F.I.O.

USER MANUAL FOR F.I.O. INSTALLATION

Edition	Revision	Date
2	5	15/03/2012

ENCLOSURE A   STRUCTURE OF "ECU" MENU
ENCLOSURE B   PROCEDURE FOR THE EXPORT OF THE CONFIGURATION OF P&CD AND ECU TO THE LAPTOP AND IMPORT FROM THE LAPTOP
ENCLOSURE C   PROCEDURE FOR THE REPLACEMENT OF THE MAIN P&CD BOARD
ENCLOSURE D   OVERALL DIMENSIONS Q-KIT AND P-KIT
ENCLOSURE E   OPTIONAL KIT AND COMPONENT LIST

1. Introduction

This document is a USER MANUAL FOR THE EXPLANATION OF THE OPERATIONS TO BE PERFORMED ON FIELD AND REMOTELY FOR THE INSTALLATION AND COMMISSIONING OF THE F.I.O. SYSTEM.

ALL THE OPERATIONS TO DO HAVE BEEN PRESENTED IN SEQUENTIAL ORDER, SO IT CAN BE ASSUMED AS A PROCEDURE FOR INSTALLATION AND COMMISSIONING OF THE PLANT (SEE GREEN COLOR INDICATIONS).

It describes the phases of:

-installation of the single components

-pneumatic and electric wiring

-startup of the equipment and preliminary verifications.

-manual configurations of unit on field (ECU).

-basic configurations with terminal (FioTerm).

-complete configuration with terminal FioTerm or remotely with DMS.

This manual does not replace the manuals of the single equipment. It has been realized in order to provide to the installer a consultation tool for the connection among them of all the equipment that are included on the system F.I.O.

When the information gathered in this manual is not sufficient, please refer to the manuals of the single equipment:

- FIO – User Manual Explorer ECU
- FIO – SMS protocol
- FIO – User Manual P&CD
- User Manual FioTerm
- User Manual DMS

2. Installation of the single components

PROCEDURE STEP 1:

- Before starting the operations, close upstream and downstream ball or butterfly valves and discharge all the pressure in the line.

- Installation of Q-kit, ECU, P-kit and P&CD. Refer to the following instructions.

Note: if one of these units is not required, don't consider the corresponding chapter.

There is also a video showing all these operations.

2.1 Q-kit

The Q-kit consists of a device for the acquisition of the displacement % of the pressure regulator from the closing position. It is necessary for the calculation of the flow rate with the indirect method. It is composed on a resistive transducer supported by a suitable bracket and coupled to the stroke indicator of the regulator for the reading of the position. The transducer is covered by an aluminum cylinder in order to ensure the protection against atmospheric events. It is supplied already preassembled (see picture on the right). If it is an upgrade of an already installed regulator, start from Pict 1, otherwise start from Pict 8:
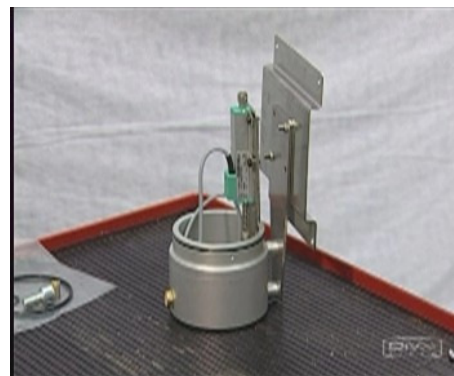
Pict 1- Disassemble the upper cover of the regulator

Pict 2- Replace the upper flange with the flange supplied in the Q-kit.

Pict 3- Replace the stroke indicator rod with the longer one supplied in the Q-kit.

Pict 4- Move the upper cover toward the lower cover paying attention that the base of the stroke indicator rod is correctly inserted into the groove.

Pict 5- Position correctly the upper cover and fix the screws.

Pict 6- Insert the visual indicator of position and push it up to the end. Then insert the small glass.

Pict 7- Fix the nut with anti-dust gasket.

Pict 8- Position the Q-kit on the upper flange of the pressure regulator

Pict 9- Insert the central screw.

Pict 10- Fix the central screw.

Pict 11- Couple, with the suitable junction, the position transducer with the extended rod of the pressure regulator.

Pict 12- Verify, lifting manually the rod of the position transducer, that it can move for a stroke at least equal to the stroke indicated on the small glass of the visual indicator. In case the rod of the transducer is not able to translate enough, loosen the 4 fixing screws of the transducer on the bracket and lift it as needed. Fix again the 4 screws.

Pict 13- Push the rod of the position transducer to the bottom so that the coupling is well fixed.

Pict 14- Close the transducer with the cover

Pict 15- Fixing it with the lateral screw.

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.

Technical data may undergo changes without notice

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.

Technical data may undergo changes without notice
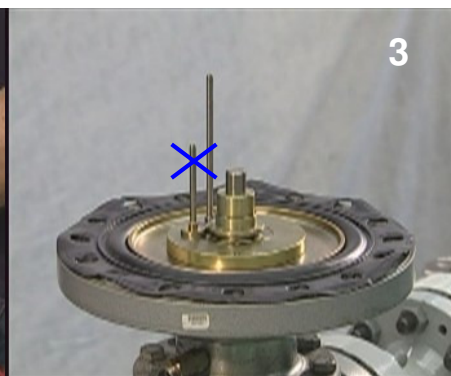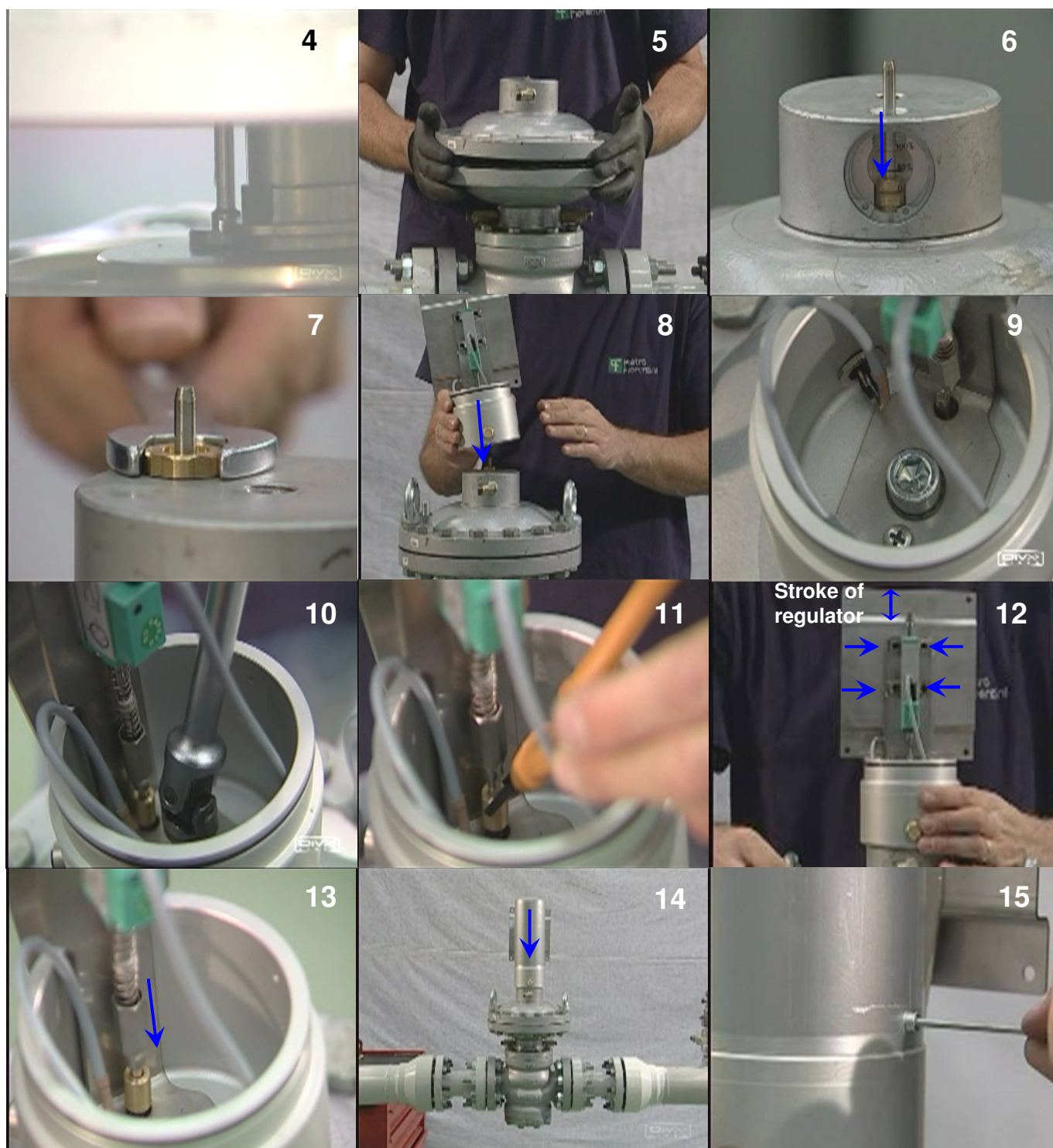
2.2 ECU Electronic Control Unit

2.2.1 Installation on board of the regulator:

This configuration is required in case of indirect measurement of flow rate. The application Q-kit includes the bracket and the screws necessary for the fixing of the ECU. Furthermore it includes the cable for the connection of the displacement transducer to the ECU.

Pict 1- Prepare the screws with the nut screwed on the bracket.

Pict 2- Install the ECU and fix the screws

Pict 3- Remove one of the small fairleads. Bring the cable for the connection of the displacement transducer to the ECU. There is a fairlead already assembled on it. Remove the fixing nut of the fairlead. Pass the white connector through the threaded hole.

Pict 4- Insert the fixing nut of the fairlead through the connector and fix the nut on the fairlead.

Pict 5- Insert the connector on the card

Pict 6- From the other side of the cable screw the male connector on the female connection of the transducer.

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice
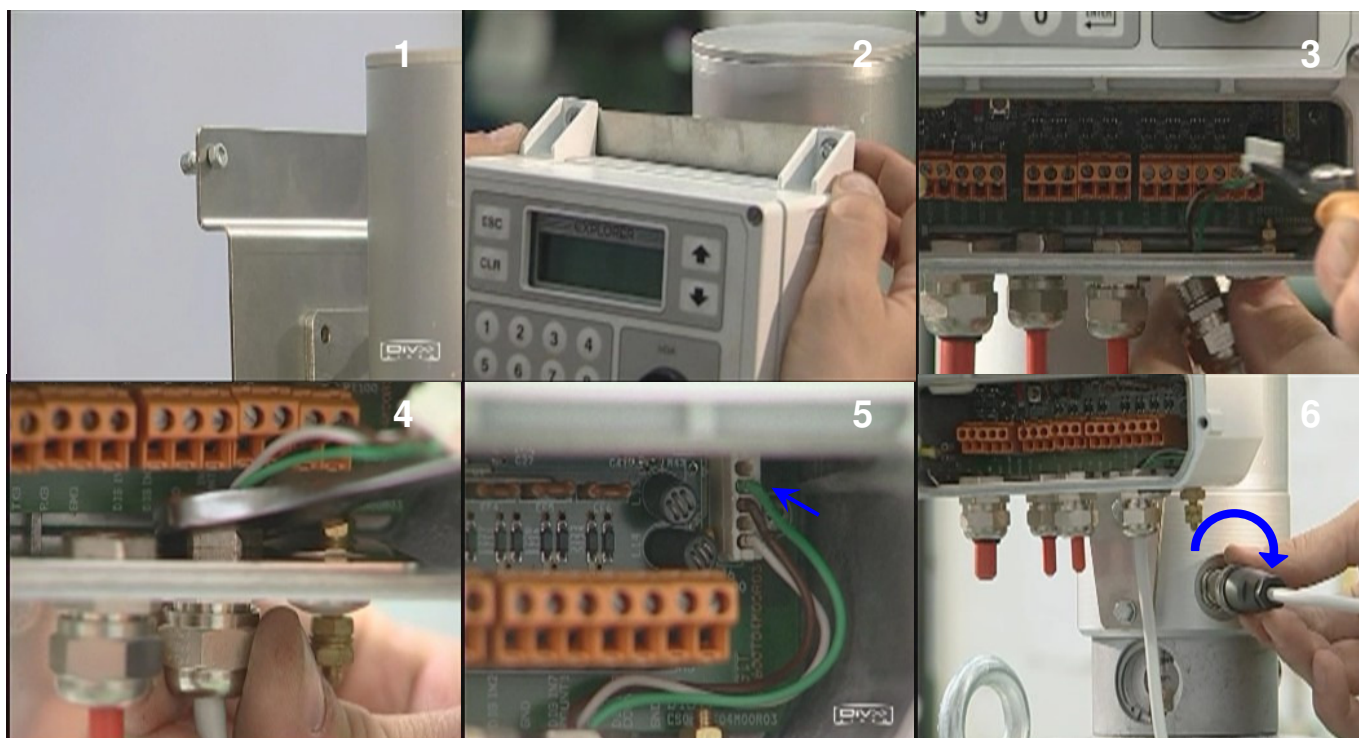
2.2.2 Installation on the pipeline or vertical circular support:

If there is no Q-kit because the indirect measurement of the flow rate is not requested, is necessary to fix the ECU in another position. The position of the ECU can be selected according to the distance from the solenoid valves and the flow rate meter.

Pict 1- Fix the two brackets with the nuts

Pict 2- Cut a piece of stainless steel band. The length has to be measured as the circumference of the pipeline + 150 mm (6 inch)

Pict 3- Pass one side of the stainless steel band in the endless-head as shown in pict 3

Pict 4- Pass the opposite side of the band on the slits of the bracket as shown in picture 4.

Pict 5- Pass the band around the pipe and then insert it inside the endless-head, screwing the endless screw

Pict 6- Adjust the bracket in the proper position and then fix it definitively

Pict 7- Prepare the screws with the nut on the bracket.

Pict 8- Install the ECU and fix the screws

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice

2.3   P-kit

The pilot P-kit is installed if it the pressure modulation is requested.

If is an upgrade of a regulator already working, first remove the traditional pilot. Replace the traditional pilot with the new P-kit. Since there are several models of pilot, the bracketing systems varies according to the applications.

The operations to be performed are the followings:
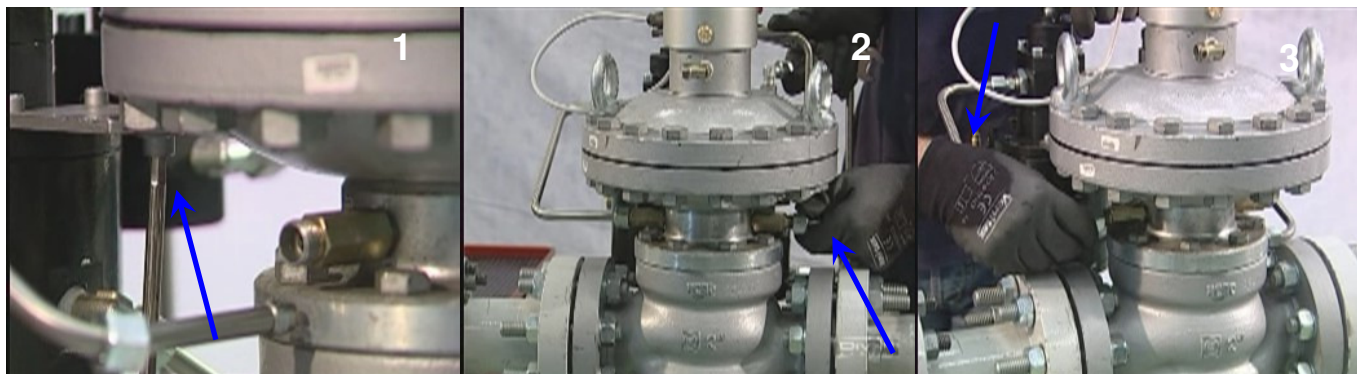
Pict 1- Fix the bracket on the regulator

Pict 2- Prepare and connect the feeding tube to the pilot system.

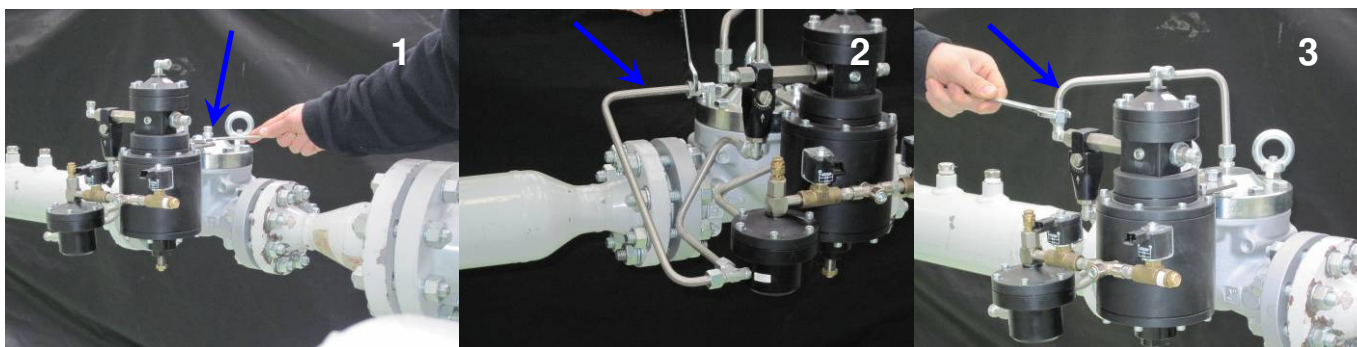Pict 3- Prepare and connect the tube of control pressure

REFLUX / REVAL:

APERFLUX / APERVAL:

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.

Technical data may undergo changes without notice

2.4 P&CD Power & Communication Device

- It must be installed in a safe area and it can be fixed on the wall.
  The following versions are available:

2.4.1- **Power supply only from battery**. Inside: card P&CD (a) and battery pack (b)

2.4.2- **External power supply**. Inside: card P&CD (a), back-up battery (b), AC to DC power supply (c), main switch (d), switch for card P&CD and optosender (e), optosender for remote supplying of ECU (f)

2.4.3- **Power supply from solar panel**. Inside: card P&CD (a), back-up battery (b), power supply controller(c), switch for card P&CD and optosender (e), optosender for remote supplying of ECU (f). The solar panel (g) must be fixed in a max. sun exposed zone, according to the direction and inclination specifications provided by the manufacturer.

