höntzsch
flow measuring technology

ExactSonic III

Portable Ultrasonic Flow Meter

Operating Instructions

Contents

1 General Description

1.1 Introduction

This manual describes the operation of the ExactSonic III portable flowmeter. The flowmeter is designed to work with clamp-on transducers to enable the flow of a liquid within a closed pipe to be measured accurately without needing to insert any mechanical parts through the pipe wall or protrude into the flow system.

Using ultrasonic transit time techniques, the ExactSonic III is controlled by a microprocessor system which contains a wide range of data enabling it to be used with pipes with an outside diameter ranging from 13 mm to 2000 mm and constructed of almost any material. The instrument will also operate over a wide range of fluid temperatures.

Easy to operate, the ExactSonic III standard features are:

- large, easy to read graphic display with backlighting
- simple to follow duak function keypad
- simple 'Quick Start' set up procedure
- continuous signal monitoring
- 3 isolated switched outputs for use in any combination as a
  - Pulse output (volume)
  - Frequency output (flow)
  - Alarm output (flow, volume, flow signal quality)
- current output with a selectable range between 0 and 24 mA (e.g. 4 … 20mA), including support for an alarm current
- rechargeable battery
- battery management
- diagnostics

Volumetric flow rates are displayed in: l/s, l/min, l/h, m³/s, m³/min, m³/h, Ml/s, Ml/min, Ml/hr, Ml/day, USgals/sec, USgals/min, USgals/h, USgals/day, Barrel/h, Barrel/day, ft3/sec, ft3/min, ft3/hr, MUSgal/hr), MUSgal/day, Imp Gals/sec, Imp. Gal/m, Imp Gals/hr, Imp Gals/day, Barrels/hr, Barrels/day.
Flow velocity is displayed in metres or feet per second.

When operating in the 'Flow Reading' mode the integrated volume (or amount), is displayed as a 12-digit number with correct sign.

The flowmeter can be used to measure liquids with less than 3% volume of solids content. An appli-cation for cloudy liquids such as rivers and wastewater is also possible as well as for demineralised water.

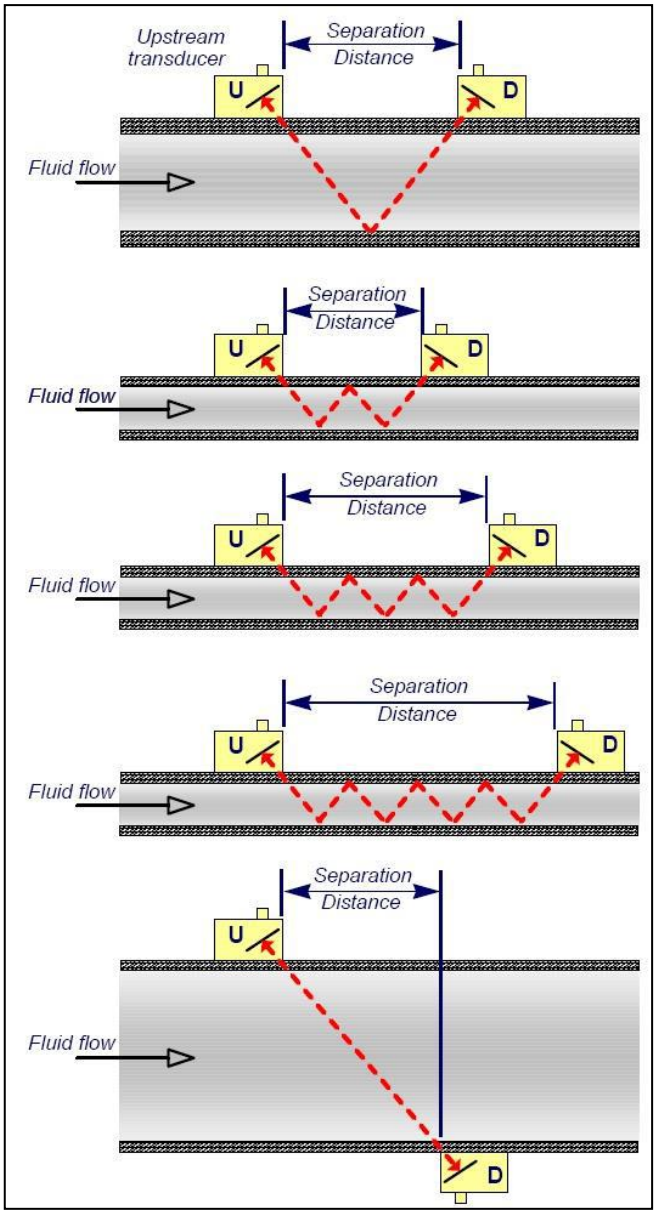
Typical ExactSonic III applications are
- river water
- sea water
- potable water
- demineralised water
- treated water

2 Principle of Operation

When ultrasound is transmitted through a liquid the speed at which the sound travels through the liquid is accelerated slightly if it is transmitted in the same direction as the liquid flow and decelerated slightly if transmitted against it. The difference in time taken by the sound to travel the same distance but in opposite directions is therefore directly proportional to the flow velocity of the liquid.

