Contents

1. About the User Manual

1.1. Introduction

This manual of instructions on how to use the *SIS1.0 Mini* anti-collision device is intended for the Buyer/User, as well as the Fitter. It provides details on the use of the device based on the purpose for which it was designed and the technical features.
The User Manual describes how to install the device, and use and service it correctly, to ensure that it gives the best possible results and lasts a long time.

The instructions contained herein are intended for the following:

- Plant manager
- Fitters
- Fork-lift truck drivers
- Cleaning and maintenance personnel

The User Manual must be consulted with regard to the following information:

- Operating conditions for the device
- Instructions on:
    - Installation and set-up
    - Operation
    - Cleaning and maintenance

This manual must be read carefully and kept for future reference because it contains vital information on how to use the anti-collision device correctly.
The Fitter should complete the table in section 8 with the set distances and maintenance interventions performed on the anti-collision device, and sign it.
The SIS anti-collision device presents no hazards for the operator if it is installed and used in accordance with the Manufacturer's instructions and the industrial vehicle on which it is mounted is driven/manoeuvred by fully trained and authorised personnel.

1.2. How to use the manual

This User Manual is an integral part of the *SIS 1.0 Mini* anti-collision device and it is the responsibility of the Buyer/User to keep it in good condition and make it available at all times for the operators and Fitters. It must be kept onboard the industrial vehicle on which the device is installed.
If this User Manual gets lost or damaged, a replacement copy can be obtained from the Manufacturer.
The manual must be kept for the device's entire life cycle, even if it is sold on.
The Manufacturer reserves the right to make changes to the production process and the manual at any time, without this entailing the obligation to update previous production processes and manuals.

1.3. Disclaimer

The Manufacturer disclaims all liability for:

- improper use of the *SIS1.0 Mini* anti-collision device
- use by unauthorised or untrained personnel
- installation by unqualified personnel
- a lack of cleaning and maintenance
- failure to follow the instructions in this User Manual
- modifications not authorised by the Manufacturer.

1.4. Identification of the Manufacturer

The Manufacturer of the *SIS1.0 Mini* anti-collision device is, in accordance with regulations in force, identified by the following:

- EC Declaration of Conformity (see Section 9)
- CE marking on the device
- User Manual

Removing the *CE Marking* plate and replacing it with another from a similar device present on the Buyer's/User's premises are strictly forbidden.
If the *CE Marking* plate gets damaged or detached from the device, the Buyer/User must inform the Manufacturer promptly.

1.5. Warranty

1.5.1 Operating conditions

The Manufacturer's obligations under the warranty described herein are subordinate to the following conditions:

a) The warranty is only valid if the product is installed, used and serviced correctly, and the Buyer performs the inspections specified in the instructions provided by the Manufacturer in this User Manual, which is supplied together with the device and the Buyer explicitly declares it has read and understood.
b) The warranty does not apply if, in the Manufacturer's opinion, the product has been serviced and/or modified and/or tampered with by subjects not referring to or authorised by the Manufacturer.
c) The warranty does not apply in the event of defects or malfunctions occurring when the product is mounted or installed on malfunctioning machinery and terminals or ones incompatible with the product's constructional/technical/operating characteristics stated in this User Manual.
The warranty is only valid for correct operation of the device and its ability to interface with the vehicle on which it is installed, in accordance with the technical specifications and within the limits indicated in the instruction handbook.
d) The Buyer declares it is well aware of the fact that the anti-collision device does not replace the operator, it merely acts as an aid, so the Buyer must train the operator on how to use the device properly.
e) The proximity, temperature, pressure, load, light and gas sensors only operate correctly in the environmental conditions described in the technical specifications herein. Ultrasound sensors only operate correctly in the absence of extraneous sources operating on the same frequency.
f) The warranty is invalidated if the anti-collision device is integrated with or mounted with sensors made by other manufacturers or ones having characteristics that are incompatible with this device (see technical specifications in the instruction handbook) or if used on vehicles the mass, weight and technical features of which are incompatible with the technical features appearing in this User Manual, and only when the vehicle's operating speed is not kept to a moderate level and within the range established by the Fitter for the vehicle's various braking and stopping areas.

1.5.2 Product warranty

The Seller warrants that the products comply with the quantity and description contained in the Order Confirmation and duly specified in the instruction handbook, which the Buyer declares it has received, viewed and approved, and that they are free from manufacturing defects.
For details of the warranty period, please refer to the purchase documentation.
The Buyer must examine the products, or have them examined by an expert, as soon as possible after purchase, in any case within eight days of receipt, and must inform the Seller by fax or email of any product discrepancies or defects within the following terms, otherwise the warranty is invalidated and all associated rights are forfeited:

- within 8 (eight) days of delivery, for defects in terms of type or quantity;
- within 8 (eight) days of delivery, for further evident faults or defects;
- within 8 (eight) days of discovery for hidden faults or defects not identified on the time of delivery.

In such cases, the Seller is entitled to examine the products which the Buyer has reported as being faulty or defective, or have them examined by an expert.
If the Seller ascertains that the products are effectively faulty or defective, it will, at its own discretion, either repair them or replace the faulty or defective products and components free of charge.

Except in the event of wilful misconduct or gross negligence, the Manufacturer cannot be held liable towards the Buyer, even if the latter is a Distributor of the product, for any damage or loss suffered by it following or as the result of any warranty action by an end user of the product or recourse by a different intermediary in the distribution change or any other intermediary, with express waiver by the Buyer of any action or recourse.

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1.5.3 Warranty for epidemic defects

The Supplier warrants that the products are free from epidemic defects.
A supply is considered as having an epidemic defect when the defect or fault, even if minor, is repeated more than twice in the same lot, or when it is repeated only once in three consecutive lots.
If a supply of products is ascertained to have an epidemic defect, the Supplier undertakes to replace the entire supply and bear all the related expenses.

1.5.4 Guarantee of marketability and suitability for the intended use

Due to the exclusive nature of the product supplied, standard performance is ruled and the Manufacturer is not required to guarantee results other than those specified in the instruction handbook and the other illustrative material.
Likewise, the guarantee of suitability for the intended use only applies if there is an express agreement between the parties to this end. In this case, the Buyer must provide the Manufacturer with all the data required to assess the intended use of the product, and if the Manufacturer agrees to issue the warranty, follow carefully the technical and operating instructions provided for installation and comply with the specifications and limits of utilisation indicated.

1.6. Applicable standards and compliance with the law

The *SIS1.0 Mini* anti-collision device has been manufactured and the attached documents drawn up in accordance with the following standards:

- **Directive 2006/42/CE**: Machinery Directive
- **Directive 2004/108/CE**: Electromagnetic Compatibility
- **UNI EN ISO 12100**: Safety of machinery – General principles for design – Risk assessment and risk reduction
- **CEI EN 60204 – 1**: Safety of machinery – Electrical equipment of machines - Part 1: General Rules

1.6.1 Legislative Decree no. 81 of 9th April 2008 as amended

In addition to the rules set out in the User Manual, the User of the machine must comply with the applicable laws on occupational health and safety, in accordance with Legislative Decree no. 81 of 9th April 2008 as amended:

Art. 20: Workers' obligations

1. Workers must look after their own health and safety and that of the other people present in the workplace, who could be effected by their actions or omissions, in accordance with the training, instructions and equipment provided by the employer.
2. In particular, workers must:
   a) contribute, together with the employer, executives and supervisors, to fulfilment of the obligations provided for the protection of health and safety in the workplace;
   b) observe the provisions and instructions imparted by the employer, executives and supervisors for the purpose of collective and invidual protection;
   c) make proper use of the work equipment, hazardous substances and preparations, means of transport and safety devices;
   d) make appropriate use of the personal protection equipment provided;
   e) report immediately to the employer or an executive or supervisor any lack of the equipment and devices as per letters c) and d), and any hazardous situation that comes to their knowledge and, in urgent cases, intervene directly in as far as their skills and capability allow, subject to the obligations under letter f), in order to eliminate or reduce situations of grave and imminent danger, and inform the worker safety representative thereof;
   f) not remove or modify any of the safety, warning or control devices, unless authorised to do so;
   g) not perform on their own initiative any operations or manoeuvres that do not fall within their competence or may jeopardize their own safety or that of other workers;
   h) attend the training courses organised by the employer;
   i) undergo the medical check-ups provided for in this legislative decree or ordered by the factory doctor.

2. Description of the SIS1.0 Mini anti-collision device

2.1 Description of the anti-collision device

The *SIS1.0 Mini* anti-colllision system has been designed and built for use as an aid in manoeuvring industrial vehicles. It is an active assisted-manoeuvring system that detects obstacles in order to prevent the risk of collision during manoeuvres in reverse, and either slows the vehicle down or stops it in the event of danger.

The version covered by this manual (*SIS1.0 Mini*) is designed mainly for small forklift trucks (maximum width approx. 170 cm), on which it can:

- detect and display obstacles behind it (reverse protection)
- monitor the height of the lift forks (elevation protection).

Both functions refer to optional modules.

2.1.1 Description of the display kit

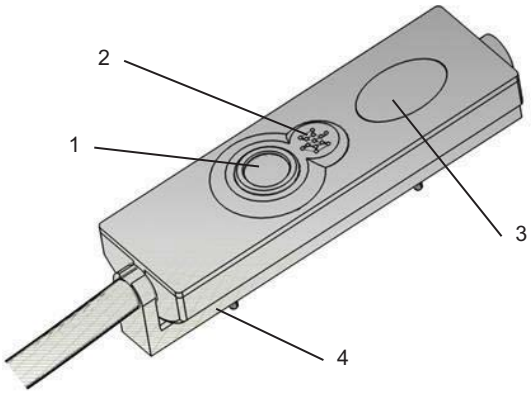


Figure 1: Anti-collision display

The display kit mainly comprises an advanced display and the connectors/contacts/gaskets required to operate the system.

