UF 831, open channel or river

User manual

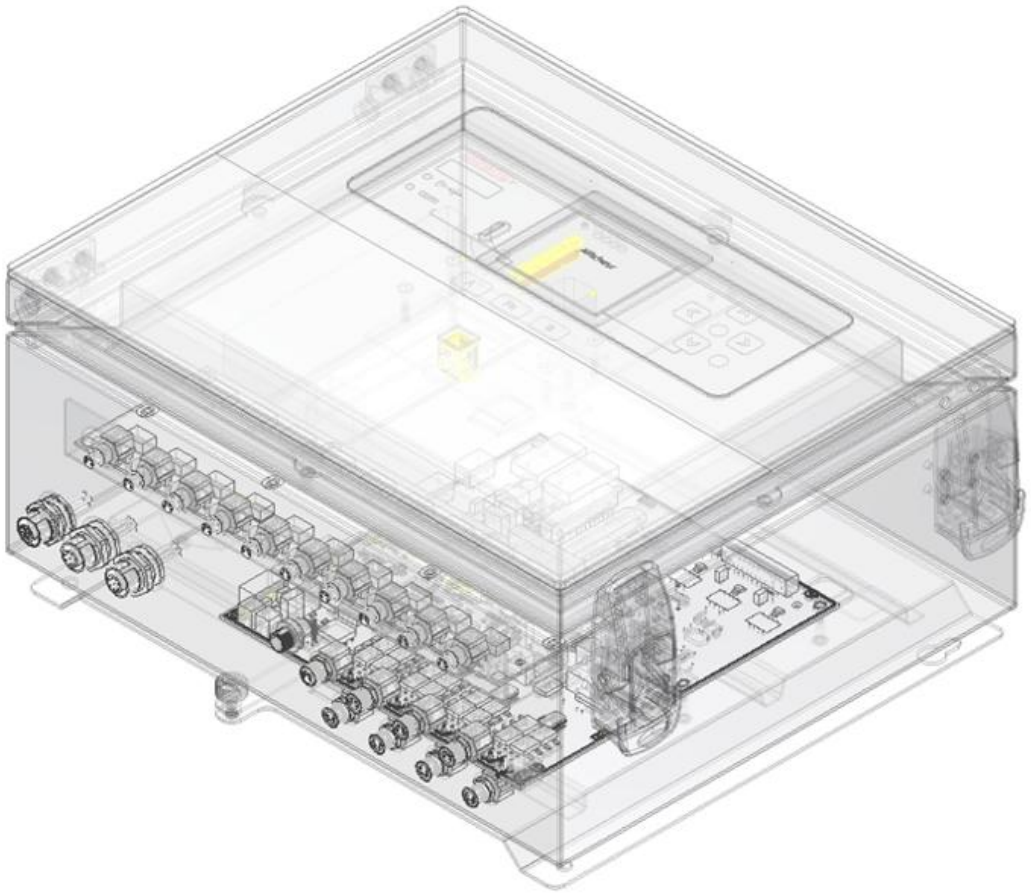


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The UF 831 flow meter complies with the current regulations of the European Community and bears the CE compliance mark.

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Note: A detailed table of contents is provided at the end of the manual.

Important: If you are unfamiliar with the transit time difference measuring technique, we recommend you start by reading our training manual "Ultrasonic transit time flowmeter".

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CHAPTER 1: OVERVIEW

UF 831 flow meters are ultrasonic flow meters used to measure open channel flows using the transit time difference method.

The measurement can be taken using an installation with up to 8 ultrasonic measurement chords. (One chord designates the acoustic path between two probes, each alternating between emitting and receiving. The use of several chords is above all required when the hydraulic conditions are poor and high accuracy is required).

1.1 Inputs/Outputs

In addition to the links with the probes, UF 831 converters offer the following possibilities:

- Integration of up to 10 single modules (or 5 double modules) of inputs/outputs.
- Connection of the inputs/outputs to the equipment, which is made directly on the base of the cabinet via connectors, without the need for any intervention inside the flow meter.

The modules are put in place by Ultraflux in the factory.

1.2 Communication with the flow meter

UF 831 has a serial link, which can be configured by RS232 or RS485 wiring. For this communication interface, the standard protocol chosen is the Slave JBUS (MODBUS). This is used to connect the flow meter to an instrumentation and control system or to a computer (Ultraflux provides PC software compatible with Windows XP or later, allowing you to configure the flow meter, unload the logger and display the values measured).

As an option, communication modules managing the following protocols may be installed on request:

- MODBUS TCP (Ethernet)
- MODBUS RTU

Important: This option must be requested on ordering, since it requires a specific cabinet.

A USB interface on the front panel allows a computer to be connected for the configuration. This is only accessible with the door open.

1.3 Recording possibilities

The flow meter is used to record the measurement data (logger function). Up to 30 variables can be recorded (for example: average flow, minimum flow, maximum flow, water level). A total of 530,000 readings can be recorded.

1.4 Echo display

It is possible to display the measurement echo for each chord, which allows you in particular to check the quality of the measurement and directly view the effect of certain corrective actions (positioning and alignment of the probes, adjustment of the settings, cleaning of the probes, etc.).

1.5 Other functions available

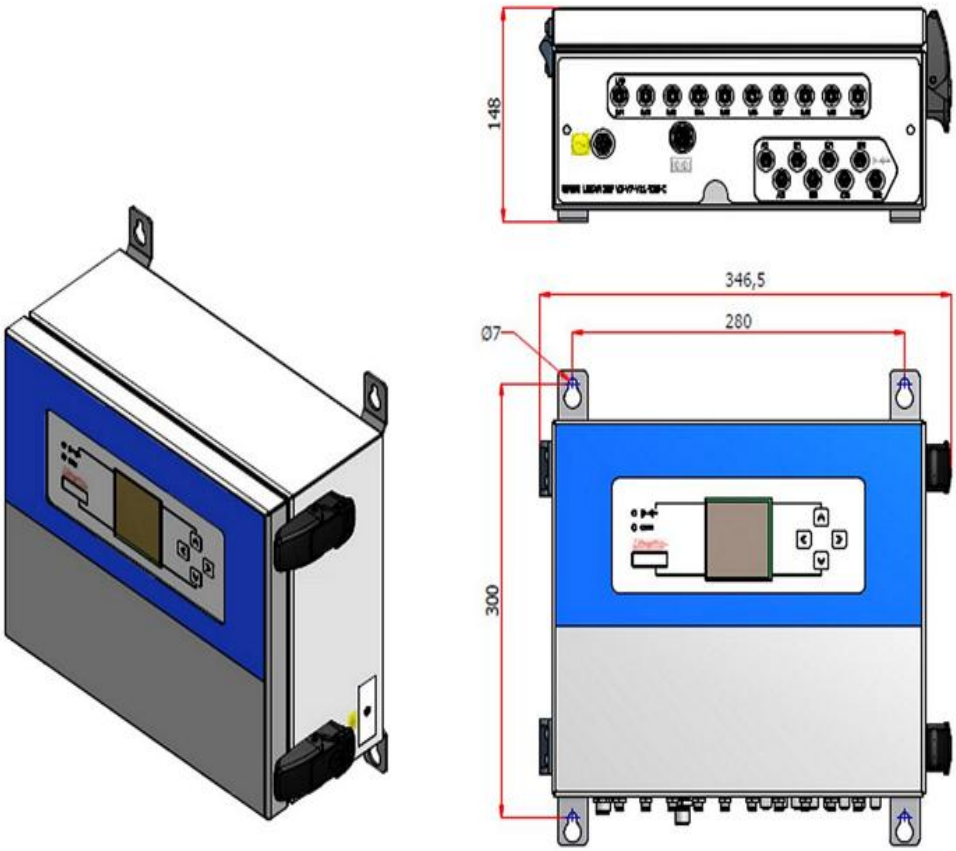
- Four flow volume totalizers which can count the positive flows, the negative flows or the total flows, regardless of their sign,
- Filtering of the measurement using a first-order filter allowing the non-significant flow fluctuations to be smoothed,
- Storage of the measurement in memory in the event of a momentary loss of the echo (due, for example, to the passing of air bubbles) or other faults (adjustable storage interval),
- Setting the measurement to zero if the flow is below a programmable value,
- Readjustment of the zero if it is possible to completely stop the flow.

1.6 Accuracy and availability

- Accuracy on the velocity measured: up to ±0.5%
- Repeatability: up to 0.1%
- Linearity: up to 0.1%

- Accuracy on the level acquisition: up to 0.1%
- Accuracy in the description of the section: up to 0.25%
- Typical accuracy on the flow calculation: from 1 to 5% depending on the application and the number of chords

1.7 Dimensions and weight



Weight: 7 kg (cabinet only)

1.8 Supply

- a UF 831 box
- the connectors
- the Y-cables for the probes

1.9 Protection against dust and immersion

IP 67: Total protection against dust; protection against immersion (30 minutes under 1m of water). This protection is only valid if the installation was carried out or audited by Ultraflux.

This protection is only ensured when the connectors are connected or plugged (if not in use).

Important: If the flow meter is equipped with an optional communication module (Ethernet for example), the protection index becomes **IP20**.

1.10 Power supply

There are two power supply ranges for the flow meter:

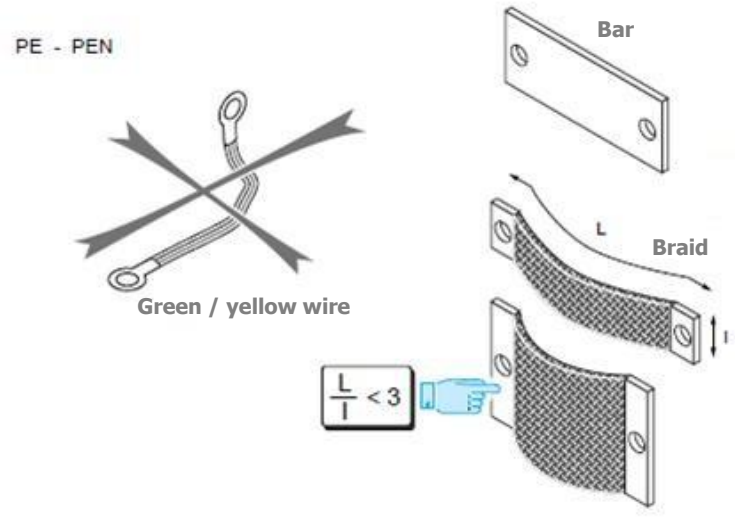
- 110 to 240 VAC (50 - 60 Hz)
- 9 to 36 VDC

The power of the flow meter is less than 40 W. A fuse-type internal protection protects the equipment. If this protection is triggered, the equipment must be returned to Ultraflux, otherwise the guarantee will no longer be valid.

The ground must be connected to both the power connector and to the ground connection contact, located alongside the connectors. For the ground connection, it is recommended to use a copper braid.

When choosing the braid, it is important to respect the following rule:

Length / Width < 3



The cabinet power supply can be provided using an H05-RNF-3G0.75 type cable.

It is recommended to install a disconnectable bipolar circuit breaker interrupter with visible cut-off of 10 A upstream of the flow meter power supply. It is also recommended to install lightning arresters on each of the inputs/outputs of the flow meter, along with a galvanic isolator.

Important:

- The wiring and unwiring of the flow meter must be performed by a person with electrical accreditation. This accreditation must be obtained before dismounting the plate including the keypad and the display. It is essential for this plate to be closed with a tool after each intervention.
- Connection and disconnection from the outlets must be carried out with the power off and the equipment isolated.

Ultraflux accepts no responsibility for incidents which may occur following a failure to respect these instructions.

Comments:

- Check the marking on the cabinet to ensure its supply voltage.
- The flow meter is intended for an overvoltage category II installation.

1.11 Environment for use of the cabinet

- Cabinet: –25°C to 50°C
- Hygrometry: 80% maximum
- Ventilation: no specific precautions.

Warning: This flow meter is a class A device. In a residential environment, it may cause radio-frequency interference. In this case, the user may be asked to take appropriate measures.

1.12 Cleaning the flow meter

Use a dry cloth to clean the screen and the keypad.

The box may be cleaned with water, diluted alcohol or detergent using a sponge or a soft cloth. Do not use abrasive materials or solvents.

1.13 Composition of a measuring point

Apart from the electronic converter (the cabinet), a measuring point includes the following elements:

- 1 to 8 pairs of probes
- 1 to 16 special cables for the probes (provided by Ultraflux)
- 1 to 4 level measurements per channel (which may or may not be provided by Ultraflux)

CHAPTER 2: SAFETY INSTRUCTIONS

For safety reasons, this flow meter must be used by qualified persons aware of the possible dangers involved.

It is important for the user to be fully familiar with the indications covering the possibilities, the applications and the operation of this flow meter.

The protection provided by this flow meter may be compromised if it is not used in compliance with the instructions of this manual or if technical modifications are made to suit the user.

This flow meter complies with the safety standard IEC 61010-1 (cat II).

2.1 Symbols used on the flow meter

	Warning, risk of electric shock
	Warning, risk of DANGER (see note)
	Ground
	Protective ground
	User manual must be read before use
	Disconnection of flow meter when powered OFF

2.2 Assembly

The cabinets do not pose any particular danger to users. It is however recommended to wear personal protective equipment during assembly, including: gloves, safety boots, impact goggles. This equipment will allow you to avoid any risk when installing the flow meter.

It is recommended to follow the assembly method described below in order to avoid any risk of injury.

The assembly must be carried out or inspected by Ultraflux to have all the guarantees in terms of protection against dust and immersion, and correct operation.

2.3 Wiring

The wiring must be carried out by a person with electrical accreditation. The flow meter must be powered off before installing or uninstalling. The sectioning devices must be locked and tagged. The wiring must respect the diagrams provided in the appendix for the power supply and for the inputs/outputs.

The protective cover must be fixed in place using a tool before powering on. The sectioning device must be locked and tagged before dismounting this cover. The cover can be identified by the marking series printed on its surface (symbol described later).

The flow meter must be powered off before dismounting the power connector. To do this, use the sectioning device provided for this purpose.

It is sometimes necessary to protect the inputs/outputs, the power supply and the ultrasonic chords. It is highly recommended to contact Ultraflux to obtain a diagnosis on this point. Ultraflux accepts no responsibility in the event of the incorrect use of the flow meter, and in such cases, the Ultraflux guarantee would not be valid.

2.4 Using the flow meter

The flow meter, equipped with ultrasonic measuring probes, is used to measure the flow of a fluid in open channels (channel or river).

It is important to correctly configure the flow meter for its measurement results to be correct. It is recommended that interventions be carried out by qualified staff from Ultraflux to ensure this is the case. This is highly recommended if your equipment is used to regulate an installation, intervene in a monitoring system, or in the case of other applications for which an incorrect flow measurement would lead to risks.

The heating surface of the flow meter must not be visible, since it is liable to cause burns. It is not necessary to take any particular precautions to allow it to cool. Should the temperature of the cabinet rise abnormally, it is recommended to power off the flow meter and call Ultraflux for expert advice. In the event of a fire inside the flow meter, power it off without opening or touching it, then call the services concerned in order to secure the premises.

The flow meter must not be used beyond the possibilities and specifications given in this manual. The flow meter must be stored in a dry place, with the packaging provided by Ultraflux in order to protect the parts liable to be damaged by a collision. The use of PPE (Personal Protective Equipment) adapted for the handling and installation of the flow meter (safety boots, protective gloves) is recommended.

The flow meter must only be modified or disassembled by Ultraflux personnel. Ultraflux accepts no responsibility should this rule not be respected. No consumables are used for the operation of the flow meter.

2.5 Recycling the flow meter

In the context of decree no. 2005-829 dated 20 July 2005 relating to the collection, treatment and disposal of electrical and electronic equipment in France, Ultraflux delegates the responsibility for financial and also logistical recovery to the user, who will manage their own waste.

2.6 Contact address

For any requests for information, please contact us at:

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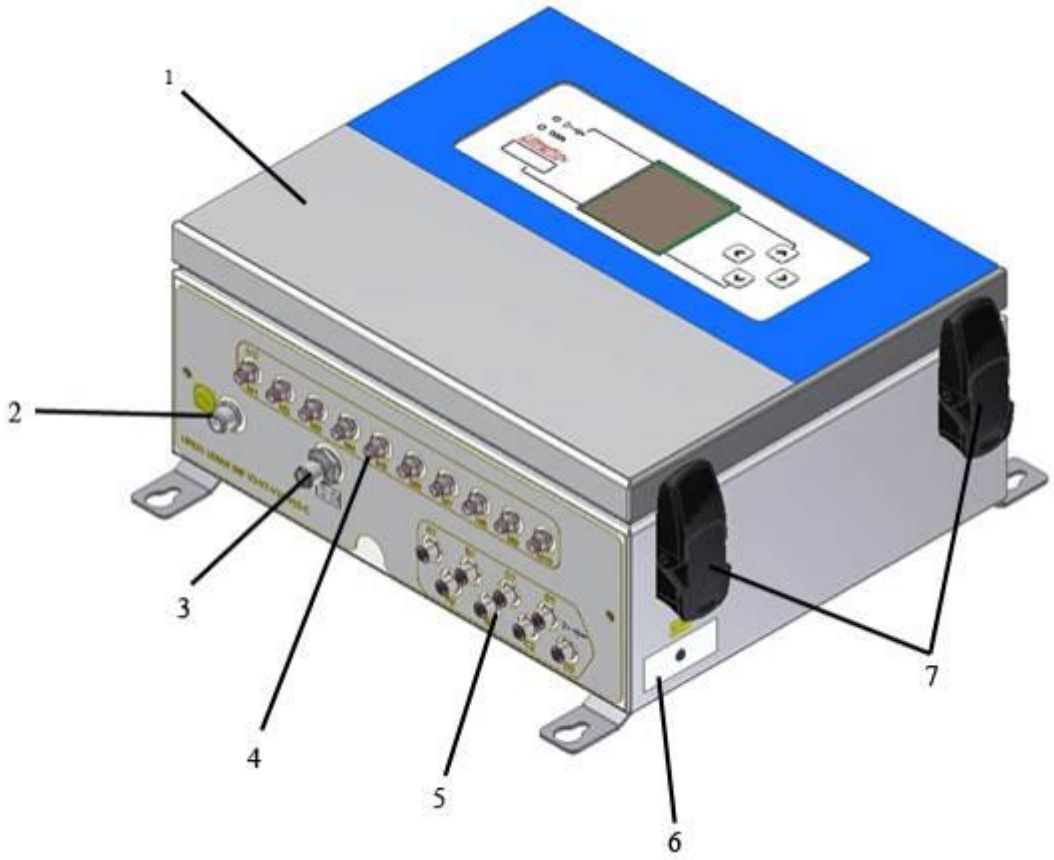
CHAPTER 3: INSTALLATION AND WIRING

3.1 Opening the cabinet

In order to configure the flow meter, the protective cover must be opened. It is opened by flipping and unlocking the latches located on the side of the cabinet.

On certain models, one of the latches may include a lock restricting access only to authorized persons.

These latches also ensure that the protection against dust and immersion is maintained. They must therefore remain closed in normal use.



1. Protective opening,
2. Power supply connector,
3. Communication connectors,
4. Input/output connectors,
5. Chord connectors,
6. Ground connection contact,
7. Latches (optional lock on one of the two).

The latches are adjusted in the factory. The guarantee of protection against dust and immersion is dependent upon this adjustment not being modified.

Likewise, this guarantee is no longer valid if the Lexan has deteriorated.

3.2 General procedures

3.2.1 Wall attachment

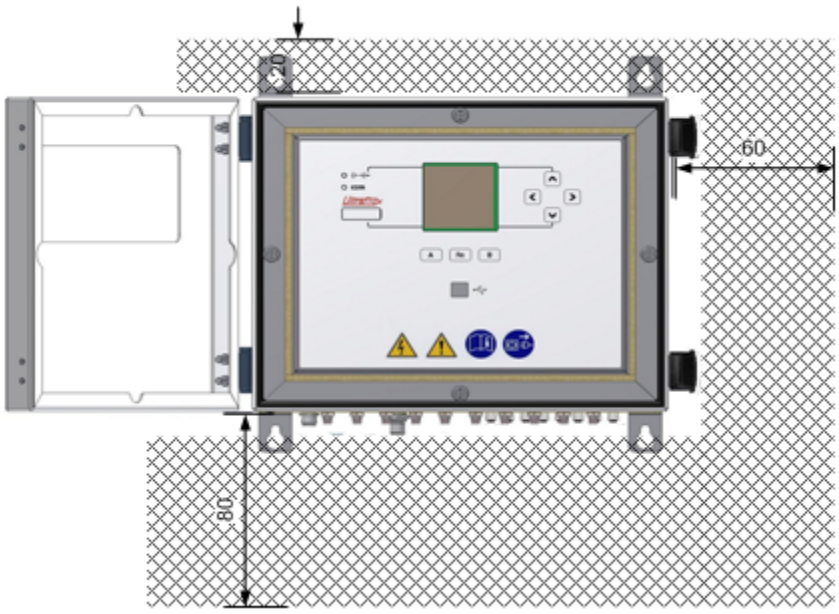
To install the flow meter on a wall:

Make attachment holes on a wall which is sufficiently solid. Firmly screw the flow meter to the wall so that it does not fall (take care with cavity walls).

The area around the support must be clear in order to allow:

- the connection of the connectors,
- the movement of the latches.





3.2.2 Wiring of the connectors

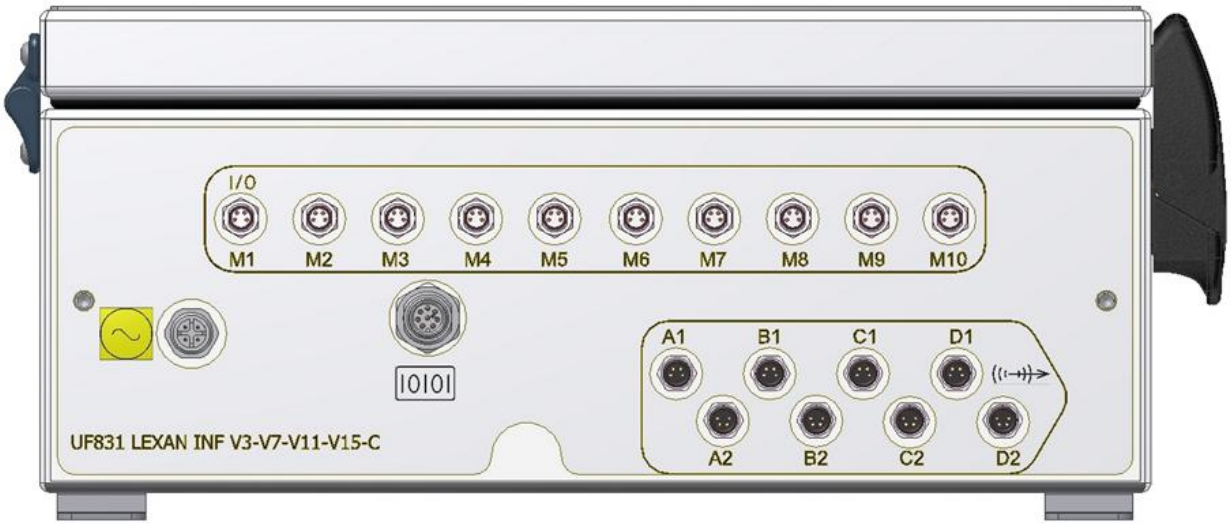
The cables must be stripped in such a way that the armor remains outside the connectors. The shielding must pass through the connector in order to prevent interfering signals from damaging the quality of the measurement. Remember to allow sufficient lengths to be able to access the locations of the probes and the inputs/outputs.

Important: If using an armored cable, be careful with the "cutting edge" of the armor after cutting it to strip the wire. This edge may be very sharp. It is recommended to cover the cut edge of the armor with insulating tape to prevent any accidents.

Screw the connector to the cable using the torque intended for the connector.

3.2.3 Connection

The connectors of the UF 831 box are installed as shown on the figure below:



Comment: The addition of communication modules modifies the layout. Contact us for the details of the changes.

