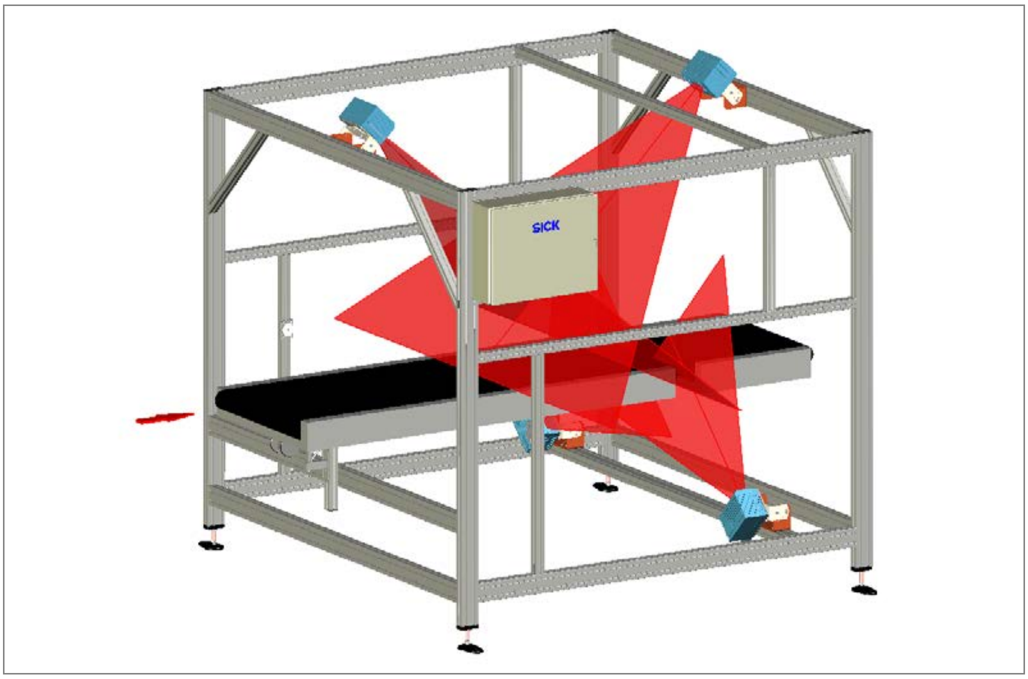


Fig. 9: Operating principle of deformation control

Using dimensions for deformation control

The VMC800 evaluation unit processes the raw data collected and calculates the edges and corners based on the point clouds. When the transport speed and the position of the object on the belt are also taken into account, a three-dimensional image can be rendered (1). The VMC800 calculates the length, width, and height (2) after raw data optimization/filtering. To calculate the length, the system needs to know the position of the object on the conveyor belt after it has passed through the photoelectric sensor. This is provided by the measuring wheel encoder in the form of incremental signals.

At the same time, the smallest enveloping cuboid is determined from the raw data (3).

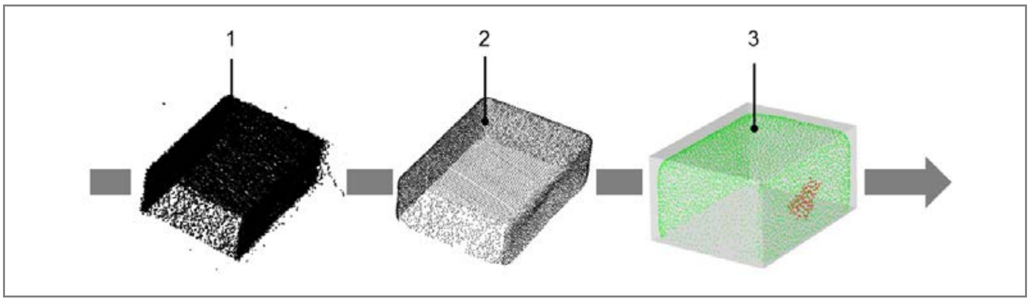


Fig. 10: Processing the measured data to create a 3 D model

The distance value between the recorded contour (1) and the ideal contour of the enveloping cuboid (2) results in the deformation dimensions (3). The following figures show the deformation dimensions for a dent…

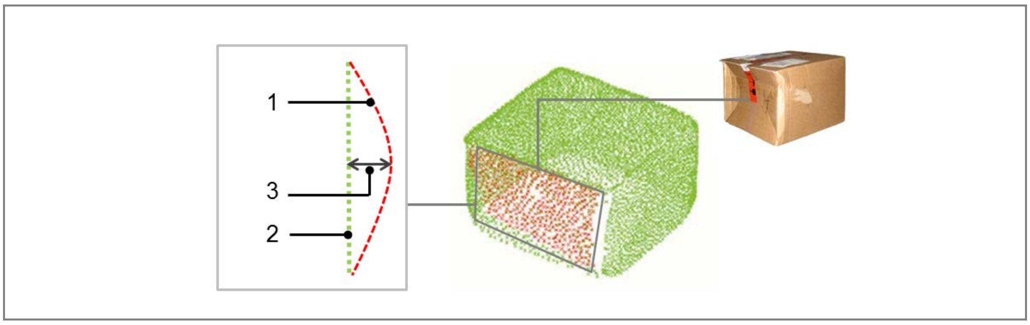


Fig. 11: Deformation dimensions (dent)

… and for a bulge.

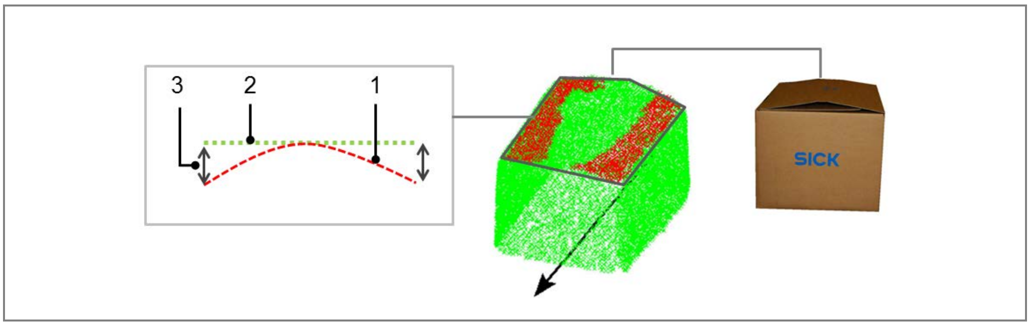


Fig. 12: Deformation dimensions (bulge)

Note In light of the described principle of operation, the VMS4x0 Contour Verification does not differentiate between dents and bulges.

Configuring the sensitivity of the deformation control

You can set the sensitivity of deformation using parameters.

To do so, the minimum and maximum permissible dimensions of the object are stored in the system for comparison. The maximum object height can be divided into two zones. Zone 1 reaches from the upper edge of the conveyor belt to the defined height of the first zone (1); zone 2 reaches from the upper edge of the conveyor belt to the maximum object height (2).

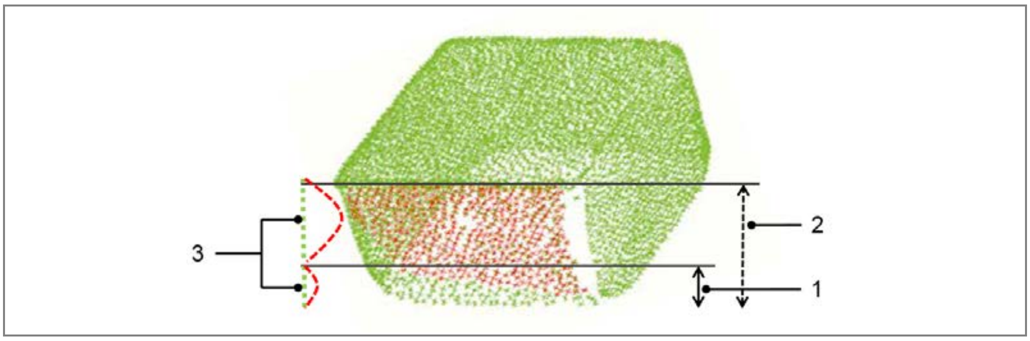


Fig. 13: Setting deformation sensitivity using parameters

A quality parameter can be set separately for both zones and the sensitivity of the deformation control can be determined depending on the application situation.

If, for example, the grippers of the storage and retrieval system take hold in this zone, you should specify a higher sensitivity of the deformation control there.

Note Do not choose the deviation dimensions too small to prevent incorrect detection of objects as deformed.

We recommend specifying dimensions no smaller than 22 mm.

Data processing and data output

All information converges in the MSC800 central control unit. The MSC800 processes the trigger signal and forwards the object's position so that the length can be calculated.

The data of all measurement results to the superior system control is output by the host data interface. Alternatively, the digital switching outputs of the MSC800 are available for further processing of the deformation results.

Minimum distance between objects (package flow)

The measurement system detects isolated, cuboid objects on flat conveying systems. Objects are singulated by the customer.

The objects must be transported with a minimum distance between them. The minimum distance must ensure that there is always an object in the measuring range.

A minimum distance of at least 1200 mm applies (depending on the project-specific object height, measured from the rear object edge to the front object edge of the following object). Object twists of up to ± 45° are detected.

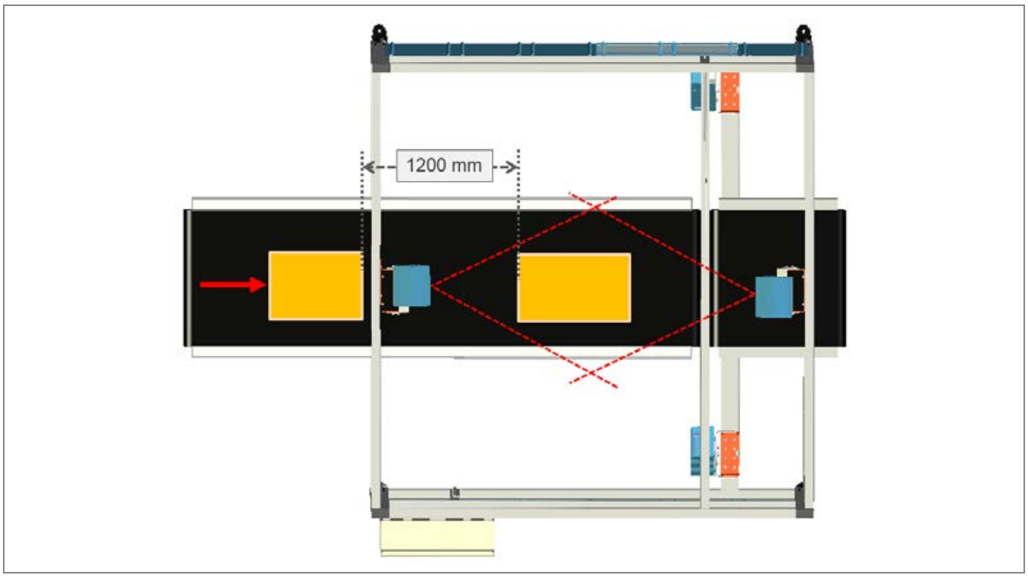


Fig. 14: Correct minimum distance between objects

Objects that are touching or lying side-by-side cannot be measured using the measurement system.

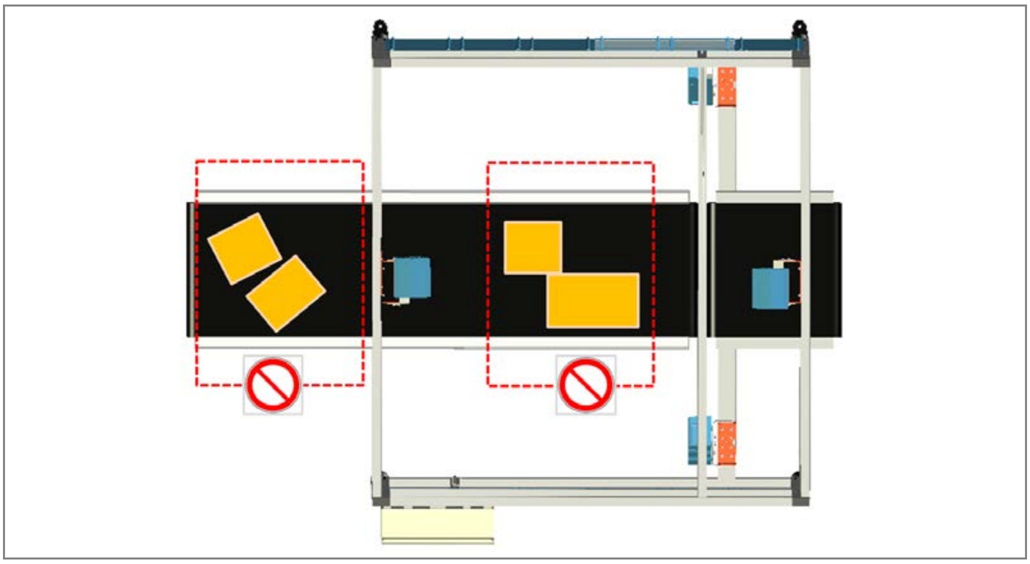


Fig. 15: Unable to measure objects that are touching or lying side by side

Deformations of irregular bodies as well as objects with openings are also **not** measured.

Operation

After installation and configuration, the VMS4x0 Contour Verification measurement system continues running without any further handling and provides the required data.

3.3 Project planning

3.3.1 System requirements

To operate the measurement system, the following are required:

- Supply voltage: 100 … 264 V AC / 50 … 60 Hz
- Host computer **with** RS-232, RS-422/485, Ethernet or PROFIBUS data interface for further processing of the read data

3.3.2 Requirements for the operation site:

The operation site for the measurement system must have the following features:

- Closed room
- Flat and firm surface
- Low-vibration environment
- Protected from wind and free of drafts
- Well-lit
- Clean and dry
- Room temperature from 0 °C to 40 °C

3.3.3 Conveying system requirements

The two VMD devices mounted below the conveying technology require a belt gap of about 40 to 50 mm between the incoming and outgoing belt.

The incoming and the outgoing belt must be flat and operate at the same speed. The upper sides of the conveyor belts must be on one level.

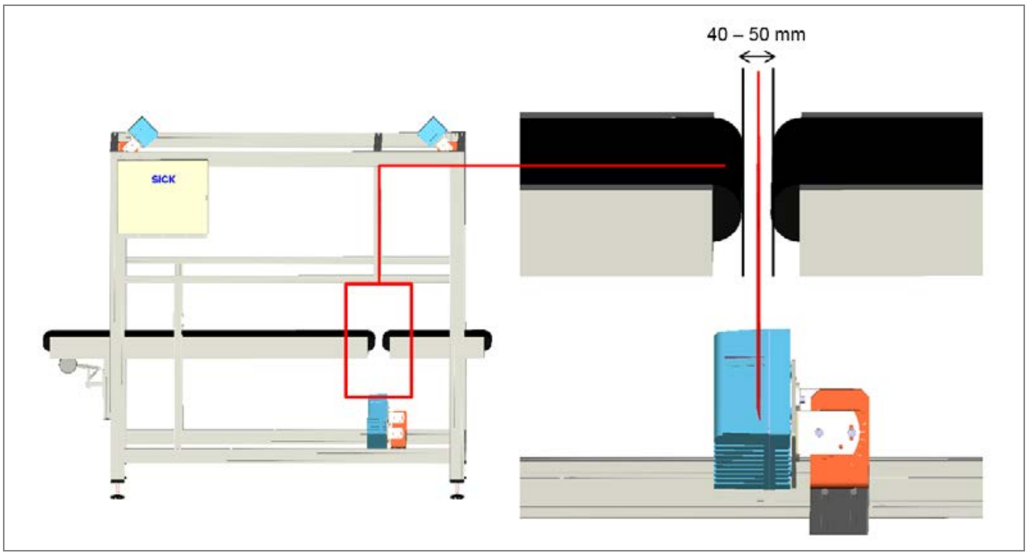


Fig. 16: Belt gap for the VMD mounted below the conveyor belts

Component	**Explanation**
Min. object size (L x W x H)	200 x 100 x 100 mm
Max. object size (L x W x H)	2,000 x 1,000 x 1,000 mm
Minimum distance between objects	> 1200 mm
Object rotation	± 45°
Object properties / Remission value	15% - 200% (based on Kodak White Paper and red light laser), not glossy (e.g. tape) You can find more information on this in the LMS400 operating instructions in chapters 3.6.1 and 3.6.2
Conveyor speed	Up to 2.0 m/s [1] Synchronous and consistent belt speed in the measuring range
Conveying system	• Flat conveying surface • Individual objects (see minimum distance)
Accuracy of volume measurement	Up to ± 5/5/5 mm (L x W x H) at 1 m/s [2] Up to ± 10/5/5 mm (L x W x H) at 2 m/s [2]
Power consumption of entire system	Typically 480 W
Enclosure rating / protection class	IP54
Ambient operating temperature	0 °C … +40 °C
Storage temperature	-20 °C … +70 °C
Interfaces	RS-232, -422, -485; PROFIBUS; Ethernet (TCP/IP, FTP, EtherNet/IP™)

[1] Higher speeds on request

[2] For cubic objects

Tab. 3: Conveying system and object requirements

Notes If the objects rotate, vibrate, roll, or slip on the belt and on uneven conveying surfaces, the accuracy may be reduced and the data acquisition of the VMS4x0 Contour Verification may be impaired.

3.3.4 Mounting requirements

Frame

The measurement system requires both a stable, secure frame to prevent rotation and a sufficient load bearing capacity to support the system components.

- ➢ To achieve a high level of measurement accuracy, use the optional aluminum profiles and the corresponding mounting kits for mounting.
- ➢ The frame must be attached to the conveying system in such a way that it is free of vibrations and oscillations.
- ➢ The frame must be positioned at right angles to the conveying direction.

Mounting the VMD550

The VMD500 is mounted above and below the conveying system in accordance with the technical drawing at an angle of inclination of 45°.

- ➢ The distance between the VMD and the objects being transported should be as short as possible.

➢ The smallest permissible distance of the measuring object from the zero point of the VMD is 700 mm. The zero point is marked both on the upper and lower side of the housing of the VMD.

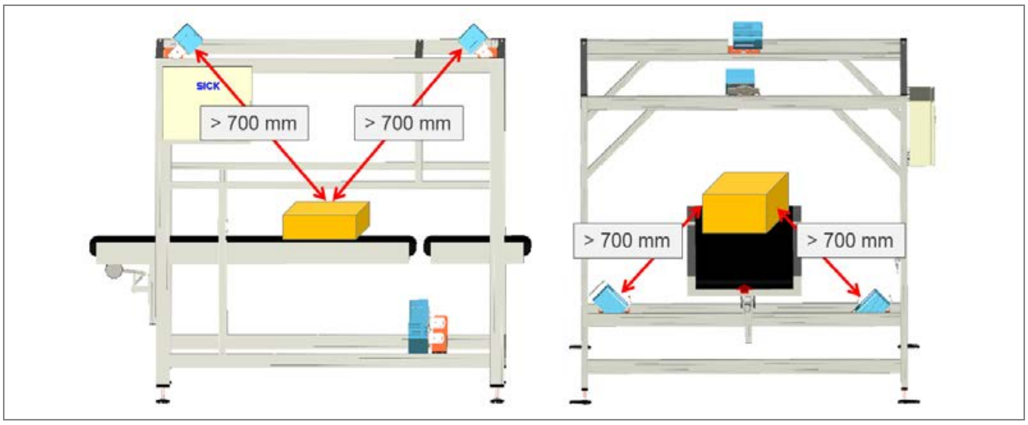


Fig. 17: Object edge - VMD minimum distance

Optimization of the read results

To achieve an **optimal read result**, observe the following:

- The VMD devices must have a clear view of the conveying system.
- The VMD devices must be far enough away from bends, induction lines, start/stop areas, areas with upward and downward slopes, and breaks in the conveying system.
- The conveyor speed must be constant from the trigger start point up until leaving the reading field.
- No side guards are to be mounted in the vicinity of the scan lines.

Data output

The calculated deformation is forwarded at the earliest 2.0 s (or respectively 4000 mm at V_{max}) after the rear edge of the object has left the reading field of the deformation control.

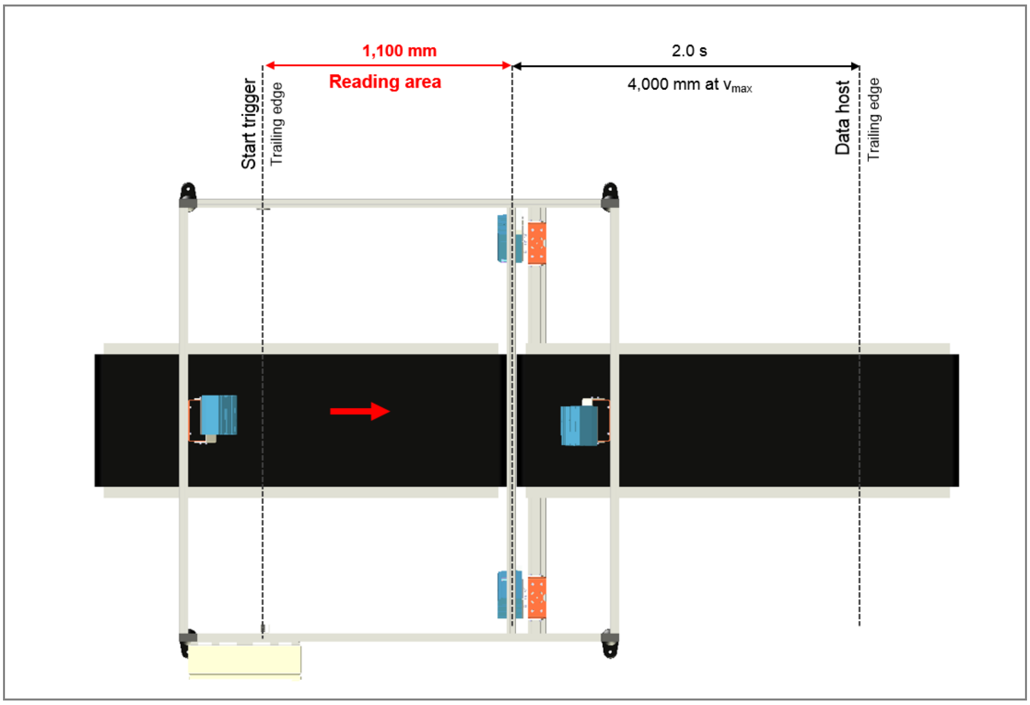


Fig. 18: Distances: trigger - reading field data forwarding

3.4 Status indicators

The accessible LEDs of the measuring system are located on the following devices:

3.4.1 LEDs on the VMD500

The volume measurement device is fully automatic in normal operation and requires no operator intervention. Six LEDs provide a visual indication of the operational status of the device and any occurring faults.

Fig. 19: Status indicators of the VMD

LED	Color	Meaning
Device Ready	green	Initialization and self-test successful. Device is ready.
	red	Fault during initialization or self-test or occurrence of errors during operation.
Result	Off	Not allocated.
Laser on	green	Laser diode on.
Data	green	Flickers when the VMD transmits data via the host interface.
LNK 10 Base-T	green	Ethernet contacted
TX 10 Base-T	green	Flickers when the VMD transmits data to the computer via the Ethernet interface

Tab. 4: Status indicators of the VMD

3.4.2 LEDs on the MSC800

Fig. 20: Status indicators on the MSC800

LED	Color	Meaning
READY	green	ON: Controller is ready for operation OFF: Controller is not ready for operation
SYSTEM READY	green	ON: Complete system consisting of MSC800 and all connected devices is ready for operation OFF: Complete system is not ready for operation
RESULT	green	ON: There is a valid read result OFF: No valid read result
RUN FIELDBUS	green	ON: Fieldbus communication is active OFF: No fieldbus communication
READY FIELDBUS	green	ON: Fieldbus application is ready OFF: Fieldbus application is not ready
OUT	green	ON: Switching output is active OFF: Switching output is deactivated
IN, TRIGGER, INC	green	ON: Switching input is active OFF: Switching input is deactivated
POWER (1/2)	green	ON: Supply voltage is on OFF: No supply voltage
microSD ACT	green	ON: MSC800 reading data from / writing data to microSD card OFF: Deactivated
PROFIBUS STA ERR	 green green	ON: Data interface is ready for communication ON: Bus or communication error
ETHERNET LNK ACT 100	 green green green	ON: Data interface is connected to Ethernet ON: Data transmission ON: Data transmission rate 100 Mbit/s OFF: Data transmission rate 10 Mbit/s
HOST (1/2) AUX (1/2) Tx 232	 green green	ON: Data interface is sending data ON: Interface is operating as an RS-232 interface OFF: Interface is operating as an RS-422/485 interface
CAN 1/2 Rx		ON: Data interface is receiving data

Tab. 5: Status indicators on the MSC800

3.4.3 Photoelectric retro-reflective sensor LEDs

The photoelectric retro-reflective sensor features a yellow LED receive indicator (1) and a green LED function indicator (2).

The yellow LED lights up when the emitted light signal is reflected by the reflector and received correctly. If the light beam is interrupted by an object, the LED must go out. If the LED flashes, the reflector is only being detected in the fringe range. The green LED lights up if the supply voltage has been connected.

Fig. 21: Status indicators on the photoelectric retro-reflective sensor

3.5 Interfaces

Various data interfaces are available on the MSC800 for outputting measurement results to a further system.

Interface	**For component**	**Function**
CAN network	VMS4x0, VMC800	Component monitoring and triggering
Ethernet #1	Customer interface	Transmits the summarized data to a host
Ethernet #2	Switch, auxiliary interface	Available for maintenance, service, and commissioning by a technician
Ethernet #3	Auxiliary interface	Available for maintenance, service, and commissioning by a technician
Digital I/Os	Photoelectric sensor Measuring wheel encoder	Object trigger Measuring wheel encoder
RS-232/RS-422 PROFIBUS DP Ethernet	Host	Transmits the summarized data to a host
Serial connection #2 or Ethernet	SICK Visualization Platform	Sends all analysis and diagnostic information

Tab. 6: Function of data interfaces

The data interfaces can be configured using the SOPAS configuration software.

4 Mounting

NOTE

VMS4x0 as two, three and four head solution

The VMS4x0 Contour Verification is described in these operating instructions with its basic equipment with four measurement heads. Note that other mechanical structures may exist depending on the installation situation of the measurement heads.

VMS4x0 Contour Verification is available as a two or three head system on request.

For deviations from the basic system described here, proceed in accordance with the project-specific documents included in the scope of delivery.

4.1 Preparation for mounting

Getting the frame components ready

- Aluminum profiles for setting up the frame (application-specific as per the order)
- Universal connection kits and mounting brackets 40 x 40 mm for screwing the profiles together.
- Cable channels for mounting on sides of profiles

Providing devices

- Controller cabinet with VMC800, MSC800, power supply module, and Ethernet switch
- 4 VMD500 devices with modular hood, also with laser protective cover if necessary
- DFV60 measuring wheel encoder
- WL-18 photoelectric retro-reflective sensor
- Mounting brackets and device mounting kits

Preparing connecting cables

- 2 CAN cables (purple) for connecting the VMD devices to one another
- 1 CAN Only cable for connecting the VMD devices to one another
- 1 CAN cable with plug connector and open end for connecting to the CAN bus and the voltage supply in the MSC800.
- 1 24 V Only cable for separate connection to the power supply of the MSC800
- 1 Y-distribution for connecting the 24 V Only and the CAN Only cable to the VMD
- 1 terminator
- 2 FSI cables for synchronization of the opposing VMD devices
- 4 Ethernet cables for connecting the VMD devices to the Ethernet switch
- 1 incremental cable (black) with open end for connecting the master sensor to the MSC800 logic unit
- 1 connecting cable for measuring wheel encoder – screened (black with green male connector)
- 1 connecting cable for photoelectric retro-reflective sensor – not screened (black with green male connector)

Getting the accessories ready

Fig. 22: Required tools

The following tools are required for installation:

Tool	**Application area**
Wrench 24	Cable glands/foot
Wrench 20	Cable glands
Wrench 17	Foot
Allen key 6	For mounting the components
Allen key 5	For mounting the components
Allen key 4	For mounting the components
Allen key 3	Replacing the MSC800
Flat blade screwdriver 6.5 *) or Torx screwdriver TX25 *)	Replacing the VMC800
Flat blade screwdriver 4	Electrical installation
Flat blade screwdriver 2.5	Electrical installation, for replacing the VMC800
Diagonal cutter	Electrical installation
Cable stripping knife	Electrical installation
Wire stripper	Electrical installation
Multi-grip pliers	Cable glands

Tab. 7: Required tools

*) Recommendation: Magnetize the screwdriver.

