

NT 228A GB1

1st Ed.: 20/12/2007

UF 801-P / UF 801-PB

**NEW GENERATION ULTRASONIC
PORTABLE FLOWMETERS**

INTRODUCTION:

Thank you for choosing Ultraflux to make your flow measurement. We offer since the years 70'Th a full range of portable or fix installation flowmeters backed by more than 30 years' expertise and experience using Ultrasonic techniques:

- The famous Digisonic P/E family portable devices with integral loggers and signal analysis functions are still available.
- The UF322 family of dedicated devices has adapted versions for liquids (L), Gas (G), Multichords (MC, L&G), Open channels (CO) and large Rivers (RV).
- The MiniSonic family with the portable version (Mini-P), the dual pipe version (PB), the dedicated devices CO_Mini-600 / 2000 with also EEx d versions (COD), the dual chord versions (CO_Mini-600-2 / 2000-2), the dual pipes versions CO_Mini 600-B / 2000-B and the Speed versions Mini-Speed 1 & 2.
- We recently have introduced a low cost version name E-Wave, reserved to environment / water applications up to 600 mm pipe diameter.
- The new UF 8xx family is our last state of art and offers improved characteristics

UF 801-P portable unit is the first new baby of this family.

Regarding this manual, it has been specifically written for the personal operating of this UF 801-P. It contains very important information about instrument to guide you in the different steps of handling precaution, installation, commissioning and possible troubleshooting.

Other documents and tools are available on paper or in electronic format, as:

- *A training manual concerning ultrasound measurement, reference **NT 122***
- *The specific PC software **LS 801W_version** *** with connection cable*

Make sure you have read and understood these manual before using UF 801P

All our flow-meters work on the principle of ultrasonic's transit time and can be associated with clamp-on or wetted probes depending on the application.

Our manual NT 122 will tell you more about basis of this technology and principle.

Most of these manuals or PC tools exist and can operate in different language, and at minimum English and French, that you can select among the proposed choices.

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ULTRAFLUX SA_

**Le Technoparc
17 rue Charles.Edouard Jeanneret
78306 Poissy Cedex – France**

**Tel: +33 (0) 1 39 79 26 40
Fax : +33 (0) 1 39 79 91 22
E-mail : ultraflux@ultraflux.fr
Web : www.ultraflux.com**

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In the interest of continuous improvement of its products, Ultraflux reserves the right to change them or some of their characteristics without notice.

This document is written at the attention of the end user. It tries to explain all the instrument and measurement method to a not specialist or a specialist as well, for the best expected results.

Meanwhile, Ultraflux will not accept any liability for any error, including language, or missing information which could have crept into the documentation in spite of the care taken to write it.

On the other hand, Ultraflux encourages everybody who will help us to upgrade this document by sending in writing their remarks or constructive suggestions.

Note that the document reference NT 228 has two added signs:

- *A letter that concerns the contents revision (here A)*
- *A number after the language (GB = English) , that concerns a text or grammatical revision (1).*

UF 801-P COMPLIANCE:

1-Safety Precautions:

When using this UF 801-P with its probes or accessories, please respect site safety regulations. Access to pipes requires very often some secured way or protection. Same with pipe surface temperature or possibly corrosive liquids: use you individual protections as helmet, gloves, glasses ...

A particular attention when a flow test is asked in an Ex classified area: please respect site instructions and ask for a possible permit. Probes connection, instrument handling... could make some dangerous spark, able to light an flammable or explosive mixture.

Proceed always with attention to keep your instrument in good conditions.

Charging the UF 801-P batteries is a very current operation involving power connection. Even with the best built-in safety components, any accident stays always possible: over-voltage, over-heating... Avoid to let the device connected a too long time without survey or securing these connections.

2-Conformity to EC Norms: All equipments are CE certified.

UF 801-P is typically IP67. Anyway, prevent it from immersion or ask for an optional heavy duty protection if the immersion risk is important.

ATEX certification can be delivered for the relevant probes and standards, when this quality is required accepted and documented. All equipment will be labeled accordingly. Without any mark, and attached certificate, never consider the instrument as certified!

Main Applicable Standards:

- *Concerning high voltage human safety risks :
UF 801-P: N/A – Only low voltage (< 60 V).
Charger: 100-240 V AC conform to CE/UL/...*
- *Concerning EMC : EN 61000, EN 55022 et EN 50204*
- *Concerning tightness (IP) : EN 60529*
- *Concerning ATEX : Directive 94 / 4 / CE
UF 801-P could be only concerned by EEx m IIC T6 transducers with cables
Please refer to official documents / conformity certificates*

3- Other Certifications:

All equipments receive before delivery a flow result test in comparison with standard. On request (but not free of charge), the instrument can be delivered with a calibration certificate. Contact our sales people to know more about these conditions.

4-Warranty: Please refer to the sales contract for term and conditions.

This Warranty supposes that this instrument is used for the purpose of its design and has been operated according the instructions given in this manual. Any maintenance operation or component replacement must be done by an Ultraflux authorized agent.

TABLE OF CONTENTS:

> *Introduction & Compliance: See pages 2 & 3*

Matter with Index

> page

1 The Flowmeter & its Applications:

- 1.1 Overview
- 1.2 Measurement Principle
- 1.3 Typical Applications
- 1.4 Probes & Accessories

2 Handling the Flowmeter

- 2.1 Presentation / Scope of Delivery
- 2.2 On/Off/Keypad/Connections
- 2.3 General Precautions/Cleaning
- 2.4 Battery: Handling & Charging

3 Getting started the UF 801-P

- 3.1 Using the keypad
- 3.2 The Menus
- 3.3 The Configuration menu
- 3.4 The PC Software Ls801W-xx

4 Basic Settings with Simple Menu

- 4.1 Input of the Fluid/Pipe parameters
- 4.2 Chosen Probes & installation distance.
- 4.3 Other parameters

5 Probes Installation (all menus)

- 5.1 Selection of Measurement Section
- 5.2 Probes Coupling
- 5.3 Ultrasonic Signal Quality.

6 Measurement Menu (Simple)

- 6.1 Displayed Screens & Values
- 6.2 Signal acceptance criteria.

7 Normal & Expert Setting Menus

- 7.1 Additional Parameters (Pipe / Fluid).
- 7.2 Advanced measuring Functions

8 Measur^t. with Normal & Expert menus

9 Extra Menus on UF 801-PB

10 Echo Display Menu

- 10.1 When & How use this menu
- 10.2 Echoes Example / Criteria

11 Operating with PC Software

- 11.1 Installation and Connection
- 11.2 Saving or Uploading a File
- 11.3 Printing a File / Example

Matter with Index

> page

12 Storage Functions / Data-Logger

- 12.1 Setting the Data-Logger
- 12.2 Reading the Data-Logger
- 12.3 Editing the Data-Logger

13 Totalizers

14 Output of Measured Values.

- 14.1 Current Output (4-20 mA)
- 14.2 Pulsed Volume Output through Relays
- 14.3 Other Relays combination
- 14.4 Other Modules : Frequency, PT100
- 14.5 I/O modules Connection table

15 Programmable Timer / Sequencer

16 Using the Settings Records

- 16.1 Saving / Loading
- 16.2 Re-init

17 Pipe Wall Thickness Measurement

- 17.1 Standard use
- 17.2 Celerity mode for unknown material

18 Optional Modules & Functions

- 18.1 Input Modules
- 18.2 Special Functions

19 Caloric Option / Heat Flow & Qty

- 19.1 PT100 acquisition modules
- 19.2 Installation & Connections
- 19.3 Using & recommendations

20 Troubleshooting

21 Upgrading the Firmware & Software

22 References / Appendix

23 Index

1 – THE FLOWMETER & ITS APPLICATIONS

1.1 Overview :

UF 801-P is a high performance ultrasonic portable flowmeter for closed pipes or conduits.

UF 801-PB is the dual pipe or channels version that offers doubled menus and that multiplex the E/R resources. We will consider mainly UF 801-P but some points as mentioned in §9.

They both use ultrasonic signals between two aligned probes arranged on one or two paths, to integrate a flow section, thus with a typical arrangement depending on chosen probes.

> *See measurement principle on 2.2 or better NT122.*

UF 801-P performs a very accurate time of flight measurement on these ultrasonic pulsed signals and, after calculation from entered weighting data, it can display the following results:

- The flow velocity
- The volume flow
- The totalized flow
- The sound velocity
- And much more information that you will discover.

For that, the **right probes** must be selected versus pipe diameter, pipe or fluid conditions, pipe wall temperature and so one.

> *We invite you to contact our Sales people who will guide you for those choices.*

As the **UF 801-P is a portable unit**, it is usually powered from a built-in (or external) battery. It is delivered with an external charger that does also an external supply to be connected to Mains from 100 to 240 V AC / 50 or 60 Hz, by using the suitable cables with connectors.

UF 801-P with its accessories is presented in a robust carrying case. See picture.

With an optional probe (**SE 1701**), UF 801-P is able to measure the thickness of the pipe walls.

UF 801-P can operate in different languages. This selection is done in the Config. Menu. After that, let you guide by friendly arranged menus. You can refer to our short form guide NT 227. This NT 228 manual stays the reference manual.

It is possible to customize your UF 801-P by choosing your input / output modules. Basically, UF 801-P has one 4-20 mA output, 2 Relays and one RS232 port.

As the **UF 801-P** is a self operating unit, it has an integrated data-logger able to record up to 135 000 measured flow values with their time and date or up to 14 simultaneous values but less (36 000) records lines.

Each record can be the averaging or the min/max peak value during the recording period.

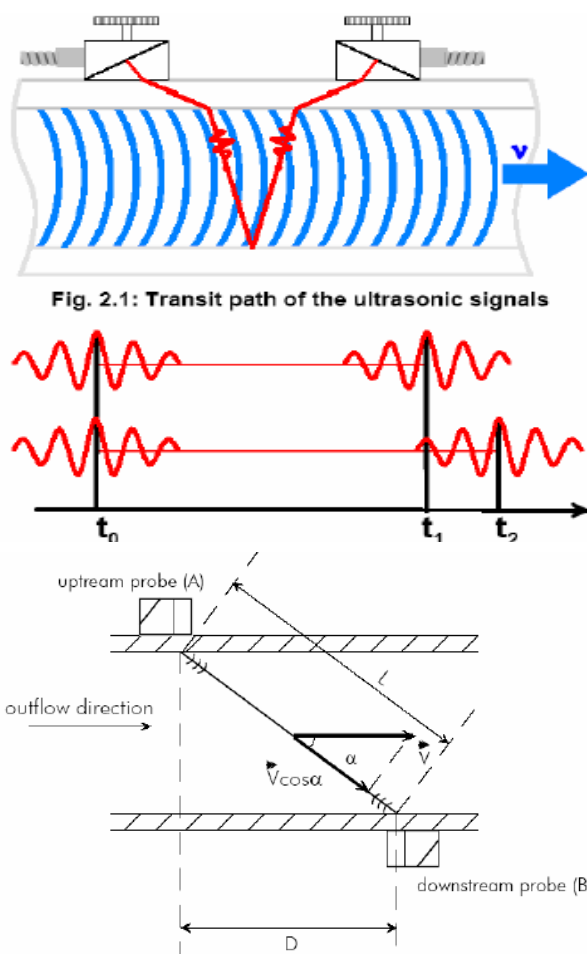
1.2 Measurement Principle

As written above, we kindly ask you to print out from our CD the NT122 didactic handbook. You can find inside very useful information on this principle, the ultrasonic waves transmission, the hydraulic conditions, the flow profile influence, the Reynolds Number,...

The first condition to measure a flow is that the fluid can transmit ultrasound at chosen F, thus not be too viscous or include too much particles that could make barrier or disperse energy.

Contrary at Electromagnetic principle, there is no influence of fluid conductivity.

Thus, with two probes with following installation:



The two probes being used alternatively as emitter and receiver, the composition between the sound and the flowing fluid velocities does a small time difference between upstream to downstream and invert direction beams.

UF 801-P, with its sophisticated dual 32 bits processors and DSP PC Board, permits a signal digital shape analyse and offers a very high resolution and accurate transit time and Delta t measurements, the key of high level and reliable results.

$$\Delta t = t_{BA} - t_{AB} \text{ (we use nanosecond)}$$

$$V_{US} = (L^2/2 \cdot D) \cdot (\Delta t / t_{AB} \cdot t_{BA}) \text{ (m/s)}$$

$$\text{And, with } Kh = V_{US} / V_s \text{ (S = section)}$$

$$Q \text{ (Flow)} = S \cdot V_{US} / Kh \text{ (m}^3\text{/h ...)}$$

$$\text{Volume} = Q \cdot \text{Time} \text{ (m}^3 \text{ ...)}$$

Always keep in your mind that the flow integration quality, thus flow results, depends on the flow section, thus the flow profile. Choose the best probe arrangement and location to minimize influences. Developed and stabilized hydraulic conditions are preferred to irregular circuits.

Always keep in your mind that the physical measurement is based on time and Delta t result. Lower is Delta t, more attention must be paid for probe choice, installation care, zero setting ...

So, a flow of 2 m/s in a 1 m I.D. pipe would give a Delta t around 1500 nanosecond when 0.5 m/s in a 10 mm ID pipe would show 5 ns, which could be sufficient but is a low range value.

1.3 Typical Applications:

UF_801 P and P-B main purpose is to offer a performing flow measurement solution at a **very competitive price** by saving any installation costs. With **clamp-on** transducers, there is no need of any spool piece or tapping by keeping the same final accuracy than any flow meter. Compared to previous or actual devices and compared to our mains competitors, this new device is pushing ahead the performance limits.

Their conception permits a smart use of the hardware and firmware resources to adapt them end to user flow problem and to offer a complete diagnostic on actual flow conditions and also liquid quality or density ...

The UF 801-P/PB gives the actual flow value and its direction. Normally used as a portable device, it can also be use for temporary replacement of any flow-meter for flow indication, regulation but also volume counter.

Ultraflux offers a wide range of probes with different sizes and frequencies to be selected depending on the application and pipe diameter from 10 mm I.D. to more than 5 metres. A large advantage and measurement comfort is obtained by choosing our microstructure technology probes SE 1586/2 MHz, SE 1515/1 MHz or SE 1599/0.5 MHz.

The clamp on solution is available on all metallic or plastic pipes. Most of asbestos are also accepted. Only limitation could come from too high corrosion or too thick internal deposits.

When pipe wall material (concrete ...) or condition (corrosion ...) is not suitable for clamp on transducers , we can propose insertion transducers with possible installation by hot tapping.

Most of liquids are accepted: Water, any quality, even ultra-pure and not conductive is the first application field. That includes also overheated water.

Clamp-on solution is also very convenient for petrochemical products, acids or any liquid presenting some danger.

With some restrictions concerning the pipe diameter, its quality and the pressure, UF 801-P permits clamp-on results on pipes flowing gas : natural gas, compressed air....

When the instrument must have an official use, it is recommended to obtain an official certificate by comparing it to a standard on a flow rig.

Then, after some reserves concerning a correct use, the unit can be accepted as a portable standard to check other installed flow-meters or for flow expertises.

Basically, we practice only a dry calibration. Its reliability is sufficient for a standard use. Because its high repeatability, placing UF 801-P and its probes at the same location with the same settings, permits a reliable following-up in the time of pump characteristics or any other flow-meter, even with an higher accuracy claim.

Example of installation:

*Here is a dual pipe installation.
SE_1586 probes are in V reflex mode.
Application concerns ultra pure water
Purpose is to know from out flow and return flow what is the real production / consumption.*



1.4 Probes & their Supports or Accessories

The UF 801-P / PB accept all standard or special transducers of Ultraflux's catalogue with frequency from 200 KHz up to 4 MHz. Most of them, for portable use, are clamp-on, but UF 801 can accept insertion or wetted models as well.

Please, refer to the used probe data sheet for specific technical characteristics.

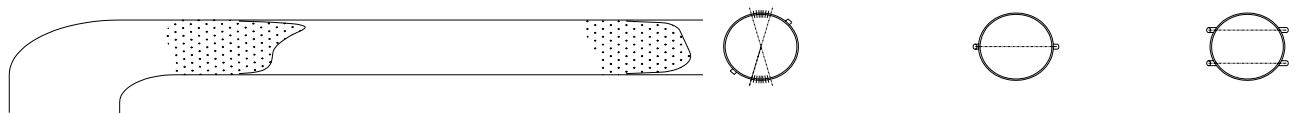
UF 801-P menu lists the standard available probes:

- **Clamp-on probes are referenced SE.** Each reference is attached to an internal table with the probe frequency, the beam angle and the dead time in the wedge.
- **Insertion probes or wetted probes are referenced SM.** The attached table considers only the crystal frequency and the dead time in probe face. If probe has a built-in angle, only **L & D** installation distances will describe the exact installation.
- It is also possible to enter **special probe SA or SB** (clamp-on or wetted).

The selected pipe section to install the probes should allow for the best the straight lengths, mainly upstream the probes, but also downstream, in order to have benefit from a predictable and stabilized hydraulic profile.

We usually consider 10 pipe diameter upstream distance + 3 downstream, as acceptable conditions. Larger distances are preferred, if possible to have. Consider these distances versus the upstream perturbation: a divergent is typically worth than a convergent !

Same, to avoid the nuisance of deposits or accumulation of gas, planes close to vertical ($\pm 15^\circ$) must be avoided. So, prefer a horizontal plane (but if the conduit is vertical !).



Please read general recommendations as detailed in our training manual NT 122. Under header §2, we give some information about expected accuracy depending on available straight length and transducers mounting modes.

If you are using intrusive/wetted probes, adjust the insertion then the alignment or orientation of the probes for the same pair (up to have parallel faces).

*Once these adjustments are finished, it is necessary to measure with accuracy the distance **L** between transducers face to face and its projection **D** on flow axis. Note these "As Built" values up to later entering in UF 801-P menu.*

! The final flow accuracy depends on these data.

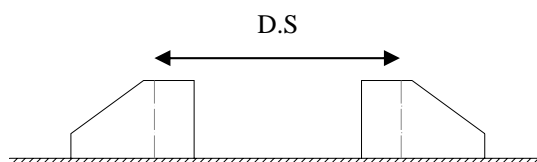


With external probes, the evident freedom should not prompt the user to ignore the above rules.

The choice of a Direct (Λ), a Reflex (V) or a N/W installation mode will depend on your the decision regarding the pipe dimensions and internal / external condition and also the flowing fluid to be measured.

Therefore, we recommend doing a temporary first installation to validate the site conditions. A quick checking on echo signal level and attached information as sound velocity ... will allow you to go ahead up to finalize this installation by using probes supports, doing a reliable coupling with the best guaranties of success.

From entered data and selected probes characteristics, the UF 801-P calculates for you the distance D.S required between these probes.



Particular attention will be paid to cleaning the conduit at the probe location and to ensure the coupling surface.

More than 90% of usual installations are done by using Reflex "V" mode.

> See figure at 1.2 / Picture at 1.3.

Criteria to select a clamp-on probe:

High frequency probes are smallest compared to lower frequency ones and thus suitable for smallest pipes with thinner pipe wall. They offer a higher Delta T accuracy measurement, insuring a good theoretical zero and better flow accuracy.

But, at higher frequency, pipe or liquid difficult conditions could have more influence on signal quality: a too high signal damping or a too much high distortion could bring some use limitation.

- Our recommended choice for pipes 15 to 80 mm: SE_1586-E2 – F=2 MHz

Lower frequency transducers are less sensitive to above conditions and are more suitable for larger pipes. For such applications, the Delta T is more important and thus it weights less on the zero and flow results.

- Our recommended choice for pipes from 0.8 m up to 10 m: our SE_1599-I –F=0.5 MHz.

Between them, for pipes ND 60 to 1000 mm, the good compromise is using F=1 MHz probes.

- We recommend our SE_1515 (SE_1707) or our SE_1662/S

Most of these probes are delivered with a support including a ruler and fittings for fast fixing on to the pipe. Rulers with included magnets as our SE_1707, SE_1519 or elder SE_1596 are very convenient on carbon steel pipes.

Always remember that a good installation with a good echo signal and a good correlation between expected and displayed value sound velocity are the key for good flow results.

Take benefits of your installation care.

2 – HANDLING THE FLOWMETER

2.1 Presentation / Scope of delivery :

On delivery, please make sure that all items of the following list are in the package (standard scope of delivery):

- 1 Transport case with internal arrangement for usual items
- 1 The UF_801-P or P-B pocket converter with inserted (charged) NiMH batteries.
- 1 protection bag for UF_801
- 1 Power adapter and battery charger with EC mains cable
- 1 Cable with "Y" termination for connection to probes (L=5m)
- 1 Cable for connection to PC or other outputs
- 1 Pair of straps for general purpose probes attach to the pipe
- 1 Coupling gel bottle
- 1 Short form user guide
- 1 CD Rom including PC Software and Technical manuals / probes data sheets

Depending on your choice / P.O., different probes and supports in relation with your expected use are included in the transportation case or packed separately.