All connectors must be connected with the equipment powered off, isolated and locked and tagged, by authorized staff. **The power supply connector must be the last to be connected.**

1) Power supply connector (wiring diagram in appendix 5)

Female 4-pin M12 plug



2) Probe connector (wiring diagram in appendix 5)

Male 4-pin M8 plug



Each connector corresponds to an ultrasonic chord, in other words two probes. As standard, it is therefore necessary to use the Y-cable provided with the flow meter in order to separate the two probe cables. The flow meter can be configured to have only one probe per connector, but the number of chords possible is then halved. It is recommended to contact Ultraflux in order to define the most favorable configuration for your situation.

3) Communication connector (wiring diagram in appendix 5)

Female 8-pin M12 plug



4) Input/output connector (wiring diagram in appendix 5)

Female 4-pin M8 plug



3.2.4 Connectors

Preliminary comment: Before accessing the area reserved for the electronic connectors used to connect the flow meter to the inputs/outputs and to the probes, the wires must be stripped and the grounding strip assembled.

Once the cabinet is fixed and the cables installed on the connectors, the probe connectors and the input/output connectors must be installed in order to plug them in at their allocated positions.

1) Analog inputs/outputs

The UF 831 allows two types of inputs/outputs to be used:

- Current inputs/outputs (0-20mA, 4-20mA, 0-24mA) or voltage inputs/outputs (0-10V),
- Temperature measurement Pt 100 and Pt 1000 with 2, 3 or 4 wires.

The sensors must be powered externally. The wiring of the analog inputs/outputs is indicated in appendix 5: Wiring of the inputs - outputs.

2) On/Off inputs/outputs (relay)

Each relay of the UF 831 is a normally-open relay contact:

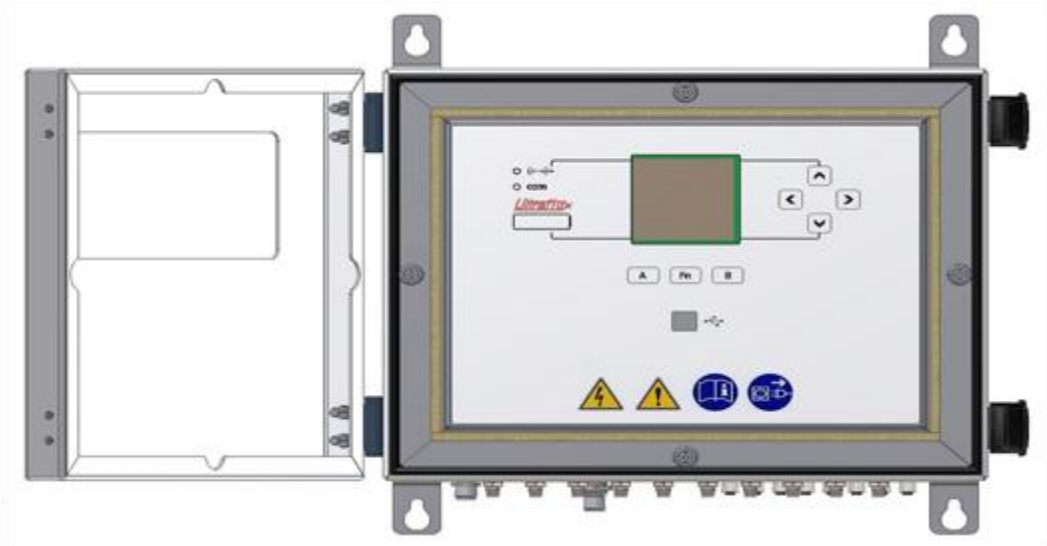
- Breaking capacity of each relay: U < 50 V, I < 10 mA,
- The maximum frequency of a relay in pulse mode depends on the length of the pulse.

3) Serial link

The serial link is connected using a connector, which can be configured by RS232 or RS485 wiring. The wiring diagrams are presented in appendix 5: Wiring of the communication port.

4) Connection to the PC

The connection to the PC is made using a USB connector on the front panel of the flow meter.



3.2.5 Installing the UF 831 close to a frequency converter

Important: Avoid installing the UF 831 close to a frequency converter. If this cannot be avoided, interference filters must be installed. It is highly recommended to contact us if this situation arises.

It is also recommended to separate the paths of the probe cables and the power cables.

3.2.6 Power supply wiring

Warning: Before wiring the power supply, check that no current is circulating on the power supply cables. The installation must be locked and tagged so that it cannot be inadvertently powered on, for example by someone other than the user.

Steps:

- Install the protective ground cable (green & yellow) on the terminal block indicated by the  symbol on the outside of the cabinet.

- Install the wired protective ground wire on the connector, and screw in. Then install the phase and the neutral on the connector provided.

Warning: To dismount the power supply connector, check that the flow meter is powered off correctly. The flow meter may suffer irreversible damage should the power supply connector be dismounted when the flow meter is powered on.

CHAPTER 4: IMPLEMENTING A MEASURING POINT

There are 5 main steps to commissioning a measuring point and these must be followed very carefully. We would also like to remind you that Ultraflux can help with commissioning of your flow meters (for further information on this service, please contact us).

4.1 Choosing the measurement location

We highly recommend that you follow the instructions given in our document "Flow measurement by transit time difference".

As a reminder, the main precautions to be taken are as follows:

- Choose a measurement location providing straight lengths upstream and downstream of around 10 times the width of the channel or the river.
- Also choose a location where there is little aeration of the water. You should therefore avoid locations immediately downstream of:
    - a waterfall or a weir,
    - a screw-type pump,
    - a highly aerated grit chamber/oil separator,
    - an aerobic decantation installation,
    - a permanent tunnel aeration device.

4.2 Installing the probes

Given the many attachments and supports that are possible for wet probes (for open channels and rivers), we will not go into each of them in detail, but rather list the general principles and prerequisites for smooth operation of the installation.

1. When positioning the probe supports:
    - Respect the "axis diameter" when installing the supports. This value is provided by Ultraflux and is calculated based on the range of velocities expected at the measuring point.
    - Position the probe supports on each bank so that the ultrasonic chord(s) is (are) parallel to the water level (each probe the same distance from the water level).

2. When fixing the probe support:
    - Make sure that the position of the probe can still be adjusted (directional probes only).
    - Make sure that the attachments points are secure.

3. When aligning the probes:
    - Align the probes as far as possible using a laser sight or a rifle scope (depending on the distance and the meteorological conditions),
    - Once the work has been completed, make sure that the probe alignment mechanism is locked in place.

Comment: Probe alignment can be checked when the electronics have been put in place. You can then simply view the relative gain on each chord in your flow meter.

4.3 Measurements to be taken on site

4.3.1 Topography of the site

For future configuration of your Uf 831, the following points should be measured:

- Geometry of banks upstream, downstream and level with the measuring point,
- Pile (or probe support) position and the position of the ultrasonic probes,
- Floor profile (bathymetry),
- Water level on the water level gauge (day, date and time of operation).

4.3.2 Determining the different levels in relation to the stream

For future configuration of your Uf 831, the following measurements need to be taken on site in relation to the water level:

- The level probe(s),
- The velocity measurement chords (ultrasonic probes).

4.4 Analysing and processing data measured on site

In preparation for configuring your meter, produce the site plan and the plan of the different heights using the data collected.

Follow the 5 steps below to produce your 2 plans.

1. Trace the position:
    - Of the probe supports
    - Of the water level gauge
    - Of the banks

2. Work out the main axis of flow

3. Project the position of the probes onto this axis

4. On the plan, measure:
    - The distance between probes "L"
    - The axis diameter

5. Produce the plan of the different heights:
    - Of the water level gauge
    - Of the velocity measurement chords (ultrasonic probes)
    - Of the level sensors

4.5 Transferring the data collected to the converter

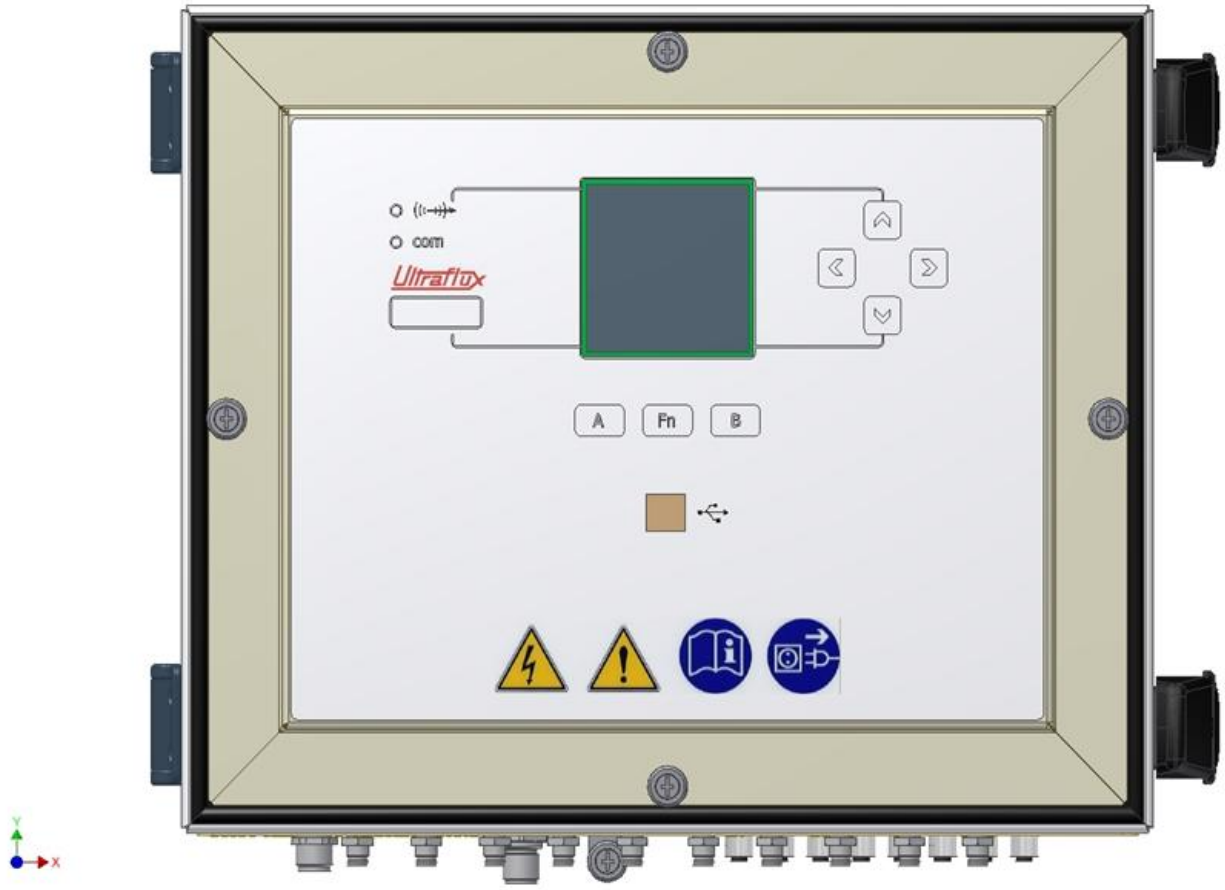
All of the data collected previously (points 4.3 and 4.4) must be transferred to the converter. There are two ways you can do this:

- Using the PC software for your Uf 831 (see Chapter 7),
- Directly in your UF 831's interface (see Chapter 5).

CHAPTER 5: USING AND CONFIGURING THE UF 831

5.1 Using the UF 831

The UF 831 has a screen and a keypad which can be used to configure and view the measurements as they are taken. LEDs indicate the status of the measurement and of the flow meter communication.



5.1.1 Operating mode

The flow meters operate with 3 different types of displays:

- "Measurement" displays/mode (flow, quality…),
- "Settings" displays/mode (description of section, logger...),
- "Echo" displays/mode (landscape, zoom…).

5.1.2 Keypad

The **Fn** (for Function) key is used to switch between displays/modes. This **Fn** key is used in particular to enter the "settings" mode.

The **<** and **>** keys are used to browse through the menus of this mode.

A long press on the **Fn** key, or allowing approximately 1 minute to pass without using the keypad, returns you to the "measurement" mode.

Within a menu, the **<** and **>** keys are used to change page. These keys may also have a contextual function. If this is the case, a reminder of this function will be provided at the bottom of the screen page, in the same way as the choice of the screen in measurement mode which is displayed by default.

After powering on the 831, the screen displays the page which has been selected as priority. To choose this "default" screen, select and validate it by pressing **B** in measurement mode.

To scroll through the measurement screens, use the ▲ and ▼ keys.

To access the other menus, press the **Fn** key, then successively press the **<** key, or browse using the **<** and **>** keys.

To enter a menu, press ▼ or ▲.

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

To modify a line, select it using ▼ or ▲ and modify the value using **<** or **>**.

If no key is pressed for approximately one minute, the UF 831 automatically returns to measurement mode and to the display chosen as priority using **B**.

For a given parameter, the value to be applied is defined using the **>** (increase) and **<** (decrease) keys.

Comment: An extended press on one of these two keys accelerates the increase or the decrease.

5.1.3 LEDs

Two LEDs are present on the front panel:

- *Blue measurement LED:* indicates whether or not the flow meter is measuring.
    - A flashing LED indicates normal operation.
    - An LED which is fixed on or off indicates abnormal or interrupted operation.

- *Red, orange or green Communication LED:* indicates the status of the external communication of the flow meter (serial link or USB).
    - Flashing green on each dialog on the serial link.
    - Long red flashing on each dialog error on the serial link.
    - Orange LED fixed on when the flow calculation is in degraded mode or when a related function is faulty.
    - Red LED fixed on when the flow calculation is faulty.

5.2 Main configuration elements

5.2.1 Geometrical and physical definition of the measuring point

1) Composition of a measuring point

A measuring point consists of:

- an open channel measurement section (channel or river),
- a description of the hydraulic profiles,
- a fluid,
- one or more ultrasonic chords,
- up to four level sensors (which may or may not be provided by Ultraflux).

Comment: UF 831 is used to produce up to eight measuring points with the same flow meter.

2) Reference systems used

Two reference systems are used:

- The customer reference system: the one used in measurement mode to display the water level. "Level" is used to refer to all elevations measured in this reference system,
- The section description reference system: the one used to describe the form of the channel or the river. "Height" is used to refer to all elevations given in this reference system.

Example: The water is at 150 mm on a water level gauge. The flow meter will display the level of the water surface in the customer reference system.

However, to describe the section, you may wish to take the bottom of the channel as a reference, with the water level to be displayed in relation to the customer reference system. The joint use of the two reference systems then involves reference planes.

3) Definition of the reference planes

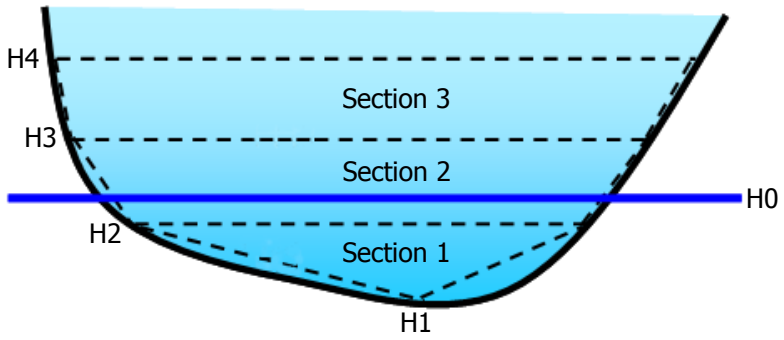
Each channel is defined by a set of trapeziums. Each trapezium is defined by:

- height at top/height at bottom,
- width at top left and right/width at bottom left and right.

To define the section of the channel, two reference planes are used, one for the heights (H0) and one for the width (W0). The form of the channel or the river is broken down into sections. Each section represents a part of the trapeziums. The heights and widths of the trapeziums are measured in relation to two reference planes.

Example:

For the following sections:

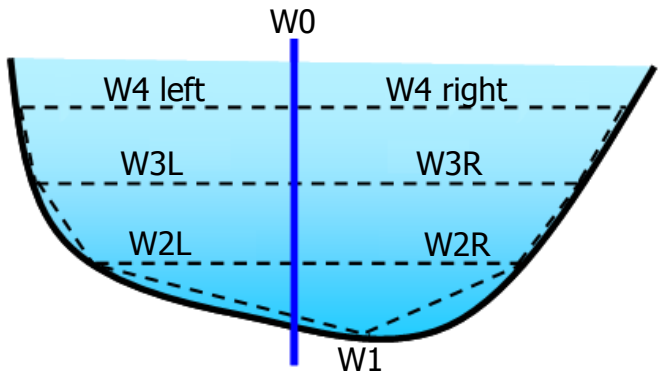


The section heights are defined as follows:

- H1= - 0.5 m
- H2= - 0.2 m
- H3= 1.2 m
- H4= 1.9 m

The elevations may be negative, null or positive depending on the H0 chosen.

The widths meanwhile are defined with regard to a vertical plane



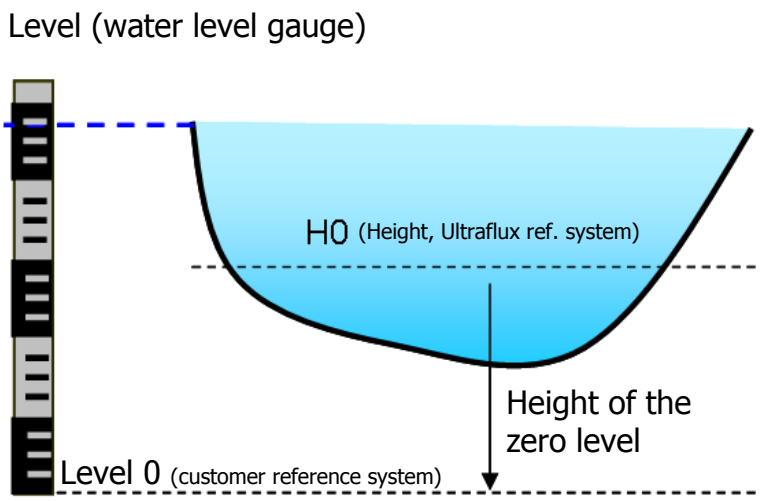
As for the heights, the widths may be negative, null or positive with regard to this plane.

Comments:

- The highest point must be greater than the maximum foreseeable water level. If the water exceeds this height, the entire area located above this last point is not taken into account.
- For rather complex sections (e.g. semi-circular outfall sewer with cunette), it is important to surround the discontinuities with two elevations close together.
- It is not compulsory to define 20 pairs of points. The widths of the unused points may be set to 0.

4) Correspondence between customer reference system and section description reference system

To connect these two reference systems, the elevation must be defined between the zero of the level and the plane H0.



Three scenarios can be envisaged:

- If the zero level of the water level gauge is **below** the plane H0, the height of the zero level has a **negative** value (see figure above),
- If the plane H0 and the bottom of the water level gauge correspond to the river bed, the height of the zero level is 0,
- If the plane H0 is defined as being the surface of the water at a reference height of 26m NGF (General Leveling of France), the height of level zero (therefore 0 NGF) has a value of -26m since, in the description of the section, the plane is located at a height of -26m NGF.

5.2.2 Number of channels

Note: for multi-channel flow meters only, it is possible to define the number of channels to be managed by the flow meter. The geometric and physical description of the measuring point must then be produced for each channel.

In the case of several channels, the channels are named in alphabetical order (A, B...). Qa, Qb... are the flows calculated for each channel. Qt is the total flow.

The open channel pipe is defined by its section, its hydraulic profile and the position of the ultrasonic chords.

The number of chords must be determined based on

- the required accuracy
- the amplitude in the variation of the level (since the probes must be immerged in order to operate)

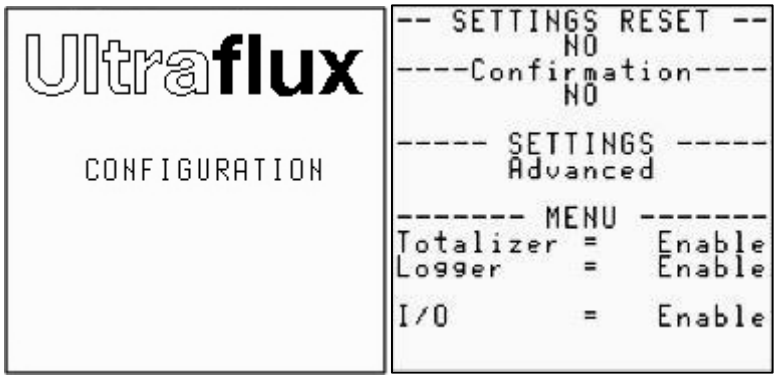
For all of these technical points, consult Ultraflux if necessary.

5.3 Configuring the UF 831

The configuration for the flow meter is divided into three levels:

- Simple: simplified configuration for basic use of the flow meter.
- Normal: configuration allowing more detailed use.
- Advanced: mode allowing the complete adjustment of the flow meter settings. This mode is reserved for users with detailed knowledge of the transit time difference flow measuring technique and with some idea of hydraulic concepts.

The level can be changed by going to the menu Configuration / Settings / Simple, Normal or Advanced:



This menu is also used to activate functions such as

- the logger,
- the inputs/outputs,
- the totalizers.

To activate these options, place the cursor on the line corresponding to the required option and use the < and > keys.

5.3.1 Flow meter menu

Depending on the type of flow meter and the configuration (simple, normal or advanced) selected, the flow meter menu may change. Below is a non-exhaustive list of the sections for the flow meter:

- CONFIGURATION: configuration of the operating modes, the registration name, the JBUS characteristics; configuration management, etc.
- PIPE / FLUID SETTINGS: setting of the type of fluid, the pipe, the chords, the geometry of the chords of the measuring point, etc.
- DESCRIPTION OF SECTION SETTINGS: settings of the section of the channel or the river.
- LEVEL SETTINGS: settings of the level measurement(s).
- HYDRAULIC PROFILE: settings of the hydraulic profile curve that the flow meter must use.
- HEIGHT/VELOCITY (SPEED) SETTINGS: settings of the height/velocity law in the event that the probes are all out of the water.
- TOTALIZERS SETTINGS: totalizer settings.
- INPUT / OUTPUT SETTINGS: settings of the inputs/outputs.

- LOGGER SETTINGS: logger settings.
- LINEARIZATION SETTINGS: linearization settings.
- FUNCTIONS SETTINGS: settings of the inputs for the function engine. This menu is only available on request for specific applications.
- ADVANCED SETTINGS: settings of the simulation mode, the special probes, the specific codes for ultrasonic treatment, etc.
- ECHO DISPLAY: display of the echo signals of the ultrasonic probes.
- FIRMWARE UPDATE: firmware update.

5.4 SIMPLE configuration

Below you will find the description of the menus, screen by screen, to guide you through the configuration of your flow meter.

5.4.1 "Configuration" menu



1) Access code (code access)

The flow meter is initially delivered without an access code (access code is 0), allowing you to freely modify all the settings. The introduction of a valid code is used to prohibit the modification of the settings for anyone who does not have the code. The settings can then be viewed freely, but cannot be modified.
The code comes into operation when the flow meter returns to measurement mode. The code must be entered in order to exit this mode. If the code is incorrect, the flow meter is locked for a few seconds. The time for which the flow meter is locked increases each time that an incorrect code is entered by the user.

Notes:
- The flow meter can be locked manually. Select the "Locked" field and set it to "YES".
- The code can be modified using the keypad (it is then defined using the **<** and **>** keys) or the serial link.

Important: For writing operations via the serial link or USB, the code must be "written" before any "writing" frame. The flow meter is automatically locked after 10 seconds without any "writing". Each incorrect attempt at entering the code increases the time before the next attempt can be made.

2) Serial link settings (connection)

Enter the JBUS number of the flow meter (number assigned to the flow meter and to which it will respond on a Modbus query).

3) Transmission speed (bitrate)

Enter the transmission speed that you wish to apply.

4) Display language

The possible display languages are: French, English, Spanish, German, Italian, Portuguese and Russian.

5) Station's name

Each flow meter can be assigned a label with up to 8 characters (registration number). The position of the current character is chosen using the ▼ and ▲ keys. To scroll through the characters, use the **<** and **>** keys.

6) Back light

The possible options are:

- ON: the back light is on for one minute after pressing any key, then remains dimly lit,
- TIMED: the back light is on for one minute after pressing any key, then goes off,
- OFF: No back light.

7) Timer before return to "Measurement" mode

The flow meter automatically returns to Measurement mode after approximately one minute. The modified settings will then be taken into account. This avoids the risk of forgetting to exit Paramétrage (Configuration) mode and needing to intervene again on the flow meter to return to Measurement mode.