4.2 Mounting the frame

4.2.1 Notes on mounting

The frame that holds the device components is made up of individual aluminum profiles. The number and length of the profiles are customer- and system-specific. More detail can be found in the delivery specification.

The frame consists of the following components:

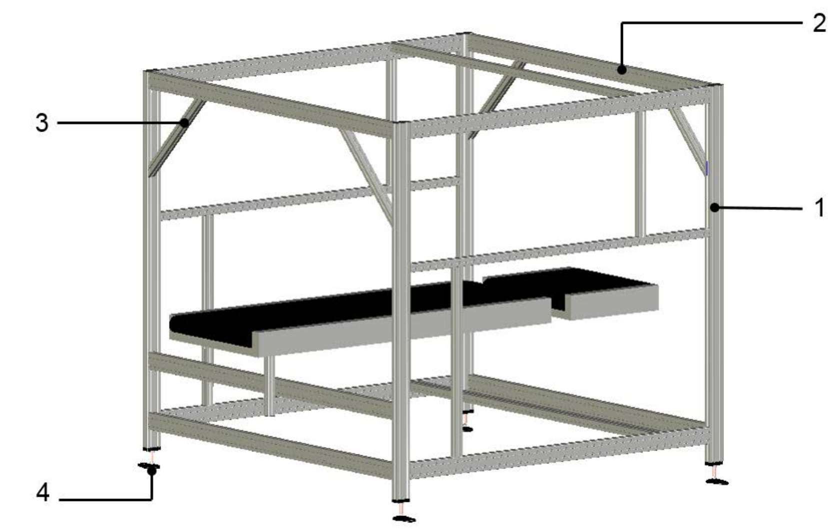


Fig. 23: Frame components

Number	Designation
1	Carrier profiles
2	Transverse profiles for connecting the carrier profiles
3	45° struts for stabilizing the frame
4	Angled feet for leveling and anchoring the frame to the floor

Tab. 8 Frame components

The aluminum profiles are mounted using the universal connector for extruded aluminum profiles that is included with delivery. Universal connectors for extruded aluminum profiles are rectangular friction-fitted aluminum profile connectors that can be adjusted.

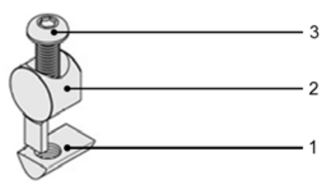


Fig. 24: Universal connector for mounting the profiles

Mounting

- Separate the profiles.
- Slide the sliding nut (1) into the slot.
- Insert the universal connector (2) into the profile of the carrier.
- Insert the screw (3) into the universal connector.
- Use the ball head screwdriver to tighten the universal connector.

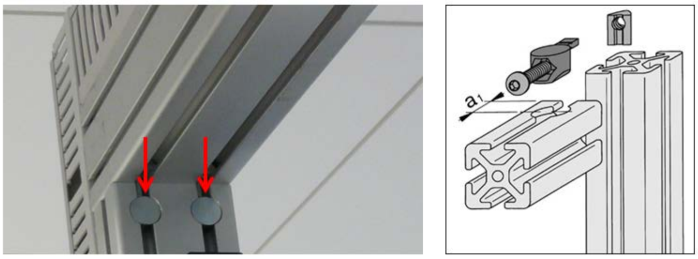


Fig. 25: Working with universal connectors

WARNING

Risk of injury due to components tipping over

If profiles of the mounting frame have been upended, they could possibly tip over during disassembly.

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

4.2.2 Screwing on the 45° struts

The 45° stabilizing struts have been milled out at both ends to receive the frame. Use the M8x25 Allen screws and the M8 sliding nut supplied to screw the struts in place.

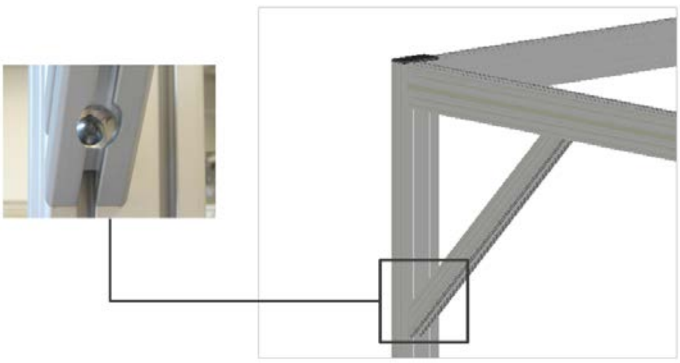


Fig. 26: Screwing on the 45° struts

4.2.3 Connecting the frame parts to each other

➢ Use the mounting brackets 40 x 40 mm to screw together the frame according to the technical drawing.

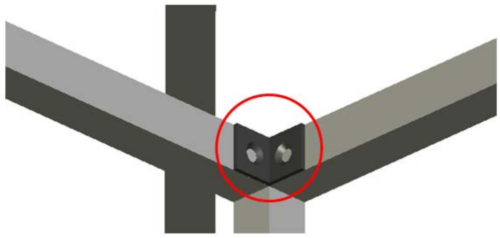


Fig. 27: Connecting the frame parts

4.2.4 Aligning the frame

Align the frame so it is parallel (1) to the conveying system. The distances from the belt (2) must be equidistant, i.e., the same on both sides (or as per the assembly drawing).

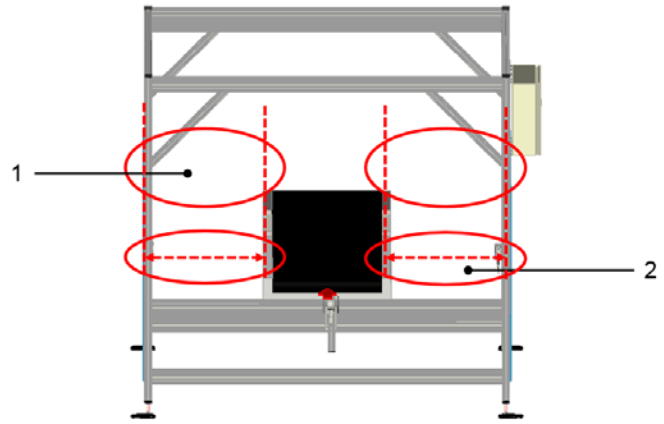


Fig. 28: Aligning the frame

4.2.5 Leveling the frame

You can use the adjustable feet to align the complete frame horizontally, thereby ensuring that the frame is perpendicular.

1. Slightly unscrew the counter nut (1) on the adjustable foot.

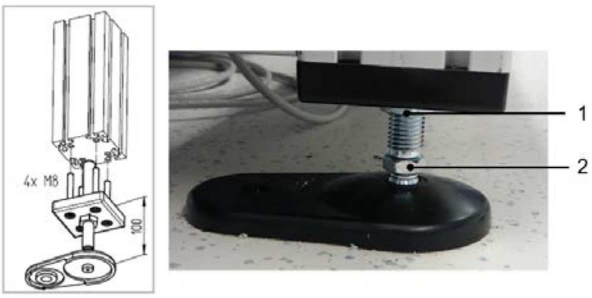


Fig. 29: Using the adjustable foot to level the frame

2. Use the adjusting nuts (2) to raise or lower the carrier profiles until the entire frame is perpendicular to the conveying direction.

4.2.6 Anchoring the frame to the floor

The frame must be screwed to the floor via the angled adjustable feet.

- Use the 10 mm high-load dowels and concrete screws included with delivery.
- Screw down the frame at all angled adjustable feet.

Note If the frame is standing on a grate, use hook bolts instead of the high-load dowels.

4.2.7 Attaching the cable channels

The cable channels supplied must be mounted on the relevant parts of the profiles in accordance with the assembly drawing.

Check how the cables are to be routed at the site. Typically, the cable channels are mounted on the upper transverse profiles and on one of the carrier profiles (the one on which the controller cabinet is to be subsequently mounted).

Cable channels are supplied in two widths according to whether they are to be mounted on the narrow or the wide side of the profile.

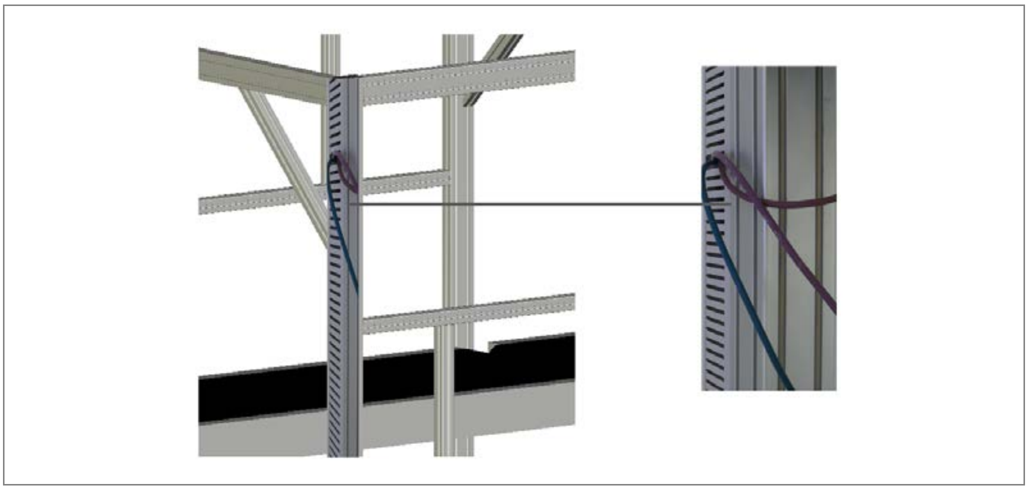


Fig. 30: Attaching the cable channels to the frame

Mounting

1. Insert the ULF M6 x 12 mm screws supplied into the slotted holes of the cable channel so they are approximately 300 mm apart.
2. Slightly screw the M6 slot nuts supplied on the opposite side.
3. Place the cable channel on the relevant profile.
4. Insert the slot nuts in the slot on the profile section.
5. Tighten the ULF screws. This fixes the sliding nuts in the slot.

4.3 Positioning the devices in the coordinate system

All components are mounted on the aluminum profiles on the frame using the mounting bracket according to the technical drawing.

Precise device positioning is achieved using a three-dimensional coordinate system.

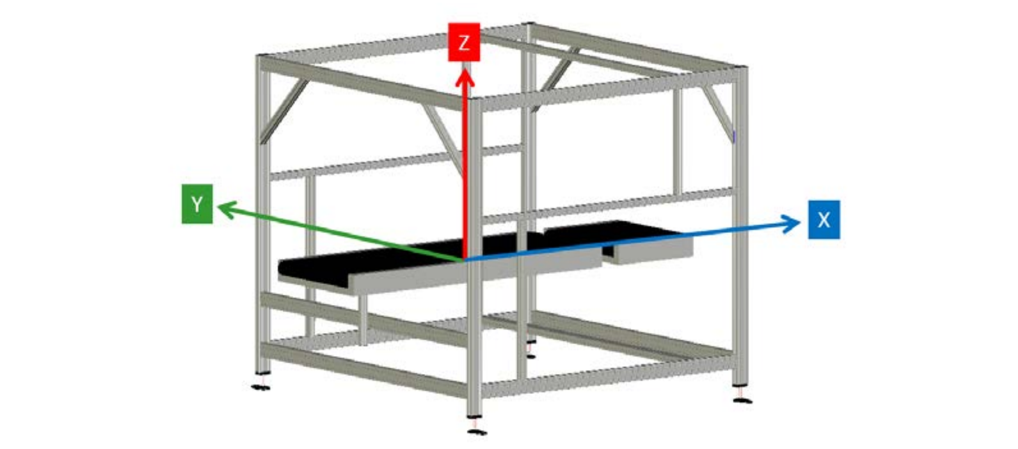


Fig. 31: Positioning the devices in the coordinate system

The following zero points apply to this coordinate system:

- The zero point for the Y coordinate is the right-hand edge of the belt in the conveying direction.
- The zero point for the Z coordinate is the height of the conveyor belt.
- The zero point for the X coordinate is the trigger line.

The rotation of the components is defined via three angles. The angles are determined by the angle table in the technical drawing.

The coordinates and angles of the devices are calibrated with the help of the SOPAS configuration software when the system itself undergoes calibration.

4.4 Mounting volume measurement devices

4.4.1 The mounting bracket

Special mountings are used to mount the volume measurement devices. The mounting brackets consist of a uni-bracket (1), a uni-panel (2) and an adapter panel (3) for holding the VMD.

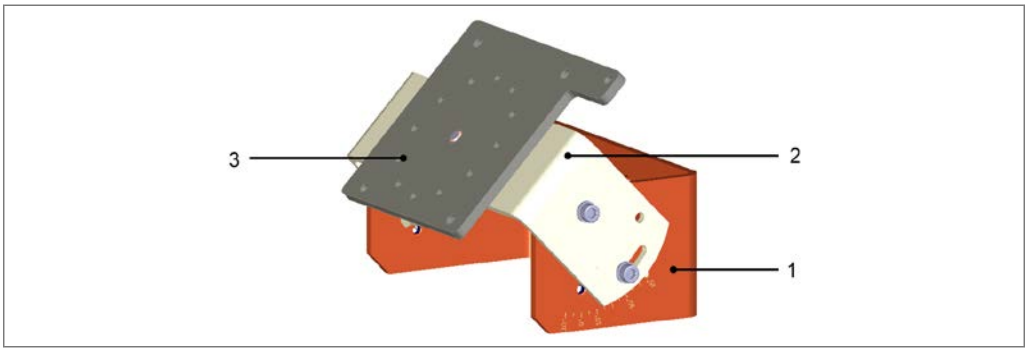


Fig. 32: Mounting bracket for VMD

The mounting bracket can be adjusted in two axles. An adjusting screw with the corresponding angle scale is located on the uni-bracket and on the uni-panel.

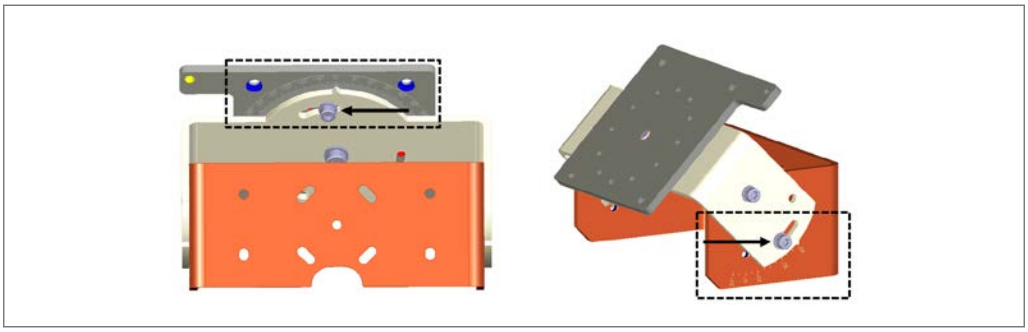


Fig. 33: Alignment options on the VMD mounting bracket

Preparation

➢ Before mounting the VMD, set both angles to 0°. Correct alignment is done after the VMD has been mounted.

4.4.2 Mounting the mounting bracket on the frame

Mount the mounting brackets on the frame at the designated locations. This specifies the X-, Y- and Z- position of the VMD in the coordinate system.

1. Insert the four M6 sliding nuts (1) into the slot on the aluminum profile.

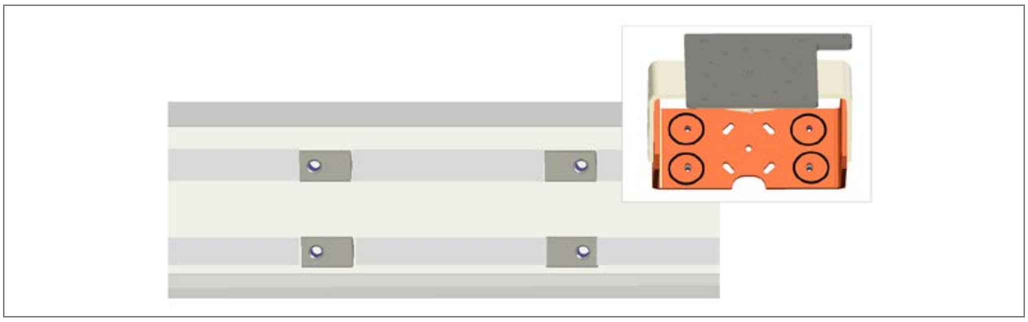


Fig. 34: Mounting of VMD mounting bracket: Setting sliding nuts in aluminum profile

2. Set the mounting bracket with the D6 drill holes on the profile.
3. Screw on the mounting bracket with the four supplied M6 screws.

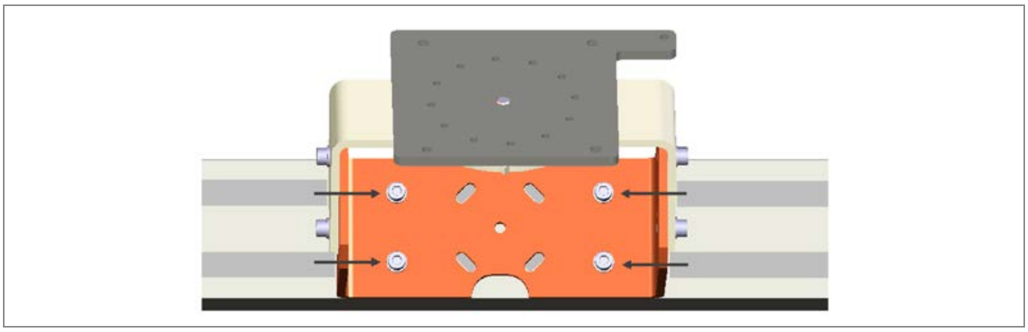


Fig. 35: Mounting of VMD mounting bracket: Screw onto profile

4.4.3 Mounting the VMD on the mounting bracket

The VMD is first mounted to the mounting bracket without the modular hood.

The rear side of the mounting bracket has two dowel pins for mounting the VMD; they are attached asymmetrically.

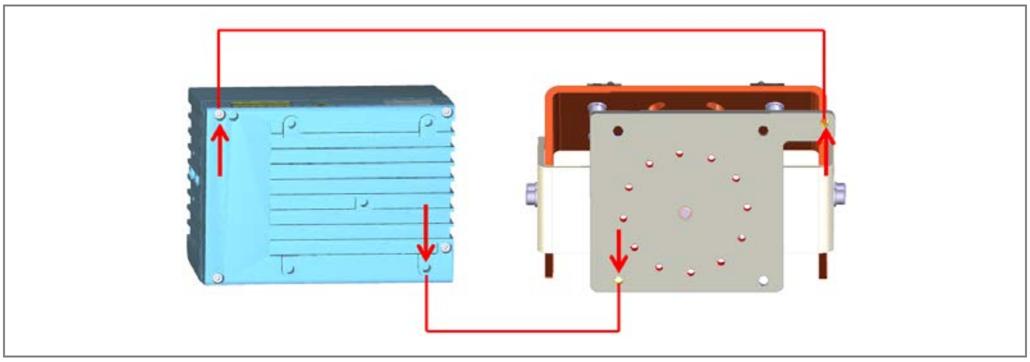


Fig. 36: Mounting the VMD: Dowel pins and locating holes

The dowel pins mean that the VDM can only be mounted in the right orientation. In other words, this coding system prevents them from being incorrectly rotated by 180°.

1. Insert the studs of the mounting bracket into the locating holes of the VDM.
2. Press down the VDM with one hand and screw the VMD to the mounting bracket with three M6 × 12 screws with washers.

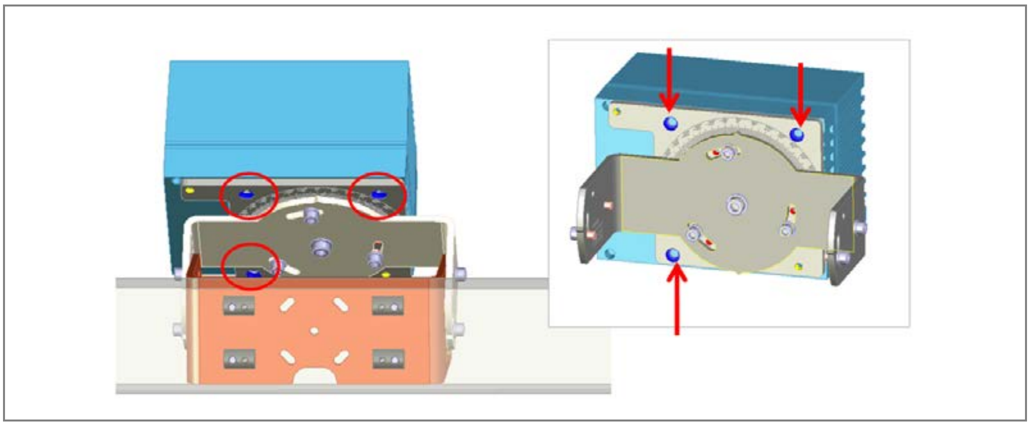


Fig. 37: Mounting of VMD: Screwing on mounting bracket

3. Check that the VMD is securely attached.

4.4.4 Aligning the VMD

Align the mounted VMD devices in accordance with the angle coordinates stored in the angle table of the technical drawing, each with an angle of inclination of 45°.

VMD above the conveying technology

➢ For the VMD mounted above the conveying technology, set the angle of the bracket to 45° and the angle of the panel to 0°.

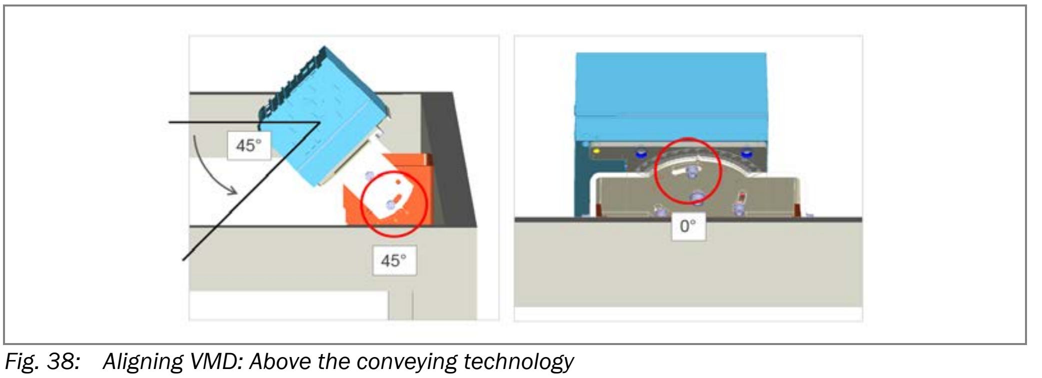


Fig. 38: Aligning VMD: Above the conveying technology

VMD below the conveying technology

➢ For the VMD mounted below the conveying technology, set the angle of the bracket to 0° and the angle of the panel to 45°.

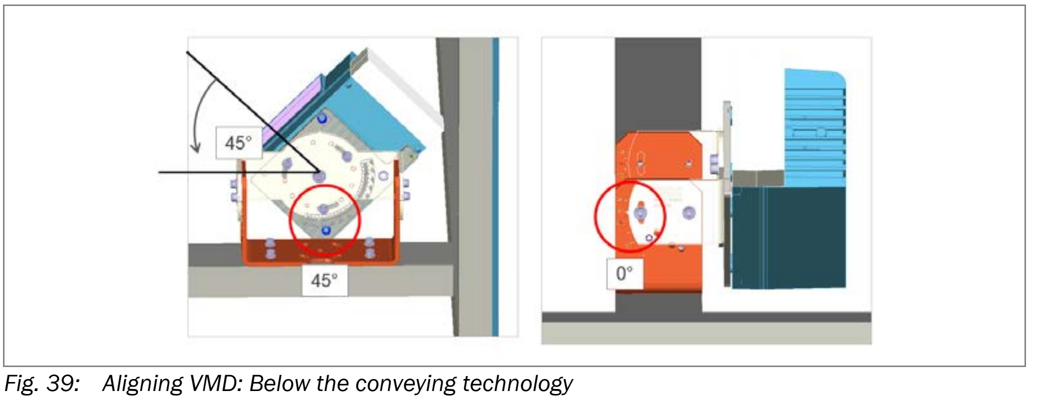


Fig. 39: Aligning VMD: Below the conveying technology

➢ When aligning the VMD in the X-direction (1), make sure that the outgoing laser beam passes by the conveying system at a maximum distance of 5 mm (2). In doing so, you ensure that the maximum receiving area is available on the reading window of the VMD (3) at a belt gap of 40 to 50 mm.

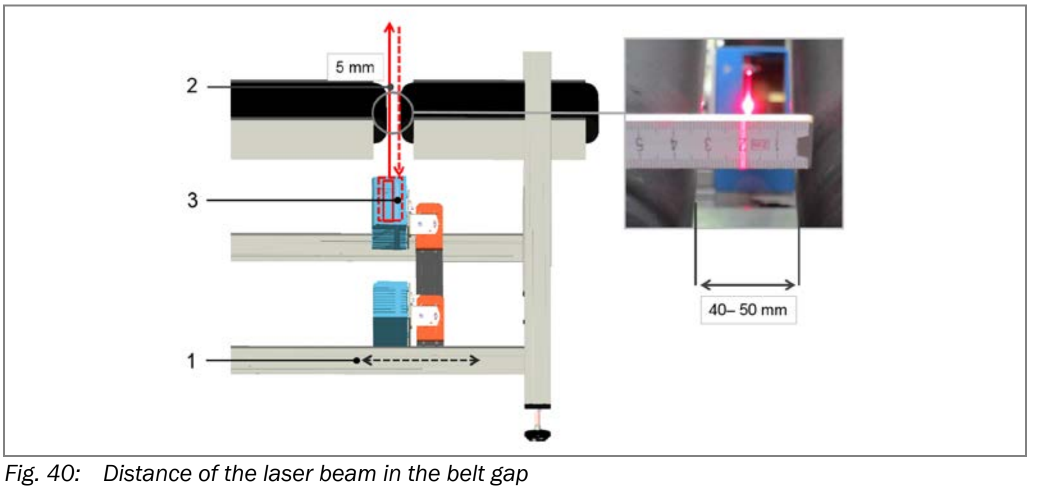


Fig. 40: Distance of the laser beam in the belt gap

4.5 Mounting measuring wheel encoder

The DFV60 measuring wheel encoder can be used to determine the position and speed of objects directly on the belt. Measurement is performed directly on the running surface of the belt (1) using a precise measuring wheel (2) that is mounted on a sprung attachment arm (3). This arm compensates for mechanical errors in different directions on the conveyor belt.

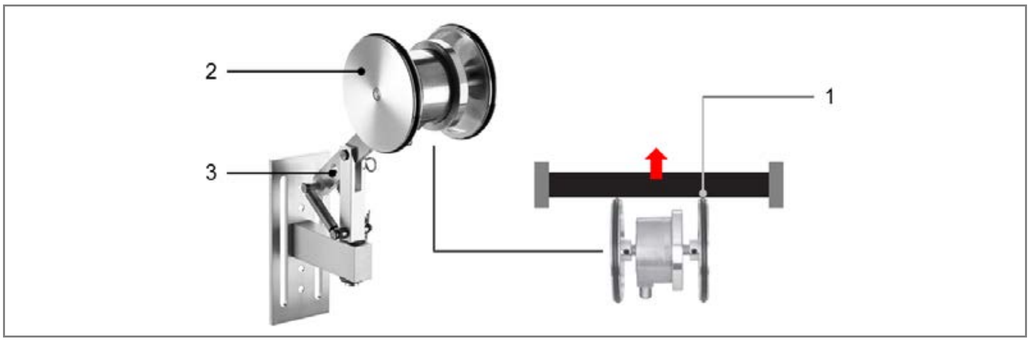


Fig. 41: Mounting the measuring wheel encoder components

Mounting

The DFV60 measuring wheel encoder is attached directly to the belt and does not interfere with the existing structure in any way.