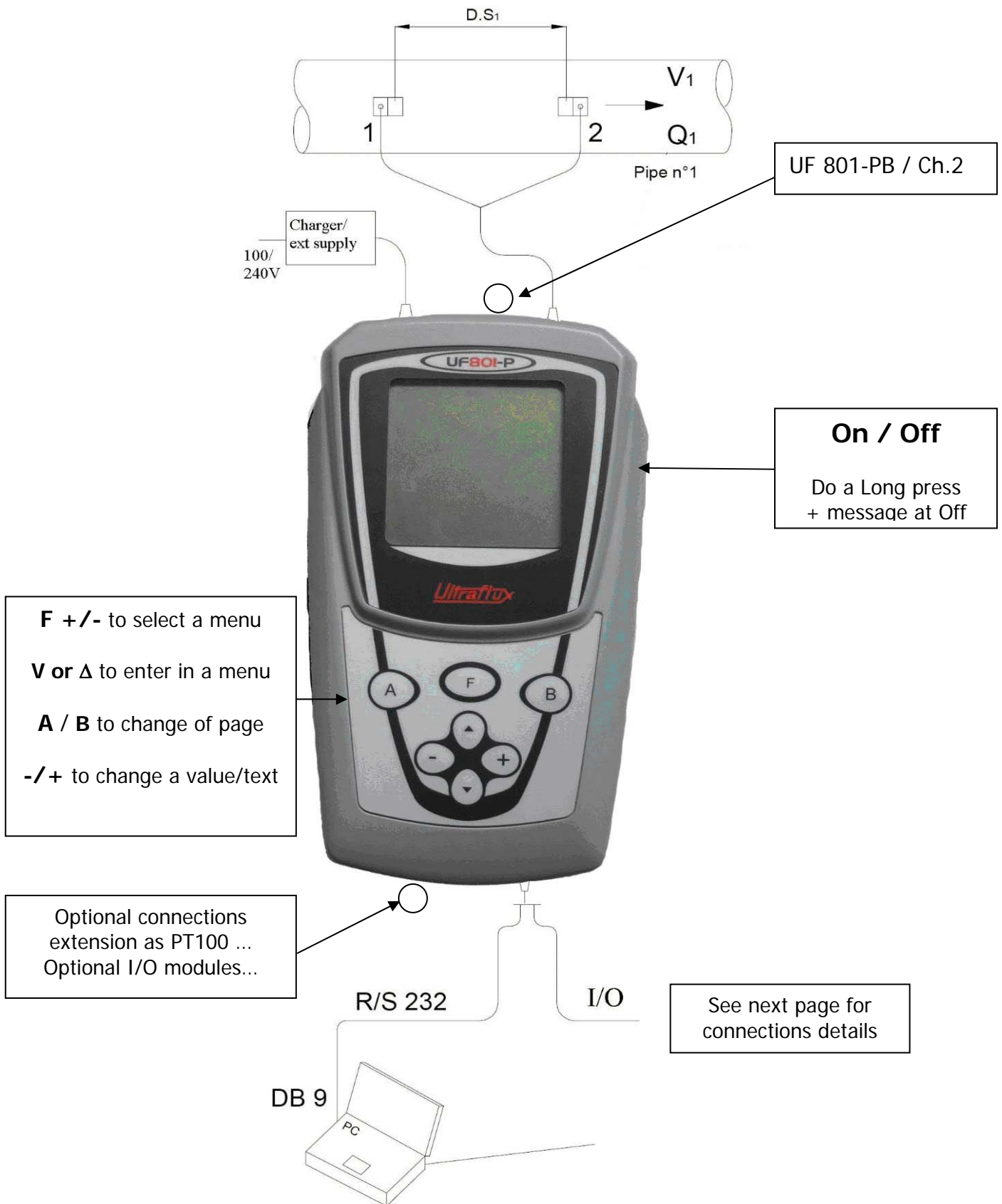
Example of delivery presentation of UF 801-P in its case with 3 sets of probes: SE1586 / SE1707 / SE1599. Under the cover at right side there is space for cables, belts and charger.



If you ever detect something that seems abnormal, please inform immediately our sales or after sales services.

2.2 Putting On/Off the Uf 801-P _Keypad use & Connections:

The UF 801-P is tested and its batteries are charged before delivery. Thus it is ready for use.



Recommendations to a new user: *(See also the short form user guide)*

Please, train yourself by traveling in the different menus, without changing settings at this first step. Note that some touches can have a different action following a short or a long pressing action. As so, F touch permits to reach the next menu after a short press and does a return to measurement menu after a long press.

Inside some menus, touch A & B can have a dedicated function that is shown at concerned display screen bottom (as for instance "by default screen" selection in measurement menu).

External Connections / Wirings on UF 801-P :

See § 14 for more information and wiring instructions + pin-out.

Connection to a PC is asked for data logger unloading. Our delivered cable is ready for use.

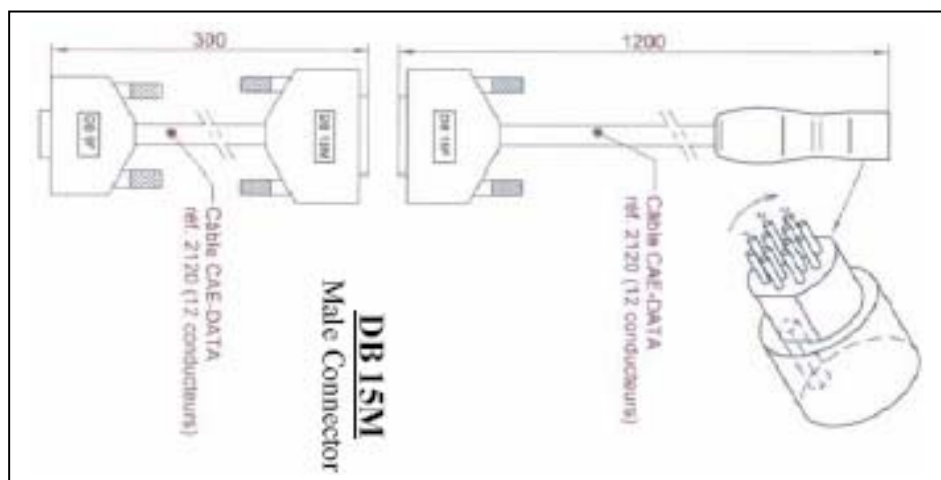
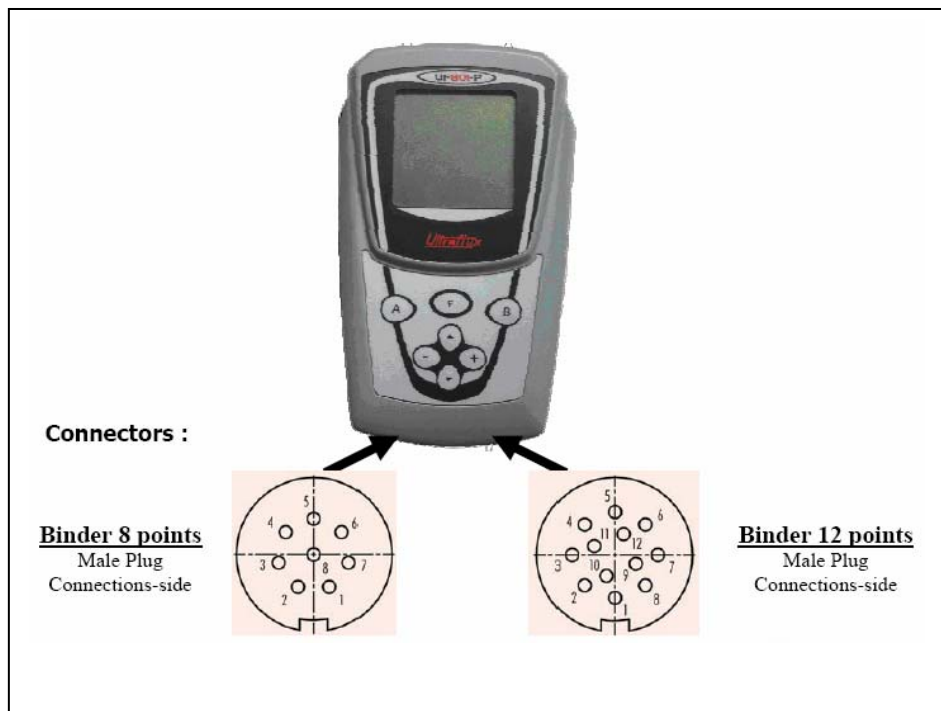
Other connections can be done to transmit or acquire analog data or On/Off status.

Relays : solid state
 R on = 10 Ohm
 V < 100 V
 I < 0.1 A

Analog Output :
 Active from battery
 Max loop R = 600 Ohm

Analog Inputs :
 Current (Auto +/-)
 Loop R = 600 Ohm
 Voltage = 50 kOhm

Temperature Probes
 PT 100 / 4 Wires *
 0.1 °C Typical %
 (*: recommended)



2.3 General precautions / Cleaning:

UF 801-P/PB is a very reliable instrument. It has been designed for and not any special service work is requested. Anyway, always respect the usual handling precautions and special instructions given in this manual.

Some macro components (LCD display) or flat cable connections could have some limitations from vibrations; prevent the device from heavy shocks or from bad condition transportation. For instance, if you travel by flight with your instrument, prefer keeping the UF 801-P/PB in its bag with you or place all items with an over packing.

Never let the UF 801-P/PB a long time in front hard sun rays. The black of LCD display can cause an overheating and damage the liquid crystals; same with very cold conditions.

On dirty sites, please keep the UF 801-P/PB inside its protection bag.

We deliver UF 801-P with a transparent protection tape on the LCD display PU glass, to prevent it from scratches. Contact Ultraflux to know how to replace it.

If the UF 801-P/PB is dirty after some use (finger prints, muddy water projection...), clean the instrument with a soft cloth. Do not use detergents. Alcohol solution is acceptable.

Remove traces of acoustic gel from the probes with a paper tissue before placing them at their storage place.

Be careful with the powerful magnets of concerned supports (SE/SU 1707...). Never remove them from their initial place or housing.

For long storage conditions, please keep all items in the packing case.

Meanwhile, if this storage is very long (many months), please take care that the batteries will not become self discharged (current for the clock...). We recommend doing a complete charging cycle every 2 months and to let the device in charged conditions (see here after).

2.4 Battery & Charger

UF 801-P/PB have an internal NiMH batteries pack. This pack includes some protection against short circuits or over currents / over temperature.

This battery is permanently supervised by a dedicated component & circuitry that looks for all input/output currents. This component, after self learning (see after), permits to show its **autonomy time as a % of the full capacity**. It also drives the fast/slow charging sequences.

Same, to prevent from damages due to a too low battery voltage, these supervising circuits do an automatic unit powering off, if this voltage becomes lower than an internally set threshold.

User battery life: Completely charged new batteries should offer a continuous use of 14 hours. It is possible to increase this service time by using the ON/OFF sequencer (See §16).

Charger use / Charging time: Connect the charger at Mains 100 to 240 V AC 50/60 Hz (Green LED must be lighted) and plug-in the output to UF 801-P dedicated connector.

The charger supervisor switches automatically from a high current during the first period of charging (typically 2.5 hours See*) to a lower current to keep the batteries charged.

It is very useful if the unit stays ON for a long time, this charger becoming an external supply. No problem to use this supply module during a long time, even if the battery pack becomes a little bit hot (but not too hot !).

(*) In the Measur.[†] menu, a dedicated screen must show: **Battery range xx% / Charging**

If you detect a too high temperature at UF 810-P/PB back or any abnormal situation, please unplug the charger supply and advise Ultraflux's after sales service.

How the re-initialize the battery supervisor ? In the measurement menu, you can read the battery range as a % of its actual life. But, it is necessary to calibrate this range in relation with the actual battery condition.

For that, do a complete cycle after the UF 801-P has been automatically powered off by low battery voltage detection (that set the zero %) up to the maximum charge (that set the 100%). We recommend doing it every two months.

Battery pack whole life.

Any battery pack has a limited life depending on the complete charging/discharging cycles number and also the care that you have had for their use. NiMH technology offers typically 500 complete cycles following IEC standard. So, during your UF 801-P life, it could be normal to proceed to the battery pack exchange.

For such a reconditioning, this pack is easily removable. Meanwhile, this operation must be done by an Ultraflux's qualified agent unless to loose our Guaranty and also some instrument characteristics as IP67_ *See maintenance chapter § 20.*

Thus, please prefer sending back the unit and have our guaranty. We decline any responsibility for not duly authorized operations.

3 – GETTING STARTED THE UF 801-P

3.1 Using the Keypad : *You can also start with the short form User's Guide NT 227*

After switching **ON** (Long Press on the right side button), the UF 801-P displays its configuration (serial Nr, Hardware/Firmware revision), its actual main settings (set probe) and starts automatically in the Measurement mode menu: Q / Graph / Flow information (*).

If the unit is already set for the expected use, no need of extra setting: only read results in the screen that you can select by **V** or **Δ** up/down touches, after probes installation and connection.

(*) To select the measurement screen "by default", select it and press **B**

Menus Header Access : Press **F** , repeat it to go the next or travel with **+** or **-**

*A short press does access to the different menus header.
A long press does return back to measurement menu.*

To enter in a menu, press **V** or **Δ**

To change of page, press **A** or **B**

To change a line, select it with **V** or **Δ**

and modify value or text with **+** or **-**


*If not any touch is pressed during 60 seconds, the display returns automatically to the measurement display screen that was selected with B (see * above).*

3.2 The Menus Review

Pressing **F** one time gives access to Configuration Menu

From this Configuration menu, you can select the interface language, the wanted level of the settings (simple, normal or advanced). You can also enable or disable some optional functions as the totalizers, the data logger, and the timer/sequencer or the installed Input/Output functions or modules.




You can also load an already saved configuration with attached settings or reset existing settings to the factory test settings.

Pressing  twice gives access to **Pipe / Fluid Settings Menu**

Depending on your choice of settings level, you will have more or less asked questions to fill up.
With option "Simple", only water fluid is considered.

With option "Normal" or "Advanced for Expert", there are more questions and data concerning the fluid and the pipe description (up to 3 layers with expert menu).

Important data to confirm are the probes and their installation, the pipe dimensions and its characteristics, the fluid and the flow unit and its range (only for the graph).

Pressing  or  &  three or more times,

Gives access to the **optional functions or menus** as enable in Config. Menu :

- **Totalizers Settings**
- **Input / Output Settings**
- **Data Logger Settings**
- **Timer / Sequencer Settings**

Next menu is the **ECHO DISPLAY menu**

This menu is very important to control the quality of the ultrasonic signals.

We highly encourage you to use it !

Next menu is the **Thickness Measurement menu**

It requires our probe SE_1701

Only in Expert Advanced mode, there are two more menus:

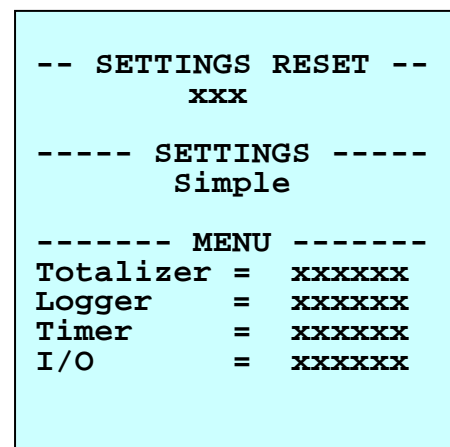
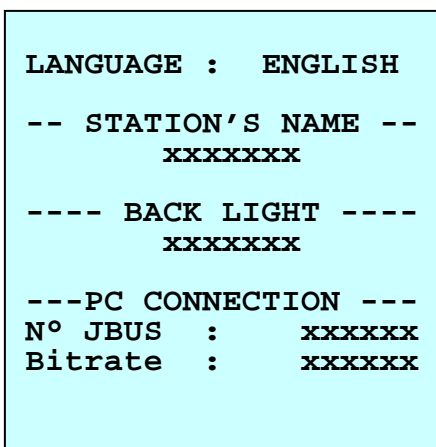
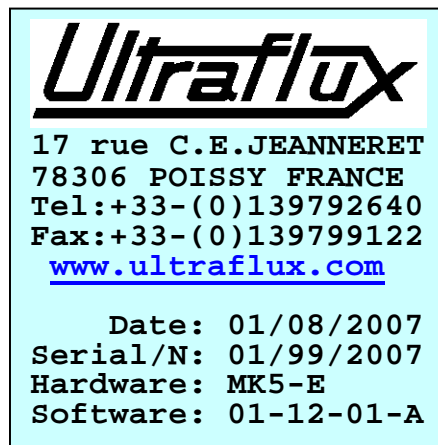
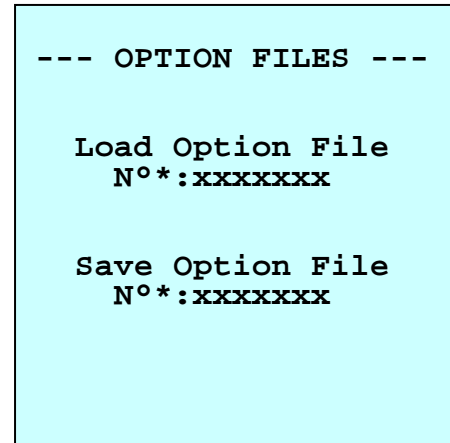
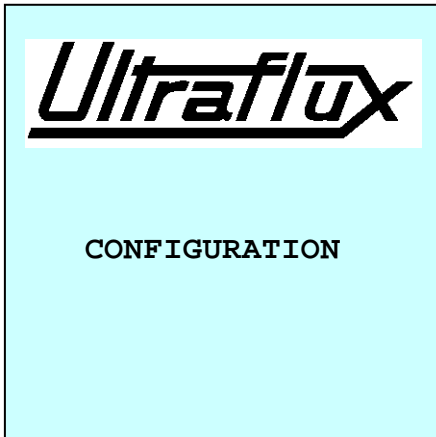
- **Possibility of Linearization a flow response curve** after comparison with a flow standard.
- **Possibility of special tests**, setting of special probes or setting of specific signal treatment with the **Factory Settings menu** (Ultraflux reserve the right to activate or not some of these functions).

3.3 The Configuration menu:

As explained above, from this menu you can decide at any time to have an efficient but basic instrument, very simple to use or a very powerful flow-meter with plenty of available resources.

This menu shows also the manufacturer information about your instrument version.

We just list below with only few comments these possibilities:



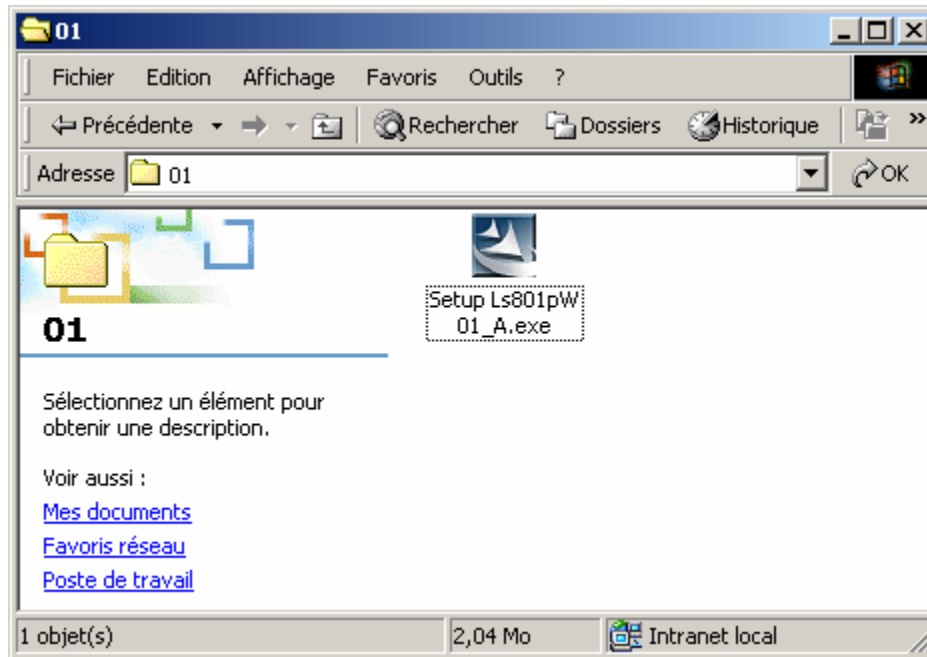
3.4 The PC Software : Generalities

Operating details are given in § 11 : Installation and User Instructions.

Other user information concerning the Data-Logger Down-Loading are in § 12.

This PC Software is included in the CD Rom, delivered with the UF 801-P

Use your PC browser to select it up to have a Set-Up file as follows:



This software works on **all Microsoft Versions** since Windows 98, included: 2000 or Millenium, NT, XP pack 1 or 2, Vista.

The installation proposes to create an **Ultraflux folder in Program Files** and makes an attached sub-data file to store your results or settings configuration.

It asks also for **interface language** that you would prefer in a list.

The installation proposes also the **connection to your already installed Microsoft Excel** version. It is up to you to accept this tie. It will be very useful later for data-logger treatment.

Note that some languages as French considers the coma as a **decimal separator** and some others as English use the dot point.

We change that versus the language, but some French people for instance prefer to use dot separator. Think about the right adaptation and Excel right interpretation.

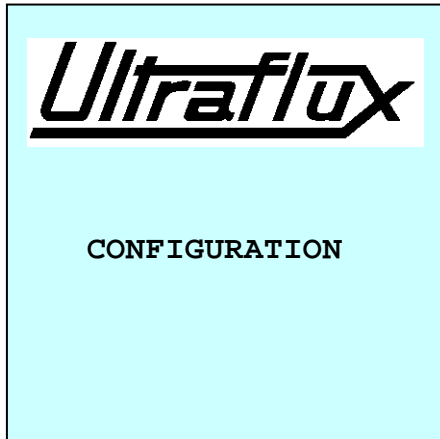
Our software included a **Macro-Function for automatic flow curve edition by Excel**.

Important! To allow its execution, it is necessary since Excel 2000 or 2003 to set the acceptance level in Excel menu : *Tools / Macro / Safety / Medium.*

4 – BASIC SETTINGS WITH SIMPLE MENU

This menu is limited to flow measurements on water, at ambient temperature.

First, select Configuration menu and set your level as Simple plus Optional Functions that you could need:



4.1 Inputs concerning the Application (Fluid/Pipe)

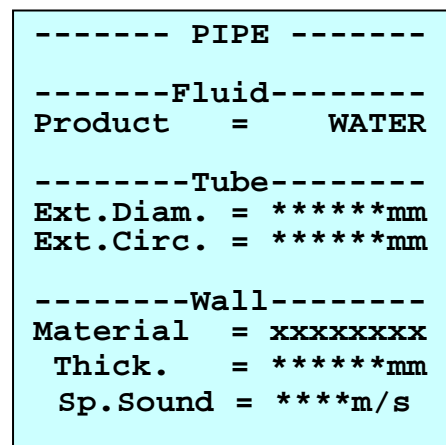
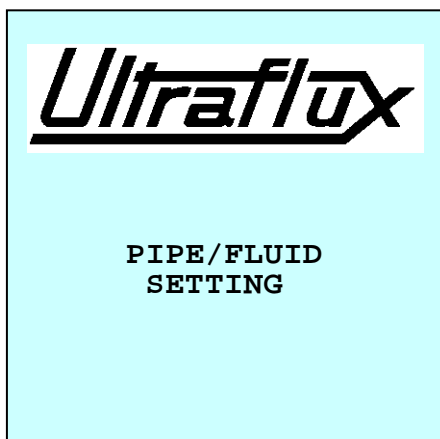
This menu is designed for the best efficiency with the minimum of questions.

It considers water in usual ambient temperature of quality range. Sound velocity, which drives the requested distance between probes, is considered around **15°C, with Co=1472 m/s**.

Allowed **Delta C Range around Co is set automatically large, at +/- 400 m/s**, that is sufficient for 95% of the applications, without any consequence on the final accuracy.

UF 801-P applies an automatic correction factor if actual C is different from Co.

Meanwhile, if water includes a glycol mixture or if flow measurements are done on overheated water, it could be preferable to consider Fluid as = Other and enter typical C, as allows Option = normal or advanced.



Please enter with accuracy the pipe dimensions as Ext. Diam or Ext. Circ.= Π *O.D. UF 801-P displays both and calculates the pipe I.D.

Use a tape or a slide gage for Ext. Diam. and a thickness gage for pipe thickness unless well known characteristics (as marks on pipe or site construction records).