The ExactSonic III system employs two ultrasonic transducers attached to the pipe carrying the liquid and

compares the time taken to transmit an ultrasound signal in each direction. If the sound characteris-tics of the fluid are known, the ExactSonic III microprocessor can use the results of the transit time calculations to compute the fluid flow velocity. Once the flow velocity is known, the volumetric flow can be calculated easily for a given pipe diameter. The ExactSonic II can be set up to operate in one of five modes deter-mined mainly by the pipe diameter and the type of transducer set in use. The diagram below illustrates the importance of applying the correct separation distance between the transducers to obtain the strongest signal.



Reflex (V) mode
(single bounce)

Reflex (W) mode
(double bounce)

Reflex (WV) mode
(triple bounce)

Reflex (WW) mode
(quadruple bounce)

Diagonal mode
(without bounce)

Figure 2.1 Operationg Modes

2.1 Reflex (V) Mode

This is the most commonly used mode. The two transducers (U & D) are attached to the pipe in line with each other and the signals passing between them are reflected by the opposite pipe wall.
The separation distance is calculated by the instrument in response to entered data concerning the pipe and fluid characteristics.

2.2 Double Reflex (W) Mode

In this mode the separation distance is calculated to give a double bounce*. This is most likely to occur if the pipe diameter is so small that the calculated reflex mode separation distance would be impractical for the transducers in use.

2.3 Triple Reflex (WV) Mode

This mode goes one step further to show a triple bounce* situation. This would normally apply when working with very small pipes relative to the transducer range in use.

2.4 Quadruple Reflex (WW) Mode

This mode goes one step further again, to use a quadruple bounce*. Again this would normally apply when working with very small pipes relative to the transducer range in use.

2.5 Diagonal Mode

This mode might be selected where relatively large pipes are concerned. In this mode the transducers are located on opposite sides of the pipe but the separation distance is still critical in order for the signals to be received correctly.

* In general, if should be noted that errors accumulate as the number of bounces increase. Units are calibrated using single reflex mode. Any inherent inaccuracy will be amplified by using higher order modes such as triple or quadruple bounce. In addition to this, as the path length is longer, the signal will also be more attenuated with higher order operating modes.

3 Scope of Delivery

The ExactSonic III equipment is supplied in a rugged IP67 carrying case fitted with a foam insert to give added protection for transportation. The supplied components are shown below in figure 3.1.

Figure 3.1 Standard Equipment

Standard equipment

1 ExactSonic III instrument with backlit graphic display
2. Power supply with UK/US/European adapters, 110/240VAC
3. Output signal cable (current loop & 3 digital outputs)
4. Transducer cables (2x) each 2 m long
5. Chains (2x), each 3.3 m long
6. Guide rails (2x) for use with A or B type transducers
7. Ultrasonic couplant
8. Tape measure
9. Transducer set „A" for use on pipes with 13 mm to 115 mm outside diameter.
   Transducer set „B" for use on pipes with 50 mm to 2000 mm outside diameter.
10. Test block
11. Syringe (for the application of the couplant during installation)
12. Ruled separation bar (two pieces)
13. USB stick

3.1 ExactSonic III Instrument

The ExactSonic III is a microprocessor controlled instrument, operated through a menu system using an inbuilt LCD and keypad. It can be used to display the instantaneous fluid flow rate or velocity, together with totalised values.

The instrument can also provide a variable current or variable 'pulse' (volumetric or flow frequency) output that is proportional to the detected flow rate. In addition to this, the instrument can also be used to signal alarm conditions such as flow too high, too low or a volume being exceeded. This output can be calibrated to suit a particular flow range and used with a range of external interface devices, such as those found in building management systems or site monitoring systems. The three isolated outputs provided can be configured as required in any order and with any functionality as just mentioned.

