



Exactor



■ ■ I N D E X ■ ■

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1. INTRODUCTION AND DESCRIPTION OF COMPONENTS

The function of the changer is to carry out all the transactions within an automatic vending machine. That is, recognising all the programmed coins, their values and the classification of four of them (the user chooses which four) to be used as change.

It is a communication changer that is designed to be installed in those machines that use a communication protocol, either **EXECUTIVE** or **MDB**. In each case, the protocol of the changer must be the same as that of the machine.

The changer has a wiring loom to communicate to the machine, through which there is permanent dialogue (**COMMUNICATION PROTOCOL**). This protocol has all the necessary commands for completing the vend process.

1.1. PRINCIPLE TECHNICAL CHARACTERISTICS

- The capacity to work with 32 different coins of which two of them are tokens that can be programmed on site by the user.
- It allows the configuration of four acceptance levels for each coin; this is especially useful for rejecting frauds and optimising the acceptance of valid coins.
- It incorporates an internal string detection system that foils any attempt of fraud using a piece of thread fixed to the coin.
- It has four high capacity change extractors that are automatically loaded with the coins introduced by the customers.
- The four coins for giving change are programmable.
- All the coins in the change tube can be used as change when making a vend.
- Up to three of the change tube tubes can give change simultaneously.
- Control of the minimum change coins to assure that all the change is given.
- The level of the coins in the change tubes and the amount can be shown on the display.
- It can communicate with machines that support the EXECUTIVE and/or MDB ICP 2.0 protocols.
- It can be re programmed with an external programming tool.
- Permanent and programmable clock/calendar for the user is optional depending on the model of the changer.



- Total accounting facilities: number and types of coin, number and types of sales and incidents. This data can be printed and/or read through an external device.
- Led indicator to indicate the working status.
- Modularity: it is made up of independent modules that can be individually substituted.
- Water-tight: the most delicate parts are protected in water-tight compartments.
- Very strong thanks to being composed of polycarbonate and fibre glass.
- Low weight, 1950 g.
- It has a handle for ease of transport
- Optimization of the consumption using software
- It meets the BDV size norms. This norm indicates all the general dimensions of the elements of the changer that interact with the machine (exterior dimensions, coin exits, connection cables to the machine, position of the coin return lever and mounting parts in the machine).
- Auto diagnosis
- Anti vandalism, the coin extraction system is not accessible from the exterior of the machine.

1.2. ELECTRICAL SPECIFICATIONS

1.2.1. Power supply

It is determined by the protocols and is as follows:

PROTOCOL	VOLTAGE
EXECUTIVE	24 VAC \pm 10%
MDB	18 VDC – 40 VDC

1.2.2. Current draw

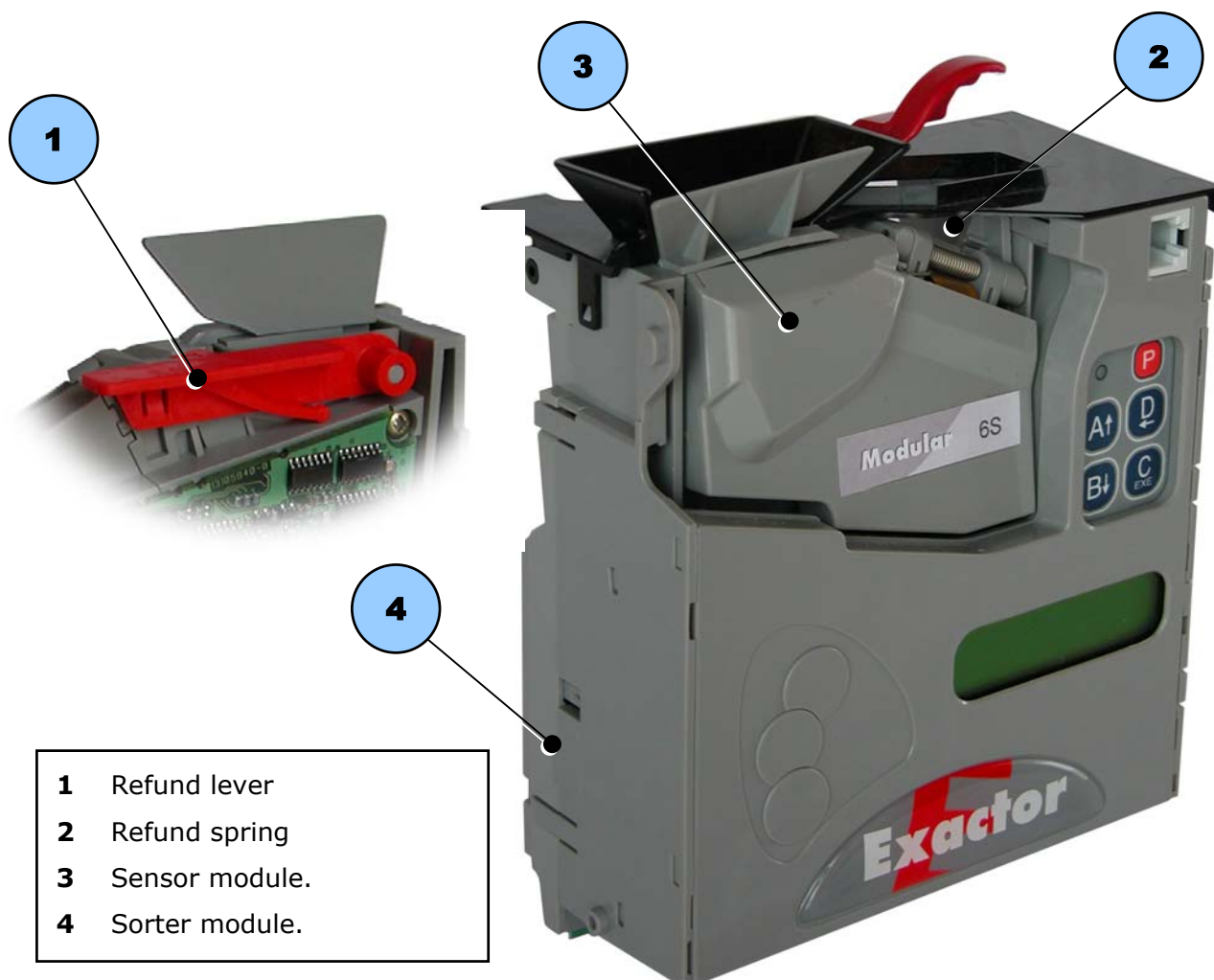
VOLTAGE : 18 VDC	
At rest	50 mA
Classifying: activating the 4 solenoids simultaneously	600 mA
Giving change: activating the three change extractors simultaneously with full tubes	1 A

1.3. DESCRIPTION of COMPONENTS

Coin return lever (1) and return spring (2)

The two elements make up the refund system for the recuperation of coins from the changer. The coin return lever opens the validator door on the module sensor which produces a signal for the recuperation of the coins.

The device is designed to perform more than 250,000 services. The minimum force necessary to activate the refund lever is 0.2 kg., which is compatible with the standards used by vending machines in the market.

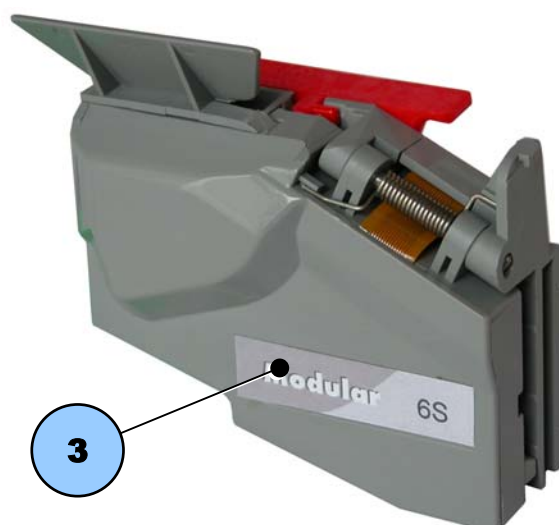


Sensor module (3)

It analyses the different coins that are introduced into the changer. Its precision allows it to detect and reject frauds, distinguishing them from coins of legal currency.

