DS4 STANDARD
DS4 STANDARD ETHERNET

PRODUCT REFERENCE GUIDE



Measurement and Detection Light Curtains

DATASENSING

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Patents

See www.patents.datasensing.com for patent list.

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

Utility patents: IT1363719, IT1427575, US10188007

ORIGINAL INSTRUCTIONS (ref. 2006/42/EC)

This manual refers to software version 1.1.0 and later.

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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.

TECHNICAL SUPPORT

Support Through the Website

Datasensing provides several services as well as technical support through its website. Log on to (www.datasensing.com).

For quick access, from the home page click on the search icon, and type in the name of the product you're looking for. This allows you access to download Data Sheets, Manuals, Software & Utilities, and Drawings.

Reseller Technical Support

An excellent source for technical assistance and information is an authorized Datasensing reseller. A reseller is acquainted with specific types of businesses, application software, and computer systems and can provide individualized assistance.

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Datasensing warrants that the Products shall be free from defects in materials and workmanship under normal and proper use during the Warranty Period. Products are sold on the basis of specifications applicable at the time of manufacture and Datasensing has no obligation to modify or update Products once sold. The Warranty Period shall be **three years** from the date of shipment by Datasensing, unless otherwise agreed in an applicable writing by Datasensing.

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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 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.

DS4 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

Resolution
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 = Analog configurable, IO-Link/SIO, Configurable I/O, 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 Sensitivity	
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 Standard models. For Base models refer to relative Product Reference Guide.

COMPLIANCE

European Declaration of Conformity

Hereby, Datasensing S.r.l. declares that the full text of the European Declaration of Conformity is available at: www.datasensing.com. Mouse over the download tab and click on CE Declarations.

UKCA Declaration of Conformity

Hereby, Datasensing S.r.l. declares that this product complies with the UKCA requirements.

Brazil

“Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados”.

“Este produto incorpora o módulo Type1LD, número ANATEL 02733-25-14776”.

FCC Compliance

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

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.

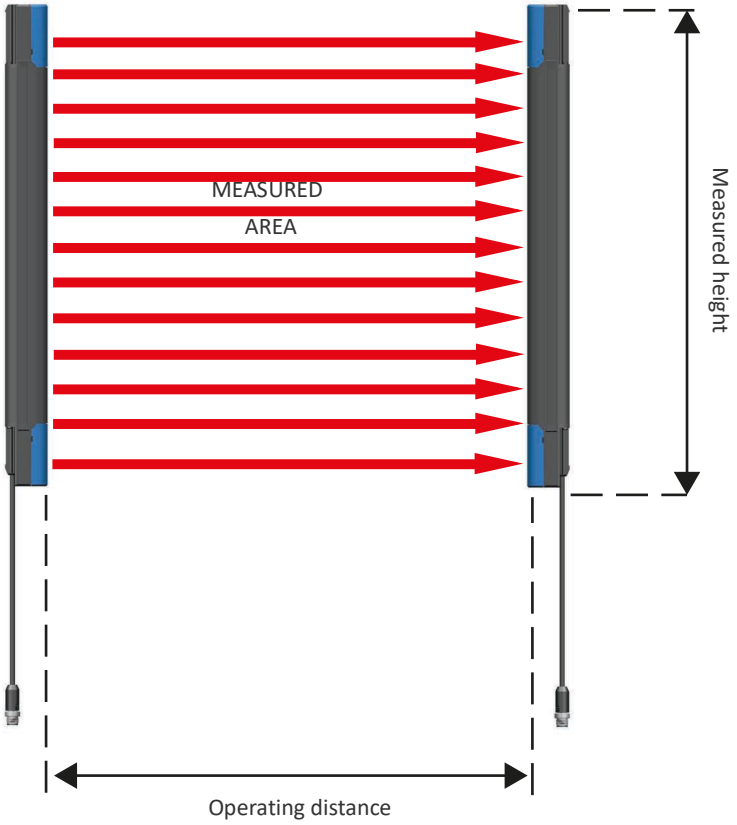


Figure 1: Measured zone

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

MODEL	MEASURED HEIGHT (mm)
DS4-xx-0300-Sxx-Jx	300
DS4-xx-0450-Sxx-Jx	450
DS4-xx-0600-Sxx-Jx	600
DS4-xx-0750-Sxx-Jx	750
DS4-xx-0900-Sxx-Jx	900
DS4-xx-1050-Sxx-Jx	1050
DS4-xx-1200-Sxx-Jx	1200
DS4-xx-1350-Sxx-Jx	1350
DS4-xx-1500-Sxx-Jx	1500
DS4-xx-1650-Sxx-Jx	1650
DS4-xx-1800-Sxx-Jx	1800
DS4-xx-1950-Sxx-Jx	1950
DS4-xx-2100-Sxx-Jx	2100
DS4-xx-2250-Sxx-Jx	2250
DS4-xx-2400-Sxx-Jx	2400
DS4-xx-2550-Sxx-Jx	2550
DS4-xx-2700-Sxx-Jx	2700
DS4-xx-2850-Sxx-Jx	2850
DS4-xx-3000-Sxx-Jx	3000

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).

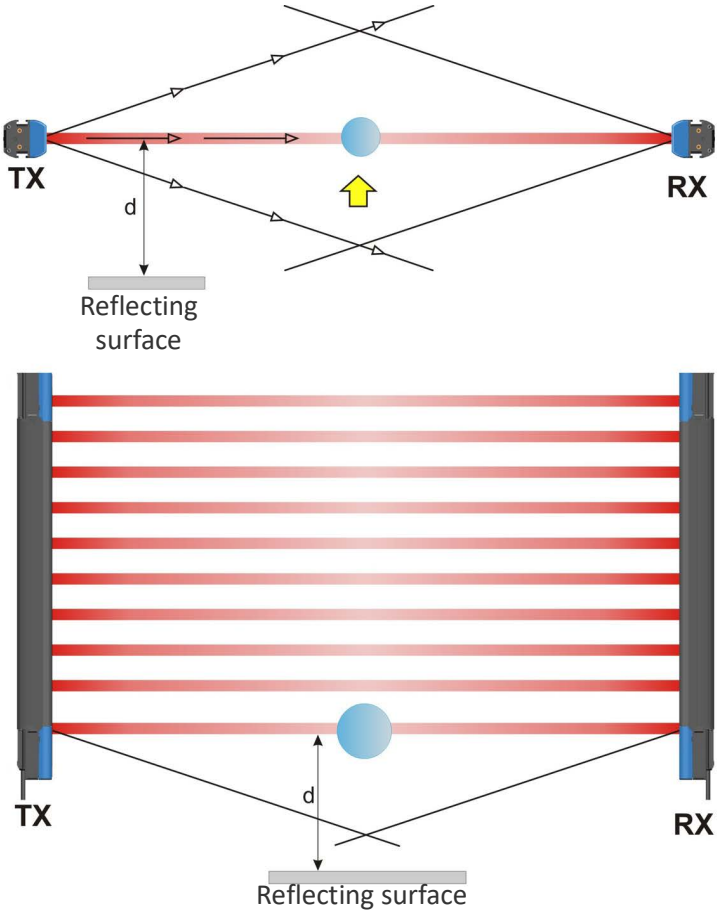


Figure 2: Reflecting surface

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:

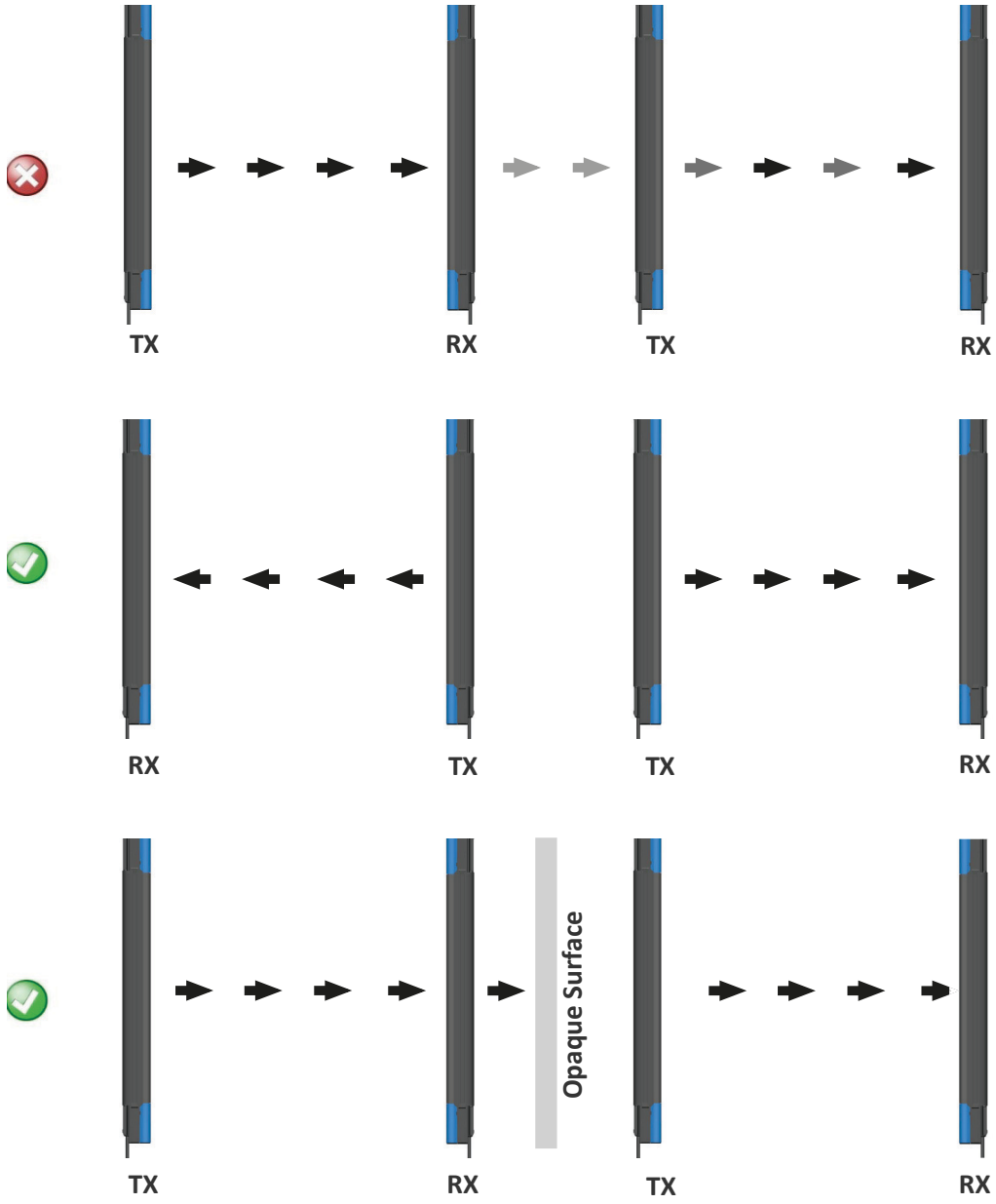
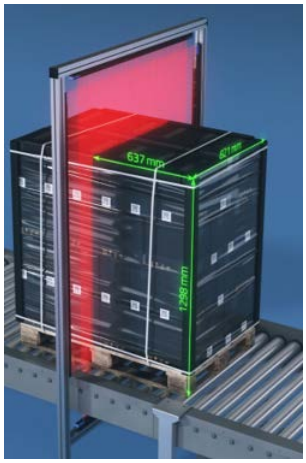


Figure 3: Installation of several adjacent light grids

TYPICAL APPLICATIONS

The following images supply an overview on some main applications:

LOGISTICS



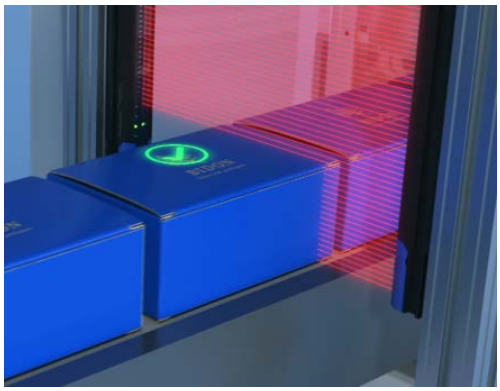
Detection of objects/pallets on conveyors
Pallet height measurement

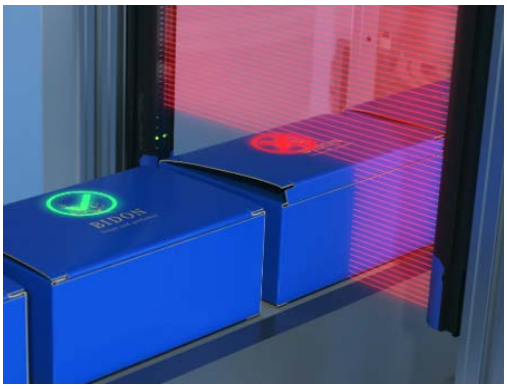
WOOD



Detection and measurement of tree trunks or wooden panels

PACKAGING





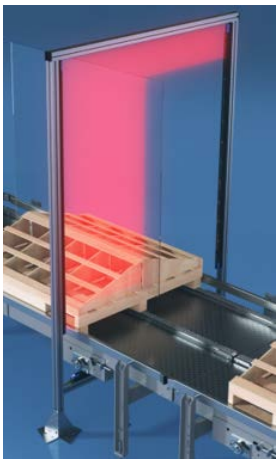
Detection and measure objects in the monitored area such as secondary packages, bundles, containers, pallets, etc...

PAINTING



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

GLASS



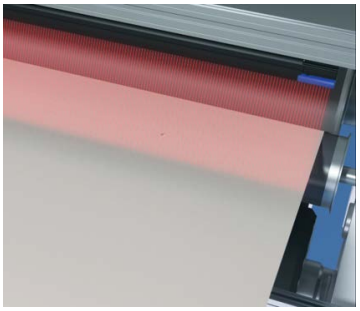
Detection and measurement of glass panels

PAPER/TEXTILE



Detection of holes, cuts or tears on paper/ textile rolls

TISSUE



Monitoring lateral tissue displacement (edge detection)

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 (Standard models only).

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.

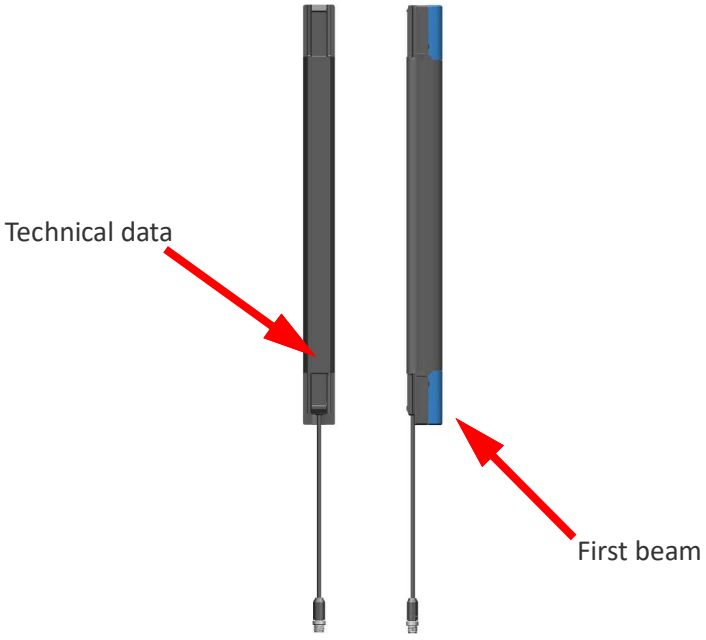


Figure 4: First beam location

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.

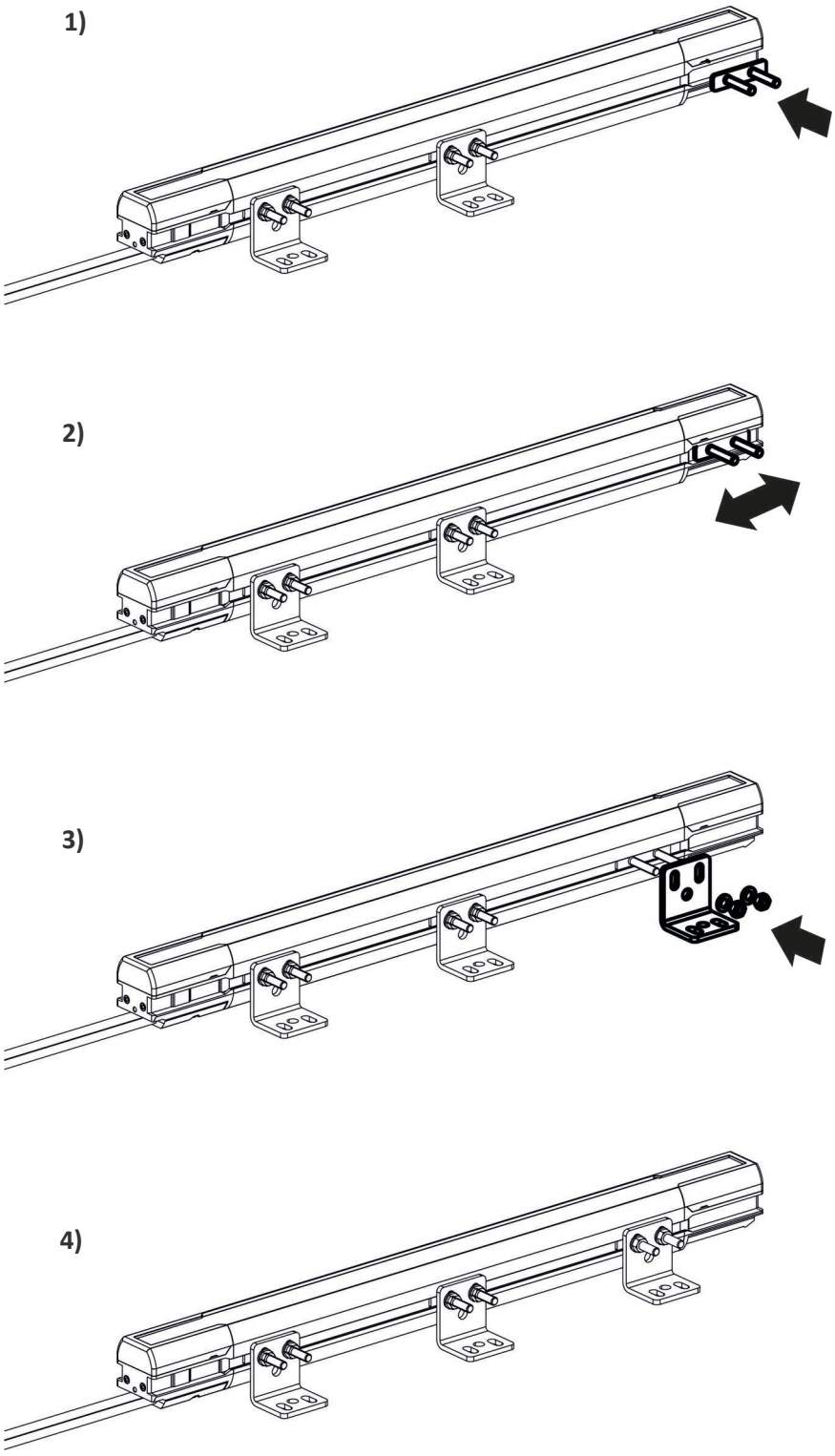


Figure 5: Fixed brackets mounting procedure

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

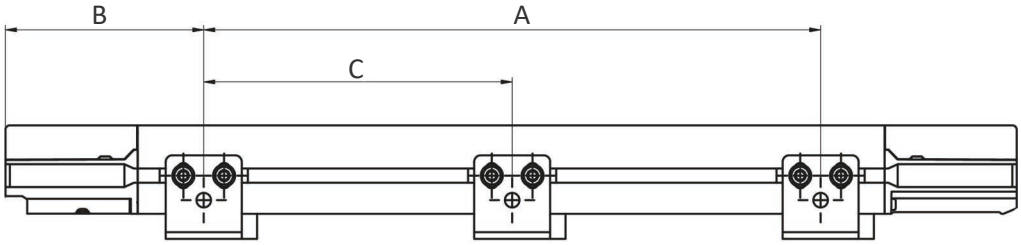


Figure 6 - Light curtain dimensions

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
DS4-xx-1650-xxx-Jx	1209	225	604.5	3
DS4-xx-1800-xxx-Jx	1309	250	654.5	3
DS4-xx-1950-xxx-Jx	1409	276.3	704.5	3
DS4-xx-2100-xxx-Jx	1509	301.3	754.5	3
DS4-xx-2250-xxx-Jx	1609	326.3	804.5	3
DS4-xx-2400-xxx-Jx	1909	251.3	636.3	4
DS4-xx-2550-xxx-Jx	2009	276.3	669.7	4
DS4-xx-2700-xxx-Jx	2109	301.3	703	4
DS4-xx-2850-xxx-Jx	2209	326.3	736.3	4
DS4-xx-3000-xxx-Jx	2309	351.3	769.7	4

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:

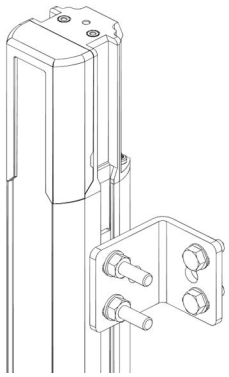


Figure 7: Fixing with two screws

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

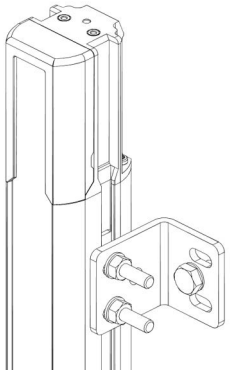


Figure 8: Fixing with a screw

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).

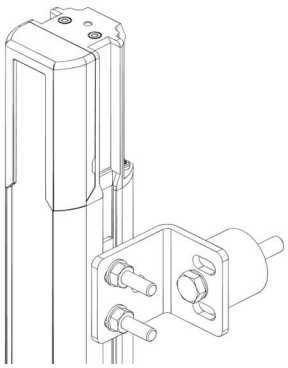


Figure 9: Anti-vibration dampers

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).

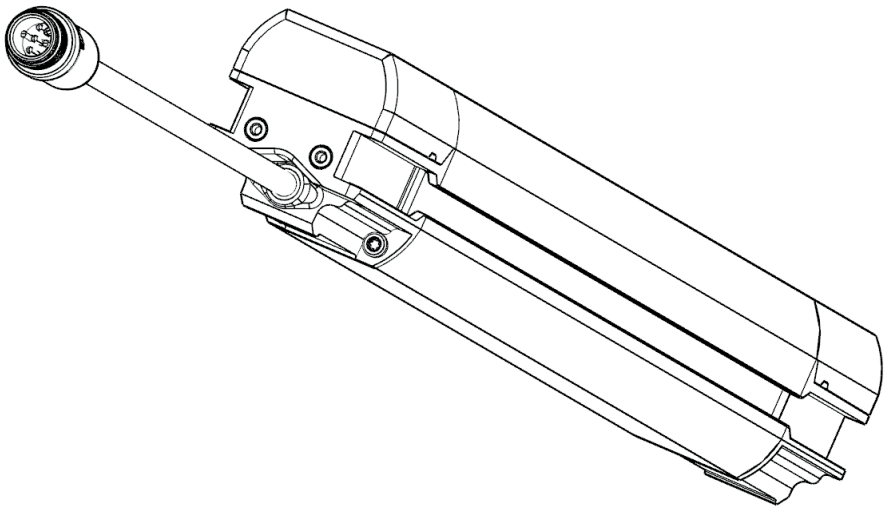
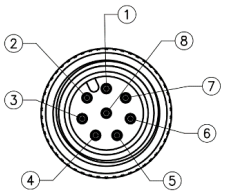
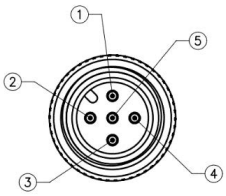


Figure 10: Connections

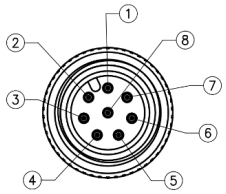
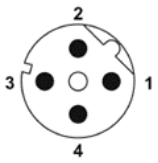
DS4-xx-xxxx-S08-JZ

RECEIVER
M12 male 8 pin

1 - GP DIGITAL IN/OUT + RS485- (white)
2 - 24VDC (brown)
3 - ANALOG OUTPUT (green)
4 - DIGITAL OUT + IO-LINK (yellow)
5 - GP DIGITAL IN (grey)
6 - GP DIGITAL IN/OUT + RS485+ (pink)
7 - GND (blue)
8 - SYNC (red)

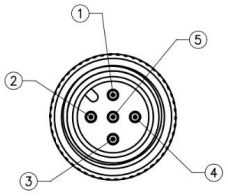
NOTE: The M12 8 pin connector of the receiver unit is provided with a pin-out default configuration. Please refer to “Default configuration” on page 21 for further information.

TRANSMITTER
M12 male 5 pin

1 - 24VDC (brown)
2 - SYNC/RANGE (white)
3 - GND (blue)
4 - NOT CONNECTED (black)
5 - NOT CONNECTED (grey)

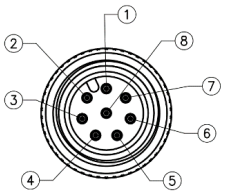
DS4-xx-xxxx-S12-JE

RECEIVER	
M12 male 8 pin	M12 female D-coded 4 pin
	
1 - GP DIGITAL IN/OUT (white)	1 - TX+ (brown)
2 - 24VDC (brown)	2 - RX+ (white)
3 - ANALOG OUTPUT (green)	3 - TX- (blue)
4 - DIGITAL OUT + IO-LINK (yellow)	4 - RX- (black)
5 - GP DIGITAL IN (grey)	
6 - GP DIGITAL IN/OUT (pink)	
7 - GND (blue)	
8 - SYNC (red)	

NOTE: The M12 8 pin connector of the receiver unit is provided with a pin-out default configuration. Please refer to “Default configuration” on page 21 for further information.

