TECHNICAL INFORMATION

TiM55x/TiM56x/TiM57x

RANGING LASER SCANNER

Mounting and electrical installation

SICK
Sensor Intelligence.

Described product

TiM55x/56x/57x

Manufacturer

SICK AG

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Original document

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1 About this document

This document summarizes supplementary information on **mounting** and **electrical installation** as well as **measured value output fomat** of the TiM55x/56x/57x.
It is aimed at sufficiently qualified personnel for the purposes of installation, commissioning and further data processing.

Notes on commissioning, configuration and maintenance can be found in the TiM55x/56x/57x operating instructions.

Information on the TiM55x/56x/57x can be found on the Internet on the TiM5xx product page at **www.sick.com/tim5xx**:

- Technical specifications in the online data sheet (PDF)
- Dimensional drawing and 3D CAD dimension models in various electronic formats
- Range diagram (PDF)
- EC Declaration of Conformity (PDF)
- Configuration software SOPAS ET (**www.sick.com/SOPAS_ET**)
- Product information with overview of available accessories (PDF)
- TiM5xx operation instructions (PDF) in additional languages where applicable
- This technical information (PDF)

Support is also available from your sales partner, see **www.sick.com/worldwide.**

In the following the TiM55x/56x/57x is referred to in simplified form as "TiM5xx".

Symbols used

Certain information in this documentation is emphasized as follows to enable faster access to the information:

NOTICE

Notice!

A notice indicates potentially damaging hazards or functional impairments to the TiM5xx or its connected devices.

⚠ WARNING

Warning!

A warning indicates specific or potential dangers to the user's physical integrity. It is intended to protect the user against accidents.

The safety symbol to the left of the warning indicates the type of accident hazard e.g. due to electricity. Increasing warning levels (CAUTION, WARNING, DANGER) indicate the severity of the possible hazard.

➢ Always reading warnings carefully and obey them meticulously.

Important This important notice informs you about special aspects.

This symbol refers to supplementary technical documentation.

Safety information

- Read the notes on mounting and electrical installation before carrying out these tasks.
- Read additionally the TiM5xx operating instructions to familiarize yourself with the device and its functions.
- The TiM5xx complies with laser class 1, for laser warnings see the operating instructions.
- Only use the device in permissible ambient conditions (e.g. temperature, ground potential). Any applicable legal regulations or regulations of other authorities will have to be observed during operation.
- Opening the screws of the TiM5xx housing will invalidate any warranty claims against SICK AG.
- Repairs may only be performed on the TiM5xx by trained and authorized SICK AG service personnel.
- The TiM5xx does not constitute personal protection equipment in sense of the respective applicable safety standards for machines.
- The TiM5xx must not come into contact with moisture and dust when the cover of the USB port is open and/or the USB cable is connected. In this status, the TiM5xx does not correspond to any specified IP protection class.
- For CE conformity, the maximum length of all connecting cables on the TiM5xx must not exceed 3 m.
- Turn the swivel connector with the electrical connections max 180° from end position to end position.

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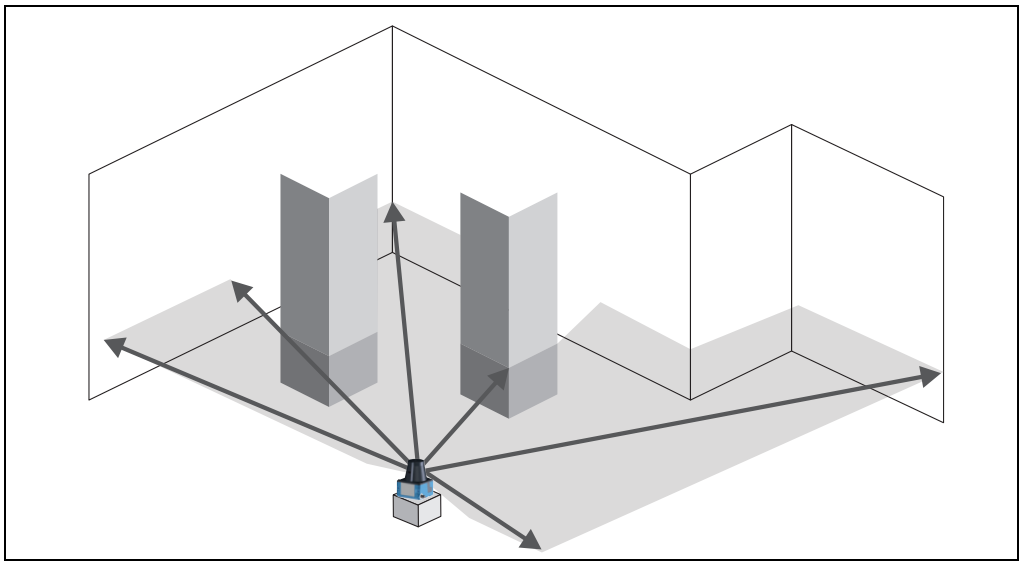
2 Operating principle of the TiM5xx

2.1 Measurement principle

The TiM5xx is an opto-electronic laser scanner that electro-sensitively scans the perimeter of its surroundings at a single plane with the aid of laser beams. The TiM5xx measures its surroundings using two-dimensional polar coordinates based on its measurement origin. This is marked on the hood in the centre using a circular indentation. If a laser beam hits an object, its position in terms of distance and direction is determined.



Scanning is performed across a 270° sector. The maximum range of the TiM5xx is max. 10 m (TiM55x/TiM56x) and 25 m (TiM57x) on light, natural surfaces with an object reflectivity > 50 % (e.g. a white house wall).

The scanning range is 8 m in the case of dark surfaces with remission of > 10%.

2.2 Distance measurement

The TiM5xx emits pulsed laser beams using a laser diode. If one of these laser pulses hits an object or a person, this is reflected at its surface. The reflection is detected in the TiM5xx's receiver by a photodiode. The TiM5xx uses HDDM technology (**H**igh **D**efinition **D**istance **M**easurement), a SICK own-development. Using this measurement method, a measured value is formed by the average value for several individual pulses. The TiM5xx calculates the distance to the object from the transit time required by the light from emission of the beam to receipt of the reflection. This principle of "time-of-flight measurement" is used by radar systems in a similar manner.

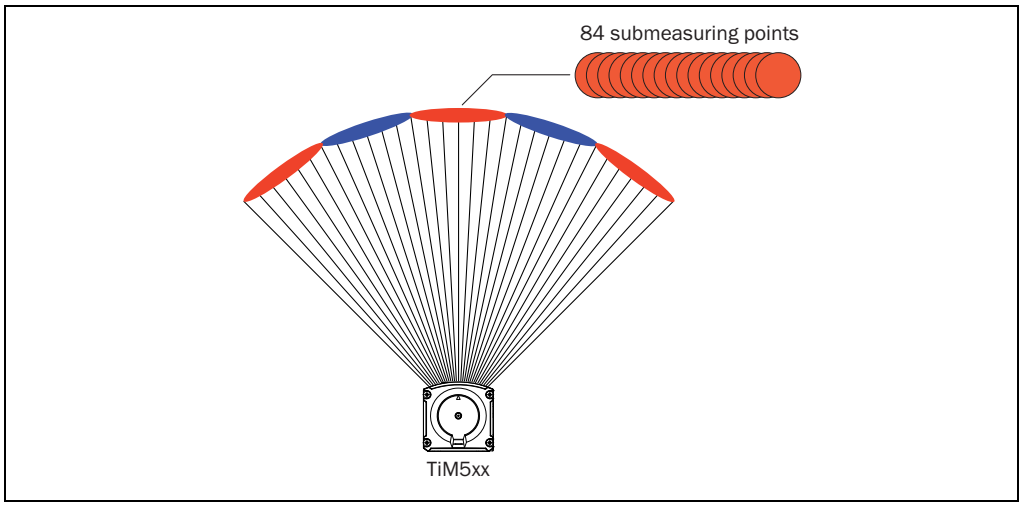
2.3 Direction measurement

The emitted laser beams are deflected by the TiM5xx using a rotating mirror and its surroundings scanned in a circular form. The measurements are triggered internally at regular angle increments using an angular encoder. One complete rotation represents one measuring process (scan).

