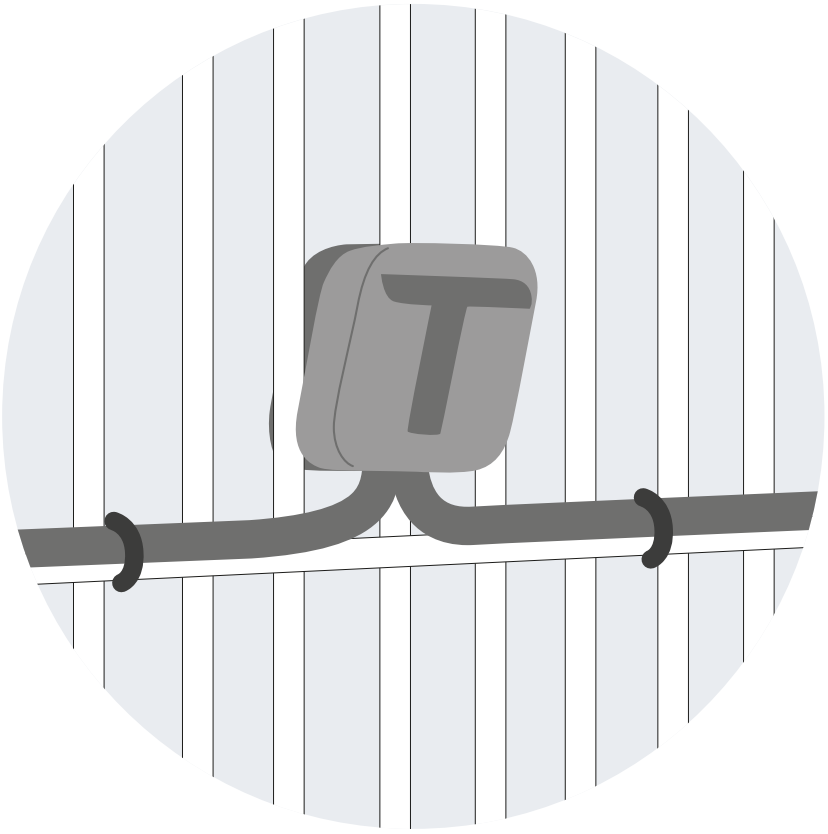
TECHNOLOGY FOR SECURITY

MACS

Anti-intrusion perimeter system for rigid, semi-rigid and mesh metal fences



Instruction manual
v1.2 - EN

Carefully read this manual in its entirety.
You will find useful information to take full advantage of the product's potential, use it safely and obtain the best results.

MACS / instruction manual v1.2 01-2023 / MACS_instructions_en_v1.2 / © 2018-2023 TSec Srl

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Updates to the instruction manual

Publication date	Code	Updates
01-2023	MACS_ instructions_en _ v1.2	Features added: installation on mesh fences, cut detection, pre alarm detection.
11-2018	MACS_ instructions_en _ v1.1	First pubblication

Provided documentation

Manual	Code	Date	Format	Distribution
Manual instructions (this manual)	MACS_instructions_ en_ v1.2	01-2023	PDF	Website: www.tsec.it
Installation instructions MACS	MACS_installation_en _v1.0	01-2019	Printed	Supplied in MACS packaging
MACS-KIT-CON Jointing kit Installation instructions	MACS-KIT-CON_ installation_en_v1.0	01-2019	Printed	Supplied in MACS packaging
MACS-KIT-TERM Termination kit. Installations instructions	MACS-KIT-TERM_ installation_en_v1.0	01-2019	Printed	Supplied in MACS packaging
MACS-SC Jointing system Installations instructions	MACS-SC_ instructions-multi	11-2019	Printed	Supplied in MACS packaging
MACS-SC-TERM Termination system Installation instructions	MACS-SC_ instructions-multi	11-2019	Printed	Supplied in MACS packaging

Intended users of this instruction manual

Recipient	Assignments	Skills
Security system designer	• Defines the composition of security system	Security systems expert
Installer	• Installs all system components • Configures the system	Security systems expert
Maintenance technician	• Performs maintenance on the system	High technical knowledge in the field of security systems
System owner/Security manager	• Monitors the system	-

1. Reception

1.1 Package contents

1.1.1 Sensor package

- Pre-wired sensorchains
- For each sensor:
  - long and short screw
  - counter-plate
  - T-cap
  - spacer
- Installation instructions

1.1.2 Master Package

- Circuit board in watertight case
- Four screws per cover

1.1.3 Ethernet board package

MACS-ETH:

- Circuit board with DIN rail
- DIN rail
- Magnet

MACS-ETH-PS:

- Circuit board in metallic box with wired power supply unit (input 230V ac)
- Magnet
- Battery (optional)
- Installations instructions

1.1.4 Material excluded

- Bus cable for connection of the ethernet board and the master board and for any extension of the cable between the sensors
- Termination kit
- Possible cable jointing kit
- Possible self-drilling screws for installation of sensors on pole
- Ethernet cable to connect the ethernet board

1.1.5 Spare parts and accessories

For orders and consulting the spare parts and accessories catalog contact the local distributor or manufacturer

2. Get to Know MACS

Contents

This section includes the following topics:

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2.3 The sensors (MACS-S3H) **8**
2.4 The Master (MACS-MAS) **9**
2.5 The ethernet board (MACS-ETH) **11**
2.6 Connection to the ethernet board **12**
2.7 Web interface **12**

2.1 Introduction to MACS system

2.1.1 Description

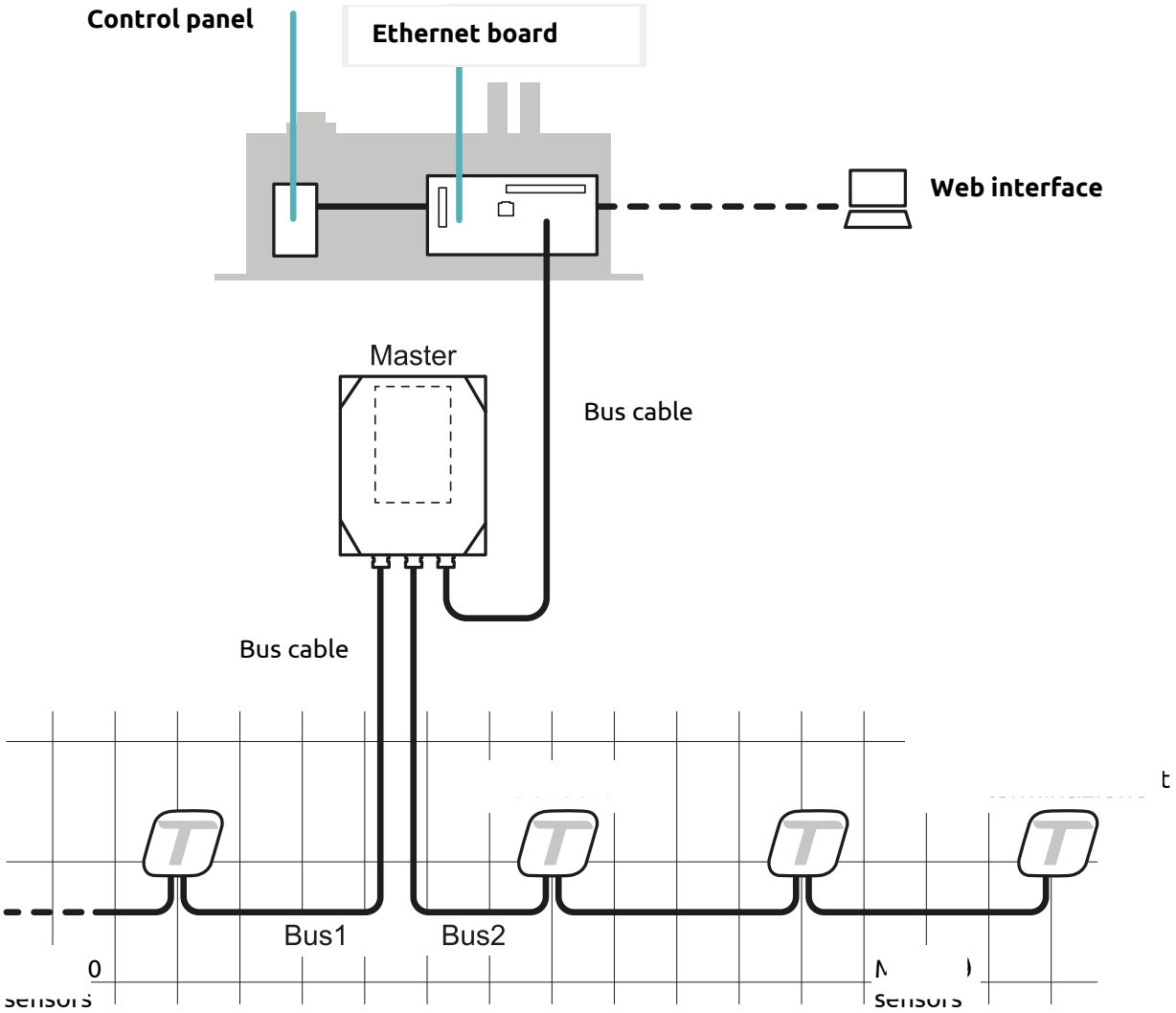
MACS is an anti-intrusion perimeter system for metallic fences:

- rigid and semirigid fences with metallic panels higher than 1,50m (4.92 ft) and total height (panel and wall) over 1,70m (5.57 ft)
- mesh fences with metallic panels higher than 1,50m (4.92 ft).

Thanks to an accelerometer inside of each sensor and a proprietary algorithm, the system detects and signals vibrations caused by climbing over the fence and other potentially damaging actions (e.g. attempted removal of the fence). Furthermore, it distinguishes and filters innocuous vibrations caused by involuntary actions, like accidental impacts or weather. Even if installed on mesh fences the system can detect also cuts attempts.

Control of the system is divided between two components, the Ethernet board and the Master. The Ethernet board is the only component of the system to which supply power, the Master and the sensors receive power supply from the Ethernet board. The system is configured and monitored via the web interface, accessible by browser.

2.1.2 Main components



Component	Code	Description
Sensors	**MACS-S3H**	Up to 2 chains with 120 sensors each (bus 1 and bus 2)
Master	**MACS-MAS**	Electronic circuit board for managing the sensors mounted in the watertight case for outdoor installation

Component	Code	Description
Ethernet board	**MACS-ETH**	Communication electronic circuit board with the alarm control panel and Ethernet port for access to the web interface
Bus cable	**MACS-CAB**	Proprietary bus cable
Web interface	-	Interface accessible by browser to configure and manage the system

2.1.3 Applications

The system is suitable for large fences (e.g. military sites, airports, industrial sites, etc.) as well as residential and commercial sites.