EMITTER
M12 male 5 pin

1 - 24VDC (brown)
2 - SYNC/RANGE (white)
3 - GND (blue)
4 - NOT CONNECTED (black)
5 - NOT CONNECTED (grey)

Default configuration

RECEIVER
M12 male 8 pin

1 - NO FUNCTION - (white)
2 - 24VDC - (brown)
3 - ANALOG OUTPUT 4...20 mA (Number of Dark Beams) - (green)
4 - DIGITAL OUT 1 + IO-LINK (Object Detection)- (yellow)
5 - GAIN TEACH - (grey)
6 - NO FUNCTION - (pink)
7 - GND - (blue)
8 - SYNC - (red)

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 68 for more information.

Digital Output selection and parametrization

The DS4 Standard models can drive up to 3 Digital outputs. Output current is limited to 100mA with 100nF maximum capacitive load. Refer to the "Digital output selection and parametrization" on page 72 for more information.

Serial Output RS485 selection and parametrization

The DS4 Standard models can transmit information on user-selected measurements or operating status via a configurable RS485 interface. Refer to the "Serial Output RS485 selection and parametrization (DS4-xx-xxxx-S08-JZ models only)" on page 75 for more information.

Ethernet Output selection and parametrization

The DS4 Standard Ethernet models are capable of transmitting information regarding user-selected measurements or their operating status through a configurable Ethernet interface. Refer to the "Ethernet Output Selection and Parametrization (DS4-xx-xxxx-S12-JE models only)" on page 78 for more information.

CHAPTER 5
LC DESIGNER

The user select among advanced functions/advanced parameters by means of a Multi-platform Software App running on PC or mobile devices (Available for RX only).

The app connects the measurement light curtain by means of a Wi-Fi connection embedded inside the light curtain.

Wi-Fi is enabled at light curtain start-up. An optional time-out may be configured after which Wi-Fi connection is not allowed.

Wi-Fi can also be disable from a digital input (see "Wi-Fi Disable" on page 48).

The Wi-Fi connection is point-to-point: the light curtain generate a wireless network with unique SSID containing its Serial Number and Model with password protection and WPA2 encryption.



NOTE: Internet on your device may not be available in this case.

LC Designer App for PC or mobile devices allows the user to: set the light curtain advanced configuration, firmware update, change network password, monitoring the device status and restore the default configuration. Many parameters are available to customize the light curtain behavior for specific applications.

GET THE APP

Download LC Designer App for PC or mobile devices from the store:

	Available on the App Store	GET IT ON Google Play
Visit www.datasensing.com		

HOW TO CONNECT TO THE LIGHT CURTAIN

NOTE: Internet on your device may not be available in this case.

1. Connect the device to the Wi-Fi generated by the Light Curtain
2. Insert the password (**datasensing**)
3. Launch the LC Designer

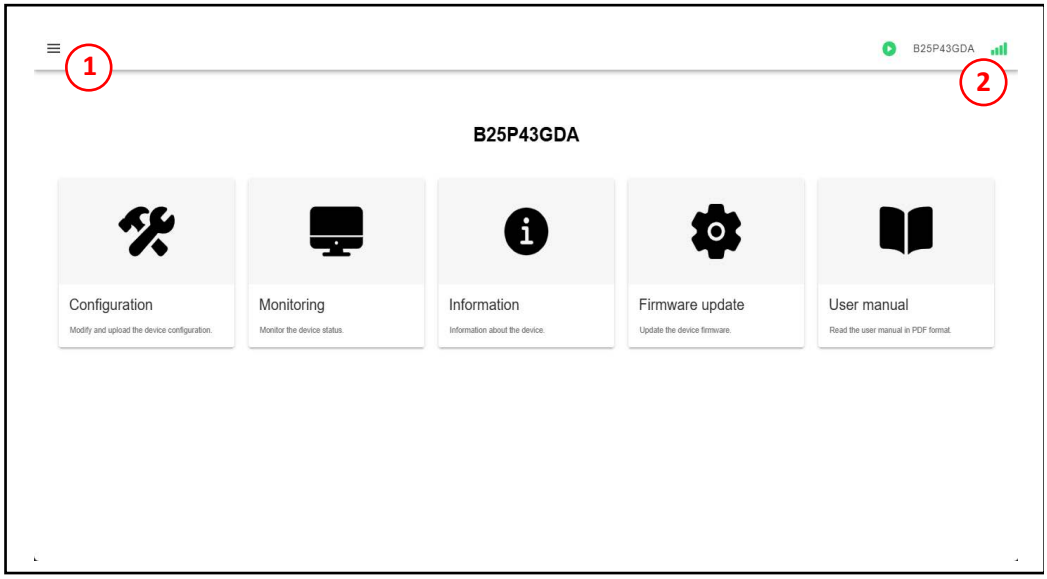
The picture below shows the main window of LC Designer when you access it:



AREA	DESCRIPTION
1	**Menu toolbar icon:** Click the icon to open the menu toolbar. From this menu it is possible to: - access the offline configuration and open a previously saved configuration - change language - access the product reference guide - access the help section
2	**Connection area:** Connect to the device
3	**Network connection:** Shows the network connection status

USER INTERFACE

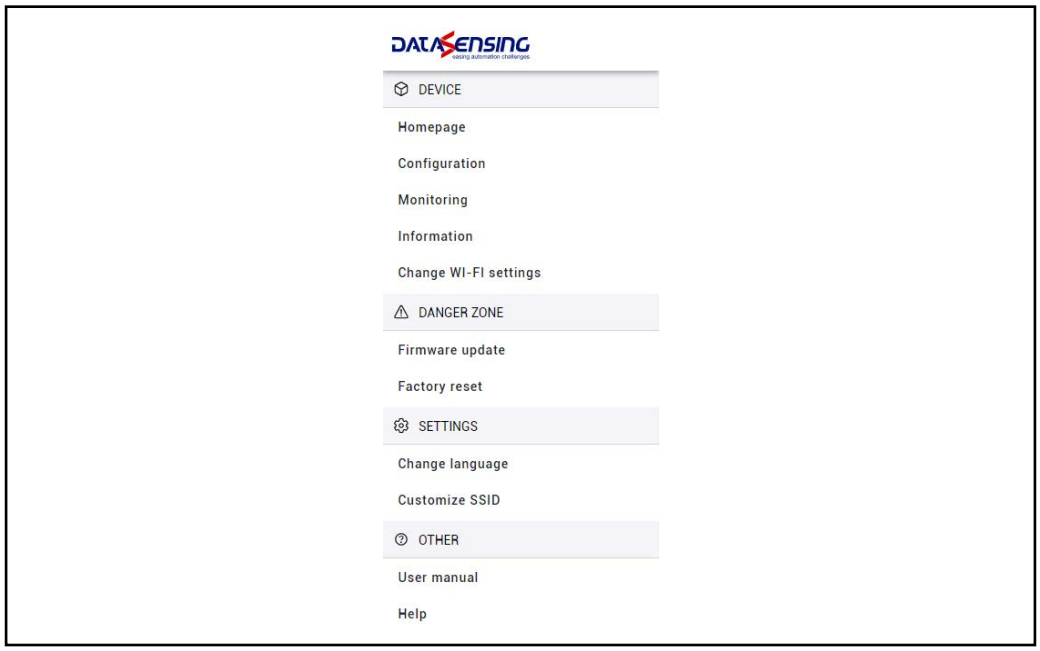
The picture below shows the home page window of LC Designer when you access it:



AREA	DESCRIPTION
1	**Menu toolbar icon:** Click the icon to open the menu toolbar
2	**Status:** Shows the device and network connection status

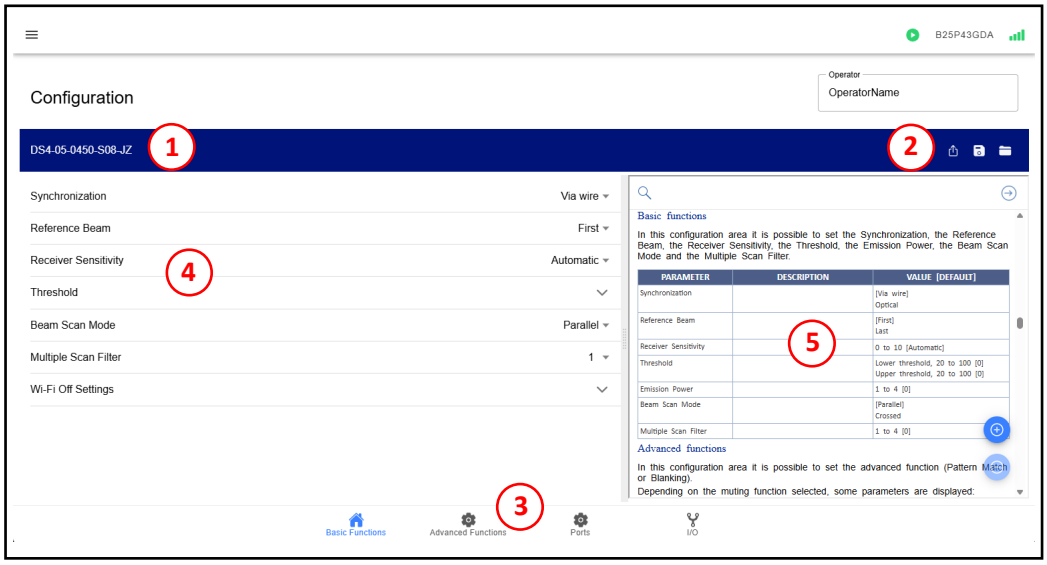
BUTTON	DESCRIPTION
Configuration	Opens the device configuration window
Monitoring	Allows to receive the device status in real time
Information	Allows to see the information about the connected device
Firmware update	Allows to perform the firmware update
User Manual	Opens the Product Reference Guide

Menu toolbar



COMMAND	DESCRIPTION
Homepage	Opens the home page window
Configuration	Opens the device configuration window
Monitoring	Allows to receive the device status in real time
Information	Allows to see the information about the connected device
Change Wi-Fi settings	Allows to change or reset the Wi-Fi settings
Firmware update	Allows to perform the firmware update
Factory reset	Allows to perform the factory reset
Change Language	It lists the available languages for the user interface. Select the language you want to use
Customize SSID	Allows to change the Wi-Fi network name
User Manual	Opens the Product Reference Guide
Help	Opens the search windows to help the user

Configuration



AREA	DESCRIPTION
1	**Device info:** Shows the model of the light curtain connected
2	**Standard button:** This toolbar shows the open\save buttons and the configuration updates. There is also a share button for mobile devices
3	**Function toolbar:** This toolbar shows the configuration buttons
4	**Configuration area:** In this area you can set the basic and advanced functions, ports and the I/O
5	**OnLine Help:** Online Help is displayed in this area

Standard button

BUTTON	DESCRIPTION
	It allows to upload a new configuration on the light curtain (see How to change configuration, starting on page 38)
	It opens the window that allows saving a configuration
	It opens the window that allows choosing an existing configuration
	It allows to share a configuration (available only for mobile device)

Function toolbar

BUTTON	DESCRIPTION
Basic Functions	It allows setting the basic function
Advanced Functions	It allows setting the advanced function
Ports	This button allow to configure the three digital outputs, the analog output and the RS485/Ethernet serial
I/O	It allows to configure the Input and Output signals

Configuration area

Here you can configure the system:

- "Basic functions"
- "Advanced functions"
- "Ports"
- "I/O Manager"

Basic functions

In this configuration area it is possible to set the Synchronization, the Reference Beam, the Receiver Sensitivity, the Thresholds, the Emission Power, the Beam Scan Mode, the Multiple Scan Filter and choose the option and choose whether and how to disable Wi-Fi.

PARAMETER	DESCRIPTION	VALUE [DEFAULT]
Synchronization		[Via wire] Optical
Reference Beam		[First] Last
Receiver Sensitivity	Automatic option available only if Synchronization is set to "Via wire"	Automatic, 1 to 10 [Automatic]
Threshold		Lower threshold, 30 to 99 [30] Upper threshold, 40 to 100 [40]
Emission Power	Available only if Synchronization is set to "Via wire" and Receiver Sensitivity is set to a value different from Automatic	1 to 4 [4]
Beam Scan Mode	Crossed beam scan mode must be set only with Via wire Synchronization and Receiver Sensitivity set to a value different from Automatic. Augmented beam scan mode must be set only with Via wire Synchronization.	[Parallel] Crossed Augmented[1]
Multiple Scan Filter		1 to 4 [1]
Wi-Fi Off Settings	Allows to disable the WiFi	Timeout: 0 to 30 min [0] Switch Wi-Fi on/off from input: ON or OFF [OFF]

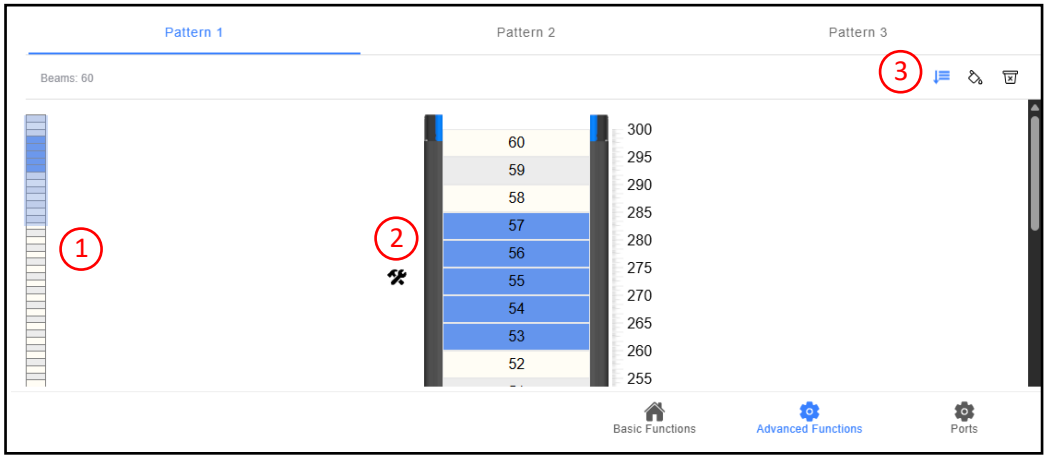
1. DS4-05-xxxx-Sxx-Jx models only

Advanced functions

In this configuration area it is possible to set the advanced function (Pattern Match or Blanking).
Depending on the advanced function selected, some parameters are displayed:

PARAMETER	DESCRIPTION	VALUE [DEFAULT]
Advanced function	Pattern Match and Blanking are available only if Beam Scan Mode is set to Parallel	[None] Pattern Match Blanking
External Teach on pattern 1	Available with Pattern Match function active	ON [OFF]
Mode	Available with Pattern Match function active	[Fixed] Floating
Beam Tolerance	Available with Pattern Match function active	0 to 4 [0]
Trigger Stretch (ms)	Available with Pattern Match function active	0 to 250 [0]
Minimum Pattern Stability Time (ms)	Available with Pattern Match function active	0 to 1000 [0]
External Teach	Available with Blanking function active	ON [OFF]
Blanked beams value	Available with Blanking function active	[Free] Intercepted
Teach Expansion	Available with Blanking function active and with External Teach active	0 to 4 [0]

Also, when an advanced function is set, a graphic window is available to select the single beams individually according to the functions used.



AREA	DESCRIPTION
1	Shows an overview of the connected device
2	Shows the beams of the light curtain. By selecting the individual beams it is possible to configure one or more zones. When one or more zones are configured, it is possible to change the parameters using the icon
3	Beams management buttons: allows to flip the order of beam displayed (top to bottom or bottom to top). allows to select all the beams. allows to delete areas.

Ports

In this configuration area it is possible to set the output ports configuration.

PARAMETER		DESCRIPTION	VALUE [DEFAULT]
Digital out 1	Mode	Pattern Match can be selected only if Pattern Match is set as Advanced Function.	• Disabled • [Always Enabled] • External trigger • Pattern Match
	Update Mode (External Trigger)	Available only with External Trigger mode. **Switch:** Measurement 1 and Measurement 2 conditions must be set.	• [Enabled] • Freeze • Latch • Switch
	Update Mode (Pattern Match)	Available only with Pattern Match mode. **Switch:** Measurement 1 and Measurement 2 conditions must be set. **Match:** No condition must be set	• Enabled • Freeze • Latch • Switch • [Match]
	Pattern Match	Available only if Pattern Match mode is selected.	• Pattern 1: [ON] - OFF • Pattern 2: ON - [OFF] • Pattern 3: ON - [OFF]
	Condition	Allows to choose if the light curtain must use only the Measurement 1 condition or if it must perform a logical operation between Measurement 1 and Measurement 2 conditions.	• [None] • AND • OR
	Measurement 1 _Measurement list	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL • [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement 1 _Condition		• None • [=] • ≥ • ≤
	Measurement 1 _Value		• 0... #Beams[1] [0]
	Measurement 2 _Measurement list	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL • [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement 2 _Condition		• None • [=] • ≥ • ≤
	Measurement 2 _Value		• 0... #Beams[1] [0]

1. #Beam: total number of physical beams of the light curtain in case of Parallel Beam Scan Mode or [2*physical beams - 1] in case of Crossed or Augmented Beam Scan Mode.

PARAMETER		DESCRIPTION	VALUE [DEFAULT]
Digital out 2	Mode	Pattern Match can be selected only if Pattern Match is set as Advanced Function.	• [Disabled] • Always Enabled • External trigger • Pattern Match
	Update Mode (External Trigger)	Available only with External Trigger mode. **Switch:** Measurement 1 and Measurement 2 conditions must be set.	• [Enabled] • Freeze • Latch • Switch
	Update Mode (Pattern Match)	Available only with Pattern Match mode. **Switch:** Measurement 1 and Measurement 2 conditions must be set. **Match:** No condition must be set.	• [Enabled] • Freeze • Latch • Switch • Match
	Pattern Match	Available only if Pattern Match mode is selected	• Pattern 1: ON - [OFF] • Pattern 2: ON - [OFF] • Pattern 3: ON - [OFF]
	Condition	Allows to choose if the light curtain must use only the Measurement 1 condition or if it must perform a logical operation between Measurement 1 and Measurement 2 conditions.	• [None] • AND • OR
	Measurement 1 _Measurement list	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL • [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement 1 _Condition		• [None] • = • ≥ • ≤
	Measurement 1 _Value		• 0... #Beams[1] [0]
	Measurement 2 _Measurement list	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL • [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement 2 _Condition		• [None] • = • ≥ • ≤
	Measurement 2 _Value		0... #Beams [1] [0]

1. #Beam: total number of physical beams of the light curtain in case of Parallel Beam Scan Mode or [2*physical beams - 1] in case of Crossed or Augmented Beam Scan Mode.

Digital out 3	Mode	Pattern Match can be selected only if Pattern Match is set as Advanced Function.	• [Disabled] • Always Enabled • External trigger • Pattern Match	
	Update Mode (External Trigger)	Available only with External Trigger mode. **Switch:** Measurement 1 and Measurement 2 conditions must be set.	• [Enabled] • Freeze • Latch • Switch	
	Update Mode Pattern Match)	Available only with Pattern Match mode. **Switch:** Measurement 1 and Measurement 2 conditions must be set. **Match:** No condition must be set.	• [Enabled] • Freeze • Latch • Switch • Match	
	Pattern Match	Available only if Pattern Match mode is selected.	• Pattern 1: ON - [OFF] • Pattern 2: ON - [OFF] • Pattern 3: ON - [OFF]	
	Condition	Allows to choose if the light curtain must use only the Measurement 1 condition or if it must perform a logical operation between Measurement 1 and Measurement 2 conditions.	• [None] • AND • OR	
	Measurement 1 _Measurement list	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL	• [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement 1 _Condition		• [None] • = • ≥ • ≤	
	Measurement 1 _Value		• 0... #Beams [1] [0]	
	Measurement 2 _Measurement list	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL	• [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement 2 _Condition		• [None] • = • ≥ • ≤	
	Measurement 2_Value		• 0... #Beams [1] [0]	

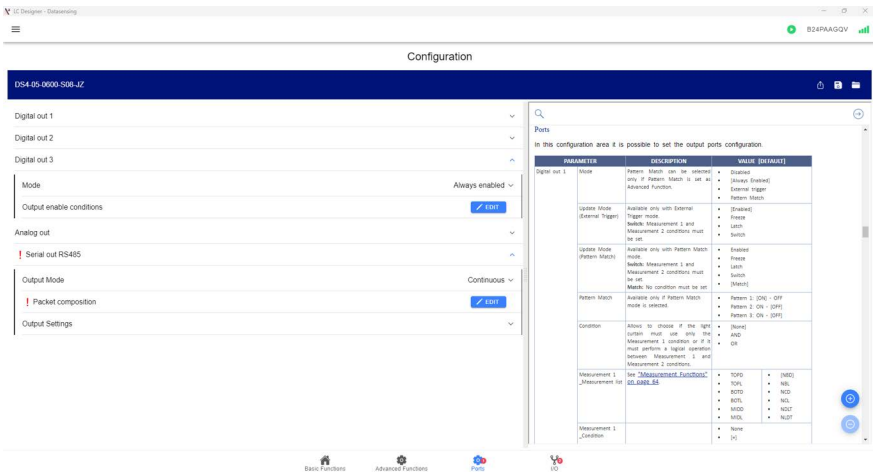
1. #Beam: total number of physical beams of the light curtain in case of Parallel Beam Scan Mode or [2*physical beams - 1] in case of Crossed or Augmented Beam Scan Mode.

Analog out	Output Type		• Disabled • [Current 4-20 mA] • Voltage 10 V	
	Output Mode	Available only if Output type is different from “Disabled”. Pattern Match can be selected only if Pattern Match is set as Advanced Function.	• [Continuous Measurement] • External Trigger • Pattern Match	
	Update Mode	Available only if Output mode is different from “Continuous Measurement2.	• [Enable] • Freeze • Max Detector • Min Detector • Measure Switch	
	Pattern Match	Available only if Pattern Match mode is selected.	• Pattern 1: ON [OFF] • Pattern 2: ON [OFF] • Pattern 3: ON [OFF]	
	Measurement list _Measurement 1	See "Measurement Functions" on page 66.	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL	• [NBD] • NBL • NCD • NCL • NDLT • NLDT
	Measurement list _Measurement 2	See "Measurement Functions" on page 66. Available only if Measure Switch is selected	• TOPD • TOPL • BOTD • BOTL • MIDD • MIDL • [None]	• NBD • NBL • NCD • NCL • NDLT • NLDT
Serial out RS485	Output Mode	On Digital Out 1 Change, On Analog Change and Enable on Pattern Match are available only if the corresponding function is enabled.	• [Disabled] • Continuous • On Digital Output 1 Change • On Analog Output Change • On Request • Enable on EXT Trigger • Enable on Pattern Match	
	Request Command	Available only if On Request mode is selected.	• Free hex input of 1 or 2 bytes	
	Pattern Match	Available only if Pattern Match mode is selected.	• Pattern 1: ON [OFF] • Pattern 2: ON [OFF] • Pattern 3: ON [OFF]	
	Packet Composition		• [Short] • Binary • Custom	
	BSA Logic	Available only if BSA is selected in Binary or Custom protocol.	• [1 Free] • 0 Free	
	Baud Rate	2400, 115200, 460800, 921600 are available only if Custom protocol is selected.	• 2400 • 9600 • 19200 • 38400 • [57600] • 115200 • 230400 • 460800 • 921600	
	Parity	Even, Odd, Mark and Space are available only if Custom protocol is selected.	• [None] • Even • Odd • Mark • Space	
	Stop Bits	2 is available only if Custom protocol is selected.	• [1] • 2	

Ethernet	Output Mode	On Digital Out 1 Change, On Analog Change and Enable on Pattern Match are available only if the corresponding function is enabled.	• [Disabled] • Continuous • On Digital Output 1 Change • On Analog Output Change • On Request • Enable on EXT Trigger • Enable on Pattern Match
	Request Command	Available only if On Request mode is selected.	• Free hex input of 1 or 2 bytes
	Pattern Match	Available only if Pattern Match mode is selected.	• Pattern 1: ON [OFF] • Pattern 2: ON [OFF] • Pattern 3: ON [OFF]
	Packet Composition		• [Short] • Binary • Custom
	BSA Logic	Available only if BSA is selected in Binary or Custom protocol.	• [1 Free] • 0 Free
	DHCP		• DHCP • [Static]
	IP Address	Available only if DHCP is Static.	• [192.168.0.82]
	Subnet Mask	Available only if DHCP is Static.	• [255.255.255.0]
	Gateway	Available only if DHCP is Static.	• [0.0.0.0]
	Port	Available only if DHCP is Static.	• [36910]

NOTE: If the configuration created by the user is incomplete (i.e. not all the parameter values required for correct light curtain operation have been entered), a red exclamation mark appears next to the corresponding parameter.
At the bottom of the Configuration page, a red alert indicator is displayed next to the section navigation buttons, showing the number of errors present in each section.

Until the configuration is complete and valid, LC Designer does not allow the configuration to be uploaded, saved, or shared (see the picture below).