3.1.1 Connections

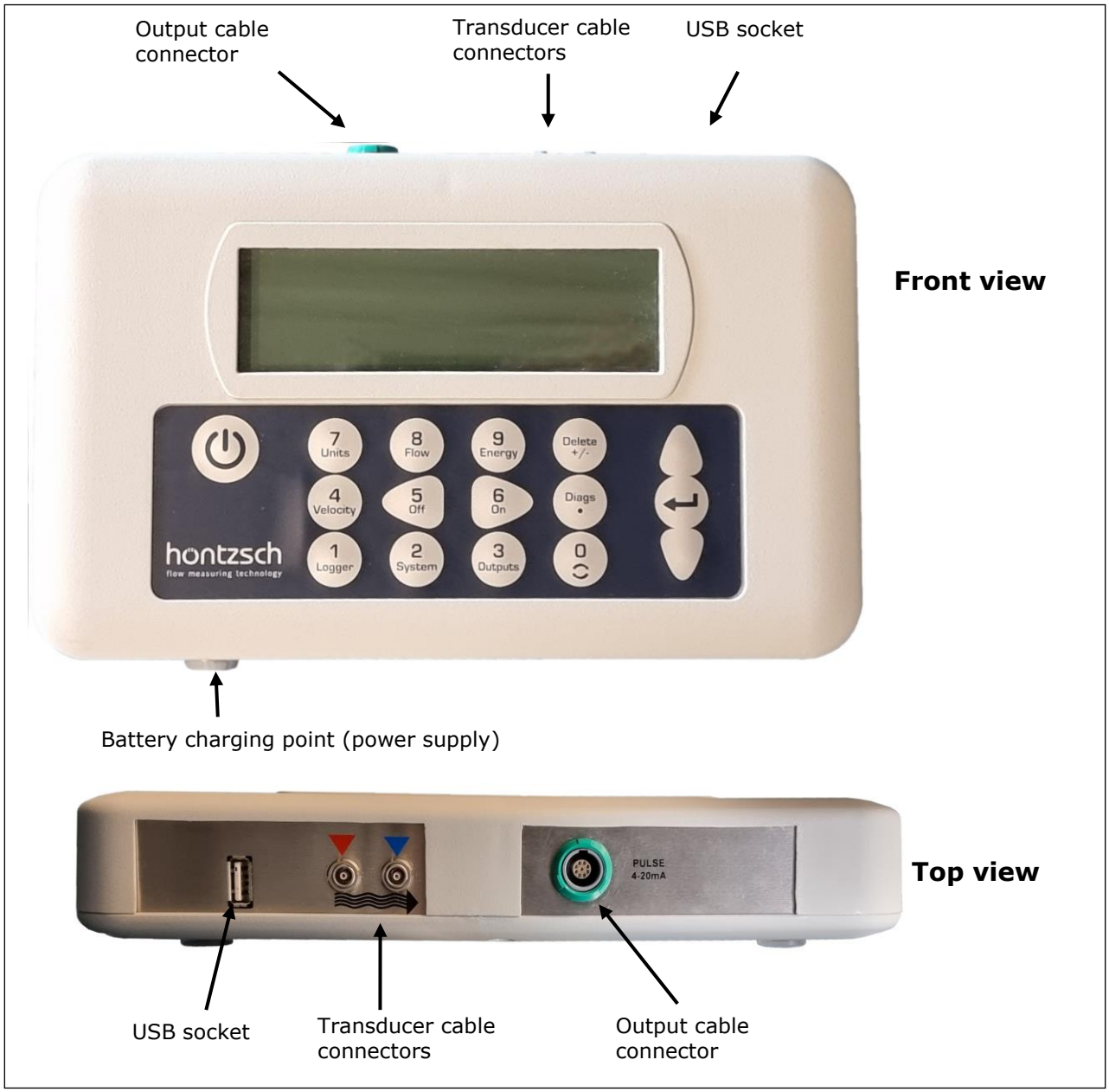


Figure 3.2 Front and top view

Transducer cable connectors
The transducers are connected to two colour-coded miniature coaxial sockets located on the top of the instrument. Using the red/blue connector cables provided, the upstream transducer should always be connected to the RED socket and the downstream transducer to the BLUE one for a positive flow reading. It is safe to connect or disconnect the cable while the instrument is switched on (see figure 3.2).

USB socket
USB memory sticks can be inserted here so that recorded logger data can be transferred (see figure 3.2).

Output cable connector
The current/'pulse' output cable should be connected to the 9-pin connector on the top of the flowmeter. The 'tails' on the free end of the cable must be terminated to suit the intended application (see under 4.3).

Battery charger connection (power supply)
The supplied battery charger is connected tot he instrument by means oft he grey 2-pin connector at the base of the unit as shown in figure 3.2. More info see under 4.4.
Note: The above connectors have different key-ways to prevent incorrect cable connection.