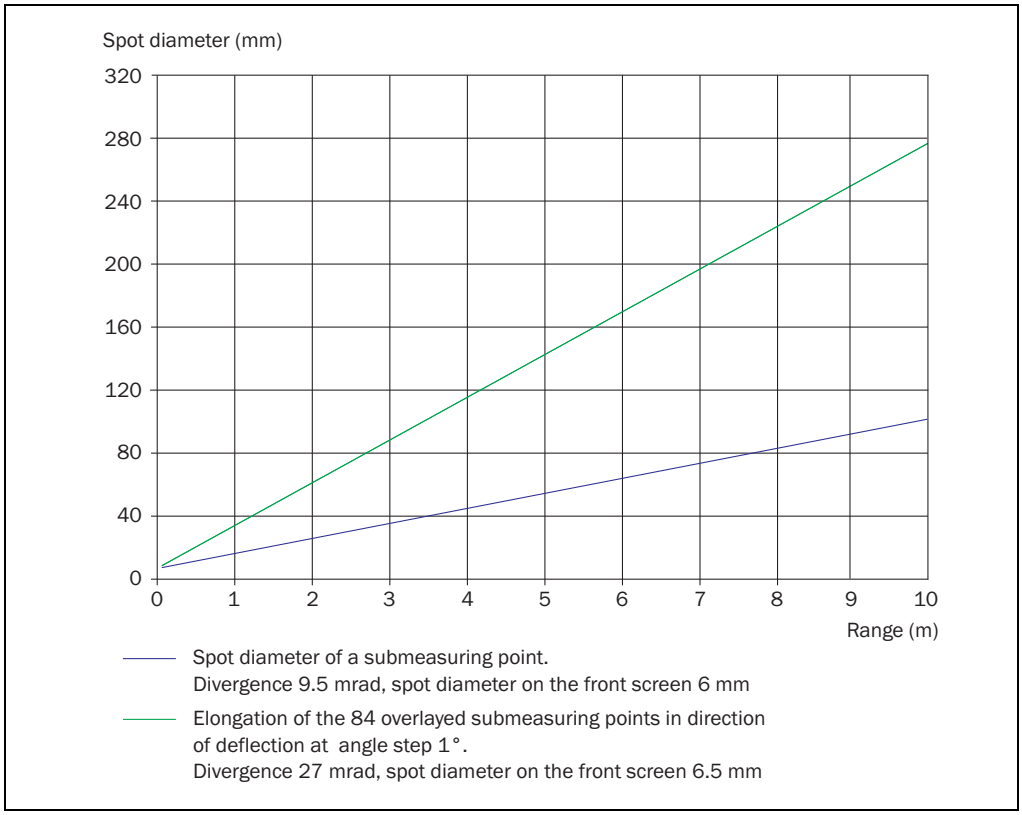
The TiM5xx works at a scanning frequency of 15 Hz, i.e. it performs 15 measuring processes per second and makes the measurement results continuously available in real time via an Ethernet interface.

The measurement method forms an average value from several pulses to determine individual measured values.

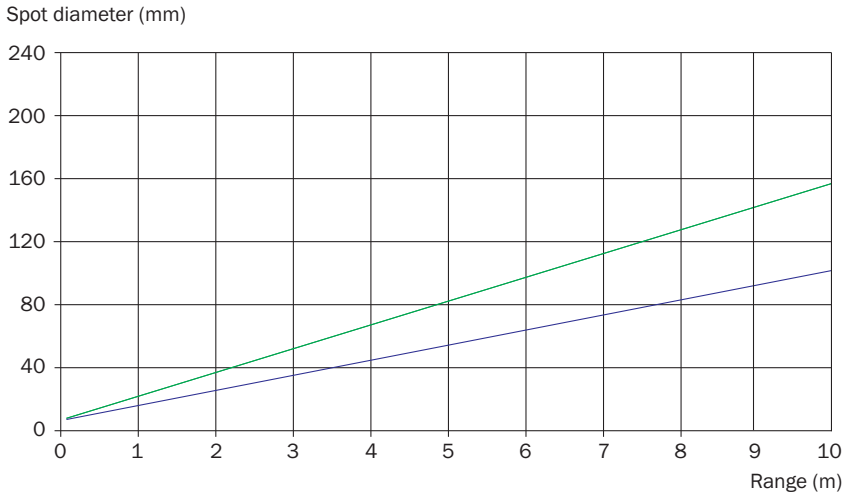
At an angle resolution of 1° (TiM55x) and 0.3° (TiM56x/TiM57x), a measuring point is formed from the average of 84 measurements.



TiM55x



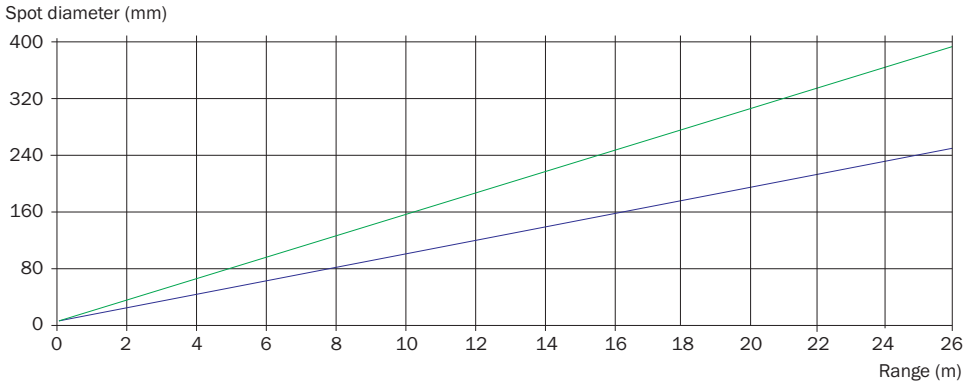
TiM56x



Spot diameter of a submeasuring point.
Divergence 9.5 mrad, spot diameter on the front screen 6 mm

Elongation of the 84 overlayed submeasuring points in direction of deflection at angle step 0.3°.
Divergence 15 mrad, spot diameter on the front screen 6.5 mm

TiM57x



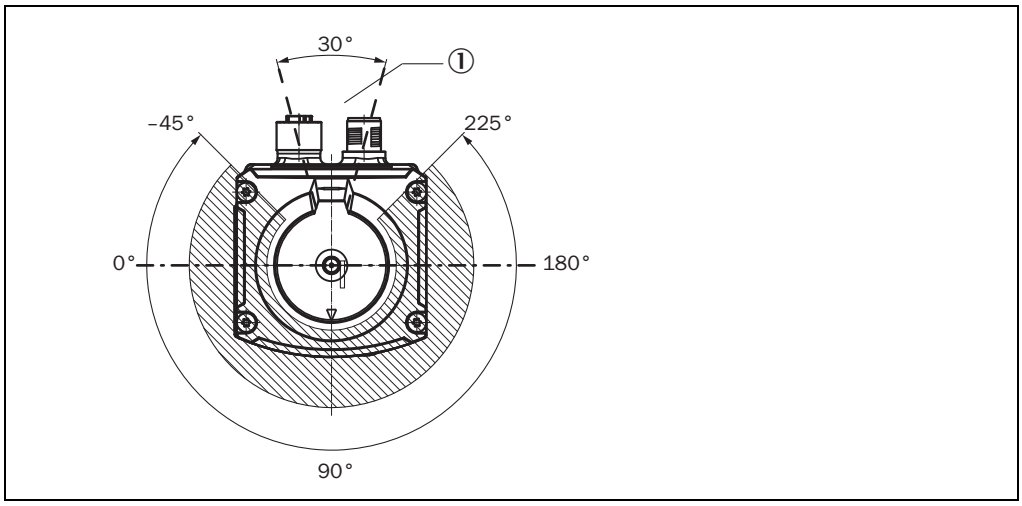
Spot diameter of a submeasuring point.
Divergence 9.6 mrad, spot diameter on the front screen 6 mm

