DS4 BASE

PRODUCT REFERENCE GUIDE

Measurement and Detection Light Curtains

DATASENSING

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This product is covered by one or more of the following patents:

Utility patents: IT1363719, IT1427575, US10188007

ORIGINAL INSTRUCTIONS (ref. 2006/42/EC)

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PREFACE

ABOUT THIS MANUAL

This Product Reference Guide (PRG) is provided for users seeking advanced technical information, including connection, programming, maintenance and specifications. The Quick Reference Guide (QRG) and other publications associated with this product can be downloaded free of charge from the website listed on the back cover of this manual.

Manual Conventions

The symbols listed below are used in this manual to notify the reader of key issues or procedures that must be observed when using the product:

NOTE: Notes contain information necessary for properly diagnosing, repairing and operating the light curtain.

CAUTION: This symbol advises you of actions that could damage equipment or property.

WARNING: This symbol advises you of actions that could result in harm or injury to the person performing the task.

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CHAPTER 1
GENERAL INFORMATION

GENERAL DESCRIPTION

The measurement light curtains - DS4 Series - are optoelectronic multi-beam devices that are used to measure or detect material being worked in automatic machines or automation lines.

The light grids of the DS4 Series are manufactured in accordance with the international Standards in force and in particular:

NORM	DESCRIPTION
EN IEC 60947-5-2: 2020	Low voltage proximity devices.
EN IEC 60947-5-7:2024	Proximity switches: requirements for proximity switches with analogue output.

The device, consisting in one emitting and one receiving unit housed inside strong aluminum profiles, generates infrared beams that detect any opaque object positioned within the light curtain detection field.

Additionally, Standard DS4 models are also capable of detecting partially transparent objects thanks to a precise emission power/reception gain automatic regulation from a gain teach procedure.

Emitting and the receiving units can be parametrized either by simple wire connections (Base models only) or through a Graphical User Interface running on PC (Windows) or mobile devices (Android, iOS) connecting to the device via an embedded Wi-Fi interface (Standard models only). All models, however, can be parameterized via the IO-link interface.

Electrical connections are made through pig-tails which provides one or two M12 standard connectors: the first can be 5 (all emitter and base model's receiver units) or 8 pins (standard model's receiver unit); the second (always 4 pins M12 D-coded) connector provides Ethernet TCP/IP 10/100Mbps interface.

The synchronization between the emitter and the receiver can take place either optically (only option for Base Models, selectable on Standard models) or by a single wire connection.

DS light curtains provides a variety of output interface, ranging from standard digital and analog outputs (Base models) to flexible and configurable digital/analog outputs plus RS485 and Ethernet interface (Standard models).

Standard models also provide up to three digital inputs to use as measurement triggers or teach inputs for auto-sensitivity, pattern matching or blanking functions.

The units consist of modular opto-electronic elements which can be chained to obtain monitored heights from 300 mm up to 3000 mm[1].

Receiver part is the main controller of all function, it drives the optic scan and compute all measurement and advanced functions. It also triggers TX emission cycle when using wire sync.

1. Depending on model.

MODEL DESCRIPTION

DS4 measurement light curtains are described by their model description which indicates the characteristics listed in the diagram below. Not all combinations are available. For a complete list of combinations see the models tab on the product page of the website.

DS4-xx-xxxx-xxx-Jx

Detection Capability
05 = 5 mm
10 = 10 mm
25 = 25 mm

Measurement height
0300 = 300 mm
to
3000 = 3000 mm

Functionality Package
B = Base
S = Standard

Output type
A = Analog Voltage + IO-Link/SIO
Z = Analog configurable, IO-Link/SIO,
      Configurable I/O, RS485
E = Ethernet

Rx main connector
05 = M12 5 pin
08 = M12 8 pin
12 = M12 8 pin + M12 4 pin
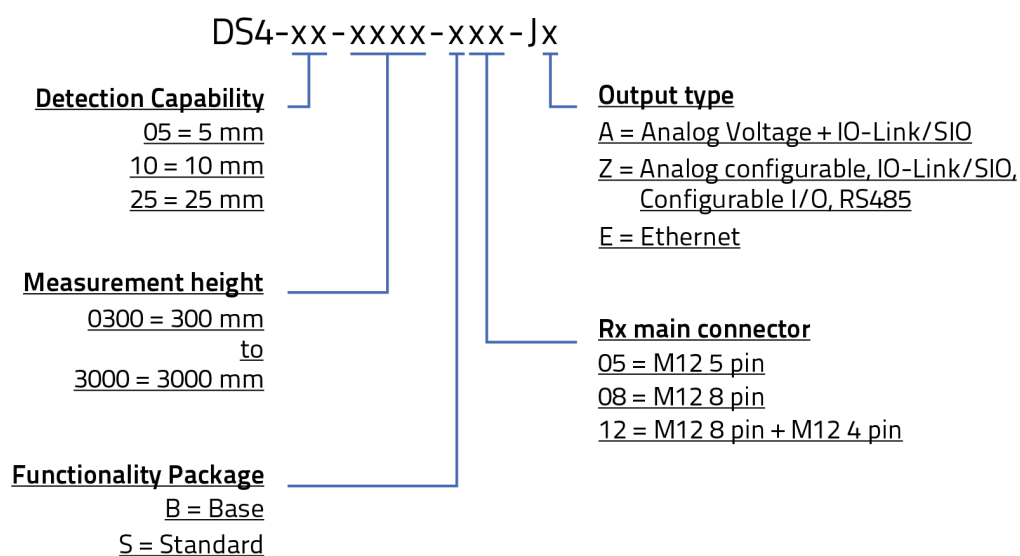
BASE	STANDARD	STANDARD ETHERNET
FUNCTION		
Fixed Receiver Sensitivity	Adjustable/Automatic Receiver Sensivity	
Low/High Emission Power	Selectable/Automatic Emission Power	
Parallel Beam Scan Mode	Selectable Beam Scan Mode	
Multiple Scan Filter (IOL)	Multiple Scan Filter	
Basic Analog Output	Fully customizable Analog Output	
Basic single Digital Output	Up to 3 customizable Digital Output	
Basic IO-Link Interface	Advanced IO-Link Interface	
	I/O Manager	
	Pattern Match	
	Blanking	
	Serial Output RS485	
		Ethernet Output
CONFIGURATION		
By wiring / IO-Link	By APP via Wi-Fi / IO-Link	

NOTE: This Product Reference Guide describes the Base models. For Standard models refer to relative Product Reference Guide.

COMPLIANCE

European Declaration of Conformity

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UKCA Declaration of Conformity

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CHAPTER 2
INSTALLATION

PACKAGE CONTENTS

Package contains the following objects:

- Receiver (RX) for DS4-xx-xxxx-xxx-Jx models
- Emitter (TX) for DS4-xx-xxxx-xxx-Jx models
- Quick Guide of measurement and detection light curtain
- Angled fixing brackets and specific fasteners

PRECAUTIONS TO BE OBSERVED FOR THE CHOICE AND INSTALLATION

NOTE: The dimension of the smallest object to be detected should not to be lower than the resolution level of the device.

NOTE: The DS4 must be installed in a place compatible with the technical characteristics of the light grids (see "Technical Data" appendix)

NOTE: Avoid installation near very intense and/or flashing light sources, in particular near the receiver unit.

NOTE: Strong electromagnetic interference can compromise the correct functioning of the device. Please contact Technical Service when this problem occurs.

NOTE: The operating distance of the device can be reduced in the presence of smog, fog or airborne dust.

NOTE: A sudden change in environment temperature, with very low minimum peaks, can generate a small condensation layer on the lenses and jeopardize functioning.

NOTE: Relevant variations of the power supply can reduce the operating distance of the device.

HOW TO CHOOSE THE DEVICE

There are at least three different main characteristics that should be considered when choosing a dimensional light curtain.

Height of the measurement zone

The controlled height is the height measured by the dimensional light curtain.

In DS4 Measured Height is equal to device total length: no dead zone is present.
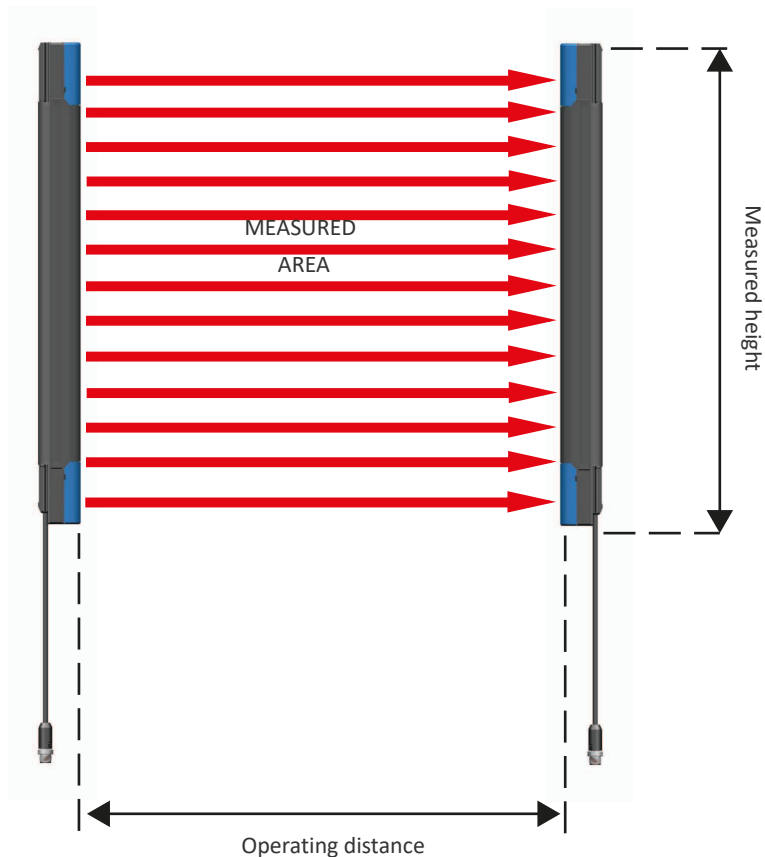
Figure 1: Measured zone

Referring to the figure above the measured height is reported in the table here below.

MODEL	MEASURED HEIGHT (mm)
DS4-xx-0300-Bxx-JA	300
DS4-xx-0450-Bxx-JA	450
DS4-xx-0600-Bxx-JA	600
DS4-xx-0750-Bxx-JA	750
DS4-xx-0900-Bxx-JA	900
DS4-xx-1050-Bxx-JA	1050
DS4-xx-1200-Bxx-JA	1200
DS4-xx-1350-Bxx-JA	1350
DS4-xx-1500-Bxx-JA	1500

GENERAL INFORMATION ON DEVICE POSITIONING

NOTE: Align the receiver (RX) and transmitter (TX) units in order that they are the most parallel possible. Verify that the green receiver LED is on (stability condition), otherwise slight adjustments of both units have to be made in order to reach the stability position.

