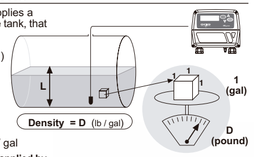
2. How Ocio works

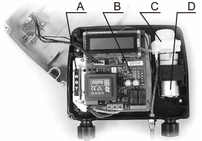
A fluid contained in a tank applies a **pressure** at the bottom of the tank, that depends on:
- the level of the liquid (L)
- the density of the liquid (D)



Examples:
- *WATER:*
- *DIESEL OIL:*
- *OIL* (optional):

D = 8,34 lb / gal
D = 7,01 lb / gal
D = 7,09 - 7,67 lb / gal

OCIO measures the pressure applied by the fluid through a probe which is held at the bottom of the tank by a weight.
Given the value of the **DENSITY (D) of the fluid contained inside the tank**, OCIO will automatically calculate the surface level of the liquid within the tank and show it on the display.
The DENSITY (D) of any fluid can be easily entered in the instrument through CALIBRATION.
A microchip placed on the electronic CIRCUIT BOARD automatically activates a small electric COMPRESSOR located inside the CONTROL UNIT, whenever it is necessary.
That, and a special CONTROL VALVE, maintains ideal operating conditions inside the PROBE.
The microchip also controls a HEATING RESISTANCE that prevents the temperature inside the housing to fall below a pre-determined value, in order to allow accurate readings and avoid the forming of condensate on the circuitry.



A. Heating resistance
B. Circuit board
C. Control valve
D. Compressor

OCIO provides accurate and constantly updated readings even when the fluid level changes or under variable ambient conditions (atmospheric pressure and temperature).

3. Installing Ocio

OCIO can be installed easily and quickly, even on tanks that have already been filled.

Warning!

The CONTROL UNIT is an electric device that is NOT suited for use in areas where there may be risks of explosion.

3.1 Installation

A **POSITIONING the control unit**

The CONTROL UNIT, connected to the probe supplied with OCIO (total length 10 metres), can be installed outdoors in any location offering easy access, directly on the tank or in its immediate vicinity.
The probe tube should be laid out with care, avoiding any damage that might impair its sealing tightness.

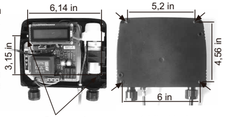
Important note!

If necessary, **the CONTROL UNIT can be installed at a distance of up to 50 metres from the tank**, by applying an extension the probe tube, with no consequences on the instrument's performance.
Great care must be given to ensuring perfect sealing tightness to all coupling joints.

The CONTROL UNIT functions regularly either in a **vertical** or a **horizontal** position.
When **installed outdoors**, the vertical position is preferable, and the unit should also be sheltered from direct sunlight.

B **FASTENING the control unit**

There are two ways to fasten the housing:
- **DIRECT WALL fastening**
It is necessary to open the housing before fastening.



no. 2 through holes Ø 4,5
no. 4 blind holes Ø 2,8 depth 6 mm

- **BRACKET fastening**
(bracket not supplied)
In this case it is NOT necessary to open the housing.

C **INSTALLING and connecting the probe**

The supplied probe is suitable for Ocio with fluids having a viscosity lower than 30 Cst. (diesel oil, water, etc). If Ocio is to be used with fluids having a viscosity between 30 and 2000 Cst, it is necessary to purchase the "OIL"-type probe kit which is not supplied with Ocio.

"STANDARD"- type PROBE:
- Make sure there is an opening (with a cap or a flange) on the tank top, wide enough for the STANDARD-type end weight to go through (check size on specifications sheet).
- Drill a 1/2" DN threaded hole on the cap of the opening.
- Take the core hitch that is supplied with the probe, which has a 1/2" DN male thread, and mount it on the cap of the opening.
- Introduce the probe through the core hitch.
- Connect the probe to the weighted end and fasten it tightly.
- Pass the end piece through the opening and make sure it reaches the bottom of the tank.
- Place the cap (or flange) back on the opening.
- Tighten the core hitch after checking once again that the weighted end is lying on the bottom of the tank.
- Connect the probe tube to the joint on the outside of the CONTROL UNIT housing and fasten it tightly.
- Over 1000 Cst wait a few minutes for the probe to stabilise.

