

Industrial Metal Detectors THS/21

Instruction manual for installation, use and maintenance

Document	Date	Hardware	Software
FI 027 GB 2K8v3	2008-12-01	HV5.x	THSV532x – ALMV526x



Read this manual carefully before installing, operating or carrying out maintenance on the device. Keep the manual in a safe place for future reference, and in perfect condition. This manual must accompany the device described therein in the case of change of ownership, and until the device is broken up.

SYMBOLS



The equipment is marked with this symbol wherever the user should refer to this manual in order to avoid possible damage. The same symbol appears in the manual at points where warnings or particularly important instructions, essential for safe, correct operation of the device, are given.



The equipment is marked with this symbol in the areas where there is dangerous voltage. Only trained maintenance personnel should carry out work in these areas. The same symbol appears in the manual at points where warnings essential for safe, are given.



The equipment is marked with this symbol in the areas where the user must be careful to avoid crushing of hands. Only trained maintenance personnel should carry out work in these areas. The same symbol appears in the manual at points where warnings essential for safe, are given.



The equipment is marked with this symbol in the areas where the user must be careful to avoid coming into contact with bodies in motion. Only trained maintenance personnel should carry out work in these areas. The same symbol appears in the manual at points where warnings essential for safe, are given.



The equipment is marked with this symbol wherever the user shall not have access to potentially dangerous areas.



The equipment is marked with this symbol in the areas where the user must be careful to avoid crushing of feet. Only trained maintenance personnel should carry out work in these areas. The same symbol appears in the manual at points where warnings essential for safe, are given.



LASER LIGHT: This symbol appears in the present booklet at those points where warnings or information relating to devices with laser pointing are given. **Such devices may be dangerous. It is therefore essential that the guidelines reported in this booklet be followed.**



This symbol appears in the manual at points where suggestions, additional information or other relevant notes are given.

REVISION TABLE

Rev.	Date	Author	Reference	Description
1	2007-02-28	TP2 – Pasquini	-	First emission
2	2008-07-30	TP2 – Pasquini	-	Electrical schemes and minor changes
2.01	2008-12-01	TP2 – Pasquini	-	Addition of THS/G21 installation notes and minor changes
3	2008-12-19	TP2 – Pasquini	-	Software upgrade to THSV532x and ALMV526x – Warnings updated

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Warranty terms

The warranty on all CEIA products, extended to the period agreed with the Sales Department, is applicable to goods supplied from our factory, and for every constituent part thereof, with the exception of the batteries. Any form of tampering with the device, and in particular opening its container, is strictly forbidden and will invalidate the warranty.

Customer Satisfaction Report

Your suggestions and comments on the products and services offered by CEIA and its distribution network are extremely important for improving our procedures.

We would ask you to send them to us by compiling and returning the form available at:

<http://www.ceia.net/industrial/satisfaction>

Thank you for your kind interest and co-operation.



Read this manual carefully before installing or operating the device and before carrying out maintenance operations.

1 – SAFETY INSTRUCTIONS – WARNINGS

1.1 - Warnings

1.1.1 – General warnings

- All personnel operating with or performing operations on the device must have an adequate preparation and shall know the procedures described in this manual.
- Observe current regulations regarding electrical and personal safety for both the operator and the installer when installing the device.
- Any modification to the configuration setup by CEIA is forbidden and void all warranties and certifications.
- Follow the instructions contained in this manual for all operations relating to installation, use and maintenance of the device.
CEIA cannot be held responsible for any damage resulting from procedures which are not expressly indicated in this manual, or from any lack of attention, either partial or total, of the procedures described therein.
- This manual must accompany the device described therein in the case of change of ownership, and until the device is broken up.

1.1.2 – Installation warnings



Observe current regulations regarding electrical and personal safety for both the operator and the installer when installing the device.

- Make all electrical connections following the procedures described in the **Installation** section of this manual.
- Position the device as far as possible from sources of electromagnetic interference, such as transformers or motors.
- This device contains electrical and electronic components, and may therefore be susceptible to fire. Do not install in explosive atmosphere or in contact with inflammable material, Do not use water or foam in the case of fire when the device is powered up
- The device must be connected to a power supply circuit fitted with a switch or other device which allows the power to be cut off.
- If the device is to be powered via an external autotransformer to regulate the voltage, ensure that the common terminal of the autotransformer is connected to the neutral of the power-supply circuit.
- Only make the connections to the internal terminals of the power supply unit when the unit is disconnected from the mains
- Before connecting the device to the power supply, ensure that the power supply voltage corresponds to that indicated on the plate affixed to the device. Verification that the power supply conforms to the values specified plate and to the regulations in force is the total responsibility of the customer.
- The power supply plug must only be inserted into a socket fitted with an earth/ground connection.
Any break in the safety conductor, either inside or outside the device, or disconnection of the earth/ground safety terminal, will render the device dangerous. Intentional cutting or disconnection is strictly forbidden.
- The device should be connected to the mains voltage only after all connections required for full installation have been carried out.
- After installation the device should be stable, and not subject to vibration or accidental movement. All connecting cables should be properly fastened down, in order to avoid knocks and accidental damage and to obtain optimum performance.
- Once the electrical connections have been completed, close the unused cable grips to stop water or other foreign bodies entering power supply unit.

SAFETY INSTRUCTIONS - WARNINGS

- There are dangerous voltages inside the power supply unit. Close the cover and keep the key safe so that it is only available for use by trained personnel (Regulation EN 60204).
- The installation shall be carried out avoiding, at all times, that the product could come in contact with, or impact onto the detector aperture or the internal surface.

1.1.3 – Use warnings

- If the device is stored for a long period in temperatures outside the operating range, wait for the temperature of the detector to come back within that range before switching on
- Do not supply the device when the Power Supply Box is open.
- To avoid damage due to lightning, disconnect the power-supply cable during storms.
- Do not place body parts, clothing or objects close to the device.
- During use do not insert body parts or objects inside the material transit tunnel.
- Before performing any operation on the device, disconnect both the power supply and the compressed air system.
- With the system operative, only the controls of the machine itself (control panels, emergency buttons) are allowed to be used.
- Whenever there is any suggestion that the level of protection has been reduced, the device should be taken out of service and secured against any possibility of unintentional use, and authorised service technicians should be called. The level of protection is considered to have been reduced when:
 - *the device shows visible signs of wear and tear, especially on parts that ensures the device protections (boxes, gaskets, glands, fixing screws, etc.);*
 - *the Power Supply Box is not correctly closed;*
 - *the ground connections are not compliant;*
 - *the device has suffered mechanical or electrical stress (shocks, bumps, etc.);*
 - *the device does not operate correctly, respect on how described in this manual;*
 - *the device has been stored for long periods in sub-optimal conditions;*
 - *the device has suffered severe stress during transport;*
 - *the device has come into contact with corrosive substances.*

1.1.4 – Maintenance warnings

- During all maintenance operations ensure the complete absence of any potentially explosive atmosphere.
- Perform all maintenance operations following the procedures described in the **Maintenance** section of this manual.
- The device must be disconnected from all power sources before undergoing any maintenance or cleaning, and before being moved.
- Ensure that replacement fuses are of the correct rating and of the prescribed type. Makeshift fuses and short-circuiting of the fuse boards are strictly forbidden.
- Do not wash the device with liquid detergents or chemical substances. Any cleaning should be done using a slightly-damp, non-abrasive cloth.
- Read the chapter on “Maintenance” carefully before calling the service centre. Whatever the problem, only specialised service personnel authorised to work with CEIA equipment should be called.
- Any damaged parts of the device should be replaced with original components only.
- Any maintenance or repair of the device while open and energised should be avoided, and in any case should only be carried out by trained personnel who are fully aware of the risks which the operation entails, following the instructions given in the **Maintenance** section.
- Disposal of parts with environmental impact: follow the regulations in force in the country where the device is being used (refer to the **Maintenance** section).

1.2 – Correct and Forbidden use of the device

1.2.1 – Correct use of the device

- The **THS/21** Metal Detectors are electronic devices for the detection of metal masses (magnetic and non-magnetic metals) transiting inside the detection antenna.
- Handle the device with care and without excessive force during installation, use and maintenance
- The device is fitted with mechanical and electronic protections, described in this manual. Removing or reducing these protections is forbidden.
- The final user is responsible for selecting the appropriate sensitivity for their application. After this selection has been made, and programming has been adjusted accordingly, it is also the final user's responsibility to verify calibration using the test object(s) appropriate to the level of security selected. Additionally, this test should be carried out periodically to ensure no changes have occurred in the equipment.

1.2.2 – Forbidden use of the device

- The THS/21 Metal Detectors are not suitable to be installed or used in environments where could be present, even accidentally, an explosive atmosphere.
- Any maintenance or repair of the device while open and energised should be avoided, and in any case should only be carried out by trained personnel who are fully aware of the risks which the operation entails.
- Electric arc welding shall not be carried out on the detector antenna, on the Control Power Box or on any part of the attached structure.

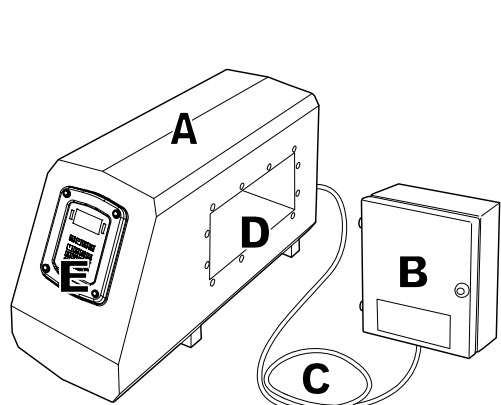
1.3 – Residual risks

- Before any movement of the detector, take care about the facts that it could be heavy to be handled by only one person. Establish and implement adequate procedures to perform this operation. CEIA cannot be held responsible for any damage resulting from incorrect procedures for the container clearing.
- In systems with conveyor belt, make sure that nothing, screwdrivers, tools or anything else, has been left on the belt, after a maintenance, to avoid that they can be launched away restarting the motor.

2 - DESCRIPTION

2.1 – General description

The **THS/21** is an extremely compact metal detector with very high sensitivity, controlled by a microprocessor and designed for industrial use. The device is made up of:

	A The Metal Detector probe, complete with electronic control unit.
	B The Power Supply Box , for connecting the device to mains power and to the external supports (photocell, ejector, etc.)
	C Connecting cable
	D Tunnel
	E Control panel

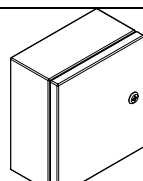
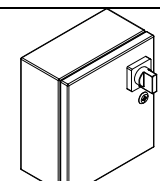
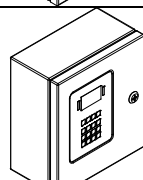
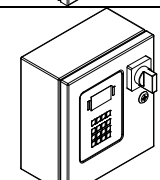
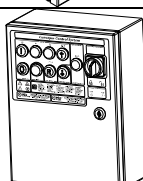
The metal detector is enclosed in an extremely robust metal casing, in a tunnel shape which is designed to be mounted on the conveyor belt or other feed system.

The unit contains the sensitive antenna and the control panel.

A cable leads from the unit (on the side of the control panel) to connect up with the power supply unit.

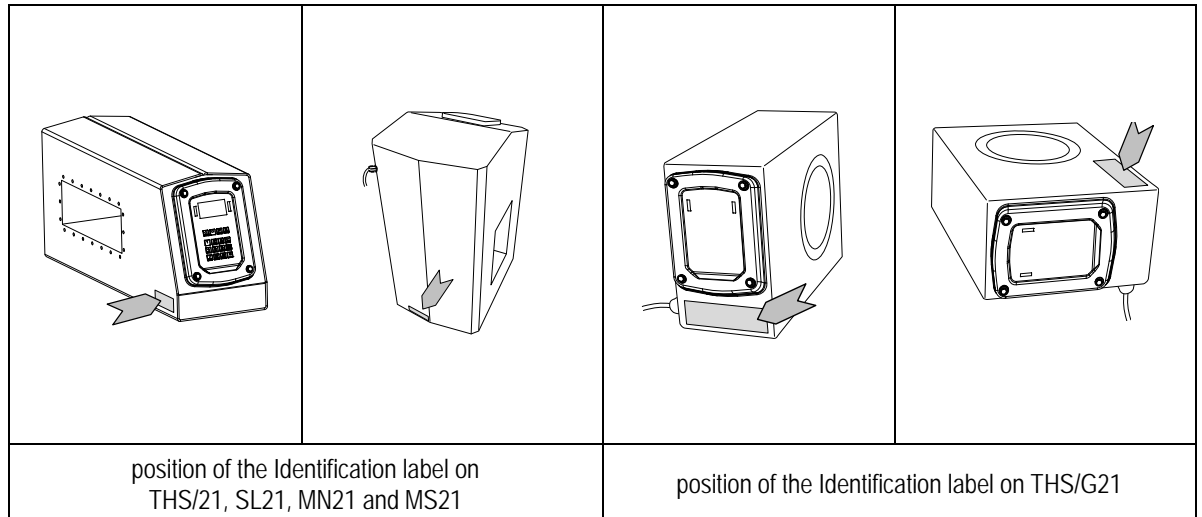
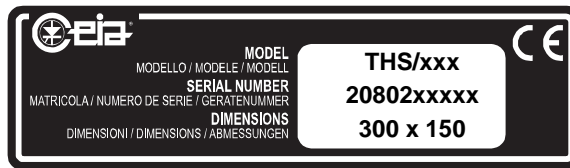
The Power Supply Box is housed in a watertight box in stainless steel which is designed to be attached by means of four screws and through which pass the connecting cables.

The power supply unit is available in five different versions:

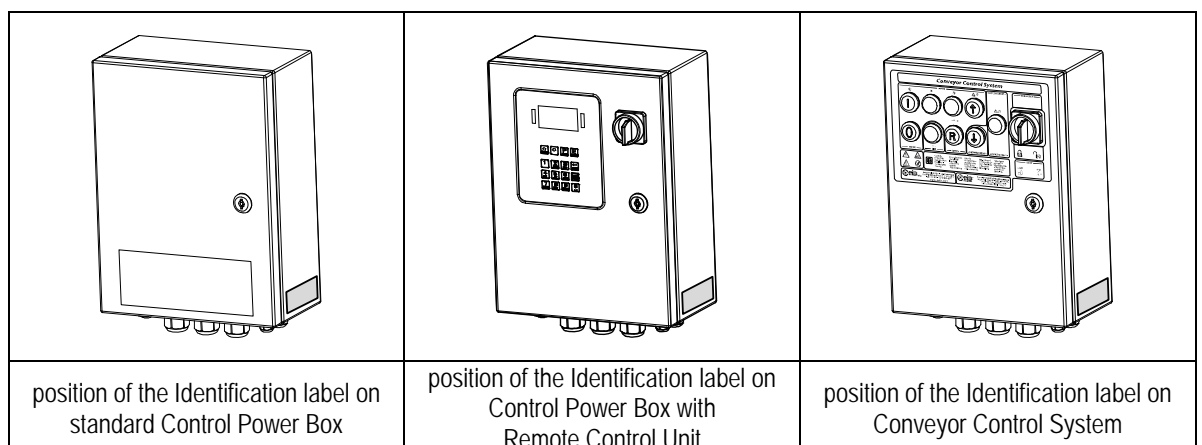
	Control Power Box , containing the metal detector power supply section and designed to allow connection of external sensors and slave devices	Control Power Box , version with main switch	
	Control Power Box , version with Remote Control Unit	Control Power Box , version with Remote Control Unit and main switch	
	Conveyor Control System , with the same functions as the Control Power Box, but with the addition of a conveyor belt motor driver/control section		

2.1.1 – Device identification

Antenna



Power Supply Box

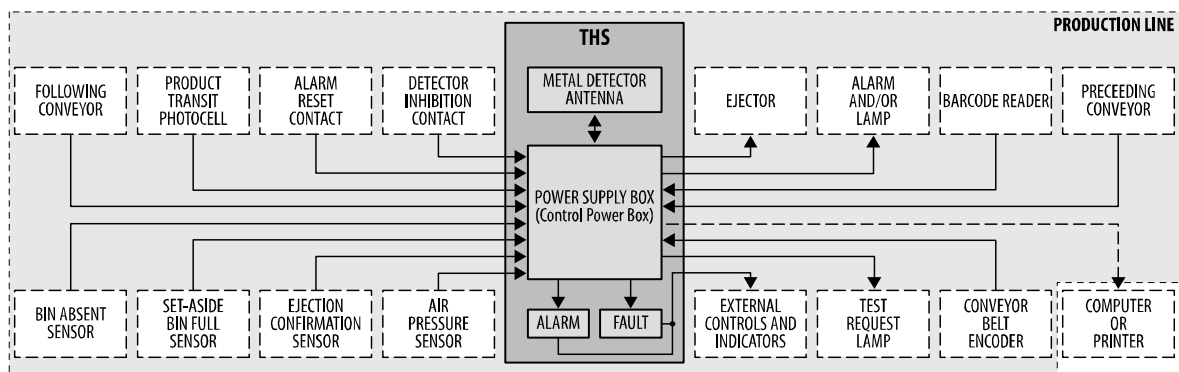


2.2 – Control Power Box

The module contains only the electronics needed for supplying power to the probe and the connection terminals for external sensors and slave devices. The card inside (card **ALM**), allows connections to be made to the following:

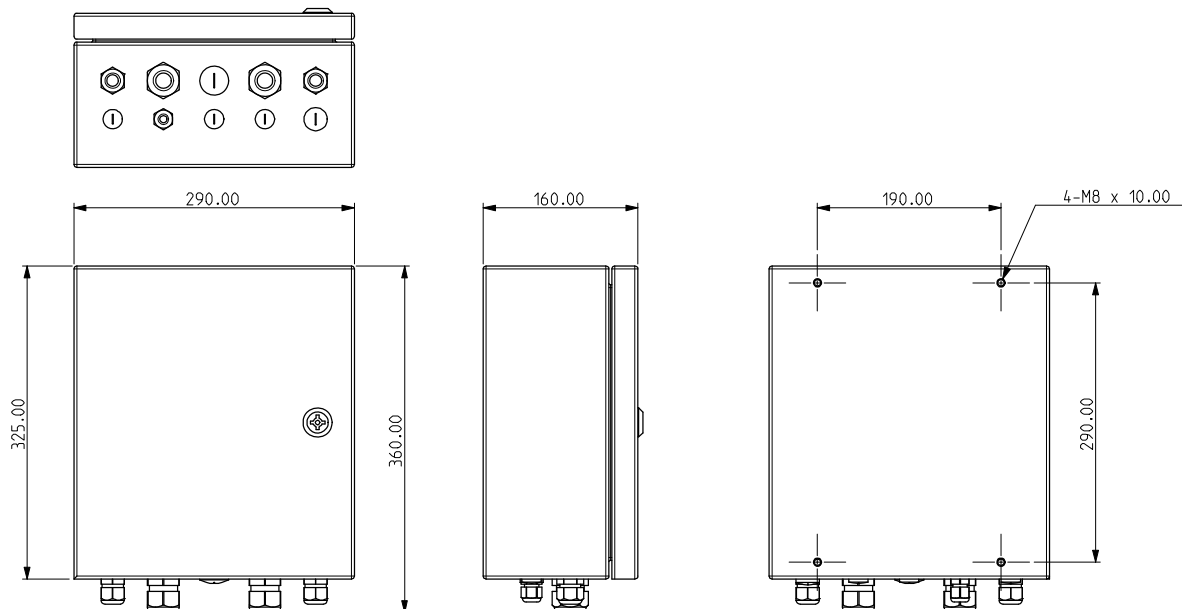
- metal detector probe
- mains power supply
- product transit photocell
- external activators and sensors
- personal computer

2.2.1 – Functional Diagram

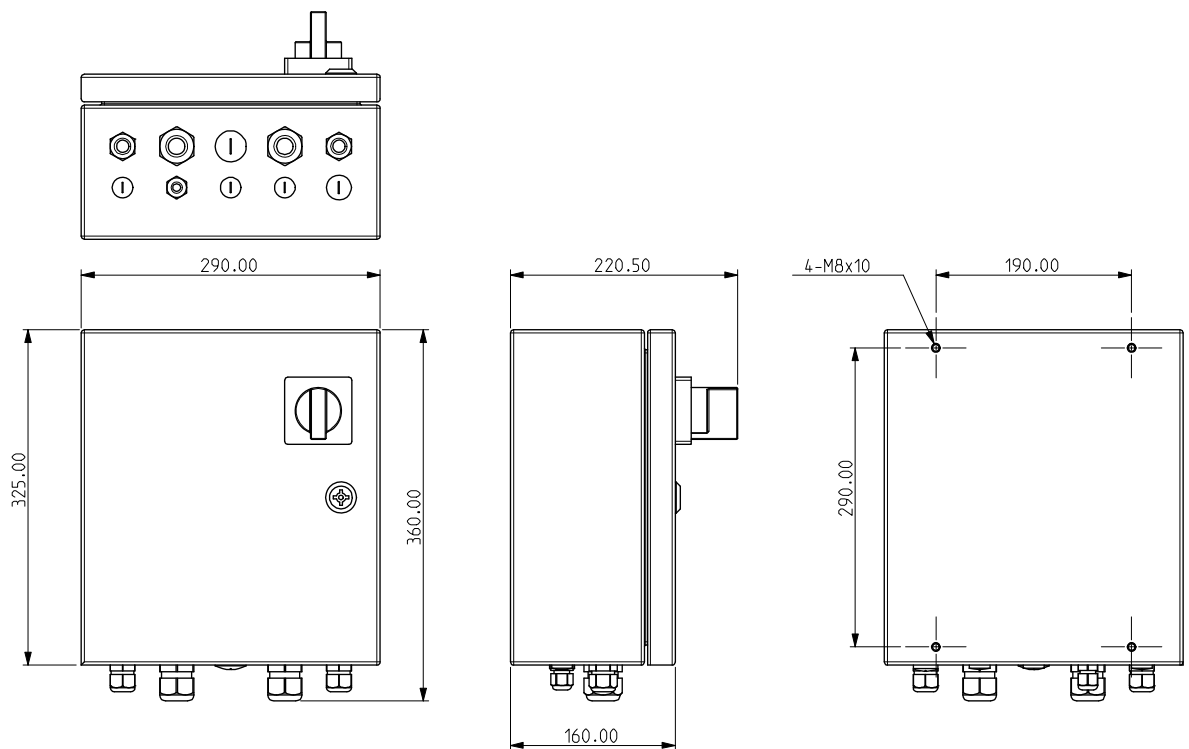


2.2.2 – External dimensions

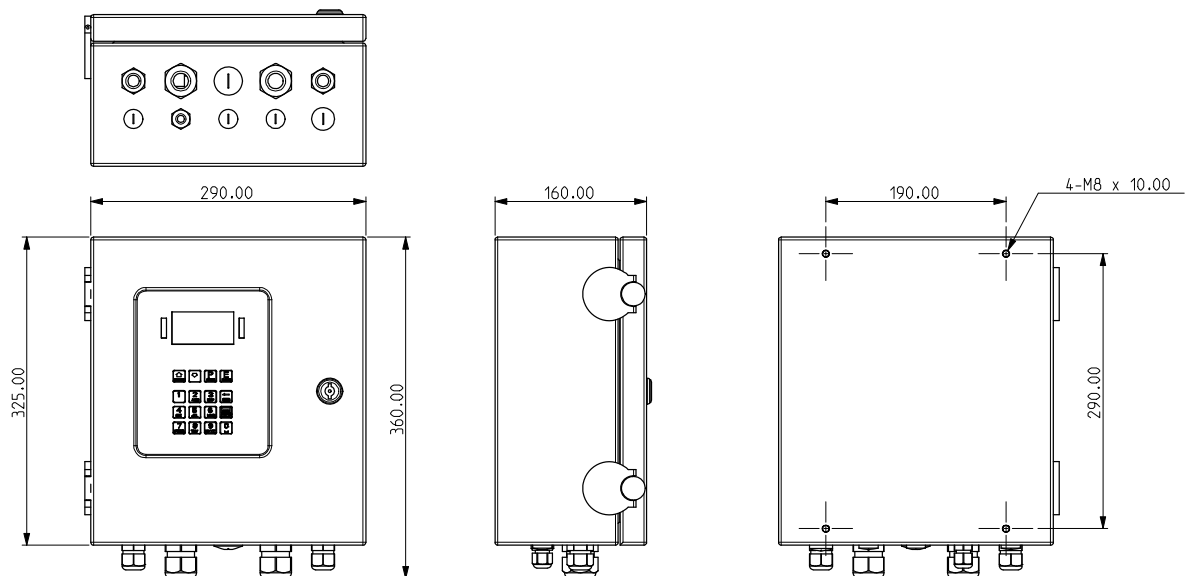
Version without main switch



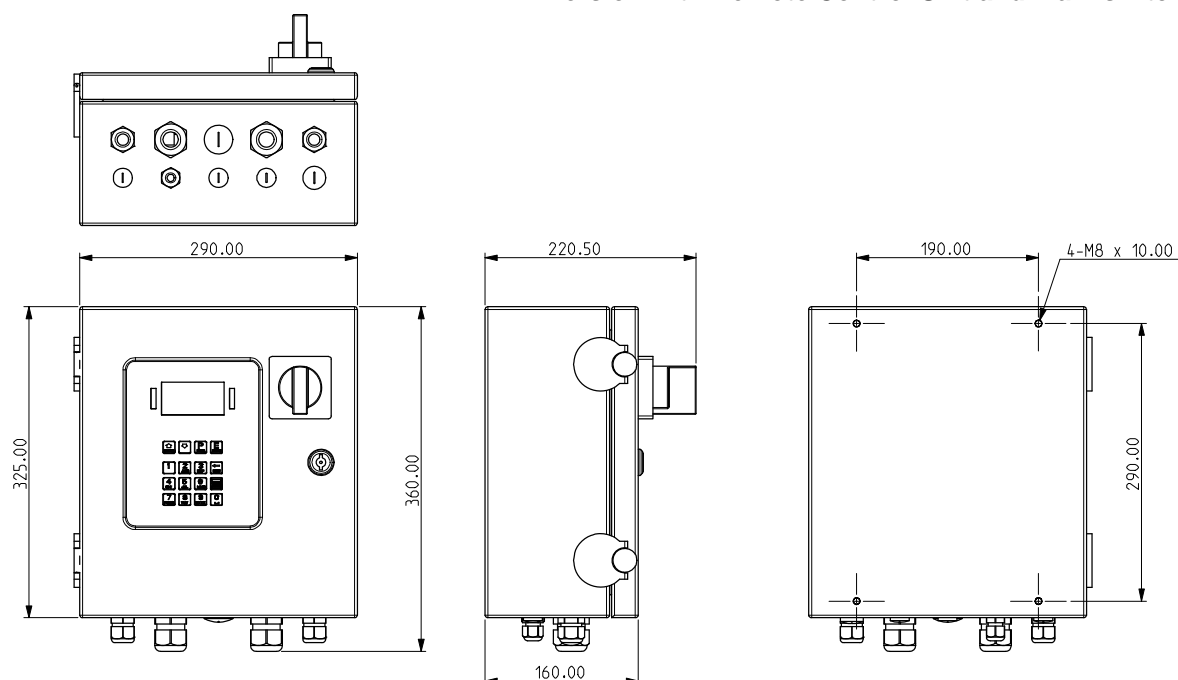
Version with main switch



Version with Remote Control Unit



Version with Remote Control Unit and main switch



2.3 - Conveyor Control System

In addition to the functions provided by the Control Power Box, this includes a module to drive the conveyor belt motor. This module is available in the following versions:

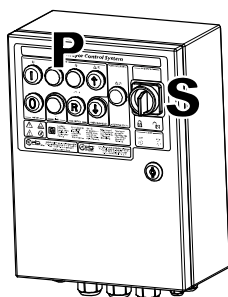
Version	Input Voltage	Full-load ampacity (FLA)	Output voltage (motor power supply) *	Maximum power of motor
Conveyor Control System CE version	200-240V \pm 10% 50-60Hz	11,4 A	230V three-phase	750W
Conveyor Control System - 115V USA version	100-120V \pm 10% 50-60Hz	11,2 A	230V three-phase	375W
Conveyor Control System - 230V USA version	200-240V \pm 10% 50-60Hz	11,4 A	230V three-phase	750W

* Three-phase asynchronous motor, delta connection



If the device is to be mounted on the customer's own conveyor belt, please specify the power supply voltage in the order.