Each one of these versions can be supplied with internal antenna (no activity required) or with external antenna (in this case, by means of the incorporated magnet, the antenna must be fixed in open space and the cable connected to the P&CD through the connector).
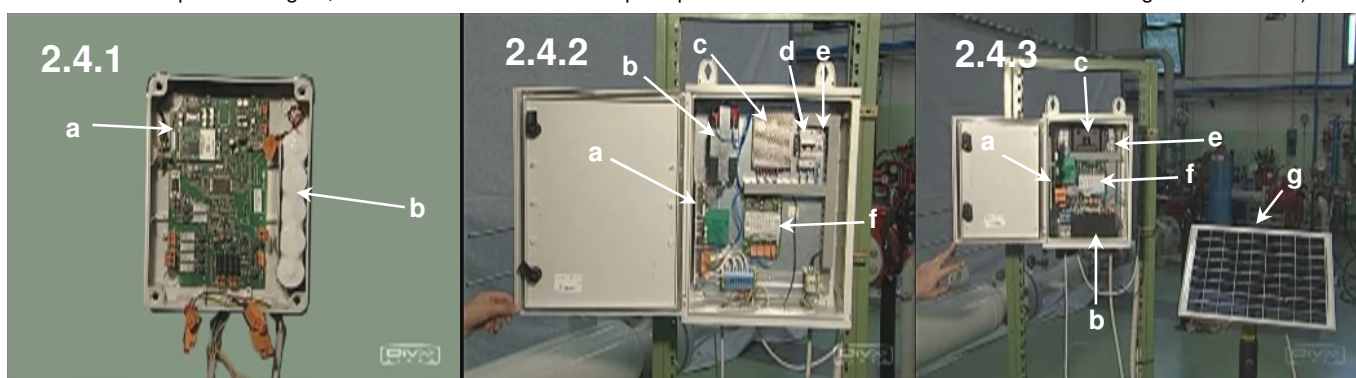
Battery only version:

Pict 1- Fix the box on the wall with screws anchor

External power supply version:

Pict 1- Mark the positions on the corners of the box (see picture 1)

Pict 2- Insert the brass supports on the four holes

Pict 3- Beat, using an hammer and a parallel pin, in the center of the support in order to move the internal plate to the bottom position

Pict 4- Fix the support with the screw in vertical position or…

Pict 5- fix the support with the screw in horizontal position

Pict 6- Fix the box on the wall with screws anchor and close with the black covers
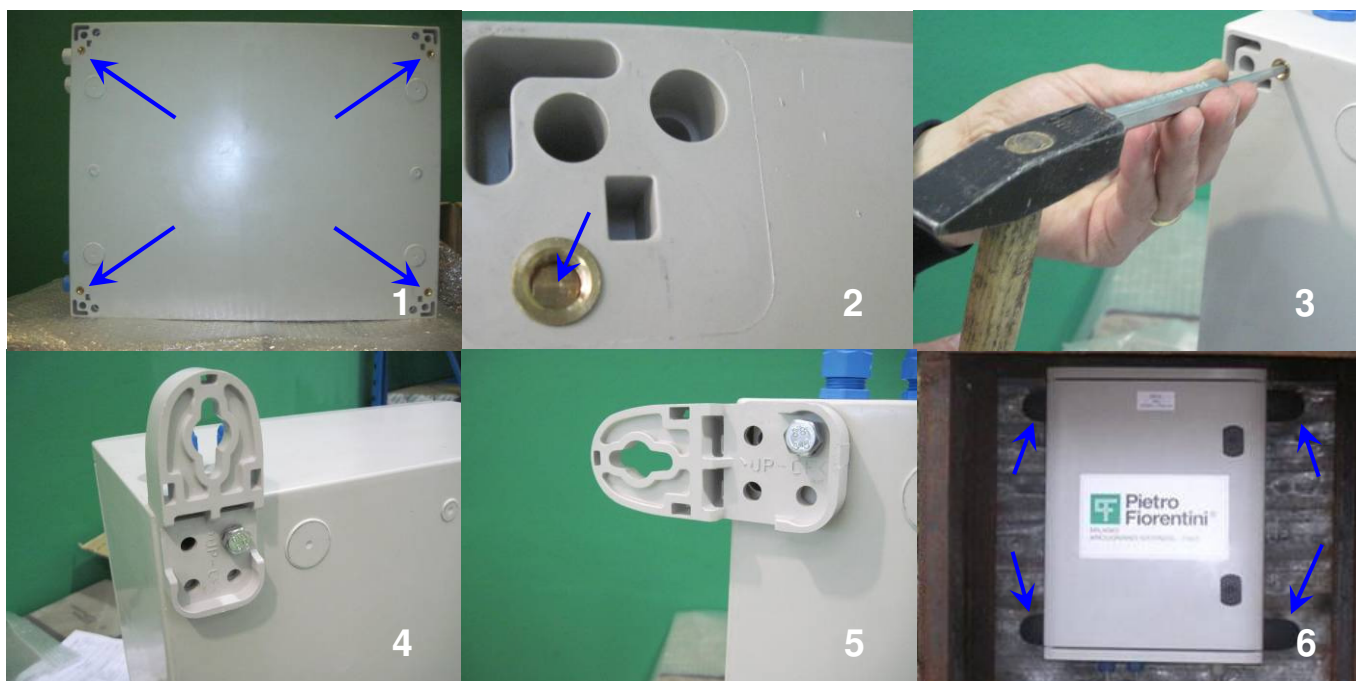
3. Connections

PROCEDURE STEP 2:

Once all the equipment have been installed, is possible to connect them together pneumatically and electrically.

-Realize the pneumatic connection of P-kit and ECU. Refer to the following instructions.

-Realize the electrical connection between P&CD, source 230 Vac or solar panel, external antenna (optional), ECU, flow meter (optional), digital input (optional), solenoid valves. Refer to the following instructions.

The line has to remain vented during this step.

Note: if one of these units is not provided, don't consider the corresponding chapter.

3.1   Pneumatic connections

Pict 1- Screw the compression fittings on the ECU sensors.

Pict 2- Prepare the tubing for the upstream and downstream pressure measurement. Connect on ECU

Pict 3- Connect on the upstream line the tubing for the pressure measurement (provide a needle valve for the isolation)

Pict 4- Connect on the downstream line the tubing for the pressure measurement (provide a needle valve for the isolation)

Pict 5- Connect the sensing line on the pilot

Pict 6- Connect the sensing line on the multiple take-off (don't insert needle valve through this line)

Pict 7- For REFLUX / REVAL: Connect the discharge tube on the upper head.

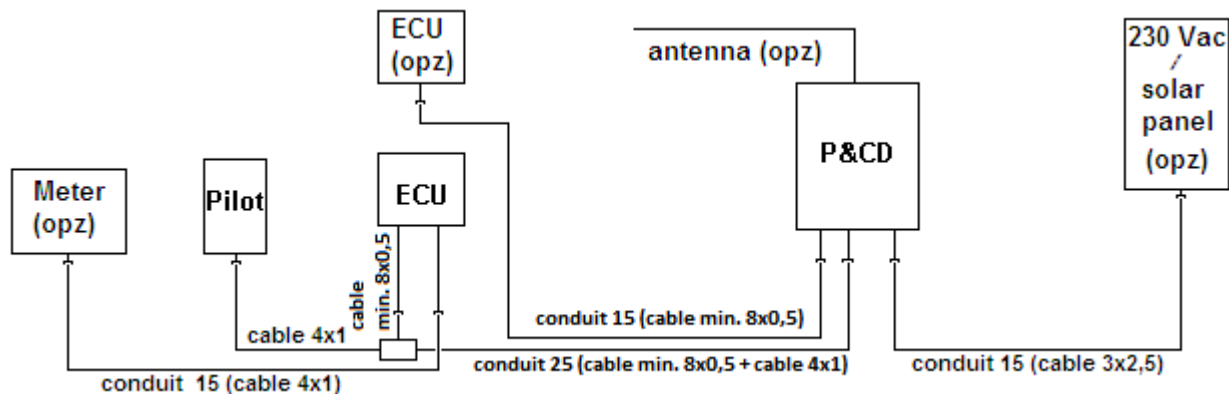Pict 8- For APERFLUX / APERVAL : Connect the discharge tube on the pilot

Pict 9- Connect the discharge tube on downstream (don't insert needle valve through this line). Only for REFLUX / REVAL: the discharge tube of the head can be connected in the same multiple take-off of the sensing line.
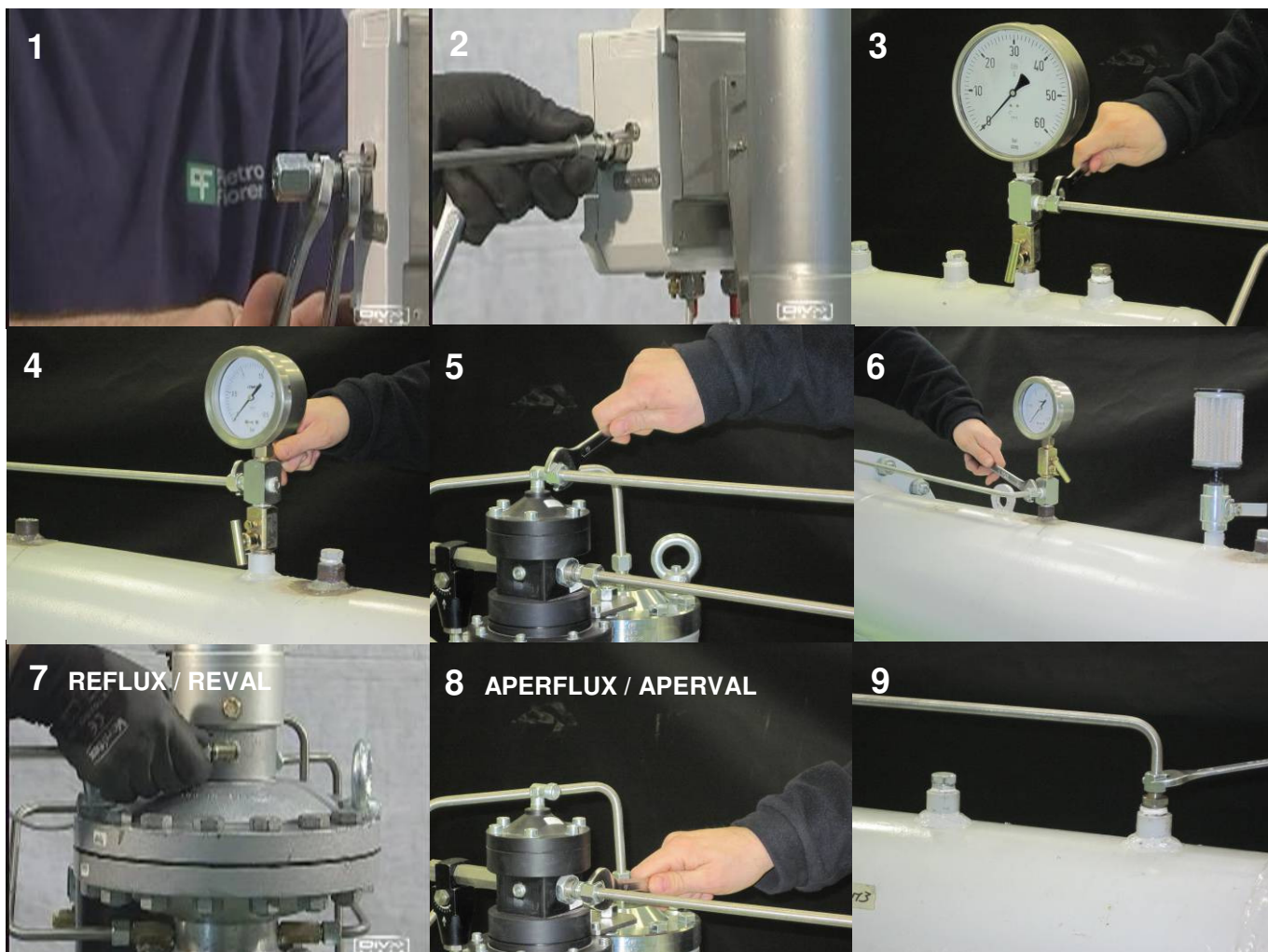
3.2 Electrical connections

3.2.1 General connections:

4x1 = cable n°4 wires x min. section 1 mm² shielded *

12x0.5 = cable min. n°8 wires x min. section 0.5 mm² shielded *

3x2,5 = cable n°3 wires x min. section 2,5 mm²

CONDUIT 25 = flexible tube recommended for mechanical protection with a minimum internal diameter of 25 mm

CONDUIT 15 = flexible tube recommended for mechanical protection with a minimum internal diameter of 15 mm

The connections of the displacement transducer are not mentioned in these drawing because the cable is already supplied with the Q-kit.

* The shield has to be connected to ECU side (see ECU manual)

3.2.2 Connections P&CD–230 Vac and P&CD–solar panel:

In both cases (optional) the cable from the main supply or from the solar panel must be inserted in the box of the P&CD through the fairlead on the right.

The terminal board of the power supply inside the box is in both cases in the lower right corner.

3.2.3 Connections P&CD–external antenna:

The external antenna (optional) must be connected to the P&CD through a connector positioned on the box.

3.2.4 Connections ECU–meter / digital input:

The meter for the direct measurement of flow rate (optional), that can be a turbine or a rotary, is interfaced with the ECU through low frequency pulse emitter LF.

Furthermore 2 digital inputs are available, coming from the field.

Insert each cable through the small fairleads of the ECU.
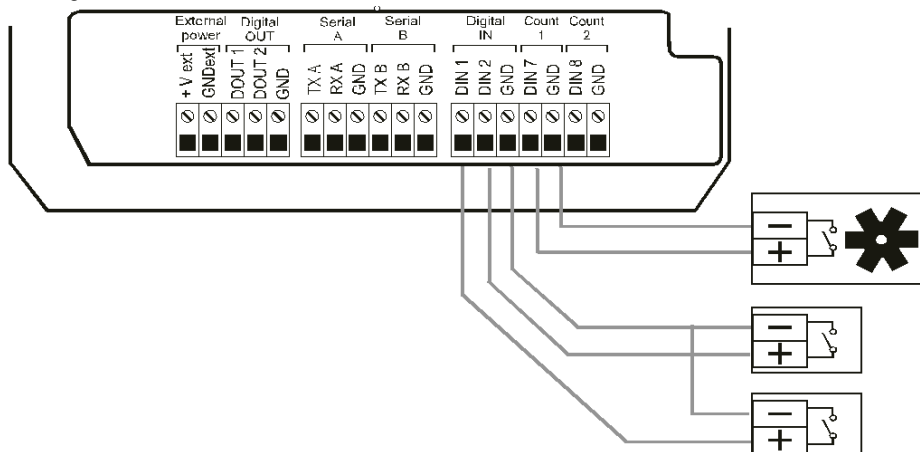
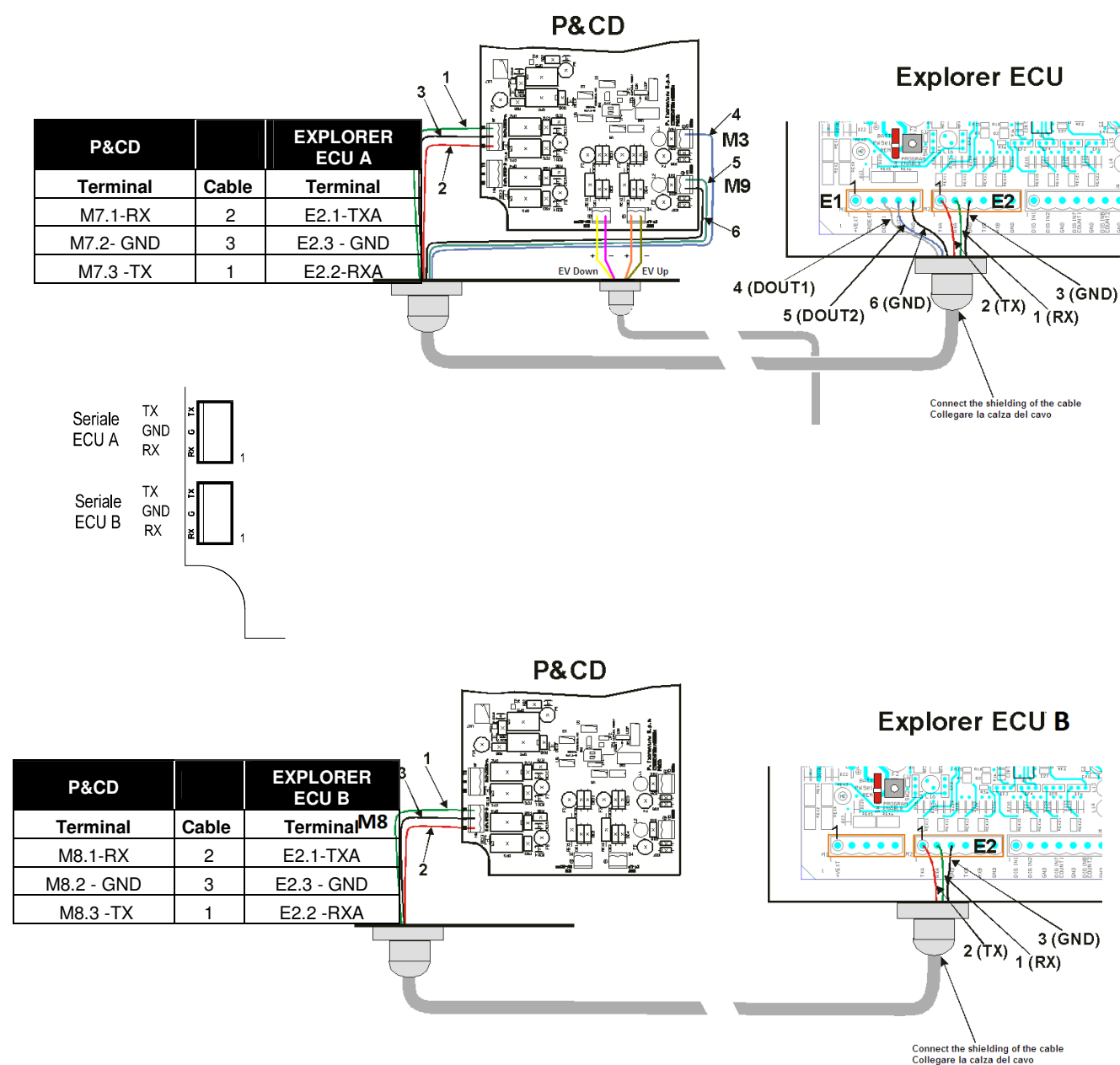### 3.2.5 Connections ECU-P&CD and P&CD-solenoid valves of P-kit.

The connecting cable between ECU and P&CD allows to the user to communicate in local, or in remote from the control room, and to perform the functions of modulation/control of the pressure and limitation of the flow rate (through the energized outputs of the P&CD). Insert the shielded cable in the bigger metallic fairlead PG13 of ECU on the left, and in the bigger fairlead of blue color in the P&CD on the left. Connect the shield of the cable to the fairlead of the ECU.

For the serial port connection, the transmitter TX of the ECU must be connected to the receiver RX of the P&CD and vice versa.

The energized outputs of the P&CD to the solenoid valves of the pilot P-kit act the commands that come from the ECU. Use a cable of 4 wires, insert the cable in one small fairlead of the P&CD.

Connect according to the instruction of the following figure and table.

3.2.5.1 Battery version

P&CD		EXPLORER ECU A	
Terminal	**Cable**	**Terminal**	
M7.1-RX	2	E2.1-TXA	
M7.2- GND	3	E2.3 - GND	
M7.3 -TX	1	E2.2-RXA	

P&CD		EXPLORER ECU B	
Terminal	**Cable**	**Terminal**	
M8.1-RX	2	E2.1-TXA	
M8.2 - GND	3	E2.3 - GND	
M8.3 -TX	1	E2.2 -RXA	

3.2.5.2 Mains or solar panel version
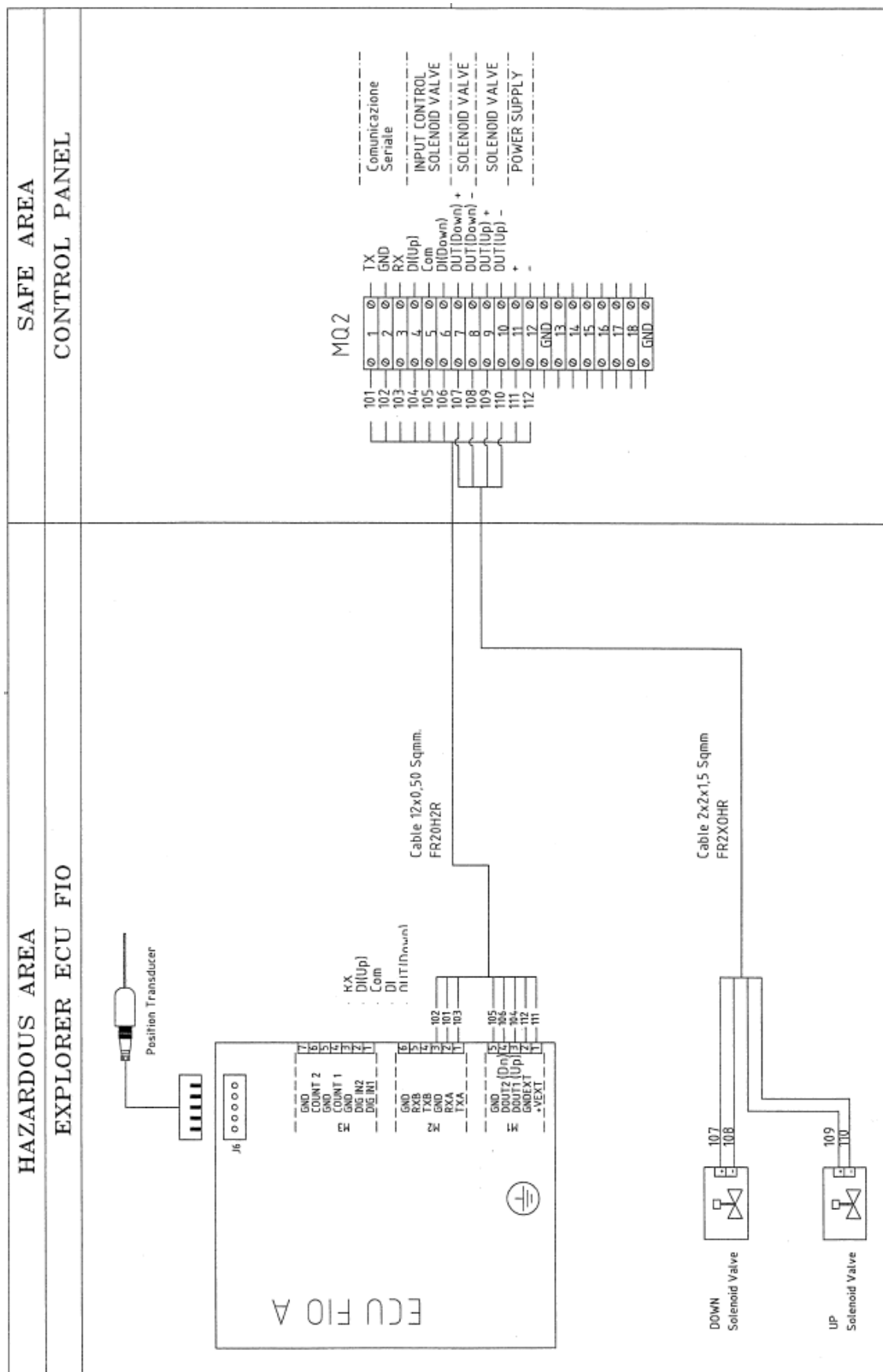
3.2.5.3 ECU B 2nd stream version (optional)

3.2.5.4 Detail of connections on the P&CD side

- **Battery version (the wires must be connected directly on the card P&CD):**

Pict 1- Connections on the left: serial connection between the devices ECU and the P&CD.