NOTE: Fix the receiver and emitter units on rigid supports not conditioned by strong vibrations using specific fixing brackets (see chapter "Mechanical mounting").

NOTE: Check that the distance between the receiver and emitter units is within the device operating distances in use (see Appendix A - Technical Data)

Minimum installation distance

The minimum installation distance corresponds to the minimum operating distance = 0.2 m.

> **NOTE: Check that the distance between the receiver and emitter units is within the device operating distances in use (see Appendix A – Technical Data)**

Minimum distance from reflecting surfaces

Reflecting surfaces placed near light beams of the DS4 device (over, under or laterally) may cause passive reflections that can compromise the detection of an object inside the controlled area (see picture below).
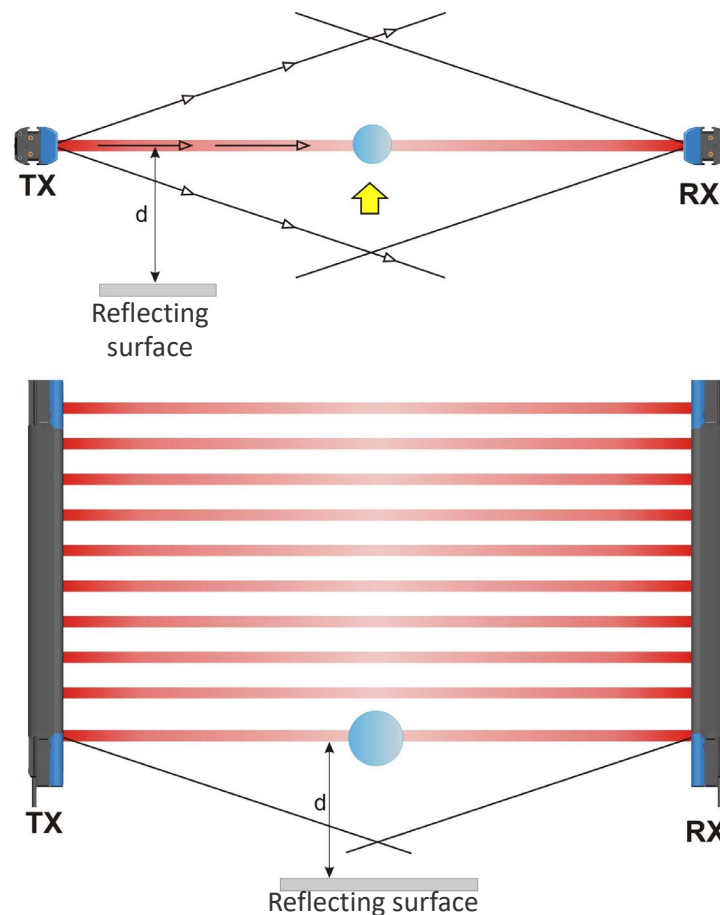
Figure 2: Reflecting surface

However, the object may not be detected if the receiver detects a secondary beam (reflected by the side-reflecting surface), even if the entering object interrupts the main beam.

It is thus important to position the units at the correct distance from any reflecting surface:

The minimum distance depends on:

- device operating distance
- reflecting surface nature
- position of the object inside the sensitive area

It is necessary to evaluate this distance on the field according to the operating conditions; however a minimum distance from the reflecting surface of about 0.5 m is suggested.

Installation of several adjacent light grids

When several devices must be installed in adjacent areas, it is necessary to prevent the interference between the emitter of one device and the receiver of another.

The following picture provides an installation example of possible interference between different devices and two possible solutions:
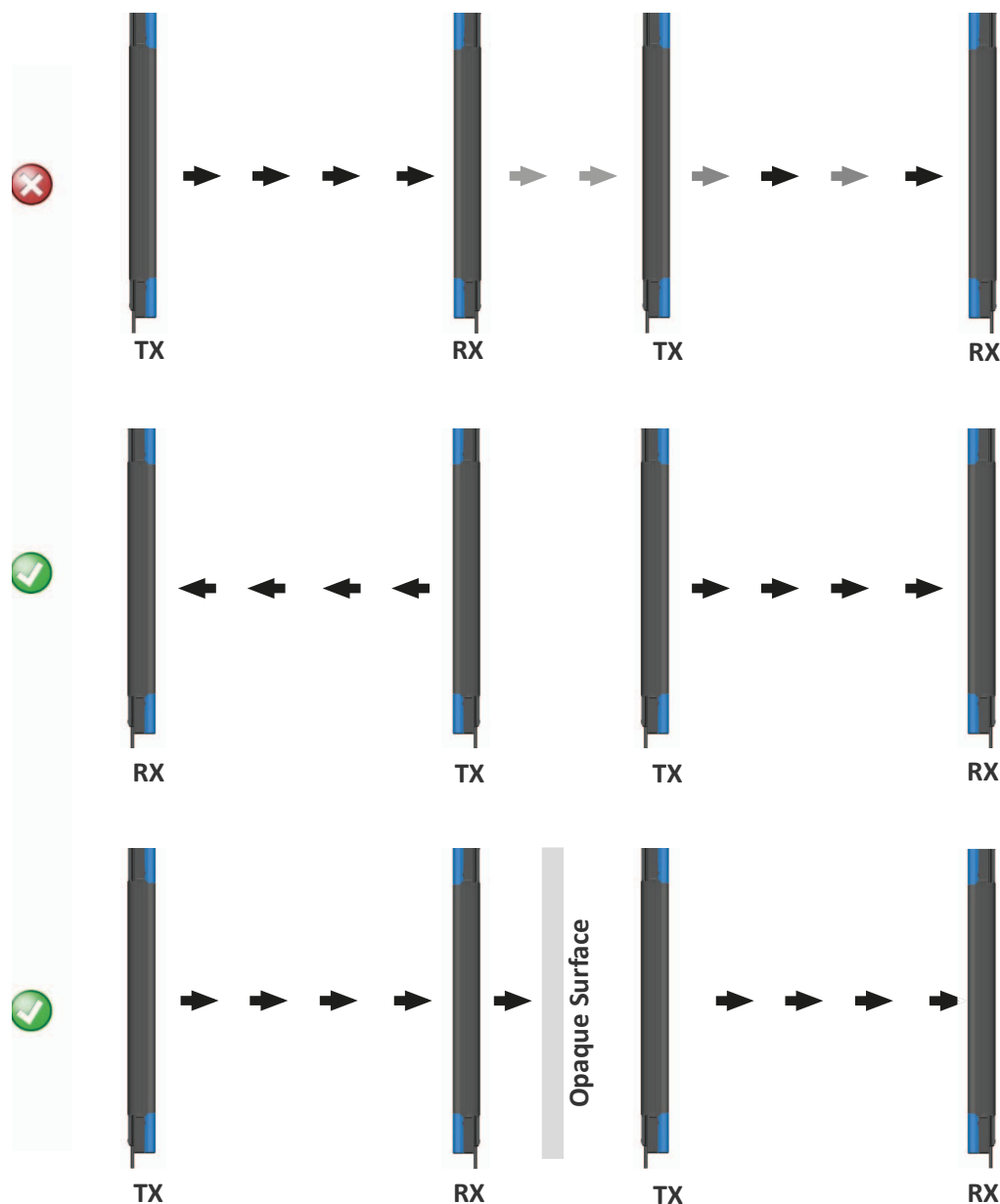
Figure 3: Installation of several adjacent light grids

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TYPICAL APPLICATIONS

The following images supply an overview on some main applications:

LOGISTICS
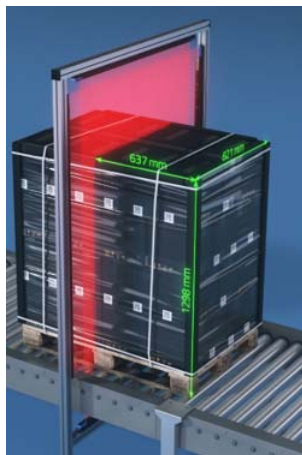
Detection of objects/pallets on conveyors Pallet height measurement

WOOD

Detection and measurement of tree trunks or wooden panels

PACKAGING
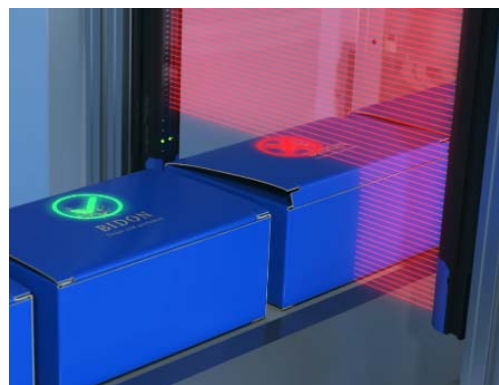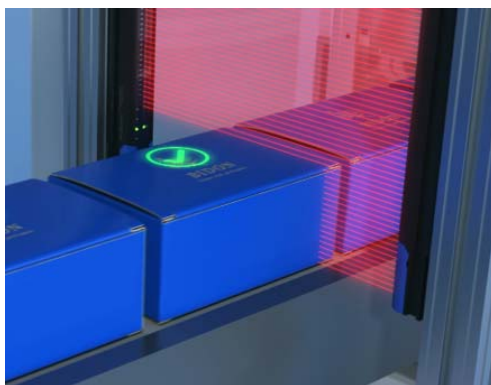
Detection and measure objects in the monitored area such as secondary packages, bundles, containers, pallets, etc...

PAINTING

Apply paint only where it is needed (saving material and time)

GLASS
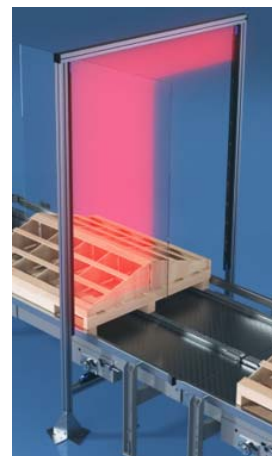
Detection and measurement of glass panels

PAPER/TEXTILE

TISSUE

Detection of holes, cuts or tears on paper/ textile rolls
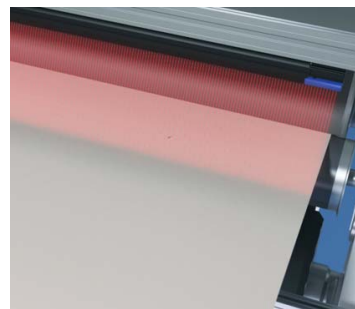
Monitoring lateral tissue displacement (edge detection)

DATA SENSING

CHAPTER 3
MECHANICAL MOUNTING

POSITIONING

The transmitting (TX) and receiving (RX) units must be installed with the relevant sensitive surfaces facing each other.