4.2 Probes choice:

It is very important to **select the right probes & supports** for your application. See §1.4

Depending on these probes and your application or pipe conditions, select the best compromise for the probes installation. **By default, start with the V Reflex mode.**

```
----- PIPE -----  
  
-----Chord1-----  
Probe      = xxxxxx  
Mounting   = xxxxxx
```

(Clamp-on probes menu)

```
----- PIPE -----  
  
-----Chord1-----  
Probe (SE) = xxxxxx  
Mounting   = xxxxxx  
  
Probe (SM) = xxxxx  
Length     = xxxxx.x mm  
Axial D    = xxxxx.x mm
```

(Wetted probes menu)

4.3 Other Settings:

You can select also the **flow unit that corresponds to your practice.**

To have a flow curve that respects your flow range, you can also fix the **Graph response time (with period) and the min. / max. range.**

These settings have no influence on the flow results.

```
----- PIPE -----  
  
-----General-----  
Q Unit      = xxxxxx  
  
-----Graph.-----  
Q Period    = xxxxxx  
Q Qmin      = xxxxxx  
Q Qmax      = xxxxxx
```

Optional Functions:

See corresponding chapters 12, 13, 14, 15...

They can be set later, after 4.4 and probes installation are completed and everything OK.

4.4 Asked Distance between Probes:

When above basic settings are finished, do a **long press on** **F** to return Meas.[†] menu.

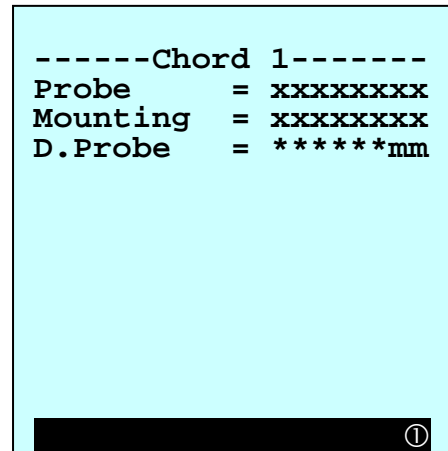
UF 801-P displays temporarily the following screen that you can also select with



For instance = Probes SE 1515

Mounting = Reflex (V)

D. Probe = 225 mm, depending on Fluid, Pipe characteristics, Probes and their Mounting mode



Note this D. Probes for the installation to be done as follows in § 5

5 – PROBES INSTALLATION

5.1 Selection of the Measurement Section:

See 1.4 and our NT122 for general purpose recommendations.

Most of the following rules are from the common sense for efficiency with the best compromise.

- An easy access and the possibility to have the UF 801-P at sight allows easier diagnostics.
- Check that you have a sufficient space to install probes support.
- If there are existing straight lengths, take benefit of them. It is gratis!
- If you detect an upstream reason of aeration or cavitations, try to place probes more upstream or much more downstream.
- Check that the pipe is really full.
- Avoid measuring locations in the vicinity of pipe defects or deformations.
- Same, avoid the vicinity of welding.
- If the installation must stay working for many days, we recommend paying a little bit more attention than for a short time diagnostic for which the best rule is "Try and See".

In case of turbulent to laminar flow transition risk (very rare with water), we give some complementary recommendations in Expert menu § 8.

5.2 Probes Coupling

Clean the pipe at location for the probes: take in account the above asked distance and judge of the possibility to install the probe support or ruler.

This cleaning can be done simply with a paper tissue or an old cloth piece. If the pipe is very dusty, use a metallic brush

No need to remove a good painting. Moreover, it is better to keep it and so avoid any later corrosion at this location. It is the same with most of external liners for pipes.

But, if painting is flaking off (you can do simply a test with your finger-nail), please remove it with a brush or a scrapper: *the included air gap under the painting would stop refracted ultrasonic waves.*

Use the right gel for actual conditions. Blue Gel is for ambient temperature and temporary measurements. In wet or rainy conditions, it could be better to use grease.

Spread with a finger some gel over these points and apply gel on each probe face.

Attach probes to the pipe with straps or better by using their support.

Ensure always the gel interface between each probe and the pipe is continuous.

Avoid slipping too much a probe: this could break the coupling film.

5.3 Ultrasonic signal quality first test

More information are developed in § 6 / Simple Measurement menu

First operation consists of **connecting the probes to the UF 801-P.**

Use the dedicated cable with a Y termination. When it is too short (very large pipes), you must use our 5m female / male cables prolongations (always two cables, for symmetry).

To have later a **positive flow display, connect cable Nr.1 to upstream probe** and Nr.2 to downstream one.

If you have a two pipe version, connect Pipe Nr.1 to Probes connector Nr.1 (at the upper right side). Channel Nr.2 is located just at its left side.

Check immediately that you have a flow display. Check that the amplification gain is not too high (refer to §10.1 & 10.2) : it is usually less than 50/60 dB on carbon steel pipes and 20 to 40 dB on plastic, copper or stainless steel pipes.

The best method is to refer to the Echo Display menu (see § 10).

If something do not go as well as you were expecting, analyze the reasons why:

- Coupling has been damaged.
- Pipe is too corroded or includes too much internal deposits at this location?
- Is the fluid homogeneous?
- Is there a risk of too much included air?

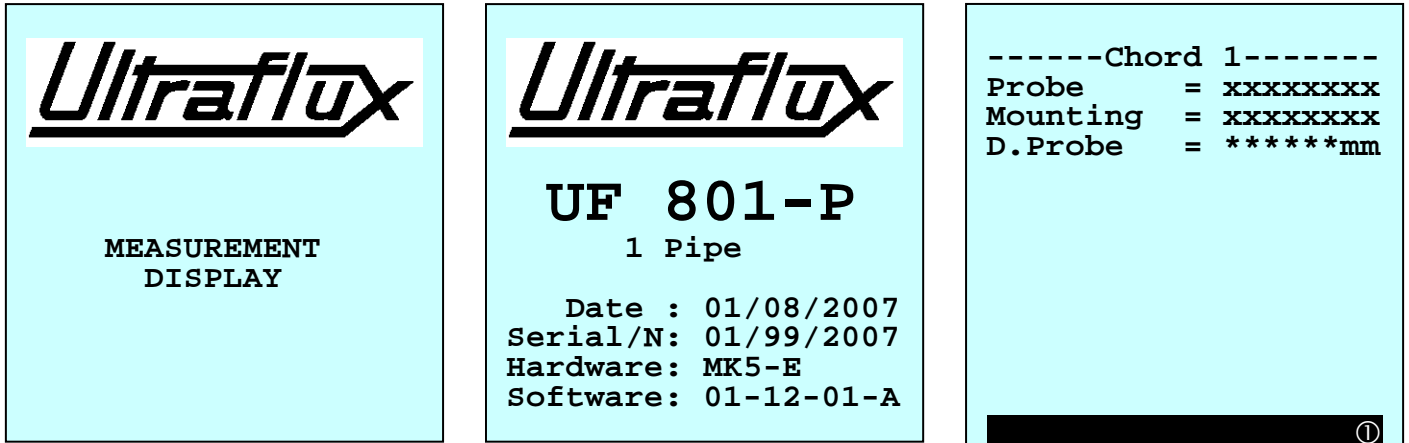
The Echo display menu pictures give you a mine of precious information.

6 – SIMPLE MODE MEASUREMENT MENU

6.1 Simple Menu : Displayed Screens & Values

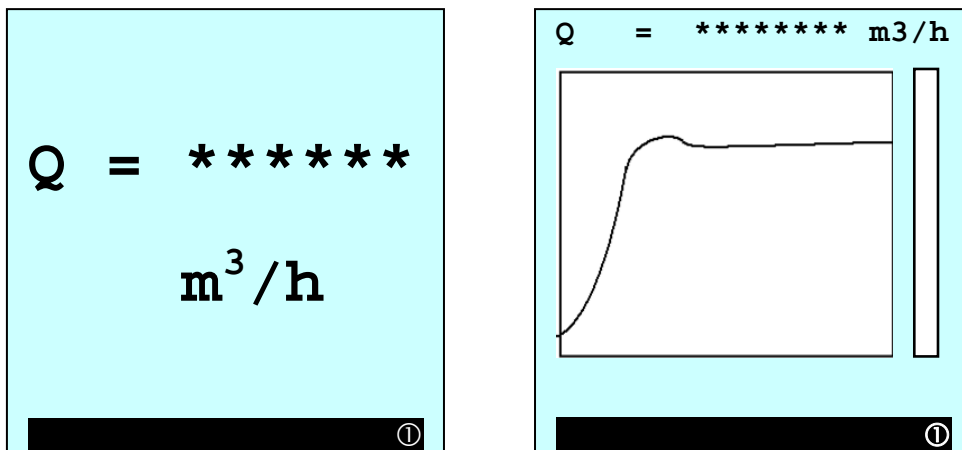
After switching ON, the UF 801-P displays during 2 seconds the menu title, the instrument configuration with serial numbers (see 3.3) and then reminds you actual the chord / probes configuration (see 4.4).

When leaving any menu after a long press on **F**, UF 801-P displays temporary the menu title and then reminds you the actual chord / probe configuration.



Next automatic display is the "By Default" screen that you have selected with **B** that you can select at any time among the following displays (see 3.1)

Numeric or Graphic Numeric Flow Display:



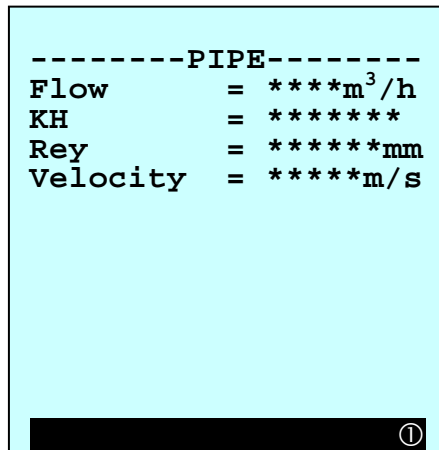
Note that, with Simple Option Menu, some settings are forces at following values:

- Product = Water with $C_o=1472$ m/s and $\Delta C = +/- 400$ m/s
- K Hydro = Auto / Viscosity = 1.0 C Stoke / Pipe Roughness = 0.1 mm
- Flow Cut-Off = 0 / AutoZero = No
- Memory = 10 s / Filter = 10 s
- Graph Period = 10 s

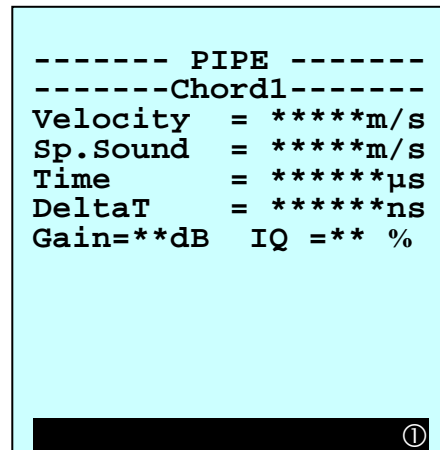
To know more about these settings and to allow their modification, it is necessary to select Normal or Advanced Settings Configuration (see § 7)

Technical Displays:

```
-----PIPE-----  
Flow      = ****m3/h  
KH        = *****  
Rey       = *****mm  
Velocity  = ****m/s
```



```
----- PIPE -----  
-----Chord1-----  
Velocity  = ****m/s  
Sp.Sound  = ****m/s  
Time      = ****µs  
DeltaT    = ****ns  
Gain=**dB  IQ =** %
```



These technical displays can help for your flow measurement acceptance criteria.

The flow velocity informs you about actual conditions compared to the typical flow range of a flowmeter (0.5 to 5 m/s).

A too low velocity value signifies that actual conditions are more risky for possible errors.

The Reynolds Number (see NT122) shows the flow turbulence coefficient.

If its value is less than 4000, you are informed that the laminar flow transition is very near.

The KH shows the applied automatic correction coefficient for the typical flow profile.

It considers that probes section is chosen to have a fully developed flow profile (straight lengths).

In very different conditions, it could be better to manage this coefficient manually by using Normal or Advanced modes.

Speed of Sound value (Ultrasonic wave velocity) permits correlations versus water temperature.

Transit time is the raw transit time measurement.

Actual Delta T (given in nanosecond) is very important to estimate the possible flow measurement error due to possible offset influence. The UF 801-P time measurement resolution is smaller than 0.05 ns. Probes time accuracy depends on their frequency. For instance, SE 1586 can offer better than 0.1 ns. But, if this Delta T is very small and if actual flow zero has not been checked, you must question yourself about the actual accuracy limits.

The amplification gain (in dB) shows the signal strength. Lower is this amplification stronger is the signal. This strength depends on probes choice and pipe conditions.

I.Q (%) shows the signal rejection ratio. IQ=100 % means that all measurements are accepted.

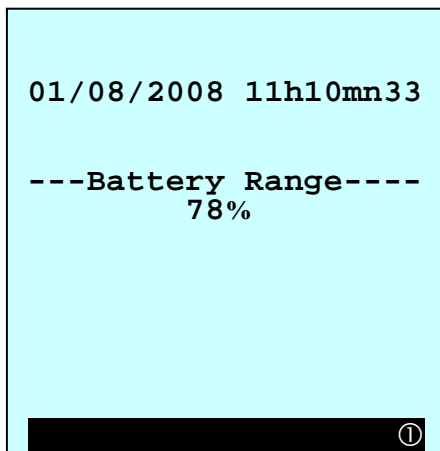
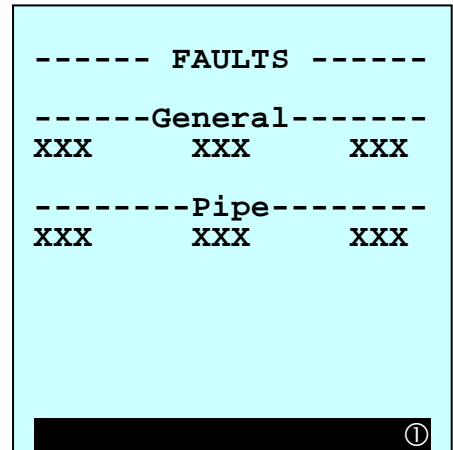
Other Displays are concerning general information as:

Faults Report Table:

This do not mean that the unit is faulty !
This means only that actual conditions do not
Permit the velocity and flow measurement on
the considered chord.

Other fault warnings:

In measurement mode, when a value is replaced
with - - - -, this means that there is no result.
At measurement screens bottom, if display shows $\Delta\Delta\Delta\Delta$,
this means some fault warning. Consult fault report.

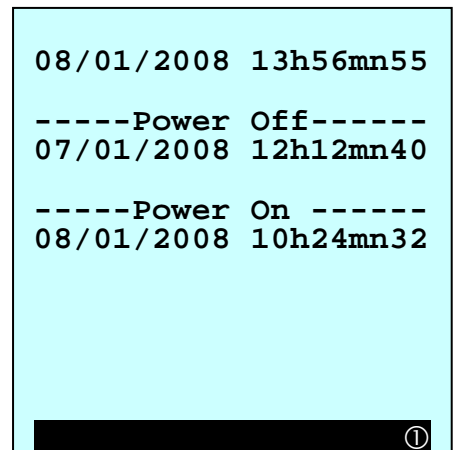


This screen shows the actual
date and time

And also the battery condition
(see 2.4)

This screen shows also
the actual time and date

And traces the date and time
of the last powering Off / On



Measurement menu can show other displayed screens depending on the activated functions in Configuration menu.

We treat this matter in the corresponding chapters:

- § 12 concerning data logger
- § 13 concerning data logger
- § 14 concerning the analogue outputs
- § 18 concerning the inputs and special functions
- § 19 concerning the heat flow measurements.

6.2 Signal Acceptance Criteria (See § 6.1 for the available screens / values)

In 95% of the applications, reading directly the flow display results would be sufficient and also accurate if all above steps have been respected.

Meanwhile, to insure the best results and the best reliability, we highly recommend you to train yourself on the following tests. **Never forget that the pipe itself has also some influence on the signals!**

Although the UF 801-P tries always to manage any situation up to its physical limits, the site conditions knowledge could permit you to avoid some traps or unsuccessful tries.

The echo display menu will give you first acceptance criteria. With experience and depending on the probes that you are using in your application field, you will know what is normal, difficult or impossible. See § 10.

Especially from this menu, you will train yourself on what is a good shaping of echo signal. A fast rising edge makes easier is the automatic threshold adjustment and time triggering point.

The second criteria is the amplification gain: lower it is, less sensitive will be the device to EMC noises or less will the interference risk between the ultrasonic signals through the flowing fluid and those travelling through pipe wall.

Echo display menu gives also some idea about these existing noises.

The third criteria, especially with water flow applications, is the very reliable relation between the water temperature and the sound velocity.

From transit time measurement and set pipe dimensions, UF 801-P displays the sound velocity.

In the appendix (+ NT 122), we give a table with theoretical values.

If shown value is very different, you must question yourself on the reason why: may be entered pipe dimensions are not correct; may be the probes distance has not been respected.

A difference of 1% on C could cause around 1% error on the flow result.

The fourth criteria is the zero flow balance setting and its possible influence on the relative flow result. When we deliver a pair of probes, we check them at zero and sometimes it is necessary to match them. But, the pipe can also have some influence !

Thus, have a look on actual Delta t or its possible range and compare it to statistical zero offset.

If this report is negligible, you can forget the zero flow checking procedure.

If the comparison imposes you to do not take this risk, check this zero offset, if possible.

***The Simple mode menu do not allow you to do compensate this Zero.
To permit it or the Auto-Zero, you must select Normal or Expert Advanced modes.***

7 –NORMAL & ADVANCED SETTING MENUS

The Normal mode allows deeper flow investigations on any fluid or application including water.

You must select it (or Advanced) for petroleum products, most of chemical products and also gas flow applications.

The Advanced mode is not reserved only to experts. It allows more possibilities as:

- Settings on pipes with up to 3 layers (internal or external liners)
- Adapting the Kh within the turbulent to laminar flow transition range
- Entering a 2 slopes filtering on a Delta V threshold

The Advanced mode permits extra features as:

- Setting the amplification in manual mode,
- Entering a linearization curve,
- If accepted by an Ultraflux code, the access to Factory Settings menu including a test menu, special probes setting and specific ultrasonic signal treatments TRT-ER.xx.

7.1 Additional Parameters included in Normal Settings Menu:

Compared to Simple mode menus, there are two separated screens for pipe and fluid.

You can also adapt the memory time and the flow response filtering.

```
----- PIPE -----  
  
-----Tube-----  
Ext.Diam. = *****mm  
Ext.Circ. = *****mm  
  
-----Wall-----  
Material 1= xxxxxxxx  
Thick.1 = ***.**mm  
Sp.Sound = ****m/s  
(If Other)
```

```
----- PIPE -----  
  
-----Fluid -----  
Product = OTHER  
Co = 1250 m/s  
Delta C = 300 m/s  
KH mode = AUTO/MAN  
Viscosity= 2.5 CST  
Roughness= 0.15 mm  
  
----Calibration----  
CutOff Q = 5.00 l/s  
AutoZero = No / Yes
```

```
----- PIPE -----  
  
-----General-----  
Q Unit = 1/s...  
Memory = 30 s  
Filter = 10 s  
  
-----Graph -----  
Q Period = 1s to 24h  
Q Qmin = 0.0  
Q Qmax = 500.0
```

Most of these new settings do not require special comments.

It is very important to adapt the fluid settings to your application. We give in appendix some usual product physical characteristics.



If your product is not in the list, you can proceed to a temporary setting by entering an approximate Co and a large Delta C range, expecting just having an echo in the capture window. Read the returned Speed of Sound (Measurement menu), enter it instead of previous value, read and adjust the new distance between probes and check again. If new Speed of Sound display is very closed to this entered Co, you have a reliable estimation of this characteristic in your product.

A particular attention must be paid when using the Zero calibration menu.

As already commented, the Delta To offset can have a significant influence on the flow reading.

With the Cut-Off on Q, you can force a Zero Flow display below the set value (here, Q=0 if less than 5 l/s).

Attention! This does not mean that you have adjusted the zero! It is juts a blanking!

Practically, this function is rarely used on portable applications and is more reserved to dedicated installation devices.

The best procedure when you can is to do the zero control and, if too different from the expected value, do proceed to the zero setting.

- First, do the zero flow and ensure this situation: no leaking valves ...

If you read a too high Delta T value at zero expected conditions, check again if a little flow could stay, because a wrong adjustment would be worst than doing nothing!

- When these expected conditions are OK, you have two solutions to compensate this offset:

1- Manual method : read this Delta To, and enter it in probes menu at Delta To line.

2- Automatic method with AutoZero :
(see previous page screen)

Change No to Yes by setting the averaging time that you can select from 30 sec. to 5 mn.

Longer is this zero offset estimation time more accurate is the result (there are always slight fluid movements in a pipe or they take a very long time to be null!)

```
----- PIPE -----  
-----Chord1-----  
Delta T0    = x.xx ns  
Probe       = xxxxxx  
Mounting    = V/...
```

Attention! The flow must stay at zero during this averaging and auto-setting time.

After the UF 801-P has acquired this actual Zero offset and it does automatically the zero balance.

Important! This zero setting is attached to the installation where it has been done.

Thus, when you move everything to the next measurement point, never forget to reset this previous Delta To in probes menu.

This zero offset adjustment is not possible everywhere. But, you can do a partial zero as follows. This method is very useful on small pipes and quick flow tests.



When you are using the same probes for many successive flow tests, connecting always the same probe at cable termination plug Nr.1 (upstream probe) and thus the other to plug Nr.2 and doing the zero test once on a selected section will permit you to carry UF 801-P + Probes offset.

The only cause of remaining offset would come from the pipe itself.

7.2 Additional Parameters included in Advanced Settings Menu:

Exact Setting on a multilayer pipe:

In the other modes, you can simply enter the whole thickness and a material Speed of Sound (CM) that takes in accounts the diverse materials and their %.

Here, this setting is much more accurate.

If there is only two materials, set NONE at material 3

```

----- PIPE -----
-----Tube-----
Ext.Diam. = *****mm
Ext.Circ. = *****mm

-----Wall-----
Material 1= xxxxxxxx
Thick.1 = **.*mm
Material 2= xxxxxxxx
Thick.2 = **.*mm
Material 3= xxxxxxxx
Thick.3 = **.*mm
Sp. Sound = I Other
    
```

Turbulent to Laminar transition range:

We remember you that the Kh varies from some 1.10~1.14 at lower limit of turbulent state up to 1.333 when the laminar flow is established.

In the other modes, the UF 801-P manages this transition. The typical entered values (Critical Reynolds=2800 / LBR=3) offer good results on viscous fluids as hydraulic oil ...

Here, you can adapt these settings to your fluid and your installation by adjusting this Reynolds Critic and the transition range with LBR.

On Air / 1 bar, Reyn Crit=1500/LBR=4 is better.