It is manufactured using the latest technology. It uses a flash memory.

This module is designed to handle the introduction of 1,000,000 coins without significant loss of its precision.

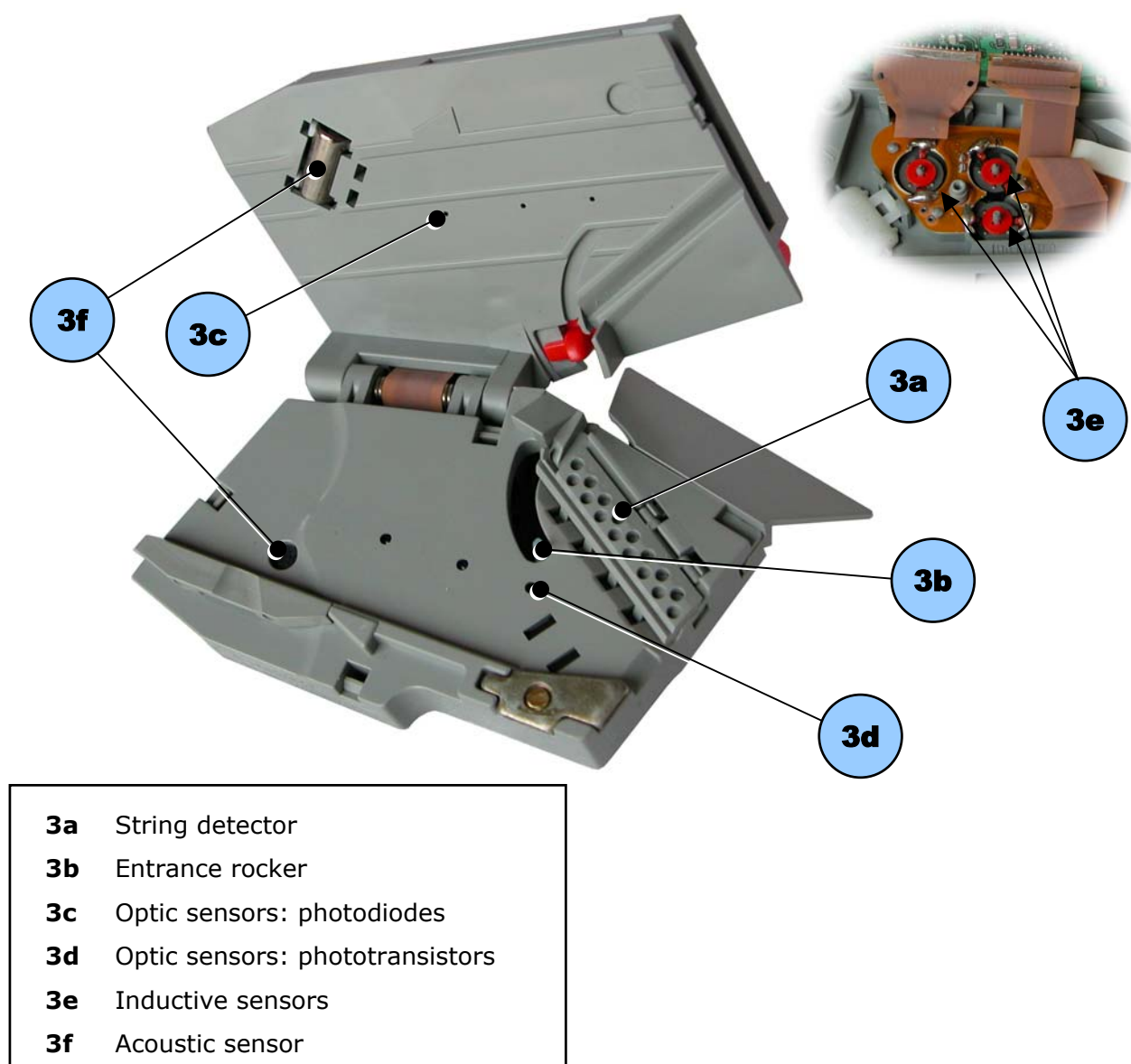


It is possible to use different sensor modules from the range that have varying sensor capacities, depending on the necessities in each case.

The **types of coins** that the validator can accept and its **precision in discriminating** them, are defined by the programming carried out in the factory; therefore, the sensor *module* is open to re programming which may vary these two factors depending on its application.

This module can be updated with **firmware**, **adjustments** and **programming** using a PC or the Tele programmers TL20 or TL21

Description



String detector (3a)

This is an electro mechanical system that detects an attempt at fraud using a string attached



to a coin. The system uses a lever that, when displaced by the string that is attached to the coin, breaks an infrared beam advising of the presence of the string.

Entry rocker (3b)

This rocker has the task of regulating the speed of the coin before it passes the sensors that read the parameters so all the readings are carried out under similar conditions.

Optic sensors (3c and 3d)

They are infrared photocells, 3 photodiodes (3c) and 3 phototransistors (3d) that create three infrared beams. Knowing the speed at which the coin passes the beams will make it possible to determine the size of the coin.

Inductive sensors (3e)

It has 6 coils with a ferrite nucleus in the **high sensorisation** model and 2 in the **normal sensorisation** model. The coils create a magnetic field that varies when a coin passes; this variation is proportional to the physical characteristics and material of the coin.

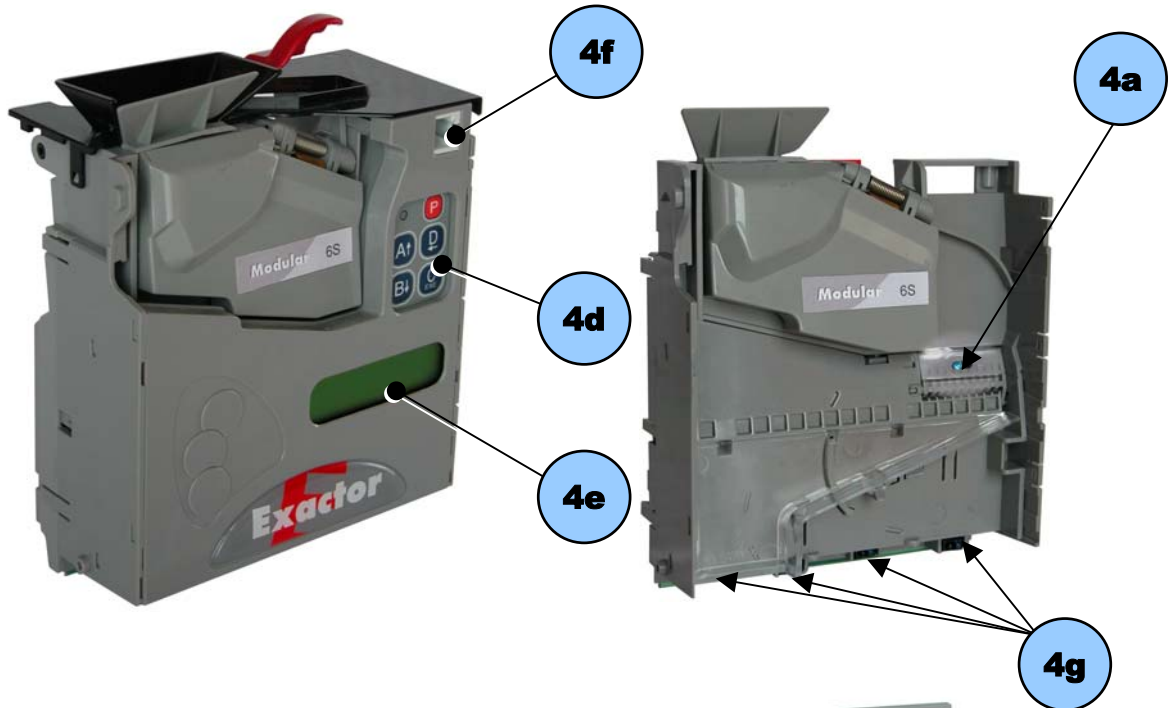
Acoustic sensor (3f)

This is made up of a metal cylinder and a microphone. When the coin hits the **metallic cylinder**, it emits a sound that is unique to a particular coin, which is captured by the microphone.