Refer to Section 2.3 - *General Features* for the technical characteristics of the display.

The display (Figure 1) works like a control unit that processes the data received from the sensor and relays to the operator visual and acoustic signals regarding the vehicle's operating conditions.
The shape is designed for easy installation in the cab of the forklift truck without the need for invasive interventions.
The visual and acoustic signals transmitted to the operator are designed to attract his attention without disturbing the driving and manoeuvring operations.

The display unit comprises the following:

1. *A release button*, which must be pressed and held down to acknowledge the alert received following the detection of an obstacle that has caused the vehicle to stop.
2. *A loudspeaker,* which transmits the acoustic alert to the operator.
3. *An illuminated display*, which gives a visual indication of the alert. The display can be green, yellow, red or blue, depending on the obstacle situation. Please refer to Section 5 – *How to use the anti-collision device.* The display lights up, i.e. indicates the presence of obstacles, only when the vehicle is proceeding in reverse.
4. *A supporting bracket*, for mounting the display in the cab. The geometrical features are shown in Figure 2.

The display kit includes two M3 DIN7500C self-tapping screws. They can be used for direct mounting with a blind hole or through hole. The screws can be used with metal or plastic materials, using the same pre-drilled hole.

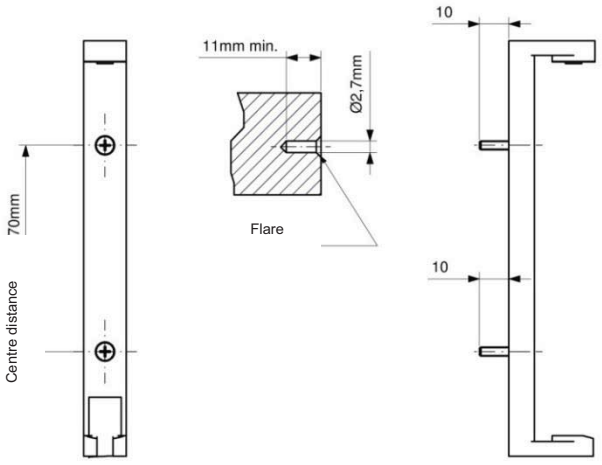


Figure 2: Hole layout

2.1.2 Description of the sensor kit

In addition to the sensor itself, the sensor kit contains a cable with connectors/contacts/gaskets and brackets.

The CySens ultrasonic sensor (Figure 3) detects and warns the driver of obstacles within the operating range while the vehicle is moving.
The sensor can detect an object that is solidly and stably perpendicular to the axis of the vehicle up to a distance of 4 metres. The lateral sections identify obstacles within a range of 1.5 metres. The combination of the three sections produces nearly 180° coverage at the rear of the vehicle.
The sensor comprises the following parts:

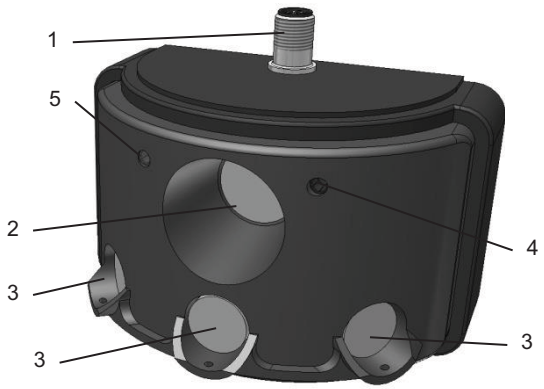


Figure 3: Anti-collision device sensor

1. CONN–S1 cable connecting point (see 4.4.3 – *Details of the advanced display branches*).
2. Ultrasonic signal transmission capsule for detecting obstacles.
3. Centre, right and left capsules for receiving the return signal from the transmitter.
4. Sensor-on light. If the light flashes blue, it means the sensor is operating correctly. If it does not, contact your dealer.
5. LED sensor showing the obstacle detection status. The indicator shows green, yellow or red, depending on the actual movement and the presence of obstacles.
   The CySens sensor detects the presence of obstacles and is active when the vehicle is travelling forwards or in reverse.

2.2 Accessories for the SIS1.0 Mini anti-collision device

In addition to the display kit and the *CySens* kit, the *SIS1.0 Mini* anti-collision device is available with the following accessories:

2.2.1 Elevation sensor (optional)

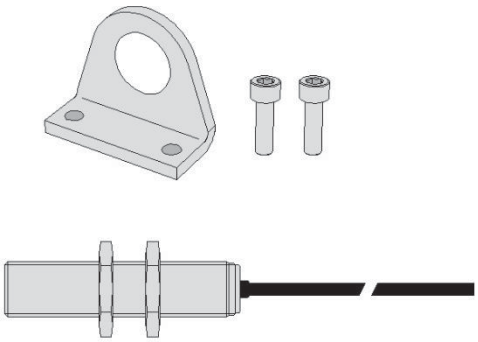


Figure 4: Elevation sensor

In addition to the sensor itself, the sensor kit (Figure 4) contains a cable with connectors/contacts/gaskets and a bracket.

The elevation sensor determines the height of the forks and if they exceed the limit set at the installation stage, a blue visual alert is displayed.

Physical features	
Sensor dimensions	Casing M18x1, length 72mm
Cable length	3m
Cable features	3 conductors, cross section 0.25mm^2 / OD 5mm / black

2.2.2 Power/service kit

This kit comprises a cable and the necessary connectors/contacts/gaskets, in addition to a fuse holder and a safety fuse.
The universal standard configuration has no particular control devices or specific connectors for interfacing with the vehicle, but these elements can be supplied on request following a technical inspection. The cable supplied may not be necessary if the length of cable attached to the MiniMind display is long enough to cover the required distance.

2.3 General features

2.3.1 Technical features of the display

Physical features	
Casing dimensions	width 40mm, height 140mm, thickness 35mm
Cable length	3 m
Cable features	18 conductors, cross section 0.5mm^2, OD 11.1mm, black

2.3.2 Technical features of the CySens sensor

Physical features	
Casing dimensions	width 101mm, height 127mm, thickness 80mm
Cable length	3 m
Cable features	8 conductors, cross section 0.25mm^2, OD 5mm, black

Detection system	
Operation	Ultrasound
Max vertical detection distance	4 m
Max lateral detection distance	1.5 metres per side

Diagram of the coverage area

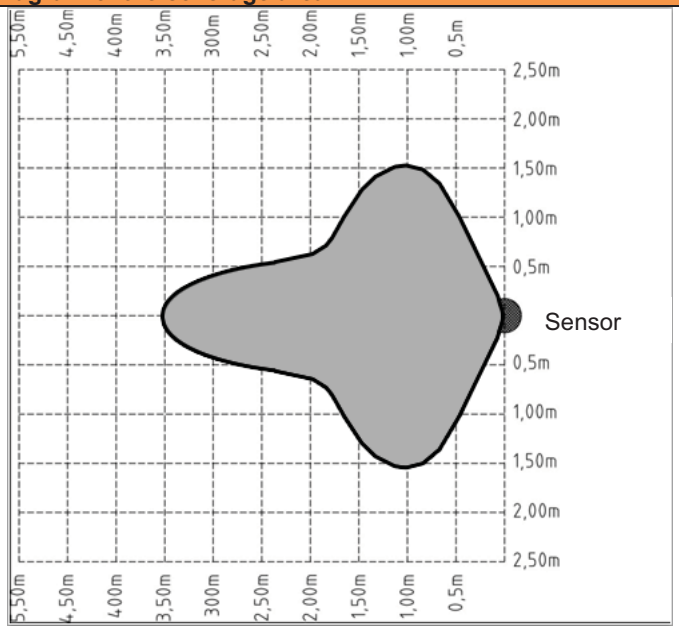


Figure 5: Diagram of the coverage area

Figure 5 on the left shows the area within which the sensor can detect obstacles. The area was obtained by taking as a reference an aluminium pipe with an outside diameter of 86 mm and height 120 cm.

The intervention range of the anti-collision device can be determined within the coverage area.

2.3.3 Technical features of the power/service kit

Physical features	
Cable length	3m
Cable features	18 conductors, cross section 0.5mm^2, OD 11.1mm, black

2.4 Intended use

The *SIS1.0 Mini* anti-collision device has been designed and built for use as an aid in manoeuvring industrial vehicles. It is an active assisted-manoeuvring system that detects obstacles in order to prevent the risk of collision during manoeuvres in reverse, by slowing the vehicle down gradually until it comes to a complete stop.

The *SIS1.0 Mini* anti-collision system is designed solely for this purpose. It must never be used for any other purpose. The Manufacturer disclaims all liability for damage or injury due to incorrect use of the anti-collision device.

2.5 Prohibited uses

Use of the device for purposes other than that for which it was designed and built is considered an abnormal condition and may damage the vehicle and put the User in serious danger.

The *SIS1.0 Mini* anti-collision device must not be installed on any type of vehicle other than small forklift trucks up to a maximum width of 170 cm.

The *SIS1.0 Mini* anti-collision device is particularly indicated for electric forklift trucks .
With vehicles using other systems (e.g. diesel or gas), it operates correctly with regard to the electricity supply and display of the various alerts. For gradual vehicle slowing and stopping, it is necessary to assess the vehicle's construction features case by case, which means contacting the manufacturer of the vehicle.

The *SIS1.0 Mini* anti-collision device cannot be used to detect obstacles at distances higher than that for which it was designed and built (see Figure 5).

The *SIS1.0 Mini* anti-collision device must not be used in wet, dusty or muddy areas because the ultrasonic detection system cannot operate in such environments.

Do not use the *SIS1.0 Mini* anti-collision device in noisy environments where other ultrasonic machines are operating, or in the presence of structural conditions likely to alter the normal detection function, as this could interfere with the signal to/from the sensor and generate a false alert.

Improper use of the device and a lack of maintenance or cleaning could cause a hazard for the operator and other personnel or damage the vehicle and work materials or environments, in addition to affecting the operation and safety of the device itself.