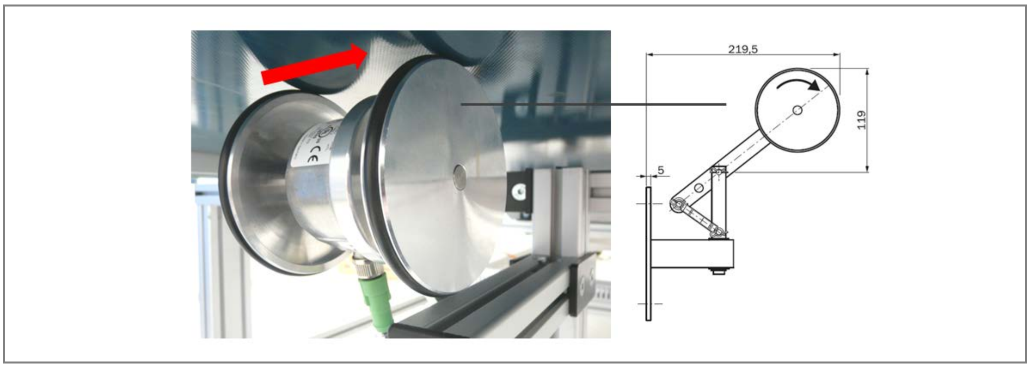


Fig. 42: Attaching the measuring wheel encoder to the belt

Note The encoder must be attached at a point where the level of vibration on the belt is as low as possible.

➢ Therefore, you should mount the measuring wheel encoder close to the pulley or at the end of the belt.

4.6 Mounting the photoelectric retro-reflective sensor and reflector

Mount the photoelectric sensor and reflector on the frame in accordance with the technical drawing. A mounting bracket is included for the mounting of the photoelectric retro-reflective sensor.

Mounting

1. Insert the two M6 sliding nuts into the slot of the support profile on which the photo-electric sensor is mounted.
2. Set the support rail on the profile and screw it on with two M6 screws (see the two arrows).

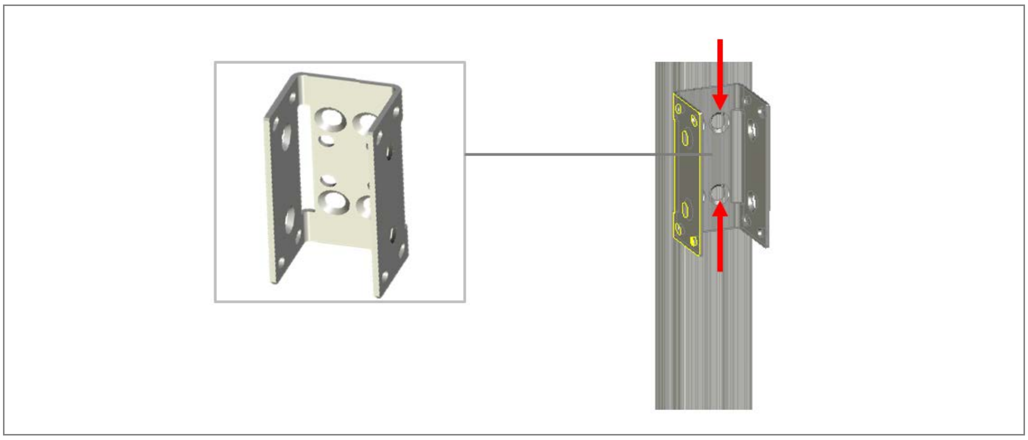


Fig. 43: Mounting the photoelectric sensor: Mounting the support rail

3. Mount the photoelectric retro-reflective sensor on the support rail.

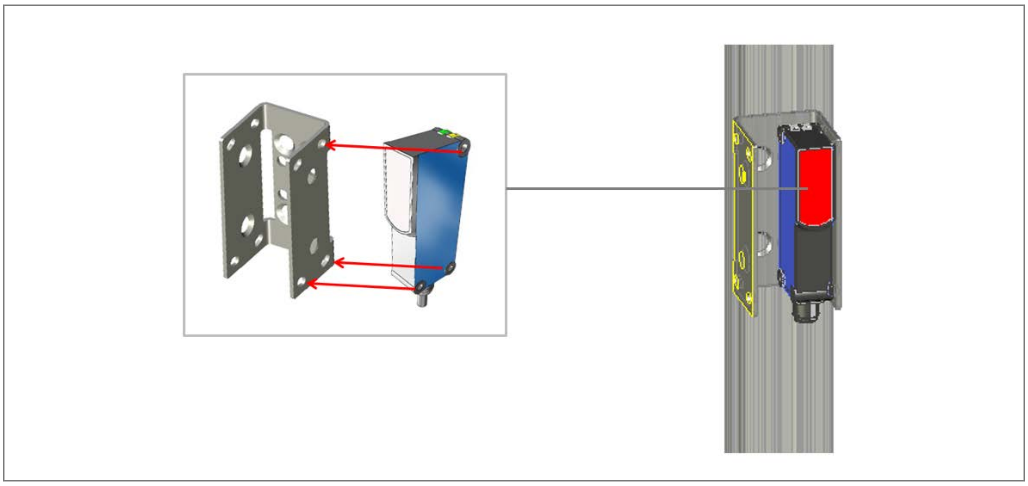


Fig. 44: Mounting photoelectric sensor:Mounting photoelectric sensor on support rail

Mounting the reflector

➢ Mount the reflector on the opposite side of the conveyor belt. Use the supplied adapter plate.

Note The reflector must be positioned in line with the light beam from the photoelectric retro-reflective sensor.

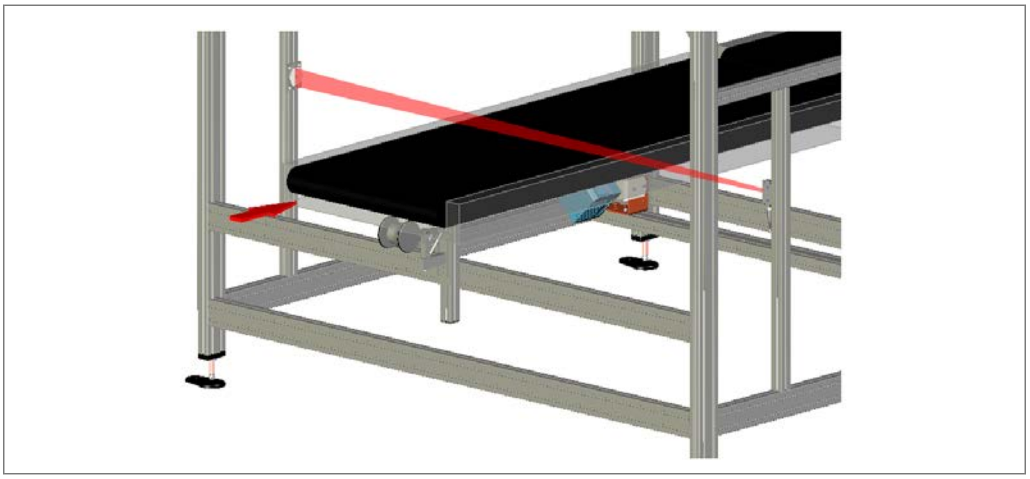


Fig. 45: Photoelectric retro-reflective sensor and reflector

4.7 Mounting the controller cabinet

The controller cabinet contains the VMC800 volume measurement controller, the MSC800 central control unit, the Ethernet switch, and the voltage supply units. It is mounted on the frame.

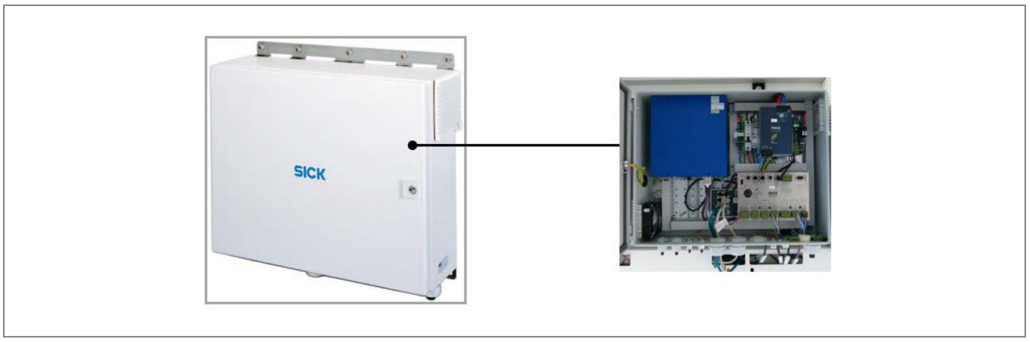


Fig. 46: Mounting the controller cabinet

Note The position selected for the controller cabinet should ensure that cables can be easily routed and that the cabinet is easy to open.

⚠ ***WARNING***

Risk of injury due to falling components

The controller cabinet weighs approx. 20 kg.

➢ Do **not** perform any mounting work alone.

➢ Ask a second person to hold the components during mounting.

➢ Wear safety shoes.

Mounting

➢ Fasten the controller cabinet on two transverse profiles using the attachment rail, as per the technical drawing.

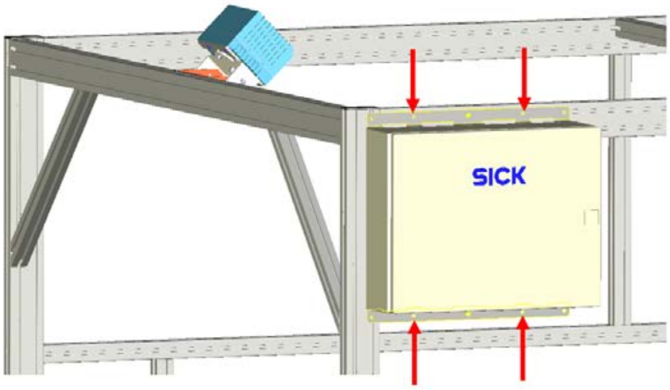


Fig. 47: Mounting the controller cabinet on the side frame with the mounting kit

4.8 Dismantling the measurement system

⚠ ***WARNING***

Risk of injury due to components tipping over

If profiles of the mounting frame have been upended, it is possible they could tip over during disassembly.

➢ Do **not** perform mounting work alone unless it is absolutely safe to do so.

➢ Where applicable, ask a second person to assist you with the component replacement process.

➢ Wear safety shoes.

Dismantling

1. Switch off the supply voltage.
2. Disconnect all connection cables.
3. Remove all devices from the mounting brackets.
4. Dismantle the frame.

Note On final decommissioning, please observe the requirements for environmentally correct disposal in the chapter **7.4 Disposal**.

5 Electrical installation

HAZARD

Risk of injury due to electrical current

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

HAZARD

Disconnect the power to the system

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

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

HAZARD

Risk of injury due to electrical current

The central control unit of the system is connected to the voltage supply (100 V … 264 V AC / 50 Hz … 60 Hz).

➢ Standard safety requirements must be met when working on electrical systems.

➢ The power supply must be disconnected when attaching and detaching electrical connections.

➢ Select and implement wire cross-sections and their correct fuse protection in accordance with the applicable standards.

5.1 Wiring diagram

NOTE

VMS4x0 as two, three and four head solution

The VMS4x0 Contour Verification is described in these operating instructions with its basic equipment with four measurement heads. Note that other mechanical structures may exist depending on the installation situation of the measurement heads.

VMS4x0 Contour Verification is available as a two or three head system on request.

For deviations from the basic system described here, proceed in accordance with the project-specific documents included in the scope of delivery.

Establish the connections in the VMS4x0 Contour Verification in accordance with the following wiring diagram.

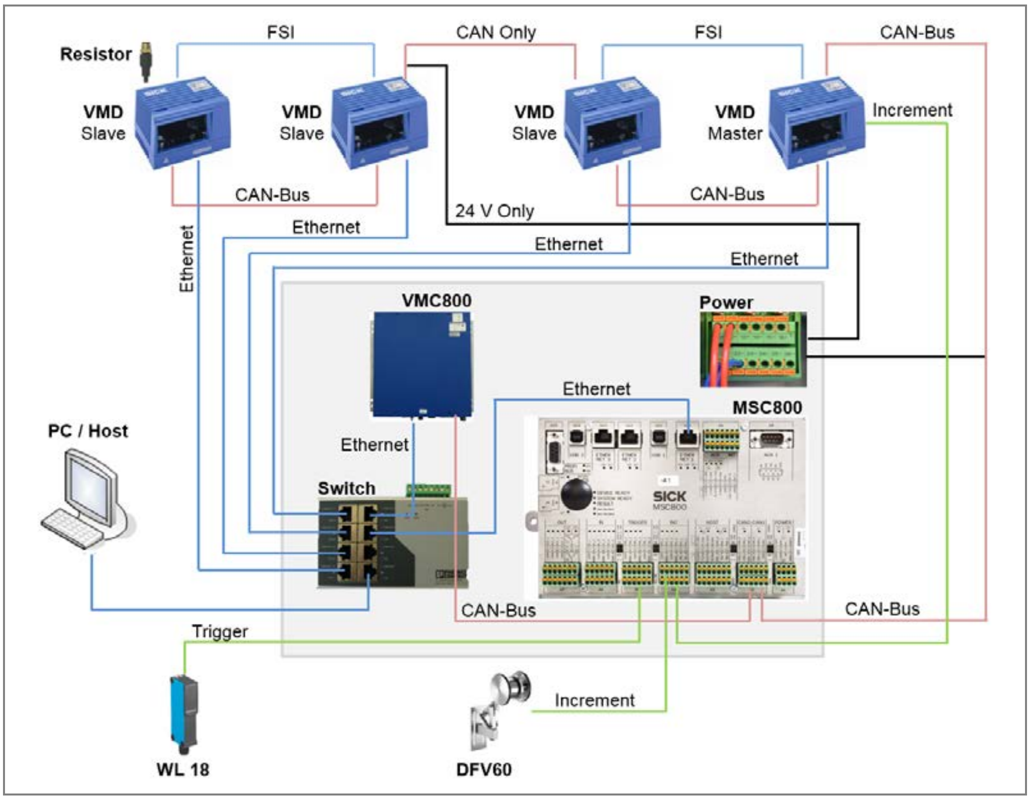


Fig. 48: VMS4x0 Contour Verification wiring diagram

Note Be sure to also observe the VMS4x0 Contour Verification **connection diagrams** contained in the appendix to these operating instructions.

5.2 General notes

5.2.1 Routing the cable to the controller

Be sure to closely observe the following notes during connection to the MSC800:

1. Run the cable to the controller cabinet. Use the cable channels on the mounting frame.
2. Put the rubber sleeve over the cable
3. Route the cable through the sleeve and cable entry of the controller cabinet.

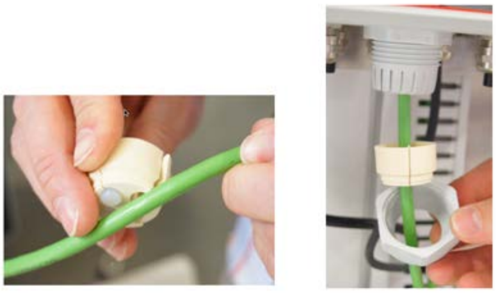


Fig. 49: Guiding cables in the controller cabinet through sleeve and cable entries

4. Tightly screw the cable entry.

5.2.2 Connecting the cable shield

To protect the communication against external interference, some connecting cables have shielding which must be connected to the housing of the MSC800.

Connecting the shielding to the housing

1. Shorten the cable to the required length.
2. Remove approx. 30 cm of the cable sheath, which is the length required for connection.
3. Shorten the shield, leaving 30 mm at the bottom end.
4. Insert the cable through the cable entry screw.
5. Put the shield around the cable gland screw as shown.

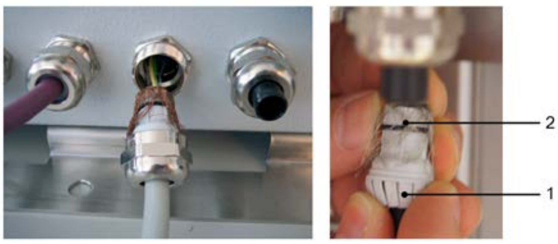


Fig. 50: Connecting the cable shields at the inlet to the controller cabinet

6. Screw in the cable entry screw. Use the size 20 open-end wrench to tighten the screw.

Note ➢ Make sure that the cable is securely attached and cannot be pulled out (strain relief).

5.2.3 Connecting wire ends in the controller terminal block

Connect the wire ends to the terminals blocks of the MSC800 as follows:

1. Remove approx. 10 mm of the insulation from each of the four wires.
2. Twist the wire ends.
3. Do not use ferrules and do not solder the wire ends.
4. Insert the wires in the terminal block as follows: Using a small screwdriver, push the clamping device down.

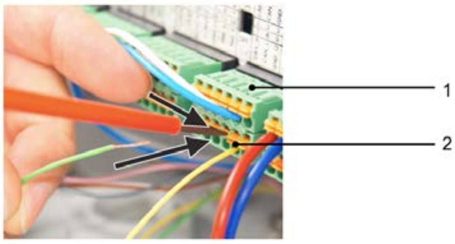


Fig. 51: Inserting wires into the controller terminal block

5. Insert the wire ends. Make sure that no wires are sticking out.
6. Release the clamping device and check that the wires are firmly attached.

Note The wire ends that are not connected must be insulated with a heat-shrinkable sleeve and secured to prevent electrical connections.

5.3 Components in the controller cabinet

The control cabinet of the MSC800 contains the volume measurement controller and an Ethernet switch along with the logic unit and the power supply unit.

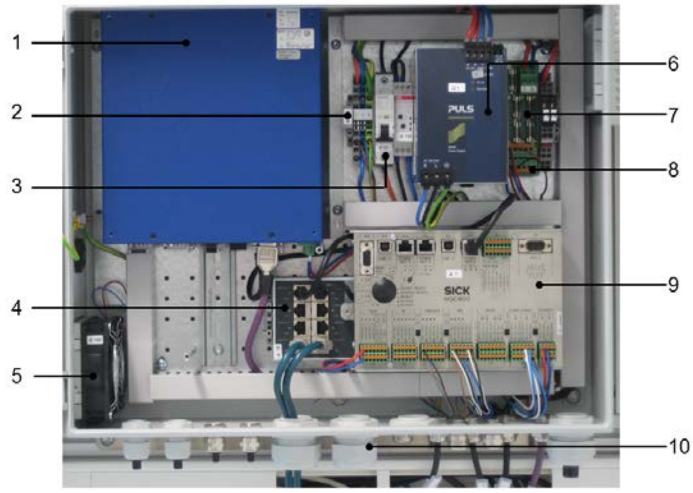


Fig. 52: Components in the MSC800

No.	Component	Explanation
1	VMC800 volume measurement controller	The VMC800 calculates a three-dimensional model of the object from the raw data measured and uses this model to determine the length, width, and height.
2	Voltage supply 110 to 230 V	Terminal strip for connecting the voltage supply
3	Circuit breaker	For switching the entire system on/off. (All system components are connected downstream of the fuse.)
4	Ethernet switch	Connects the VMS4x0 CV and VMC800 and allows you to configure the system via an Ethernet connection.
5	Fan	Air inlet for cooling with fan and filter mat
6	24 V power supply unit	For powering the components
7	Fuses	The fuses are equipped with LEDs that light up when a fuse is defective. Top: Two spare fuses (type: T2A and T4A)
8	24 V terminal	For internal voltage supply • Top: +24 V • Bottom: Ground
9	MSC800 control unit	The MSC800 controls the entire system, analyzes the data, and sends the results to a host.
10	Cable glands	The cable glands are dust-proof and splash-proof. Where necessary, make sure that the cable glands are correctly mounted.

Tab. 9: Components in the MSC800

5.4 Connecting the MSC800 to the voltage supply

HAZARD

Disconnect the power to the system

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

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

Connecting the voltage supply

HAZARD

Risk of injury due to electrical current

The power supply (AC 100 ... 264 V/50 ... 60 Hz) is protected by a 1-pin line safety switch (phase).

If the phase and neutral conductors are swapped when connecting to the -X100 terminal block, there is a risk of electrocution if you touch the respective contacts, even after the input circuit has been switched off with the -F12 circuit breaker.

➢ Carefully connect the power supply to the -X100 terminal block.

➢ Verify that the power supply is connected correctly before the main switch is used to switch on the customer's power.

Note To ensure the cables are securely attached and in compliance with the IP 54 enclosure rating, the coupling nuts for strain relief on the controller cabinet must be tightened.

➢ Check that the cables are firmly attached.

➢ No visible metal surfaces on the wires are permitted.

Connect the voltage supply to the X100 terminal block as follows:

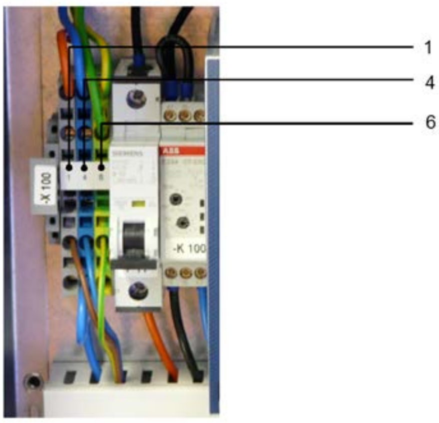


Fig. 53: Connecting the power supply

Terminal	Color of the terminal block	Signal	Function
-X100/1.1	gray	L	Power supply AC 100 ... 264 V/50 ... 60 Hz (phase)
-X100/1.4	blue.	N	Power supply AC 100 ... 264 V/50 ... 60 Hz (neutral conductor)
-X100/1.6	green-yellow	PE	Protective conductor

Tab. 10: -X100 terminal block pin assignment for power supply IN

5.5 Connecting VMD

The VMD devices are connected to one another and to the MSC800 central control unit via the following cables:

- 2 CAN cables (purple) for connecting the VMD devices to one another
- 1 CAN Only cable for connecting the VMD devices to one another
- 1 CAN cable with plug connector and open end for connecting to the CAN bus and the voltage supply in the MSC800.
- 1 24 V Only cable for separate connection to the power supply of the MSC800
- 1 Y-distribution for connecting the 24 V Only and the CAN Only cable to the VMD
- 1 terminator
- 2 FSI cables for synchronization of the opposing VMD devices
- 4 Ethernet cables for connecting the VMD devices to the Ethernet switch
- 1 incremental cable (black) with open end for connecting the master sensor to the MSC800 logic unit

Note

From a technical perspective, both VMD devices are identical. However, a difference must be made between a master VMD and the VMD set up as the slave in terms of cabling and configuration.

The VMD that receives the signal from the measuring wheel encoder is configured as the **master VMD.** The other VMD devices are set up as the slave.

The opposing VMD devices are synchronized with one another. The synchronization master is determined via the SOPAS configuration software.

5.5.1 Mounting the modular hood

All VMD devices feature a removable modular hood, which has all the device parameters permanently stored inside it. This makes replacing the component very easy.

Mount the modular hood on the VMD. The modular hood is delivered with covers attached to the female and male connectors.

Unscrew these covers before you start the cabling work. For the VMD that receives the encoder signal, the cover over the increment female connector must also be unscrewed.

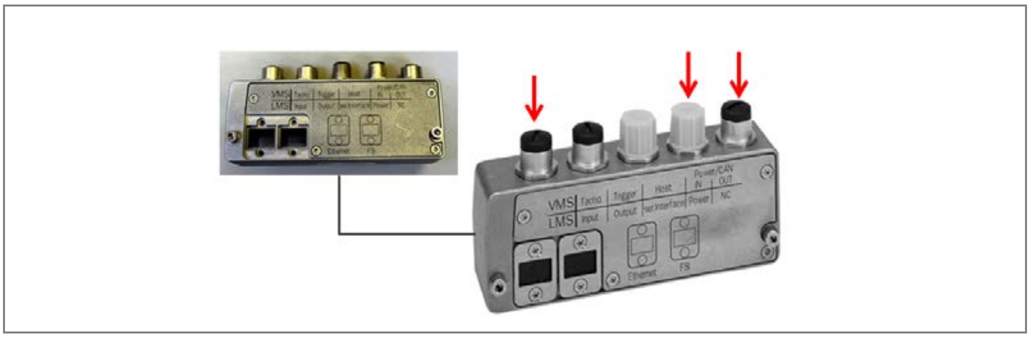


Fig. 54: Modular hood for VMD

1. Place the modular hoods on the device carefully so that the protruding 15-pin plug connectors grip the plug connectors of the device.
2. Fasten the connector hoods to the VMD with both 3 mm Allen screws of the modular hood.

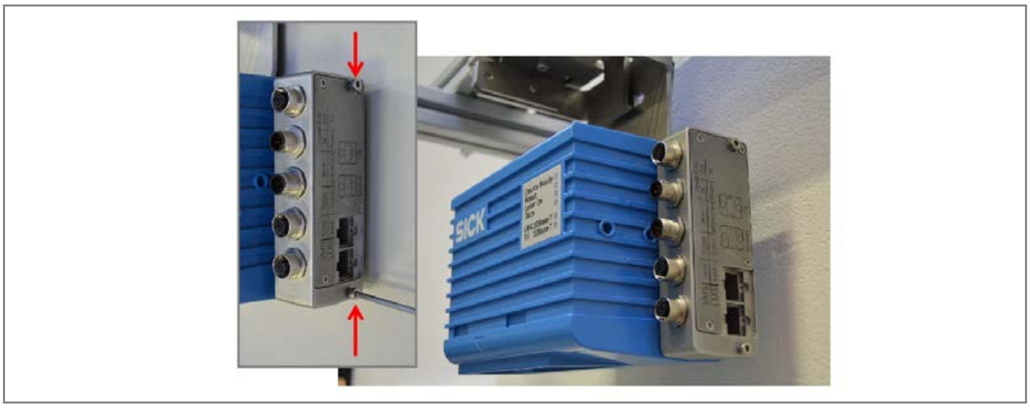


Fig. 55: Screwing modular hood to VMD

Connections

The VMD modular hood features the following male and female connectors:

Fig. 56: Overview of VMD connections

No.	Connection
1	CAN bus OUT
2	CAN bus IN
3	FSI connection
4	Ethernet connection
5	Incremental connection (speedometer)

Tab. 11 Overview of VMD connections (modular hood)

5.5.2 Connecting the VMD devices to each other

The VMD devices are synchronized with one another via the CAN bus. They are connected to each other via two CAN cables and a CAN Only cable.

There is an M12 plug connector at each end of the cables so that the inputs of one VMD can be connected to the outputs of the other. The CAN Only cable is labeled with a blue mark on the plug connector.

The CAN output of a VMD is connected to the CAN input of the next VMD. It does not matter which of the VMD devices is to be subsequently configured as the master and which one as the slave.

A Y-distribution is inserted to the CAN input of the VMD, which is connected to the separate power supply. The VMD which ends the CAN network is terminated with a CAN terminator.

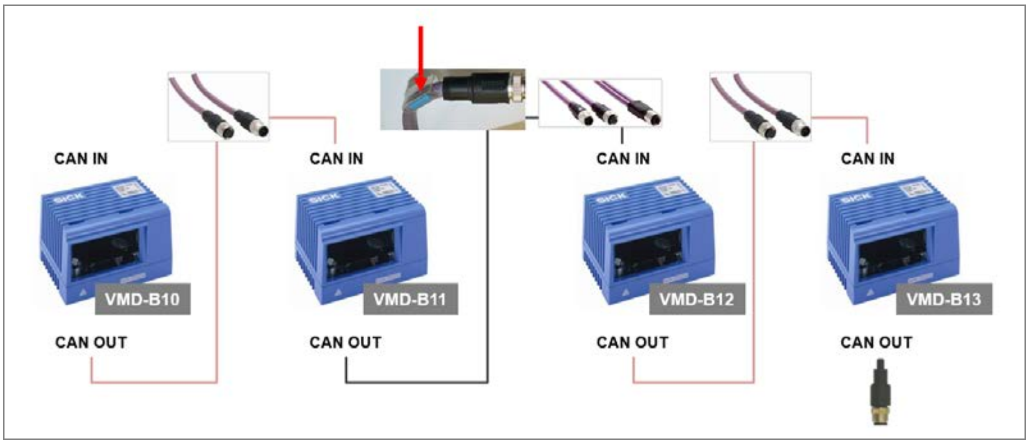


Fig. 57: Connecting the VMD devices

Connecting the Y-distribution

➢ Connect the Y-distribution on the **VMD-B12** to the **CAN-OUT** M12 plug and screw together the plug connector.