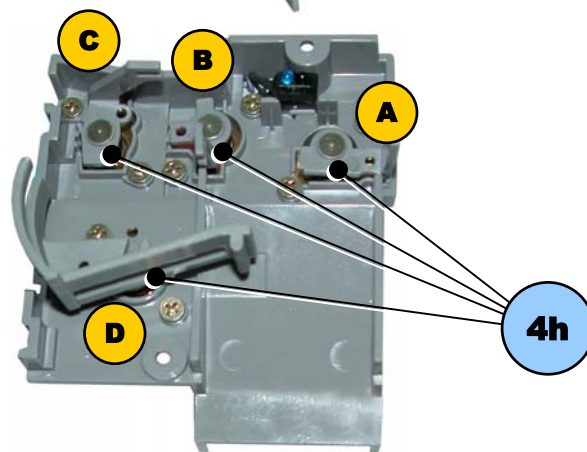
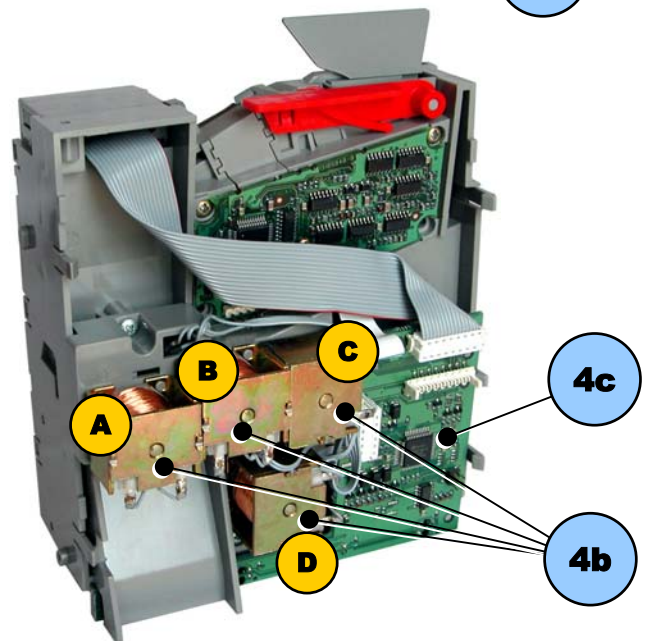
Sorter module (4)

The following parts are found in the sorter module:

- An optic sensor for detecting the accepted coins
- The classification gates and solenoids of the various paths
- The control board of the sorter that also houses the optic sensors that detect the full state of the change tubes
- The keyboard, display and connector



- 4a** Optic sensor for detecting the accepted coins
- 4b** Classification solenoids
- 4c** Sorter control board, Sorter module
- 4d** Keyboard
- 4e** Display
- 4f** RS232 Connector
- 4g** Detection sensors for passing coin and full status
- 4h** Gates



Optic sensor for detecting the accepted coins (4a)

It is made up of a photodiode (blue) and a phototransistor (black) that works in reflexive mode, it detects the pass of the coins that have been validated and are directed to the sorter.

Classification solenoids and associated gates (4b)

Their function is to direct the coins through the correct path: **cash box, change tubes or refund.**

It comprises of 4 solenoids that use 12 Vdc and have a resistance of 80 ohms.

Table with the activation of the solenoids, depending on the path of the coin

	Solenoid A	Solenoid B	Solenoid C	Solenoid D
Tube A	<i>activated</i>	<i>Activated</i>	<i>activated</i>	
Tube B	<i>activated</i>	<i>Activated</i>		<i>activated</i>
Tube C	<i>activated</i>	<i>Activated</i>		
Tube D	<i>activated</i>	<i>Activated</i>	<i>activated</i>	<i>activated</i>
Cash box	<i>activated</i>			
Refund				

Control board, sorter module (4c)

It has its own firmware and communicates with the central control board through a SPI bus. It directly controls:

- The 4 classification solenoids (4b).
- The optic sensor for the detection of accepted coins (4a).
- The 4 pairs of optic sensors for the detection of the coin passing and full status of the coin tubes (4g).
- The keyboard and display (4d and 4e).

It acts as an interface:

- In the RS232 communications through RJ 11 connector.
- Between the **sensor module** and the control board on the central module.



Keyboard (4d)

This membrane keyboard is comprised of 5 buttons and a green LED diode.

It is totally watertight and is tactile to signal a correct activation.

Each button has a minimum life of 300,000 presses.

The led informs of four possible states of the changer, see **AUTO DIAGNOSIS** (page 22).

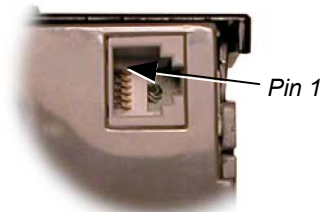
Display (4e)

It is an alphanumeric display with 2 16-character lines and communicates through an I²C bus.

Connector (4f)

It is an RS 232 connection using an RJ-11 6-way connector.

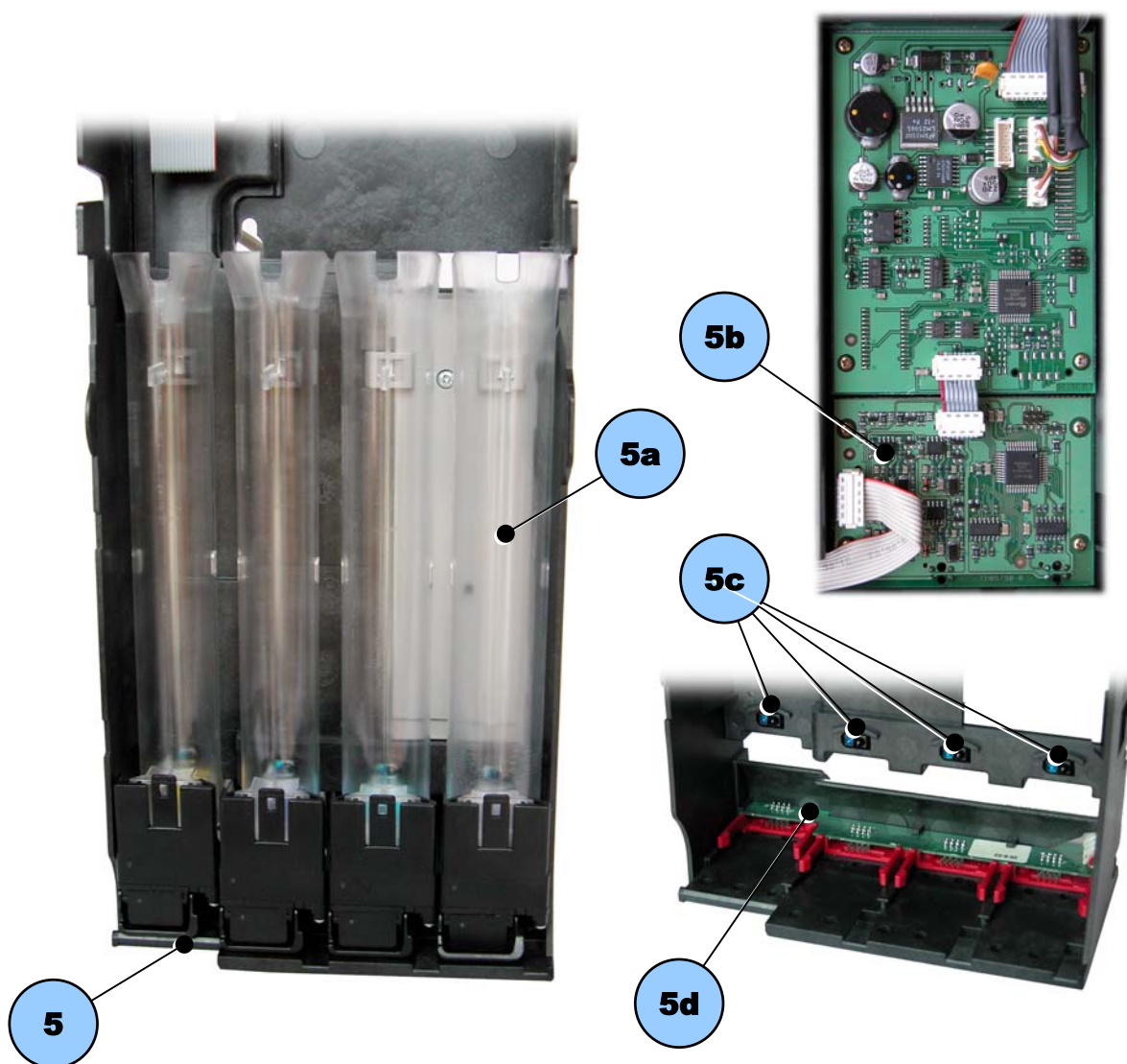
All the communication from the exterior to the changer is carried out through this connector and with a maximum communication speed of 115,000 bauds.