The position and dimensions of the device must never be modified in view of altering its operation.
If you wish to change any of the parameters or do something not covered by this User Manual, please contact the dealer from which you purchased it.

Do not use water to wash or clean the vehicle on which the *SIS1.0 Mini* anti-collision device is installed as this could damage the working parts. Use a specific detergent to clean the vehicle.

Installation and set-up of the *SIS1.0 Mini* anti-collision device must be performed as instructed in this User Manual. Any other type of operation and maintenance is prohibited.

Unauthorised or unqualified personnel or minors must never be allowed to operated the vehicle, even if it is fitted with an *SIS1.0 Mini* anti-collision device.

Do not use the vehicle in poor lighting or visibility, even if it is fitted with an *SIS1.0 Mini* anti-collision device.

Maintenance and repairs must not be carried out by unauthorised or untrained personnel.

2.6 Important safety rules

- **The *SIS1.0 Mini* anti-collision device is not a substitute for the operator manoeuvring vehicles forwards or in reverse. Such vehicles must be driven and manoeuvred by personnel authorised to do so and adequately trained in accordance with the applicable regulations.**
- Since the *SIS1.0 Mini* anti-collision device is merely an aid for manoeuvring a vehicle forwards or in reverse, the driver must ***always look in the direction of travel***, and make sure for himself that there are no hazards.
- The Buyer/User is responsible for installing and setting up the *SIS1.0 Mini* anti-collision device. These operations must be performed by fully qualified personnel whom the Buyer/User has ascertained to be in possession of the technical and professional requirements.
  The Buyer/User or the Fitter must consult the instruction handbook for the vehicle on which the *SIS1.0 Mini* anti-collision device is to be installed, with specific reference to the wiring diagram, in order to identify the best branching point for the power supply.
- The *SIS1.0 Mini* anti-collision device is an aid for manoeuvring the vehicle. The slowdown and stop functions are guaranteed if the speeds in the various areas are correctly determined (yellow = slowing, red = stopping), according to the shape and features of the place of use.
- The setting of the various vehicle slowing and stopping speeds must be compatible with the distances, the dimensions of the slowing (yellow) and stopping (red) areas, and the shape and configuration of the workplace.
- While driving or manoeuvring a forklift truck on which an *SIS1.0 Mini* anti-collision device is mounted, it is mandatory to proceed at a moderate speed to ensure that the vehicle can stop within the red band based on the speed settings.
- The Buyer/User must provide the users of industrial vehicles using the *SIS1.0 Mini* anti-collision device with information and training on the speed settings for the various slowdown and stop areas in the presence of obstacles. The various parameters are shown in the tables at the end of this User Manual compiled by the Fitter.

2.7 Identification of residual risks

No residual risks connected with the use of the *SIS1.0 Mini* anti-collision device itself have been identified.
There are, however, some residual risks associated with the use of the *SIS1.0 Mini* anti-collision device installed in an industrial vehicle. The following factors may cause a hazard:

- Incorrect behaviour while driving or manoeuvring the vehicle. Vehicle drivers must be informed and trained on how to use the vehicles correctly and the risks associated with incorrect behaviour and failure to travel at the speeds required for activation of the vehicle slowing down and stopping system.
- Failure to keep the sensor clean. An accumulation of dust and dirt on the capsules of the *CySens* transmitter and receiver may generate interference with the ultrasound signal transmitted/received, limit performance and reduce sensitivity.
- Misuse and poor maintenance of the sensor. If the sensor signal transmission/reception capsules get crushed during cleaning or maintenance, this will affect the quality of the signal received and, as above, limit performance by reducing sensitivity.
  No part of the *SIS1.0 Mini* anti-collision device must be covered, as this would affect operation.
- Wrong sensor position. If the transmission cone and receivers face downwards and are not positioned virtually parallel to the ground, the sensor will only detect the ground, not the correct distance from any obstacles.
- Interference with the surrounding environment. The presence of high ambient noise in the ultrasound wavelengths (e.g. with US machines) is likely to generate false alerts.

The diagrams below present a series of situations that could affect operation of the *SIS1.0 Mini* anti-collision device and cause a hazard for the driver of the vehicle.
In Figure 6, which shows an obstacle covered by sound-absorbing material, the signal from the sensor transmitter is absorbed, so the system is unable to detect the obstacle.
In Figures 7 and 8, the obstacles are out of range in terms of the height of the sensor, so the system cannot detect them. This is why it is vital for the operator always to look in the direction in which the vehicle is moving.
Figure 9 shows the presence of a projection, which can deviate the US signal emitted, preventing the device from detecting the obstacle and the range.

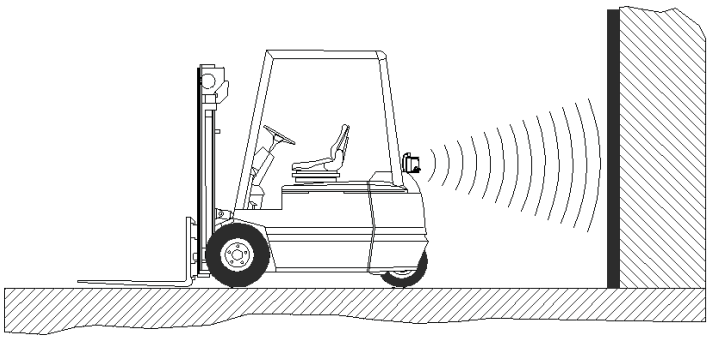


Figure 6: Obstacle covered by highly sound-absorbing material

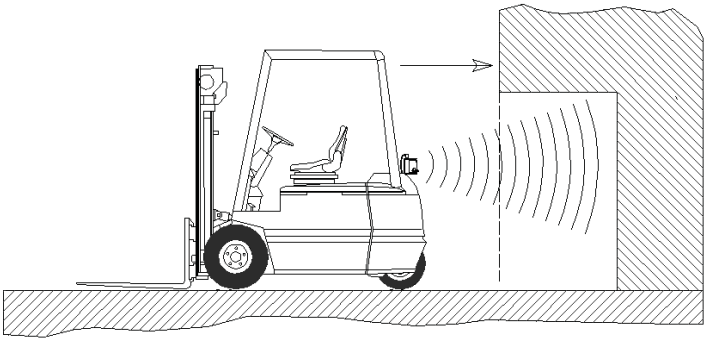


Figure 7: Obstacle projecting outside the detection area

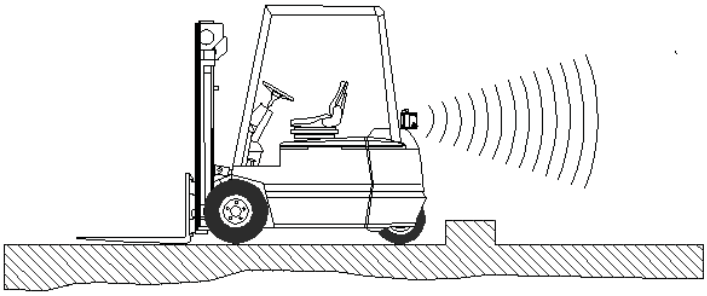


Figure 8: Obstacle projecting from the ground close to the vehicle

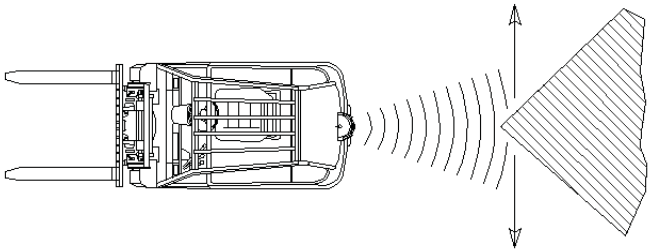


Figure 9: Obstacle with a shape that deviates the US waves

3. Post-delivery checks

When you have taken delivery of the *SIS1.0 Mini* anti-collision device, check for any missing parts.
On arrival at the Buyer's/User's premises, check for structural damage to the device and accessories caused during transportation.

Below is a sample list of contents.

	System	Description	
Pre-configurations	SIS10.MINI.00	• MiniMind advanced display • CySens sensor (one) • Supply/interface kit	
	SIS10.MINI.01	• MiniMind advanced display • CySens sensor (one) • Supply/interface kit • Secondary sensor kit • Rear viewing kit	

	Module	Description	
Single modules	KD.MM.00	• Display with 3m cable • Set of connectors/contacts/gaskets • Set of brackets/screws for cab mounting	
	Module	**Description**	
	KS1.SIS10.00	• CySens ultrasonic sensor • Set of brackets/screws • 8-wire cable and moulded-on plug • Set of connectors/contacts/gaskets	
	Module	**Description**	
	KS2.SIS10.00	• Inductive sensor • Set of brackets/screws • 4m 3-wire cable • Set of connectors/contacts/gaskets	
	Module	**Description**	
	KARB.SIS10.00	• 3m 18-wire cable Set of connectors/contacts/gaskets	
	Module	**Description**	
	KVP.SIS10.00	• Prewired 5" monitor • Prewired IR camera • 10m connecting cable • Set of connectors/contacts/gaskets	

If the *SIS1.0 Mini* anti-collision device is not installed immediately, it must be stored in the original packaging in a clean, dry place, protected from moisture, maximum humidity 60%. Take suitable precautions to prevent dust, dirt and moisture from coming into contact with the system.

4. How to install the SIS1.0 Mini anti-collision device

4.1 Important recommendations

The Buyer/User is responsible for installing and setting up the *SIS1.0 Mini* anti-collision device. These operations must be performed by fully qualified personnel whom the Buyer/User has ascertained to be in possession of the technical and professional requirements.

Prior to installation, the Buyer/User, or the Fitter, ***must consult:***

- ***the data on the SIS1.0 Mini anti-collision device rating plate;***
- ***the general wiring diagram*** (Figure 11);
- ***the instruction handbook*** for the industrial vehicle on which the system is to be installed, more specifically the ***wiring diagram***, in order to identify the best branching point.