The connectors must be positioned on the same side and the distance must be included within the operating range of the model used (see appendix "Technical Data").

The two units must be positioned the most aligned and parallel possible.

To fine tune the alignment for best detection performances please use Monitoring page in the LC Designer GUI.

Outfit angled fixing brackets kit for units mounting must be used as described below.

Adjustable supports for adjusting unit inclinations around the axes are available on request (see appendix "Accessories").

First beam location

The beams must be positioned on the same direction. For all DS4 models, the first beam is located at the bottom edge of the light curtain, near to connections and the last beam is at the opposite side.

Technical data
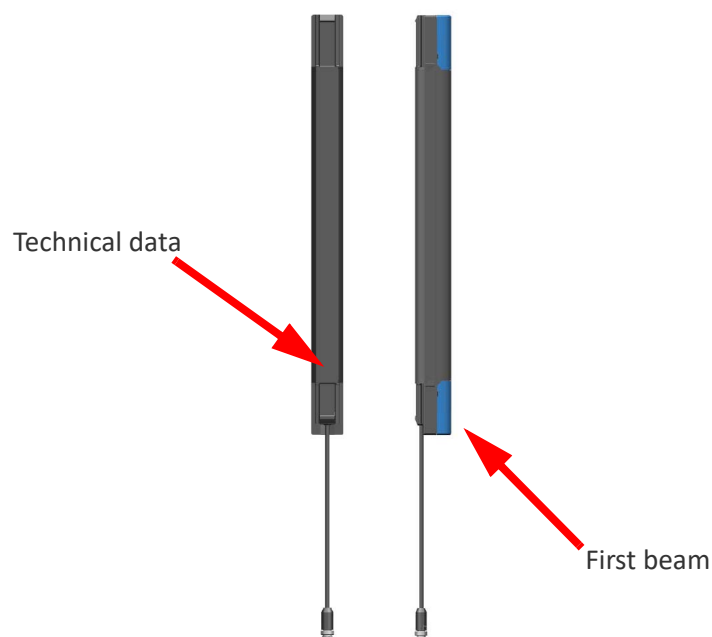
First beam

Figure 4: First beam location

FIXING

To mount the angled fixing brackets kit, place the threaded pins metallic insert into the dedicated side seat of the terminator cap side light curtain closing cap (1); slide the insert towards the metallic drawn profile groove (2).

Fix the bracket against the profile by tightening (torque 2.5 Nm) the M5 hexagonal nuts (3-4). It's possible to slide the bracket group along their dedicated rail and fix it once again just working on the above-mentioned nuts.

1)

2)

3)

4)
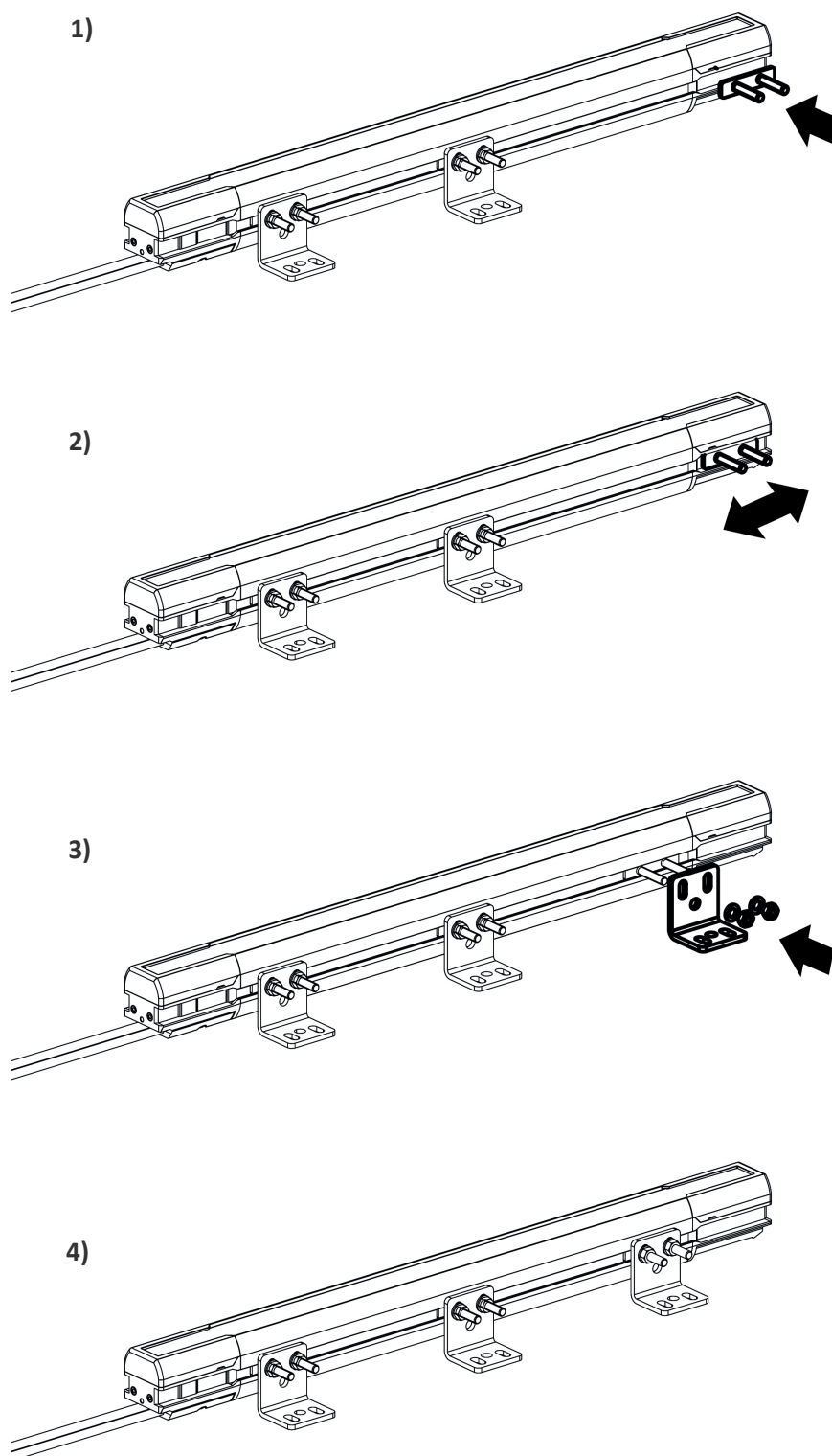
Figure 5: Fixed brackets mounting procedure

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The recommended mounting positions according to the light curtain length are shown in Figure 6 and in the following table.
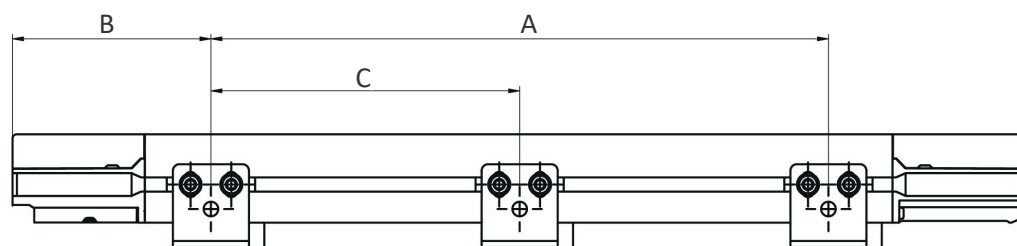
Figure 6 – Light curtain dimensions

MODEL	A	B	C	N. of Brackets
DS4-xx-0300-xxx-Jx	89	110	-	2
DS4-xx-0450-xxx-Jx	239	110	-	2
DS4-xx-0600-xxx-Jx	309	150	-	2
DS4-xx-0750-xxx-Jx	409	175	-	2
DS4-xx-0900-xxx-Jx	509	200	-	2
DS4-xx-1050-xxx-Jx	609	225	-	2
DS4-xx-1200-xxx-Jx	909	150	454.5	3
DS4-xx-1350-xxx-Jx	1009	175	504.5	3
DS4-xx-1500-xxx-Jx	1109	200	554.5	3

NOTE: The measures are in mm.

Fixing on support

NOTE: The screws to attach the brackets to the support are not provided.

It is possible to fix the supports in two ways:

1) Two screws M5 UNI 5739 and two washers J5 UNI 8842 using the two holes:
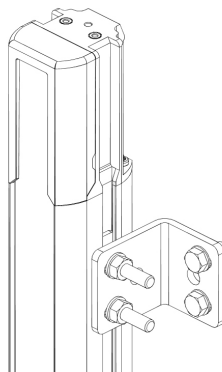
Figure 7: Fixing with two screws

2) A screw M6 UNI 5739 and a washer J6 UNI 8842 using the central hole:
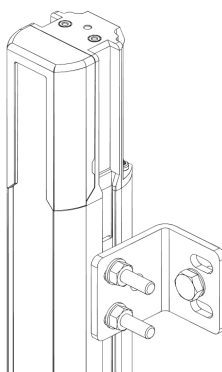
Figure 8: Fixing with a screw

In case of applications with particularly strong vibration, it is recommended to interpose between the bracket and the support the anti-vibration accessory, that can be ordered separately (4 pieces in ST-K4AV, or 6 pieces in ST-K6AV).
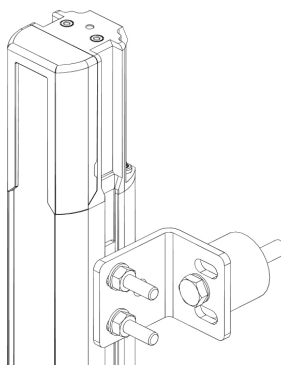
Figure 9: Anti-vibration dampers