"OIL"- type PROBE *(option)*:
- Make sure there is an opening (with a cap or a flange) on the tank top, wide enough for the end weight to go through
- Drill a 1/2" gas DN threaded hole on the cap of the opening.
- Take the core hitch that is supplied with the probe, which has a 1/2" gas DN male thread, and mount it on the cap of the opening.
- Introduce the 4x6 DN tube through the core hitch.
- Connect the two tubes (4x6 DN and 9x12 DN) using the joint supplied with the OIL-type probe and fasten them tightly. Cut the 9x12 DN tube so that its length is slightly less than the tank's height; the entire 9x12 DN tube should now fit completely inside the tank.
Connect the 9x12 DN tube to the weighted end - previously installed - and fasten it tightly.
- Pass the end piece through the opening and make sure it reaches the bottom of the tank.
- Place the cap (or flange) back on the opening.
- Tighten the core hitch after checking once again that the weighted end is lying on the bottom of the tank.
- Connect the probe tube to the joint on the outside of the CONTROL UNIT housing and fasten it tightly.

3.2 Electric connections

Important note!

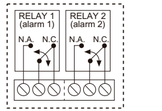
- All electric connections should be made by qualified personnel. The installer is responsible for respecting all relevant regulations.
- During installation and maintenance operations, make sure that OCIO is disconnected from the power supply.
- Before connecting OCIO to a power supply, check the nameplate for information on the required characteristics of the power source.
- Use wires with an adequate section for connecting to the power source.
- Make sure that the earth wire is properly connected to the earthing system.
- Before connecting any device to the clean contacts of the minimum-level and maximum-level alarms, make sure that the maximum voltage and current do not exceed the values supported by the contacts. Use wires with adequate sections for the expected workload.
- Always close the cover of the control unit before connecting the power supply.

A **POWER SUPPLY** control unit

It is necessary to open the housing when connecting the control unit to a power source, because it is supplied without cord and plug.
The circuit board is protected from overloads by a fuse (F1).
Check the fuse if the instrument should fail to function.

Important note!

The required characteristics of the power source depend on the model of OCIO and are inscribed on the nameplate placed on the cover of the CONTROL UNIT housing.



F1 Power supply J2 J3

If the power source cannot be reached, the installer shall have to use an extension cable, respecting existing safety regulations.

B **CONNECTING the electric alarms (this operation is optional)**

To connect the alarms it is necessary to open the housing.
The CONTROL UNIT housing is provided with a second core hitch to be used for connecting the alarms.
It is closed by a cap, which must be removed before use.
The alarm line consists of two **CLEAN CONTACTS** that are **NORMALLY OPEN** and that switch to the CLOSED POSITION when the corresponding alarm is activated.
The two clean contacts are located on the terminal:
J2 : Alarm no. 1
J3 : Alarm no. 2

The electric characteristics of these contacts are shown in the **Specifications** sheet.

Warning!

OCIO is not a SAFETY DEVICE.

Specifically, the ALARMS are designed to provide SIGNALS for local or remote use, they DO NOT DIRECTLY ACTIVATE ANY SAFETY DEVICE.
Therefore, DO NOT CONNECT to OCIO's alarm terminals any device whose non-functioning or delayed functioning might affect the SAFETY of PERSONS or of the ENVIRONMENT.

4. Before starting

Using OCIO is easy and uncomplicated, thanks to the keypad and to the display that guides the user through the various steps.
The following paragraphs show how to use OCIO, with a graphic representation of what keys to press and the corresponding indications that appears on the LCD.

- **The 4 KEYS on OCIO's keypad.**

Enter Cancel Up Down

- **How to use the KEYS :**

SHORT TAP (press and release immediately)

LONG TAP (press and hold briefly)

HOLDING (press and hold down)

DOUBLE KEYING (press one key and, while holding it down, press and release another key)

- **A non-specific LCD SCREEN**

The LCD can pass from ONE SCREEN to another

- when the **KEYS ARE PRESSED** as indicated above, or
- when a **CERTAIN AMOUNT OF TIME** goes by without any key being pressed.