The unit also incorporates the main switch, the controls for activating the belt and the LED indicators needed for operation (STC card).

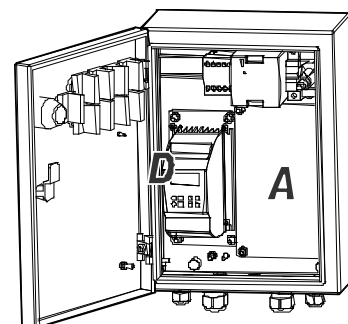


View of the
Conveyor Control System

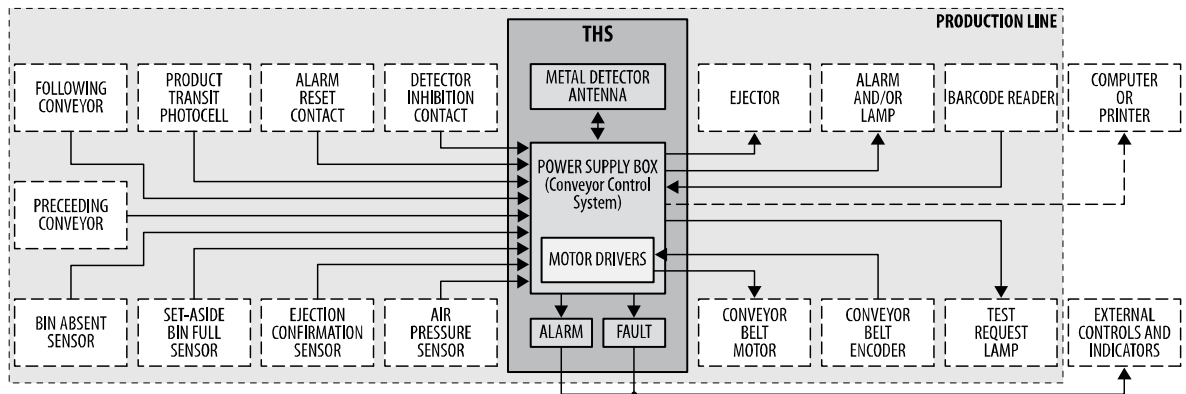
S: ON/OFF switch;
P: Control Panel;

Internal view of the
Conveyor Control System

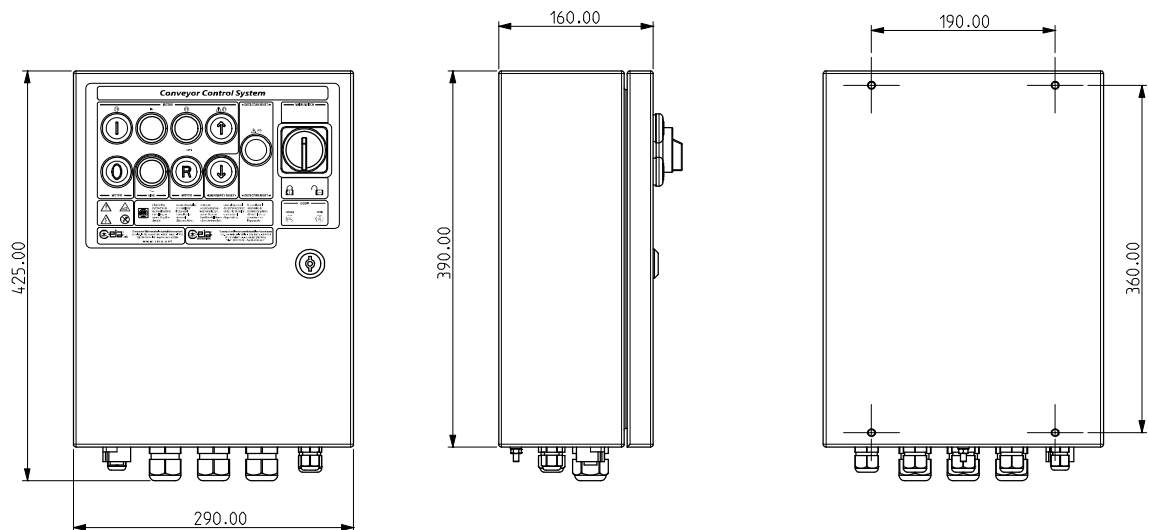
A: ALM card;
D: Inverter module



2.3.1 – Functional diagram



2.3.2 – External dimensions

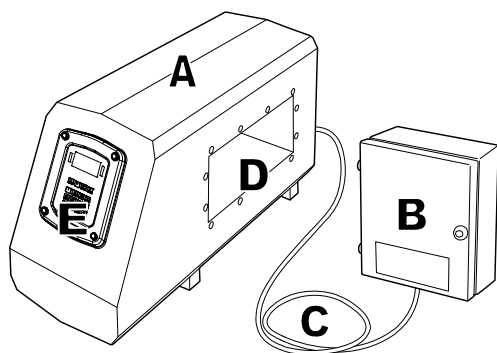


2.4 – THS/21 and THS/MS21

The **THS/21** is a model for universal use, for mounting on a conveyor belt.

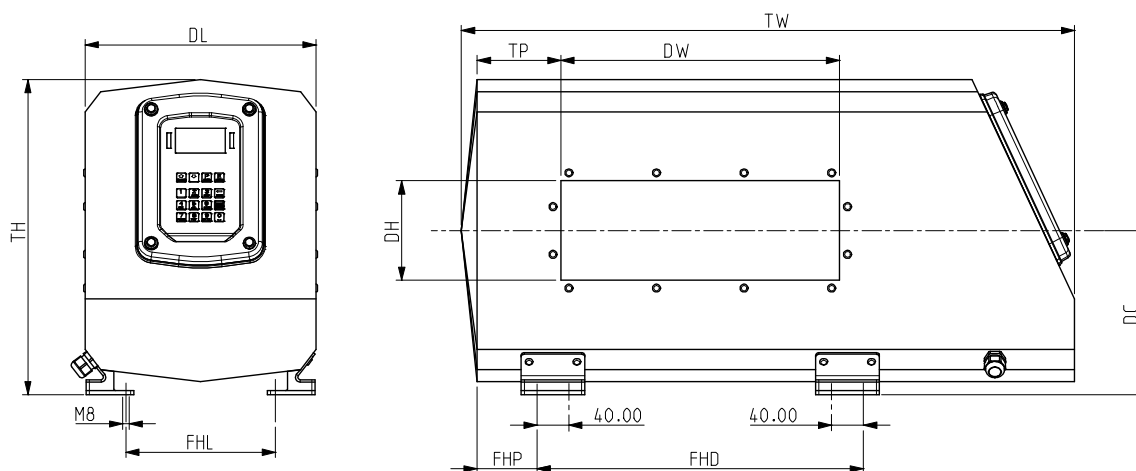
The **THS/MS21** is a multi-frequency model for mounting on a conveyor belt, for use with a variety of products with significant chemical-physical differences (variable conductivity and so on).

Is commonly used for inspection on semi-frozen products in aluminised packaging and/or products preserved in vinegar or oil, meat, fish etc.



A	The Metal Detector probe, complete with electronic control unit.
B	The Power Supply Box , for connecting the device to mains power and to the external supports (photocell, ejector, etc.)
C	Connecting cable
D	Tunnel
E	Control panel

2.4.1 – External dimensions

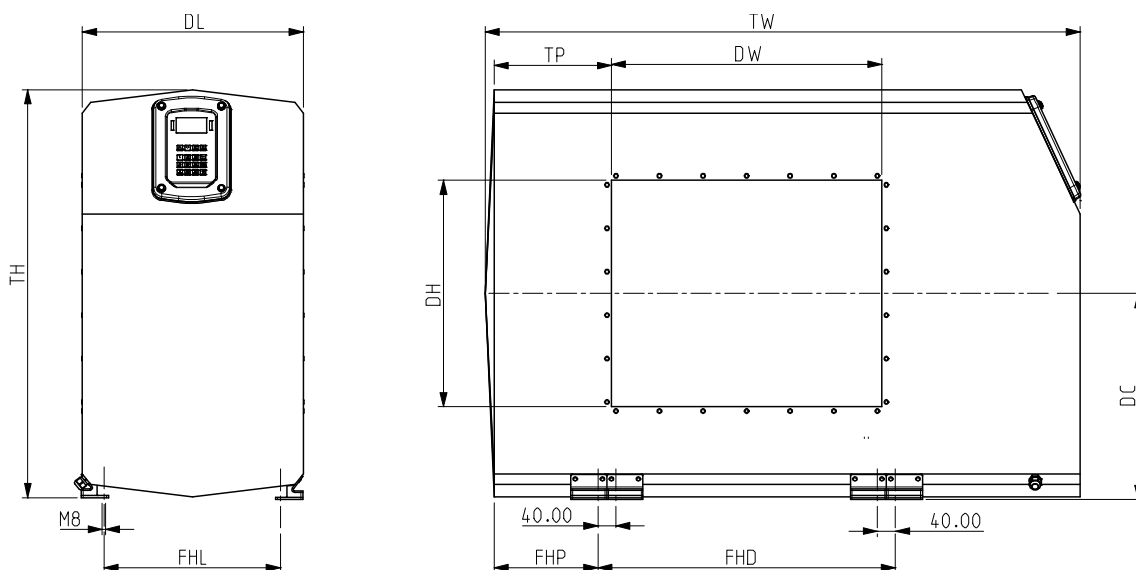


Series	DW ^a	DH ^a	TH	DL	FHL	TP	FHP	FHD	DC	TW
A	200, 250, ..., 1000	100, 125 150, 175	395	290	190	105	TP-30 ^b	DW+60 ^b	205	DW+420
B	350, 400, ..., 800	200, 225, 250, 275	550	390	290	160			280	DW+520
C	450, 500, ..., 1000	300, 325, 350	635	490	390	210			320	DW+620

^a For customized versions with different dimensions, see the configuration card at the end of the booklet.

^b The position of the support depends on the shape of the load-bearing structure.

Order codes: THS/21-DWxDH or THS/MS21-DWxDH



Series	DW ^a	DH ^a	TH	DL	FHL	TP	FHP	FHD	DC	TW
D	500, 600, ..., 1300	400, 450, 500	905	490	390	260	TP-30 ^b	DW+60 ^b	455	DW+720

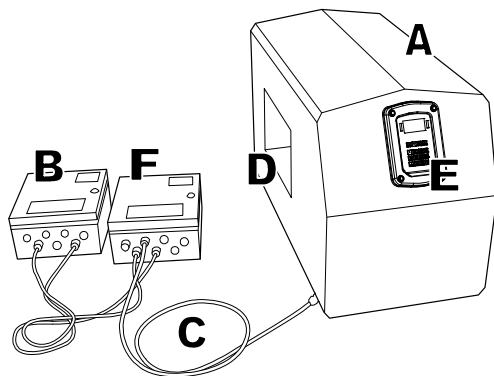
^a For customized versions with different dimensions, see the configuration card at the end of the booklet.

^b The position of the support depends on the shape of the load-bearing structure.

Order codes: THS/21-DWxDH or THS/MS21-DWxDH

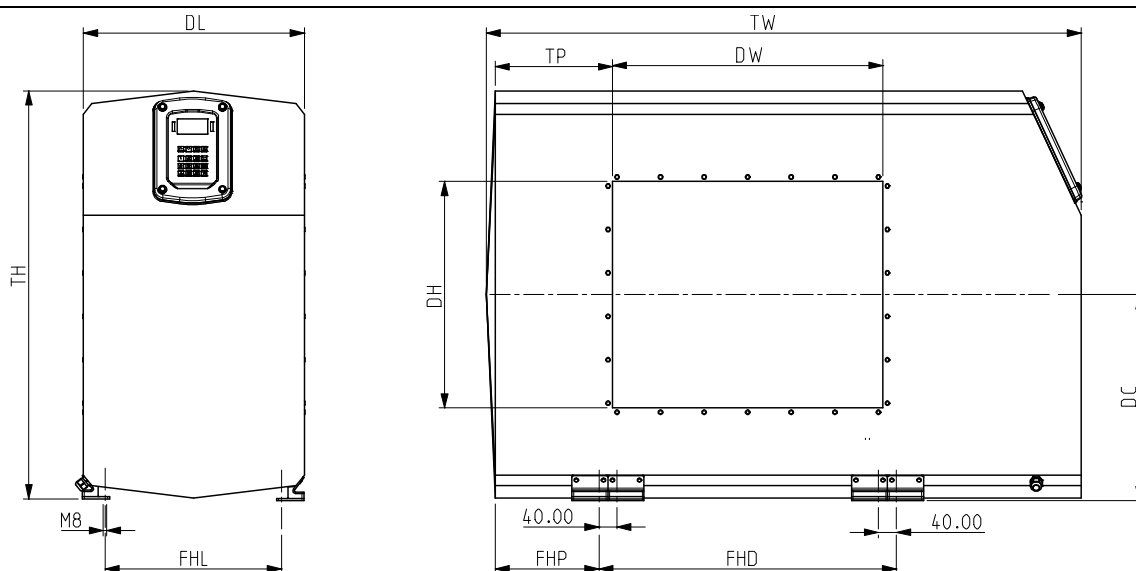
2.5 – THS/MN21

The **THS/MN21** is a model for mounting on a conveyor belt, for detecting magnetic contaminants on products packed in non-magnetic metal containers, such as products in aluminium tray. It is also used to detect needles in clothes with non-magnetic accessories (buttons, zips, etc ...)



A	The Metal Detector probe, complete with electronic control unit.
B	The standard Power Supply Box, for connecting the device to mains power and to the external supports (photocell, ejector, etc.)
C	Connecting cable
D	Tunnel
E	Control panel
F	The probe Power Supply Box

2.5.1 – External dimensions



Model (opening)	DW ^a	DH ^a	TH	FHD	TW
125	350, 550	125	590	DW+60	DW+620
150	350, 550	150	570		
200	350, 550	200	620		

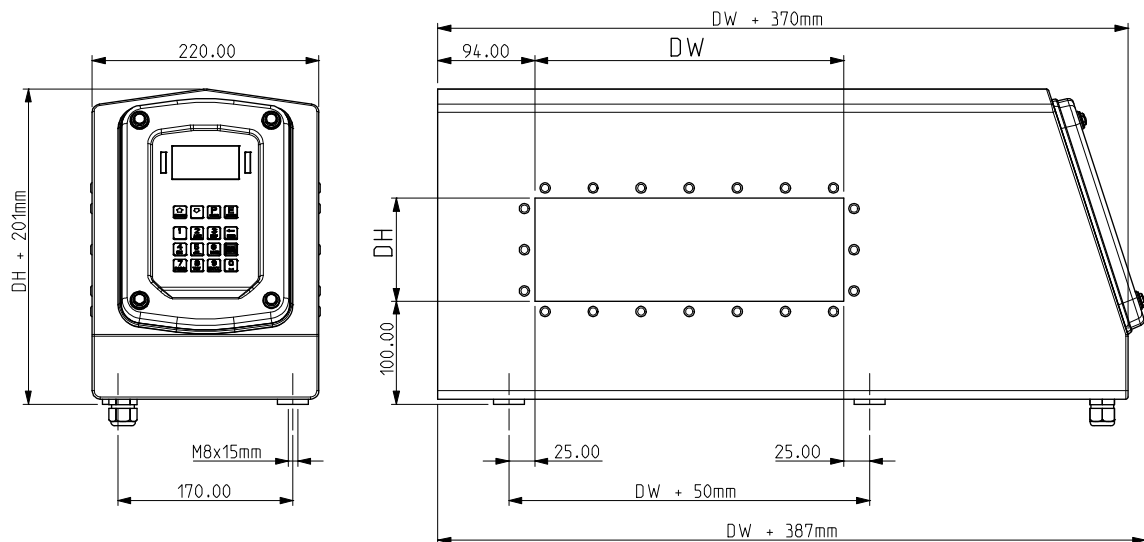
^a For customised versions with different dimensions, see the configuration card at the end of the booklet.

Order code: THS/MN21-DWxDH

2.6 – THS/SL21

The **THS/SL21** is a SLIM LINE model for mounting on a conveyor belt, with extremely reduced dimensions in the direction of transit, especially suited on weighing machines.

2.6.1 – External dimensions



Series	DW ^a	DH ^a
A	300, 450	100, 150, 200

^a For customised versions with different dimensions, see the configuration card at the end of the booklet.

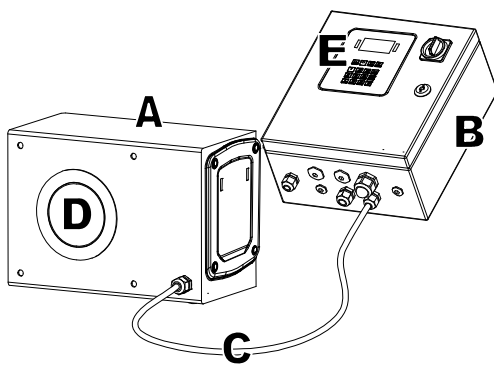
Order code: THS/SL21-DWxDH

2.7 – THS/G21

The **THS/G21** is a model with circular tunnel for products transported in tubing.

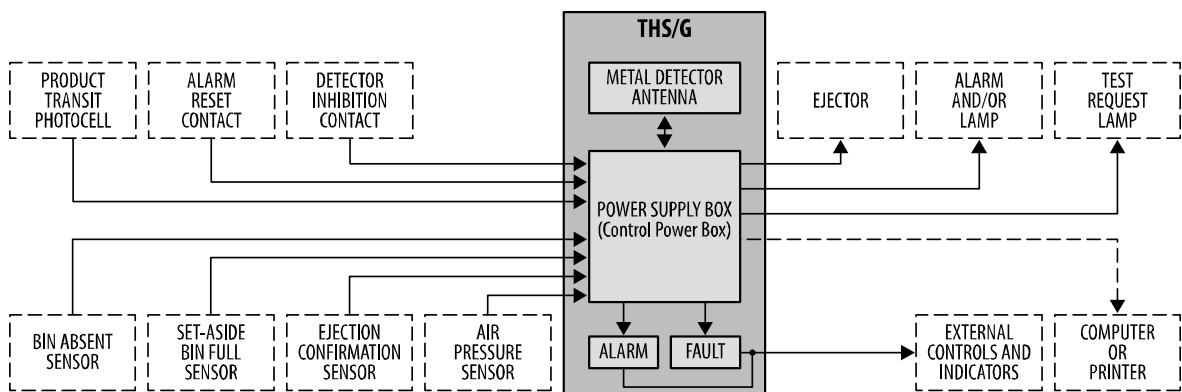
In the case of the **THS/G21** model, the probe is designed to be fixed, generally, in an inaccessible position. The detector controls are therefore incorporated into the power supply unit, on the **RCU** card fixed to the casing cover.

The typical use of THS/G21 is between multi-head weighting machines and packaging machines, or in gravitational and pneumatic product transport in general (powders, granulated products, liquids etc.).

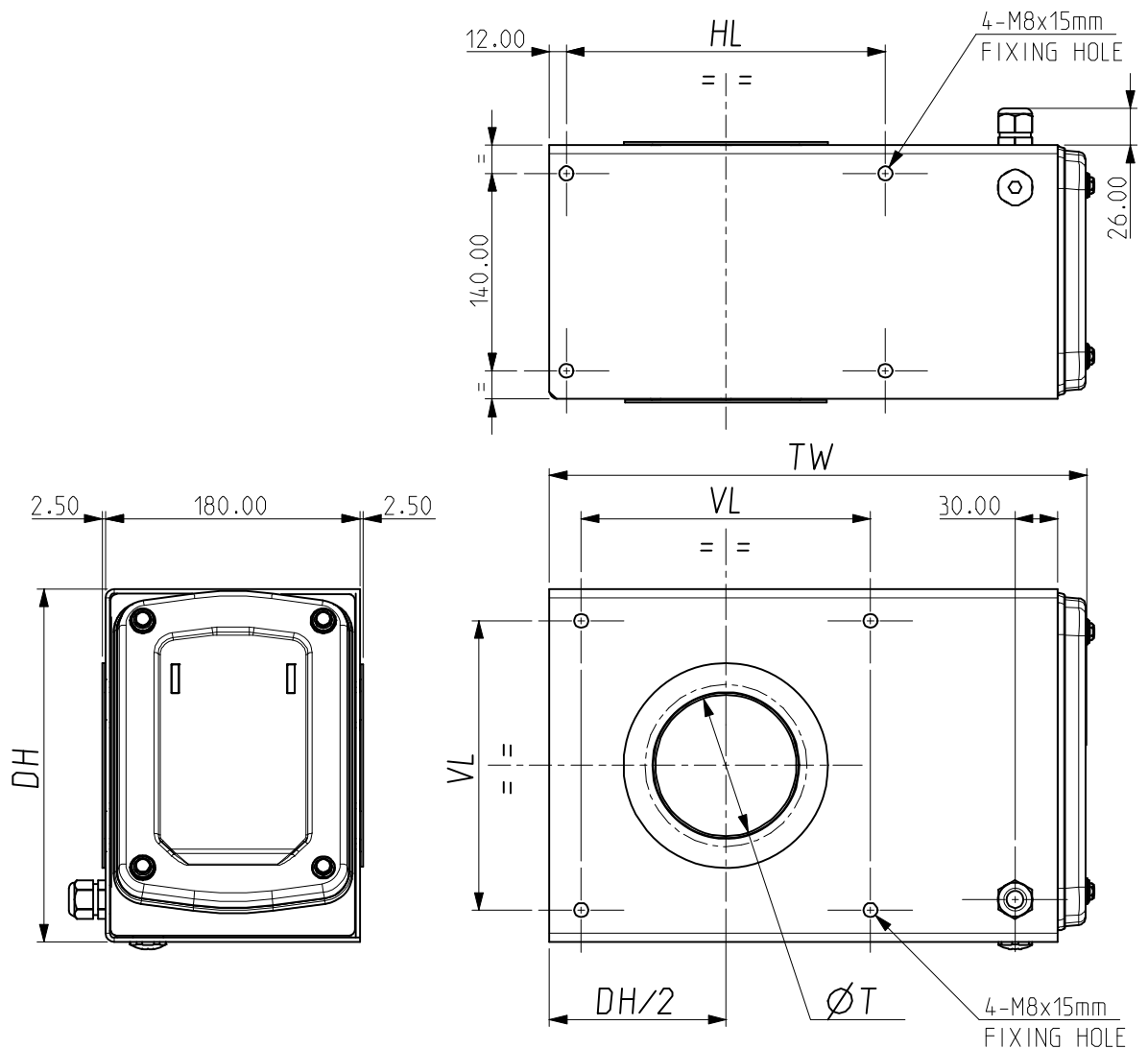


A	The Metal Detector probe, complete with electronic control unit.
B	The Power Supply Box, for connecting the device to mains power and to the external supports (photocell, ejector, etc.), with RCU for the remote control of the unit.
C	Connecting cable
D	Tunnel
E	Control panel

2.7.1 – Functional diagram



2.7.2 – External dimensions



Model (opening)	T ^a	TW	DH	VL	HL
THS/G21-50	50	380	250	205	226
THS/G21-100	100				
THS/G21-150	150	430	300	255	276
THS/G21-200	200	480	350	305	326
THS/G21-250	250	530	400	355	376

^a For customised versions with different dimensions, see the configuration card at the end of the booklet.