CHAPTER 4
CONNECTIONS

ELECTRICAL CONNECTION
Pin-out and configuration pin connection

All electrical connections to the transmitting and receiving units are made through M12 connector(s).
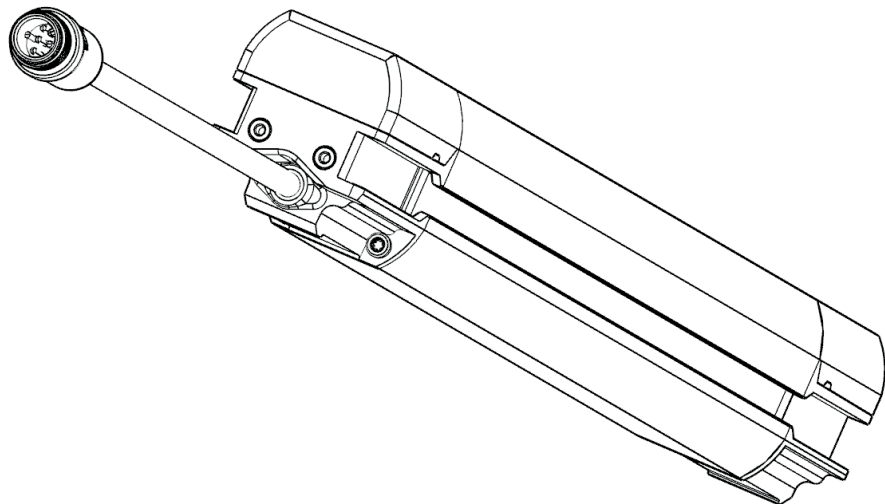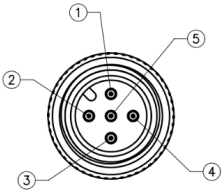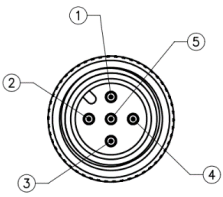
Figure 10: Connections

DS4-xx-xxxx-B05-JA

RECEIVER
M12 male 5 pin

1 – 24VDC (brown)
2 – ANALOG OUTPUT (white)
3 – GND (blue)
4 – DIGITAL OUT + IO-LINK (black)
5 – NO/NC + V/A Selection (grey)

TRANSMITTER
M12 male 5 pin

1 – 24VDC (brown)
2 – RANGE SELECTION (white)
3 – GND (blue)
4 – NOT CONNECTED (black)
5 – NOT CONNECTED (grey)

DATA**S**ENSING

I/O CONFIGURATION

Analog Output selection and parametrization

The DS4 have one analog output that can be configured to be either in voltage (0...10V) or in current (4...20mA). Refer to the "Analog Output selection and parametrization" on page 26 for more information.

Digital Output selection and parametrization

The DS4 Base models can drive one Digital output. Output current is limited to 100mA with 100nF maximum capacitive load. Refer to the "Digital output selection and parametrization" on page 26 for more information.

CHAPTER 5
FUNCTIONS

FUNCTIONING MODES

This chapter describes all the functions of the light curtain.

The DS4 light grids detect and measure objects placed inside the detection area. Hence, beam interruptions can cause the switching of the digital output and the variation of the analogue output signal.

Beam scanning is sequential and the update of all the outputs is made at each scanning, within a period equal to the device response time.

TX-RX Synchronization

The TX-RX synchronization can be achieved through optical synchronization. The first beam (the one near the connector size) and the last beam are used for synchronization. To maintain synchronization, at least one sync beam must remain free.

Reference Beam (Light Curtain orientation)

The light curtain can be mounted with the connector facing downwards (default orientation) or upwards (reverse orientation). Therefore, for measurement applications, it is useful to select the reference beam for measurements. Via IO-Link, the user can select whether to use the first beam (near the connector) or the last beam (near the end cap) as the reference.

The selected reference beam is then considered as beam #1.

Receiver Sensitivity

The basic model has a single level of fixed receiver sensitivity.

Fixed sensitivity setting will set same sensitivity for all light curtain beams.

Gain Setting	Distance Factor RX (Df RX)	Typical operating distance at maximum TX power		
		5 mm	10mm	25mm
1	0.12	0.6	0.8	1.6
2	0.15	0.8	1.1	2.0
3	0.19	1.0	1.3	2.5
4	0.23	1.2	1.6	3.0
5	0.30	1.5	2.1	3.9
6	0.39	2.0	2.7	5.1
7	0.50	2.5	3.5	6.5
8	0.64	3.2	4.5	8.3
9	0.77	3.9	5.4	10.0
10	1.00	5.0	7.0	13.0

Two additional parameters are available and can only be modified via IO-Link:

- **Lower Threshold [30...100%]** is the value in % below which beam are considered intercepted when the signal is decreasing
- **Upper Threshold [40...100%]** is the value in % above which beam are considered free when the signal is increasing

NOTE: By default the system will use 30% as lower threshold and 40% as upper threshold.

NOTE: Please note that the higher the setting the more sensible the light curtain will be to front window contamination, floating particles, mechanical vibrations, environmental conditions changes.

Emission Power
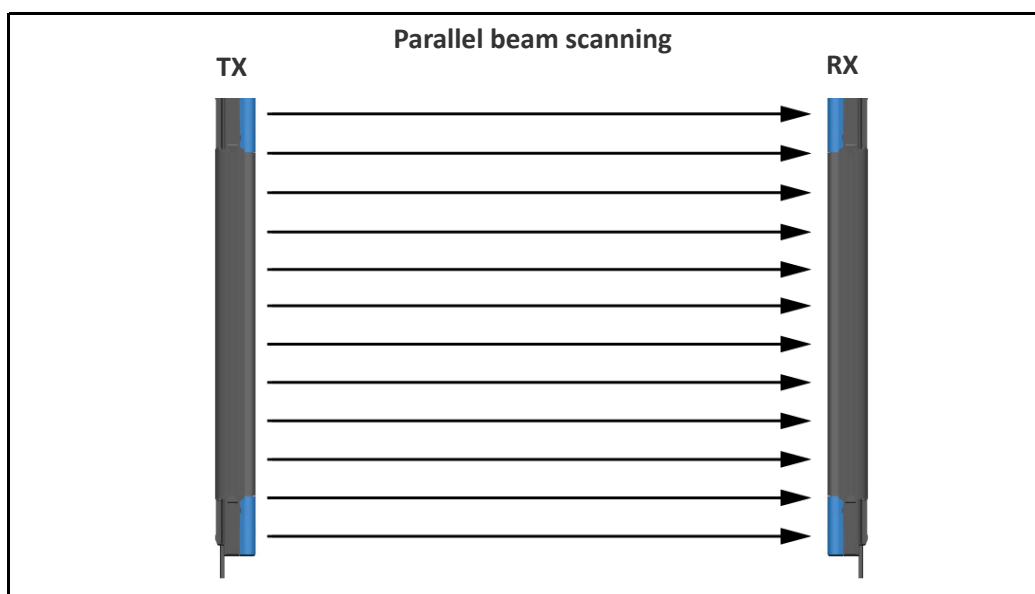
The emission power can be set HIGH or LOW depending on the connection of RANGE emitter pin at emitter power up (see Electrical Connection, starting on page 17.).

Range Input	Distance Factor TX (Df TX)
LOW	0.6
HIGH	1

Beam Scan Mode

The beam scan is always parallel, ensuring that the light beam from each transmitter is detected by the directly opposing receiver.

Multiple Scan Filter

Multiple Scan Filter can be set via IO-Link. It is used to provide a more robust output and is useful in environments where debris occasionally blocks the beams, or when it is necessary to measure objects with small features to reject.

The parameter N to give to the multiple scan filter is the number of consecutive consistent beam state for the system to update the filtered beam state on which measurements are computed. For each beam, if a status in not kept consistent for at least N consecutive cycle the filtered beam state it's not updated. Filtered Beam state is initialized to all free beams (1).

For example, for N set to 2

Beam #	Beam state (t-3)	Beam state (t-2)	Beam state (t-1)	Beam state (t)	Filtered Beam state (t)
1	1	0	0	0	0 (updated ad t)
2	1	1	0	0	0 (updated ad t)
3	1	1	1	0	1 (updated ad t-1)
4	1	1	1	1	1 (updated ad t)

For example, for N set to 3

Beam #	Beam state (t-3)	Beam state (t-2)	Beam state (t-1)	Beam state (t)	Filtered Beam state (t)
1	1	0	0	0	0 (updated ad t)
2	1	1	0	0	1 (initial value)
3	1	1	1	0	1 (updated ad t-1)
4	1	1	1	1	1 (updated ad t)

For each scan cycle the system can compute the Filtered Beam state (t) value for each beam, depending on Multiple Scan Filter setting.

For example, for Multiple Scan Filter setting = 2:

If Beam state (t) = Beam state (t-1)

Then Filtered Beam state (t) = Beam state (t)

Else Filtered Beam state (t) is not updated

For example for Multiple Scan Filter setting = 3:

If Beam state (t) = Beam state (t-1) = Beam state (t-2)

Then Filtered Beam state (t) = Beam state (t)

Else Filtered Beam state (t) is not updated

Measurement Functions

The measurement mode depends on the number of interrupted beams and causes the switching of the analogue output.

For each scan cycle DS4 light curtains calculate all the measures below that will then be used to drive analog (refer to "Analog Output selection and parametrization" on page 26).

The DS4 presents many different measurement functions, listed here below:

1. **Top Dark (TOPD):** provides the relative position of the blocked beam furthest away from the reference beam.

2. **Top Light (TOPL):** provides the relative position of the free beam furthest away from the reference beam.

3. **Bottom Dark (BOTD):** provides the relative position of the blocked beam closest to the reference beam.

4. **Bottom Light (BOTL):** provides the relative position of the free beam closest to the reference beam.

5. **Middle Dark (MIDD):** provides the mean value between TOPD and BOTD. Non integer values are rounded up.

6. **Middle Light (MIDL):** provides the mean value between TOPL and BOTL. Non integer values are rounded up.

7. **Number of Beams Dark (NBD):** provides the measurement of the total number of obscured beams.

8. **Number of Beams Light (NBL):** provides the measurement of the total number of free beams (default setting).

9. **Number of Contiguous Dark (NCD):** provides the measurement of the maximum number of contiguous blocked beams.

10. **Number of Contiguous Light (NCL):** provides the measurement of the maximum number of contiguous free beams.

11. **Number of Dark to Light Transitions (NDLT):** provides the measurement of the total number of Dark to Light transitions starting from reference beam. A Dark to Light transition happens when one beam is blocked and the next one is free.

12. **Number of Light to Dark Transitions (NLDT):** provides the measurement of the total number of Light to Dark transitions starting from reference beam. A Light to Dark transition happens when one beam is free and the next one is blocked.

NOTE: Measures (1-6 and 11-12) will depend on reference beam setting (refer to "Reference Beam (Light Curtain orientation)" on page 20**).**

For example, on a 60beam device with reference beam set as "last" and only beam#59 interrupted, TOPD=2, TOPL=60, BOTD=2, BOTL=1, MIDD=2, MIDL=31, NDLT=1, NLDT=1.

IO-Link Process data setting value[1]	
TOPD	17
TOPL	18
BOTD	19
BOTL	20
MIDD	21
MIDL	22
NBD	23
NBL	24
NCD	25
NCL	26
NDLT	27
NLDT	28

1. See "IO-Link Interface Selection and Parametrization" on page 27

Analog Output selection and parametrization

The DS4 have one analog output that can be configured to be either in voltage (0...10V) or in current (4...20mA).

