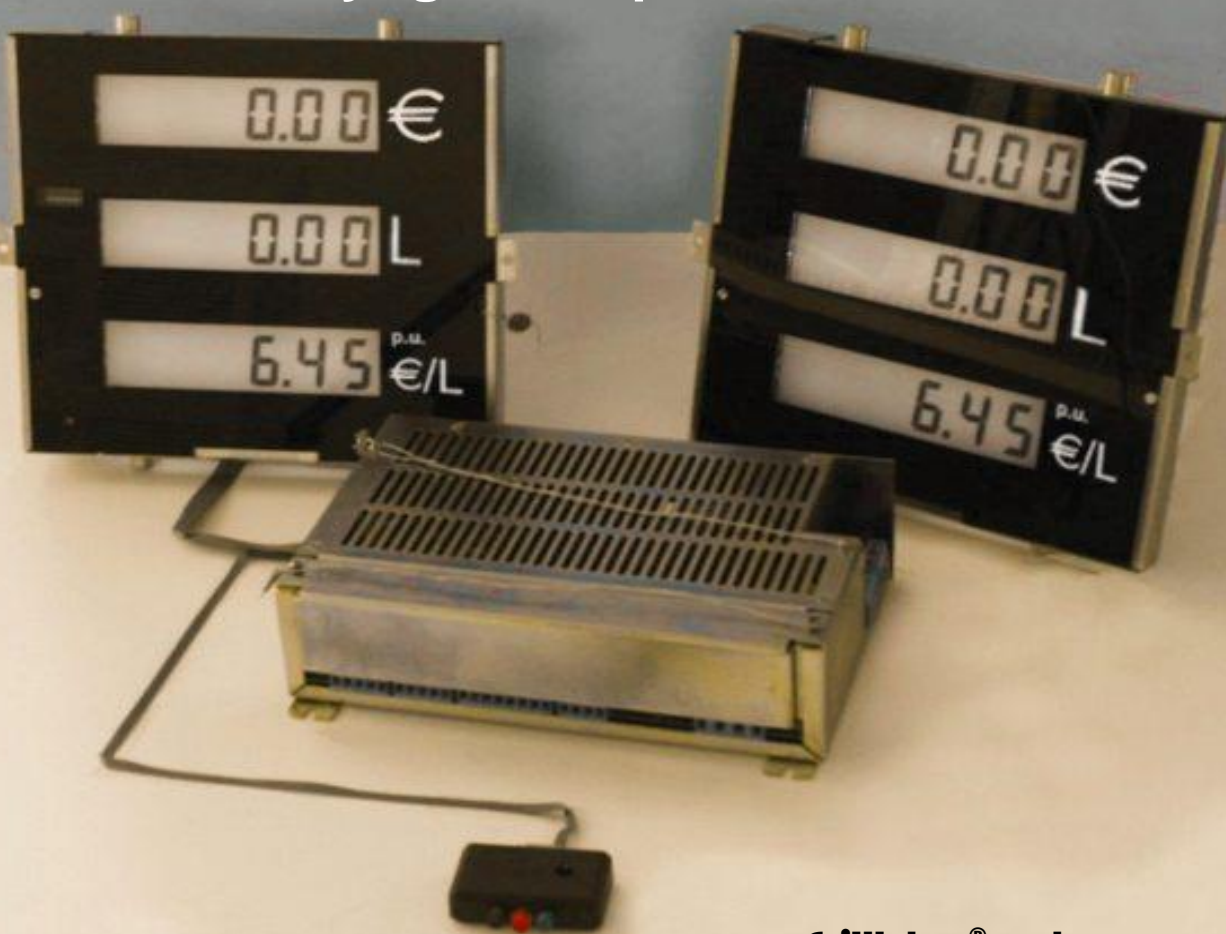# EsiWelma® s.r.l.

TW1-B.M.. Computing Head
User Guide
Cryogenic liquids version

EsiWelma® s.r.l.
Via F.lli Canepa 134d-e
16010 Serra Riccó (Genoa)
ITALY
Tel: +39 010 754211
Fax: +39 010 7542178
email: info@esiwelma.it

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	1	36

CONTENTS

LIST of figures

LIST of photos

EsiWelma® s.r.l.

1. TECHNICAL DESCRIPTION

The TW1-B.M.. electronic computing head is designed to operate on LNG single-nozzle fuel dispensers. One or two-sided display systems can be used. It can communicate with a Host sending data concerning the refuelling during the process and/or at the time of the device.

1.1. Structural specifications

The computing head is made up of:

■ a *CPU board* complete with power supply and communication interface. The board is housed in a metal enclosure that protects it mechanically and against EMI jamming.

Photo 1: CPU

■ a *price change / setup board* in a plastic enclosure. The assembly can be housed where the user desires, or inserted only when necessary.

Photo 2: Setup / Price change

■ one or two *display cards,* inserted inside a metal enclosure.

Photo 3: Display

1.2. Technical specifications

Power supply:	230Vac ± 10%
Power consumption:	10VA
Temperature:	min. –40°C max. 70°C
Humidity (non condensing):	95%
Max flow rate:	3.5Kg/s (or l/s in the case of vol. counter)
Measuring unit:	10g (or 1cl in the case of vol. counter)
Max counting channel 1:	990,00 or 9990,00 Kg for each delivery
Max counting channel 2:	99,00 for each delivery
Solenoid valve control:	N.O. max 270Vca/3A Standard /1A ATEX (*)
Counter Inputs: max 2 (see setup):	Mono-channel Mass Flow Meters
Protection grade	IP20(**)
Electr. Totalizer not resettable (10 digit):	1Kg/step
Dimensions of head CPU:	(230 x 154 x 66) mm
Weight of head CPU:	1950g
Dimensions of head Display:	(225 x 250 x 50) mm
Weight of head Display:	960g

(*) Outputs device depending:
Relays for TW1-B.M "Standard", or Solid State Relays for TW1nA-B.M "ATEX".
(**) The declared protection grade concern the metallic box. The devices enclosed by the dotted line in **Figure 1** must be installed in a cabinet with at least protection degree IP54, compliant to standard EN60079-15 of ATEX directive.

EsiWelma® s.r.l.
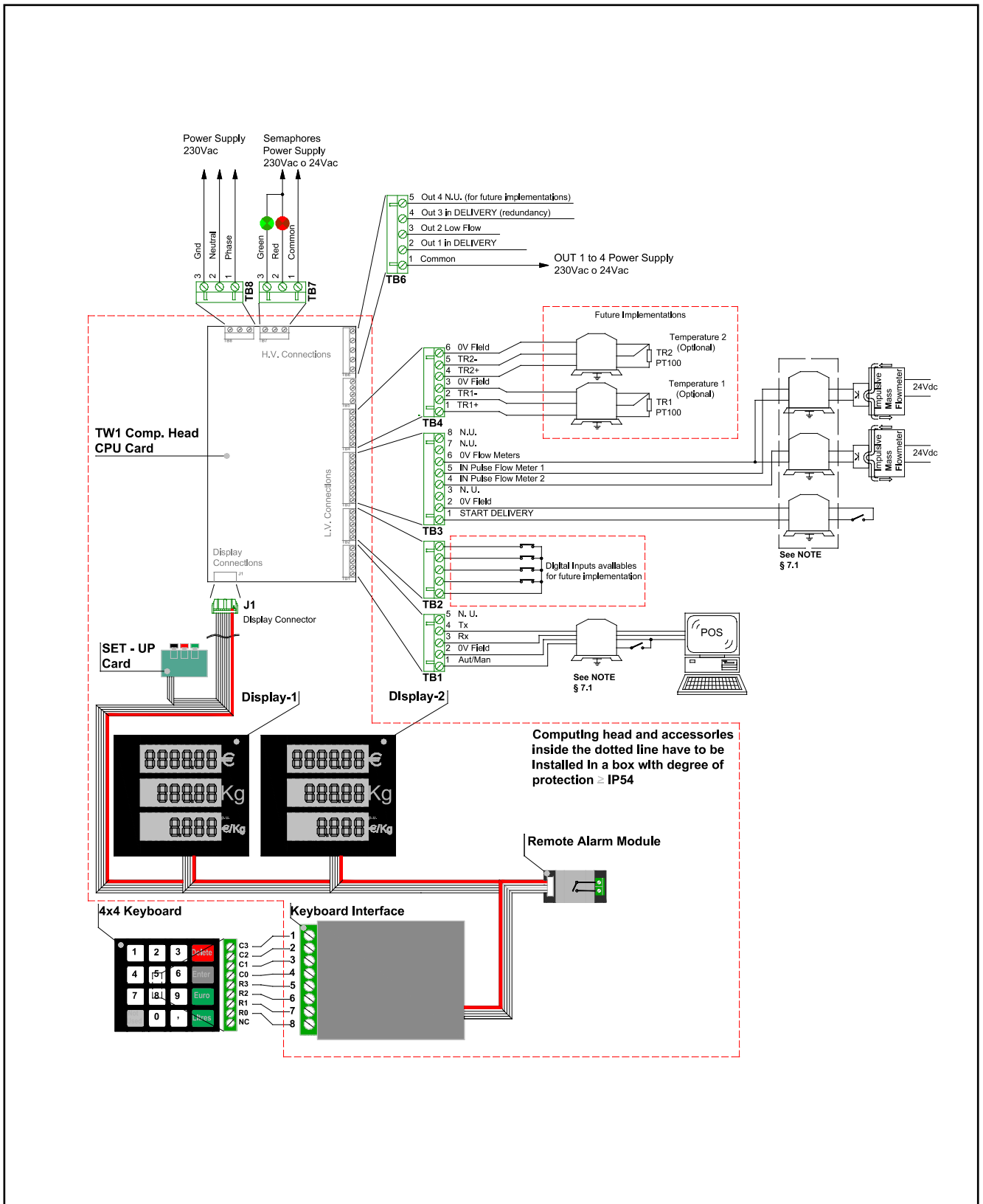
Figure 1: Diagram of electrical connections

Within the diagram, the following labels appear:

Power Supply 230Vac

Semaphores Power Supply 230Vac o 24Vac

5 Out 4 N.U. (for future implementations)
4 Out 3 in DELIVERY (redundancy)
3 Out 2 Low Flow
2 Out 1 in DELIVERY
1 Common
TB6

OUT 1 to 4 Power Supply 230Vac o 24Vac

3 Gnd
2 Neutral
1 Phase
TB8

Green
Red
Common
3 2 1
TB7

H.V. Connections

Future Implementations

6 0V Field
5 TR2-
4 TR2+
3 0V Field
2 TR1-
1 TR1+
TB4

Temperature 2 (Optional) TR2 PT100

Temperature 1 (Optional) TR1 PT100

TW1 Comp. Head CPU Card

8 N.U.
7 N.U.
6 0V Flow Meters
5 IN Pulse Flow Meter 1
4 IN Pulse Flow Meter 2
3 N. U.
2 0V Field
1 START DELIVERY
TB3

L.V. Connections

Impulsive Mass Flowmeter 24Vdc
Impulsive Mass Flowmeter 24Vdc

See NOTE § 7.1

Digital Inputs availables for future implementation
TB2

Display Connections

5 N. U.
4 Tx
3 Rx
2 0V Field
1 Aut/Man
TB1

See NOTE § 7.1

POS

J1 Display Connector

SET - UP Card

Display-1   **Display-2**

Computing head and accessories inside the dotted line have to be installed in a box with degree of protection ≥ IP54

€ Kg e/Kg

Remote Alarm Module

4x4 Keyboard   **Keyboard Interface**

1 C3
2 C2
3 C1
4 C0
5 R3
6 R2
7 R1
8 R0
NC

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	5	36

2. FUNCTIONAL DESCRIPTION

2.1. Display

The TW1-B.M computing head can be used with LNG single-nozzle fuel dispensers. Data is always displayed as follows: 6-digit display for sale price, 5 or 6-digit display for the dispensing volume and 4-digit display for unit price.