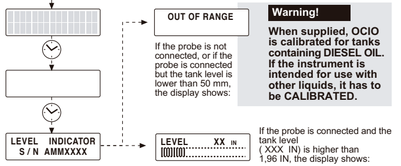
LCD **BEFORE** pressing keys — pressure on keys — LCD **AFTER** pressing keys — no pressure on keys for a certain time — LCD **AFTER** a certain time

5. Start-up

When OCIO is switched on, it carries out a self-test by performing the following activities in sequence:
- turning on all segments of the LCD
- turning off all segments of the LCD
- briefly activating the compressor
- displaying the SERIAL NUMBER
- AUTOMATICALLY entering into level display mode.

Warning!

This message remains on the display until the instrument detects a tank level higher than 50 mm.



Warning!

When supplied, OCIO is calibrated for tanks containing DIESEL OIL. If the instrument is intended for use with other liquids, it has to be CALIBRATED.

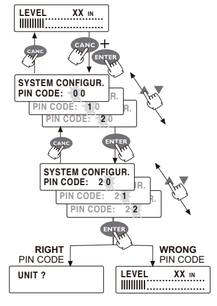
6. Configuration

CONFIGURATION is the procedure by which OCIO is adjusted to meet the specific operating conditions.
CONFIGURATION should be performed at the time of installation, after carefully reading and understanding the instructions contained in this manual.

6.1 How to ENTER CONFIGURATION MODE

In order to access CONFIGURATION mode you must enter a 2-DIGIT **PIN CODE** (the PIN code CANNOT be changed).

The PIN code corresponds to the last two digits of the SERIAL NUMBER and is therefore different for each instrument (see section: Displaying the SERIAL NUMBER).

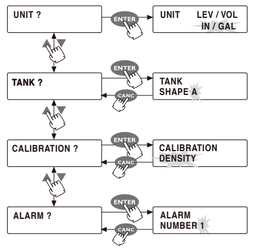


6.1 CONFIGURATION OPERATIONS

Once you have entered the CONFIGURATION mode, you can perform the following activities by pressing the keys as shown:

Warning!

SETTING THE ALARMS can be done only after CONFIGURING THE TANK



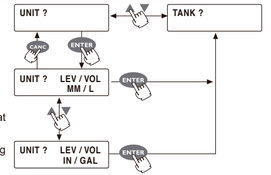
CHOOSING THE UNITS OF MEASUREMENT

OCIO can display measurements in either of two measuring systems:

METRIC SYSTEM (millimetres and litres)

UK SYSTEM (inches and gallons)

Once you have selected what system to use, all data (i.e. tank dimensions and liquid density) must be entered using the appropriate system.



CONFIGURING THE TANK

OCIO can display two different quantities:
the **LEVEL** of the liquid inside the tank
the **VOLUME** of the liquid.

Important note!

OCIO always detects the LEVEL of the liquid, and uses this information to determine the VOLUME of the liquid **only if** the tank has been regularly configured.

Configuring the tank means:

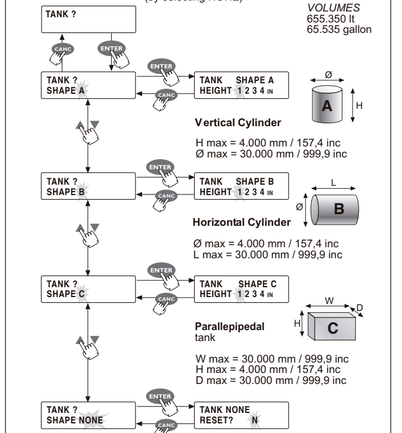
selecting the **shape** of the tank — **TYPE**

entering the **dimensions** of the tank — **DIMENSIONS**

TYPE

Selecting **TANK SHAPE**

OCIO allows you to choose between **3 kinds of tanks** (A, B, C), or **NOT TO CONFIGURE** the tank (by selecting NONE)