> **NOTE: The output resolution will depend on the total number of beams of the particular system (that is height divided by pitch), so that blocking one beam in a 2.5m high measurement curtain with 5mm pitch will produce a 16mA / (2500mm/5mm) = 0.032mA difference in the output, or 10V / (2500mm/5mm) = 0.02V.**

The analog output can be configured either by connecting pin 5 to 24V or 0V at startup, or by using IO-Link. The analog output is always enabled and updated with each measurement cycle, providing the measurement of the blocked beam:

Current mode: $(I = 16*[measurement]/[beam\#]+4)$.

Voltage mode: $V = 10*[measurement]/[beam\#]$

NC/NO Input	Output Type
LOW	CURRENT
HIGH	VOTAGE

> **NOTE: If the analog output is configured via IO-Link, this configuration takes priority over the wired configuration. In order for the light curtain to use the wired analog output configuration, the 'Analog Out Mode' parameter must be set to 'Disabled'.**

Digital output selection and parametrization

The DS4 Base models can drive one Digital outputs. Output current is limited to 100mA with 100nF maximum capacitive load.

An over-current/short circuit is signaled on UI (refer to "RX Side dialogue" on page 29) until the fault condition persist.

The light curtains only have one SIO/IO-Link output. When used in SIO mode it's status will depend on light curtain beams status and NC/NO (**pin 5**) external connection (see "Electrical Connection" on page 17.

NC/NO Input	Beam Status	Output Status
LOW	All free	LOW
	At least one intercepted	HIGH
HIGH	All free	HIGH
	At least one intercepted	LOW

Base model's digital output it's also capable of IO-Link communication (see "IO-Link Interface Selection and Parametrization" on page 27).

DATASENSING

IO-Link Interface Selection and Parametrization

Digital I/O may be also linked to I/O-Link process data. The I/O link represent a virtual pin. In this case, the input will be activated via an IO-Link command. For outputs, the status of the digital outputs will be displayed in the Process Data Input.

The IO-Link parameters can be downloaded by clicking or scanning the following QR code:

CHAPTER 6
USER INTERFACE DIALOGUE

A user interface of 8 on the first Receiver (RX) module (2 for others optical modules) or 8 on Transmitter (TX) LEDs helps customer to control and check the state of the light curtain, for alignment mode, normal operation and for troubleshooting activity.

For each optical module on RX unit two RGB led will inform about single module status and light curtain operation.

RX

1st module   2nd module   Nth module
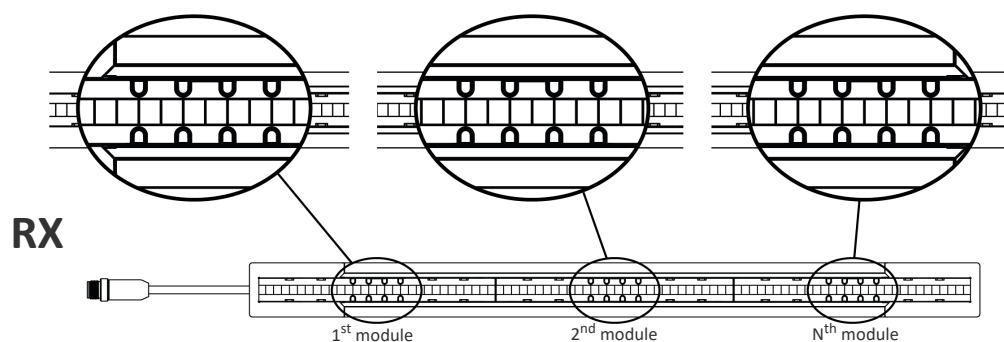
Figure 11: Receiver LED interface

TX

1st module   2nd module   Nth module
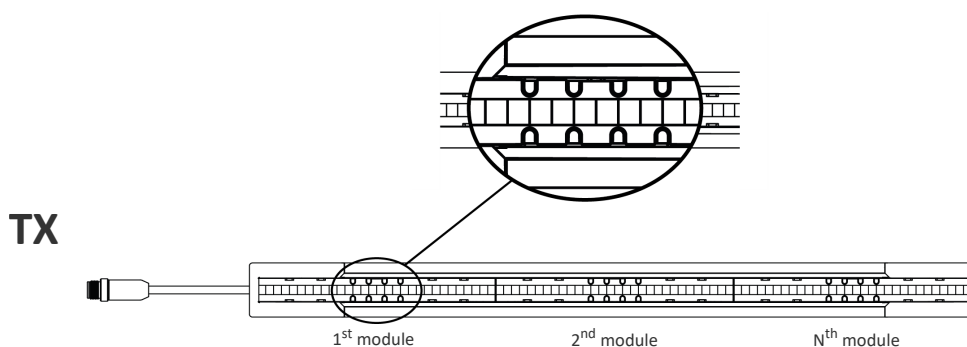
Figure 12: Transmitter LED interface

LED meanings

     = ON   = INDIFFERENT

     = OFF   = BLINK

RX Side dialogue
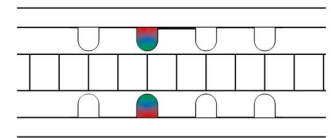
2nd module   Nth module

INDICATION	LED CONFIGURATION	
All module beams signals above upper threshold		
All module beams above lower threshold, at least one below upper threshold		
At least one module beam below lower threshold		
Eg. Different signals levels between first and second module halves		
Digital Output Active		
Short Circuit/Overload on Digital Output		4 Hz
Connection Active (IO-Link)		
Serial Connection Error		4 Hz
TX Sync (optical) active. At least one sync beam aligned and free		4 Hz
Hardware Error		4 Hz
Invalid Configuration		4 Hz
IOL configuration pending, Device Reset needed		
FindMe (IO-Link)		

TX Side dialogue
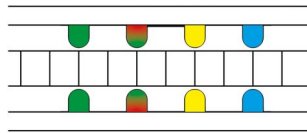
ESPE WORKING MODE	INDICATION	LED CONFIGURATION
Normal Operation Emission Active	Emission Active, low Range	
	Emission Active, high range	
Failure	HW Error	

CHAPTER 7

CHECKS AND PERIODICAL MAINTENANCE

The following is a list of recommended check and maintenance operations that should be periodically carried out by qualified personnel.

Check that:

• The operating distance and the alignment of the two units conforms to the indications given in "General information on device positioning" on page 8 and "Technical Data" on page 32.

• The DS4 light curtains and external electrical connections are not damaged.

The frequency of the checks depends on the particular application and operating conditions of the light grid.

> **NOTE: The DS4 light curtains do not require particular maintenance, with the exception of the cleaning of the protective surfaces of the optics. Use a cotton cloth dampened with water for cleaning.**

> **CAUTION: Do not use under any circumstances:**
> • **alcohol or solvents**
> • **wool cloths of synthetic fabric.**

> **NOTE: The DS4 light curtains do not require particular maintenance, with the exception of the cleaning of the protective surfaces of the optics. Use a cotton cloth dampened with water for cleaning.**

PRODUCT DISPOSAL

Under current Italian and European laws, Datasensing is not obliged to take care of product disposal at the end of its life.

Datasensing recommends disposing of the product in compliance with local laws or contact authorized waste collection centers.

APPENDIX A
TECHNICAL DATA

ELECTRICAL DATA	
Power supply	24 Vdc ± 20%[1]
Transmitter consumption (TX)	2 W max
Receiver consumption (RX)	5 W max (without load)
Outputs	1 Digital I/O + IO-Link 1 Analog Output (A or V selectable) 2 Digital I/O (for Standard models only)
Digital Output load	100 mA max, 100 nF max / each output
Output voltage - ON min (PP, PNP)	2.5 Vdc
Output voltage - OFF max (PP, PNP)	1 V
Output Leakage current	< 120 µA
Communication interface	IO-Link 230400 bits/s RS485 2400 to 921600 bps (Standard models) Ethernet TCP/IP 100 Mbps (Standard Ethernet models)
Measurement time	0.03 ms * number of beams + 1ms
Monitored height * (no blind zone)	From 300 to 1500 mm for DS4-xx-xxxx-B05-JA models From 300 to 3000 mm for DS4-xx-xxxx-Sxx-Jx models
Auxiliary functions * (depending on the model)	Transparent mode detection Pattern Match Blanking Flexible I/O
Electrical protection	Class III
Connections	M12 5; 8; 4 poles *(depending on the model)
Cable length (for power supply)	30 m max.
Pollution degree	2

1. The external voltage supply must be able to bridge main power failure of 20ms as specified in IEC 60240-1.

OPTICAL DATA

Light source	Infrared LED (850 nm wavelength)
Resolution	5 mm - 10 mm - 25 mm
Operating distance (opaque mode)	0.2 to 5 m for DS4-05-xxxx-xxx-Jx models 0.2 to 7 m for DS4-10-xxxx-xxx-Jx models 0.2 to 13 m for DS4-25-xxxx-xxx-Jx models
Operating distance vs target light transmissivity (transparent mode)	**DS4-05-xxxx-Sxx-Jx models:** 10%: 0.35-1.5m 20%: 0.35-2.5m 30%: 0.35-4m **DS4-10-xxxx-Sxx-Jx models:** 10%: 0.5-2m 20%: 0.5-4m 30%: 0.5-6m
Operating distance for crossed beam mode	0.30...5 m for DS4-05-xxxx-Sxx-Jx models 0.70...7 m DS4-10-xxxx-Sxx-Jx models
Typical optical aperture angle	< ± 5° @ 3m for DS4-05-xxxx-xxx-Jx models < ± 2.5° @3 m for other models
Ambient light rejection	EN IEC 60947-5-2

MECHANICAL AND ENVIRONMENTAL DATA

Operating temperature	-30...+55 °C (-22...+131 °F)
Operating temperature for reliable transparent targets detection	0 ... 50°C (32...122 °F)
Storage temperature	-30...+70 °C (-22...+158 °F)
Humidity	15...95% (no condensation)
Altitude during operation	< 2000 m
Mechanical protection	IP65, IP67 (EN 60529)
Vibrations	10 mm / 3g, 5 to 150 Hz frequency, (EN 60068-2-6 / Class 3M7 IEC TR 60721-4-3)
Shock resistance	25g x 6 ms x 600 (EN 60068-2-27 / Class 3M7 IEC TR 60721-4-3)
Housing material	Painted aluminum (black)
Caps material	PBT Valox 553 black
Caps cover material	PBT 1403g3 blue (pantone 072C)
Frontal cover material	PMMA
Weight	1.4 Kg/m (single bar - without packaged)

APPENDIX B
AVAILABLE MODELS AND RESPONSE TIMES

MODELS

Detection Capability: 5 mm

Model	Ordering num	Controlled height (mm)
DS4-05-0300-B05-JA	957650001	300
DS4-05-0450-B05-JA	957650002	450
DS4-05-0600-B05-JA	957650003	600
DS4-05-0750-B05-JA	957650004	750
DS4-05-0900-B05-JA	957650005	900
DS4-05-1050-B05-JA	957650006	1050
DS4-05-1200-B05-JA	957650007	1200
DS4-05-1350-B05-JA	957650008	1350
DS4-05-1500-B05-JA	957650008	1500

Detection Capability: 10 mm

Model	Ordering num	Controlled height (mm)
DS4-10-0300-B05-JA	957650048	300
DS4-10-0450-B05-JA	957650049	450
DS4-10-0600-B05-JA	957650050	600
DS4-10-0750-B05-JA	957650051	750
DS4-10-0900-B05-JA	957650052	900
DS4-10-1050-B05-JA	957650053	1050
DS4-10-1200-B05-JA	957650054	1200
DS4-10-1350-B05-JA	957650055	1350
DS4-10-1500-B05-JA	957650056	1500

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Detection Capability: 25 mm

Model	Ordering num	Controlled height (mm)
DS4-25-0300-B05-JA	957650095	300
DS4-25-0450-B05-JA	957650096	450
DS4-25-0600-B05-JA	957650097	600
DS4-25-0750-B05-JA	957650098	750
DS4-25-0900-B05-JA	957650099	900
DS4-25-1050-B05-JA	957650100	1050
DS4-25-1200-B05-JAZ	957650101	1200
DS4-25-1350-B05-JA	957650102	1350
DS4-25-1500-B05-JA	957650103	1500

RESPONSE TIME

Next tables resumes the response time values related to the number of beams and the controlled height.