2.2 System start-up

2.2.1 System start-up

The sequence of macro- procedures for starting up the system is presented as follows:

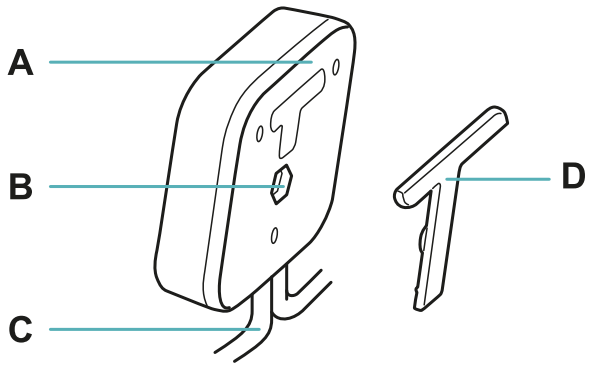
1. “install the sensors” on page 18.
2. "Install the Master” on page 22.
3. "Install the ethernet board” on page 23.
4. “Initial operations” on page 27.
5. “Manage system settings” on page 30.

2.3 The sensors (MACS-S3H)

2.3.1 Functioning

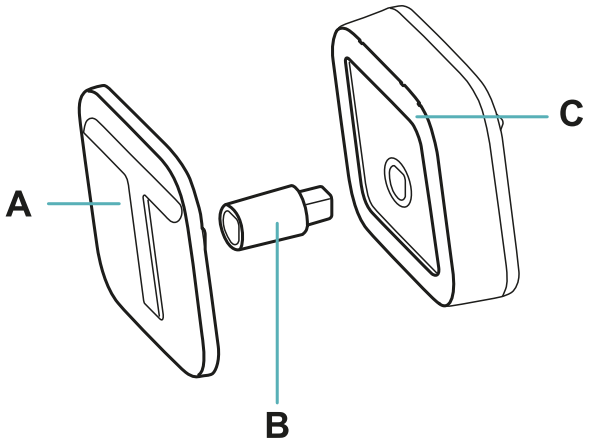
The sensors detect the vibrations caused by motions of the fence thanks to an accelerometer and send the signals to the Master via bus. The algorithm recognizes attempts to climb over the fence or cuts by filtering out vibrations caused by accidental impacts or weather.

2.3.2 Sensor front



Part	Description
A	Sensor body
B	Hole for fastening screw to pole or counter-plate
C	Bus cable
D	T-cap

2.3.3 Sensor Back



Part	Description
A	Counter- plate for panel installation
B	Spacer for panel installation with thick mesh
C	Rubber fastening gasket

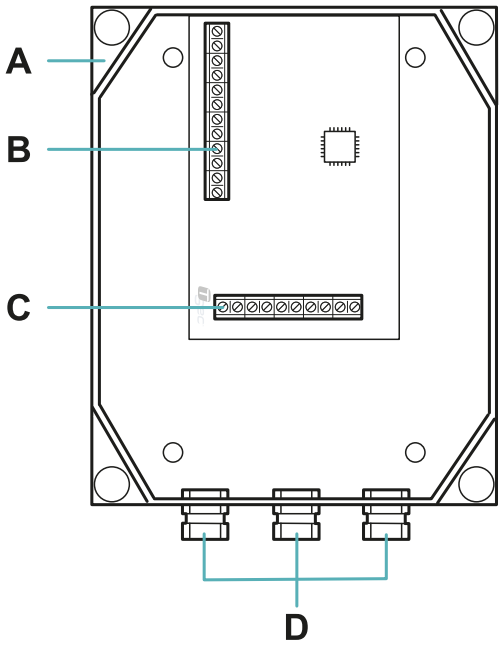
2.4 The Master (MACS-MAS)

2.4.1 Functions

The Master performs the following functions:

- Manages the sensor chains.
- Transmits signals from the sensors to the Ethernet board.

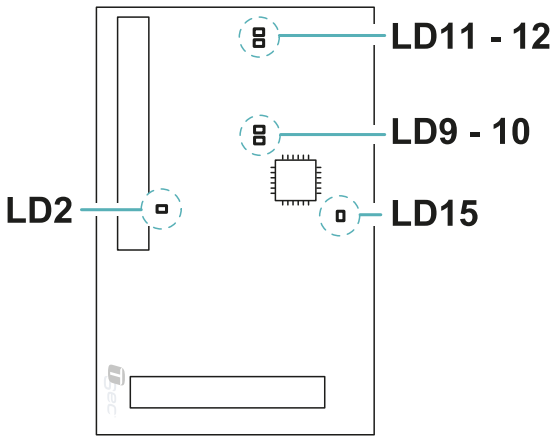
2.4.2 Main components



Part	Description
A	Watertight box
B	Terminal block for connecting sensor chains (see"Description of terminal block for connecting sensor chains" on page 23)

Part	Description
C	Terminal block for connecting Ethernet board (see "Description of terminal block for connectingthe Ethernet board" on page 23)
D	Cable glands, for bus cables of the two sensor chains and towards the ethernet board

2.4.3 LED



LED	Color	Description
LD2	Green	Power supply status: • Steady: powered up. • Off: not powered up (see "LED of the Master" on page32).
LD9	Green	Power supply status bus 2: • Steady: powered up. In the start- up and configuration phase, the LED turns off for a few seconds and then turns back on. • Off: not powered up (see "LED of the Master" on page 32).
LD10	Red	Short-circuit bus 2: • Steady: short-circuit • One flashing: short- circuit detected. The Master attempts to power up the bus again and the LED turns off. If the short- circuit is detected again, the LED turns back on and stays on.
LD11	Green	Power supply status bus 1: • Steady: powered up. In the start- up and configuration phase, the LED turns off for a few seconds and then turns back on. • Off: not powered up (see "LED on the Master" on page 32).
LD12	Red	Short-circuit bus 1: • Steady: short-circuit • One flashing: short- circuit detected. The Master attempts to power up the bus again and the LED turns off. If the short- circuit is detected again, the LED turns back on and stays on.
LD15	Green	Firmware status : • Flashing: normal functioning. •Steady or off: malfunctioning (see "LED on the Master" on page 32).
	Orange	Sensor configuration status: • Steady: configuration in progress. The sensor alarms are not read. The LED turns off after about 30 s of inactivity in the web interface. • Off: configuration concluded.

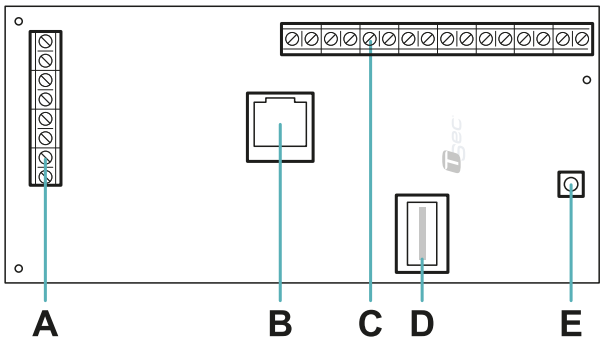
2.5 The ethernet board (MACS-ETH)

2.5.1 Functions

The Ethernet board performs the following functions:

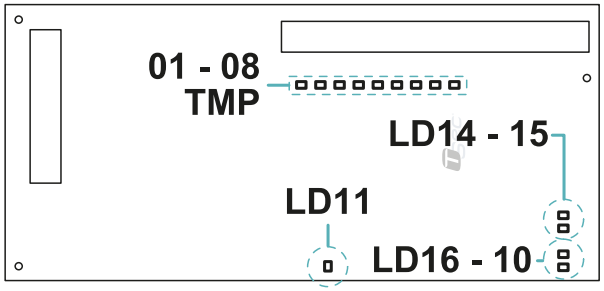
- Powers the other system components.
- Receives signals from the sensors through the Master.
- Signals alarms to the control unit through outputs.
- Allows configuration of the system through the web interface.

2.5.2 Main components



Part	Description
A	Terminal block towards the Master and for system power supply (see " Description of terminal block towards the Master and for power supply" on page 24)
B	Ethernet port
C	Terminal block towards the alarm control panel (see " Description of terminal block towards the alarm control panel" on page 24)
D	Label with serial number of the Ethernet board
E	Reset button

2.5.3 LED



LED	Color	Description
LD10	Red	Reset in progress (see "Reset the system" on page 32).
LD11	Green	Power supply status: • Steady: powered up. • Off: not powered up (see "LED of the ethernet board" on page 32).
LD14	Orange	Enabled connection option (see "Connection to the Ethernet board " on the next page): • Steady: through the serial number of the controller and IP address. • Off: only through IP address.

LED	Colore	Descrizione
LD15	Green	Network connection status: • Rapid flashing: search in progress. • Single slow flashing: through dynamic IP. • Double slow flashing: through static IP. • Off: no connection.
LD16	Green	Firmware status: • Flashing: normal functioning. • Off or steady: malfunctioning (see "LED of the Ethernet board" on page 31).
TMP	Orange	Tampering: • Steady and all **01**–**08** steady: total system fault or error in start-up phase. The system encountered faults in the saved configurations. • Steady and at least one among **01**- –**08** steady: sensors tampering in the zone(s) indi or bus short circuit. • Off: no tampering.
01–**08**	Orange	Climbing alarm: • All steady: fist start-up or restored factory default settings. The system has no sensors saved in the memory. • Steady: climbing alarm from at least one sensor of the indicated zone(s). • Alternating flashing: system configuration in progress. • Off: no alarms.

2.6 Connection to the Ethernet board

2.6.1 Connection options

Three connection options are available:

- Static IP
- Dynamic IP
- Serial number of the Ethernet board (see "Default settings" below)

The network settings define the enabled connection options and can be modified through the web interface (see "Manage system settings").

Consult the network administrator to identify the best configuration.

2.6.2 Default settings

The preset connection options are:

Static IP: 192.168.0.45
Controller serial number: printed on the label of the Ethernet board (e.g. macs00000000)

2.7 Web interface

2.7.1 Functions

The web interface is used to perform the following functions:

- Configure the sensors.
- Associate the sensors with monitoring zones and alarm outputs.
- Enable/disable the sensors.
- Monitor the system status (sensors, zones, outputs).
- Download the sensor log file.
- Manage the system and network settings.
- Enable/disable pre alarm output.