TOTAL AMOUNT

DELIVERED FUEL

UNIT PRICE

Figure 2: Maximum displayed

25 mm high backlit LCD displays. The backlighting system is formed of a PCB, carrying a LED matrix; it is mounted on the back of the metal enclosure and emits a flooded green light. It is also possible to use a neon-tube system or the lighting of the dispenser itself.

2.2. Description of operating sequences

When switched on, the computing head performs some checks:

- EPROM — it checks the EPROM CRC and compares it with the data shown on the program.
- RAM — it checks the writing and reading capability of the data RAM.
- EEPROM — it checks the congruence of the data shown in EEPROM.
- DISPLAY — it checks the display connection status.
- RX-TX — presence of active connection to the Host.
- DATA COMPLIANCE — conformity of the data in RAM with the original data in EEPROM.
- UNIT PRICE — check that the unit price is not zero.
- MEASUREMENT — it checks that the mass flow meter(s) is(are) present (only for MODBUS type flow meter: <u>future implementations</u>)

If the above checks give a positive result, before switching off, the display temporarily shows the program code, and immediately after it brings up the last dispensing data. If there are any abnormalities, the display will show the relative error code.   (see Troubleshooting §3.)

When the dispenser is in STOP-mode, the computing head performs continuously the same controls described above.

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	6	36

The refueling operation begins by turning the switch to START:

If the dispenser is available and nozzle(s) is(are) connected to the refueling receptacle on the vehicle, it's possible to actuate the START switch, activating the delivering sequence of the computing head, which will perform the following controls:

● The same ones described above - see §2.2.

If the above mentioned checks give a positive result, dispensing can start with a visual control of the display and subsequent activation of the outputs:

● Display   - All digits display 8, followed by Blank then 0.00 Euro and 0.00 Kg. Each sequence takes about 1 seconds so the operator can check that each segment is operating correctly, at a glance.
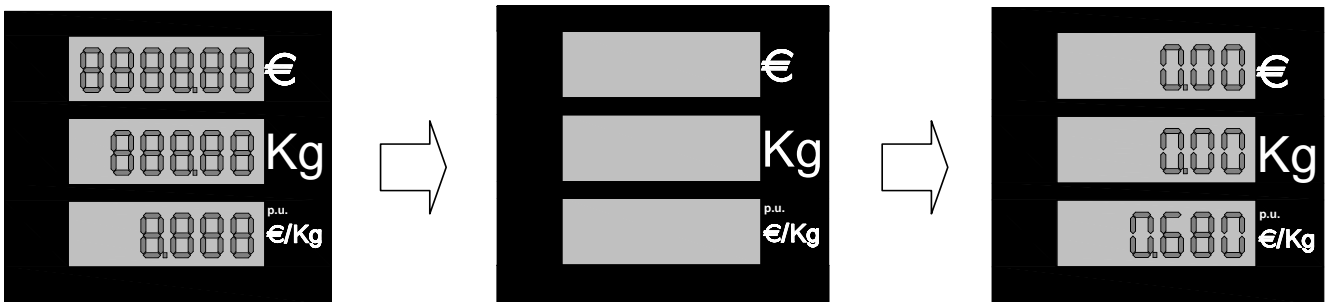
Figure 3: Dispensing start-up sequence

During dispensing the computing head performs the following functions:

● Activates command modules on the ouputs and signal-lights.
● Acquires pulses from the transducer(s). 1 pulse = 1 dag.
● Calculates and displays the volume dispensed and the sale price.
● Checks that the data displayed is correct (implicit with RAM and EPROM).
● Checks that display is operating.
● Checks the connections to the mass flow meter(s)
  (only for MODBUS type flow meter: future implementations).

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	7	36

Dispensing ends when:

- The computing head go in STOP-mode (START switch in off)
- The end delivery timeout value has been reached (see setup)
- The preset quantity/price has been reached
- Abnormality/fault conditions (see §3)
- Block command from Host.

…If dispensing stops due to an abnormality

the display will show the relative error code (see Troubleshooting §3.).

2.2.1. *Manual dispensing*

The operator starts and stops dispensing by acting START/STOP switch.

2.2.2. *Pre-set value dispensing*

The head independently cuts off supply when the amount required is reached, whether it has been programmed using the preset buttons (or keyboard) or in the event of Host programming.

The amount requested is shown as follows:

- Unit price display - always active.
- Sale price display - if Euro is selected, the requested value is shown otherwise it is off.
- Display of volume dispensed - if KG are selected, the requested value is shown otherwise it is off.

Figure 4: Example of pre-setting Sale price of 5.00 €
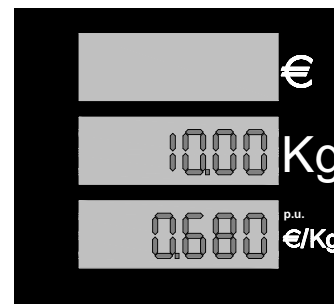
Figure 5: Example of pre-setting 10 KG dispensed

2.2.3. *Pre-setting by Host*

Every time the computing head is connected to a Host with Post-pay function, it can receive an order of price change, by sending a new unit price, or an order of delivering stop.

<div style="border:2px solid red; color:red; text-align:center; font-weight:bold">

Metrological parameter settings cannot be modified by Host.
Unit price cannot be modified during the delivery.

</div>

EsiWelma® s.r.l.

2.2.4. *Pre-setting by 16-key keypad*

When the computing head switches on it carries out a keypad presence check. If this test is positive, the computer manages the keypad to preset a quantity or an amount to be delivered.

Figure 6: 16-key keypad

In STOP-mode, the keypad is operative and can be used as follows:

1. Pre-set Euro or KG/Litr by pressing the corresponding key. This is obligatory to continue.
2. Press number keys (with comma if necessary) to preset value.
3. Press «ENTER ». The display of the computing head will now show on the corresponding LCD the sale price (top line) or the dispensing quantity (middle line) selected.
4. If the value is correct dispensing can begin. If an error occurs, press « DELETE » and repeat steps 1 to 3.

The keypad will not work during dispensing. At the end of dispensing, in STOP-mode again, the keypad can be used for a new operation.

2.2.5. *Automatic stop sequence*

The automatic stop occurs when the set quantity or amount is reached and this condition is signaled to the dedicated outputs.

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	9	36

2.2.6. *Managing a power failure*

During normal operations, whether or not the dispenser is currently in use, there may be a power failure; if this occurs, the computing head will enter a PWF procedure so it can memorise: sale price, volume dispensed and totalizer. The data is displayed for about 30 minutes after the power fail. The power fail status is shown by the word OFF on the unit price display. When the power supply is restored the memory brings up the last sale data and shows it on the display.

2.3. Connection to Host

The computing head has a standard LOGITRON Pumalan 3-wire connection: TX, RX, Gnd. Other connections are possible by using an adapter card (to be implemented). To use and implement different protocols a licence agreement issued by the owner is required.
Pumalan is a registered mark of GILBARCO (LOGITRON).

2.4. Euro €

As described below in §4.2. the computing head can be set up to operate in different currencies; the decimal points can be moved to suit the unit price and the sale price. In any case, the Euro can be configured rapidly by setting Jumper J3; when the computing head starts up it will automatically set the correct decimal points.
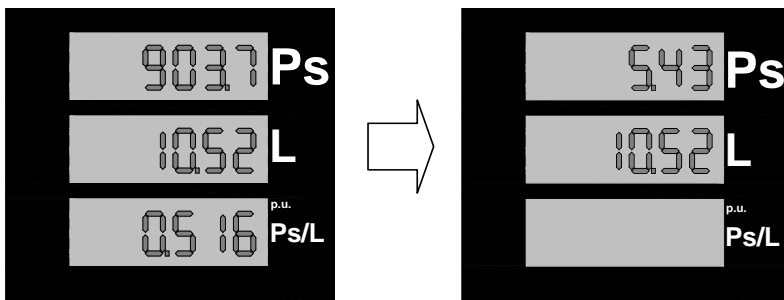
Figure 7: Temporary conversion of sale price into Euro

2.5. Warning light management (semaphores)

To allow operators to follow in remote the operations, each possible status of the dispenser is coupled with a unique code as shown in the table below:

Dispenser state	Green light	Red light
Dispenser off	Off	Off
Dispenser ready	On	Off
START switch ON	Off	On
In delivery	Off	On
End of delivery (START switch ON)	Off	On
End of delivery (START switch OFF) ≡ Dispenser ready	On	Off
Computing head in <u>non fatal error</u> (START switch OFF)	On	Off
Computing head in <u>non fatal error</u> (delivery locked)	Off	Flashing
Computing head in <u>fatal error</u> (a restart is required)	Off	On
Computing head in set-up (dispenser not available)	Flashing	Off

3. TROUBLESHOOTING

During normal operations, the computing head controls the internal data flow and congruence of the field data. Abnormalities are handled differently according to the damage they may cause to data.

The computing head can detect *Fatal* or *non-Fatal* errors, as described below.

In any case, the computing head stops current dispensing, displays the memorized error code and, if connected to Host, communicates the error status.

3.1. Fatal errors

These are normally due to malfunctioning which can cause loss of data.

In this case, the computing head stops dispensing, displays the corresponding code and does not start up again.

To start up again it needs to be reset by switching off the power supply for a few seconds.

- Data congruence
- EPROM error
- RAM error
- EEPROM error
- Output 1 Failure
- Mass Flow Meter(s) (*)

3.2. Non fatal errors

All stops caused by an abnormal field status and all stops caused by a temporary operating abnormality caused by a contingent situation such as the lack of unit price, or an occasional situation such as a data invalidated by a disturbance belong to this category. In this case, the error will be automatically deleted as soon as the cause that created it is removed.