Detection Capability: 5 mm

Model	Controlled height (mm)	Beam number	Response time (ms)
DS4-05-0300-B05-JA	300	60	2.80
DS4-05-0450-B05-JA	450	90	3.70
DS4-05-0600-B05-JA	600	120	4.60
DS4-05-0750-B05-JA	750	150	5.50
DS4-05-0900-B05-JA	900	180	6.40
DS4-05-1050-B05-JA	1050	210	7.30
DS4-05-1200-B05-JA	1200	240	8.20
DS4-05-1350-B05-JA	1350	270	9.10
DS4-05-1500-B05-JA	1500	300	10.00

Detection Capability: 10 mm

Model	Controlled height (mm)	Beam number	Response time (ms)
DS4-10-0300-B05-JA	300	30	1.90
DS4-10-0450-B05-JA	450	45	2.35
DS4-10-0600-B05-JA	600	60	2.80
DS4-10-0750-B05-JA	750	75	3.25
DS4-10-0900-B05-JA	900	90	3.70
DS4-10-1050-B05-JA	1050	105	4.15
DS4-10-1200-B05-JA	1200	120	4.60
DS4-10-1350-B05-JA	1350	135	5.05
DS4-10-1500-B05-JA	1500	150	5.50

Detection Capability: 25 mm

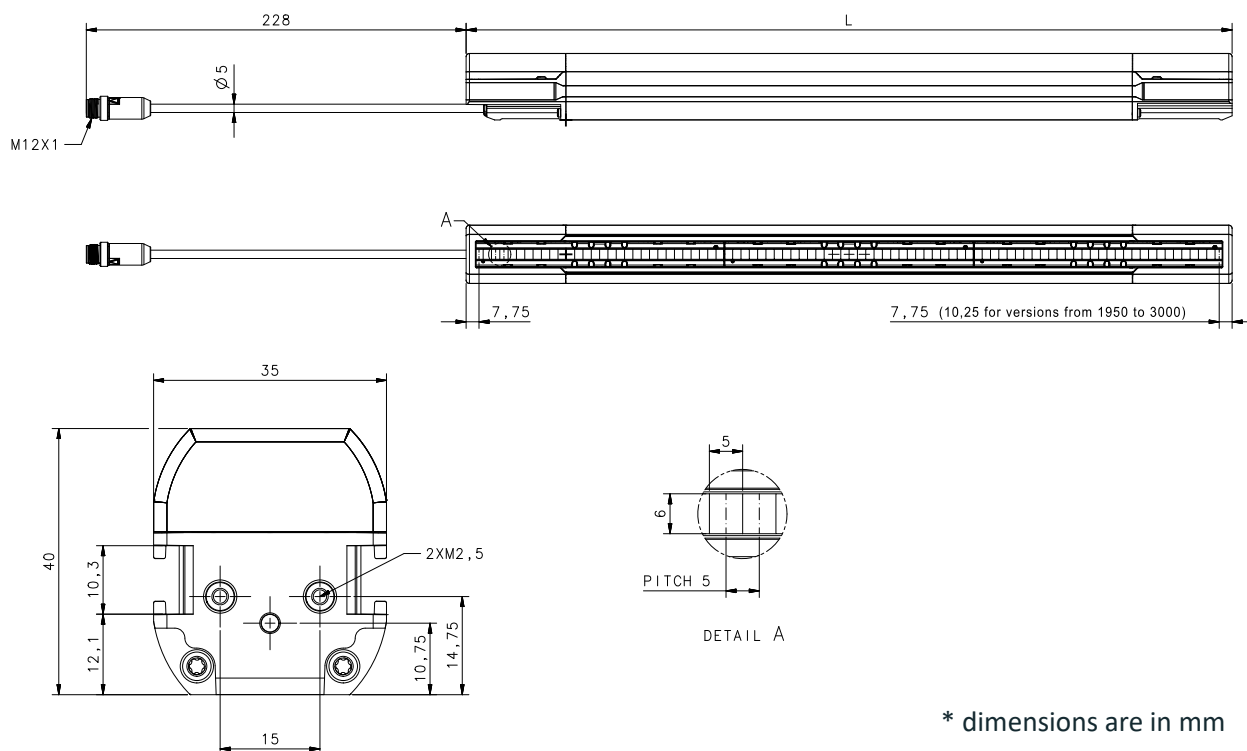| Model	Controlled height (mm)	Beam number	Response time (ms)
DS4-25-0300-B05-JA	300	12	1.36
DS4-25-0450-B05-JA	450	18	1.54
DS4-25-0600-B05-JA	600	24	1.72
DS4-25-0750-B05-JA	750	30	1.90
DS4-25-0900-B05-JA	900	36	2.08
DS4-25-1050-B05-JA	1050	42	2.26
DS4-25-1200-B05-JA	1200	48	2.44
DS4-25-1350-B05-JA	1350	54	2.62
DS4-25-1500-B05-JA	1500	60	2.80

DATASENSING

APPENDIX C
OVERALL DIMENSIONS

NOTE: Please refer to Datasensing website for detailed drawings.
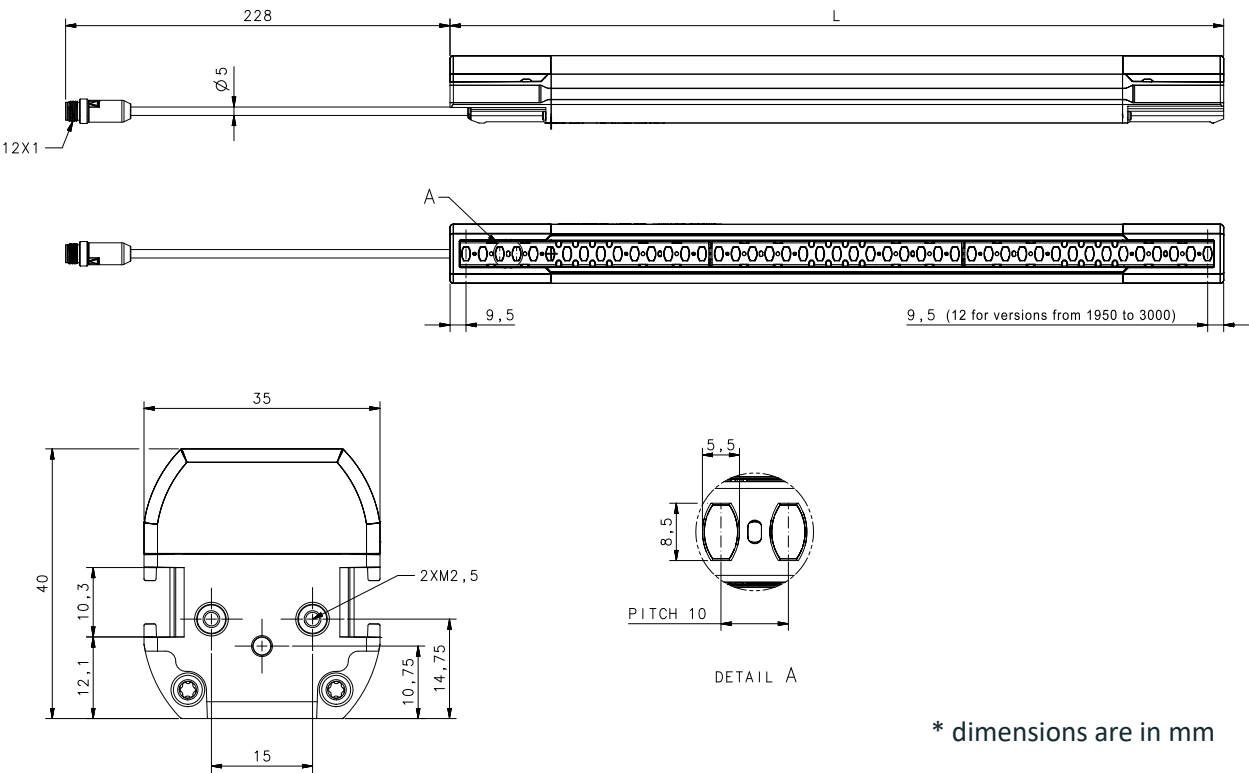
Below are drawings of the following models:

- "DS4-05-xxxx-B05-JA" on page 38
- "DS4-10-xxxx-B05-JA" on page 39
- "DS4-25-xxxx-B05-JA" on page 40

DS4-05-xxxx-B05-JA

M12X1

228

L

Ø 5

7,75

7,75 (10,25 for versions from 1950 to 3000)

A

35

40

10,3

12,1

10,75

14,75

15

2XM2,5

5

6

PITCH 5

DETAIL A

* dimensions are in mm

MODEL	L (mm)
DS4-05-0300-B05-JA	310.5
DS4-05-0450-B05-JA	460.5
DS4-05-0600-B05-JA	610.5
DS4-05-0750-B05-JA	760.5
DS4-05-0900-B05-JA	910.5
DS4-05-1050-B05-JA	1060.5
DS4-05-1200-B05-JA	1210.5
DS4-05-1350-B05-JA	1360.5
DS4-05-1500-B05-JA	1510.5