Connecting the VMD to the CAN bus

1. Screw the M12 plug connector of the CAN cable on the **VMD-B10** to the **CAN-OUT** M12 female connector.
2. Route the cable in the cable channel to the **VMD-B11** and screw the M12 plug connector to the **CAN-IN** plug.
3. Connect the **VMD-B11** to the **VMD-B12** via the **CAN Only cable**. Use the **CAN-OUT** female connector on the **VMD-B11** and the plug of the Y-connector.
4. Connect the **VMD-B12** to the **VMD-B13** via the CAN cable.

Screwing on terminator

➢ Terminate the CAN network. Screw the the CAN terminator on the **VMD-B13** to the **CAN-OUT** M12 female connector.

5.5.3 Synchronizing VMD

The opposing VMD devices above and below the conveyor belt must also be connected via a RJ45 plug connector with sleeve.

The synchronization master is determined via the SOPAS configuration software.

Fig. 58: Connecting VMD via FSI cable

5.5.4 Connecting VMD to CAN bus and power supply of the MSC800

The **VMD-B10** and **VMD-B11** are connected to the power supply of the MSC800 via the CAN bus. The connection is established via the purple CAN cable with open end.

The **VMD-B12** and **VMD-B13** are connected to the power supply via a separate 24 V Only cable. One end of the cable has an M12 plug connector and other is open. The cable is labeled with a **red mark** on the plug connector.

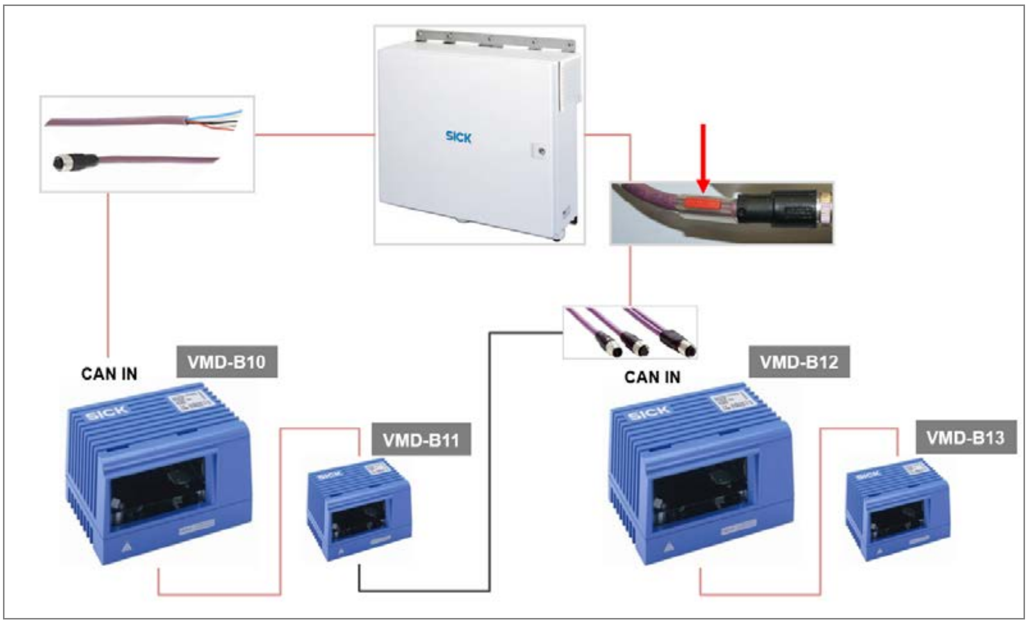


Fig. 59: Connecting VMD to CAN bus and power supply of the MSC800

Connecting CAN cable on the VMD-B10

1. Screw the M12 plug connector of the CAN cable on the **VMD-B10** onto the **CAN-IN** plug.
2. Route the open end of the cable to the controller and onwards through the cable gland and into the control cabinet.

Inserting the CAN cable into the CAN bus of the MSC800

➢ Insert the free wire ends into the **X2 (CAN1)** terminal block.

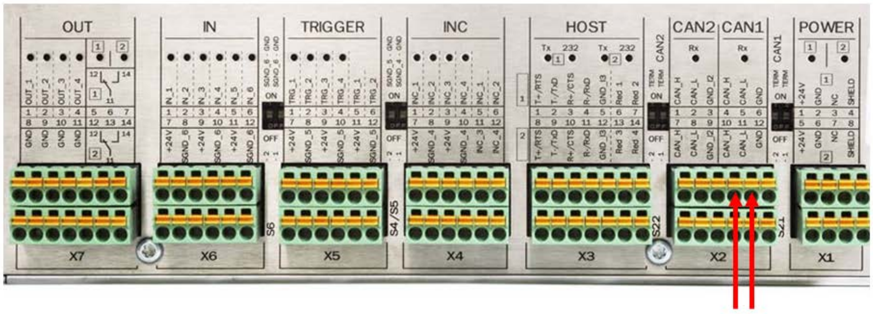


Fig. 60: Connecting CAN cable to CAN bus of the MSC800

Wire color	Terminal block	Connection
White	X2 (CAN1)	4 CAN_H
blue.	X2 (CAN1)	5 CAN_L

Tab. 12: Connecting CAN cable to CAN bus of the MSC800

Connecting CAN cable to power supply of the MSC800

➢ Connect the wire ends in the fuse block of the controller as follows.

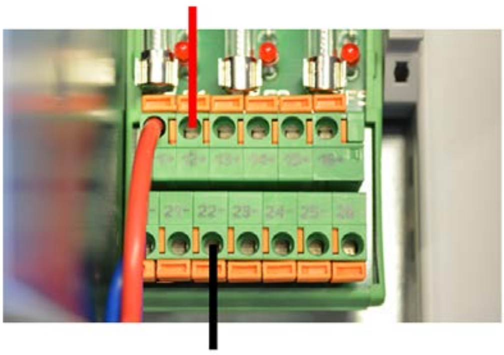


Fig. 61: Connecting CAN cable to power supply of the MSC800

Wire color	Area on fuse block	Connection
Red	F1_6	13 +
black.	F1_6	23 -

Tab. 13: Connecting CAN cable to power supply of the MSC800

Connecting 24 V Only cable to the VMD-B12

1. Screw the M12 plug connector of the 24 V Only cable on the **VMD-B12** onto the free connection of the Y-connector.
2. Route the 24 V Only cable to the controller and then through the cable entry and into the controller cabinet.

Inserting 24 V Only cable into the power supply of the MSC800

➢ Connect the free wire ends in the fuse block as follows:

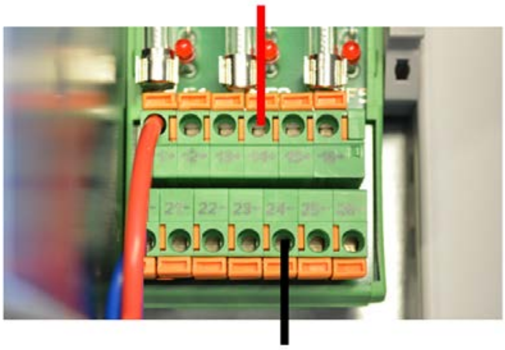


Fig. 62: Connecting 24 V Only cable to the power supply of the MSC800

Wire color	Area on fuse block	Connection
Red	F1_6	14 +
black.	F1_6	24 –

Tab. 14: Connecting 24 V Only cable to the power supply of the MSC800

5.5.5 Connecting the VMD to the MSC800 via Ethernet cable

All VMD devices of the VMS4x0 Contour Verification are connected to the Ethernet switch in the controller cabinet via an Ethernet cable.

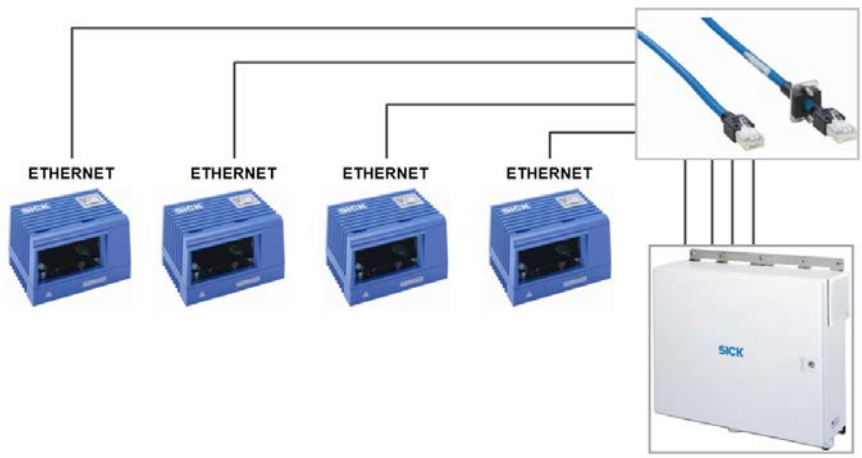


Fig. 63: Connecting VMS4x0 CV to MSC800 using Ethernet

Inserting Ethernet cable to the VMD

1. Connect the Ethernet cable with sleeve into the Ethernet female connector of the respective modular hood and screw together the plug connector.

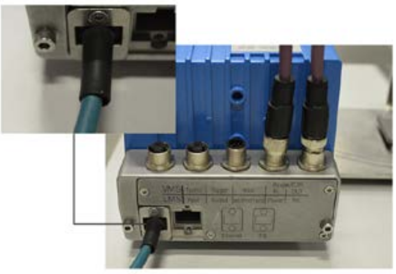


Fig. 64: Connecting Ethernet cable with sleeve to the VMD

2. Route the Ethernet cable from the VMD to the controller and then through the cable entry and into the controller cabinet. Tightly screw the cable entry.

Connecting Ethernet cables to the MSC800

➢ Connect the Ethernet cables to the Ethernet switch of the MSC800 via ports **X1**, **X2**, **X3** and **X4**.

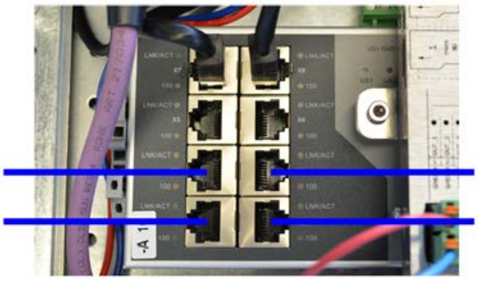


Fig. 65: Connecting Ethernet cables of the VMD to the MSC800

5.5.6 Connecting the master VMD to the MSC800 via incremental cable

The incremental signal provided by the measuring wheel encoder is forwarded to the master VMD by the controller. It is forwarded via a connecting cable included with delivery. There is an M12 plug connector at one end of it. The other end is open **with** a shield.

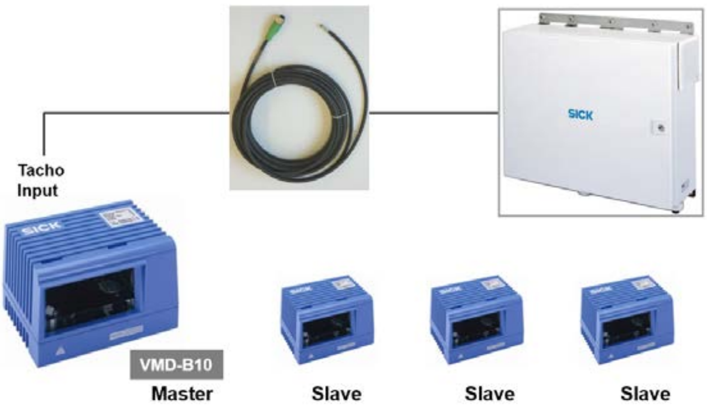


Fig. 66: Master VMD - MSC800 incremental cable

Note

Do not get this cable mixed up with the connecting cable for the measuring wheel encoder. The cable for the measuring wheel encoder has an M12 female connector while the cable for the incremental signal has an M12 male connector.

1. Screw the M12 male connector of the incremental cable on the modular hood of the **master VMD** onto the **speedometer input** female connector.
2. Route the open end of the incremental cable to the controller and then through the cable entry and into the controller cabinet.
3. Put the shield around the cable gland screw of the controller cabinet.

Inserting the incremental encoder into the MSC800

Insert the free wire ends into the **X4 (INC)** terminal block.

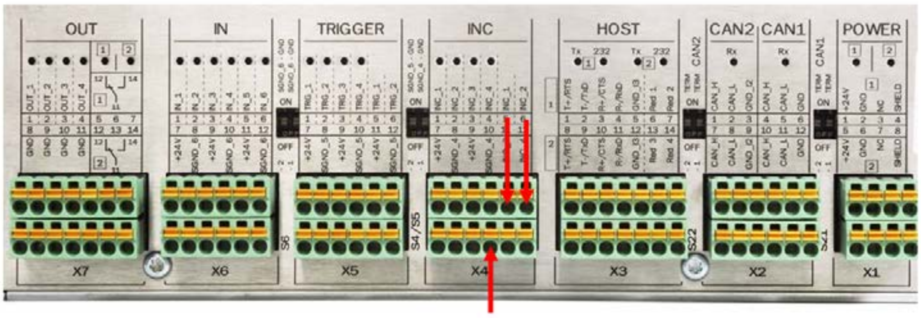


Fig. 67: Inserting the incremental encoder into the MSC800

Wire color	Terminal block	Connection
White	X4 (INC)	5 INC_1
black.	X4 (INC)	6 INC_2
blue.	X4 (INC)	10 SGND_4
Brown	Not connected*	

Tab. 15: Inserting the incremental encoder into the MSC800

* The brown wire end that remains unconnected must be insulated with a heat-shrinkable sleeve and secured to prevent electrical connections.

5.6 Connecting the measuring wheel encoder

The DFV60 measuring wheel encoder is connected to the MSC800 via a connecting cable that is included with delivery. There is an M12 female connector (1) at one end of this. The other end is open **with** a shield (2).

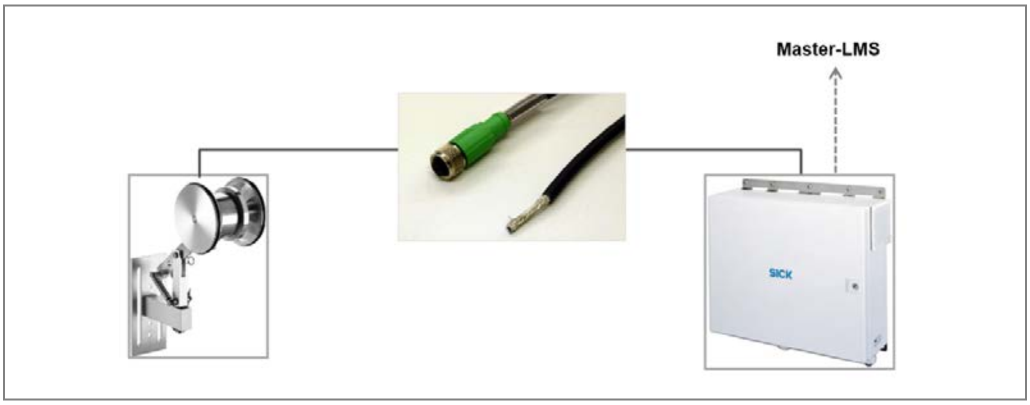


Fig. 68: Measuring wheel encoder - MSC800 connecting cable

Note Be careful not to mix up this cable with the connecting cable for the photoelectric retro-reflective sensor. They look the same. However, the open end has no shield.

1. Screw the M12 connector onto the male connector on the measuring wheel encoder.
2. Route the open end of the cable to the controller and onwards through the cable gland and into the control cabinet.
3. Put the shield around the cable gland screw of the control cabinet.
4. Screw in the cable entry screw.

Connecting Ethernet cable to the MSC800

Insert two of the free wire ends into the **X4 (INC)** terminal block as follows.

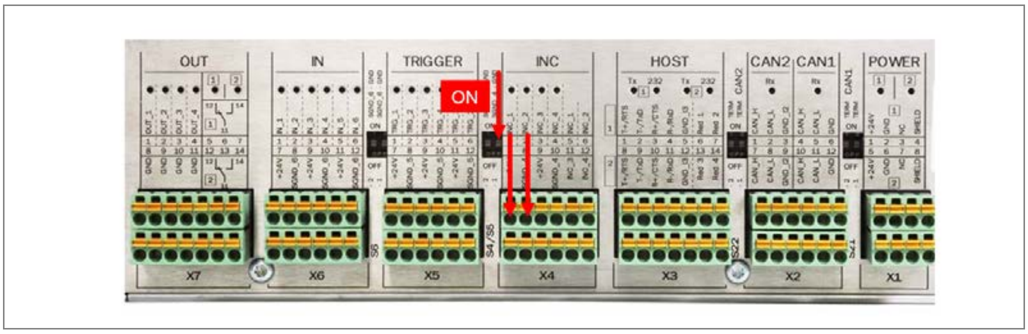


Fig. 69: Inserting measuring wheel encoder connecting cable into MSC800

Wire color	Terminal block	Connection
White	X4 - INC	1 INC_1
Pink	X4 - INC	2 INC_2

Tab. 16: Inserting measuring wheel encoder connecting cable into MSC800

Switching on the signal ground

Activate the signal ground for the measuring wheel encoder.

➢ Using a small screwdriver, push the **SGND 4 GND** switch **upwards**.

5.7 Connecting the photoelectric retro-reflective sensor

The photoelectric retro-reflective sensor is connected to the controller via a connecting cable included with delivery. There is an M12 plug connector at one end of it. The other end is open **without** a shield.

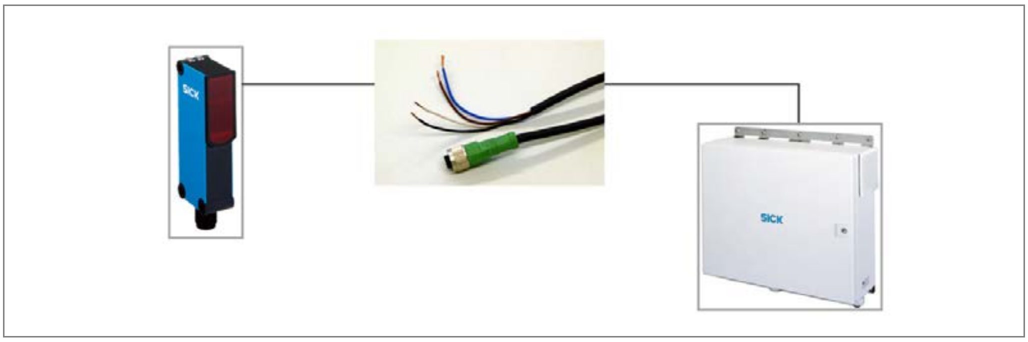


Fig. 70: Photoelectric retro-reflective sensor - MSC800 connecting cable

1. Screw the M12 plug connector into the male connector on the photoelectric retro-reflective sensor.
2. Route the open end of the cable to the controller and onwards through the cable gland and into the control cabinet.

Connecting the photoelectric sensor to the controller

Insert the two free wire ends into the **X5 (TRIGGER)** terminal block as follows:

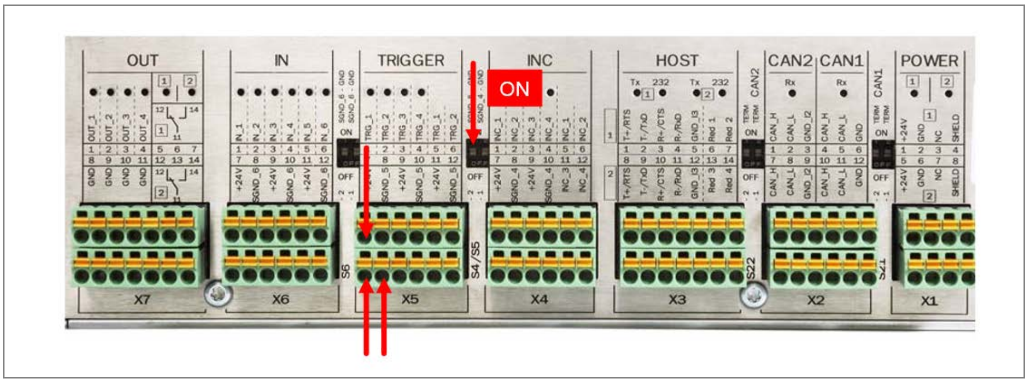


Fig. 71: Inserting photoelectric retro-reflective sensor connecting cable into MSC800

Wire color	Terminal block	Connection
black.	TRIGGER	1 TRG_1
Brown	TRIGGER	7 24 V
blue.	TRIGGER	8 SGND_5
White	Not connected*	

Tab. 17: Inserting photoelectric retro-reflective sensor connecting cable into MSC800

Switching on the signal ground

Switch on the signal ground for the trigger signal.

➢ Using a small screwdriver, push the **SGND 5 GND** switch **upward**.

5.8 Connecting the MSC800 controller

On delivery, the MSC800 central control unit is already connected to the Ethernet switch.

On the controller side, the connection is established via the **ETHERNET 1 X10** female Ethernet connector. At the Ethernet switch, the cable is connected via port **X8**.

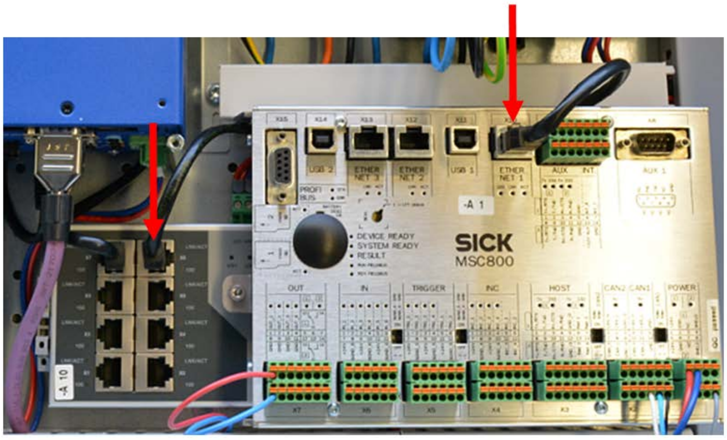


Fig. 72: MSC800 - Ethernet switch pre-installed connection

5.9 Connecting the VMC800 volume measurement controller

The VMC800 volume measurement controller inside the controller cabinet is connected to the Ethernet switch and CAN bus of the MSC800. The equipment is delivered with both of these connections pre-installed.

5.9.1 Connecting the VMC800 to the Ethernet switch

The Ethernet connection between the VMC800 and the Ethernet switch is established via port **X7**.

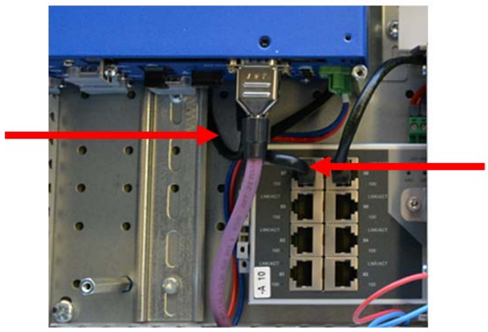


Fig. 73: VMC800 – Ethernet switch pre-installed connection

5.9.2 Connecting the VMC800 to the CAN bus

The VMC800 is connected to the CAN bus via the integrated connecting cable.

Fig. 74: Pre-mounted CAN connection between VMC800 and MSC800

Pre-installed CAN cable connection (VMC800) to the controller

The free wire ends are connected to the **CAN 1** and **POWER** terminal blocks as follows:

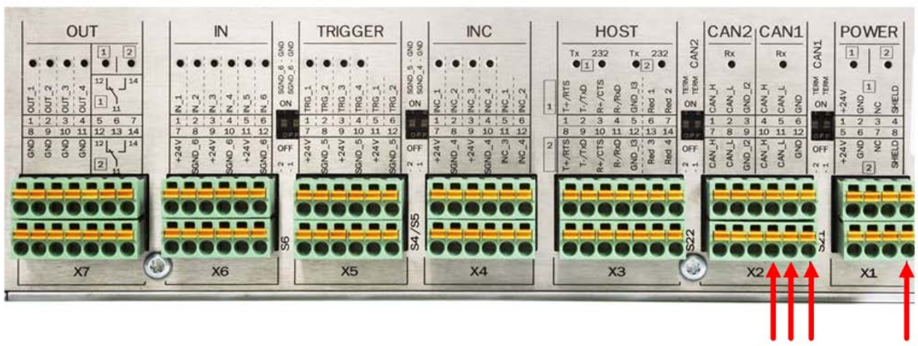


Fig. 75: Pre-installed CAN cable connection between VMC800 and MSC800

Wire color	Terminal block	Connection
White	X2 (CAN1)	10 CAN_H
blue.	X2 (CAN1)	11 CAN_L
black.	X2 (CAN1)	12 GND
Gray	X1 (POWER)	SHIELD*

Tab. 18: Pre-installed CAN cable connection between VMC800 and MSC800

* The CAN cable is not shielded via the control cabinet housing but by the connection in the **POWER** terminal block.

6 Commissioning

WARNING

Do not commission without testing by qualified safety personnel

Before you operate the VMS4x0 Contour Verification measurement system for the first time, you must have it checked and approved by qualified safety personnel. Observe the notes provided in Chapter **2 Safety**.

6.1 Switching on the system

Connect the power supply to the devices. All system components automatically start up.

Internal check for operational readiness

Self-diagnosis is performed to check the operational readiness of the devices. During the power-up cycle, the status indicators show the device status.

Operational readiness after 60 s

The system is ready for operation after approx. 60 seconds.

Putting line into operation

The line is put into operation via the higher-level control.

6.2 Checking the operational readiness of the devices

If all the devices have been connected correctly, a check can be performed following power-up to see whether the devices are functioning correctly.

Checking the operational readiness of the MSC800

If the controller is ready for operation after powering up, the **DEVICE READY** LED lights up.

Fig. 76: Checking the operational readiness of the MSC800

Checking the operational readiness of the VMC800

Following power-up, the Power LED lights up on the VMC800 volume measurement controller.

Fig. 77: Checking the operational readiness of the VMC800

Checking the operational readiness of the Ethernet switch

Each port on the Ethernet switch has two LEDs. LED **100** (2) at the bottom lights up orange when the port is operating at a transmission rate of 100 Mbit/s. If the transmission rate is lower than this, the LED remains off.

LED **LNK/ACT** (1) at the top lights up green when the port recognizes the connected device and data is being sent or received.

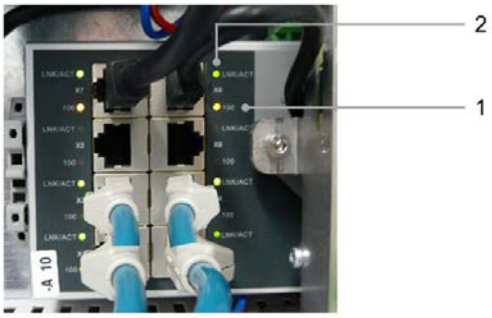


Fig. 78: Checking the operational readiness of the Ethernet switch

Checking the operational readiness of the VMD devices

The green **Device Ready** LEDs on the VMD devices indicate that the scanners are running in measuring mode without any errors.

Fig. 79: Checking the operational readiness of the VMD

Checking the operational readiness of the photoelectric retro-reflective sensor

If the reflector and photoelectric sensor have been correctly aligned with one another and the sensing range is sufficient, the yellow LED receive indicator lights up.

Fig. 80: Checking the operational readiness of the photoelectric retro-reflective sensor

If the yellow LED receive indicator does not light up, you must readjust the photoelectric sensor and reflector or increase the sensing range.

➢ Position the reflector in line with the light beam from the photoelectric sensor and align the light spot with the reflector.