The computing head will attempt three start-ups; at the fourth unsuccessful attempt the error turns fatal.

- Display 1 and 2
- Communication with Host
- Setup data loss
- Fuel cut-off device (**)

(*) Only for MODBUS type flow meter: <u>future implementations</u>.
(**) Not used for LNG.

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	11	36

EsiWelma® s.r.l.

3.3. Error review table

ERRORS REVIEW TABLE

Non fatal errors

Display Code	Code protocol [E+][E-] Hex	Code protocol [E+][E-] Ascii	Description
Erd1	[0x37][0x30]	[7][0]	Display 1
Erd2	[0x37][0x30]	[7][0]	Display 2
ErLn	[0x38][0x30]	[8][0]	Comunication error
ErSU	[0x34][0x31]	[4][1]	Setup data loss

Fatal errors

Display Code	Code protocol [E+][E-] Hex	Code protocol [E+][E-] Ascii	Description
FECd	[0x33][0x30]	[3][0]	Data congruence
FEEP	[0x31][0x31]	[1][1]	EPROM error
FErA	[0x31][0x30]	[1][0]	RAM error
FEEE	[0x31][0x35]	[1][5]	EEPROM error
FEiHt	[0x34][0x38]	[4][8]	Output 1 control Error
FEPd	[0x47][0x30]	[G][0]	Display after 3 NF errors

Errors description:

- Display — Checks the presence of the single LCD bars and identifies the missing line.
  Error code: **Erd1 or Erd2**

- Comunication with Host — Checks that there is a "polling" call from Host at least every 5s. If there is no call, dispensing will be cut off.
  Error code: **ErLn**

- Set-up data missing — If there are no Set-up data or they are not conformable, the computing head does not deliver and operator must input these data
  Error Code: **ErSU**

- Data congruence — Checks the congruence of the memorised data. The computing head constantly checks the EPROM and the RAM data, also during dispensing; if there is an error it cuts off supply.
  Error code: **FECd**

- EPROM Error — The CPU calculates the EPROM checksumand makes sure it is the same as what the EPROM shows. The computing head is blocked if there is an abnormality.
  Error code: **FEEP**

- RAM Error — With the nozzle in place (STOP-mode), the CPU checks the RAM. The computing head is blocked if there is an abnormality.
  Error code: **FErA**

- EEPROM Error — With the nozzle in place (STOP-mode), the CPU checks the EEPROM. The computing head is blocked if there is an abnormality.
  Error code: **FEEE**

- Output 1 Control Error — Checks the load connection on the Output 1 (pin 1 & 2 of TB6). The computing head is blocked if there is an abnormality.
  Error code: **FEHt**

4. PROCEDURES

Further the normal refuelling, three other procedures are available:

◆ General totalizer reading

◆ Computing head setup (change settings), price change

◆ Metric office (simulating abnormalities)

To start a procedure just press one of the buttons on the setup board. The display shows the following flashing notice:

Press one of the setup buttons to start-up the corresponding procedure; the buttons are on the printed circuit connected to the display cable:

Figure 8: Display "Select procedure"

Procedure «black «t» general **totalizer** reading

Procedure «red «S» **Computing head setup:** change parameters

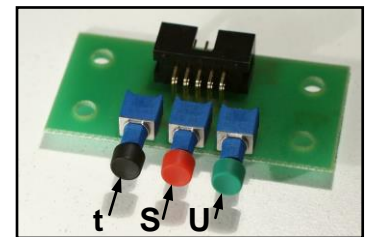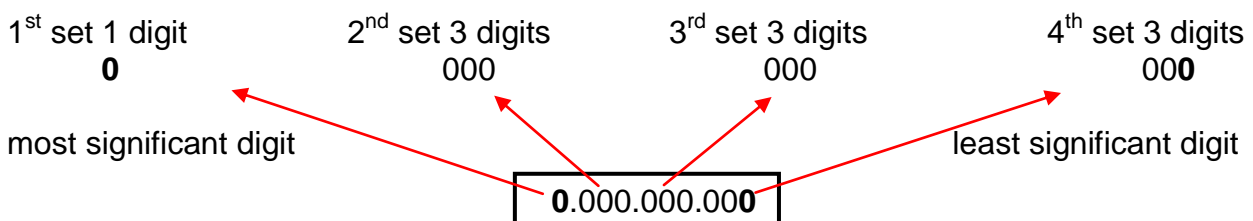Procedure «green «U» **Metric office:** simulating abnormalities

Figure 9: Setup buttons

4.1. General totalizer reading

The general totalizer is a non-settable counter that can be used to store and display the KG (or Litres) dispensed in 10 digits; since a display with that many digits is not available, digits are broken down into sets and displayed as follows:

1st set 1 digit	2nd set 3 digits	3rd set 3 digits	4th set 3 digits
0	000	000	00**0**

most significant digit   least significant digit

0.000.000.00**0**

The reading of absolute totalizers is also possible by repeatedly pressing a dedicated key connected to terminals 1 and 2 of TB2.

After pressing black button «t», the computing head displays the first set; in order to pass to the second and to the third sets, it is necessary to push the green «U» button each time.

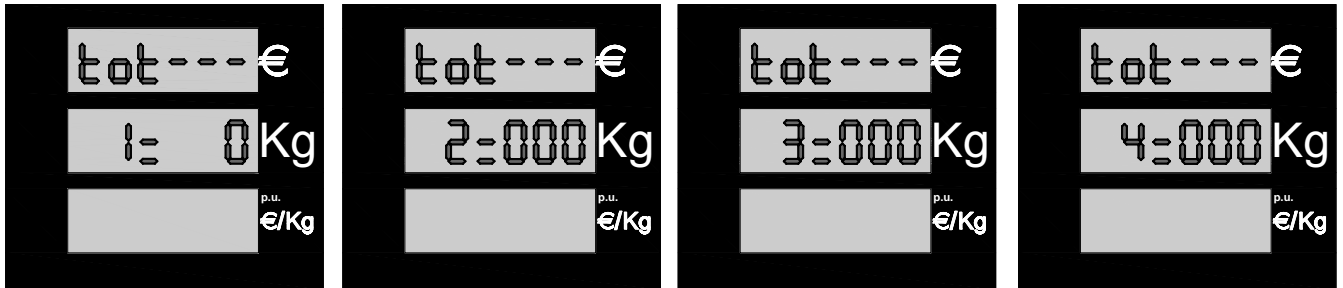**Figure 10:** General totalizer display KG

The dashes represent the various totalizers, and in particular:

- The first totalizer shows the total delivered tot-dE (= tot-C1 - tot-C2)

- The second totalizer shows total delivered of the measuring channel 1, dedicated to filling the tank tot-C1

- The third totalizer shows total delivered of the measuring channel 2, dedicated to recovery tot-C2.

4.2. Computing head setup

Press the red «S» button to enter setup mode; then the computing head requires the default password "20000". Follow the procedure below to enter the correct code:

> **To enter the SETUP procedure, set Jumper JP2 to "closed".**
> **SETUP is not possible if Jumper JP2 is "open".**
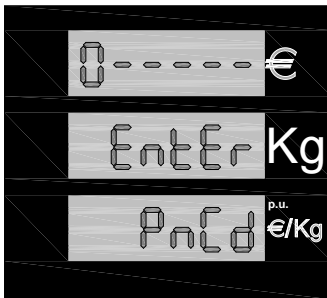
- Set Jumper J2
- Press black «t» button to go to the value desired for the first digit
- Press red «S» button to go to next digit
- When the correct value is reached for the last digit, press red «S» button again to enter setup.

Figure 11: Entering Setup password

If the password is incorrect, setup procedure stops immediately and the computing head goes into stand-by.

If the password is correct the parameter values can be reset.

If you forget to set Jumper J2, the computing head notifies you that the Jumper must be set to perform setup by displaying this message: Set JP2.

Figure 12: Request to set Jumper JP2

EsiWelma® s.r.l.

The following table shows all the available settings:

Computing head setup parameters						
Code	Abbrev.	Meaning	Field	Step	Default	Units
01	LF	Slow flow rate	10-90 N.U.	10	30	dag
02	AS	Fuel cut-off	0-90 N.U.	3	06	dag
03	AL	LAN address	1-32	1	1	----
04	PL	Declared level protocol	1-4	1	4	----
05	EL	Clearance first dag dispensed	0-10	1	0	dag
06	AP	N. of dag in slow flow dispensing start	0-10	1	10	dag
07	Pc	Min. tank level contact polarity	0-1 N.U.	1	0	----
08	bc	Block mode for min. tank level	0-1 N.U.	1	1	----
09	nd	Number of displays connected	1-2	1	2	----
10	CE	Number of delivered display digits	5-6	1	5	----
11	Ar	Approximation of sale price	0-3	1	3	----
12	dP	Decimals in unit price	0-3	1	3	----
13	di	Decimals in sale price	0-3	1	2	----
14	Ct	Switch to round figure	1-3	1	1	----
15	Lc	Tank level / Vapors recovery	0-1 N.U.	1	0	----
16	SE	No flow timeout	1-60	1	24	10s
17	Po	POS option	0-2	1	0	----
18	Sd	Motor start-up delay	0-3	1	1	----
19	PnCd	Password	X0-X9999	1	X0000	----

Description of setup parameters:

- **LF** slow flow — At the end of dispensing with pre-setting, in order to reduce mechanical inertia of the dispenser, it is necessary to slow down the flow. LF shows at how many **dag** (decagrams) the dispenser will switch to slow flow before the end of dispensing. **Not Used in LNG**.

- **AS** fuel cut-off device — Quantity in **dag** that the computing head counts before starting fast flow dispensing. **Not Used in LNG**.

- **AL** LAN address — This is the address of the computing head if connected to Host Computer (POS).

- **PL** Protocol Level — It sets the Protocol Level used for communication:
  - 1 Pumalan standard
  - 2 Pumalan (mono + multiproduct + mix)
  - 3 Pumalan esteso (mono + multiproduct + mix)
  - 4 Pumalan like 3 with the totals and data counting
  Pumalan is a LOGITRON trademark

- **EL** dag clearance — This is the number of **dag** that may be counted but not shown in the display, at the beginning of each dispensing.

- **AP** slow flow dispensing — Indicates how many **dag** are dispensed in slow flow before beginning fast flow dispensing, signaling by closing contact between 1 and of TB6

- **Pc** Min. tank level — This indicates if the minimum level alarm status will activate with NC or NO contact. **Not Used in LNG**.

- **bc** intervention mode — This indicates whether the minimum level alarm must activate at the end of dispensing (bc=0) or if it can also activate during dispensing (bc=1). **Not Used in LNG**.

- **nd** number of displays — specifies the number of displays connected.