3.1.2 Keypad

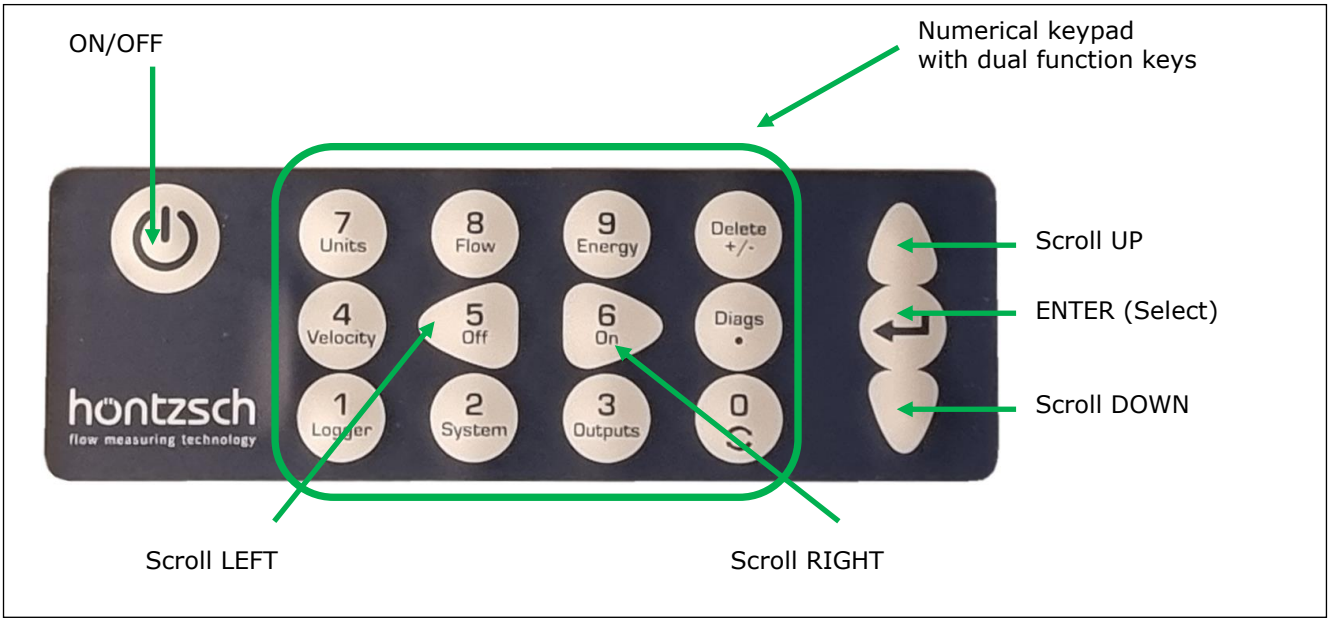


Figure 3.3 Keypad

The instrument is configured and controlled via a 16-key tactile membrane keypad as shown in figure 3.3.

ON/OFF Key
The ON/OFF key is shown on the top left of the keypad. When turned ON an initialisation screen is displayed on the LCD showing the instrument's serial number and software revision.
Once this appears, the instrument can be started by pressing the ENTER key once – the initialization screen is then re-placed by a MAIN MENU which provides access to the remaining functions.

Menus and the menu selection keys
The ExactSonic III menus are arranged hierarchically with the MAIN MENU being at the top level. Menu navigation is achieved by three keys on the right hand side of the keypad which are used to scroll UP and DOWN a menu list and SELECT a menu item. When scrolling through a menu an arrow-shaped cursor moves up and down the left hand side of the screen to indicate the active menu choice which can then be selected by pressing the ENTER (SELECT) key. Some menus have more options than can be shown on the screen at the same time, in which case the 'overflowed' choices can be brought into view by continuing to scroll DOWN past the bottom visible item. If you select Exit it usually results in taking you back one level in

the menu hierarchy, but in some cases it may go directly to the FLOW READING screen. Some screens require you to move the cursor left and right along the display as well as up and down. This is achieved using keys 5 (scroll LEFT) and 6 (scroll RIGHT).

Dual Function Numerical Keypad
The block of keys shown in the centre of the keypad in figure 3.3 are dual function keys. They can be used to enter straightforward numerical data, select the displayed flow units or provide quick access to frequently required control menus.

Key	Use
0	Switch between READ FLOW and READ VELOCITY screens (via a short press when reading flow or velocity), enter the SET ZERO FLOW screen (long press when reading flow), or freeze and un-freeze diagnostic values in the DIAGNOSTIC screen.
1	Display the LOGGER menu (see under 7).
2	Display the SYSTEM SETTING menu (see under 4.5.1).
3	Display the OUTPUT SETUP menu (see under 8)
4	Switch to READ VELOCITY from the READ FLOW display
5	No function – reserved for future use
6	No function – reserved for future use
7	Cycle through the available display units
8	Switch to READ FLOW from the READ VELOCITY display
9	No function – reserved for future use
Delete +/-	No shortcut function: within text entries, deletes character to left of flashing cursor. Deletes alarms when activated, or return to the MAIN MENU from the SUMMARY screen
Diags .	Display the DIAGNOSTICS screen (see under 12.6)

Main Menu

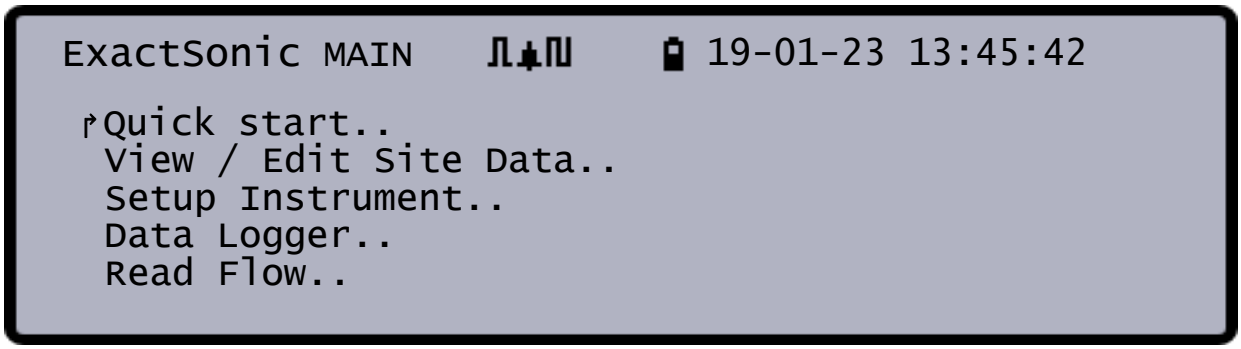


Figure 3.4 MAIN MENU

4 Installation

4.1 Transducer Positioning

In many applications an even flow velocity profile over a full 360° is unattainable due, for example, to the presence of air turbulence at the top of the flow and possibly sludge in the bottom of the pipe. Experience has shown that the most consistently accurate results are achieved when the transducer guide rails are mounted at 45° with respect to the top of the pipe.