8) Loading and saving a configuration (option files)

The current configuration of the flow meter can be saved directly in the flow meter, or on a PC. Up to 11 configurations can be saved, numbered from 1 to 11.



To save the current configuration on the flow meter, select the configuration number under which you wish to save it. The saving of the configuration is then validated when passing to another menu page or following an extended press of the **Fn** key.

To recall a configuration, enter the configuration number and validate this choice by passing to another menu page.

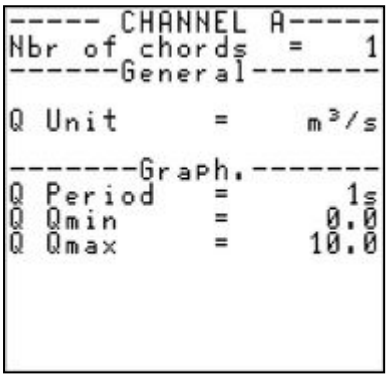
5.4.2 "Pipe / fluid settings" menu

In simple configuration mode, access to the settings is restricted to the following sections:

1) Flow unit (Q Unit)

Enter the flow unit which will be displayed.

2) Flow graph



The flow graph is a screen of the Measurement mode displaying in the form of a curve the evolution of a specific dimension (see the possible dimensions below).

Enter the minimum and maximum limits of the dimension associated with the flow graph. These limits mark the boundaries of the vertical display of the flow graph.

The flow graph Period setting is used to define the time interval between two successive points. The possible values are: 1 s, 5 s, 10 s, 30 s, 1 min, 2 mins, 5 mins, 10 mins, 15 mins, 30 mins, 1 hr, 2 hrs, 6 hrs, 12 hrs and 24 hrs.

Example: If the period of the flow graph is 1 min, each point of the curve represents the average value of the dimension associated with the flow graph over 1 min and the whole screen shows the evolution of the flow over the last 144 minutes.

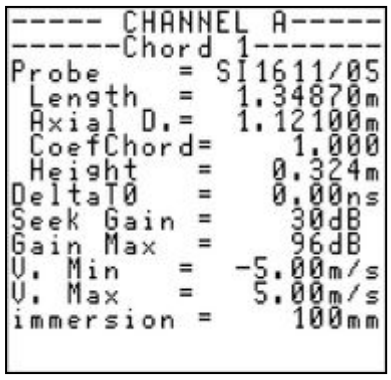
3) Type of fluid

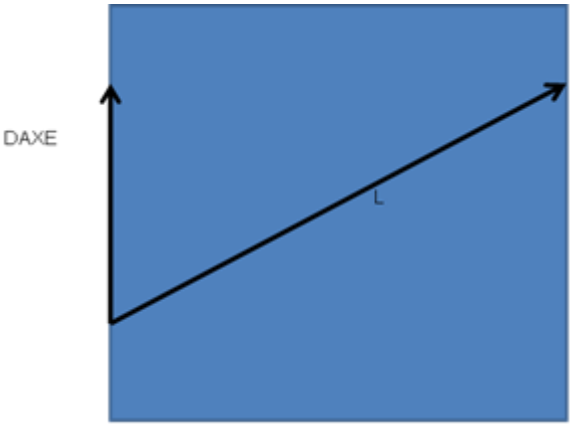
In simple configuration mode, the fluid must be water at ambient temperature (cannot be modified).

4) Chord settings

The settings to be entered for the definition of a chord are as follows:

- the reference of the probes used,
- the length (in meters) between the faces of the two probes,
- the projected length (Axial D.) with regard to the axis of the channel or the river,
- the height compared to H0.

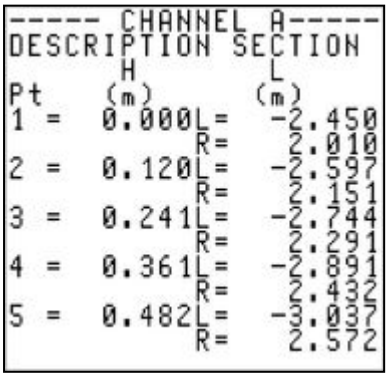




5.4.3 "Description of section settings" menu

This menu is used to describe the section of the channel or the river.

1) Description of the section

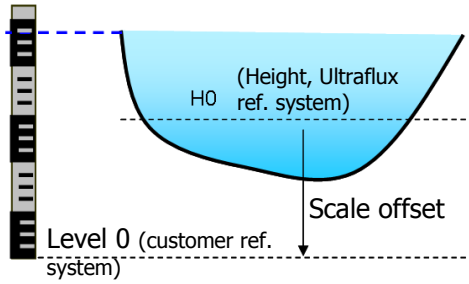


For each chord, enter the elevation of the plane of the chord with regard to the plane H0 and the two widths with regard to the plane W0. This section can be defined in 20 points.

It is possible to define a distance to the right and to the left of the plane W0.

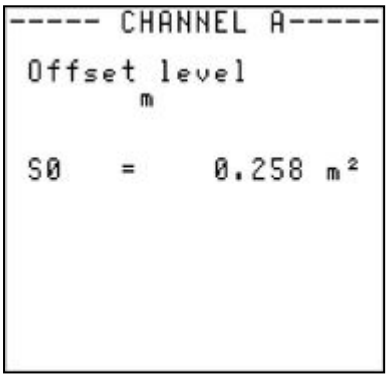
2) Scale offset

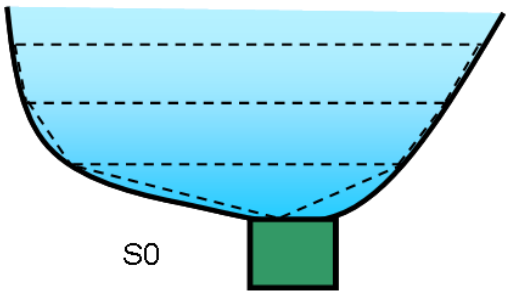
Level (water level gauge)



The scale offset is the numerical value used to pass from the section description reference system ("height reference system") to the customer reference system ("level reference system").

3) Surface S0





When the bottom of the channel or the river is difficult to describe, both in terms of section and hydraulic profile (for example if there is sand silting, pebbles, etc.), it can be estimated using parameter S0 which defines a surface of the section in which the velocity is constant.

If this parameter is positive, the calculation of the flow adds this section to the hydraulic section (erosion of the channel) and considers a constant fluid velocity equal to the lowest hydraulic section velocity.

If the value of S0 is negative, the value of S0 is deducted from the section and it is considered that so long as the wetted section is smaller than S0, the flow is null (silting). The aim is to simulate a silting of the channel.

5.4.4 "Level settings" menu

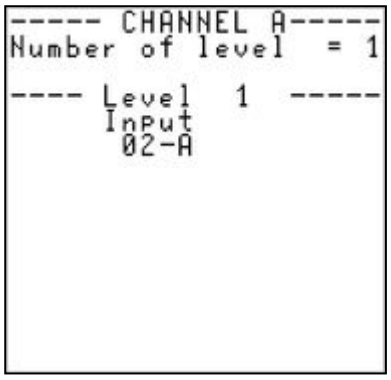
This menu is dedicated to setting the level measurement.

The level measurement is essential for measuring the flow. In fact, ultrasonic probes are used to measure the average flow velocity of the fluid in the channel and the level is used to find out the surface wetted by the fluid in the section of the channel.

1) Number of level measurements

UF 831 can be used to manage up to four level measurements.

The menu below is used to select by level the input channel which corresponds to the level measurement (for example, a 4-20mA input):



The measurement used to calculate the flow (priority measurement) is level 1. If this is faulty, the flow meter automatically switches to level 2 (and so on, potentially up until level 4). The red fault LED is then lit and the flow meter generates a Level 1 fault.

Note: To measure a level, a simple solution involves using a current input. The flow meter will deduce the level of water in which the sensor is immerged from the current measured. Simply configure the range of the sensor and the base of its scale. For further information on the configuration of the inputs/outputs, see the chapter dedicated to this subject.

Comment: For a level sensor taking a downward measurement (for example, a measurement by ultrasound in the air), the range of the measurement entered in the flow meter must be negative.

5.4.5 "Hydraulic profile settings" menu

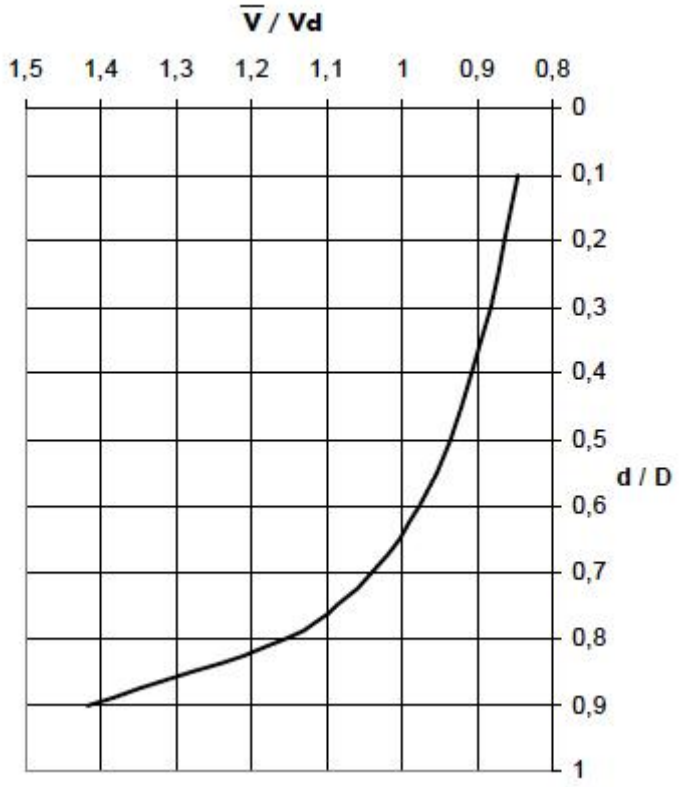
1) Description of the hydraulic profile

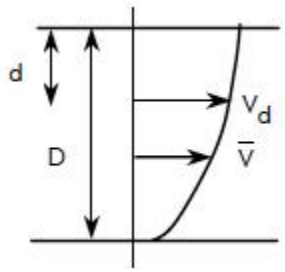
The vertical hydraulic profile is described using 20 sections.

Each section is defined by its lower and upper elevations and by its hydraulic coefficient (see this concept in our didactic handbook "Ultrasonic transit time flowmeter").

The value of this coefficient may be fixed section by section (absolute mode) or may be calculated for each section based on the distance from the section to the surface.

The graph below shows the rest of the coefficients specified by standard ISO 6416 (indicates the existing relation between the average velocity $\overline{V}$ in the entire wetted section and the velocity measured by a chord immerged at d / D.):





Comments:

- The deepest section is marked by the bottom of the channel or the river and by elevation no. 1,
- The sections describing the hydraulic profile are fully independent of the sections describing the measurement section.

2) Choosing the definition mode of the hydraulic profile

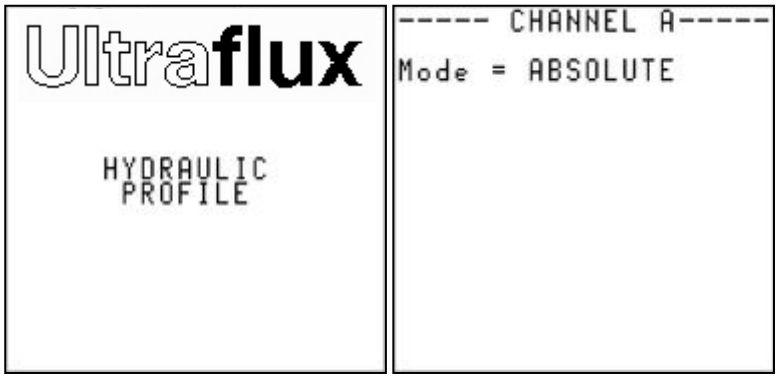
The hydraulic profile may be defined according to two modes:

- **Absolute mode**, in which the elevations marking the sections are specified in meters starting from the bottom of the channel or the river up until the maximum foreseeable height (point 1 = lowest elevation; point 20 = maximum foreseeable height) and in which the hydraulic coefficient of each section is fixed. This mode is particularly suited for narrow channels with an irregular section.

  Important: In absolute mode, all elevations are specified with regard to the reference plane H0.

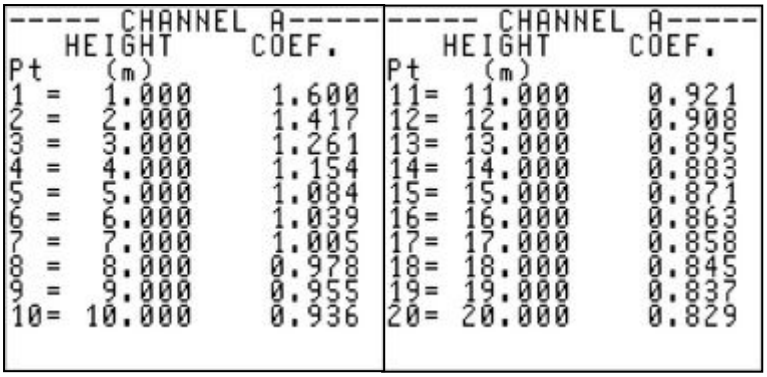
- **Relative mode**, in which the elevations marking the sections are specified as an immersion percentage (for example, point 1 = 95% immersion; point 20 = 0% immersion = surface), the hydraulic coefficient being calculated based on the depth of the section. This mode is more particularly suited to wide channels with a fairly regular section.

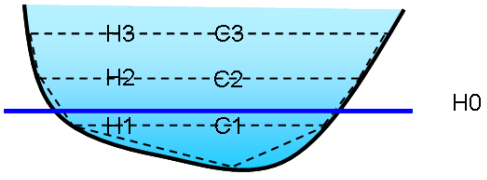
Select the required mode, absolute or relative.



3) Absolute mode

Starting with the lowest elevation (Pt1), specify for each section the upper elevation of the section and the corresponding hydraulic coefficient.



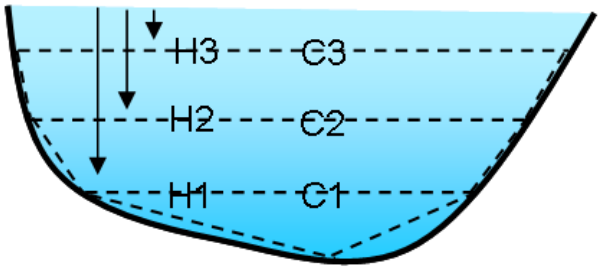


Comments:

- The elevation of point no. 20 must be greater than the maximum foreseeable level,
- For a given section, the velocity must be roughly constant.

4) Relative mode

Starting from the bottom, specify for each section the immersion percentage of the upper elevation and the corresponding hydraulic coefficient, the elevation of the last section being 0 (surface of the channel or the river).



----- CHANNEL A-----			----- CHANNEL A-----		
Pt	IMMERS. %	COEF.	Pt	IMMERS. %	COEF.
1 =	95	1.600	11=	45	0.921
2 =	90	1.417	12=	40	0.908
3 =	85	1.261	13=	35	0.895
4 =	80	1.154	14=	30	0.883
5 =	75	1.084	15=	25	0.871
6 =	70	1.039	16=	20	0.863
7 =	65	1.005	17=	15	0.858
8 =	60	0.978	18=	10	0.845
9 =	55	0.955	19=	5	0.837
10=	50	0.936	20=	0	0.829

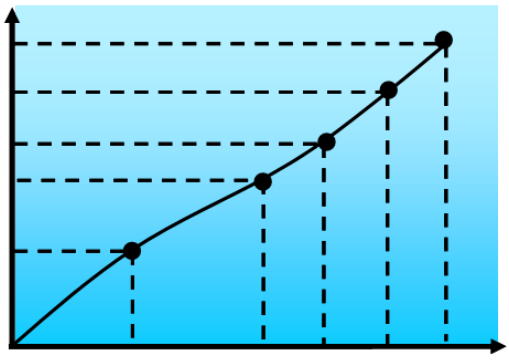
Comment: By default, the breakdown of the hydraulic profile (into basic sections) proposed by the flow meter copies the one recommended by the ISO 6416 standard concerning the ultrasonic flow measurement in an open channel.

5.4.6 "Height / velocity (speed) settings" menu

1) Velocity profile in low water situation

When the level is below the lowest chord, the flow cannot be measured using ultrasound. It can however be estimated using a linear interpolation curve with 4 points, or by self-learning (automatic regression).

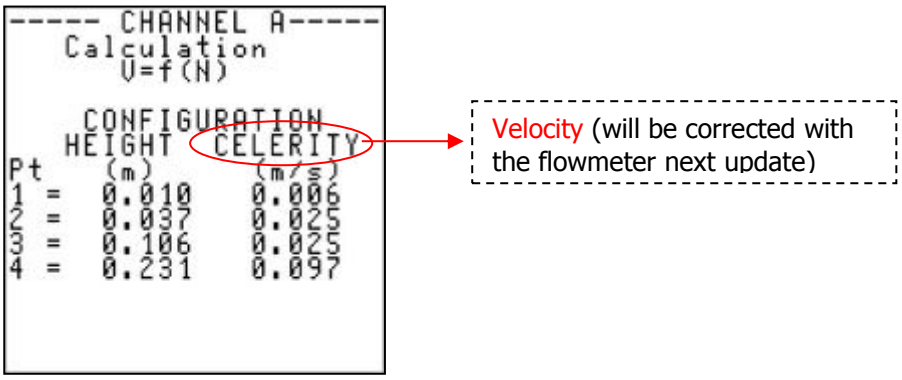
Velocity



Height

The settings to be indicated depend on the technique chosen:

- height / velocity curve:



- automatic regression:



It is possible to trigger a "learning" mode for this height/velocity law, which is done by automatic regression. The flow meter will then estimate what the height/velocity curve could be, taking into account the measuring points.

A coefficient can then be defined which will be used until the flow meter takes new measurements.

5.4.7 "Totalizers settings" menu (if activated)



1) Activation and direction of metering

For each of the totalizers, the possible modes are:

- **OFF**: totalizer not activated,
- **+**: totalization of the positive flows, in other words going from the upstream probes to the downstream probes (see the wiring of the probes),
- **–**: totalization of the negative flows, in other words going from the downstream probes to the upstream probes,
- **±**: totalization of all flows, whatever the direction.

2) Pulse unit and weight

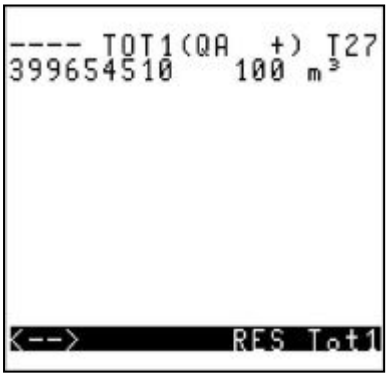
Each activated totalizer emits an incrementation pulse (which can be returned on a relay output; see p.X) each time that the Pulse weight x Unit volume flows in the metering direction of the totalizer.

The possible units are: 1ml, 1l, 1m^3, 1000 m^3, 1Gal, 1Bbl.

3) Resetting a totalizer

To reset a totalizer:

1. Switch to measurement mode (long press on the **Fn** key) on the page of the totalizer concerned,
2. Press the **A** key until the totalizer that you wish to reset is displayed on the right,
3. Press the **B** key to reset the totalizer. A negative image of the pop-up menu is then displayed.



5.4.8 "Input/Output settings" menu (if activated)

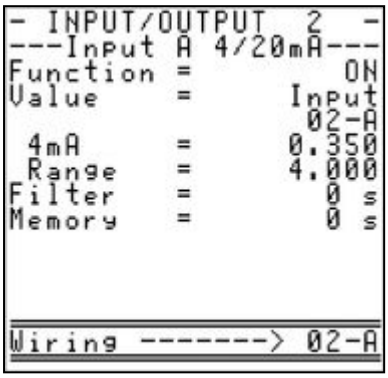
The input/output modules are:

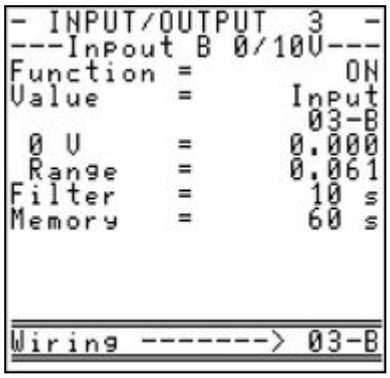
- As input:
  - Current,
  - Voltage,
  - Temperature (PT100/PT1000),
  - Contact.

- As output:
  - Current/Voltage,
  - Relay.

The menu only appears if inputs or outputs are installed on the flow meter. To install additional inputs/outputs, please contact Ultraflux to find out the specifications of all available inputs/outputs.

1) Current input and voltage input module





The possible options are:

- OFF: deactivation,
- ON: activation,
- Simulation.

For ON and Simulation, the following must be defined:

- the value corresponding to 4 mA (for a current input),
- the value corresponding to 0 V (for a voltage input),
- the sensor range,
- the value to be simulated (in simulation mode),
- the value of the filter and the memory (in ON mode).

2) Temperature input module

The possible options are:

- OFF: deactivation,
- PT100-PT1000 mode 2-, 3- or 4-wire (for further details, contact Ultraflux).

  Define:

  - the type of sensor, Pt 100 or Pt 1000,
  - the type of assembly, 2-wire, 3-wire or 4-wire,
  - the value of the filter and the memory,
  - any offset.

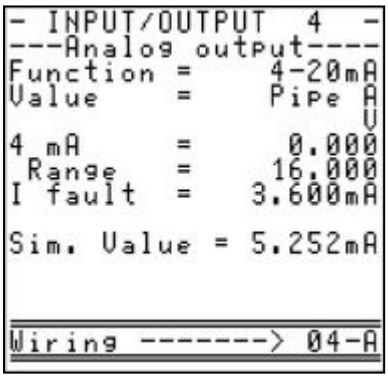
- Simulation
  Enter the temperature value to be simulated.

3) Contact input module

The possible options are:

- OFF: deactivation,
- Status: whether the contact is open or closed,
- Pulse: the number of opening - closing cycles of the contact.

4) Current/voltage output module



The possible options are:

- OFF: deactivation,
- Voltage output:
  - 0-5 V,
  - absolute value |0 - 5 V|.
- Current output:
  - 0-20 mA, 4-20 mA, 0-24 mA,
  - absolute value |0-20 mA|, |4-20 mA|, |0-24 mA|.

For the voltage output and current output choices, the following must be defined:

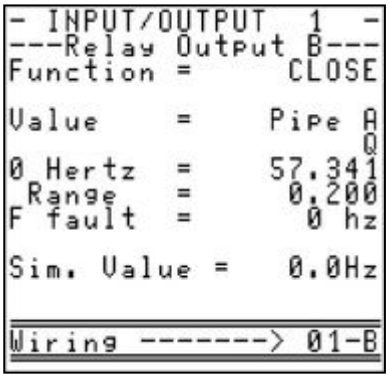
- the parameter that the output represents. Select the dimension that you wish to associate with the analog output using the chapter headers (function) and the chapter items (value)
- the base of the scale:
  - value corresponding to 0mA or 4mA (for a current output),
  - value corresponding to 0V (for a voltage output).
- the range,
- the value in the event of a fault in mA (for a current output) or in volts (for a voltage output).

Comment: This module can be used as a current or voltage generator.

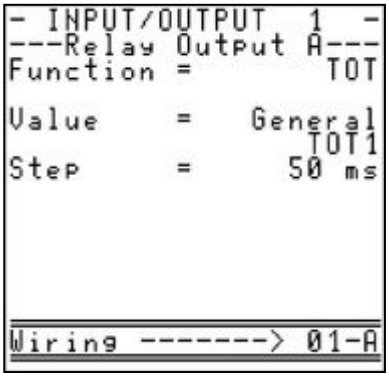
5) Relay output module

Each relay output may be configured according to one of the following operating modes:

- *Open:* The relay remains constantly off.
- *Closed:* The relay is on if the UF 831 is powered on, and off if it is not powered on. This choice therefore allows the relay to be used to detect the presence of the power supply (positive safety).



- *Totalizer:* The relay generates a pulse with an adjustable width on each incrementation of the selected totalizer.