I/O Manager

User can establish how to map inputs, outputs or communication interfaces activated for the configuration of product functions through the I/O Manager panel of LC Designer.

For Each logical signal required by current configuration (listed in rows), I/O Manager show a dot symbol for each pin that can be used for the signal.

For example, when setting “Receiver Sensitivity” to automatic a Gain Teach input must be defined, a symbol appears on Gain Teach row, dot symbols are displayed under Pin 5, Pin 7, Pin 8. By clicking on a dot symbol the signal and the pin are linked and a virtual wire is shown with the color expected for cables according to the Receiver connection (see "Electrical Connection" on page 18).

The number in red on IO/Manager panel icon represent the logical signal still to be linked to physical pins before the configuration may be uploaded.

Digital I/O may be also linked to I/O-Link process data. 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 (see "IO-Link Interface Selection and Parametrization" on page 81 for further details).

NOTE: More than one functionality can be assigned at the same time to the IO-Link “virtual” pin.

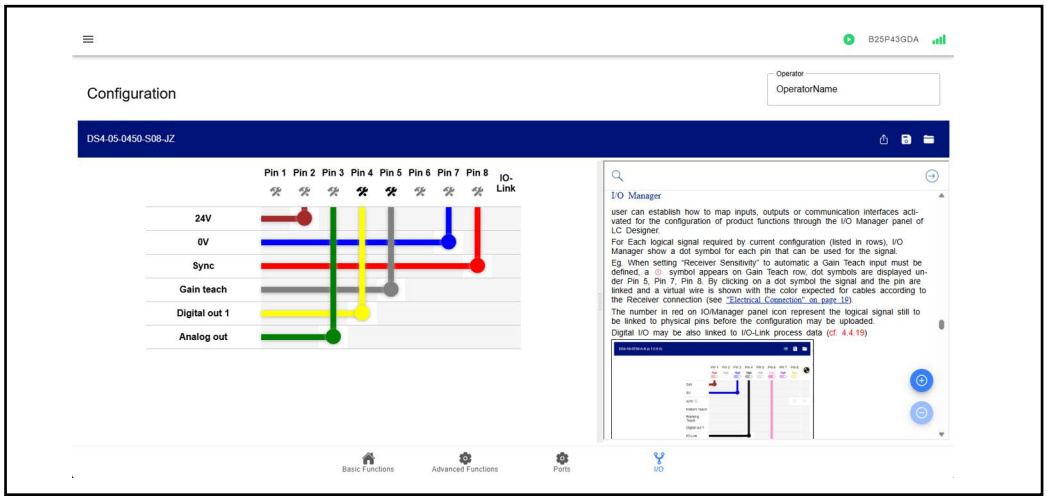
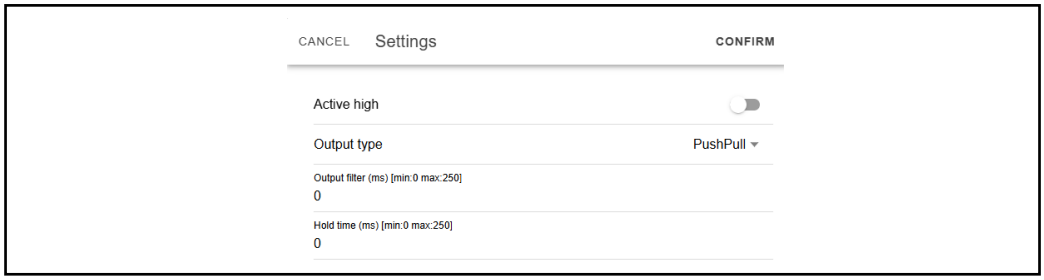
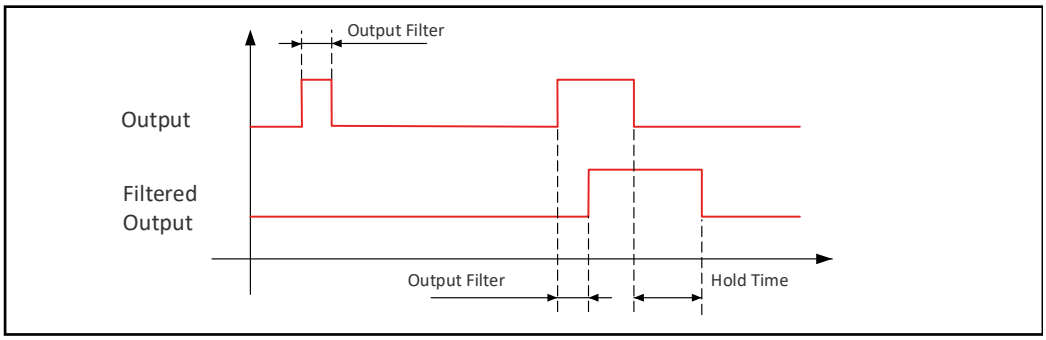


Figure 11: Input Output Manager windows

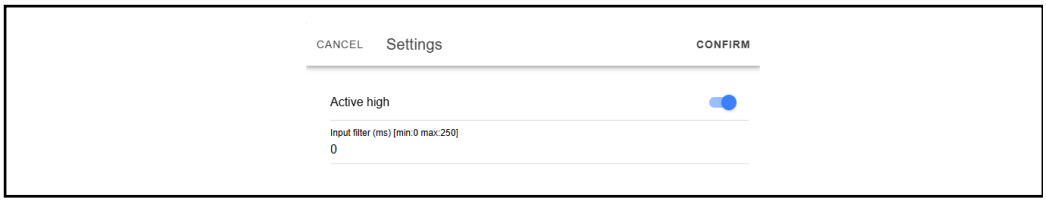
When pins are linked to logical inputs or outputs additional configuration is available for each pins by clicking on the tools icon.

For **Digital Outputs** the user can choose polarity, output type (PNP, NPN, PushPull), Output filter and Hold time. Output filter will filter-out pulses shorter than set value, while the hold time extends the duration of a pulse by a time equal to the value entered, ranging from 0 to 250 milliseconds.

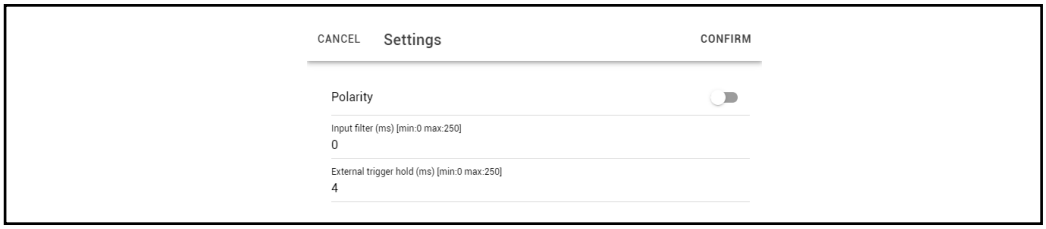


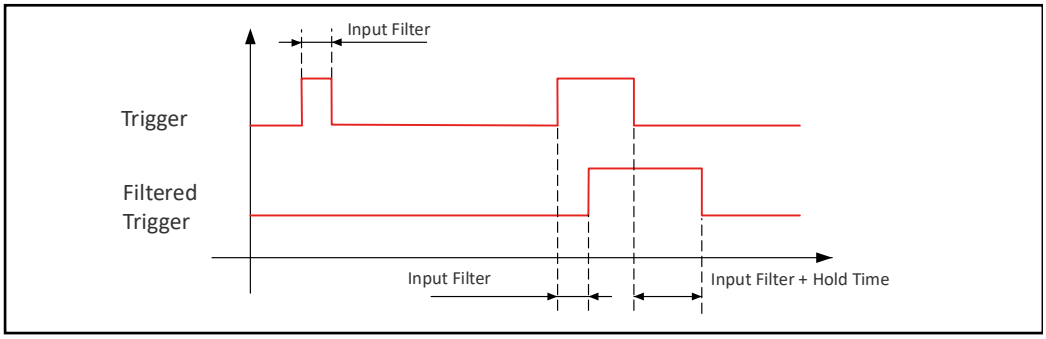


For **Inputs** (External teach, Pattern teach, Gain teach, Blanking teach, WiFi off) the user can choose polarity and Input Filter. Input Filter will filter-out pulses shorter than set value.



Additionally when one input is used as trigger also hold time may be set to allow triggering from fast signals.





Following tables reports available signal-pin connections (●) and constraints (Fx):

	pin1	pin2	pin3	pin4	pin5	pin6	pin7	pin8	IO-Link
24V		F							
0V							F		
Sync								F1	
External Trigger	●				●	●		●	●
Pattern Teach	●				●	●		●	●
Gain Teach	●				●	●			●
Blanking Teach	●				●	●		●	●
Digital Out 1	●			●		●		●	●
Digital Out 2	●			●		●		●	●
Digital Out 3	●			●		●		●	●
Analog Out			F2						
RS485-	F3								
RS485+						F3			
Wi-Fi off	●				●	●		●	●

- User can connect when no other signal already connected for same pin.

F: fixed and already connected by GUI

F1: fixed and already connected if Basic Function->Synchronization = via wire

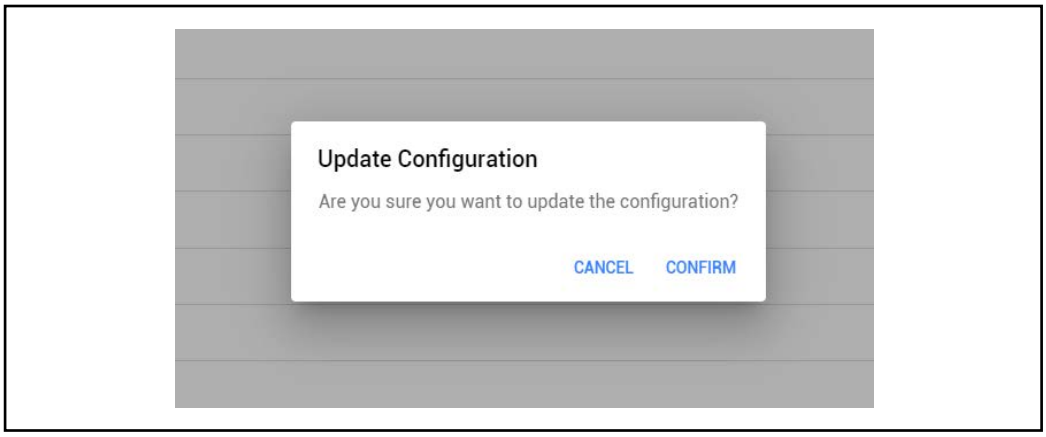
F2: fixed and already connected if Ports->Analog Out ≠ Disabled

F3: fixed and already connected if Ports->RS485->Output Mode ≠ Disabled

How to change configuration

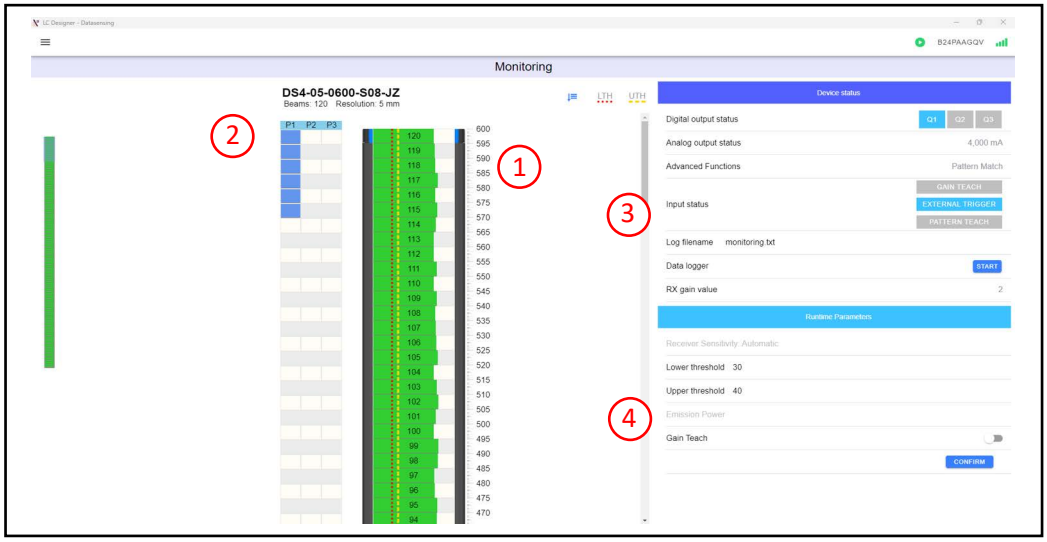
In order to apply changes to the configuration, it is necessary to follow the steps below:

1. Click on the  icon
2. Confirm to proceed or cancel:



Monitoring

Allows to receive the device status in real time.

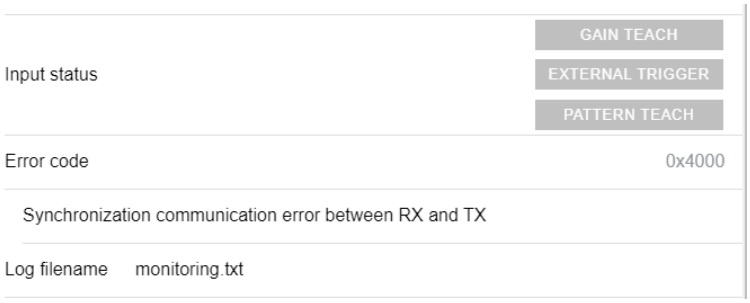


AREA	DESCRIPTION
1	It allows the user to see the real-time status of each light curtain beams: • **GREEN:** the received signal level is above the set upper threshold (UTH). The beam is considered FREE. • **RED:** the received signal level is below the set lower threshold (LTH). The beam is considered INTERCEPTED. • **YELLOW:** the received signal level is between the set lower threshold (LTH) and the set upper threshold.
2	It displays areas defined for the 3 Pattern Masks [P1, P2, P3] or for the Blanking Mask [B]
3	It displays information about: • Digital outputs, • Analog output, • Inputs, • Advanced function, • Gain value of the Receiver. It informs the user if errors occur and allows to record a log with the signal status of each light curtain beams.
4	It allows the user to change the runtime parameters or perform a Gain teach. After modifying parameters, it is necessary to press the CONFIRM button to make the changes effective. When a parameter cannot be changed for the defined configuration, it is greyed out.

NOTE: The parameters in the *Device status* section can change based on the type of configuration chosen by the user. A configuration parameter is only displayed when enabled on the Configuration page.

The Digital outputs and Input status parameter boxes are grey when enabled on the Configuration page, but the function is not active; they turn blue if the function is active.

NOTE: When an event/error occurs, the Error code parameter is displayed:



Log file

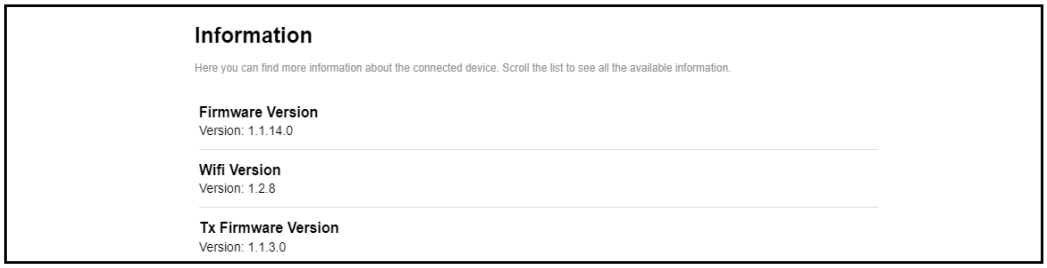
To log the light curtain analog signal data, follow these steps:

1. Choose the file name (default name `monitoring.txt`).
2. Press the START button at the Data logger line (blue button).
3. Press the STOP button to stop the recording (red button).

NOTE: After recording is complete, the file is saved by default in the *Downloads* folder (Android app) or in the *LC Designer* folder (iOS app). In Windows version of the LC Designer, however, the user can choose the path to save the file.

Information

More information about the connected device.



INFO	DESCRIPTION
RX Firmware version	Receiver firmware version
TX Firmware version	Transmitter firmware version
Wi-Fi version	Wi-Fi version

NOTE: The TX Firmware Version parameter is displayed only when the Synchronization parameter is set to Via Wire and the SYNC pins are connected together.

Change Wi-Fi settings

Wi-Fi password can be re-set to its default connecting **Receiver** pin 1 (White) with pin 5 (Grey), then powering up the light curtain.

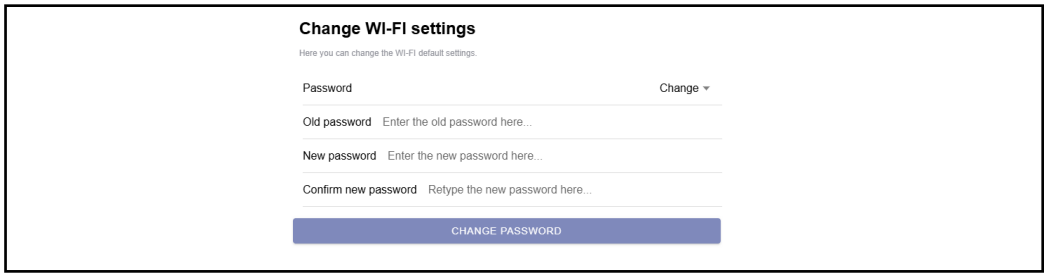
At startup the default Wi-Fi password is set and “Wi-Fi password reset” UI pattern is visualized.

NOTE: Product configuration is not re-set with such method.

NOTE: A power cycle of the light curtain is needed to make effective the new Wi-Fi password or the default one.

Through the LC Designer interface, the user can change the light curtain’s Wi-Fi password or reset it.

The new password must have minimum length of 8 characters.



Customize SSID

SSID contains light curtain model and serial number, for example:

Model	Serial Number
DS4-05-0450	B21P13431

User can change only the model part with a custom string (max. 12 character) to ease light curtain identification on multiple devices installations.

NOTE: A power cycle the light curtain is needed to make effective the new SSID.

Firmware update

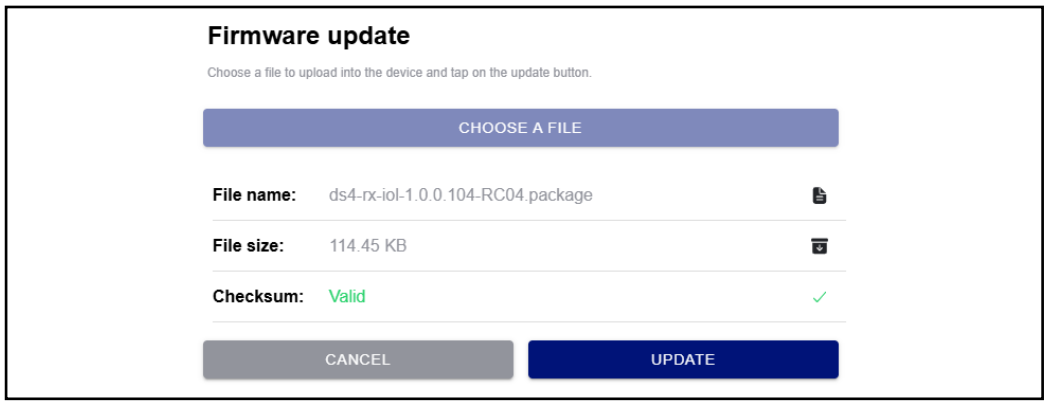
LC Designer App allows to update:

- the Receiver device firmware
- the Receiver Wi-Fi firmware
- the Transmitter device firmware

NOTE: Please contact Datasensing Technical Support for the latest firmware and support on update.

How to update the Receiver device firmware:

1. Open the "*Firmware update*" tab.
2. Press "*Choose a file*" and select the firmware obtained from the Technical Support.



3. If the file checksum passes, press "*Update*" and proceed with the update.
4. Wait the end of the procedure.

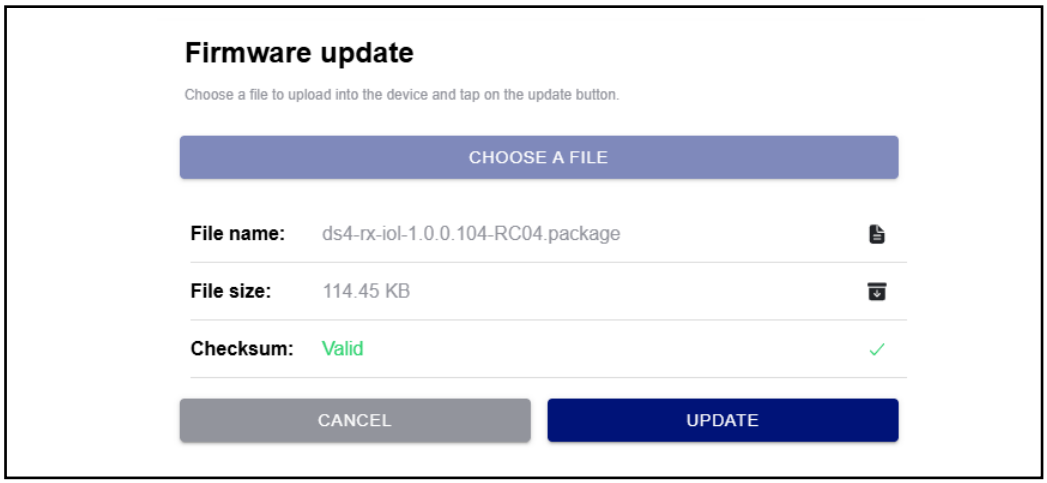
NOTE: During this operation the light curtain restarts itself.

How to update the Receiver Wi-Fi firmware:

1. Open the "*Firmware update*" tab.
2. Press "*Choose a file*" and select the firmware obtained from the Technical Support.
3. If the file checksum passes, press "*Update*" and proceed with the update.
4. Wait the end of the procedure.
5. Power cycle the device to load the new firmware.

How to update the Transmitter device firmware:

1. Connect the Transmitter unit to the Receiver unit by SYNC pins.
2. Open the "*Firmware update*" tab.
3. Press "*Choose a file*" and select the firmware obtained from the Technical Support.

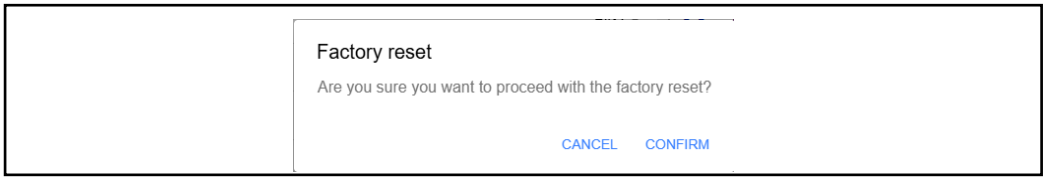


4. If the file checksum passes, press "*Update*" and proceed with the update.
5. Wait the end of the procedure.
6. Power cycle the light curtain.
7. Wait until the receiver has completed transferring the Firmware to the Transmitter.
8. Disconnect the Receiver from the Transmitter (only if Optic Sync is set).

Factory Reset

Factory reset allows to reset advanced configuration stored in flash after Wi-Fi parametrization.

In order to perform the factory reset and wait until the end of the procedure.