The ExactSonic III equipment expects a uniform flow profile as a distorted flow will produce unpredictable measurement errors. Flow profile distortions can result from upstream disturbances such as bends, tees, valves, pumps and other similar obstructions. To ensure a uniform profile the transducers must be mounted far enough away from any cause of distortion such that it no longer has an effect.

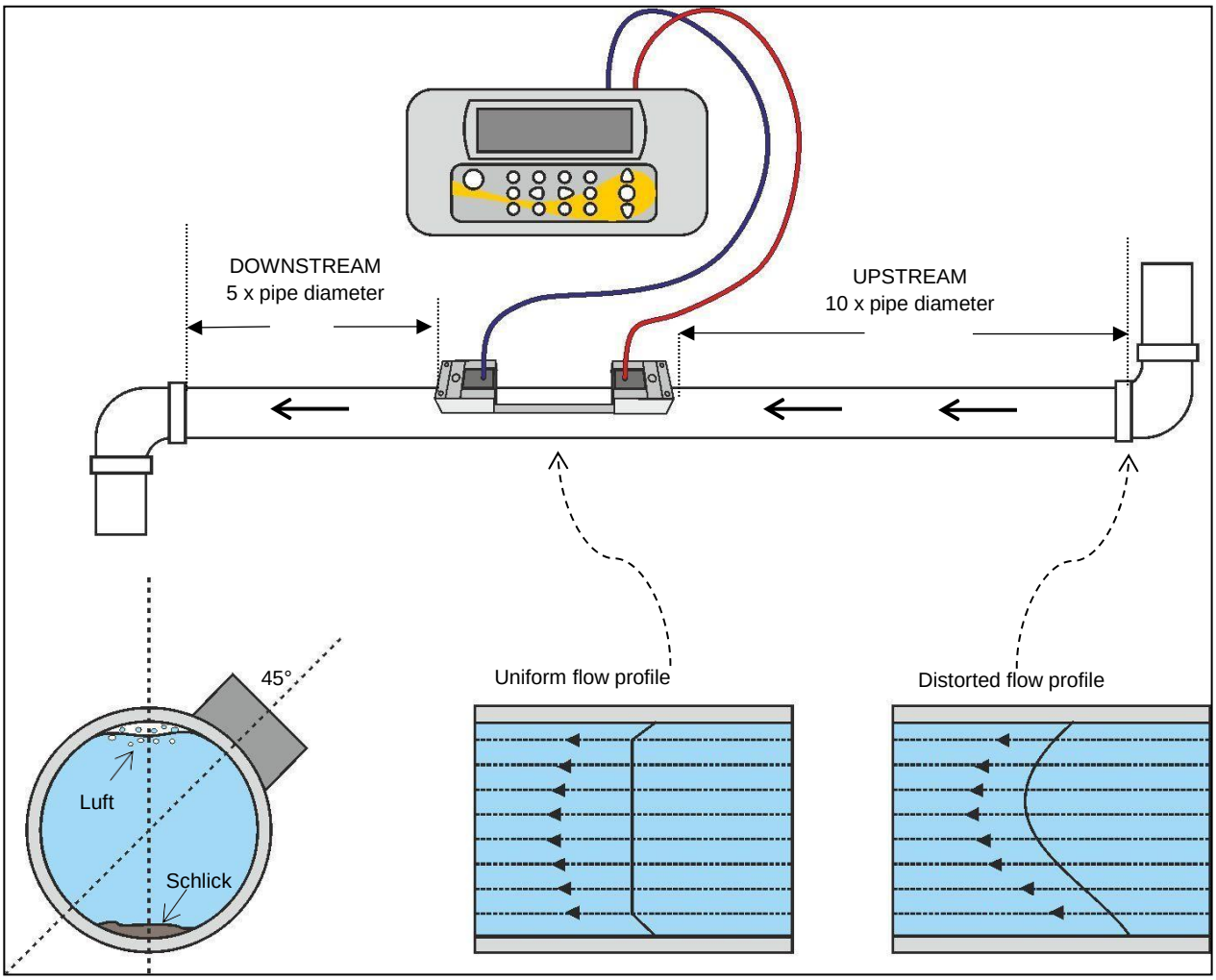


Figure 4.1: Location of unit

To obtain the most accurate results, the condition of both the liquid and the pipe must be suitable to allow ultrasound transmission along the predetermined path.

It is important that the liquid flows symmetrically within the measuring section and that the flow profile is not distorted by upstream or downstream obstacles. This is ensured by having a straight length upstream oft he transducers of at least 10x the pipe diameter, and 5x the pipe diameter on the downstream side (see under 4.1).

The measurement can also be carried out in shorter, straight pipe sections. However, the measurement uncertainty increases undefined if the transducer is placed too close to obstacles.

REMARK: If there is no sufficient inlet and outlet section, the measurement uncertainty will increase.

4.2 Attaching the Transducers

Type 'A' & 'B' transducers are fitted to adjustable guide rails. These in turn are secured to the pipe using wrap-around chains and mechanically connected together by a steel separation bar. The separation bar also acts as a ruler to allow the distance between the transducers to be accurately set to the value determined by the ExactSonic III instrument.

When fitting the guide rails it is easiest to assemble them onto the separation bar and adjust to the required separation distance before attaching them to the pipe.