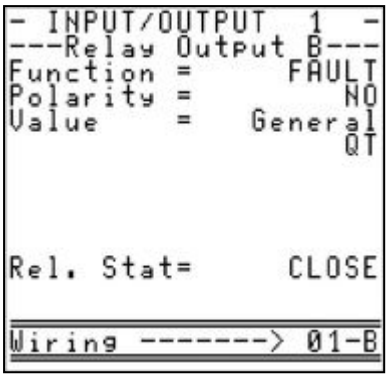
The pulse width must then be defined, determining the time for which the relay remains closed (the relay, initially off, is then on for half of the period, then off again for at least the same duration).

Care must therefore be taken, for a given pulse weight, not to choose a pulse width which is too large, since the metering pulse frequency then risks being greater than the maximum frequency of the relay. The relay would then suffer an ever-increasing delay with regard to the totalizer.

The table below shows the possible pulse widths and the corresponding maximum frequencies:

1 ms	1000 Hz
10 ms	100 Hz
50 ms	20 Hz
100 ms	10 Hz
200 ms	5 Hz
500 ms	2 Hz
1000 ms	1 Hz

- *Fault:* Depending on the polarity chosen (NO: normally open, NF (NC): normally closed), the relay state changes when the associated fault occurs.



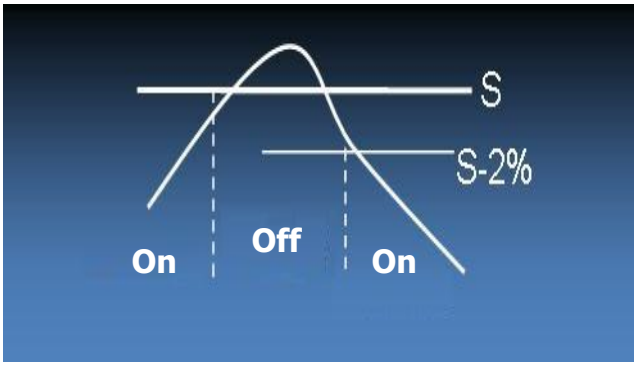
In the example, the variable selected is "general Q". This means that the relay closes when the flow meter is not measuring a flow and remains open otherwise.

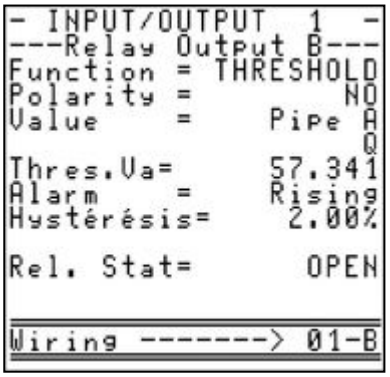
- *Direction:* Depending on the polarity chosen (NO: normally open, NC: normally closed), the relay state changes when the sign (+ or -) of the associated dimension changes.

- *Threshold:* Depending on the polarity chosen (NO: normally open, NC: normally closed) and the direction in which the threshold is crossed, the relay takes one state if the value is greater than the indicated threshold. The relay switches to the opposite state if the value concerned is lower than the threshold.

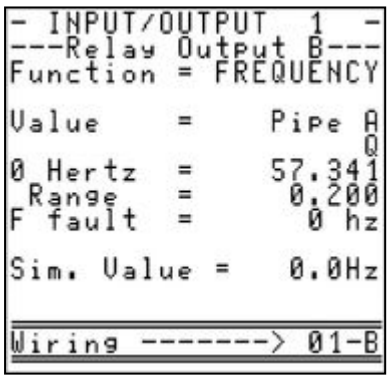
  Comment: In order to restrict the relay backlash when the dimension concerned fluctuates around the threshold, hysteresis must be defined.

  The diagram below illustrates this principle with hysteresis at 2% and the threshold crossed in the ascending direction:





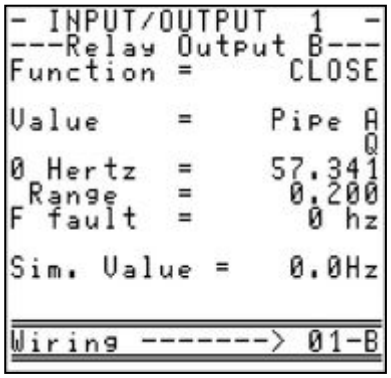
- *Frequency:* The frequency at which the relay is opened and closed depends on a value to be defined. Example: high flow, high frequency, low flow, low frequency.



The following must be defined:

  - the parameter that the output represents.
    Select the dimension that you wish to associate with the output using the chapter headers (function) and the chapter items (value).
  - the value corresponding to 0 hertz.
  - the value corresponding to 1 kHz.
  - the value in the event of a fault.

The relays can be tested individually: select the open or closed mode on the relay status line.



5.4.9 "Logger settings" menu (if activated)

Up to 30 variables can be recorded in the logger. The number of variables can be adjusted. Its maximum autonomy is for 530,000 time-stamped readings.



Important: The modification in the number of variables must be preceded by the logger being reset.

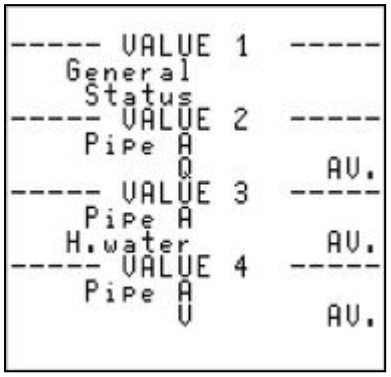
1) Logger period (step)

The recording period of the logger can be set from 1s to 24 hrs: 1 s, 5 s, 10 s, 30 s, 1 min, 2 mins, 5 mins, 10 mins, 15 mins, 30 mins, 1 hr, 2 hrs, 6 hrs, 12 hrs and 24 hrs. Each recording presents the average, the minimum and the maximum for the measurements between this record and the previous one.

The logger is deleted via a field requiring confirmation (protection against handling errors).

2) Logger variables (value)

For each of the variables of the logger, one of the following functions can be selected:

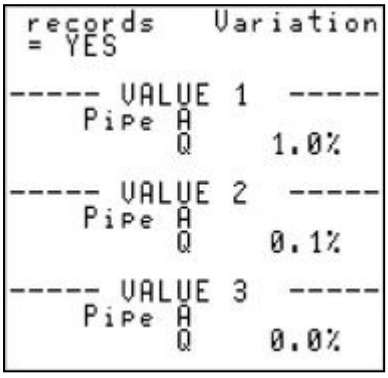


- *AV.:* average value over the recording period,
- *MIN:* minimum value over the recording period,
- *MAX:* maximum value over the recording period.

3) Logger on variation (records variation)

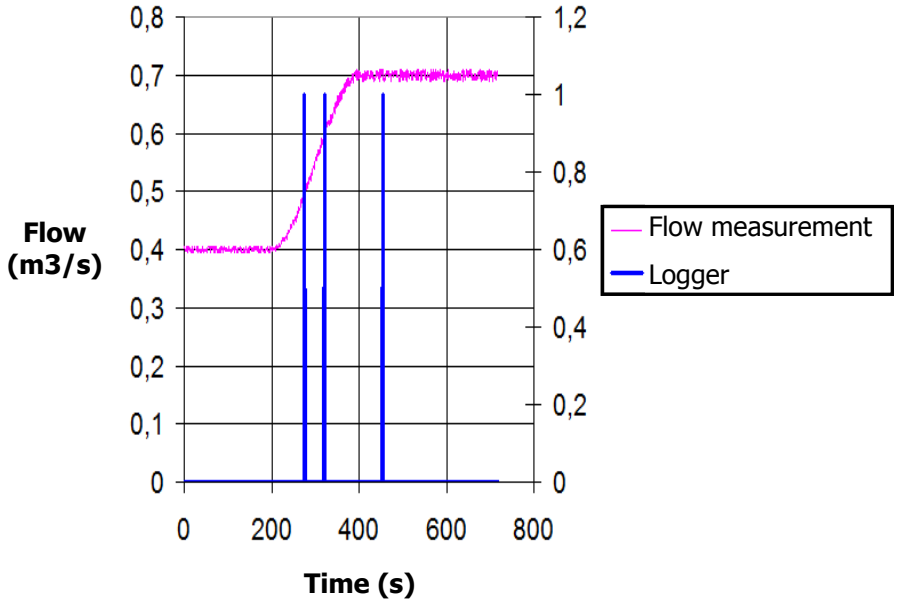
The variation mode of the logger is used to reduce the recording period for the data in the logger.

To do this, define the maximum variation percentage with regard to the previous recording. If the variation measured is greater than this maximum, the recording is instantly triggered (no more than once per second).



Comment: A percentage equal to 0% disables the associated value.

The following figure shows the reduction in the period of the logger when the flow experiences a variation:



The vertical lines (blue) correspond to the triggering of records of the logger. If the variation of the flow is greater than the configured threshold, the logger forces a recording.

5.4.10 "Echo display" menu

Warning: The Echo display/analysis mode blocks the measurement function (The measurement values are no longer calculated, the logger no longer records data).

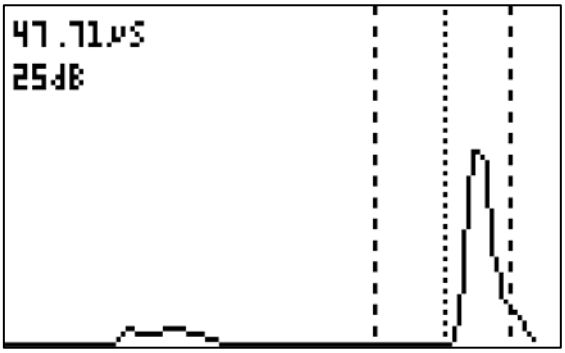
The Echo analysis mode is used to view the acoustic signal of each chord, which is of use during the commissioning or maintenance phase, or for example:

- to check the connection of the probes and their good working order,
- to check that the probes are placed at the correct distance,
- to find the origin of a measurement incident (clogging of the probes, obstruction of the structure between the probes, unforeseen pollution, rupture of a probe cable, etc.).

Comment: Various characteristic signals are analysed in appendix 1.

The "Echo analysis" includes two screens per chord:

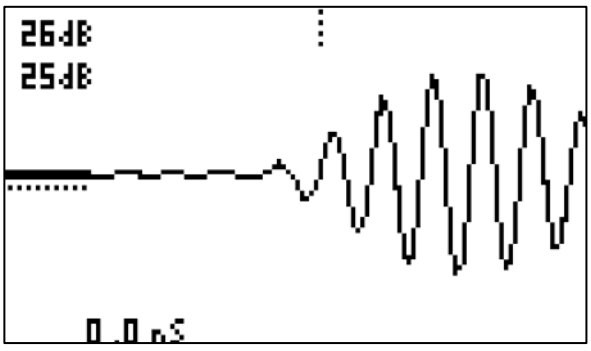
- The first displays the acoustic signal between the emission (peak to the left of the screen) and the echo analysis zone. This screen is called the "landscape display":



  - The two dashed vertical lines show the zone in which the echo is expected. An echo received outside this zone is not taken into account.
  - The dotted vertical line shows the measuring point on the echo.
  - The number of the chord is indicated below the graph.
  - The top-left of the screen shows the gain applied to the echo and the wave travel time.

  Comment: If no acoustic signal reaches the expected zone (for example if one of the probes is not connected, or if one of the probe cables is damaged), the screen displays a "!" sign in place of the acoustic signal.

- The second screen shows a zoom on the echo chosen for the measurement. This screen is called the "zoom display":



  - The continuous horizontal bar indicates the noise level.
  - The dotted vertical bar shows the position at which the travel time measurement is taken. If there is no such line, it means that no measurement is taken (for example if there is too much interference).
  - The dotted horizontal line indicates the measurement threshold. The measurement is taken the first time the alternation crossing this threshold reaches 0.

5.5 NORMAL configuration mode

Comment: This section will be restricted to an explanation of the additional functions of normal mode compared to simple mode. The entire common base already explained in the simple mode section is not repeated in this section.

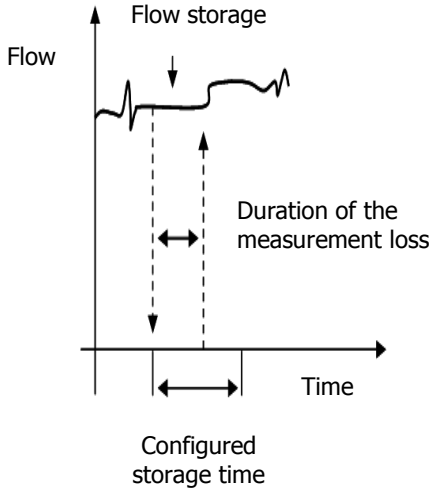
5.5.1 "Pipe / fluid settings" menu

1) Memory

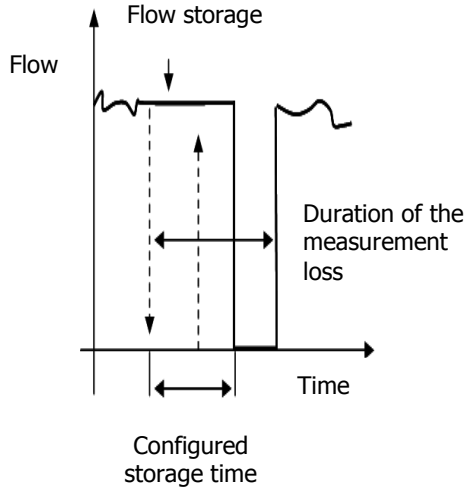
The memory is the time, given in seconds, for which the measurement is stored in memory when a measurement is lost (echo loss).

This storage is used in particular to avoid inopportune actions from the instrumentation and control part of the installation.

Two situations may arise:



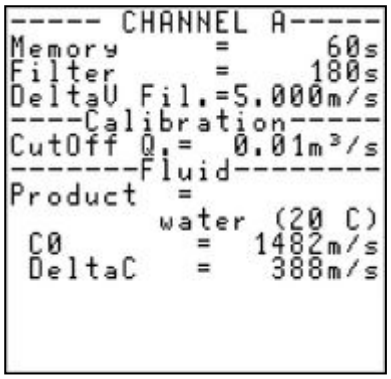
Scenario no. 1: Duration of the loss of measurement less than the memory storage time. In this case, the flow meter retains the last measurement until a new measurement is valid.



Scenario no. 2: Duration of the loss of measurement greater than the memory storage time. The flow meter extends the last measurement, until the time which has passed is greater than the storage time. At this point the flow measurement becomes faulty and there is still no new flow measurement valid.

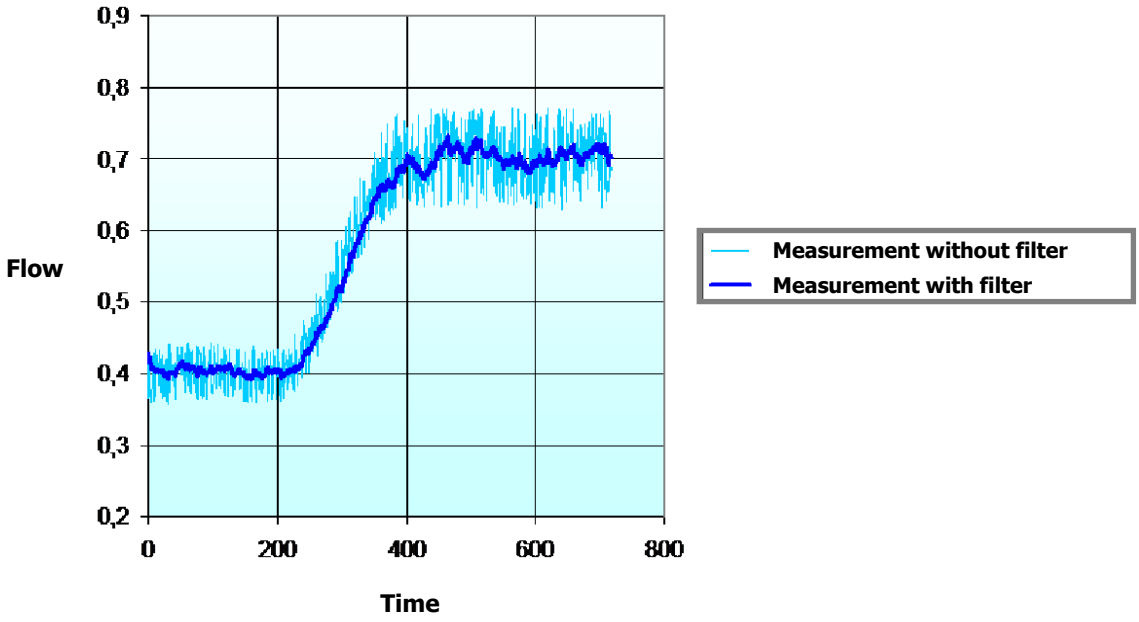
2) Filter

The flow measurement can be filtered so as to make the measurement results more legible.



This feature must be used when the flow is extremely chaotic and an average for the flow needs to be produced in order to view its evolution.

The diagram below illustrates the effect of the filtering in the event of a very versatile and turbulent measurement:



The filter time constant, given in seconds, defines the "force" of the filtering: following a flow rate step (quick opening of the isolation dam), the value measured reaches the final value at 1% after the time constant.

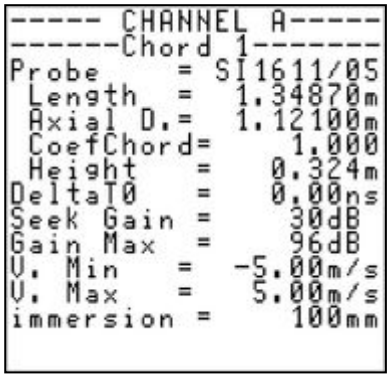
To adjust this time constant, a simple rule involves taking as the time constant a value equal to two or three times the foreseeable duration of any interference: for example, if you wish to avoid seeing flow variations quicker than every 20 seconds, give the time constant a value of 40 or 60 s.

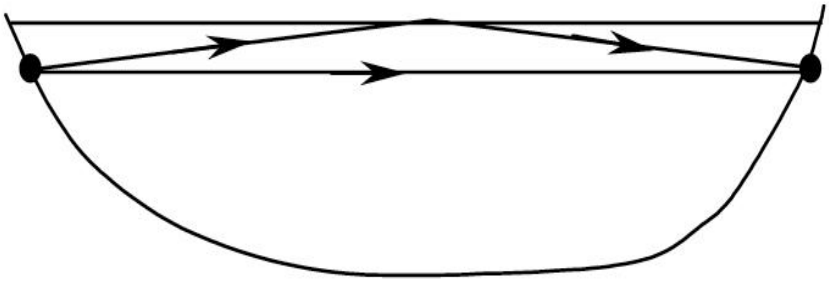
However, you must ensure that the time constant is not too large, since this would risk masking significant events.

3) Calibration (CutOff Q)

The deletion rate is the flow value below which the flow meter will display 0. This will provide you with a clear indication of a flow considered as null.

4) Immersion depth of the probes





For it to be possible for the velocity measured by a chord to be included in the flow calculation, the chord must be sufficiently immersed so as not to suffer disturbances created by the trough of the wavelets or for there to be no interference between the direct path of the ultrasonic wave and the path of the wave reflected by the surface.

If the signal generated by the reflected wave follows the signal generated by the direct wave too closely, the wanted signal may be appreciably altered by the secondary signal. It may even almost disappear if there is phase opposition between the two signals. The minimum immersion depth of the probes below which the measured velocity is considered invalid must therefore be indicated. This minimum immersion depends on the frequency used and the length of the acoustic path.

Comment: The immersion depth of the probes is counted from the central plane of a chord.

5) Weighting coefficients of the chords (coef chord)

A weighting coefficient is a corrective factor and is applied when calculating the velocity. For example, if you wish to reduce the velocity of a chord by 10%, a coefficient of 0.9 must be entered.

6) Delta T0

The delta T0 field is used to correct installation errors. For example, it is possible to compensate for a bias due to an incorrect position of the probes by adding to delta T0 the value required in order to rectify it.

7) Vmin and Vmax

In certain situations, the velocity of the fluid measured by the flow meter may be disrupted. Limits can then be set for the velocity of the fluid using a minimum velocity and a maximum velocity.

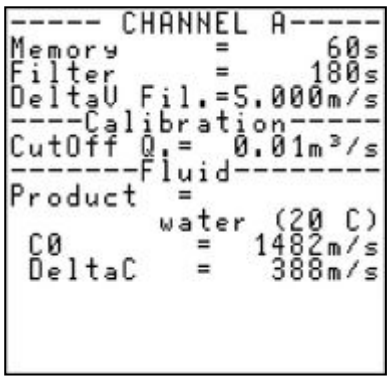
5.6 ADVANCED configuration mode

Comment: This section will be restricted to an explanation of the additional functions of advanced mode compared to the two modes defined above (simple and normal). The entire common base already explained above in this document is not repeated in this section.

5.6.1 "Pipe / fluid settings" menu

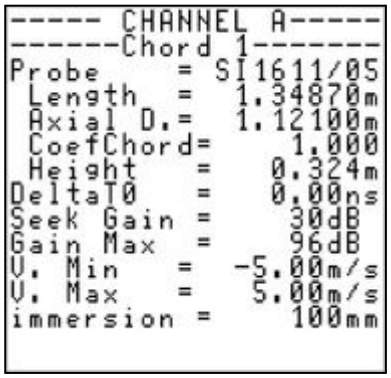
1) Delta V filtering

When a filter has been activated, it is possible to request that the flow meter disables the filter if the measurement evolves very quickly. This provides a filter which is sufficient to comfortably see the evolution of the measurement and to retain reactivity while not filtering large variations in velocity:



2) Seek gain and max gain

The gain is the parameter which determines the amplification of the ultrasonic signal required for the flow meter to take a measurement. If the flow meter needs to increase the gain, this means that the ultrasonic signal received is very weak. The poorer the quality of the signal, the greater the gain and the more difficult it is to measure the flow.

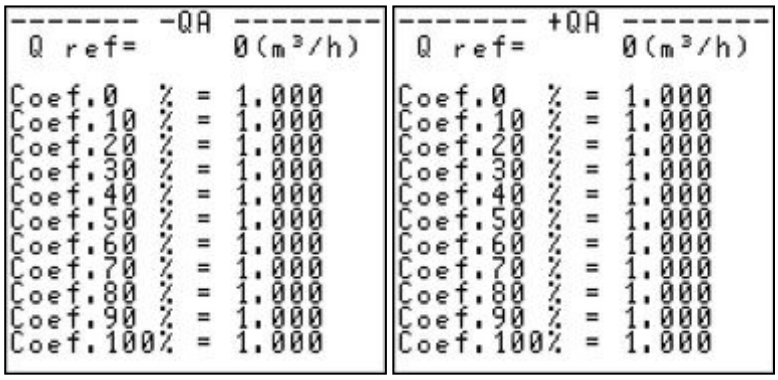


Using the maximum gain parameter, you can limit the gain so that the unwanted acoustic noise does not disrupt the operation of the flow meter.

Important: It is highly recommended to contact Ultraflux before modifying these settings.

5.6.2 "Linearization settings" menu

One last action possible on the flow is the linearization of the result. Depending on the flow, the flow is corrected by X % based on a pre-defined table:



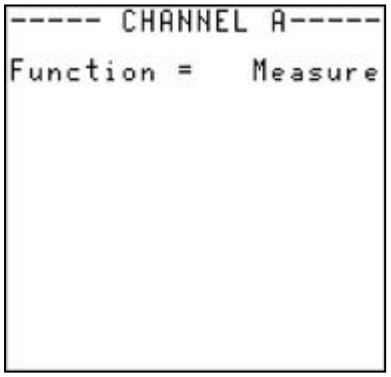
The parameter Q ref defines the maximum flow used for the linearization. The points of the table are then defined as a percentage of this maximum.

The rectifier coefficient must be defined by the user:
- A coefficient of 1 does not change anything in the result.
- A coefficient of 0.8 reduces the value of the flow by 20 % at this point, etc.

There are two tables, one for positive flows and one for negative flows.

5.6.3 "Advanced settings" menu

1) Simulation mode



The flow meter can be used:

- in Measurement mode (normal operation of the flow meter),
- in Velocity simulation mode.

Enter the value of the flow required and the sine wave (as a percentage) applied around this value.