Order code: THS/G21-T

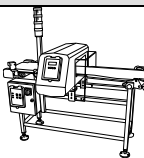
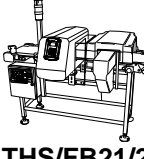
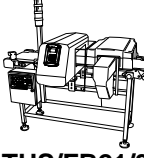
2.8 – THS/FB21 Conveyor Belt

Conveyor belts fully complying with HACCP criteria, with speed adjustment, robustly built and with simplified maintenance, available in several versions:

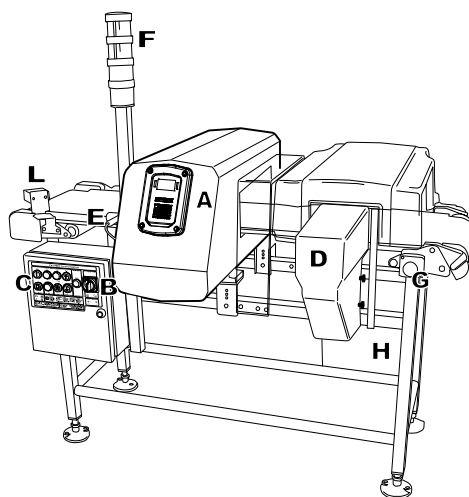
Features

- Belt available in PU approved for food handling
- Adjustable speed 20...60m/min. (standard version, other speeds on request)
- Electrical characteristics see Conveyor Control System unit
- Compressed air supply

Pressure	200-1000 kPa
Airflow	50 litres/min (piston ejector)
	600 litres/min (airblow ejector, optional)

Type	Models* (width x belt length)	Application	Features	Models THS	
				THS/21	THS/MS21
 THS/FB21/1	200 x 1500mm	Packaged or loose product	Conveyor belt with block. Devices included: - photocell - buzzer/flashing light - two auxiliary emergency buttons	•	•
	300 x 1500mm				
	400 x 1500mm				
	500 x 1500mm				
 THS/FB21/2	200 x 1500mm	Packaged product	Conveyor belt with piston ejector. Devices included: - as THS-FB type 1 - piston ejector	•	•
	300 x 1500mm				
	400 x 1500mm				
	500 x 1500mm				
 THS/FB21/3	200 x 1500mm	Packaged product	Conveyor belt with piston ejector and accessory devices. Devices included: - as THS-FB type 2 - ejection confirmation sensor - full set-aside container sensor - insufficient air-pressure sensor - blue flashing light to indicate test due "Supermarket compliant" system	•	•
	300 x 1500mm				
	400 x 1500mm				
	500 x 1500mm				

* Other dimensions available on request.



THS/FB21/2

A	Metal Detector antenna with Electronic Control Panel
B	Main Switch
C	Conveyor Control Panel
D	Ejector unit
E	Photocell
F	Buzzer/flashing light
G	Auxiliary emergency button
H	Set/aside container
L	Barcode reader

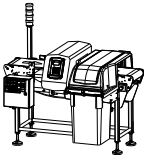
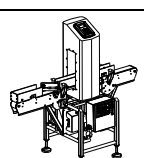
2.9 – THS/MB21 Conveyor Belt

Modular conveyor belts fully complying with HACCP criteria, with speed adjustment, robustly built and with simplified maintenance, in Stainless Steel and plastic materials compatible with food handling, complying with FDA and USDA specifications:

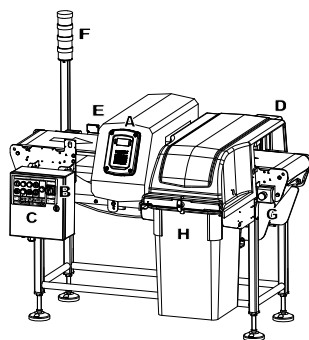
Features

- Modular belt certified for food handling
- Adjustable speed 20...60m/min. (standard version, other speeds on request)
- Electrical characteristics see Conveyor Control System unit
- Compressed air supply

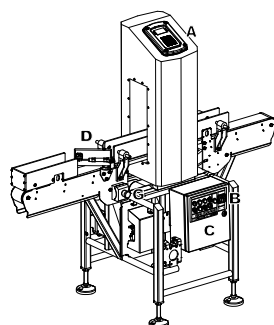
Pressure	200-1000 kPa
Airflow	50 litres/min (piston ejector)
	600 litres/min (airblow ejector, optional)

Type	Models* (width x belt length)	Application	Features	Modello THS		
				21	MS21	MN21
 THS/MB21/1	300 x 1500mm	Packaged or loose product	Conveyor belt with block. Devices included: - photocell - buzzer/flashing light - two auxiliary emergency buttons - complete reversibility of assembly for accessories and Metal Detector			
	450 x 1500mm					
	600 x 1500mm			•	•	
	600 x 1800mm					
	750 x 1800mm					
	300 x 1800mm			•	•	•
	450 x 1800mm					
 THS/MB21/2	85 x 1800mm	Packaged product	Ejection through flap. Devices included: - as THS/MB21 type 1 - ejection system through flap - material containment shores	•	•	
	150 x 1800mm					

* Other dimensions available on request.



THS/MB21/1



THS/MB21/2

A	Metal Detector antenna with Electronic Control Panel
B	Main Switch
C	Conveyor Control Panel
D	Ejector unit
E	Photocell
F	Buzzer/flashing light
G	Auxiliary emergency button
H	Set/aside container
L	Barcode reader

2.10 – Safety devices and warning labels

The **THS/21** is fitted with a list of safety features described below, in order to warrant the proper protection level, during the correct use.

IP Protection degree	<p>All the containers of the system (antenna and supply box) have a protection degree of IP66 – IP69K. This means that they are strongly watertight during operations and cleaning.</p> <p>All conveyor additional components have a protection degree of IP65. This also means that they are watertight.</p>
Cable glands	<p>The cable glands installed on the system are IP68 and they are dimensioned for M16, M20 and M25 cables.</p> <p>In order to ensure the protection degree, it's mandatory to use cables with characteristics and diameter compliant with the device glands and following the guidelines written in this manual. Insert only one cable for each gland and take care that all of them are streightened in the correct way. Do not remove the caps from unused glands.</p>
Self diagnosis system	<p>An internal self diagnosis system checks constantly the Metal Detector functionality. In case of fault a message is shown on the control display and all alarm indicators are activated together with corresponding relays.</p>
Password	<p>The access to Metal Detector parameters is protected by six levels of passwords</p>

2.11 – Options & Accessories

For the list of options and accessories available for the THS/21, see the *Spare parts, Accessories and Options Manual*.

2.12 – Technical characteristics

Control Power Box Standard power supply unit	In watertight, stainless steel casing (grade of protection: standard: IP66 – IP69K)	
	Dimensions (wxdxh):	290x160x425 mm / 11.4x6.3x14 inches
	Voltage:	115/230 V~ (+10 / -22%), single phase - 48/62 Hz
	Max. power absorbed:	80 VA (THS/MN21: 200VA)
Conveyor Control System Power supply unit with inverter card	In watertight, stainless steel casing (grade of protection: standard: IP66 – IP69K)	
	Dimensions (wxdxh):	290x188x425 mm / 11.4x7.4x14 inches
	Voltage:	115/230 v~ (+10 / -22%), single phase - 48/62 Hz
	Max. power absorbed:	1000 VA (THS/MN21: 1200VA) – Depending on installed motor
Probe-electronics unit	Tunnel-shaped, stainless steel structure containing the sensitive antenna and the control panel	
	Dimensions:	See related paragraph
Special features	Ultra-high sensitivity	
	High immunity to environmental interference	
	High-contrast organic graphical display to show data	
	Remote or direct programming of the operating parameters (type of product, immunity level, speed of transit, processing of signal, control over external actuators, etc.) by means of keyboard	
	Audio and visual detection indicators.	
	Display of the signal level by means of bar-graph.	
	Statistical analysis of the number of inspected and contaminated products	
	ISO 9001 product quality control	
	Model THS/SL21 (Slim Line)	extremely compact probe
	Model THS/MS21	detector for magnetic and non-magnetic metals, for use with different types of product thanks to selection of the operating frequency
Model THS/MN21	detection of ferromagnetic metals when considerable quantities of aluminium or other non-magnetic metals are present	
Model THS/G21	probe with circular opening for checking material transported in tubing	
Password	7 levels: operator / supervisor / engineer / quality control operator / head of quality control / remote user	
Stored sets of parameters	500 sets of parameter settings may be stored, corresponding to 500 possible different products	
Control inputs	Connector for link-up to	photocell
		manual reset button
		downstream belt authorization
		ejection confirmation
		set-aside contained full sensor
		encoder to detect the belt speed
		emergency button
		barcode reader (on demand)
		compressed air pressure sensor (for ejection)
		serial interface RS232
Ethernet interface (on request)		
Outputs	5 programmable relays (250Vac - 3A) to activate the external support units	alarm relay
		fault relay
		ejector relay
		upstream belt authorization relay
		auxiliary relay
Alarm signalling	Visual:	by means of indicator light on central electronics unit
	Audio:	by means of buzzer on power supply unit
	By means of output relays	
Environmental conditions	Working temperature:	0-50°C
	Humidity:	5-90%, without condensation

3 - INSTALLATION



Before starting any installation operation, read carefully the **Safety instructions – Warnings** section of this manual.



Observe current regulations regarding electrical and personal safety for both the operator and the installer when installing the device.

3.1 – General guidelines

According to regulation EN60204-1, the main switch and the other controls to be used by the operator must be at a height ranging from 60 to 180 cm from the flooring.

If it proves impossible to comply with this measurement due to the configuration of the system, an additional control unit, which complies with the regulations, must be set up.

3.1.1 – Probe

Mount and fix the probe onto the structure of the production line using the holes located on the base-plates. For the fixing distances see paragraph **External dimensions** of the relative model, at chapter **2 – Description** of this manual.



On some models the base-plates can be fixed in two different positions to adapt to the shape of the load-bearing structure

3.1.2 – Power Supply unit

The power supply unit must be firmly attached to the load-bearing structure by means of four screws; it must be close to the central electronics unit and to the external subsidiary devices connected to the unit (photocell, ejector, etc.).

For the fixing distances see paragraph **External dimensions** of the relative model, at chapter **2 – Description** of this manual.

3.1.3 – Load-bearing structure

During assembly the solidity of the load-bearing structure should be borne in mind, in order to ensure that the detector does not oscillate, causing false alarms.

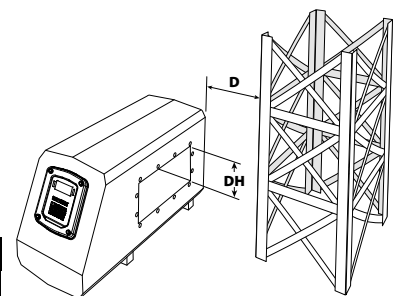
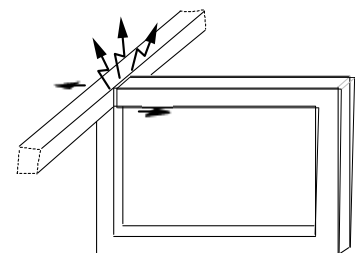
Fixed metal structures

All the fixed metallic structures in proximity to the detector must be **securely fastened down with bolts and self-blocking nuts** and, if they form intermittent loops, **soldered**.

This is due to the fact that **sporadic metallic contacts** due to vibrations, resulting in the intermittent short-circuiting of the voltages induced by the probe, may lead to interference with subsequent false alarms in the device.

Installation of structures or equipment with ferromagnetic frames in the proximity of the Metal Detector is not recommended. If this will not be possible, they must be placed at least at distance **D** from each side of the probe.

Fixed metal structures (frames, metal furniture, etc.) must, in all cases, be located at a distance (**D**) that is at least equal to the height of the probe (**DH**), on both sides of the probe.

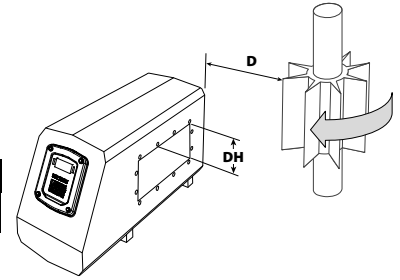


	All models	THS/MN21
D	$\geq DH$	$\geq 3 DH$

Moving metal structures

Such structures, especially when of a considerable mass, must be located as far away as possible from the probe.

	All models	THS/MN21
D	$\geq 6 \text{ DH}$	$\geq 10 \text{ DH}$



3.2 – Installation on Conveyor belts



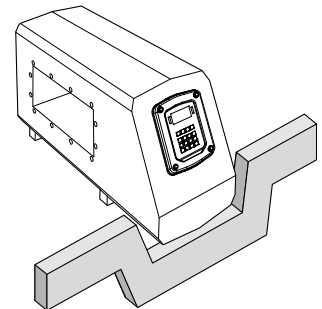
The following notes provide additional instructions necessary for installing the detector on a conveyor belt or other transport system set up by the customer.

For the installation checks you need to be able to switch on the system, understand the signals given during use and set the applicable operating parameters. These operations are described in the first part of the “USE” section.

3.2.1 – Load-bearing structures

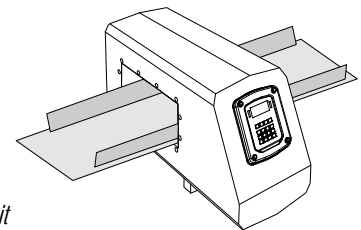
The load-bearing structures of the conveyor belt must be stable and not subject to detectable vibration during movement of the belt.

For a **THS/MN21** the structure of the belt must be in non-magnetic steel (e.g. non-magnetic AISI 304).



3.2.2 – Side panels to contain the material in transit

Near the probe, such edges must be made of insulating material (plastic, wood, etc.).



Side panels for containing the material in transit

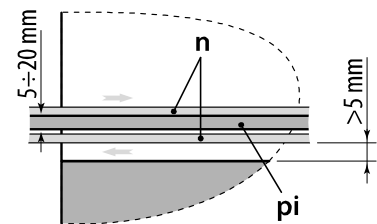
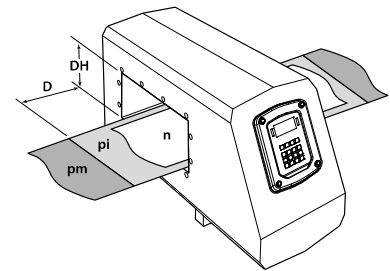
3.2.3 - Position of the conveyor belt inside the probe

The conveyor belt must pass as close as possible to the lower surface of the tunnel. In order to prevent it from accidentally rubbing against the probe it is advisable that it be supported within the probe by means of a sheet of insulating material, which is thick enough to support the weight of the material being transported (approximately 5-20 mm). It is necessary to take this measure when the belt is of considerable length and must therefore be supported, while at the same time prevented from vibrating. The sheet must not touch the probe (in the illustration an intervening distance of 5-10 mm is shown); if it were to touch the probe it could send vibrations to the antenna. In any event, if there is a supporting metal layer for the belt, when it arrives at the probe, it must be interrupted for a distance D, to both sides of the antenna.

Model	THS/MN21	Other models
D	$\geq 4 \text{ DH}$	$\geq 2 \text{ DH}$



THS/MN21 Model: if the product is contained in an aluminum tray, the optimum distance between the bottom of the tray and the surface of the tunnel is of 20-30mm
20-30mm.



Position of the conveyor belt inside the probe

pi: sheet of insulating material;
pm: layer of metal material;
n: belt

3.2.4 - Rollers



The distances quoted below are indicative only, and subject to variation according to the sensitivity required and to the type of probe. When installation has been completed, therefore, correct operation should be checked.

In general, it is advisable that any rollers located near the antenna be of insulating material.

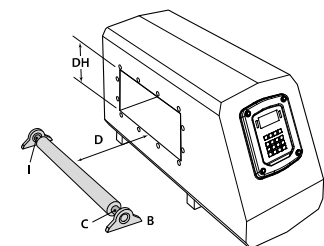
In which case, there must be an electrical connection on only one side of the roller, in order to allow the discharge of any electrostatic charges.

Model	THS/MN21	Other models
D	$\geq 3 \text{ DH}^1$	$\geq 1,5 \text{ DH}^2$

¹ Use nonmagnetic steel bearings.

² plastic roller with fixed non-magnetic steel axle and magnetic steel bearings.

I: insulated support;
C: non-insulated support;
B: bearing



Rollers in insulating material with metallic bearings



The bearings must be placed at the ends of the rollers, never in the middle.

Metal rollers, pulling or free, must be located at a distance **D**, to both sides of the antenna. Such rollers must also be insulated on a single supporting piece in order to avoid forming electromagnetic coils and allow the discharge of any electrostatic charges.

Model	THS/MN21	Other models
D	$\geq 6 DH^1$	$\geq 2 DH$

¹ Use nonmagnetic steel bearings.

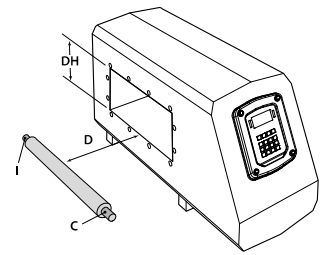
*I: insulated support;
C: non-insulated support;
S: screening*

Metal rollers must be perfectly concentric.

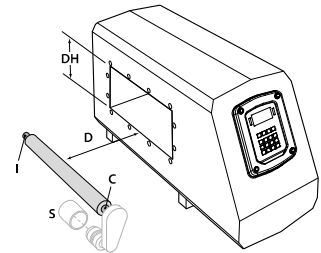
Attention: Rollers for V-shaped belts, if attached to the frame on one side only, do not require the insulation of the pin. As in the preceding case, their distance from the probe must be at least equal to D, to both sides of the antenna

Model	THS/MN21	Other models
D	$\geq 9 DH$	$\geq 3 DH$

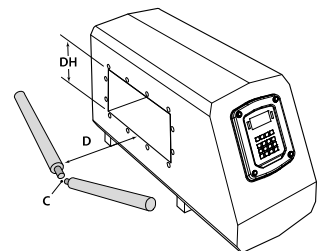
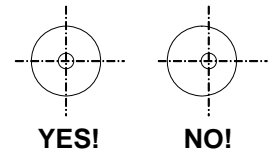
C: non-insulated support



Free metal rollers



Pulling metal rollers

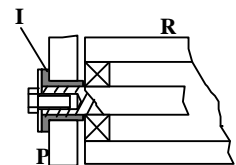


V-shaped Metal rollers

Examples of roller insulation

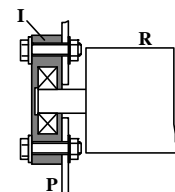
Insulation of the pin of a roller.

*R: roller;
I: ferrule in insulating material;
P: side bulkhead of the belt frame;*



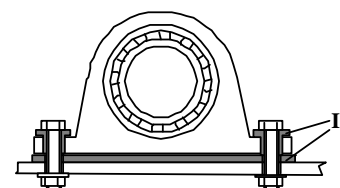
Insulation of the pin support of a roller.

*R: roller;
I: bearing support in insulating material;
P: side bulkhead of the belt frame;*



Insulation of the bearing support of a roller pin.

I: ferrule and spacer in insulating material.



3.3 - Installation of the THS/G21 probe

Mount the probe on the pipe carrying the material to be inspected and fix it with screws and plastic spacers, using the holes provided on underside (see paragraph 2.7.2).

Fix the control unit in a convenient position for use, within the limit set by the length of the probe connecting cable.



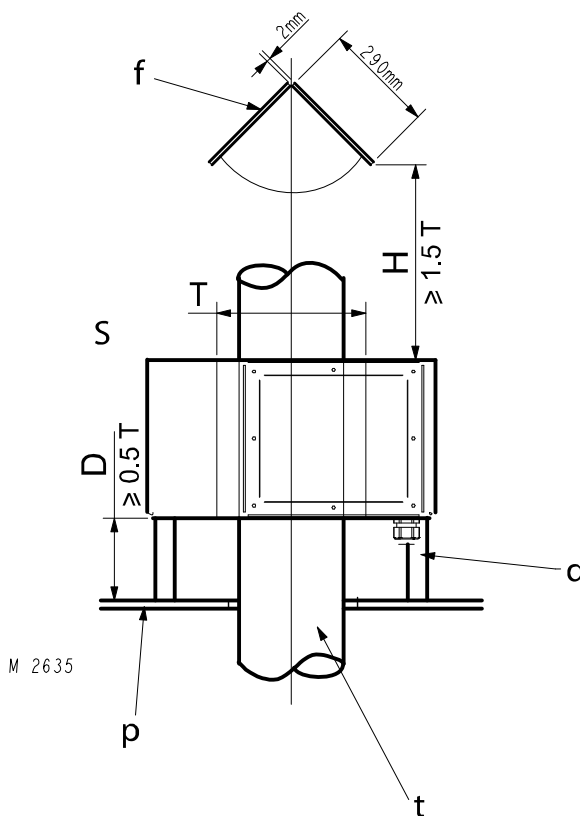
Fix the cable which connects the probe to the power supply unit so that it can not oscillate or vibrate.

If the cable is too long, DO NOT CUT THE CABLE: COIL UP THE EXCESS!

3.3.1 - Proximity limits around the THS/G21 probe

The distance between the probe and fixed or moving masses depends on the sensitivity selected and on the size of the masses. The figure below shows:

- the minimum distance **D** between the probe **S** and the support plate **P**
- the minimum distance **H** between the probe **S** and the deflector **f**, based on a sensitivity setting of 280 and a flap-type deflector in stainless steel. If the sensitivity or the type of deflector is changed, this minimum distance may decrease: using the procedure for checking environmental interference (see "Maintenance" section), check that activation of the deflector does not influence operation of the metal detector.



D	Distance between probe S and support plate P
d	Rigid plastic spacer
f	Steel flap deflector (dim. 290x200x2mm);
H	Distance between probe S and deflector f
p	Stainless steel support plate
S	Probe
T	Diameter of the probe
t	Plastic pipe

3.4 – Unpacking

Store the system in its original packaging, or in a way that protects it adequately from atmospheric agents or other possible causes of damage (moving objects, weights, solvents etc.).

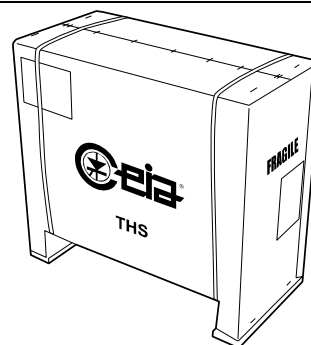
Storage temperature (Regulation EN 60204): -25°C - +55°C long-term, +70°C for 24 hours maximum.

3.4.1 – Package handling and movement

Handle the package with care and without excessive force during movement.

Use lift trucks or sling the package, and ensure that the load is balanced during movement.

Place the equipment, still in its package, as close as possible to the final installation site.