Elongation of the 84 overlayed submeasuring points in direction of deflection at angle step 0.3°.
Divergence 15 mrad, spot diameter on the front screen 6.5 mm

3 Mounting

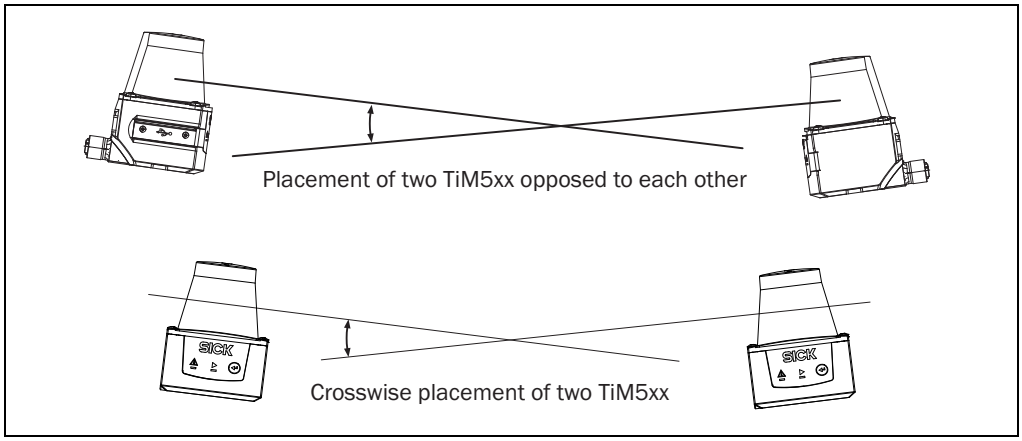
3.1 Notes on mounting

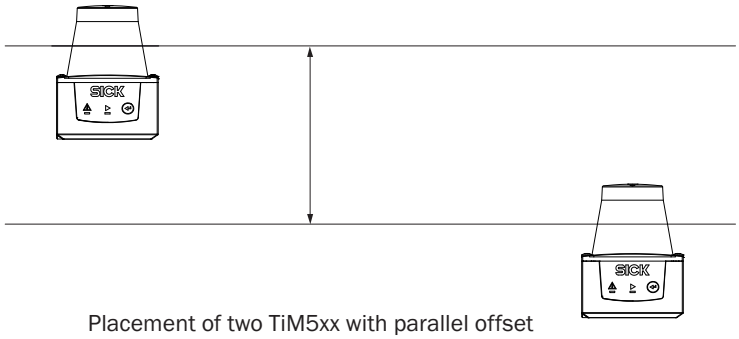
- The TiM5xx can, depending on the application purpose, be mounted in any position.
- Install the TiM5xx so it as unaffected by shocks and vibrations as possible.
- Install the TiM5xx so it is not exposed to any direct sunlight (window, skylight) or any other heat sources. This prevents impermissible temperature increases inside the device.
- During installation make sure there is no light or reflective surface behind the reference target (see Figure ①).



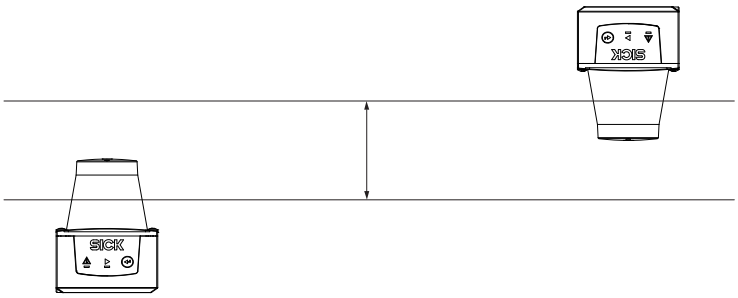
Using several TiM5xx

The TiM5xx is designed so that mutual interference of the same types of sensors is very unlikely. To preclude even the slightest of influences on the measuring accuracy, we recommend installing the TiM5xx as in the examples below.

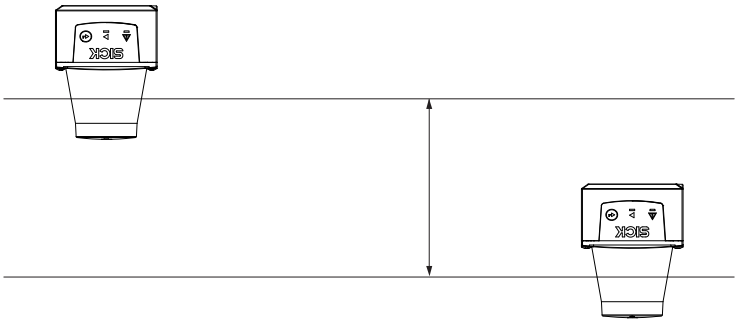




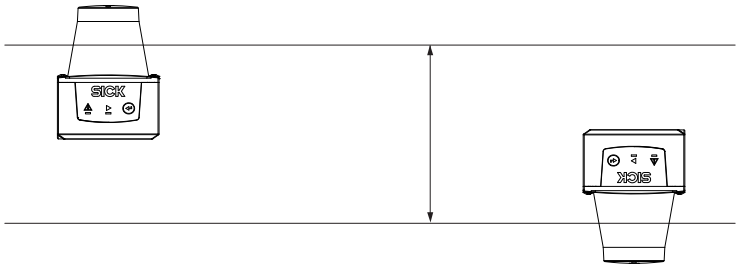
Placement of two TiM5xx with parallel offset