On crude oil, Reynolds=2500/LBR=5 give good § 19 concerning the inputs or special function results in this transition area.

```

----- PIPE -----
-----Fluid-----
Product = OTHER
Co = 1250 m/s
Delta C = 300 m/s
KH mode = AUTO/MAN
Viscosity= 2.5 CST
Roughness= 0.15 mm
Reyn.Crit= 2800
LBR = 3.000

----Calibration----
CutOff Q = 5.00 l/s
AutoZero = No / Yes
    
```

We remember you that this transition is very weak. We can only speak about statistical results.



Supposing a very low Reynolds number that may force a Laminar flow profile: After some "T" fitting or any pipe bend or similar, the flow will become temporary turbulent and will recover its laminar profile after 15 to 25 pipe diameters.

Installing the probes just after the disturbance will force a turbulent flow: setting KH=Manual= ~1.10 could be more efficient that letting the unit manage the coefficient.

If you would like to know if upstream distance is sufficient to recover the laminar flow, please do two or more tests: a first just after the disturbance and another after the maximum distance. If these two tests are showing around +20% difference on the second test, this means that the flow has really become Laminar.

Optimisation of the flow display filtering / response time:

A high filter value gives very stable flow readings.

But, if the actual flow changes suddenly (starting of a pump for instance), the UF 801-P flow display will be in late and not realistic during some time. Same when this pump stops.

The Delta V Filter parameter offers an efficient compromise.

The UF 801-P surveys the raw acquisitions (Delta T) before the filter. The raw flow velocity is calculated from this Delta T.

Thus, if this raw V result changes suddenly, setting a threshold (Delta V Filter) in relation with your installation will permit to by-pass the filter on the flow reading during this transition.

As a consequence, the UF 801-P has a fast response time during this flow transition and a stable display in stable pumping conditions.

```
----- PIPE -----
-----General-----
Q Unit      = 1/s...
Memory      = 30 s
Filter       = 10 s
DeltaV Filt=0.5 m/s

-----Graph -----
Q Period    = 1s to 24h
Q Qmin      = 0.0
Q Qmax      = 500.0
```

Advanced tests or Settings on Amplification Gain Management:

These settings are reserved to experts or are done under Ultraflux's recommendations.

The amplification gain can be set in Manual mode

or its max. range can be limited to avoid some EMC or other noises capture risks.

```
----- PIPE -----
-----Chord1-----
Probe (SE)  = xxxxxx
Mounting    = xxxxxx
Ext.Coeff   =Auto/Man

Delta To    = x.xx ns

Gain Type   =Auto/Man
Gain Max    = xxx dB
or Gain     = xxx dB
```

If allowed by Ultraflux, it could be possible from the Factory Settings menu to adapt the digital treatment by the DSP processor on the ultrasonic signals.

Never play by changing actual treatment mode with this menu if you do not have any instructions from Ultraflux.

```
--Processing U.S.--
TRT_ER1    = *x****
TRT_ER2    = *x****
TRT_ER3    = *x****
```

Advanced / Expert mode allows two more possibilities from Factory Settings menu.

The first one is the possibility of setting special probes.

We recommend using the PC Software for such entering.

- **To** is the dead time through the probe face or wedge.
- **F** is the probe crystal frequency.
- **Angle** concerns only clamp-on probes. We set the typical refracted angle in carbon steel.
- **The attached text** can only be entered with the PC Software.

| ---SPECIAL PROBES--- | |
|----------------------|-----------|
| -----Probe SA----- | |
| To | = xx.x μs |
| F | = x MHz |
| Angle | = 54°x |
| Text | = abcd |
| -----Probe SA----- | |
| To | = xx.x μs |
| F | = xxx kHz |
| Angle | = 0°x |
| Text | = efgh |

The second possibility is the entering of a linearization or error compensation curve.

This function is rarely used with a portable unit.

Meanwhile, for users who would need the best accuracy guaranties and who have very repetitive applications (with may be a special configuration or disturbance), they can compare the UF 801-P flow response with a standard in a calibration plant.

UF 801-P permits entering of a different compensation curve for positive flows (+Q) and for negative (-Q).

From the error curve results, enter the compensation coefficient in the range as the symmetric value.

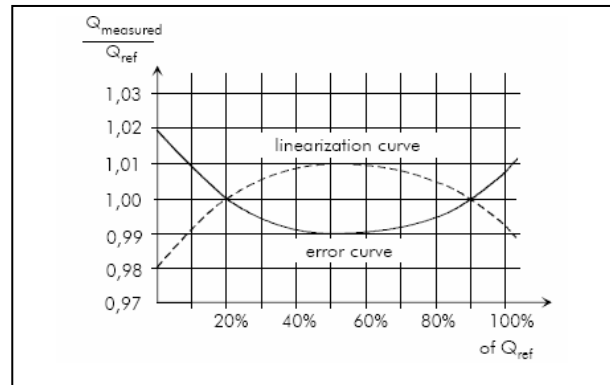
Note that the UF 801-P does a linear interpolation between two successive points. This 100 % is set in relation with a Q max (set in your flow unit)) that can be a little higher than your max. flow range Q max (flow curve, 4-20 mA ...)

Thus, supposing the whole error (UF801-P + Probes + Cables + Installation) at -0.8% at 30% of the range, you must enter a compensation coefficient=1.008 (+ 0.8%).

| ----- +Q or -Q ----- | |
|----------------------------------|--------------|
| Q Ref = 0 or x m ³ /h | |
| Coef. | 0% = 1.000 |
| Coef. | 10% = 1.005 |
| Coef. | 20% = 1.012 |
| Coef. | 30% = 1.008 |
| Coef. | 40% = 1.007 |
| Coef. | 50% = 1.005 |
| Coef. | 60% = 1.003 |
| Coef. | 70% = 1.001 |
| Coef. | 80% = 1.000 |
| Coef. | 90% = 0.999 |
| Coef. | 100% = 0.998 |

When this function is unused, let all the coefficients set to 1.000 and let the Q Ref at 0.

As the compensation curve is defined up to this Q max, it will stay inactive.



8 –MEASUREMENT MENU WITH NORMAL & ADVANCED SETTING

There is not any display difference between these configurations and the Simple Settings Option.

Indeed, with simple option, the UF 801-P forces the unused parameters to a "By Default" value.

Anyway, because these normal and advanced options are permitting more accurate data to define your application, the global accuracy should be better or you should put more interest to analyse the technical displays.

Thus, for these different screens, please refer to § 6.

9 –EXTRA MENUS & DISPLAYS ON UF 801-P B (Dual Pipe)

The UF 801 Hardware permits to have two ultrasonic chords by multiplexing internal resources of the emitting/receiving circuits.

These two chords option can be designed for installation on a same pipe: this gives the Reference UF 801-P2 called Dual Chord version.

Compared to the one chord standard version, there are very few differences but two probes separated menus. After have selected Nr.of Chords = 2, the next menus architecture is evident and would not disturb the end-user.

Meanwhile, this option being mainly used on dedicated unit, rarely with portable units, we prefer to limit its explanations to these few words.

A more usual configuration is with these two chords to be installed on two different pipes. The Reference UF 801-PB is called a Dual-Pipes Version that presents real features of two flow meters in one package : QA and QB

In parallel, you only need a double set of probes + cables.

An UF 801-PB can also be set to work on only one pipe with Nr of pipes=1.

It will be very similar to UF 801-P but QT (as total flow) that appears and will be equal to QA.

After setting Nr.of pipes =2 (Pipe/Fluid Menu), you will have complete and totally independent resources to set your applications on two pipes.

Contrary to our MiniSonic PB, up to you to use different probes and have different fluids.

The operation QT from QA and QB can be set with coefficients = +1 / -1 or Zero : Sum or Difference ...

```
----- TOTAL Q-----  
  
-----General-----  
Number of pipes= 2  
QT Unit   =   m3/h  
QT =   +/-QA+/-QB  
  
-----Graph-----  
QT Period  =    5 s  
QT Q min   =   xx.x  
QT Q max   =   xx.x
```

UF 801-P B offers complete and separated screens for pipe A and pipe B in Pipes / Fluids Settings Menus.

Except the mention to pipe A or B, they are the same screens that shown in the previous § , Simple / Normal or Advanced configuration as well.

Examples :

```

----- PIPE A-----
-----Fluid -----
Product  =   OTHER
Co       =  1250 m/s
Delta C  =   300 m/s
KH mode  = AUTO/MAN
Viscosity=   2.5 CSt
Roughness=  0.15 mm

----Calibration----
CutOff Q = 5.00 l/s
AutoZero = No / Yes
    
```

```

----- PIPE B-----
-----Tube-----
Ext.Diam. = *****mm
Ext.Circ.  = *****mm

-----Wall-----
Material 1= xxxxxxxx
Thick.1   = ***.**mm
Sp.Sound  = ****m/s
          (If Other)
    
```

```

----- PIPE A-----
-----Chord1-----
Probe (SE) = xxxxxxxx
Mounting   = xxxxxxxx
Ext.Coeff  =Auto/Man

Delta To   = x.xx ns

Gain Type  =Auto/Man
Gain Max   = xxx dB
or Gain    = xxx dB
    
```

For each pipe, we mention Chord 1: this means the Chord Nr. 1 on considered pipe. Further dedicated versions could have two chords per pipe.

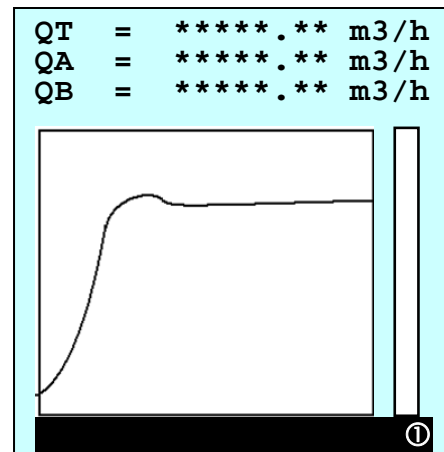
The main difference concerns the Measurement Menu: Two new screens are available:

```

QT = ****. **
      m3 / h

QA = ****. **
      m3 / h

QB = ****. **
      m3 / h
    
```



The displayed graph follows up your selection from QT / QA or QB

Technical Screens are identical to the previous ones, but with mention QA or QB

There are also two separated linearization functions.

In Factory Settings, there are separated menus to simulate values on Pipe A and B.

10 –ECHO DISPLAY MENU

10.1 When and How Use this Menu ?

We highly recommend checking Ultrasonic Signals Quality by using this high level built-in Oscilloscope Function.

So, you can detect if your installation conditions are very easy, if your selected probes are suitable or not ideal for this application or, if there is a fault report or a warning, you will know the reason why you cannot perform your expected measurement.

To use this function, select this menu header >

And enter in the menus with

V

The parameter **Q. max=** permits to adjust the Delta T display sensibility depending your application.

! It is not the exact Delta T. Firstly, its display is limited to $\frac{1}{4}$ of the ultrasonic signal period. Secondly, from Q.max setting, you can force a Delta T display for any small or large actual Delta T.

There are two graphic displays (4 if a dual chord / pipe vers

The first one shows, from the right to the left side of the screen, all energised signals (ultrasonic, but also noises) that UF 801-P is receiving and must filter and treat.

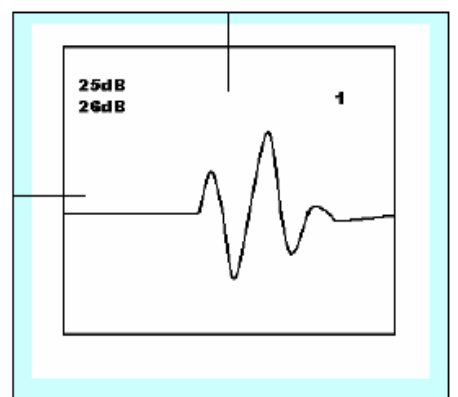
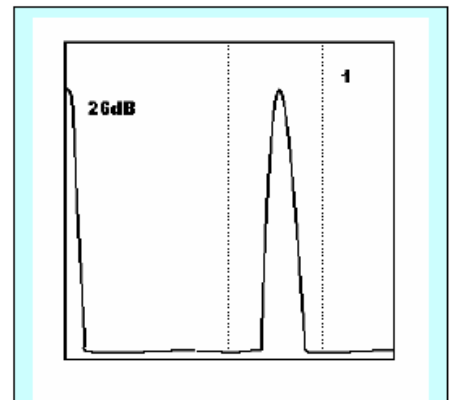
On this first screen, the two vertical dotted lines are showing the selection window that results from your settings as pipe dimensions or L, Fluid and probes installation.

Any signal out from this window will be ignored.

The second screen is an expanded view inside the above window that results from the digital acquisition-tracking window, our "electronic lens" for ultrasonic.

This screen shows, if all is OK, two dotted lines.

- The vertical dotted line shows where is triggered the transit time measurement (usually at zero crossing).
- The horizontal one shows the automatic threshold result, thus the edge selection on the echo signal.



10.2 Echoes examples/Criteria

What are the criteria to say that this echo is good or acceptable for a temporary test, or else risky for the flow results or even impossible for DSP treatment?

The UF 801-P is so performing that usual limits are pushed up. Anyway, have a quick look on your actual conditions could avoid you some traps or, worst, bad results with possible consequences on your flow diagnostic.

To help for your own experience, we give below some typical pictures of echoes display.

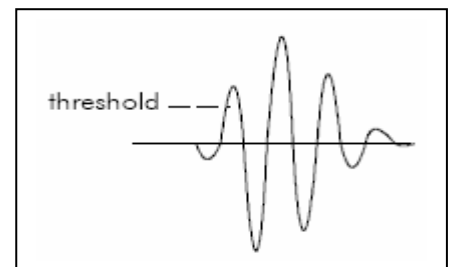
So, you will learn by experience that an echo shape is more propitious when distance between probes is a little bit shorter than asked distance. A larger distance has the contrary effect.

This is due to the total beam surface in comparison with multiple echoes in pipe wall thickness and thus the multiple possible combinations.

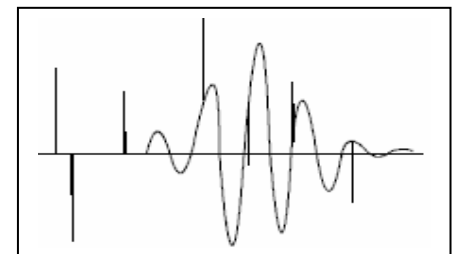
Same, probe frequency, from its wavelength in pipe material compared to pipe thickness, has influence on the echo shape. This could lead you to use higher frequency probes.

Last point, this probe frequency let more or less influence from the pipe roughness, corrosion or internal deposits.

Here is a good echo: low amplification gain (35 dB), low noise level, fast signal rising.

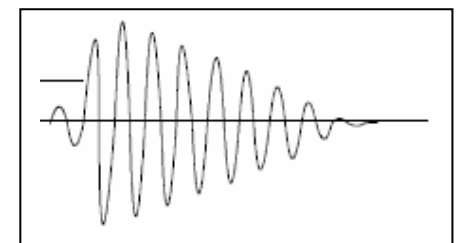


At contrary, here are very difficult conditions: high gain (65 dB), noise, bad shape.

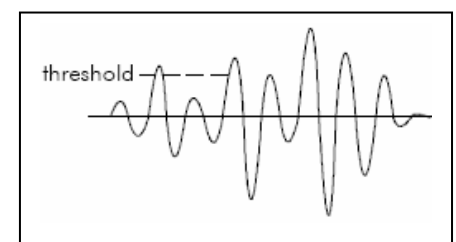


Here below, we compare signals on the same pipe with different probes.

First example shows the benefit of higher frequency probes on a thin and very clean pipe:



Second example shows the benefits of lower frequency probes on a thick and corroded pipe:



11 –OPERATING WITH PC SOFTWARE

Some earlier information is given in § 3.4



Setup Ls801pW
01_A.exe

11.1 Installation & Connection

A double click on Set-Up*.exe icon launches the installation.

By default, you can accept the proposed options (path / folder...) until completed.

The only operation to install and accept our Macro and thus the automatic tie with Excel is to adapt its safety level for Macros (Tools / Safety / Medium / Valid)..

To connect a UF 801-P to a PC, you need the dedicated cable that is delivered in the package. Connect it as shown in 2.2.

If your PC does not have any RS232 serial port (DB9), most of USB <> RS232 converters are accepted by PC and UF 801-P as well. Most are limited to 9600 Baud rate (*).

Ultraflux can provide such a suitable converting tool. Ask to our Sales Service.

To establish the connection and the dialogue, the UF 801-P must be ON.

UF 801-P communication parameters are set by Default as shown already in the configuration menu, § 3.3:

Note that the exchange protocol is JBus/ModBus that requires for any instrument a slave number.

By Default, set this slave **N° JBUS at 1**

The Bits rate or Baud Rate can be set from 300 up to 115200, that is much more faster and thus better for the data exchanges. Set **Bits Rate at 115200 Bd (*)**

```
LANGUAGE : ENGLISH
-- STATION'S NAME --
XXXXXXXXX
---- BACK LIGHT ----
XXXXXXXXX

---PC CONNECTION ---
N° JBUS : XXXXXXX
Bits Rate: XXXXXXX
```

() : If OK, but the same on UF 801 & PC*

To launch our Ls801PW software, do a double click on the *.exe Icon that shall be installed on your PC Desktop:



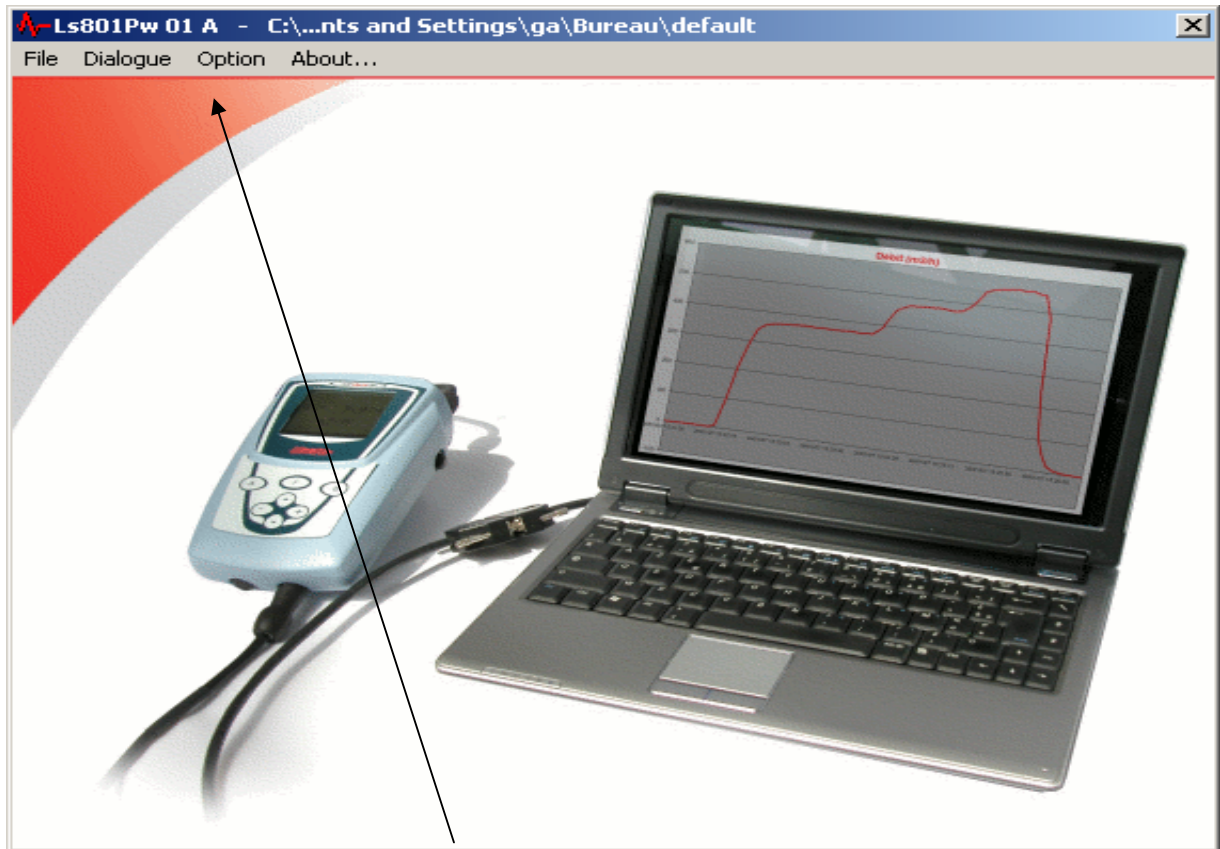
You can also do it from your browser from the folder where is installed our Software: **C / Program Files / Ultraflux / Ls801PW xx / Ls801PWxx.exe**

Note that there are, after a first connection, other files in Ls801PW folder, as.

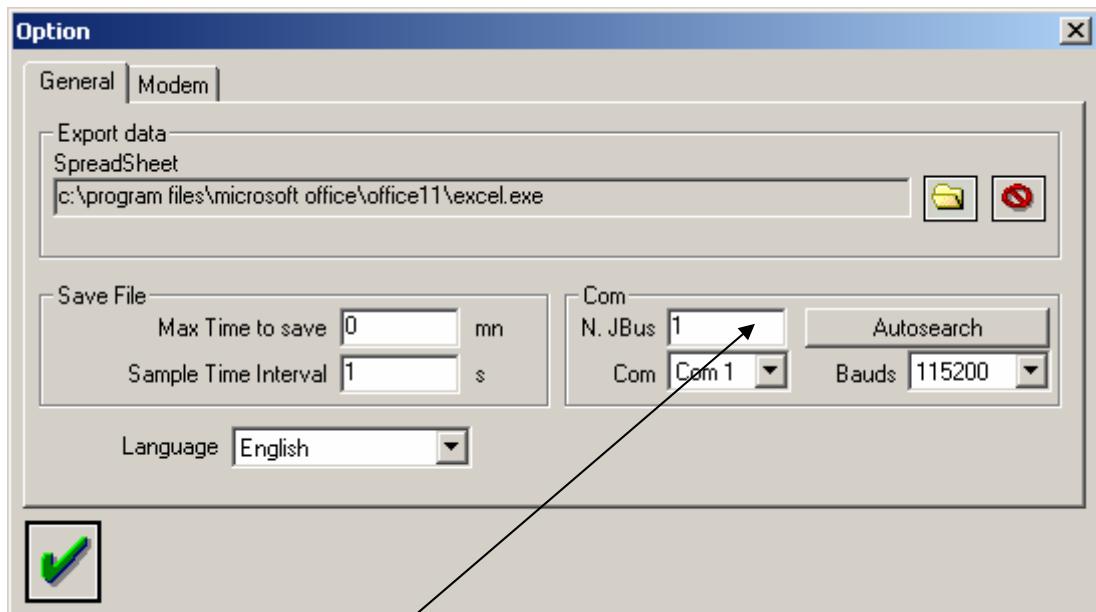
- The Excel Macro
- A data folder to store saved files.
- Already or last saved Config.that have been validated by:



This following screen must appear on your PC:



Select firstly with your mouse the Option Tab:



You can select your interface language. You can see the existing tie with Excel.