4.2.1 Preparation

1. Before you attach the transducers you should first ensure that the proposed location satisfies the distance requirements shown in Figure 4.1 otherwise the resulting accuracy of the flow readings may be affected.
2. Prepare the pipe by degreasing it and removing any loose material or flaking paint in order to obtain the best possible surface. A smooth contact between pipe surface and the face of the transducers is an important factor in achieving a good ultrasound signal strength and therefore maximum accuracy.

4.2.2 Assembling the Guide Rails

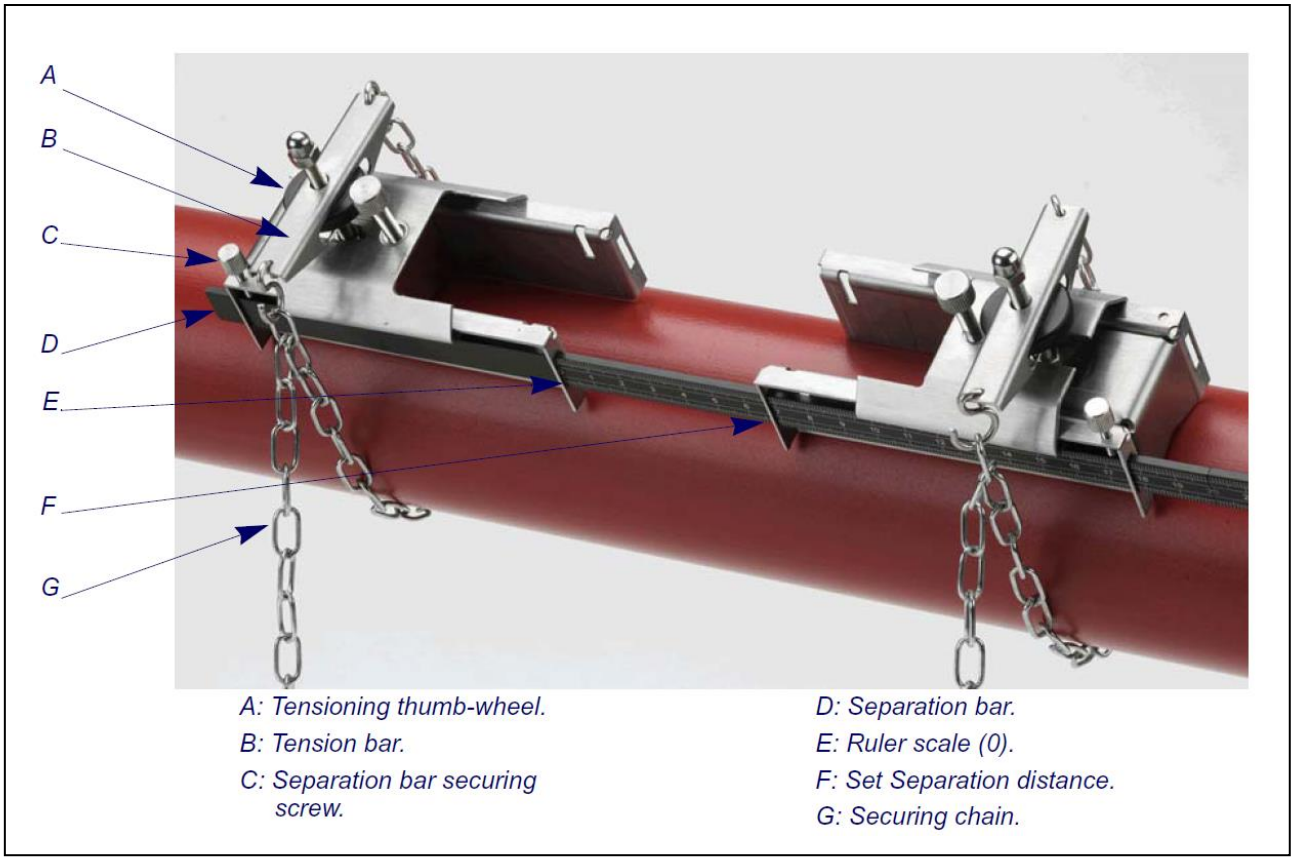


Figure 4.2 Guide rail assembly

1. Slide the separation bar (D) into the front of the left-hand guide rail, align the front edge of the guide rail with ‚0' on the ruler scale (E) and secure it in place by tightening the thumbscrew (C).
2. Slide the other end of the separation bar into the front of the right-hand guide rail, align the front edge of the guide rail to the required separation distance (obtained from the ExactSonic III instrument) on the ruler, then secure it in place by tightening the thumbscrew.
3. On each guide rail, attach one end of a securing chain to a hook on the tensioning bar (B), wrap the chain around the pipe (G) and then attach it to the hook on the other end of the tensioning bar whilst keeping the chain as tight as possible.
4. Rotate the complete guide rail assembly so that it is approximately 45° with respect to the top of the pipe. Then tighten the chain by turning the tensioning thumb-wheel (A) on each guide block until the assembly is securely attached to the pipe.

Note: If you are unable to get sufficient tension on the chain to hold the assembly in place, fully slacken the tensioning thumb-wheel and shorten the effective length of the chain wrapped around the pipe by connecting the tensioning bar to the next link in the chain, then re-tension.