Placement of two TiM5xx with parallel offset, one of these upside down



Placement of two TiM5xx upside down, parallel offset

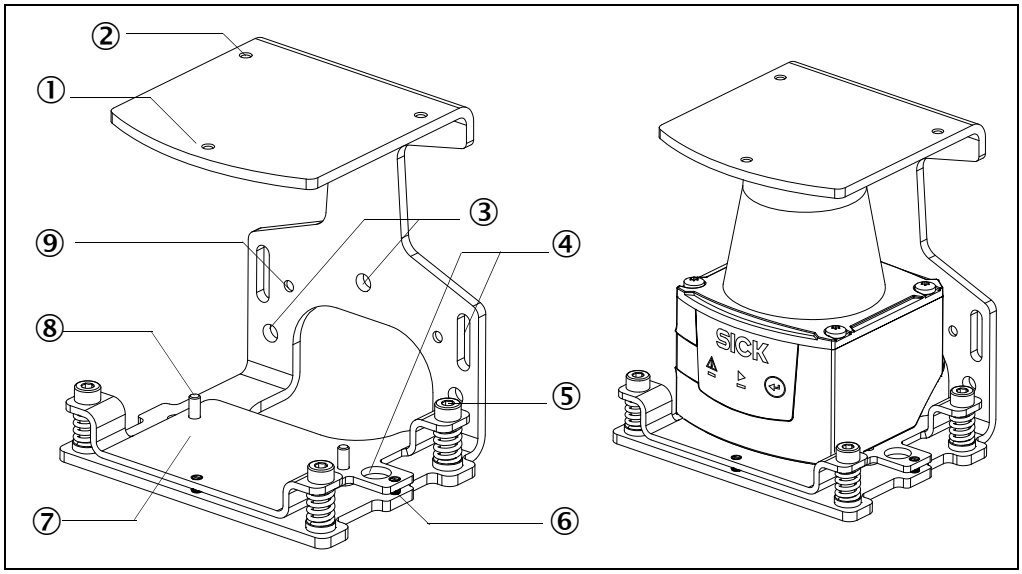


Placement of two TiM5xx with parallel offset, one of these upside down

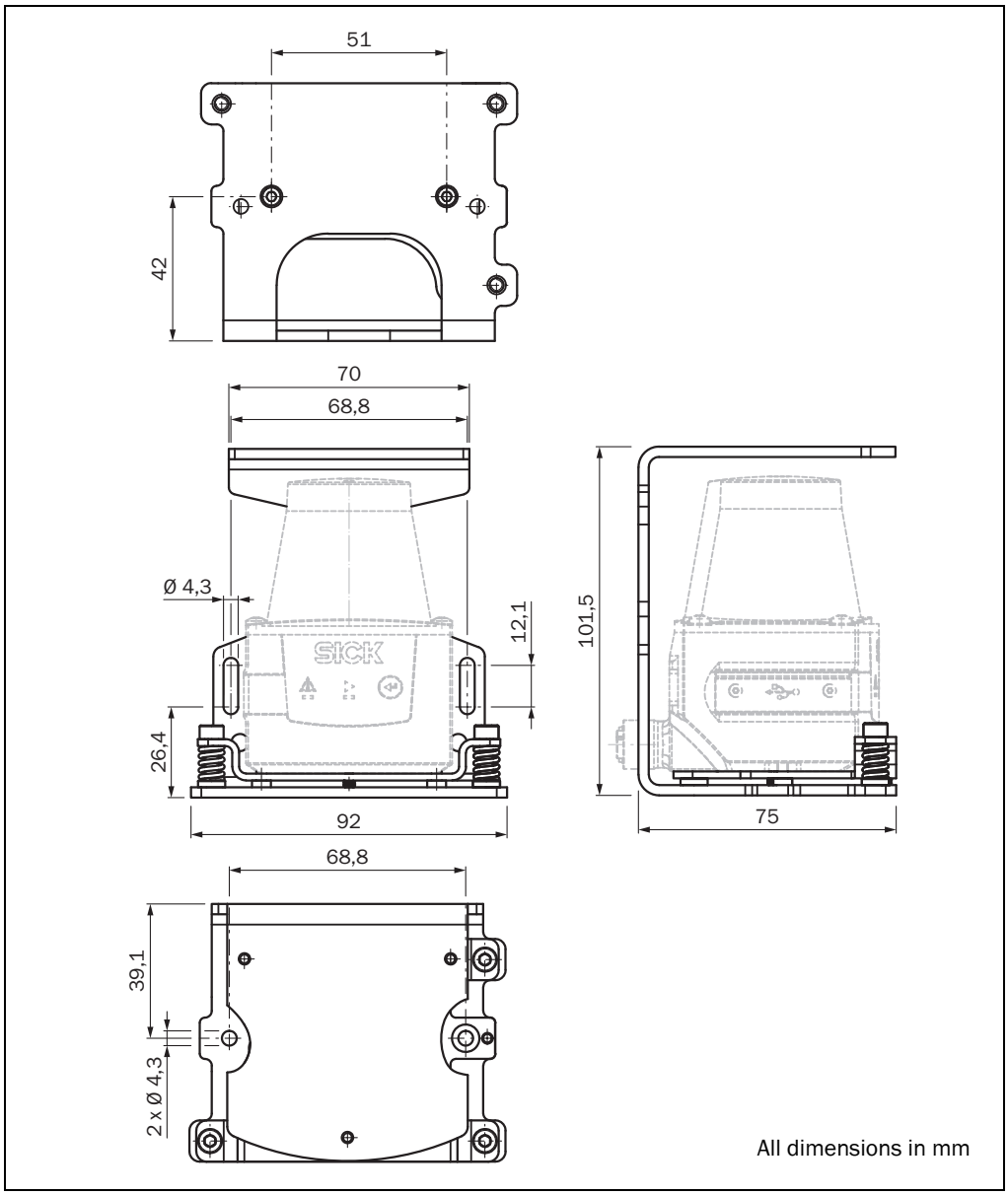
3.2 Optional accessories

3.2.1 Install mounting set 2 (part no. 2068398) on the TiM5xx

The hanger-shaped mounting set 2 is used as skirting protection and as a bracket for making fine adjustments on the scan plane. The TiM5xx can also be fastened directly onto the bracket without the adapter plate (skirting protection only).



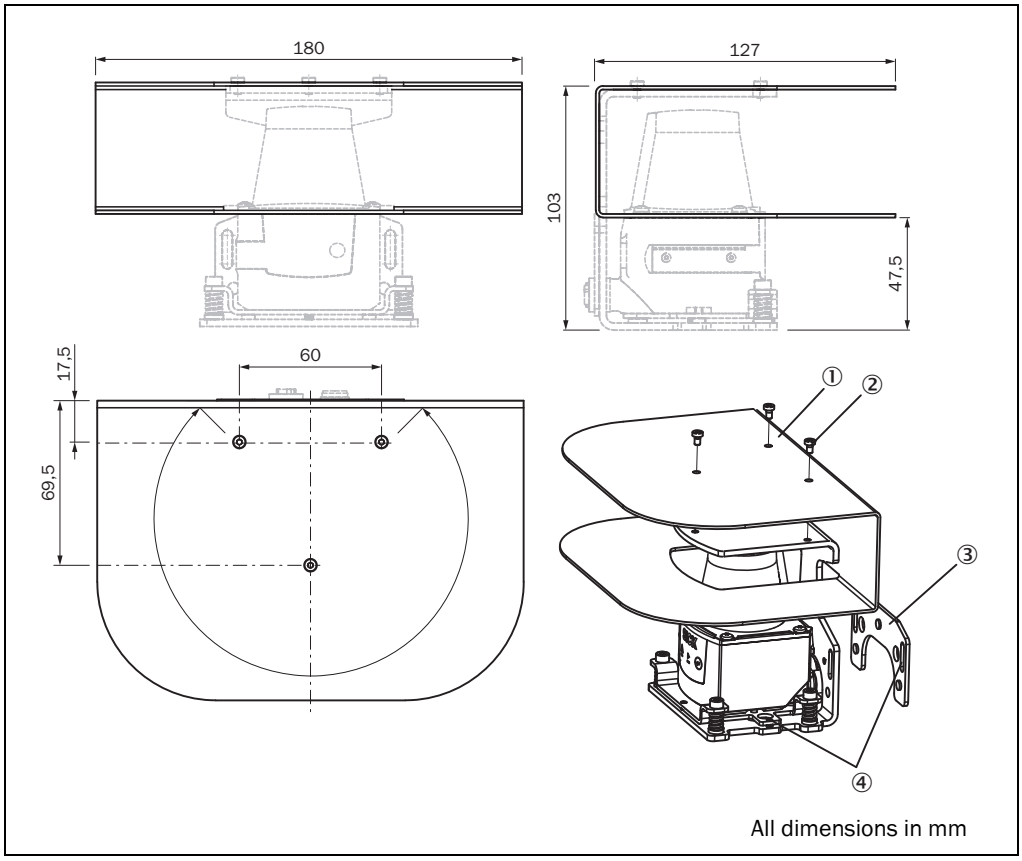
① Mounting bracket
② Hole for mounting the weatherproof housing, 3 x
③ Holes for mounting the spacer (for mounting weatherproof housing), 3 x
④ Hole for horizontal or vertical mounting of the mounting bracket on a base, 2 x 2
⑤ M4 x 16 cylinder head screw (hexagon socket) and compression spring for aligning the TiM5xx, 3 x
⑥ Stud for locking the adapter plate after alignment, 2 x
⑦ Adapter plate
⑧ M3 x 8 cylinder head screw in ∅ 3.2 mm hole for mounting the TiM5xx on the adapter plate, 2 x
⑨ Hole for mounting the TiM5xx directly on the mounting bracket, 2 x (alternatively, without the option of adjusting the scan level)



Procedure for mounting the TiM5xx

1. Mount the TiM5xx on the adapter plate using the two M3 x 8 screws supplied. To do this, insert the screws from below through the hole in the mounting bracket and the hole in the adapter plate.
2. Align the scan level of the TiM5xx using the three cylinder head screws ⑤.
3. After adjusting the adapter plate using the two studs ⑥, lock against the mounting bracket.
4. Mount the mounting bracket horizontally or vertically on a base using suitable screws ④ or mount weatherproof housing; see *Chapter Procedure for mounting the weatherproof housing, Page 13*.

Weatherproof housing



All dimensions in mm

NOTICE

Restricted scanning range!