Pict 2- Connections on the right: digital inputs connected to the digital outputs of ECU. The ECU, through these low consumption digitals, operates the energized repetition that goes to the solenoid valves from the P&CD (see 3 and 4). The wires MUST NOT pass over the card laying on the components but laterally or lifted from the card of at least 6 mm from it.
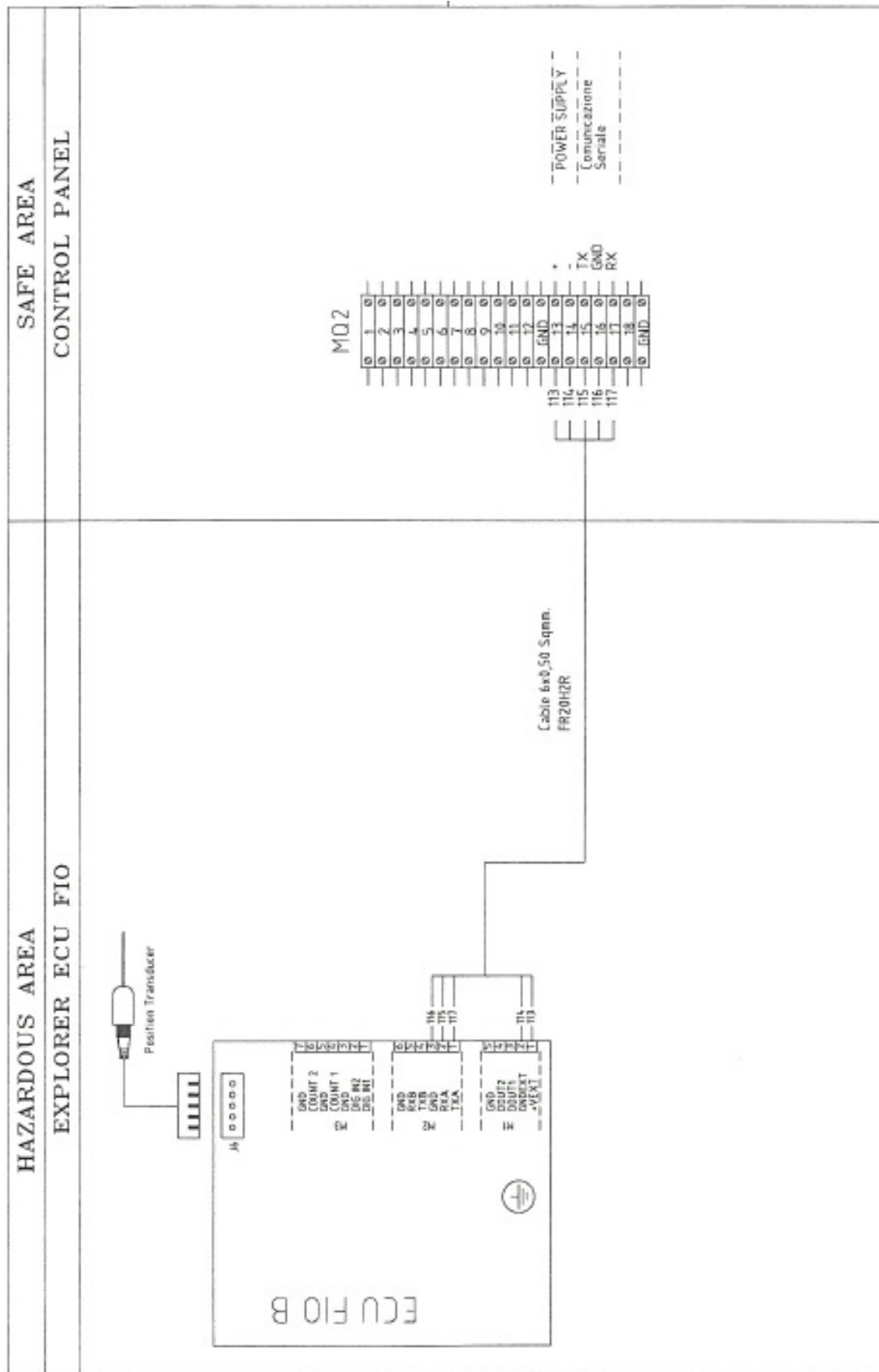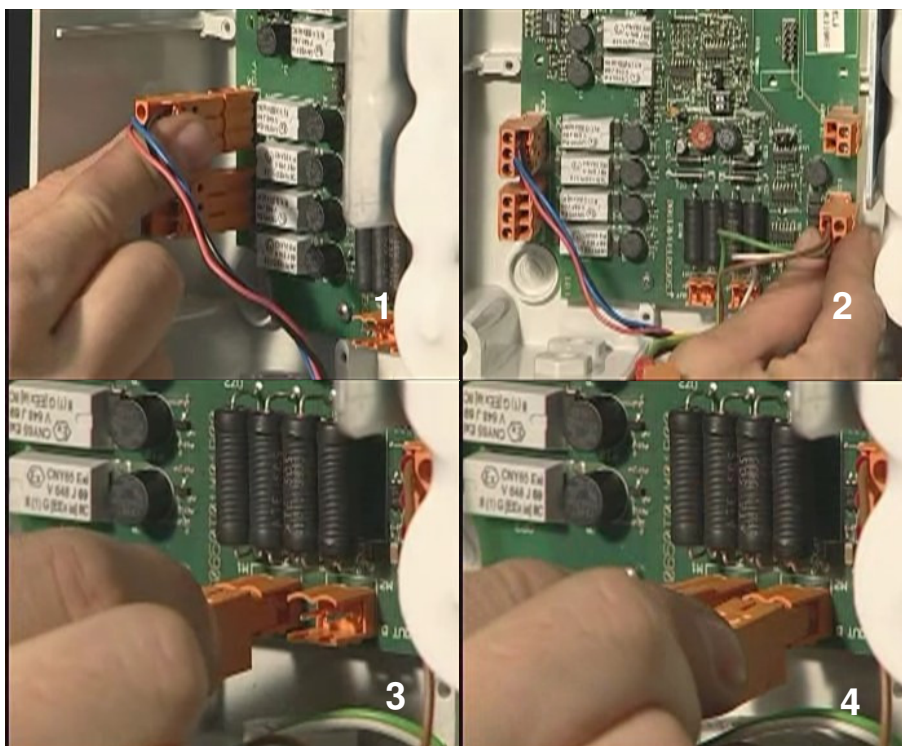
Pict 3- Connector on the bottom left: decrease solenoid valve.

Pict 4- Connector on the bottom right: increase solenoid valve.

- **External supply or solar panel version (the wires from the field must be connected on the terminal board of the P&CD on the bottom left.**

Pict 1- Only in the case of the solar panel version connect the wires to the back-up battery (pay attention to the polarity).

Pict 2- Connect the wires of the external supply cable (230 Vac) or of the solar panel.

Pict 3- Connect the wires coming from the field according to the drawing in the previous page.
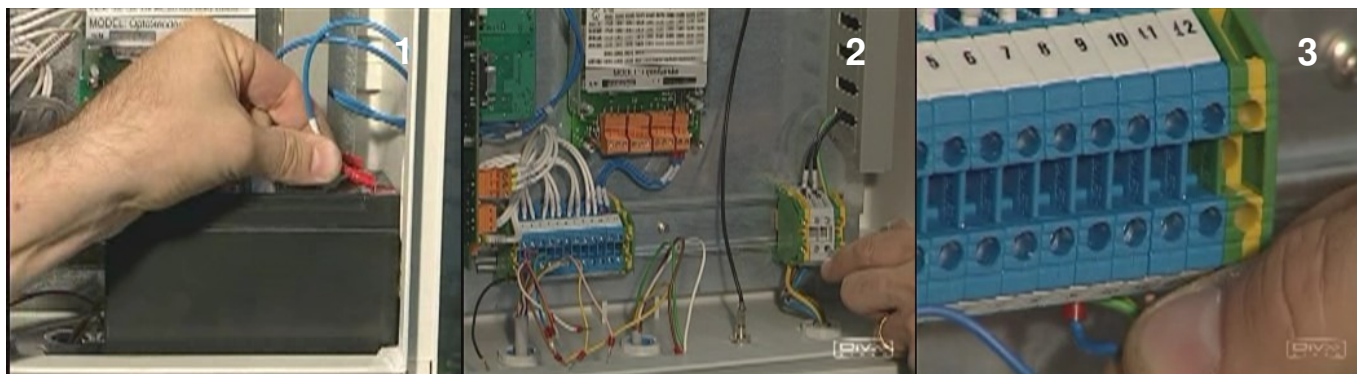
3.2.5.5 Detail of connections on the ECU side

Pict 1- Extract the connector, connect the wire and reinsert the connector.

Pict 2- Connect all the wires.

Finally close the bottom door, accurately fix all the four screws and the fairlead in order to ensure the correct insulation from outside.
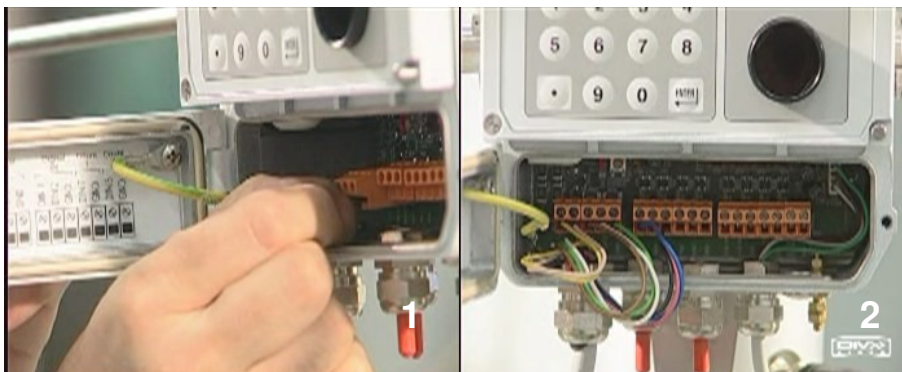
3.2.5.6 Detail of the connections on the solenoid valves side

For the connection of the wires to the prewired connectors of the solenoid valves, use the suitable joints to crimp, supplied. Is also suggested to cover these junctions with some thermo-shrinking sheathing.

Pict 1- Insert with force the connector until hearing a net trigger.

Pict 2- Couple the wires of the pre-wired connectors to the wires coming from the P&CD through a joint to be crimped

Pict 3- Cover with thermo-shrinking sheath
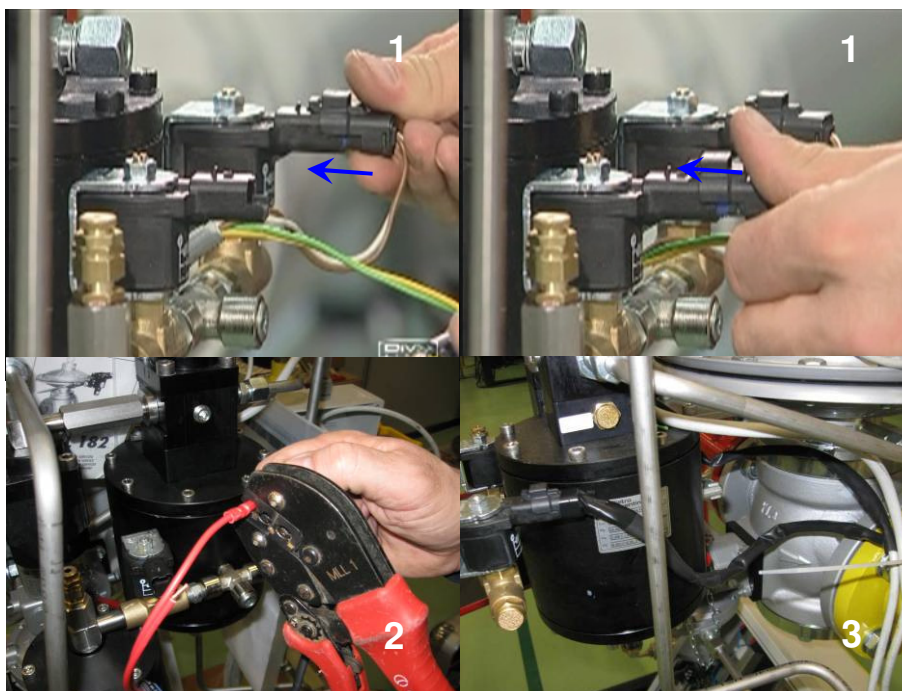
4. Startup of the electrical devices and preliminary tests

PROCEDURE STEP 3:

After all the pneumatic and electric connections has been realized, is possible to startup the electrical devices.

- Switch on ECU and P&CD devices. Refer to the following instructions.

- In order to avoid malfunctioning, verify the connections between P&CD, ECU, solenoid valves and serial connections. Refer to the following instructions.

The line has to remain vented during this step.

4.1 ECU Startup

1- Remove the four screws of the upper panel of the ECU.
2- Select the source of power supply. Set the SW1 (PW Sel):
   a. On BATT (to the top) if the apparatus is power supplied exclusively from battery
   b. On REM (to the bottom) if the apparatus is tele-supplied (230 Vac or solar panel) with/without support of the battery in back-up
3- Connect the lithium battery to its connector
4- Finally close the upper panel and accurately fix all the four screws in order to ensure the correct insulation from outside.
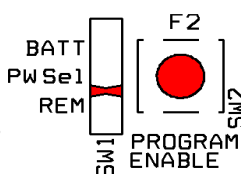
4.2 P&CD Startup

The sequence changes according to the type of P&CD:

4.2.1 Battery-operated

Pict 1- Insert the SIM card into the slot
Pict 2- Lower the metallic hook to block it.
Pict 3- Connect the battery pack into its connector.
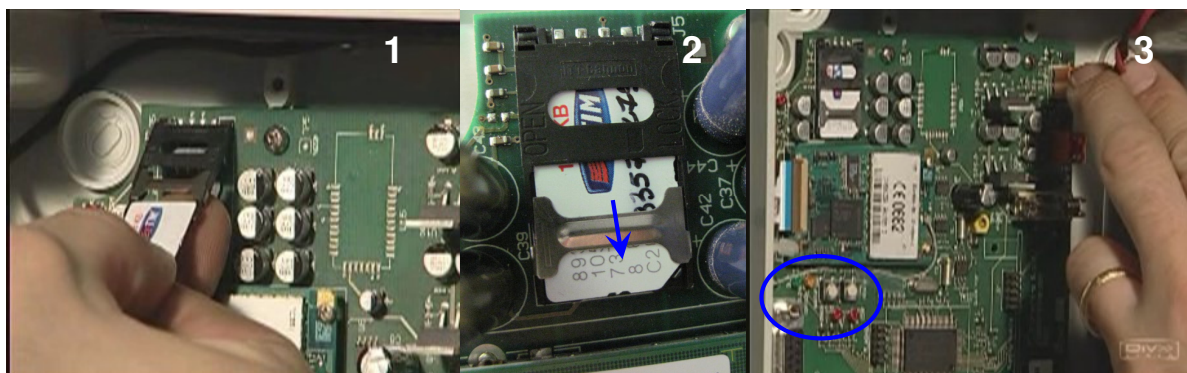
4.2.2 External supply 230 Vac

First of all check that the connections of the back-up battery are well fixed.

Pict 1- Insert the SIM card into the slot
Pict 2- Lower the metallic hook to block it.
Pict 3- Lift the main switch.
Pict 4- Lift the switch for the card P&CD and the optosender.
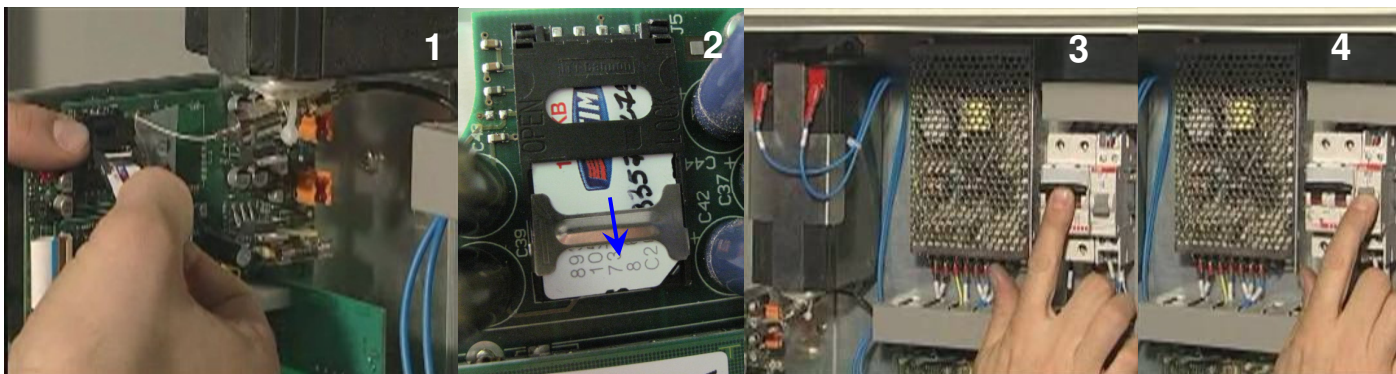
4.2.3 Power supply from solar panel

Pict 1- Insert the SIM card into the slot
Pict 2- Lower the metallic hook to block it.
Pict 3- Lift the switch for the card P&CD and the optosender.
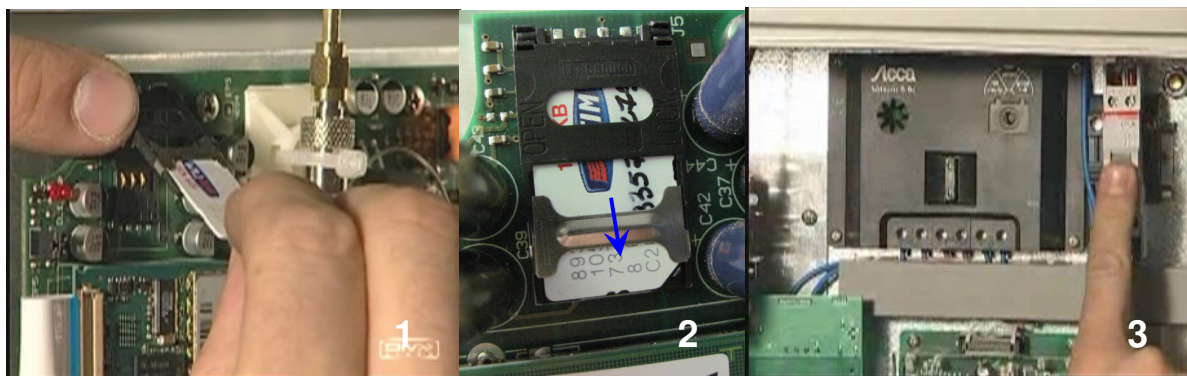
In all the cases, after the P&CD has been supplied, the 4 led of the card shall be ON in sequence. After few seconds of self-test, the green led starts to fast blinking.

After a period of 10 to 60 seconds (depend by field conditions) the green led will be:

Fixed ON: it indicates that the modem has a good/sufficient field signal.

Blinking slowly: it indicates that the field signal is insufficient but the remote communication is possible in any case.

Blinking fast: it indicates that there is no SIM or that it has not been recognized by the provider.
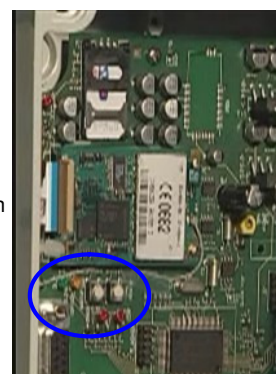
4.3 Test of solenoid valves

To check the correct wiring of the whole loop from the ECU to the P&CD up to the solenoid valves, manually force the intervention of each solenoid valve from the keyboard ECU with the following procedure:

1- Verify that the jumper JP4 on the P&CD is set on "LOOP".
2- Reach the Menu "Fio- Five In One \ Maintenance \ Press. Modul. \ Press. Step Up/Dn" (see enclosure A "Structure of the menu ECU"). For the navigation through ECU menus see 5.1.
3- Select "Enabled" with ENTER (after entering the password).
4- Press "▲" for one single step of increase. The triggering of the increase solenoid valve (tic) should be heard.
5- Press "▼" for one single step of decrease. The triggering of the decrease solenoid valve (tic) should be heard.
6- Press ESC to disable and exit.
7- Exit from the menu "Press.Modul."
8- Enter again in "Maintenance" to bring back the machine from the "Maintenance" status to normal status pressing Enter from the page "Main. Exit" (see Enclosure A "Structure of the menu ECU").

4.4 Serial communications configuration

All the ECUs coming from the factory have the Modbus Address set to 0 (default). P&CDs are set to 20 (default).