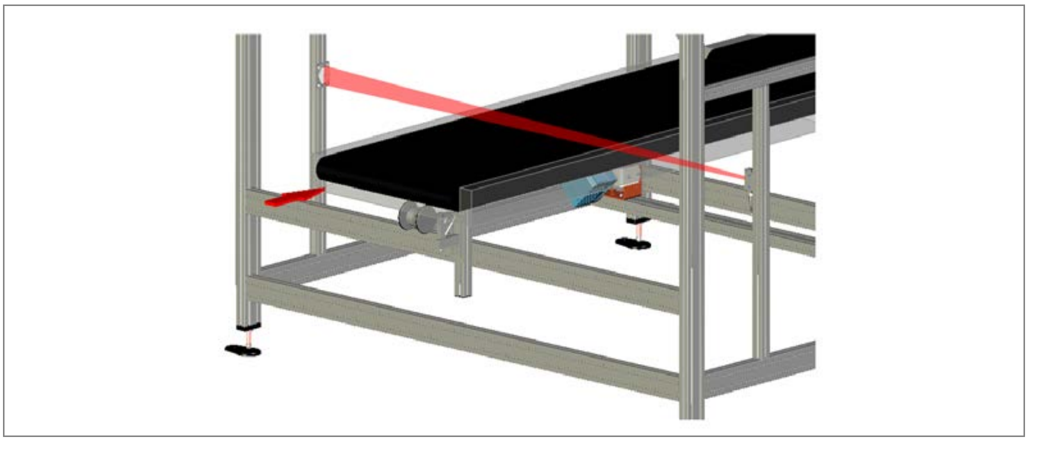


Fig. 81: Aligning the reflector and photoelectric sensor

Use the potentiometer (rotary knob) on the photoelectric sensor to set the sensing range.

➢ Turn the potentiometer clockwise until the yellow receive indicator lights up. This indicates that the reflector is reliably detected.

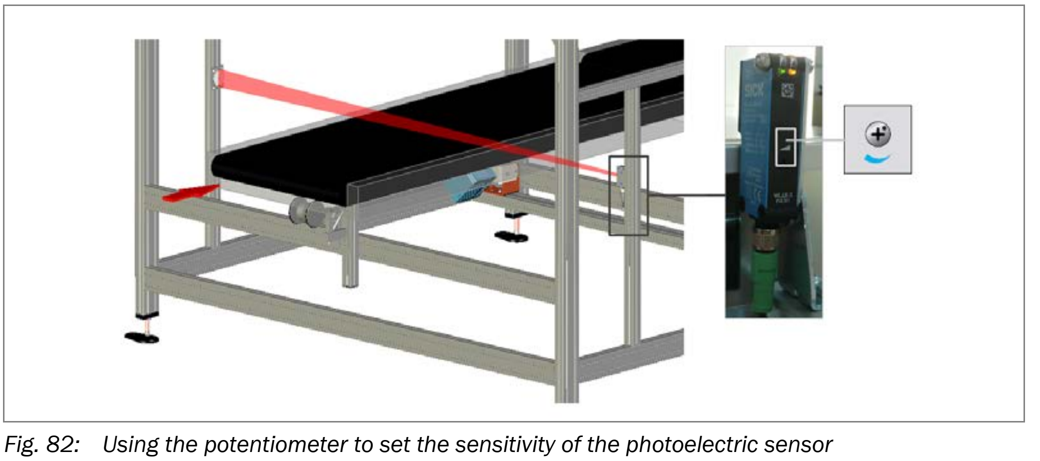


Fig. 82: Using the potentiometer to set the sensitivity of the photoelectric sensor

Note If the yellow LED flashes, the reflector is only being detected in the fringe range.

Checking whether objects are detected

➢ Move an object into the light beam. The LED receive indicator should go out.

➢ If it remains lit or flashes, you must use the rotary knob to reduce the sensitivity until it goes out.

Once the object is removed, the LED should light up again.

➢ If this does not happen, adjust the sensitivity until the switching threshold has been set correctly.

You can also tell whether the device is functioning properly by looking at the controller. If the path to the reflector is clear, the LED for the **1 TRG_1** connection on the **TRIGGER** block should light up. The LED goes out if an object breaks the light beam and activates the trigger.

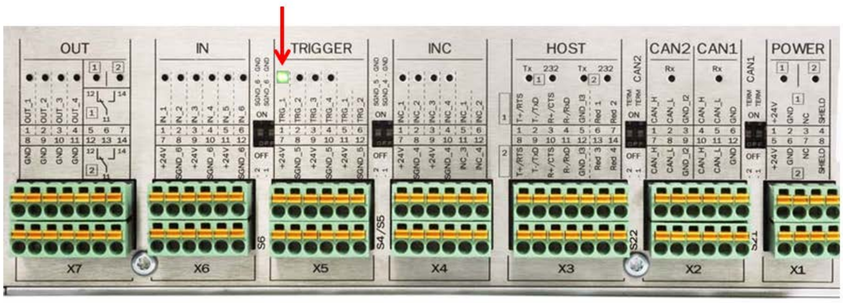


Fig. 83: Checking the operational readiness of the photoelectric sensor by looking at the LED on the MSC800

Checking the operational readiness of the measuring wheel encoder

Check that the measuring wheel encoder is functioning correctly.

➢ Turn the measuring wheel of the encoder by hand – if possible – and watch the **INC_1** and **INC_2** LEDs on the **INC** terminal block.

- The LEDs should be flashing.

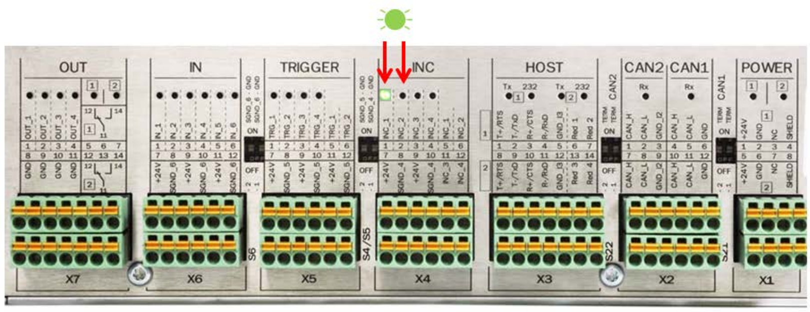


Fig. 84: Checking the operational readiness of the encoder by looking at the LEDs on the MSC800

Note

➢ Alternatively, you can also start the conveyor belt.

➢ Make sure that there is good contact between the measuring wheel and the conveyor belt.

6.3 Configuration (parameterization) using SOPAS

The measurement system is adjusted by configuring the measuring conditions on site. This enables measurement, analysis, and output properties to be configured as required.

The SOPAS configuration software (included) allows interactive configuration. You can use the software to configure and test the properties, analysis behavior, and output properties of the system as required.

In this chapter, we describe a standard configuration, which ensures proper operation of the measurement system.

Installing the SOPAS configuration software

Installation instructions are also available in the booklet included with the CD-ROM sleeve. Install SOPAS on the configuration computer.

1. Start the configuration PC and insert the installation CD.
2. If installation does not start automatically, launch the **setup.exe** file on the CD-ROM.
3. Follow the operating instructions to complete the installation.

Establishing an Ethernet connection

1. Connect the configuration computer to the controller.
2. To do this, use one of the free interfaces on the Ethernet switch (**X4**, **X5**, **X6**).

IP addresses

Recommendations for assigning CAN and IP addresses:

	CAN	**TCP/IP**
MSC800	32	192.168.0.32
VMC800	9	192.168.0.100
VMD500 Master	10	192.168.0.10
VMD500 slave	11	192.168.0.11
VMD500 slave	12	192.168.0.12
VMD500 slave	13	192.168.0.13

Tab. 19: IP addresses of device components

Note Upon delivery, the default IP address for both the VMD and the MSC800 is 192.168.0.1. The addresses of these components must be adjusted during the configuration process.

Upon delivery, the IP address of the VMC800 volume measurement controller is 192.168.0.100. This address can be retained.

6.3.1 Allocating IP addresses

The IP addresses are assigned device by device.

Establishing Ethernet connections

1. Ensure that the VMD is properly mounted and electrically connected.
2. Detach all Ethernet connections from the Ethernet switch in the VMC800 so that only one VMD is connected to the Ethernet switch.
3. Connect the PC using the a free port on the Ethernet switch in the VMC800.

Scanning device

1. Start SOPAS and create a new project.
2. Then, scan for connected devices and add the VMD to the SOPAS project tree.

Configuring the Ethernet interface

1. Log in as an AUTHORIZED CUSTOMER on the VMD with the **client** password assigned at the factory.
2. Configure the IP address for the VMD.

Configuring the VMD and MSC800

1. Detach the Ethernet connection of the VMD and connect the next VMD to the free port of the Ethernet switch in the VMC800.
2. Execute the **Scanning device** and **Configuring Ethernet interface** steps described above for both the other VMD devices.
3. Detach the Ethernet connection of the VMD and connect the MSC800 to the free port of the Ethernet switch in the VMC800.
4. Carry out the **Scanning the device** and **Configuring the Ethernet interface** steps described above for the MSC800.
5. Complete the assignment of IP addresses.

1. Connect the three VMDs using a free port on the Ethernet switch in the VMC800 in each case.
2. Then scan for connected devices. The VMS4x0 Contour Verification components are displayed in the scan assistant under FOUND DEVICES.
3. Add the three VMD devices, the MSC800 and the VMC800 to the SOPAS project tree.

6.3.2 Configuring the VMD and VMC800

An installation setup assistant is available for the configuration of the VMD and the VMC800 as well as for calibration of position and rotation of the VMD. You will find detailed instructions on every step of commissioning in this assistant.

The following steps are required:

- ➢ Storing the measuring range.
- ➢ Entering the encoder parameters.
- ➢ Storing the CAN addresses of the VMC800 and MSC800.
- ➢ Entering the IP and CAN addresses of the VMD.
- ➢ Calibrating the position and rotation of the VMD.

Note The VMS4x0 Contour Verification must be able to scan the conveying surface for the installation setup assistant to work. Stick a black surface, for example with white tape, along the scan line.

The installation setup assistant must be executed for every VMD device.

6.3.3 Configuring basic settings for the MSC800

Configure the MSC800 directly in SOPAS. Configure the basic settings described below and click the Save Permanently icon to save the configuration.

- ➢ Configure the trigger control settings.
- ➢ Store the encoder parameters.
- ➢ Enter the CAN IDs of the components.
- ➢ Activate the time stamp.

6.4 Checking system readiness

If the system is configured and working properly, the **SYSTEM READY** LED lights up on the controller.

Fig. 85: Checking system readiness

This means that the controller has received a positive feedback signal from all the components and that the devices are communicating with one another.

6.5 Testing the configuration

Finish commissioning the system by performing a test run. The test run must ensure that the volume measurement devices are operating correctly and that the dimensions of the passing objects are being accurately measured.

Use the reference box to test the measurement accuracy of the system:

➢ Place the reference box on the belt and take several measurements. The read results are output directly in your SOPAS project so that they can be analyzed.

➢ Compare the measured values with the actual dimensions.

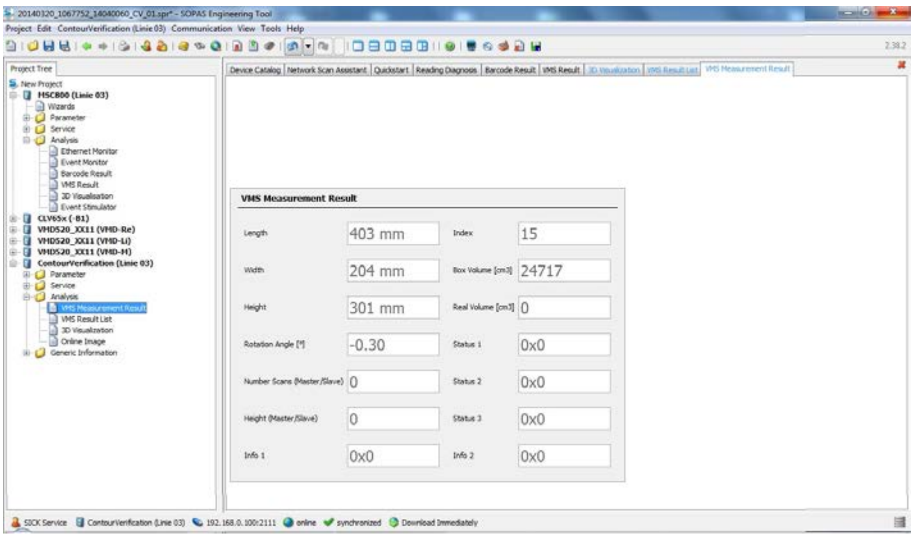
➢ Check the measurements produced when the reference box is rotated into different positions.

Getting started

1. Go to the SOPAS project tree and open the **ContourVerification** entry.
2. Various analyses of the measurements are available under the **Analysis** entry.

Checking an individual measurement result

The measurement results of the current test run are displayed under **Analysis → VMS Measurement Results**. Check here whether the dimensions of the reference box have been calculated correctly.

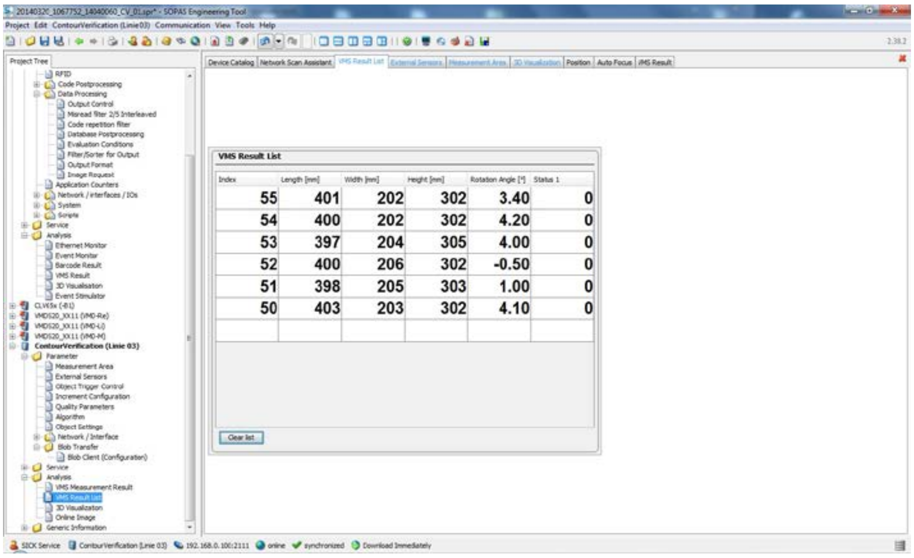


Note If the measurements are free of errors, a value of zero (0x0) appears in the **Status 1 field**. A value other than zero indicates a measurement error. To help locate the error, the **Status 2** and
Status 3 fields provide further details. In this case, please contact your local SICK support team.

Comparing the measurement results with each other

To see the measurement results from the last 10 test runs, select **Analysis → VMS Result List**. This list can be used to verify the measurement accuracy of the system.

Make sure that the calculated dimensions are within the tolerance range.



If no dimensions are calculated

If no dimensions can be calculated, this may be because the system configuration does not match the physical conditions.

➢ Check whether the **trigger control** settings have been correctly entered in the MSC800. The trigger must be set to **Active Low**.

➢ Check whether the **encoder parameters** entered for the MSC800 tally with the VMC800 parameters.

➢ Check whether the **master VMD** has been configured correctly. The master VMD must receive the encoder signal.

➢ Check whether the **timestamp** has been activated.

6.6 Optimizing the measurement results

If necessary, the measurement results can be optimized even further.

Optimizing the length measurement

The length measurement (x-coordinate) is adjusted by changing the encoder resolution in the **Encoder Resolution** field under **ContourVerification → Parameter → Increment Configuration**.

- If the measurement result is greater than the actual length value, reduce the resolution (e.g., by 0.05 mm).
- If the measurement result is smaller, the resolution must be increased accordingly.

Optimizing the width measurement

The width measurement is adjusted by changing the y-coordinate for the volume measurement devices under **ContourVerification → Parameter → External Sensors**.

- If the measurement result is smaller than the actual width value, **reduce** the y-coordinate of **scanner 1** and **increase** the y-coordinate of **scanner 2**.
- If the measurement result is greater, do the opposite.

Notes

- ➢ Treat the scanners equally by reducing/increasing the y-coordinate of each one by the same value.
- ➢ When adding/subtracting, pay attention to the signs of the y-coordinates.

Optimizing the height measurement

The width measurement is adjusted by changing the y-coordinate for the volume measurement devices under **ContourVerification → Parameter → External Sensors**.

- If the measurement result is smaller than the actual height value, **reduce** the z-coordinates of **the scanners** by the same value.
- If the measurement result is greater, the z-coordinates must be **increased** accordingly.

7 Maintenance and repairs

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

Device	Maintenance task	Interval *	Carried out by
VMD	Clean the front screen	1 x/month	Trained personnel
Photoelectric retro-reflective sensor	• Clean the light emission and reflector • Visually inspect the photoelectric retro-reflective sensor and reflector for rotation that may have occurred as a result of touching or the like	4 x/year	Trained personnel
Measuring wheel encoder	Visually inspect the measuring wheel encoder for signs of measuring wheel wear and check the measuring wheel/conveyor belt contact	1 x/month	Trained personnel
MSC800	Cleaning the Air Inlets and Outlets Replacement of the filter mat in the air inlets and outlets		Trained personnel
General	Visually inspect the electrical cabling and wiring for damage	1 x/year	Specialist
	Check the measurement accuracy	1 x/year	Specialist
	Carry out a functional test with a reference object	Whenever the system is started	Trained personnel
* The intervals depend on the ambient conditions and degree of contamination. In addition, the intervals must be defined according to how significant they are for the customer process.			

Tab. 20: Maintenance intervals

7.1 Maintenance and repairs

7.1.1 Cleaning the VMD

The VMD are maintenance-free. Maintenance is not necessary to ensure compliance with laser class 2.

To achieve the full optical output of the VMD devices, the front screen must be regularly checked for contamination. This is especially true in harsh operating environments (dust, abrasion, humidity, fingerprints).

WARNING

Damage to the eye by laser beam

The VMD works with a red, Class 2 laser. When exposed to the laser beam for longer periods of time, the retina of the eye may be damaged.

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

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

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

Fig. 86: Warning label for laser protective cover

Clean the front screen.

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

Recommendation

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

NOTE

Damage to the front screen

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

➢ Do not use aggressive cleaning agents.

➢ Do not use abrasive cleaning agents.

➢ Avoid scratching and chafing motion on the front screen.

7.1.2 Cleaning the controller cabinet

The components of the controller cabinet are maintenance-free.

Recommendation

To prevent the electrical devices from overheating and sustaining damage, the air inlets and outlets on the controller cabinet must be cleaned on a regular basis. Contaminated or clogged filters at the air inlets and outlets must be replaced immediately.

Cleaning the Air Inlets and Outlets

To ensure sufficient cooling of the power supply units, care must be taken to keep the air inlets and outlets clean. This is especially true in harsh operating environments (dust, abrasion, etc.).

Use a soft brush to clear any dust from the air inlet and outlet openings on the side of the controller cabinet.

Replacing the filters at the air inlets and outlets

There is a filter mat behind the covers for the air inlets and outlets on the controller cabinet. Contaminated or clogged filters can cause the power supply units to overheat. Therefore, any such filters must be replaced with new ones immediately. It is not necessary to open the controller cabinet for this.

1. Remove all the covers from the air inlets and outlets on the side of the controller cabinet. To do this, insert your fingers into the semi-circular recesses in the covers and carefully pull each cover forward to remove it.

2. Remove the old filter mats and replace them with new ones.

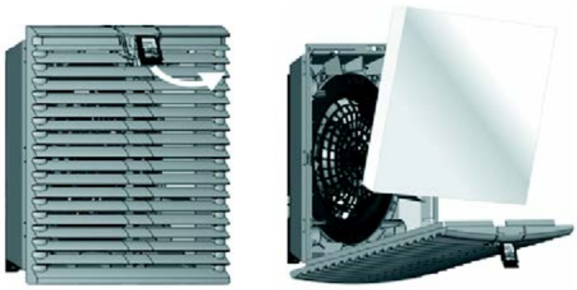


Fig. 87: Replacing the filters at the air inlets and outlets of the controller cabinet

3. Reattach the covers to the correct sides and apply pressure to them until you hear them snap into place.

7.1.3 Visual inspection of the photoelectric retro-reflective sensor

Contamination can result in faulty switching behavior.

- ➢ Remove any contamination on the optical surfaces of the sensors to prevent faulty switching behavior.
- ➢ Check the screws and plug connectors at regular intervals.
- ➢ Check that the photoelectric sensor and reflector are correctly aligned.

7.1.4 Visual inspection of measuring wheel encoder

Make sure that measuring wheel of the measuring wheel encoder is in direct and steady contact with the conveyor belt and that the measuring wheel is not slipping as it turns.

Contamination on the measuring wheel or damaged rubber rings can cause faulty behavior of the measuring wheel encoder.

Fig. 88: Visual inspection of measuring wheel encoder

- ➢ Remove contamination on the measuring wheel of the measuring wheel encoder.
- ➢ Replace damaged rubber rings.
- ➢ Check the level of wear on the measuring wheel. If it is so badly worn that contact with the belt is impaired, the measuring wheel encoder must be replaced.

7.1.5 Visual inspection of the cables

Regularly check the electrical installation. Check that all cable connections are securely attached.

WARNING

Loose connections or scorched cables

➢ Defects such as loose connections or scorched cables must be rectified immediately.

HAZARD

Damaged cable insulation

There is a risk of electrocution if the insulation of the connecting cables is damaged.

7.2 Replacing components

Faulty or damaged components must be dismantled and replaced with new or repaired components. All customer-specific parameters are saved as a parameter set in the internal memory of the respective device and on storage media:

- MicroSD card in MSC800,
- USB-Stick in VMC800,
- Modular hood in the VMD.

Therefore, components can be easily replaced without involving a qualified technician.

NOTE

Repair work on the individual components may only be performed by qualified and authorized service personnel from SICK AG.

HAZARD

Disconnect the power to the system

➢ Make sure the power supply for the entire system is disconnected throughout the entire time that you are carrying out maintenance and repair work.

HAZARD

Risk of injury due to electrical current

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

7.2.1 Replacing VMD

All VMD devices feature a removable modular hood, which has all the device parameters permanently stored inside it. This makes replacing the component very easy.

NOTE

Claims under the warranty rendered void

Do not open the device housing. The devices are sealed.

If the device is opened, any warranty claims against SICK AG will be void.

Removing modular hood

Remove the modular hood from the VMD.

1. To do so, remove the two 3 mm Allen screws of the modular hood.

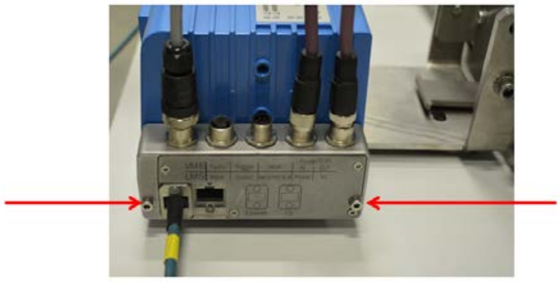


Fig. 89: Disassembling VMD:Removing modular hood

2. Remove the modular hood with the connected cables from the VMD.

Removing VMD

1. Remove the three M6 fixing screws on the rear side of the adapter plate.

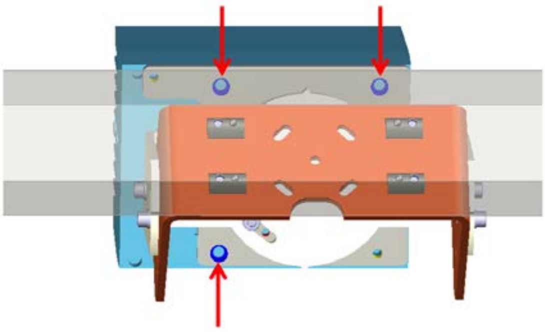


Fig. 90: Detaching the VMD: Removing the fixing screws

Note When loosening the last screw of the VMD, press on the bracket with one hand to fasten the device.

2. Remove the defective VMD from the bracket. The mounting bracket remains mounted on the frame.

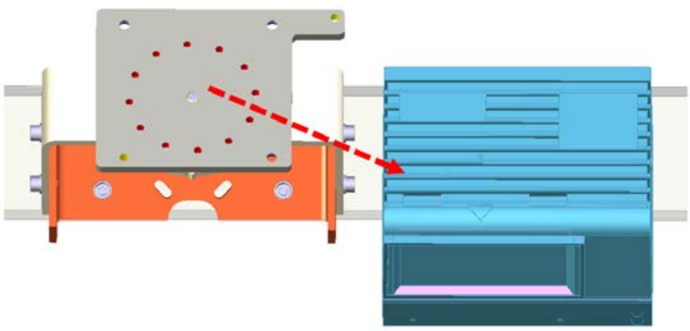


Fig. 91: Disassembling VMD: Removing from mounting bracket

Mounting the Replacement Device

1. Mount the new VMD on the respective mounting bracket. Tighten the three 6 mm Allen screws and check that the device is firmly attached.
2. Place the modular hood on the device carefully so that the protruding 15-pin plug connectors grip the plug connectors of the device. Ensure that the modular hood does not tilt during mounting.
3. Screw on the modular hood with the two 3 mm screws.
4. Switch the voltage supply inside the controller cabinet back on. The configuration stored in the parameter memory of the modular hood is transferred to the VMD.
5. Check that the status LED lights up green after approximately 40 seconds.

Test run

➢ Start a test run and check whether the measurement system is providing plausible measurement results.

➢ It may be necessary to recalibrate the exchanged sensor using SOPAS.

7.2.2 Replacing the controller of the MSC800

HAZARD

Risk of injury due to electrical current

The power supply unit of the controller cabinet is connected to the voltage supply (100 V … 264 V AC / 50 Hz … 60 Hz).

➢ Standard safety requirements must be met when working on electrical systems.

Note

➢ Before removing the MSC800, you should make a note of how the cables are assigned to the connections.

Removing connecting cables

1. Switch off the MSC800 supply voltage.
2. Unplug the connected Ethernet cable (1) from the female connector.

Fig. 92: Unplugging the cables and terminal blocks from the controller

3. Unplug the terminal blocks (2), together with the cabling, from the controller slots.

Note

Make sure that no wires are pulled out from the terminal blocks.

Removing the controller

1. Undo the controller fixing screw (3) on the left-hand side.
2. Pull the controller to the right and then remove it from the control cabinet.
3. Remove the microSD card from the slot (4) in the controller that has been removed.

Installing the controller

1. Insert the microSD card that you have removed into **Slot SD 1** on the new controller.
2. Insert the new controller in the control cabinet.
3. Pull it to the left and use the fixing screw to secure it in the control cabinet.
4. Place the terminal blocks, together with the cabling, back inside the designated slots.
5. Plug the Ethernet cables into the designated connectors.
6. Check the switch positions of the micro switches between the terminal blocks. Set them to the same positions as the switches on the controller that has been removed (signal ground).
7. Switch the controller supply voltage back on. The controller starts and, after initialization, loads the parameter set from the memory card to the permanent parameter memory of the logic unit.

7.2.3 Replacing the battery in the MSC800

A battery powers the real-time clock of the MSC800. The battery must be replaced when drained.

Fig. 93: Position of the battery in the MSC800 controller

1. Remove the black plastic cover on the MSC800.
2. Remove the battery from the holder and replace it with a new type 2032 CR battery.
3. Reattach the black plastic cover.
4. Dispose of the old battery as hazardous waste according to RoHS guidelines (Europe).
5. Set the system time again using the SOPAS software (**project tree → MSC800 → System → REAL-TIME CLOCK area**).

7.2.4 Replacing the power supply unit

HAZARD

Risk of injury due to electrical current

The power supply unit of the controller cabinet is connected to the voltage supply (100 V … 264 V AC / 50 Hz … 60 Hz).

➢ Standard safety requirements must be met when working on electrical systems.

Note

➢ Before removing the power supply, you should make a note of how the cables are assigned to the connections.

Removing the power supply unit

1. Switch off the MSC800 supply voltage.
2. Undo and disconnect all cables from the power supply module (1).

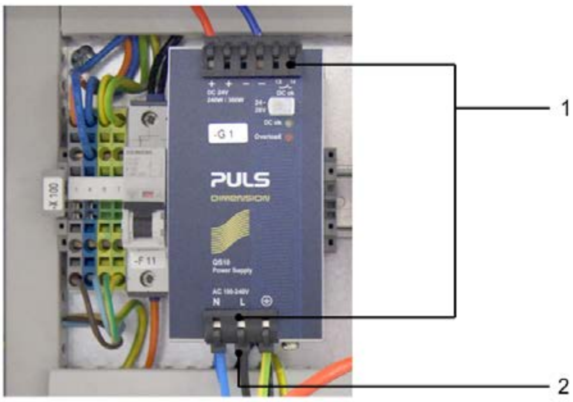


Fig. 94: Disconnecting the cables from the MSC800 power supply unit

3. Release the defective power supply module from the controller cabinet. To do this, use a suitable screwdriver to slide the black clip forward on the bottom of the power supply (2).
4. Lift the power supply and pull it forward and out of the bracket.