You can adapt the Com. Parameters as those already set on UF 801-P, but the easier method is to click on **Auto Search** that must find these settings plus find the Com Port that is decided by the PC in case of USB converter (UF 801-P at 9600 Bauds ?).

Software displays the following message: **The Connection has been Successful**

Now, everything is ready to use the other Tabs, especially Dialogue Tab.

The Tab "Files" permits to open an already saved file (File / Open) or to start a new Settings File for later up loading (after saving) to an UF 801-P, as it is possible from Dialogue Settings option. Just note that this menu offers only "Normal Mode Menu".

11.2 Importing, Saving and Uploading a File with "Dialogue"

Clicking on "**dialogue**" Tab offers in standard (*) the following options:

() If allowed by Ultraflux with a confidential code (CUSF procedure), other options can appear. Some are reserved only to Ultraflux. Some could concern authorised maintenance people or experts. We do not give any information about that in this manual.*

Logger menu is explained in § 12.2

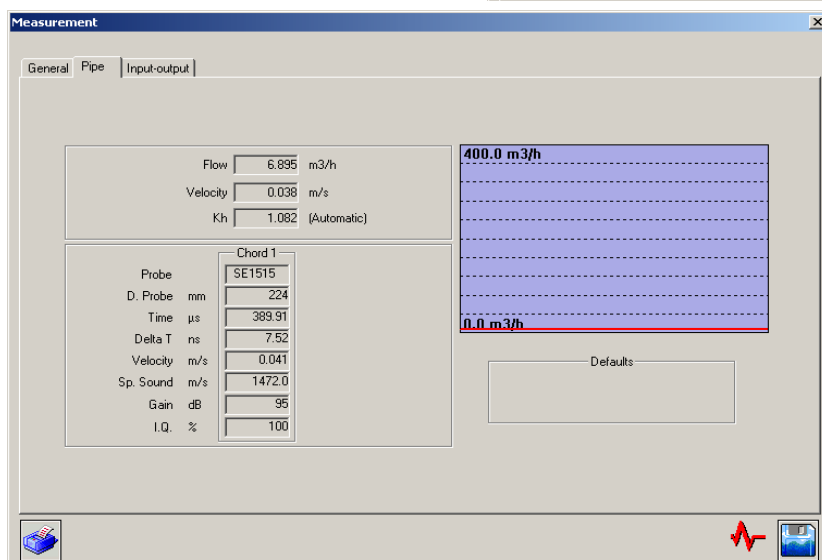
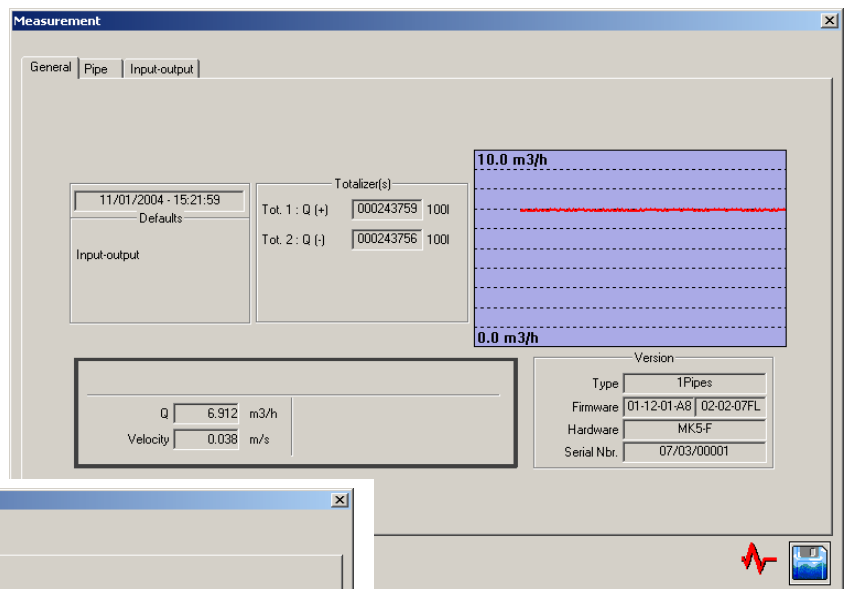


Clicking on **Measurement** option permits to import the actual values on the UF 801-P

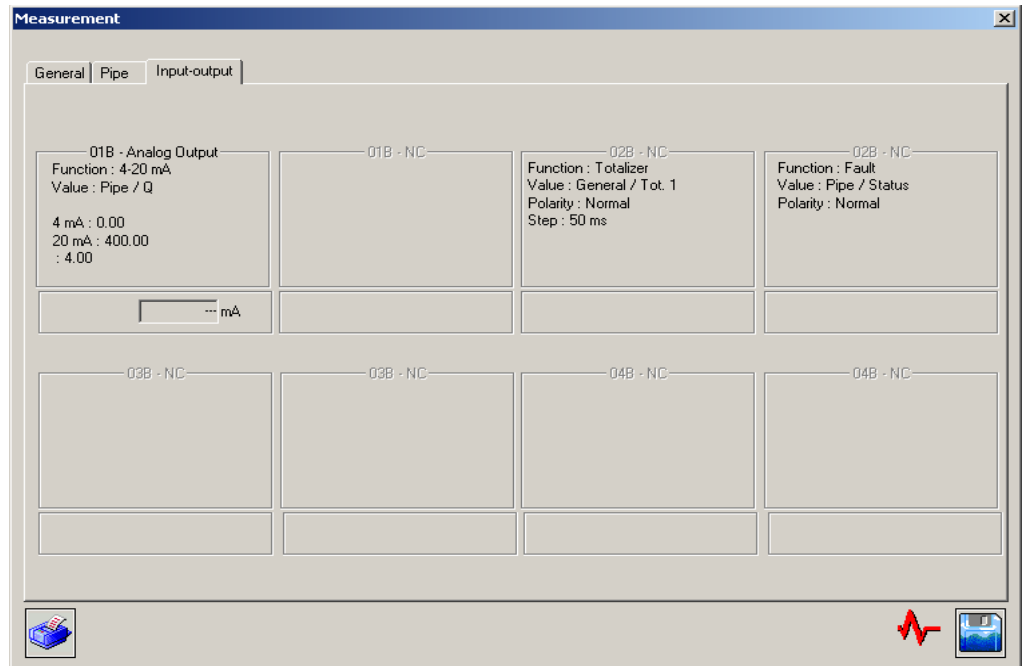
The refreshment period is every 1-second in standard.

There are three display screens:

- General with Tot.: >
- Pipe with technical data
- Pus one (pipe B) with a dual chord version.
- Input Outputs (next page)



Inputs / Outputs screen:



Note the three Tabs at page bottom.

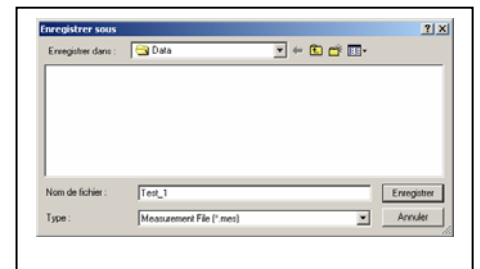


A click on this Tab launches measurements saving as a file into data folder (or any other from user choice).

The software invites you to give a name and to confirm the folder.

Then, the records will be done at sampling time period, and for the duration, that are set in option menu "Save Files" (see some pages before).

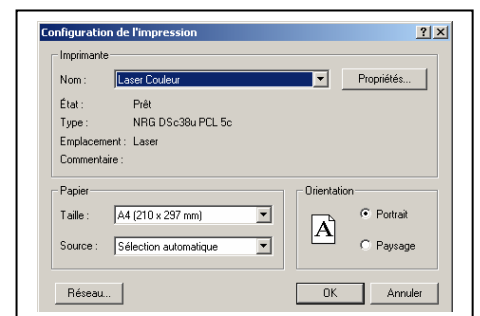
Setting Max Time = 0 means manual stop.



Later, you can read, print, treat with Excel these records from File / Open / Selection Menu.



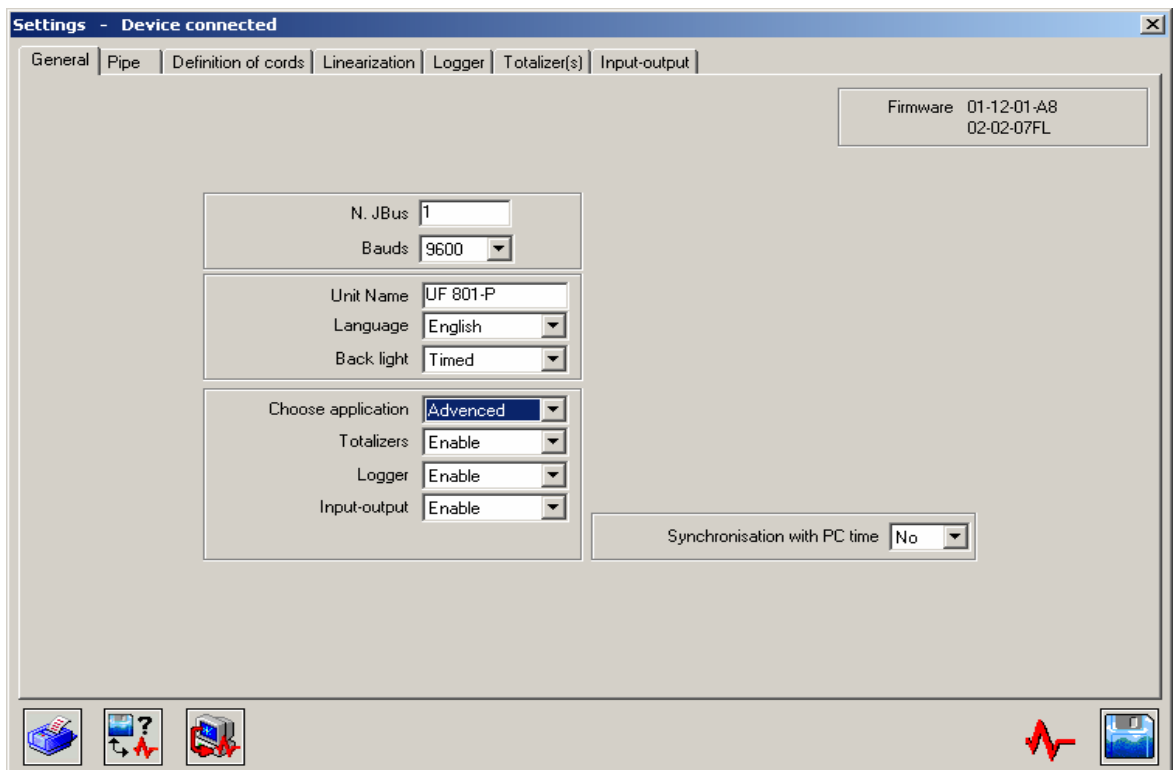
A click on this Tab permits a printing after you have confirmed your printer.



This Icon is unused in this mode.



Clicking on Settings option permits to import the actual Settings on the UF 801-P

As it is with the keypad use mode, you can select the degree or complexity of your settings from the Tab "General" / Choose application / Level = *Simple* / *Normal* / *Advanced*.



As it is allowed with keypad operations, you can enable Tot / Logger / I_O functions.

This PC interface permits to set the UF 801-P clock at PC time and date.

To do it, only select  before sending to UF 801-P by 

This clock setting is very important for your data logger records.

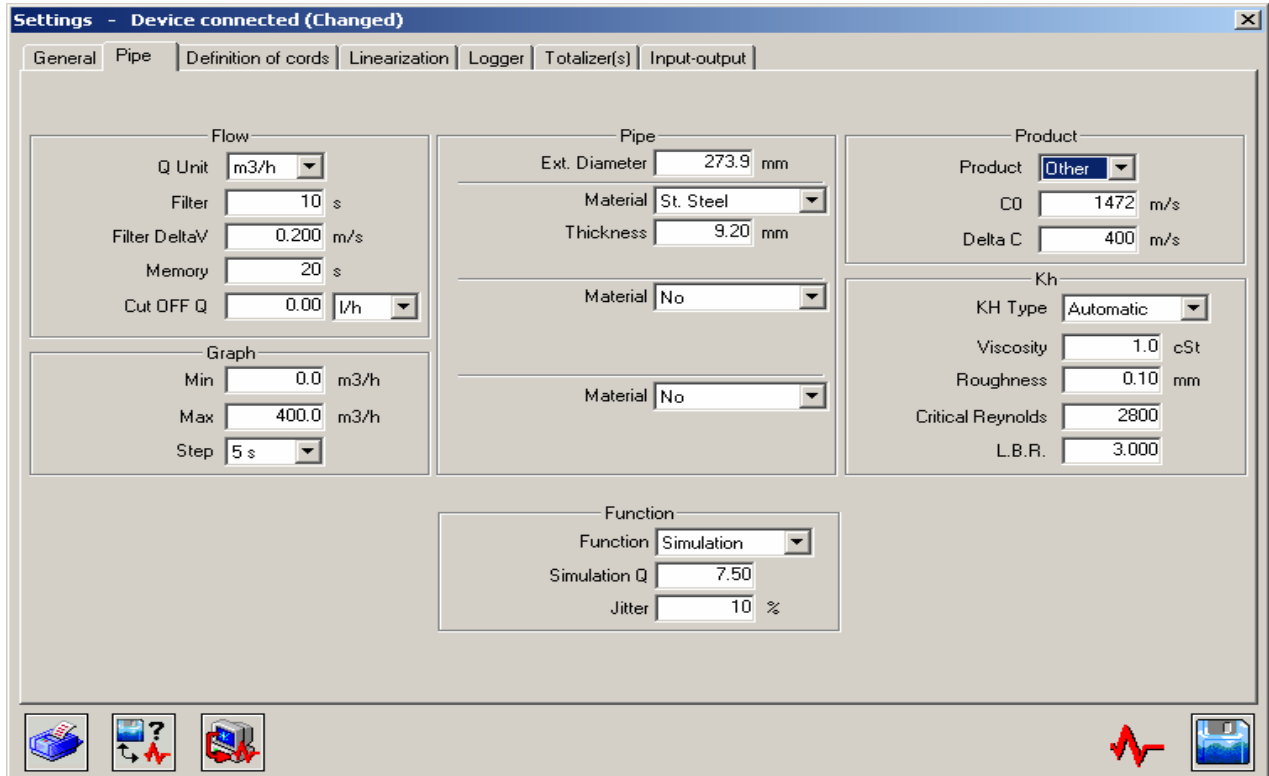
- It must set in accordance with your country time.
- As this time & date are secured by the instrument battery, every time that this battery will have a too low voltage detection or will be disconnected (after sales service), it will be necessary to re-init them (otherwise, it restarts at 01/01/2001).

On the menu header, you can see a Tab for the different items: Pipe_Fluid_Flow / Probes / Linearisation (only advanced) / Enabled Functions.

There are few comments about. All parameters that you can access with the keypad are here grouped in similar menus.

You can change them, export them  and save them in a file with 

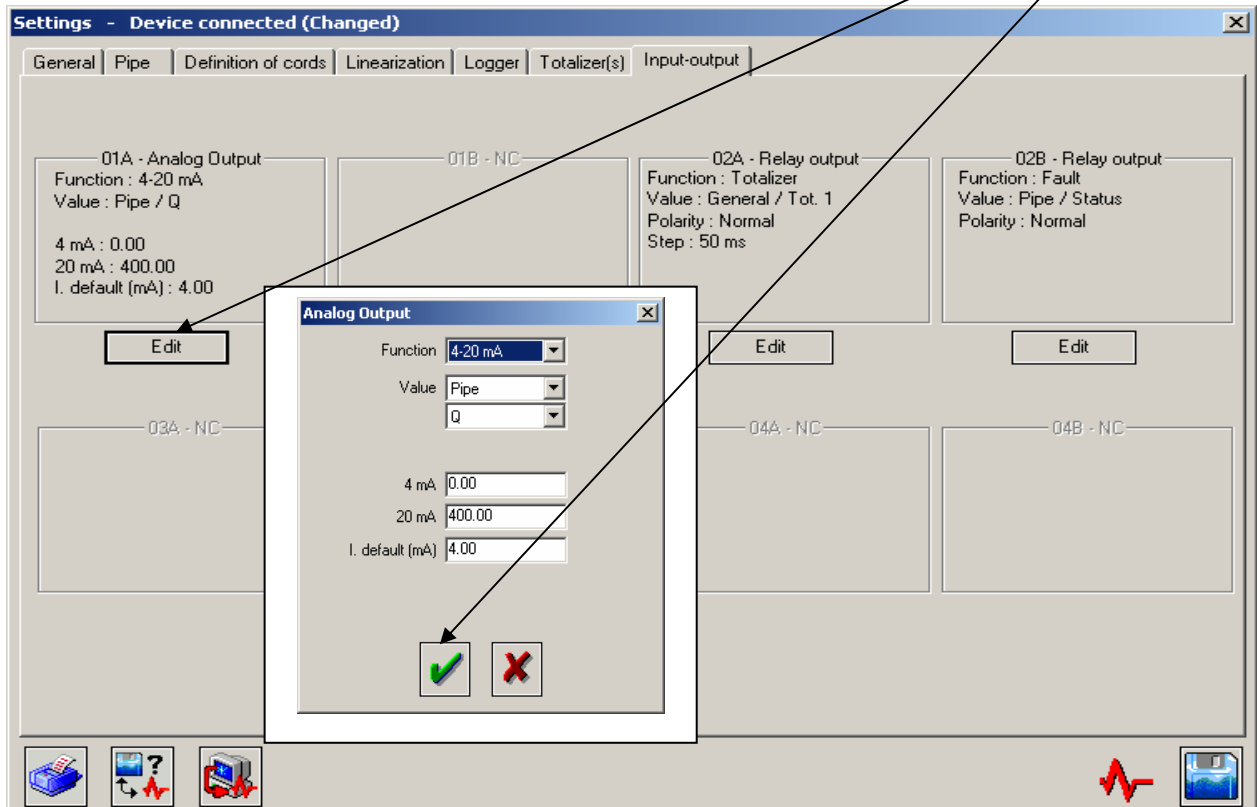
Here below, we show as an example the advanced option Pipe / Fluid / Flow setting menu:



With a Dual Pipe version, you will have doubled data.

Note that the Linearization menu offers the possibility to reset to 1.000 all the coefficients.

The PC menu can be very useful to set your functions that you can see or edit / modify



11.3 Archiving and/or Printing a File

Saving and archiving a file is very useful for later treatment of your expertise results. All these files can be opened later from Files / Open / Given Name

Measurement results: Their record can be a useful complement to data logger records > §12.

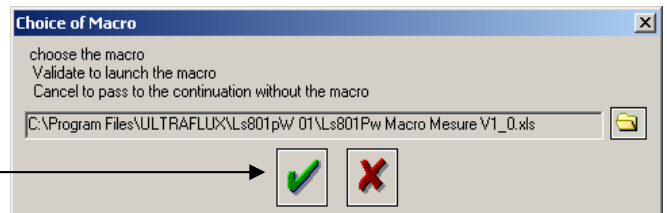
They are exactly presented as you can see in 11.1, plus some icon at bottom of pages.

Indeed, they are the more complete records (*.meas) and they act from actual conditions if you need a certified statement report.

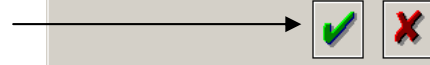
- Any of these records can selected with  to be printed separately with 

- If you have done many records (Config. Option / General / Save Files / Period ...), you can treat them by using our Excel Macro and edit flow curves.

This Excel tie is launched with 



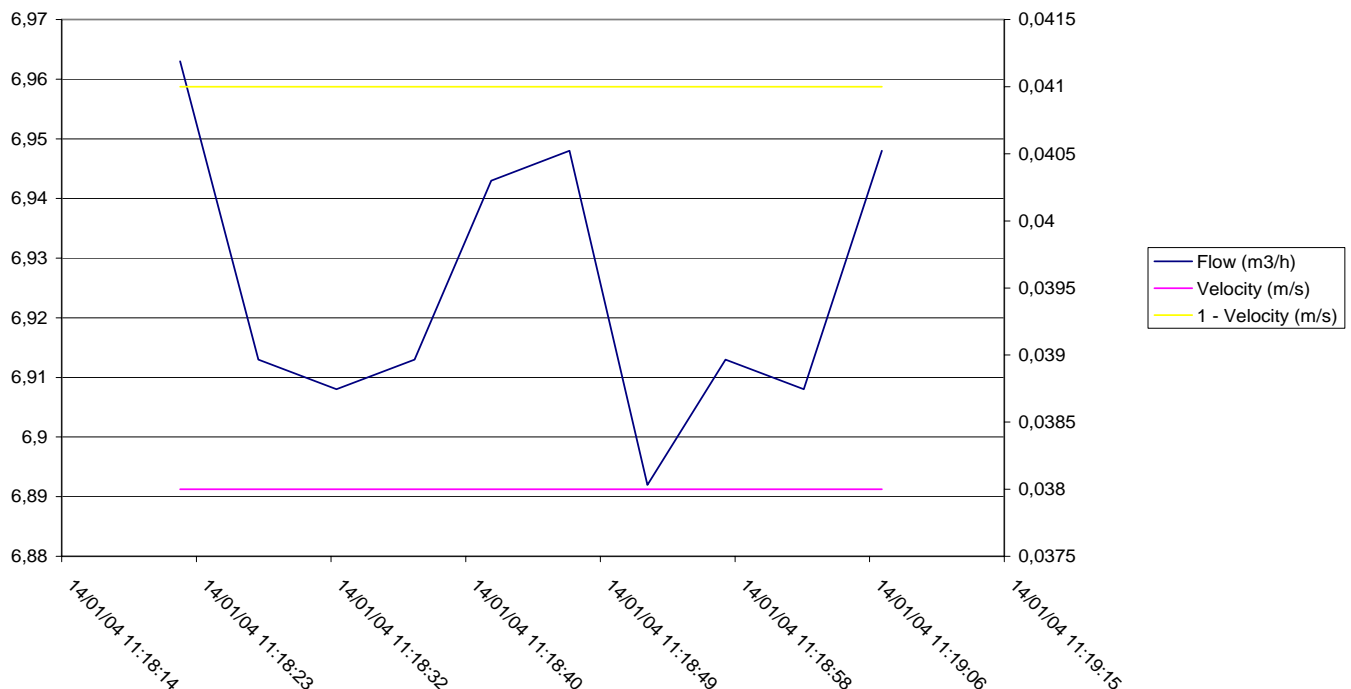
Software asks you the valid this connection by



After have confirmed the file, another message from Excel asks you to accept (activate) the Macro which safety level has been already set (see before).