This is the usual configuration on field of F.I.O.:

	Modbus Address
ECU1	0
ECU2	10
P&CD	20

Before connecting with ECU2 it is necessary to set it manually from the numeric pad the Modbus Address = 10.

For this modification it is necessary to reach the Menu "Settings \ System Settings \ Modbus Adr." and modify the address from 0 to 10. For the navigation through ECU menus see 5.1.

The user can change as much as he likes the addresses of the equipment (for example 1-11-21, 2-12-22, etc.), on condition that he chooses in FioTerm the same address before launching the call.

## 4.5 Serial communications test

To test the serial connection just performs with the software FioTerm a connection with each equipment installed:

1- Verify that jumper JP3 on the P&CD is closed
2- Connect the cable with adapter RS232/USB on the connector of the P&CD board.
3- Connect the cable to the laptop
4- Start the software FioTerm
5- Open the window "Setup \ Communication \ Serial line".

6- Insert the COM used. If necessary verify in the operating system of the PC on "Peripheral management \ COM port" the number of COM in use.
FioTerm permits to select COM from 1 to 7.

7- The other parameters are 9600; 8; none; 1.

8- Press OK

9- Open the window "**Setup \ Communication \ Communication**".

10- Connection modality: **Local ; phone N° not necessary; Password of connection: conn (default)**

11- **In "Device and address" select the device "P&CD"** entering the Modbus address (default 20).

12- Press OK

13- Press the pushbutton "GO " or "File \ Start connection".

14- Wait some seconds and it should connect with the P&CD.

15- Exit from the connection pressing the red pushbutton with the X or "File \ Close".

16- Open the window "Setup \ Communication \ Communication".

17- In "Device and address" select the device ECU1 entering the corresponding Modbus address (default 0).

18- Press the pushbutton "GO "or "File \ Start connection".

19- Wait some seconds and it should connect with ECU1.

20- Exit from the connection pressing the red pushbutton with the X or "File \ Close".

21- **Repeat the procedure eventually with ECU2** (set on ECU2 the address ModBus default 10, see 4.4).
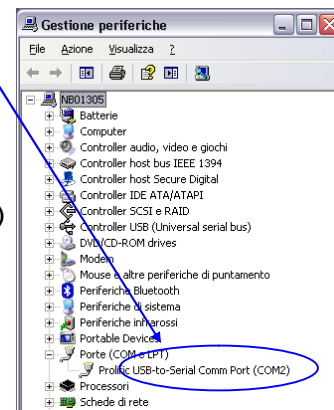
4.6   Test of tele-power supply

To verify that the ECU on field is supplied by the P&CD (external supply 230 Vac or solar panel) verify that on the display of the ECU appears the plug symbol

If this is not, verify:

1- That the selector inside the ECU is in Rem (see 4.1). If no, switch to REM. If yes:

2- Extract the first connector of ECU on the left and verify with a voltmeter if is coming from P&CD the inlet voltage: 5V - 6.5 VDC.

3- If the correct voltage is not measured, verify the wiring connections.

5. Basic configurations on ECU

PROCEDURE STEP 4:

After the electrical devices and connections have been verified, the first configuration has to be done on ECU.

- In case of direct measurement of the flow rate, set the parameters for the calculation. Refer to the following instructions.

- In case of indirect measurement of the flow rate, set the full scale (100%) and the zero (0%) of the regulator. Refer to the following instructions.

IMPORTANT: After the first modification made directly via keypad, the ECU goes in "Maintenance" status. In this status the ECU stops all the modulation activities, so remember to bring back the ECU in "Normal working status" (see Enclosure A at the end of manual).

At the end of the configuration of flow rate measurement parameters:

- *Pressurize the upstream line if it has not been done yet (depending from the case with the spring of the P-kit completely free and opening slowly the upstream ball or butterfly valve. Leave the downstream valve closed.*
- *Screw the setting screw of P-kit keeping a small flow rate from the downstream side to the atmosphere through the vent valve. Increase the downstream pressure and set the spring of P-kit at the pneumatic setting agreed with the customer. When possible, latch the SSV if present.*

Note: if one of these units is not provided, don't consider the corresponding chapter.

5.1 Instruction for the navigation through ECU menus

For the visualization/modification of variables from the keypad:

-pressing ENTER is possible to go inside the next sub-menu

-pressing ESC is possible to go back to the higher menu

-pressing the arrows "▲" or "▼" is possible to move inside the menu

For the modifications of the parameters related to the direct measurement of flow rate in menu "Settings" from the keypad:

1- Press the "PROGRAM ENABLE" botton on the board of ECU. If this operation is forgotten, the message "Access denied remove seals" appear
2- Press ENTER on the page where there is the value to modify (the value moves to the left)
3- Write with the keypad the new value
4- Press ENTER
5- When all the selected values in that menu has been updated, press ESC
6- Press ENTER to save the modifications
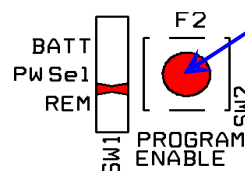
For the modifications of the other parameters in menu "Settings" and "F.I.O. Five in One \ Maintenance" from the keypad:

7- Press ENTER on the page where there is the value to modify
8- Type the requirred password (default 0000)
9- Press ENTER
10- Press ENTER again (the value moves to the left)
11- Write with the keypad the new value
12- Press ENTER
13- When all the selected values in that menu has been updated, press ESC
14- Press ENTER to save the modifications

5.2 *Measurement of the flow rate with direct method*

The flow rate is measured acquiring the turbine impulses.

€xplorer ECU FT has an input counter for the volume measurement (that can be chosen between one of the two physical LF inputs), on which it is possible to make also the correction of the turbine errors. The pressure upstream or downstream (depending where the turbine is installed) must be measured by a certified sensor. The temperature probe installed near the turbine must be connected to the input PT100. Respecting all these conditions the converted volumes and the converted flow rates can be considered custody transfer.

Also the **€xplorer ECU** has the input counter for the volume with the same characteristic of ECU FT, but the pressure upstream or downstream where the turbine is installed is measured by a traditional sensor, while the temperature can only be entered as a parameter of calculation, using an average fixed value. In this case the correct volumes and flow rates cannot be considered as custody transfer.

The main parameters to be configured on **€xplorer ECU FT** and **€xplorer ECU** are:

Menu "Settings \ Calculation settings":

1- Base references (pressure and temperature at base conditions). Is possible to select base pressure and temperature for Standard or Normal conditions. Is also possible to set different user-defined conditions. In this case, before proceed with next parameters, follow this procedure: select "user-defined", then press ESC, press ENTER to confirm, press ENTER again and proceed to References (see point 7). Than go back to Relative density (point2).

2- Relative density

3- References of relative density

4- Temperature measurement. Only in case of €xplorer ECU, set manually the average value of temperature of the gas in the turbine. In case of €xplorer ECU FT the temperature has to be left to 0 (enable T measurement with PT100)

5- Z formula.

6- Gas composition: % CO_2; % N_2; % H_2 (if requested); % CO (if requested)

7- References: only in case of "user-defined" selection set the new base pressure and temperature

8- Q formula

9- Pulse weight

10- Unit STD. Choose between Default (m³;m³/h;bar;°K,…); S.I. (m³;m³/h;MPa;°K,…); U.S. (ft³;ft³/h;psi;°F,…)

Menu "Settings \ Counter settings":

1- Vm Meas. Volume: read the value in m³ or ft³ in the display of the turbine and set the same value in this location, in order to align the ECU pulse counter to the turbine display.

Menu "Settings \ System settings":

1- Current date: set the current date and time

2- Language: set the preferred language

For more details please refer to the user's manual of the Explorer ECU.

Pressurize the line (see above instructions of PROCEDURE STEP 4).

5.3   Measurement of the flow rate with indirect method

The indirect measurement of the flow rate is based on the correlation between the position of the obturator of a specific regulator and the inlet and outlet pressures. The position of the obturator is measured through the resistive displacement transducer. It has a measurement range greater than the stroke of the regulator. So it is necessary for the ECU to know exactly the position of complete opening and complete closing of the regulator (see example on the right) on order to calculate by interpolation the intermediate position % during the working operation.

After positioning the displacement transducer on its bracket and fixing correctly all the screws (the regulator has to do the whole stroke inside the range of the transducer, see 2.1), proceed as follows:
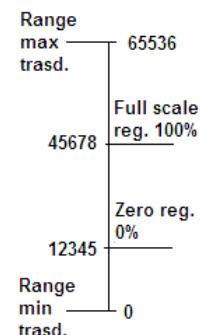
5.3.1   Setting the full scale of the regulator (100%).

5.3.1.1   Without monitor
1- With the line still discharged, disconnect the steel pipe that connects the pilot with the lower chamber of the regulator (loading pressure). With Fail Open regulator is not necessary because it is already at 100%.
2- Connect on the lower chamber an external pressure source: for regulators type Reval 200-300 mbar are sufficient, for regulators type Reflux 500-600 mbar are sufficient.
3- Feed gradually the lower chamber with the pressure required and verify, through the visual indicator, that the regulator is totally open.
4- Enter in Menu "Fio- Five In One \ Maintenance \ Meas. Setup \ FS Setup" (see Enclosure A "Structure of the menu ECU").
5- Press Enter (after entering the password). It is displayed the current value (max. 65536). When this value is stable press again Enter.
6- Exit from the menu "FS Setup" and save pressing again Enter.
7- Disconnect the external source and remove the pressure from the lower chamber
8- Reconnect the original pipe.

5.3.1.2   With monitor (in line or incorporated)
1- Pressurize the line (see above instructions of PROCEDURE STEP 4) and create a small flow rate on the downstream side.
2- Screw the spring of the pilot F.I.O. to a value higher than the setting of the monitor.
3- The monitor starts to operate and the regulator with F.I.O. must reach a complete opening position. Verify through the visual indicator.
4- Enter in Menu "Fio- Five In One \ Maintenance \ Meas. Setup \ FS Setup" (see Enclosure A "Structure of the menu ECU").
5- Press Enter (after entering the password). It shall be displayed the current value (max. 65536). When this value is stable press again Enter.
6- Exit from the menu "FS Setup" and save by pressing again Enter.
7- Unscrew the spring of the pilot F.I.O.

5.3.2   Setting the zero of the regulator (0%)
1- Pressurize the line (see above instructions of PROCEDURE STEP 4) if it is not yet pressurized.
2- Perform all the required settings (Slam shut valve, relief valve, monitor, accelerator).
3- Set as last the pilot F.I.O. setting with a ½" ball valve on downstream side open at 45° discharging in atmosphere.
4- Enter the Menu "Fio- Five In One \ Maintenance \ Meas. Setup \ Zero Setup" (see Enclosure A "Structure of the menu ECU").
5- Press Enter (after entering the password). It is displayed the current value (min. 0). When this value is stable press again Enter (*).
6- Exit from the menu Zero Setup and save by pressing again Enter.

(*) we suggest to perform the zero setting with this small flow rate in order to be sure that the regulator is not working under lock-up pressure. In fact, in lock-up pressure case, the zero would correspond to the position of the plug while it is penetrating in the rubber (see example on the right, case A). The error that could be made in the indirect measurement of the flow rate would be with no doubt greater than the error generated when considering the zero in a condition of lamination very close to the rubber surface (see example on the right, case B).
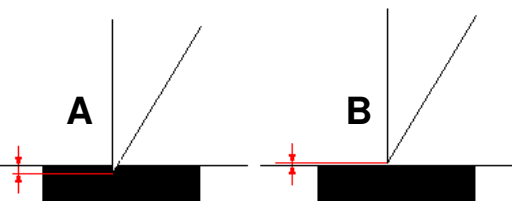
6. Basic configurations with terminal FioTerm

PROCEDURE STEP 5:

After the configuration on ECU, is possible to perform the basic configuration with terminal FioTerm for the setting of the type of the regulator that is assembled. Refer to the following instructions.

Note: if Q-kit is not provided, don't consider the following chapter.

Here below we shall see the basic parameters that are mandatory to configure locally.

Before starting the connection with the P&CD and ECU, it is suggested to set from terminal FioTerm:

1- The preferred language of the terminal: from the menu bar select "Setup \ Language".
2- Initially FioTerm is protected against modifications of the configuration. In order to make the terminal enabled to perform modifications, enter the password: from the menu bar, select "Setup \ Password (default "PF"). Click on "Apply" and "OK".
3- The unit of measurement for each variable: from the menu bar select "Setup \ Units of measurement".

Now you can start the connection with the ECU (eventually review the procedure on **item 4.5**).

CAUTION: For the decimals numbers, always enter the dot, never enter the comma on FioTerm!

The ECU does not know yet on what type of regulator is being interfaced for the calculation of the flow rate.

To configure the regulator, proceed as follows:

1- Select the page "Flow rate measurement".
2- Click "Modify".
3- Enter the average relative density.
4- Enter "Indirect measurement".
5- Click "Adjust…"
6- Select the type of regulator with its configuration from the list and save.
7- The page "Flow rate measurement" must appear as in the example in bottom right.

List of regulators types:

REFREV: both for Reflux and Reval.

REFLUX: only for Reflux.
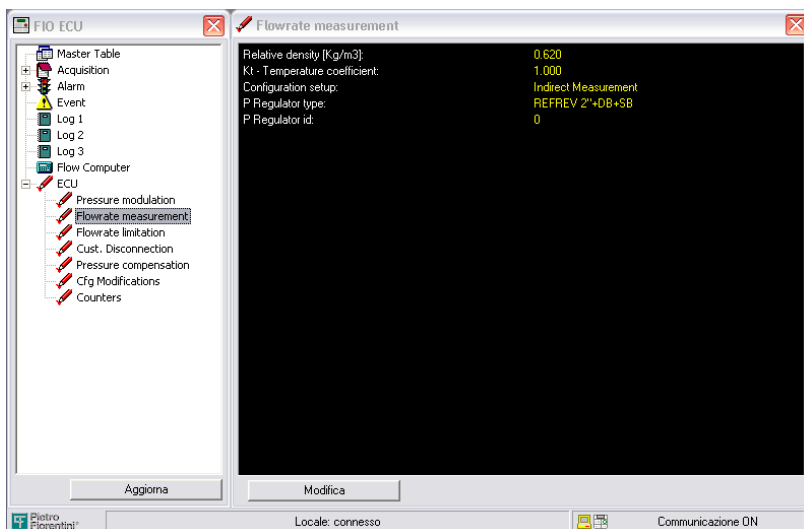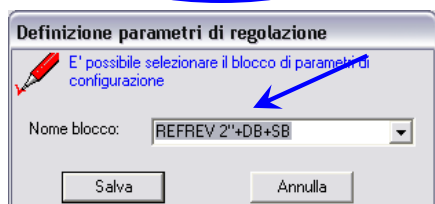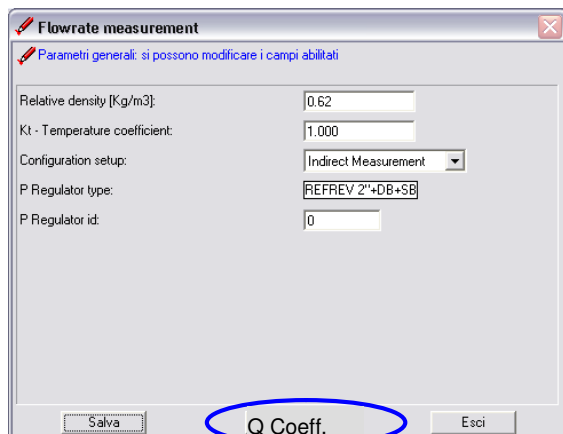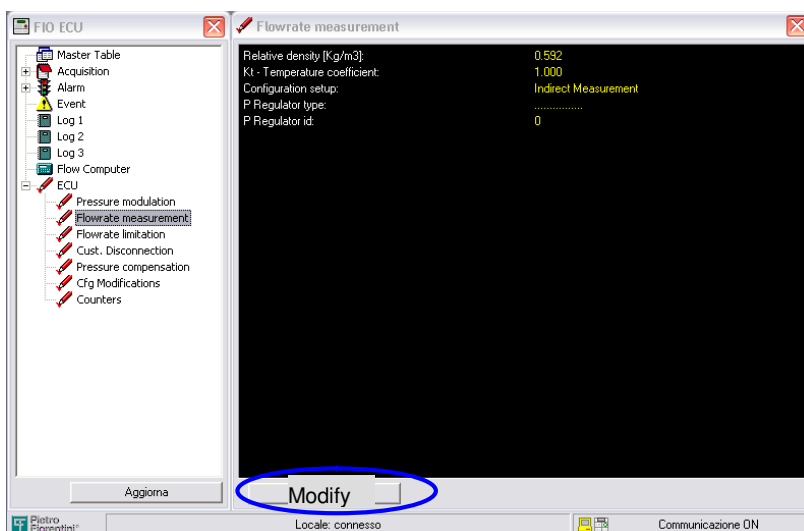
REVAL: only for Reval.

+DB: regulator with silencer incorporated.

+SB: regulator with slam shut valve type SB incorporated.

+VB: regulator with slam shut valve type VB incorporated.

+PM: regulator with monitor incorporated.

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice

7. Complete configuration with terminal FioTerm or with DMS.

PROCEDURE STEP 6:

To proceed with the complete configuration is possible to choose to use either the FioTerm in local or the DMS remotely. Do not use the FioTerm remotely!

In case of configuration with terminal FioTerm ONLY (NO DMS utilization after commissioning): Refer only to item 7.1

In case of DMS utilization after commissioning:

Alternative n°1:

- *preliminary configuration with terminal FioTerm: Verify and set the proper parameters of P&CD (set date and time, SMS for alarm notification, …); Verify and set the proper parameters of ECU (set date and time, set alarm, events). Refer to the following instructions on item 7.1*
- *configuration parameter for GPRS/GSM modem connection (refer to item 7.2)*
- *create only the plant profile on DMS and then connect to it. READ ON P&CD AND ECU THE CURRENT CONFIGURATION. IT WILL BE SAVED ON DMS.*
- *following modification will be made only via DMS (*)*

Alternative n°2:

- *configuration parameter for GPRS/GSM modem connection (refer to item 7.2)*
- *create the plant and configure totally the parameters on DMS profile of the plant. The parameters of configuration on DMS are equivalent of the parameters explained in item 7.1.*
- *connect with DMS to the plant. WRITE ON P&CD AND ECU THE NEW CONFIGURATION*
- *following modification will be made only via DMS (*)*

(*) In case of DMS utilization after commissioning , **all** the subsequent variations of configuration must be performed **only** with the DMS in order to don't cause misalignments between the equipment and the control room, because DMS always saves in its registers the configuration before sending it, and it uses this save for its following modifications. If, after sending the configuration from DMS, some modifications are made from terminal FioTerm, it is created a misalignment between the real configuration and the saved one. The following time that the configuration is sent from DMS, the modifications performed from FioTerm will be overwritten and so cancelled.

The parameters of configuration that will be described below are mainly equivalent both for FioTerm and DMS.

7.1 Complete configuration with terminal FioTerm.

7.1.1 P&CD

To start the connection with the P&CD, open the window "Setup \ Communication \ Communication". Connection modality: Local; phone N° not necessary; Password of connection: conn (default); "Device and address" select the device P&CD entering the Modbus address (default 20) (**see item 4.5**).