- Enable/disable Master board tamper signal.
- Manage the users and relative permissions.

2.7.2 Access procedure

1. Make sure that the monitoring computer is connected to the network where the Ethernet board is located and open the web browser.
   ***Note**: to check compatibility of the browser with the web interface, access the link www.tsec.it/browser-check-macs/.*
2. Insert the address assigned to the Ethernet board in the address bar:

To connect…	**Then type...**
through the serial number of the controller (default)	https://*serialnumber*.local (e.g. https://macs00000000.local)
through static IP (default)	https://192.168.0.45 (default IP) or static IP
through dynamic IP	https://*serialnumber*.local (e.g. https://macs00000000.local)

   ***Note**: if a security warning appears, see "Troubleshooting" on page 32.*

3. Insert the user name and password (default "installer", "installer") then click **Login**.

2.7.3 Main menu

For instructions on how to use the web interface, see "Operate with the web interface" on page 28.

***Note**: the available functions may vary based on the permissions of the users.*

Page	Function
Dashboard	Monitor outputs, zones and sensors in real time.
Sensors	Select a sensor for: • Display the sensor in the Dashboard • Change the sensor configuration.
Configurations	Consult, change, eliminate and rename the configurations.
Settings	• Display and change the system settings (e.g. date and time, user management) and network settings. • Manage firmware updates. • Download the sensor log file.

3. System installation

Contents

This section includes the following topics:

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3.2 Before installing the system 18
3.3 Install the sensors 18
3.4 Install the Master 22
3.5 Install the Ethernet board 23

3.1 Things to know

3.1.1 Sensor chains

The sensors are supplied pre- wired in a chain. The sensor chains can be connected to one another to reach the necessary number of sensors for covering the entire fence. Each chain can be made up of a maximum of 120 sensors.

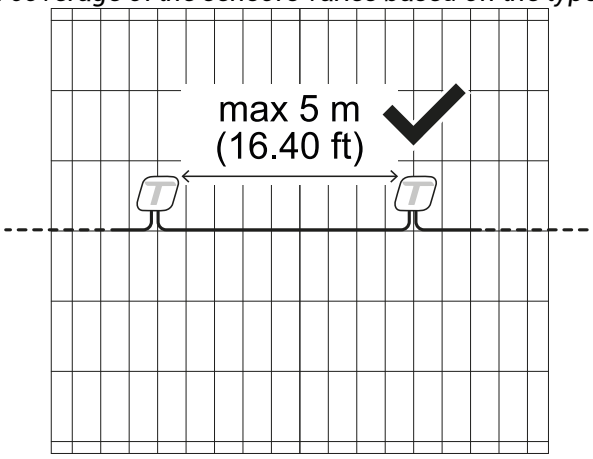
3.1.2 Cables

- Maximum length of bus cable between the Ethernet board and the Master circuit board: 1000 m (3280.84 ft)
- Maximum length of bus cable for a chain of sensors: 800 m (2624.67 ft)
- Interval between sensors: 6 m (19.68 ft)

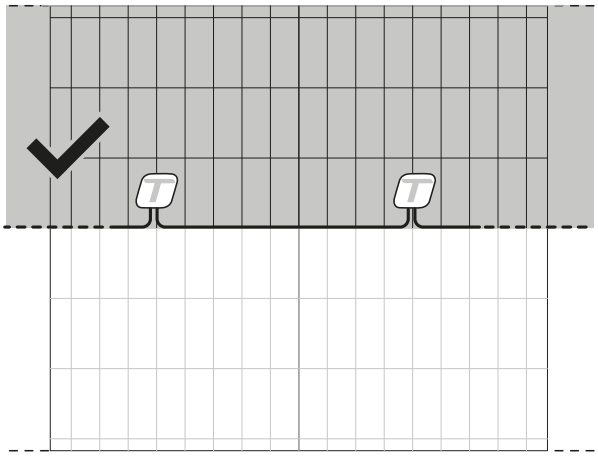
3.1.3 Sensor

- For continuos coverege:
  - On rigid and semi-rigid fences, the recommended distance between the sensor is 5 mt (16.40 ft) (maximum distance: 5mt (16.40 ft))
  - On mesh metal fences, the recommended distance between the sensor is 4 mt (13.12 ft) (maximum distance: 5mt (16.40 ft))

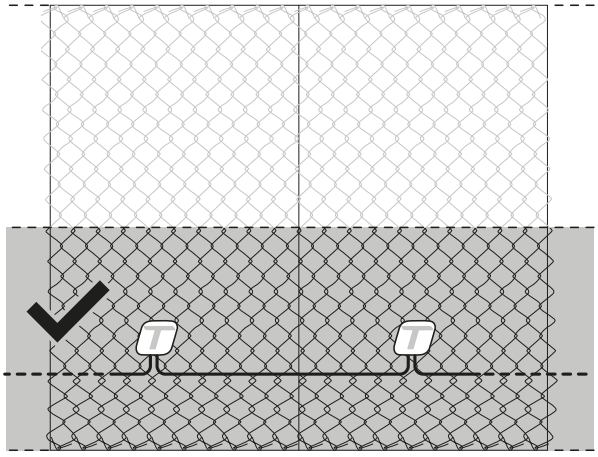
  ***NOTICE**: the actual range of coverage of the sensors varies based on the type of fence.*



- On rigid and semi-rigidi fences, the sensor must be installed in the upper middle part of the panel/pole for greater vibration detection.



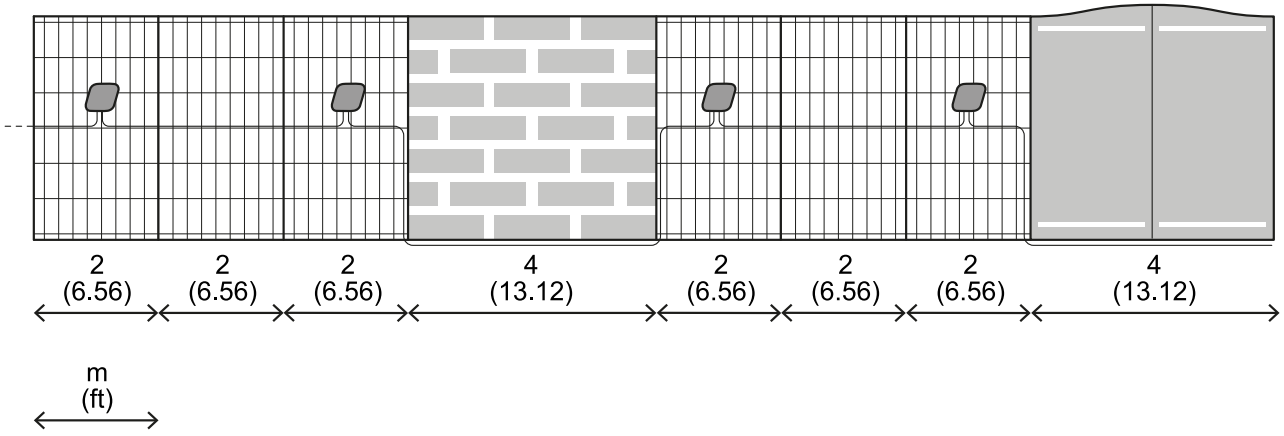
- On mesh Metal fences, the sensors must be installed in the lower middle part of the fences for a greater cut detection.



3.1.4 Maximum coverage

The maximum coverage for the complete system (2 chains of 120 sensors each) is 1200 m (3937 ft). If th e fence to be protected has a length over 1200 m (3937 ft), more than one MACS system must be installed.

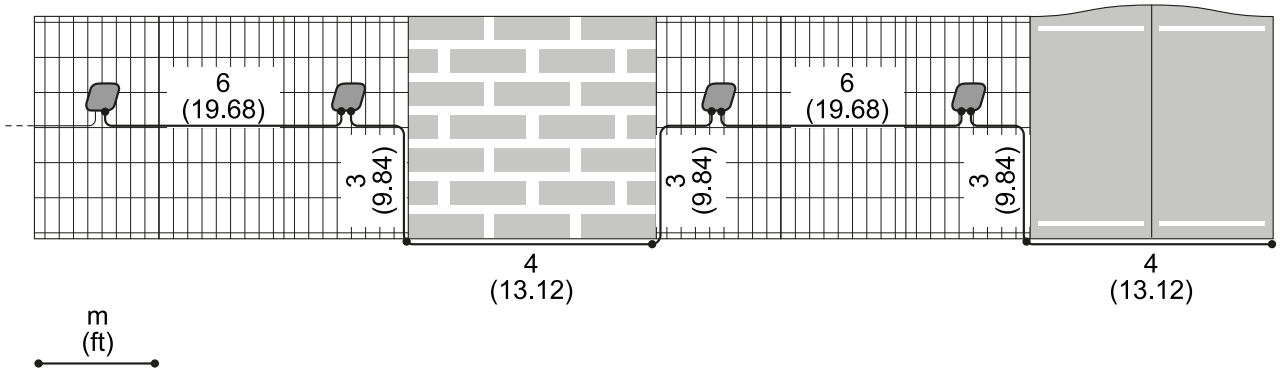
The maximum cov erage doe s not take into acc ount any inte rruptions in the fence (e.g . gate, wall). For example, for the section of f ence represented in the illustration, the system coverage is 12 m (39.37 ft). 4 m (13.12 ft) of wall and 4 m (13.12 ft) of gate are exc luded.



3.1.5 Interruptions in the fence

In the case of interruptions in the fence, the interval between the sensors must be increased by making a cable joint.

The length of the cable necessary for covering the interruption must be considered in the calculation of the total length of the cable. In the example presented in the illustration, the length of the cable in the section is 29 m (95.14 ft).