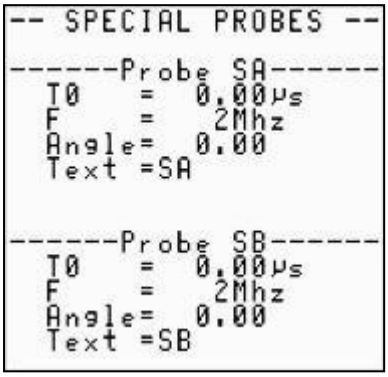
Comment: A modulation of 0 % keeps the flow velocity constant. A modulation of 100 % fluctuates the simulated velocity between 0 and 2 times the indicated value.

To simulate the level, go to the input/output settings and change the simulation value in the input corresponding to the level measurement (see chapter dedicated to inputs/outputs).

2) Special probes

It may be necessary in certain cases to define a probe which is not referenced in the list of Ultraflux probes. Before using this option, it is highly recommended to contact Ultraflux.

To use probes other than those of Ultraflux, use the "special probes" function.



T0 represents the dead time of the probe.

F represents the frequency of the probe.

Angle relates to angle of the ultrasound probe. For an open channel probe, the angle is always 0.

Text is used to identify the special probe created in the list of references of accessible probes.

3) US & TRT treatment

These settings allow the Ultraflux teams to adapt the operation of the flow meter to a specific case. You must consult us before any modification of these settings.

5.6.4 Firmware update

This option is used to update the flow meter without needing to dismount it. Consult us prior to using this option.

5.7 Measurement mode/displays

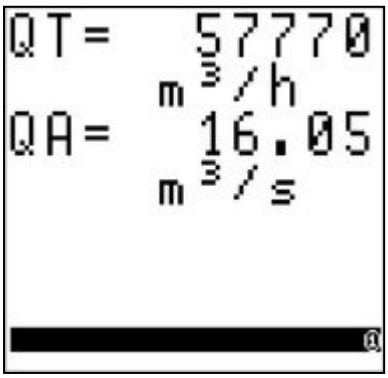
The flow meter has measurement pages (different values are displayed, page after page) and a flow graph.

5.7.1 Pages available

The Measurement mode can be used to find out a large amount of information: to scroll through and access the screens, use the ▲ and ▼ keys.

The same information is displayed for each of the chords of the application:

1) Flow



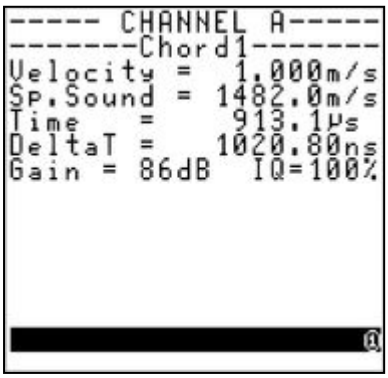
This page displays the flow measured with the unit.

2) Channel measurement



This page displays the data relating to the flow: flow rate, average velocity in the channel, water level.

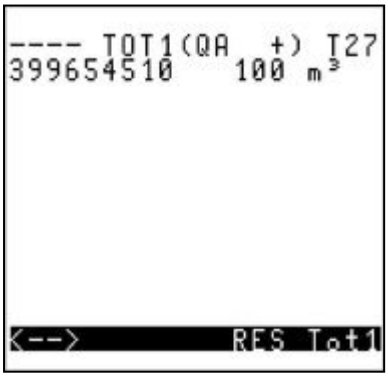
3) Specific information relating to the chords



These pages (depending on the number of chords) provide information on the specific measurements for a chord:

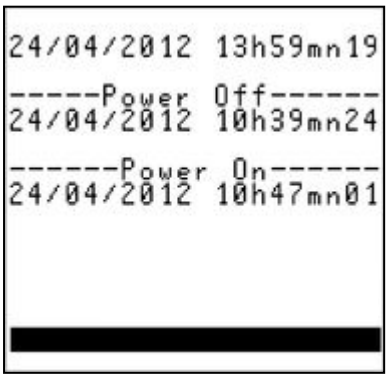
- average time (average of the time for the upstream-downstream journey and the time for the downstream-upstream journey),
- delta T (time difference between the upstream-downstream journey time and the downstream-upstream journey time),
- measurement gain (the higher the gain, the more difficult it is to obtain a measurement),
- IQ quality index (100% indicates a very good measurement, 0% indicates that the measurement is not possible).

4) Totalizers



This screen indicates the metering status of the totalizers and allows them to be reset.

5) Date and time



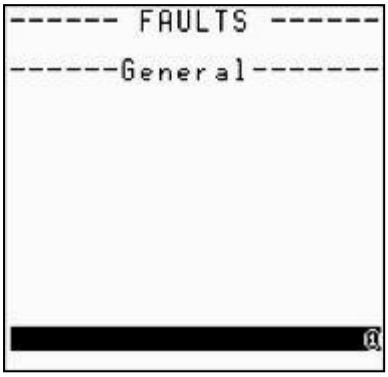
This screen indicates the date and time of the flow meter and the information concerning the last powering on.

6) Info. logger

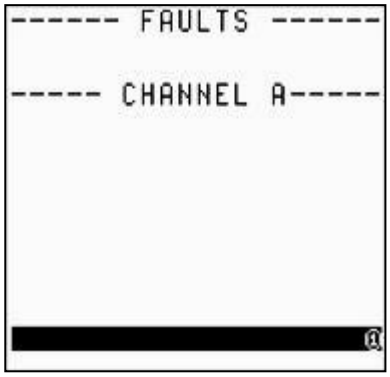


This page indicates the status of the logger and the last recording made.

7) Events



These pages are used to find out whether there is a problem on the flow meter and to localize it in order to resolve it.



8) Distance between probes



These pages (depending on the number of chords) provide the reference of the associated probes for each chord.

9) Flow graph

The flow graph is a screen displaying in the form of a curve the evolution of a specific dimension.

CHAPTER 6: FUNCTION ENGINE

6.1 Principle

Each UF 831 includes a miniature automaton. This automaton allows Ultraflux to easily arrange additional features for this flow meter.

On request, Ultraflux can quickly integrate a new feature for your UF 831.

6.2 Example of application

6.2.1 Calculating the temperature of the water

The calculation of the temperature of the water can be determined based on the celerity.

You will find in the appendix the polynomial used to determine the temperature of the water based on the celerity measured by our flow meters.

CHAPTER 7: PC SOFTWARE

7.1 Introduction

The PC software is used to configure the flow meter using a PC, rather than accessing the parameters using the keypad of the flow meter.

It is used in particular:

- to define all settings for the application,
- to monitor, in real time, the measurement parameters (flow, average velocity, speed of sound and gain for each chord, etc.),
- to save the measurement or settings data in a file for later consultation,
- to download, using the serial link or USB, the flow meter operation settings, the measurement data, the logger,
- to print the displayed data,
- to transfer the measurement and logger data to a spreadsheet program.

The minimum PC configuration required is a PC with a Windows version later than Windows XP.

7.1.1 Installing and running the software

To install the software:

1. Run the Setup.exe installation program included on the CD-ROM,
2. Select the language to use for the installation and for displaying the screens,
3. Using the Browse button, specify the software installation path (by default C: \ Program Files \ Ultraflux \ [PC software corresponding to your flow meter].x, with x designating the version no.).

Comment: For an identical reinstallation of the program (for example in the event of damage to the execution file) or to uninstall it, select the program from the list of installed programs (Start / Settings / Configuration panel / Add/Remove programs) and click the Add/Remove button.
A window asks you which action you wish to carry out: Change (function not available for the software, since it only contains a single component), Repair or Remove.

The program is run by double-clicking the  icon associated with the software and placed on the desktop, or by selecting the program via Start \ Programs \ Ultraflux \ software corresponding to your flow meter.

The choices proposed by the four main menus are:

- "File" menu – to:
  - open a measurement file,
  - open or create a settings file,
  - open a logger file and transfer to a spreadsheet program,
  - close the program.

- "Dialogue" menu – to:
  - open the measurement window,
  - open the settings window,
  - download the logger data from the flow meter to the PC,
  - modify the access code,
  - save all settings of the flow meter.

- "Option" menu
  - Configuration of the PC software.

- "About" menu
  - Information on the version of the PC software.

7.1.2 Connecting the flow meter to the PC

To connect the UF 831 to the PC, you must connect the lead provided (serial link or USB cable). The exchanges are made in the JBus/ModBus protocol, the PC being master and the UF 831, identified by its number, being the slave.

7.1.3 Home page

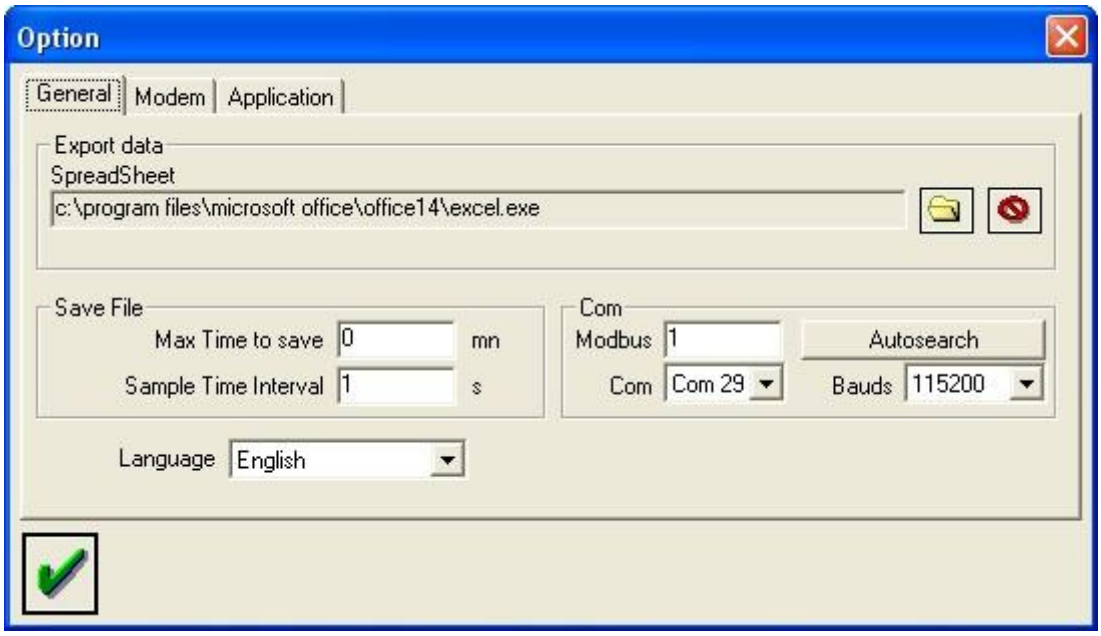
When run, the software displays the following window:



This window contains four main menus:
- "File",
- "Dialogue",
- "Option",
- "About".

First open the Option menu to define the settings relating to your application.

7.1.4 Option window



The window opened by the Option menu is used in particular to select the display language and to define the path of the software used to work with the data (Excel by default, if this is installed on your computer).

It also includes an **"Autosearch" button** used to automatically detect the presence of an Ultraflux flow meter.

Comment: To use the serial link, the transmission speed can be set from 300 to 115,200 bauds, the fastest speed being preferable, especially for data-logger downloads.

7.1.5 Icons

Icons are displayed at the bottom of the window.



This icon in the form of a disk runs the save procedure. The software then asks you for the name of the folder in which to save. You can then read, print or handle in Excel (or the data processing software) these records using the command File / Open / [save name].

Comment: When measuring, once the saving has started ("Save" button), the data is saved at the pace established by the period entered in the option menu of the software, for the time established. When Time = 0, it is stopped manually.



This icon is used to print all data displayed on the screen.



This icon launches the data transfer procedure from the PC to the flow meter.

7.1.6 File menu

The File menu allows you to open a saved file ("Open" command), or prepare a settings file offline ("New" command). Once the file is saved, you can export it to a UF 831.



7.1.7 Measurement window

The measurement window is opened using the "Dialogue/Measurement" command.



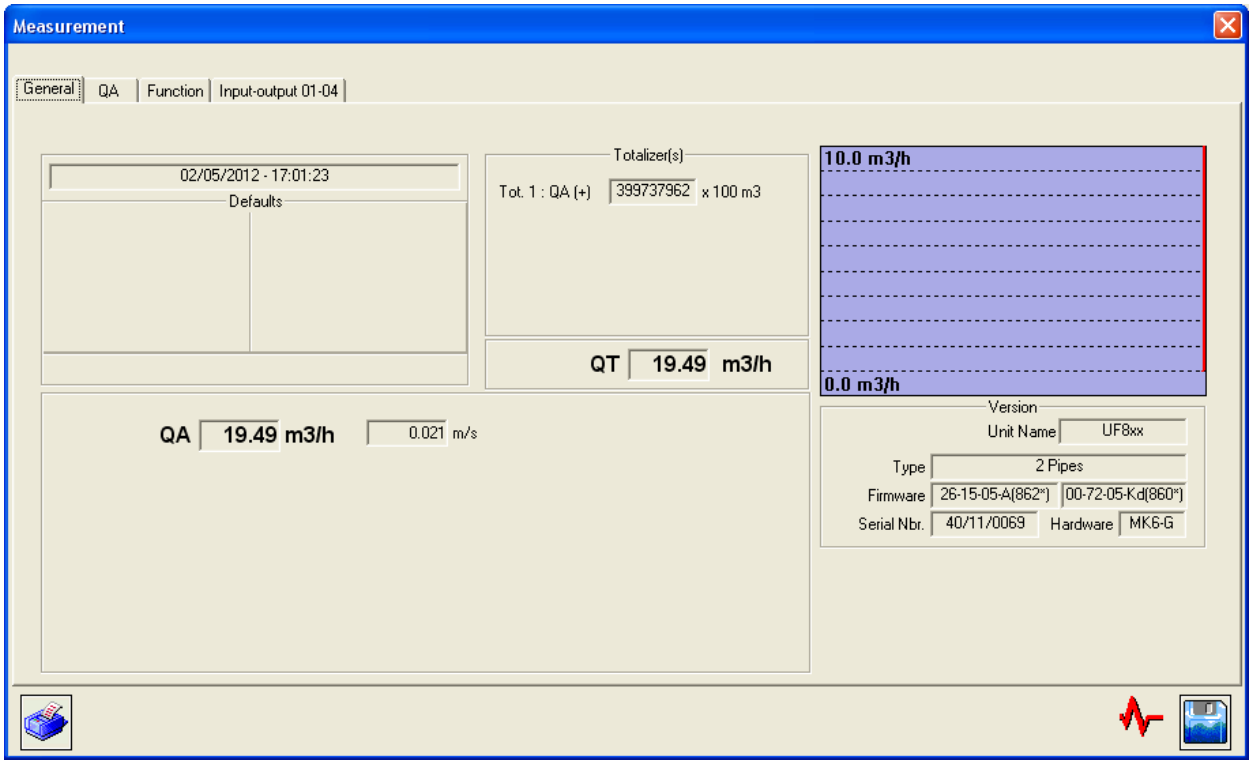
1) List of available tabs

The (measurement) window contains the following tabs:

- "General" tab: contains the general information on the measurement.
- "QA" tab: contains the general information concerning the measurement channel.
- "Input-output" tab: contains the general information on the inputs-outputs.
- "Function" tab (optional): contains configuration data for the function engine if this is used (this tab only appears if at least one output from the engine is configured).

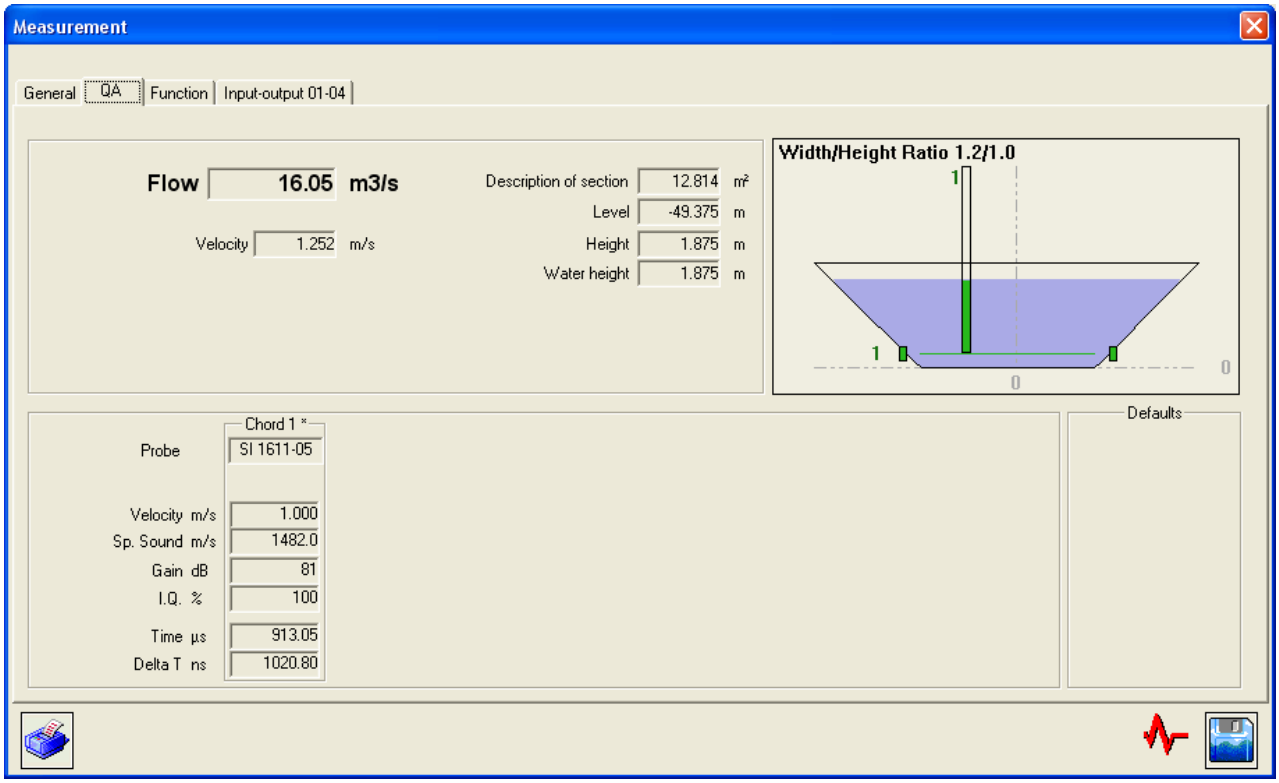
2) "General" tab

This tab displays the main information of the measurement: graphic display of the measurement, instant values of the flow rate and flow velocity, totalizers.



3) "QA" tab

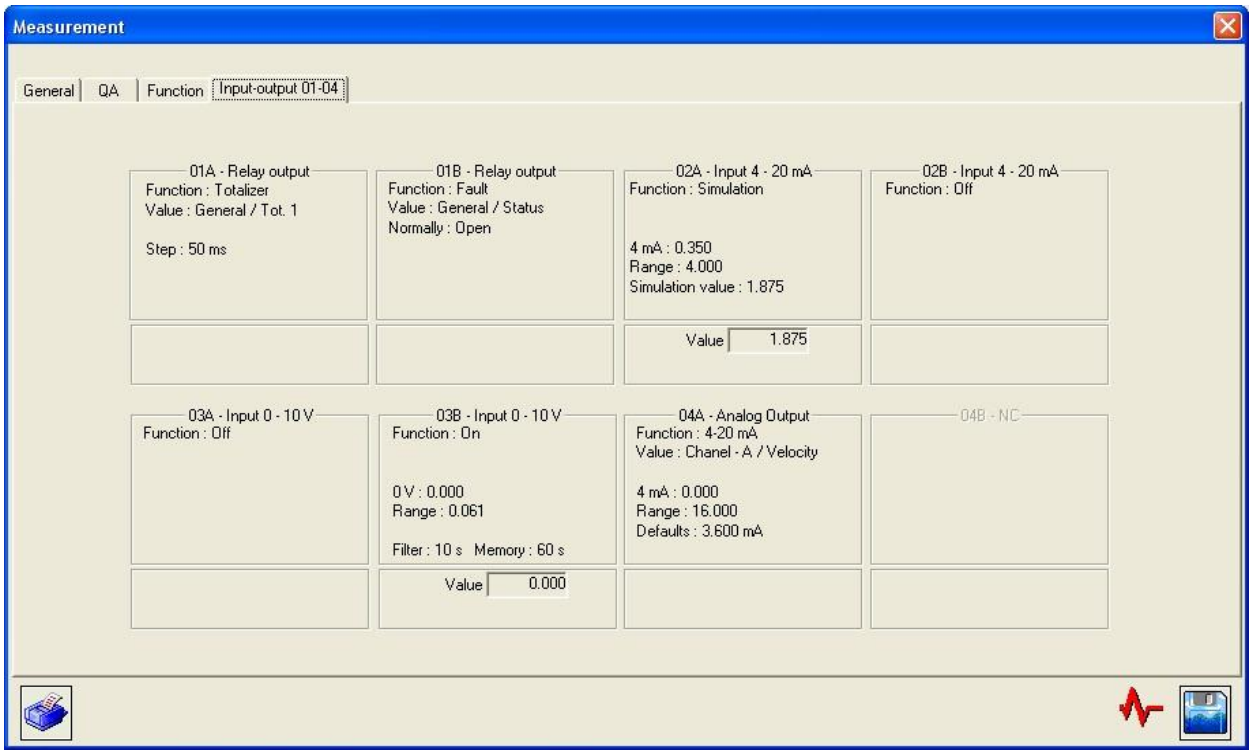
This tab displays the main information concerning the measurement channel: value of the flow, the flow velocity, the section and the water height. It also provides information concerning the measurement chords.



Comment: There are as many tabs as there are channels configured.

4) "Input-output" tab

This tab displays the information concerning the inputs/outputs of the flow meter.



7.1.8 Settings window

1) List of available tabs

This window, opened using the Dialogue/Settings command, contains the following tabs:

- In « General » drop-down menu
  - "General" tab: selection of the flow meter display language (and name of the flow meter defined during the installation).
  - "Logger" tab: description of the operation of the logger.
  - "Totalizer(s)" tab: definition of the operation of the totalizers.
  - "Function" tab: definition of the engine input constants accessible to the user (when a function is located in the engine).
  - "Advanced" tab: definition of the Advanced operating mode.
  - "Input-output" tab: definition of the input/output settings (including the 4-20 mA inputs for the Level inputs).

- In « Channel » drop-down menu
    - "Channel" tab: flow unit, time constants, flow graph settings, display options, etc.
    - "Definition of chords" tab: definition of the probes, positions of the chords, etc.
    - "Chords advanced" tab: definition of specific codes used to fine-tune the behavior of the flow meter (contact Ultraflux before modifying these settings).
    - "Description of section" tab: definition of the geometry of the measurement section.
    - "Hydraulic profile" tab: settings of the measurement section hydraulic profile.
    - "Level" tab: number of level measurements and assignment of the inputs.
    - "Height/Velocity" tab: definition of the operation of the flow meter in low water mode.
    - "Linearization" tab: flow linearization coefficient.