6-WAY RJ-11 CONNECTOR SMD REF. 95003-6661		
Pin	FUNCTION	TYPE of CONNECTION
1	Control selector	Control VDC selector 12V
2	GND	
3	VDC	+5V
4	V out	+12V
5	TXD-232	Transmission RS-232 standard
6	RXD-232	Reception RS-232 standard

Change giver module (5)

This module is made up of four independent change extractor modules, a change giver control board and the interface board for the change extractor modules.



- 5a** Change giver module
- 5b** Control board for the change giver module
- 5c** Optic sensors for the detection of minimum level of coins in the tubes
- 5d** Interface board for change extractor module

Change extractor modules (5a)

These are plug-in and are made up of a tube, a spacer and an extraction system.

Tube: They are transparent and its interior diameter determines which coins can be stored for change giving.

Spacer: It determines the thickness of the coin to be returned as change.

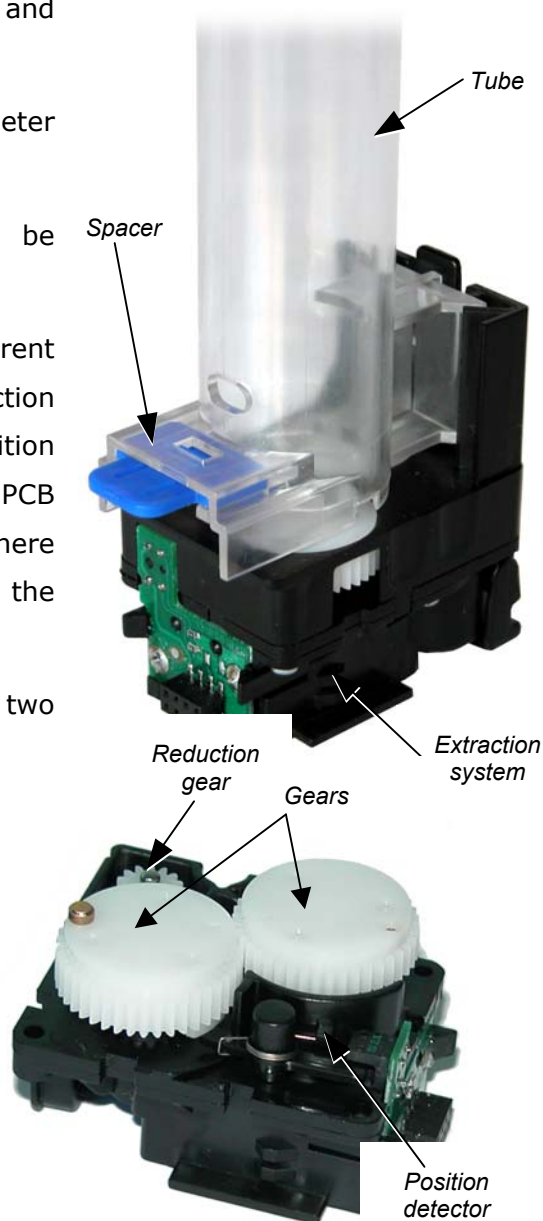
Extraction system: These are the same for the 4 different tubes. They are comprised of a 10 Vdc motor, a reduction gear, two extractor pivots and an optic sensor. The position of the system is controlled by the optic sensor and a PCB that all the electronic components are mounted and where there is a connector that joins the change extractor to the changer.

The extraction is carried out by the movement of the two pivots that allow the extraction of all the coins.

The extraction speed can reach 3 coins per second

The useful life of the mechanism is over 250,000 services

The dimensions of the coins that can be used as change in the tubes with their corresponding spacers are the following:



POSITION	DIAMETER IN MM	
	Between 16.25 and 27	Between 1.2 and 3.2
Tube B	Between 16.25 and 31.5	Between 1.2 and 3.2
Tube C	Between 16.25 and 28.5	Between 1.2 and 3.2
Tube D	Between 16.25 and 27	Between 1.2 and 3.2

* see **2.3 CHANGING THE CHANGE COIN TYPE**, the standard change giving configurations

* Any coin that is not circular should first be checked with Azkoyen for compatibility.

Control board, change giver module (5b)

It has its own firmware and communicates with the central control board through an SPI bus. It directly controls:

- **The 4 change extractor modules:** activation and braking of motors, and the counting of extracted coins
- **The 4 pairs of optic sensors (5c), detection of the minimum level of coins.** These sensors are found at the height of the 5th thickest coins, this way it is considered that there will be enough coins to guarantee the delivery of change when the tube is nearly out of change.

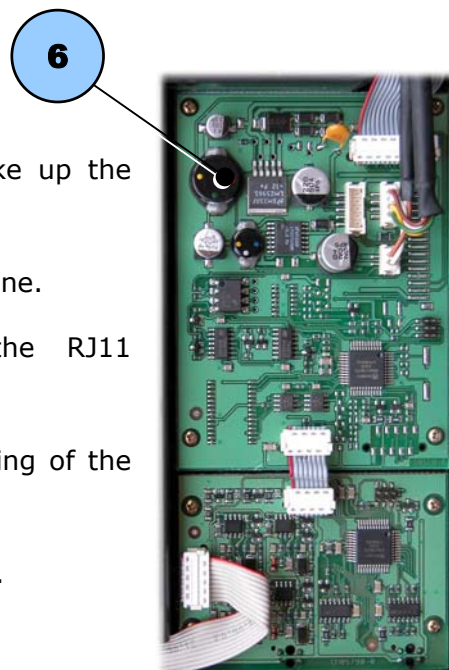
Change extractor module interface board (5d)

This houses the 4 connectors that the 4 coin extractor modules plug into and that connect them to the control board of the change giver module.

Central control board (6)

Its functions are the following:

- Provide power to the other modules that make up the changer.
- Establish exterior communication with the machine.
- Establish RS232 communication through the RJ11 connection.
- Store the configuration file with the programming of the functions.
- Coordinate the function of the different modules.