VOLUMES
655,350 lt
65.535 gallon

Vertical Cylinder
H max = 4.000 mm / 157,4 inc
Ø max = 30.000 mm / 999,9 inc

Horizontal Cylinder
Ø max = 4.000 mm / 157,4 inc
L max = 30.000 mm / 999,9 inc

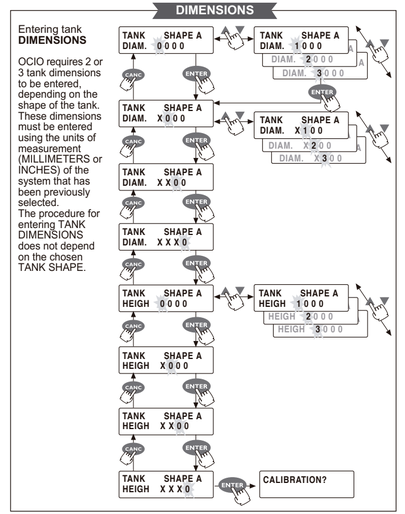
Parallepipedal tank
W max = 30.000 mm / 999,9 inc
H max = 4.000 mm / 157,4 inc
D max = 30.000 mm / 999,9 inc

NON configured tank

DIMENSIONS

Entering tank **DIMENSIONS**

OCIO requires 2 or 3 tank dimensions to be entered, depending on the shape of the tank. These dimensions must be entered using the units of measurement (MILLIMETERS or INCHES) of the system that has been previously selected.
The procedure for entering TANK DIMENSIONS does not depend on the chosen TANK SHAPE.



CALIBRATION

OCIO determines the level of the liquid in a tank by detecting the pressure applied by the liquid, which depends on the liquid's level and also on its DENSITY.
CALIBRATION is the operation by which OCIO is assigned a value for the liquid's DENSITY.

Warning!

OCIO is factory-calibrated for use with tanks containing DIESEL OIL, which has a DENSITY of 7,01 lb/gal at a temperature of 20 °C.

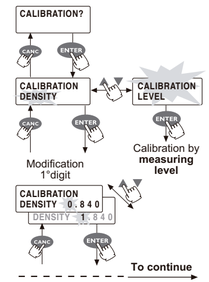
The "DENSITY" value is therefore preset at 7,01

If the instrument is intended for use with tanks containing diesel oil, NO FURTHER CALIBRATION IS NECESSARY.

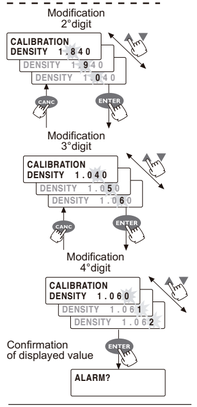
A **CALIBRATION by known DENSITY**

When the liquid's DENSITY is KNOWN, OCIO can be calibrated by simply entering the known value.

The density must be entered using:
- **kg / dm 3** if the **METRIC SYSTEM** has been selected
- **oz / inch 3** if the **UK SYSTEM** has been selected



To continue



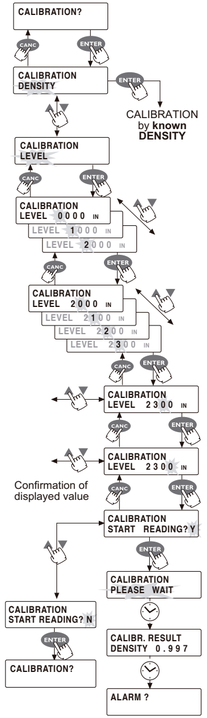
B CALIBRATION by MEASURING LEVEL

If the DENSITY is not known, **OCIO can be CALIBRATED by having it read a known LEVEL.**
To do this, proceed as follows:
• Place the probe inside a tank whose level can be accurately measured and that contains the same liquid that will be used in the tank where OCIO will be installed.
• Enter the known level on the keypad.
• Confirm the CALIBRATION READING that OCIO will initiate.
After the CALIBRATION READING, OCIO will automatically calculate the liquid's DENSITY and use that value for all further level readings.

Important note!

• Make sure that the liquid used for calibrating the instrument is the same kind of liquid that will be used in the tank where OCIO will be installed.
• Use a reliable instrument to measure the calibration level, e.g. a graduated staff.
• Enter the measured level using the same UNITS OF MEASUREMENT of the system that has been selected (METRIC UNITS: millimetres; UK UNITS: inches).
• Install the probe so that it is properly lying on the bottom of the tank used for calibration.
• When calibrating the instrument, if possible use the same tank where OCIO will be definitely installed.
• If you cannot use the same tank, choose a tank that is large enough to ensure that the level will not by affected by the pumping of air that OCIO will perform during the calibration reading.
• Always perform the calibration with a tank level that is 70% or more of the maximum level that OCIO will measure in its definitive installation.