The results are arranged in Excel lines and columns and an automatic flow and velocity curves is edited, which you can also adapt yourself from the data.

Flow



Settings menu files.

No need to save all your operations, thus to have always a PC available for the UF 801-P

The UF 801-P has some dedicated memory space to store two actual configurations (see § 16).
> *After, you can call them back with Load, edit or use them again or, simply, save them on PC.*

Anyway, there are many reasons to save these settings menus on a PC:

- The first one is that any flow measurement is depending from these settings (pipe diam. , probes choice, fluids setting ...).
> *In case of later doubt, you must remember your test conditions and attached data.*
- If a flow control is frequently asked or its purpose is the following up in the time of another flow meter, a pump or any process, it is much more rigorous the save the settings once in a PC file and upload them every time you have to do this control.
> *Then, you will have the best guaranties to repeat these control results.*
> *Remember always your exact probes position and repeat it as close as you can.*
- If you want to share the settings or actual results with another end-user or to carry them on another UF 801-P, this saving/uploading is an easy and rigorous mean.
> *With Option Save All, you will have the more completed recording (settings + Measur^t. + Factory or other hidden menus and echo).*

If you have many clients or sites to expertise or supervise, we recommend creating sub-folders in our main data folder or another in your documents file.

Same, when you save a file, we recommend attaching the date at its name as, for instance:

C:\Programm files\Ultraflux\Ls801PWxx\data\Site_Client\Pump Nr xx_Year_Month_Date

You can print your actual calibration file, or any saved file as well, by clicking the printer icon.
The presentation is slightly different, only to limit number of pages. Example in Simple mode:

| General | | | |
|--------------------------------------|-----------------------------|-----------------------------|--|
| General | | | |
| Firmware = 01-12-01-A8 02-02-07FL | N. JBus = 1 Bauds = 9600 | Choose application = Simple | Logger = Desable Totalizers = Desable Input-output = Desable |
| Language = English | | | |
| Back light = Timed | | | |
| Unit Name = UF 801-P | | | |
| Pipe | | | |
| Pipe | Flow | Graph | |
| Ext. DianQ Unit = m3/h mm | | Step = 5 s | |
| Material Filter = S = 3t10 s | | Min = 0.0 m3/h | |
| ThicknesMemory = 9.20 sim | | Max = 400.0 m3/h | |
| Cords | | | |
| Probe | SE1515 | | |
| Probe mounting | V | | |



This function permits to compare 2 files and to give a difference table (dedicated devices)

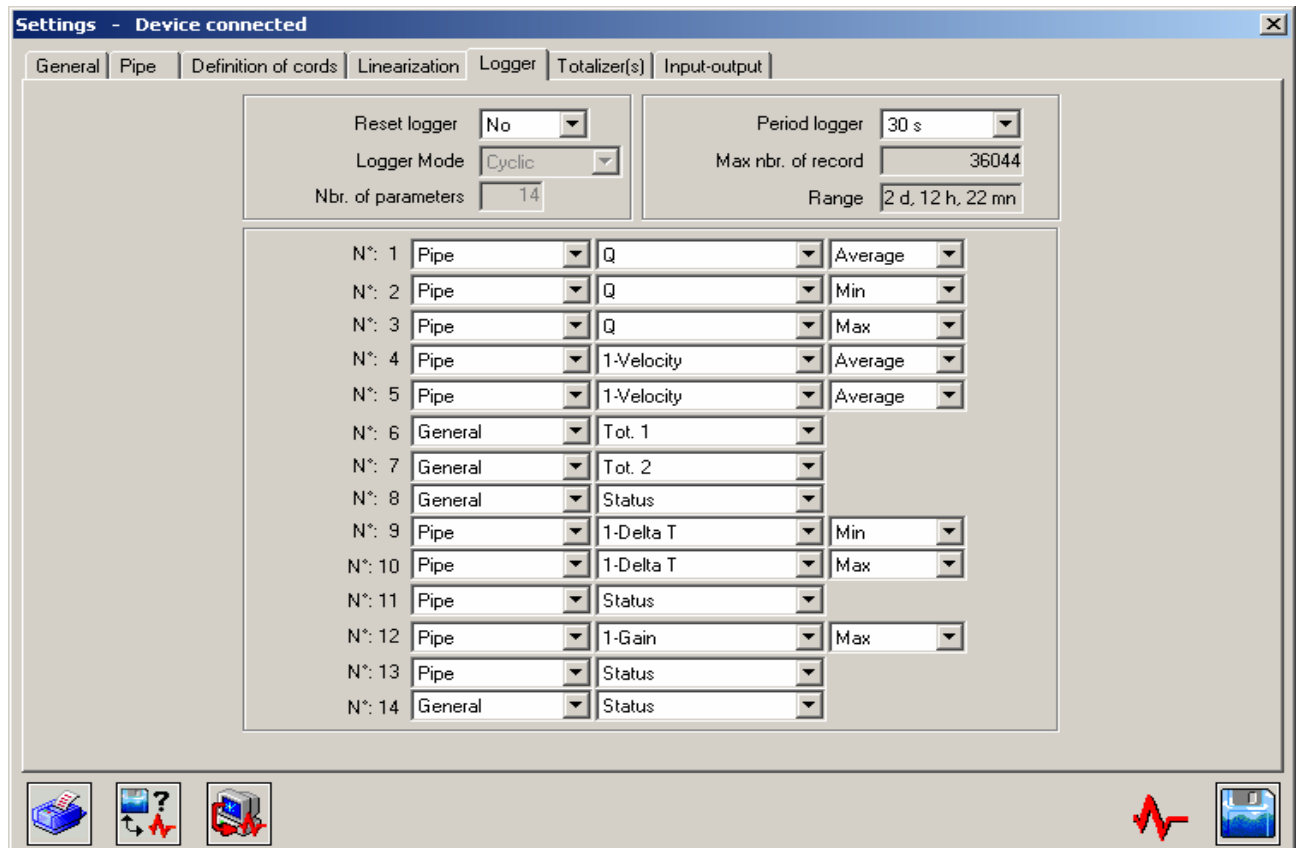
12 –DATA LOGGER / Storage Functions

UF 801-P / P B have a very large flash memory space to store the running flow and attached data measurements. Up to you to use it for the best.


First operation consist to [enable this resource](#) from Keypad / Config. Menu or from PC Software, Settings / General.

12.1 Setting the Data-Logger

If you would prefer using the PC Software, select this Data-Logger tab in settings menu:



If you prefer entering settings from the Keypad, you will have some successive screens , as:

| | | |
|--|---|--|
|  <p style="text-align: center;">LOGGER SETTING</p> | <pre> --- LOGGER RESET --- xxx -Nbr of parameters- ***** -----Logger Mode----- xxxxxxx -----Logger Step----- xxxxxxx -----Logger Range----- xxxxxxxx </pre> | <pre> ----- VALUE 1----- Pipe1/Input/General Q AVerage ----- VALUE 2----- Pipe1/ C1 Max ----- VALUE 3----- General Tot 1 xxxxxx ----- VALUE 4 Input/Int. Fct. XXXX xxxxxx </pre> |
|--|---|--|

Data-Logger can store up to 14 (*) simultaneous values + their time & date.

(*) Greater is this number, less is the total amount of records (or logger range).

To adapt this number to your requirements, you need first to **Reset the Data-Logger**.

Do not forget to save the previous data if there are.

Same, the Data-Logger can be set as **Cyclic or Stop when full**.

Next setting is the Logging Step or Period. Shorter it is, shorter is the available time.

UF 801-P displays this available time (Nr of days / Time / mn).

For most of data selection, UF 801-P proposes you to save the average value during the recording period or the min./max. peak values.

*This is very important compared to most of data loggers available on the market that only can record samples: **with UF 801-P, there is not any information loss.***

Even with a long period, thus with less records, you can keep a very high accuracy by saving your data treatment time.

After that, you can select the data that you could need or those that are interesting to follow up the quality of the results.

Note that some values as Q (flow) , Velocity (V), ... are attached to the pipe (pipe A or B if a dual chord version) and some others are classified General values as the totalizers and also QT if a dual pipe version.

Fill up this recording table and accept it by leaving the menu or by up-loading it from PC.

Data-Logger is ready and will start immediately its records as long it is ON or it is full (if stop when full option).

At any time, from display and measurement menu, you can see some data-logger info as Max number of records, Nbr of written records and the time and date of the last record.

But, there is no display of these saved values on UF 801. Only Software permits the reading.

```
--- INFO. LOGGER ---
-Max Nbr of records-
*****
-Nb written records-
*****
----Last record----
01/08/2007 11h09mn00
```

It can be useful to stop temporary the records during the probes installation for instance or any other adjustments. This permits to avoid uninteresting sequences. You have two means:

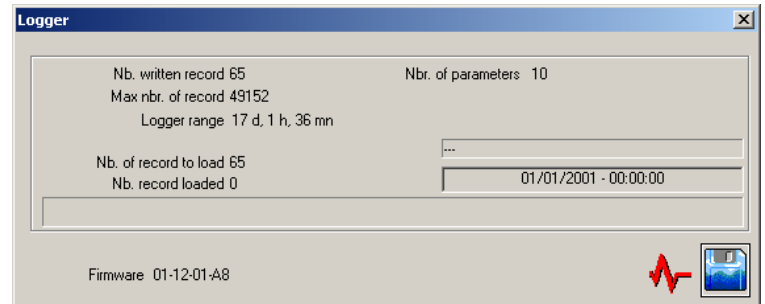


- Or change the recording period
- Or disable temporary the data-logger

Do not forget to restore these parameters in due time.

12.2 Reading the Data-Logger : *You need the Software / PC connection.*

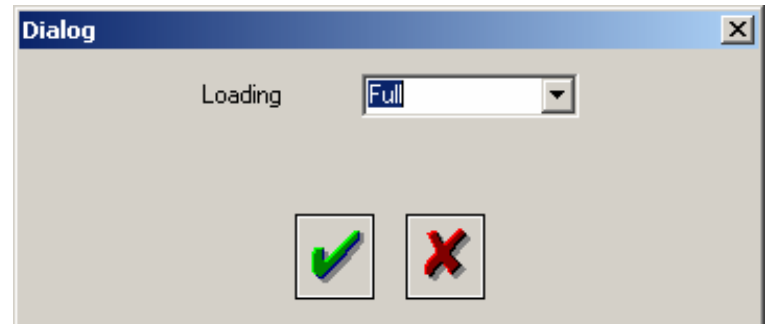
Select Dialogue / Logger,
that opens following window:



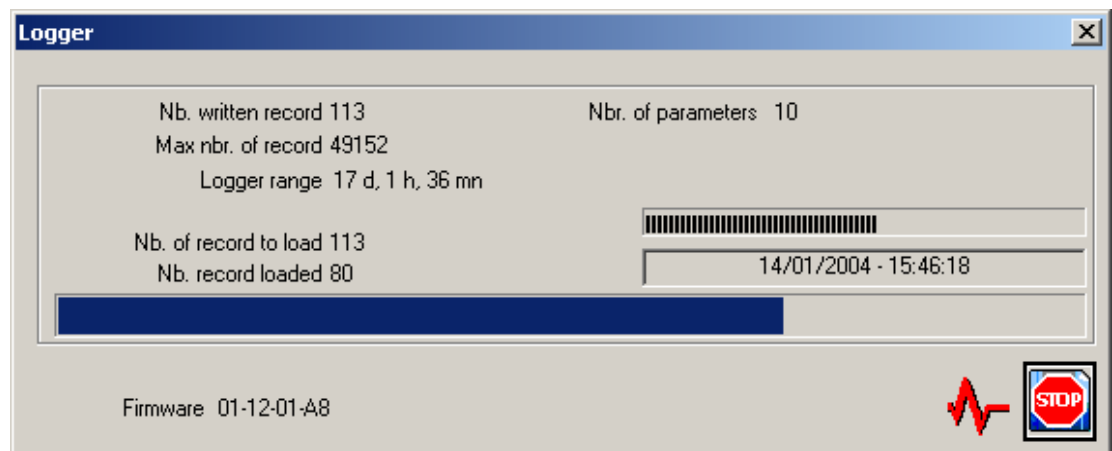
Clicking on Diskette icon opens a
second window with two options:

- downloading **fully** the data logger
- downloading **from a chosen date.**

Confirm with the green tab.



You are invited to give a name to the file to be saved. Then, **downloading starts automatically.**
You can see it "in progress" as follows:



Clicking on Stop closes the file at reached Number / Time.

This file is stored "by default" in the data folder or sub-folder with an extension [***.log**]

This Excel compatible by respecting a [*.prn] format_(ASCII + Tab separators).

To see (or all others), it is better to use your browser rather doing (*.*)

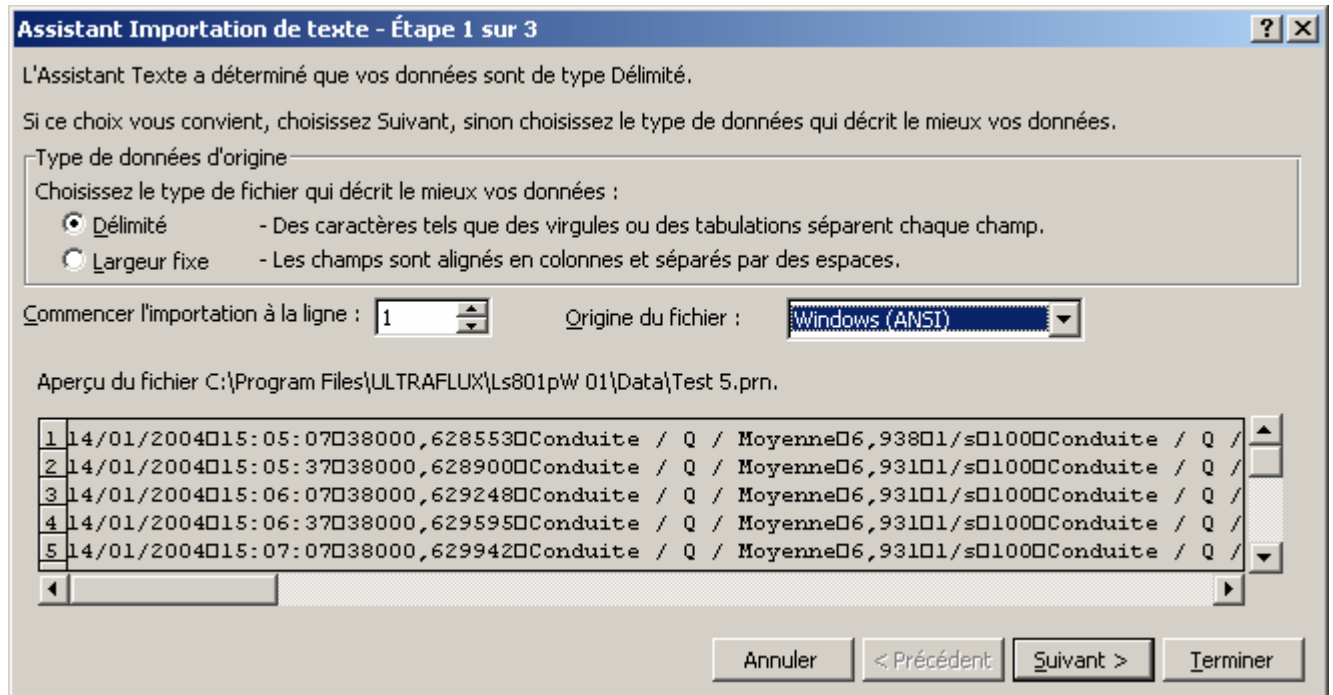
Ultraflux software cannot open it directly: this a job or function for Excel.

12.3 Editing the Data-Logger :

Manual edition with Excel assistant:

Launch Excel and select the file to open (option All Files) with your browser.

As the (*.log) file has a (*.prn) format, Excel asks for its assistant:



Accept Next / Next ..., up to Finish **that opens Excel spreadsheet.**

It could be necessary to force the format on column 3 that has a date + time information. Select it. Do Format / Cellular / Your Date + Time format.

Automatic Edition:

Just after have imported the data-logger contents in the PC named file, our software asks you (if Excel is available and tight) if you want to use our Macro for an automatic edition.

If you accept, results will be arranged as above and the flow curve will be automatically edited. If you have an UF 801-PB version (dual-pipe), we will edit the three curves Q_A , Q_B and Q_T .

When all is OK for you on Excel, you can rename the final file as an *.xls file, for further direct opening by Excel.

13 –TOTALIZERS

As it is with the data-logger function, it is necessary to enable them in instrument Configuration menu or through PC Software, Settings mode./ General

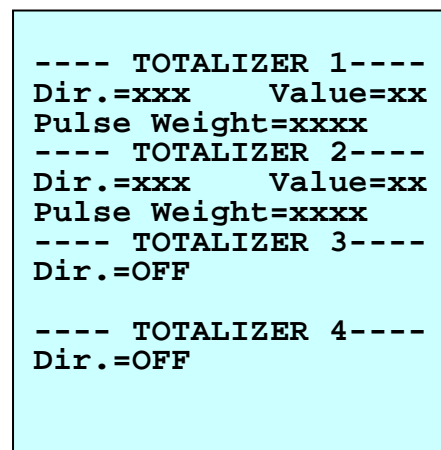
With these totalizers ON, the UF 801-P becomes a counter. The function is mainly used on dedicated units but can be useful with portable applications as well.

For instance, this resource permits to check another counter by direct comparison on volumes.

With caloric/heat flow option, these totalizers can count energy in kWh (see § 19).

Another current use is when connecting the UF 801-P to an external data-logger designed for time events recording. Every time that our counter will do +1, this event can be copied through a relay output connected to this data-logger that does a record.

UF 801-P offers up to 4*9 digits totalizers, settable from software or from keypad as well:



Any totalizer can be set OFF or ON by attaching it to a flow direction (+ or - or +/-).
One can be set for positive flows and another for negative flows (useful in water networks).

If you have an **UF 801-P B** dual chord version, **you can select which pipe** must drive the concerned totalizer with flow value selection = QA / QB or QT (= sum or difference).

The pulse weight of each totalizer is settable by decades from 1 cl to 100 m³.

Totalized volumes (Nr + set weight) readings are displayed in the measurement menu.

Resetting of a totalizer (or all) can be done from software (Settings/Totalizers/Reset = No/Yes) or from keypad/measurement menu, same page than readings:

With **A** (< --- >), select which totalizer you would like to reset. : you can see your selection on the right of the bottom line. Accept by pressing **B**

14 –OUTPUT of MEASURED VALUES (Q, V, Tot. ...) or EVENTS

The UF 810-P / P B has the possibility to export their data & measured values.

The Serial port RS-232 is always installed and shall be available. With a PC + Ls801PW Software, we use it exactly as can do an external PLC, if setted accordingly to our JBus/Modbus protocol and addresses table (available on request).

The other analog resources are obtained by plugged internal modules. There are up to 4 slots.

- A Current Output requires one internal module
- The Relays module includes 2 On/Off relays
- An analogue input module (current or voltage) offers two inputs.
- A PT100 temperature sensor acquisition requires one module.

UF 801-P / PB are delivered in standard with two modules: 1 current output and 2 relays.

Optionally, it can receive two other modules for more relays, but also analogue inputs (4-20 mA, U) or PT100 input modules.


The UF 801-P / PB detects the presence of these modules and must accept their function. It proposes the corresponding settings menus plus wiring instructions.

To use these installed modules, you need to enable them in the configuration menu.

When not used, disabling them saves some energy and increases the battery life.

The Settings operations can be done through our Software. We shows in § 11.2 end how to see actual setting of existing modules, how to edit it and how to modify it.

Here below, we show the same operations but by using keypad / display because it offers the following extra information: the pin-out for external connections wiring :

| | | |
|---|--|---|
|  INPUT/OUTPUT SETTINGS | <pre>- INPUT / OUTPUT 1 - ---Analogue Output-- Function = [4-20mA] Value = Pipe Q 4 mA = 0.00 20 mA = 400.00 I Fault = 4.00mA Sim.Value = 12.5mA Wiring -----> 01-A</pre> | <pre>- INPUT/OUTPUT 2 - ---Relay Output A--- Function = TOT Value = St.General TOT 1 Step. = 50 ms Rel. Stat.= OPEN Wiring -----> 02-A</pre> |
|---|--|---|

At each displayed screen header, you can see which module is concerned and its slot Nr.

At each screen bottom, you can read connection/wiring information.

For instance, module 1 (slot 1) is a I/O_Analogue Output available at 01-A (see table).

14.1 Analogue Output

See previous page typical displayed screens and some pages after for wirings.

You can set its format : 0-20 / 0-24 / **4-20 mA** with **taking in account or not the sign** of the concerned value by selecting this format without or with [] vertical bars.

For instance, [4-20 mA] / Value from Pipe (A) = 0 will permit to copy the measured flow without any care for the flow direction.

You can set the flow range (or other data) from 4 mA (or 0) to 20 mA (end of range).

*The used units are defined in pipe / flow settings menu.
The format 0-24 mA permits over-ranging.*

At Simulation line, you can force and simulate a current (if the concerned output is wired and its circuits closed with a resistor), for loop test or calibration test.

*This analog output is **active**, thus powered by UF 801-P. It is **galvanic insulated**.
The loop resistor must be **less than 600 Ohms**.
If **overloaded**, it switches automatically Off, for circuitry safety reasons.*

To use it, you must do connections on the DB 15 male connector (or a dedicated one) as shown in attached **table 01-A**. It is necessary to sold two wires.

*Pay some attention to **avoid short-circuits** ...
Before connecting, check that the **receiver is OK**..*

14.2 Volume Pulsed Output though a Relay

See previous page typical displayed screen.

As a module includes two relays, they are notes **A** and **B**. They here belong to **module Nr.2**

As here the purpose it to copy a totalizer increasing, you must select Function = TOT.

Totalizers belong to General data. Select which one you want to copy (here, TOT.1).

Step is the duration of the event copy (changing of state of the relay).
A too long step limits the relay maximum frequency.

Next parameter permits to set the relay rest state (opened or closed).
ON state resistor is around 10 Ohm. OFF state gives infinite resistance.

Last information is where to wire this relay circuit (Here **02-A**).

If this circuit must be energized by the external circuit, check that it respects our static relay characteristics in max. voltage, current or power : < 100 V/0.1 A/3 Watt.

This volume increasing event copy permits to order a sampler (to have the sampling rate proportional to the flow), an external data-logger or more simply an external counter.

14.3 Other Relays Output/ Combination

The relays can be set to copy other events as:

Fault status when UF 801-P is not operating.

*This does not mean that UF 801-P is in Default!
This usually means that actual conditions are
not permitting the flow measurement.*

Or

Flow Direction from (+) or (-) sign.