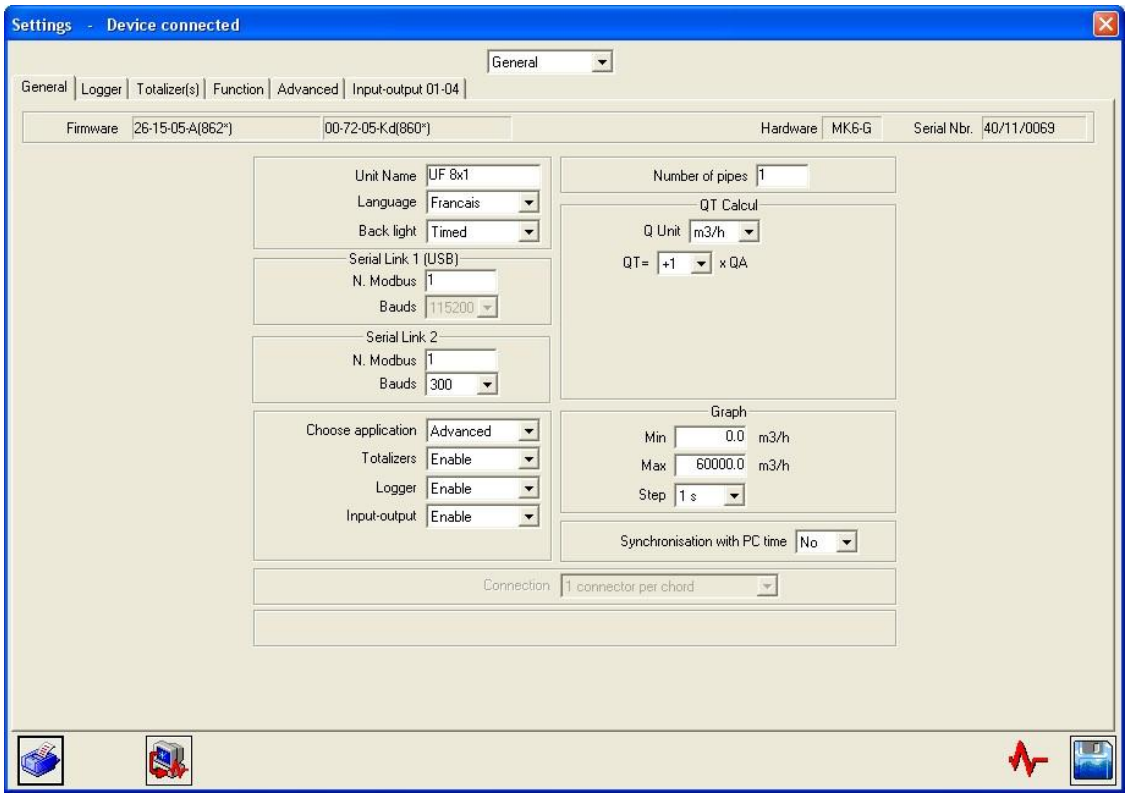
Once the settings are completed, upload the configuration to the flow meter by clicking this button.

Comment: On opening the settings window, the configuration loaded in the PC is the current configuration of the flow meter.

2) "General" tab (in the « General » drop-down menu)

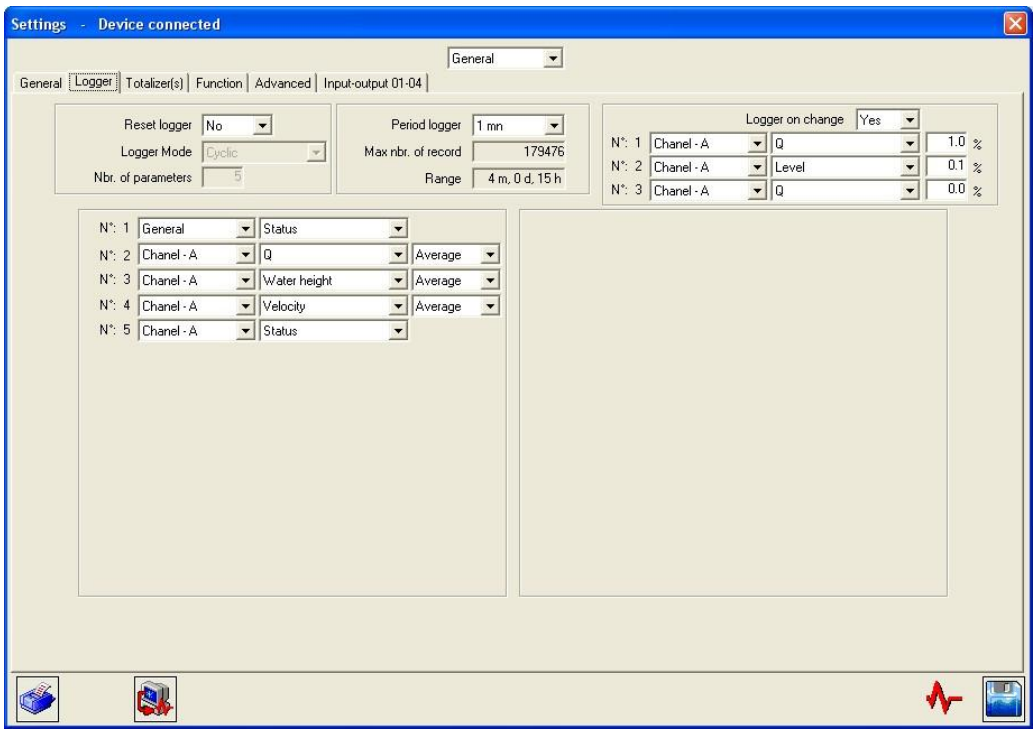
The settings window is used to configure the flow meter from the PC. As with the keypad, you can choose the level of complexity using the command: General/Choose Application/Simple, Normal or Advanced.

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



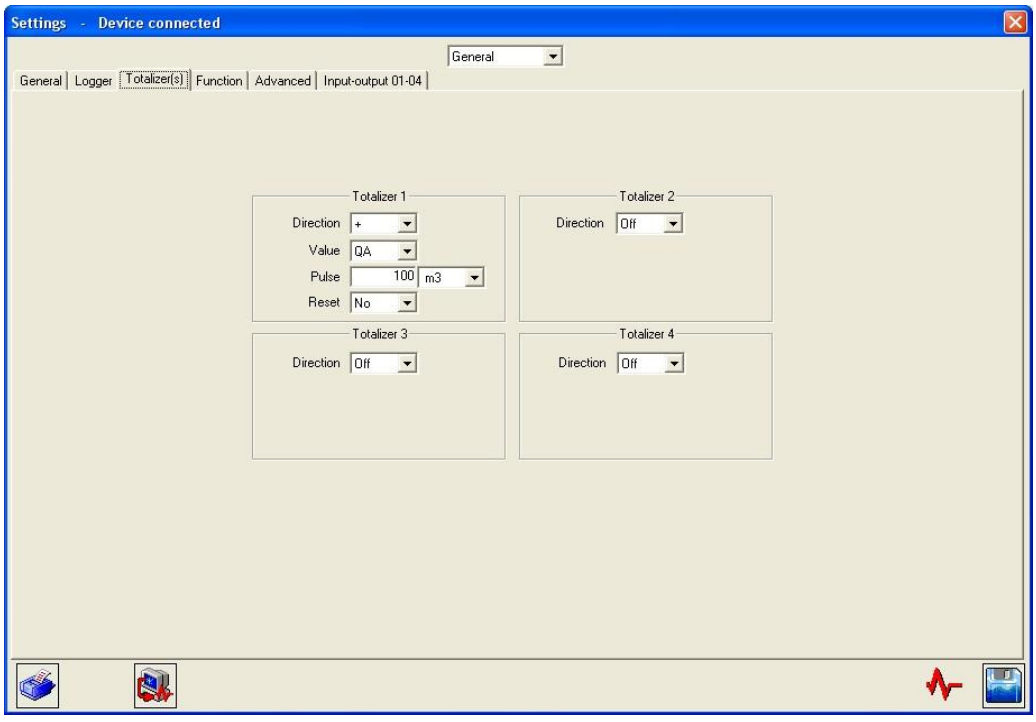
3) "Logger" tab (in the « General » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



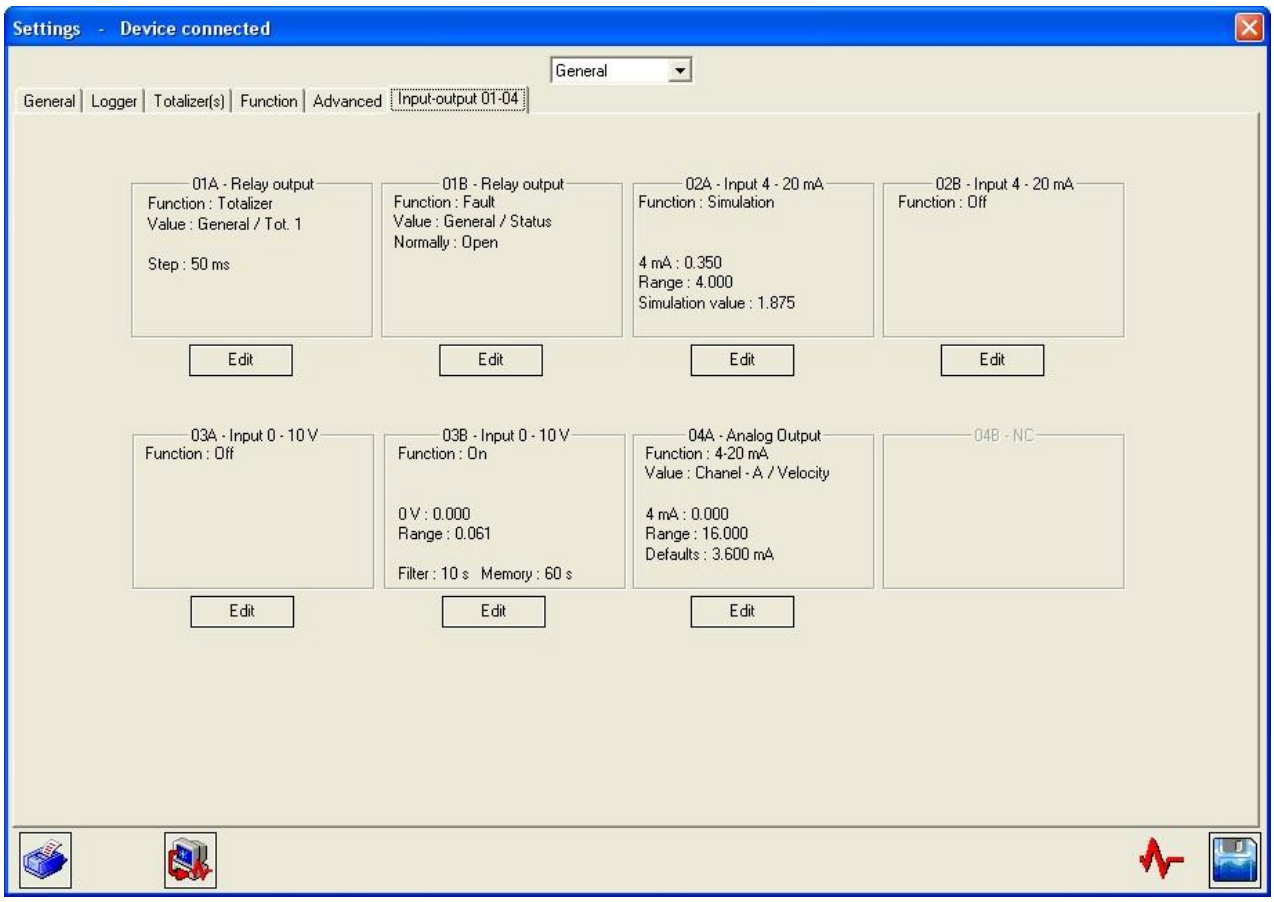
4) "Totalizer(s)" tab (in the « General » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



5) "Input-output" tab (in the « General » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



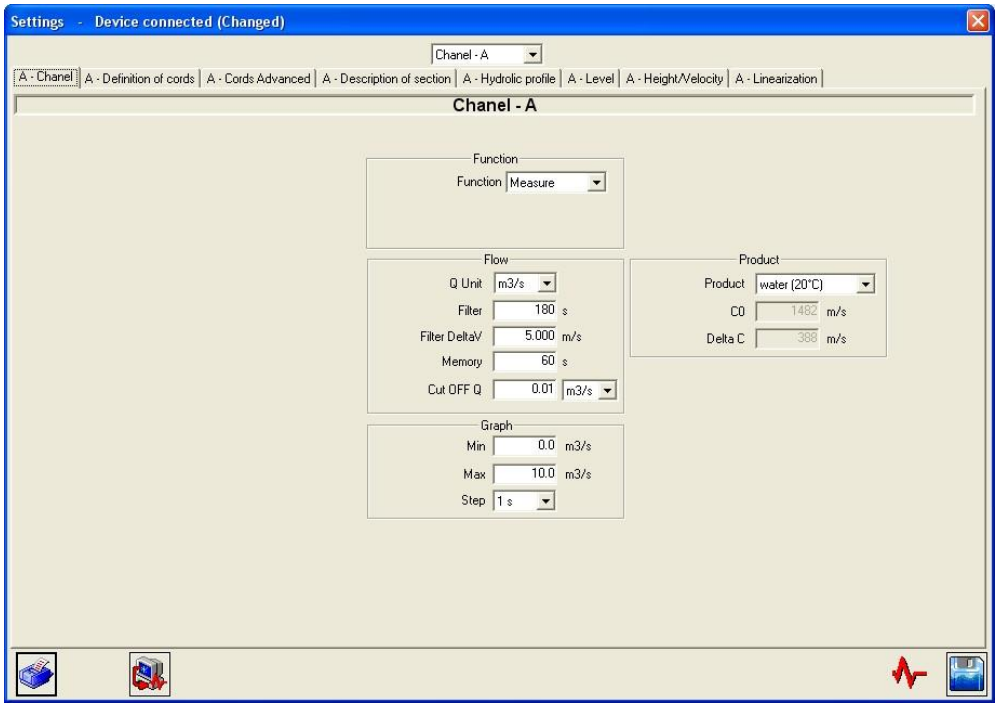
You can choose whether or not to activate the Totalizer, Logger and Input/output functions resources.

The software allows the date and time of the UF 831 to be synchronized with those of the host PC: select the option "Synchronize with PC time" before saving the settings on the flow meter.

It is important to correctly set the date and time in order to time stamp the records (country, summer/winter time).

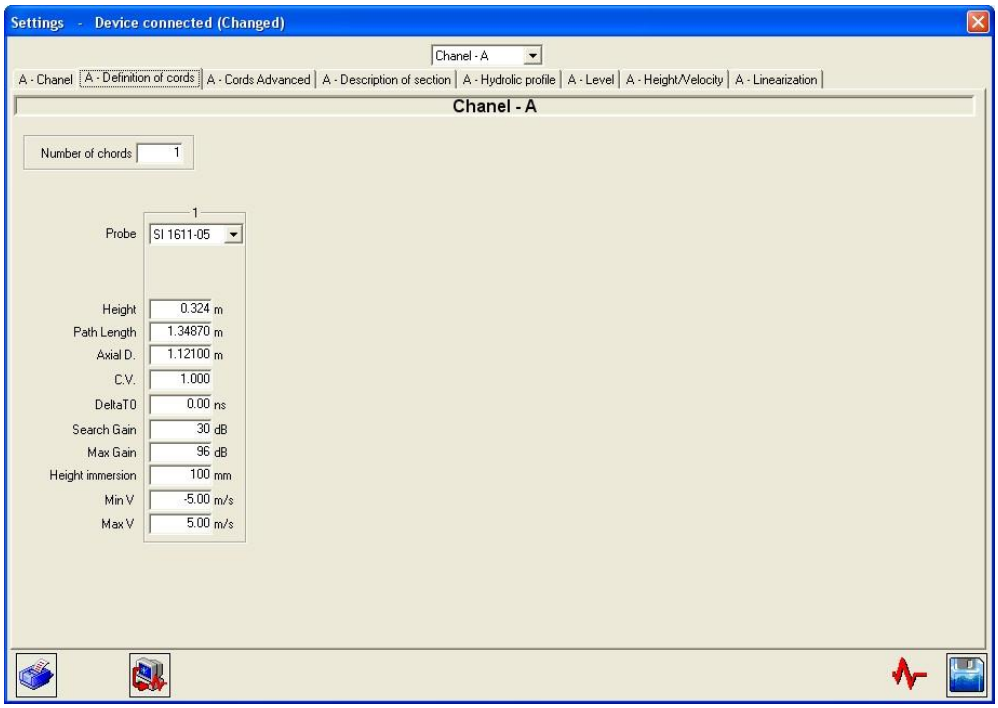
6) "Channel" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



7) "Definition of chords" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



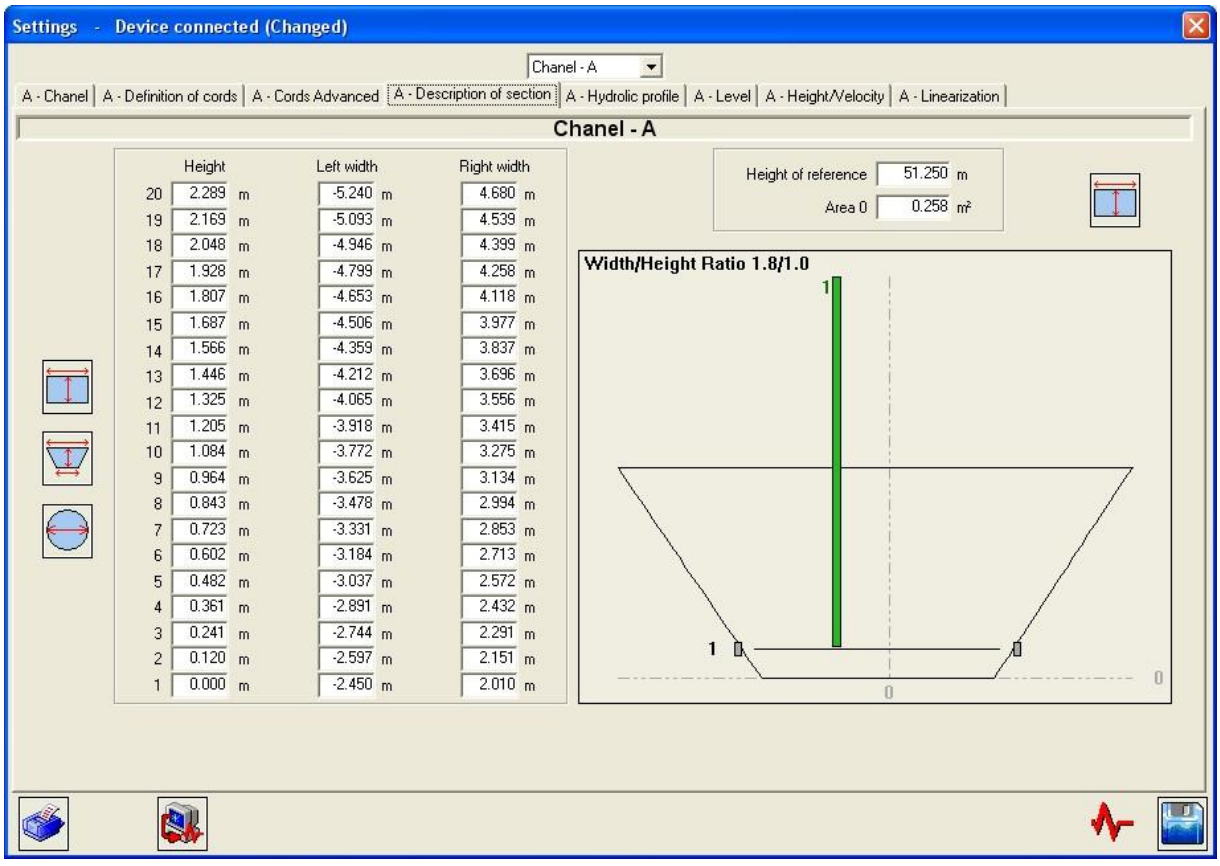
Note: It is possible to enter in the flow rate calculation a chord external to the converter (for example, a Doppler velocity measurement). The settings to be defined for this chord are the same as those for the internal chords, but the following must also be defined:

- the internal chord associated with the external chord: when the internal chord is faulty, it is the external chord which takes over.
- the input module which will serve as a velocity measurement: a 4-20 mA module may serve to recover a Doppler velocity.

The main advantage of this virtual chord lies in being able to measure the flow using several measurement methods.

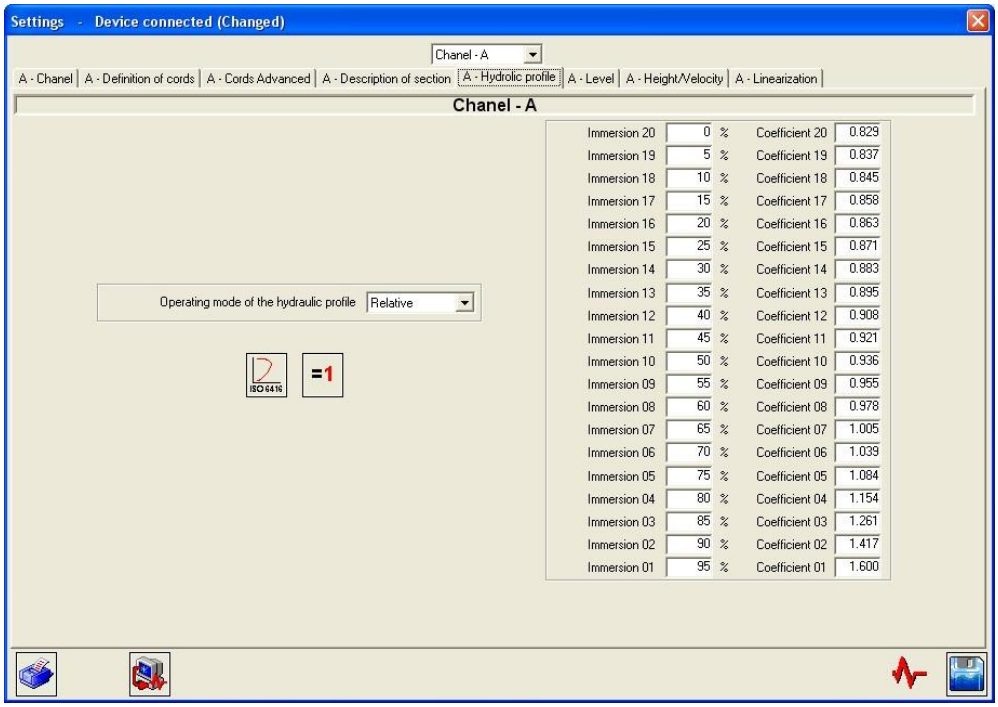
8) "Description of section" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



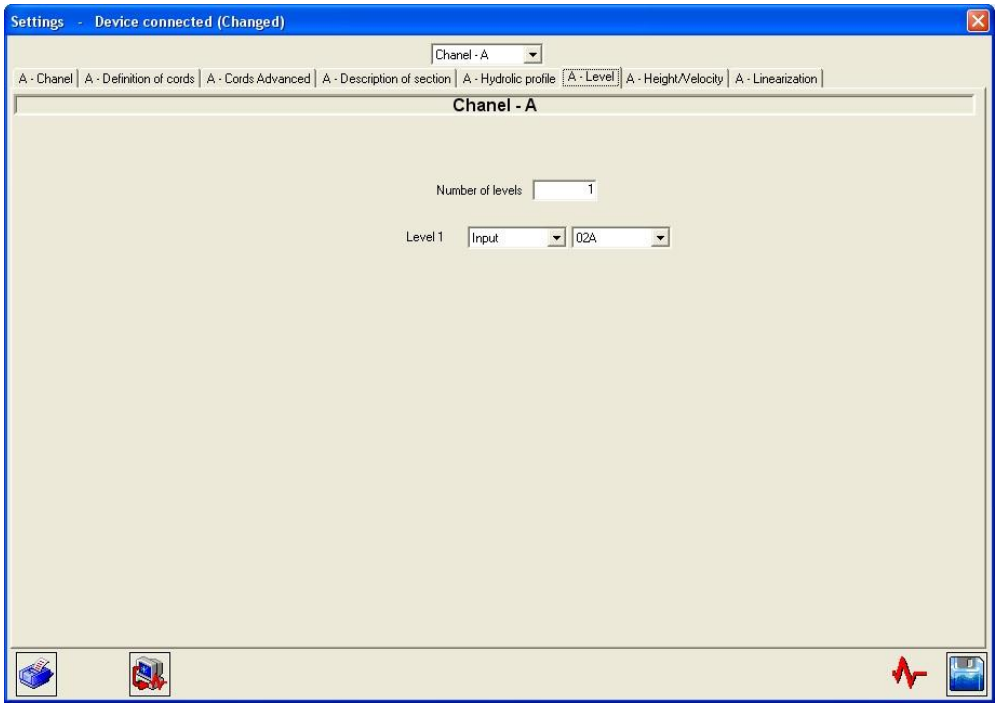
9) "Hydraulic profile" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