Installing the power supply unit

1. Place the new power supply module on the controller cabinet mounting rail and apply pressure until the power supply module audibly clicks into place.
2. Reconnect all the cables to the power supply unit.
3. Switch the supply voltage on again.

7.2.5 Replacing the VMC800

All the VMC800 parameters are stored on the USB stick. This makes replacing the component very easy.

HAZARD

Disconnect the power to the system

➢ Make sure the power supply for the entire system is disconnected throughout the entire time that you are carrying out maintenance and repair work.

NOTE

Claims under the warranty rendered void

Do not open the housing of the VMC800. None of the parts inside it need to be maintained or replaced.
Any modifications to the VMC800 (e.g., caused by opening the housing) shall render any warranty claims against SICK AG null and void.

Removing the VMC800

1. Undo the CAN cable screws and unplug the male connector.

Fig. 95: Removing the VMC800: Unplugging the CAN cable

2. Undo the screws for the supply connection and unplug the power connector.

Fig. 96: Removing the VMC800: Unplugging the supply connection

Note Create enough space to make use of the screwdriver and, if necessary, unplug some of the Ethernet cables from the female connectors of the Ethernet switch.

3. Unplug the Ethernet cable from the female connector.

Fig. 97: Removing the VMC800: Unplugging the Ethernet cable

4. Using a flat blade screwdriver or a torx screwdriver, undo the 4 screws on the VMC800 bracket.

Tipp Use a magnetized screwdriver.

Note Hold the device firmly with one hand while you are undoing the last screw.

5. Remove the defective VMC800 from the controller cabinet.

Replacing the USB stick/USB dongle

1. Remove the USB stick that contains the saved parameters (1) from the slot on the defective VMC800 and insert it into the new device.

Fig. 98: VMC800: Replacing the USB stick/USB dongle

2. Apply the same process for the USB dongle. Insert it into the slot of the new device.

Installing the controller

1. Mount the new VMC800 in the controller cabinet. Tighten the four fixing screws and check that the device is securely attached.
2. Plug the Ethernet cable into the female connector.
3. Plug in the CAN cable and power connector and securely install.

Note If you disconnected any of the cables from the Ethernet switch to make it easier to perform the work, do not forget to plug them back in.

Final steps

- ➢ Switch the voltage supply back on and check whether the Power LED on the VMC800 lights up green when the system is powered up.
- ➢ Start a test run and check whether the VMC800 is providing plausible measurement results.

7.2.6 Replacing the photoelectric retro-reflective sensor

1. Unscrew the M12 plug connector from the male connector on the photoelectric retro-reflective sensor.
2. Loosen the defective photoelectric sensor from the support rail.

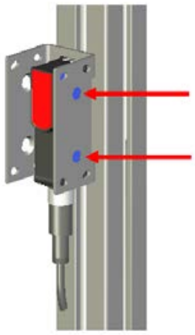


Fig. 99: Replacing the photoelectric retro-reflective sensor

3. Replace the defective photoelectric sensor with a new one. Mount the new photoelectric retro-reflective sensor on the support rail.
4. Screw the M12 plug connector onto the male connector on the photoelectric retro-reflective sensor.
5. Align the photoelectric sensor with the reflector. The reflector must be in line with the light beam from the photoelectric retro-reflective sensor.

Note Check that the photoelectric retro-reflective sensor is functioning correctly. This procedure is described in detail in chapter **6.2 Checking the operational readiness of the devices**.

7.2.7 Replacing the measuring wheel encoder

1. Unscrew the M12 connector from the male connector on the measuring wheel encoder.

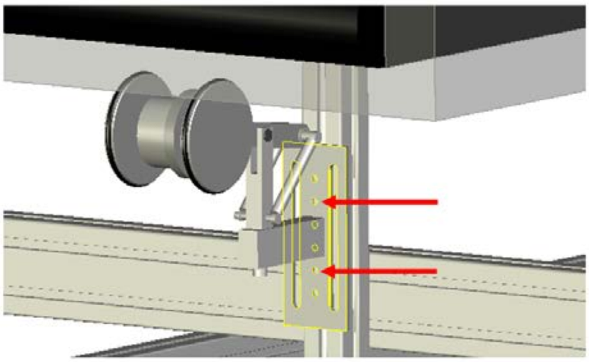


Fig. 100: Replacing the measuring wheel encoder

2. Undo the fixing element that is holding the defective measuring wheel encoder to the belt.
3. Replace the defective measuring wheel encoder with a new one. Mount the new encoder on the belt.

Note Make sure that it is installed in the right direction on the belt.

4. Screw the M12 connector onto the male connector on the measuring wheel encoder.

Note Check that the measuring wheel encoder is functioning correctly. This procedure is described in detail in chapter **6.2 Checking the operational readiness** of the devices.

7.3 Checking the measurement accuracy

The measurement accuracy must be checked after performing the following maintenance work/modifications:

- Replacement of the volume measurement devices.
- Replacement of the measuring wheel encoder.
- Changes to the frame that alter the position of the volume measurement devices.
- Replacement of the belt on the conveying line that has the measuring wheel encoder attached to it.
- Changes to the side guards that cause them to encroach on the scan line of the volume measurement devices.

7.4 Disposal

Unusable or irreparable devices must be dismantled and disposed of in an environmentally safe manner in accordance with the relevant national waste disposal regulations.

SICK AG is not currently able to take back devices that are irreparable or can no longer be used.

8 Fault diagnosis

This chapter describes how to identify and remedy faults affecting the measurement system.

8.1 Response to faults

WARNING

Danger due to malfunction!

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

➢ Immediately put the machine/system out of operation if you cannot clearly identify or allocate the fault and if you cannot safely remedy the fault.

8.2 SICK support

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

8.3 Component fault indicators

This section explains what the fault indicators for the individual devices mean and how to respond to them.

8.3.1 Fault indication on the VMD

The volume measurement devices independently monitor beam generation and automatically shut it down in the event of irregularities. In such cases, the Device Ready LED illuminates red. The VMD no longer sends any measured values.

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

Tab. 21: LED indicator in case of a fault on the VMD

To delete the fault status, proceed as follows:

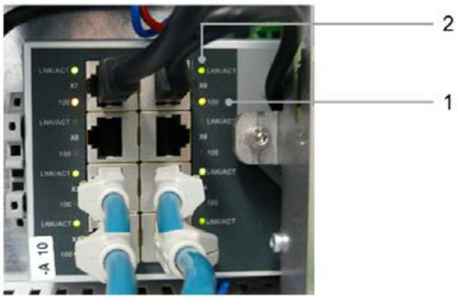
➢ Switch off the measurement system and turn it on again, if necessary.

➢ If the fault persists or occurs again after a restart, check the device status using SOPAS (see below). If faults are listed there, please contact SICK Service.

8.3.2 Fault indication on the Ethernet switch

Each port on the Ethernet switch has two LEDs. LED **100** (2) at the bottom lights up orange when the port is operating at a transmission rate of 100 Mbit/s. If the transmission rate is lower than this, the LED remains off.

LED **LNK/ACT** (1) at the top lights up green when the port recognizes the connected device and data is being sent or received.



Tab. 22: Fault indication on the Ethernet switch

If the port LEDs do not light up, possible causes might be:

Cause	**Remedy**
Ethernet cable is defective	Replace the Ethernet cable.
Ethernet switch is defective	Replace the device.
Connected device is defective	Check connected device and, if necessary, replace it.

Tab. 23: Fault indication on the Ethernet switch

8.3.3 Fault indication on the photoelectric retro-reflective sensor

The following behavior of the LED receive indicator suggests a fault/error:

LED	**Meaning**
Permanently off	Reflector is not aligned with the light beam of the photoelectric sensor. ➢ Readjust the photoelectric sensor, clean it, or check the application conditions.
Flashing	Reflector is only being detected in the fringe range. ➢ Readjust the photoelectric sensor, clean it, or check the application conditions.
Lit or flashing even when there is an object in the path of the light beam	➢ Reduce the sensitivity via the potentiometer until the LED goes out. Once the object is removed, the LED should light up again. ➢ If this does not happen, adjust the sensitivity until the switching threshold has been set correctly.

Tab. 24: LED fault indication in the event of a photoelectric retro-reflective sensor fault

8.4 Troubleshooting the controller

Check that all MSC800 interfaces are connected correctly.

Checking the trigger

If both the measuring range and the path to the reflector are clear, the LED for the **1 TRG_1** connection on the **TRIGGER** block should light up.

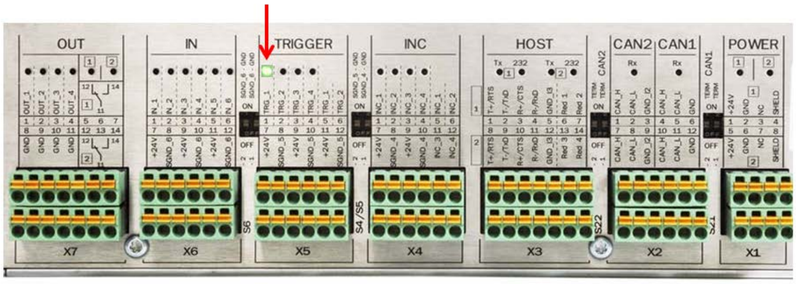


Fig. 101: Fault situation: Checking triggering on the MSC800

If the LED does not light up, possible causes might be:

Cause	**Remedy**
Path of the beam is permanently interrupted by an object	➢ Stop the beam from being permanently interrupted by the object.
Photoelectric sensor is not aligned with the reflector	➢ Readjust the photoelectric sensor and align it with the reflector.
Signal ground not activated	➢ Set the **SGND_5** signal ground switch to **ON**.
Wire is not attached correctly in the terminal block.	➢ Check that the wires are attached correctly.
Photoelectric sensor is defective	➢ Replace the device.

Tab. 25: Fault situation: Checking triggering on the MSC800

Checking the measuring wheel encoder

The LEDs on the **INC** terminal block should flash alternately as the conveyor belt turns.

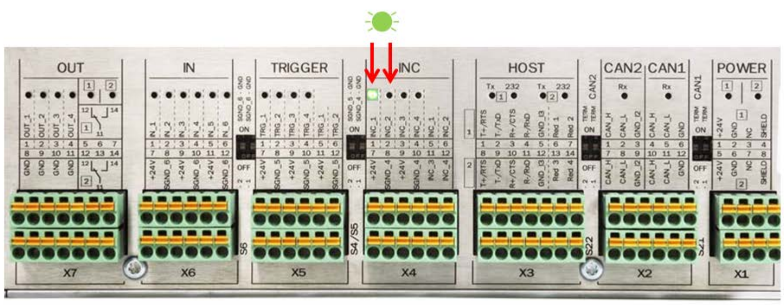


Fig. 102: Fault situation: Checking incremental signals on the MSC800

If the LEDs do not flash, possible causes might be:

Cause	Remedy
There is no/insufficient contact between the measuring wheel and the conveyor belt	➢ Make sure that there is good contact between the measuring wheel and the conveyor belt on-site. ➢ If the measuring wheel shows signs of wear, replace it.
Signal ground not activated	➢ Set the **SGND_4** signal ground switch to **ON**.
Wire is not attached correctly in the terminal block (2).	➢ Check that the wires are attached correctly.
Encoder is defective	➢ Replace the device.

Tab. 26: Fault situation: Checking incremental signals on the MSC800

Checking Ethernet connection of the VMD devices

All VMD devices are connected to ports **X1**, **X2**, **X3**, and **X4** of the Ethernet switch via an Ethernet cable. The measured data is transferred to the VMC800 via this connection.

If this data transmission is subject to a fault, the **SYSTEM READY** LED does not light up.

Fig. 103: Fault situation: VMD Ethernet connection

Check the LED displays of ports used on the Ethernet switch (see also Chapter **8.3.2 Fault indication on** the Ethernet switch). If the LEDs do not light up, possible causes might be:

Cause	Remedy
Ethernet switch is defective	➢ Replace the device.
Ethernet cable is defective	➢ Replace the Ethernet cable.
VMD is defective	➢ Replace the device if necessary.

Tab. 27: Fault situation: VMD Ethernet connection

Checking the CAN1 cabling

If the CAN is cabled correctly, the LED in terminal block **CAN1** lights up weakly during operation.

If the conveyor belt is switched off, the LED should flicker if the CAN cabling is correct.

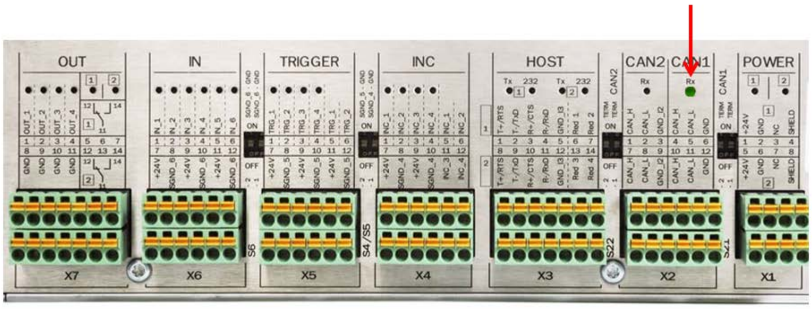


Fig. 104: Fault situation: CAN1 cabling

If the LED lights up **brightly** like the others, the device CAN connection is not correct. Possible causes might be:

Cause	Remedy
The wires have been swapped	➢ Connect the VMD to the MSC800 as follows • White cable to 4 CAN_H • Blue cable to 5 CAN_L ➢ Connect the VMC800 as follows: • White cable to 10 CAN_H • Blue cable to 11 CAN_L • Black cable to 12 GND • Grey cable to SHIELD
Wire is not attached correctly in the terminal block	➢ Check that the wires are attached correctly.
Terminator is defective	➢ Replace the terminator.

Tab. 28: Fault situation: CAN1 cabling

8.5 Faults during Operation

Controller does not work

- The **DEVICE READY** LED on the MSC800 does not light up.

Cause	**Remedy**
Fuse is defective	➢ Check the fuse block **-F1-6** in the MSC800 and replace the defective fuse if necessary.
Device is defective	➢ Replace MSC800 (see chapter **7.2.2 Replacing the controller of** the MSC800).

Tab. 29: Fault situation: Controller does not work

VMD does not work

Cause	**Remedy**
Fuse is defective	➢ Check the fuse block **-F1-6** in the MSC800 and replace the defective fuse if necessary.

Tab. 30: Fault situation: VMD does not work

The **Device Ready** LED on the VMD lights up red.

Cause	**Remedy**
VMD is not in measuring mode or it is in measuring mode, but errors have occurred	➢ Check the voltage supply.
Device is defective	➢ Replace VMD (see chapter **7.2.1 Replacing VMD**).

Tab. 31: Fault situation: VMD does not work

Photoelectric retro-reflective sensor does not work

The LED at the **1 TRG_1** connection does not light up (see chapter **8.4 Troubleshooting the controller**).

The LED receive indicator on the photoelectric sensor does not light up (see chapter **8.3.3 Fault indication on the** photoelectric retro-reflective sensor).

Cause	**Remedy**
Path of the beam is permanently interrupted by an object	➢ Stop the beam from being permanently interrupted by the object.
Photoelectric sensor has been rotated and is no longer aligned with the reflector	➢ Readjust the photoelectric sensor and align it with the reflector.

Tab. 32: Fault situation: Photoelectric retro-reflective sensor does not work

Measuring wheel encoder does not work

The LEDs on the **INC** terminal block (1) do not flash during operation.

Cause	Remedy
Fuse is defective	➢ Check the fuse block **-F1-6** in the MSC800 and replace the defective fuse if necessary.
Measuring wheel encoder is contaminated	➢ Check the measuring wheel encoder for signs of wear. ➢ Replace the measuring wheel encoder if necessary.

Tab. 33: Fault situation: Measuring wheel encoder does not work

"SYSTEM READY" LED does not light up

The **SYSTEM READY** LED on the MSC800 does not light up.

Fig. 105: Fault situation: "SYSTEM READY'"LED does not light up

Possible causes can include:

Cause	Remedy
VMD is defective	➢ Replace the device.
VMD front screen is significantly contaminated	➢ Clean the front screen.
VMC800 is defective	➢ Replace the device.
MSC800 is defective	➢ Replace the device.
CAN cable attached incorrectly	➢ Check the CAN connections on the **CAN1** terminal block.
VMD Ethernet cable or Ethernet switch is defective	➢ Check the Ethernet cable and, if necessary, replace it. ➢ Check the Ethernet switch and, if necessary, replace it.

Tab. 34: Fault situation: "SYSTEM READY" LED does not light up

8.6 Detailed fault analysis

The MSC800 control unit outputs faults in different ways. Fault output is staggered, allowing for an increasingly detailed level of analysis:

- Communication errors can occur when transmitting telegrams to the MSC800, for example. The MSC800 then returns a fault code.
- For faults that occur during reading, fault codes are written to a **status log**.

8.6.1 The status log

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

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

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

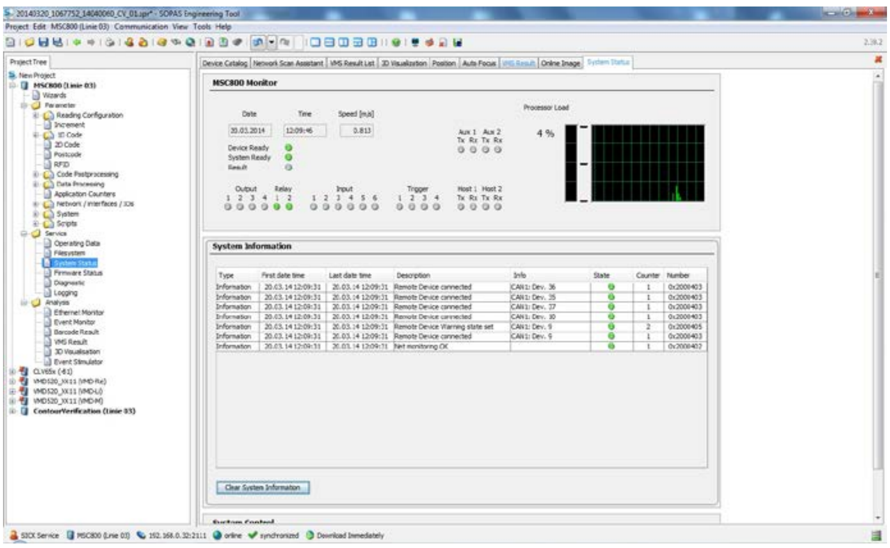
8.6.2 Checking the status log with SOPAS

To display the status log, there must be an online connection between the SOPAS configuration software and the controller (see also Chapter **6.3 Configuration (parameterization) using SOPAS**).

The status logs for the MSC800 and VMC800 are output separately.

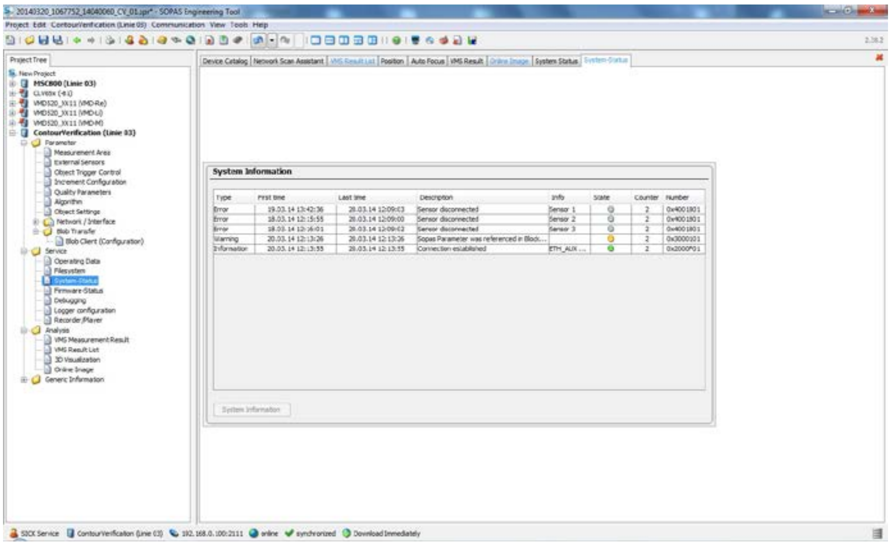
MSC800 status log

➢ Go to the SOPAS project tree and select the following entry:
MSC800 → Service → System Status.



VMC800 status log

➢ Go to the SOPAS project tree and select the following entry:
ContourVerification → Service → System Status.



9 Technical Data

9.1 VMS4x0 Contour Verification data sheet

Component	**Explanation**
Min. object size (L x W x H)	200 x 100 x 100 mm
Max. object size (L x W x H)	2,000 x 1,000 x 1,000 mm
Minimum distance between objects	> 1200 mm
Object rotation	± 45°
Object properties / Remission value	15% - 200% (based on Kodak White Paper and red light laser), not glossy (e.g. tape) You can find more information on this in the LMS400 operating instructions in chapters 3.6.1 and 3.6.2
Conveyor speed	Up to 2.0 m/s [1] Synchronous and consistent belt speed in the measuring range
Conveying system	• Flat conveying surface • Individual objects (see minimum distance)
Accuracy of volume measurement	Up to ± 5/5/5 mm (L x W x H) at 1 m/s [2] Up to ± 10/5/5 mm (L x W x H) at 2 m/s [2]
Power consumption of entire system	Typically 480 W
Enclosure rating / protection class	IP54
Ambient operating temperature	0 °C ... +40 °C
Storage temperature	–20 °C ... +70 °C
Interfaces	RS-232, -422, -485; PROFIBUS; Ethernet (TCP/IP, FTP, EtherNet/IP™)
[1] Higher speeds on request [2] For cubic objects	

Tab. 35: VMS4x0 Contour Verification data sheet

9.1.1 MSC800 / VMC800 data sheet

Functions	Receives all digital signals, e.g., trigger and/or encoder. Combines the results read from the attached sensors, e.g., VMD or bar code reader. Calculates, filters, and assigns results to an object. Outputs results to the host interface. Outputs the diagnostics data to the connected SVP diagnostic tool (optional).
Number of VMD550 devices	4
Optical indication on the device	26 x LED status and function indicators
"HOST" data interface	RS-232, RS-422/485, Ethernet, PROFIBUS DP Data output format is freely selectable
"HOST" data transmission rate	Serial: 300 … 57,600 bit/s Ethernet: 10/100 Mbit/s PROFIBUS DP: 12 MBd
"HOST" protocols	SICK standard, all standard system integrator interfaces. Customization upon request
"Terminal" data interface	RS-232, 57,600 bit/s, 8 data bits, no parity, 1 stop bit Ethernet TCP/IP
Switching inputs	16 (all inputs are displayed via one LED each). All inputs are optically isolated and protected against reverse polarity.
OSSDs	4 x PNP Imax = 30 mA, short-circuit protected, variable Signal duration adjustable, 2 x volt-free relay contacts
Interfaces	1 x serial, AUX (9-pin D-SUB for serial diagnostics) 2 x serial, Host (wiring) 3 x Ethernet, AUX, or Host (RJ-45) 1 x PROFIBUS, Host (9-pin D-SUB)
Voltage supply	AC 100 … 264 V/50 … 60 Hz
Housing	Powder-coated metal housing
Enclosure rating	IP 54 (acc. to EN 60529)
Protection class	Class 1 (acc. to EN 61140)
Standardization	EN61439-1;A1, EN 60529, EN61140;A1, EN61000-6-2, EN61000-6-4, IEC68-2-6, IEC68-2-27
Weight	Approx. 20 kg
Operating temperature	0 °C … +40 °C
Storage temperature	–20 °C … +70 °C
Max. rel. air humidity	90%, non-condensing
Dimensions	500 mm x 400 mm x 155 mm

Tab. 36: MSC800 data sheet

9.1.2 VMD500 data sheet

Laser output aperture	On the front
Usable aperture angle	Maximum 70°
Laser diode (wavelength)	Visible light (λ = 650 nm)
Laser class	Laser class 2
Laser power	Maximum 9.5 W
Optical indicators	6 x LED
Operating voltage	24 V DC ±15%
Power consumption	Maximum 25 W
Enclosure rating / protection class	IP 20 (acc. to DIN 40050), with modular hood IP 65 (acc. to EN 60529)
EMC test	In accordance with EN 6100062:2001, EN 6100064:2001
Vibration/Shock test	In accordance with EN 6006826, 27, 29, 64
Weight	Approx. 2,300 g
Rel. Air humidity	90%, non-condensing
Ambient temperature (operation)	0 °C … +40 °C
Storage temperature range (without packaging)	–20 °C... +70 °C (max. 24 h)
Dimensions (H x W x D)	130 mm x 179 mm x 130 mm

Tab. 37: VMD500 data sheet

9.1.3 Data sheet for photoelectric retro-reflective sensor

Sensing range	Typ. max/to reflector 7 m/PL80A
Sensitivity	Adjustable via potentiometer, 270°
Light sender	Visible red light
Light beam diameter	40 mm at a distance of 2 m
Supply voltage	UV DC 10 … 30 V
Switching output	PNP, complementary
Response time	500 µs
Connection type	Cable, 4-wire
M12 male connector	4-pin
Enclosure rating	IP 67
Ambient temperature (operation)	–40 °C …+60 °C
Storage temperature range (without packaging)	–40 °C …+75 °C
Weight with M12 plug connector	Approx. 40 g.