- **CE** Nr. of delivered display digits — It specifies the number of digit on the delivered display.
  - 5 digit available – max supplied 990.00
  - 6 digit available – max supplied 9990.00

  (max count on channel C2 is, in any case, 99,00)
  (visible only for retail dispenser)

- **Ar** rounding off
  - this specifies the type of rounding off:
    - 0 last digit not rounded-off
    - 1 if ld ≥ 5 last digit rounded up   10
      if ld < 5 last digit rounded down   0
    - 2 if ld > 0 and ≤ 5 last digit rounded up   5
      if ld > 5 and ≤ 9 last digit rounded up   10
    - 3 if pd ≥ 5 last digit rounded up   10
      if pd < 5 last digit rounded down   0
  - where: ld = last digit displayed, pd = previous digit
  - **(visible only for retail dispenser)**

- **dP** Decimals in unit price
  - specifies the number of digits to the right of the decimal point (unit price).
  - **(visible only for retail dispenser)**

- **di** Decimals in sale price
  - specifies the number of digits to the right of the decimal point (sale price).
  - **(visible only for retail dispenser)**

- **Ct** Switch to round figure
  - specifies the type of passage to a round figure:
    - 1 no switch to round figure
    - 2 rounding off units (1.00, 2.00, etc.)
    - 3 rounding off tens (1.00, 2.00, etc.)
  - The position of the decimal point (100 or 10.0 or 1.00 etc.) makes no difference.
  - **(visible only for retail dispenser)**

- **Lc** Tank level / Vapors recovery
  - specifies if Lc input will be used to detect a tank level or to display the fume recovery system status. **Not Used in LNG**.

- **SE** no flow timeout
  - specifies, in tens of seconds (from 10 to 50s), the no flow timeout before blocking dispensing; if dispensing is blocked the nozzle must be replaced.

- **Po** Pos. option
  - This setting decides how the computing head sends the sale price:
    - 0 sale price X 1
    - 1 sale price X 10

- **Sd** Start delay
  - Specifies the pump start delay mode:
    - 0 Start when nozzle is extracted (START command)
    - 1 Start at the end of blank display (no fuel cut-off)
    - 2 Start after display time shows 0.00 (no fuel cut-off)

After the SETUP procedure is completed, set Jumper JP2 to "open" for dispensing. Dispensing is not possible if Jumper JP2 is "closed".
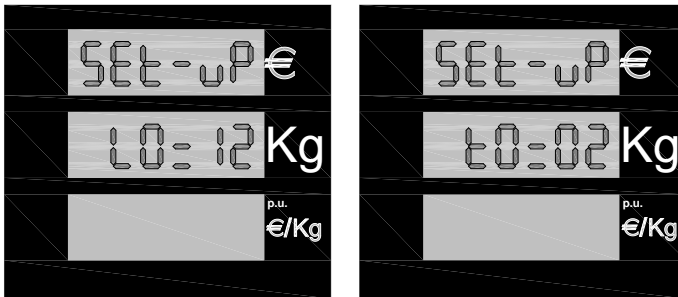
4.2.1. *Simple parameters*

Figure 13: Display of some setup parameters

- Select the parameter to change (press the green button «U» to change parameter).
- Press black «t» button to increment the current parameter value.
- Press red «S» button to clear the current parameter value or set it to the minimum.
- Press the green button «U» to pass to the next parameter.
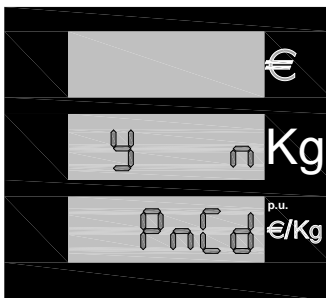
4.2.2. *Password*

Figure 14: Password change request setup

At the end of the setup the computing head asks whether changing the password or not and waits for an answer **Y**es or **N**o.
Press black button to change the password. Press green button to exit without changing the password. (see § 4. Figure 11)

Figure 15: Data saving display

If the answer is No, the procedure terminates after saving data.
If the answer is Yes, a similar sequence to the ones already seen can be used to change the password:

The password is structured as follows:

Manager password value: **1XXXX**
This can only be used to change prices. The first value is always 1 and marks the codes reserved for the system manager.
The starting value is 10000

Technician password value: **2XXXX**
This can be used to change all the parameters in the computing head setup procedure. The first value is always 2 and marks the codes reserved for the maintenance company.
The starting value is 20000

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	20	36

Importer password value: **3XXXX**
This can only be used to clear the previous passwords
The initial value is wired inside the firmware; it is communicated to the client at the time of sale and cannot be changed.

The password is made up of 5 digits. The first digit shows the access level: Importer, Technician, Manager. Within the procedure, the first digit (access level) cannot be changed so it is not displayed; the other four digits are set by the user.

- Press black button to go to the value desired for the first digit.
- Press red button to go to next digit.
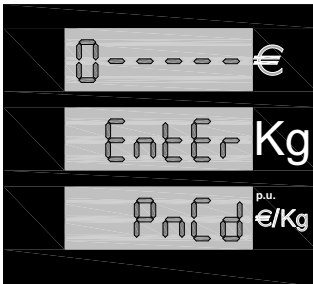- Once the last digit is also correct, press the green button to confirm.

Figure 16: Change Password

<div style="border:2px solid red; color:red; text-align:center;">

To exit the SETUP procedure, reset Jumper JP2 to "open".
Dispensing is not possible if Jumper JP2 is "closed" in SETUP.

</div>

4.2.3. *Price change*

Press the red «S» button to enter setup mode; then the computing head requires the password (if not changed previously, the default password is "10000"). Follow the procedure below to enter the correct code:

Figure 17: Enter Password Price change

- Press black button　　«t»　to go to the value desired for the first digit
- Press red button　　　«S»　to go to the next digit

Once the last digit is also correct,

- Press red «S» button again to enter setup.

---

*To enter the **Price change** procedure it is not necessary to remove the lead seal to set Jumper J2, because this operation is not metrically relevant.*

If the password is incorrect, setup procedure stops immediately and the computing head goes into stand-by.

If the password is correct the unit price can be reset. The operating sequence is the same as above:

- Press red button　　　«S»　to select the price to change.
- Press black button　　«t»　until you reach the desired value.
- Press green button　　«U»　to exit the procedure.

At the end of the setup the computing head asks whether changing the password or not and waits for an answer **Y**es or **N**o.
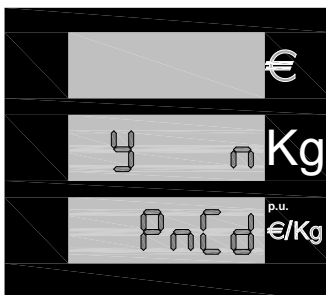
Press the black button to confirm that you want to change the password. Press the green button to exit without changing the password.

Figure 18: Password change request Price change

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	22	36

If the answer is No, the procedure terminates after saving the new unit price.

Figure 19: Display of unit price saving

If the answer is Yes, a similar sequence to the ones already seen can be used to change the password:

- Press black button «t» to go to the value desired for the first digit.
- Press red button «S» to go to next digit.
- Once the last digit is also correct, press the green button to confirm.

Figure 20: Password change Price change

4.3. Metric office procedure

This metric testing procedure is used to simulate a sequence of errors and to test that the computing head blocks dispensing by showing the corresponding code.

Press green button «U» to enter in this procedure,
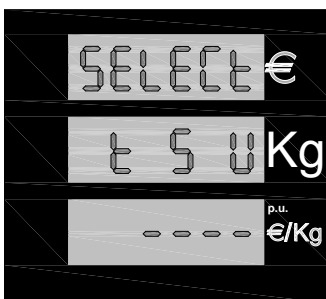
The simulated errors are shown in the ERROR CODES table (§3.3.). To highlight the current simulation status, the computing head switches on all the points available on the unit price bar and the two external points on the dispensed volume bar.

At this point, whenever the nozzle is extracted, dispensing begins, an error is simulated and as a result the control device shuts off supply as soon as it detects the fault. The fault code is displayed on the unit price bar.

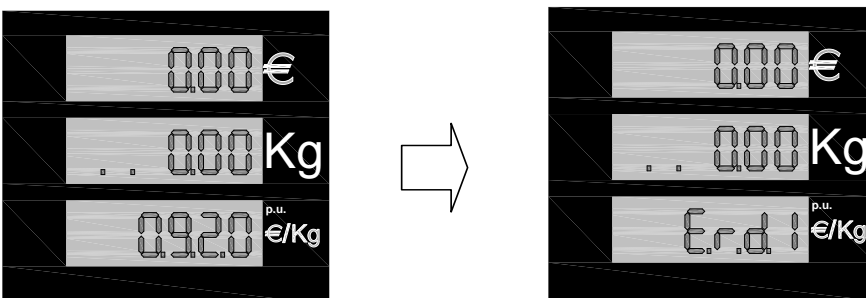**Figure 21:** Request procedure of error simulation

Figure 22: Passage from dispensing to shut off during "error simulation" phase.

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	23	36

5. HARDWARE CUSTOMISING

There are three selectors called JP on the CPU, located inside the enclosure and protected by a metric lead seal, which can be used to change the function of the computing head as follows:

● JP1   Not used for LNG, available for future applications

● JP2   Enables to perform setup operations
- ✦ Open   dispensing **normal**
- ✦ Closed enabled for **setup**