7.1.1.1 Master Table

Here are displayed the information relative to the P&CD and the status of operation, type version of the firmware, GSM field, battery status, etc…

No modifications to be performed.
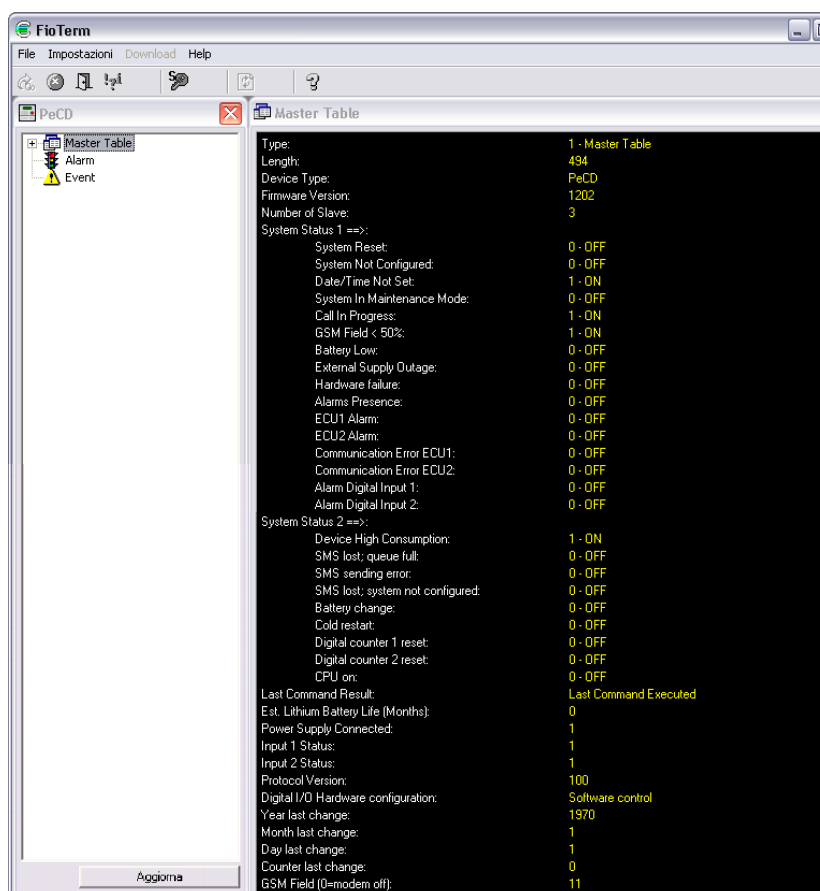
7.1.1.2 Date and time

Set the date and current time clicking on "Modify".
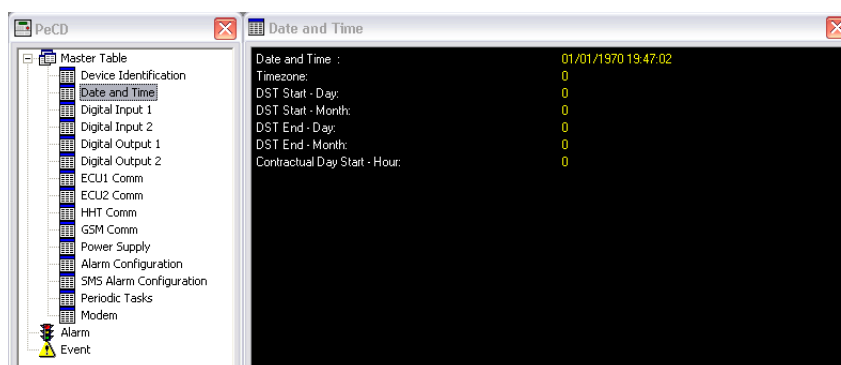
7.1.1.3   SMS Alarm configuration

Enter all phone number which you wish to send an SMS after the activation and restore of the alarms, … clicking on "Modify".

Selecting the strategy "Sequential", it is sent an SMS to the first number of the list. If the notification reply does not arrive on time, it will send the same SMS to the second number and so on.

Selecting the strategy "Send to all" it will send simultaneously the same message to all numbers.
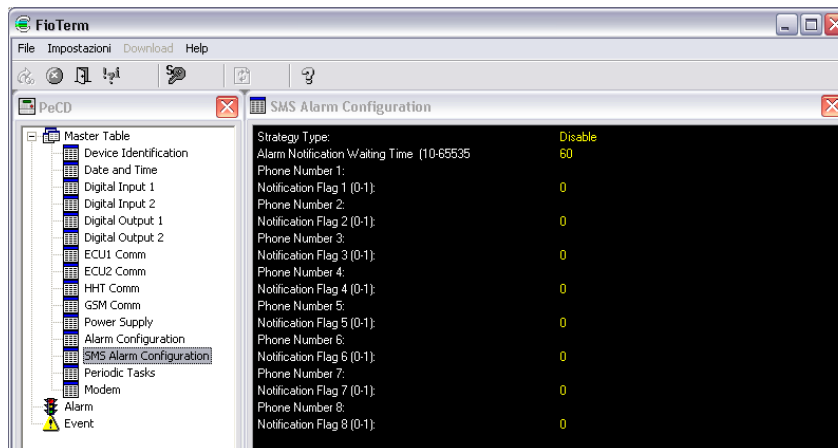
7.1.1.4   Alarms and events

All the changing of status of controls indicated in Master Table are saved in the events. It is also possible to enable them as alarms (some of them are by default). In this case they have a greater importance and can generate SMS.
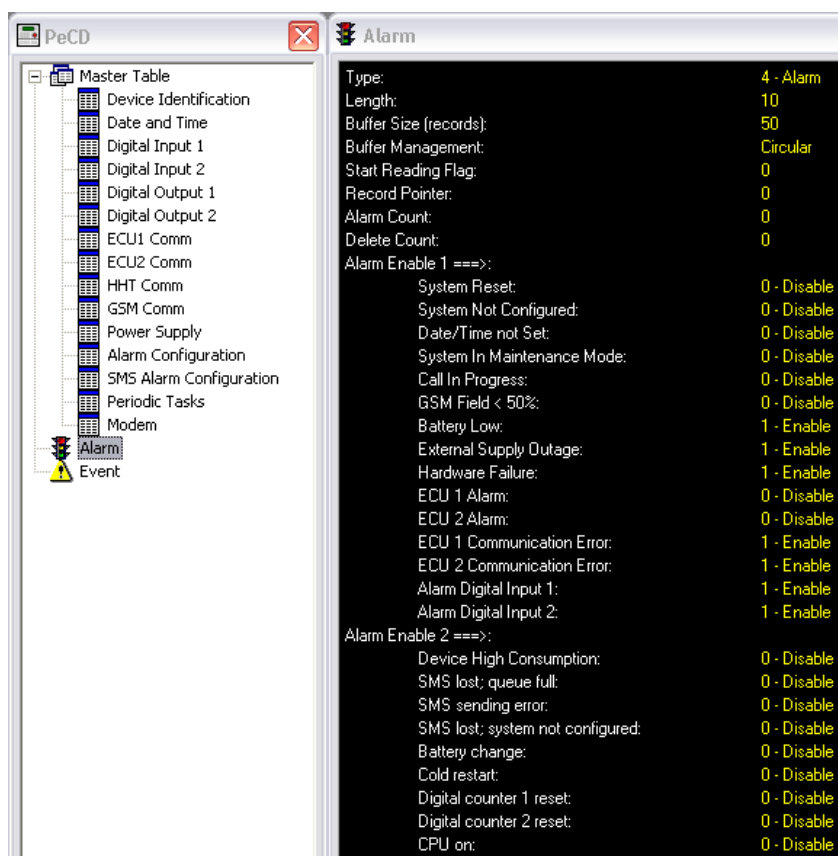
These are the minimum settings necessary for the startup of P&CD. The other settings are for an advanced use.

Further information are available in the manual P&CD.

7.1.2 ECU

To start the connection with the ECU: open the window "Setup \ Communication \ Communication". Connection modality: Local ; phone N° not necessary; Password of connection: conn (default); "Device and address" select the device ECU1 entering the Modbus address (default 0) or ECU2 (default 10) (**see item 4.5**).

7.1.2.1 Master Table

Here are displayed information relative to the equipment type, firmware version, logging status, date and hour, etc… and the status of controls like battery status, inputs status, etc…

Clicking on "Modify" it is possible to set the number of the plant (not to be confused with the Modbus address that can be set only from the keyboard of ECU), the language of the ECU, the day closing hour, the password (default 0), the date of start and end of daylight saving time hour.

Clicking on "Set Date" it is possible to set the date and hour. Selecting "immediate definition" the new time is set immediately, while selecting "Progressive Setting" it moves from the old to the new one progressively without letting gaps in the log.

It is possible to activate all the log configured simultaneously with "Start Log", deactivate them simultaneously with "Stop Log". Before reactivating them, clear the stored logs with "Clear Log".
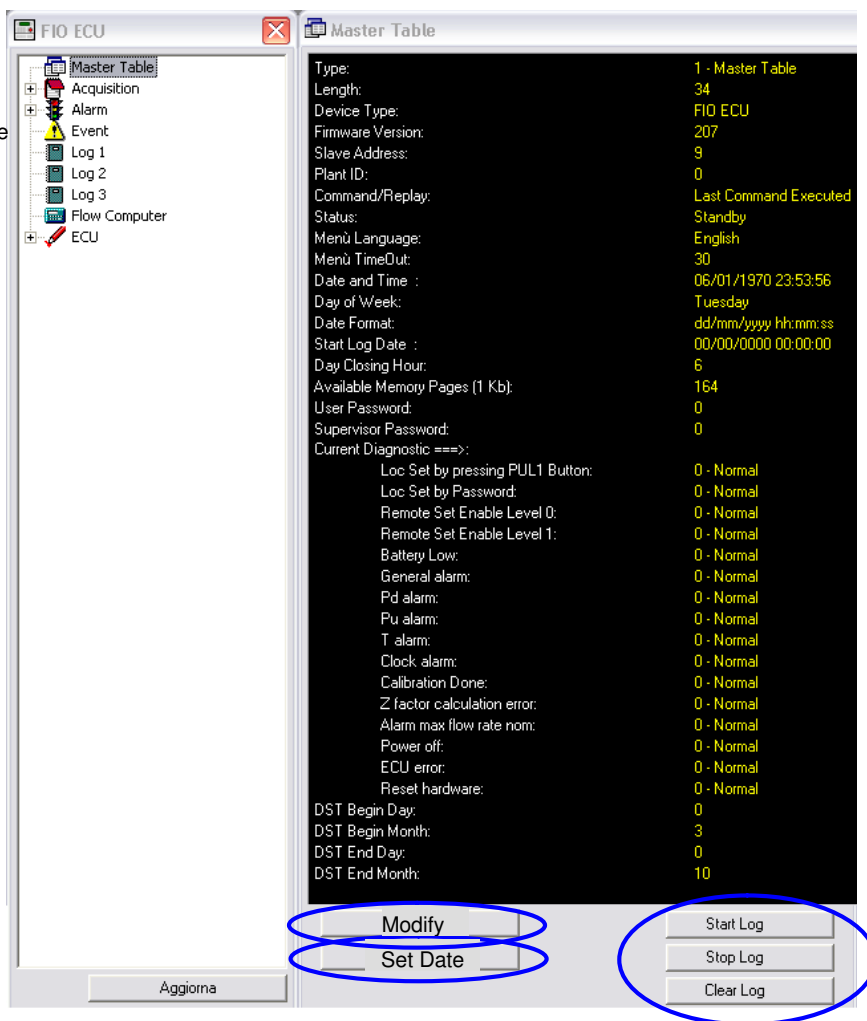
7.1.2.2 Acquisition

Here it is possible to see information relative to each analog or digital variable, see the example on the right, related to the downstream pressure.

Here are also displayed the status of the alarm related to that specific variable.

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice
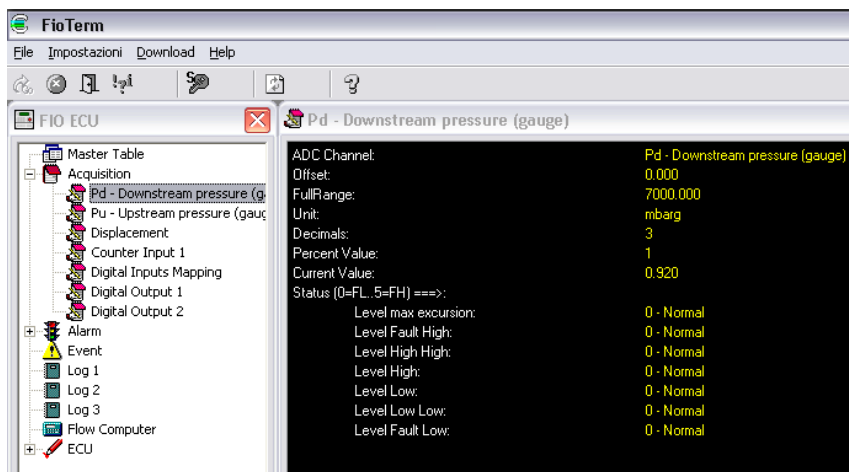
7.1.2.3 Alarm

In the general page "Alarm" clicking on "Show Log" it is possible to see all the status changes of the alarms stored in the ECU.
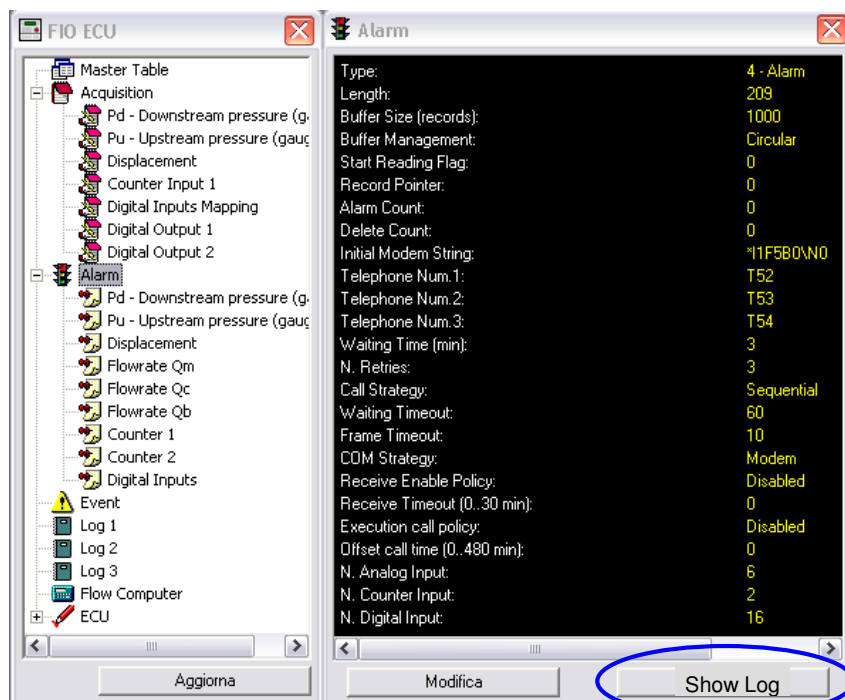
In the page related to the variable to be monitored, clicking on "Modify" it is possible to select 3 alarm levels for high limit ("High, "High High" and "Fault High") and 3 alarm levels of low limit ("Low, "Low Low" and "Fault Low"). It is also possible to set a value of maximum excursion of the variable ("Max range").

Each intervention can be monitored as an event, selecting it on "Event enable" (it is only recorded in the memory of the ECU) or as an alarm, selecting it on "Alarm enable" (in this case it is generated also an SMS).

Finally, it is possible to display the current status of the thresholds.
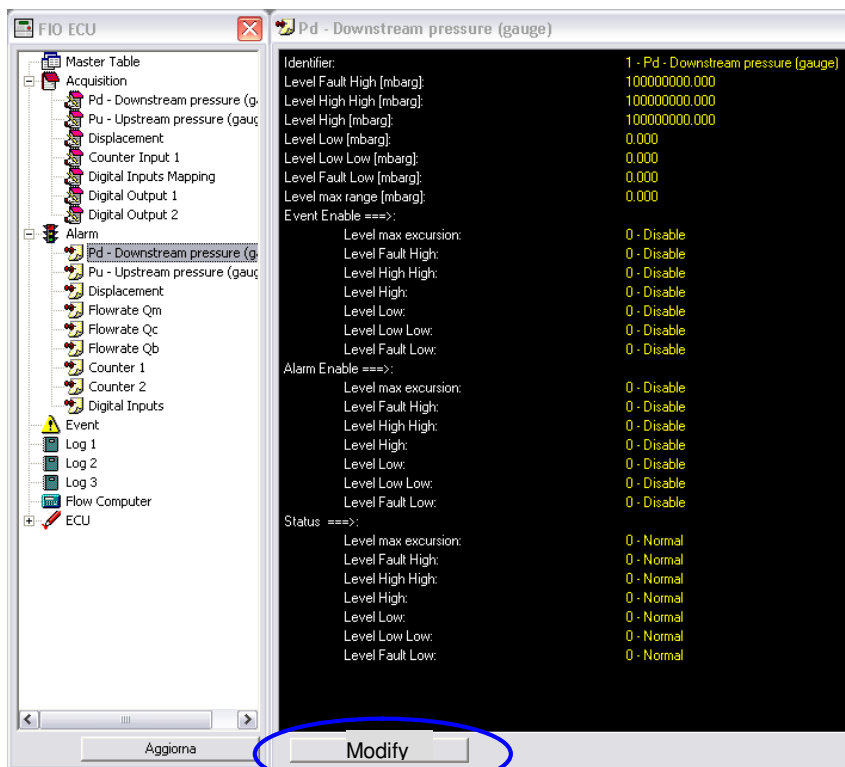
7.1.2.4 Event

In the page "Event" clicking on "Show Log" it is possible to see all the events stored in the ECU.
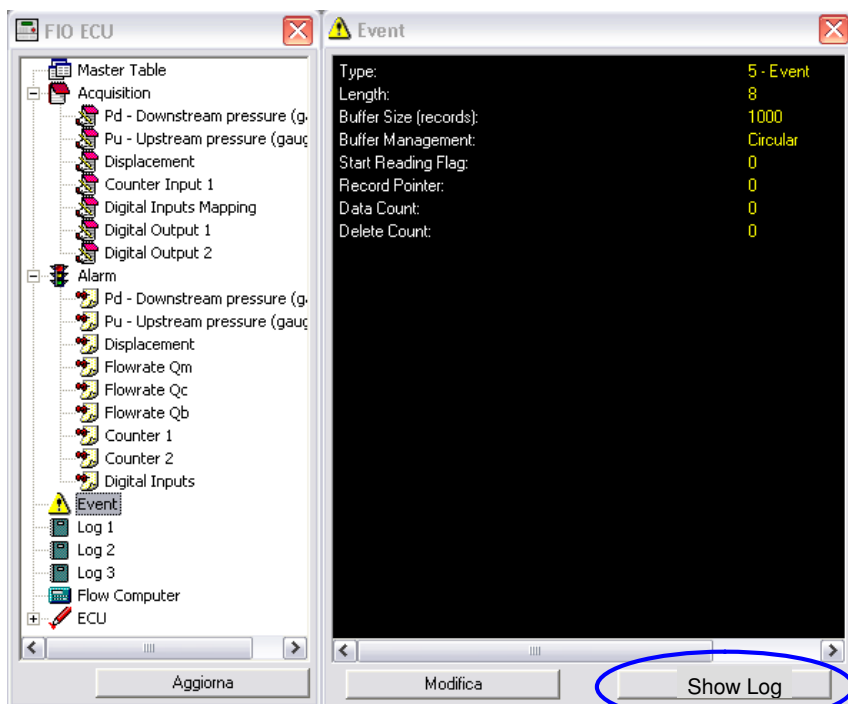
7.1.2.5 Log

The Log is a configurable memory location where the selected variables of that Log are stored.

Clicking on "Modify" it is possible to set:

- The name of the Log.
- Log rate (time between two consecutive acquisitions).
- "Circular" if, when it has filled the available memory, it stores the most recent value and cancels the oldest one, or "Filling" if, when it has filled the available memory, it stops the memorization of new data.
- "Buffer size" is the max. size of the Log. Each record is an acquisition of the group of selected variables. If for example we wish to accumulate data for 30 days with a Log rate of 3600 seconds (1 h) we must set the buffer size at:
  24 h x 30 days = 720 records.
- Up to n°15 variables can be monitored: pressures, position, flow rates, volumes, and diagnostics.
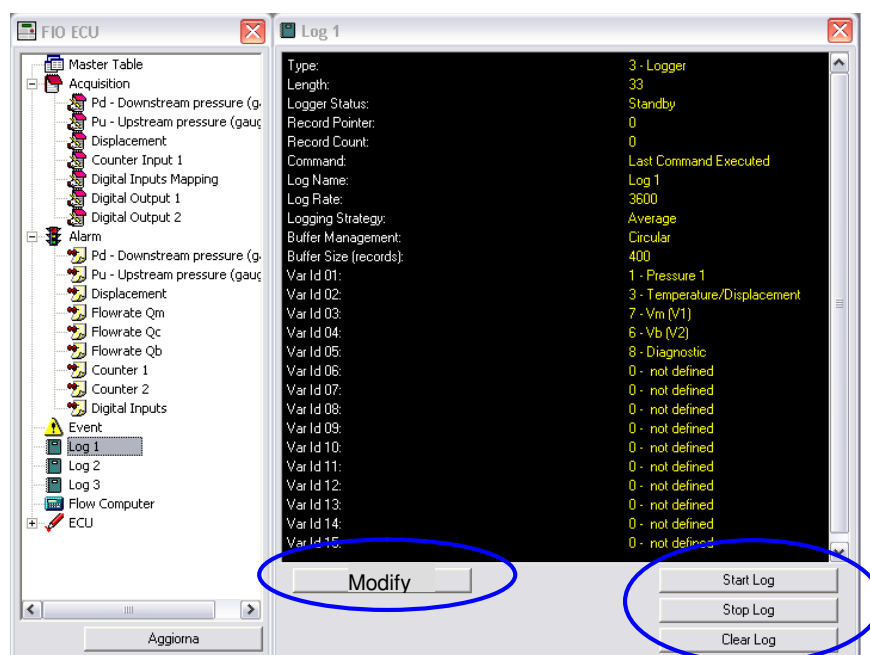
Each Log can be configured with different step, size and variables.

N.B.
Qm/Vm = flow rate/volume measured.
Qc/Vc = flow rate/volume corrected by the error introduced of the turbine, if known.
Qb/Vb = flow rate/volume converted to the reference conditions.

F.I.O. User Manual – Ed.2. Rev.5   *Page 31/ 53*

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice

7.1.2.6   Flow computer

Here are all the variables relative to the Flow Computer section (useful mostly in case of direct method measurements).