DS4-10-xxxx-B05-JA

228
L
Ø5
12X1

A

9,5
9,5 (12 for versions from 1950 to 3000)

35
40
10,3
12,1
2XM2,5
10,75
14,75
15

5,5
8,5
PITCH 10

DETAIL A

* dimensions are in mm

MODEL	L (mm)
DS4-10-0300-B05-JA	309
DS4-10-0450-B05-JA	459
DS4-10-0600-B05-JA	609
DS4-10-0750-B05-JA	759
DS4-10-0900-B05-JA	909
DS4-10-1050-B05-JA	1059
DS4-10-1200-B05-JA	1209
DS4-10-1350-B05-JA	1359
DS4-10-1500-B05-JA	1509

DS4-25-xxxx-B05-JA

PITCH 25

DETAIL A

* dimensions are in mm
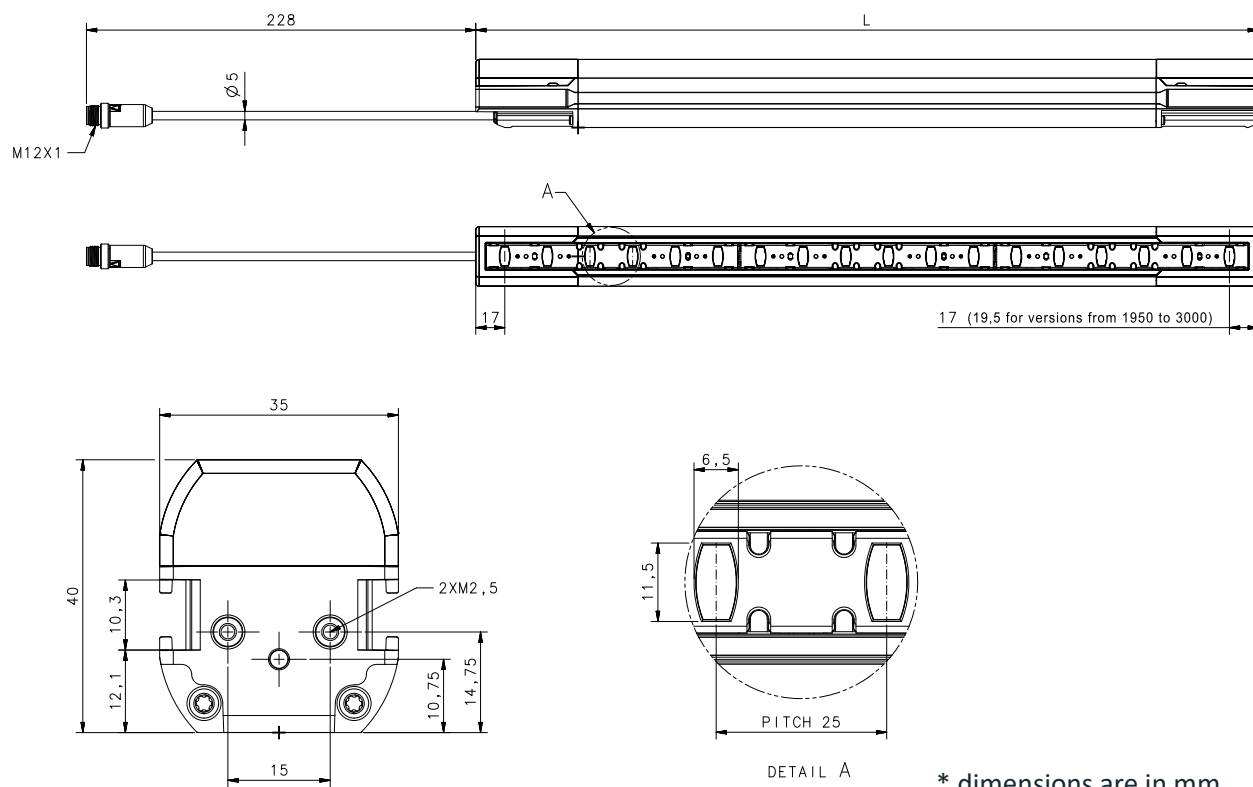
MODEL	L (mm)
DS4-25-0300-B05-JA	309
DS4-25-0450-B05-JA	459
DS4-25-0600-B05-JA	609
DS4-25-0750-B05-JA	759
DS4-25-0900-B05-JA	909
DS4-25-1050-B05-JA	1059
DS4-25-1200-B05-JA	1209
DS4-25-1350-B05-JA	1359
DS4-25-1500-B05-JA	1509

APPENDIX D
INCLUDED ACCESSORIES

METAL ANGLED FIXING BRACKET
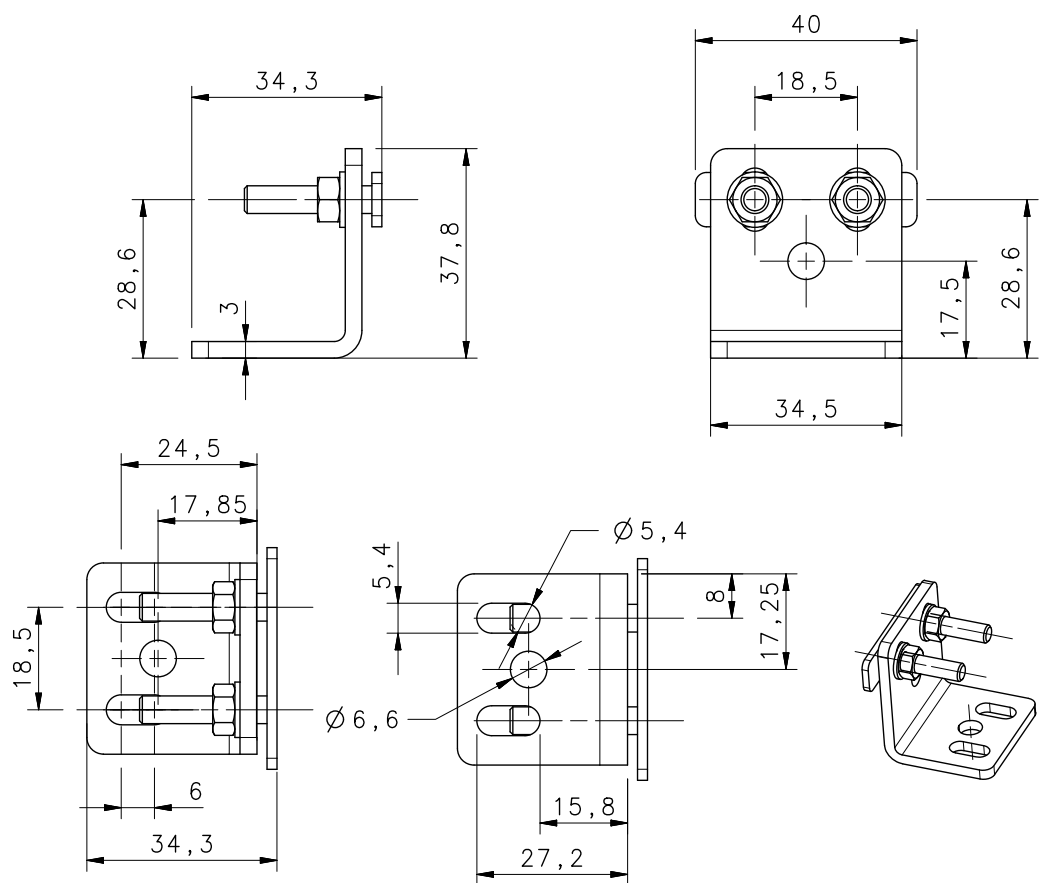
Figure 13 – Metal Angled fixing Bracket

NOTE: Dimensions are in mm.

APPENDIX E
ACCESSORIES

BRACKETS

Metal Angled Fixing Bracket

MODEL	DESCRIPTION	CODE
ST-KSTD	Angled fixing bracket (4 pcs kit)	95ACC1670
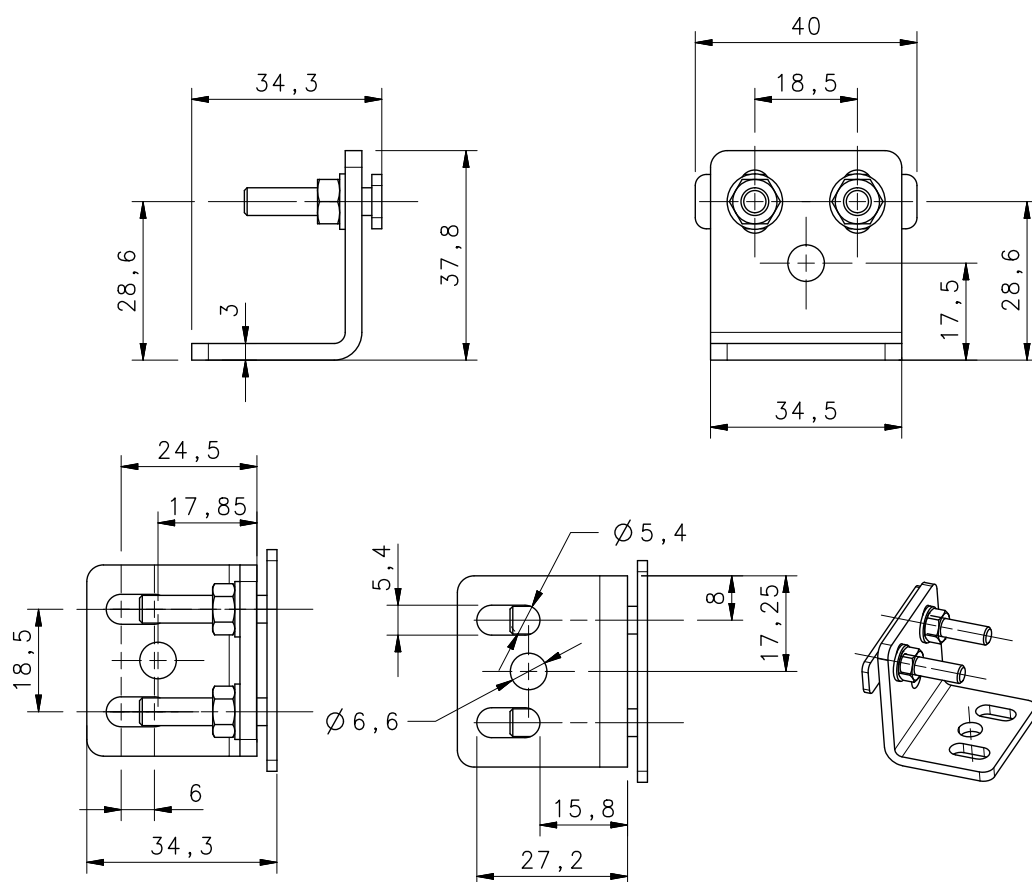
Figure 14 – ST-KSTD

NOTE: Dimensions are in mm.