4.2.3 Fitting the transducers

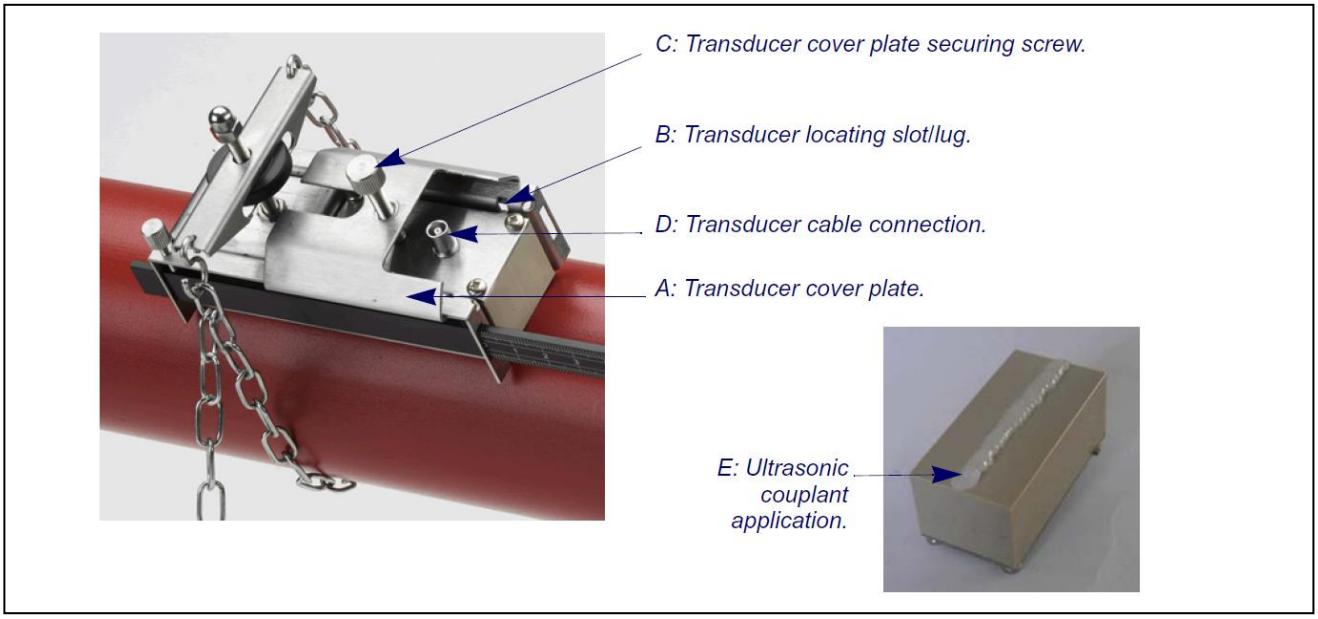


Figure 4.3 Fitting the transducers

1. Slide the transducer cover plate (A) fully towards the outside of the guide assembly to allow sufficient access to fit the transducer.
2. Clean the face of the transducer, removing all traces of dirt and grease.
3. Apply a 3mm bead of ultrasonic couplant along the centre length of the transducer (E) (see Figure 4.3).
4. Fit the transducer into the guide block – ensuring the lugs on the sides of the transducer are correctly located into the slots on the sides of the guide block (B).
5. Slide the transducer cover plate (A) over the top of the transducer and tighten the thumbscrew (C) finger tight to secure the transducer in place. When securing the cover plate take care to leave sufficient room around the transducer connector (D) to connect the cable.
6. Repeat the above steps for the second transducer.
7. Connect the transducers to the ExactSonic III instrument using the coaxial cables provided. The RED cable must be connected to the upstream transducer and the BLUE cable to the downstream transducer.

4.3 Connecting Outputs

The output cable provides a current source that can drive a maximum load of < 600Ω and 3 digital output pairs for pulse, frequency or alarm outputs.
The isolated pulse output is provided by a SPNO/SPNC MOSFET relay which has a maximum load current of 500mA and maximum load voltage of 24V AC/DC.


This output is suitable for SELV circuits only.

The pulse output is a Volt or potential free contact and when selected as an alarm, is configurable as NO/NC.

The current output is available on the white (high polarity) and black (low polarity) wire pairs (pins 1+2 on the connector). The alarm current due to an out-of-bounds condition must be set outside the working range.

Using the instrument's menu system (see under 8), you can:

- Select the current output function Off/On
- Select the current output range (set the current range, where 4-20mA, 0-20mA, 0-16mA are common ranges), but the device is capable of generating currents of up to 24mA
- Calibrate the current output signal to a required flow range
- Select the alarm cause (and alarm current for the current output)
- Set a trigger value for the alarm when it is associated with ‚Under Value' or ‚Exceeds Value'
- Set current trim values to accommodate any inaccuracies in the user's system