*(+) is obtained for flow stream from sensor 1 (= upstream)
to Sensors 2 (= downstream)*

```
- INPUT/OUTPUT 2 -  
---Relay Output B---  
Function = FAULT/DIR  
Polarity = Norm/Open  
  
Value      = Pipe (A/B)  
              Q  
  
Rel. Stat.=      OPEN  
  
Wiring -----> 02-B
```

Threshold on a flow set value:

This value is set in used flow units.

```
- INPUT/OUTPUT 2 -  
---Relay Output B---  
Function = THRESHOLD  
Polarity = Norm/Open  
  
Value      = Pipe (A/B)  
              Q  
Thresh.Val.=  xx.xx  
  
Rel. Stat.=  Closed  
  
Wiring -----> 02-B
```

With two or more relays, you can do some combinations as ordering a sampler from volume pulses but only if flow is over a set value, or any other logical combination.

14.4 Frequency Output

It is possible to order a relay with a frequency proportional to flow (or another data) from 0.5 Hz up to 1 kHz.

To obtain a pulsed voltage (logical 1/0) level, it is necessary to connect a DC source.

The main use is for calibration tests, to have the highest definition.

At Simul. F line, you can simulate a frequency.

```
- INPUT/OUTPUT 2 -  
---Relay Output A---  
Function = FREQUENCY  
  
Value      = Pipe(A/B)  
              Q  
0 Hertz   =  xxx.xx  
1 kHertz  =  xxx.xx  
Rel. Stat.=  Closed  
F Fault   =  0 Hz  
  
Simul. F.=  xxx Hz  
  
Wiring -----> 02-B
```

Other Modules : Inputs / PT 100

They are normally tight to special functions. Those concerning PT 100 and heat flow / energy measurement are explained in § 19, the other in § 18.

14.5 Connections Table / Wirings

From the Wiring code that you can read in above menus, connections on each Binder (12 or 8 Pts) and on DB 15 Male (recommended) are:

The here below table shows the standard wiring for each I/O label

ANALOGUE CURENT OUTPUT / VOLTAGE INPUT / CURENT INPUT

| | CONNECTOR | PINS | OR | CONNECTOR | PINS |
|------|---------------|---------------|----|-----------|---------------|
| 01-A | Binder 12 pts | 4(+) / 5(-) | ↔ | DB 15M | 7(+) / 14(-) |
| 01-B | Binder 12 pts | 6(+) / 7(-) | ↔ | DB 15M | 8(+) / 15(-) |
| 02-A | Binder 12 pts | 8(+) / 9(-) | ↔ | DB 15M | 10(+) / 11(-) |
| 02-B | Binder 12 pts | 10(+) / 11(-) | ↔ | DB 15M | 12(+) / 13(-) |
| 03-A | Binder 8 pts | 1(+) / 2(-) | | / | / |
| 03-B | Binder 8 pts | 3(+) / 4(-) | | / | / |
| 04-A | Binder 8 pts | 5(+) / 6(-) | | / | / |
| 04-B | Binder 8 pts | 7(+) / 8(-) | | / | / |

RELAYS OUTPUTS / LOGIC INPUT

| | CONNECTEUR | PINS | OU | CONNECTEUR | PINS |
|------|---------------|---------|----|------------|---------|
| 01-A | Binder 12 pts | 4 / 5 | ↔ | DB 15M | 7 / 14 |
| 01-B | Binder 12 pts | 6 / 7 | ↔ | DB 15M | 8 / 15 |
| 02-A | Binder 12 pts | 8 / 9 | ↔ | DB 15M | 10 / 11 |
| 02-B | Binder 12 pts | 10 / 11 | ↔ | DB 15M | 12 / 13 |
| 03-A | Binder 8 pts | 1 / 2 | | / | / |
| 03-B | Binder 8 pts | 3 / 4 | | / | / |
| 04-A | Binder 8 pts | 5 / 6 | | / | / |
| 04-B | Binder 8 pts | 7 / 8 | | / | / |

In UF 801-P/PB standard version (only 2 modules), only Binder 12 Pts connector is installed. The delivered cable for PC offers an easier connection on the DB 15M. You have pin-out for both.

If extra modules, we equip the UF 810-P/PB with a second Binder, 8 Pts, to avoid swapping.

Optionally, Ultraflux can prepare for you and sell the dedicated cables. Ask for our sales services.

15 –PROGRAMMABLE TIMER / SEQUENCER

This function will not be used when you are operating by yourself the flow measurements.
In these conditions, it must be disabled from Configuration menu or set Off.

Its purpose is multiple:

- You install everything now, but your interest is putted on later records, during the next night for instance: UF 801-P offers a delayed auto-starting.
- Your flow investigations are on flow survey at a same time period (11:00 to 13:00) every day for a week: UF 801-P offers a delayed starting and then a periodic ON/OFF sequence.
- You want to save energy and thus keep the battery available for a much longer time: UF 801-P permits to sequence infinitively the ON/OFF periods.

To help for the records during these ON periods, the data-logger is automatically synchronized.

In practice, the waking up is some few seconds earlier, to have the UF 801-P ready.

The Settings of the Timer / Sequencer are only available on the instrument, not through the PC.

The TIMER has four modes:

- **OFF** but enabled, for temporary reasons, as during the installation or other settings.
- **Differed**, thus with a delayed starting and then a measurement/one shot recording period.
- **ON**, that offers a delayed starting and then the putting ON/OFF period with the Duration of ON state, during a whole duration (for instance one week).
- **∞ or infinite** mode, that is very similar to the previous mode, but with no time limitation but the data-logger capacity (*Set it as "Stop when Full" to keep the oldest records*).

The different active menus are:

```
----- TIMER -----
      Differed

-----Recording-----
Log. Step=      ****
Duration = **h**m**s
-----Powering On-----
      25 Jan.  05h30min

-----
                        11:10
```

```
----- TIMER -----
              ON

-----Recording-----
Log. Step=      ****
Duration = **h**m**s
-----Powering On-----
Start      = **h**m
Period     = **h**m
-----Total Duration----
              **d**h**mn

-----
                        11:10
```

```
----- TIMER -----
              ∞
      ! Data-Logger !
-----Recording-----
Log. Step=      ****
Duration = **h**m**s
-----Powering On-----
Start      = **h**m
Period     = **h**m
-----Total Duration----
99999 d *99 h 99 mn

-----
                        11:10
```

Log Step permits to record **from one sample per ON state duration to many** if you need an **accurate following up** of the flow or other data during this period.

If you have forgotten to enable and set the data-logger, setting the timer / sequencer will active automatically this data-logger with the same period.

If you want to set the data logger elementary recording period longer than the set ON state duration, the first one increases the second. Indeed, UF 801-P data-logger could not do its records.

Very important!

When your selected mode is set, you must valid it by a long press on F that returns to the Measurement menu.

Check that everything is OK concerning your installation and measurement conditions.

Then, switch OFF the UF 801-P/PB with the bottom on its right side.

The UF 801-P will self-switch ON at set time and then periodically (if asked) as per your settings.

Complementary information:

If you have set the Differed mode, the Timer is automatically reset OFF after the operation.

Same with ON mode: automatic reset after the set whole time is over.

The Infinite mode must be reset manually. You can do that when it is ON. Otherwise, proceed as below.

In any case, if the timer is started and thus the UF 801-P waiting for its automatic waking-up, pressing the ON bottom will restart the UF 801-P and give you the possibility to cancel or modify every thing that you would like.

16 –USING THE SETTINGS INTERNAL RECORDS FILES

We have already given some information in § 3.2

The UF 801-P has memory space to store 1+2 calibrations / settings.

- The actual one (we name it "Config. 0")
- Two (or more) archive space (1 & 2) that you are free to use.

All these operations are done from Configuration menu.

```
LANGUAGE : ENGLISH
-- STATION'S NAME --
      xxxxxxxx
---- BACK LIGHT ----
      xxxxxxxx
---PC CONNECTION ---
N° JBUS : xxxxxxxx
Bits Rate: xxxxxxxx
```

```
--- OPTION FILES ---

Load Option File
N°*:xxxxxxx

Save Option File
N°*:xxxxxxx
```

Supposing **that you have set the UF 801-P** as per you want and that you would like **to keep an archive of actual settings** in memory space Nr. 0 for a possible later use:

- Give a name to this menu or site **at Station Name line** (letter per letter)
- At Save Option File, select memory space Nr. 1 or 2.
- Valid the saving by changing of line.

You can do the same operation with the second archive memory space.

When you will need to use again this archived settings :

- Go to **"Load Option File"** line and select which one you want
- **It comes instead of actual settings** in zone 0 **as soon you leave this line**.

*The archive is kept in memory but previous actual settings (Nr 0) are lost.
UF 801-P switches in Measurement menu with these settings.*

- If you want **to cancel an archive**, you only have to overwrite on it with a new one.

These archives can be done with Simple / Normal or Expert modes.

But, if you want to import a normal or an expert setting, you need first to configure your UF 801-P in the corresponding mode.

Settings Reset: UF 801-P have 1 permanent memory the typical factory settings. They correspond to our tests, and UF 801-P is normally delivered with these data as actual settings.

To re-install these settings, enter in configuration menu, select **"Settings Reset" and "Yes"**.

17 –PIPE WALL THICKNESS MEASUREMENT

The measurement principle of an ultrasonic thickness gage is very common. A probe includes an emitting cellular and a receiving one in the same body. They are looking with some convergence angle to the wall to control. When the probe is coupled to the test piece, the short emitted pulse is transmitted into this material at out wall and then reflected by the other side of the test piece or its first boundary layer and is returned to the receiving probe.

With the knowledge of the longitudinal sound velocity in the tested material and the transit time measurement, we can know with accuracy ($< \pm 0.1$ m) the thickness of this layer.

This pipe wall thickness knowledge is very important for flow results accuracy.

The UF 801-P plus our probe SE_1701 offers advanced features of thickness gage compared to most dedicated devices.

As this thickness measurement function and menu are installed in standard, **you need this SE_1701 probe to use the function.**



Installation of the probe:

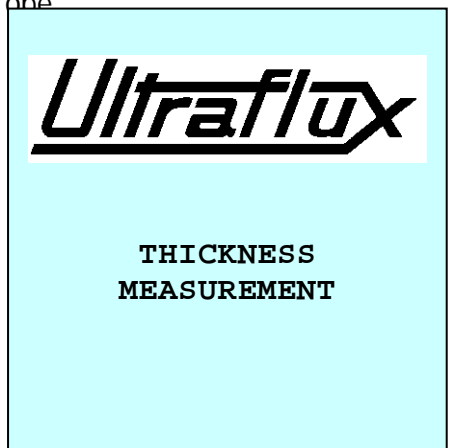
Clean-up the pipe at location where you want to place the probe
We recommend removing locally the painting.

Spread some coupling gel at this location and on probe face.

Connect this probe at the reserved place
(instead of channel 1 flow probes).

Take the probe and keep it pressed on the pipe.
(this operation will be done after following settings)

Select the Thickness Measurement Menu of UF 801-P :



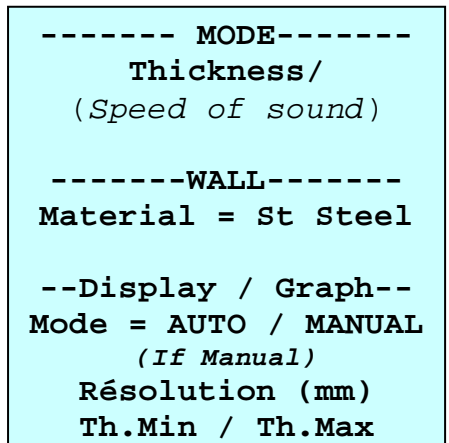
17.1 Standard Use = Thickness + The pipe material is included in our list.

Select the right material in the list.

If you are not interested with the Graph Display, you can let its mode on **Auto**. *Graph is only used to confirm numeric result.*

Auto mode will center the graphic display of the obtained echo in the middle of a 5 mm wide window.

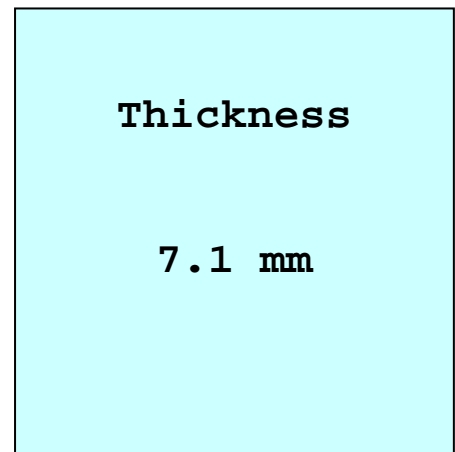
In Manual mode, you can set this window width by resolution parameter (see example next page).



Go to the next display screen (with V)

And keep the probe in position.

You must obtain a display similar to the following:

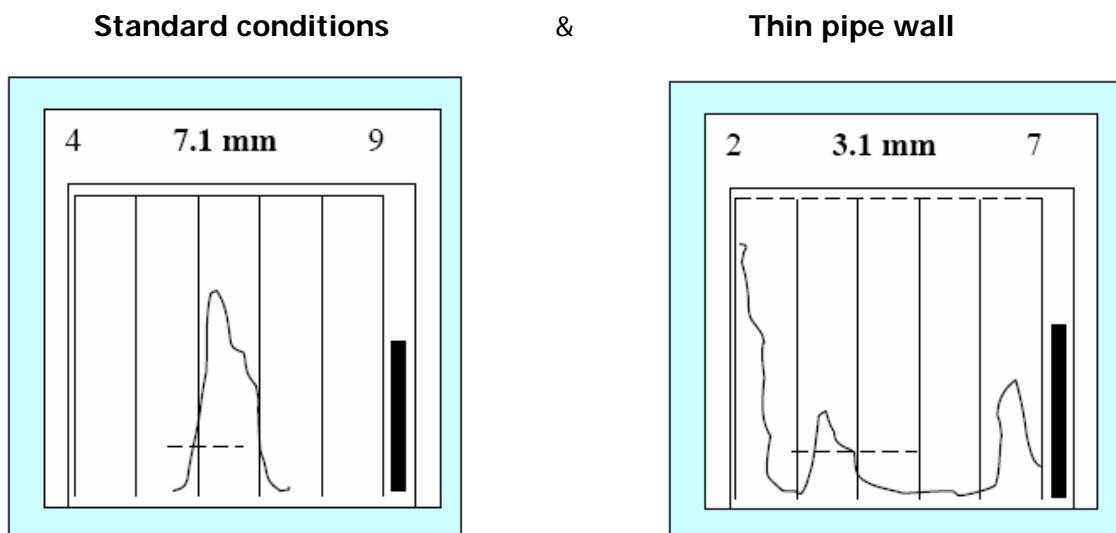


With the graph, you can have complementary information on the echo and other conditions attached to this wall thickness: corrosion, included crystallization (as it is with grey cast iron):

- The **vertical bar** graph gives you information on echo strength.
- The **dotted horizontal** line shows you which echo is considered.

With very thin pipe walls (less than 3 mm on steel) the danger is to trig on the second echo and to display twice the wall thickness real value. Graphic mode permits you to valid the numeric value and, if is wrong, to estimate it from the graph vertical graduations.

Here below, we show to examples to illustrate the above explanations:



Thickness probe orientation: from the probe face, you can see the separation wall between emitter and receiver.

With more importance on the results with thin pipe walls, it is recommended to orientate the probe to have this separation perpendicular to the pipe axis.

Keep the probe perfectly perpendicular to the measured wall.

17.2 Celerity (Speed of Sound) mode for unknown materials

This unknown sound speed or velocity (longitudinal mode) will be measured from the first echo delay time in the test piece material and its known thickness.

Thus, to use this menu, you need to have a sample of this material, with parallel faces, and to know exactly its thickness.

Select the Speed of Sound Mode

And enter this measured thickness

```
----- MODE-----  
Speed of sound  
  (Thickness)  
  
----Test Material---  
Thickness= xx.x mm
```

Go to the next screen with **V**

It displays this sound speed.

You can keep a record note that you can use later in the first mode, Material = Other / CM = xxxx m/s

```
Speed Sound  
  
xxxxx m/s  
  
Thickness Mode →
```

Otherwise, pressing **B** (touch below the arrow), will transfer this Speed of Sound value at Material = Other / CM data line of the previous menu

Placing the probe on the pipe wall (same material that test piece) as explained in 17.1 will permit its thickness measurement.



Some typical or usual materials that are in the list (as PVC, Plastics, Cast Iron ...) could present some deviation because their exact chemical or physical composition. Because that, some raw thickness measurements could be slightly wrong and cause flow errors.

So, we encourage you to do above speed of sound controls on calibrated test pieces.

18 – OPTIONAL MODULES & ATTACHED FUNCTIONS

As explained in § 14, UF 801-P / PB have up to 4 space to install Input / Output modules. Those installed in standard and their connections are explained in this § 14.

Optionally, we can install the modules that you would like to achieve your requirements... up to this 4 slots limit. If you need more output modules, their use is as per § 14, but their dedicated connections.

Here purpose is to explain input modules and functions that you could have with.

There are now three kinds of available modules:

- Logical off/on state (0/1) modules: they have two inputs each.
They can acquire an external order and execute some action that must be allowed by our program. For instance, this logical level can be recorded in the data-logger and trace a door opening. Pulse choice permits to import a frequency (number) each 0.1 s.
- Analog input modules, two per module:
*Thus, it is allowed to import any analog value as from another flow-meter (Doppler ?) or the fluid pressure or also its temperature. We can also have two T °C inputs at contrary of PT100 direct connection.
These input values can be treated by an internal but optional function or more simply recorded by the data-logger.*
- Temperature PT100 probes acquisition module, one PT100 per module:
*This is the usual module and connections with the calorific / heat flow & energy option.
We explain these modules and attached function in § 19.*

18.1 – Input Modules Settings:

If one or many input modules are installed in your UF 801-P, the automatic detection will allow you their corresponding menus.

They are for the 4-20 mA module and the logical module :

```
- INPUT / OUTPUT 3 -
---Input A 4/20 mA---
Function=ON(Off, Sim)
Value      =      Input
              03-A
  4 mA     =      0.00
 20 mA     =     100.00
Filter     =       05 s
Memory     =       10 s

Sim.Value  =     12.5mA

Wiring -----> 03-A
```

```
- INPUT / OUTPUT 4 -
---Input B Contact---
Function=ON(Off, State
              Pulse)
Value      =      Input
              04-B

Wiring -----> 04-B
```

At a 4-20 mA input, we attach a linear number without here any physical unit, which will be the purpose of the attached function. It can be considered later as a temperature, a pressure, a flow, a level You can apply a filtering or a memory in case of temporary lack.

18.2 – Special Functions:

As explained above, any formatted input data comes into the list of the data-logger.

After recording and after have exported these records to Excel, up to you to set any function and obtain attached results in the dedicated Excel column for calculation results.

Some built-in functions are also possible. Some are now ready as caloric/energy flow (§ 19).

Some others are under developing and near future should be very rich.

Typical applications that would be available in the near future are P & T (Z) corrections for gas flow, Mass flow calculation ...

The function program writing is not opened to the client.

It follows the same logic that our Module Brio that we use, for instance, with interface detectors as P&T correcting unit. It is a step by step "macro functions" linking from selected data inputs or other constant values (totally 10) up to one or many outputs (1 to 10) data that come into the list for data-logger or an output module.

But the following caloric / heat flow function that is frequently asked with portable units, this manual does not explain the other possibilities. We prefer to deliver a specific additive note adapted to your application, should the occasion arise

18.3 – Connections / Wiring terminals

The display shows which connector is concerned by the existing hardware and which the terminals to wire.

Please refer to 14.5 table.

19 – CALORIC / HEAT FLOW RATE & ENERGY MEASUREMENT

As this function and attached acquisition modules are optional, you need that there are implemented to see following menus and evidently to use them.

When equipped, the UF 801-P can measure the heat flow rate (K Watt) and the heat quantity (K Watt-h). Such a calculation can be done manually later from records of actual flow and notes on the input and output temperature. Here, it is automatically done, *all in one*, and the continuous following-up plus the high sampling rate permit a very accurate result.

The applications are multiple as the performance of a heat exchanger, the power of a boiler, the power and energy sent to a building for central heating ...

To keep the flexibility of a non-invasive measurement, as it is with ultrasonic clamp-on probes, we usually install clamp-on thermal sensors, PT100 Din quality. Meanwhile, invasive probes, if they exist, could offer a better accuracy.

Just a comment about above: Supposing a delta T°C of 20 °C between the inlet and outlet of the circuit, an error of +/- 0.5 °C on each T acquisition can make 5 % error on the heat flow !

Pay some attention to install these PT100 probes with some heat conductive paste, and keep them tight to the pipe with straps.

19.1 – PT 100 or T (4-20 mA) Acquisition

If the T °C is obtained through a 4-20 mA input, our heat flow and energy function have first been factory set accordingly. Then, only set your input ranges as in § 18.

If there is only one input (supposing that the inlet or outlet branch is showing a constant T °C), you can use the simulation mode to force a T °C.

With the direct connection of a PT 100, you will have the following display screen in our Input/output menu:

As above, you can force a simulated value.

Otherwise, the module is pre-calibrated to show T °C,
(as soon a PT 100 is connected - See after).

Accuracy between two reference modules is +/- 0.1 °C

Absolute accuracy depends on the PT 100 itself and also on wiring mode. Prefer 4 wires connections that compensate totally the wires resistor.

```
- INPUT / OUTPUT 3 -  
---Input --- PT100  
Function=ON(Off, Sim)  
Value      =      Input  
              03  
  
Filter      =      05 s  
Memory     =      10 s  
  
Sim.Value  =      45.5°C  
  
Wiring -----> 03
```

*To perform a good heat flow measurement; it is recommended to use 2 * T °C / 2 modules.*

19.2 – Installation & Connections

As explained in 14.5, each above display shows which connector is concerned by the existing hardware and which are the terminals.

Here is a typical connection table:

PT100 INPUT

| | CONNECTOR | PINS | | OU | CONNECTOR | PINS | |
|------|---------------|-----------|-------------|----|-----------|-------------|-------------|
| | | Source | Sensor | | | Source | Sensor |
| 01-A | Binder 12 pts | 4(+)/5(-) | 6(+)/7(-) | ↔ | DB 15M | 7(+)/14(-) | 8(+)/15(-) |
| 02-A | Binder 12 pts | 8(+)/9(-) | 10(+)/11(-) | ↔ | DB 15M | 10(+)/11(-) | 12(+)/13(-) |
| 03-A | Binder 8 pts | 1(+)/2(-) | 3(+)/4(-) | | / | / | / |
| 04-A | Binder 8 pts | 5(+)/6(-) | 7(+)/8(-) | | / | / | / |

If connections are asked on Binder 12 Pts, it is better to use the DB 15 male connector, easier to wire. You can use a dedicated DB 15 with your pre-soldered wires.

If connections are asked on Binder DB 8 Pts, do your wirings directly on the pins, by soldering.