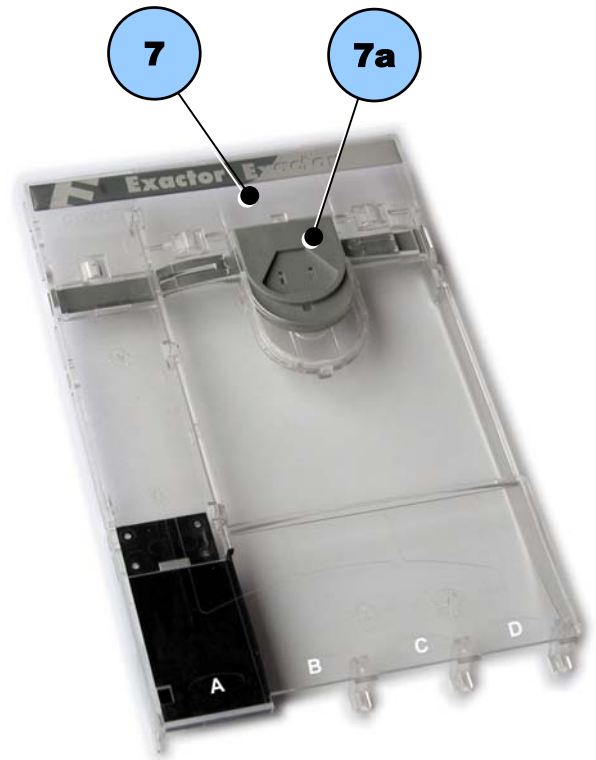
Front cover (7)

Its function is to protect the change giver module and guide the refund coins to their destination.

It is transparent to allow the coins that are in the tubes to be seen.

To remove it, slide the latch downwards and pull outwards (7a).

The identification of each change tube is shown on the lower part (A, B, C and D).



Exterior casing (8)

All the different modules are housed here, it is made of polycarbonate with 30% fibre glass that gives it added strength.

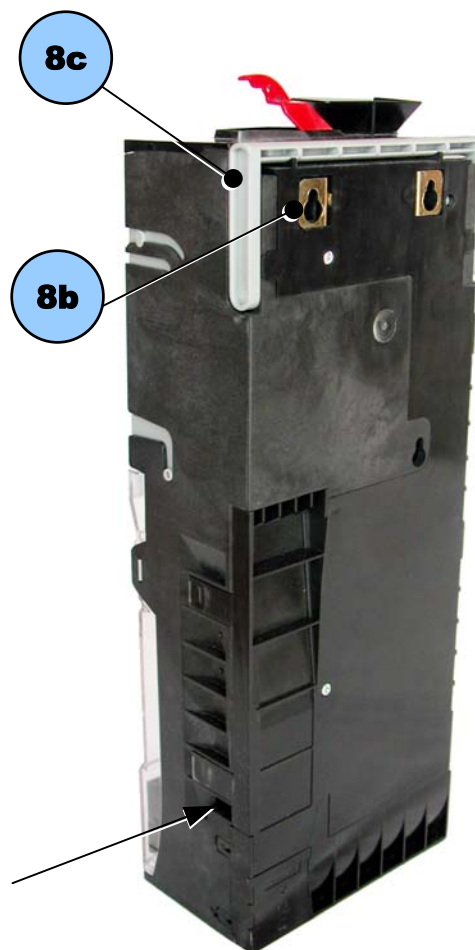
It is designed to protect against the entrance of liquids, guiding the liquid to the exterior so they do not affect the sensitive modules (liquid channel, 8a).

The fixing of the changer to any machine is carried out with the metal plate (8b).

It has a handle for easy transport (8c).



8a



8c

8b

Liquid outlet

2. WORKING AND STARTING UP

2.1. CONNECTION EXTERIOR TO THE MACHINE

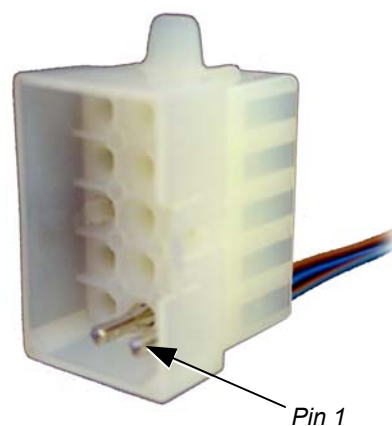
This connection is determined by the protocol used and will be different depending on the type of changer, MDB or Executive.

Executive

The connection with the machine is made using two connectors, a 9-way and 15-way Molex connector.

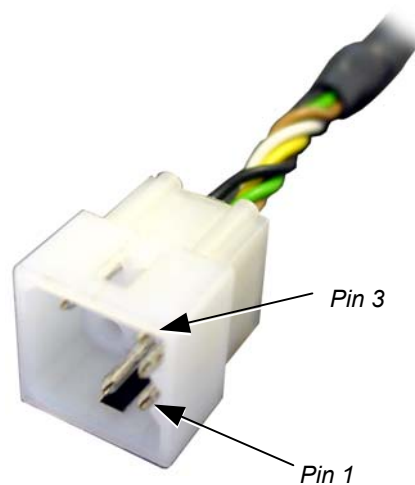
The 15-way connector is used for the 24 VAC to the changer.

Pin	Colour	Function
1	Brown	24 VAC (Phase)
2	Blue	24 VAC (Neutral)



The 9-way connector is used to establish the communication with the machine.

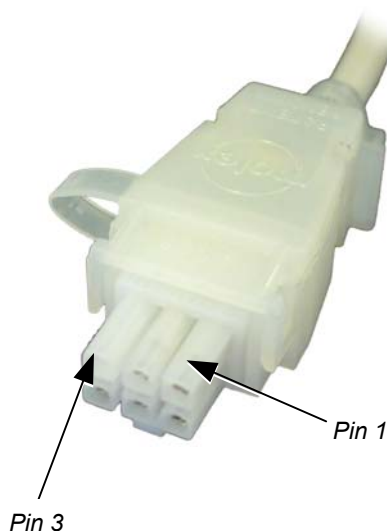
Pin	Colour	Function
1	Yellow	TX+
2	Brown	Rx-
3	White	Rx+
4	Green	TX-
9	Black	Screen



MDB

The connection with the machine is made with a 6-way minifit connector.

Pin	Colour	Function
1	Pink	+ VAC
2	Grey	GND
3		Not used
4	White	TX
5	Green	RX
6	Yellow	SCREEN

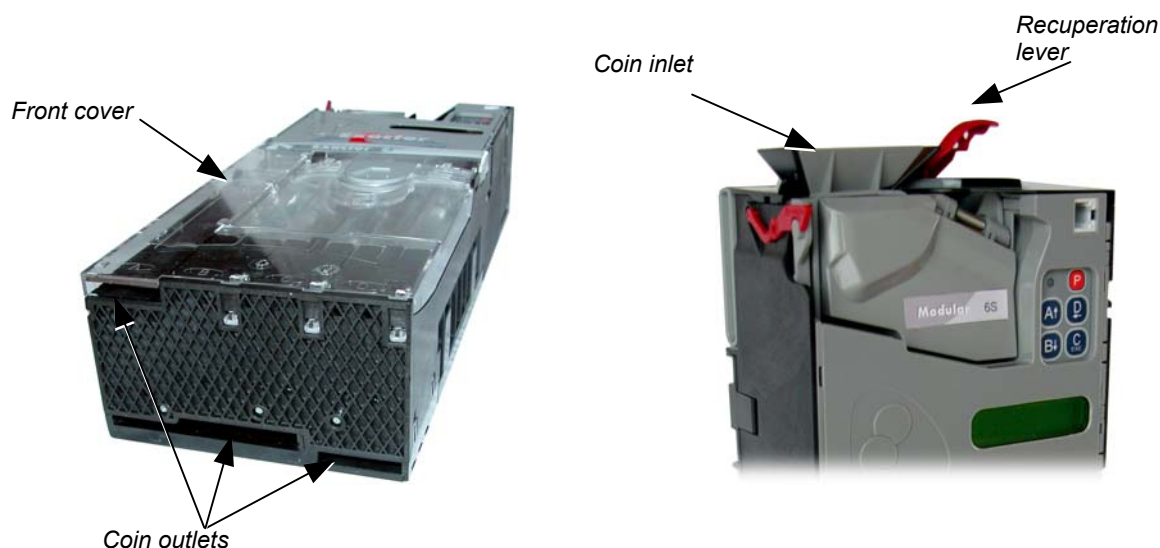


2.2. INSTALLATION

The installation in a machine is made using the followings steps:

1. Verify that the communication protocol of the machine is the same as that of the changer that is being installed.
2. Fit the changer in the housing in the machine, using the **bracket** on the changer for this purpose. It must not go above a maximum inclination of more than 3° on any of its axis.
3. Check that the coin inlets and outlets are lined up with there respective coin channels within the machine.