● JP3   Forces the computing head to use parameters consistent with Euro, despite the current setup:
- ✦ Open   uses the **Setup** values
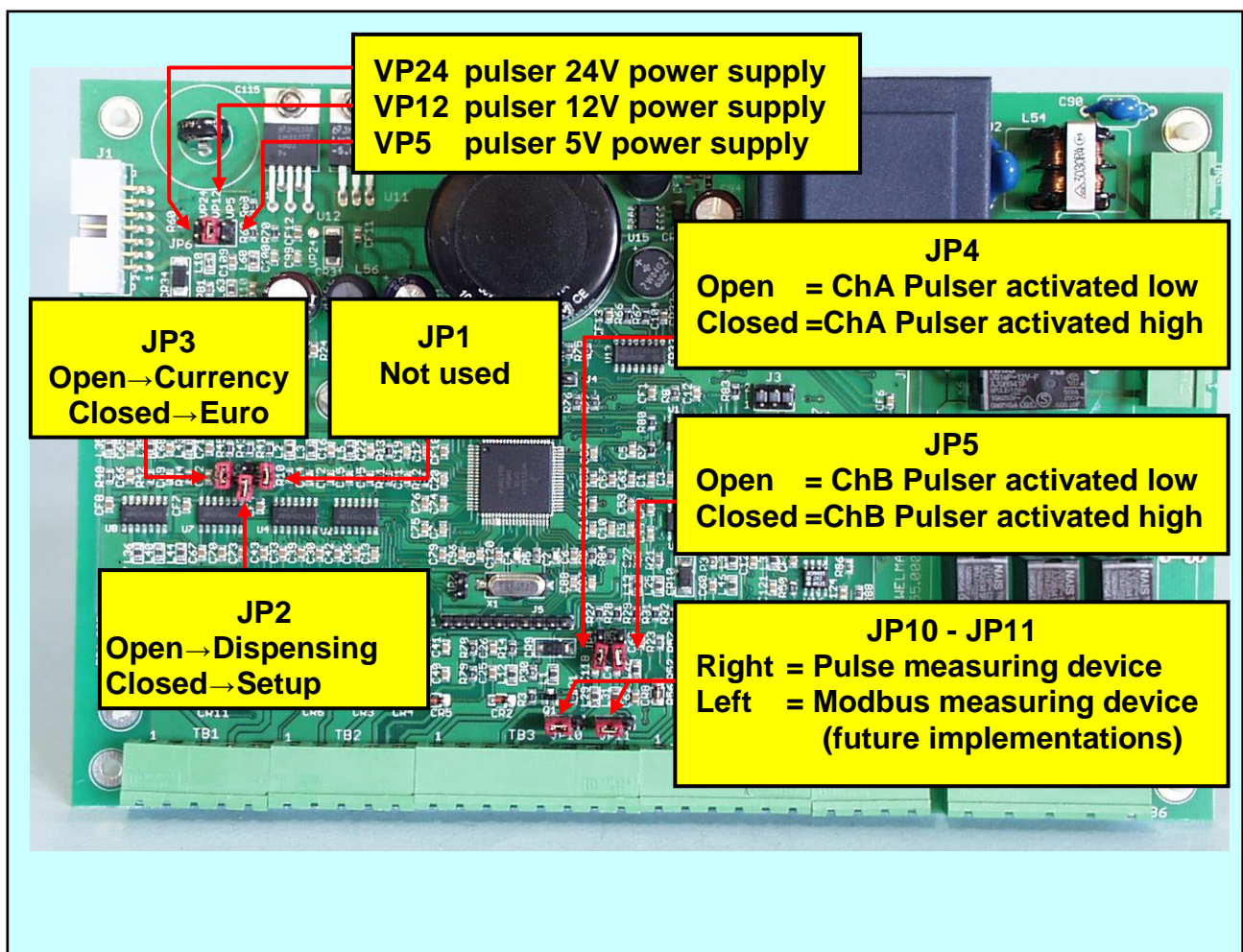- ✦ Closed uses the congruent **Euro** values

Photo 4: Jumpers on CPU

EsiWelma® s.r.l.

The Pulse measuring device can be configured to the following specifications:

- Rated power supply voltage:

  → 5V   200mA   insert the Jumper to position VP5
  → 12V 100mA   insert the Jumper to position VP12   } mutually exclusive
  → 24V   50mA   insert the Jumper to position VP24

- Type of output:

  → Channel A activated low   jumper JP4 open
  → Channel A activated high   jumper JP4 closed

  → Channel B activated low   jumper JP5 open
  → Channel B activated high   jumper JP5 closed

The connection terminals of the Pulse measuring device must only be used to connect the Pulser. Do not use the power supply or channel terminals for any purposes other than what they are designed for.

6. OPTIONS

6.1. 4X4 field keypad

If it is necessary to preset a quantity of product with very different values and with a variable decimal point, a 16-key keypad is essential. Both language and functions of this keypad can be customized to suit customer requirements. It is also possible to use a field keypad to select setting in Euro or in liters each time.

Photo 5: *Example of preset customised keypad*

6.2. 12-digit-on-2-line display (Future implementations)

If the keypad is in an inconvenient position to see the main display of the computing head, it is possible to add a small secondary display next to the keypad: this display completes the human-computer interface and also works for complex procedures such as automatic payment, inserting a password, kilometers covered etc.

In this case, the display shows:
Date........ Temperature
Time………Alarm status

Photo 6: *Secondary display*

6.3. Abnormality signaling device

If a detected abnormality has to be shown in remote, a simple device can be used: it is connected to the same flat cable used for display and can be used to activate a free voltage contact in turn used to supply power to a light or any other signaling device.

Electrical specifications:

- Max voltage 270Vca or 350Vdc
- Output current depending on device used:
  - 3A → Relay (Standard)
  - 1A → Solid state devices (ATEX not sparking)

Mechanical specifications:

- Fixing method   DIN rail
- Overall dimension: 90x35x58mm
- Weight: 60g

Photo 7: *Abnormality signaling device*

6.4. I/O expansion device

When the application imposes a test of non-standard apparatus, an I/O expansion device can be used.

The board set up for this can read 6 inputs and manages the same number of outputs. The inputs are available on a terminal board. The Open Collector outputs can be connected to the corresponding activation using flat cables.

Electrical specifications:

- INPUT   Vmax +5Vdc   with open terminal
            Imax   1mA   with closed terminal at 0V
- OUTPUT Vmax +24Vdc   non-active output
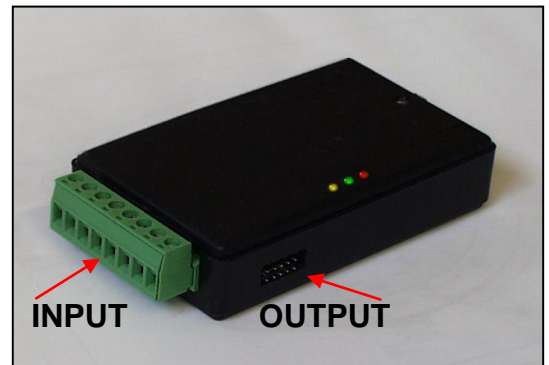   Imax   10mA   with active output

Photo 8: *I/O expansion device*

To use the outputs in environments that pose a hazard to the I/O expansion device, a flat cable can be used to connect an analogue field interface like the one described above (§6.3) with the following specifications:

- Maximum voltage: 270Vca or 350Vdc

- Output current: depending on device used:
  - 3A   → Relay (Standard)
  - 1A   → Solid state devices (ATEX not sparking).

	# EsiWelma® s.r.l.

7. ELECTRICAL CONNECTIONS

7.1. Low Voltage connections

In general, all tests carried out using micro-switch or buttons are "normally open" and must close at 0V when used. In particular:

- START contact   open in STOP mode, closed in delivery
- Tank level / Vapor Rec. contact   changeable in setup (not used in LNG)
- Spare buttons   normally open, closed in activation
- Pulse measuring device   Pulse type
    - current per channel: 50mA
    - outputs: low active
    - pulses: 100 x KG/liter

WARNINGS:

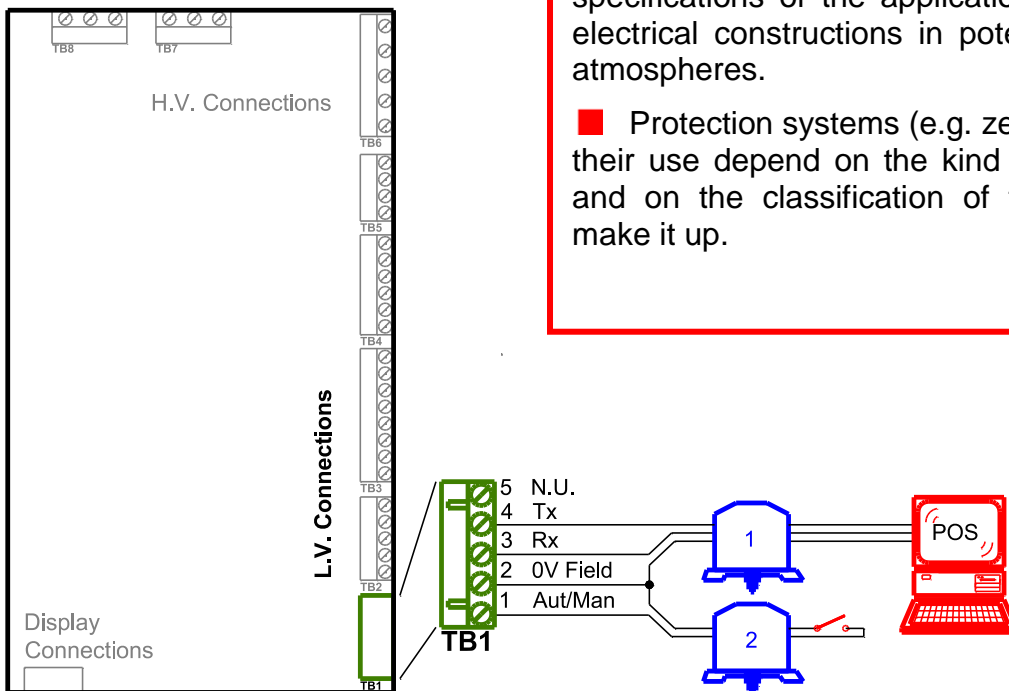**Terminal Board TB1**

⚠ **CAUTION:**

■ The cable connection diagrams shown below do not waive the installer from conformity to the local laws. The installer shall also comply with safety regulations in place for the type and specifications of the application, particularly in electrical constructions in potentially explosive atmospheres.

■ Protection systems (e.g. zener barriers) and their use depend on the kind of the dispenser and on the classification of the areas which make it up.