Factory Settings

The system configuration in the factory condition is as follows:

BASIC FUNCTIONS:

- Synchronization: **Via Wire**
- Reference Beam: **First**
- Receiver Sensitivity: **Automatic**
- Upper detection threshold: **40**
- Lower detection threshold: **30**
- Emission Power: **4**
- Beam Scan Mode: **Parallel**
- Multiple Scan Filter: **1**
- Switch Wi-Fi on/off from input: **DISABLED**
- Timeout: **0**

ADVANCED FUNCTIONS:

- Advanced Function: **None**
- Pattern Match:
  - External teach on pattern 1: **False**
  - Mode: **Fixed**
  - Beam Tolerance: **0**
  - Trigger Stretch: **0**
  - Minimum Pattern Stability: **0**
  - Pattern Mask_x: **No zones**
- Blanking:
  - External Teach: **False**
  - Teach Expansion: **0**
  - Blanked beam value: **Free**
  - Blanking Mask: **No zones**

PORTS:

- Digital Out 1:
  - Mode: **Always enabled**
  - Update Mode (External Trigger): **Enabled**
  - Update Mode (Pattern Match): **Match**
  - Pattern 1: **Enabled**
  - Pattern 2: **Disabled**
  - Pattern 3: **Disabled**
  - Condition: **None**

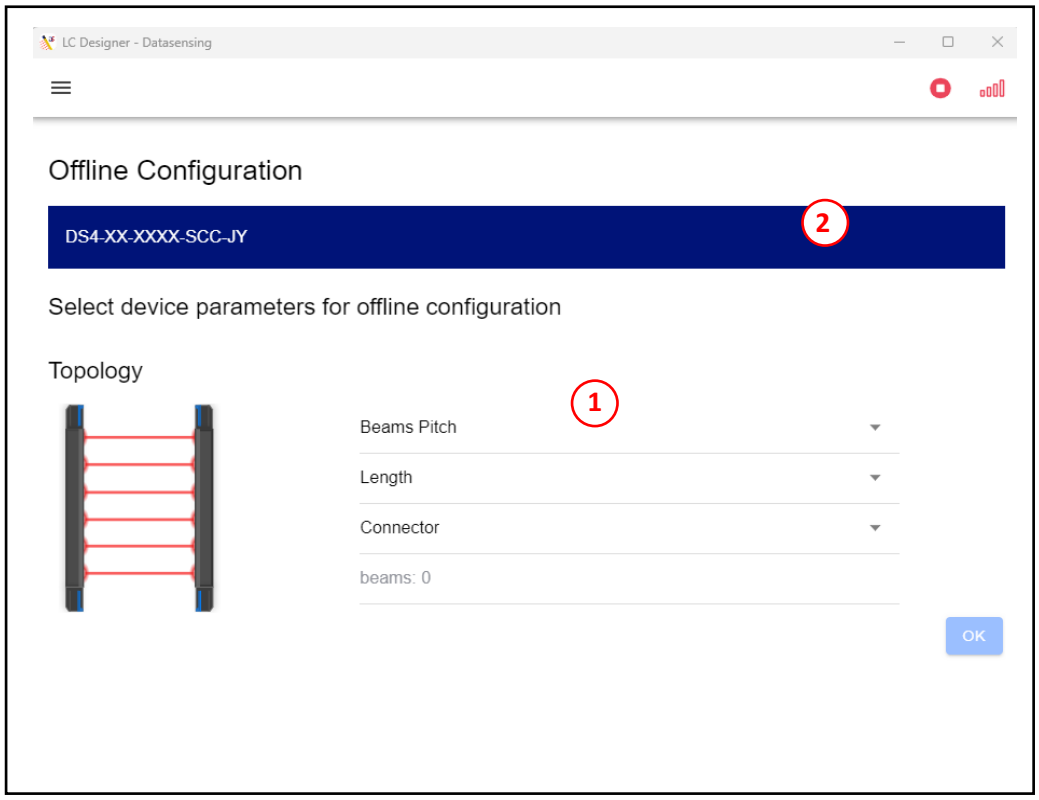
  - Measurement 1: **NBD = 0**
  - Measurement 2: **NBD None 0**
- Digital Out 2 and Digital Out 3:
  - Mode: **Disabled**
  - Update Mode (External Trigger): **Enabled**
  - Update Mode (Pattern Match): **Enabled**
  - Pattern 1: **Disabled**
  - Pattern 2: **Disabled**
  - Pattern 3: **Disabled**
  - Condition: **None**
  - Measurement 1: **NBD None 0**
  - Measurement 2: **NBD None 0**
- Analog Out:
  - Output Type: **Current 4-20 mA**
  - Output Mode: **Continuous Measurement**
  - Update Mode: **Enable**
  - Pattern 1: **Disabled**
  - Pattern 2: **Disabled**
  - Pattern 3: **Disabled**
  - Measurement 1: **NBD**
  - Measurement 2: **None**
- Serial out RS485:
  - Output Mode: **Disabled**
  - Pattern 1: **Disabled**
  - Pattern 2: **Disabled**
  - Pattern 3: **Disabled**
  - Request command: **0000**
  - Packet composition: **Short**
  - Measurements: **[]**
  - BSA logic: **1 FREE**
  - Baud rate: **57600**
  - Parity: **None**
  - Stop Bits: **1**
- Ethernet:
  - Output Mode: **Disabled**
  - Pattern 1: **Disabled**
  - Pattern 2: **Disabled**
  - Pattern 3: **Disabled**
  - Request command: **0000**
  - Packet composition: **Short**
  - Measurements: **[]**
  - BSA logic: **1 FREE**
  - DHCP: **Static**
  - IP Address: **192.168.0.82**
  - Subnet Mask: **255.255.255.0**
  - Gateway: **0.0.0.0**
  - Port: **36910**

User Manual

Opens the device's Product Reference Guide in PDF format.

Offline Configuration

The DS4 Designer App allows to create a configuration in offline mode. By choosing “Offline configuration” from the menu toolbar (see page 24) it is possible to select the device and the system topology.



AREA	DESCRIPTION
1	**Topology:** Choose the system length, pitch and the type of connector.
2	**Standard buttons (Offline mode):** This toolbar shows the open\save and reset configuration buttons. There is also a share button for mobile devices

Once the system has been defined by selecting the topology, press “OK” button to move on the configuring the functions. The standard buttons will be available in the new screen.

Standard button (Offline mode)

BUTTON	DESCRIPTION
	It allows the user to reset the configuration and return to the offline configuration home page
	It opens the window that allows saving a configuration
	It opens the window that allows choosing an existing configuration
	It allows to share a configuration (available only for mobile device)

CHAPTER 6
FUNCTIONS

FUNCTIONING MODES

This chapter describes all the functions of the light curtain.

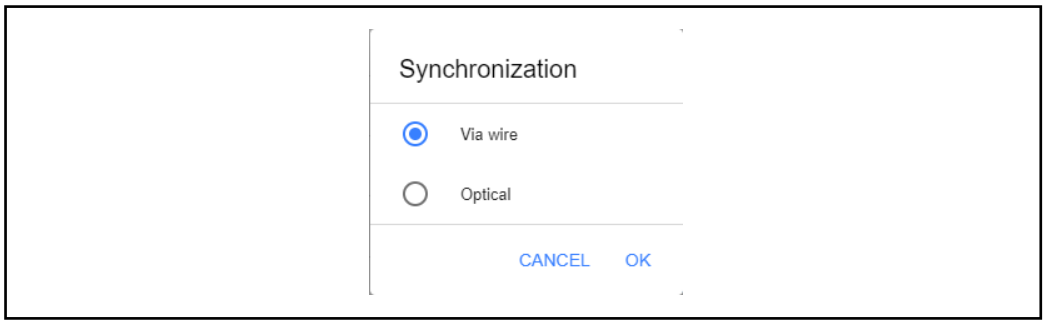
The DS4 light grids detect and measure objects placed inside the detection area. Hence, beam interruptions can cause the switching of the digital output and the variation of the analogue output signal.

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 done via cable and optical synchronization from the GUI. When selecting wire sync a dedicated RX pin is automatically assigned in I/O Manager, then TX and RX units must be connected on the designated pins (see "Electrical Connection" on page 18).

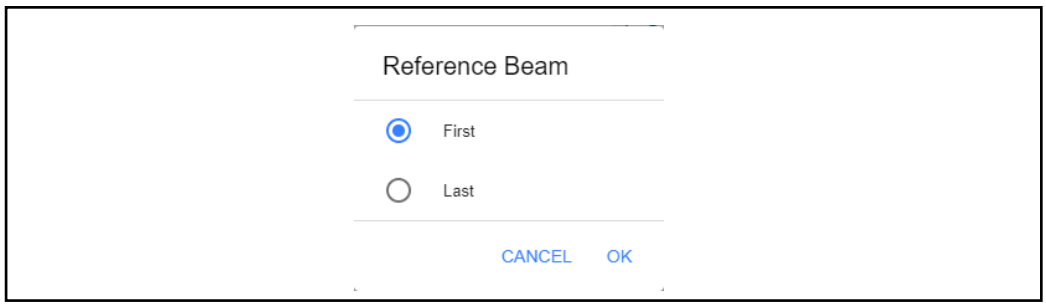
NOTE: When using Optical Sync, automatic regulation of emission power and receiver sensitivity, and consequently transparent detection capability, it's not available.



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. Through IO-Link or the GUI, the user can choose whether to designate 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.



Wi-Fi Disable

It is possible to disable Wi-Fi communication by means of a configurable timeout and/or a digital input that can be assigned in I/O Manager (see "I/O Manager" on page 35).



Both Timeout and Switch Wi-Fi on/off from input options are only considered when there is no active connection.

When Switch Wi-Fi on/off from input is selected light curtain start with Wi-Fi OFF, then wait for the Input status.

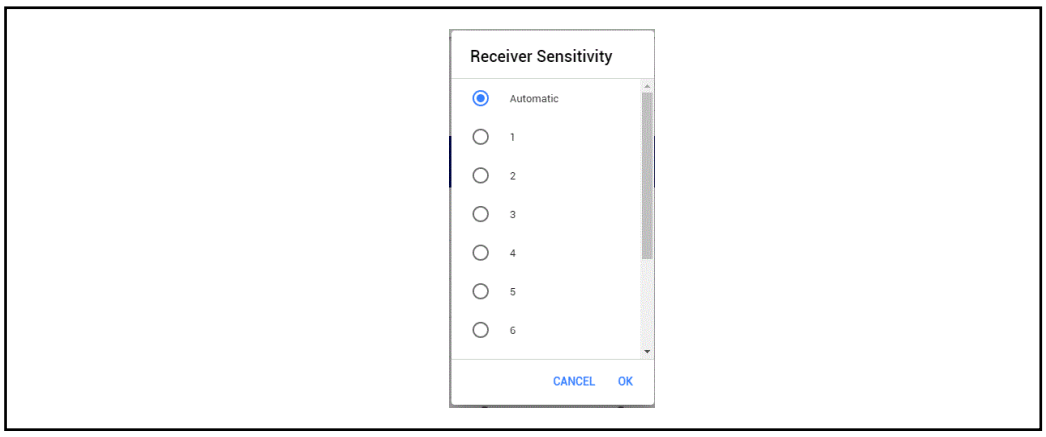
Wi-Fi Switching Input	Wi-Fi Status
LOW	OFF
HIGH	ON

The user can also choose the type of logic to use (High-Active or Low-Active) and set an input filter (from 0 to 250 ms).

NOTE: Wi-Fi can also be disabled via IO-Link commands.

Receiver Sensitivity

The Receiver Sensitivity can be set either Automatic or in 10 fixed steps for better ambient light handling or when trying to detect objects smaller than stated detection capability.



Fixed sensitivity setting will set same sensitivity for all light curtain beams, and it's only recommended when Auto Sensitivity can't be used (for example unavailable teach input, impossibility to have all-free beams for a gain teach time).

Gain Setting	Distance Factor RX (Df RX)	Typical operating distance at maximum TX power		
		5 mm	10 mm	25 mm
AUTO	0.12 ÷ 1	0.2 ÷ 5 m	0.2 ÷ 7 m	0.2 ÷ 13 m
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

For detecting transparent targets or object smaller than detection capability Auto-sensitivity shall be used where a teach procedure initiated by the user will automatically set receiver gain and emission power in order to level all beams received signal amplitude to a fixed target value.

NOTE: That can be observed in GUI monitoring section while teach procedure is running.

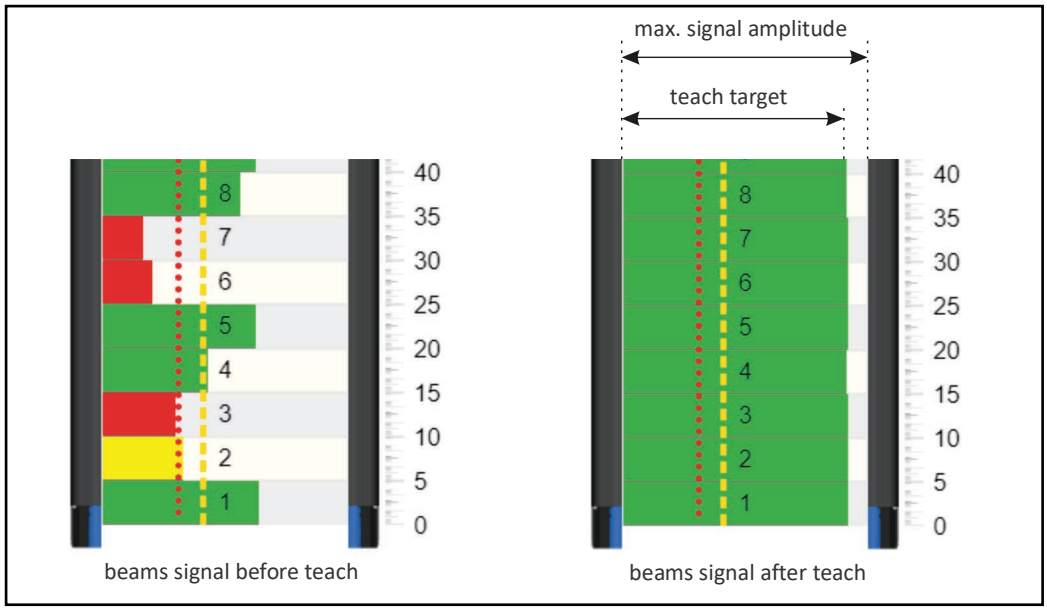


Figure 12: Auto-sensitivity

Auto sensitivity setting is only available when wire sync is selected (refer to "TX-RX Synchronization" on page 47) and the setting for the Receiver unit will be automatically applied on transmitter too.

Two additional parameters are available:

- **Lower Threshold [30...99%]** is the value in % of teach target below which beam are considered intercepted when the signal is decreasing (red dotted line in GUI monitoring)
- **Upper Threshold [40...100%]** is the value in % of teach target above which beam are considered free when the signal is increasing (yellow dotted line in GUI monitoring)

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

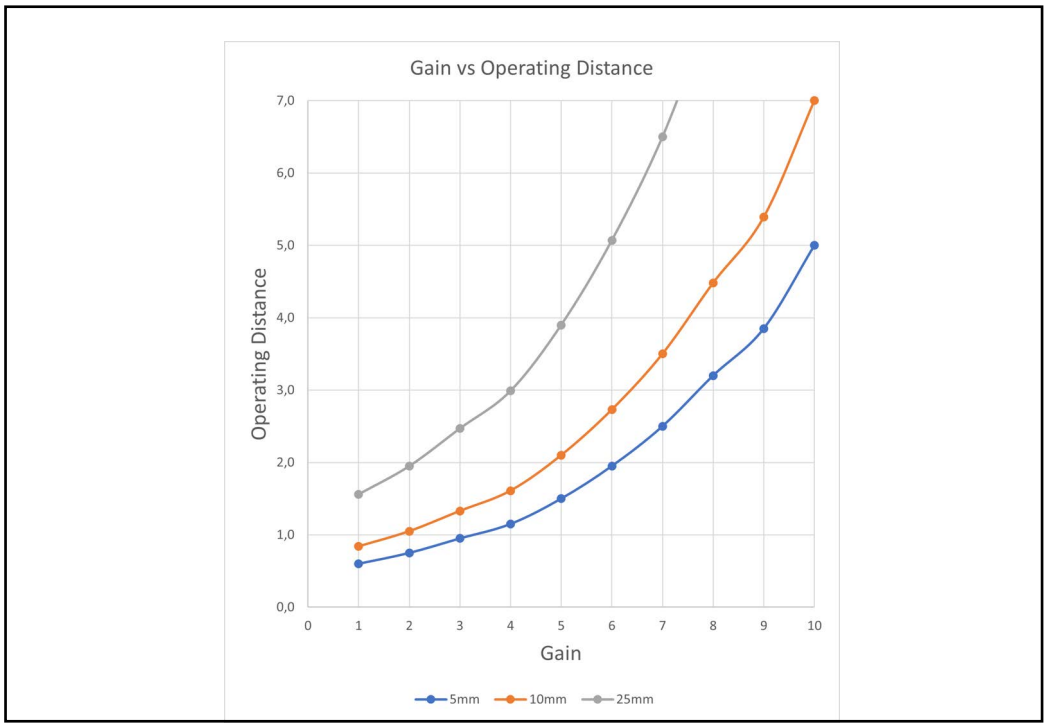
NOTE: Please note that the higher the setting the more sensible the light curtain will be to front window contamination, floating particles, mechanical vibrations, environmental conditions changes.

To be able to detect very transparent object (light transmissivity >70%) it is very important to perfectly align the light curtain so the automatic gain setup (Gain Teach) will end with the lowest possible receiver gain. The higher the gain, indeed, the higher the noise will be on received signal: with high noise it's not advisable to set high threshold needed for transparent detection, otherwise false detection will happen (signal going below threshold because of noise and not object occlusion).

NOTE: In the case of particularly noisy environments, it is advisable to set the Upper detection threshold to a maximum value of 85%-90% to detect transparent objects.

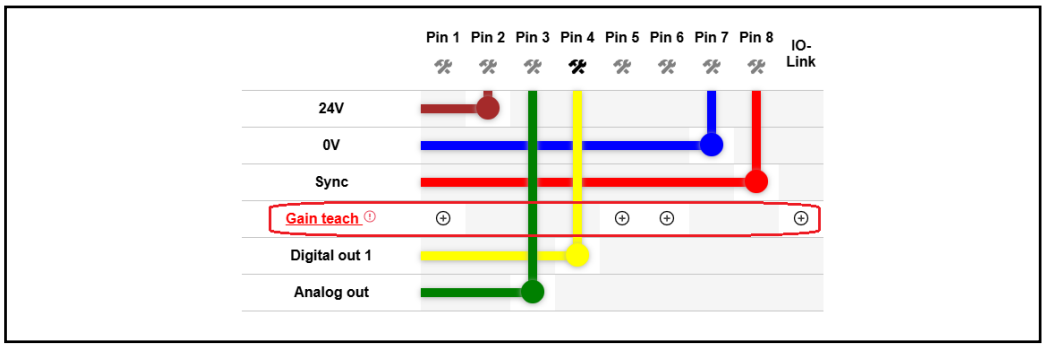
The graph below shows the maximum distances for the 3 different DS4 resolutions depending on RX gain. Thus, alignment quality may be judged against this graph.

Eg. For a TX-RX distance of 2m on 10mm resolution an optimal alignment should lead to a gain of around 5.



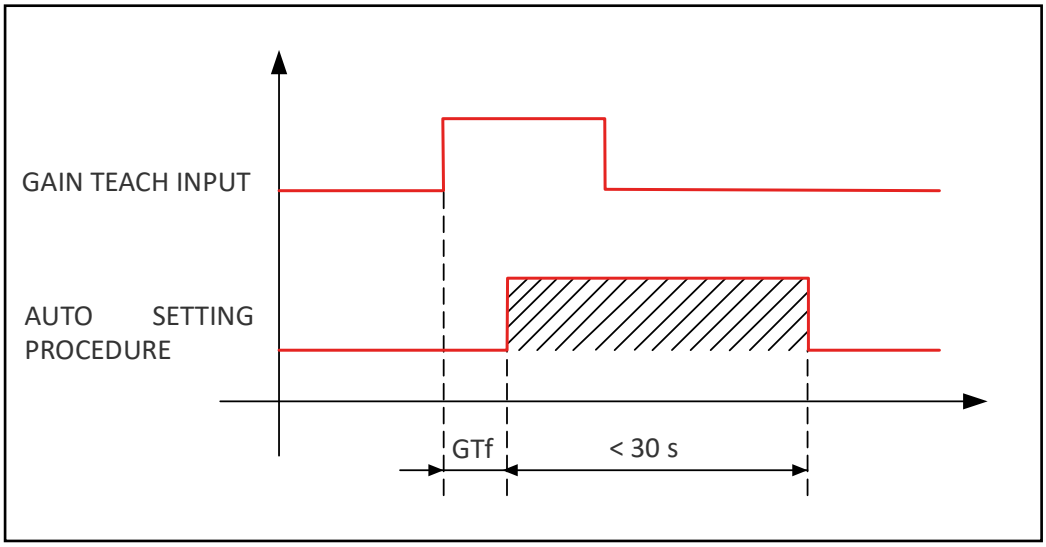
When choosing Auto setting a **Gain Teach Input** must be assigned in I/O Manager to an available input pin.

An optional filter GTf up to 250ms can be configured in I/O manager for Gain Teach Input.



At power-up DS4 Light Curtain will set last taught receiver sensitivity/emission power (if any, otherwise maximum gain and emission are set), then a proper signal on Gain Teach.

Input will trigger the Auto-setting procedure that can last up to 30 s depending on light curtain length and resolution.



NOTE: It's fundamental to assure that gain teach is performed only with uninterrupted beams and it's repeated when environmental condition (mostly temperature and ambient light) changes.

Emission Power

When using Optic Sync, 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 18.).

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

When a wire sync is established with RX unit, emission power is overridden by Receiver settings.

The Emission Power can be set from GUI in 4 steps to minimize influence on nearby sensors or when using the light curtain near reflective surfaces.

Step	Distance Factor TX (Df TX)
1	0.2
2	0.35
3	0.6
4	1

When Automatic Receiver Sensitivity is chosen for the receiver, all emitter options are disabled: transmission power will be set automatically during Gain Teach procedure triggered on the receiver unit.

When manually setting receiver sensitivity and emission power effective maximum operating distance (Od) can be calculated from nominal operating distance (refer to "Technical Data" on page 87) according to following formula:

Effective Od = Nominal Od x Df RX x Df TX

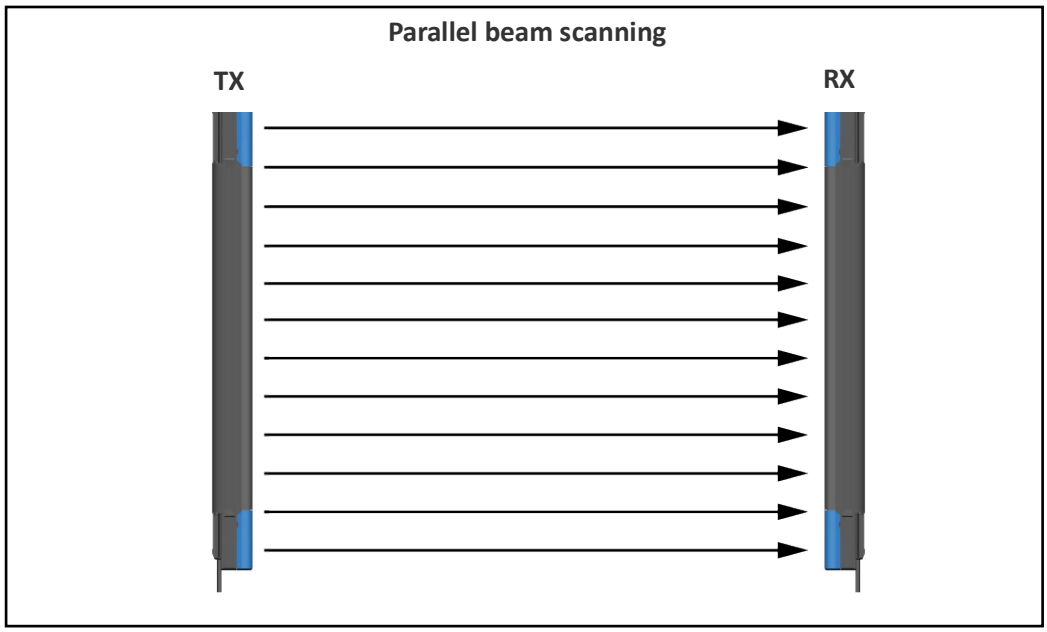
Beam Scan Mode

It is possible to choose the beam scan between the following modes:

- "Parallel mode" on page 54
- "Crossed Beam Scanning mode" on page 55
- "Augmented Resolution mode (DS4-05-xxxx-Sxx-Jx models only)" on page 55 (DS4-05-xxxx-Sxx-Jx models only)

Parallel mode

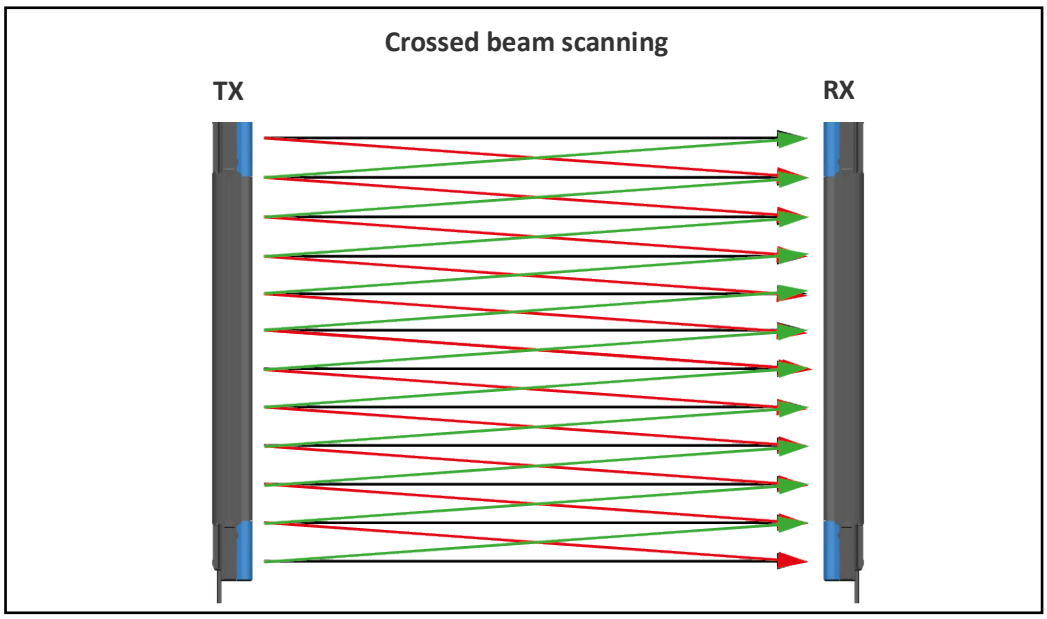
In Parallel mode light beam of each transmitter is detected by the directly opposing receiver.



NOTE: Pattern Match and Blanking functions can be used only with parallel beam scan mode.

Crossed Beam Scanning mode

In Crossed Beam Scanning mode, the light beam of each transmitter LED is detected in multiple scans both by the directly opposing receiver (1st scan) as well as by the two adjacent receivers (i+1 on 2nd scan, i-1 on 3rd scan).



After the 3 scan cycles beam vectors obtained from SCAN2 and SCAN3 are ANDED into one vector, then interleaved with SCAN 1 results, obtaining a beam vector with [2 x physical beam -1] logical beams.