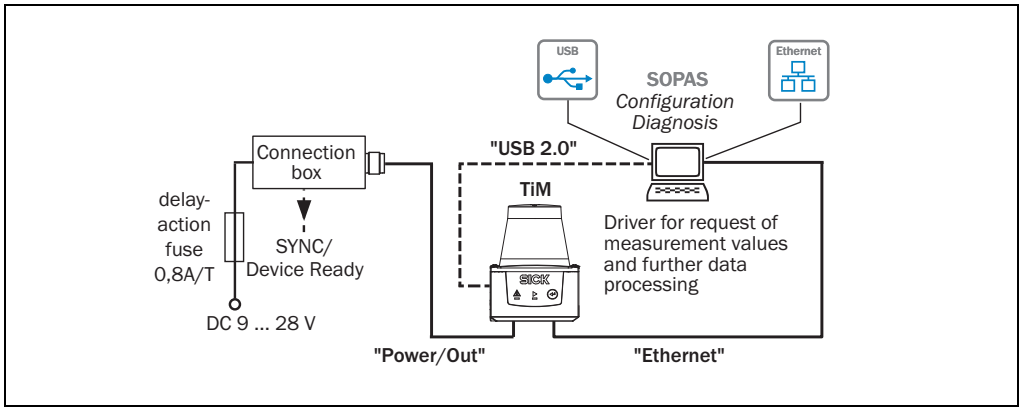
Using the weatherproof housing restricts the field of vision of the TiM5xx to a full extent of 210°.

Procedure for mounting the weatherproof housing

1. Lock and mount the TiM5xx in the mounting kit as desired; see *Chapter Procedure for mounting the TiM5xx, Page 12*.
2. Mount the spacer plate ③.
3. Slide the weatherproof housing ① over the TiM5xx in the mounting kit.
4. Secure the weatherproof housing to the TiM5xx using the fixing screws ②.
5. Mount the mounting bracket horizontally or vertically on a base using suitable screws ④.

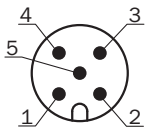
4 Electrical installation

4.1 Overview of all interfaces



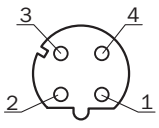
4.2 Pin and wire color assignments

"Power/Out" connection (plug, M12, 5-pin, A-coded)



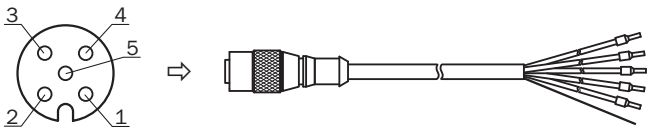
Pin	Signal	Color of wire	Function
1	DC 9 V ...28 V	Brown	Supply voltage
2	SYNC/DEVICE READY	White	Synchronization output (SYNC/Device Ready)
3	GND	Blue	Ground
4	N.c.	–	–
5	N.c.	–	
–	–	Metal	Shield
Do not connect reserved pins!			

"Ethernet" connection (socket, M12, 4-pin, D-coded), for adapter cable No. 6034415



Pin	Signal	Funktion
1	TD+ (Ethernet)	Transmitter+
2	RD+ (Ethernet)	Receiver+
3	TD– (Ethernet)	Transmitter–
4	RD– (Ethernet)	Receiver–
–	–	Shield

4.2.1 Optional accessory: adapter cabe No. 6036159 with socket, M12, 5-pin, A-coded and open end



Socket, M12, 5-pin, A-coded (front view)

Illustration may differ

Pin	Signal	Color of wire	Function
1	DC 9 V ... 28 V	Brown	Supply voltage
2	SYNC/DEVICE READY	White	Synchronization output (SYNC/Device Ready)
3	GND	Blue	Ground
4	N.c.	–	–
5	N.c.	–	–
–	–	Metal	Shield
Do not connect reserved pins!			

4.3 Notes on electrical installation

- When the cover of the USB socket is open or the USB cable is connected, the TiM5xx must not come into contact with moisture and dust. In this status, the TiM5xx does not correspond to any specified IP enclosure rating.
  Use the supplied seal for the USB connection to prevent contact with moisture and dirt.
- When operating the USB interface, ESD/EMC interferences can lead to an interruption of the USB connection. To continue with the data transfer, disconnect the USB cable from the TiM5xx and reattach it to establish contact. To re-establish communication between TiM5xx and PC, select COMMUNICATION > GO ONLINE in the SOPAS configuration software.
- Electrical connections between the TiM5xx and other devices may only be connected or disconnected when the system is not live, otherwise the devices may be damaged.
- All connection cables on the TiM5xx may not exceed a length of 3 m (9.84 ft) in order to ensure that it conforms with the CE.
- Conducting cross sections of the supply cable from the customer's power system should be selected and perform in accordance with the applicable standards.
- Protected the TiM5xx with an external 0.8 A delay-action fuse at the start of the supply cable from the point of view of the power supply.
- All electrical circuits connected to the TiM5xx must be designed as SELV or PELV electric circuits (SELV = **S**afety **E**xtra **L**ow **V**oltage, PELV = **P**rotective **E**xtra **L**ow **V**oltage).
- When setting up a startup device with a 5-pin M12 male connector, do not wire the reserved pins (e.g. as solder post)!
- Do not switch on the supply voltage for the TiM5xx until the connection work has been completed and wiring work has been checked carefully.

4.4 Prerequisites for safe operation of the TiM5xx in a system

The TiM5xx is designed and tested for electrical safety according to the standard IEC 61010-1 (ed. 3):

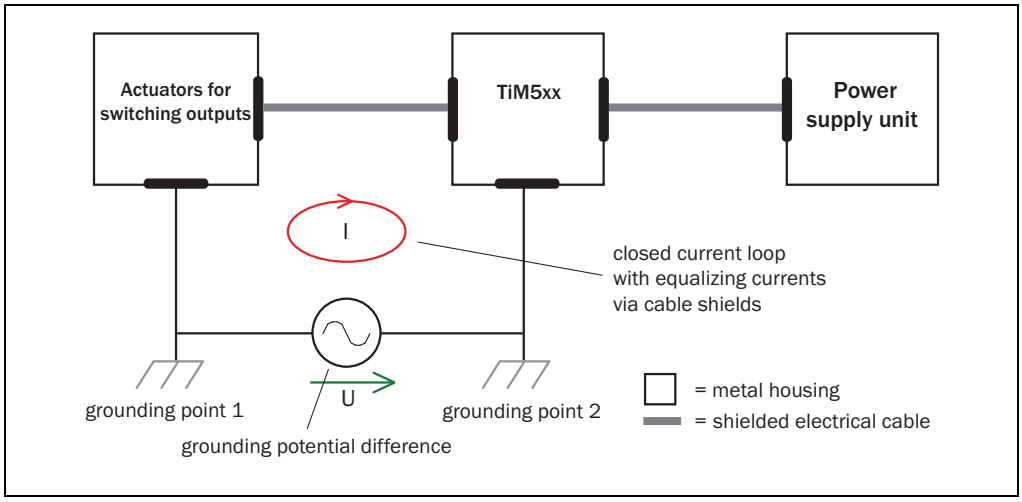
It is connected to peripheral devices (power supply, control, actuators) via shielded cables. The cable shield e.g. of the supply line is therefore flush with the metal housing of the TiM5xx. The device can either be grounded via the cable shield or via the two straight plates.

If the peripheral devices also have metal housing and if the cable shields also flush with their housing, it is assumed that all devices involved in installation have the **same ground potential**.

This is achieved by observing the following conditions for instance:

- mounting of devices on conducting metal surfaces
- professional grounding of devices/metal surfaces in the system
- low-impedance and current-conducting equipotential bonding between areas with different ground potentials if necessary.

If these conditions are not met, e.g. on devices in a widely distributed system across several buildings, equipotential bonding currents may, due to different ground potentials, flow via the cable shields between the devices, which can lead to dangers.



Insufficient ground potential equalization leads to voltage differences arising between grounding points 1 and 2. The current loop closes via the shielded cables/metal housing.