It is also advisable to consult the vehicle manufacturer first to verify compatibility with the *SIS1.0 Mini* anti-collision device. If you have any problems with the system, contact your local dealer.

The system must be installed in accordance with the instructions in this User Manual. Programming of the operating parameters and management of the anti-collision device must be performed as instructed in the *Basic Programming Manual* supplied with this User Manual.

If you need to change any of the parameters or perform an operation not covered by this User Manual, please contact your local dealer.

Prior to installation, make sure the vehicle is compatible with the *SIS1.0 Mini* anti-collision device in terms of mass, weight and technical features.
N.B. The *SIS1.0 Mini* anti-collision device must not be installed on any type of vehicle other than small forklift trucks up to a maximum width of 170 cm.

The system must be installed in accordance with the rules of good practice in order not to compromise the vehicle's operational safety.
The Manufacturer disclaims all liability for damage or injury caused if the vehicle is tampered with in any way.

The *SIS1.0 Mini* anti-collision device must be installed without making any modifications to it.
The Manufacturer disclaims all liability for damage or injury caused if the system is tampered with in any way.

The vehicle slowdown and stop functions are guaranteed if the speeds in the various areas are correctly determined (yellow = slowing, red = stopping), according to the shape and features of the place of use.
The setting of the various vehicle slowing and stopping speeds must be compatible with the distances, the dimensions of the slowing (yellow) and stopping (red) areas, and the shape and configuration of the workplace. The Fitter can refer to the *Basic Programming Manual* for the slowing and stopping parameter settings.

Installation of the slowdown/stop function must not affect the behaviour of the vehicle under normal operating conditions in terms of running, slowing, braking and stopping.

After installing and testing the *SIS1.0 Mini* anti-collision device, the Fitter must issue the Buyer/ User with a **statement of correct installation,** in accordance with the Manufacturer's indications in this User Manual.

Following installation and after each subsequent intervention, the Fitter must record the parameter settings and details of the work done in the table at the end of this manual.

Check during installation that the vehicle safety systems have not been deactivated, and double check before putting the *SIS1.0 Mini* anti-collision device into operation.

After installing the system, test it thoroughly but do not use people or structural elements in the workplace as obstacles.

It is advisable to install a lock so that the device switches on and off at the same time as the vehicle on which it is fitted.

The *SIS1.0 Mini* anti-collision device is particularly indicated for electric forklift trucks.
With vehicles using other systems (e.g. diesel or gas), it operates correctly with regard to the electricity supply and display of the various alerts. For gradual vehicle slowing and stopping, it is necessary to assess the vehicle's construction features case by case, which means contacting the manufacturer of the vehicle.

The *SIS1.0 Mini* anti-collision device must not be used in wet, dusty or muddy areas because the ultrasonic detection system cannot operate in such environments.

Do not use the *SIS1.0 Mini* anti-collision device in noisy environments where other ultrasonic machines are operating, or in the presence of structural conditions likely to alter the normal detection function, as this could interfere with the signal to/from the sensor and generate a false alert.

4.2 Preliminary checks

The advanced display is considered the heart of the system. The output cable handles all the system's functional signals. In practical terms, it is advisable to identify a point of the vehicle for connecting the cable and for branching cables to connected devices.

4.2.1 Example of installation

In Figure 10 below, the display cable is laid to the rear guard, passing inside the upright protection, under the floor and inside the cab panelling. The branches of the original system (e.g. seat connections) and the reversing beeper are generally located in this area.
It is therefore easy to obtain the power required for operation and the reversing beeper. It is also easy to connect the CySens sensor and the slowing/stopping devices.
Prior to installation, the Buyer/User must consult the wiring diagram provided by the vehicle manufacturer in order to identify the best branching point without affecting operation of the other safety devices already mounted.