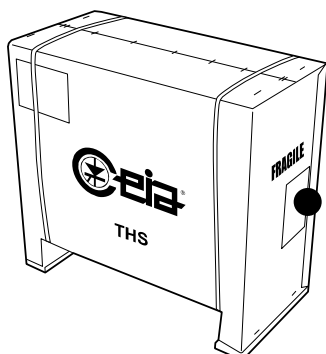


3.4.2 – Unpacking procedure

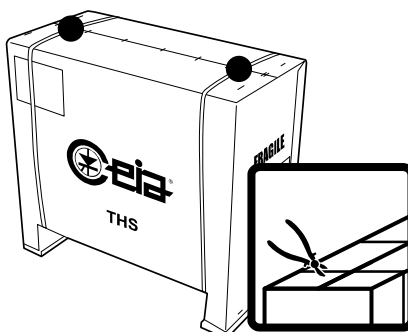


Keep the packaging materials for possible future transport.

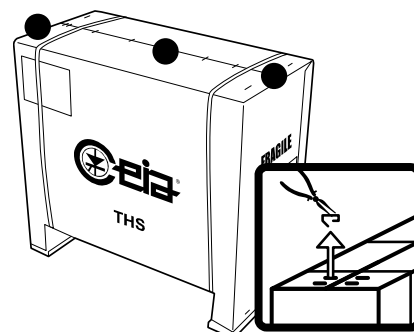
THS/21



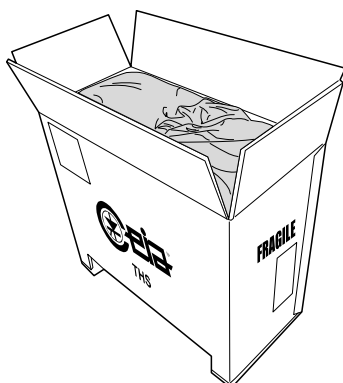
Read the Packing List to check the packing content



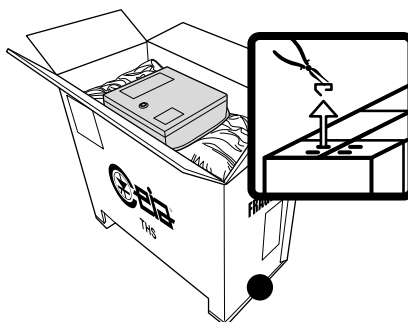
Using shears, cut and remove all plastic binds from the packing. Throw them away



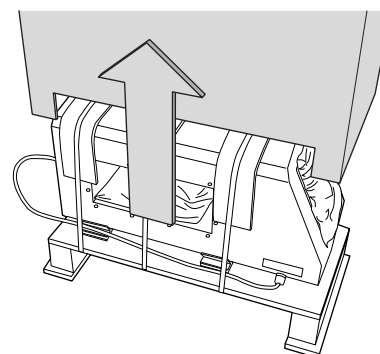
Using pliers, extract all metallic clips from the upper surface of the packing. Throw them away



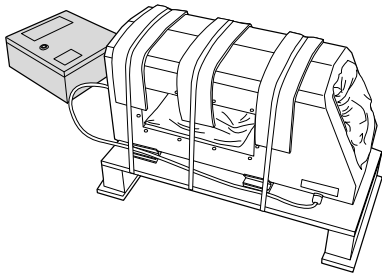
Open the box and extract the protective support.



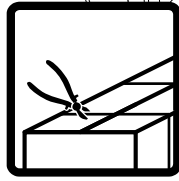
Using pliers, extract all metallic clips from the bottom side surface of the packing. Throw them away.



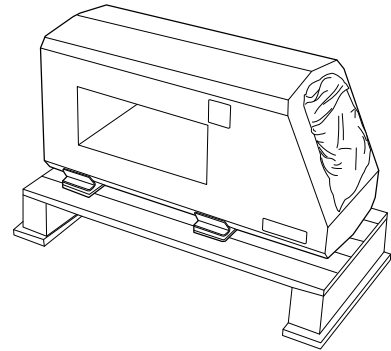
Lift up the box from the wooden base, taking care that the Power Supply Box will not fall.



Put the Power Supply Box down to the floor and remove the protective support.



Using shears, cut and remove all plastic binds from the antenna. Throw them away.



The Metal Detector is ready to be installed.

3.4.3 – Content list

THS/21

The packing consist of:

- THS/21 Metal Detector antenna, connected to the ordered Power Supply Box.
- Instruction Manual (this document).
- Quality Control Test Samples (if ordered).

3.4.4 – Movement of the Metal Detector



Before any movement of the detector, take care about the facts that it could be heavy to be handled by only one person. Establish and implement adequate procedures to perform it safely. CEIA cannot be held responsible for any damage resulting from incorrect procedures for the container clearing.

Use lift trucks or sling the load-bearing structure, and ensure that the load is balanced during movement. Avoid deforming the structure or its component parts.



When transporting and handling the Metal Detector, slings, ropes, forklifts, hands or any other lifting equipment, shall not pass through the detector aperture.

3.5 – Mechanical installation

3.5.1 – Assembly of components

THS/21

Any mechanical assembly procedure is request,



During the installation phase, if the connection cable between the antenna and the power supply box needs to be disconnected, do it from the power supply box side and not from the antenna side.

3.6 - Electrical Installation

3.6.1 – Minimum requirements

See 2.7 – *Technical characteristics* for the minimum electrical requirements of **THS/21** models.

3.6.2 - General guidelines

Possible sources of electrical interference may be **power supply cables** (electromagnetic fields generated by alternating currents) or **impulsive electromagnetic sources** (electrical motors with high start-up absorption of power and their power supply cables, fluorescent lights, emergency generators, remote control devices, etc.) located near the probe.

Power supply cables to other devices.

The route of the conductors must never be allowed to create a large-scale electromagnetic loop. The power supply cables must be distanced as far as possible from the probe and braided with the shortest possible pitch. In general, it is advisable that the power supply cable harnesses be inserted into special insulated channels. In the event that the conductors have to pass near the probe of the metal detector, it is advisable that they be inserted into an iron tube, either electro-welded or drawn, which is at least 2 mm thick and has a suitable diameter.

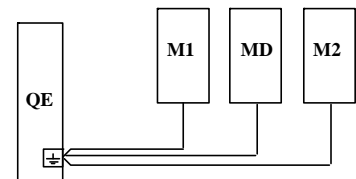


This solution is only valid if the tube is not subject to vibrations; should it be subject to vibrations this solution could even be counter-productive.

Grounding

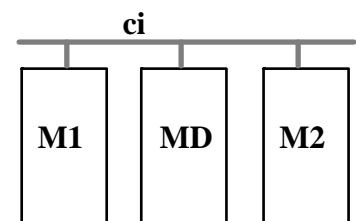
This connection must lead directly to the electrical power supply board and must not be derived from any other electrical devices.

*QE: electrical board; M1: machine 1
M2: machine 2; MD: Metal Detector.*



Warning! If metal ducts are used for production line power and control lines, it is advisable not to create an electrical connection between the conveyor belt base structure and other nearby devices through the same ducts: if this is done, interference due to multiple ground returns could be produced.

In general, avoid electrical contact between the conveyor belt base structure or antenna, and other surrounding metal structures (conveyor belts or others).



*ci: ducts in insulating material;
M1: machine 1; M2: machine 2; MD: Metal Detector*

Impulsive sources

In general, impulsive sources must be distanced or eliminated.

It is therefore recommended that, during installation, the following procedures be carried out:

1. Position as far as possible from the probe any motors, electrical power boards or electromagnetic actuators (it is recommended that they be replaced with similar pneumatic devices); position fluorescent lights and their respective reactors at a distance from the metal detector probe; where possible replace fluorescent lights with filament lights.
2. Equip electrical motors with special iron screens and mains filters of sufficient capacity. It is recommended that motors running on alternating current be used as opposed to those running on direct current. The table that follows provides some general guidelines for the distances to be placed between the probe and asynchronous motors, depending on their power.

Recommended minimum distance between the probe and motors with alternating current (without screening of the motor)		
Power	Minimum distance	
	THS/MN21	Other THS/21 models
0,5 CV	5 DH	3 DH
1 CV	6 DH	4 DH
2 CV	8 DH	5 DH
3 CV	10 DH	6 DH
20 CV	15 DH (10 DH if screened)	10 DH (6 DH if screened)

2.1 In the immediate proximity of the metal detector, the motors may be screened by means of cylindrical enveloping in iron; such cylinders must have a sufficiently large diameter in order to contain the motors and a thickness of not less than 2 mm. The cylinders must be of the unwelded type.

3. Fit the electromagnets, remote controls and continuous current motors with RC muffling nets (ask our technical office for details of the dimensions) and braid the respective power supply cables with as short a pitch as possible.



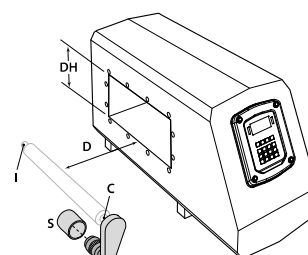
Fix the cable that connects the probe to the power supply unit so that it cannot oscillate or vibrate. If the cable is too long, **DO NOT CUT THE CABLE: COIL UP THE EXCESS!**

Conveyor belts motors

The motors must be located at a distance **D** from the antenna, adopting measures identical to those described for the rollers above.

Fit electrical motors with special iron screens and mains filters of sufficient capacity. It is recommended that motors running on alternating current be used rather than those running on continuous current. The table that follows provides some general guidelines for the distances to be placed between the probe and asynchronous motors, depending on their power.

Minimum distance advisable between the probe and motors with alternating current (without motor screening)		
Power	THS/MN	Other models
0,5 CV	≥ 5 DH	≥ 3 DH
1 CV	≥ 6 DH	≥ 4 DH




Motors

*C: non-insulated support;
I: insulated support;
S: screening*

- In the immediate proximity of the metal detector, the motors may be screened by means of cylindrical enveloping in iron; such cylinders must have a sufficiently large diameter to contain the motors and a thickness of not less than 2 mm. The cylinders must be of the unwelded type
- The table indicates distance measurements corresponding to a high sensitivity level; for lower sensitivity levels, distance D may be reduced.

3.6.3 – Inputs connection



Make all connections relating to input lines using screened cable, connecting the shielding only at the THS/21 system end to the contacts marked with the  symbol which are provided on the various connectors.

Bar-code reader	The bar-code reader is supplied upon request: for connection, follow the indications in the plan on the previous pages.						
Downstream belt authorisation (Following conveyor - Conveyor Control System only)	When active, this input indicates that the downstream belt is operating and can accept the product.						
Photocell	When active, this input indicates the passage of the product in front of the photocell. The input is monitored by the self-diagnosis system.						
Ejection confirmation	When active, this input indicates the passage of the product into the set-aside container. The input is monitored by the self-diagnosis system.						
Container full (Bin full)	When active for at least 5 seconds, this input indicates that the set-aside container is full (the malfunction relay is activated).						
Bin absent	When active for at least 5 seconds, this input indicates that the set-aside container is not present (the malfunction relay is activated).						
Impulse encoder (Encoder)	This input is used to measure the speed of the conveyor belt if an encoder has been installed. The sensor must provide impulses, the amplitude of which is indicated in the table "Electrical connections", with a minimum frequency of 2 Hz and a maximum frequency of 1kHz. It may be contact type, open collector (NPN or PNP) or push-pull. For correct operation a coefficient KE must be determined during installation and set-up, as per the procedure described in the para. "Transit speed".						
Alarm reset (Reset)	When active, this input forces the Metal Detector to exit from the alarm state (used in the case of operation with belt block and manual reset).						
Inhibition	When active, this input disables the detector: it is generally used to avoid false alarms caused by the start-up of the conveyor belt when it is not possible to adjust the mechanical structure of the belt.						
Alarm inhibition when belt is switched on	<p>If the start-up of the belt is accompanied by interference which is serious enough to cause a false alarm, the alarm can be inhibited:</p> <table> <tr> <td>Control Power Box:</td><td>connect a contact which is activated at start-up to the inhibition input;</td></tr> <tr> <td></td><td>set the IN parameter to a suitable value determined by experiment (see "Programming" manual).</td></tr> <tr> <td>Conveyor Control System:</td><td>simply set the IN parameter to a suitable value determined by experiment (see "Programming" section).</td></tr> </table>	Control Power Box:	connect a contact which is activated at start-up to the inhibition input;		set the IN parameter to a suitable value determined by experiment (see "Programming" manual).	Conveyor Control System:	simply set the IN parameter to a suitable value determined by experiment (see "Programming" section).
Control Power Box:	connect a contact which is activated at start-up to the inhibition input;						
	set the IN parameter to a suitable value determined by experiment (see "Programming" manual).						
Conveyor Control System:	simply set the IN parameter to a suitable value determined by experiment (see "Programming" section).						
Air pressure sensor	When active, this input indicates that the compressed air pressure is sufficient for the ejector.						

3.6.4 - Operation of the relays (J15 and J19 connectors)

Ejector relay (Eject relay):

Programmable relay with delayed action (with respect to the detector alarm); capacity 3A; the programming parameters that relate to the functioning of this relay are **ED**, **EM** and **ET** (see Programming chapter).

Alarm relay

Programmable relay with immediate action (with respect to the detector alarm); capacity 3A; the programming parameter that relates to the functioning of this relay is **AT**.

Malfunction relay (Fault relay)

Safety operation relay (contacts NA and C connected in correct operation); capacity 3A; the programming parameter that relates to the functioning of this relay is **FR**.
Malfunction conditions are described in the Maintenance section.



when the device is switched on, the relay is not activated (malfunction condition) for about 6 seconds.

Upstream belt authorisation relay (Preceding conveyor relay)

Safety operation relay (contacts NA and C connected in correct operation); capacity 3A.

Auxiliary relay for signalling when periodic test is due (TEST LAMP relay)

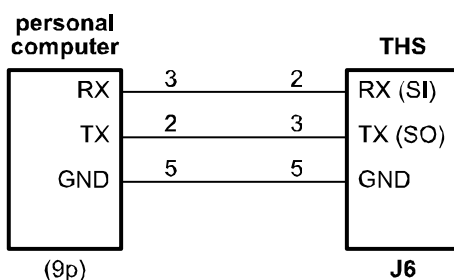
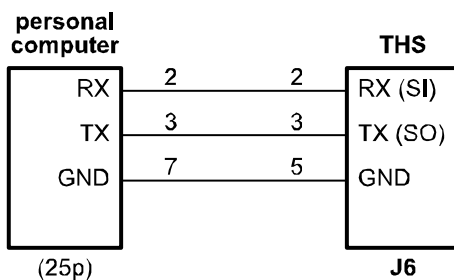
Programmable relay ; 3A current-carrying capacity; the programming parameters relating to operation of this relay are **LB** and the parameters of the QA configuration menu (see Programming section).

3.6.5 - Serial line connection

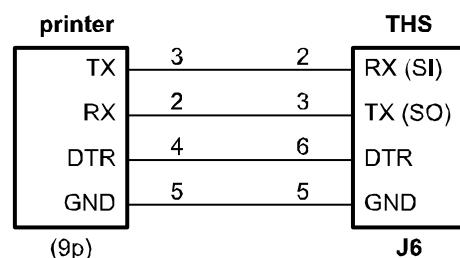
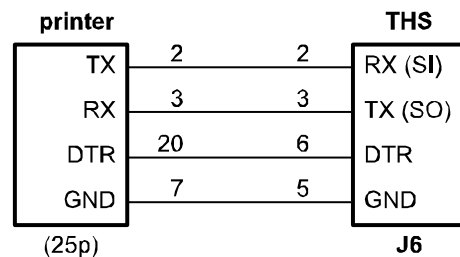
Connect the serial communication cable to the terminal board: contacts for RS232 standards are catered for.

RS 232
connections

Connection of a personal computer
to a single THS metal detector only



Connection of a printer
fitted with a serial interface



Select DTR=H mode on the THS

3.6.6 – Connecting to the mains power supply



The device can be seriously damaged if supplied at voltages different from what indicated on the external label. CEIA cannot be held responsible for any damage resulting from the above situation. Verification that the power supply conforms to the values specified plate and to the regulations in force is the total responsibility of the customer.

Connection to the ground

Connect a grounding conductor to the **PE** terminal; the size of the conductor should be in line with the safety standards in force.

For the Conveyor Control System put in a ground fault interrupter upstream, provided that the trip current is at least 300 mA.

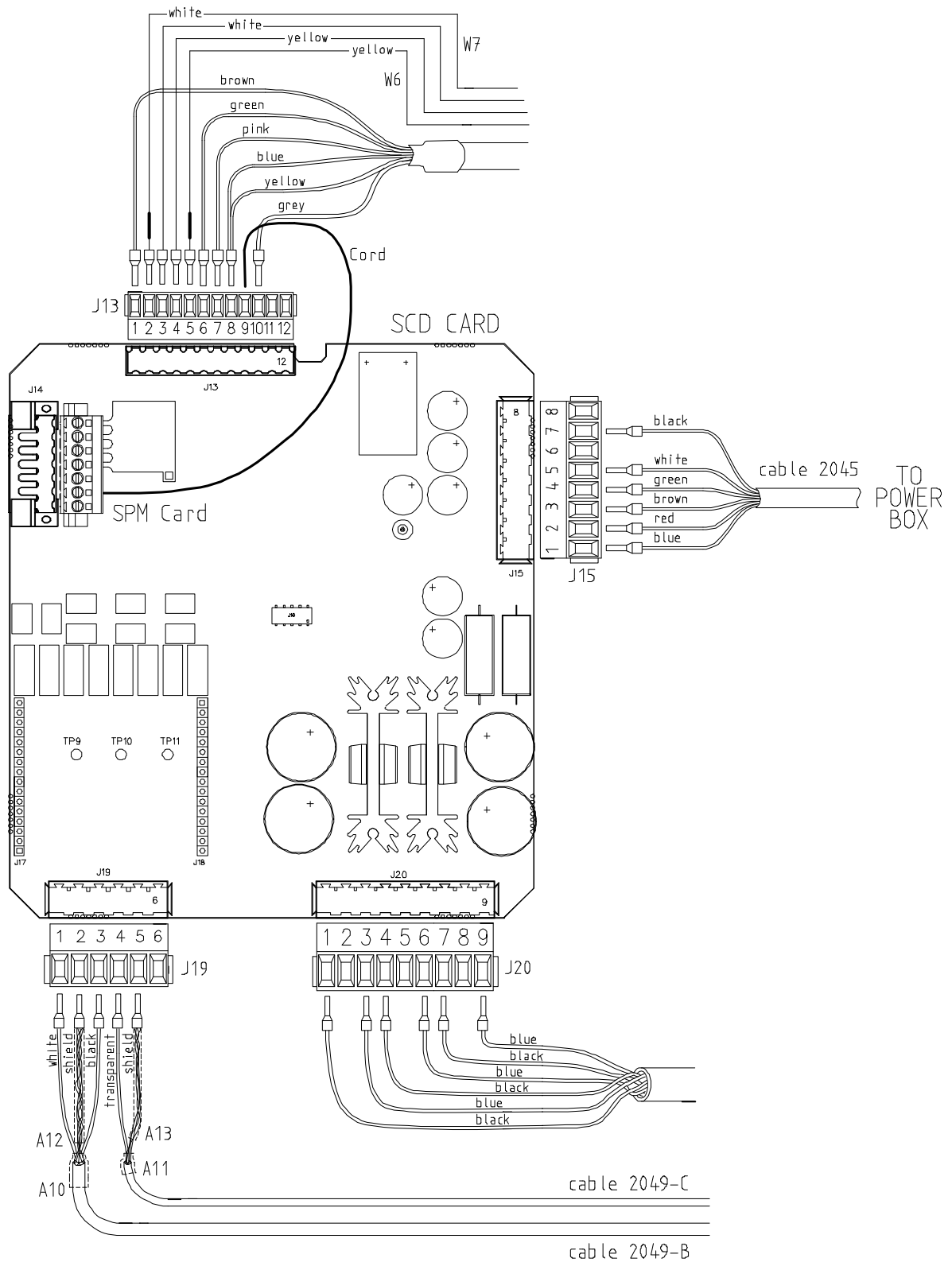
Connect directly to the yellow/green terminal board, identified with PE label, inside the box.
Conductor section: AWG14 or 2.5 mm².