3.1.6 Types of sensor installation

To adapt to different types of fences, the sensors can be installed in four ways:

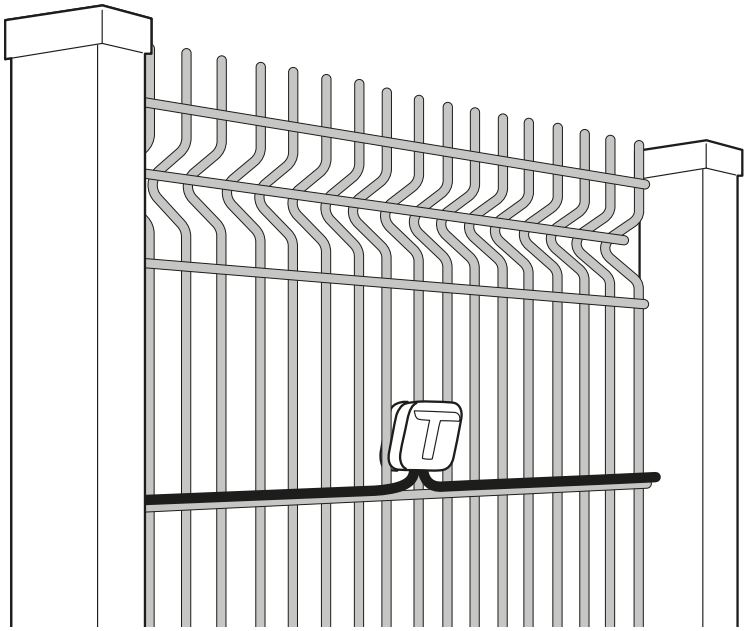
- On thin mesh panels: thickness from 4 to 13 mm (from 0.15 to 0.51 in)
- On thick mesh panels: thickness from 24 to 28 mm (from 0.94 to 1.10 in)
- On the pole: in the case of panels with mesh thicker than 28 mm (1.10 in) or for special needs
- On well-stretched mesh metal fences

On rigid or semi-rigid fences, where possible, install on panel.

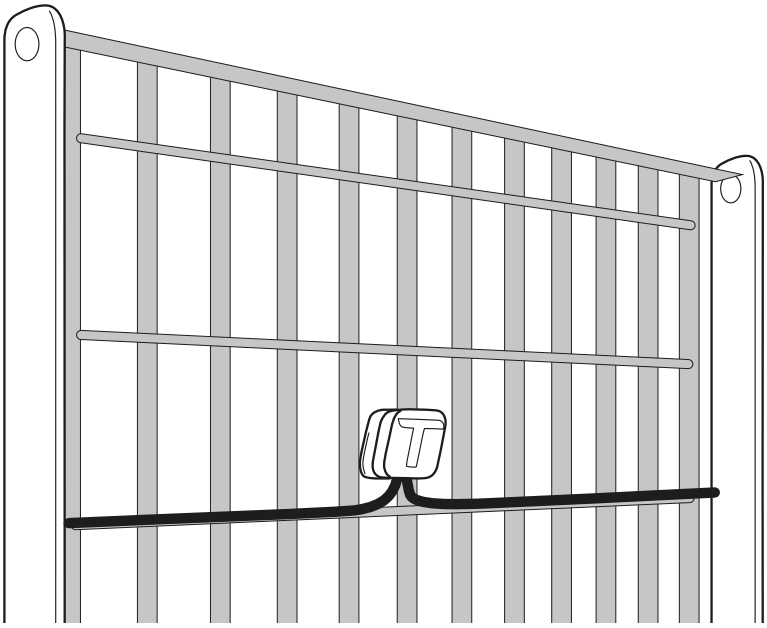
3.1.7 Other environmental conditions

Vegetation very close to the fence could cause detections (eg. with wind). If necessary, reduce the vegetation around the fence.

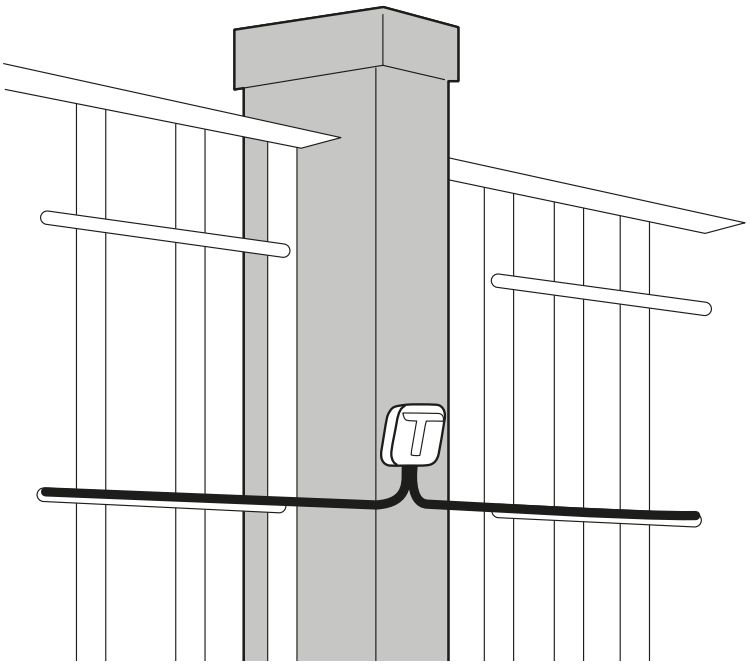
3.1.8 Example of installation on a thin mesh panel



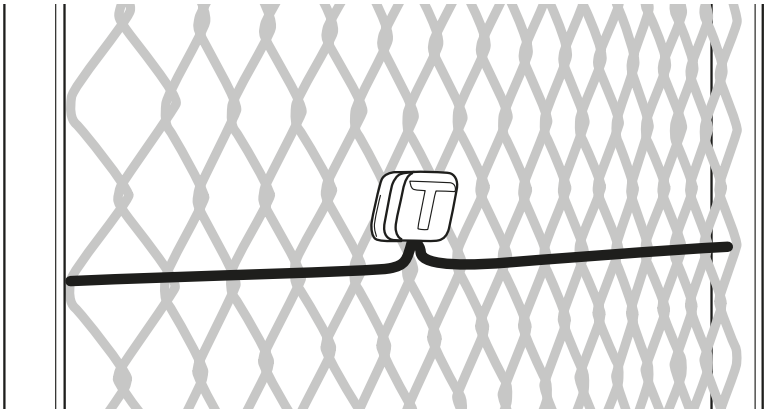
3.1.9 Example of installation on a thick mesh panel



3.1.10 Example of intallation on pole



3.1.11 Exemple of installation on mesh metal fence



3.2 Before installing the system

3.2.1 Material required

- Bus cable for the connection of the Ethernet board and the Master and for extending the intervals between sensors (product code MACS- CAB- 100 or MACS- CAB- 300).
- Termination kit, one for each sensor chain (product code: MACS- KIT- TERM or MACS- BOX- CON).
- Possible cable joining kit (product code: MACS- KIT- CON or MACS- BOX- CON).
- Possible self- drilling screws for installation of sensors on pole.
- Ethernet cable to connect the Ethernet board.
- Branch cable from the alarm control panel with conductors necessary to connect the Ethernet board.
- Only for MACS- ETH, for independent power supply from the alarm control panel, 12 VDC 3A power supply.

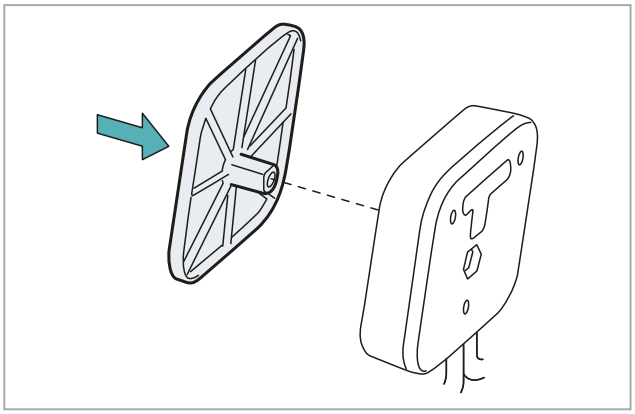
3.3 Install the sensors

3.3.1 Installation precautions

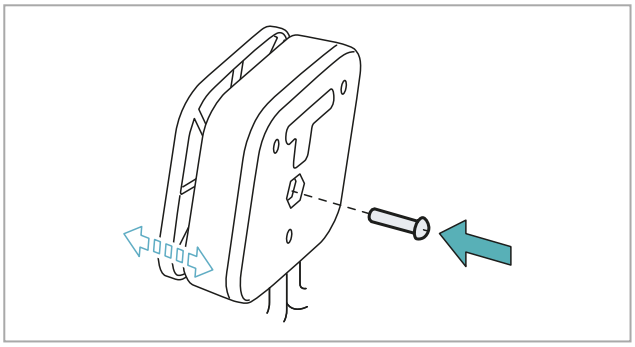
- Install the sensors with the cable outlet hole turned downwards.
- Perform the cable joints with special care. The system reliability depends on it. Refer to the instructions provided with the cable joining kit.

3.3.2 Prepare the sensor for thin mesh panels and for metal mesh fence

1. Mount the counter-plate on the sensor.

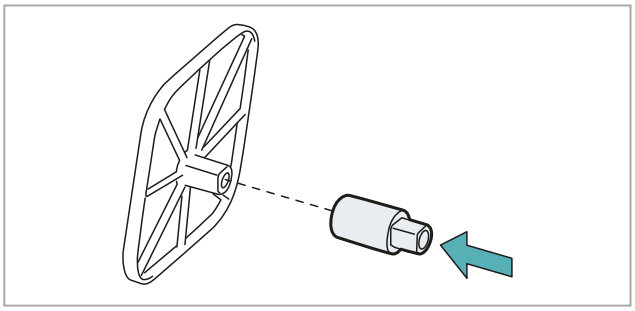


2. Fasten the counter-plate to the sensor by partially tightening the provided short screw.

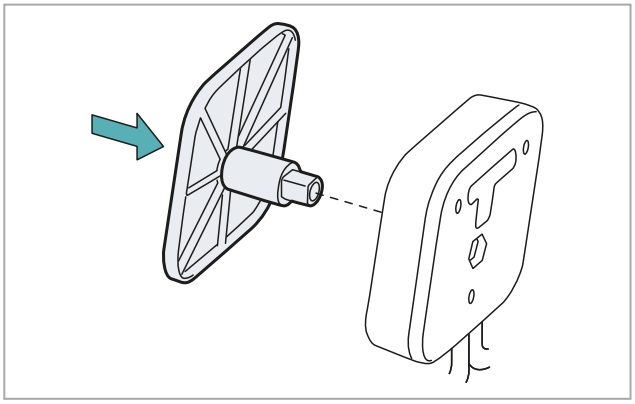


3.3.3 Prepare the sensor for thick mesh panels

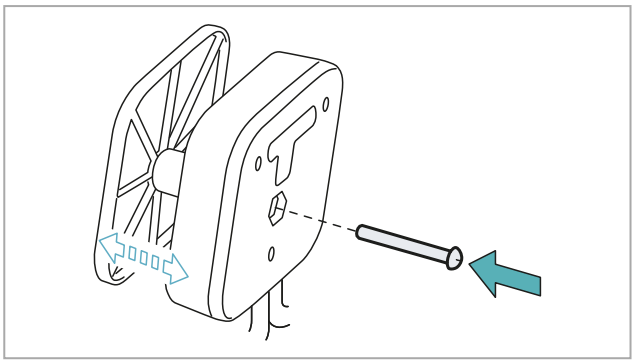
1. Mount the spacer on the counter-plate.