EXAMPLE: If OCIO is to be installed in a tank shaped as a HORIZONTAL CYLINDER having a DIAMETER of 1 METER, the calibration should be performed by reading a tank level of 2,75 or more inch (in the same tank or in another one).



SETTING THE ALARMS

The OCIO system includes **two alarms** which can be used:
- for activating remote devices (such as acoustic or visual alarms);
- for stopping any pumps that may be connected to the tank.
For each of the two alarms, both the normally open contact and the normally closed contact are available.
i.e.: No. 3 connectors are available for both alarms.

The alarms can be set only after configuring a tank.

Warning!

OCIO is not a SAFETY DEVICE.

Therefore, DO NOT CONNECT to OCIO's alarm terminals any device whose non-functioning or delayed functioning might affect the SAFETY of PERSONS or of the ENVIRONMENT.

To set the alarms it is necessary to:

• choose the TYPE of alarm:
- LOW LEVEL alarm **= LOW**
The alarm is activated when the tank level falls below the pre-set value.
- HIGH LEVEL alarm **= HIGH**
The alarm is activated when the tank level rises above the pre-set value.

The alarms can be set independently from one another; this means that you can have:
- two alarms of different kinds (one H-level alarm and one L-level alarm)
- two alarms of the same kind (two H-level alarms or two L-level alarms).

• enter the VALUE that activates the alarm.
The values that activate the alarms are ALWAYS expressed as PERCENTAGE VALUES of the tank's full capacity.

The values that activate the alarms can be any number that falls within the following range:
- **H**-level alarm:
values with a **MAXIMUM** value of **90 %**
- **L**-level alarm:
values with a **MINIMUM** value of **3 %**

If the alarm values are set at **0 %** (whether the H-level or L-level alarm) they will not be activated under any circumstances.

Important note!

In order to avoid the alarms being activated/deactivated by small variations of level, OCIO will:

• activate the alarm when the pre-set value is reached in a "stable" manner (i.e. after at least x consecutive readings)

• deactivate the alarm when the tank level diverges from the pre-set value by at least 2%.

EXAMPLE:
If the H-level alarm is set at 75%:
- The alarm will be activated when the tank level, while **going up**, reaches the value of 75% and maintains it for at least x readings.
- The alarm will be deactivated when the tank level, while **going down**, reaches the value of 73%.

If the L-level alarm is set at 15% :
- The alarm will be activated when the tank level, while **going down**, reaches the value of 15% and maintains it for at least x readings.
- The alarm will be deactivated when the tank level, while **going up**, reaches the value of 17%.

Confirm the value and return to the configuration menu.

7. Daily use

Using OCIO is easy and uncomplicated.

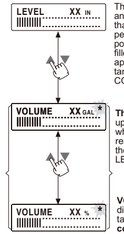
A Displaying tank LEVEL or tank volume

At start-up, OCIO automatically starts measuring.

NORMAL CONDITIONS

(no alarms are on)

The user can easily switch from displaying one quantity to another at the touch of a key.
The instrument will display the selected QUANTITY until the user selects another one or until an alarm is activated.



The **LEVEL BAR** is an **analog indicator** that shows (in percentage) what portion of the tank is filled. The level bar appears only if the tank has been CONFIGURED.

The asterisk (on the upper right) **flashes** whenever OCIO is reading or updating the displayed LEVEL or VOLUME.

VOLUMES can be displayed only if the tank has been **configurated.**

OCIO can display any of the following QUANTITIES:

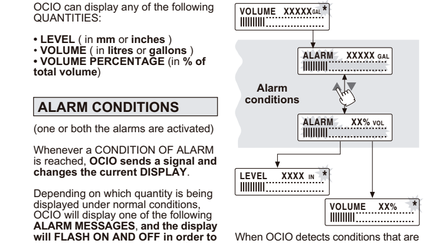
• **LEVEL** (in **mm** or **inches**)
• **VOLUME** (in **litres** or **gallons**)
• **VOLUME PERCENTAGE** (in **% of total volume**)

ALARM CONDITIONS

(one or both the alarms are activated)

Whenever a CONDITION OF ALARM is reached, **OCIO sends a signal and changes the current DISPLAY.**

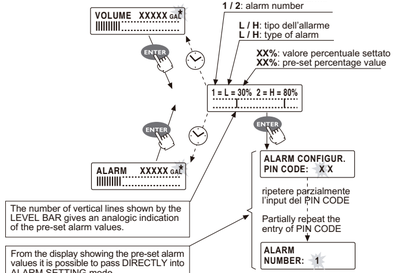
Depending on which quantity is being displayed under normal conditions, OCIO will display one of the following **ALARM MESSAGES**, **and the display will FLASH ON AND OFF in order to alert the user that a condition of alarm has been reached**.