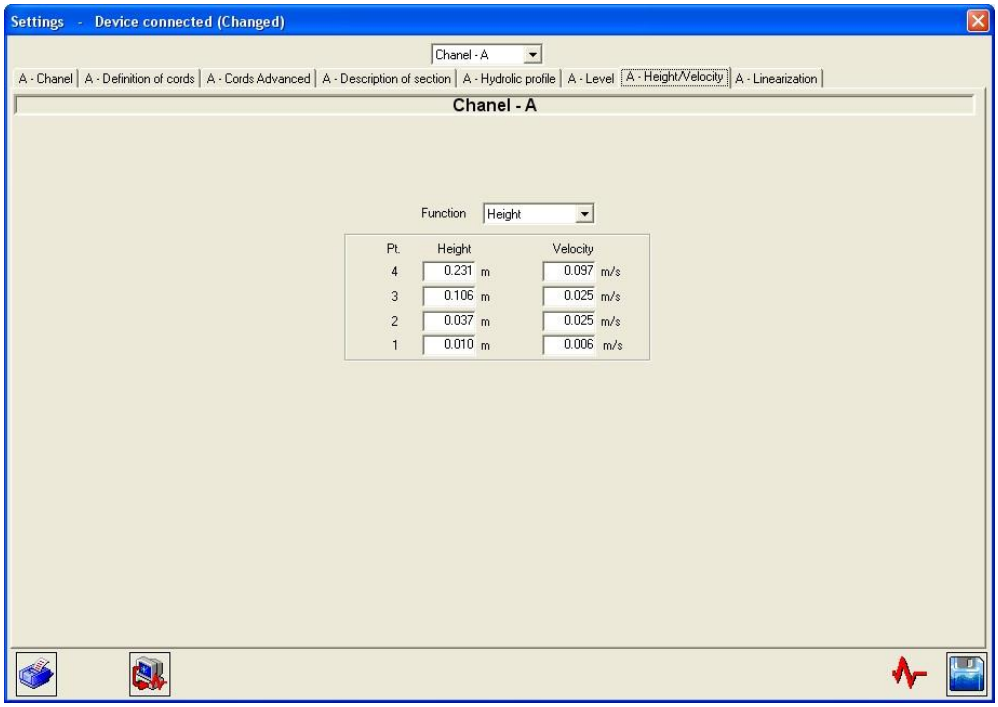
10) "Level" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



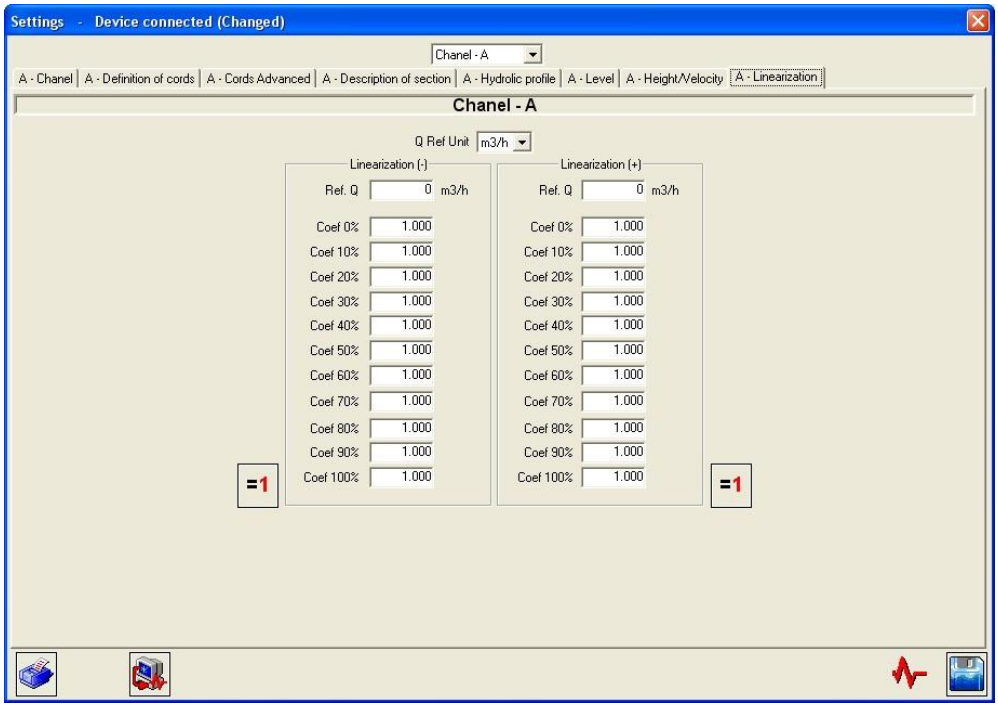
11) "Height/Velocity" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



12) "Linearization" tab (in the « Channel » drop-down menu)

The screenshot below shows an example of settings in Advanced mode. All parameters displayed below are described previously in this document (see chapter 5).



7.2 Archiving, processing and printing of saved files

You can save the settings for the flow meter and the associated measurement results.

These are complete records of the measurements and conditions observed, which are a useful addition to those of the data-logger. The files are named with an extension [*.mes].

These records on the screen are presented in the same way as the Measurement displays (see part 5.7), with a few additional icons at the bottom of the screen.

Use the following buttons to browse or select the records: 

Use the following button to print the records: 

If you have saved a sequence (Option / General / Save file / Period and Time… commands), you will be able to process this data with the software used for data handling (Excel by default, if this is installed on your computer). A macro for Excel is provided.

The data processing is opened by clicking the following button: 

In the windows opened, confirm the name of the file to be processed, and accept the macro. You should first specify the security level of this macro.

The results from the measurement pages are automatically arranged in the columns and rows of Excel, and the flow and velocity curves are produced. You can then freely modify this data.

7.3 Settings files

The UF 831 has 11 spaces in its free memory for the storage of configurations (see page 34 – point 8): you can therefore recall or save your selections.

Important: only the first 5 locations are accessible from the PC software, the other 6 may only be accessed via the converter.

Appendix 1: Characteristic echo signals

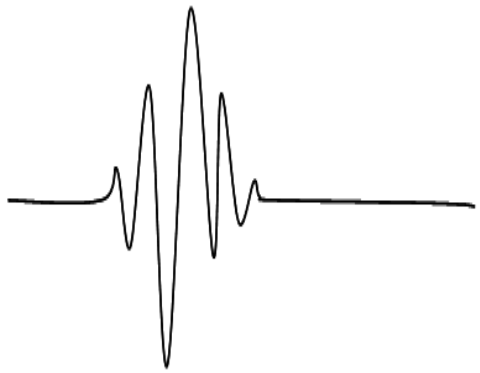
Characteristic echo signals

The display of the echo signal is not essential, but does facilitate the implementation of the measuring point. It also allows the origin of a problem to be detected.

The positioning and orientation of the probes are correct when the amplitude of the echo is at its maximum and the echo is rising rapidly, without too much distortion (deformations).

The following figures show the most commonly observed echo signals:

- Ideal signal: quick rise well above the detection threshold.



Comment: The signals observed are often longer than the one shown above. This is completely normal, the important criterion being the velocity of the signal rise above the threshold.

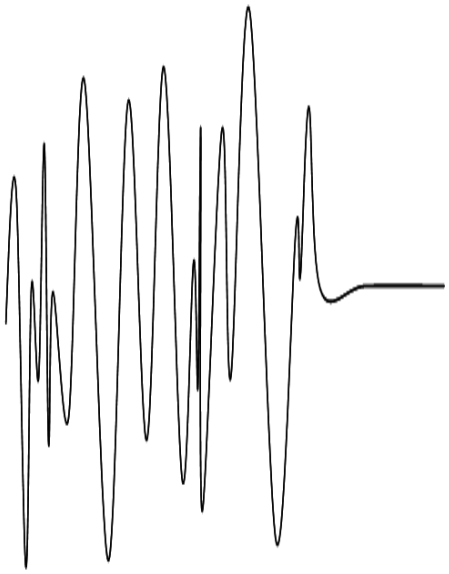
- Slowly rising signal:



- Signal distorted by an incorrect positioning of the probes:



- Presence of noise (acoustic interference)



Comment: For the last three cases, a weak signal (gain greater than 50 dB) may mean that the probes require realignment or maintenance (pollution on the surface of the probe).

- Presence of electromagnetic interference



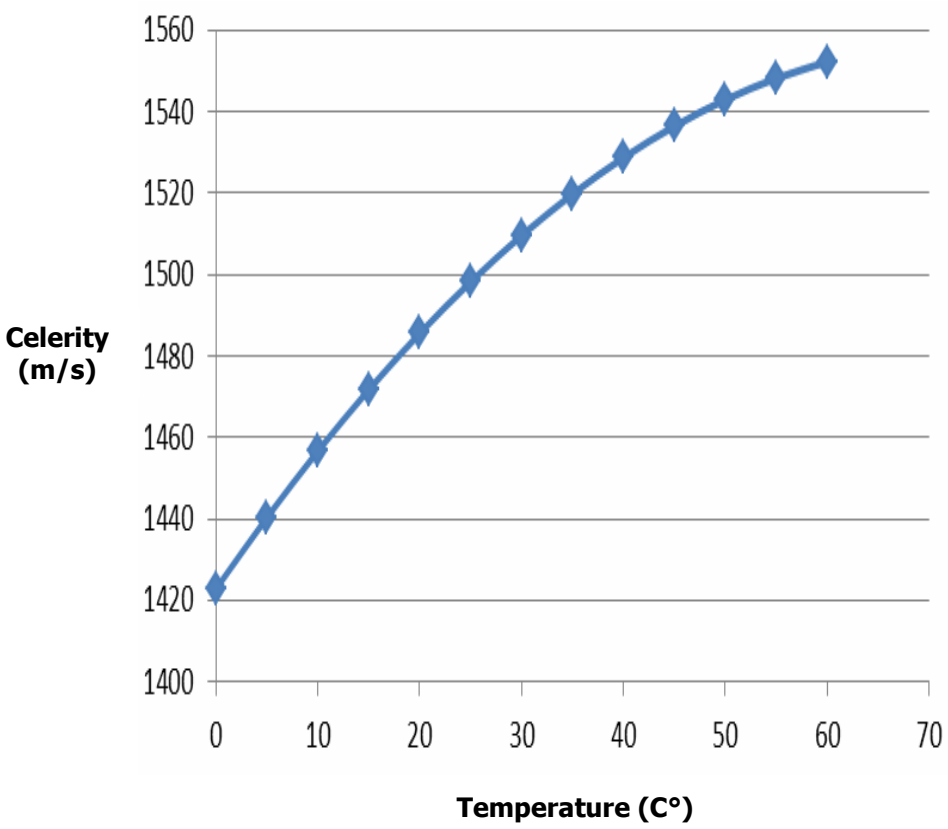
Comment: in this case, move the cables (in particular the probe cables) away from the power cables. Check the ground connections and the shielding.

Appendix 2: Speed of sound in water

Speed of sound in water

t (°C)	C (m/s)	t (°C)	C (m/s)
0	1422.8	30	1506.4
5	1426.5	35	1520.1
10	1447.6	40	1529.2
15	1466.3	45	1536.7
20	1482.7	50	1542.9
25	1497	—	—

Approximate value: $C = 1557 - 0.0245.(74 - t)^2$



Appendix 3: Troubleshooting

Diagnosis indications

Description of the fault bits

Fault grid

Diagnosis indications

Certain factors may lead to a degradation of the measurement. The following diagnosis indications will help you to resolve any problems which may occur.

- **The message "faults V" (velocity faults) is permanently displayed**

  Possible causes:

  - Probes different to those indicated in the settings. Incorrect programming of the Axial D. and W. settings.
  - Incorrect connection of the probes. A probe may have been disconnected.
  - Presence of a solid body between the probes.
  - Chords out of the water.
  - Probes incorrectly positioned with regard to each other.
  - Probes excessively clogged.
  - Fluid too absorbent, too much slurry, excessively aerated. Consult us and we can work together to find the best solution.
  - Faulty probes or failure of the UF 831. Contact us if your verifications lead to this conclusion.
  - Problem on the level measurement.

- **The message "faults Q" (flow faults) appears intermittently**

  The intermittent message "faults Q" may be due to a weak echo, resulting in a high gain.

  The possible causes are, to a lesser extent, identical to those of the permanent "faults V" (Velocity faults) message (see above), and in particular:

  - Probes misaligned,
  - Probes clogged,
  - Fluide absorbent, or slurry, or aerated.

  Comment: A simple action to mask the intermittent measurement faults and increase the memory storage time (see page 50).

- **The measurement differs from the predicted flow**

  Actions to take

  - Check that the probes are far enough away from hydraulic disturbances.
  - Check the precise dimensions of the section of the pipe or the channel at the location of the measurement and the position of the probes.
  - Have faith in your UF 831.

- **The message "relay overflow" appears permanently or intermittently in the event of a relay output configured in totalizer mode**

  Cause:

  - Too many pulses output within the allocated time.

  Actions to take

  - Adapt the pulse weight and/or the width based on the flow of your application (see the "Totalizer" section).

- **The message "open loop" appears permanently when setting a current output**

Cause:

  - Break in the loop.

- **The message "out of bands" appears permanently or intermittently when setting an analog input**

Cause:

  - Current or voltage outside the range of use.

Description of the fault bits

In general, a bit set to 1 means that there is a fault present and 0 means there is no fault. The numbering of the bits **starts at Zero**!

Two bits have the same meaning on each fault field:

BIT No.	FUNCTION NAME	DESCRIPTION
30	fault	The measurement is faulty.
31	not valid	The measurement is not possible, but not abnormal (1).

(1) For example, all probes are out of flow.

General fault

BIT No.	FUNCTION NAME	DESCRIPTION
18	function engine	A problem has occurred on one of the outputs of the function engine. This fault is used to identify a calorimetry problem for example.
19	ultrasound configuration	The ultrasonic board has a configuration problem.
20	alarm C	A peripheral system has a fault.
21	alarm B	Maintenance is required on the flow meter.
22	alarm A	The flow meter has a general fault.
23	access code	The maximum number of unlocking attempts has been reached. Please wait before trying again.
24	logger	At least one reading in the logger is not coherent.
25	power supply	The power supply has been cut off and restored.
26	inputs/outputs	Fault on an input/output module.
27	internal clock	The clock time must be set correctly.
28	Qb	Fault on the Qb pipe.
29	Qa	Fault on the Qa pipe.
30	QT	Fault on the total flow.
31	QT not valid	Total flow invalid.

Pipe/channel fault

BIT No.	FUNCTION NAME	DESCRIPTION
0	Velocity1	Chord 1 velocity faulty.
1	Velocity2	Chord 2 velocity faulty.
2	Velocity3	Chord 3 velocity faulty.
3	Velocity4	Chord 4 velocity faulty.
4	Velocity5	Chord 5 velocity faulty.
5	Velocity6	Chord 6 velocity faulty.
6	Velocity7	Chord 7 velocity faulty.
7	Velocity8	Chord 8 velocity faulty.
16	General velocity	All velocities are faulty.
17	General level (a)	All levels are faulty.
18	Height velocity (a)	The height velocity law or the automatic regression is activated.
30	Fault	Fault on a velocity.
31	Not valid	Velocity not valid.

(a) Open channel only

Input/output modules fault

BIT No.	FUNCTION NAME	DESCRIPTION
0	on relay A output metering	Relay A cannot output the number of pulses required based on the programmed period.
1	relay A output outside range	Relay A cannot output the required frequency based on the programmed range.
2	on relay B output metering	Relay B cannot output the number of pulses required based on the programmed period.
3	relay B output outside range	Relay B cannot output the required frequency based on the programmed range.
4	current A output loop open	Current loop open.
5	current A output value outside range	The value of current A is outside the authorized range.
8	value outside range input PT100/1000	The temperature measurement of PT100 A is outside the authorized range.
12	current A input value outside range	The measurement of current A is outside the authorized range.
14	current B input value outside range	The measurement of current B is outside the authorized range.
16	voltage A input value outside range	The measurement of voltage A is outside the authorized range.
18	voltage B input value outside range	The measurement of voltage B is outside the authorized range.

Chord fault

BIT No.	FUNCTION NAME	DESCRIPTION
22	chord immersion	Chord submerged.
26	overspeed/underspeed	Chord overspeed/underspeed.
29	flow calculation	Chord taken into account in the flow calculation.
30	fault	Fault on a chord.
31	not valid	Chord not valid.

Function fault

BIT No.	FUNCTION NAME	DESCRIPTION
30	fault	Function output fault.

Fault grid

There are three types of alarm:

- Alarm A: General fault,
- Alarm B: Maintenance requirement / Degraded mode,
- Alarm C: Alarm on peripheral system.

Using the PC software, you can find the detail of each of these alarms with the key word displayed in the fault window (see the chapter dedicated to the PC software).

The explanation of these key words is given below:

Alarm A:

KEY WORD	EXPLANATION
firmware	There is a recognition problem for the internal software of the flow meter. Contact Ultraflux.
EEprom	The non-volatile memory is faulty, the measurement is impossible. Contact Ultraflux.
Function	There is a bug in the execution of the function engine. Check the function engine inputs. If the problem persists, contact Ultraflux.
Com .ER	There is a programming problem for the two DSP processors. Turn the flow meter off, and then back on. If the problem persists, contact Ultraflux.
Bad software	The internal software of the flow meter is not compatible with the type of flow meter programmed (Full Pipe, Open Channel, ISD, PSD, etc.). Contact Ultraflux.
Q	Fault on the flow.

Alarm B:

KEY WORD	EXPLANATION
velocity	Fault on one of the eight velocities.

Alarm C:

KEY WORD	EXPLANATION
Dataflash	The non-volatile memory is faulty; the measurement is possible but not the archiving by the logger. Contact Ultraflux.
logger	The data of the logger cannot be used or is false. Contact Ultraflux.
h/w I/O	One of the inputs/outputs is no longer responding. Contact Ultraflux.
i/o	One of the inputs/outputs is incorrectly configured. Contact Ultraflux.
clock	The clock time must be set correctly.

Appendix 4: Link protocol of the UF 831

Serial link characteristics

Reading of N words (with N ≤ 125)

JBUS/MODBUS table

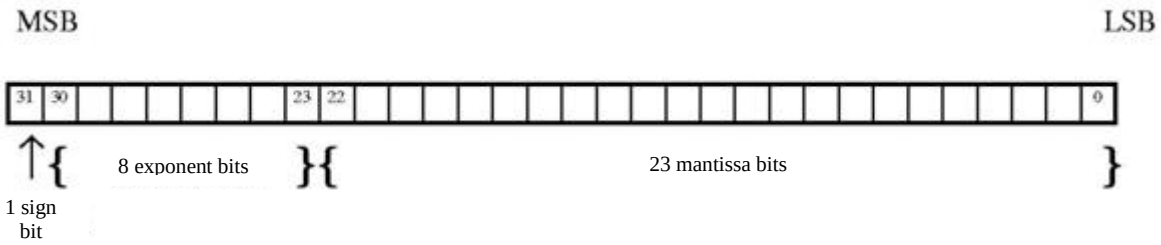
CRC16 calculation algorithm

Serial link characteristics

The following list presents the characteristics of the serial link to be used:

- Protocol used: JBUS/MODBUS,
- Transmission speed: from 300 to 115,200 bauds,
- Number of bits: 8,
- Parity: None,
- Number of stop bits: 1.

Comment: To ensure that an automaton can take measurement recordings, contact Ultraflux to obtain the measurement variables description table in the JBUS/MODBUS protocol.



Where: $V = (-1)^S * \left(1 + \frac{M}{2^{23}}\right) * 2^{(E-127)}$

Example: float value = $40, $21, $00, $40

$S = 0 ; E = , \$80 = 128d ; M = 210040 = 2162752d$

$$V = (-1)^0 * \left(1 + \frac{2162752}{2^{23}}\right) * 2^{(128-127)} = 2.5151640259$$

For FLOAT type information, it must be possible to read two consecutive words (or 4 bytes). The format complies with the IEEE standard.

For LONG type information, two consecutive words (or 4 bytes) must be read.

Reading of N words (with N ≤ 125)

The function code for reading N words is 3.

Request

Slave no.	3	address 1st word	number of words	CRC16
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response

Slave no.	3	number of bytes read	value 1st word	value last word	CRC16
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes

JBUS/MODBUS table

(1): full pipe only
(2): open channel only

For the other channels (C to H), there is simply an offset address of 200 hexadecimal or 512 decimal between each channel.

		Channel A		Channel B	
PARAMETER NAME	Type	JBUS Hexa address	JBUS Dec address	JBUS Hexa address	JBUS Dec address
Logger		**0200**	**512**	**0400**	**1024**
No. Variables Per Line	USHORT	**0200**	**512**	**0400**	**1024**
No. Completed Lines	ULONG	**0201**	**513**	**0401**	**1025**
Max. Line No.	ULONG	**0203**	**515**	**0403**	**1027**
Period (seconds)	ULONG	**0205**	**517**	**0405**	**1029**
		0207	**519**	**0407**	**1031**
Totalizers		**0207**	**519**	**0407**	**1031**
Totalizer1 value	ULONG	**0207**	**519**	**0407**	**1031**
Totalizer1 Weight	USHORT	**0209**	**521**	**0409**	**1033**
Totalizer1 Unit	USHORT	**020A**	**522**	**040A**	**1034**
Totalizer2 value	ULONG	**020B**	**523**	**040B**	**1035**
Totalizer2 Weight	USHORT	**020D**	**525**	**040D**	**1037**
Totalizer2 Unit	USHORT	**020E**	**526**	**040E**	**1038**
Totalizer3 value	ULONG	**020F**	**527**	**040F**	**1039**
Totalizer3 Weight	USHORT	**0211**	**529**	**0411**	**1041**
Totalizer3 Unit	USHORT	**0212**	**530**	**0412**	**1042**
Totalizer4 value	ULONG	**0213**	**531**	**0413**	**1043**
Totalizer4 Weight	USHORT	**0215**	**533**	**0415**	**1045**
Totalizer4 Unit	USHORT	**0216**	**534**	**0416**	**1046**
		0217	**535**	**0417**	**1047**
		0217	**535**	**0417**	**1047**
Year Clock	USHORT	**0217**	**535**	**0417**	**1047**
Clock Month	USHORT	**0218**	**536**	**0418**	**1048**
Clock Days	USHORT	**0219**	**537**	**0419**	**1049**
Clock Hour	USHORT	**021A**	**538**	**041A**	**1050**
Clock Minutes	USHORT	**021B**	**539**	**041B**	**1051**
Clock Seconds	USHORT	**021C**	**540**	**041C**	**1052**
QT Q	FLOAT	**021D**	**541**	**041D**	**1053**
QT unit	USHORT	**021F**	**543**	**041F**	**1055**
QT Fault	ULONG	**0220**	**544**	**0420**	**1056**
		0222	**546**	**0422**	**1058**
Pipe		**0222**	**546**	**0422**	**1058**
Q	FLOAT	**0222**	**546**	**0422**	**1058**
Flow unit index	USHORT	**0224**	**548**	**0424**	**1060**
Average V	FLOAT	**0225**	**549**	**0425**	**1061**
Average C	FLOAT	**0227**	**551**	**0427**	**1063**
KH (1)	FLOAT	**0229**	**553**	**0429**	**1065**
Reynolds (1)	FLOAT	**022B**	**555**	**042B**	**1067**
Surface	FLOAT	**022D**	**557**	**042D**	**1069**
Level (2)	FLOAT	**022F**	**559**	**042F**	**1071**
Height / Channel Description	FLOAT	**0231**	**561**	**0431**	**1073**