DANGER

Risk of injury/risk of damage due to electrical current!

Equipotential bonding currents between the TiM5xx and other grounded devices in the system may have the following effects:

- dangerous currents on the metal housing e.g. of the TiM5xx
- incorrect functioning or irreparable damage to the devices
- Damage/irreparable damage of the cable shield due to heating and cable fires

➢ Where local conditions are unfavorable and thus do not meet conditions for a safe earthing method (same ground potential at all grounding points), carry out the measures below.

DANGER

Risque de blessure ou d'endommagement dû au courant électrique !

Des courants d'équipotentialité entre le TiM5xx et les autres appareils mis à la terre de l'installation peuvent avoir les effets suivants :

- tensions dangereuses sur le boîtier métallique du TiM5xx par ex.
- comportement défectueux ou destruction des appareils
- endommagement ou destruction du blindage des câbles par échauffement et par combustion des câbles

➢ Prendre des mesures selon les indications suivantes là où les caractéristiques locales sont défavorables et ne permettent pas un concept de mise à la terre sûr (même potentiel de terre dans tous les points de mise à la terre).

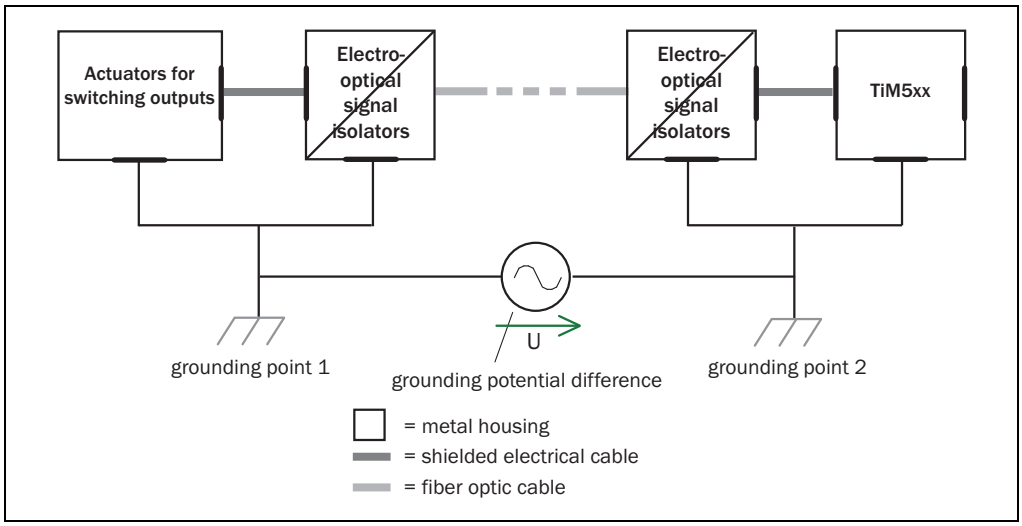
Remedial measures

The primary solution for avoiding equipotential bonding currents on the cable shields is to guarantee low-impedance and current-conducting potential equalization. If this is not possible, the following two solution approaches are intended as suggestions.

Important It is not advisable to open up the cable shields. This can cause compliance with EMC limit values for the devices to be no longer guaranteed.

a) Measures for widely distributed system installations

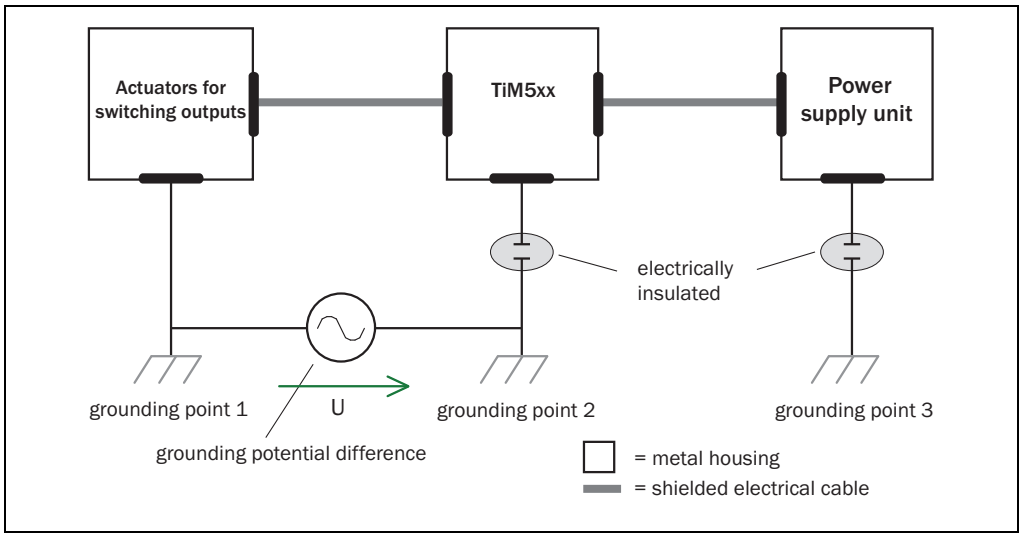
On widely distributed system installations with correspondingly large potential differences, we recommend setting up local islands and connecting them using commercially available **electro-optical signal isolators**. This will attain maximum resistance to electromagnetic interference, while observing all requirements of EN 60950-1 at the same time.



The ground loop is isolated by using the electro-optical signal isolator between the islands. Equalization currents are prevented on the cable shields within the islands by conductible equipotential bonding.

b) Measures for small system installations

For smaller installations with only slight potential differences, insulated installation of the TiM5xx and of peripheral devices may be a sufficient solution.



There is effective suppression of ground loops even at ground potential differentials of up to 60 V RMS / 80 V DC maximum. As result, equalizing currents can no longer flow via the cable shields and metal housing.

Important The power supply for the TiM5xx and the connected peripheral devices must also guarantee the required level of insulation.

Under certain circumstances, a tangible potential can develop between the insulated metal housings and the local ground potential.

Special national regulations for Sweden and Norway

Varning och atjarder

Utrustning som ar kopplad till skyddsjord via jordat vagguttag och/eller via annan utrustning och samtidigt ar kopplad till kabel-TV nat kan i vissa fall medfora risk for brand.

➢ For att undvika detta skall vid anslutning av utrustningen till kabel-TV nat galvanisk isolator finnas mellan utrustningen och kabel-TV natet.

Advarsel og tiltaker

Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr - og er tilkoplet et kabel - TV nett, kan forarsake brannfare.

➢ For a unnga dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel-TV nettet.

Corresponding English translation

Devices which are connected to the electrical system PE of the building via a mains connection or other devices with a connection to the PE, and which are connected to a cable distribution system with coaxial cables, can under certain circumstances cause a risk of fire.

➢ Connections to a cable distribution system must therefore be made such that electrical insulation is offered below a certain frequency range (galvanic separating link).

4.5 Installation steps

4.5.1 Supply voltage connection

The TiM5xx requires a supply voltage between DC 9 and 28 V (stabilized protective extra-low voltage [SELV] as per the IEC 60364-4-41 standard) .
The electricity source must be able to provide a power of 5 W at minimum.

DANGER

Risk of injury due to electrical current!

If the supply voltage is generated by extracting and converting current from the alternating current network using a stabilized power supply unit, insufficient electrical separation between the input and output circuit may lead to an electric shock.

➢ Only use a power supply unit whose output circuit has reliable electrical separation due to double insulation and a safety transformer as per IEC 742.

DANGER

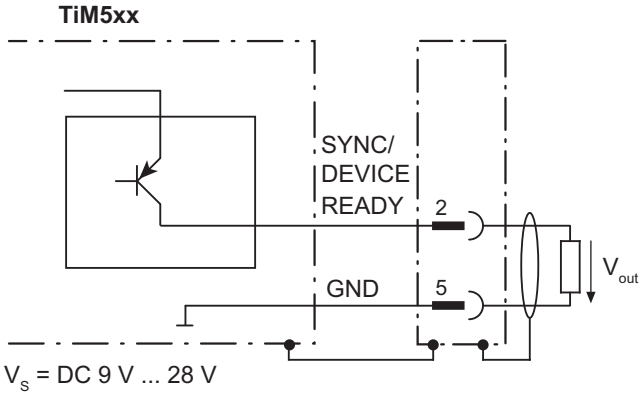
Risque de blessure dû au courant électrique !