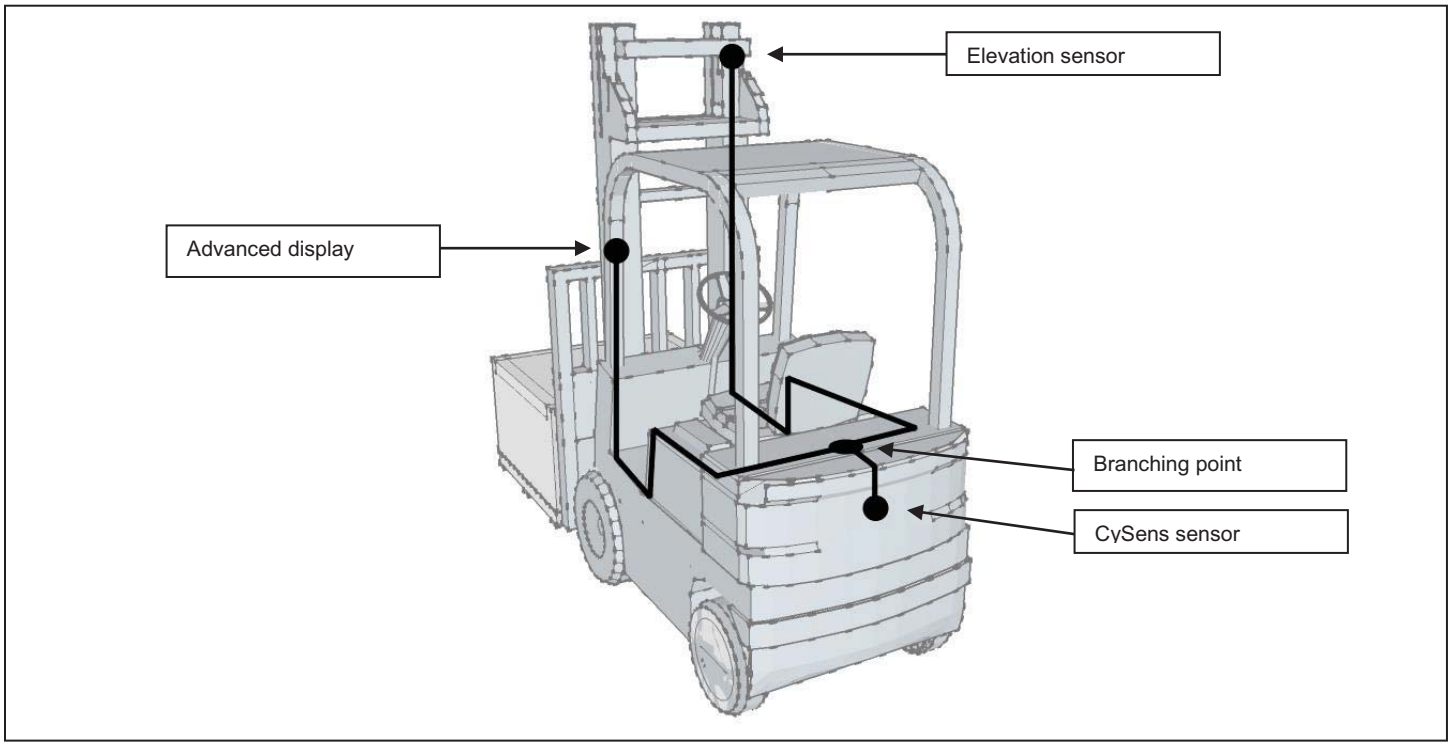


Figure 10: Example of installation of the SIS1.1 Mini anti-collision device

4.3 Overall wiring diagram of the anti-collision device

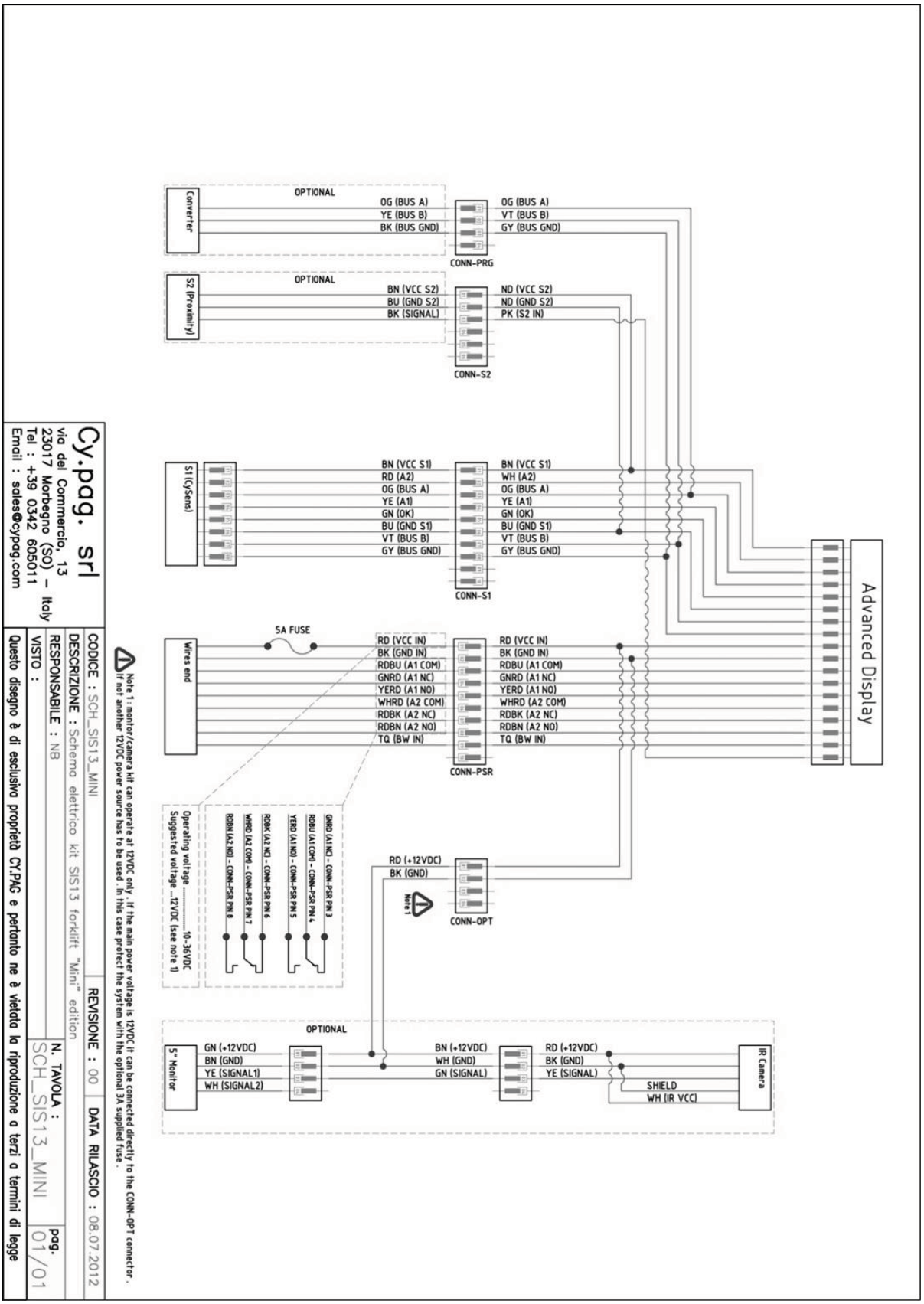


Figure 11: Overall wiring diagram of the anti-collision device

4.4 How to install the advanced display

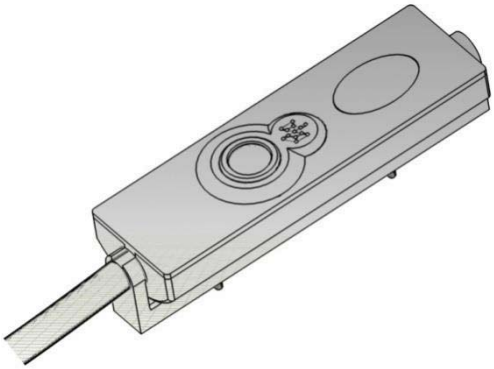


Figure 12: Advanced display of the SIS1.0 Mini anti-collision device

The display is considered the heart of the system in terms of installation. All the input and output signals travel along the pre-mounted 18-way cable. The connectors are not pre-mounted to make it easier to pass the cable along ducts or sheaths present on the vehicle.

Once powered on, it supplies all the other devices connected to it.

4.4.1 Cab installation

Points to bear in mind when installing the advanced display in the cab.

- The display must be located in a clearly visible position.
- The display must be located in the most impact-free position possible.
- The display must be located so that the release button is easily accessible.
- The cable must be laid and secured in such a way as to protect it from damage by impact or wrenching.
- The display is IP41 protected, which means it must NOT be exposed to wet weather conditions or washed.
- The contacts require the use of a specific crimping tool. The use of universal pliers could affect the reliability of the system.

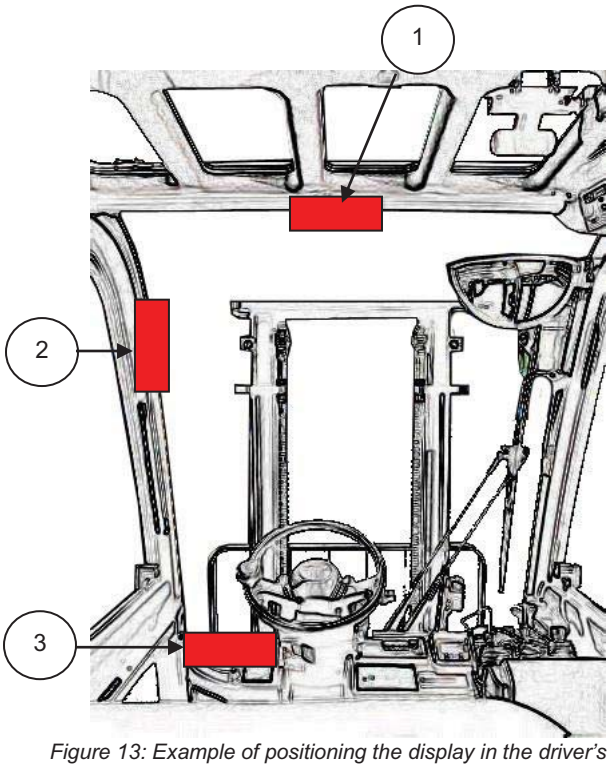


Figure 13: Example of positioning the display in the driver's cab

Figure 13 shows three possible points of installation of the advanced display inside the cab.

The display should not be positioned on the same side as the control levers. The vehicle stop function may inhibit the use of the levers unless the release button is kept pressed. If the above rule is followed, the operator will be able to use both hands and complete the manoeuvre. Remember that disengaging reverse gear will deactivate the vehicle stop function.

When the display is mounted on an upright (2), make sure it does not interfere with the operator getting into or out of the cab.

The light intensity of the LEDs on the display can be regulated by the Fitter. The intensity must not be so bright that it disturbs the operator while driving and manoeuvring the vehicle.

4.4.2 Advanced display inputs/outputs

Signal	Description	Colour (code)	Colour
+10-36V supply	10-36V general power input	RD	Red
GND supply	10-36V general ground supply	BK	Black
S1+ power	S1 sensor 10-36V power output	BN	Brown
S1 GND supply	S1 sensor 10-36V GND output	BU	Blue
Input A2 S1	A2 signal input – sensor S1	WH	White
Input A1 S1	A1 signal input – sensor S1	YE	Yellow
Input OK S1	OK signal input – sensor S1	GN	Green
RS485 A	Bus RS485 I/O "A"	OG	Orange
RS485 B	Bus RS485 I/O "B"	VT	Violet
RS485 GND	Bus RS485 I/O "GND"	GY	Grey
Relay A1 COM	General relay common - alert A1	RDBU	Red/Blue
Relay A1 NC	General relay normally closed – alert A1	GNRD	Green/Red
Relay A1 NO	General relay normally open – alert A1	YERD	Yellow/Red
Relay A2 COM	General relay common - alert A2	WHRD	White/Red
Relay A2 NC	General relay normally closed – alert A2	RDBK	Red/Black
Relay A2 NO	General relay normally open – alert A2	RDBN	Red/Brown
Input signal S2	Sensor S2 signal input (PNP)	PK	Pink
Input signal RM	Activation signal input (reverse)	TQ	Turquoise

4.4.3 Advanced display – Branch details

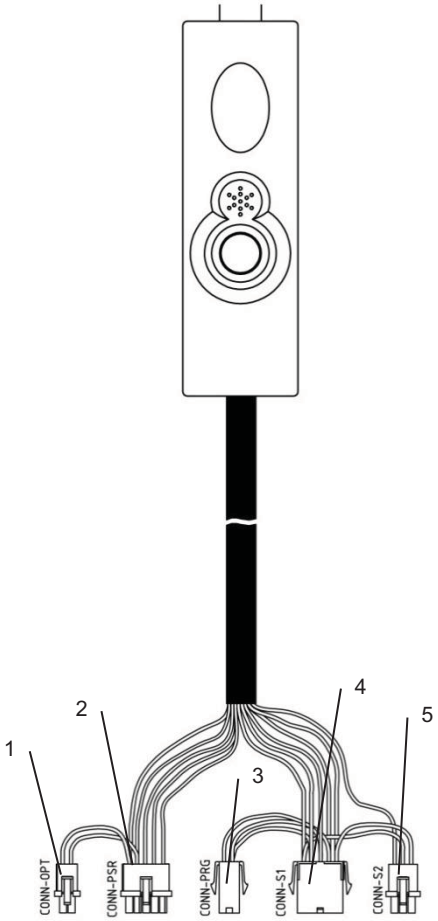
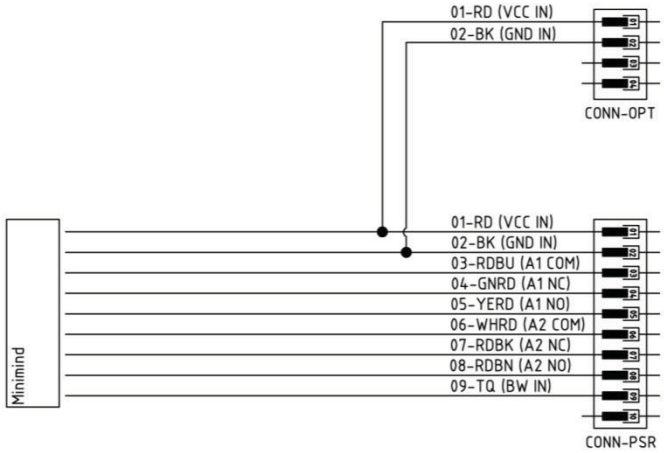
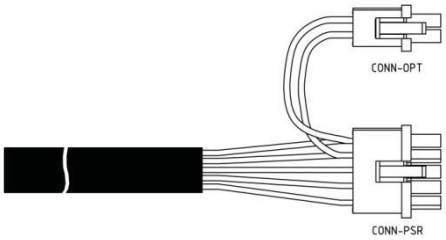