See Warnings

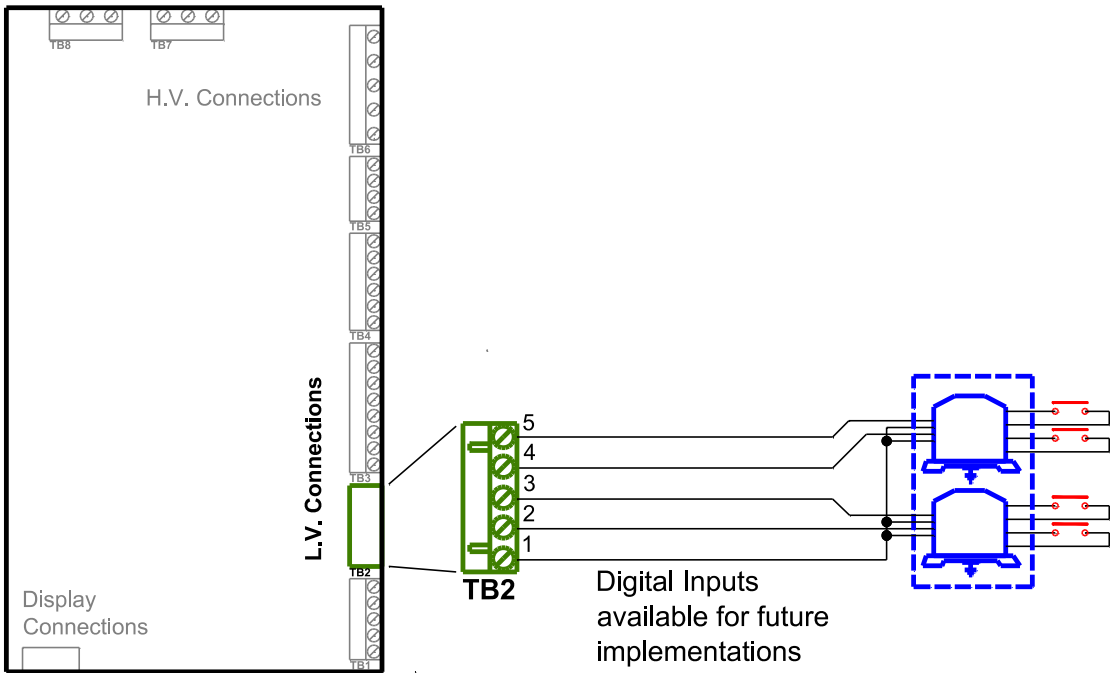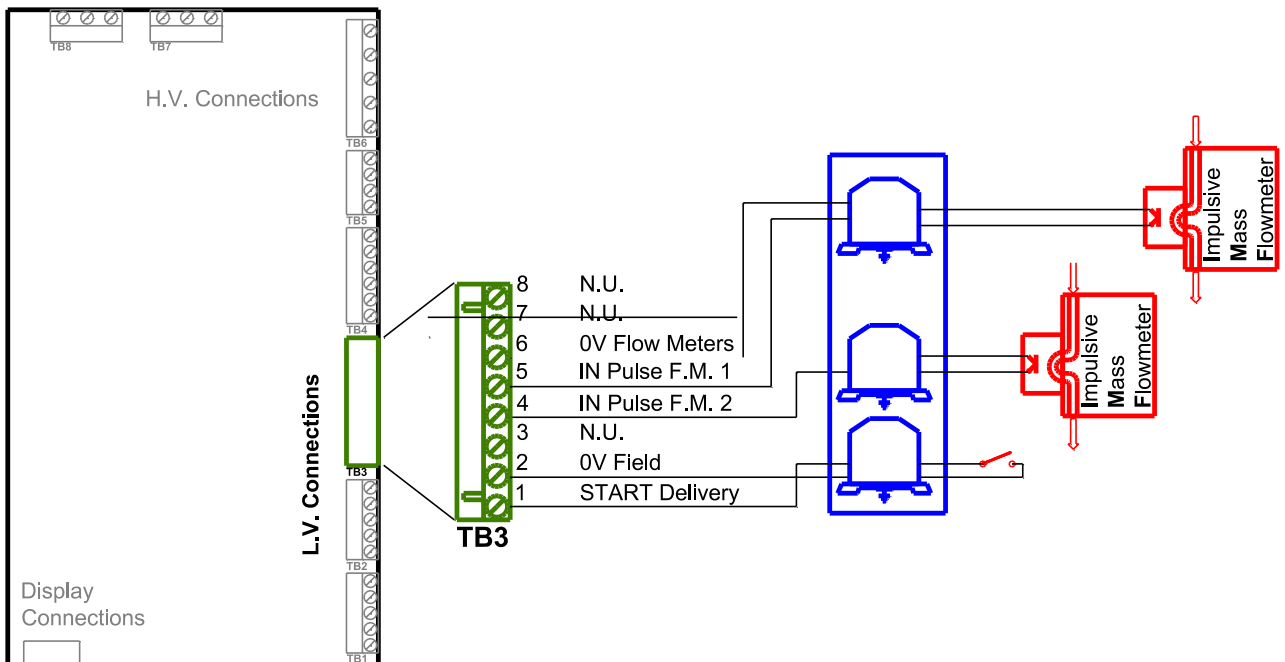| Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	28	36

Terminal Board TB2

TB2

Digital Inputs available for future implementations

Terminal Board TB3

TB3

8	N.U.
7	N.U.
6	0V Flow Meters
5	IN Pulse F.M. 1
4	IN Pulse F.M. 2
3	N.U.
2	0V Field
1	START Delivery

Impulsive Mass Flowmeter

Impulsive Mass Flowmeter

Terminal Board TB4

H.V. Connections

L.V. Connections

Display
Connections

6 N.U.
5 N.U.
4 N.U.
3 N.U.
2 N.U.
1 N.U.

TB4
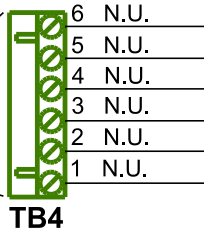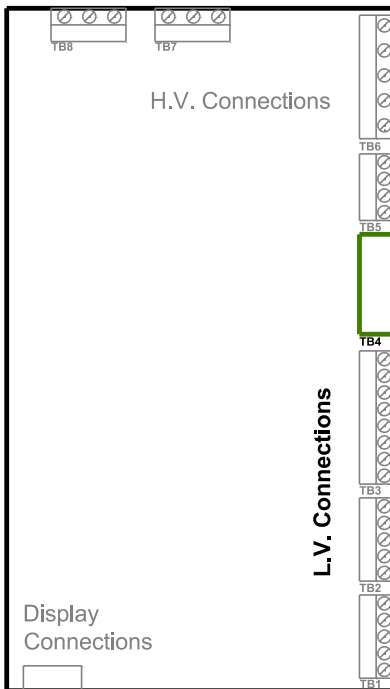
N.2 PT100 Compensated (3 wires)
Inputs for future Implementations

Terminal Board TB5

H.V. Connections

L.V. Connections

Display
Connections

4 N.U.
3 N.U.
2 N.U.
1 N.U.

TB5
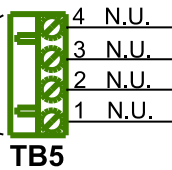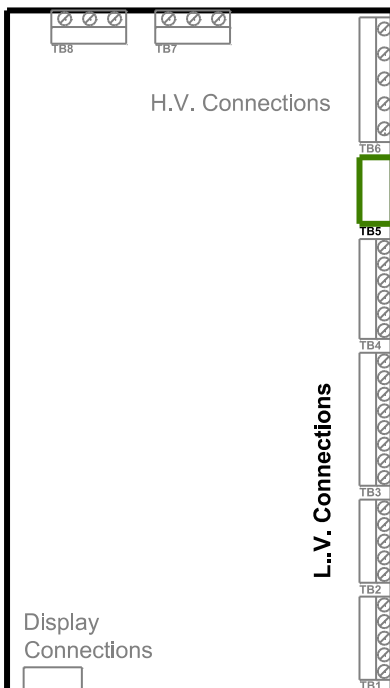
N.2 4...20mA Inputs
for future Implementations

J1 Connector

EsiWelma® s.r.l.
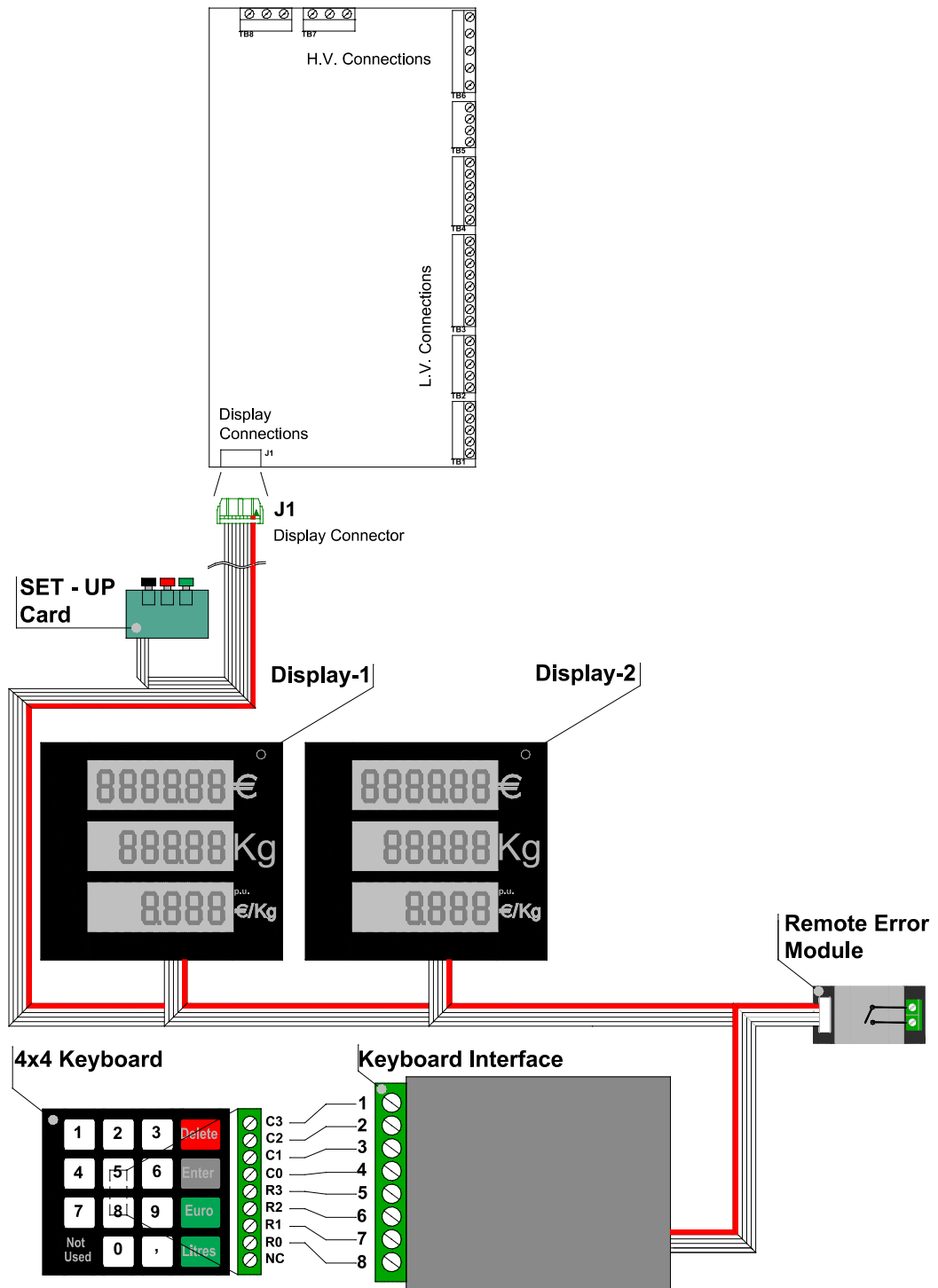
7.2. High Voltage connections

The computing head provides voltage-free contacts that can direct resistive and/or induction loads with the following specifications:

- Max voltage 270Vca
- Depending on output devices used:
  - Relay (Standard)   → Max current 3A
  - Solid state devices (ATEX not sparking)   → Max current 1A

Terminal Board TB6

TB6	
5	Out 4 N.U. (for future implementations)
4	Out 3 in DELIVERY (redundancy)
3	Out 2 Low Flow
2	Out 1 in DELIVERY
1	Common