The parameters as composition of gas, reference conditions, etc… can be set only from the keyboard of ECU.

For more information see the ECU manual.
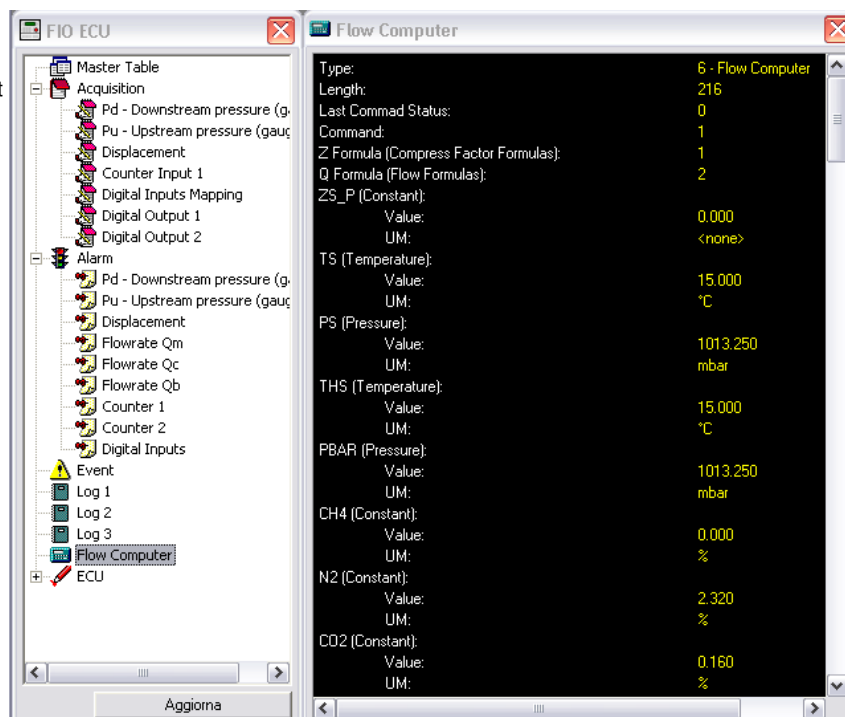
7.1.2.7   ECU

This page describes all the main functions of the F.I.O.:

Active functions:

- Measurement mode of the flow rate (EVCD ECU FT, Indirect, direct from turbine, direct from EVCD).
- Limitation of flow rate.
- Pressure modulation.
- Remote disconnection.

Diagnostics:

- Generic alarm.
- Battery discharged.
- Status of pressure modulation (Failed, Excluded, In progress, Set-point reached).
- Maintenance status.
- Status of back-pressure.

- Type of modulation (Excluded, Fixed Set, Profiling, Pressure Compensation).
- Set-point of outlet pressure.
- Outlet Pressure.
- Current time range of the profiling.
- Coefficient of current flow rate Cg (only with indirect method).
- Current flow rate.
- Status of limitation of flow rate.
- N° of interventions of the limitation of flow rate and duration.
- Remote disconnection.
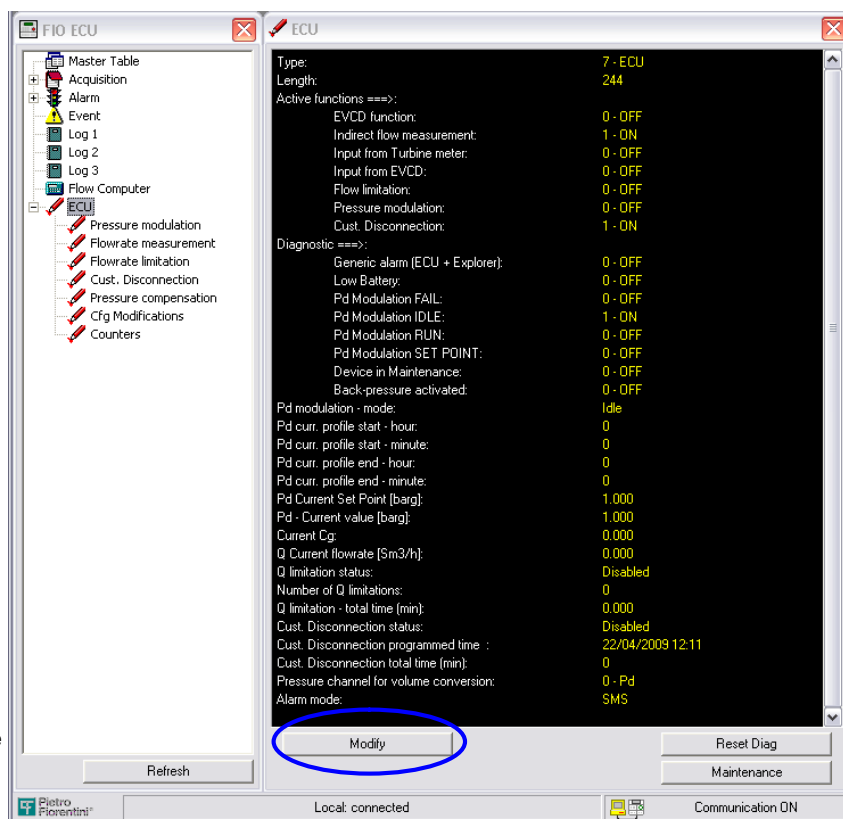
Clicking "Modify", can be set:

- Pressure channel for volume conversion: side in which it the turbine is installed (only in the case of direct measurement of the flow rate) for the conversion of the flow rate measured according to the reference conditions (Pu= upstream; Pd= downstream).
- Alarm mode: set "SMS". In this mode the alarm interventions shall arrive via SMS according to the procedure indicated on item 7.1.1.3.

7.1.2.8   *Commissioning of the system*

PROCEDURE STEP 7:

- agree with the customer the fixed set-point of pressure to be entered, and the hypothetic range of the outlet pressure that will be performed from F.I.O. in the future. Agree also the minimum pressure of F.I.O. (that has to be higher than the pneumatic pressure already set) and the maximum pressure of F.I.O. according to the minimum of F.I.O. +variation range. Consider that a higher distance between pneumatic setting and F.I.O. minimum pressure permits a better modulation of pressure. Enter these values on ECU via FioTerm

- enter with FioTerm the configuration of pressure modulation, pressure profiling, pressure compensation and flow rate limitation.

- first activate the fixed set-point modulation (Remote or Remote+back-pressure). Refer to the following instructions.

Before proceeding with the operations, is necessary to connect the downstream part of the line to the network according to this procedure:

- increase manually, operating with the increment solenoid valve (see 4.3), the pressure downstream the regulator up to the value of the pressure in the network has reached.

- open slowly the downstream ball or butterfly valve

- To start the set-point modulation, exit from the "Maintenance" status, if present. See "Enclosure A", end of the manual.

7.1.2.9   *Pressure modulation*

It is possible to configure and modify all the parameters related to the modulation of pressure. Clicking on "Modify" you can set:

- Fixed Set-point of pressure. Enter the value agreed with the customer.

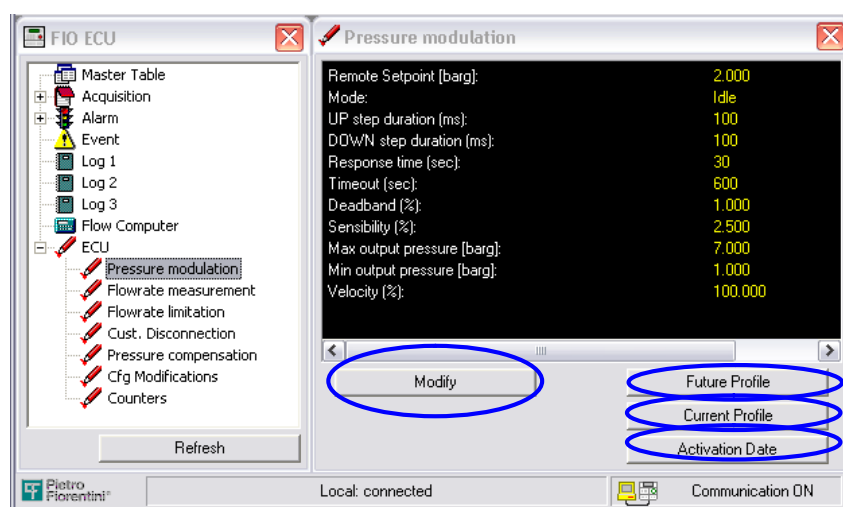- Modality of modulation of pressure:
  -Remote (fixed set point).
  -Profiling (see 7.1.2.11)
  -Pressure Compensation (see 7.1.2.12)
  Each one can be selected with or without Back-pressure. During the first commissioning is suggested to start with the fixed set-point. When the correct behavior of the system is verified, is possible to switch in Profiling or Pressure Compensation.

The Back-pressure is a software control that stops the modulation in case of return of the downstream pressure from the net, superior to the set-point set on the ECU. If the pressure, which is controlled by another plant connected in loop with the regulator, is greater than its set-point, the ECU suspends the modulation until the downstream pressure drops and is again controllable.

- UP step duration: duration of opening of the increasing solenoid valve, minimum 100 ms. If with 100 ms, at each pulse, the pressure raises too slowly, it is possible to increase this time.

- DOWN step duration: duration of the opening of the decreasing solenoid valve, minimum 100 ms. If with 100 ms, at each pulse, the pressure drops too slowly, it is possible to increase this time.

- Response time: time between one step UP/DOWN and the following, minimum 30 sec. If with 30 seconds the pressure increases or decreases too fast, it is possible to increase this time with multiples of 30 seconds (60, 90, 120, etc.).

- Time-out: during the RUN condition, is the time within the outlet pressure must reach the dead band of the set-point. If not, when the time-out is reached the modulation is blocked and moved to the status of FAIL. It goes back to normal status only after receiving a new command. This parameter must be set greater than the maximum time took from the modulation to cover the range from the minimum pressure to the maximum and vice versa. Maximum value is 32000 seconds in multiples of 30 seconds (60, 90, 120, etc.).

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice
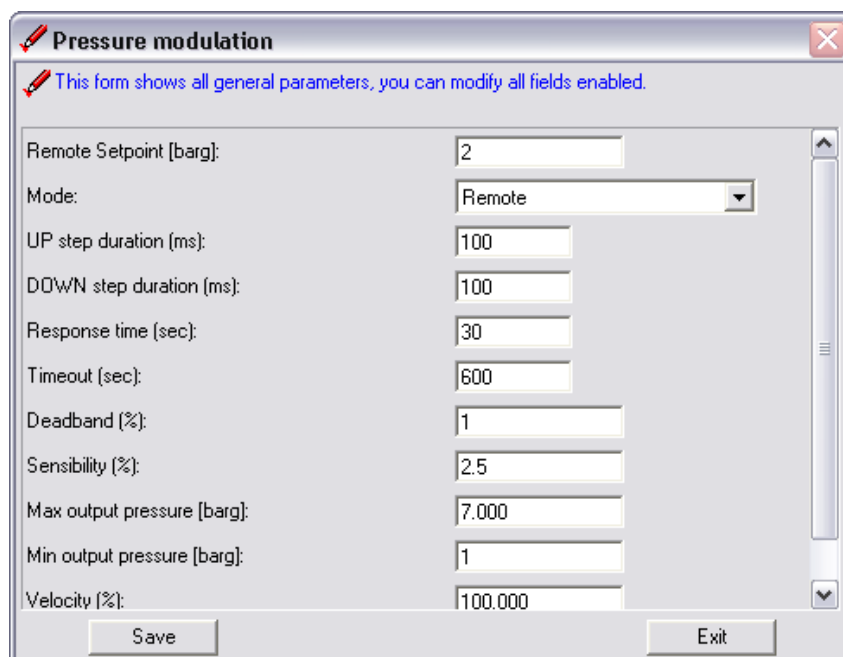
- Dead band: in % of the set-point. The modulation continues to increase or decrease the downstream pressure until it reaches the value represented by the set-point ± the dead band. In the figure above, supposing that the pressure was initially at 1 bar, the modulation activates the increasing solenoid valve until the downstream pressure reaches 2 bar ±1%, i.e. until it reaches the range between 1.98 bar and 2.02 bar. The ECU considers reached the set-point and the modulation stops.

- Sensibility: in % of the set-point. The ECU, after reaching the dead band of the set-point, verify continuously that the pressure controlled by the regulator does not exit above or below the band of sensibility (in the figure above the pressure must remain between 2 bars ±2,5%, i.e. in the range between 1.95 bar and 2.05 bar). If the pressure exits from this range, the ECU reactivates the modulation, brings back the downstream pressure inside the dead band, and stops. Is suggested to set the sensibility same as the accuracy class AC of the regulator, in order to reduce the number of interventions of the modulation.

- Max output pressure: max. pressure over that is not possible to perform any intervention of increasing solenoid valve. Enter the value agreed with the customer

- Min output pressure: minimum pressure below that is not possible to perform any intervention of decreasing solenoid valve. Enter the value agreed with the customer

- Velocity: parameter that automatically modifies the cadence of the steps in order to reduce (if is set lower than 100%) or increase (if it is set greater than at 100%) the ramp of variation of the downstream pressure during the modulation.

7.1.2.10   *Emergency setting of Fixed Set-point, Pd min e Pd max from ECU*

In case of failure of laptop or trouble on serial connection, is possible to change directly some parameters from the ECU:

1. Enter in Menu "Fio- Five In One \ Maintenance \ Press.Modul. \ Pres.SetPoint" (see Enclosure A "Structure of the menu ECU"). It is displayed the current value of Set-point.
2. Press Enter (after entering the password). Write the new Set-point and press Enter again.
3. Exit from the menu "Pres.SetPoint" and save pressing again Enter.
4. Verify, and eventually modify, the Pd min e Pd max values
5. Exit from the menu "Press.Modul."
6. Enter again in "Maintenance" to bring back the machine from the "Maintenance" status to "Normal status", pressing Enter from the page "Main. Exit" (see Enclosure A "Structure of the menu F.I.O.").

The F.I.O. will work with these new setting, up to new modification will be made manually, via FioTerm or via DMS.

7.1.2.11   *Profiling*

Clicking on "Future profile" (menu Pressure modulation, see 7.1.2.9) it is possible to program many time ranges with a different set-point for each one.

Must be selected:

- The day of the week.
- One of the 7 periods available every day.
- Hour and minutes of start and hour and minutes of end.
- The set-point that you wish in that range.
- Then save the range (clicking "Save") and select the following one.

It must also be inserted the value of default relative to that day in case there are program gaps.

At the end of the insertion of all ranges, click on "Download".

Clicking on "Current profile" (menu Pressure modulation, see 7.1.2.9) it is possible to visualize the programming already present.

Clicking on "Activation Date" (menu Pressure modulation, see 7.1.2.9) it is possible to choose if activate the "Profiling" immediately or when reaching a certain date/hour.

However, it must always be selected the Modulation mode in "Profiling" (see 7.1.2.9).

F.I.O. User Manual – Ed.2. Rev.5   *Page 34/ 53*

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice

7.1.2.12   Pressure compensation

The function pressure compensation foresees to divide the max. flow rate of the plant in 10 ranges, and into each range it is assigned a set-point. The ECU changes the set-point according to the range of flow rate passing through the regulator in that moment.

The changing of the range has a hysteresis of 50%, i.e. the change of range in increase is made when exceeding the flow rates indicated in the example, (100, 200, 300, …Sm³/h) while when decreasing the change in the previous range is made at 250, 150, 50 Sm³/h).

In the page "Pressure compensation" clicking on "Modify" it is possible to set, facultative, the period in which the function activates and a value of default for the periods not activated (or let it always activated).

The ranges are programmed in the page "Future Compensation".

Select:

- The maximum flow rate (it calculates automatically the 10 ranges of flow rate).
- The desired set-points matched to each range. Not necessarily increasing, it is also possible decreasing.

At the end of the insertion of all the set-point, click on "Download".

Clicking on "Current profile" it is possible to visualize the programming inserted.

Clicking on "Activation Date" it is possible to choose if to activate the "Pressure compensation" immediately or at a certain date and hour.

However, it must always be selected the Modulation mode in "Pressure Compensation" (see 7.1.2.9).
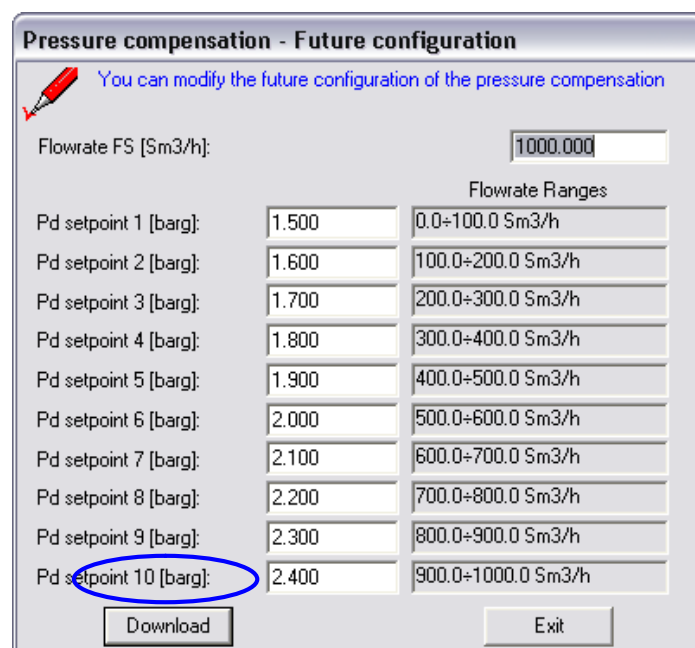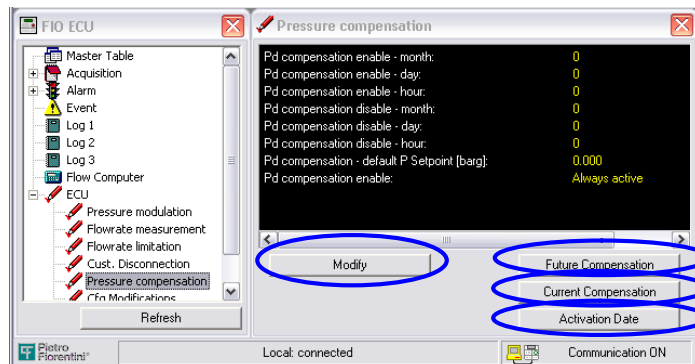
7.1.2.13   Flow rate limitation

The function "Flow rate limitation", if enabled, always verifies that the flow rate is kept under the limit set in this page. When the flow rate starts to exceed the threshold, the ECU starts to decrease the setting of the pilot activating the decreasing solenoid valve until the flow rate is stabilized around the threshold value. When the flow rate decreases under the threshold, the ECU increases again the setting of the pilot activating the increasing solenoid valve until bringing back the downstream pressure to its set-point.

Clicking on "Modify" it is possible to set:

- If the limitation is enabled or disabled.

- The threshold of the flow rate that the system has to limit.

- Dead band: in % of the threshold of flow rate. When the flow rate exceeds the threshold, the ECU decreases the setting of the pilot until the flow rate returns within the value represented by the threshold ± the dead band. In the example, supposing that the threshold is at 1000 Sm³/h, the ECU activates the decreasing solenoid valve until the flow rate reaches 1000 Sm³/h ±5%, i.e. until it stays between 950 Sm³/h and 1050 Sm³/h. in this range the ECU remains in limitation status.

- Sensibility: in % of the threshold of flow rate. The ECU, after reaching the dead band, controls if the flow rate of the regulator exits above or below the range of sensibility. In the example the flow rate must remain between 1000 Sm³/h ±10%, i.e. between 900 Sm³/h and 1100 Sm³/h. If the flow rate exceeds this range, the ECU brings back the flow rate inside the dead band, and stops. If the flow rate drops below, it increases again the setting of the pilot activating the increasing solenoid valve until is reached again the downstream pressure to its set-point.

- Minimum pressure: A value of minimum pressure under which the limitation of flow rate cannot lower the downstream pressure.

- Flow rate verification time: time between a verification of the flow rate and the following one, is recommended the minimum of 30 sec. It is possible to increase this time with multiples of 30 seconds (60, 90, 120, etc.).