4. Check that the **front cover** is fitted correctly, and that the **recuperation lever** of the sensor module is not permanently activated.
5. Connect the changer.
6. If you are going to introduce coins into the tubes, do it using the function «**002 Filling the change tubes**» (See the programming module). If you directly introduce the coins into the tubes, the changer will behave in the following way:
 - **In service mode**, the amount in the tubes will take the predetermined value that the software has for the coins at minimum level for that tube. The green led will slowly flash indicating that there is an anomaly, if "P" is pressed the message "Msg 17: Adjusting Accounting" will appear. When another coin is introduced, the led will stay lit and the coins will continue to go to the corresponding tube, incrementing the amount. The amount will correct itself when the level of coins goes below the level of the minimum sensors.
7. Check that it is working correctly by introducing coins, carrying out vends and refunds.

2.3. CHANGING THE COIN USED AS CHANGE

To modify the coin type, carry out the following steps:

- Adapt the tubes and the spacers for the coins to be used in each tube, (see change coin table).
- Programme the new change coin in the function «**414 CLASSIFICATION**».

CHANGE COIN TABLE

- All the coins in their corresponding tube, can be returned in any position (A, B, C, D), keeping in mind the limitations indicated on page 13 that refers to the diameters and thicknesses.

EUROS - €					
COIN	Diameter	Thickness	TUBE	SPACER	CAPACITY
0.01 €	16.25	1.67	11030991-0	11031131-0 Orange	97 coins
0.02 €	18.75	1.67	11031011-0	11031141-0 Yellow	96 coins
0.05 €	21.25	1.67	11031031-0	11031141-0 Yellow	95 coins
0.1 €	19.75	1.93	11031021-0	11031151-0 Dark blue	83 coins
0.2 €	22.25	2.14	11031041-0	11031161-0 Light blue	74 coins
0.5 €	24.25	2.36	11031061-0	11031171-0 Violet	66 coins
1 €	23.25	2.33	11031051-0	11031171-0 Violet	67 coins
2 €	25.75	2.1	11031071-0	11031161-0 Light blue	73 coins

POUNDS - £					
COIN	Diameter	Thickness	TUBE	SPACER	CAPACITY
0.01 £	20.25	1.5	11031021-0	11031131-0 Orange	106 coins
0.02 £	25.75	2	11031071-0	11031151-0 Dark blue	76 coins
0.05 £	18	1.7	11031001-0	11031141-0 Yellow	95 coins
0.1 £	24.5	1.8	11031061-0	11031141-0 Yellow	85 coins
0.2 £	21.5	1.7	11031031-0	11031141-0 Yellow	92 coins
0.5 £	27.25	1.8	11031091-0	11031141-0 Yellow	83 coins
1 £	22.5	3.2	11031041-0	11031201-0 Grey	49 coins
2 £	28.5	2.6	11031091-0	11031181-0 White	58 coins

2.4. AUTO DIAGNOSIS

The changer is capable of showing 17 different error messages of the detected incident on the display.

They can be divided into three groups:

Sorter Module: Seven different messages are shown.

Extractor Module: Six different messages are shown.

Central Module: Four different messages are shown.

Whenever the changer detects an incident, the green led will advice of its existence and the changer will modify its working status in the following way:

Switched off: Not working

Slow flashing: Working correctly but with anomalies that are not too serious



Fast flashing: Working correctly but with serious anomalies

Always lit: Working correctly

To access the messages, press the button **P**.

Then the errors, their causes and their consequences in the changer will be shown in groups.

SORTER MODULE



Msg 3: Discrimin. Not Detected

Causes:

- **No sensor module**
- **Not connected to the control board**
- **Faulty**

Consequences:

- **No coins accepted**

<div data-bbox="188 248 483 313">Msg 5: Acceptor modul StuckOpen</div>	<p>Causes:</p> <ul style="list-style-type: none">- The return lever on the sensor module does not work correctly; it holds the validator door open.- Coin jam. <p>Consequences:</p> <ul style="list-style-type: none">- No coins accepted
<div data-bbox="188 748 483 813">Msg 10 : Acceptor Sensor Error</div>	<p>Causes:</p> <ul style="list-style-type: none">- The acceptance gate does not open. The solenoid does not activate because of low voltage, connection or badly assembled.- Entry sensor is faulty. Component damaged. <p>Consequences:</p> <ul style="list-style-type: none">- No coins accepted.
<div data-bbox="188 1229 483 1294">Msg 11 : Failure Full sensor tub A</div>	<p>Causes:</p> <ul style="list-style-type: none">- The coin was not classified to the tube in position A.- Fault in the Full/Entry Sensor. <p>Consequences:</p> <ul style="list-style-type: none">- The accounting does not correctly reflect the quantity of coins in the tube.- Error in the classification of the corresponding tube.- Jam in the sorter.

**Msg 12 : Failure Full
sensor tub B****Causes:**

- The coin was not classified to the tube in position B.
- Fault in the Full/Entry Sensor.

Consequences:

- The accounting does not correctly reflect the quantity of coins in the tube.
- Error in the classification of the corresponding tube.
- Jam in the sorter.

**Msg 13 : Failure Full
sensor tub C****Causes:**

- The coin was not classified to the tube in position C.
- Fault in the Full/Entry Sensor.

Consequences:

- The accounting does not correctly reflect the quantity of coins in the tube.
- Error in the classification of the corresponding tube.
- Jam in the sorter.

**Msg 14 : Failure Full
sensor tub D****Causes:**

- The coin was not classified to the tube in position D.
- Fault in the Full/Entry Sensor.

Consequences:

- The accounting does not correctly reflect the quantity of coins in the tube.
- Error in the classification of the corresponding tube.
- Jam in the sorter.

EXTRACTOR MODULE



**Msg 2 : Payout Module
Not Detected**

Causes:

- Fault on the interface board.
- Bad connection of the wiring.

Consequences:

- Does not return from any of the four tubes.

**Msg 6 : Dispenser
Fail in module A**

Causes:

- The module is not present.
- Jam in the extractor system.
- Internal sensor faulty.
- Bad connection.

Consequences:

- Does not return coins from tube A but from the rest it does.
- No coins are stored in the tube A and are directed to the cash box.