		Channel A		Channel B	
PARAMETER NAME	Type	JBUS Hexa address	JBUS Dec address	JBUS Hexa address	JBUS Dec address
Point (2)					
Water Height (2)	FLOAT	**0233**	**563**	**0433**	**1075**
Water Height Max. Delta (2)	FLOAT	**0235**	**565**	**0435**	**1077**
Fault	ULONG	**0237**	**567**	**0437**	**1079**
		0239	**569**	**0439**	**1081**
chord 01		**0239**	**569**	**0439**	**1081**
Average V	FLOAT	**0239**	**569**	**0439**	**1081**
T	FLOAT	**023B**	**571**	**043B**	**1083**
DeltaT	FLOAT	**023D**	**573**	**043D**	**1085**
C	FLOAT	**023F**	**575**	**043F**	**1087**
Gain	FLOAT	**0241**	**577**	**0441**	**1089**
IQ	FLOAT	**0243**	**579**	**0443**	**1091**
Fault	ULONG	**0245**	**581**	**0445**	**1093**
Probe Reference	USHORT	**0247**	**583**	**0447**	**1095**
Distance Between Probes	USHORT	**0248**	**584**	**0448**	**1096**
		0249	**585**	**0449**	**1097**
chord 02		**0249**	**585**	**0449**	**1097**
Average V	FLOAT	**0249**	**585**	**0449**	**1097**
T	FLOAT	**024B**	**587**	**044B**	**1099**
DeltaT	FLOAT	**024D**	**589**	**044D**	**1101**
C	FLOAT	**024F**	**591**	**044F**	**1103**
Gain	FLOAT	**0251**	**593**	**0451**	**1105**
IQ	FLOAT	**0253**	**595**	**0453**	**1107**
Fault	ULONG	**0255**	**597**	**0455**	**1109**
Probe Reference	USHORT	**0257**	**599**	**0457**	**1111**
Distance Between Probes	USHORT	**0258**	**600**	**0458**	**1112**
		0259	**601**	**0459**	**1113**
chord 03		**0259**	**601**	**0459**	**1113**
Average V	FLOAT	**0259**	**601**	**0459**	**1113**
T	FLOAT	**025B**	**603**	**045B**	**1115**
DeltaT	FLOAT	**025D**	**605**	**045D**	**1117**
C	FLOAT	**025F**	**607**	**045F**	**1119**
Gain	FLOAT	**0261**	**609**	**0461**	**1121**
IQ	FLOAT	**0263**	**611**	**0463**	**1123**
Fault	ULONG	**0265**	**613**	**0465**	**1125**
Probe Reference	USHORT	**0267**	**615**	**0467**	**1127**
Distance Between Probes	USHORT	**0268**	**616**	**0468**	**1128**
		0269	**617**	**0469**	**1129**
chord 04		**0269**	**617**	**0469**	**1129**
Average V	FLOAT	**0269**	**617**	**0469**	**1129**
T	FLOAT	**026B**	**619**	**046B**	**1131**
DeltaT	FLOAT	**026D**	**621**	**046D**	**1133**
C	FLOAT	**026F**	**623**	**046F**	**1135**
Gain	FLOAT	**0271**	**625**	**0471**	**1137**
IQ	FLOAT	**0273**	**627**	**0473**	**1139**

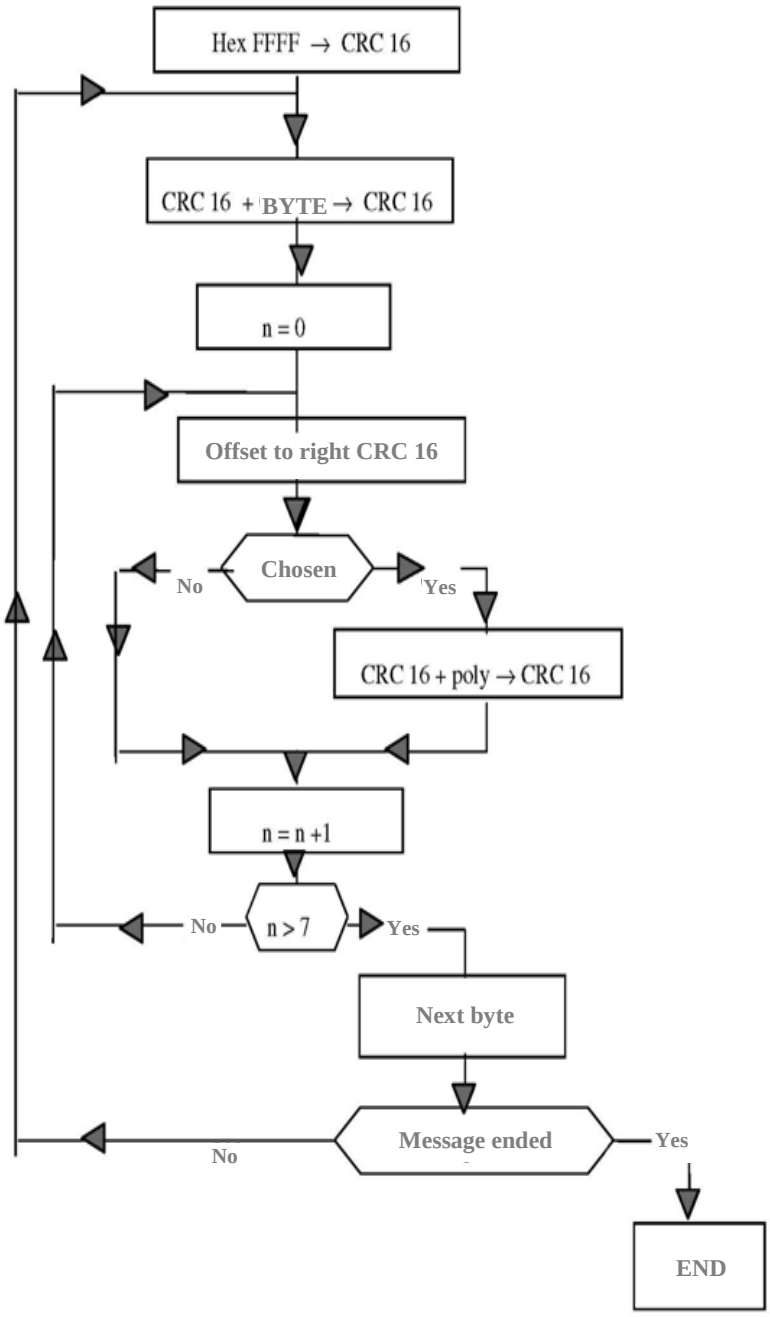
		Channel A		Channel B	
PARAMETER NAME	Type	JBUS Hexa address	JBUS Dec address	JBUS Hexa address	JBUS Dec address
Fault	ULONG	**0275**	**629**	**0475**	**1141**
Probe Reference	USHORT	**0277**	**631**	**0477**	**1143**
Distance Between Probes	USHORT	**0278**	**632**	**0478**	**1144**
		0279	**633**	**0479**	**1145**
chord 05		**0279**	**633**	**0479**	**1145**
Average V	FLOAT	**0279**	**633**	**0479**	**1145**
T	FLOAT	**027B**	**635**	**047B**	**1147**
DeltaT	FLOAT	**027D**	**637**	**047D**	**1149**
C	FLOAT	**027F**	**639**	**047F**	**1151**
Gain	FLOAT	**0281**	**641**	**0481**	**1153**
IQ	FLOAT	**0283**	**643**	**0483**	**1155**
Fault	ULONG	**0285**	**645**	**0485**	**1157**
Probe Reference	USHORT	**0287**	**647**	**0487**	**1159**
Distance Between Probes	USHORT	**0288**	**648**	**0488**	**1160**
		0289	**649**	**0489**	**1161**
chord 06		**0289**	**649**	**0489**	**1161**
Average V	FLOAT	**0289**	**649**	**0489**	**1161**
T	FLOAT	**028B**	**651**	**048B**	**1163**
DeltaT	FLOAT	**028D**	**653**	**048D**	**1165**
C	FLOAT	**028F**	**655**	**048F**	**1167**
Gain	FLOAT	**0291**	**657**	**0491**	**1169**
IQ	FLOAT	**0293**	**659**	**0493**	**1171**
Fault	ULONG	**0295**	**661**	**0495**	**1173**
Probe Reference	USHORT	**0297**	**663**	**0497**	**1175**
Distance Between Probes	USHORT	**0298**	**664**	**0498**	**1176**
		0299	**665**	**0499**	**1177**
chord 07		**0299**	**665**	**0499**	**1177**
Average V	FLOAT	**0299**	**665**	**0499**	**1177**
T	FLOAT	**029B**	**667**	**049B**	**1179**
DeltaT	FLOAT	**029D**	**669**	**049D**	**1181**
C	FLOAT	**029F**	**671**	**049F**	**1183**
Gain	FLOAT	**02A1**	**673**	**04A1**	**1185**
IQ	FLOAT	**02A3**	**675**	**04A3**	**1187**
Fault	ULONG	**02A5**	**677**	**04A5**	**1189**
Probe Reference	USHORT	**02A7**	**679**	**04A7**	**1191**
Distance Between Probes	USHORT	**02A8**	**680**	**04A8**	**1192**
		02A9	**681**	**04A9**	**1193**
chord 08		**02A9**	**681**	**04A9**	**1193**
Average V	FLOAT	**02A9**	**681**	**04A9**	**1193**
T	FLOAT	**02AB**	**683**	**04AB**	**1195**
DeltaT	FLOAT	**02AD**	**685**	**04AD**	**1197**
C	FLOAT	**02AF**	**687**	**04AF**	**1199**
Gain	FLOAT	**02B1**	**689**	**04B1**	**1201**
IQ	FLOAT	**02B3**	**691**	**04B3**	**1203**
Fault	ULONG	**02B5**	**693**	**04B5**	**1205**

		Channel A		Channel B	
PARAMETER NAME	Type	JBUS Hexa address	JBUS Dec address	JBUS Hexa address	JBUS Dec address
Probe Reference	USHORT	**02B7**	**695**	**04B7**	**1207**
Distance Between Probes	USHORT	**02B8**	**696**	**04B8**	**1208**
		02B9	**697**	**04B9**	**1209**
chord 09		**02B9**	**697**	**04B9**	**1209**
Average V	FLOAT	**02B9**	**697**	**04B9**	**1209**
T	FLOAT	**02BB**	**699**	**04BB**	**1211**
DeltaT	FLOAT	**02BD**	**701**	**04BD**	**1213**
C	FLOAT	**02BF**	**703**	**04BF**	**1215**
Gain	FLOAT	**02C1**	**705**	**04C1**	**1217**
IQ	FLOAT	**02C3**	**707**	**04C3**	**1219**
Fault	ULONG	**02C5**	**709**	**04C5**	**1221**
Probe Reference	USHORT	**02C7**	**711**	**04C7**	**1223**
Distance Between Probes	USHORT	**02C8**	**712**	**04C8**	**1224**
		02C9	**713**	**04C9**	**1225**
Inputs/Outputs		**02C9**	**713**	**04C9**	**1225**
IO 01		**02C9**	**713**	**04C9**	**1225**
Value	FLOAT	**02C9**	**713**	**04C9**	**1225**
Fault	ULONG	**02CB**	**715**	**04CB**	**1227**
		02CD	**717**	**04CD**	**1229**
IO 02		**02CD**	**717**	**04CD**	**1229**
Value	FLOAT	**02CD**	**717**	**04CD**	**1229**
Fault	ULONG	**02CF**	**719**	**04CF**	**1231**
		02D1	**721**	**04D1**	**1233**
IO 03		**02D1**	**721**	**04D1**	**1233**
Value	FLOAT	**02D1**	**721**	**04D1**	**1233**
Fault	ULONG	**02D3**	**723**	**04D3**	**1235**
		02D5	**725**	**04D5**	**1237**
IO 04		**02D5**	**725**	**04D5**	**1237**
Value	FLOAT	**02D5**	**725**	**04D5**	**1237**
Fault	ULONG	**02D7**	**727**	**04D7**	**1239**
		02D9	**729**	**04D9**	**1241**
IO 05		**02D9**	**729**	**04D9**	**1241**
Value	FLOAT	**02D9**	**729**	**04D9**	**1241**
Fault	ULONG	**02DB**	**731**	**04DB**	**1243**
		02DD	**733**	**04DD**	**1245**
IO 06		**02DD**	**733**	**04DD**	**1245**
Value	FLOAT	**02DD**	**733**	**04DD**	**1245**
Fault	ULONG	**02DF**	**735**	**04DF**	**1247**
		02E1	**737**	**04E1**	**1249**
IO 07		**02E1**	**737**	**04E1**	**1249**
Value	FLOAT	**02E1**	**737**	**04E1**	**1249**
Fault	ULONG	**02E3**	**739**	**04E3**	**1251**
		02E5	**741**	**04E5**	**1253**
IO 08		**02E5**	**741**	**04E5**	**1253**
Value	FLOAT	**02E5**	**741**	**04E5**	**1253**

		Channel A		Channel B	
PARAMETER NAME	Type	JBUS Hexa address	JBUS Dec address	JBUS Hexa address	JBUS Dec address
Fault	ULONG	**02E7**	**743**	**04E7**	**1255**
		02E9	**745**	**04E9**	**1257**
IO 09		**02E9**	**745**	**04E9**	**1257**
Value	FLOAT	**02E9**	**745**	**04E9**	**1257**
Fault	ULONG	**02EB**	**747**	**04EB**	**1259**
		02ED	**749**	**04ED**	**1261**
IO 10		**02ED**	**749**	**04ED**	**1261**
Value	FLOAT	**02ED**	**749**	**04ED**	**1261**
Fault	ULONG	**02EF**	**751**	**04EF**	**1263**
		02F1	**753**	**04F1**	**1265**
IO 11		**02F1**	**753**	**04F1**	**1265**
Value	FLOAT	**02F1**	**753**	**04F1**	**1265**
Fault	ULONG	**02F3**	**755**	**04F3**	**1267**
		02F5	**757**	**04F5**	**1269**
IO 12		**02F5**	**757**	**04F5**	**1269**
Value	FLOAT	**02F5**	**757**	**04F5**	**1269**
Fault	ULONG	**02F7**	**759**	**04F7**	**1271**
		02F9	**761**	**04F9**	**1273**
IO 13		**02F9**	**761**	**04F9**	**1273**
Value	FLOAT	**02F9**	**761**	**04F9**	**1273**
Fault	ULONG	**02FB**	**763**	**04FB**	**1275**
		02FD	**765**	**04FD**	**1277**
IO 14		**02FD**	**765**	**04FD**	**1277**
Value	FLOAT	**02FD**	**765**	**04FD**	**1277**
Fault	ULONG	**02FF**	**767**	**04FF**	**1279**
		0301	**769**	**0501**	**1281**
IO 15		**0301**	**769**	**0501**	**1281**
Value	FLOAT	**0301**	**769**	**0501**	**1281**
Fault	ULONG	**0303**	**771**	**0503**	**1283**
		0305	**773**	**0505**	**1285**
IO 16		**0305**	**773**	**0505**	**1285**
Value	FLOAT	**0305**	**773**	**0505**	**1285**
Fault	ULONG	**0307**	**775**	**0507**	**1287**
		0309	**777**	**0509**	**1289**
IO 17	0	**0309**	**777**	**0509**	**1289**
Value	FLOAT	**0309**	**777**	**0509**	**1289**
Fault	ULONG	**030B**	**779**	**050B**	**1291**
		030D	**781**	**050D**	**1293**
IO 18		**030D**	**781**	**050D**	**1293**
Value	FLOAT	**030D**	**781**	**050D**	**1293**
Fault	ULONG	**030F**	**783**	**050F**	**1295**
		0311	**785**	**0511**	**1297**
IO 19		**0311**	**785**	**0511**	**1297**
Value	FLOAT	**0311**	**785**	**0511**	**1297**
Fault	ULONG	**0313**	**787**	**0513**	**1299**

		Channel A		Channel B	
PARAMETER NAME	Type	JBUS Hexa address	JBUS Dec address	JBUS Hexa address	JBUS Dec address
		0315	**789**	**0515**	**1301**
IO 20		**0315**	**789**	**0515**	**1301**
Value	FLOAT	**0315**	**789**	**0515**	**1301**
Fault	ULONG	**0317**	**791**	**0517**	**1303**
		0319	**793**	**0519**	**1305**
Function output Start		**0319**	**793**	**0519**	**1305**
Function output 01		**0319**	**793**	**0519**	**1305**
Value	FLOAT	**0319**	**793**	**0519**	**1305**
Fault	ULONG	**031B**	**795**	**051B**	**1307**
		031D	**797**	**051D**	**1309**
Function output 02		**031D**	**797**	**051D**	**1309**
Value	FLOAT	**031D**	**797**	**051D**	**1309**
Fault	ULONG	**031F**	**799**	**051F**	**1311**
		0321	**801**	**0521**	**1313**
Function output 03		**0321**	**801**	**0521**	**1313**
Value	FLOAT	**0321**	**801**	**0521**	**1313**
Fault	ULONG	**0323**	**803**	**0523**	**1315**
		0325	**805**	**0525**	**1317**
Function output 04		**0325**	**805**	**0525**	**1317**
Value	FLOAT	**0325**	**805**	**0525**	**1317**
Fault	ULONG	**0327**	**807**	**0527**	**1319**
		0329	**809**	**0529**	**1321**
Function output 05		**0329**	**809**	**0529**	**1321**
Value	FLOAT	**0329**	**809**	**0529**	**1321**
Fault	ULONG	**032B**	**811**	**052B**	**1323**
		032D	**813**	**052D**	**1325**
Function output 06		**032D**	**813**	**052D**	**1325**
Value	FLOAT	**032D**	**813**	**052D**	**1325**
Fault	ULONG	**032F**	**815**	**052F**	**1327**
		0331	**817**	**0531**	**1329**
Function output 07		**0331**	**817**	**0531**	**1329**
Value	FLOAT	**0331**	**817**	**0531**	**1329**
Fault	ULONG	**0333**	**819**	**0533**	**1331**
		0335	**821**	**0535**	**1333**
Function output 08		**0335**	**821**	**0535**	**1333**
Value	FLOAT	**0335**	**821**	**0535**	**1333**
Fault	ULONG	**0337**	**823**	**0537**	**1335**
		0339	**825**	**0539**	**1337**
Function output 09		**0339**	**825**	**0539**	**1337**
Value	FLOAT	**0339**	**825**	**0539**	**1337**
Fault	ULONG	**033B**	**827**	**053B**	**1339**
		033D	**829**	**053D**	**1341**
Function output 10		**033D**	**829**	**053D**	**1341**
Value	FLOAT	**033D**	**829**	**053D**	**1341**
Fault	ULONG	**033F**	**831**	**053F**	**1343**

CRC16 calculation algorithm



⊕ = exclusive OR

n = number of bits

poly = calculation polynomial of CRC16 = 1010 0000 0000 0001 (generator polynomial = 2 X^2 X^{15} X^{16})

the first byte sent is the one with the least significant bits

Appendix 5: Wiring

Wiring of ultrasonic probes

Wiring of the inputs - outputs

Wiring of the relay modules
Wiring of the current output modules
Wiring of the current input modules
Wiring of the voltage input modules
Wiring of the temperature modules

Wiring of the communication port

Wiring of the serial link in RS232 mode
Wiring of the serial link in RS485 mode

Supply wiring

Pin function for the 110-240 VAC supply
Pin function for the DC supply



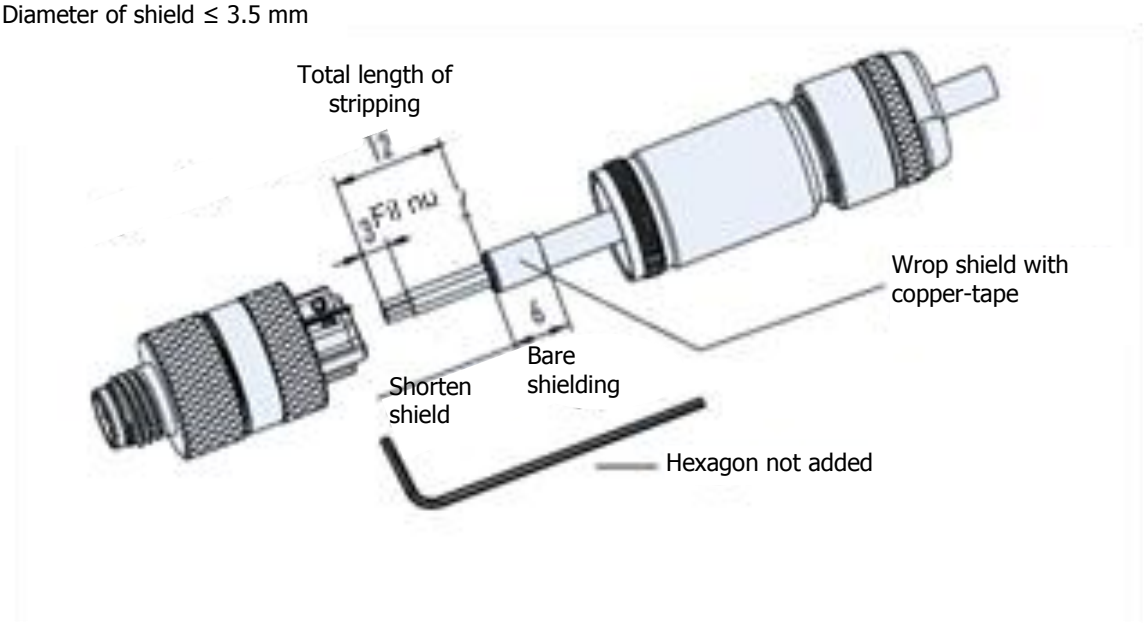
Wiring of ultrasonic probes

The ultrasonic probes must be wired as follows:

Base view 

Pins	Functions
1	probe upstream wire A
2	probe upstream wire B
3	probe downstream wire A
4	probe downstream wire B

Diameter of shield ≤ 3.5 mm



Wiring of the inputs - outputs

Base view



The wiring depends on the module assigned to the connector.

Wiring of the relay modules

The pins have the following functions:

Pins	Functions
1	relay A
2	relay A
3	relay B
4	relay B

Wiring of the current output modules

The pins have the following functions:

Pins	Functions
1	current (+)
2	current (-)
3	-
4	-

Wiring of the current input modules

The pins have the following functions:

Pins	Functions
1	current A wire 1
2	current A wire 2
3	current B wire 1
4	current B wire 2

Wiring of the voltage input modules

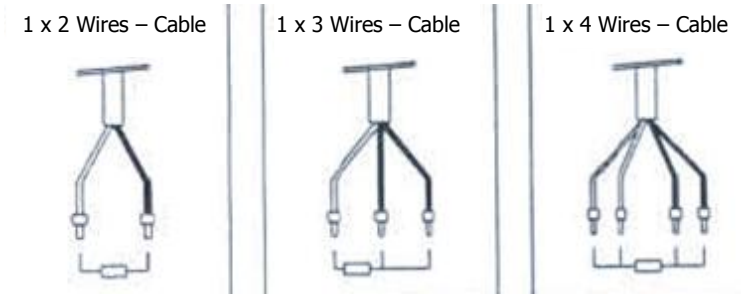
The pins have the following functions:

Pins	Functions
1	voltage A(+)
2	voltage A(-)
3	voltage B(+)
4	voltage B(-)

Wiring of the temperature modules

Comment: This 2-input module takes up the physical space of two modules.

The sensors Pt 100 and Pt 1000 can be wired in different ways:



The most complete wiring is that of a 4-wire sensor:

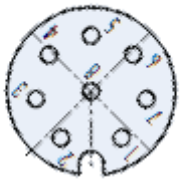
Pins	Functions
1	red wire 1
2	white wire 1
3	red wire 2
4	white wire 2

Warning: In order to provide a good measurement quality, it is recommended to use platinum armoured probes. The 360° shield connection is operated by the binder connector.

Important: For 2- or 3-wire wiring, simply produce "bridging" to make up for the missing wires. In the 3-wire version, a white wire is missing: simply bridge the two white wire 1 and 2 terminals, and place the white cable on the "white wire" pin.

Wiring of the communication port

Base view



There are two possible ways to wire the serial link:

- RS232
- RS485

The choice of the mode is made through specific wiring. It is not possible to use the flow meter in a mode other than the one chosen by wiring.

The serial link connector is a 6-pin connector, the function of which depends on the type of wiring.

Wiring of the serial link in RS232 mode

The pins have the following functions:

Pins	Functions
1	Rx (UF 831)
7	Tx (UF 831)
8	SG
Jumper between 6 and 8	Forcing mode RS 232
2, 3, 4, 5	Not used

Wiring of the serial link in RS485 mode

The pins have the following functions:

Pins	Functions
4	Z
2	Y
8	SG
Jumper between 2 and 3	To activate the terminating resistance
1, 5, 6, 7	Not used

Supply wiring

The supply connector is a 4-pin connector. The function of the pins depends on the type of supply: 110-240 VAC supply or DC supply.

Base view



Pin function for the 110-240 VAC supply

The pins have the following functions:

Pins	Functions
1	phase
2	not connected
3	neutral
4	protective ground

Pin function for the DC supply

The pins have the following functions:

Pins	Functions
1	Vin +
2	not connected
3	Vin -
4	protective ground

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