2. Mount the counter-plate on the sensor, inserting the spacer in the hole.



3. Fasten the counter-plate to the sensor by partially tightening the provided long screw.

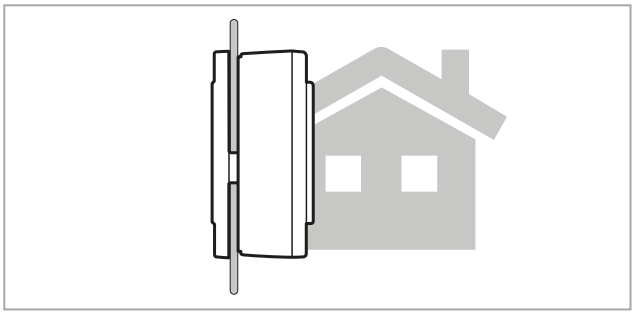


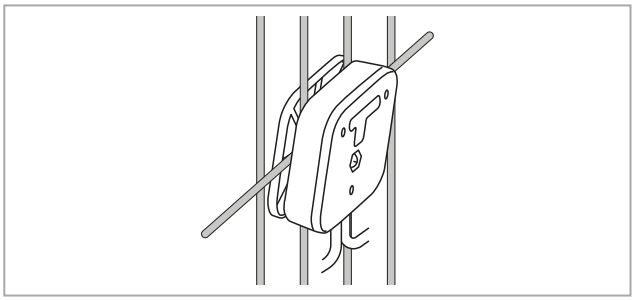
3.3.4 Install the sensors on thin mesh panels and on metal mesh fence

***Note**: as an example, the illustrations refer to a thin mesh panel.*

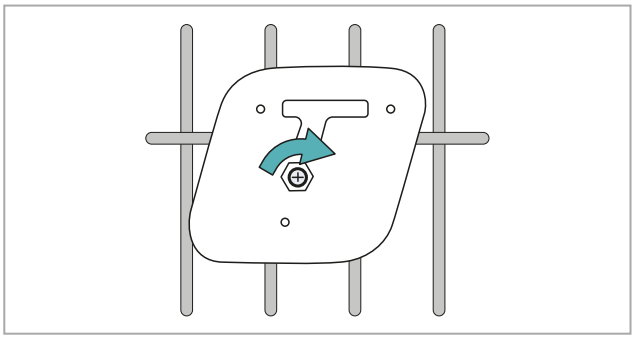
1. Position the sensor with the counter-plate outside of the fence.

Make sure that the gasket touches as much of the mesh as possible (e.g. on a cross-piece).

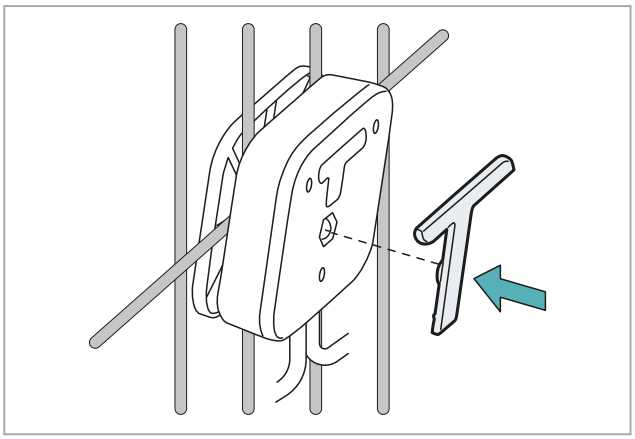




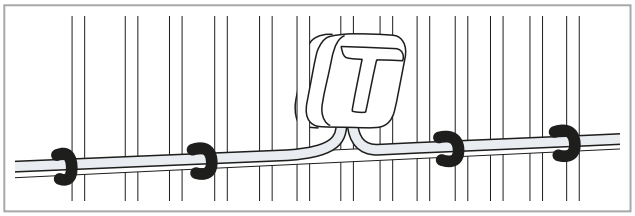
2. Tighten the screws and make sure that the sensor is firmly mounted.



3. Mount the T-cap.



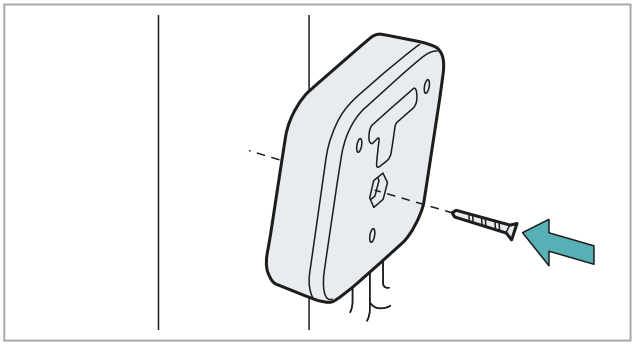
4. Properly fasten the cables with cable ties.



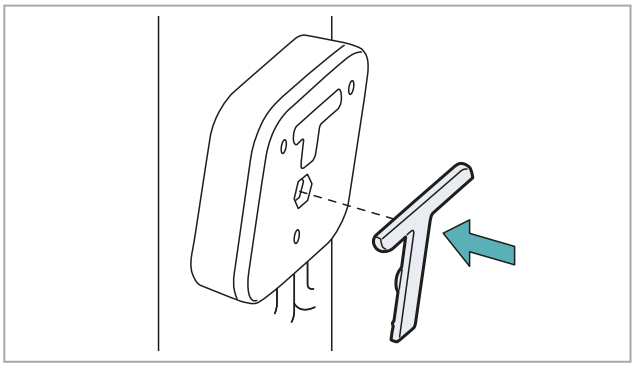
5. Proceed by mounting the other sensors of the chain and connecting more chains if necessary.
6. After the last sensor of the chain, install the termination kit. Refer to the instructions provided with the termination kit.

3.3.5 Install the sensors on the pole

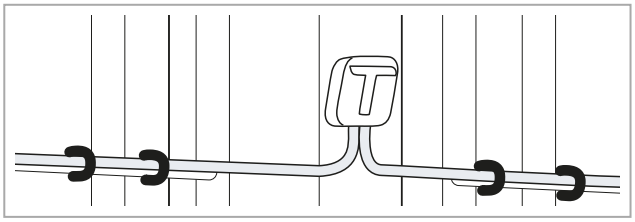
1. Establish the installation point and fasten the sensor with a self-drilling screw (not supplied), then make sure that the sensor is firmly mounted.



2. Mount the T-cap.



3. Properly fasten the cables with cable ties.



4. Proceed by mounting the other sensors of the chain and connecting more chains if necessary.
5. After the last sensor of the chain, install the termination kit. Refer to the instructions provided with the termination kit.

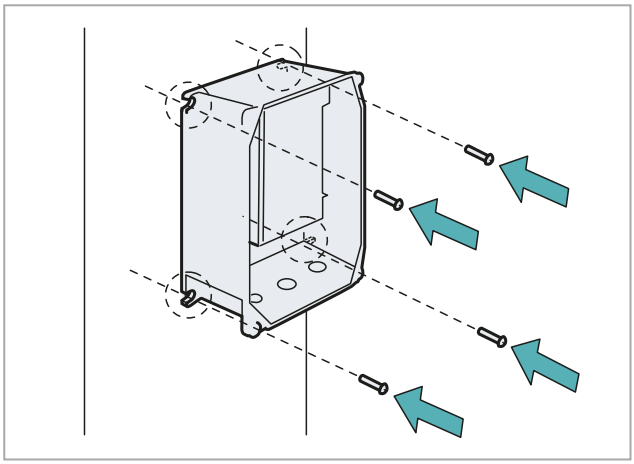
3.4 Install the Master

3.4.1 Warnings

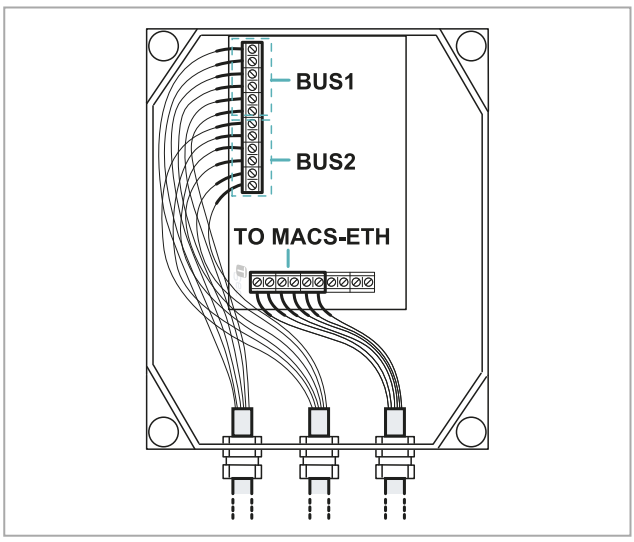
***NOTICE**: to guarantee the protection degree of the watertight case, do not drill the box during installation. Use the dedicated holes for fastening to the wall. Use cable glands mounted on the box to connect the bus cables to the Master.*

3.4.2 Install the Master

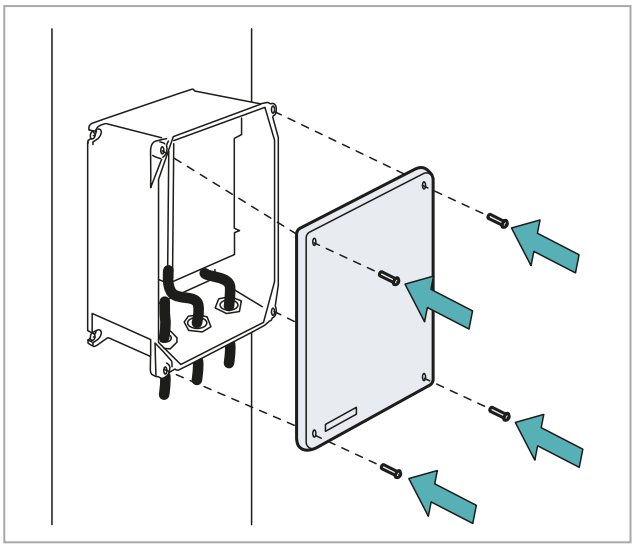
1. Fasten the watertight case to the wall using four screws (not provided).