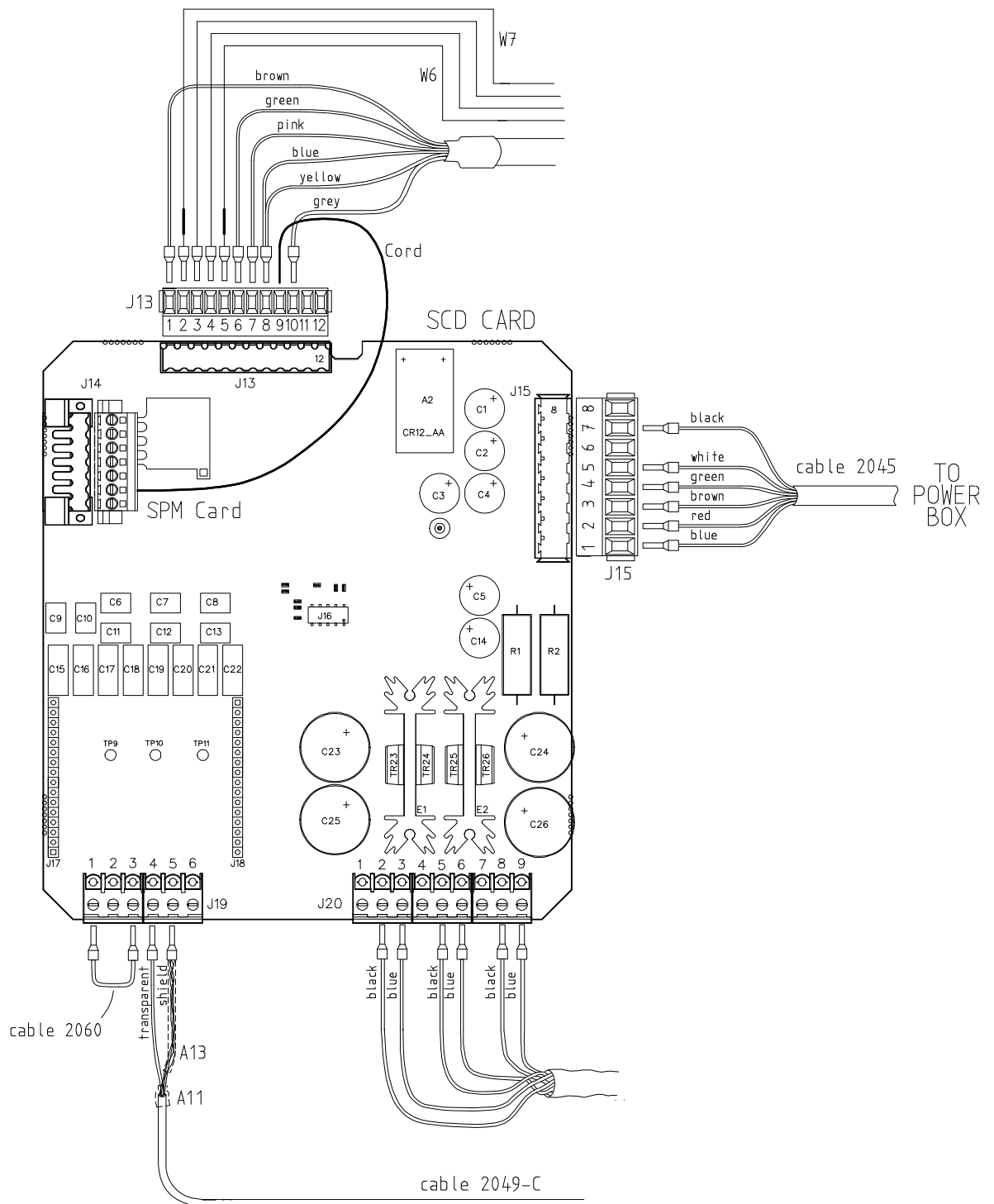


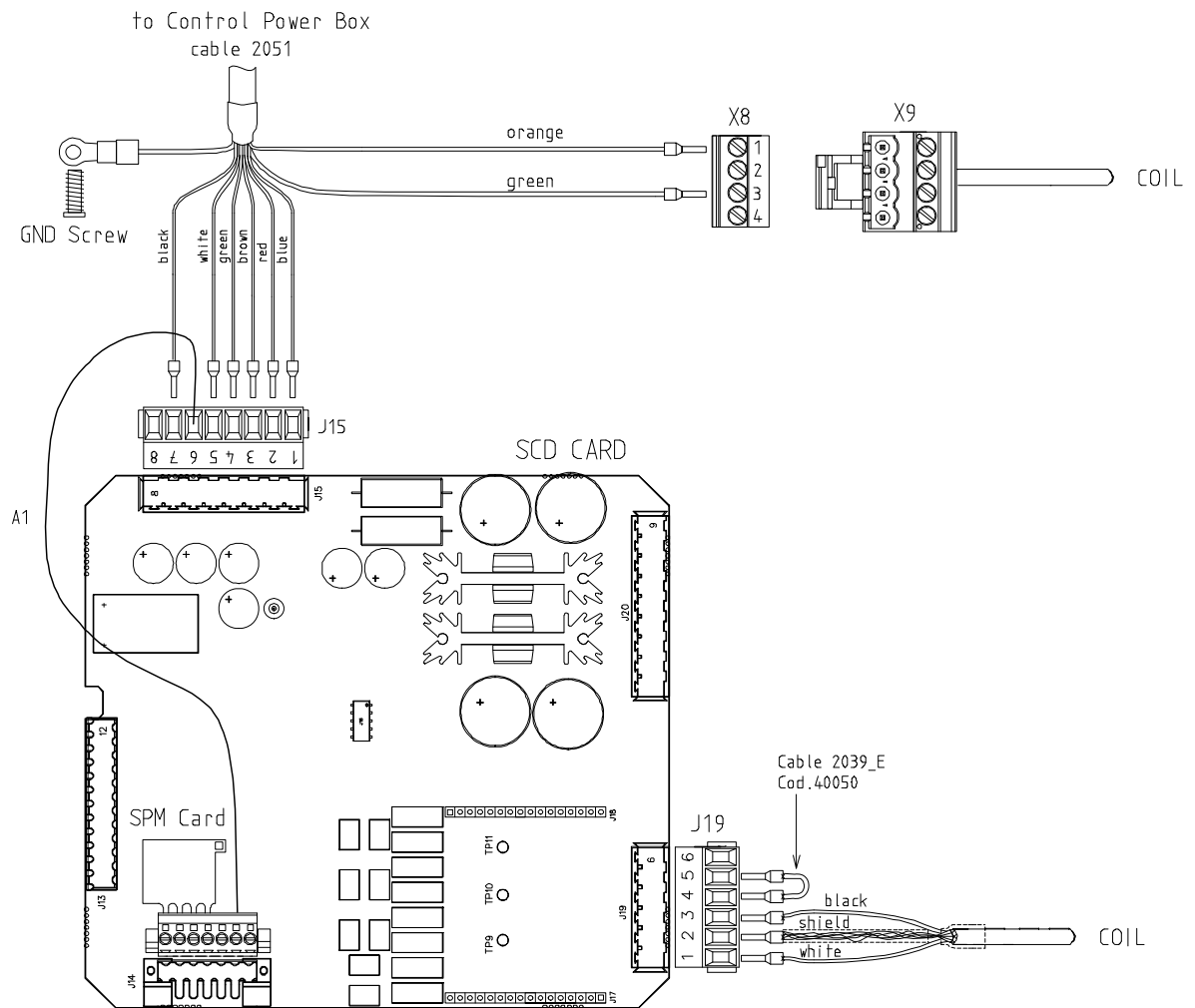
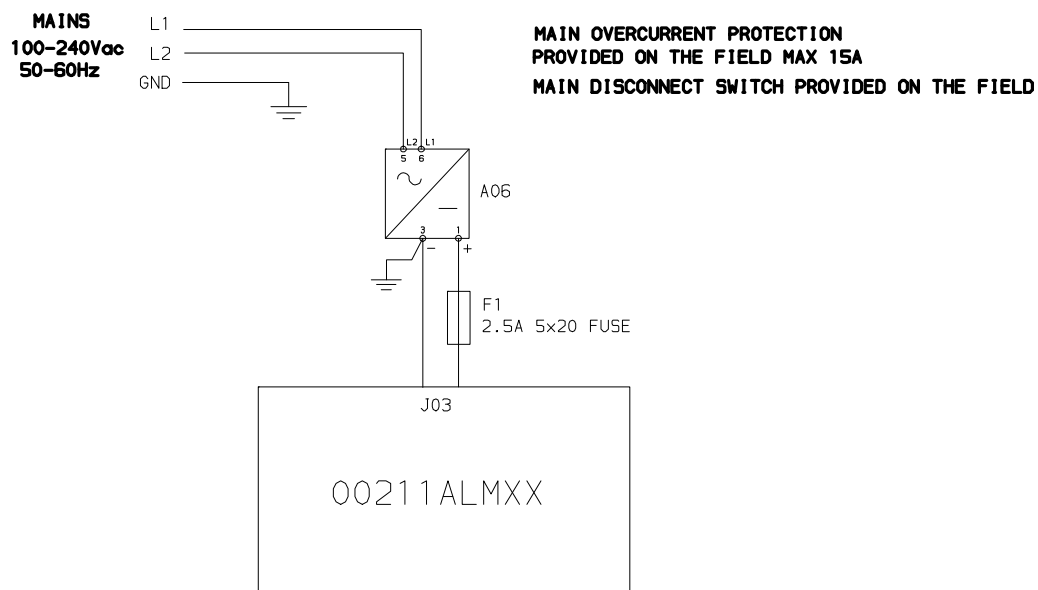
Provide a Main disconnect switch, when not present in the Power Control Box. **Main overcurrent protection provided on the field MAX 15A.**

Connection of the terminals

Connect directly to the terminal boards, identified with L1 and L2 labels, inside the
Conductor section: AWG14 or 2.5 mm².

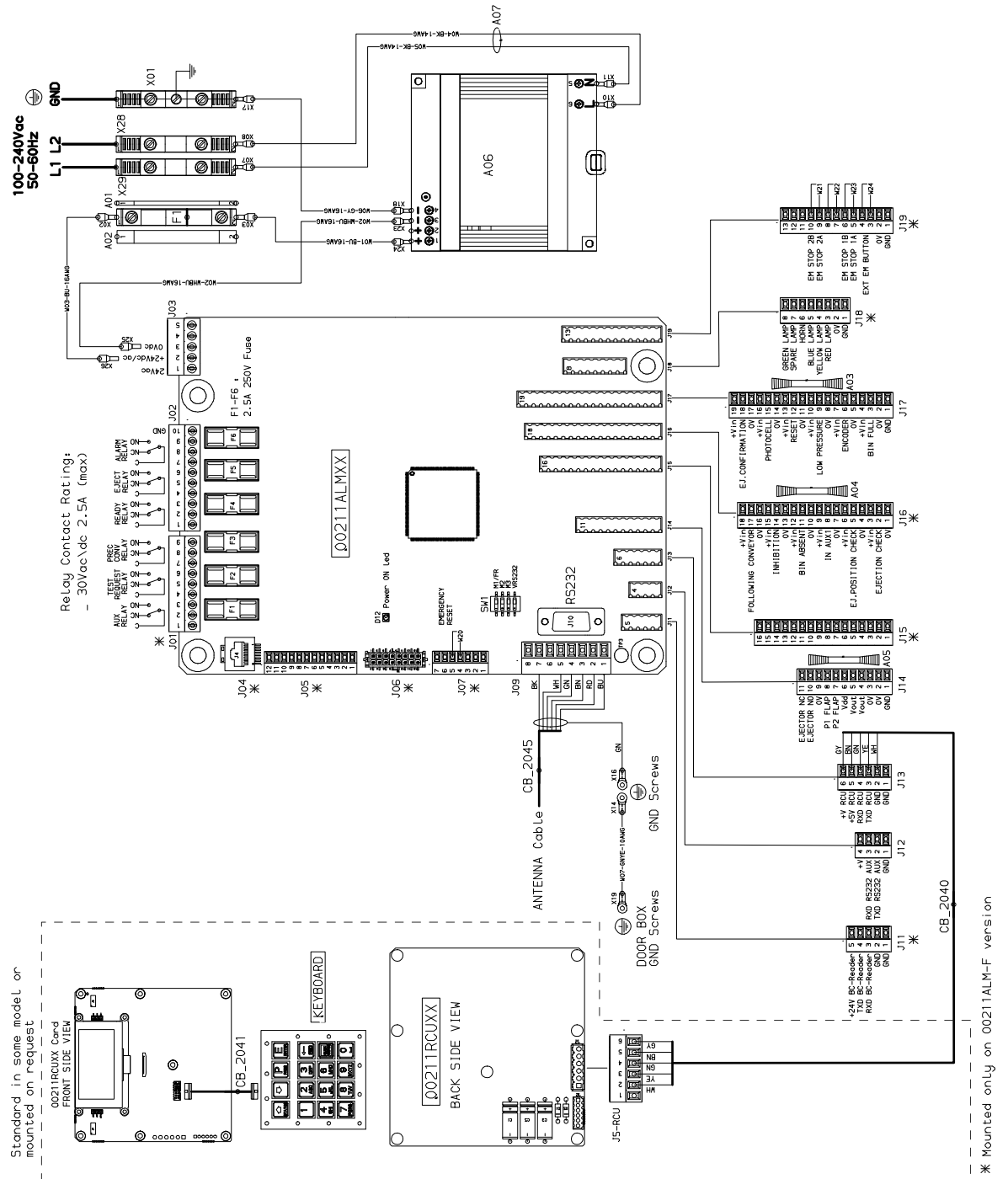
3.6.7 – SCD board Electrical Diagrams**THS/MS21 series (E2526)**

THS/21 and THS/3F21 series (E2527)


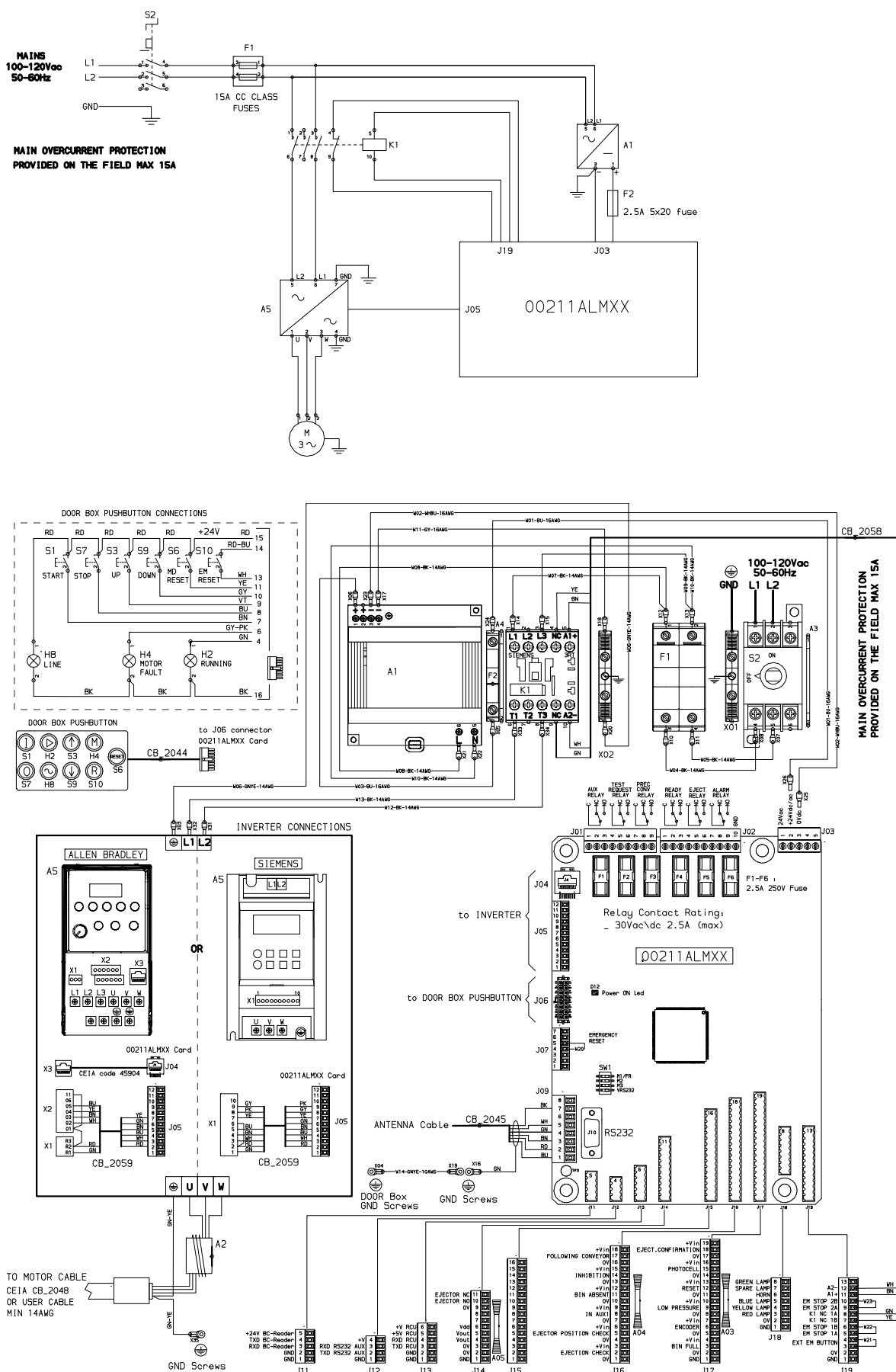
THS/MN21 (E2456)**3.6.8 - ALM board Electrical Diagrams****THS/21, THS/MS21, THS/3F21, THS/MN21 (E2491)**

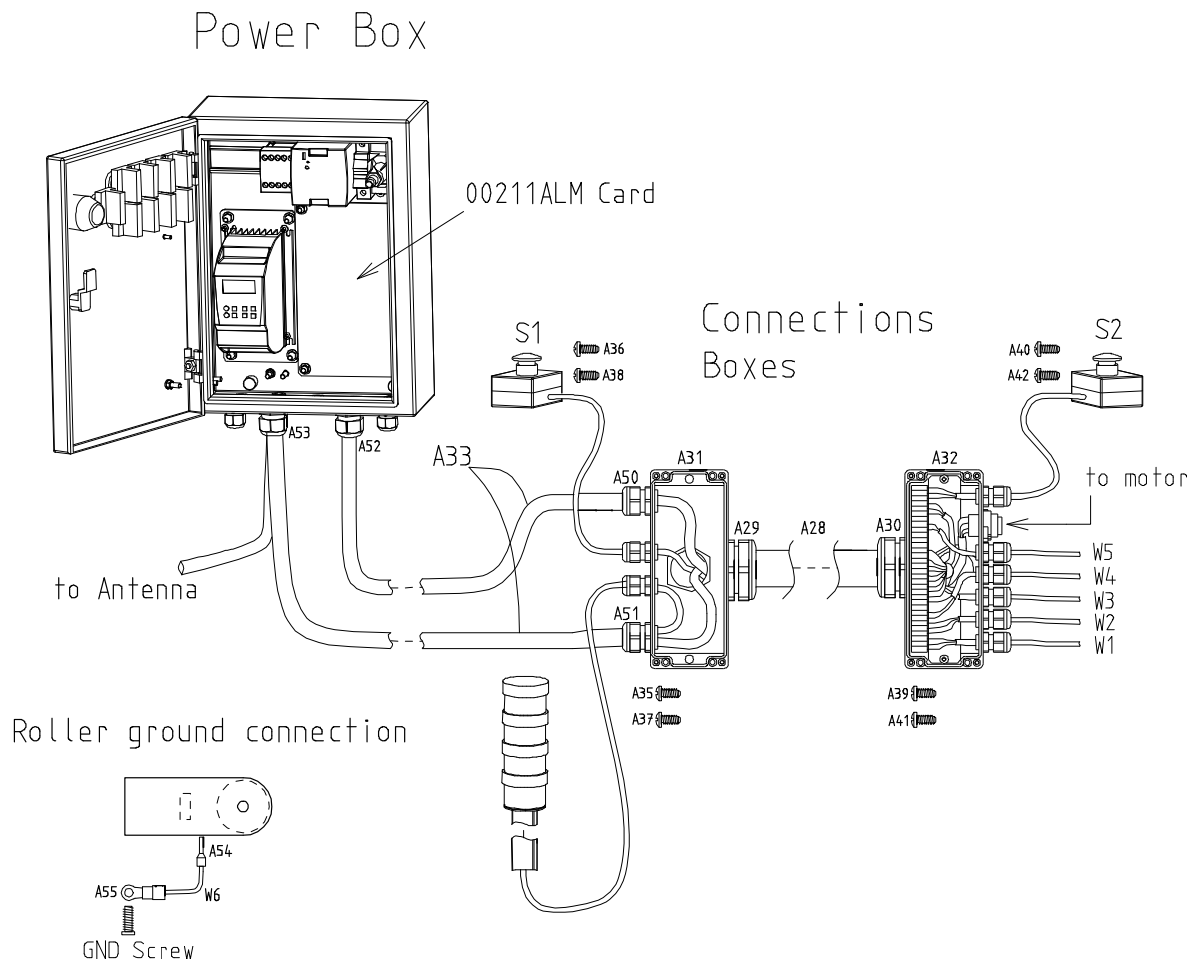
MAIN OVERCURRENT PROTECTION
PROVIDED ON THE FIELD MAX 15A

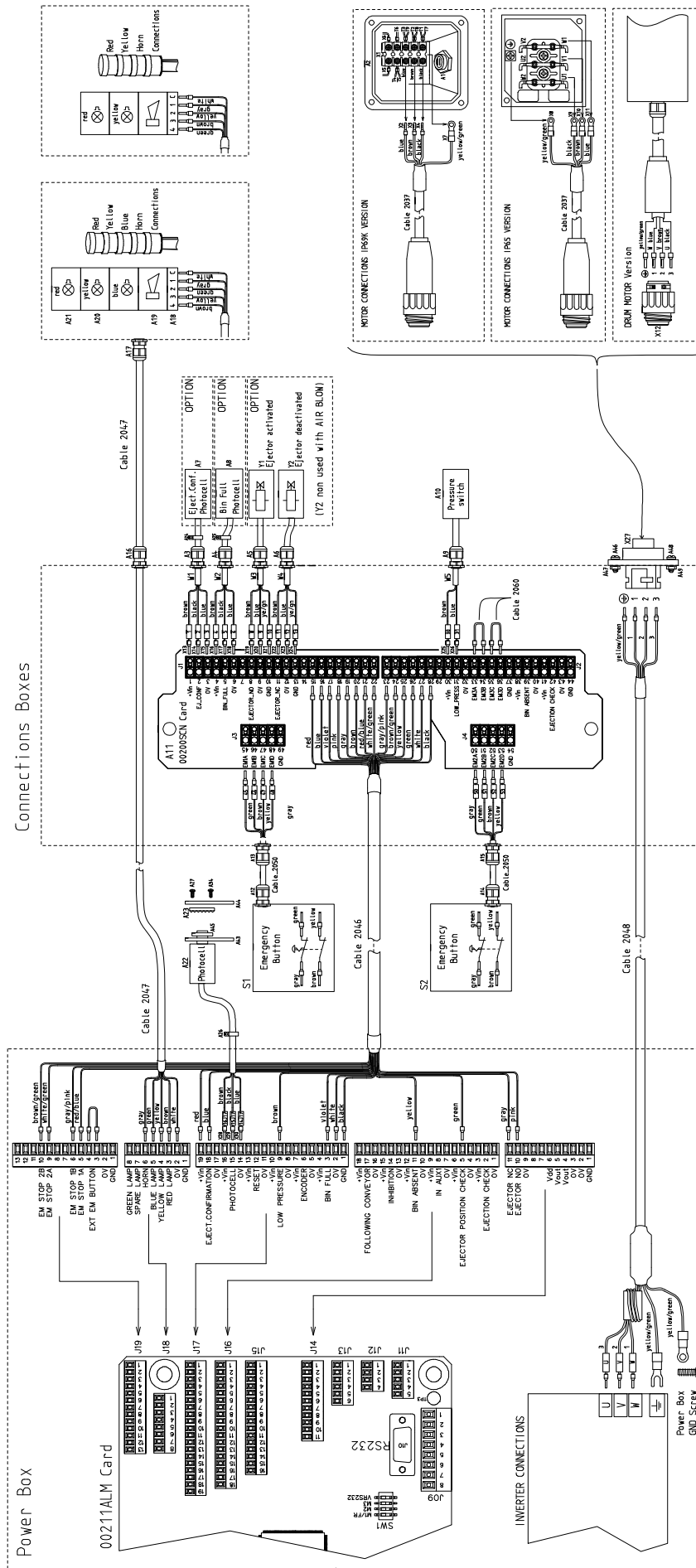
MAIN DISCONNECT SWITCH PROVIDED ON THE FIELD



THS/FB21 and THS/MB21 : 115V versions (E2516_115V)



3.6.9 – Electrical diagrams for Conveyor Control System (E2519)



3.7 – Switching on and starting to operate

3.7.1 – First start

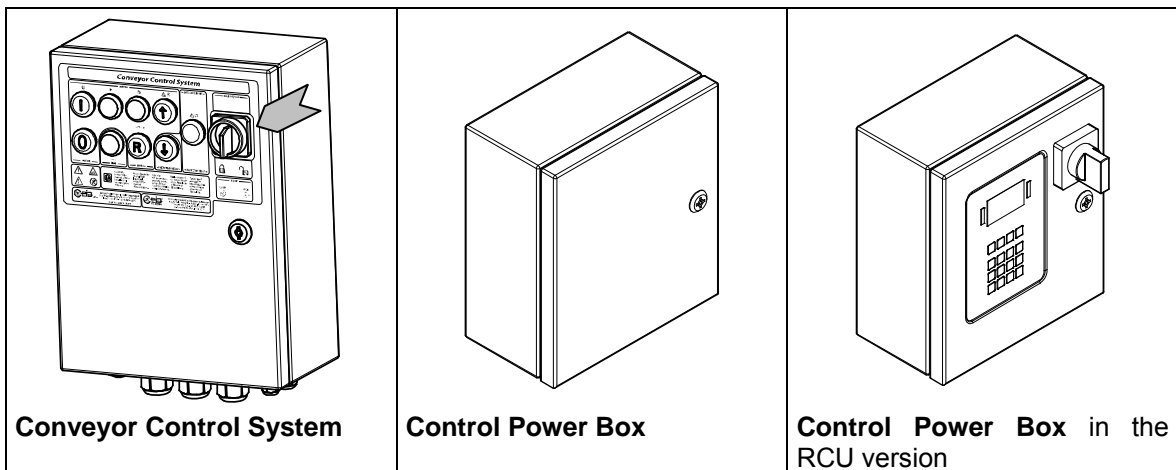
If the equipment is being switched on for the first time, some checks must be carried out and the value of some operating parameters must be set. These operations, which are listed on the first page of the Installation section, are described in the subsequent paragraphs in this section.



When it is first powered up, the Metal Detector's configuration includes 6 factory-set passwords (shown in the test card at the end of the manual). It is **extremely important** that the person in charge of the detector modifies the passwords in order to avoid unauthorised access to programming.

3.7.2 - Power Switch

On the **Conveyor Control System** model, the On/Off switch is located on the power supply unit cover; in the case of the Control Power Box, an external switch must be fitted.



During use do not insert body parts or objects inside the material transit tunnel.



Do not place body parts, clothing or objects close to the device.



Before performing any operation on the device, disconnect both the power supply and the compressed air system.

With the system operative, only the controls of the machine itself (control panels, emergency buttons) are allowed to be used.

3.8 – Setting of installation parameters

The programming parameters must be properly defined depending on the type of installation. To know how to access the programming phase and to modify this parameters values, refers to the **Programming Manual**,

3.8.1 - Transit speed

The THS/21 Programming parameters, managing the transit speed of the product under verification, are the followings:

Programming parameters	Meaning	Generally-applied setting				
		THS/G21	THS/21	THS/SL21	THS/MS21	THS/MN21
BS	Transit speed	2 – 250 m/min				
BL	Minimum transit speed	2 m/min				
BM	Maximum transit speed	250 m/min				
KT	Transmission constant of the motor reducer unit	-	$KT = \frac{transit_speed}{motor_driver_frequency}$			
DI	Diameter of roller	-	$DI = \phi_roller + (2 \times belt_thickness)$			
KE	Encoder constant (impulses per revolution)	-	0-1000 impulses per revolution			
MI	Maximum motor operating frequency	-	60-100 (Hz)			
CU	Maximum motor current absorbtion	-	0.000 - 7.000 A			

Fixed-speed application

Without inverter card and without encoder (KT=0.000, KE=0)

BS should be assigned the true value of the transit speed.



With MDT card but without encoder (KT=F, KE=0)

BS should be assigned the true value of the transit speed.

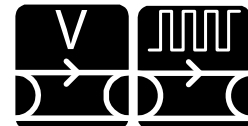
Variable-speed application

With encoder, without inverter card

Speed detected by the encoder.

The speed limits (**BL** e **BM**) must be selected.

The **KT** parameter is **0.000**.



Assign to the **KE** parameter the number of pulses per revolution of the encoder.

Assign to the **DI** parameter the value of the diameter of the motor roller (see table above).

With inverter card, with or without encoder

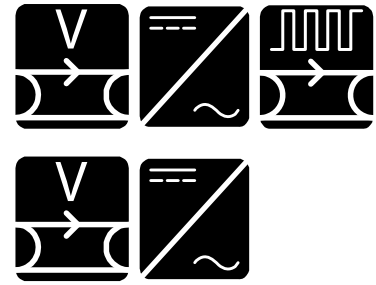
BS should be assigned the desired value of the transit speed (the current speed is detected by the system based on the working location of the inverter, or via an encoder if fitted).