Figure 14: Details of the advanced display branches

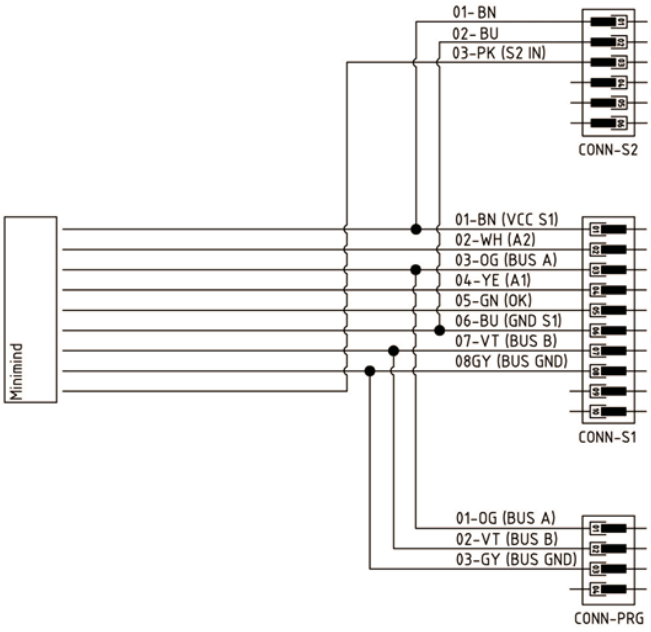
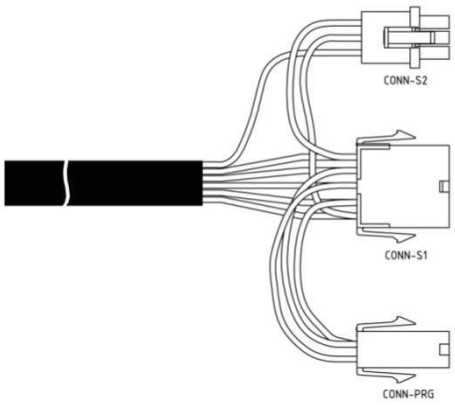
The *MiniMind* advanced display transmits, receives and handles various input and output signals from the connected devices. *All the related physical connections for this must be prepared at the installation stage*.
Below is a detailed description of the various points of connection (see Figure 14).

Connection ID	Description
CONN-OPT (1)	Provision for connecting optional kits (e.g. monitor or camera). The standard configuration has only two pins (equivalent to mains voltage) to power the kit.
CONN-PSR (2)	This connection point receives all signals relating to the system power supply and the slowing/stopping devices. There are two pins for the mains supply and three pins for the alert relays and the activation signal input (usually reverse).
CONN-PRG (3)	Point of connection for a programmer.
CONN-S1 (4)	Connection for sensor S1 (CySens). Specifically designed for connecting a CySens sensor, and includes power supply and alert signals.
CONN-S2 (5)	Connection for sensor S2. Connects PNP sensors, with two power pins (equivalent to mains supply) and one pin for the activation signal input.

Connectors CONN-PSR and CONN-OPT

Diagram	Instructions
 *Figure 15: Wiring diagram for connectors CONN-PSR and CONN- OPT*	Configure the sockets and plugs according to Figure 15. Note that pins 1 and 2 on the 10-pin plug must be inserted in the 4-pin connector for optional modules (e.g. monitor/camera kit). It is advisable to use wires of the same colour as the main signal wire. 

Connectors CONN-S1, CONN-S2 and CONN-PRG

Diagram	Instructions
 *Figure 16: Wiring diagram for connectors CON-S1, CONN-S2 and CONN-PRG*	Configure the sockets and plugs according to Figure 16. Note that pins 1, 3, 6, 7 and 8 on the 10-pin socket must be inserted in the 6- and 4-pin connectors for connecting the secondary sensor and the programming kit. It is advisable to use wires of the same colour as the main signal wire. 

If there is no fork height module, connector CONN-S2 branching is not necessary. Connect the S2 IN signal wire (wire PK – pink) to a 10-36VDC continuous power source such as the VCC IN signal wire (wire RD – red).

4.5 How to install the CySens sensor

Figure 17: CySens sensor

The CySens sensor is installed using the CONN-S1 connection point described previously.

4.5.1 Onboard installation

Points to bear in mind when installing the sensor onboard the vehicle.

- The display must be located in the most impact-free position possible.
- Do not apply pressure to the TX transmission / RX reception capsules as deformation could affect operation.
- The sensor must be positioned so that there are no fixed elements of the vehicle (e.g. uprights) in the range of action.
- The cable must be laid and secured in such a way as to protect it from damage by impact or wrenching.
- The contacts require the use of a specific crimping tool. The use of universal pliers could affect the reliability of the system.

Figure 18 shows the optimal installation dimensions.
The sensor must be mounted about 110 cm above ground level, centrally with respect to the vehicle width. This is to prevent the ground from being detected by the sensor.

The front edge of the sensor must be within the rear limit of the vehicle to reduce the risk of impact.

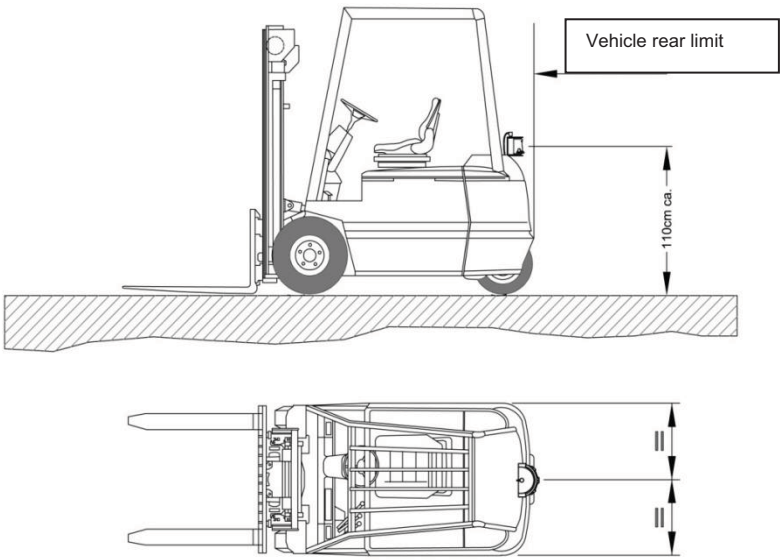


Figure 18: Example of CySens sensor positioning

4.5.2 Hole layout

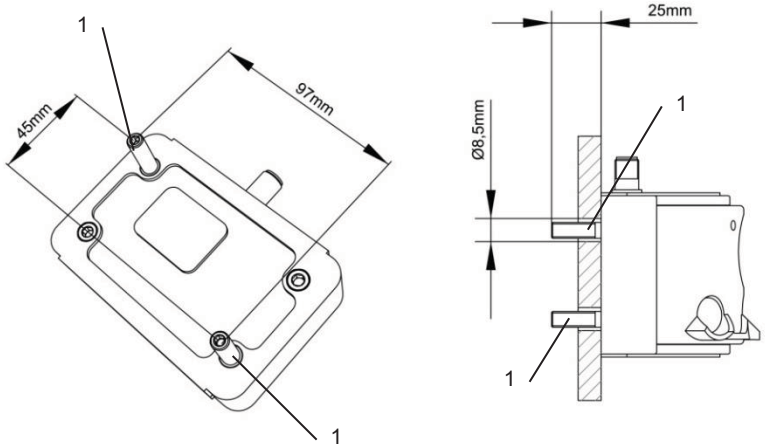


Figure 19: CySens sensor hole layout

The sensor is mounted using the two M8 projecting bolts on the back (ref. 1, Figure 19).
The safety bracket and 90° leg provided come with holes for this purpose.
An alternative is to make your own brackets. Figure 19 shows the centre distances and measurements required.
When tightening the nuts on the projecting bolts (ref. 1, Figure 19), insert a socket wrench in the end to prevent rotation.

4.5.3 CySens sensor inputs/outputs

Signal	Description	Colour (code)	Colour
+ power	Positive power input	BN	Brown
GND power	Negative power input	BU	Blue
A2	Alert A2 output	RD	Red
A1	Alert A1 output	YE	Yellow
OK	OK signal output	GN	Green
RS485 A	RS485 I/O “A”	OG	Orange
RS485 B	RS485 I/O “B”	VT	Violet
RS485 GND	RS485 I/O GND	GY	Grey

4.5.4 Connector CONN-S1

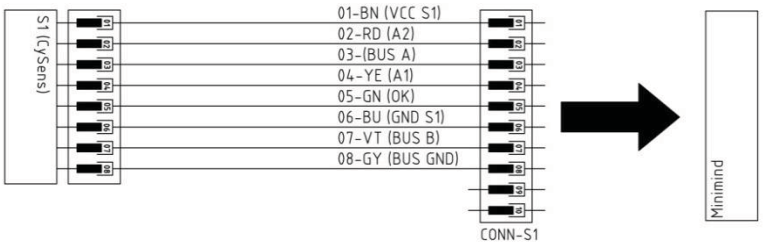
Diagram	Instructions
	Configure the 10-pin plug according to the diagram shown in Figure 20. 

Figure 20: Connector CONN-S1

4.6 How to install the optional elevation sensor

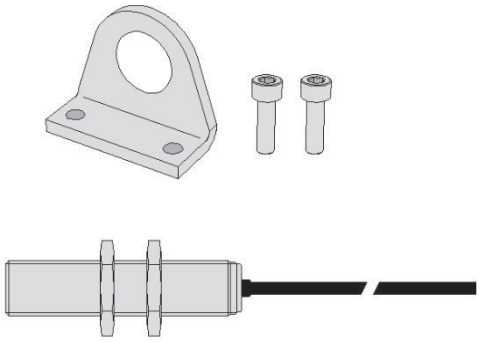


Figure 21: Elevation sensor

The CySens sensor is installed using the CONN-S2 connection point described previously.

4.6.1 Onboard installation

Points to bear in mind when installing the sensor onboard the vehicle.

- The sensor reacts to the presence of metal objects within a 5 mm detection range.
- Check that the moving parts of the turret cannot come into contact with the sensor.
- The cable must be laid and secured in such a way as to protect it from damage by impact or wrenching.
- The contacts require the use of a specific crimping tool. The use of universal pliers could affect the reliability of the system.

Figure 22 shows a typical installation of the elevation sensor. The lifting system normally comprises a series of telescopic elements that extend upwards.
The alert activation point is determining by pointing the sensor towards one of these elements (presence/absence detection).