2. Perform the electrical connections.



3. Position the cover and tighten the screws.



3.4.3 Description of terminal block for connecting sensor chains

Terminal	Description	Wire color
SH	Bus cables of sensor chains	Shield
C		Orange
B		Green
A		Yellow
-		Black
+		Red

3.4.4 Description of terminal block for connecting the Ethernet board

Terminal	Description	Wire color
SH	Bus cable towards the Ethernet board	Shield
C		Orange
B		Green
A		Yellow
-		Black
+		Red
IN	Not in use	-
OUT	Generic alarm output (not in use)	-

3.5 Install the Ethernet board

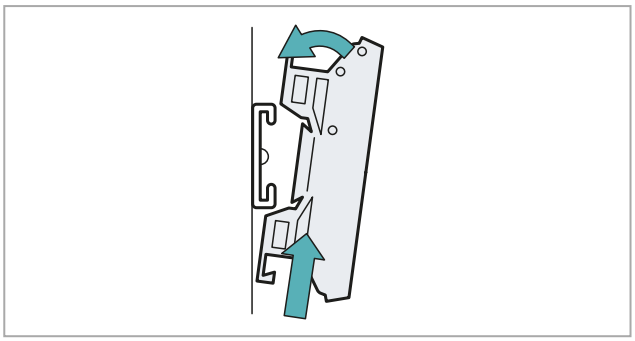
3.5.1 Warnings

***NOTICE**: only for MACS-ETH, install the Ethernet board in a dedicated box.*
***NOTICE**: install the box in a covered, protected area to prevent damage to the components.*

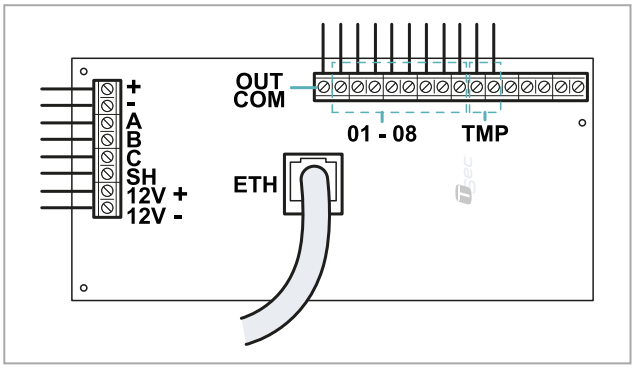
3.5.2 Install the Ethernet board

Note: the procedure refers to the installation of MACS-ETH. For the installation of MACS-ETH-PS, refer to the instructions provided with the product, then perform the electrical connections, described as follows.

1. Fasten the DIN rail and mount the support for the controller on the rail.



2. Perform the electrical connections.



3.5.3 Description of terminal block towards the alarm control panel

Terminal	Description
OUT COM	Common mode output
01–08	Alarm outputs for the eight zones
TMP	Tampering alarm output
IN COM, I1, I2, I3, I4	Not in use

3.5.4 Description of terminal block towards the Master and for power supply

Terminal	Description	Wire color
-	Bus cable towards the Master	Black
+		Red
A		Yellow
B		Green
C		Orange
SH		Shield
12 V +	System power supply	-
12 V -		-

4. System configuration

Contents

This section includes the following topics:

4.1 General concepts about sensors **26**
4.2 Initial operations **27**
4.3 Operate with the web interface **28**

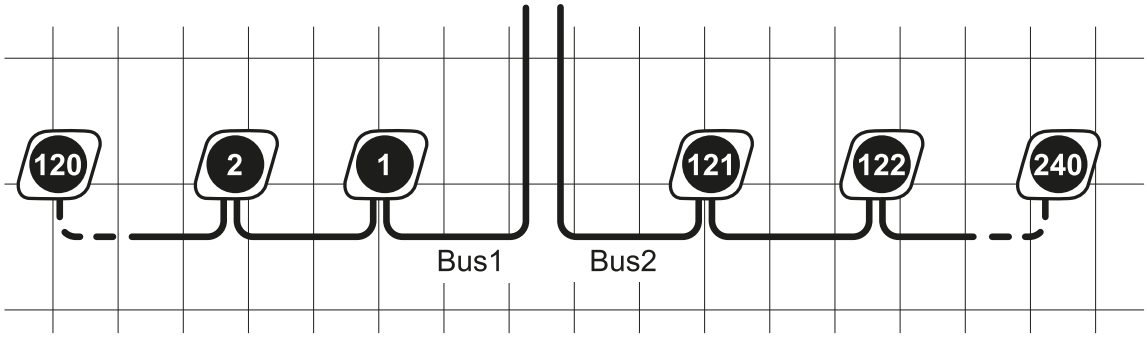
4.1 General concepts about sensors

4.1.1 Sesnors identification

The system numbers the sensors installed in the first chain (bus 1) in sequence from 1 to 120 and the sensors installed in the second chain (bus 2) from 121 to 240. For each chain, the numbering starts from the sensor closest to the Master.

The first sensor of bus 2 will always be numbered 121, even if bus 1 has less than 120 sensors or if bus 1 is absent.

It is not possible to modify sensor numbering.



4.1.2 Sensor configuration

Sensor configuration is defined by the following settings:

- Type of fence (rigid or semi- rigid): adapts the reaction of the system based on the rigidity of the fence.
- Climbing sensitivity level: increase or decrease the climbing detection threshold.
- Climbing delay: defines the number of times the threshold is exceeded before the system reacts to the alarm.
- Calibration and fence type (rigid or semi-rigid): adapts the reaction of the system according to the rigidity of the fence.
- (Only for mesh metal fence) Cut sensibility: increase or decrease the cut detection threshold.
- (Only for mesh metal fence) Cut delay: defines the number of cuts (the numbers of times the threshold is exceeded) before the system reacts to the cut (standard and sporadic).
- (Only for mesh metal fence) Cut reset: defines the counter time reset of standard cut.
- (Only for mesh metal fence) Sporadic cut reset: defines the counter time reset of sporadic cut.

The type of fence is defined automatically by the system through the calibration process.

4.1.3 Default configuration

The default configuration is assigned to all the sensors and defined as follows:

- Configuration type: rigid/semi-rigid
- Climbing sensibility level: 5
- Climbing delay: 5
- Type of fence: first calibration result

It is possible to define up to 32 configurations and assign one or more sensors to each configuration, based on the characteristics of the fence and the position of the sensors.

4.1.4 Sensor calibration

The calibration process requires triggering the fence in proximity to the sensor. The type of fence is determined and the sensors are calibrated based on the type of vibration detected.

4.1.5 Association to zones and alarm outputs

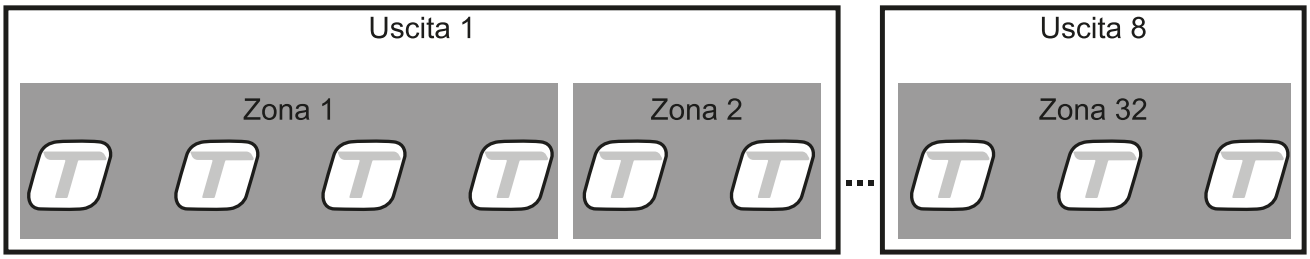
The sensors can be grouped into logical zones to facilitate monitoring (e.g. street front, rear parking, warehouse, north gate). The system manages up to 32 zones that must each be associated with one of the ei ght alarm outputs. When a sensor trips an alarm, the corresponding alarm output to that zone will also be in an alarm status.

If pre-alarm output is enabled, the output 8 can't be associated to any zone, but it will report the pre-alarm of every sensor independently of the associated zone.

There is no limit to the quantity of sensors associated with the zone or the quantity of zones associated with an alarm output.

When the system is turned on, it associates all the sensors with a single zone called " Default" and associates the zone with the alarm output 1 of the terminal block towards the alarm control panel.

An example of the links between sensors, zones and outputs is presented as follows:



4.2 Initial operations

4.2.1 Steps to prepare the sensors for use

After having installed the system the sensors must be prepared for use according to the following sequence:

1. Access the web interface (see "Access procedure" on page 13).
2. "Initialize the sensors" below.
3. "Create the zones" below.
4. "Associate the sensors with the zones" below.
5. "Create the configurations" below.
6. "Associate a configuration with the sensors" on the next page.
7. "Check the configuration of the sensors" on the next page.
8. "Perform system backup" on the next page.

4.2.2 Initialize the sensors

1. Follow the instructions to start sensor recognition and initialization: upon conclusion of the recognition phase, the quantity of sensors detected will appear on bus 1 and bus 2.
2. Follow the instructions to start sensor calibration: the type of fence is identified, all the sensors are associated with the **Default** zone and **Default** configuration.
3. To display the configured sensors, select **Output 1** > **Default** zone.

4.2.3 Create the zones

1. On the **Dashboard** page identify the output with which the zone will be associated.
2. Select the output and click **Add new zone**.
3. Insert the name of the new zone and click **Create**.

Assign a name that is understandable to all users accessing the system (e.g. rear parking, warehouse, north entrance).

4.2.4 Associate the sensors with the zones

1. On the **Dashboard** page select **Output** and **Default** zone.
2. Select the check boxes for the sensors to be associated with the zone: a light blue menu appears at the bottom of the page.
3. From the drop- down menu **Zone Name**, select the zone to be associated with the sensors: the sensors appear in the selected zone.

4.2.5 Create the configurations

1. On the **Dashboard** page select the output and zone where the sensor to be configured is located, then click the sensor identification: this opens the **Alarm settings** page.
   ***Note**: if the output and zone of the sensors are not known, they can be selected from the **Sensors** page > **Select from the list** or **Identify with magnet**.*
2. Set the sensitivity level and signal delay.
3. If necessary, click **New calibration** to identify the type of fence on which the selected sensor is installed.