- Limitation time-out: time within the flow rate must reach the dead band. If not, when the time-out is reached the modulation is blocked and moved to the status of FAIL. Max. value 32000 seconds in multiples of 30 seconds (60, 90, 120, etc.).
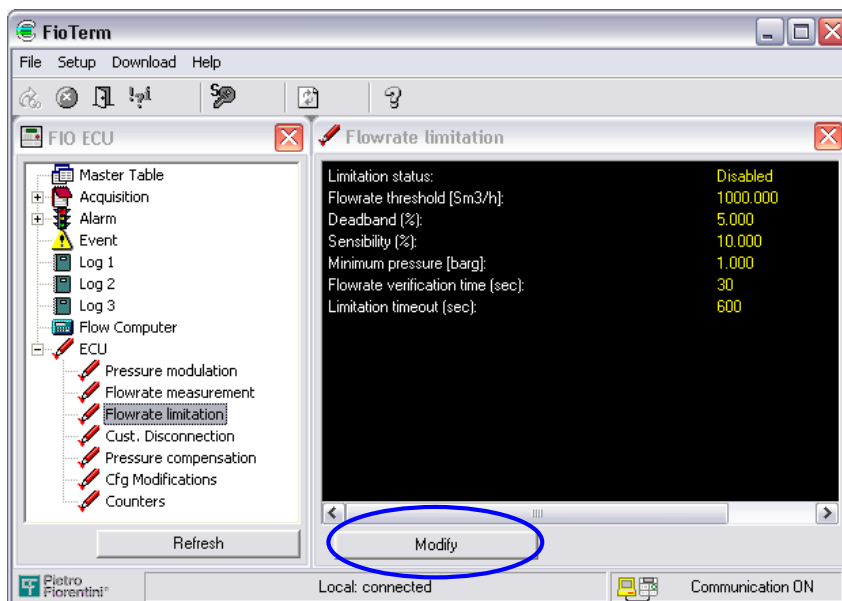
7.2   Complete configuration with DMS

For the remote programming through the DMS please refer to the DMS manual.

In case of GPRS communication, is suggested to set the following parameters on P&CD before starting the connection with DMS:

- On "Master table \ Date and time" set the current date and time (see item 7.1.1.2)

- On "Master table \ Alarm configuration" (see item 7.2.1)

- On "Master table \ Periodic tasks" (see item 7.2.2)

- On "Master table \ Modem" (see item 7.2.3)

Verify, finally, on "Master table \ Device identification", the ID number of P&CD matching with the one configured on DMS profile.

7.2.1 Alarm configuration

Enter the IP address (for the GPRS), for example 151.8.135.75, or the telephone number (for the GSM), i.e. +3933576…. of the Remote center that the P&CD has to dial for the periodic or requested connection for the data download. "Phone number 1" has the higher priority, "Phone number 8" has the lower priority.

In case of no connection dialing Phone n°1, the modem of P&CD will try to dial the Phone n°2, and so on.
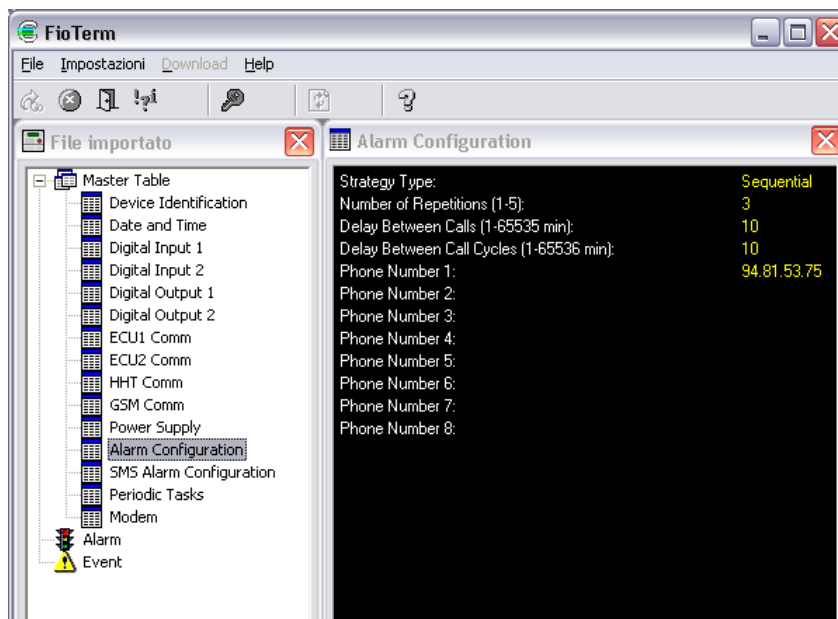
7.2.2 Periodic tasks

Is possible to set the frequency of the download of the data to DMS, the hour and the minute of the call.

In this example, the P&CD will call the DMS once a day at 17:30.
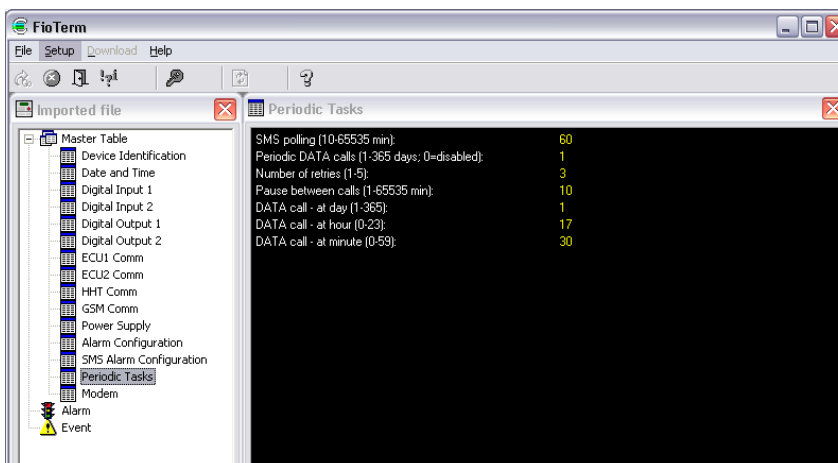
7.2.3 Modem

For the GPRS connection is necessary to enter the APN, user name and password of the mobile operator.

MAIN PAGE

```
dd mmm yyyyiiii
Vb 000000000  m3
```

ENTER

Enclosure A Structure of "ECU" menu

Measurements

Settings

System Info

FIO – FiveInOne

ESC

FIO status menu

ECU Diagnostics

Active functions

Pres.Modulation

Flow Limit.

Cust.Discon.

ENTER

ESC

Menu FIO – FiveInOne

FIO status   »

Actual cond.   »

Maintenance   »

ENTER

ESC

Menu Current Situat.

Pu Pressure

Pd Pressure

Pres. SetPoint

Qb Base Flow Rate

Cg Flow Factor

Displacement %

Pd Min

Pd Max

Flow Rate Thres.

ENTER

ESC

Menu Modul. Pres.

Press. Step Up/Dn

Pres. SetPoint

Pd min

Pd max

ENTER

ESC

Maintenance menu

Maint. exit. (*)

Pres. Modul.   »

Meas. Setup   »

ENTER

ESC

Impost. Misure

Zero setup

FS setup

Displacement %

ENTER

ESC

(*) The item with the message "Maint. exit." is activated only when the machine is in maintenance status, due to some previous operations performed in the menu "Maintenance". At the end of the maintenance activity, to bring back the machine in "normal working status", visualize the message "Maint. exit." and press Enter. In any case, after some hour the machine goes back automatically to normal operation.

Some activities in the menu "Maintenance" are protected by password. To enter them press Enter, enter the password by max. 4 digits (default is "0000") and press again Enter.

ENCLOSURE B
PROCEDURE FOR THE EXPORT OF THE CONFIGURATION OF P&CD AND ECU TO THE LAPTOP AND IMPORT FROM THE LAPTOP

B.1 P&CD

B.1.1 Export of P&CD configuration on laptop

Before replace the board, export on the laptop the current configuration of P&CD, so, after the replacement, will be possible to upload the current configuration on the new board. This operation is done with FioTerm.
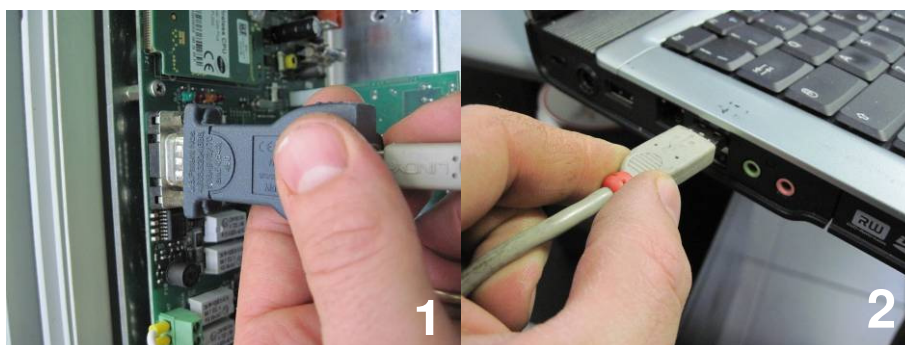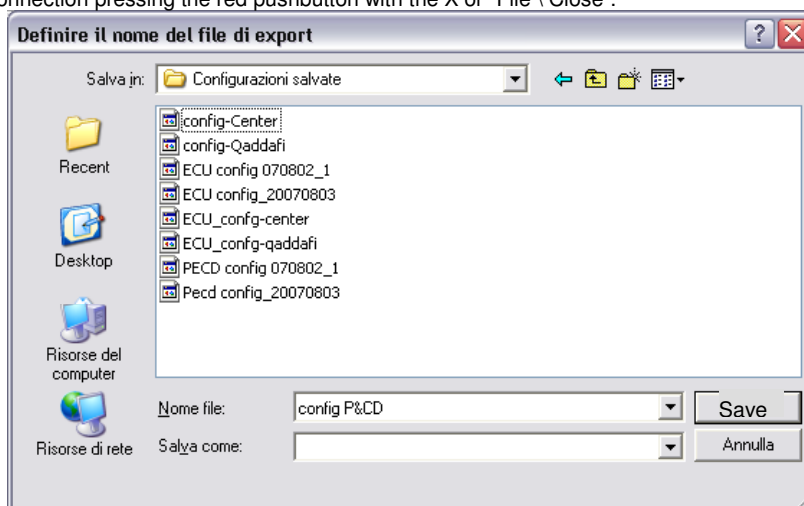

1- Connect the cable with adapter RS232/USB on the connector of the old P&CD board.
2- Connect the cable USB to the laptop
3- Start the software FioTerm
4- Open the window "Setup \ Communication \ Serial line".
5- Insert the COM used. If necessary verify in the operating system of the PC on "Peripheral management \ COM port" the number of COM in use.
   FioTerm permits to select COM from 1 to 7.
6- The other parameters are 9600; 8; none; 1.
7- Press OK
8- Open the window "**Setup \ Communication \ Communication**".
9- **Connection modality: Local ; phone N° not necessary; Password of connection: conn (default)**
10- **In "Device and address" select the device ""P&CD"** entering the Modbus address (default 20).
11- Press OK
12- Press the pushbutton " *GO* " or from the top bar "File \ Start connection".
13- Wait some seconds and it should connect with the P&CD.
14- From the top bar select "File \ Export".
15- Type the file name and press "Save" (see below)
16- Exit from the connection pressing the red pushbutton with the X or "File \ Close".

B.1.2 Import of P&CD configuration from laptop

After the board P&CD replacement (enclosure C), import on the new P&CD the configuration of old P&CD. This operation is done with FioTerm.

1- Connect the cable with adapter RS232/USB on the connector of the new P&CD board.
2- Connect the cable to the laptop
3- Start the software FioTerm
4- From the top bar select "File \ Import".
5- Select the file name saved from old P&CD (see below)
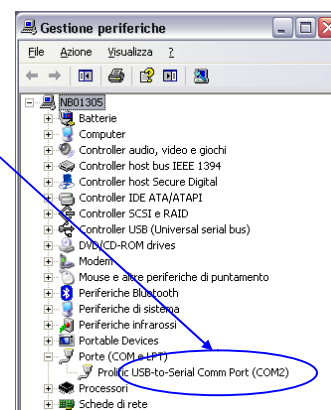6- Press Open
7- Press the pushbutton "Download complete".

B.2 ECU

B.2.1 Export of ECU configuration on laptop

Before replace the ECU, export on the laptop the current configuration of ECU, so after the replacement will be possible to upload the current configuration on the new ECU. This operation is done with FioTerm.
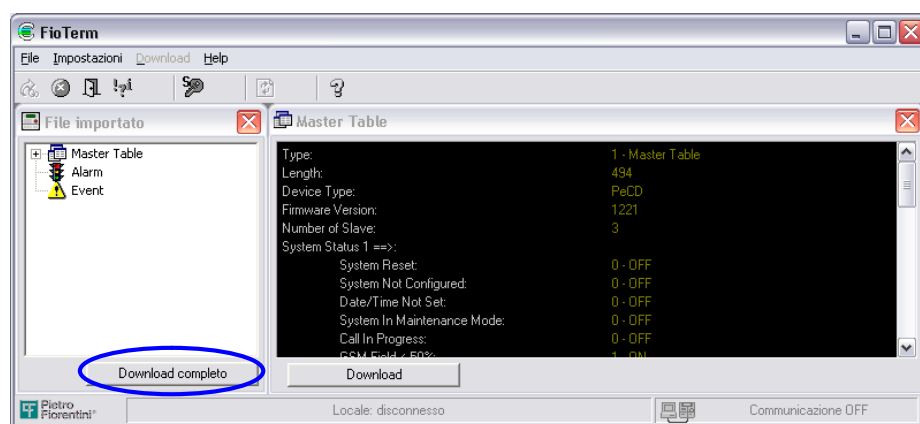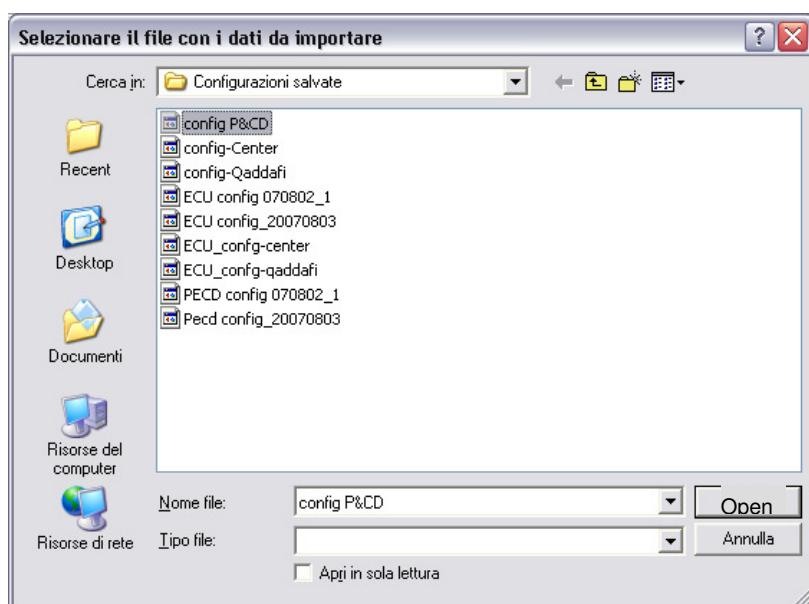
1- Connect the cable RS232 (or the cable with adapter RS232/USB) on the connector of the P&CD board.

2- Connect the cable to the laptop

3- Start the software FioTerm

4- Open the window "Setup \ Communication \ Serial line".

5- Insert the COM used. If necessary verify in the operating system of the PC on "Peripheral management \ COM port" the number of COM in use. FioTerm permits to select COM from 1 to 7.

6- The other parameters are 9600; 8; none; 1.

7- Press OK

8- Open the window **"Setup \ Communication \ Communication".**

9- **Connection modality: Local ; phone N° not necessary; Password of connection: conn (default)**

10- In **"Device and address" select the device ""ECU"** entering the Modbus address (default 0).

11- Press OK

12- Press the pushbutton " GO " or from the top bar "File \ Start connection".

13- Wait some seconds and it should connect with the ECU.

14- From the top bar select "File \ Export".

15- Type the file name and press "Save" (see below)

16- Exit from the connection pressing the red pushbutton with the X or "File \ Close".

B.2.2 Import of ECU configuration from laptop

After the ECU replacement, import on the new ECU the configuration of old ECU. This operation is done with FioTerm.

1- Connect the cable with adapter RS232/USB on the connector of the P&CD board
2- Connect the cable to the laptop.
3- Start the software FioTerm
4- From the top bar select "File \ Import".
5- Select the file name saved from old ECU (see below)
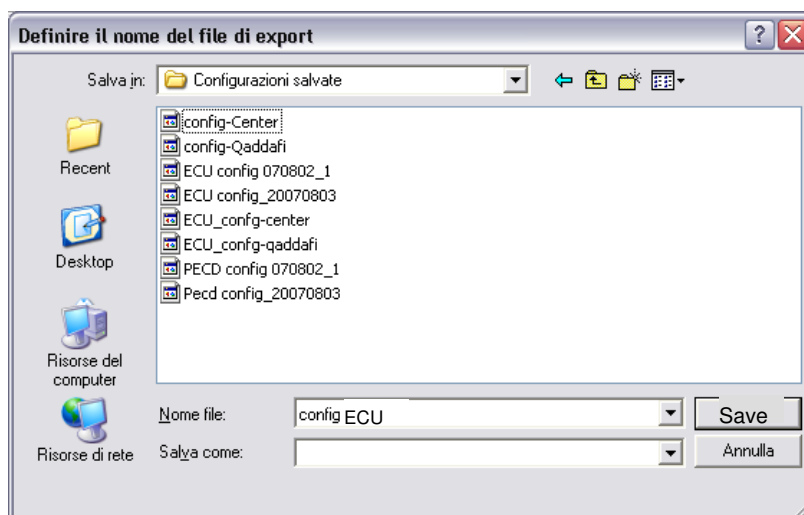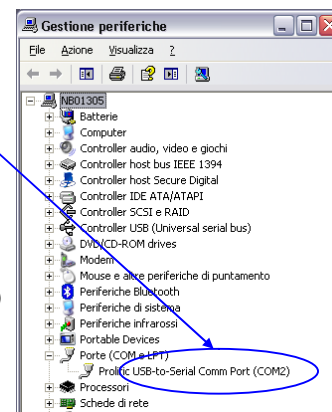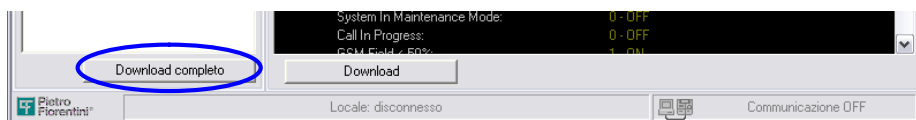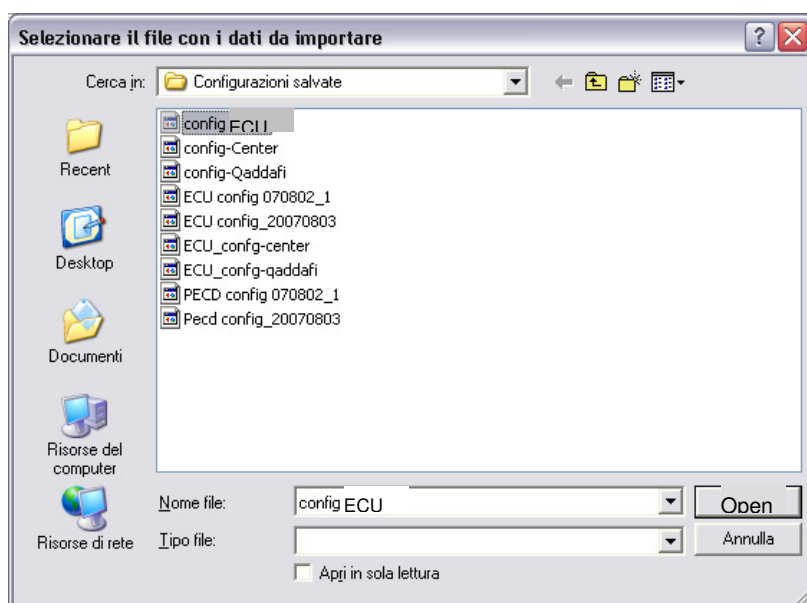6- Press Open
7- Press the pushbutton "Download complete".

ENCLOSURE C
PROCEDURE FOR THE REPLACEMENT OF THE MAIN P&CD BOARD

In case of up-grade of P&CD, for example when the customer needs to replace the old P&CD GSM modem with the newer P&CD GPRS/GSM modem, is sufficient to replace only the main P&CD board.

Pict 1- Turn off the switch

Pict 2- Push up the metallic hook and release the SIM card

Pict 3- Remove the SIM card

Pict 4- Unscrew the n°4 screws for the fixing of the plate for support of the old P&CD board on the box

Pict 5- Release the connector of the antenna

Pict 6- Pull the P&CD board outside the box (as much as possible) and unscrew the n°6 screws for the fixing of the board on the socket

Pict 7- Disconnect one-by-one the wires from the old P&CD board and connect on the new one in the same position. To avoid mistakes, after the disconnection of one wire from the old board, it is suggested to connect immediately on the new one before disconnect the second wire (follow the sequence below in Pict 7).

Pict 8- Fix the new P&CD board on the socket screwing the n°6 screws.

Pict 9- Fix the socket on the box screwing the n°4 screws.

Pict 10- Insert the SIM card

Pict 11- Verify the orientation of SIM card

Pict 12- Pull down the metallic hook to fix the SIM card

Pict 13- Turn on the switch

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.

Technical data may undergo changes without notice

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.