Logical beam #	1	2	3	4	5	6	7	8	9
	S1[1]	S2[1]^S3[1]	S1[2]	S2[2]^S3[2]	S1[3]	S2[3]^S3[3]	S1[4]	S2[4]^S3[4]	S1[5]

Where SY[x] is the status of beam x from SCAN Y

All measurement functions configured to analog, digital or communication outputs will then use logical beam vector for their calculation.

NOTE: When using Crossed Beam Scanning mode, Pattern Match and Blanking function, are disabled.

Augmented Resolution mode (DS4-05-xxxx-Sxx-Jx models only)

In Augmented Resolution mode, thanks to the peculiar optical design, analog results from beam scanning are interpolated and binarized into a vector of [2 x physical beam -1] logical beams so the output measurement resolution increases to 2.5 mm.

NOTE: When using Augmented Beam Scan Mode, Pattern Match and Blanking are disabled.

Multiple Scan Filter

Multiple Scan Filter can be set from GUI or 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)

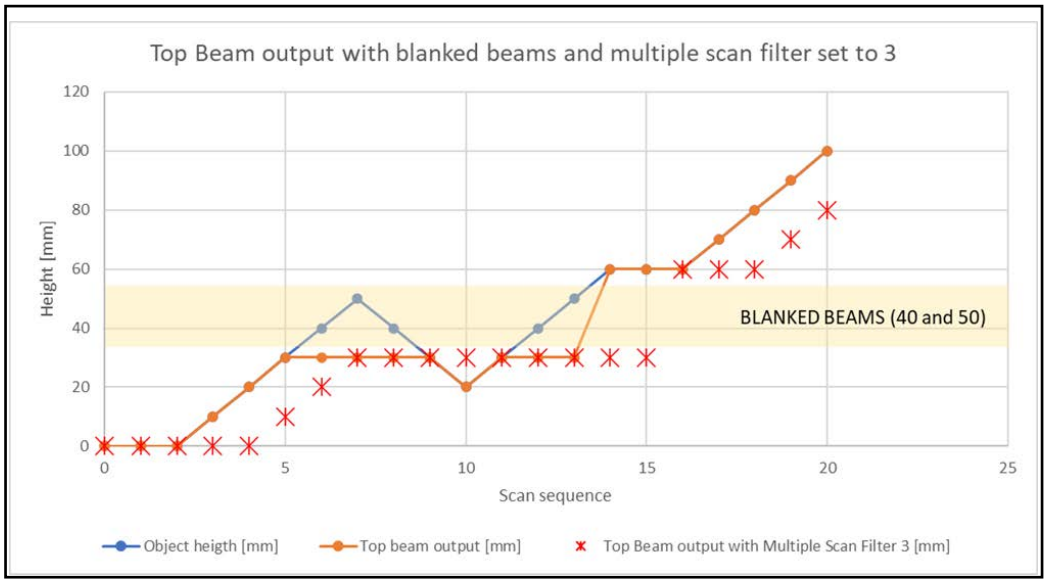
Else Filtered Beam state (t) is not updated

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



The multiple scan filter may be only configured using the GUI, under the “"I/O Manager" on page 35” section, where each Output pin may be associated with its own Multiple Scan Filter.

Configuration:



Pattern Match

Pattern match is a function designed to give an output based on the detection of a particular pattern, that is when beams at specific positions are all interrupted at the same time. In that case, an internal trigger signal is generated that can be used instead of external trigger via external input. It can be useful to identify objects, especially those with holes like pallets or supports.

Several settings are provided, both to modify the internal trigger signal and to specify the conditions at which the trigger is sent. The scope is to adapt the function to the largest number of possible applications.

NOTE: Pattern Match function may be used only with parallel beam scan mode and not together with Blanking function.

NOTE: When using Optic Sync at least one sync beam must be excluded from Pattern mask.

Here are two mutually exclusive ways to set stored pattern to match:

- "Fixed" on page 58
- "Floating Pattern" on page 58

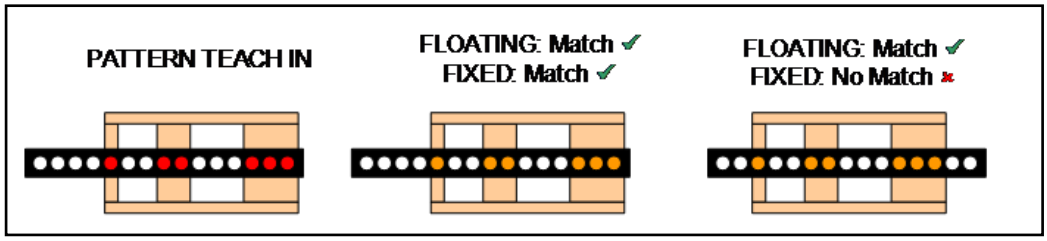
Fixed

Using the “Fixed” option, the trigger is generated only when the stored pattern appears in the exact same position it was defined (same set of interrupted/uninterrupted beams in the same positions). In Fixed mode, the user may define a free pattern mask through GUI Beam Editor or let the light curtain automatically set while using the External Teach mode.

Floating Pattern

The trigger is generated also when the stored pattern appears in different positions, while keeping the exact sequence of interrupted and uninterrupted beams. In this case the pattern will always be searched across the whole light curtain.

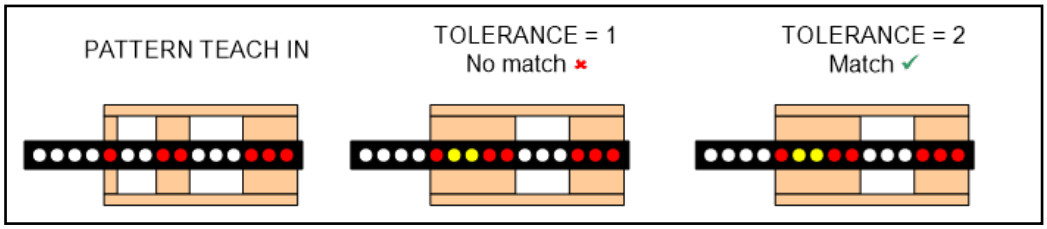
When using Floating option pattern limits are identified by uppermost and lowermost beam. As for Fixed option, pattern may be defined manually in beam editor or automatically using External Teach.



Beam Tolerance

The Tolerance option will generate a pattern match trigger even if the pattern is not exactly the one stored. Tolerance is useful for moving objects, objects with slightly variable shapes and for objects that may be slightly skewed. It may be used both for Fixed and Floating patterns.

Tolerance may be set to a value from 0 to 4 and that value is the maximum allowed consecutive 1s in bit-to-bit XOR between the scan result and stored pattern that will still generate a trigger.



This means every transition between an interrupted and an uninterrupted beam may differ with respect to the pattern up to set tolerance value and the match will still occur. This also means interruptions within the tolerance value may be completely absent and the match will still occur.

NOTE: Tolerance may not be set to a number that is bigger than total beams in stored pattern.

Pattern External Teach or Pattern Beam Editor

It is possible to define patterns in two different ways: using External Teach or the Beam Editor.

External Teach

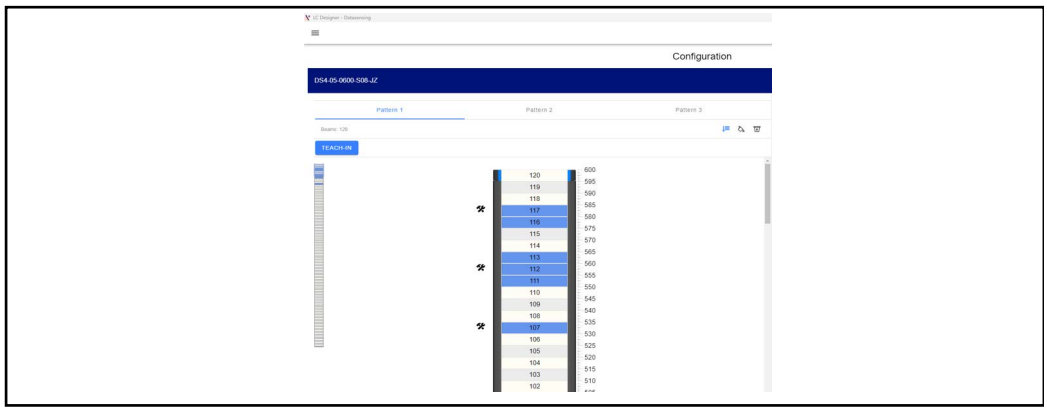
This option allows the system to automatically store a pattern, based on the current conditions of the beams when the “Teach” external input is set and kept high for at least **PTf** ms (can be configured in I/O Manager by changing input filter on Pattern Teach Input). Whenever the same set of beams will be interrupted again after the teach process, a trigger will be sent as the object will be considered identified.

NOTE: Through External Teach, only the areas related to Pattern Mask 1 can be acquired.

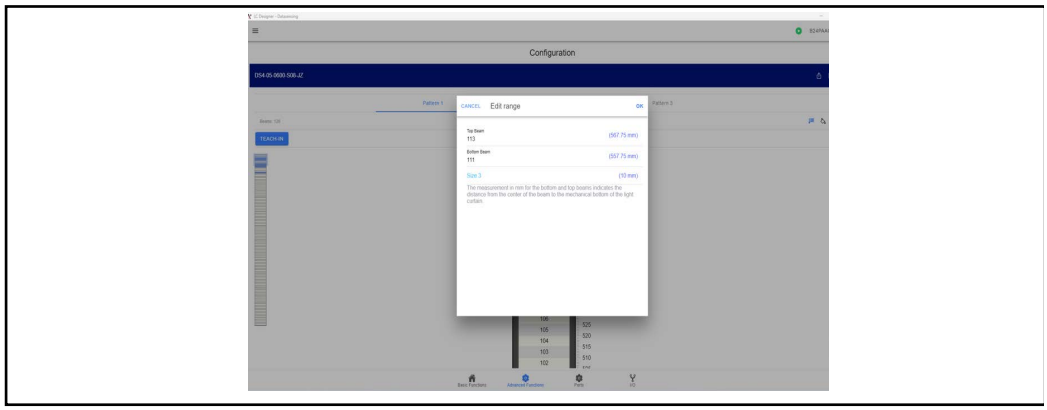
NOTE: When the External teach is not set, the user must use the Beam Editor to edit the Patter Masks.

Beam Editor

Beam Editor utilizes a graphical visualization of the light curtain, allowing the user to define a custom pattern mask by adding individual beams or groups of beams to the pattern.



For each beam group, the user can define the group limits through definition of uppermost and lowermost beams belonging to the group.



When Floating Object is selected the pattern should only be considered starting at the lowermost beam set as intercepted and ending at uppermost beam set as intercepted.

Beam Editor is an alternative to External Teach to store a pattern. Using Beam Editor it is also possible to store up to 3 different patterns. For each of such patterns a different trigger may be set, as internal trigger or output to one of the free I/O ports.

Instead, if different beam groups are configured on a single pattern, only one internal trigger may be generated.

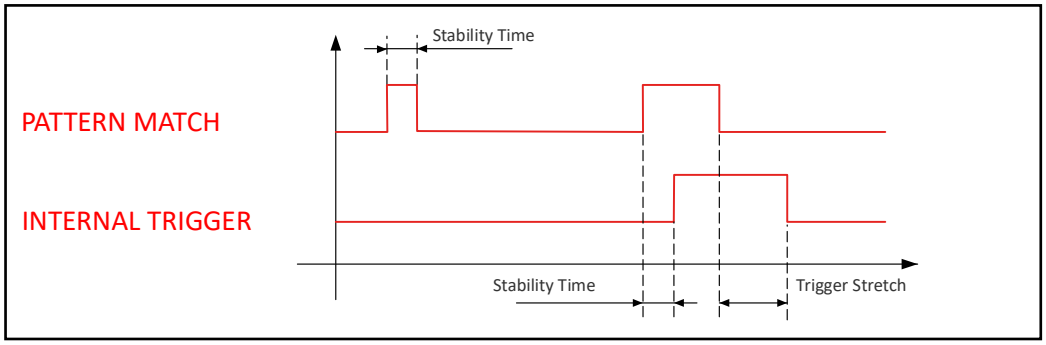
In beam editor it is possible to acquire current beams status to ease patterns setting.

When the teach-in button is pressed beam editor table is automatically populated with free beams (holes of the object to be detected) and intercepted beams (object to be detected).

NOTE: Pattern acquired through teach-in can then be edited.

Minimum pattern stability time: This is an input filter used to enhance robustness but also to allow matching of patterns that are stable in time. While using the minimum pattern stability time, the internal pattern match trigger will be generated only if the pattern is matched and stays matched for at least the time set, that may go from 0 to 1000ms. Please note this translates to a minimum subsequent scans that all match the pattern, where the precise number of scans depends both on the scan time (that in turn depends on the curtain length) and on the set time. Actual times may therefore be adapted to the closer available value.

Trigger stretch: This is an output filter mainly used for compatibility with external equipment. The Trigger Stretch extends the duration of a pulse by a time equal to the value entered, ranging from 0 to 250 milliseconds. During Stretch time additional matches are ignored.



Blanking

Blanking is an auxiliary function of light curtains for which the introduction of an opaque object inside parts of the light curtain's operational field is allowed without interfering on the measurement functions of the light curtain.

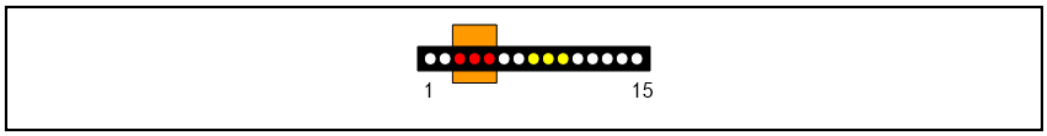
NOTE: The Blanking function may be used only with parallel Beam Scan mode and not together with Pattern Match function.

NOTE: When using Optic Sync at least one sync beam must be excluded from Blanking mask.

The blanking function is particularly useful when the light curtain's protection field must be inevitably intercepted by a fixed part of the machine. In practice, it is possible to ignore the status of some beams, forcing a fixed logical value for them, in order to avoid their status to affect the measurement.

User shall set if blanked beams are considered free or intercepted: that will affect measurement result differently. Such setting is valid for all blanked beams.

Examples of behavior of measurement functions on a 15 beams device with blanking on beams 8-10 (yellow beams):

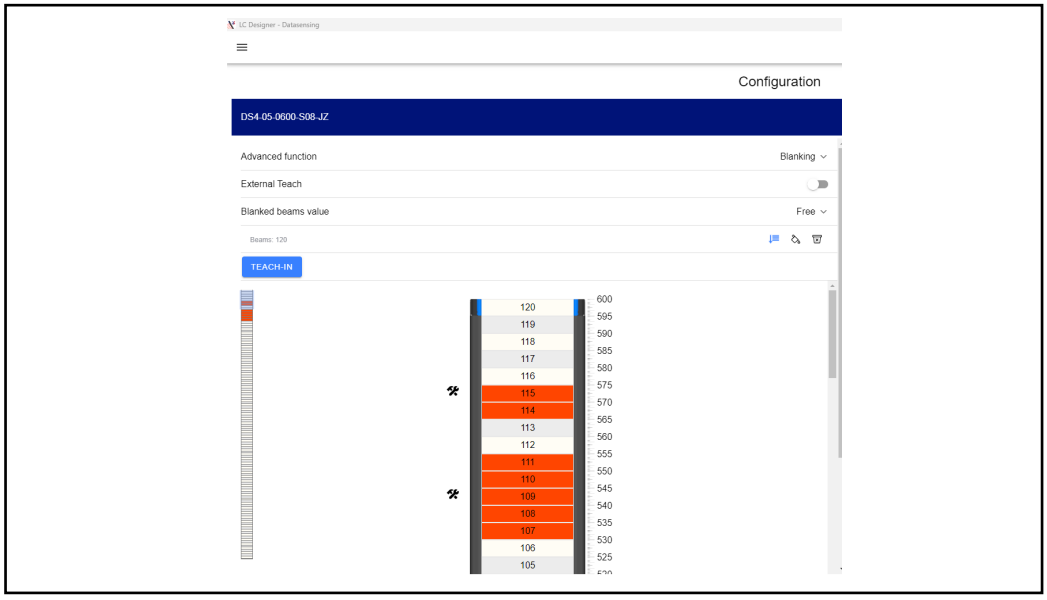


Measure	Blanked beam setting	Value
TOPD	Free	5
	Intercepted	10
BOTD	Free	3
	Intercepted	3
MIDD	Free	4
	Intercepted	7
NBD	Free	3
	Intercepted	6
NCD	Free	3
	Intercepted	3
NDLT	Free	1
	Intercepted	2

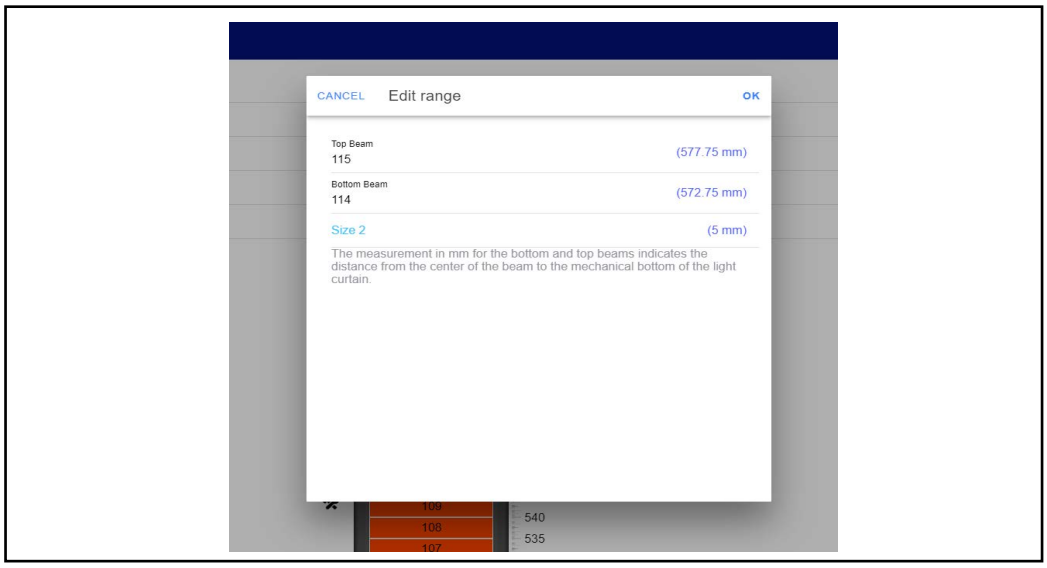
Blanking with Beam Editor

The operator may use the Beam editor provided by GUI when Blanking is selected as Beam Editor Type to select beams to be blanked.

The user will see a scheme with all the beams of the light curtain and can choose for each beam if it's blanked (red) or not.

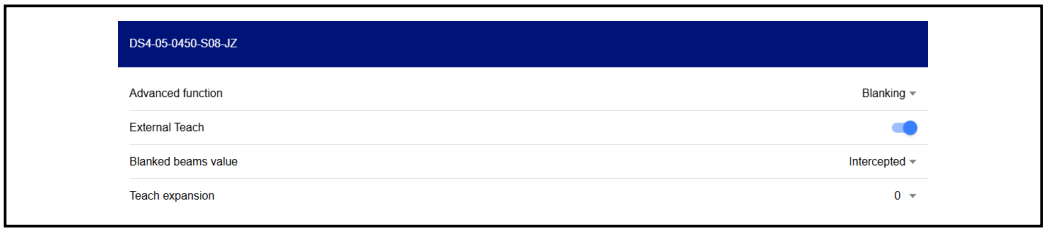


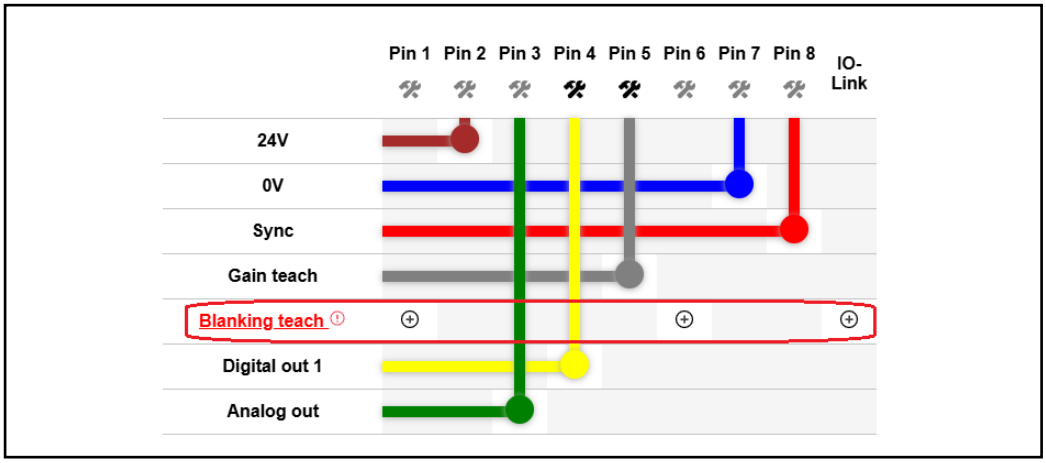
To ease multiple beams zones definitions adjacent blanked beams are automatically grouped in zones by GUI. For each defined blank zone it's possible to edit its limits defining Top and Bottom beams by clicking on tools icon.



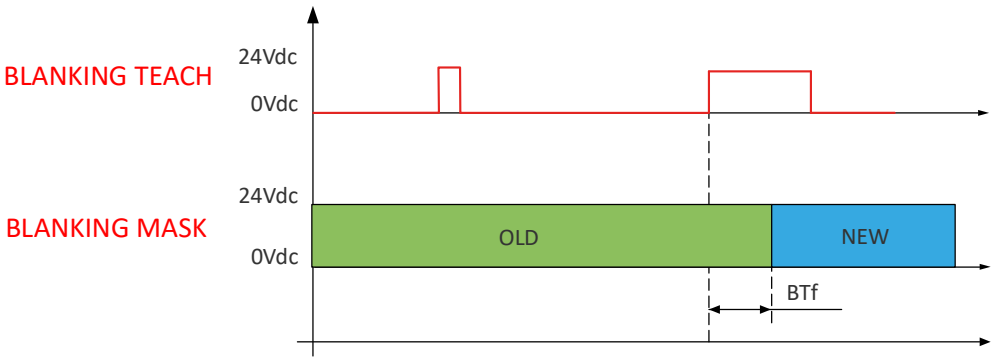
External Blanking Teach

The user may select this option to teach the blanked beams to the system. With external blanking teach, the user may just put in the detection zone the object or objects that are expected to interfere with the beams and then activate a signal which must be assigned in I/O Manager.





The Blanking Teach can be activated keeping the configured Blanking Teach input active for at least BTf ms (can be configured in I/O Manager by changing input filter on Blanking Teach Input). The blanking mask become active after **BTf** ms after the rising edge on Blanking Teach Input considering obscured beams at such time. To change blanking mask a new teach procedure is required. Blanking mask is kept also after a power cycle.

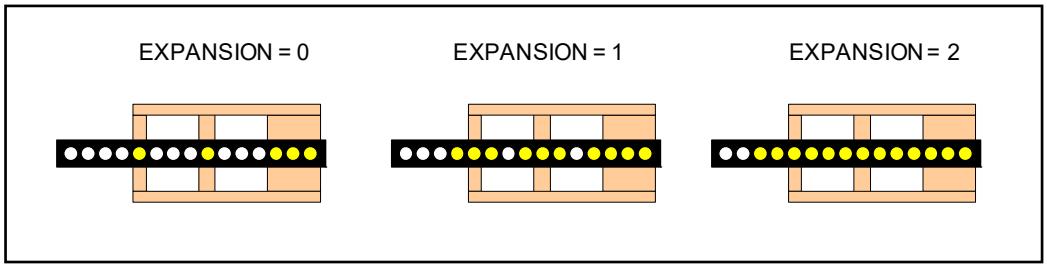


NOTE: When the External blanking teach is not set, the user must use the Beam Editor to edit the blanking mask.

Expansion

When using external blanking teach it may happen that edges of objects to be ignored are positioned in between beams. This could cause erratic measurement values in case of vibrations or little movements of blanked objects. This can be particularly evident on 5 mm resolution devices as there is no gap between optics. Hence Expansion may be used to add blanked beams around sampled blanked zone at teach instant.

The light curtain will always add configured number of beams for blanking expansion on both sides of taught blanking zone.



Measurement Functions

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

For each scan cycle DS4 light curtains calculate all the measures below that will then be used to drive analog or digital output depending on conditions set by the user (refer to "Analog Output selection and parametrization" on page 68 or "Digital output selection and parametrization" on page 72).

Calculated Measures can also be output on RS485 serial interface or Ethernet (refer to "Serial Output RS485 selection and parametrization (DS4-xx-xxxx-S08-JZ models only)" on page 75 or "Ethernet Output Selection and Parametrization (DS4-xx-xxxx-S12-JE models only)" on page 78):

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.
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 48**).**

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 81

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 choice between current and voltage is done through GUI, together with the additional parametrization shown below.

NOTE: The RX connector has a fixed pin that is dedicated to the analog output, thus it can't be re-addressed.

NOTE: Make sure to double-check your configuration before proceeding with the confirm. Ensuring everything is correctly set up will help prevent any issues during the process.