4. From the menu bar at the bottom of the page, select the **Save a new configuration for this sensor only** option, then click **Apply and save**.
5. Insert the name of the configuration, then click **Rename**.

Assign a name that is understandable to all users accessing the system (e.g. shrubs, vehicle gate, wall).

4.2.6 Associate a configuration with the sensors

1. On the **Dashboard** page select the outputs and zones where the sensors that require new configuration are located.
   ***Note**: if the output and zone of the sensors are not known, they can be selected from the **Sensors** page > **Select from the list** or **Identify with magnet**.*
2. Select the check boxes of the sensors: a light blue menu appears at the bottom of the page.
3. From the drop-down menu **Configuration Name**, select the configuration to be associated with the sensors: the name of the configuration appears near the identification of each sensor.

4.2.7 Check the configuration of the sensors

To check that the configuration of the sensors is suitable for the fence characteristics, simulate climbing over the fence and other damaging actions in several points.

Furthermore, to make sure that no false alarms are tripped, simulate innocuous actions that can generate vibrations perceived as damaging (e.g. slamming a gate).

If necessary, change the sensitivity level, the delay or perform the calibration again.

4.2.8 Perform system backup

The sensors, zones, configurations and other system data can be saved in a file for restoration (e.g. after replacing the Ethernet board and/or Master circuit board).

On the **Settings**, **Settings**, **System** page, in **Backup** click **Create backup**: a .macs file is created with all the system data.

***IMPORTANT**: do not modify the file. If the file is modified, it cannot be used to restore the system.*

Perform a backup after all changes.

4.3 Operate with the web interface

4.3.1 Manage sensors and zones

***Note**: the possible actions may vary based on the permissions of the users.*

Action	Path
Monitor the sensor status	**Dashboard** > Output with which the sensor is associated > Zone with which the sensor is associated
Disable monitoring alarms in real time	**Dashboard** > disable the **Show real-time alarms** option ***Note**: the option is re-enabled automatically when the page is changed.*
Activate or deactivate a sensor	**Dashboard** > Output with which the sensor is associated > Zone with which the sensor is associated > Sensor > **ON/OFF**
Add a new zone	**Dashboard** > Output to associate with the zone > **Add new zone**
Associate a zone with a different output	**Dashboard** > Output with which the zone is associated > **Move to output**

Action	Path
Rename or eliminate a zone	**Dashboard** > Output with which the zone is associated > > **Rename**/**Delete** ***Note**: it is not possible to eliminate a zone if it contains sensors. If sensors are present, they must be moved before eliminating the zone.*
Change the zone with which the sensors are associated	**Dashboard** > Output with which the sensor is associated > Zone with which the sensor is associated. Then: 1. Select the sensor check boxes. 2. Open the **Zone Name** menu from the menu bar at the bottom of the page. 3. Select a new zone.
Associate a configuration with the sensors	**Dashboard** > Output with which the sensor is associated > Zone with which the sensor is associated. Then: 1. Select the sensor check boxes. 2. Open the **Configuration Name** menu from the menu bar at the bottom of the page. 3. Select the configuration.
Set to 0 the counter of standard and sporadic cut of the sensors	**Dashboard** > Output with which the sensor is associated > Zone with which the sensor is associated. Then: 1. Select the sensor check boxes . 2. Open the **Cut counters** menu from the menu bar at the bottom of the page. 3. Select **Reset**.
Search and identify a sensor	**Sensors** > **Select from the list** or **Identify with magnet**
Create a new configuration	**Sensors** > **Select from the list** > **Select** > **Continue** Or **Sensors** > **Identify with magnet** > **Continue** > **Slowly swipe the magnet on the upper part of the sens or** > **Continue** Or **Dashboard** > Output with which the sensor is associated > Zone with which the sensor is associated > Sensor Then: 1. If necessary, change the sensitivity level, delay or perform calibration. 2. Click **Save a new configuration for this sensor only** 3. Insert the name of the configuration in the **New configuration** text box. 4. Click **Rename**.
Display the configuration details	**Configurations**
Rename or eliminate configurations	**Configurations** > Configuration > ⋮ > **Rename**/**Delete**

4.3.2 Manage the system settings

***Note**: the possible actions may vary based on the permissions of the users.*

Action	Path
Display the firmware and hardware versions of components	**Settings** > **Settings** > **System** > **About**
Start sensor recognition keeping the previous configurations and zones (e.g. after substitution of a sensor or addition of new sensors)	**Settings** > **Settings**> **System** > **Sensor initialization** > **Initialize** > **Partial initialization** > **Start**
Restore the system to factory default settings	**Settings** > **Settings** > **System** > **Factory reset** > **Reset**
Perform system backup	**Settings** > **Settings** > **System** > **Backup** (see "Perform system backup" on the previous page)
Restore the system to the backup version	**Settings**, **Settings** > **System** > **Restore** ***IMPORTANT**: restore requires the backup .macs file. See "Perform system backup" on the previous page. Restore includes the users, but the passwords are set as the user names.*
Set to 0 the counter of standard and sporadic cut of all sensors	**Settings > Settings > System > Reset cut algorithm**
Manage network settings	**Settings** > **Settings** > **Network**
Set the date and time of the system	**Settings** > **Settings** > **Date & Time**
Update components firmware	**Settings** > **Settings** > **Firmware update** (see "Firmware updating sequence")
Manage your account	**Settings** > **Account**
Create a user	**Settings** > **Users** > **Create new user** ***Note**: only the administrator user ("admin", "admin") has permissions for creating users.*
Manage user profiles in the system	**Settings** > **Users** > User profile to be managed > ⋮ > **permissions/Reset/Delete** ***Note**: only the administrator user ("admin", "admin") has permissions for managing users.* ***Note**: to guarantee system security and better control the use of the web interface, it is recommended to assign users with permissions according to their roles.*
Consult alarms log	**Settings**> **Alarm log** > **Download system log** Or **Settings**> **Alarm log** > **Download sensor log**
Delete alarms log	**Settings** > **Alarm log** > **Delete log**
Enable or disable the tamper signal of MACS-MAS	**Settings** > **Tamper MAS** > **ON/OFF**
Enable or disable the pre alarm output	**Settings** > **Pre alarm output** > **ON/OFF**

5. Diagnostics and maintenance

Contents

This section includes the following topics:

5.1 Diagnostics and troubleshooting **32**
5.2 Firmware and web interface updates **33**
5.3 Maintenance and cleaning **33**

5.1 Diagnostics and troubleshooting

5.1.1 LED of the Master

LED	Status	Cause	Remedy
LD2	Off	Bus cable between Ethernet bo ard and Master not connected or damaged.	Check that the bus cable is correctly connected and intact.
		Ethernet board not powered up.	Check that the power supply cable of the Ethernet board is intact and connected to the terminal block. Check the status of the power supply unit.
LD9 o LD11	Off	Bus cables of sensor chains not correctly connected to the Master or damaged.	Check that the bus cables are correctly connected and intact.
LD15	Off or steady	Master firmware not working.	Contact customer assistance.

5.1.2 LED of the Ethernet board

LED	Status	Cause	Remedy
LD11	Off	Power supply voltage of the Ethernet board is insufficient.	Check that the power supply cable of the Ethernet board is intact and connected to the terminal block. Check the status of the power supply unit.
LD16	Off or steady	Master firmware not working.	Contact customer assistance.

5.1.3 Tampering signal

To know the origin of the tampering signal, access the web interface (see "Access procedure" on page 13) and open the **Dashboard** page.

If it is not possible to access the web interface, see "Troubleshooting" below.

5.1.4 Troubleshooting

Problem	Cause	Remedy
Impossible to access the web interface.	Connection to Ethernet board absent.	Check the status of the Ethernet cable. Check the status of the network.
	Data lost due to access to the Ethernet board (administrator user credentials incorrect or lost).	Reset the system, see "Reset the system" below.
	SD memory card of the Ethernet board damaged.	Contact customer assistance.
Browser security warning (e.g. "Connection is not private" or "Problem with the security certificate")	Invalid security certificate.	Add the address to the list of secure addresses in the browser settings. The security certificate is saved on the computer where the access occurred and is valid for all MACS systems.
Sensor log unavailable.	SD memory card of the Ethernet board damaged.	Contact customer assistance.

5.1.5 Reset the system

The network settings and user profiles can be reset to factory default values.

1. To reset the network settings, disconnect and reconnect the Ethernet board to the power supply.
2. Upon restart, hold down the reset button on the Ethernet board for a few seconds: the LED **LD10** flashes slowly.

3. Keep the reset button pressed for 5 seconds: the LED **LD10** flashes rapidly and the network settings are reset to factory default values.
4. To restore user profiles to factory default values, continue to hold down the reset button for another 5 seconds: the LED **LD10** flashes faster.

At the end of reset, the Ethernet board restarts with the new settings.

5.2 Firmware and web interface updates

5.2.1 Firmware uptade

The manufacturer communicates the release of updates and provides the files to be installed.

5.2.2 Firmware updating sequence

If updates for several components must be installed, update in the following order:

1. Sensors
2. Master
3. Ethernet board

5.2.3 Install firmware updates

From the web interface: **Settings** > **Settings** > **Firmware update**

***Note**: firmware update can take up to 10 minutes. Upon conclusion of updating the components are restarted.*

5.2.4 Updates to the web interface

The manufacturer communicates the release of updates for the web interface and provides the files and instructions for installation.

5.3 Maintenance and cleaning

5.3.1 Maintenance on components

Components	Action
Sensors	Periodically, check that close to the fence vegetation don't cause false alarms. Only for mesh metal fence, check that the fence is well-stretched
Master	Check the tightness of the screws and the status of the cable glands on the watertight case periodically.
Ethernet board	Check status periodically.

5.3.2 Cleaning

The system components do not require periodical cleaning to function correctly. To clean the sensors and cables (for aesthetic reasons), do not use abrasives or solvents.