When OCIO detects conditions that are no longer of alarm, the display reverts to showing the quantity previously selected.

B Displaying the SELECTED ALARM LEVELS

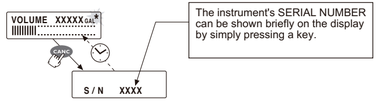
Either in NORMAL CONDITIONS (no alarm on) or in ALARM CONDITIONS, OCIO can display the selected alarm levels.



The number of vertical lines shown by the LEVEL BAR gives an analogic indication of the pre-set alarm values.

From the display showing the pre-set alarm values it is possible to pass DIRECTLY into ALARM SETTING mode.
You will be requested, however, to enter the PIN CODE that is required for entering CONFIGURATION mode.

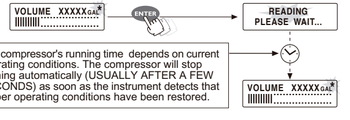
C Displaying the instrument's SERIAL NUMBER



The instrument's SERIAL NUMBER can be shown briefly on the display by simply pressing a key.

D Turning the compressor on MANUALLY

OCIO automatically turns on the compressor whenever necessary for maintaining ideal operating conditions inside the PROBE. The compressor, however, can be turned on MANUALLY by the user at any time.



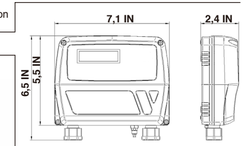
The compressor's running time depends on current operating conditions. The compressor will stop running automatically (USUALLY AFTER A FEW SECONDS) as soon as the instrument detects that proper operating conditions have been restored.

8. Specifications

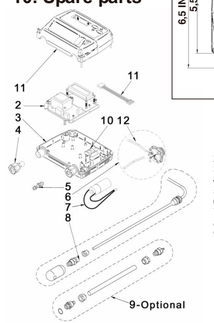
Power Supply
230 V +/- 5 50-60 Hz or
110 V +/- 5 % 50-60 Hz
Dimensions:
Control Unit Housing: 165x180x60 mm
probe: - End Ø 29,5 x L 60 mm
protection: IP55
Probe:
- **materials**: tube: Rilsan
weighted end: brass
- **dimensions**:
- for liquids having viscosity **< 30 Cst**):
- **tube**: I/E diameter = 4 mm / 6 mm
(L = 10 m)
- **end**: diameter 29,5 mm
length 60 mm
- for liquids having viscosity
< *2000* Cst (optional):
- tube for end piece I/E diameter = 9 mm / 12 mm (L = 3 m)
Compatible Fluids
Any NON-flammable fluids, NON-explosive fluids, NON-corrosive fluids that are compatible with the probe materials.
Operating Range
- **Temprature**: from –20 °C to +50 °C
- **Humidity**: up to 90 %
Tank Shapes
Can be chosen between the following:
- parallelepipedal
- vertical cylinder (with flat ends)
- horizontal cylinder (with flat ends)
Tank Dimensions
Can be entered during installation

MAXIMUM HEIGHT: 4 metres
Tank capacity
From a few dozen litres to 999,000 litres
Readings
Can be chosen between:
- LEVEL (**MAX RANGE = a column of water 400 cm tall**)
- contents expressed as PERCENTAGE of total tank capacity
- contents expressed as VOLUME (litres or gallons)
Accuracy
+/- 1 % of max range (after proper calibration)
Repeatability
+/- **0.5 %** of max range
Alarms
Two (both can be set independently)
Types of Alarms :
- H = HIGH LEVEL (HIGH)
(**contact CLOSES** when the detected level is HIGHER than the selected alarm level)
- L = LOW LEVEL (LOW)
(**contact CLOSES** when the detected level is LOWER than the selected alarm level)
Contact capacity (resistive load):
2 Amp - 277 Volt AC
5 Amp - 125 Volt AC
5 Amp - 30 Volt DC