Assign to the **KE** parameter the number of pulses per revolution of the encoder.

Assign to the **DI** parameter the value of the diameter of the motor roller (see table).

Assign the maximum motor operating frequency to parameter **MI**.

Assign the maximum motor current consumption to parameter **CU**.



Some structural relationships must be observed:

$$BL \leq BS \leq BM$$

$$BL \geq 20 \times KT$$

$$BM \leq 60 \times KT$$

The parameter **KT** depends on the system configuration, and can be determined using the following procedure (it is necessary to obtain a transit speed measurement device):

- set $KT=1.000$
- set $BS=50$
- activate the motor and measure the speed of transit V_n
- calculate $KT = V_n/50$

By changing the value of **BS**, the speed can vary between 40% and $(2 \times MI)\%$ of the nominal value of the motor (corresponding to operation at 50Hz).



Note: by modifying the value of **KT**, the parameters **BL** and **BM** are automatically set to nominal values, respectively $20 \times KT$ and $MI \times KT$. **BL** and **BM** can also be modified manually.

ExampleMotor:

operating frequency 50Hz;
max.frequency 60Hz;
max. current 3A;

Encoder:

100 impulses/rev.;

Roller diameter:

60mm;

Belt thickness:

2mm;

Desired speed:

45m/' (min. 25m/' , max. 50 m/'.)

- Set: $MI=60$, $CU=3.000$, $DI=60+(2 \times 2)=64$

- Determine **KT** via this procedure:

$$KT = 1.000, BS = 50$$



$$\text{measured } V_n = 55m/'$$



$$KT = 55/50 = 1.100$$

- Set $BL=25$ (correct value to give $20KT=22$)

- Set $BM=50$ (correct value to give $MI \times KT=66$)

- Set desired speed $BS=45$



The **BS** parameter is memorized individually for each type of product defined. If required, several speed parameters may be set for the same material by defining an equal number of product types.

3.8.2 – Photocells

Programming parameters	Meaning	Generally-applied setting				
		THS/G21	THS/21	THS/SL21	THS/MS21	THS/MN21
PD	Distance between metal detector and photocell	At the entrance to the probe: 0-2000 mm At the exit from the probe: see table below				
PH	Position of the photocell relative to the probe	IN : installed at the entrance to the probe OUT: installed at the exit from the probe				
IP	Type of "Photocell" input	NC, NO				
PA	Enabling of photocell alarm	ON, OFF				

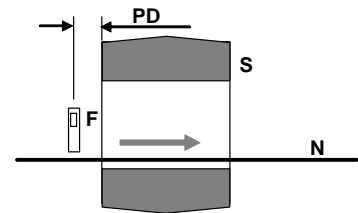


The photocell should naturally be placed at a height whereby it can have a clear view of the objects on the conveyor belt.

Photocell installed at the entrance to the probe

When installed at the entrance to the probe, the photocell distance should be within the range 50 mm to 2 meters.

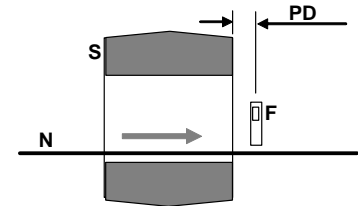
*N: conveyor belt; S: electronics unit;
F: photocell; PD: distance photocell- electronics unit*



Photocell installed at the exit from the probe

When installed at the exit from the probe, the photocell distance (PD in the figure) depends on the belt speed, but should not in any case be less than that indicated in the table below.

*N: conveyor belt; S: electronics unit;
F: photocell; PD: distance photocell- electronics unit*



Belt speed	≤ 20	30	40	50	60	70	80	90	> 100	metres/min
Minimum distance between photocell and electronics unit	50	60	100	130	160	190	230	260	290	mm

Photocell self-diagnosis

If the photocell is in a continuously active state for a long period, this is interpreted as a malfunction of the sensor by the self-diagnosis system. There are many possible causes (wrong position, short-circuited wiring etc.).

The self-diagnosis message may appear (if PA=ON):

- in case of a conveyor belt without encoder or with Power Control Box, with the belt stopped or moving
- in case of a conveyor belt without encoder or with Conveyor Control System, with the belt moving.



The system is not designed to signal a pack which is stuck for some reason in front of the photocell. For this reason, when the system can detect whether or not the conveyor belt is moving (i.e. when it is equipped with an encoder or with the Conveyor Control System power supply unit), the self-diagnosis function gives an alarm only if the photocell is in a state of malfunction when the belt is moving.

On systems without encoder with the Control Power Box, it is the installer's and operator's responsibility to ensure that material does not remain in front of the photocell when the belt is stopped: if it does, the photocell will be continuously active even though it is not malfunctioning. If the foregoing situation can not be avoided, it is advisable to disable photocell self-diagnosis (Parameter PA).

3.8.3 – Ejector

Programming parameters	Meaning	Generally-applied setting				
		THS/G21	THS/21	THS/SL21	THS/MS21	THS/MN21
EM	Ejection mode	Mode B:	halting of the production line and manual elimination of the contaminated material			
		Mode F:	automatic set-aside of contaminated material with alarm synchronisation			
		Mode S:	automatic set-aside of contaminated material with photocell synchronisation			
		Mode SB:	halting of the production line with photocell synchronisation and manual elimination of the contaminated material			
ED	Distance of ejector from probe or photocell	0 - 6000 mm Application with photocell: set Dfe parameter (see following figures) Application without photocell: set Dse parameter				
ET	Ejection relay activation time	0-3200 hundredths of a second				

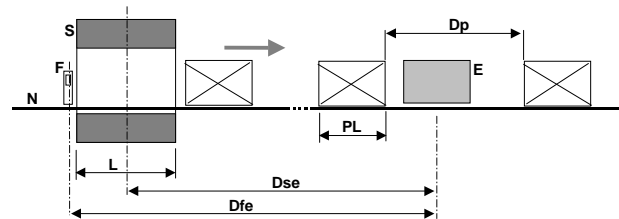
The programming parameters which relate to the ejector are CE, CT, EJ, IE, IL and LF (see Programming Manual).

Position the ejector **E** at the exit point of the central electronics unit. In general, the ejector position is constrained by the following formulas:

Synchronisation with photocell at the entrance to the probe:

$$D_{fe} \leq 20 \times (PL + D_p)$$

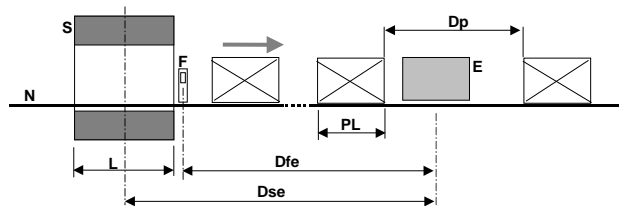
$$D_{se} > 0.5 \times (L + PL)$$



Synchronisation with photocell at the exit from the probe:

$$D_{fe} \geq 0.5 \times PL$$

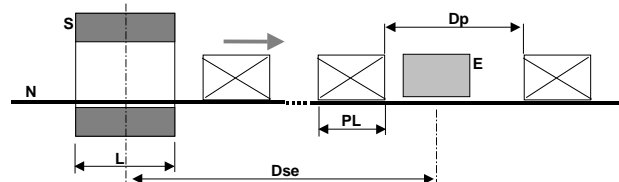
$$D_{se} \leq 20 \times (PL + D_p)$$



Synchronisation with Metal Detector:

$$D_{fe} \leq 20 \times (PL + D_p)$$

$$D_{se} > 0.5 \times (L + PL)$$



N: conveyor belt; S: electronics unit; F: photocell; PL: length of package; E: ejector; L: length of probe; Dfe: distance photocell-ejector; Dse: distance probe-ejector; Dp: distance between packs.



The ejection time **ET** must be determined by experimentation, as it depends on the type of ejector.



To minimise the number of packs rejected at each alarm, it is recommended that **Dp** is longer than **L**, so that only one pack is ejected each time the ejector is activated.

Applications at high speed (belt speeds greater than 60 m/min)

In this case, the response times of the photocell, metal detector and ejector can not be ignored. We would generally advise users to check operation of the ejector experimentally, changing its position and adjusting parameter **ED**.

3.8.4 - Bar-code reader

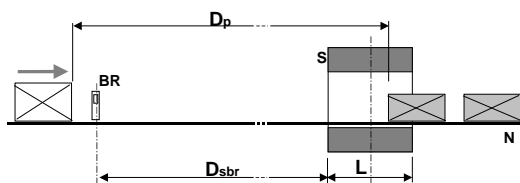
Although the power of the laser beam used in barcode readers is very low, it can be dangerous to the human eye if stared into for long periods of time. Careful attention must be paid to the warnings on use of these lasers. These warnings refer to regulations enforced by local authorities.



Turn the power off when opening the reader during maintenance or installation to avoid dangerous laser radiation.

The reader shall be mounted upstream of the probe in order to read a code stamped on the pack. If the code is recognised, the reader sends a command to the Metal Detector to select the relevant product type. The time required by the THS/21 to process the barcode is usually insignificant, but becomes important if the detection mode is changed due to a modification in the type of product. When the metal detector receives the signal to change product type, an internal adjustment procedure is activated the length of which determines the minimum distance between two packs with different codes, that is to say containing different products.

THS/MS21 with change of detection mode (DM parameter) between two products

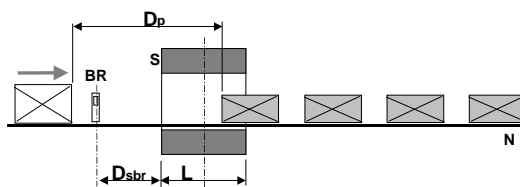


Distance between the packs	Distance between the barcode reader and the THS/21 probe
$D_p \geq L + XX \text{ mm}$	$D_{sbr} \geq XX \text{ mm}$

XX depends on the speed, on the antenna and on the detection mode selected. The correct distance is approximately 3000 mm.

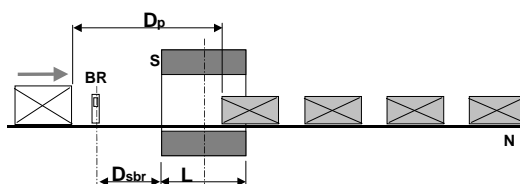
Installing the barcode reader closer than XX distance, will result in a product ejection during two detection modes transitions. After the transition time, the system will be normally operated.

THS/ MS21 without change of detection mode (DM parameter) between two products



Distance between the packs	Distance between the barcode reader and the THS/21 probe
$D_p \geq L + 200 \text{ mm}$	$D_{sbr} \geq 200 \text{ mm}$
The value of 200 mm is valid only if the speed is lower or equal to 60 m/min	

Other THS/21 models



Distance between the packs	Distance between the barcode reader and the THS/21 probe
$D_p \geq L + 200 \text{ mm}$	$D_{sbr} \geq 200 \text{ mm}$
The value of 200 mm is valid only if the speed is lower or equal to 60 m/min	

S: probe/electronics unit of the metal detector; L: length of probe; N: conveyor belt; BR: Barcode reader; D_sbr: Distance THS/21 probe-barcode reader; D_p: Distance between the packs of different products

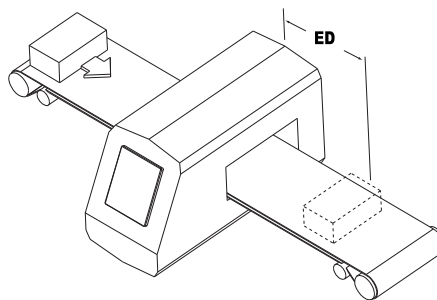
3.9 – Timing

3.9.1 - Belt blocking with manual alarm reset

EM	Product	Models
B	loose or packaged	All models

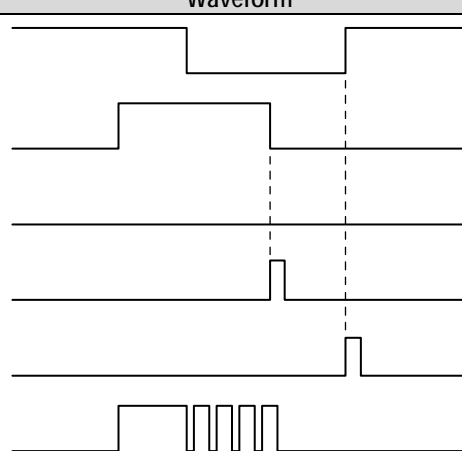
Operation with halting of the production line, manual elimination of the contaminated material and manual reset by the operator.

Belt block without ejector		
Par.	Description	Value
EM	Ejection mode	B
BS	Speed	Belt speed in m/min
ED	Ejection distance	ED (mm) pack stop position

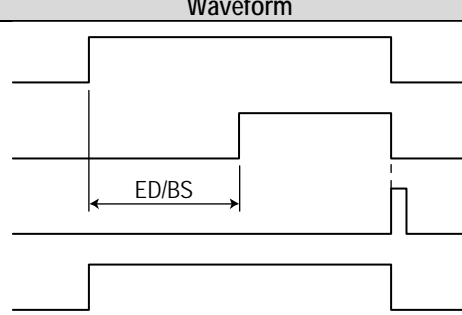


The Metal Detector does not check if there are any subsequent fragments in the material immediately following: all material under the probe must therefore be eliminated along with the part that caused the alarm. To minimise waste of material it is advisable to select a low setting for the ED parameter.

Conveyor Control System power supply unit

Signal	Waveform	Function
Preceding conveyor relay		Upstr. belt authorisation
Alarm relay		Signalling
Ejection		
Reset button		Alarm reset
Start button		Restart
Yellow lamp		Yellow lamp

Control Power Box power supply unit

Signal	Waveform	Function
Alarm relay		Signalling
Ejection		Belt block
Reset button		Alarm reset
Yellow lamp		Yellow lamp

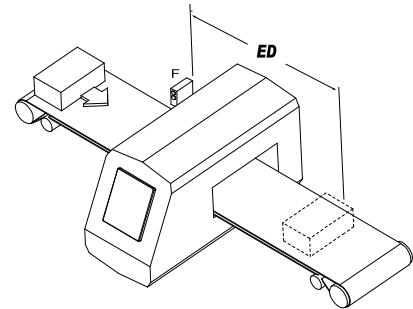
ED = Ejection distance; BS = speed

3.9.2 - Belt blocking with photocell synchronisation and manual alarm reset

EM	Product	Models
SB	loose or packaged	All models

Operation with halting of the production line synchronised by photocell, manual elimination of the contaminated material and manual reset by the operator. Allows precise positioning of the material to be rejected.

Belt block without ejector		
Par.	Description	Value
EM	Ejection mode	SB
BS	Speed	Belt speed in m/min
IP	Photocell input	NO: Normally open NC: Normally closed
ED	Ejection distance	ED (mm) pack stop position



The Metal Detector does not check if there are any subsequent fragments in the material immediately following: all material under the probe must therefore be eliminated along with the part that caused the alarm. To minimise waste of material it is advisable to select a low setting for the ED parameter.

Conveyor Control System power supply unit

Signal	Waveform	Function
Input photocell		Synchronisation
Preceding conveyor relay		Upstr. belt authorisation
Alarm relay		Signalling
Ejection		
Reset button		Alarm reset
Start button		Restart
Yellow lamp		Yellow lamp

Control Power Box power supply unit

Signal	Waveform	Function
Input photocell		Synchronisation
Alarm relay		Signalling
Ejection		
Reset button		Alarm reset
Yellow lamp		Yellow lamp

ED = Ejection distance; BS = Transit speed

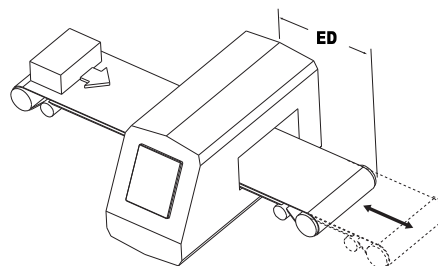
3.9.3 - Automatic ejection with alarm synchronisation



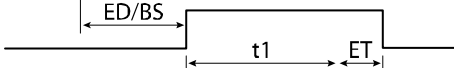

EM	Product	Models
F	loose	All models

Operation with automatic set-aside of contaminated material. The set-aside method can vary: an ejector may be used – without halting the production line – or the material can be eliminated by using a retractable belt. This application is typically used for loose material. The mode allows the following settings to be selected:

- alarm relay activation time (AT parameter);
- ejection distance (ED parameter);
- selection of activation time of the ejection relay (ET parameter).

Retractable belt		
Par.	Description	Value
EM	Ejection mode	F (flap)
BS	Speed	Belt speed in m/min
ET	Ejection time	Ejection time
EJ	Ejection	ON
ED	Ejection distance	ED (mm)



Signal	Waveform	Function
Preceding conveyor relay		None
Alarm relay		Signalling
Ejection		Ejection
Yellow lamp		None

ED = Ejection distance; BS = Transit speed; ET = Ejection relay activation time

t1 = alarm time, generally corresponding to the transit of the metal mass through the probe



Parameter AT is set to automatic (AT=A).

3.9.4 - Automatic ejection with photocell synchronisation

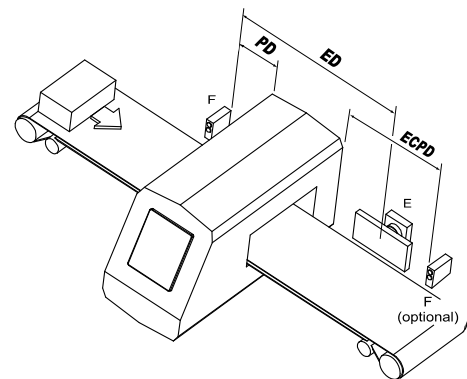
EM	Product	Models
S	packaged	All models

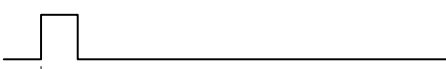
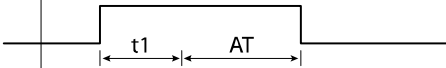
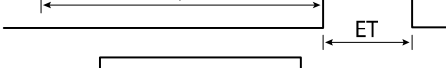
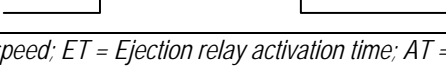
Operation with automatic set-aside of contaminated material, synchronised by photocell. Very similar to the above application, this mode can be used for packaged products.

The mode allows the following settings to be selected:

- alarm relay activation time (AT parameter);
- ejection distance (ED parameter);
- selection of activation time of the ejection (ET parameter);
- selection of the distance between metal detector and photocell (PD parameter);
- selection of the position of the photocell (PH parameter);

Photocell at entrance, with ejector		
Par.	Description	Value
EM	Ejection mode	S (synchronised)
BS	Speed	Belt speed in m/min
IP	Photocell input	NO: normally open NC: normally closed
ET	Ejection time	Ejection time in seconds
ED	Ejection distance	ED (mm)
PD	Distance photoc. Metal Detector	PD (mm)
PH	Photocell position	IN
ECPD	Check photo. dist.	ECPD (mm)

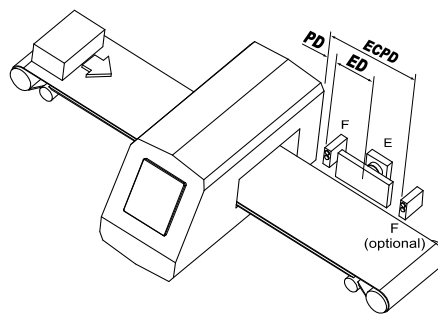


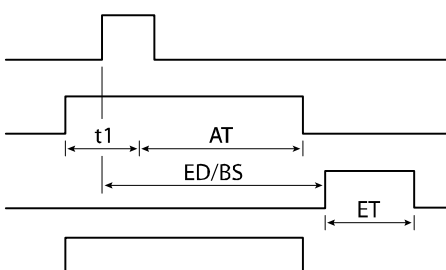
Signal	Waveform	Function
Photocell		Synchronisation
Alarm relay		Signalling
Ejection		Ejection
Yellow lamp		Yellow lamp

ED = Ejection distance; BS = Transit speed; ET = Ejection relay activation time; AT = alarm relay activation time; t1 = alarm time, generally corresponding to the transit of the metal mass through the probe.

Photocell at exit, with ejector

Par.	Description	Value
EM	Ejection mode	S (synchronised)
BS	Speed	Belt speed in m/min
IP	Photocell input	NO: normally open NC: normally closed
ET	Ejection time	Ejection time in seconds
ED	Ejection distance	ED (mm)
PD	Distance photoc. Metal Detector	PD (mm)
PH	Photocell position	OUT
ECPD	Check photo. dist.	ECPD (mm)



Signal	Waveform	Function
Photocell		Synchronisation
Alarm relay		Signalling
Ejection		Ejection
Yellow lamp		Yellow lamp

*ED = Ejection distance; BS = Transit speed; ET = Ejection relay activation time; AT = alarm relay activation time ;
t1 = alarm time, generally corresponding to the transit of the metal mass through the probe.*

3.9.5 - Automatic ejection with photocell synchronisation

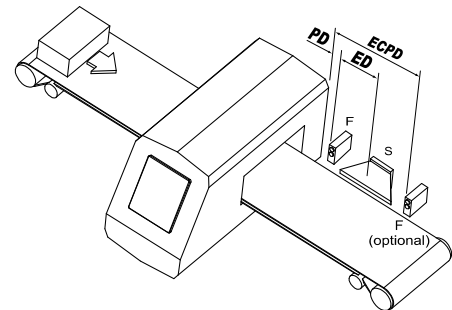
EM	Product	Models
FS	packaged	All models

Operation with automatic set-aside of contaminated material, synchronised by photocell. Very similar to the above application, this mode can be used for packaged products.

The mode allows the following settings to be selected:

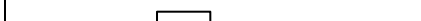

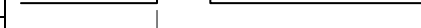

- alarm relay activation time (AT parameter);
- ejection distance (ED parameter);
- selection of activation time of the ejection (ET parameter);
- selection of the distance between metal detector and photocell (PD parameter);
- selection of the position of the photocell (PH parameter);

Photocell at exit, with air blow		
Par.	Description	Value
EM	Ejection mode	FS
BS	Speed	Belt speed in m/min
IP	Photocell input	NO: normally open / NC: normally closed
ET	Ejection time	Ejection time in seconds
ED	Ejection distance	ED (mm)
PD	Distance photoc. Metal Detector	PD (mm)
ECPD	Check photo. dist.	ECPD (mm)
ERT	Ejector activation response time	in seconds
EFR	Ejector deactivation response time	in seconds



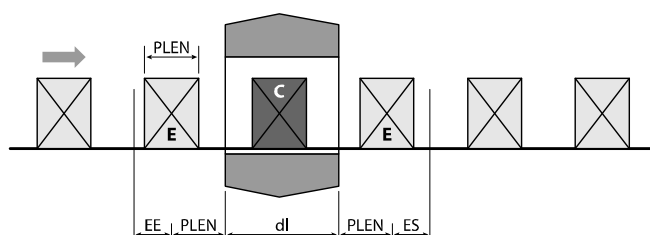
E: Ejector; F: Photocell; S: Air Blow

Photocell at exit

Signal	Waveform	Function
Photocell		Synchronisation
Alarm relay		Signalling
Ejection		Ejection
Yellow lamp		Yellow lamp

AT = alarm relay activation time;

a / b = they are set automatically from the metal detector in order to eject the product shown below.



PLEN = Pack length;

 $dl = \text{Detector length};$

E = Ejected pack:

C = Contaminated and ejected pack;

EE = Ejection end synchronization area;

ES = Ejection start synchronization area

The THS system will eject all products in an area of **EE + PLEN + dl + PLEN + ES**, including the pack that gives the alarm.

3.10 – Correct installation verification procedure

In order to verify the correct installation of the device, perform the following operations:

- 1) Switch ON the Metal Detector.
- 2) Access the programming phase and, under the **I/O Status > Inputs** menu, verify all connected inputs status, operating them in sequence (for example: Ejection confirmation, Bin full etc..)
- 3) Set all the parameters related to the installation (**Configuration** and **Configuration (advan)** menus).
- 4) Select the “Default” product.
- 5) Verify that the Test Samples indicated on the Factory Acceptance Test (FAT) are detected.
- 6) Create a new product.
- 7) Perform a product effect compensation (see Autolearn in the Programming Manual) if necessary and adjust the Sensitivity to the requested value.
- 8) Pass some not-contaminated product inside the Detector and verify the absence of alarms.
- 9) Pass some product together with the sample inside the Detector and verify the presence of alarms and the ejection of the product.