H.V. Connections

L.V. Connections

Display Connections
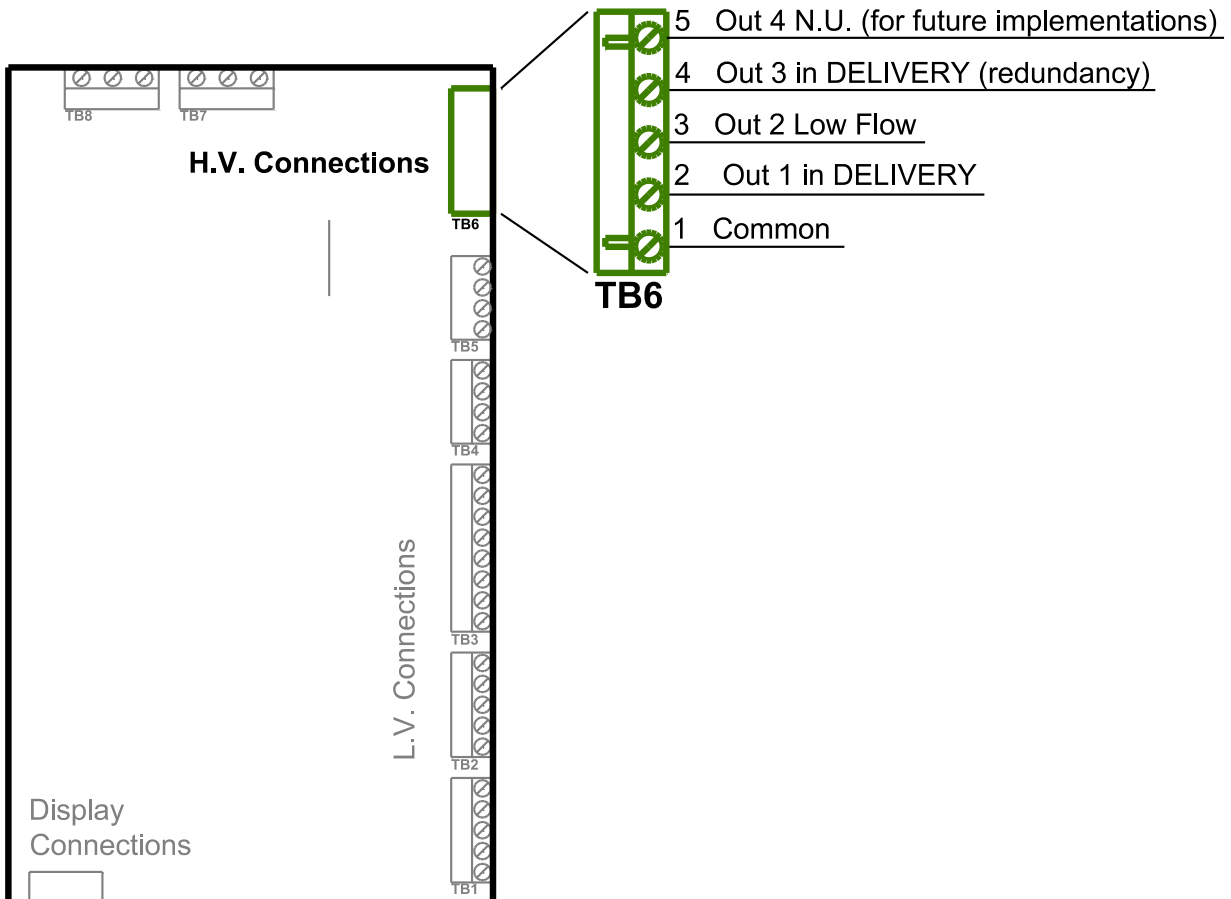
Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	32	36

Terminal Board TB7
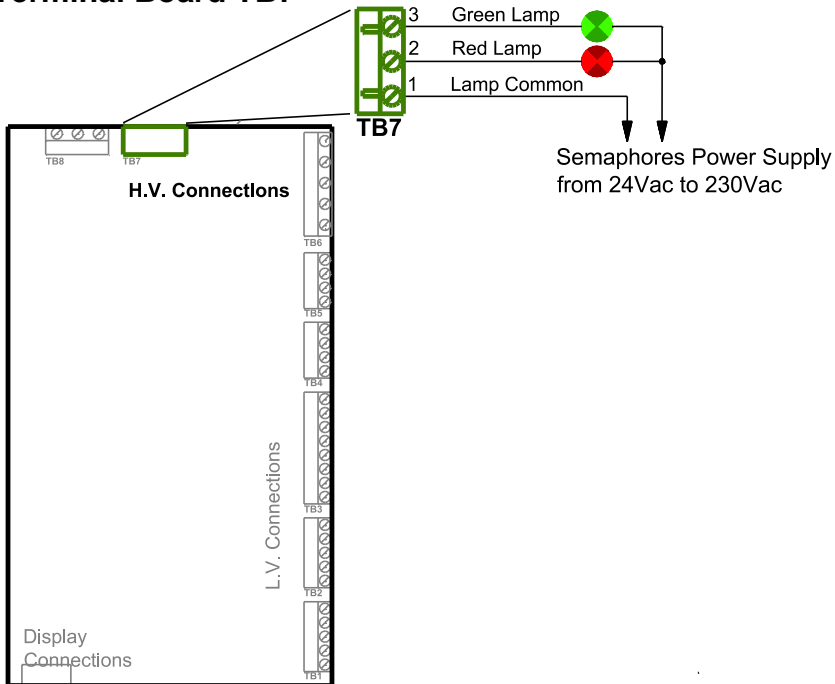
3 Green Lamp
2 Red Lamp
1 Lamp Common

TB7

Semaphores Power Supply
from 24Vac to 230Vac

H.V. Connections

L.V. Connections

Display
Connections

Terminal Board TB8

3 Gnd
2 Neutral
1 Phase

TB8

Computer Head
Power Supply
230Vac

H.V. Connections

L.V. Connections

Display
Connections
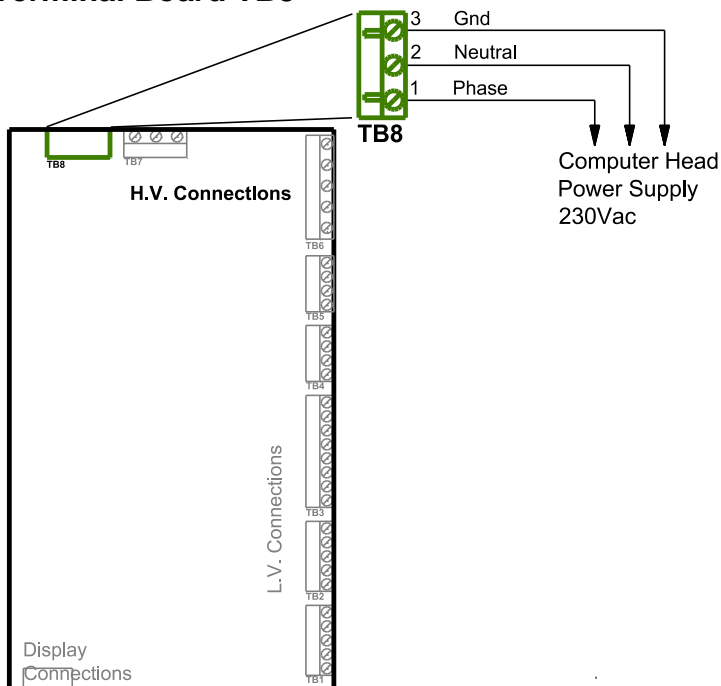
8. IDENTIFICATION OF TW1-B.M and TW1nA-B.M COMPUTING HEAD

A product identification data plate as shown in the figure below is provided, in conformity to standards in force:

EsiWelma s.r.l.
Via F.lli Canepa 134D-E 16010 Serra Riccò
GENOVA (Italia)
Certificate of Evaluation: N° LNE - 15272 rév. 2 Dtd: 26-08-09

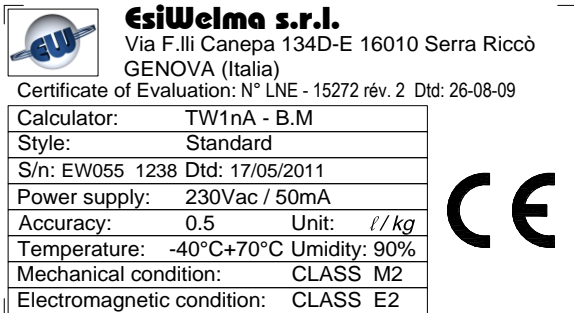|	
Calculator:	TW1nA - B.M
Style:	Standard
S/n: EW055 1238 Dtd: 17/05/2011	
Power supply:	230Vac / 50mA
Accuracy: 0.5	Unit: ℓ / kg
Temperature: -40°C+70°C Umidity: 90%	
Mechanical condition:	CLASS M2
Electromagnetic condition:	CLASS E2

C E

Figure 23: Identification plate
TW1-B.M; "Standard"

EsiWelma s.r.l.
Via F.lli Canepa 134D-E 16010 Serra Riccò
GENOVA (Italia)
Certificate of Evaluation: N° LNE - 15272 rév. 2 Dtd: 26-08-09

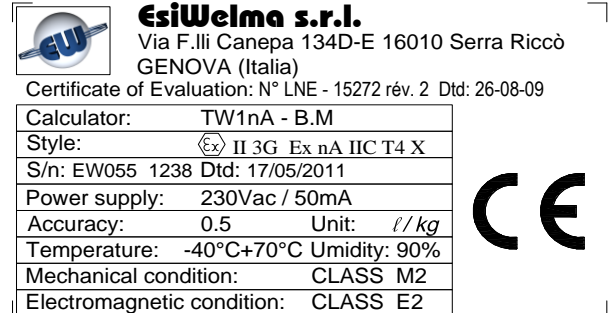|	
Calculator:	TW1nA - B.M
Style:	⟨Ex⟩ II 3G Ex nA IIC T4 X
S/n: EW055 1238 Dtd: 17/05/2011	
Power supply:	230Vac / 50mA
Accuracy: 0.5	Unit: ℓ / kg
Temperature: -40°C+70°C Umidity: 90%	
Mechanical condition:	CLASS M2
Electromagnetic condition:	CLASS E2

C E

Figure 24: Identification plate
TW1nA-B.M; "ATEX[1]"

The identification plate shows the following information:

 ⊕ Device manufacturer
 ⊕ Address
 ⊕ Evaluation Certificate
 ⊕ Device model
 ⊕ Application environment
 ⊕ Device serial no. and date

 ⊕ Rated power supply voltage and current consumption:
 ⊕ Accuracy
 ⊕ Environmental conditions
 ⊕ Mechanical specifications class
 ⊕ Electromagnetic specifications class.