9. Dimensions



10. Spare parts



1. Case cover
2. Board unit
3. Case base
4. Ring nut
5. Hose connection d. 6
6. Valve body
7. Compressor
8. Diesel oil probe kit
9. Oil probe kit (optional)
10. Capacitor bracket
11. Board connecting cable
12. Polyurethane tube

11. Ce certificate of conformity

DECLARATION OF CONFORMITY

Piusi S.p.A. Registered Office: Via Pacinotti Z.I.
Rangavino 46029 - Suzzara (MN) - Italy

DECLARE

THAT UNDER OUR SOLE RESPONSIBILITY THE PRODUCT: ELECTRONIC TYRE GAUGE Model: EOLO PANEL

TO WHICH THIS DECLARATION RELATES IN CONFORMITY WITH THE FOLLOWING STAN-DARDS AND OTHER NORMATIVE DOCUMENTS:
73/23/CEE e 93/68/CEE (Low voltage)
89/336/CEE (Electromagnetic compatibility)

For the conformity to applicable requirement of the aforesaid directives they have been applied the following norms:

EN 1050 Risk evaluation
EN60204-1 Emergency of the systems electrical workers to edge machine.

Piusi S.p.A.

Suzzara, 01.12.06

Otto Varini, President

12. Disposal

The components must be given to companies that specialise in the disposal and recycling of industrial waste and, in particular, the DISPOSAL OF PACKAGING.
The packaging consists of biodegradable cardboard which can be delivered to companies for normal recycling of cellulose.
DISPOSAL OF METAL COMPONENTS
The metal components, both painted and stainless steel, are usually recycled by companies that are specialised in the metal-scrapping industry.

DISPOSAL OF ELECTRIC AND ELECTRONIC COMPONENTS:
these have to be disposed by companies that are specialised in the disposal of electronic components, ***in accordance with the instructions of 2002/96/EC (see text of Directive below).***

ENVIRONMENTAL INFORMATION FOR CUSTOMERS IN THE EUROPEAN UNION
European Directive 2002/96/EC requires that the equipement bearing this symbol on the product and/or its packaging must not be disposed of with unsorted municipal waste. The symbol indicates that this product should be disposed of separately from regular household waste streams. It is your responsibility to dispose of this and other electric and electronic equipment via designated collection facilities appointed by the government or local authorities.

DISPOSAL OF OTHER PARTS:
The disposal of other parts such as pipes, rubber seals, plastic components and cables should be entrusted to companies that special in the disposal of industrial waste.

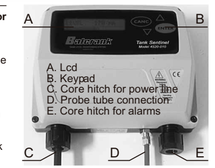
Bulletin M0162 rev. 1

OCIO

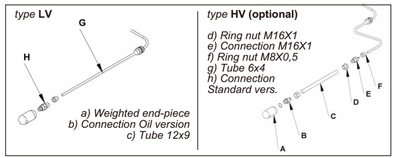
Tank level monitoring system

1. What is Ocio?

OCIO is an electronic instrument for monitoring the level of liquids contained in tanks. OCIO indicates tank levels by processing **pressure** readings made by a probe placed inside the tank. OCIO is made up of the following parts:
• CONTROL UNIT
Contained in a plastic housing and suitable for outdoor use, it includes a liquid-crystal display (LCD) and a keypad.
• PROBE to be placed inside the tank and connected to the control unit.



A. Lcd
B. Keypad
C. Core hitch for power line
D. Probe tube connection
E. Core hitch for alarms



With OCIO you can:
• have **constantly updated readings** of actual tank levels;
• set two different alarm levels that can be used to activate remote devices.
OCIO can be used in the following situations:
• non-pressurized tanks, where tank pressure is always equal to the atmospheric pressure;
• tanks having various shapes and capacities; you can select one of the available shapes and enter the tank dimensions;
• tanks containing fluids that are **not** flammable, explosive or corrosive (examples of admissible fluids are: diesel oil, lubricating oil, water, food products).
OCIO is a completely independent instrument and needs only be connected to a power source.

Warning!

For safe and proper use, carefully follow the instructions and indications contained in this manual.
Improper use may cause harm to persons and damage to property.