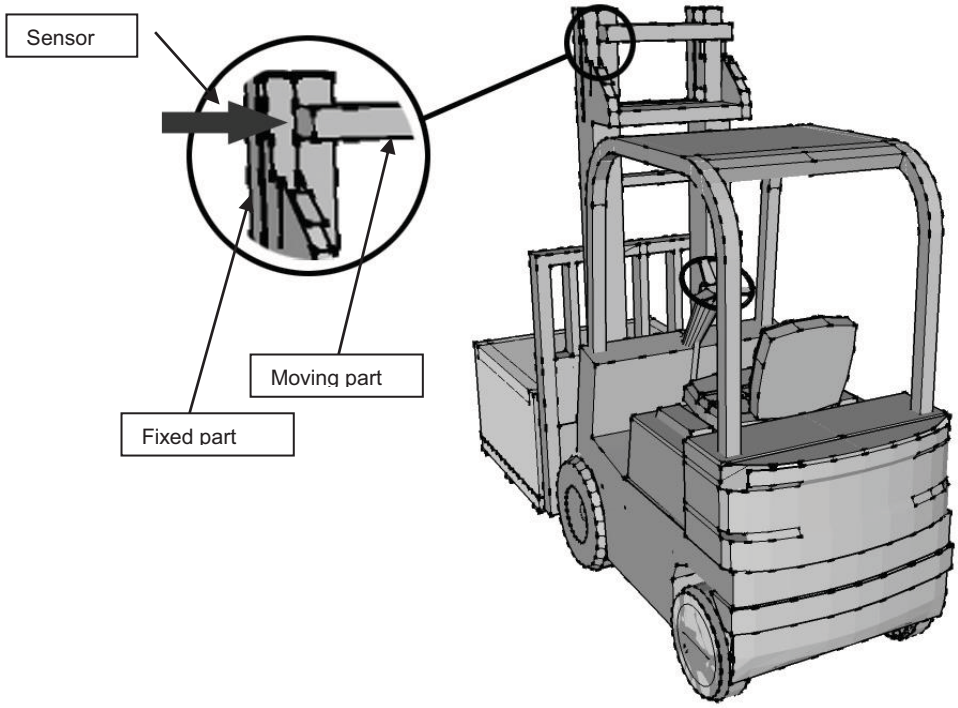
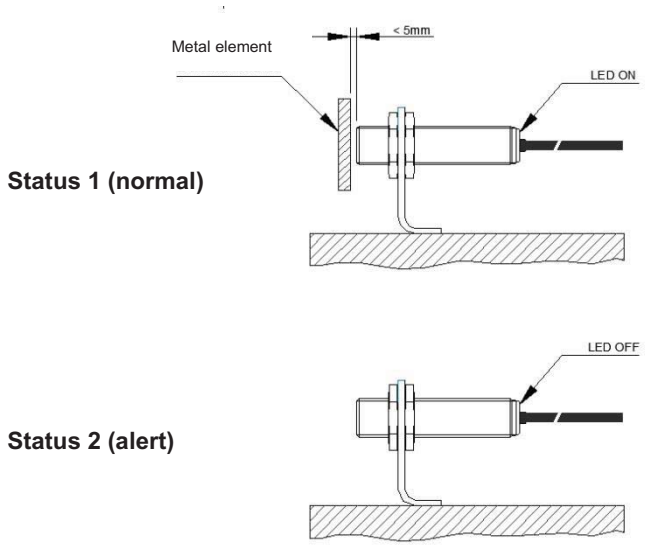


Figure 22: Example of elevation sensor positioning

4.6.2 Operating area of the elevation sensor

Diagram	Instructions
 *Figure 23: Elevation sensor operating range*	Figure 23 refers to general operation of the device. The sensor supplies output voltage as long as the metal element remains within 5 mm of the sensor. In the absence of the metal element, the sensor cuts off power, generating a system alert.

4.6.3 Hole layout

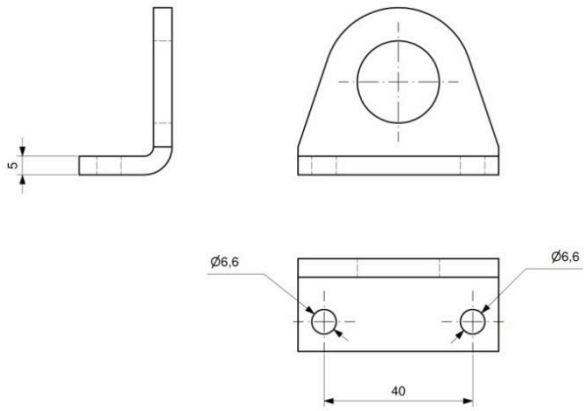


Figure 24: Elevation sensor hole layout

The sensor is mounted using the two M6x30 screws provided.

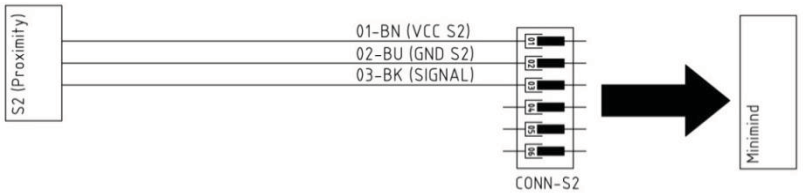
The screws are long enough to take additional elements to raise the sensor.

The leg can be mounted in the threaded hole or using through screws.

4.6.4 Elevation sensor inputs/outputs

Signal	Description	Colour (code)	Colour
+ supply	Positive supply input	BN	Brown
GND supply	Negative supply input	BU	Blue
Signal	Signal output	BK	Black

4.6.5 Connector CONN-S2

Diagram	Instructions
 *Figure 25: Connector CONN - S2 of the elevation sensor*	Configure the 6-pin socket according to the diagram shown in Figure 25. 

4.7 How to install the power/service kit (if required)

4.7.1 Kit installation

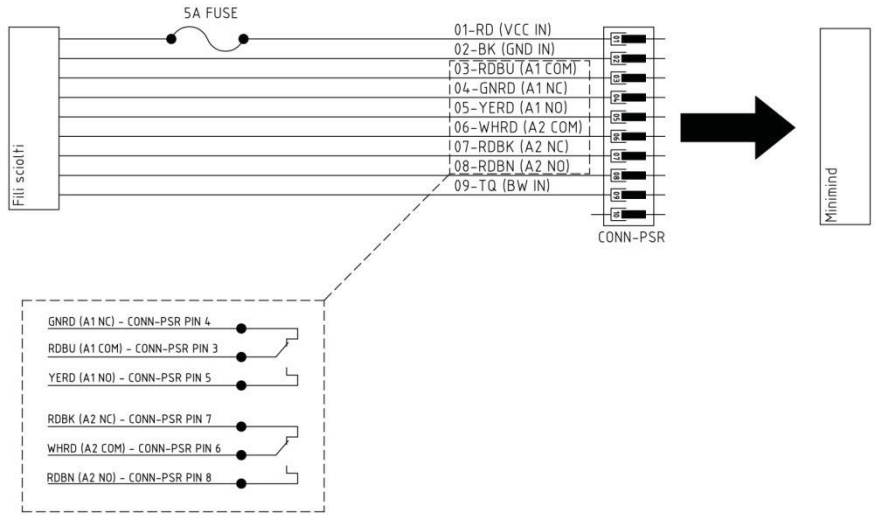
Points to bear in mind when installing the power/service cable onboard the vehicle.

- The cable must be laid and secured in such a way as to protect it from damage by impact or wrenching.
- The contacts require the use of a specific crimping tool. The use of universal pliers could affect the reliability of the system.

4.7.2 Power/service kit inputs/outputs

Signal	Description	Colour (code)	Colour
+10-36V power	10-36V general power input	RD	Red
GND power	10-36V general ground input	BK	Black
Relay A1 COM	General relay common - alert A1	RDBU	Red/Blue
Relay A1 NC	General relay normally closed – alert A1	GNRD	Green/Red
Relay A1 NO	General relay normally open – alert A1	YERD	Yellow/Red
Relay A2 COM	General relay common - alert A2	WHRD	White/Red
Relay A2 NC	General relay normally closed – alert A2	RDBK	Red/Black
Relay A2 NO	General relay normally open – alert A2	RDBN	Red/Brown

4.7.3 Connector CONN-PSR

Diagram	Instructions
 *Figure 26: Connector CONN-PSR*	Configure the 10-pin socket according to the diagram shown in Figure 26. 

4.7.4 Example of application of the power/service kit

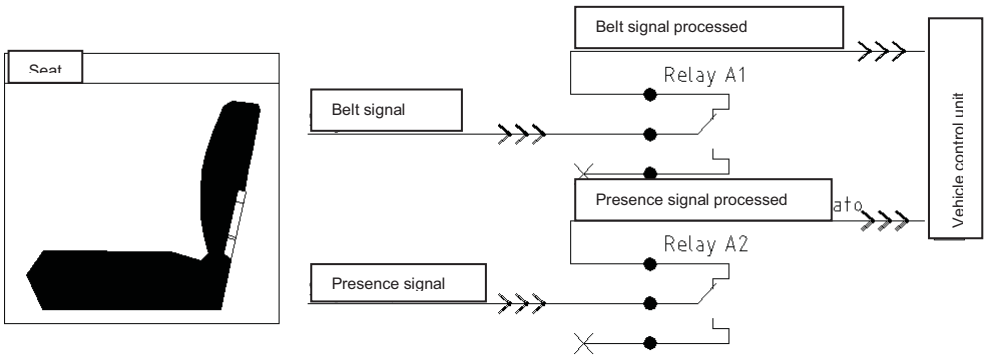


Figure 27: Example of application of the power/service kit

Figure 27 shows how you can intervene on the vehicle systems to achieve slowing and stopping.
In this case the vehicle is preconfigured to slow down if the seat belt is unfastened and stop if there is no operator on the seat.
The alert acknowledgement signals are relayed to the display, which authorises them or otherwise, based on the alert status.