Une séparation électrique insuffisante entre les circuits d'entrée et de sortie peut provoquer une électrocution si la tension d'alimentation est générée par le prélèvement et la conversion de courant du réseau alternatif à l'aide d'un bloc d'alimentation stabilisé.

➢ N'utiliser qu'un seul bloc d'alimentation dont le circuit de sortie, à l'opposé du circuit d'entrée, possède une séparation électrique sécurisée par une double isolation et un transformateur de sécurité selon CEI 742 (VDE 0551).

4.5.2 Wiring of output SYNC/DEVICE READY

Output SYNC/DEVICE READY is used to output the Device Ready signal, an error and a regular index pulse.



Structure and wiring principle of output SYNC/DEVICE READY (pin 2)

Switching behavior	PNP-switching against supply voltage V_S. • SYNC/DEVICE READY: Idle level: High (Device Ready), Working level: Low (error), low pulse (15 Hz, index, corresponds to measurement at 90°)
Properties	– Short-circuit resistant and temperature-protected – Not electrically isolated from the supply voltage V_S
Electrical values	$0\ V \leq V_{out} \leq V_S$ Guaranteed: $(V_S - 1.5\ V) \leq V_{out} \leq V_S$ at $I_{out} \leq 100$ mA

Important A longer connecting cable at the switching output of the TiM5xx should be avoided due to the resultant voltage drop. This is calculated as follows:

$$\Delta V = \frac{2 \times \text{length} \times \text{current}}{\text{Conductance value} \times \text{cross section}}$$

Conductance value for copper: 56 m/W mm^2.

5 Measured value output

5.1 Telegrams

Notation

The individual sections in the syntax of the telegrams from the TiM5xx are each separated by a space (ASCII code 32, 20h) as also neccessary in the request to the TiM5xx.

The TiM5xx sends measured values conditioned as followed:

- Values with a leading “+” or “–” as a decimal value (ASCII notation).
- Values without a leading “+” or “–” as a hexadecimal value (ASCII notation).
- The different notations can be mixed within the telegram.
- All following telegram examples refer to the CoLa-A protocol

Variable types

The variable types are the given in the syntax of the measuring data output telegram. The following variable types are possible:

Variable type	Length (byte)	Value range	Sign
uint_8	1	0 ... 255	No
uint_16	2	0 ... 65,535	No
uint_32	4	0 ... 4,294,967,295	No
int_32	4	–2,147,483,648 ... +2,147,483,647	Yes
float_32	4	$-10^{-44.85}$ ... $+10^{38.53}$	Yes
string	Context-dependent	Important: strings are not terminated by zeroes	

Important

- The information in the “Length” column of the table refers to the binary transfer of the numeric parameters.
- The information in the “Value range” column in the table refers to the value range mathematically possible for the variable type. The actual value ranges for the parameters may be different see also *Chapter 5.3 Measured value output fomat, Page 24*.

5.2 Request measured values

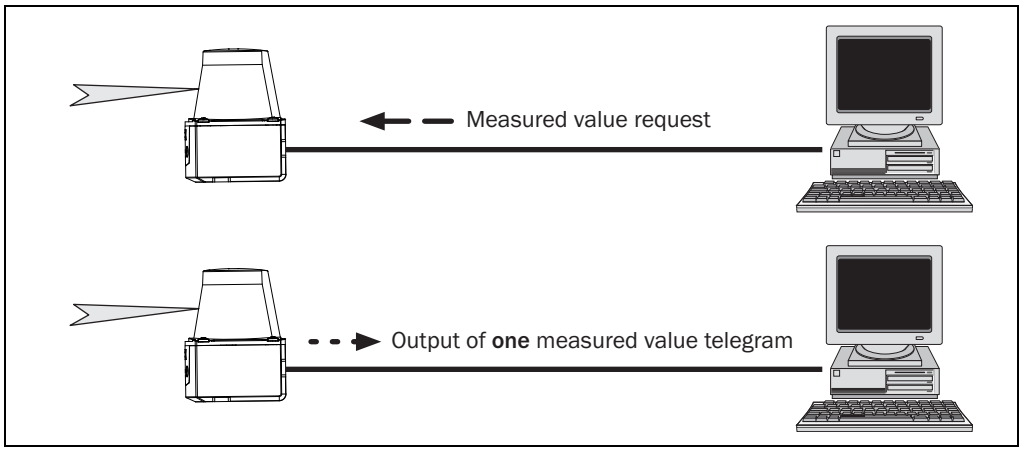
After switching on the supply voltage, the TiM5xx initializes and the green LED ▶ will light up to indicate its readiness for operation.

The TiM5xx begins its readiness to measure automatically. It continuously scans the surrounding contour in its field of vision at a frequency of 15 Hz. It continuously saves the values determined in each measuring process (scan) in its measured value memory by overwriting the previous values.

5.2.1 Single measured value output

If the data from a measuring process are required, the TiM5xx sends the measured values from the most recent scan.

Example of single measured value output



Request:

<STX>sRN LMDscandata<ETX>

Answer of TiM5xx:

<STX>sRA LMDscandata (contents see *Chapter 5.3 Measured value output fomat, Page 24*) <ETX>

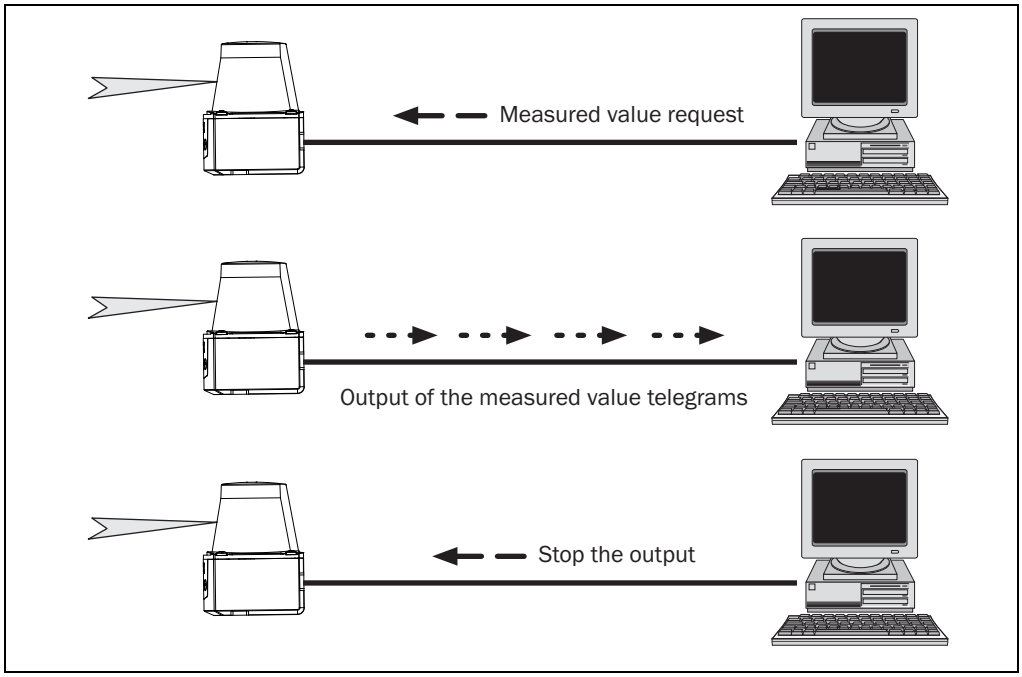
Telegram structure: **sRN LMDscandata**

Telegram part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS read by name)	string	3	**sRN**
Command	Data request	string	11	**LMDscandata**

5.2.2 Continuous measured value output

If the data from ongoing measuring processes are required, the TiM5xx sends measured values from successive scans until the output of measured values is stopped again using the same telegram.