Angled Fixing Bracket mounting with orientable and anti-vibration supports

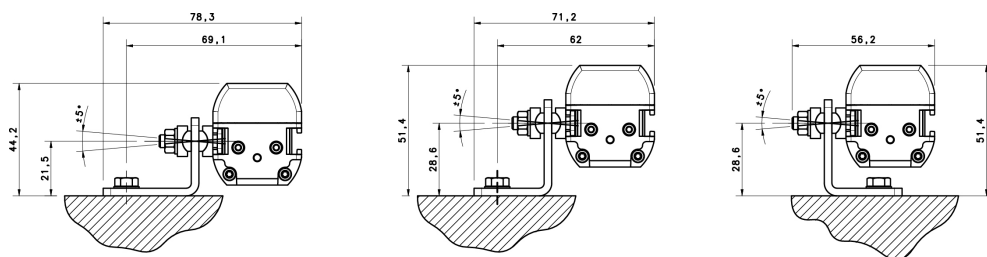| MODEL	DESCRIPTION	CODE
ST-K4OR	Orientable supports (4 pcs kit)	95ACC1680
ST-K6OR	Orientable supports (6 pcs kit)	95ACC1690
ST-K4AV	Anti-vibration supports (4 pcs kit)	95ACC1700
ST-K6AV	Anti-vibration supports (6 pcs kit)	95ACC1710
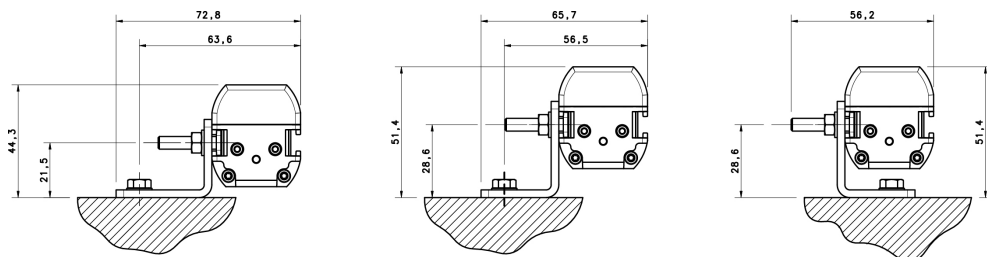
Figure 15 – Angled fixing bracket
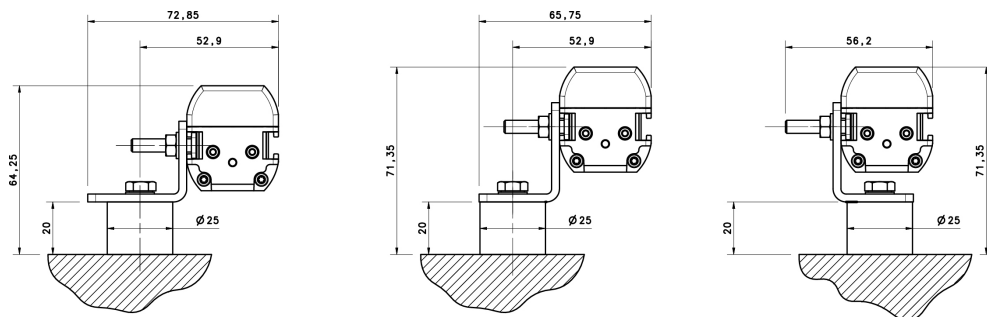
Figure 16 – Angled fixing bracket + Orientable support

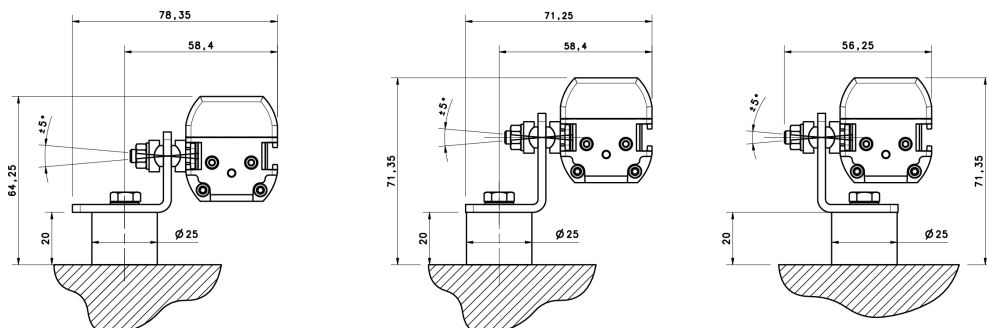**Figure 17 – Angled fixing bracket + Anti-vibration support**

Figure 18 – Angled fixing bracket + Orientable support + Anti-vibration support

NOTE: Dimensions are in mm.

Rotating Bracket

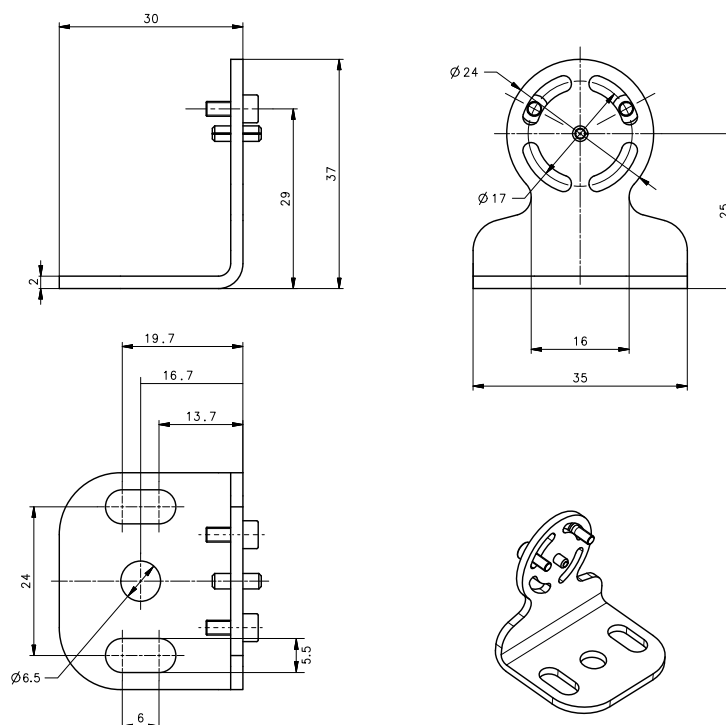| MODEL	DESCRIPTION	CODE
ST-K4ROT-SH	Metal top-bottom rotating fixing brackes kit (4 brackets) for SH4	95ASE0042

Figure 19 – ST-K4ROT-SH

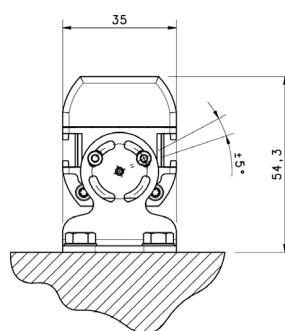**NOTE: Dimensions are in mm.**

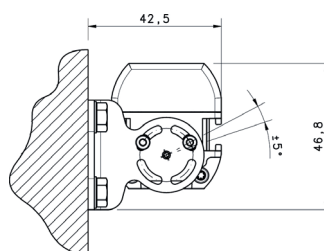## Rotating Bracket mounting

Figure 20 – Straight mounting

Figure 21 – Rotating 90° mounting

CONNECTION CABLES

MODEL	DESCRIPTION	CODE
CS-A1-03-U-03	Cable M12 5 poles axial female unshielded 3 m UL 2464	95ASE1170
CS-A1-03-U-05	Cable M12 5 poles axial female unshielded 5 m UL 2464	95ASE1180
CS-A1-03-U-10	Cable M12 5 poles axial female unshielded 10 m UL 2464	95ASE1190
CS-A1-03-U-15	Cable M12 5 poles axial female unshielded 15 m UL 2464	95ASE1200
CS-H2-03-B-01	Cascade cable for SH4 1 m	95ASE0031
CS-H2-03-B-03	Cascade cable for SH4 3 m	95ASE0032
CS-H2-03-B-10	Cascade cable for SH4 10 m	95ASE0033
CD12M/0H-050A3	Connect.M12-F,5 poles-5m,PVC,Axial	CD12M/0H-050A3
CD12M/0H-100A3	Connect.M12-F,5 poles-10m,PVC,Axial	CD12M/0H-100A3
CDP12/0B-010AA	M12-F-Axial, 4p,M12-M-Axial,PVC,1 m	CDP12/0B-010AA
CDP12/0B-030AA	M12-F-Axial, 4p,M12-M-Axial,PVC,3 m	CDP12/0B-030AA
CDP12/0B-050AA	M12-F-Axial, 4p,M12-M-Axial,PVC,5 m	CDP12/0B-050AA
CDP12/0B-100AA	M12-F-Axial, 4p,M12-M-Axial,PVC,10 m	CDP12/0B-100AA
CV12/0B-00A	Connect.M12-M-Axial,4 p,Field attach.	CV12/0B-00A
CV12/0B-00B	Connect.M12-M-90°,4 p,Field attach.	CV12/0B-00B
CV12/0H-00A	Connect.M12-M-Axial,5 p,Field attach.	CV12/0H-00A
CS-I1-02-B-03	CS-I1-02-B-03 4p M12-M/M12-F axial 3m bk	95ACC0009
CS-M1-02-B-03	CS-M1-02-B-03 5p M12-F Lcode axial 3m gr	95ACC0007
CS-A1-02-G-03	CS-A1-02-G-03 = M12 4-p axial 3m	95A251380
CS-A1-02-G-05	CS-A1-02-G-05 = M12 4-p axial 5m	95A251270
CS-A1-02-G-10	CS-A1-02-G-10 = M12 4-p axial 10m	95A251390
CS-A1-02-R-02	CS-A1-02-R-02 = M12 4-p axial 2m PUR	95A251540
CS-A1-02-R-05	CS-A1-02-R-05 = M12 4-p axial 5m PUR	95A251560
CS-A1-02-U-03	Cable M12 4 poles axial female unshielded 3m	95ASE1120
CS-A1-02-U-05	Cable M12 4 poles axial female unshielded 5m	95ASE1130
CS-A1-02-U-10	Cable M12 4 poles axial female unshielded 10m	95ASE1140
CS-A1-02-U-15	Cable M12 4 poles axial female unshielded 15m	95ASE1150
CS-A1-02-B-NC	CS-A1-02-B-NC = M12 4-p axial PG	G5085002
CBX-8IOL-PNIO	8P IOL M12 profinet master	95ACC8190
CBX-8IOL-EIP	8P IOL M12 EIP master	95ACC8180

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