Calculation of the Analogue Output Value

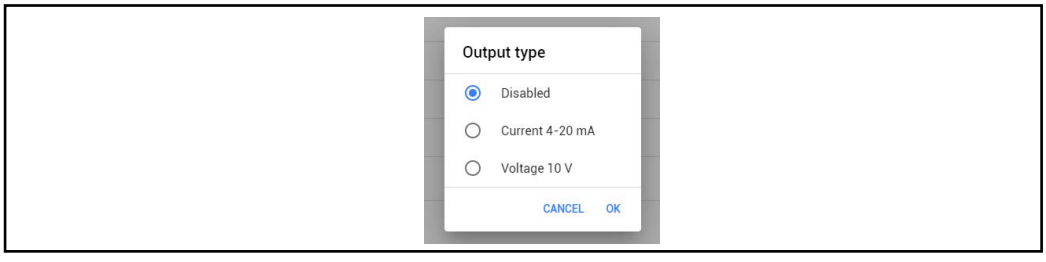
The following formulas are used to calculate the analogue output value:

Current mode:
I = 16 × (measurement / beam#) + 4

Voltage mode:
V = 10 × (measurement / beam#)

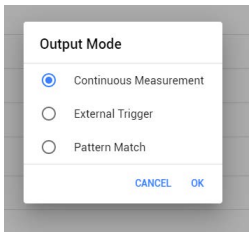
Via GUI the user may change the behavior of the analog output, defining the measurement function from which the output will depend on and eventually associate the output to an external or internal trigger.

There are three choices for analog output:

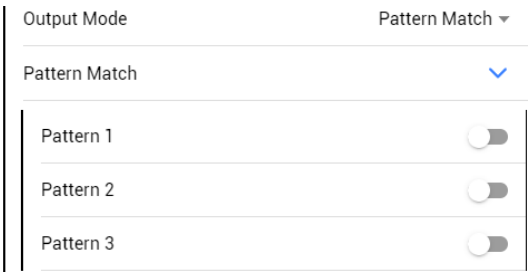


- **Disable:** In such case the output will be High-Z and the signal will not be shown in I/O Manager. Anyhow the analog output pin can't be re-addressed to other functions
- **Voltage 0...10V** analog output
- **Current 4...20mA** analog output

To trigger the analog output update there are three alternatives:



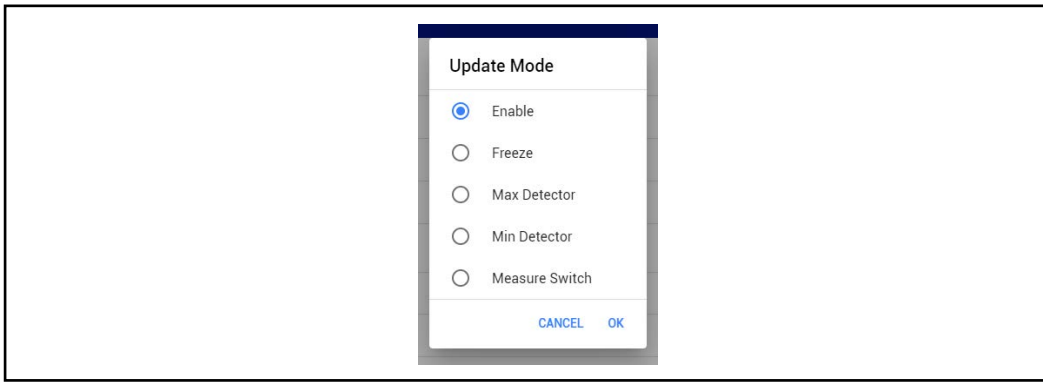
- **Continuous Measurement:** In this default option, the system updates the analog output with the result of the chosen measurement function at the end of each optic scan cycle. The cycle time depends on the light curtain length and pitch (refer to "Response Time" on page 93).
- **External Trigger:** When External Trigger is selected, an external trigger input pin has to be assigned using the I/O Manager. External Trigger conditions the analog output to the value read at the External Trigger pin in different ways, that are described in the "Analog trigger options menu" on page 70.
- **Pattern Match:** Pattern Match is a function that generates an internal trigger when a particular pattern is recognized by the system (refer to "Pattern Match" on page 58). This internal trigger may be used instead of an external trigger to condition the "Analog trigger options menu" on page 70. In this case, no pin has to be defined in the I/O Manager, but instead the user has to choose one or more patterns that will act as a trigger for the analog output. Indeed, the pattern match function may recognize up to 3 different patterns, each of those may or may not be used as a trigger.



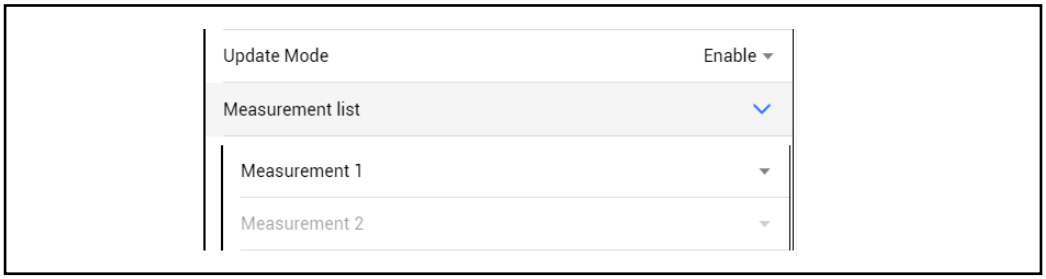
NOTE: In case the user selects more than one pattern to trigger the analog output, they will work in an OR fashion, meaning a single HIGH value will produce the trigger. This also means recognition of more than one patterns will not produce a rising edge when the second pattern is matched.

Analog trigger options menu

The analog trigger options menu is shown when External Trigger or Pattern Match mode is selected. It consists of the alternative behaviors the trigger will produce on the analog output.



After configuring Output mode and eventually Trigger Mode, the user must choose the Measurement(s) that will define the Analog Output value.



Measurement 1: Using an entry of this list, the user may decide what measurement function will be used to produce an analog output based on the current conditions of the beams (refer to "Measurement Functions" on page 66).

Measurement 2: When Measure Switch is selected as trigger mode, the user may decide a second measurement function that will be used to produce an analog output when the trigger is active.

Parameter	Value
Output type	•**Disabled**: when selected analog output driver is switched off (high-Z or 0V). All other options are disabled. •**Current 4...20mA**: current output. •**Voltage 0...10V**: voltage output.
Output mode	•**Continuous Measurement**: output updated each cycle with selected measurement. •**External Trigger**: when selected activates “Trigger” signal which has to be assigned in I/O manager. •**Pattern Match**: output updated each the system recognizes an assigned pattern.
Pattern Match (available if Pattern Match is selected)	•**Pattern 1**: choose which pattern activate internal trigger (OR) •**Pattern 2**: choose which pattern activate internal trigger (OR) •**Pattern 3**: choose which pattern activate internal trigger (OR)

Parameter	Value
Update mode (available if External Trigger or Pattern Match is selected)	•**Enable**: when the trigger is HIGH, the analog output will be updated at each scan cycle. When the trigger is LOW, the output will stay at 0V (or 4mA). •**Freeze**: when the trigger is HIGH, the output value is kept constant to last output value before trigger rising edge. When the trigger is LOW, the output will be continuously updated. •**Max Detector**: while the trigger is HIGH, the output is only updated whether a new higher value is produced, thus the output is always the highest value produced during the HIGH state of the trigger. When the trigger is LOW, the highest value produced during the last HIGH state is kept. Rising edge resets the highest value to the currently produced output. •**Min Detector**: while the trigger is HIGH, the output is only updated whether a new lower value is produced, thus the output is always the lowest value produced during the HIGH state of the trigger. When the trigger is LOW, the lowest value produced during the last HIGH state is kept. Rising edge resets the lowest value to the currently produced output. •**Measure Switch**: when selected, the user can define a second measuring function (see below). While the trigger is HIGH, the result of the said second measure function will be continuously output. While the trigger is LOW, the result of the first default measure function will be continuously output.
Measurement list	•**Measurement 1**: list of measurement function ("Measurement Functions" on page 66). •**Measurement 2**: list of measurement function only active when Measure Switch above is selected.

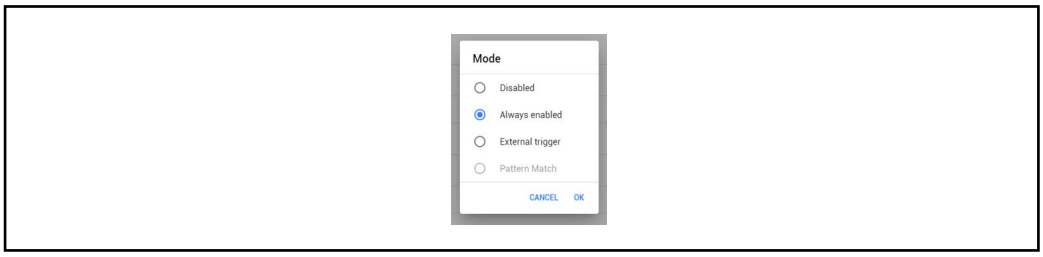
Digital output selection and parametrization

The DS4 Standard models can drive up to 3 Digital outputs. Output current is limited to 100mA with 100nF maximum capacitive load.

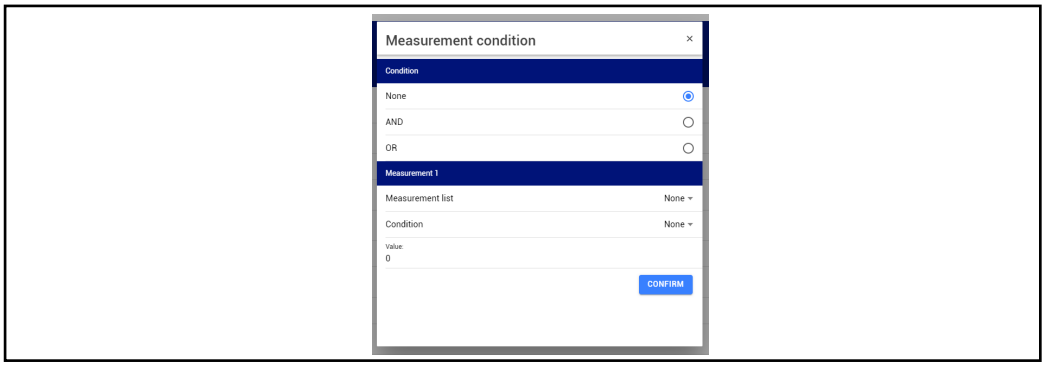
An over-current/short circuit is signaled on UI (refer to "RX Side dialogue" on page 83) until the fault condition persist.

The behavior of digital outputs can be configured via GUI in three simple steps:

1. select output mode first:



2. configure events or measures on which the outputs will depend:

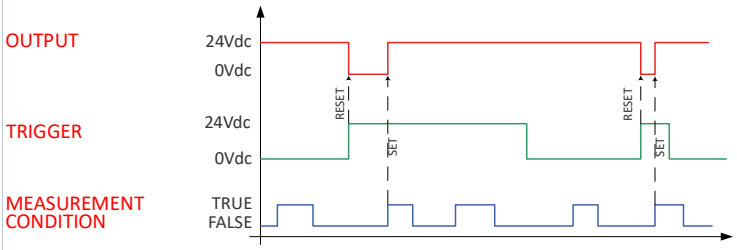
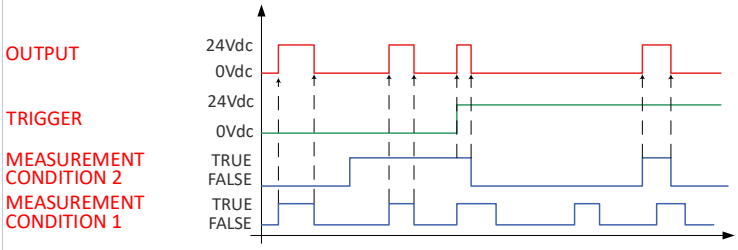




NOTE: Make sure to double-check your configuration before proceeding with the confirm. Ensuring everything is correctly set up will help prevent any issues during the process.

3. finally assign outputs signals to available connector pins in I/O Manager.

Parameter	Value
Mode	•**Disabled**: when selected no signal-pin assignment will be required in I/O Manager and additional output configuration will not be possible. •**Always enabled**: when selected the output will be updated each light curtain scan cycle according to configured measurement conditions. •**External trigger or Pattern match**: when selected the output will be updated only when an external (internal in case of Pattern Match) trigger is detected. For External Trigger a “Trigger input” signal is shown in I/O Manager and must be assigned by the user to one of the available inputs pin. **NOTE:** For Pattern match user can select which pattern will affect the output among the ones configured.

Parameter	Value
Output enable conditions	**Condition** •**None**: •**AND**: performs a logical AND operation between the two conditions •**OR**: performs a logical OR operation between the two conditions **Measurement(s)** •**Measurement list**: list of measurement function ("Measurement Functions" on page 66). •**Condition**: • None • = • ≥ • ≤ •**Value**: the measurement must be between 0 and the number of logical beams of the device.
Update mode (available if External trigger or Pattern Match is selected)	•**Enabled**: when the trigger is high, the output is active if the logical condition of AND or OR between the two set conditions is satisfied; otherwise, it remains low. When the trigger is low, the output is always low. •**Freeze**: output is always enabled and updated as long as trigger is low. Output is instead frozen on the rising edge of trigger and keep its value as long as the trigger remains high. •**Latch**: output act as a digital latch. A rising trigger edge will reset the output. Then the output will latch the result of configured measurement condition (see the following behavior chart) as long as trigger is high. When trigger goes low again last output value is kept until next rising edge.  •**Switch**: output value switch between result of measurement condition 1 and condition 2 depending on trigger input value (disable operation between conditions).  •**Match (Pattern Match only)**: output copies internal trigger value (HIGH when a pattern match occur, LOW otherwise). When selected, no measurement condition can be configured.
Pattern Match (available if Pattern Match is selected)	•**Pattern 1**: choose which pattern activate internal trigger (OR) •**Pattern 2**: choose which pattern activate internal trigger (OR) •**Pattern 3**: choose which pattern activate internal trigger (OR)

Measurement Conditions

For any output mode other than **Disabled and Match** user shall configure a logic operation whose result will affect output value.

One or two inequalities can be set. For each user shall choose:

- Measurement (refer to "Measurement Functions" on page 66), for example BOTD.
- Operation [=, ≥, ≤]
- Value [0 - to max beam number]

Logic result of first inequality can then be ANDed or ORed with a second inequality.

If nor AND neither OR is selected only first inequality is shown and will affect output result.

When “Switch” update mode is selected inequalities are not combined (AND/OR greyed out) and each of the two results will affect the output depending on trigger status (see above).

Serial Output RS485 selection and parametrization (DS4-xx-xxxx-S08-JZ models only)

In order to use the serial output RS485 it is necessary enable the RS485 transmission. When enabled, in I/O manager RS485 signals are automatically connected to proper pins (**1** and **6**), if user already assigned those pins to digital I/O those must be re-assigned to other pins (the number of unconnected signal on I/O manager icon rises).

Parameter	Value [default]
Output mode	•**[Disabled]** •**Continuous**: for each scan cycle data packet is sent on RS485 interface. •**On Digital Output 1 Change**: selectable only if Digital Output 1 is enabled. Sends data packet only when Digital output 1 changes state. •**On Analog Output Change**: selectable only if Analog Output enabled. Sends data packet only when Analog Output changes value. •**On Request**: sends data packet only when the proper command is received. Packet is formatted according to Transmission protocol setting and sent after first scan cycle completion following the request. On Request command can be customized by user choosing 1 or 2 bytes (free hex input). Request must be sent according to chosen baud rate, stop bits and parity. •**Enable on external trigger**: enables transmission when one external input is active. When selected activates “Trigger” signal which has to be assigned in I/O Manager. •**Enable on Pattern Match**: enables transmission when internal trigger from pattern match is active. User can choose which patterns enable trigger for data transmission.



NOTE: Make sure to double-check your configuration before proceeding with the configuration upload.



NOTE: To ensure reliable RS485 communication, configure the baud rate and packet size so that the packet transmission time is always shorter than the device response time. Otherwise, packet overlap and communication errors may occur.

It is now required to choose the transmission protocol and customize packet composition.

The table below lists all available data fields for RS485 communication:

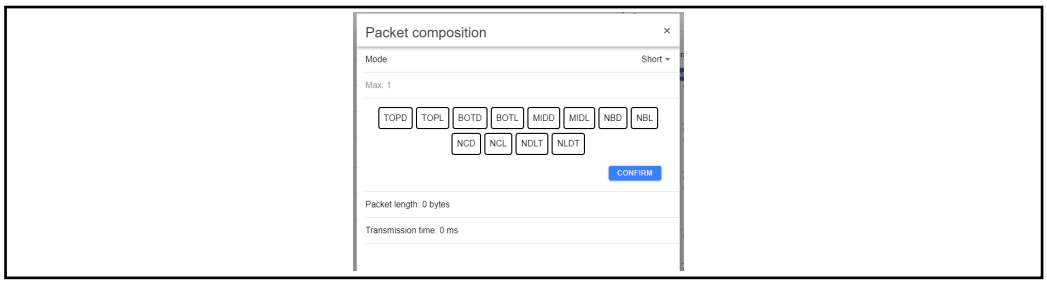
Field	Description	Bytes
STX	Packet beginning: fixed to 0x02 when Binary is selected. For Custom protocol, it can be customized to any integer value between 0-255 (free text entry)	1
LEN	Length in byte from TYP to ST (STX, END, CHK excluded - only selected fields).	1
TYP	Packet type: 0x41 when BSA is selected, 0x42 otherwise.	
TOPD...NLDT	Measurements (refer to "Measurement Functions" on page 66)	1 if logical beams <255, 2 otherwise
BSA	Bitwise status of all light curtain beams: 1 for free beams if “1 free” is selected for “BSA logic”, 0 otherwise. First beam is represented from MSB of first byte. Tailing bits not corresponding to beams are set to 0. BYTE1: Bit 7 (msb) = Beam1, Bit 6 = Beam2, Bit 5 = Beam3, Bit 4 = Beam4, Bit 3 = Beam5, Bit 2 = Beam6, Bit 1 = Beam7, Bit 0 = Beam8 BYTE2: Bit 7 = Beam9, ...	[#beams/8]
RLC	Run Length Code, (refer to I"IO-Link Interface Selection and Parametrization" on page 81). It is only available for the Custom protocol.	32
ST	1 byte indicating scanning status: **bit 0 =** Sync status - for optical sync (0 not synchronized, 1 synchronized on at least one sync beam) - for wire sync (0 emitter connection not working, 1 emitter connection working) **bit 1 =** Failure (0 OFF, 1 ON) **bit 2 =** Digital Output 1 Status (0 OFF, 1 ON) **bit 3 =** Digital Output 2 Status (0 OFF, 1 ON) **bit 4 =** Digital Output 3 Status (0 OFF, 1 ON) **bit 5 =** Teach-in running (1 if running) **bit 6 =** Current teach quality (OFF all beams signal inside 75% transparent setting windows, ON otherwise, re-teach suggested) **bit 7 =** Temperature alarm (temperature delta vs last teach > 20°)	1
END	Ending Byte fixed to 0x03	1
CHK	**For Binary protocol:** complement to one of single byte sum from LEN (included) to END (excluded). **For Custom protocol:** complement to one of single byte sum from STX to END (included).	1

Three pre-defined packet structure are available. Selectable fields depends on chosen Protocol type.

Short Protocol

This is the simplest communication protocol. Data Packet is composed by 1 Byte (2 when light curtain has more than 255 logical beams). User can select only one Measurement to send (see "Measurement Functions" on page 66).

No header nor tail is present for such kind of packet.

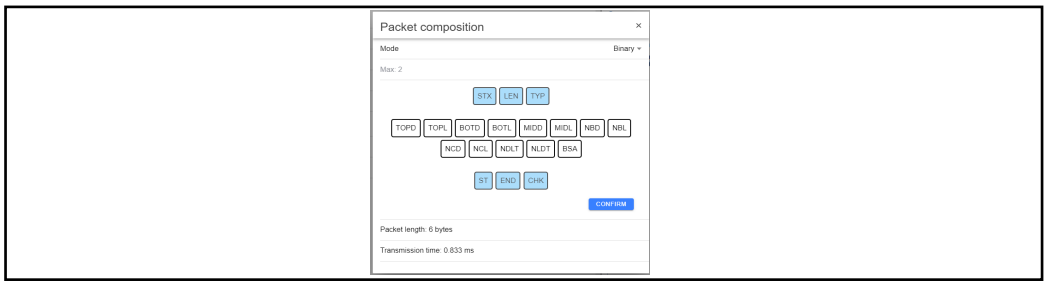


Binary

User can choose:

- Up to 2 Measurements **OR**
- BSA

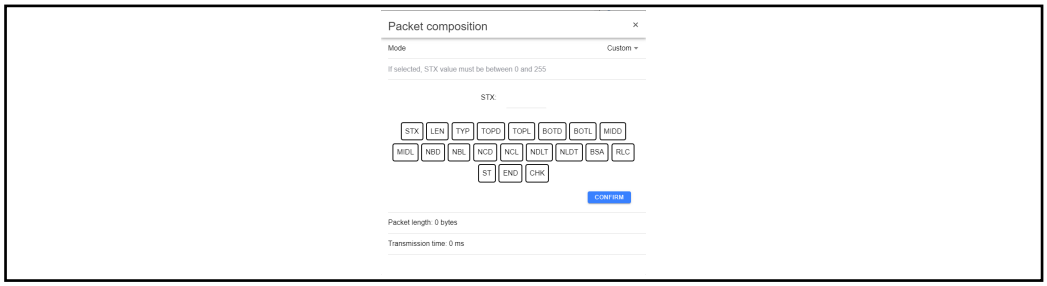
The STX, LEN, TYP, ST, END and CHK parameters are always selected by default.



Custom Protocol

User can choose packet composition selecting individual fields among a proposed selection.

User can select/deselect all fields with no restrictions.



Ethernet Output Selection and Parametrization (DS4-xx-xxxx-S12-JE models only)

For Ethernet communication payload applies everything as per RS485. Ethernet data is the same wrapped in TCP packet and sent over a TCP socket to which the user connect on a selectable port.

Parameter	Value [default]
Output mode	•**[Disabled]** •**Continuous**: for each scan cycle data packet is sent on Ethernet interface. •**On Digital Output 1 Change**: selectable only if Digital Output 1 is enabled. Sends data packet only when Digital output 1 changes state. •**On Analog Output Change**: selectable only if Analog Output enabled. Sends data packet only when Analog Output changes value. •**On Request**: sends data packet only when the proper command is received. Packet is formatted according to Transmission protocol setting and sent after first scan cycle completion following the request. On Request command can be customized by user choosing 1 or 2 bytes (free hex input). •**Enable on external trigger**: enables transmission when one external input is active. When selected activates “Trigger” signal which has to be assigned in I/O Manager. •**Enable on Pattern Match**: enables transmission when internal trigger from patter match is active. User can choose which patterns enable trigger for data transmission.



NOTE: Transmission times over the Ethernet interface are subject to variation depending on network traffic and receiving hardware.

The table below lists all available data fields for Ethernet communication:

Field	Description	Bytes
STX	Packet beginning: fixed to 0x02 when Binary is selected. For Custom protocol, it can be customized to any integer value between 0-255 (free text entry)	1
LEN	Length in byte from TYP to ST (STX, END, CHK excluded - only selected fields).	1
TYP	Packet type: 0x41 when BSA is selected, 0x42 otherwise.	
TOPD...NLDT	Measurements (refer to "Measurement Functions" on page 66)	1 if logical beams <255, 2 otherwise
BSA	Bitwise status of all light curtain beams: 1 for free beams if "1 free" is selected for "BSA logic", 0 otherwise. First beam is represented from MSB of first byte. Tailing bits not corresponding to beams are set to 0. BYTE1: Bit 7 (msb) | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 — BYTE2: Bit 7 | ... Beam1 | Beam2 | Beam3 | Beam4 | Beam5 | Beam6 | Beam7 | Beam8 — Beam9 | ...	[#beams/8]
BAA	Beams Analog Array 4 byte ms value timestamp + 2 byte for number of beams + 1byte for each beam with analog value from 0 (min signal intensity) to 255 (maximum signal intensity). That's valid only for parallel beams (when crossed beams or augmented resolution is selected such data packet is not selectable).	[4+2+#beams]
RLC	Run Length Code, (refer to "IO-Link Interface Selection and Parametrization" on page 81). It is only available for the Custom protocol.	32
ST	1 byte indicating scanning status: **bit 0 =** Sync status - for optical sync (0 not synchronized, 1 synchronized on at least one sync beam) - for wire sync (0 emitter connection not working, 1 emitter connection working) **bit 1 =** Failure (0 OFF, 1 ON) **bit 2 =** Digital Output 1 Status (0 OFF, 1 ON) **bit 3 =** Digital Output 2 Status (0 OFF, 1 ON) **bit 4 =** Digital Output 3 Status (0 OFF, 1 ON) **bit 5 =** Teach-in running (1 if running) **bit 6 =** Current teach quality (OFF all beams signal inside 75% transparent setting windows, ON otherwise, re-teach suggested) **bit 7 =** Temperature alarm (temperature delta vs last teach > 20°)	1
END	Ending Byte fixed to 0x03	1
CHK	**For Binary protocol:** complement to one of single byte sum from LEN (included) to END (excluded). **For Custom protocol:** complement to one of single byte sum from STX to END (included).	1

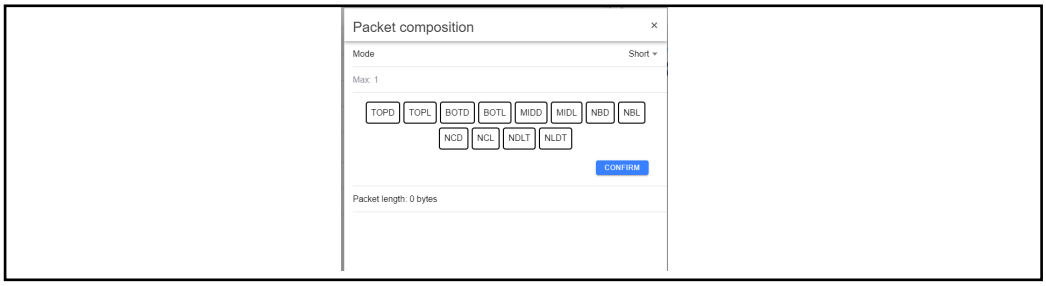
NOTE: If BAA is selected LEN field value it's fixed to 0xFF thus it can't be used to determine packet size. Instead 5th and 6th byte of BAA field tells how many additional bytes (=beams) BAA field will contain.