4 - USE OF THE DEVICE

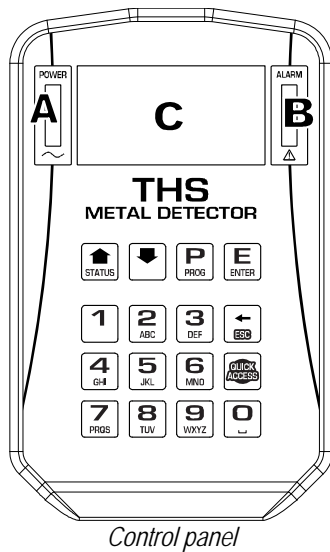


Before starting to use the device, read carefully the **Safety instructions – Warnings** section of this manual

4.1 - Indicators

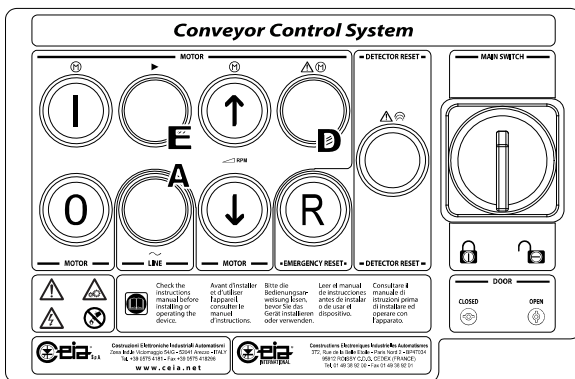
4.1.1 - Optical indicators

The control panel, containing the optical indicators and the metal detector controls, is located on one side of the electronics unit:



A	POWER	a green indicator indicates the presence of power
B	ALARM	a red indicator indicates the metal detector alarm (detection of a metal fragment or breakdown)
C	Display	display the messages relating to use, programming and self-diagnosis of the device

Conveyor Control System



A	POWER	a green indicator indicates the presence of power
D	MOTOR	a red indicator indicates the conveyor motor alarm (malfunction)
E	Conveyor movement	a green indicator indicates that the conveyor is running


















4.1.2 – Acoustical indicators

In the Power Control Box is included an acoustical indicator that is activated in case of alarm for the detection of metallic fragments, for the signalization of a fault or for the request of an operator intervention.

4.2 – Controls

4.2.1 – Control Panel

The control of the Metal Detector and the setting of the device parameters are performed through the control panel keyboard, as shown below:

Key	Function
	Access and exit from the programming phase
	Return back from the submenus to the previous menu
	Exit from the Metal Detector Status visualization
 	Scroll through the sequence of instructions
	Choice of the parameters to be changed
	Metal Detector Status visualization
	Selection of the selected submenu from the main menu
	Confirmation of the data entered
	Reset of some kinds of fault
	Cancel the last character entered
	Quick access to preset functions
         	Modification of the parameter values



4.2.2 – Conveyor Control System power supply unit control panel

On the power supply unit **Conveyor Control System**, the container cover incorporates a motor control panel.

In the case of operation with stopping of the belt and manual resetting, the motor start/stop button also functions as the alarm reset.

The motor speed control keys, if activated with UD=ON, have different functions depending on the version.

Fixed-speed Conveyor Control System



Key	Motor status	
	ON	OFF
	No function	Manual advance *
	No function	Manual reverse *

* if parameter MM = ON



During manual advance/reverse, the Metal Detector is **not** operative.

Variable-speed Conveyor Control System

Key	Motor status			
	Parameter MM = OFF		Parameter MM = ON	
	Motor ON	Motor OFF	Motor ON	Motor OFF
	Increase in speed	No function	No function	Manual advance
	Decrease in speed	No function	No function	Manual reverse



During manual advance/reverse, the Metal Detector is **not** operative.

4.3 – Access levels

Upon access to Programming a **user name** and a **password** can be requested.

Every level of programming allows access to various groups of operating parameters, as can be seen below (see *Programming Manual*).

		Operator	Supervisor	Technician	Quality Control Operator	Head of Quality Control	Administrator
MENU	Administrator						•
	Product Selection	•				•	•
	Products		•	•			•
	Autolearn		•	•			•
	Autolearn (advan)						•
	Detection		•	•			•
	Ejection		•	•			•
	Counters					•	•
	Configuration			•			•
	Configuration(advan)			•			•
	Barcode *		•	•			•
	I/O Status			•			•
	Diagnosis manager			•			•
	MD Test				•	•	•
	Print					•	•
	Q C setup					•	•

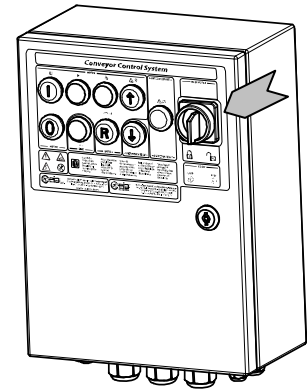
* menu available only when a barcode reader is fitted.

4.4 – Switching on the metal detector



It is strictly forbidden to start up the system if all safety features are not properly functional.
Tampering with the safety features is also forbidden, and voids all responsibility of the manufacturer for any damage caused.

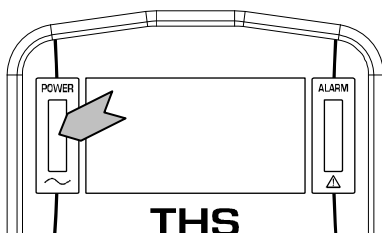
On the **Conveyor Control System** model, the ON/OFF switch is located on the power supply unit cover; in the case of the Control Power Box, the external switch must be operated.



Conveyor Control System

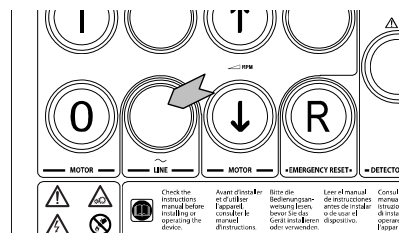
4.4.1 - Signals at power-up

The detector is designed to be switched on directly from the electrical panel that controls the production line.



Control Panel

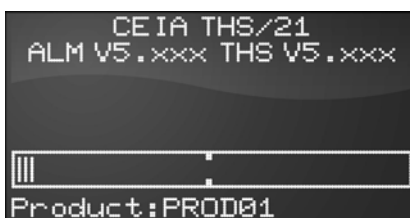
The presence of mains power supply is signalled by the lighting up of the indicator located on the control panel



Conveyor Control System

When the device is turned on, the display lights up, as do the indicators located on the front of the electronics unit.

More specifically, the display shows, in sequence, the serial number and the version of the software program that drives the power supply unit; after that the following is displayed:



The first line identifies the model

The second line identifies the software version of the metal detector

The last line indicates the type of programming, specific to one product, which may be chosen from among 250 stored sets, of which 249 can be defined by the user (see Programming chapter); each stored programming set is customised and relates to a specific product to be monitored.

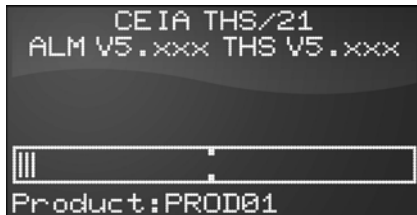
4.4.2 – Signals given during normal use



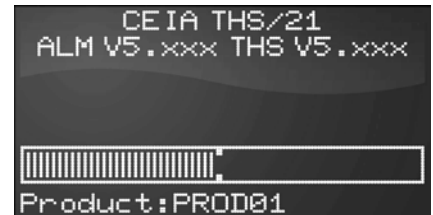
On models where there is a control panel on both the probe and the power supply unit (because the probe is installed in a position which is inaccessible to the operator), the electronics unit display is disabled (the message "Disabled" appears).

Indication of the received signal

On the fourth line of the display the signal being received is displayed by means of a horizontal illuminating bar, subdivided into sections. When the signal increases, the bar extends towards the right. The alarm threshold corresponds to the center of the bar: the sections on the left are vertical bars, those on the right fills a white area.



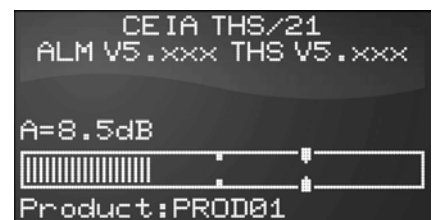
Signal well below
the threshold level



Signal just below
the threshold level



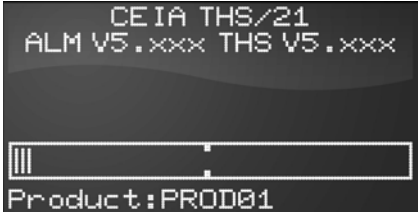
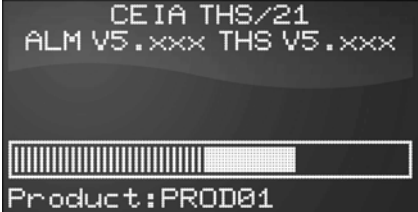




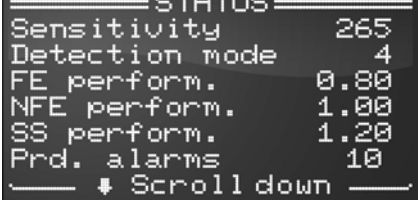




Signal above
the threshold level (alarm)



After the alarm, the maximum signal
is visualized for a few seconds
together with its amplitude

Display Messages

The Metal Detector display shows messages relating to its current mode of operation:

	<p>The Metal Detector is in normal operating mode: it will detect metals and activate connected slave devices.</p>
	<p>The Metal Detector is in normal operating mode: it has just detected a metal object, uttering the alarm and activates connected slave devices.</p>
	<p>Programming access phase: the Metal Detector requests password to be entered.</p>
	<p>The Metal Detector has been set to programming mode: accessible parameters can be modified.</p>
	<p>The Metal Detector requires an operational test to be carried out (see "Periodic test management " section below)</p>
	<p>The Metal Detector requires an intervention.</p>
	<p>If the  (increase) key is pressed when the display shows normal operation, a list of information relating to the Metal Detector's status is shown. It is possible to scroll the list of information, using  (increase) and  (decrease) keys. Press  to return to the normal operation display.</p>

4.4.3 – Signals given during Self-diagnosis

The THS/21 Metal Detector has an embedded Self-Diagnosis system. The message shown on the display are indicated on paragraph 5.5.

4.5 – Use of the device





4.5.1 – Sensitivity check with reference sample







It is important to check proper operation (sensitivity and ejection of material) of the metal detector periodically by carrying out a sensitivity test with a reference sample.
See paragraph 4.7.1 for the procedure.

4.5.2 – Normal use

Starting/stopping the conveyor belt

With the correct power supply and with the motor stopped, check that the LED indicators are ON or OFF as shown in the following table:

Indicator		Status
	Mains voltage	ON
	Motor on	OFF
	Motor malfunction	OFF
	Metal Detector alarm	OFF

- Press the **start** button  to switch on the motor: check that it starts up, and that the “motor on” indicator  comes on.
- To stop the motor press the **stop** button  again: check that it stops, and that the “motor on” indicator  goes off.
- **Fixed-speed Conveyor Control System:**
check the manual movement of the motor using the  and  keys (if MM=ON).

Adjustment of the belt speed

The motor speed control keys have different functions according to the value of parameter MM (see Programming section).



The speed of the conveyor belt can be adjusted by:

- programming the **BS** parameter on the Metal Detector
- simply pushing the keys located on the Conveyor Control System, if parameter **MM=OFF**.



During programming of the Metal Detector, the Conveyor Control System UP and DOWN keys are disabled. While the Conveyor Control System keys are being used, Metal Detector programming is disabled.

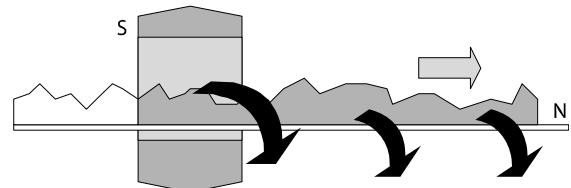
```
Minimum speed.....20+
Speed               40
Maximum speed       60
```

The “Speed” reading indicates the speed set, and varies in real time when the  and  keys are pressed. Any variation in speed is memorised as a parameter specific to the current product type.

Alarm reset



In the case of an alarm, the contaminated product is ejected from the product conveyor according to the type of operation which has been selected:

- in operation with automatic ejection, the belt is not stopped and the contaminated product is sent into a set-aside container which should be emptied periodically by the operator. In this case, the detector resets automatically.
- in operation where the conveyor belt is blocked, the belt is stopped and the contaminated product is positioned in the exit area of the metal detector for manual removal by the operator.



All material between the probe and the stop line must be removed

In this case, the belt only restarts when the operator pushes the appropriate button. In the case of the **Conveyor Control System**, this button is incorporated into the control panel:

Action	Indicators and results
Press once the button  to reset the Detector alarm	The metal detector alarm indicator goes off
Press again  to restart the motor	The motor restarts

4.5.3 – Stop

If nothing passes through the metal detector for the length of time set by parameter ST (see Programming section), the conveyor belt stops automatically.

Emergency button

An extra emergency button is mounted on the conveyor belt to stop it in case of malfunction or danger.



If necessary, the main system switch can also be used for this purpose.



The alarm indicators are activated

4.6 - Programming

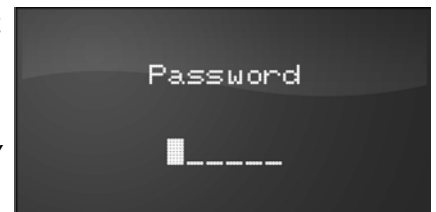
For all programming operations, modifications of installation parameters, local and remote control, see the Programming manual, shipped with the present manual.

4.6.1 - Access to Programming mode

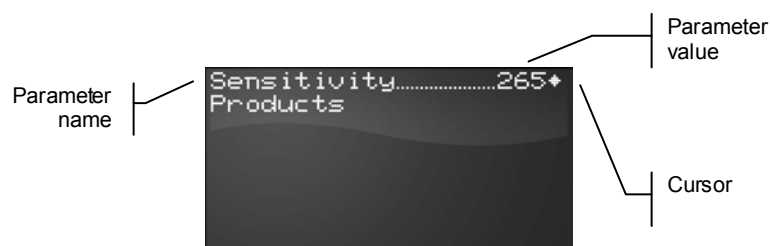
Programming mode is accessed by pressing key . The Metal Detector requests a password to be entered:

The password is entered by the numeric keypad, confirming at the end with the E key.

Access to programming: password entry



After the password has been entered, the Metal Detector is inhibited, access to programming is given, and the display shows the parameters available for the programming level in question:



Example of display output during operator-level programming

4.7 – Functional tests

4.7.1 – Sensitivity check with reference sample

It is important to check proper operation (sensitivity and ejection of material) of the metal detector periodically by carrying out a sensitivity test with a reference sample.

Test using a sample defined by the customer

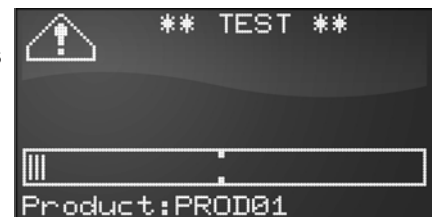
- The reference sample is identified at the end of the installation phase based on the customer's specifications; the sensitivity, trajectory and orientation of the sample must be noted if it is not spherical.
- This sample should be kept under constant conditions, and is used periodically for the test, which should be carried out under the same conditions as the end-of-installation test.

Test using a CEIA sample

- The reference sample is one of the CEIA spherical samples available in various sizes and in three types of metal (ferrous, non-ferrous and stainless steel)
- Determine by experiment the sensitivity needed to detect the sample, or carry out the procedure for minimising the product effect
- Enter the diameter of the sample in the FD parameter (or SD, or ND, depending on the type of metal used)
- Set the intervals and the waiting period for carrying out the test, and whether or not the malfunction relay is activated if the test is not performed (see QA Configuration menu)

Periodic test management

At the end of the period *Test interv.* (from when the metal detector is switched on), a message requesting a test is displayed: (this can also be signalled via an optional lamp).



The check can be carried out either by the Quality-control Operator or the Head of Quality Control.







To exclude the reminder to carry out the test periodically, set parameter $TE = 0$.

Test procedure






The procedure described below refers to the FE test; the other two tests follow the same procedure.

Positive test

	Display	Comment
1	FE test -0.80.....♦ NFE test-1.00 SS test -1.20	Press  key
2	 WAIT	Wait about 3 seconds
3	 PASS FE SAMPLE	Pass a sample through the probe within 20 seconds. If a photocell is fitted, pass the product through together with the sample.
4	 TEST FE PASSED	Test finished with positive outcome: the metal sample has been detected and possibly ejected (check of "ejection confirmation" input). The positive outcome is recorded in memory.

If the test fails, one of the following messages will be seen at point 4:

Negative test

	Display	Comment
4	 TEST FE FAILED NO SAMPLE DETECTED	In this case, no transit has been detected for 20 seconds, or the signal from the sample is below the alarm threshold. The negative outcome is reported also in the test menu.
4	 TEST FE FAILED SAMPLE TOO BIG	The sample is considered too large to carry out a valid test. The Metal Detector set itself in fault status. Pressing any key, the display returns to the MD test menu, where the negative outcome is also shown.
4	 TEST FE FAILED EJECT.NOT CONFIRM	If the sample is correctly detected, but there is not any confirmation of its ejection, the test fail. The negative outcome is reported also in the test menu.
4	FE test -0.80.....NO(1)♦ NFE test-1.00  TEST ABORTED	If the self-diagnosis system reports any other fault, as, for example, the bin full, the test sequence is aborted and the display shows a message as beside. It's mandatory to solve the fault, to reset the Metal Detector and to repeat the operation.
4	FE test -0.80.....NO(1)♦ NFE test-1.00  REMOVE FAULT CONDITIONS	In any case, after a failed test, it's mandatory to exit from programming, to reset the Metal Detector and to repeat the operation.

The outcome of the test, whether positive or negative, is always stored in memory.



In the case of abnormal operation, carry out a test using the sample indicated on the Factory Acceptance Test enclosed with each unit, after selecting the "default" product.

5 - MAINTENANCE



Before starting any maintenance operation, read carefully the Safety instructions - Warnings section of this manual.



Any maintenance or repair of the device while open and energised should be avoided, and in any case should only be carried out by trained personnel who are fully aware of the risks which the operation entails, following the instructions given in the "Maintenance" section.



When the mains is disconnected using the main switch S1 of the Conveyor Control System, the power supply section is deactivated, but the contacts which are connected permanently to the mains, e.g. the relay outputs, remain energised. When the I2 service switch is turned off, most components remain energised.

5.1 - Periodic Maintenance

The following is a list of maintenance operations and their suggested frequency.

Operation	Frequency	Operator	Procedure
Preventive maintenance	At the beginning of each shift	Operator	Visual check of the integrity of the components
	On changing product type		
	Periodically		
Detection check	At the beginning of each shift	Quality-control operator; Head of quality control	Par. 4.7.1
	On changing product type		
	Periodically		
Cleaning	At the beginning of each shift	Operator	Par. 5.2.1
	On changing product type	Operator	
	Periodically		
Cleaning of the Conveyor belt (THS/21/FB)	When needed	Operator	Par. 5.2.2
Conveyor belt tension adjustment (THS/21/FB)	6 months or when needed	Maintenance personnel	Par. 5.2.3
Locking of terminals used to connect control panels	6 months	Maintenance personnel	
Tightening of the screws	6 months	Maintenance personnel	



The operator must monitor the condition of the system and its suitability for use, and consult the maintenance personnel if necessary.

5.2 – Periodic Maintenance procedures

5.2.1 – External cleaning instructions

Use only products compatible with Stainless Steel (AISI 316), PETG and silicon.

Close the plastic door of the control panel before starting any cleaning procedure.

Use a slightly moist, non-abrasive cloth.

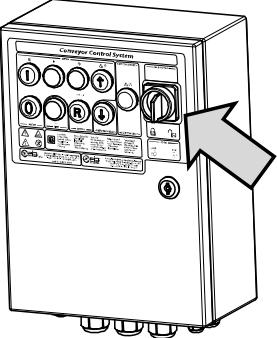
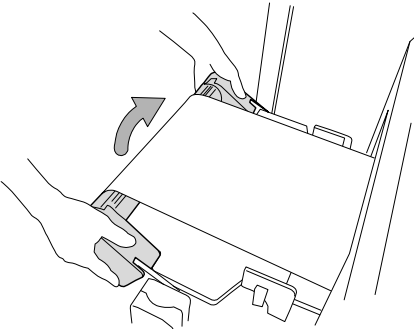
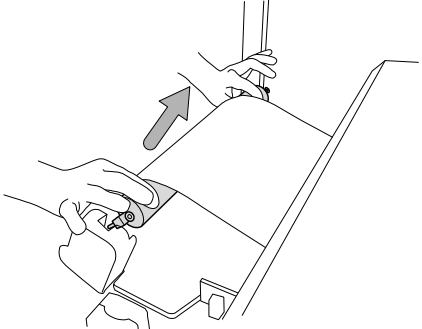
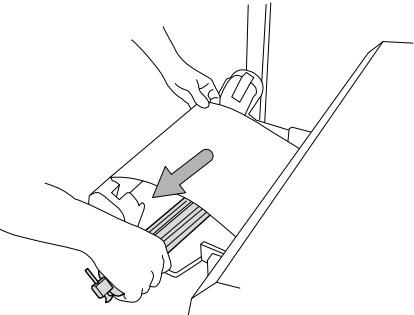
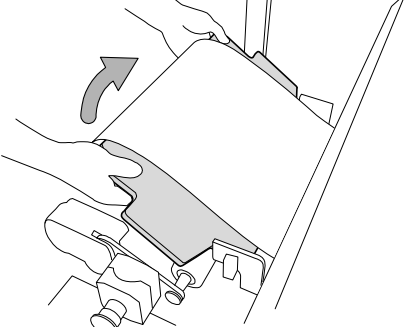
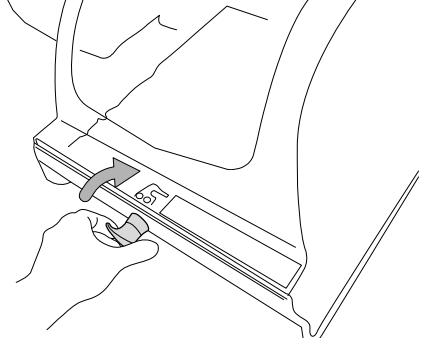
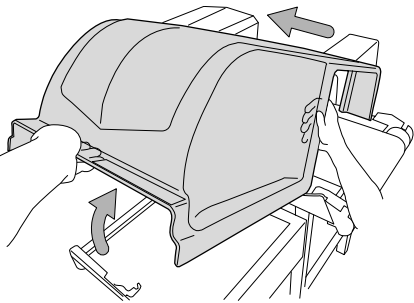
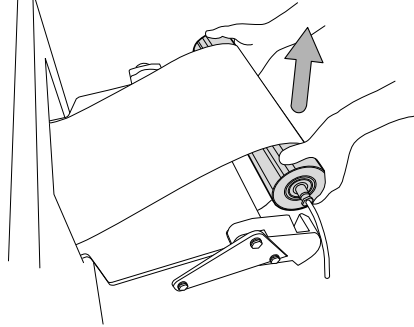
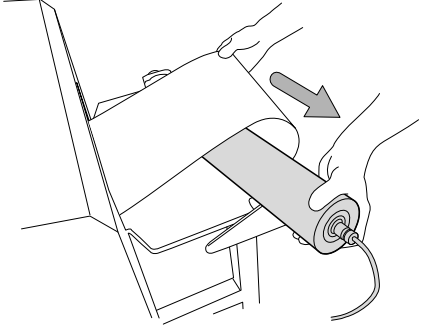


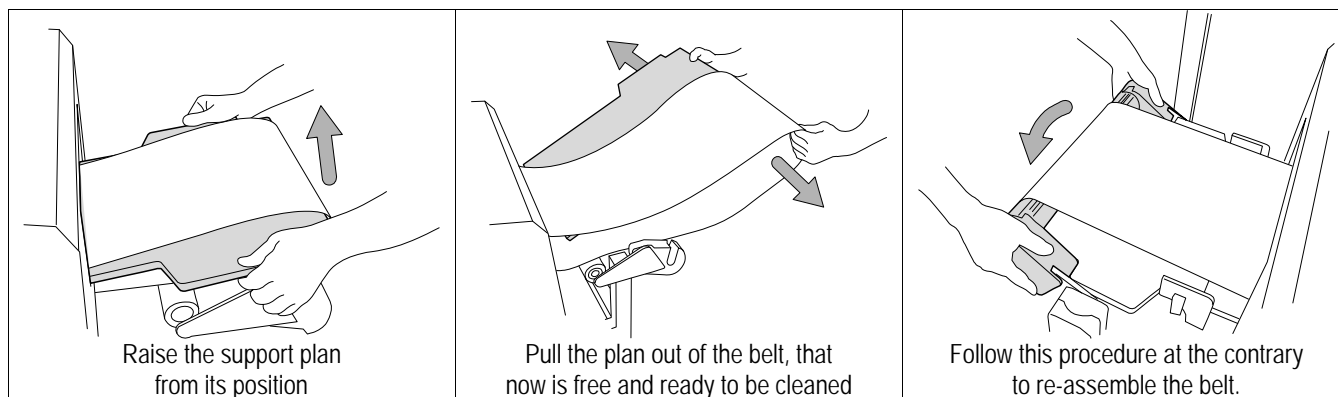
Do NOT use HYDROCHLORIC ACID or its solutions.