Tab. 38: Photoelectric retro-reflective sensor data sheet

9.1.4 Data sheet for measuring wheel encoder

Performance	
Electrical interface	4.5 … 32 V
Number of lines	30
Reference signal	Quantity: 1 Position: 90° electric., logically gated with A and B
Error limits	± 0.03°
Signal	HTL
Supply voltage	4.5 … 30 V DC
Enclosure rating	IP 65 acc. to EN 60529
Weight	0.5 kg
Operating temperature range	–20 °C … +100 °C
Storage temperature range (without packaging)	–40 °C …+100 °C
Rel. Air humidity	90%, non-condensing
Dimensions [WxHxD]	220 x 288 x 86 mm

Tab. 39: Data sheet for measuring wheel encoder

9.2 VMS4x0 Contour Verification dimensional drawings

9.2.1 VMC800 dimensional drawing

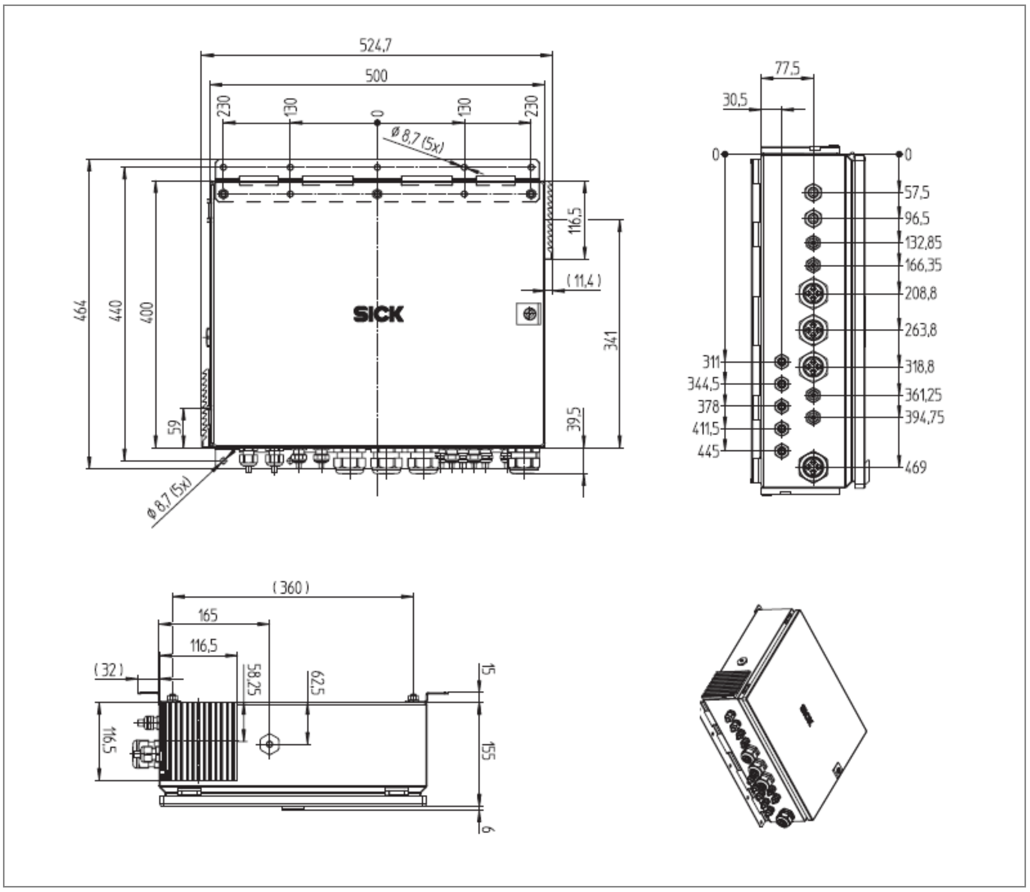
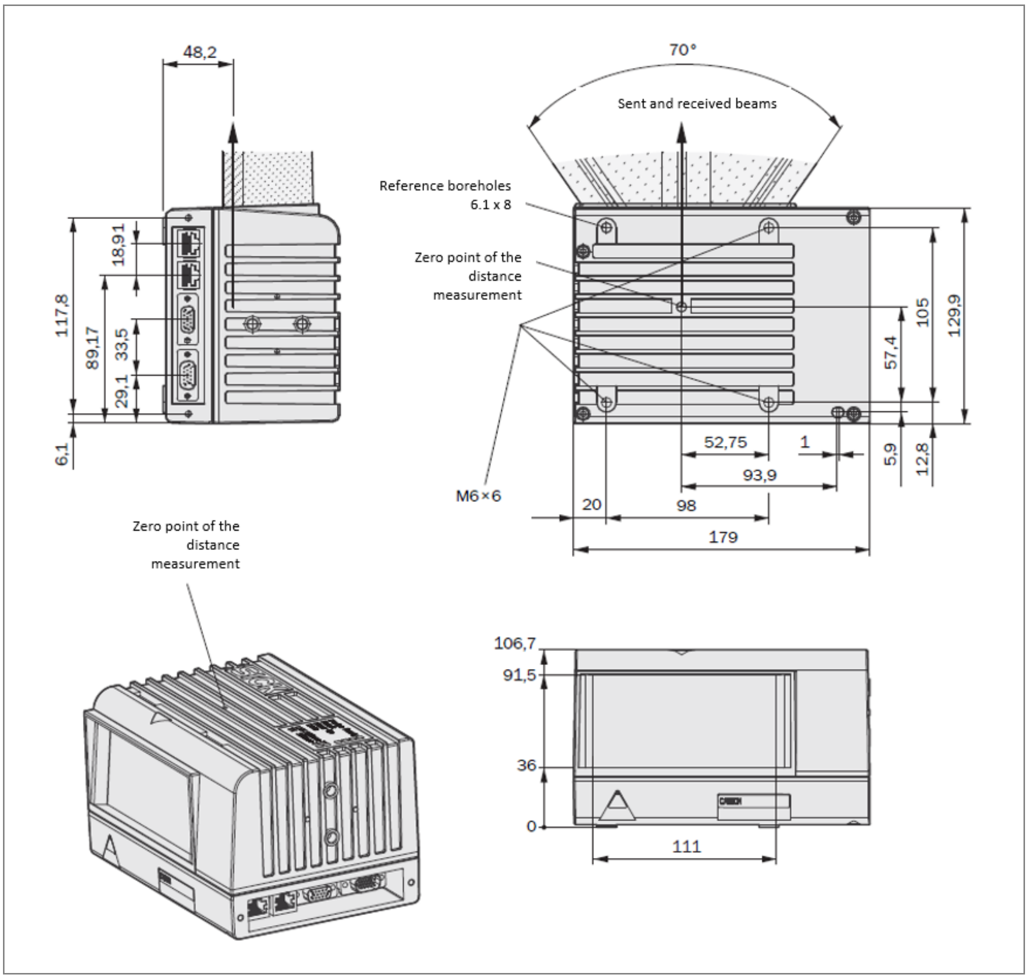


Fig. 106: Dimensional drawing: VMC800

9.2.2 VMD500 dimensional drawing with and without protective cover



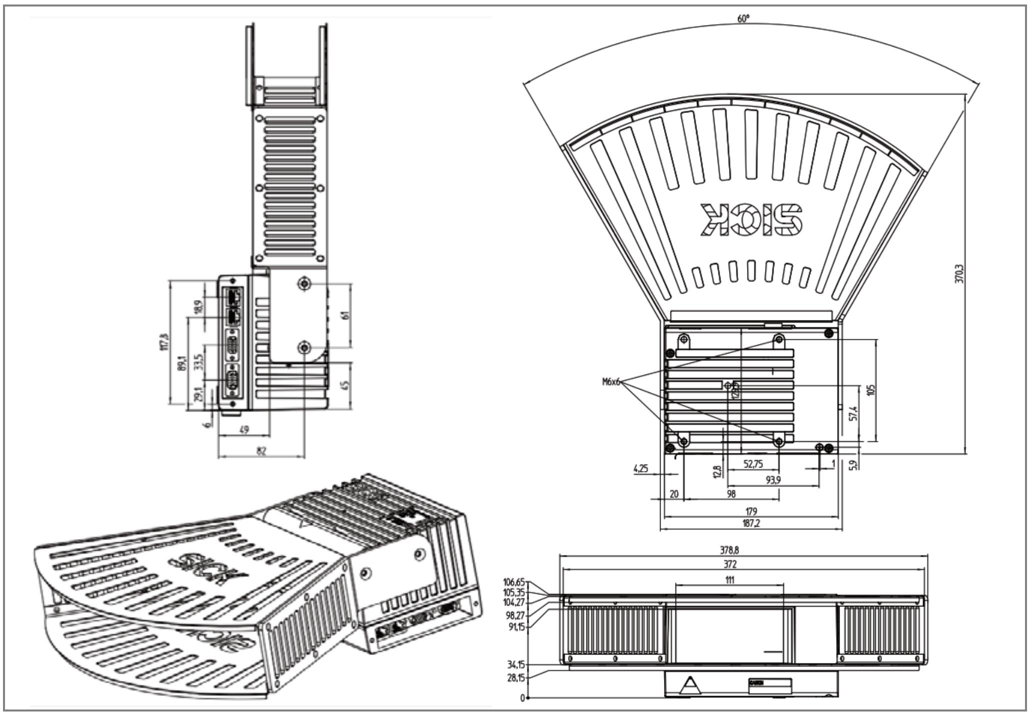


Fig. 107: Dimensional drawing:VMD500 with and without optics cover

Dimensional drawing of mounting bracket of VMD mounting support

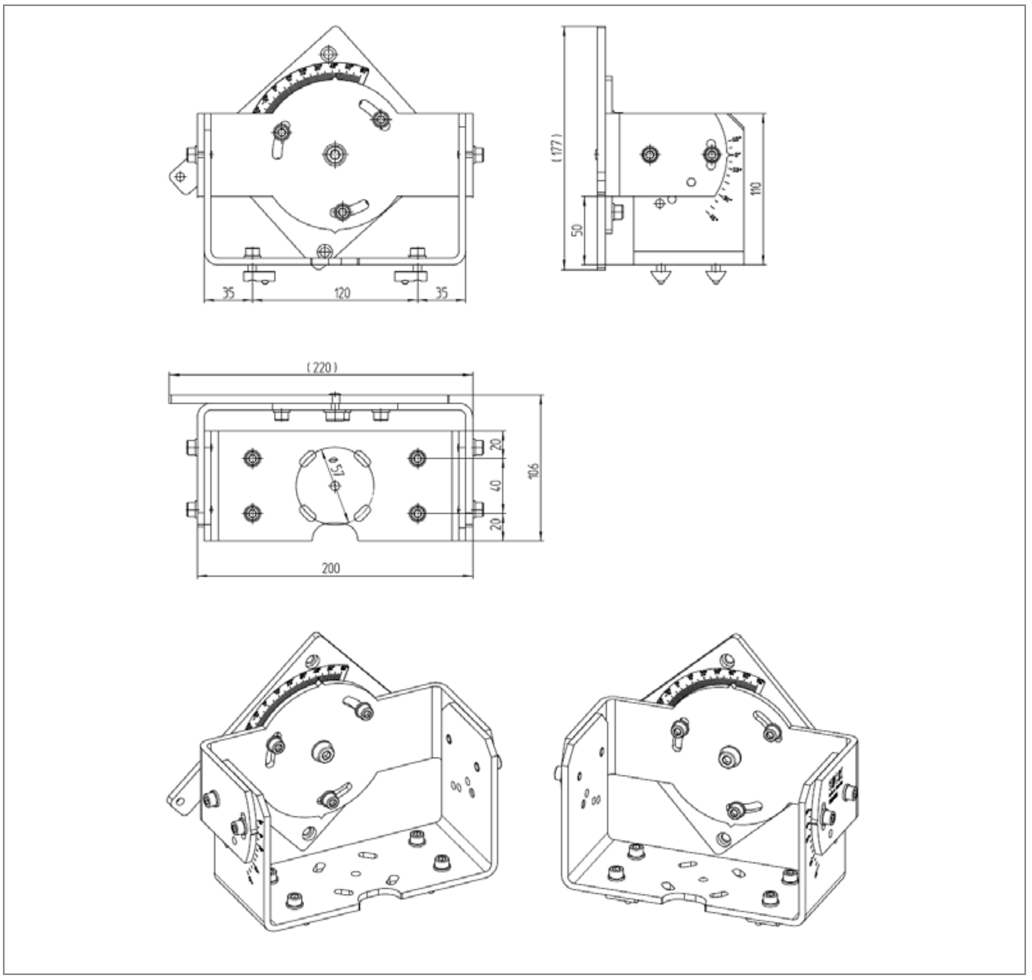


Fig.108: Dimensional drawing: Mounting bracket of VMD mounting support

9.2.3 Photoelectric retro-reflective sensor

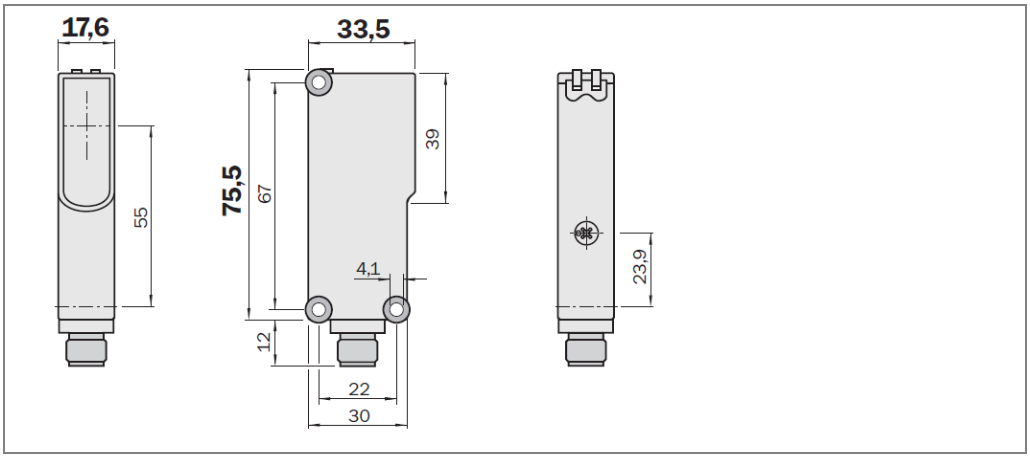


Fig. 109: Photoelectric retro-reflective sensor dimensional drawing

9.2.4 Dimensional drawing of measuring wheel encoder

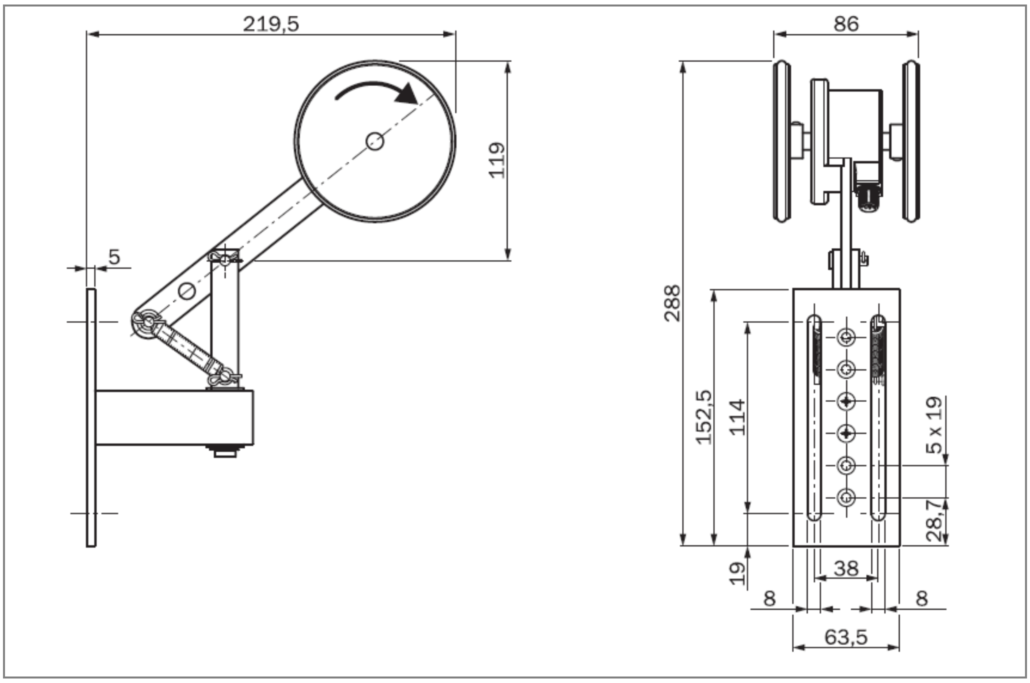
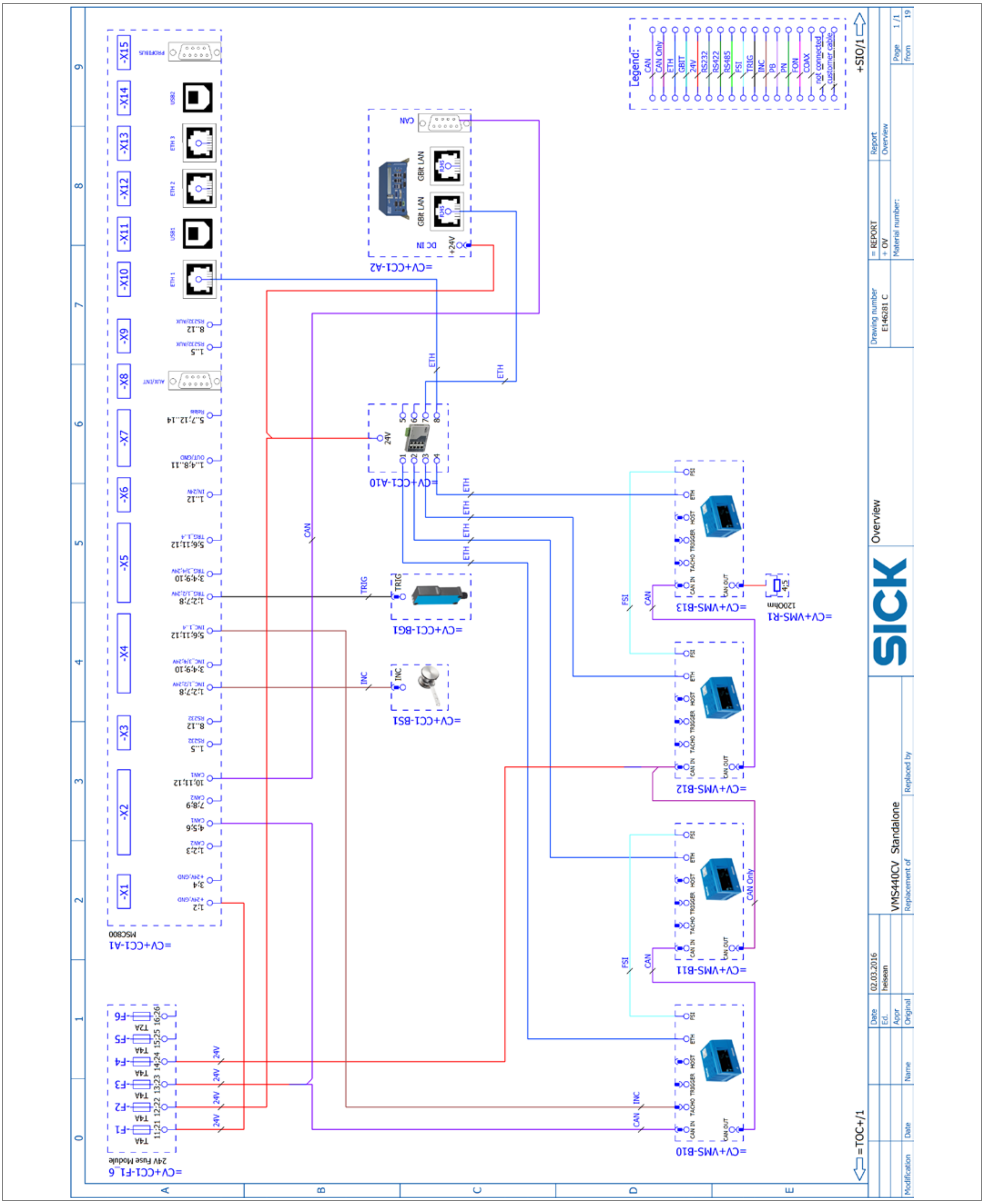