Three pre-defined packet structure are available. Selectable fields depends on chosen Protocol type.

Short Protocol

This is the simplest communication protocol. Data Packet is composed by 1 Byte (2 when light curtain has more than 255 logical beams). User can select only one Measurement to send (see "Measurement Functions" on page 66).

No header nor tail is present for such kind of packet.

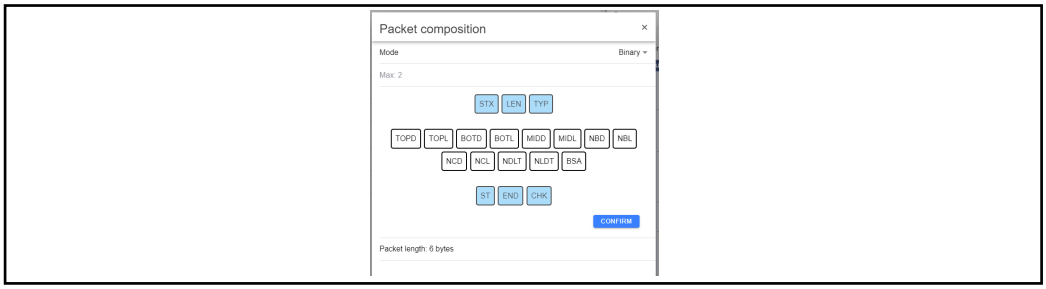


Binary

User can choose:

- Up to 2 Measurements **OR**
- BSA

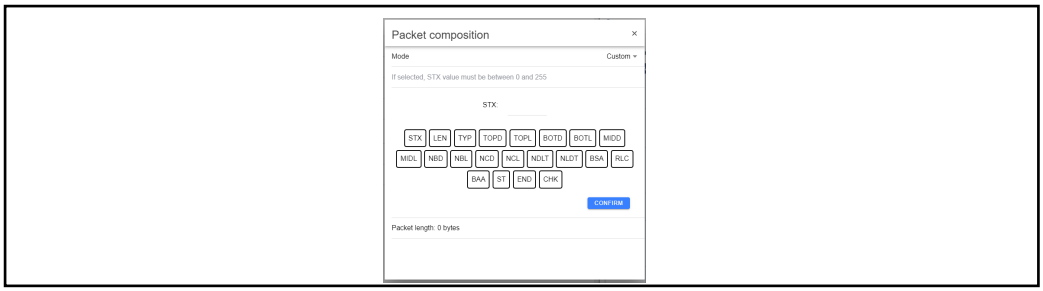
The STX, LEN, TYP, ST, END and CHK parameters are always selected by default.



Custom Protocol

User can choose packet composition selecting individual fields among a proposed selection.

User can select/deselect all fields with no restrictions.



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 7
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.

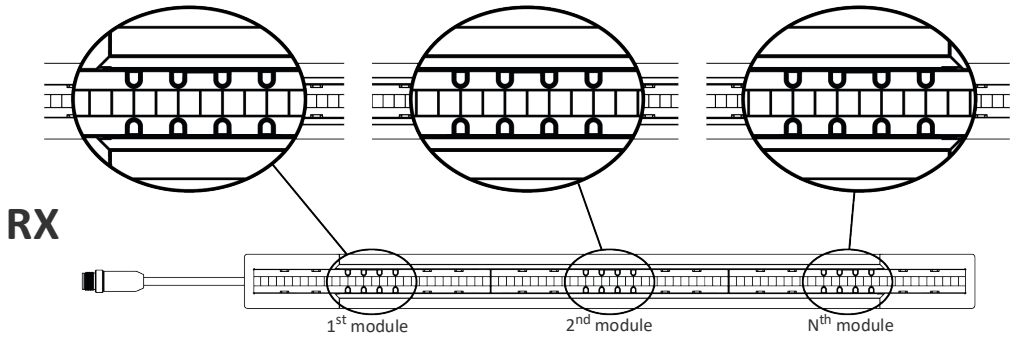


Figure 13: Receiver LED interface

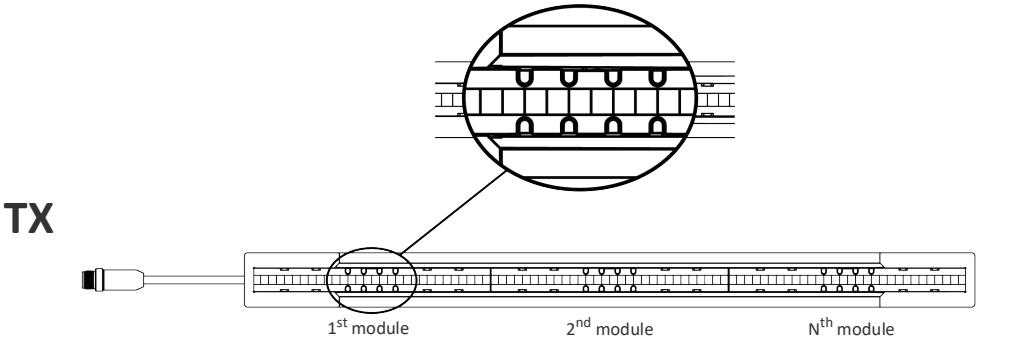


Figure 14: Transmitter LED interface

LED meanings

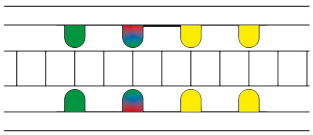
= ON

= OFF

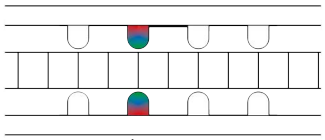
= INDIFFERENT

= BLINK

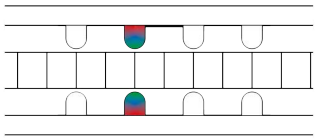
RX Side dialogue



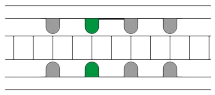
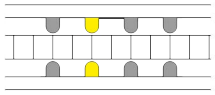
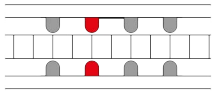
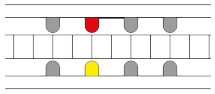
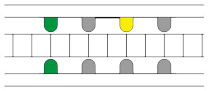
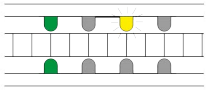
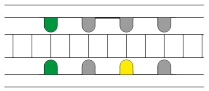
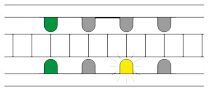
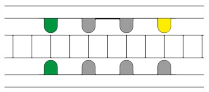
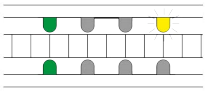
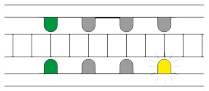
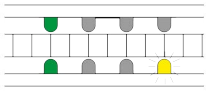
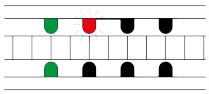
1st module

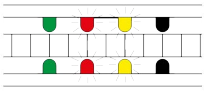
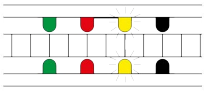
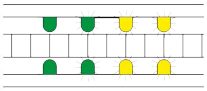
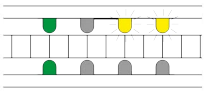


2nd module

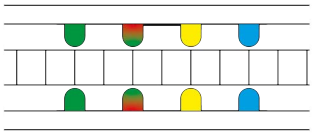


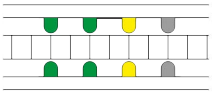
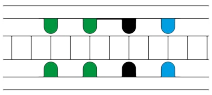
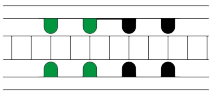
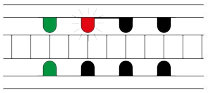
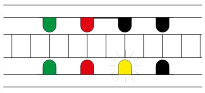
Nth module

INDICATION	LED CONFIGURATION
All module beams signals above upper threshold	
All module beams above lower threshold, at least one of each module half below upper threshold	
At least one module beam below lower threshold	
Eg. Different signals levels between first and second module halves	
At least one digital Output Active	
Short Circuit/Overload on Digital Output	 4 Hz
Connection Active (GUI, RS485, IO-Link, Ethernet)	
Serial Connection Error	 4 Hz
TX Sync (optical or wire) active. At least one sync beam aligned and free, or wire sync working	
TX Sync/Com Error. TX-RX sync connection interrupted or wrong data received on Sync channel.	 4 Hz
Gain Teach active	 1 Hz
Waiting for teach/Gain Teach error	 4 Hz
Hardware Error	 4 Hz

Invalid Configuration		4 Hz
IOL configuration pending, Device Reset needed		
FindMe (IO-Link)		
Wi-Fi password reset performed		4 Hz

TX Side dialogue



WORKING MODE	INDICATION	LED CONFIGURATION
Normal Operation Emission Active	Emission Active, low Range	
	Emission Active, high range	
	Emission Active, wire sync	
Failure	Hardware Error	
FW Update	Ongoing Update	

CHAPTER 8
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 9 and "Technical Data" on page 87.

• 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 or synthetic fabric cloths



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 for DS4-10-xxxx-Sxx-Jx models
Minimum detectable object size	**Detection with teach:** ≥ 3.5 mm for DS4-05-xxxx-Sxx-Jx 10 mm for DS4-10-xxxx-Sxx-Jx 25 mm for DS4-25-xxxx-Sxx-Jx **Detection without teach/Detection of Base models** 10 mm for DS4-05-xxxx-xxx-Jx 14 mm for DS4-10-xxxx-xxx-Jx 30 mm for DS4-25-xxxx-xxx-Jx
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)

SUPPORTED OPERATING SYSTEMS AND APP VERSIONS	
Windows	Windows 10 or later
Android	Android 11 or later
iOS	Version 17.4 or later



NOTE: The LC Designer app is compatible with screen scales of 100% or 125%.

APPENDIX B

AVAILABLE MODELS AND RESPONSE TIMES

MODELS

Resolution: 5 mm

Standard model	Ordering num	Standard Ethernet model	Ordering num	Controlled height (mm)
DS4-05-0300-S08-JZ	957650010	DS4-05-0300-S12-JE	957650029	300
DS4-05-0450-S08-JZ	957650011	DS4-05-0450-S12-JE	957650030	450
DS4-05-0600-S08-JZ	957650012	DS4-05-0600-S12-JE	957650031	600
DS4-05-0750-S08-JZ	957650013	DS4-05-0750-S12-JE	957650032	750
DS4-05-0900-S08-JZ	957650014	DS4-05-0900-S12-JE	957650033	900
DS4-05-1050-S08-JZ	957650015	DS4-05-1050-S12-JE	957650034	1050
DS4-05-1200-S08-JZ	957650016	DS4-05-1200-S12-JE	957650035	1200
DS4-05-1350-S08-JZ	957650017	DS4-05-1350-S12-JE	957650036	1350
DS4-05-1500-S08-JZ	957650018	DS4-05-1500-S12-JE	957650037	1500
DS4-05-1650-S08-JZ	957650019	DS4-05-1650-S12-JE	957650038	1650
DS4-05-1800-S08-JZ	957650020	DS4-05-1800-S12-JE	957650039	1800
DS4-05-1950-S08-JZ	957650021	DS4-05-1950-S12-JE	957650040	1950
DS4-05-2100-S08-JZ	957650022	DS4-05-2100-S12-JE	957650041	2100
DS4-05-2250-S08-JZ	957650023	DS4-05-2250-S12-JE	957650042	2250
DS4-05-2400-S08-JZ	957650024	DS4-05-2400-S12-JE	957650043	2400
DS4-05-2550-S08-JZ	957650025	DS4-05-2550-S12-JE	957650044	2550
DS4-05-2700-S08-JZ	957650026	DS4-05-2700-S12-JE	957650045	2700
DS4-05-2850-S08-JZ	957650027	DS4-05-2850-S12-JE	957650046	2850
DS4-05-3000-S08-JZ	957650028	DS4-05-3000-S12-JE	957650047	3000

Resolution: 10 mm

Standard model	Ordering num	Standard Ethernet model	Ordering num	Controlled height (mm)
DS4-10-0300-S08-JZ	957650057	DS4-10-0300-S12-JE	957650076	300
DS4-10-0450-S08-JZ	957650058	DS4-10-0450-S12-JE	957650077	450
DS4-10-0600-S08-JZ	957650059	DS4-10-0600-S12-JE	957650078	600
DS4-10-0750-S08-JZ	957650060	DS4-10-0750-S12-JE	957650079	750
DS4-10-0900-S08-JZ	957650061	DS4-10-0900-S12-JE	957650080	900
DS4-10-1050-S08-JZ	957650062	DS4-10-1050-S12-JE	957650081	1050
DS4-10-1200-S08-JZ	957650063	DS4-10-1200-S12-JE	957650082	1200
DS4-10-1350-S08-JZ	957650064	DS4-10-1350-S12-JE	957650083	1350
DS4-10-1500-S08-JZ	957650065	DS4-10-1500-S12-JE	957650084	1500
DS4-10-1650-S08-JZ	957650066	DS4-10-1650-S12-JE	957650085	1650
DS4-10-1800-S08-JZ	957650067	DS4-10-1800-S12-JE	957650086	1800
DS4-10-1950-S08-JZ	957650068	DS4-10-1950-S12-JE	957650087	1950
DS4-10-2100-S08-JZ	957650069	DS4-10-2100-S12-JE	957650088	2100
DS4-10-2250-S08-JZ	957650070	DS4-10-2250-S12-JE	957650089	2250
DS4-10-2400-S08-JZ	957650071	DS4-10-2400-S12-JE	957650090	2400
DS4-10-2550-S08-JZ	957650072	DS4-10-2550-S12-JE	957650091	2550
DS4-10-2700-S08-JZ	957650073	DS4-10-2700-S12-JE	957650092	2700
DS4-10-2850-S08-JZ	957650074	DS4-10-2850-S12-JE	957650093	2850
DS4-10-3000-S08-JZ	957650075	DS4-10-3000-S12-JE	957650094	3000

Resolution: 25 mm

Standard model	Ordering num	Standard Ethernet model	Ordering num	Controlled height (mm)
DS4-25-0300-S08-JZ	957650104	DS4-25-0300-S12-JE	957650123	300
DS4-25-0450-S08-JZ	957650105	DS4-25-0450-S12-JE	957650124	450
DS4-25-0600-S08-JZ	957650106	DS4-25-0600-S12-JE	957650125	600
DS4-25-0750-S08-JZ	957650107	DS4-25-0750-S12-JE	957650126	750
DS4-25-0900-S08-JZ	957650108	DS4-25-0900-S12-JE	957650127	900
DS4-25-1050-S08-JZ	957650109	DS4-25-1050-S12-JE	957650128	1050
DS4-25-1200-S08-JZ	957650110	DS4-25-1200-S12-JE	957650129	1200
DS4-25-1350-S08-JZ	957650111	DS4-25-1350-S12-JE	957650130	1350
DS4-25-1500-S08-JZ	957650112	DS4-25-1500-S12-JE	957650131	1500
DS4-25-1650-S08-JZ	957650113	DS4-25-1650-S12-JE	957650132	1650
DS4-25-1800-S08-JZ	957650114	DS4-25-1800-S12-JE	957650133	1800
DS4-25-1950-S08-JZ	957650115	DS4-25-1950-S12-JE	957650134	1950
DS4-25-2100-S08-JZ	957650116	DS4-25-2100-S12-JE	957650135	2100
DS4-25-2250-S08-JZ	957650117	DS4-25-2250-S12-JE	957650136	2250
DS4-25-2400-S08-JZ	957650118	DS4-25-2400-S12-JE	957650137	2400
DS4-25-2550-S08-JZ	957650119	DS4-25-2550-S12-JE	957650138	2550
DS4-25-2700-S08-JZ	957650120	DS4-25-2700-S12-JE	957650139	2700
DS4-25-2850-S08-JZ	957650121	DS4-25-2850-S12-JE	957650140	2850
DS4-25-3000-S08-JZ	957650122	DS4-25-3000-S12-JE	957650141	3000

RESPONSE TIME

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

Resolution: 5 mm

Model	Controlled height (mm)	Beam number	Response time (ms) Parallel or Augmented Resolution scan mode	Response time (ms) Crossed scan mode
DS4-05-0300-Sxx-Jx	300	60	2.80	6.40
DS4-05-0450-Sxx-Jx	450	90	3.70	9.10
DS4-05-0600-Sxx-Jx	600	120	4.60	11.80
DS4-05-0750-Sxx-Jx	750	150	5.50	14.50
DS4-05-0900-Sxx-Jx	900	180	6.40	17.20
DS4-05-1050-Sxx-Jx	1050	210	7.30	19.90
DS4-05-1200-Sxx-Jx	1200	240	8.20	22.60
DS4-05-1350-Sxx-Jx	1350	270	9.10	25.30
DS4-05-1500-Sxx-Jx	1500	300	10.00	28.00
DS4-05-1650-Sxx-Jx	1650	330	10.90	30.70
DS4-05-1800-Sxx-Jx	1800	360	11.80	33.40
DS4-05-1950-Sxx-Jx	1950	390	12.70	36.10
DS4-05-2100-Sxx-Jx	2100	420	13.60	38.80
DS4-05-2250-Sxx-Jx	2250	450	14.50	41.50
DS4-05-2400-Sxx-Jx	2400	480	15.40	44.20
DS4-05-2550-Sxx-Jx	2550	510	16.30	46.90
DS4-05-2700-Sxx-Jx	2700	540	17.20	49.60
DS4-05-2850-Sxx-Jx	2850	570	18.10	52.30
DS4-05-3000-Sxx-Jx	3000	600	19.00	55.00

Resolution: 10 mm

Model	Controlled height (mm)	Beam number	Response time (ms) Parallel or Augmented Resolution scan mode	Response time (ms) Crossed scan mode
DS4-10-0300-Sxx-Jx	300	30	1.90	3.70
DS4-10-0450-Sxx-Jx	450	45	2.35	5.05
DS4-10-0600-Sxx-Jx	600	60	2.80	6.40
DS4-10-0750-Sxx-Jx	750	75	3.25	7.75
DS4-10-0900-Sxx-Jx	900	90	3.70	9.10
DS4-10-1050-Sxx-Jx	1050	105	4.15	10.45
DS4-10-1200-Sxx-Jx	1200	120	4.60	11.80
DS4-10-1350-Sxx-Jx	1350	135	5.05	13.15
DS4-10-1500-Sxx-Jx	1500	150	5.50	14.50
DS4-10-1650-Sxx-Jx	1650	165	5.95	15.85
DS4-10-1800-Sxx-Jx	1800	180	6.40	17.20
DS4-10-1950-Sxx-Jx	1950	195	6.85	18.55
DS4-10-2100-Sxx-Jx	2100	210	7.30	19.90
DS4-10-2250-Sxx-Jx	2250	225	7.75	21.25
DS4-10-2400-Sxx-Jx	2400	240	8.20	22.60
DS4-10-2550-Sxx-Jx	2550	255	8.65	23.95
DS4-10-2700-Sxx-Jx	2700	270	9.10	25.30
DS4-10-2850-Sxx-Jx	2850	285	9.55	26.65
DS4-10-3000-Sxx-Jx	3000	300	10.00	28.00

Resolution: 25 mm

Model	Controlled height (mm)	Beam number	Response time (ms) Parallel or Augmented Resolution scan mode	Response time (ms) Crossed scan mode
DS4-25-0300-Sxx-Jx	300	12	1.36	2.08
DS4-25-0450-Sxx-Jx	450	18	1.54	2.62
DS4-25-0600-Sxx-Jx	600	24	1.72	3.16
DS4-25-0750-Sxx-Jx	750	30	1.90	3.70
DS4-25-0900-Sxx-Jx	900	36	2.08	4.24
DS4-25-1050-Sxx-Jx	1050	42	2.26	4,78
DS4-25-1200-Sxx-Jx	1200	48	2.44	5.32
DS4-25-1350-Sxx-Jx	1350	54	2.62	5.86
DS4-25-1500-Sxx-Jx	1500	60	2.80	6.40
DS4-25-1650-Sxx-Jx	1650	66	2.98	6.94
DS4-25-1800-Sxx-Jx	1800	72	3.16	7.48
DS4-25-1950-Sxx-Jx	1950	78	3.34	8.02
DS4-25-2100-Sxx-Jx	2100	84	3.52	8.56
DS4-25-2250-Sxx-Jx	2250	90	3.70	9.10
DS4-25-2400-Sxx-Jx	2400	96	3.88	9.64
DS4-25-2550-Sxx-Jx	2550	102	4.06	10.18
DS4-25-2700-Sxx-Jx	2700	108	4.24	10.72
DS4-25-2850-Sxx-Jx	2850	114	4.42	11.26
DS4-25-3000-Sxx-Jx	3000	120	4.60	11.80

APPENDIX C
OVERALL DIMENSIONS

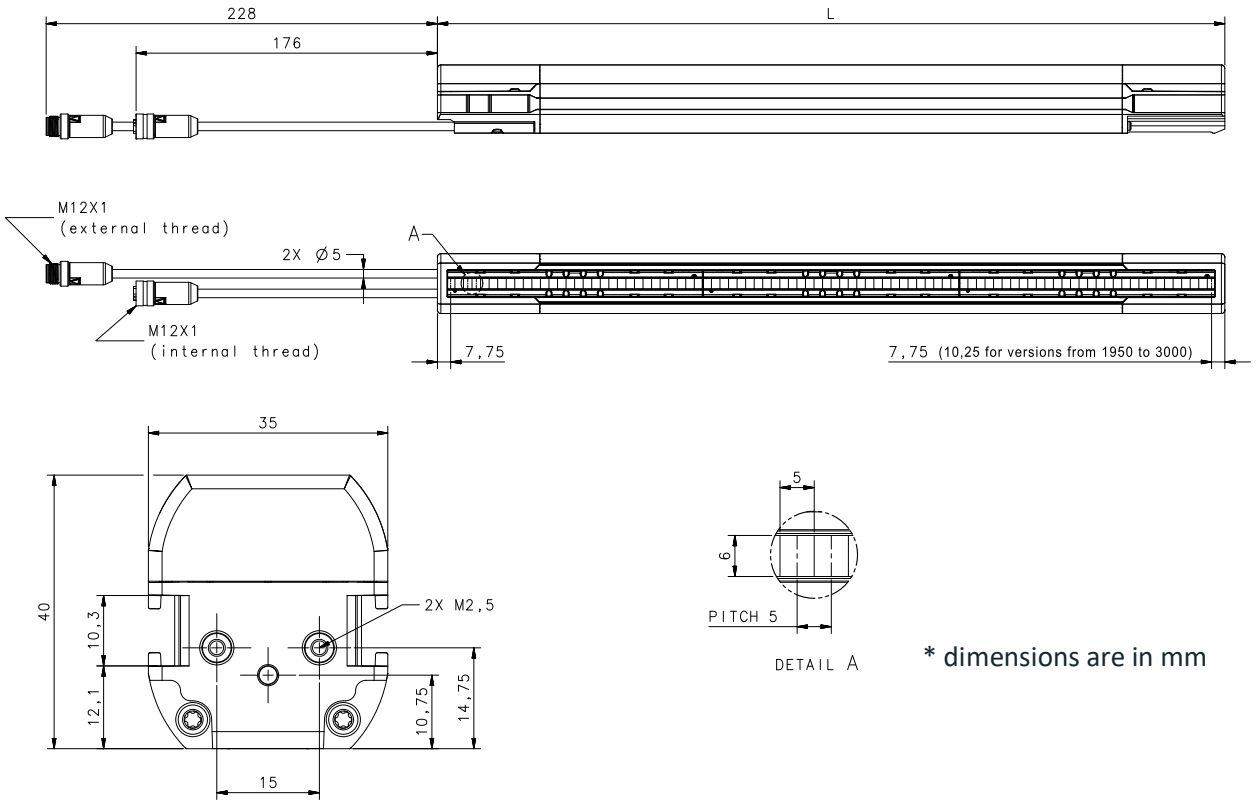


NOTE: Please refer to Datasensing website for detailed drawings.