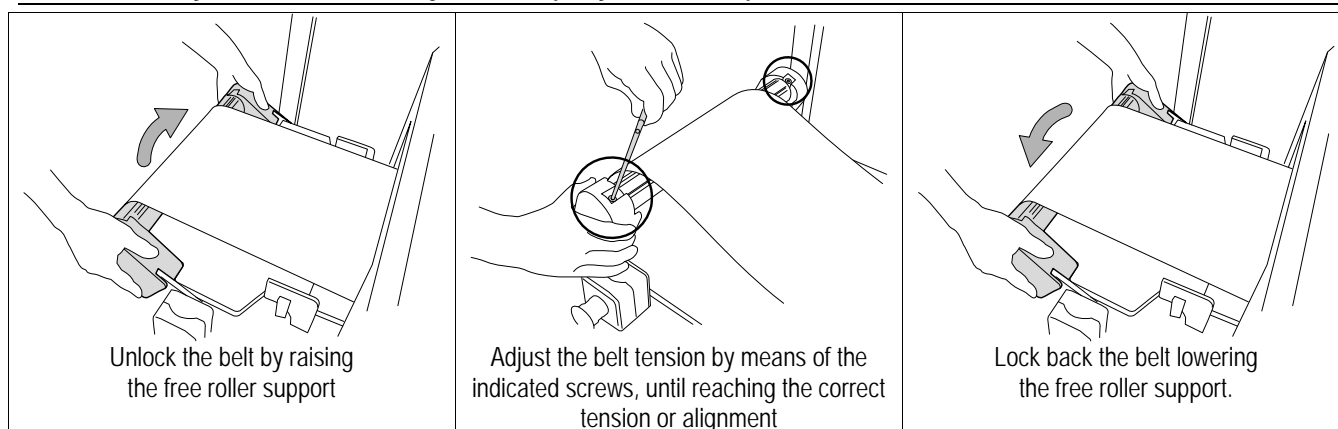
Do NOT use any other cleaning procedure.

5.2.2 – Cleaning of the Conveyor belt (only THS/FB21)

 <p>Shut down the system by means of the Main Switch</p>	 <p>Unlock the belt by raising the free roller support</p>	 <p>Extract the free roller from the side supports</p>
 <p>Pull the free roller out of the belt</p>	 <p>Raise the support plan from its position and pull it out of the belt</p>	 <p>If the THS/FB21 is fitted with an ejection system, unlock the bin turning its knob</p>
 <p>Remove the transparent cover</p>	 <p>Pull the other roller out of the side supports</p>	 <p>Remove the roller from the belt</p>



5.2.3 – Conveyor belt tension adjustment (only THS/FB21)



5.3 - Troubleshooting

5.3.1 - Self-resetting protections

- The ALM card power supply inputs are protected by self-resetting components PTC.
- The Inverter module outputs are electronically protected against short circuit between two phases and between each phase and the ground.
- The ALM card inputs are protected against wrong connection up to the voltages present on the card itself, **with the exception of the mains voltage**.

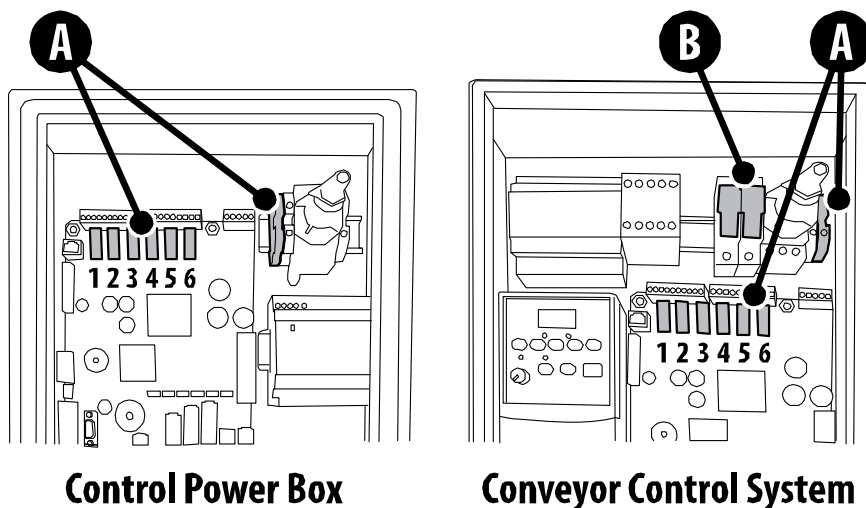
5.3.2 – Troubleshooting table

Symptom	Probable cause	Action
Power supply unit or Metal Detector system OFF	No line voltage	<i>Check the power supply connections</i>
	Unstable or partial connections	<i>Check insertion of the ALM card connectors</i>
	Malfunction of the power supply section	<i>Switch off, wait a few minutes to let any self-resetting components inside cool down, then switch on the system again. If the problem persists, replace card ALM</i>
Power supply unit or Metal Detector system alternates between ON and OFF	Malfunction of the power supply section	<i>Switch off, wait a few minutes to let any self-resetting components inside cool down, then switch on the system again. If the problem persists, replace card ALM</i>
Metal detector does not give an alarm in the presence of metal masses of the same type as the reference sample and of equal or greater mass	Wrong detection parameters for the current product	<i>Perform the Autolearn procedure as described in par.2.2 of Programming Manual. If the samples are not detected even after the Autolearn procedure, because of the product effect, use bigger samples.</i>
	SCD card malfunction	<i>Carry out the following operations in sequence:</i> <ul style="list-style-type: none"> – <i>Disconnect the ALM card connectors which do not link up to the power supply or probe.</i> – <i>Select the "Default" product and check, with the sample specified on the FAT, that the detector gives an alarm.</i> <i>If the Detector does not give an alarm, replace the SCD card, otherwise create a new product and perform the Autolearn procedure as described in par.2.2 of Programming Manual.</i>
Metal detector gives false alarms with no product in transit	Environmental interference	<i>Carry out the "Checking for environmental electromagnetic interference" procedure, as described in paragraph 5.4.2.</i>
	SCD card malfunction	<i>Deactivate all electrical and mechanical devices surrounding the detector, or move it into a place which is guaranteed free of interference. Disconnect the ALM card connectors which do not link up to the power supply or probe. If the interference signal remains the same, replace the SCD card</i>
	Line voltage insufficient or unstable	<i>Check the main.</i>

5.4 - Extraordinary maintenance procedures

5.4.1 – Fuses replacement

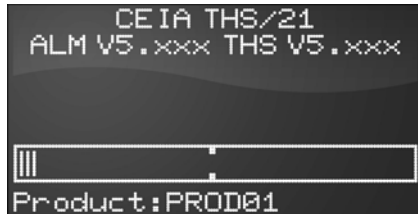
The figure shows the position and rating of the fuses fitted to the device.



Ref.	Type	Description
1	250V 2,5A fast 5x20mm	Auxiliary relay protection
2	250V 2,5A fast 5x20mm	Test request relay protection
3	250V 2,5A fast 5x20mm	Preceeding Conveyor relay protection
4	250V 2,5A fast 5x20mm	Ready relay protection
5	250V 2,5A fast 5x20mm	Ejector relay protection
6	250V 2,5A fast 5x20mm	Metal Detector Alarm relay protection
A	250V 2,5A fast 5x20mm	-
B	600V 15A – Class CC	Conveyor Control System - CE version
	600V 15A – Midget	Conveyor Control System - USA versions

5.4.2 – - Checking for environmental electromagnetic interference

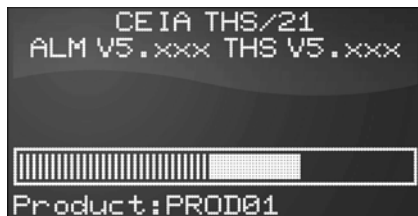
The THS/21 Metal Detector has very high immunity to electromagnetic interference. However, it may happen that electrical devices, usually power devices, cause interference which is strong enough to lead to false alarms. To identify these sources of interference the indication of the signal received from the probe, which the detectors normally shows on the display, can be used. The existence of interference is indicated by false alarms or by the display of several segments on the bar-graph when the conveyor belt is stopped and there is no product in transit:



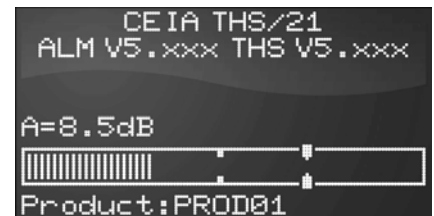
Signal well below
the threshold level



Signal just below
the threshold level



Signal above
the threshold level (alarm)



After the alarm, the maximum signal
is visualized for a few seconds
together with its amplitude

For correct operation, the bar-graph indicator should not have more than **THREE bars** lit. To eliminate the interference, the first thing to do is to identify whether it is electrical or magnetic

1. Set parameter TX=OFF.
*On model **THS/MN21**, set the switch on the internal card of the probe power-supply unit to OFF*
2. If the interference remains the same, it is **electrical**.
Examples of sources of electrical interference: electric motors, inverters, power cables, lighting.
3. If the interference decreases, it is of a **mechanical** nature.
Examples of sources of mechanical interference: unstable anchoring of the metal detector (vibrations), metal masses moving in the vicinity of the probe, intermittent loops, metal fragments in the conveyor belt.

To increase immunity to mechanical interference, adjust the **AM** parameter (see paragraph 3.3 – *Detection Menu* on Programming Manual).

To eliminate sources of interference, refer to the illustrated notes in the Installation section.

5.4.4 – Replacing Card SCD

- Switch off the device and disconnect the system from all power sources.
- Remove the control panel from the detector head by unscrewing the 4 fixing nuts.
- The card is attached to the detector control panel. Remove it taking care not to pull on the internal connecting wires. Disconnect all internal plugs.
- Take care to disconnect also the SPM module from the old board.



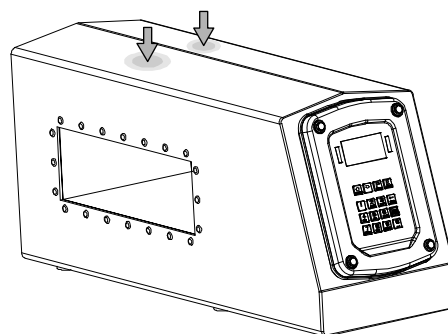
The memory card contains all the device's stored programming and products for the device it was programmed for. Do not exchange SPM cards between devices.

- Remove the old card from the steel support and replace it with the new board.
- Connect all internal plugs to the new card, taking care to place back also the SPM module.
- Fix back the Control Panel to the antenna.

Carry out the TA Autolearn (TL) procedure:

- The procedure must be carried out in an interference-free environment: deactivate any other power device in the area.
- Set the parameter **TA Autolearn = ON** (TL) and exit from Programming.
The message "TA Autolearn" will appear on the display: press forcibly for at least a second on the probe (as shown beside, on top left or right, but not in the centre).

Repeat TA autolearn for each channel (CH)



In the case that the procedure is not carried out, or is carried out improperly, products compensation may not be correct. As a check, select the "default" product and make some tests with the sample indicated in the test sheet enclosed with this manual.
















Check that the system operates properly with all the products stored in memory.











The SPM card stores the values of all the operating parameters, including those of the ALM and RCU card. If the ALM or the RCU card are replaced, therefore, it is not necessary to reprogram the system.

5.5 - Self-diagnosis

The internal diagnostic system monitors the operational status of the metal detector. If a fault is detected, the following are activated in addition to a message on the display: the illuminating alarm indicators, the buzzer, the fault relay (if Fault relays parameter is ON) and the flashing light (if FR=ON). Fault status can only be reset by eliminating the cause of the fault.

Message	Probable cause	Action
 TEST TIME OUT	Time-out for pre-programmed test.	Carry out the test
 POW. SUPPLY FAULT	Power-supply section faulty	Contact service technician
 V SUPPLY TOO HIGH	Power supply voltage too high.	Check that the voltage is within the range on the plate.
 PROBE FAULT(X)	Antenna connection broken or antenna damaged	Contact service technician. X is a numerical code corresponding to type of fault
 NO EJECT.CONFIRM	Ejection of material not carried out (<i>enabled by the Ejection confirmation parameter</i>)	Check that the ejector is not blocked, or that the ejection times are correct. Check photocell operation (positioning, connections etc.). Check the Confirm Ejection input connections. When the cause of the fault has been eliminated, press the E key to reset the alarm status.
 EJECT.SYSTEM JAM	Ejection system faulty or blocked	Check that the ejector is not blocked. Check the ejector connections. When the cause of the fault has been eliminated, press the E key.
 NO COMMUNICATION	Fault in communication between SCD and ALM cards	Check that the power-supply voltage is stable and corresponds to the values on the identification plate. Check the wiring If the wiring is correct, replace the cards
 SPM NOT DETECTED	Memory faulty or absent (<i>THS system not operative</i>)	Check presence and connections of the SPM external memory card (see para. "Replacement of SCD card")
 COMPATIBIL.ERROR	SCD card incompatible with the data stored in the SPM memory card	Use compatible SCD card (ask service personnel)
 EVENT BUFFER FULL	Event memory buffer full.	Print the list of events and delete buffer contents (see Print Menu). Reset connection to remote computer.
 BIN FULL	Storage container full	Empty it
 BIN ABSENT	Storage container not in place	Place it back or check the correct position
 LOGIN RESTRICTED	Three attempts to access with the wrong password or User ID have been made.	Enter programming at Administrator level, then exit.
 EMERGENCY	The emergency button has been pressed	Release the emergency button and press E to reset the alarm status.
 MOTOR ALARM	Overloading of the belt motor	Remove the cause of overloading and press E key.
	Wrong setting of CU parameter	Set a proper value of CU parameter and press E key.

Message	Probable cause	Action
 LOW AIR PRESSURE	Compressed air pressure too low	Check the compressed air connection.
 PHOTOCCELL FAULT	Photocell malfunction or pack stuck in front of photocell (Enabled by parameter Photocell alarm only if ECK = OFF)	Check there is no pack stuck in front of the photocell Check the photocell connections Check the positions of the photocell and the retroreflector Replace the photocell
 EMERG.CIRC.FAULT	Emergency stop circuit faulty.	Check it and repair it if necessary
 EJECT CHECK FAULT	Ejection of material not carried out correctly (Enabled by parameter ECK)	Check that the ejector is not blocked, or that the ejection times are correct. Check photocell operation (positioning, connections etc.). Check the Ejection Check input connections. When the cause of the fault has been eliminated, press the E key to reset the alarm status.
 ENCOD.FRQ.TOO LOW	Speed measured by Encoder is below BL (KT=0) or is significantly lower than BS (KT>0)	Verify KE/DI Check the connections Check encoder wheel movement
 ENCD.FRQ.TOO HIGH	Speed measured by Encoder is above BM (KT=0) or significantly higher than BS (KT>0)	
 SYNC PHOTOC.FAULT	Photocell malfunction or pack stuck in front of photocell	Check there is no pack stuck in front of the photocell Check the photocell connections Check the positions of the photocell and the retroreflector Replace the photocell
 CHECK PHOTC.FAULT	(Enabled by parameter Photocell alarm only if ECK = ON)	



The system is not designed to signal a pack which is stuck for some reason in front of the photocell. For this reason, when the system can detect whether or not the conveyor belt is moving (i.e. when it is equipped with an encoder or with the Conveyor Control System power supply unit), the self-diagnosis function gives an alarm only if the photocell is in a state of malfunction when the belt is moving.



On systems without encoder or with the Control Power Box, it is the installer's and operator's responsibility to ensure that material does not remain in front of the photocell when the belt is stopped: if it does, the photocell will be continuously active even though it is not malfunctioning. If the foregoing situation can not be avoided, it is advisable to disable photocell self-diagnosis (Parameter PA).

5.6 – Uninstallation procedure

5.6.1 – Disassembly

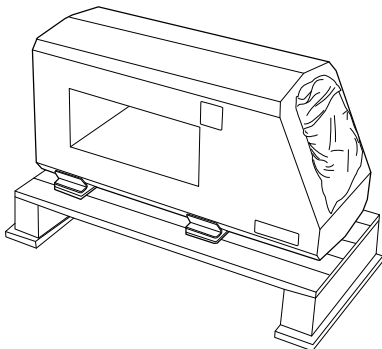
Disconnect any power source from the device, before performing any operation.



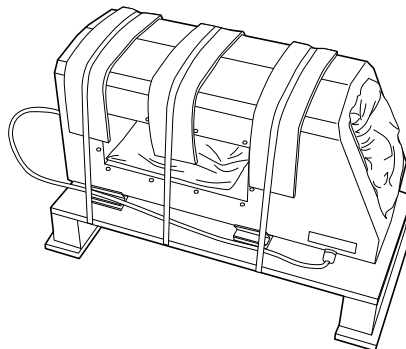
When the mains is disconnected using the main switch S1 of the Conveyor Control System, the power supply section is deactivated, but the contacts which are connected permanently to the mains, e.g. the relay outputs, remain energised. When the I2 service switch is turned off, most components remain energised.

Uninstall the antenna and the Control Power Box from the production line and place them apart.

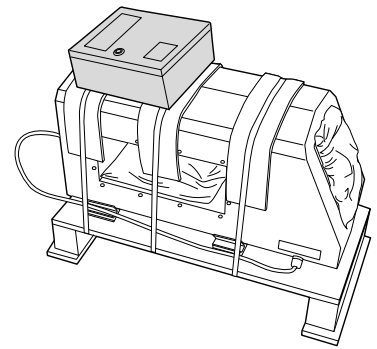
5.6.2 – Packing



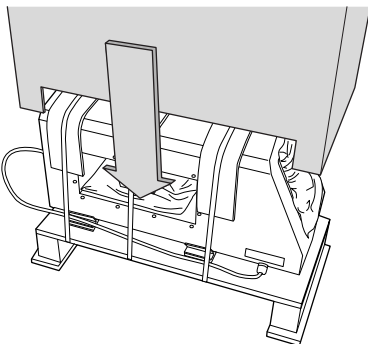
Place the antenna on the wooden base.



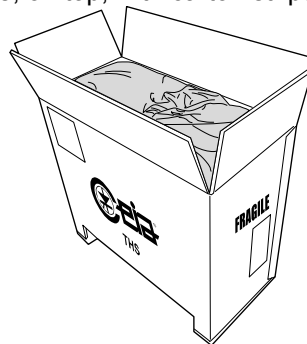
Place the manuals inside the tunnel and fix the antenna to the wooden base through plastic binds, as in the picture. Remember to protect the antenna surface, on top, with carton strips.



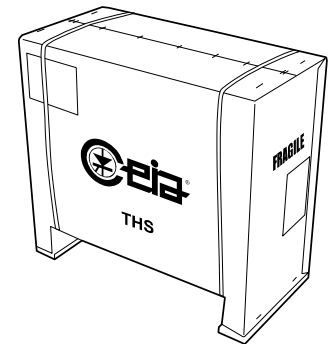
Position the Power Supply Box on top of the antenna, placing the cable around the base.



Place back the package on the wooden base.



Fill the empty space, around and on top of the Power Supply Box and close the package.



Close the package with plastic binds.

5.7 – Disposal of the device

5.7.1 - Disposal of the device and of consumables with environmental impact

For disposal follow the regulations in force in the country where the device is being used.

6 - APPENDICES

6.1 - Declaration of Conformity CE

6.1.1 – THS/21, THS/G21, THS/SL21, THSMN21, THS/MS21

DECLARATION OF CONFORMITY CE <small>DECLARATION DE CONFORMITE CE KONFORMITÄTSERKLÄRUNG CE DECLARACION DE CONFORMIDAD CE DICHIARAZIONE DI CONFORMITÀ CE</small>																	
Manufacturer: <small>Fabricant / Hersteller / Fabricante / Costruttore:</small>	CEIA S.p.A. Zona industriale Viciomaggio 54/G 52041 Viciomaggio Arezzo – ITALY																
Declares that the product <small>déclare que ce produit / erklärt, daß das Produkt / declara que el producto / dichiara che il prodotto:</small>																	
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 35%;">Product name:</td> <td>Electronic Metal Detector</td> </tr> <tr> <td><small>Nom du produit: / Produktname:</small></td> <td><small>Détecteur de métaux / Elektronischer Metalldetektor</small></td> </tr> <tr> <td><small>Nombre del producto: / Nome:</small></td> <td><small>Electronic Metal Detector / Metal Detector Elettronico</small></td> </tr> <tr> <td>Model:</td> <td>THS/21 all models</td> </tr> <tr> <td><small>Série / Serie / Serie / Modello:</small></td> <td><small>tous modèles/ alle Modelle todos los modelos/ tutti i modelli</small></td> </tr> <tr> <td>Product Options:</td> <td>This declaration covers all options</td> </tr> <tr> <td><small>Options / options:</small></td> <td><small>Cette déclaration est valide pour toutes les options / Diese Erklärung ist gültig für alle options</small></td> </tr> <tr> <td><small>Opciones / opzioni:</small></td> <td><small>Este declaración es válida para todas las opciones / Questa dichiarazione è valida per tutte le opzioni</small></td> </tr> </table>		Product name:	Electronic Metal Detector	<small>Nom du produit: / Produktname:</small>	<small>Détecteur de métaux / Elektronischer Metalldetektor</small>	<small>Nombre del producto: / Nome:</small>	<small>Electronic Metal Detector / Metal Detector Elettronico</small>	Model:	THS/21 all models	<small>Série / Serie / Serie / Modello:</small>	<small>tous modèles/ alle Modelle todos los modelos/ tutti i modelli</small>	Product Options:	This declaration covers all options	<small>Options / options:</small>	<small>Cette déclaration est valide pour toutes les options / Diese Erklärung ist gültig für alle options</small>	<small>Opciones / opzioni:</small>	<small>Este declaración es válida para todas las opciones / Questa dichiarazione è valida per tutte le opzioni</small>
Product name:	Electronic Metal Detector																
<small>Nom du produit: / Produktname:</small>	<small>Détecteur de métaux / Elektronischer Metalldetektor</small>																
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Model:	THS/21 all models																
<small>Série / Serie / Serie / Modello:</small>	<small>tous modèles/ alle Modelle todos los modelos/ tutti i modelli</small>																
Product Options:	This declaration covers all options																
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<small>Opciones / opzioni:</small>	<small>Este declaración es válida para todas las opciones / Questa dichiarazione è valida per tutte le opzioni</small>																
conforms to the following Product Specifications <small>est conforme aux spécifications suivantes / folgenden Produktspezifikationen entspricht es conforme a las siguientes especificaciones / è conforme alle seguenti specifiche di prodotto:</small>																	
Safety / Sécurité / Sicherheit / Seguridad / Sicurezza: EN 61010 – 1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use -- Part 1: General requirements This product complies with the requirements of the Low Voltage Directive 2006/95/EC. <small>Le produit ci-dessus répond aux exigences de la Directive 2006/95/CE concernant la basse tensions. Dieses Produkt entspricht den Anforderungen an Niederspannungsgeräte gemäß der Norm 2006/95/EC El producto indicado cumple los requisitos de la Low Voltage Directive 2006/95/CE. Il prodotto è conforme alle norme della direttiva 2006/95/CE sulla bassa tensione.</small>																	
EMC EN 61000-6-2:2005 Electromagnetic compatibility (EMC) -- Part 6-2: Generic standards - Immunity for industrial environments EN 61000-6-4:2007 Electromagnetic compatibility (EMC) -- Part 6-4: Generic standards - Emission standard for industrial environments This product complies with the requirements of the EMC Directive 2004/108/EC. <small>Le produit ci-dessus répond aux exigences de la Directive 2004/108/CE concernant les interférences électromagnétiques. Dieses Produkt entspricht den Anforderungen der EMC-Norm 2004/108/EC. El producto indicado cumple los requisitos de la Directiva EMC 2004/108/CE. Il prodotto è conforme alle norme della direttiva EMC 2004/108/CE.</small>																	
Arezzo, 2008-09-01	 Person in charge Lab. EMC <small>Resp. Laboratoire EMC / Verantwortlicher für EMC-Labor Resp. Laboratorio EMC / Resp. Lab. EMC</small> Ing. Enrico Sorini 																

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6.1.2 – THS/FB21 and THS/MB21

The Declaration of Conformity CE for this models are supplied in the original format, unique for each device and enclosed with the documentation.

6.2 – Spare Parts

For the list of spare parts available for THS/21 models, see the *Spare parts, Accessories and Options Manual*.