<div data-bbox="188 248 469 311">Msg 7 : Dispensor Fail in module B</div>	<p>Causes:</p> <ul style="list-style-type: none">- The module is not present.- Jam in the extractor system.- Internal sensor faulty.- Bad connection. <p>Consequences:</p> <ul style="list-style-type: none">- Does not return coins from tube B but from the rest it does.- No coins are stored in the tube A and are directed to the cash box.
<div data-bbox="188 831 469 893">Msg 8 : Dispensor Fail in module C</div>	<p>Causes:</p> <ul style="list-style-type: none">- The module is not present.- Jam in the extractor system.- Internal sensor faulty.- Bad connection. <p>Consequences:</p> <ul style="list-style-type: none">- Does not return coins from tube C but from the rest it does.- No coins are stored in the tube A and are directed to the cash box.
<div data-bbox="188 1413 469 1476">Msg 9 : Dispensor Fail in module D</div>	<p>Causes:</p> <ul style="list-style-type: none">- The module is not present.- Jam in the extractor system.- Internal sensor faulty.- Bad connection. <p>Consequences:</p> <ul style="list-style-type: none">- Does not return coins from tube D but from the rest it does.- No coins are stored in the tube A and are directed to the cash box.

**Msg 17 : Coin in Tubes
Correction**

Causes and consequences:

- Detection of coins by the minimum safe amount of change when the balance indicates there are no coins. The balance will always adjust the value to minimum safe amount.
- The minimum sensor does not detect coins and the balance says there is. The balance will adjust to zero coins.

CENTRAL MODULE



**Msg 1 : Failure VMC
Not Detected**

Causes:

- Bad connection with the machine.
- Internal fault on the central board.

Consequences:

- No communication, the system does not work.
- Does no communicate, classify or return change.

**Msg 4 : EEPROM
Checksum ERROR****Causes:**

- Configuration data and/or accounting of the changer corrupt.

Consequences:

- It may not work according to the user's configuration.

**Msg 15 : WAITING
CONFIGURATION...****Causes:**

- The changer is not configured.

Consequences:

- The changer is not operative. The configuration needs to be loaded.

3. WORKING CONDITIONS and NORMS

TEMPERATURE and HUMIDITY

RANGE of STORAGE TEMPERATURES (PACKAGED)

The range varies, depending on if it has a display or not, these are:

- **With display:** Temperatures between **-20 °C and 60 °C.**
- **Without display:** Temperatures between **- 20 °C and 70 °C.**

RANGE of WORKING TEMPERATURES and HUMIDITY

The recommended working temperatures are 0 °C up to 55 °C with a maximum relative humidity of 95% without condensation.

INCLINATION

The inclination should not be more than 3° on any of its axis.



EUROPEAN NORM CE**1 - Electromagnetic emission: 50081-1.**

EN 55022 Conducted and radiated emission.

2 - Electromagnetic immunity: 50082-1.

EN 61000-4-2. Electrostatic discharge.

EN 61000-4-3 + ENV 50204, Radiated immunity.

EN 61000-4-4. Transitory peaks.

EN 61000-4-6. Spikes.

EN 61000-4-8. Magnetic field at 50 HZ.

3 - Standard electrical safety norm (EN 60950)

4. CLEANING AND MAINTENANCE

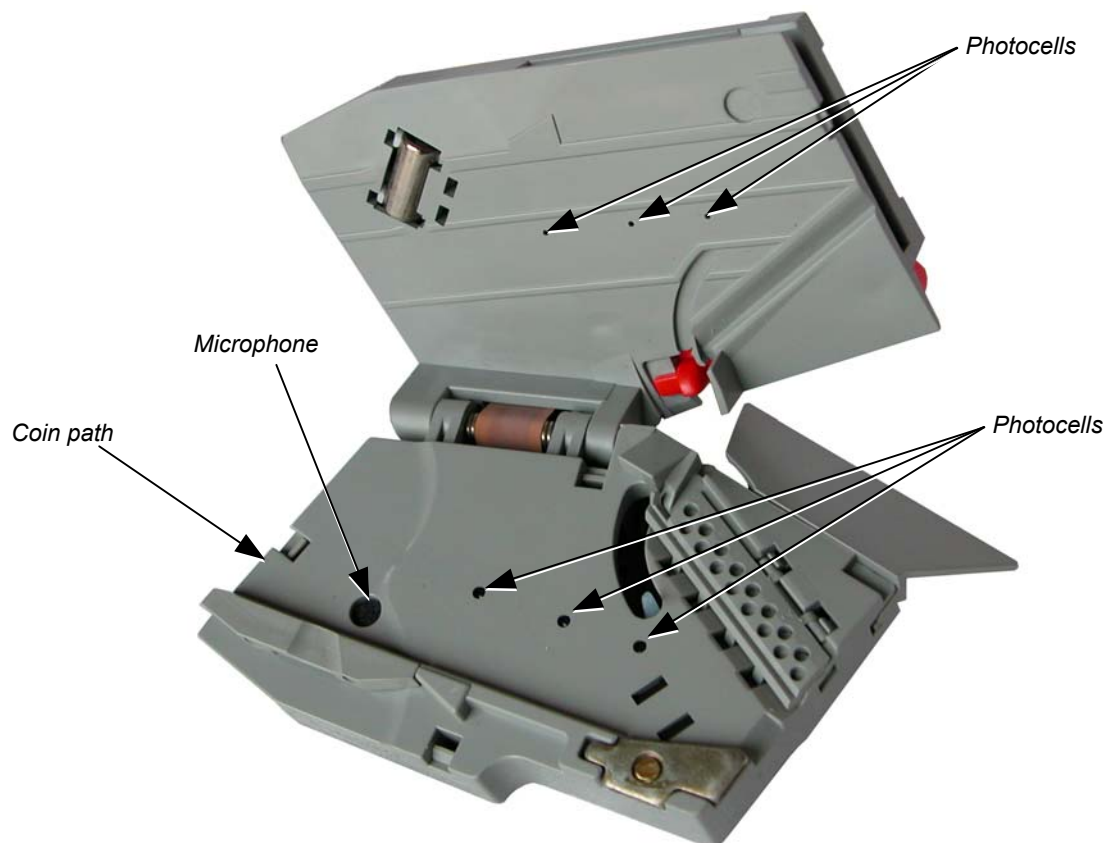
The maintenance is based on the cleaning of the elements that are most susceptible to dust, grease and dirt.

These agents are generated by different motives: by the coins that are introduced, by the environment where the changer is located and the introduction of liquids or other objects.

The most sensitive elements due to the consequences are the following:

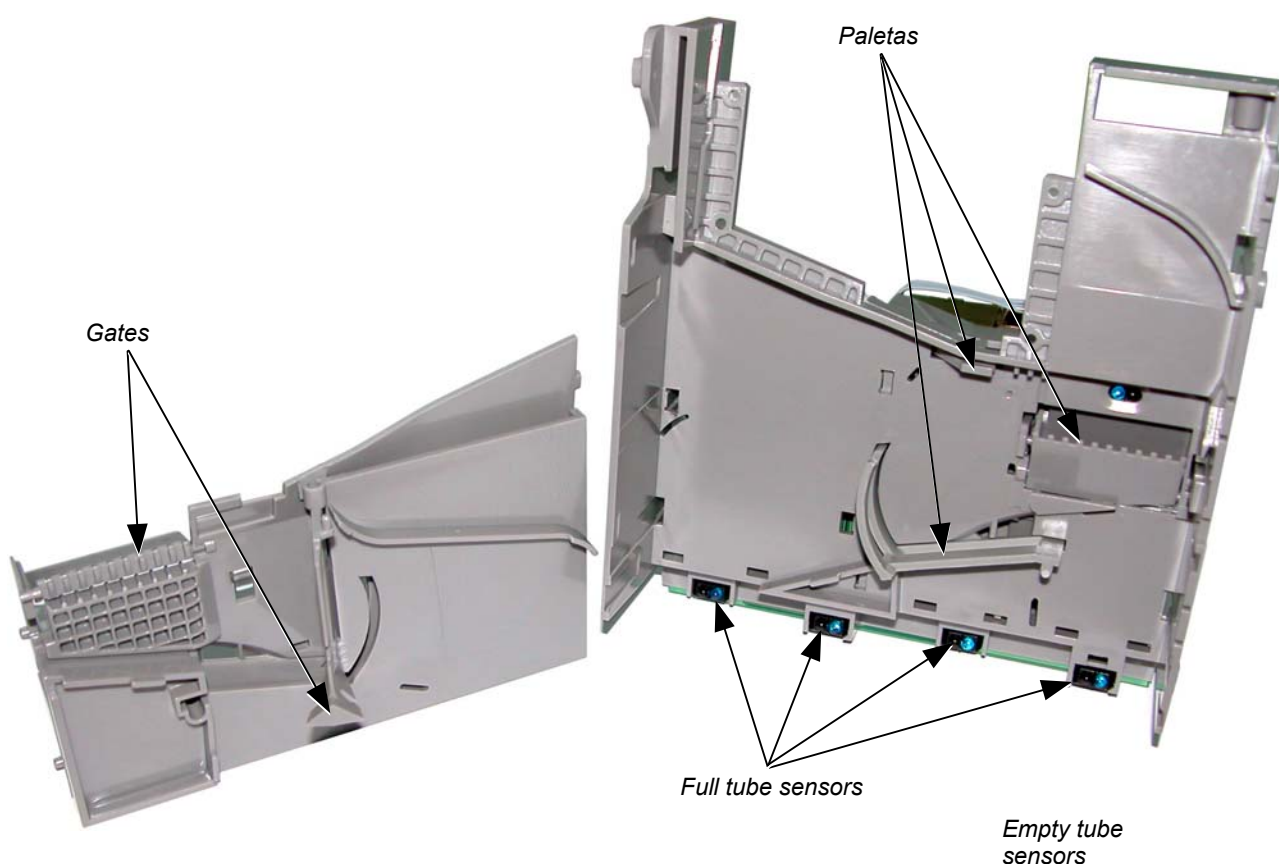
Sensor Module

The total or partial obstruction of the photocells or of the microphone, or dirt that impedes the free circulation of the coin which can cause a high number of rejected coins.



Sorter Module Sorter

If the gates do not move due to being sticky from liquids, they will provoke the incorrect classification of the coins.



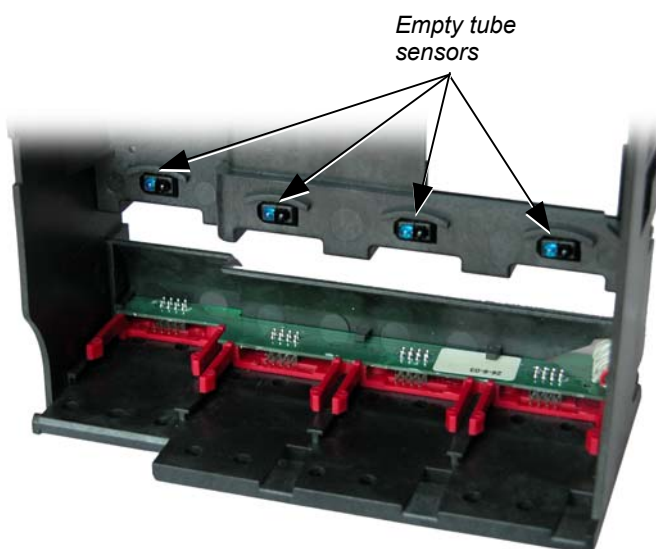
Extractor Module

If the optic sensors that detect the full and empty status of the tubes are totally or partially covered, this will provoke the incorrect reading of coins in the tubes.

There are two cleaning methods:

On site cleaning: You can use ethyl alcohol of 96° as it only needs 5 minutes to dry at room temperature.

In the workshop: Use a commercially available detergent such as KH7 that cleans and



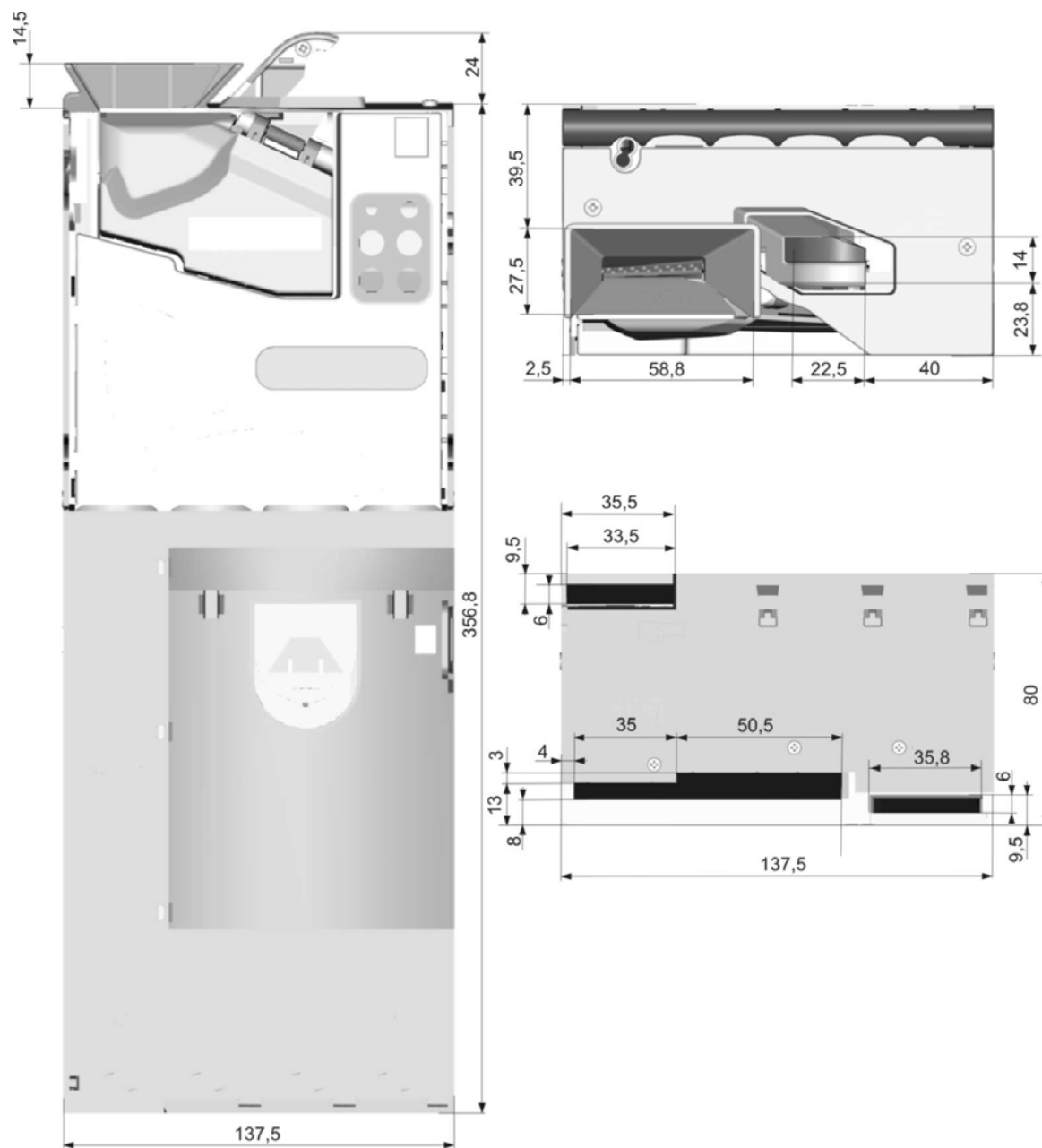


degreases. Later wipe clean with a damp cloth and drying of 12 hours at room temperature.

Note.

Never use products that contain benzene hydrocarbons as this will produce a rapid degradation of the plastics causing irreparable damage. Never submerge the validator in any cleaning liquid as this will damage the microphone.

5. DIMENSIONS and WEIGHT



Empty weight 1950 g.



Brands in the



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