Technical data may undergo changes without notice

ENCLOSURE D - OVERALL DIMENSIONS Q-KIT AND P-KIT

Q-KIT

DIMENSIONI INGOMBRI TRASMETTITORE POSIZIONE F.I.O. REVAL / REFLUX
DIMENSIONAL DRAWING POSITION TRANSMITER F.I.O. REVAL / REFLUX

	REVAL/REFLUX 1"	REVAL/REFLUX 2"	REVAL 2" 1/2	REVAL/REFLUX 3"	REVAL/REFLUX 4"	REVAL/REFLUX 6"	REVAL/REFLUX 8"
DIMENSIONE "A" (mm) / DIMENSION "A" (mm)	185	185	185	185	185	195	195
DIMENSIONE "B" (mm) / DIMENSION "B" (mm)	220	220	220	220	220	220	220
DIMENSIONE "C" (mm) / DIMENSION "C" (mm)	310	310	310	310	310	380	380
DIMENSIONE "D" (mm) / DIMENSION "D" (mm)	460	450	460	460	460	680	680

Descrizione
DISEGNO X INGOMBRI TRASMETTITORE DI POSIZIONE F.I.O. REVAL/REFLUX
DIMENSIONAL DRAWING POSITION TRANSMITTER F.I.O. REVAL/REFLUX

Rev.	Data	Comp.	Cont.	Descrizione delle modifiche (vedi simbolo▲ sul disegno)	Foglio N°	Segue N°	Data 27/05/10
B	11/10/10	F.N.	N.Z.	Aggiornato disegno con doppia lingua – Updated drawing with bilingual	Dis. N.Fortuna	Cont.	

TT1421-1 | B

N° Disegno | Est. | REV.

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice

P-KIT

DIMENSIONI INGOMBRI PILOTI 200/300 X F.I.O. VOLUME INCORPORATO
DIMENSIONAL DRAWING PILOTS 200/300 F.I.O. BUILT-IN VOLUME

	DIMENSIONE "A" (mm) DIMENSION "A" (mm)	DIMENSIONE "A1" (mm) DIMENSION "A1" (mm)	DIMENSIONE "A2" (mm) DIMENSION "A2" (mm)	DIMENSIONE "B" (mm) DIMENSION "B" (mm)	DIMENSIONE "B1" (mm) DIMENSION "B1" (mm)	DIMENSIONE "B2" (mm) DIMENSION "B2" (mm)	DIMENSIONE "C" (mm) DIMENSION "C" (mm)	DIMENSIONE "C1" (mm) DIMENSION "C1" (mm)	DIMENSIONE "C2" (mm) DIMENSION "C2" (mm)
201/A/2CS + R31/A F.I.O.	405	220	185	365	210	155	255	135	120
204/A/2CS + R14/A F.I.O.	370	220	150	280	185	95	250	130	120
301/A/2CS + AR100 F.I.O.	380	245	135	365	210	155	280	160	120
302/A/2CS + AR100 F.I.O.	375	220	135	305	210	95	680	160	120
304/A/2CS + AR100 F.I.O.	370	220	150	280	185	95	250	130	120

Pietro Fiorentini®	Descrizione DISECNO X INGOMBRI PILOTI 200/300 X F.I.O. VOLUME INCORPORATO DIMENSIONAL DRAWING PILOTS 200/300 F.I.O. BUILT-IN VOLUME	Foglio N° 1	Segue N° –	Data 27/05/10
Rev. Data Comp. Cont.	Descrizione delle modifiche (vedi simbolo▲ sul disegno)	Dis. N.Fortuna	Cont.	
B 11/10/10 F.N. N.Z.	Aggiornato disegno con doppia lingua – Updated drawing with bilingual		TT1421-2	C
C 28/01/11 F.N. U.C.	Aggiunto volume per piloti 201 e 301 e aggiornate quote relative	N° Disegno	Est.	REV.

ENCLOSURE E   OPTIONAL KIT AND COMPONENT LIST

P.S.

Some of these components probably will not be used, depending on installation or optional requested.

The code numbers below should be subsequently implemented or modified.
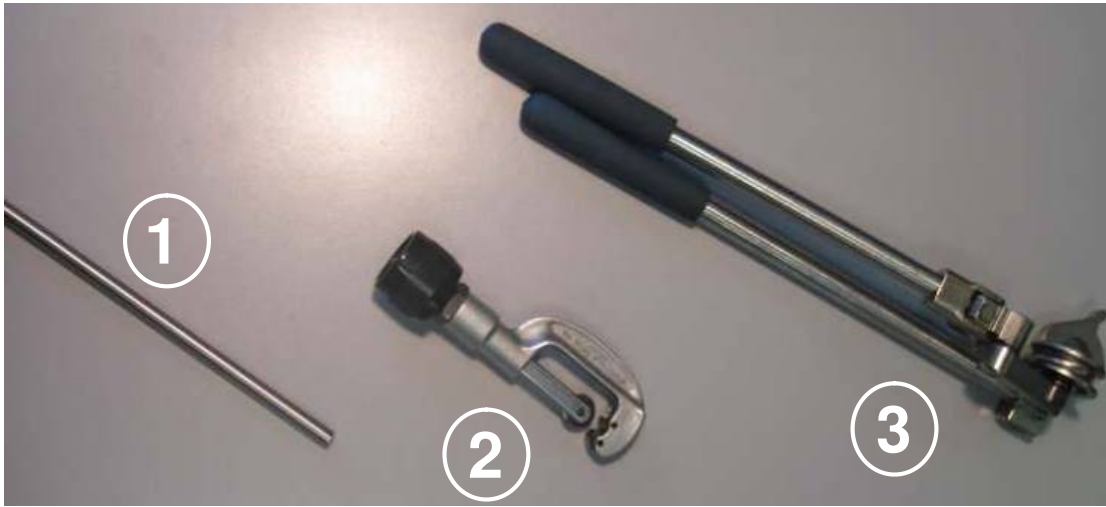
Please verify them time by time.

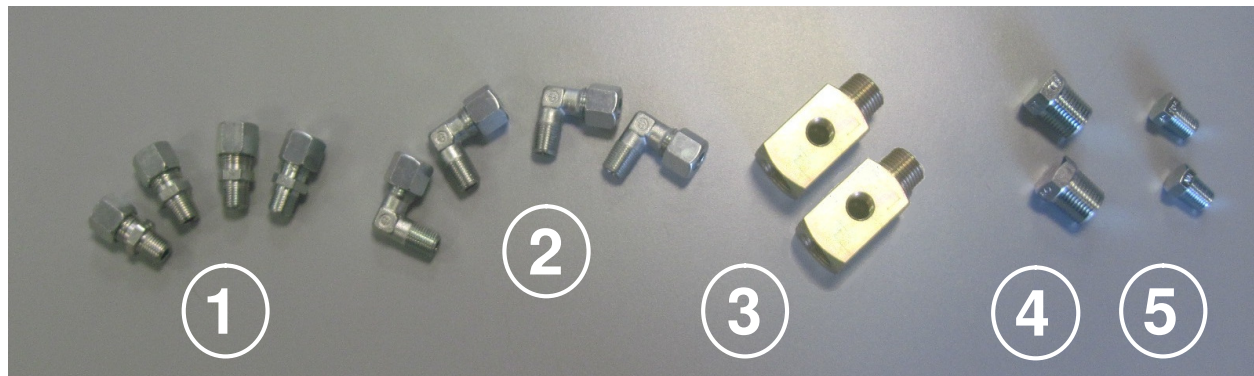| Code	7025130	PNEUMATIC CONNECTION FITTINGS KIT - ISO 7/1

	Code nr	Description	UM	Quantity
1	2403336	Compression fitting 1/4" GAS TUBO D.10 ISO 7/1	NR	4
2	2402212	Compression fitting elbow 1/4" GAS TUBO D.10 ISO 7/1	NR	4
3	8350585	Multiple take-off Female 1/2" + 2X1/4" Male 1/2" ISO 7/1	NR	2
4	2400078	Plug 1/2" ISO 7/1	NR	2
5	2400076	Plug 1/4" ISO 7/1	NR	2

Code	7025131	PNEUMATIC CONNECTION FITTINGS KIT - NPT

	Code nr	Description	UM	Quantity
1	2403335	Compression fitting 1/4" GAS TUBO D.10 NPT	NR	2
2	2403336	Compression fitting 1/4" GAS TUBO D.10 ISO 7/1	NR	2
3	2402247	Compression fitting elbow 1/4" GAS TUBO D.10 NPT	NR	2
4	2402212	Compression fitting elbow 1/4" GAS TUBO D.10 ISO 7/1	NR	2
5	8350570	Multiple take-off Female 1/2" + 2X1/4" Male 1/2" NPT	NR	2
6	2400077	Plug 1/2" NPT	NR	2
7	2100185	Plug 1/4" NPT	NR	2

Code	7025132	KIT FOR FIXING THE EXPLORER ECU ON TUBE 2"÷8"

	Code nr	Description	UM	Quantity
1	7800230	Bracket for Explorer ECU	NR	1
2	7800231	Bracket for tube 2"÷8"	NR	1
3	7800232	Bracket for Explorer ECU - top cover	NR	1
4	2300082	Screw M4x25	NR	2
5	2320740	Nut M4	NR	2
6	2321205	Nut M5	NR	2
7	2320005	Washer M5	NR	2
8	2759990	Stainless steel band 14 mm	MT	1
9	2759991	Endless-head with endless screw 14 mm	NR	1

ADDITIONAL PNEUMATIC PARTS AND TOOLS TO PROVIDE (FOR THE INSTALLER)

	Code nr	Description	UM	Quantity
1	1170056M	Tube stainless steel 10 mm		
2	M200202570	Cutter tube stainless steel 10 mm		
3	M200202569	Bender tube stainless steel 10 mm		

F.I.O. User Manual – Ed.2. Rev.5   *Page 48/ 53*

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice

Code	(1)	ELECTRICAL CONNECTION KIT		

	Code nr	Description	UM	Quantity
1	3720584	Cable n°3 wires x 2,5 mm² Distance mains/solar panel connection to P&CD	MT	......
2	3720564	Shielded cable n°4 wires x 1 mm² Distance solenoid valves to P&CD + distance meter (optional) to ECU1 + distance ECU2 (optional) to P&CD	MT	......
3	2404675 (12x0,5)	Shielded cable min.n°8 wires x min. 0,5 mm² Distance P&CD to ECU1	MT	......
4	2403953	Flexible tube in polyamide int.diam. 28 mm x ext.diam. 34 mm Distance P&CD to ECU1 or junction box (if present)	MT	......
5	2403952	Flexible tube in polyamide int.diam. 16 mm x ext.diam. 21 mm Distance solenoid valves to ECU1 or junction box (if present) + distance meter (optional) to ECU1 + distance ECU2 (optional) to P&CD + distance mains/solar panel connection to P&CD	MT	......
6	2403947	Ring nut 1"	NR	......
7		Ring nut 1/2"	NR	......
8	2801300	Junction box (optional)	NR	......
9	2403957	Fitting 1" male gas for tube 34 mm	NR	......
10	2403956	Fitting 1/2" male gas for tube 21 mm	NR	......
11		Fitting 1" female gas for tube 34 mm	NR	......
12		Terminal for tube 34 mm	NR	......
13		Terminal for tube 21 mm	NR	......

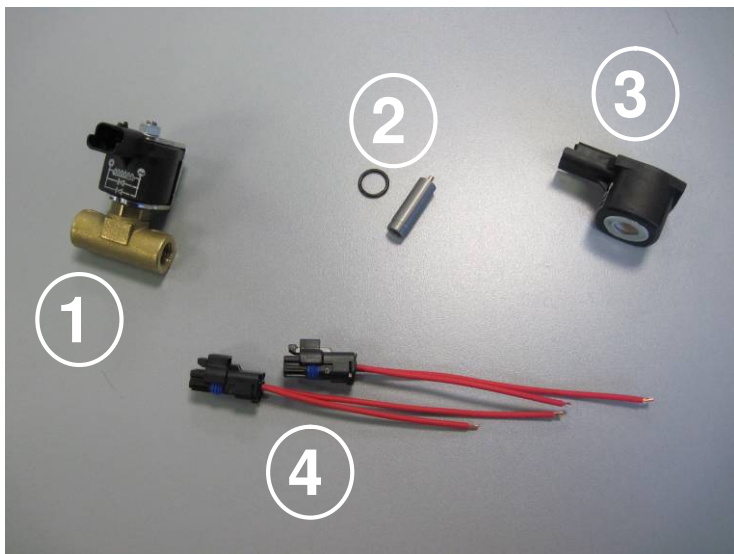| 14		Terminal for tube 34 mm	NR	……
15		Terminal for tube 21 mm	NR	……
16		"Y" distributor from tube from 34 to 28 mm	NR	……
17		Fitting for junction of tube 34 mm	NR	……
18		Fitting for junction of tube 21 mm	NR	……
19		Fitting for reduction from 34 to 21 mm	NR	……
20		Fitting for reduction from 28 to 21 mm	NR	……
21		"T" distributor from tube 34 to 34 mm	NR	……
22		"T" distributor from tube 34 to 28 mm	NR	……
23		Cable gland for tube 21 mm	NR	……

(1) The code will be created according with: length of cables and tubes, quantity of fittings.

ADDITIONAL ELECTRICAL PARTS TO PROVIDE (FOR THE INSTALLER)
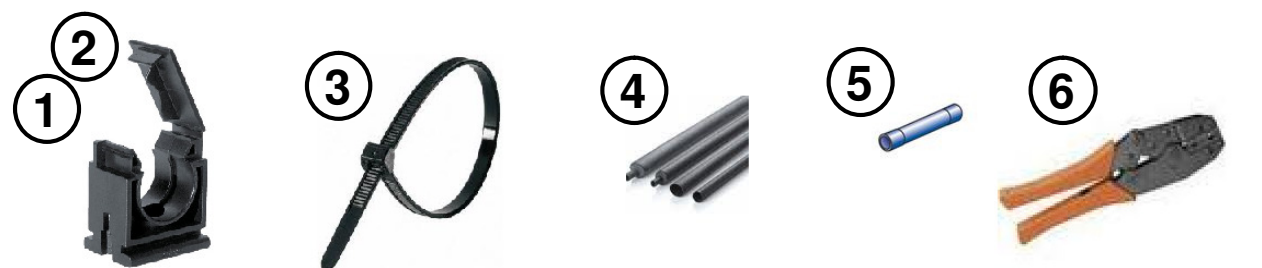
	Code nr	Description	UM	Quantity
1		Pipe holder clips for tube 34 mm (1")		
2		Pipe holder clips for tube 21 mm (1/2")		
3		Cable ties (different sizes)		
4		Thermo-reduction sheath (different sizes)		
5		Pre-insulated terminals for wire connection		
6		Wrenches for electrical connections		

Code		KIT FOR JUCTION BOX TO BE FIXED ON PILOT OR ON TUBE		

	Code nr	Description	UM	Quantity
1	2801300	Junction box	NR	1
2		Cable for connection of solenoid valve to junction box	NR	2
3		Preinsulated terminals for wire connection	NR	4
4	2403957	Fitting 1" male gas for tube 34 mm	NR	1
5	2403947	Ring nut 1"	NR	1
		Cable gland PG11	NR	1
6		Cable gland PG9	NR	2

		P-KIT ELECTRICAL PARTS		

	Code nr	Description	UM	Quantity
1	3140601	Solenoid valve 1/4 bspt		
2		Internal obturator of solenoid valve + o-ring		
3		Coil of solenoid valve		
4	ED3840401	Kit connection from solenoid valves to cable		
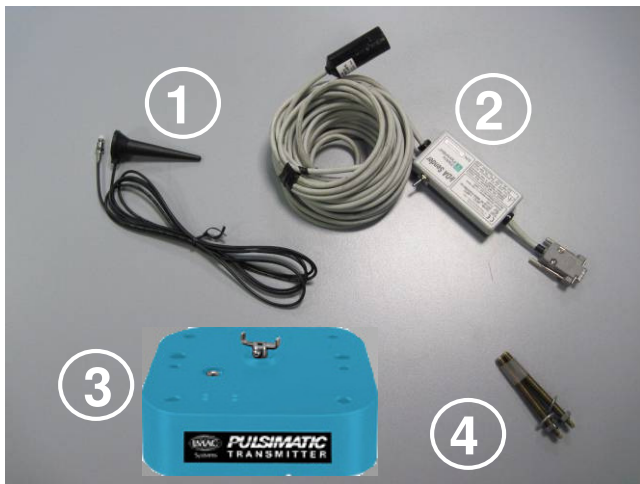
		Q-KIT ELECTRICAL SPARE PARTS		
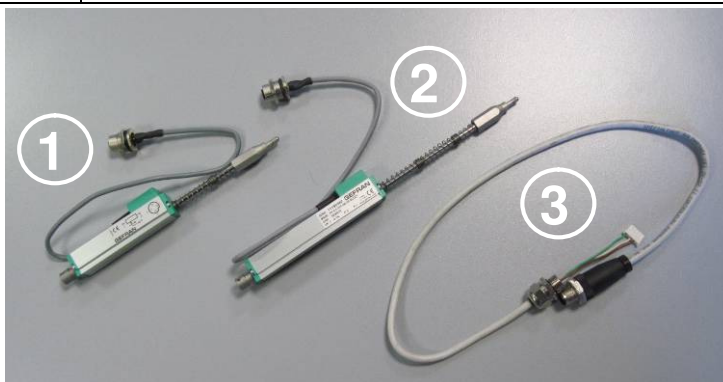
	Code nr	Description	UM	Quantity
1	POGFPY2F050S	Displacement transducer 50 mm		
2	POGFPY2F075S	Displacement transducer 75 mm		
3	CA0650T01M01R00LI	Connection cable from displacement transducer to ECU		

		ECU – P&CD ELECTRONIC PARTS		
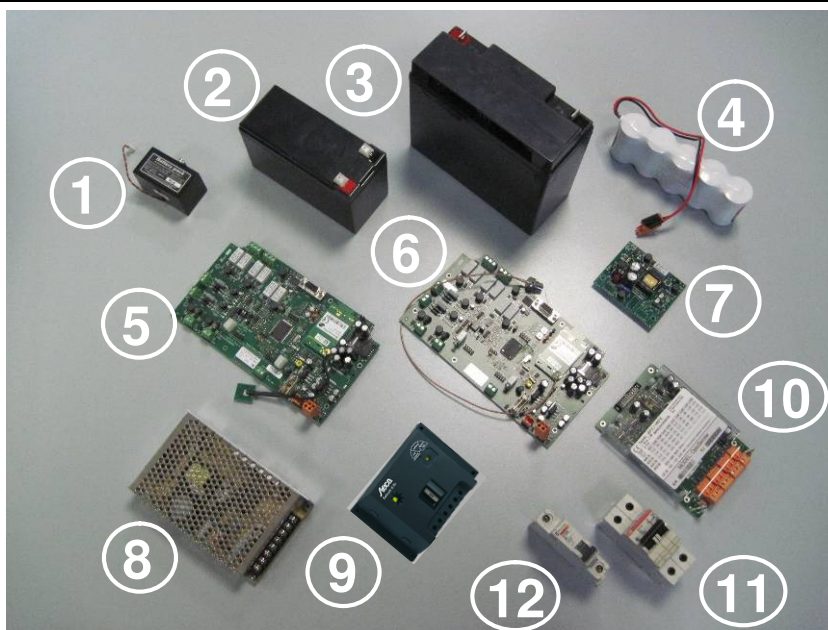
	Code nr	Description	UM	Quantity
1	ED3721177	Battery for ECU		
2	ED3721095	Battery 12v 7,2 Ah for P&CD (mains version)		
3	ED3721096	Battery 12v 18 Ah for P&CD (solar version)		
4	ED3721173	Battery alkaline for P&CD (battery version)		
5	ED3480248	P&CD internal antenna (modem GSM/GPRS included)ATEX		
6	ED3480247	P&CD external antenna(modem GSM/GPRS included)ATEX		
7	SK0650T02M01R00	P&CD power supply module board (only main 230Vac /solar)		
8	ALMWAD55A	Power supply 220V/12V for P&CD (mains version)		
9	MDXX12V6A	Electronic regulator for P&CD (solar version)		
10	ED3480348	Optosender for ECU		
11	ACBTTDF82/2	Magnetothermic switch 2 x 2 A		
12	ACABE221-20	Circuit breaker 16 A		

		OTHER		

	Code nr	Description	UM	Quantity
1	ED3480311	Antenna with magnetic base + 2 meter cable (only for P&CD external antenna)		
2	3825110	Irdasender data interface		
3	R200801066	Pulsimatic for pulse re-transmission		
4	PFR200901446	Kit pulsimatic screws 5/16		

		DEVELOPER KIT FOR SCADA		

	Codice nr	Descrizione	UM	Quantità
1	PFP201200124	FIO Developer kit for SCADA – Kit sviluppo comunicazione		1

F.I.O. User Manual – Ed.2. Rev.5   *Page 53/ 53*

The information contained in this document is confidential and the property of Pietro Fiorentini S.p.A.
Technical data may undergo changes without notice