Below are drawings of the following models:

- "DS4-05-xxxx-Sxx-Jx" on page 96
- "DS4-10-xxxx-Sxx-Jx" on page 97
- "DS4-25-xxxx-Sxx-Jx" on page 98

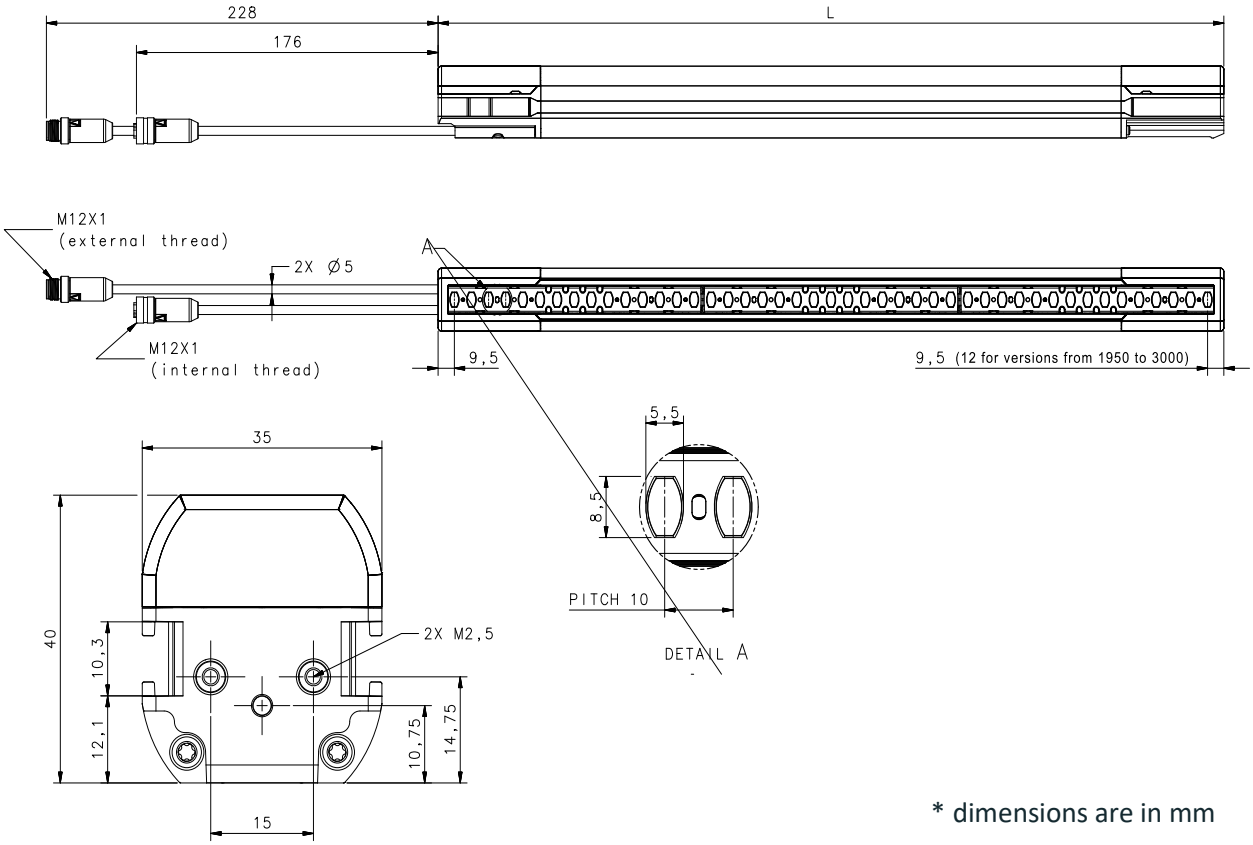
DS4-05-xxxx-Sxx-Jx



* dimensions are in mm

MODEL	L (mm)
DS4-05-0300-Sxx-Jx	310.5
DS4-05-0450-Sxx-Jx	460.5
DS4-05-0600-Sxx-Jx	610.5
DS4-05-0750-Sxx-Jx	760.5
DS4-05-0900-Sxx-Jx	910.5
DS4-05-1050-Sxx-Jx	1060.5
DS4-05-1200-Sxx-Jx	1210.5
DS4-05-1350-Sxx-Jx	1360.5
DS4-05-1500-Sxx-Jx	1510.5
DS4-05-1650-Sxx-Jx	1660.5
DS4-05-1800-Sxx-Jx	1810.5
DS4-05-1950-Sxx-Jx	1963
DS4-05-2100-Sxx-Jx	2113
DS4-05-2250-Sxx-Jx	2263
DS4-05-2400-Sxx-Jx	2413
DS4-05-2550-Sxx-Jx	2563
DS4-05-2700-Sxx-Jx	2713
DS4-05-2850-Sxx-Jx	2863
DS4-05-3000-Sxx-Jx	3011.5

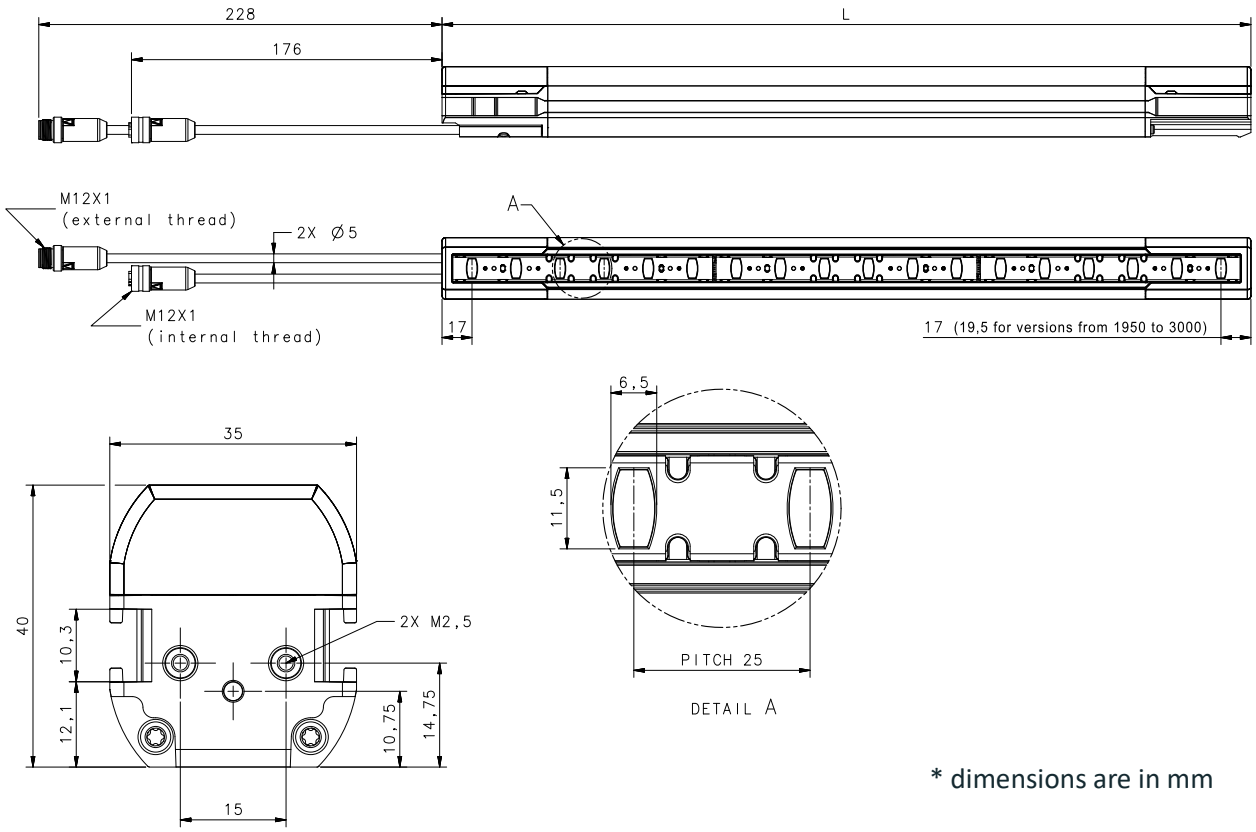
DS4-10-xxxx-Sxx-Jx



* dimensions are in mm

MODEL	L (mm)
DS4-10-0300-Sxx-Jx	309
DS4-10-0450-Sxx-Jx	459
DS4-10-0600-Sxx-Jx	609
DS4-10-0750-Sxx-Jx	759
DS4-10-0900-Sxx-Jx	909
DS4-10-1050-Sxx-Jx	1059
DS4-10-1200-Sxx-Jx	1209
DS4-10-1350-Sxx-Jx	1359
DS4-10-1500-Sxx-Jx	1509
DS4-10-1650-Sxx-Jx	1659
DS4-10-1800-Sxx-Jx	1809
DS4-10-1950-Sxx-Jx	1961.5
DS4-10-2100-Sxx-Jx	2111.5
DS4-10-2250-Sxx-Jx	2261.5
DS4-10-2400-Sxx-Jx	2411.5
DS4-10-2550-Sxx-Jx	2561.5
DS4-10-2700-Sxx-Jx	2711.5
DS4-10-2850-Sxx-Jx	2861.5
DS4-10-3000-Sxx-Jx	3011.5

DS4-25-xxxx-Sxx-Jx



* dimensions are in mm

MODEL	L (mm)
DS4-25-0300-Sxx-Jx	309
DS4-25-0450-Sxx-Jx	459
DS4-25-0600-Sxx-Jx	609
DS4-25-0750-Sxx-Jx	759
DS4-25-0900-Sxx-Jx	909
DS4-25-1050-Sxx-Jx	1059
DS4-25-1200-Sxx-Jx	1209
DS4-25-1350-Sxx-Jx	1359
DS4-25-1500-Sxx-Jx	1509
DS4-25-1650-Sxx-Jx	1659
DS4-25-1800-Sxx-Jx	1809
DS4-25-1950-Sxx-Jx	1961.5
DS4-25-2100-Sxx-Jx	2111.5
DS4-25-2250-Sxx-Jx	2261.5
DS4-25-2400-Sxx-Jx	2411.5
DS4-25-2550-Sxx-Jx	2561.5
DS4-25-2700-Sxx-Jx	2711.5
DS4-25-2850-Sxx-Jx	2861.5
DS4-25-3000-Sxx-Jx	3011.5

APPENDIX D
INCLUDED ACCESSORIES

METAL ANGLED FIXING BRACKET

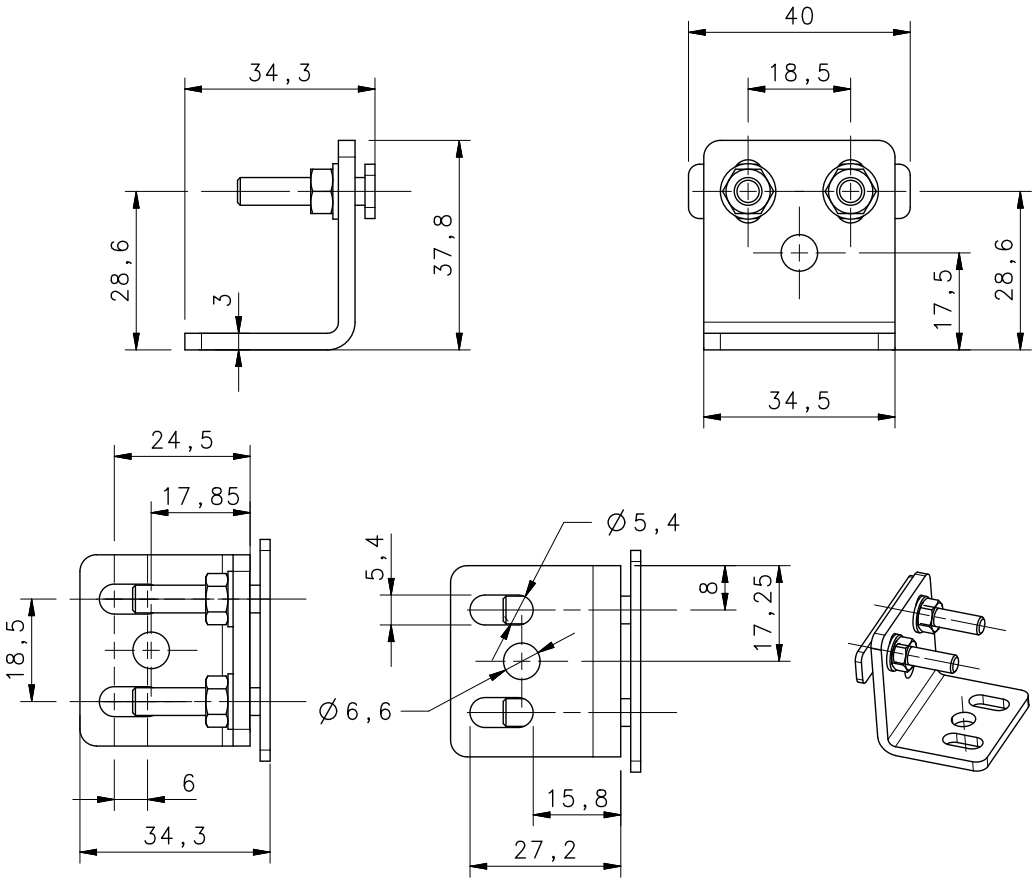


Figure 15 - Metal Angled fixing Bracket

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

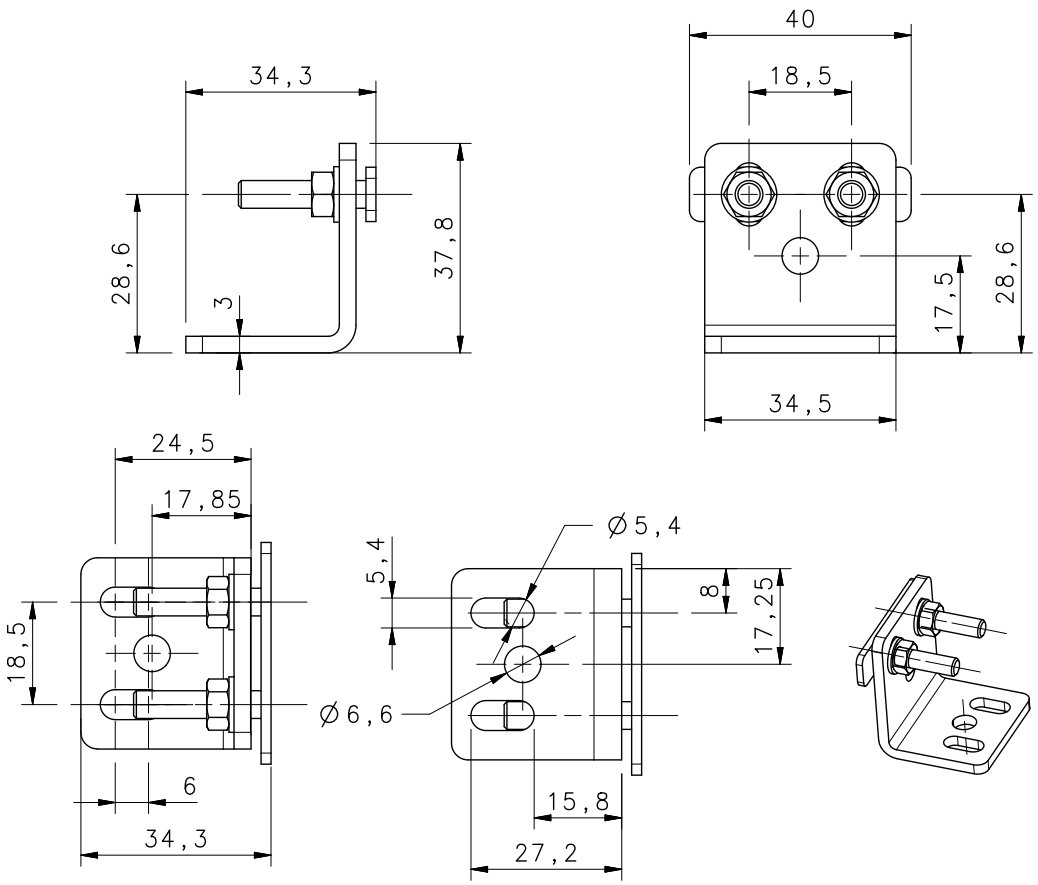


Figure 16 - ST-KSTD

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

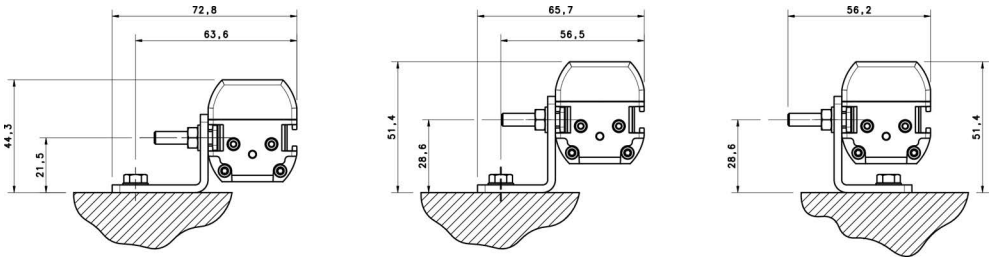


Figure 17 - Angled fixing bracket

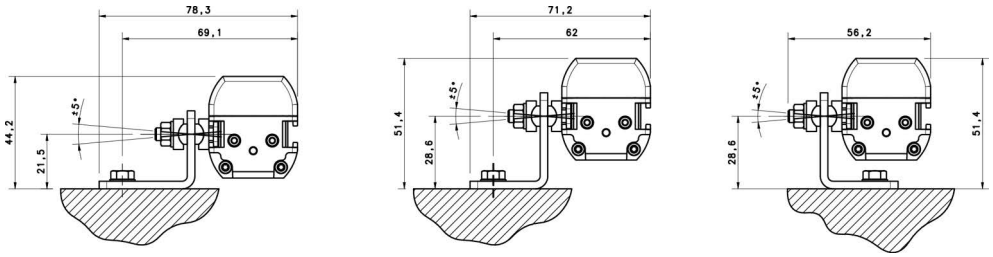


Figure 18 - Angled fixing bracket + Orientable support

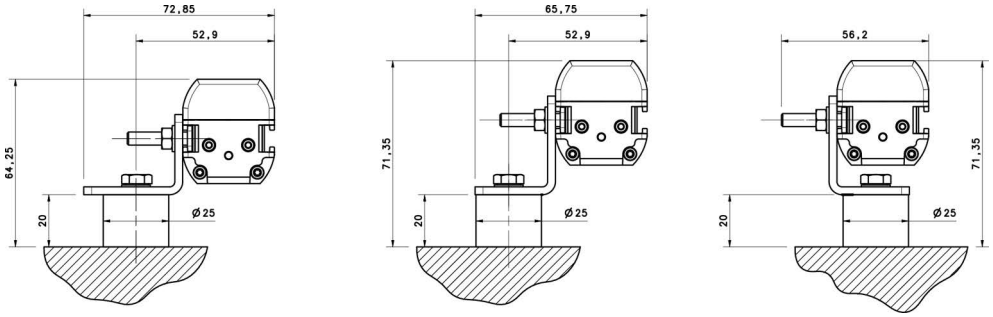


Figure 19 - Angled fixing bracket + Anti-vibration support

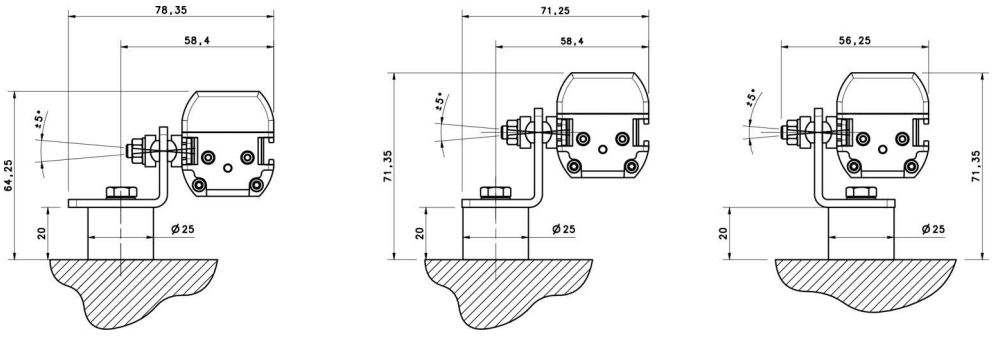


Figure 20 - Angled fixing bracket + Orientable support + Anti-vibration support

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

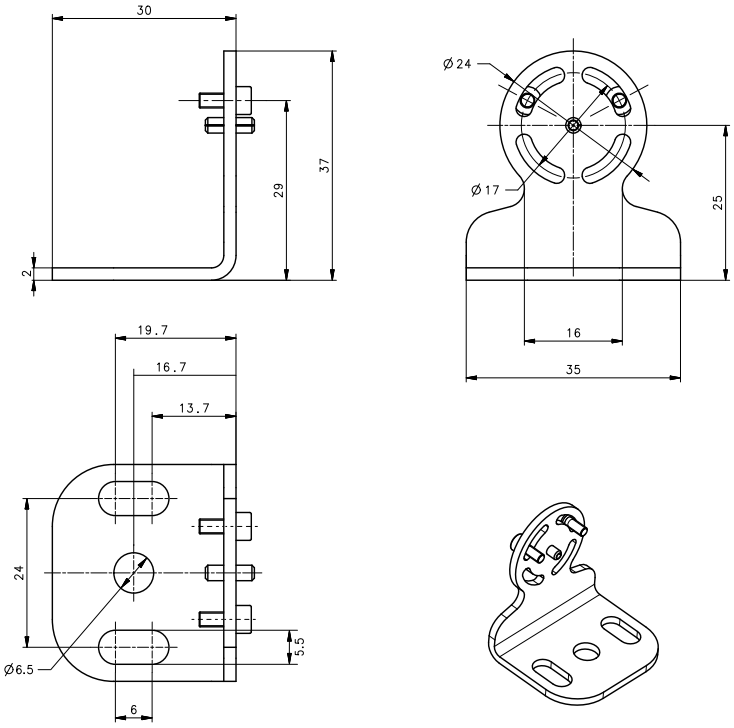


Figure 21 - ST-K4ROT-SH

NOTE: Dimensions are in mm.

Rotating Bracket mounting

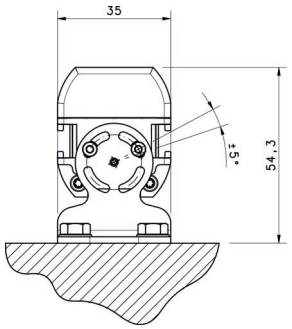


Figure 22 - Straight mounting

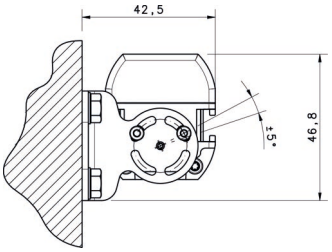


Figure 23 - Rotating 90° mounting

CONNECTION CABLES

MODEL	DESCRIPTION	CODE
CAB-ETH-M01	M12-RJ45 IP67 ethernet cable 1m	93A051346
CAB-ETH-M03	M12-RJ45 IP67 ethernet cable 3m	93A051347
CAB-ETH-M05	M12-RJ45 IP67 ethernet cable 5m	93A051348
CAB-ETH-M10	M12-RJ45 IP67 ethernet cable 10m	93A051391
CD12M/0E-050A1	Connect.M12-F,8 poles-5m,PVC,Axial	CD12M/0E-050A1
CD12M/0E-100A1	Connect.M12-F,8 poles-10m,PVC,Axial	CD12M/0E-100A1
CD12M/0E-150A1	Connect.M12-F,8 poles-15m,PVC,Axial	CD12M/0E-150A1
ADAPT CABLE TX DS4-TX DS2	Adapter cable TX DS4 to TX DS2 M12-4p male to M12-5p female	95ACC0040
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
CS-A1-02-B-NC	CS-A1-02-B-NC = M12 4-p axial PG	G5085002
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 3 m UL 2464	95ASE1120
CS-A1-02-U-05	Cable M12 4 poles axial female unshielded 5 m UL 2464	95ASE1130
CS-A1-02-U-10	Cable M12 4 poles axial female unshielded 10 m UL 2464	95ASE1140
CS-A1-02-U-15	Cable M12 4 poles axial female unshielded 15 m UL 2464	95ASE1150
CS-A1-06-B-03	CS-A1-06-B-03 = M12 8-p axial 3m	95ACC2230
CS-A1-06-B-05	CS-A1-06-B-05 = M12 8-p axial 5m	95ACC2240
CS-A1-06-B-10	CS-A1-06-B-10 M12 8 pins10 m black	95ACC2250
CS-A1-06-B-NC	M12 8-p axial PG	95ACC2550
CS-A1-06-U-03	Cable M12 8 poles axial female unshielded 3m	95ASE1220
CS-A1-06-U-05	Cable M12 8 poles axial female unshielded 5m	95ASE1230
CS-A1-06-U-10	Cable M12 8 poles axial female unshielded 10m	95ASE1240
CS-A1-06-U-15	Cable M12 8 poles axial female unshielded 15m	95ASE1250
CS-A1-06-U-25	Cable M12 8 poles axial female unshielded 25m	95ASE1260
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
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-Y2-45-B-002	Y Cable M12 8p female - M12 5p Female + M12 4p Male	95ASE0102
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
CV-A1-26-B-03	Cable M12 8 poles axial female shielded 3m	95ACC1510
CV-A1-26-B-05	Cable M12 8 poles axial female shielded 5m	95ACC1520
CV-A1-26-B-10	Cable M12 8 poles axial female shielded 10m	95ACC1530
CV-A1-26-B-15	Cable M12 8 poles axial female shielded 15m	95ACC2080
CV-A1-26-B-25	Cable M12 8 poles axial female shielded 25m	95ACC2100
CBX-8IOL-PNIO	8P IOL M12 profinet master	95ACC8190
CBX-8IOL-EIP	8P IOL M12 EIP master	95ACC8180

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