Example of continuous measured value output



1. Start measured value output

Request:

<STX>sEN LMDscandata 1<ETX>

Answer of TiM5xx (acknowledgement of request):

<STX>sEA LMDscandata 1<ETX>

Answer of TiM5xx (measured value output):

<STX>sSN LMDscandata (contents see *Chapter 5.3 Measured value output fomat, Page 24*) <ETX>

2. Stop measured value output

Request:

<STX>sEN LMDscandata 0<ETX>

Answer of TiM5xx (acknowledgement of request):

<STX>sEA LMDscandata 0<ETX>

Telegram structure: **sEN LMDscandata** MeasurementStartStop

Telegram part	Description	Variable type	Length (byte)	Value range
Type of command	Request (SOPAS event by name)	string	3	**sEN**
Command	Data request	string	11	**LMDscandata**
MeasurementStartStop		Enum8	1	**0** Stop measured value output **1** Start measured value output

5.3 Measured value output fomat

Important Information that is grayed out in the following table is not output by the TiM5xx.

Telegram part		Description	Variable type	Length (byte)	Value range
	Type of command	Request (**S**OPAS **r**ead **a**nswer/**S**OPAS **s**ent **e**vent)	string	3	**sRA**/**sSN**
	Command	Data request	string	11	**LMDscandata**
	Version number	Firmware version information	uint_16	2	**0000h ... FFFFh**
Device information	Device number	Device ID as configured in SOPAS ET	uint_16	2	**0000h ... FFFFh**
	Serial number	Factory serial number	uint_32	4	**00000000h ... FFFFFFFFh**
	Device status	Status of the TiM5xx	uint_x	2 x 2	**00 00h** Device OK **00 01h** Device error
Status information	Telegram counter	Counter, starting at the first measured value telegram (cyclic data) after confirmation of the measured value request. When the upper limit is reached, the counter starts again at 0 (= 1st telegram).	uint_16	2	**0000h**–**FFFFFh**
	Scan counter	Counter, starting with the first scan after confirmation of the measured value request. When the upper limit is reached, the counter starts again at 0 (= 1. scan).	uint_16	2	**0000h** 0 **FFFFFh** 65,535
	Time since startup	Time since the TiM5xx was switched on and the end point of the scan in micro seconds (µs)	uint_32	4	**00000000h** 0 **FFFFFFFFh** 68.719.476.735
	Time of transmission	Time since the TiM5xx was switched on and the transfer of the measured values in micro seconds (µs)	uint_32	4	**00000000h**–**FFFFFFFFh**
	Input status	The least significant byte reflects the state of the digital switching inputs by bit. The least significant bit corresponds to input 1.	uint_x	2 x 2	**00 00h** all inputs inactive
	Output status	The least significant byte reflects the state of the digital switching outputs by bit. The least significant bit corresponds to output 1.	uint_x	2 x 2	**00 00h** all outputs inactive **00 01h** Device ready
	Reserved byte A	Reserved	uint_16	2	–

Telegram part		Description	Variable type	Length (byte)	Value range
Measurement parameters	Scanning frequency	Information in 1/100 Hz	uint_32	4	**1500** 15 Hz
	Measurement frequency	Frequency between two separate measurements in 100 Hz Spot to spot frequency. At a scan frequency of 15 Hz and angular resolution of 1° (TiM55x), the spot-to-spot frequency can be calculated as follows: 15 Hz * 360° = 5.4 kHz At a scan frequency of 15 Hz and angular resolution of 0.3° (TiM56x/TiM57x), the spot-to-spot frequency can be calculated as follows: 15 Hz * 3 *360° = 16.2 kHz	uint_32	4	**00000000h ... FFFFFFFFh** 5.4 kHz (TiM55x) / 16.2 kHz (TiM56x/ TiM57x)
Number of encoders		Defines the number of encoders from which data are output	uint_16	2	**0** No encoder data (can not be changed)
Encoder	Encoder position	Information in ticks	uint_32	4	**00000000h ... FFFFFFFFh**
	Encoder speed	Information in mm/s	uint_16	2	**0000h ... FFFFh**
Number of 16 bit channels		Defines the number of 16-bit output channels on which the TiM5xx outputs measured data. If “0 output channels” are selected, no data is output.	uint_16	2	**1** The TiM5xx sends the distance data as 16 bit value via one channel
Output channels 1 ... 4 (16 bit)	Measured data contents	The telegram part defines the contents of the output channel.	string	5	**DIST1** Radial distance for the first echo
	Scaling factor	Multiplier for the values in the telegram parts Data_1 to Data_n	Real	4	**00000000h ... FFFFFFFFh**
	Scaling offset	For the TiM5xx always 0	Real	4	**00000000h ... FFFFFFFFh**
	Starting angle	Information 1/10,000 degree	Int_32	4	–450,000 ... + 2,250,000
	Angular step width	Information 1/10,000 degree	uint_16	2	10,000
	Number of data	Defines the number measured values the TiM5xx outputs	uint_16	2	91
	Data_1 ... Data_n	Output of the measured values 1 to n. The contents and the unit depend on the telegram part “Measured data contents”. DIST in mm	uint_16	2	**0000h ... FFFFh**
Number of 8 bit channels		Defines the number of 8-bit output channels on which the TiM5xx outputs measured data. If “0 output channels” are selected, no data is output.	uint_16	2	**1** as The TiM5xx sends the RSSI data 8 bit value via one channel

(contd.)

Telegram part		Description	Variable type	Length (byte)	Value range
Position		Defines the output of position data	uint_16	2	**0** No position data (can not be changed)
Position information	X position	XN coordinate of the sensor in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	Y position	YN coordinate of the sensor in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	Z position	ZN coordinate of the sensor in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	X rotation	XN rotation of the sensor in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	Y rotation	YN rotation of the sensor in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	Z rotation	ZN rotation of the sensor in a coordinate system	Real	4	00000000h ... FFFFFFFFh
	Type of rotation	Kind of rotation	Enum8	1	**0** No rotation **1** Pitching **2** Rolling **3** Free rotation
Name		Defines whether the TiM5xx outputs the device name configured with SOPAS ET	uint_16	2	**0** No device name **1** Device name (can be changed)
	Device name	Flexible range from 0 to 16 characters (20h ... FFh)	string	0 ... 16	.....
Comment		Defines whether the TiM5xx outputs the comment configured with SOPAS ET	uint_16	2	**0** No comment (can not be changed)
	Contents of comment	Configured comment	string	0 ... 128	.....
RSSI = Received Signal Strength Indicator					
Time information		Defines whether the TiM5xx outputs time information	uint_16	2	**0** No time information (can not be changed)
Time information	Year	Year (4 digits)	uint_16	2	0000h ... 270Fh
	Month	Month from 1 to 12	uint_8	1	00h ... 0Ch
	Day	Day of the month from 1 to 31	uint_8	1	00h ... 1Fh
	Hour	Hour from 0 to 23	uint_8	1	00h ... 17h
	Minute	Minute from 0 to 59	uint_8	1	00h ... 3Bh
	Second	Second from 0 to 59	uint_8	1	00h ... 3Bh
	Micro second	Micro seconds from 0 to 999,999	uint_32	4	00000000h ... 000F423Fh

(contd.)

Telegram part		Description	Variable type	Length (byte)	Value range
Event information		Defines whether the TiM5xx outputs event information	unit_16	2	**0** No event information (can not be changed)
Event information	Type of event	Fast digital input event	string	4	FDIN
	Encoder position	Encoder position at the time of the event. Information in ticks	uint_32	4	**00000000h ... FFFFFFFFh**
	Event time	Time since the TiM5xx was switched on up to the time of the event in micro second (µs)	uint_32	4	**00000000h** 0 **FFFFFFFFh** 68,719,476,735
	Angular position	Angular position of the TiM5xx at the time of the event. Information in 1/10,000 degree	int_32	4	–450,000 ... + 2,250,000

(contd.)

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