6. Appendix

Contents

This section includes the following topics:

6.1 Technical data **35**
6.2 Disposal **37**
6.3 Service and warranty **37**

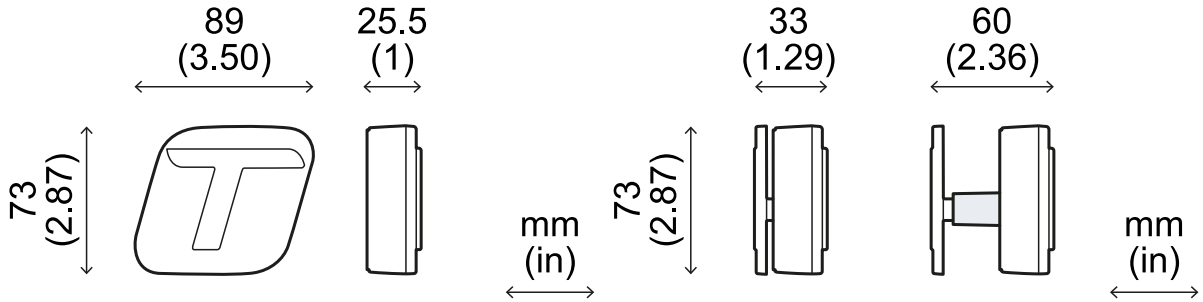
6.1 Technical data

6.1.1 General specifications

Maximum absorption	3 A (with 240 sensors)
Communication protocol	Between sensors, Master and Ethernet board: proprietary bus
Connections	Cable: MACS- CAB, maximum length: • Ethernet board- Master: 1000 m (3280.84 ft) • Master- last sensor on the chain: 800 m (2624.67 ft)
Conformity	CE
Directives	2011/65/EU (RoHS - Hazardous substances in electrical and electronic equipment) 2014/30/EU (EMC - Electromagnetic compatibility)
Standards	EN 61000- 6- 3:2007/A1:2011 EN 50130- 4:2011 (EMC - Alarm systems)

Sensors

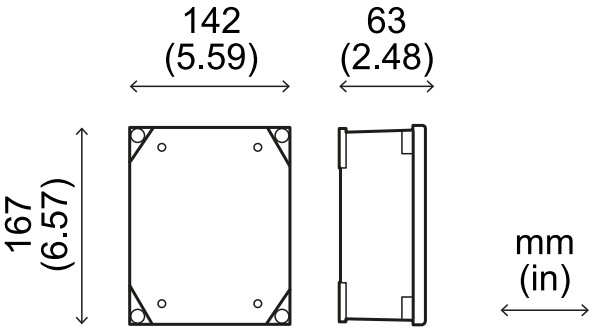
Detection method	MEMS (Micro Electro- Mechanical Systems) triaxial accelerometer with proprietary algorithm
Power supply	From the Ethernet board through proprietary bus cable
Dimensions	• Without counter- plate: 89 × 73 × 25.5 mm (3.50 × 2.87 × 1 in) • With counter- plate, without spacer: 89 × 73 × 33 mm (3.50 × 2.87 × 1.29 in) • With spacer and counter- plate: 89 × 73 × 60 mm (3.50 × 2.87 × 2.36 in)
Interval between sensors	6 m (19.68 ft)
Material	Technopolymer in fiber glass Seal in epoxy resin
Assembly	On panel or on pole
Operating temperature	From - 40 to +70 °C (from - 104 to +158 °F)
Operating relative humidity	0- 100%
Storage temperature	From - 40 to +70 °C (from - 104 to +158 °F)
Degree of protection	IP68



Master

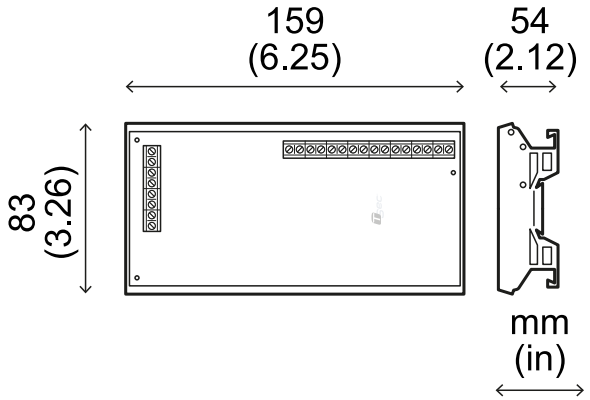
Connections	• 2 communication buses towards sensors • 1 communication bus towards the Ethernet board
Inputs/outputs	• 1 digital input (not in use) • 1 output: tampering alarm
Normal output status	NC
Power supply	From the Ethernet board through proprietary bus cable
Dimensions	142 × 167 × 63 mm (5.59 × 6.57 × 2.48 in)

Material	• Watertight box: aluminium alloy • Cable gland: nickel-plated brass
Assembly	On wall
Operating temperature	From -40 to +70 °C (from -104 to +158 °F)
Storage temperature	From -40 to +70 °C (from -104 to +158 °F)
Degree of protection	IP67



6.1.4 Ethernet board

Outputs number	• 8 alarm outputs • 1 tamper
Normal outputs state	NC
Outputs type	Max 60 V, 400 mA. Contact resistance < 2 ohm
Digital inputs number	4 (not in use)
Ethernet port	Connector: RJ45 (10 Base-T, 100 Base TX), maximum distance 100 m
Digital memory	10000 events
Power supply	12 V dc - 3 A
Dimensions	159 × 83 × 54 mm (6.25 × 3.26 × 2.12 in)
Assembly	On panel/wall with DIN rail
Operating temperature	From -25 to +70 °C (from -13 to +158 °F)
Storage temperature	From -25 to +70 °C (from -13 to +158 °F)
Degree of protection	MACS-ETH: IP00 MACS-ETH-PS: IP30



6.1.5 Bus cable

External sheath material	PVC
External diameter	Max 8.5 mm (0.33 in)
Marking	CEI-UNEL 36762 C-4 (U_0=400 V)

6.2 Disposal

As specified by the European Directive 2012/19/EU, never dispose of the product as standard urban waste.

The owner is responsible for disposing both these products and any other electronic or electrical equipment via the specific waste collection centers as specified by the government or local public authorities.

Correct disposal and recycling will contribute to the prevention of potentially harmful consequences for the environment and personal health.

To receive more detailed information about disposal, contact public authorities, waste management services or the representative from whom you purchased the product.

6.3 Service and warranty

6.3.1 Customer service

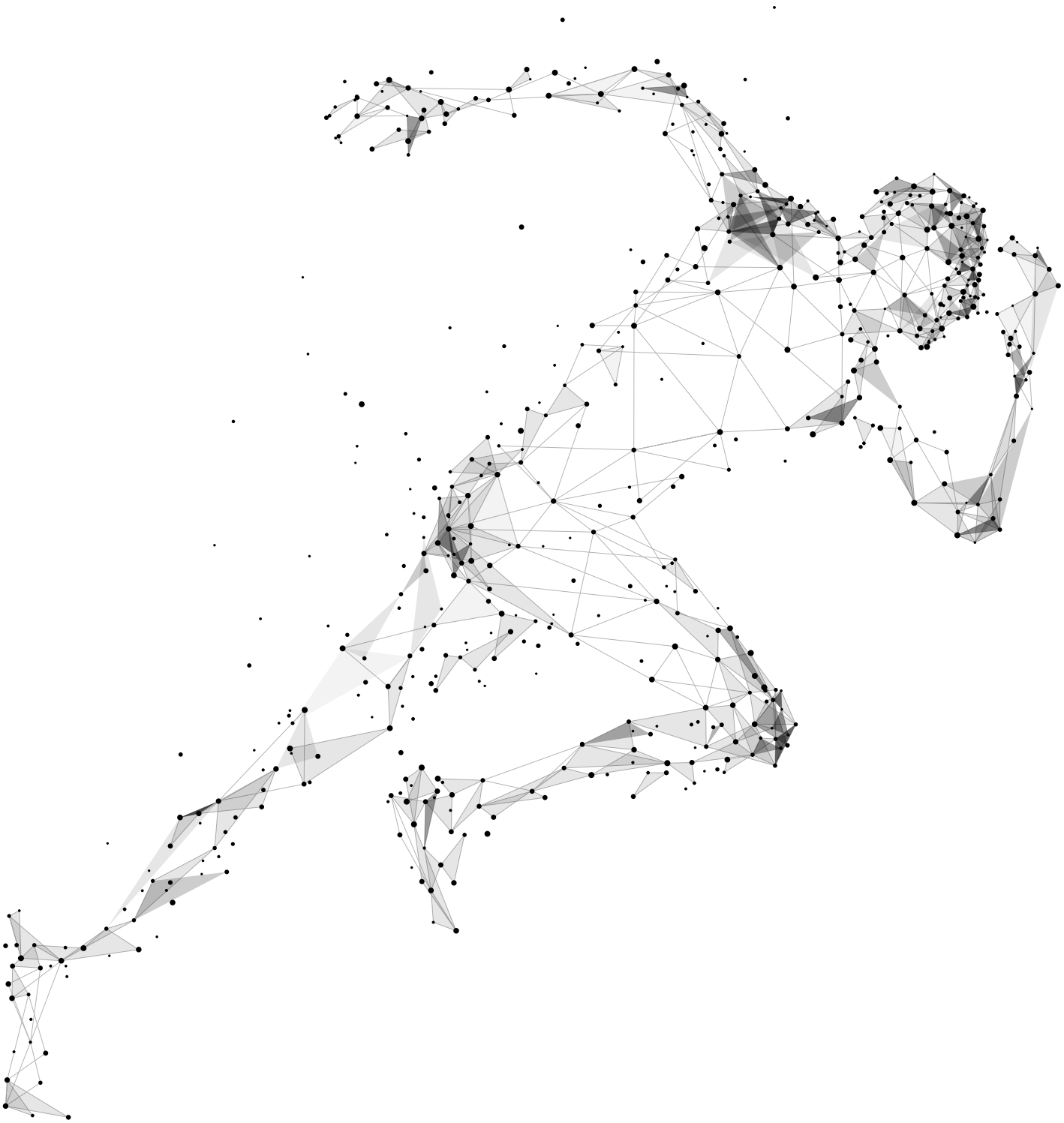
TSec Srl
Via Luigi Becchetti, 74
25081 Bedizzole (BS) - Italia
Tel: +39 030 57 85 302
Fax: +39 030 57 85 303
e-mail: supporto@tsec.it
site: www.tsec.it

6.3.2 How to return the product

If necessary, **pay to ship the product in its original packaging** to the area distributor or directly to the manufacturer.

Area distributor	Manufacturer
Note distributor information here:	TSec Srl Via Luigi Becchetti, 74 25081 Bedizzole (BS) Italy Tel: +39 030 57 85 302 Fax: +39 030 57 85 303 e-mail: info@tsec.it

TSec Srl

Via Luigi Becchetti, 74
25081 Bedizzole (BS)
Italy

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