[1] Symbol "X" indicated in the *Style* field of the Identification plate denote that computing head and accessories have to be installed in a box with degree of protection ≥ IP54.

Photo 9: *Identification plate on electronic computing head TW1*

EsiWelma® s.r.l.

9. MECHANICAL MOUNTING

The computing head CPU is housed in a metal enclosure that can be mounted both vertically and horizontally.
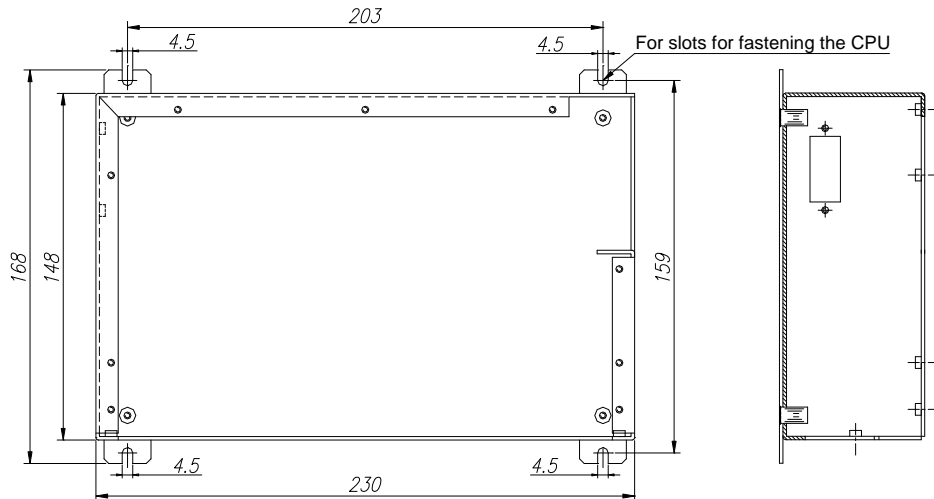Special tabs are included for correct anchorage:

Figure 25: CPU enclosure mounting

The display also has some mounting points. The tabs located in the center are not mounting points but are dedicated eyelets for the lead sealing.
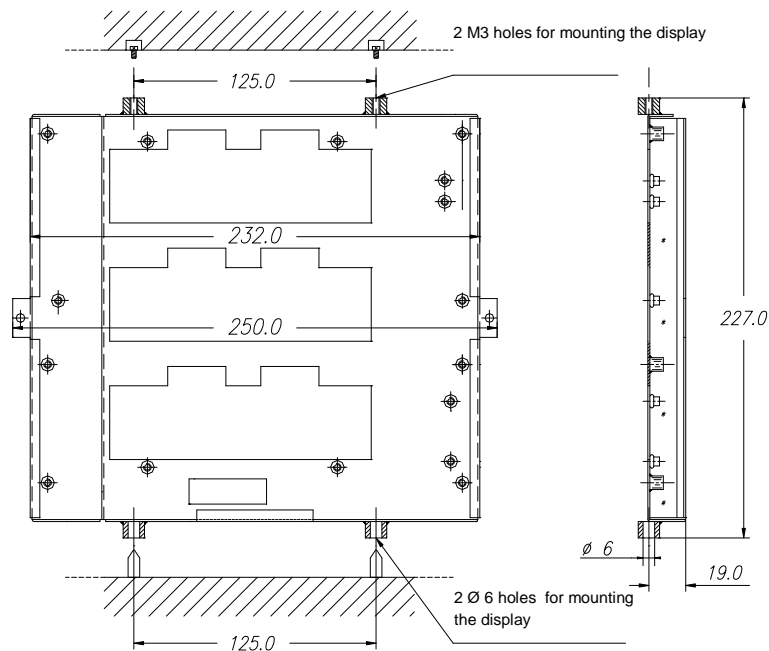
Figure 26: Display enclosure mounting

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	35	36

10. SEALING PROCEDURE FOR THE TW1-B.M / TW1nA-B.M COMPUTING HEAD

10.1. CPU sealing plan

Lead seals that prevent removal of the CPU enclosure and access to the board.

Lead seal that prevents removal of the display cable.

Lead seals that prevent removal of field connections.
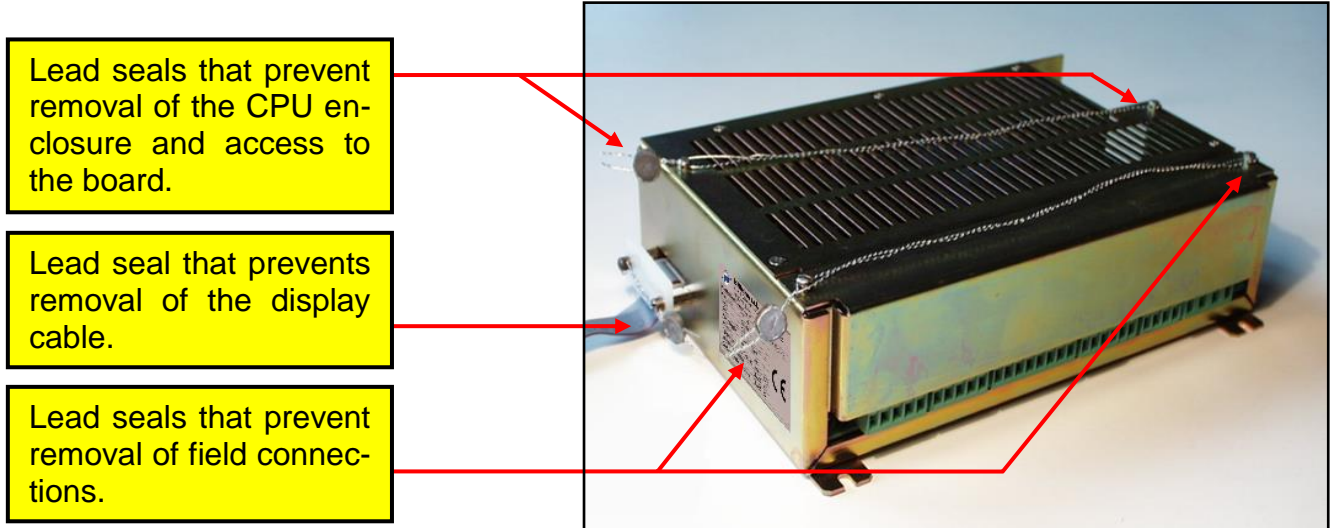
Photo 10: Computing head CPU TW1-B.M and TW1nA-B.M

10.2. Display sealing plan

Lead seal that prevents removal of the display from the dispenser mechanics.

Lead seal that prevents access to the display board.

Photo 11: Display of computing head TW1-B.M and TW1nA-B.M front view

Both the right hole and the left hole can be used without distinction.

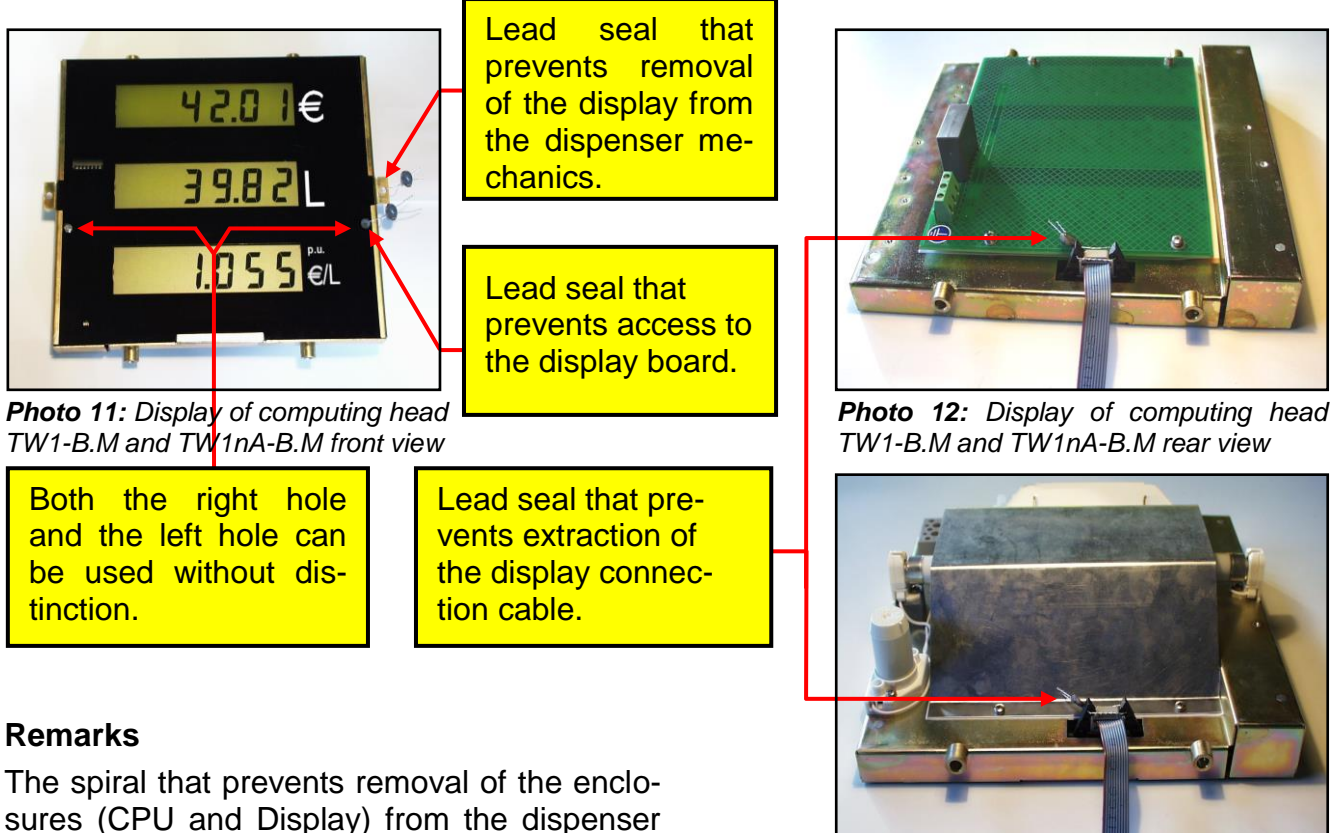Lead seal that prevents extraction of the display connection cable.

Photo 12: Display of computing head TW1-B.M and TW1nA-B.M rear view

Photo 13: Display for computing head TW1-B.M and TW1nA-B.M rear view neon tube backlit version.

Remarks

The spiral that prevents removal of the enclosures (CPU and Display) from the dispenser must be fixed to a part that cannot be moved from the dispenser.

Type / No.	Rev.	Fw	Date	Page	Total pages
EW055. 604	B	T	15 March 2017	36	36