Ultraflux can also deliver a pre-wired ready for use solution. See that with our sales people before purchase contract.

Attention !

As mentioned in the table, there are two terminals for the source and two terminals for the sensor, each with -+ and (-) sign.

This is for the 4 wires connections mode, the more accurate. On + wire is used to send the current to the PT 100 (Source) and another to read the voltage directly at PT 100 level _ Same with terminals (-) connections. This connection mode compensates totally the wires resistor.

With a 3 wires mounting (acceptable with a short cable length ~ less than 5 m), you must connect the two (-) together. Here, the wires resistor is calculated and compensated from the (+) branch.

With a only 2 wires (not recommended), you must connect the 2 * (+) together and the 2 * (-) together. Here, there is no resistor compensation. T °C will be in excess, but delta T can be OK

19.3 – User Display Menus & Recommendations

When this function is installed, you have two more display screens:

One for the Function Settings and one for the function output measurements Reading.

```
-FUNCTION SETTINGS-  
Function = Heat Flow  
Cal.Coeff.= C / CH2O  
           = 1.00
```

```
-FUNCTIONS OUTPUTS-  
Function 1:Heat Flow  
P = xxxx;xx kW  
E = xxxxxx kW-h
```

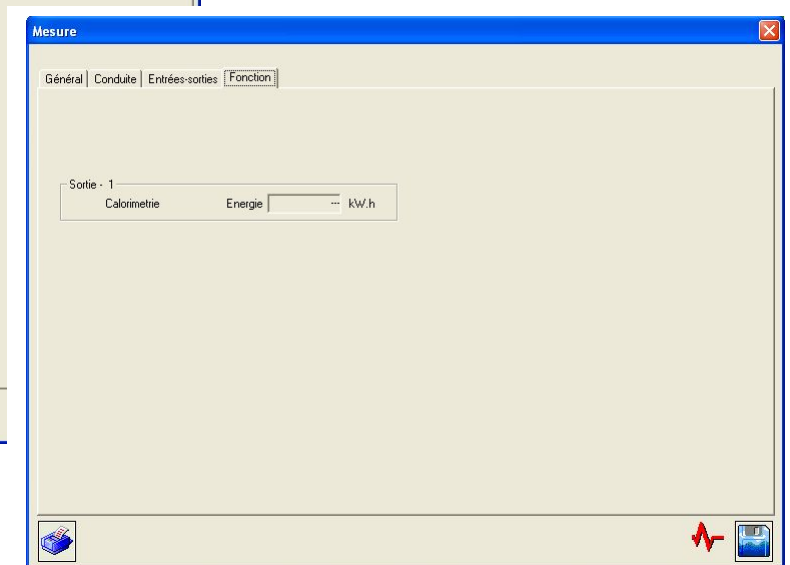
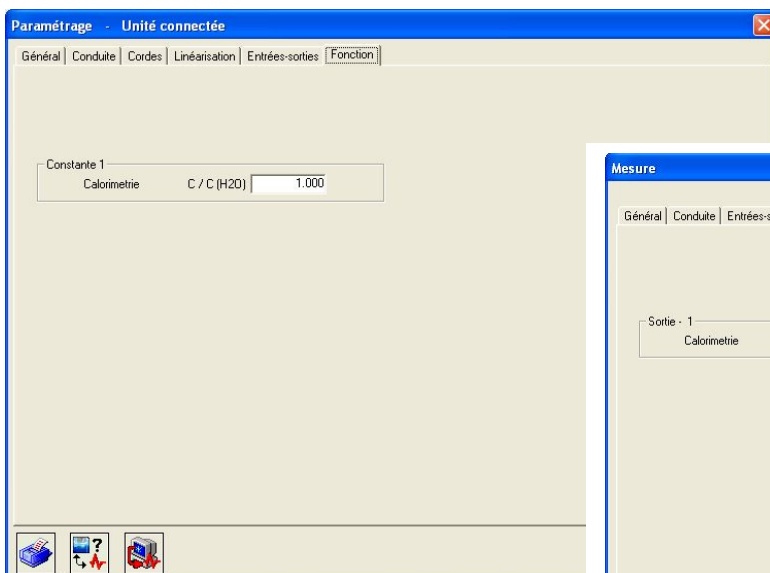
Caloric Coefficient or Specific Heat Coefficient is set in accordance with the table given in Appendix (we consider the water at 20 °C as the reference).

Set this C / C_o (H_{2O}_20°C) for you average conditions = $C_p \cdot d / C_{p_o} \cdot d_o$

The variation is not very important in the range 0 to 100 °C, but not negligible!

Example at 70 °C : $C / C_o = 0.981$. Thus 2% error is you let 1.000 !

With the Software, you have also a new tab (function) and two displays:



20 – TROUBLESHOOTING & FAQ (Frequently Asked Questions)

Important advice !

*Most of problems are site or settings problems, happily not device problems.
Thus, you must be able to share these possible difficulties from real device problems.*

General recommendations:

Always remember that each application has its own priorities. Accordingly, the UF 801-P is particularly flexible and can be adapted to extreme situations, meaning that many kind applications are possible. There are few limitations for "who knows".

Ultraflux fills or forces all internal data or settings for his final tests and thus before delivery. With Settings Reset = Yes, you can come back to these initial settings.

Thus, up to you to check them, that is very easy by running through the various menus and comparing them with the values that you usually enter. Your application will force some slight difference and has priority Nr. 1, as the used probes ...

A particular care must be put on geometrical descriptions, specific to each site, and the choice relative to the fluid: they are from the responsibility of the end user.

Another attention must be put on the transducers choices. Here, Ultraflux is at your disposition to share with you his experience.

Checking or Complementary tests:

Once the installation, connections and parameters have been set up, there may be several possible situations:

- Case 1 – The measurement displayed and transmitted meets your expectations.
- Case 2 – The measurement operates but is inaccurate or is unstable
- Case 3 – The measurement is not reliable or the UF 801-P is displaying a Fault.
- Case 4 – The UF 801-P has no display or has its touches inactive or shows a fault.

Case 1 : Although everything appears to be OK (Flow Rate = OK), check the other displayed values as:

- The echo shape or its amplification gain level, to be compared to typical values.
 - With external probes, a gain exceeding 60 dB means some difficulties such as a wrong choice of probes, uncompleted installation or coupling, rusted pipe, absorbent fluid ...
 - For intrusive probes, the gain level is usually low (excepted for gas))

> Use the Echo Display menu facilities

- The quality index I.Q.. is normally = 100 % or close value.
If it is low, this indicates several possible disturbances= electrical interference, passage of bubbles, highly charged fluid ...
> In this case, in-depth investigation is advisable on the process to improve conditions.
- The displayed speed of sound should be close to that expected, an meaning of a good control of the geometry on this application.
> Otherwise, check again pipe diam. , pipe wall thickness, distance between probes.
- If the flow can be interrupted, check the Zero
> You can use the Auto-Zero menu or enter manually the controlled offset.

® **Case 2**: In addition to the points mentioned above, the possible could be:

- A too weak installation or too poor data controls, thus wrong settings, on dimensions or concerning the fluid.
> reanalyse and correct
- An installation with bad hydraulic conditions (too short straight length from disturbance...):
> If possible, change the location of the probes.
> If installation was in Direct mode, try with a Reflex mode, less sensitive to hydraulic.
> Otherwise, choose KHydro = Manual and adjust this correction coefficient to compensate this particular flow profile and have a reliable flow rate reading (Flow = f (1/Kh)).
> With insertion probes , it is also possible to play on Axial Distance.
- The range of sound velocity (Delta C) is set too short for the fluid range:
> Set your Co and Delta Co accordingly.
> On a very large pipe, a Direct mode could be preferred to a Reflex mode
- To permit a greater precision or a wider flow range , the UF 801-P allows a "Linearization" correction law . This function is normally unused with a portable unit.
> If needed, plot the error curve and enter the complementary curve.
- The Delta t offered by the measurement conditions is too low to claim any measurement accuracy (Diameter, Flow Rate, Assembly, Choice of probes).
> Is it possible to revise these choices ? Install probes on a smaller pipe ? W mode ?
- The measurement conditions are showing a risk of turbulent to laminar flow transitions:
Adapt if necessary the declared Critical Reynolds and its range (LBR) or force a compromise with Kh=Manual = depending on probes position (placing them just after a disturbance forces a turbulent flow and a Kh around 1.08 ~1.10).

Case 3 : The UF 801-P is ON and shows its screens but does not operate the flow:

- If the UF 801-P displays "!!!!" at screen bottom, this message does not mean that it has failed, but only that there is no ultrasonic signal or that the signals exist but the UF 801-P is not configured or set to treat them.
- Never forget the Echo display / Oscilloscope mode : it will give you the key for 95 % of met problems.

> A very current reason is because the echo is out from the receiver window because wrong pipe diameter, probes mode swapped (/ <> V or W)...

> Is the pipe full or partially full (not purged), or empty?

> Bubbles in excess? Pump cavitations, water fall just upstream before the pump...

> Check connections to the probes and the cables.

> Is the pipe wall transmitting correctly ultrasonic signals? (Concrete pipe...)

> Is the installation mode unsuitable for conditions: try Direct mode (V) or other sensors.

> Are the probes correctly installed (orientation, coupling ...) .

Case 4 : The UF 801 has no display or some of its functions are inactive.

- There is no display and no backlight.

> Is the UF 801-P powered up? > Are its battery charged?

> Do an ON/OFF test after have connected the charger module as an external supply.

> If nothing changes, this means a hardware problem > contact Ultraflux

- If UF 801-P is OK on the charger but still faulty on the battery after some hours charging them, this could mean some problem on the charger supervisor or on the battery itself (for instance, battery is available for a too short time).

> Same, refer to Ultraflux for a possible solution.

- If the UF 801-P keypad is inactive, this could be due to internal firmware problem.

> If it is a temporary problem for unknown reason, it should disappear after a OFF/ON.

> You can also let the unit ON up to have the battery low and the UF 801-P automatically switched OFF. Problem must have disappeared after.

> If this problem persists, please contact Ultraflux.

- Attention ! After a very low state of the battery or any disconnecting of it, it is necessary to reinitialize the internal clock. This operation requires the Software and a PC connection.

> Otherwise, the data-logger and the timer would have some time shifting.

- If some installed modules are not copying or transmitting the expected data, please check that they have not been damaged.

> Please refer to the corresponding § and menu and active the simulation mode.

Other Investigations:

If there is a difficulty or a problem, an in-deep analysis can be done with our assistance at distance or, if possible on site.

Please, do not hesitate to share with us your problems. Everybody has to learn and progress.

A complementary device could be used as a referee.

Spare Parts / Modules Replacement / Battery pack Exchange:

Attention! Only Ultraflux qualified technicians are allowed to open a UF 801-P / PB for any operation, control or maintenance purpose. Thus, we do not sell spare parts.

Meanwhile, the UF 801-P internal design is studied to limit further maintenance costs.

How to add or exchange an Input / Output module ?

They are installed by easy plug-in at any free and reserved place.

As they are pre-calibrated, they are ready for use through the corresponding menu and function.

When to exchange a battery pack ?

Any battery pack has a limited life depending on the complete charging/discharging cycles and also the care that you have had for their use.

For easy maintenance or reconditioning, the UF 801-P battery pack is easily removable, but, this operation must be done by an Ultraflux's qualified agent unless to loose our Guaranty and some instrument characteristics. We decline any responsibility if any wild operation is practiced.

Thus, please prefer sending back the unit for such an exchange and have our guaranty.

Main P.C. Board exchange:

This exchange can be easily done in case of needs because a very important problem.

Conditions of such an exchange must be discussed with our sales or after sales persons.

Attention to only authorized persons!

*To access internal P.C.Board, modules or battery, it is necessary to **remove the unit back by unscrewing the 7 Torx screws**. Please do it with care.*

*When screwing, please **keep the seal ring in position** and respect the maximum torque of **70 N-Cm** on the screws to do not damage the thread and thus loose the device IP67 tightness protection level.*

21 – UPGRADING THE UF 801-P/PB

It could be necessary or desirable to upgrade the Firmware and attached Software of your UF 801-P instrument during its service life.

As you may know, we always do our best to improve our instrument and to allow them new applications or features.

Ultraflux should inform you about the possible improvements that may concern you and your applications. Another solution is to contact our sales people.

By the way, if an upgrading is accepted, Ultraflux will inform you in due time about the best or the simplest procedure to follow up.

Keep us in touch !

22 –APPENDIX

In this appendix, we give some first emergency information on some physical data that you could need. Many other are in our didactic handbook or can be obtained from general data bases, from Internet for instance.

Pipes typical dimensions:

*The safer investigation is to take pipe manufacturer specifications.
Then, a short control on site will confirm the data.*

Some pipes, as Stainless Steel pipes, PCV pipes, copper pipes have ink marks showing their dimensions.
Read and apply them in the UF 810-P settings.

Some pipes are using metric units concerning their ID.

It is usually the rule with cast pipes as cast iron (with or without cement liner) as Pont-à-Mousson pipes that consider 400 mm I.D. for a 400 mm pipe. From the circumference and O.D., you will have the whole pipe wall thickness.

It is similar with concrete pipes, asbestos pipes, GRP pipes ...

ANSI / API pipes consider O.D. dimensions and are labeled in inches. The thickness, thus the I.D. depends on the pipe pressure schedule.

It is similar with St. St. pipes, but steel pipes have rarely ink marks!

For pipes with diameter 14" and above, the O.D. is obtained by multiplying this Nominal pipe size by 2.54. A 20" has its O.D. = 508 mm.

With 10 and 12", consider 10.75 or 12.75. With 6" and 8", consider 6" 5/8 and 8" 5/8. A4" has its 4.5" = 114.3 mm OD and so one.

Pipe Roughness Coefficients for Pipes:

It has some influence on the flow calculation, especially on small pipes.

The problem is that this characteristic is rarely known. We must usually estimate it.

Please refer to NT 122 manual for typical values.

As a quick guide, we can say:

Drawn pipes / non ferrous metal, glass, plastics : 0.002 to 0.02 mm if some deposits.

Drawn steel & St.St. pipes : 0.02 to 0.06 mm, up to 0.10 if rough or with deposits.

Welded Steel pipes : New = 0.05 to 0.1 / Long usage but cleaned = 0.15 to 0.50 / Very old or encrusted or corroded = up to 4.0 mm

Cast Iron with lining (bitumen, cement, epoxy..) = 0.1 to 0.2 / Without lining = 0.2 to 1.0 / encrusted or corroded = up to 3.0 mm.

Sound Velocity in Fluids :

The speed of sound in a fluid is physical characteristic of this fluid which may be linked with others, such as density (d), pressure (P), temperature (T) or the % of two or several miscible products or with another magnitude having good analogy, like compressibility.

For most miscible products as refined petroleum products or petrochemical bases, experience shows a reliable and accurate relationship between the speed of sound and the density of the product for constant P and T or the concentration of the mixture.

But, some other products are showing deviations, sound velocity depending mainly on fluid compressibility.

Water has special and unique characteristics, but presents a very reliable relation between this sound velocity and the temperature that allows a number of tests to be run on the installation.

Gases have lower speeds of sound than liquids.

Refrigerating fluids are in the wide middle range, with high P & T coefficients.

Applications with water:

Water has a very reliable "speed of sound < > temperature" relationship which will be put to good use whenever possible for dimensional checking: from T, you can predict this speed and compared it with the result obtained by UF 801-P on the basis of the measured transit time and the set-up dimensions. A deviation may require these values to be reexamined, like L for intrusive probes or the pipe diameter and its thickness for external probes.

The following simple equation gives a good estimation of C between 10 and 100°C:

$$C_{m/s} = 1557 - 0,0245 * (74 - T_c)^2$$

The following table defines the customary values more accurately.

| t (°C) | C (m/s) | t (°C) | C (m/s) |
|--------|---------|--------|---------|
| 0 | 1 403 | 30 | 1 506.4 |
| 5 | 1 426.5 | 35 | 1 520.1 |
| 10 | 1 447.6 | 40 | 1 529.2 |
| 15 | 1 466.3 | 45 | 1 536.7 |
| 20 | 1 482.7 | 50 | 1 542.9 |
| 25 | 1 497 | | |

The water solid contents have little influence: this table can be applied to raw or waste water.

When compared with other fluids, the water temperature coefficient for C is positive up to 74°C. Beyond that, the water becomes a conventional product again.

The water pressure coefficient is relatively low, at around 0.15 m/s per bar.

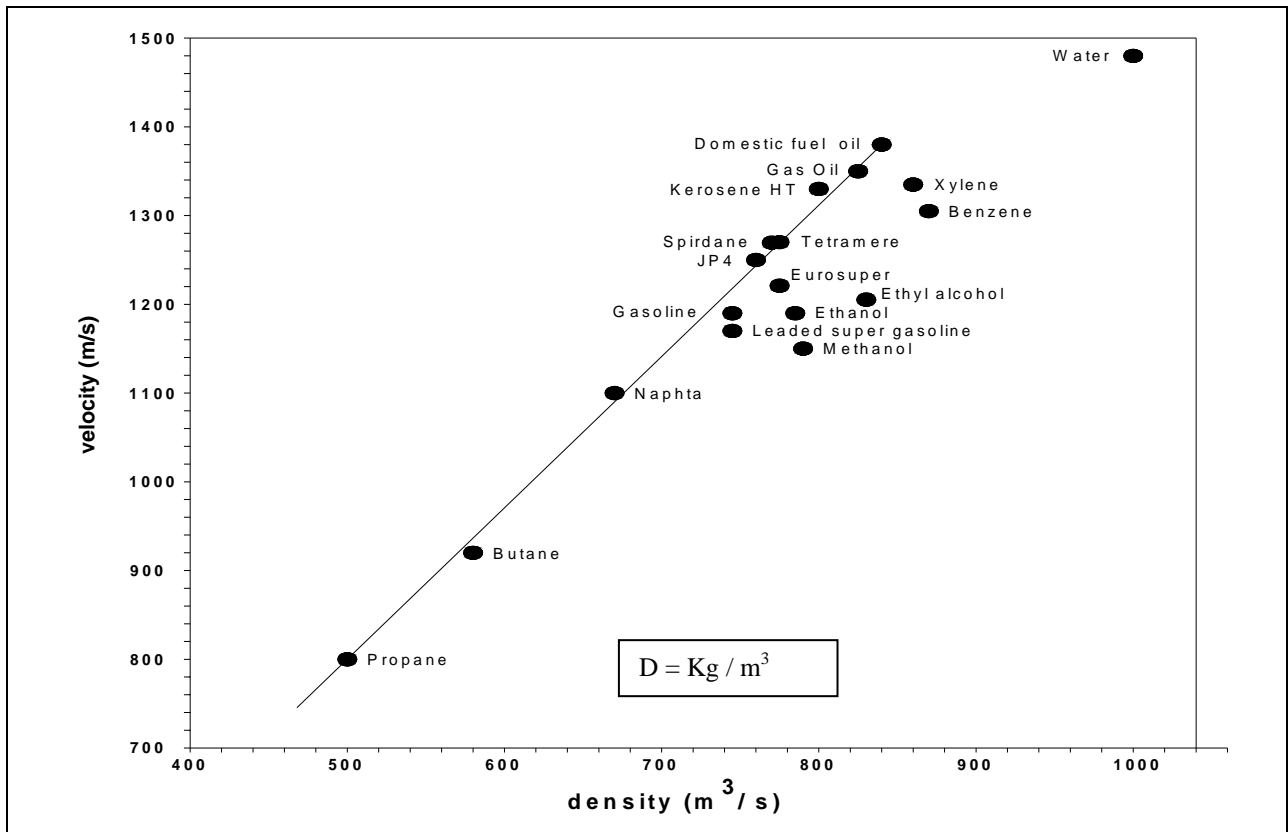
The presence of salts as NaCl in solution increases the value of C by approximately 1 m/s per g/l.

The addition of glycol ethylene increases also the speed of sound within the proportions:
For instance : 30% > 1670 m/s and 50 % gives 1705 m/s.

Overheated water involves curve or graph networks taking into consideration P & T. Consult us.

We give complementary information after on the Cp to take in account if energy measurements.

Applications on petroleum products – values at 15°C / 1 bar (but butane and propane):



This speed of sound varies also with the pressure and temperature, in a larger proportion compared to water. For instance:

- Influence of pressure = + 1 m/s per bar for liquid butane and + 0.4 m/s per bar for diesel oil.
- Influence of temperature = - 6 m/s per °C for butane and - 4 m/s per °C for diesel oil.

Chemical Products :

The list has no limitation. If you need some prior to test information, please ask us.

Refer also to the method explained in 7.1. It permits to have a good estimation of your actual sound velocity.

Measurements on Gases:

Gases are characterized by lower speeds of sound, much lower than for liquids.

Temperature coefficients are positive (0.2% per degree approximately), and pressure has low influence. Consult us for more details.

Here are two usual gases examples:

- Air: $C = 341 \text{ m/s}$ at $20 \text{ }^\circ\text{C}$ / 1 bar .
Approximate formula : $C = 20.1 * (T_{\text{°K}})^{1/2}$
- Natural gas: C around 400 m/s at $15 \text{ }^\circ\text{C}$ / 1 bar

Specific Heat Coefficient in Water (/ $P = 1 \text{ bar}$ or higher over $100 \text{ }^\circ\text{C}$)

| T °C | P bar | d Kg/m ³ | Cp (kJ*kg ⁻¹ *k ⁻¹) |
|---------------|----------|---------------------|--|
| 0 | 1 | 999.8 | 4.218 |
| 10 | 1 | 999.7 | 4.192 |
| 20 (*) | 1 | 998.2 | 4.182 |
| 30 | 1 | 995.7 | 4.179 |
| 40 | 1 | 992.3 | 4.178 |
| 50 | 1 | 988.0 | 4.181 |
| 60 | 1 | 983.2 | 4.184 |
| 70 | 1 | 977.7 | 4.190 |
| 80 | 1 | 971.6 | 4.196 |
| 90 | 1 | 965.2 | 4.205 |
| 100 | 1.01 | 958.1 | 4.216 |
| 110 | 1.5 | 950.4 | 4.230 |
| 120 | 2.0 | 942.9 | 4.245 |
| 130 | 2.75 | 934.3 | 4.265 |
| 140 | 3.6 | 925.8 | 4.285 |
| 150 | 4.5 | 916.5 | 4.312 |
| 160 | 6.2 | 907.3 | 4.339 |
| 170 | 8.0 | 897.0 | 4.373 |
| 180 | 10.0 | 886.9 | 4.408 |
| 190 | 12.5 | 875.7 | 4.452 |
| 200 | 15.5 | 864.7 | 4.497 |

These are typical values from physical books.

() is our reference conditions for caloric menu settings.*

Attention when water has some additive, as ethylene glycol or other miscible fluid or salt in solution. The above values could be slightly different.

22 – INDEX : A few Direct Connections