Fig. 110: Measuring wheel encoder dimensional drawing

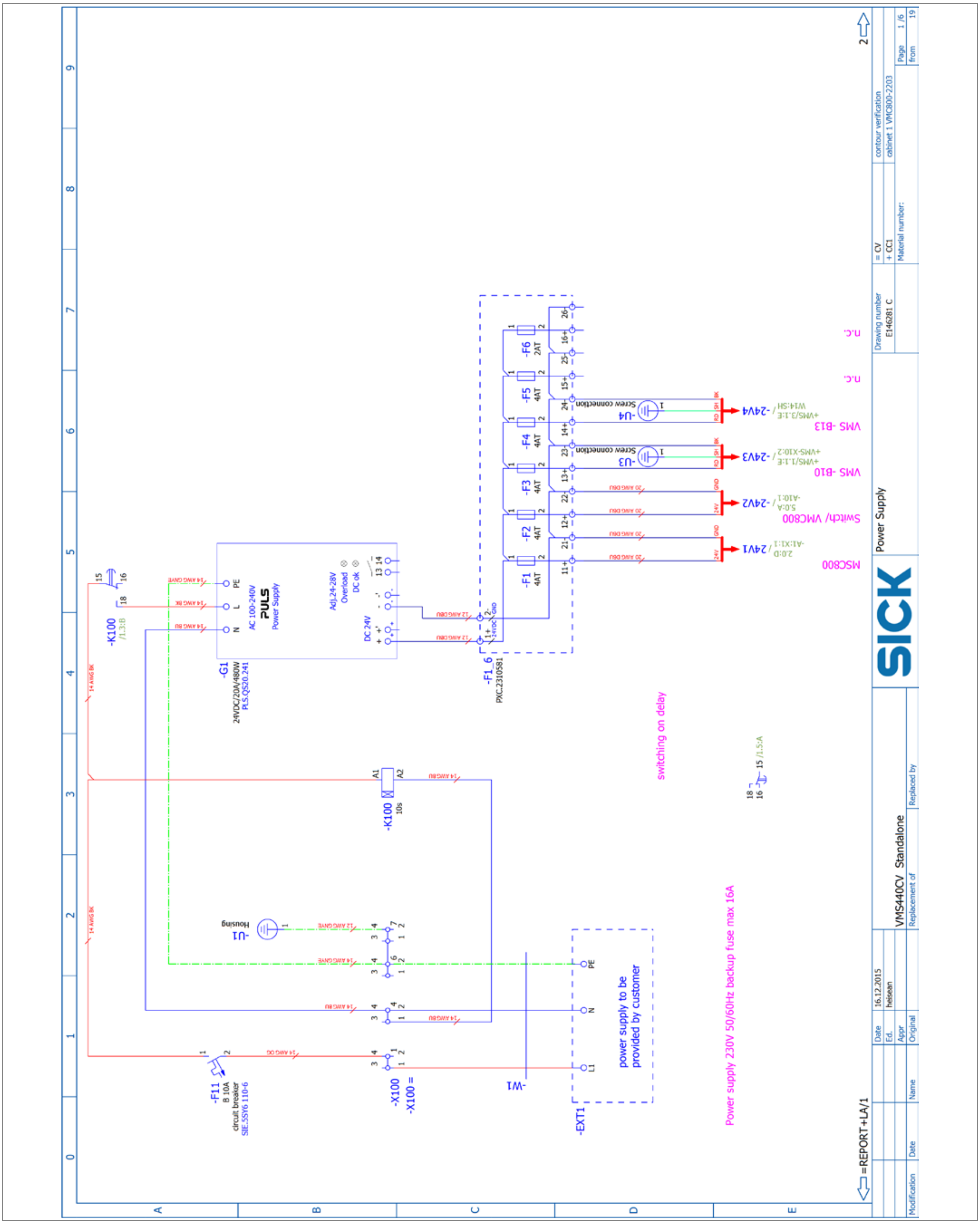
9.3 Circuit diagrams

9.3.1 Overview

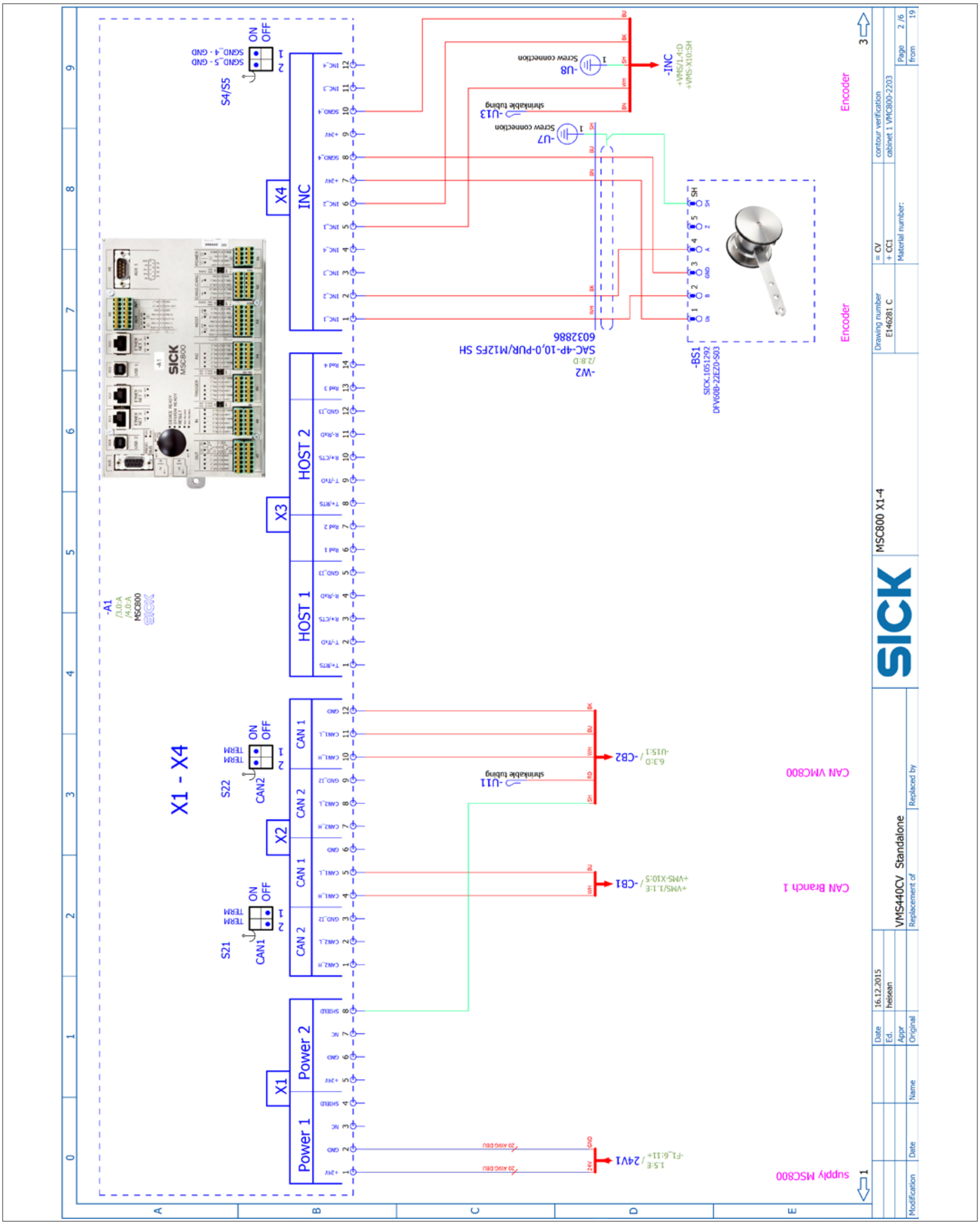


9.3.2 MSC800

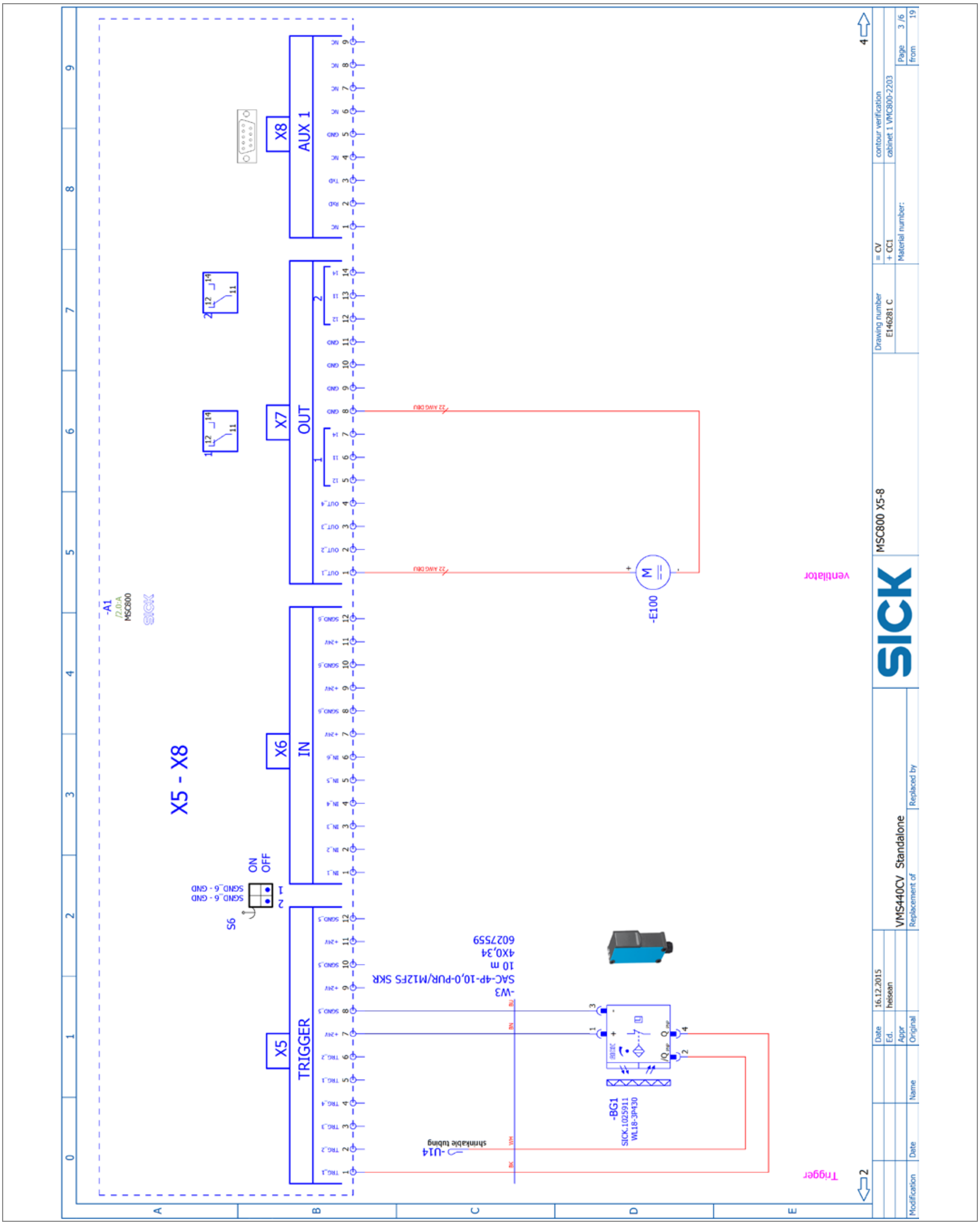
MSC800 voltage supply



MSC800 X1-4



MSC800 X5-8


X5 - X8
-A1
MSC800
X5
TRIGGER
X6
IN
X7
OUT
X8
AUX 1
S6
ON
OFF
-E100
ventilator
Trigger
-W3
SAC-4P-10,0-PUR/M12FS SKR
10 m
4X0,34
6027559
-U14
shrinkable tubing
-BG1
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WL18-3P430
SICK
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VMS440CV Standalone
Drawing number
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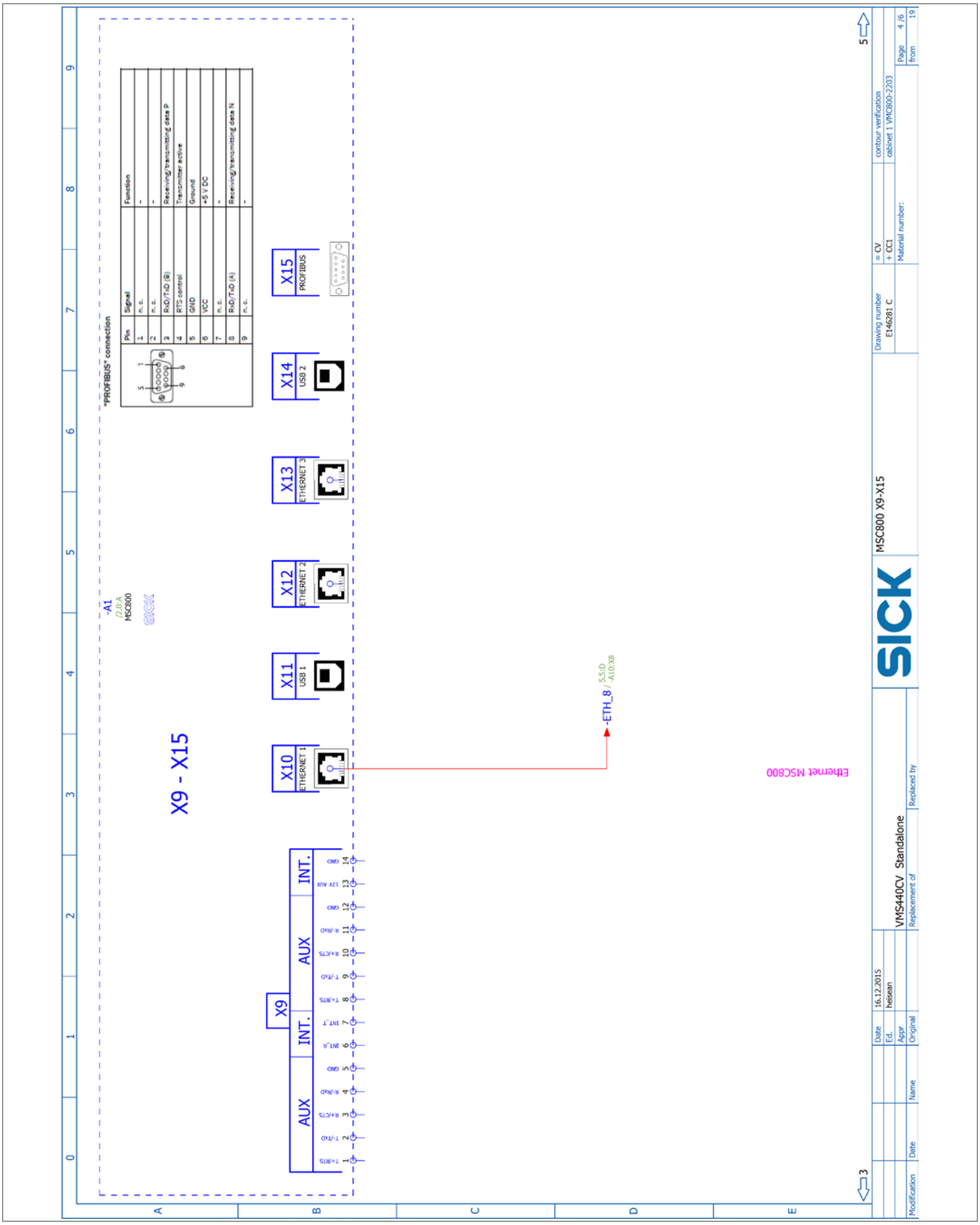
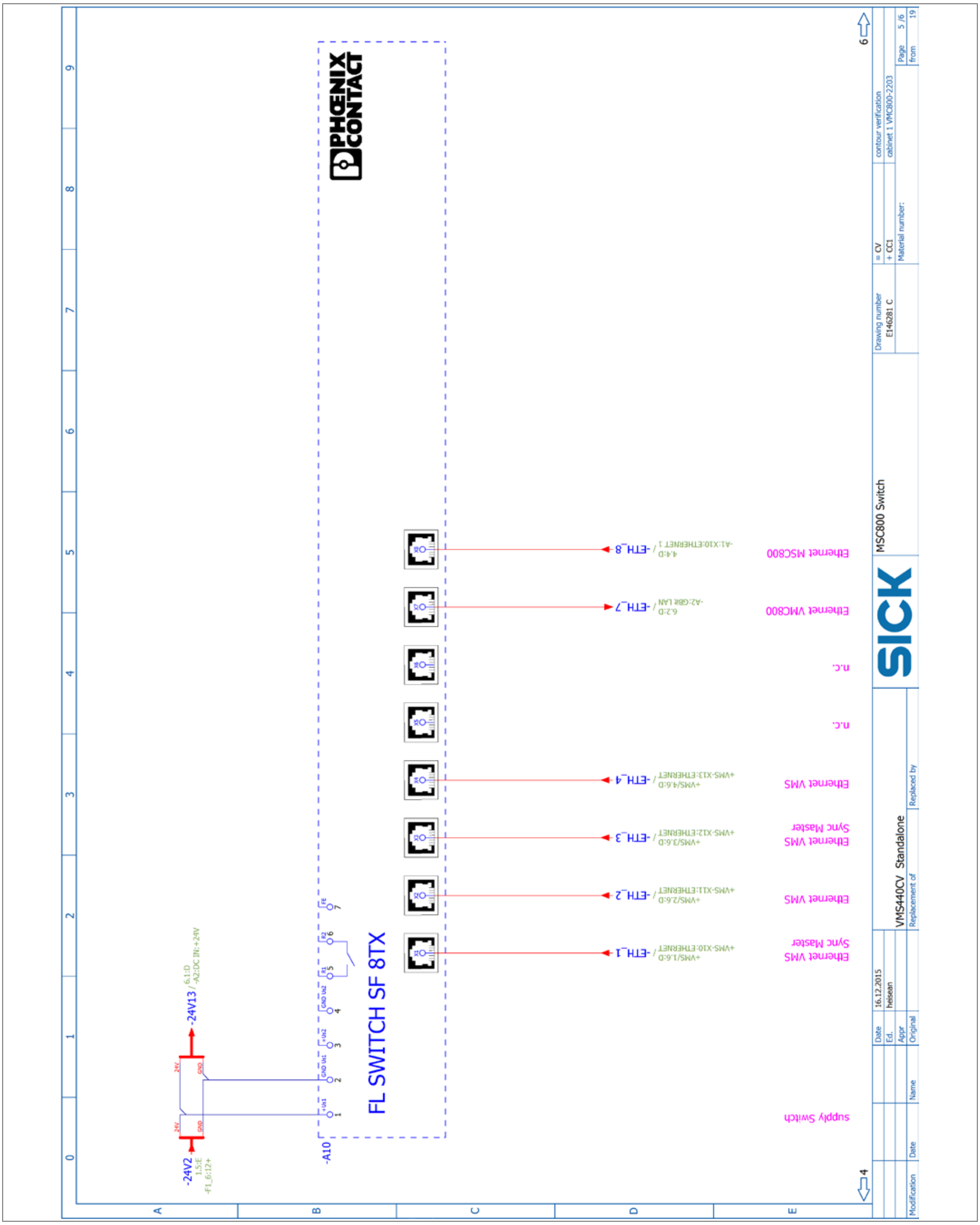
contour verification
cabinet 1 VMC800-2203
16.12.2015

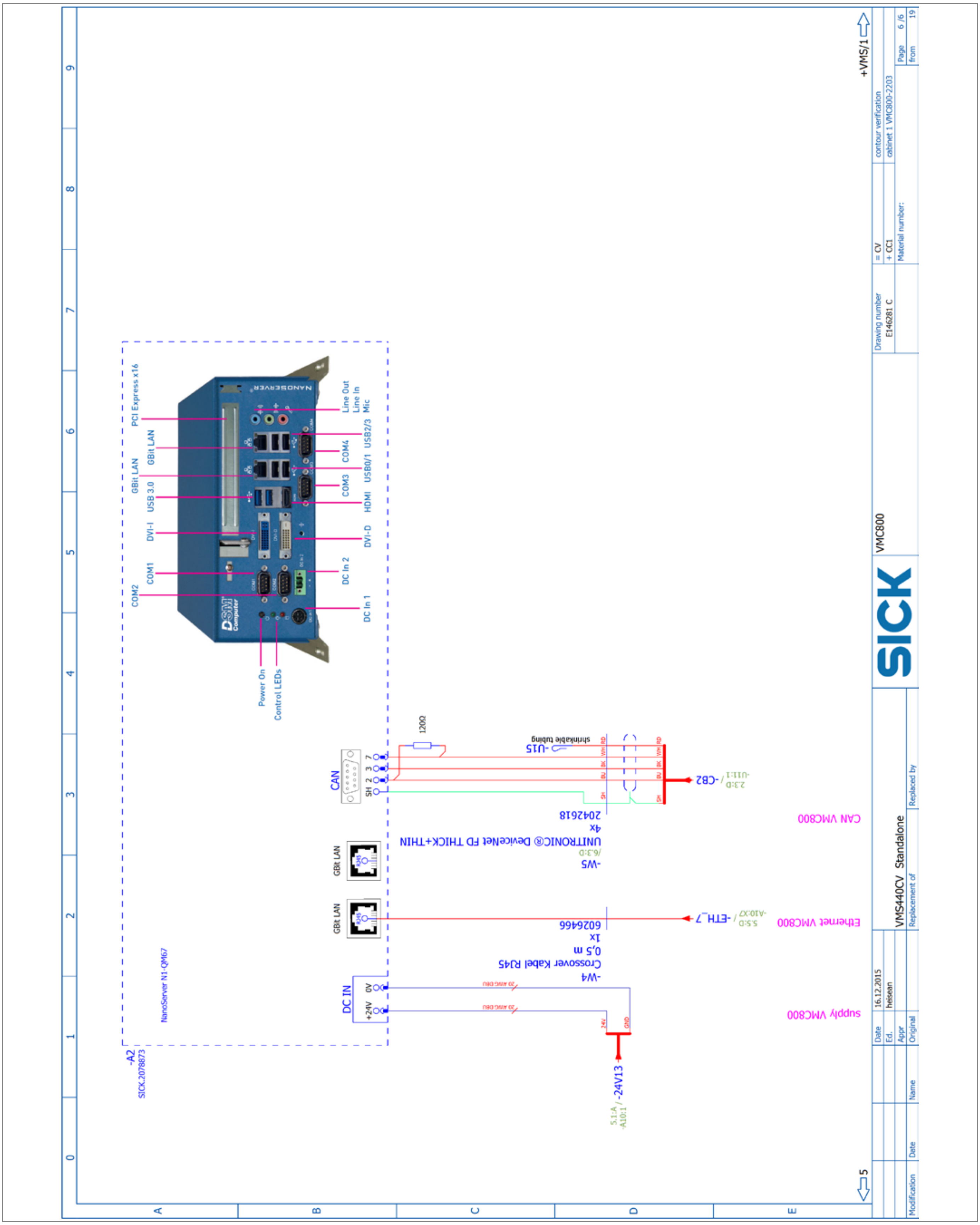
MSC800 X9-X15



MSC800 Ethernet switch



VMC800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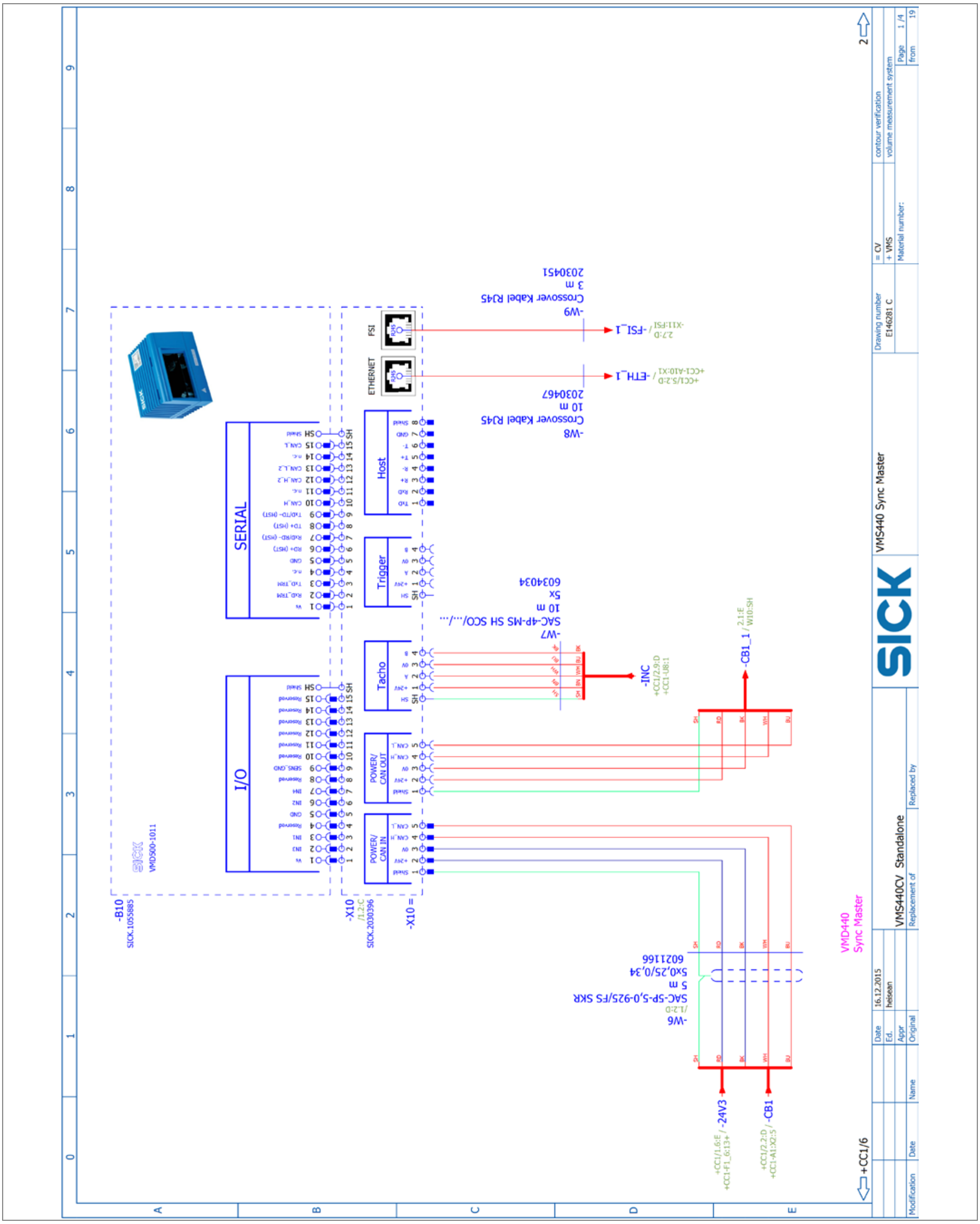
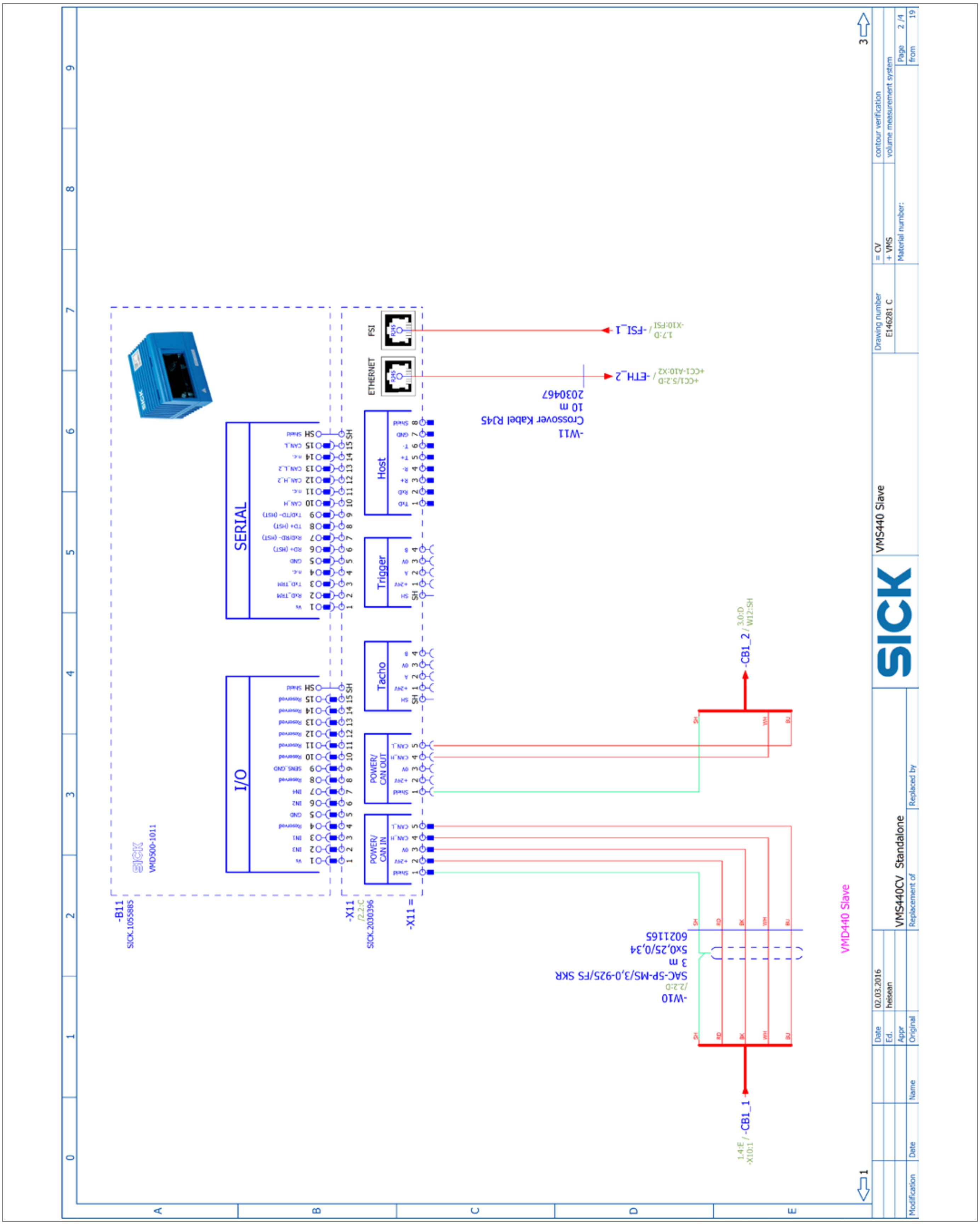
VMC800
CAN VMC800
Ethernet VMC800
supply VMC800
NanoServer N1-QM67
DC IN
GBit LAN
CAN
Drawing number
E146281 C
contour verification
cabinet 1 VMC800-2203
16.12.2015

9.3.3 VMS440 CV

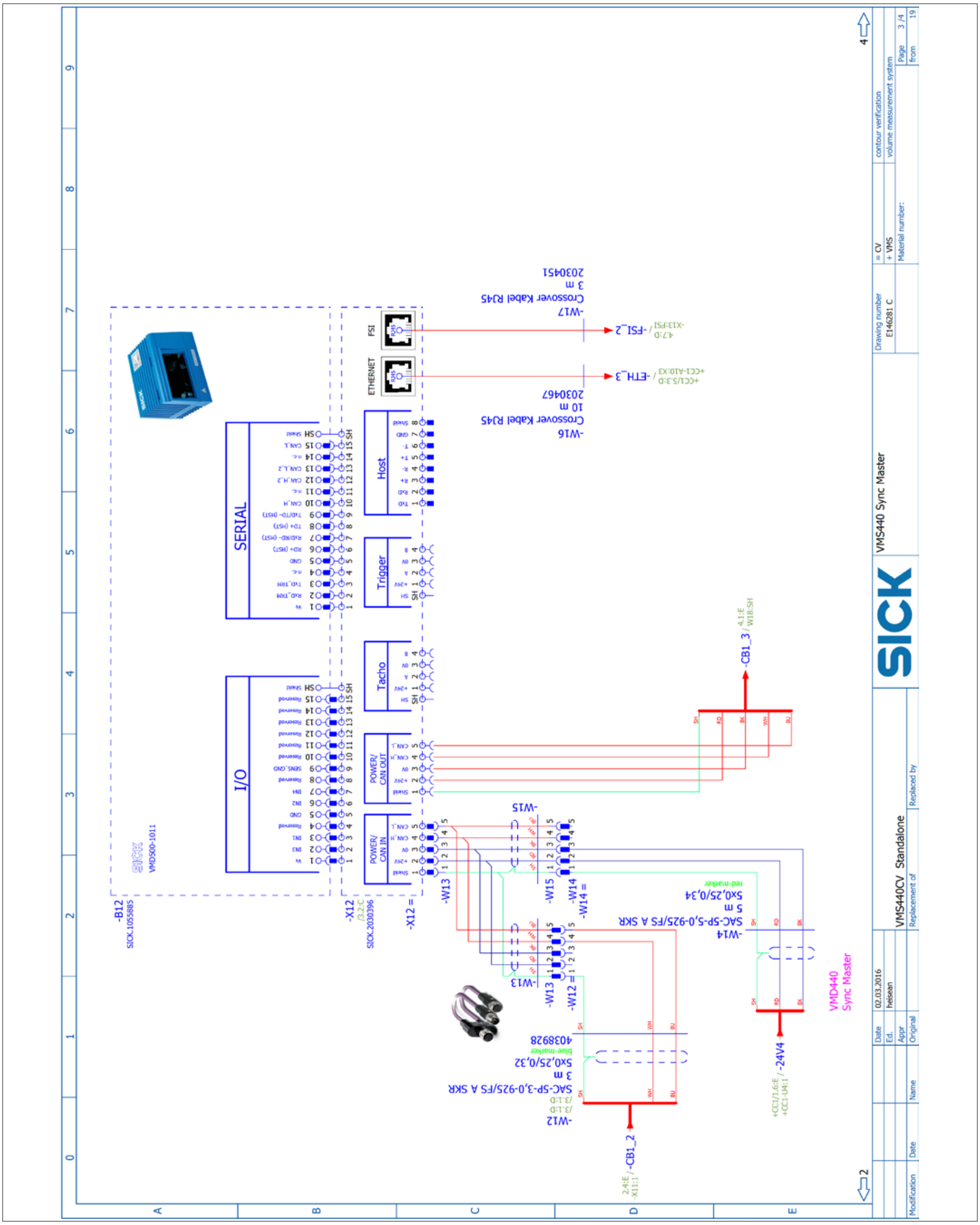
VMS440 sync master



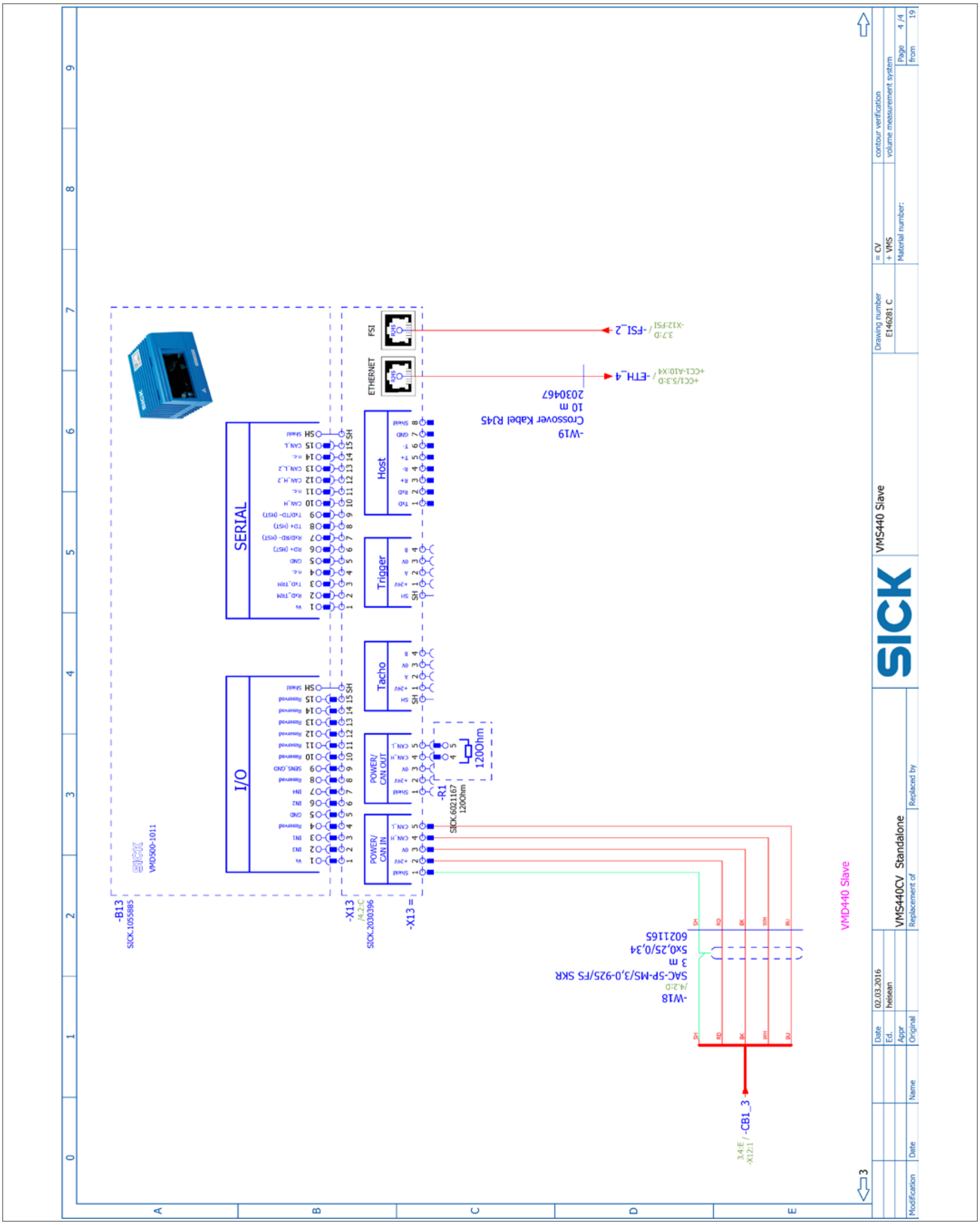
VMS440 slave



VMS440 sync master



VMS440 slave



10 Appendix

10.1 Licenses for VMC800

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10.4 Keywords index

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