Always check that the reactions on the motion of the vehicle are compatible with the safety requirements.

5. How to use the SIS1.0 Mini anti-collision device

5.1 Important safety rules

The *SIS1.0 Mini* anti-collision device is **not a substitute for the operator** manoeuvring vehicles forwards or in reverse. Such vehicles must be driven and manoeuvred by ***personnel authorised to do so and adequately trained*** in accordance with the applicable regulations.

Since the *SIS1.0 Mini* anti-collision device is merely an aid for manoeuvring a vehicle forwards or in reverse, the driver must ***always look in the direction of travel,*** and make sure for himself that there are no hazards.

The Buyer/User must provide the users of industrial vehicles using the *SIS1.0 Mini* anti-collision device with information and training on the speed settings for the various slowdown and stop areas in the presence of obstacles. The various parameters are shown in the tables at the end of this User Manual compiled by the Fitter.

While driving or manoeuvring a forklift truck on which an *SIS1.0 Mini* anti-collision device is mounted, it is mandatory to proceed at a moderate speed to ensure that the vehicle can stop within the red band based on the speed settings.

5.2 Switching the SIS system on and off

When the device has been installed and the desired parameters entered, and at the start of each shift, the Buyer/User must start up the vehicle and then proceed as follows.

- Check that the *SIS1.0 Mini* anti-collision device activates when the vehicle is switched on, namely that:
  - the display (ref. 3, Figure 28) lights up green;
  - the light (ref. 4, Figure 29) flashes blue; otherwise contact your local dealer because the sensor may be malfunctioning;
  - the light (ref. 5, Figure 29) signals obstacles correctly, i.e. it displays the correct colour based on the distance of the obstacle.
- Operate the vehicle at reduced speed in reverse to check operation of the anti-collision device: the display must show one of the colours indicated under point 5.3 - *SIS1.0 Mini anti-collision device operating modes*. Do not use people or structural elements in the workplace as obstacles.
- Contact the Fitter immediately if the device does not signal the obstacle correctly.

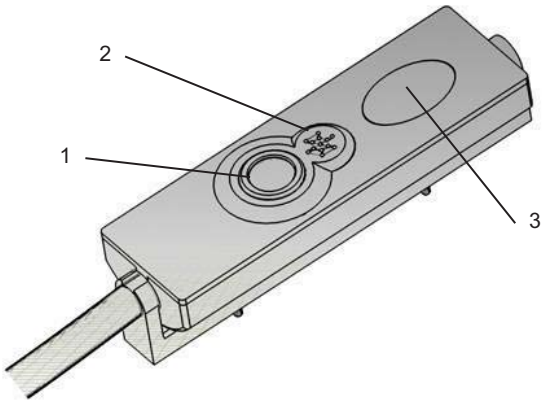


Figure 28: Anti-collision device display

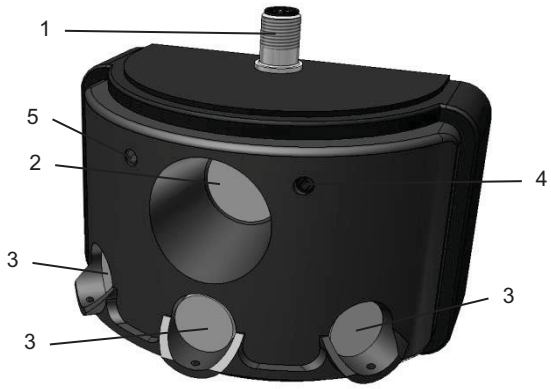
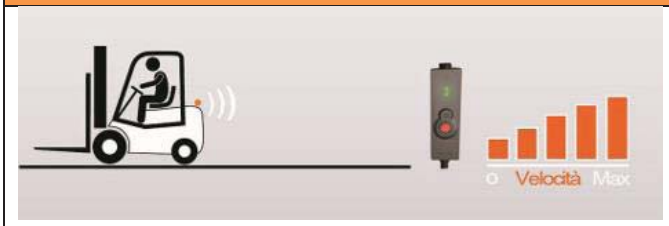
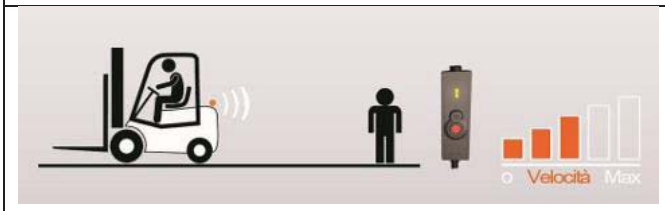
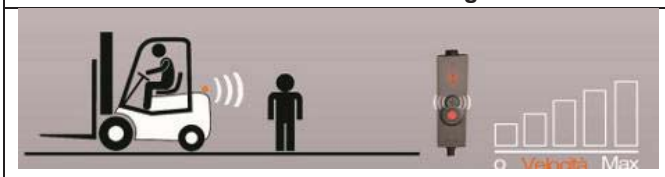
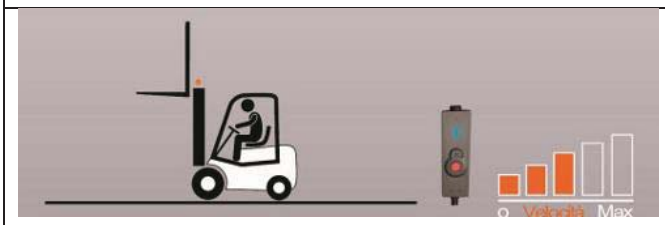


Figure 29: Anti-collision device sensor

If the slowing/stopping function has been installed but there is a fault, the vehicle stops when the driver engages reverse.
To restart the vehicle, press and hold down the red release button (ref. 1, Figure 28) on the display and complete the manoeuvre.
If this happens, contact the Fitter immediately because the system is malfunctioning and does not detect the sensor.

5.3 SIS1.0 Mini anti-collision device operating modes

The table below shows the operating modes of the *SIS1.0 Mini anti-collision device* and the types of alert.

Situation	Type of alert	Meaning
 **No obstacles in the manoeuvring area**	**GREEN** light No acoustic signal	The vehicle can operate both forwards and in reverse.
 **Obstacle in the manoeuvring area**	**YELLOW** light No acoustic signal	There is an obstacle within the “yellow” range. The vehicle slows down automatically in reverse (if function provided).
 **Risk of imminent collision**	**RED** light Acoustic signal	There is an obstacle within the “red” range. The vehicle stops automatically in reverse (if function provided).
 **Forks above the cab (optional for forklift trucks)**	**BLUE** light No acoustic signal	The forks are beyond the set limit. The vehicle slows down automatically (if function provided). .

6. Cleaning and maintenance

6.1 General rules

- Keep the display and sensor, and the vehicle on which the system is installed, clean and tidy.
- Do not perform provisional or urgent repairs on a regular basis.

It is very important to follow the maintenance schedule carefully. The device must be checked regularly to prevent malfunctions occurring.

Maintenance operations must only be performed by qualified personnel.

IMPORTANT
Never clean or service any parts with the vehicle moving.

6.2 Ordinary maintenance of the SIS1.0 Mini anti-collision device

Daily (at the start of the shift or before using the vehicle)

- Check the *SIS1.0 Mini* anti-collision device.
  - The reception/transmission capsules must not be damaged or worn.
  - The CySens sensor must not be covered or obstructed in any way.
  - The guards under the reception capsules must be integral.
- Check the position of the sensor.
  - The sensor must be perpendicular to the ground, not facing downwards and in its original position. Contact the Fitter if anything is not right.

Weekly

- Clean the *SIS1.0 Mini* anti-collision device using a specific detergent. Do not use water.
- Remove any deposits of dust and dirt from the transmission/reception capsules, taking care not to damage them.

6.3 Extraordinary maintenance

If extraordinary maintenance is required, for instance in the event of a breakdown or malfunction, please contact the Fitter and/or the Manufacturer.

6.4 FAQs

Question: What does it mean if light 4 of the *CySens* sensor does not flash blue?
Answer: It means it is not operating correctly. Contact the Fitter immediately.

Question: What does it mean if the display remains the same colour (same status) and does not signal obstacles.
Answer: If for example the display remains green when the vehicle is close to an obstacle or is yellow/red when there is no obstacle, it means the reception/transmission capsules are damaged. Contact the Fitter immediately.

Question: What does it mean if the display shows red and blue?
Answer: It means it is not communicating with the *CySens* sensor, possibly because the cables or connections have been detached or cut. Contact the Fitter immediately.

Question: Why does the display show a green alert when light 5 of the *CySens* sensor is yellow/red?
Answer: The display only shows an alert when the vehicle is in reverse. It remains green when the vehicle moves forward. The *CySens* sensor on the other hand signals obstacles in different colours when the vehicle moves forward and in reverse.

Question: What does it mean if the display remains blue?
Answer: It means the elevation sensor is not operating correctly, possibly because the cables or connections have been detached or cut. Contact the Fitter immediately.

7. Scrapping and disposal

When the *SIS1.0 Mini* anti-collision device needs to be scrapped, the various materials (metal, plastic, rubber, etc.) must be disposed of separately. It may be necessary to contact a specialised company authorised to dispose of the parts in accordance with the laws on the handling of solid urban waste.

8. SIS1.0 Mini anti-collision device data log

First installation

General data			
Date:	Fitter:		
Vehicle data			
Make:	Model:		
Serial/chassis number:			
Central section parameters			
Distance L near/yellow (cm):		Distance L alert/red (cm):	
Right section parameters			
Distance L near/yellow (cm):		Distance L alert/red (cm):	
Left section parameters			
Distance L near/yellow (cm):		Distance L alert/red (cm):	
Slowdown and stop			
Slowdown function:	☐ YES ☐ NO	Stop function :	☐ YES ☐ NO
Notes			
Fitter's signature:		Customer's signature:	