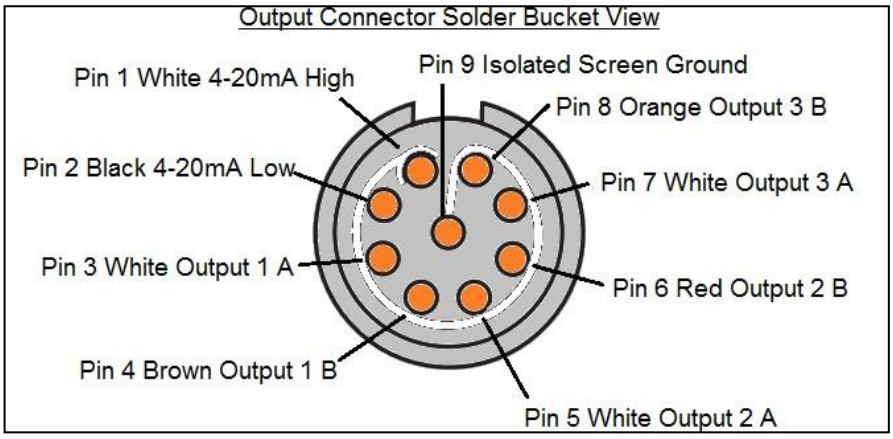


Fig. 4.4 Output Wiring

The three digital output pairs for pulse or alarm outputs are as follows

Output	Pin	Wire pair
Output 1	Pin 3 + 4	Brown/White
Output 2	Pin 5 + 6	Red/White
Output 3	Pin 7 + 8	Orange/White

4.4 Connecting the Power Supply

Operating power is provided by an internal battery that can be charged from the utility supply using the supplied external charger. When you first receive the unit, you should charge the battery for a minimum of 15 minutes before use. It is possible to use the unit while the battery is charging but if the charging fails the unit may automatically switch off. A fully charged battery will power the instrument for up to 13 hours depending on the output utilisation and backlight usage.

4.4.1 Charging the Battery

1. Connect the external battery charger to the charger socket at the bottom of the instrument then switch on the utility supply.
2. When switched on, the instrument indicates charging with an animated battery symbol to the left of the date. It will also indicate that the device is being powered externally by a plug symbol in the top status line.
3. Leave the instrument on charge for at least 15 minutes before using it for the first time.

4.4.2 Optimising Battery Life

The backlight can be configured in the Setup Instrument menu (see under 4.5.4) to be either permanently OFF, timed to switch off after 5-120 s of keypad inactivity, or permanently ON. If the backlight is active continuously it will reduce the available battery operating time to around 10 hours (depending on output conditions). Similarly, if the current loop output is used constantly at high currents, the battery life may be reduced even further. It is therefore beneficial to turn off the backlight and current loop output facilities when they are not required.

A warning message is triggered if the internal battery voltage falls below a set threshold, at which point there are tens of minutes of battery operation remaining (depending on usage). If the battery is left to discharge further, the unit is designed to shut down before the battery is completely exhausted. In this situation, all operations, including logging, will be stopped.

The battery can be charged either while the instrument is in use or when switched off.

The instrument’s internal data is stored in non-volatile memory and will not be lost even if the battery discharges completely.

 The battery is not a user-changeable item. The instrument must be returned to Höntzsch if the battery needs replacing.

 Only use the supplied charger, or special adaptor lead. Failure to comply with this will invalidate your warranty.

4.5 Initial use and adjustment of the instrument

Before using your ExactSonic III for the first time, you should first charge the battery as described above, then select the screen language and set the internal clock.

Switch on the instrument by pressing and holding down the ON/OFF button for about 2 to 3 seconds. Wait for the banner screen to be fully displayed. The battery symbol in the top right of the screen roughly indicates the level of the battery charge.

Press the ENTER key to display the MAIN menu.

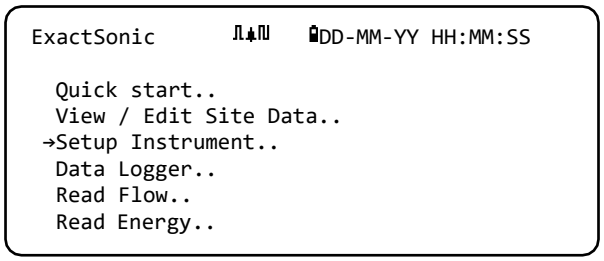
4.5.1 Checking System Health

This operation should be checked after powering up the unit for the first time, but it is useful to check periodically that all systems are operating properly, especially if errors were reported when entering the MAIN menu.

1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key.
2. It should be noted that a status message will appear to the right of the option name. If the subsystem implementing the option is working correctly, the status will read "OK". If any subsystem has a fault, two dashes will be visible.
3. If a subsystem is NOT reading OK at start-up, try restarting the ExactSonic III by turning it off then on again. If the error persists, contact your distributor or return the item for repair.

4.5.2 Selecting a Language

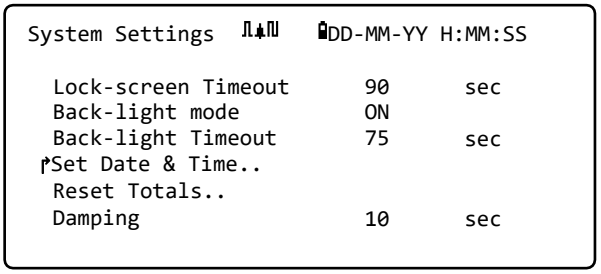
When you turn on the Exactsonic II for the first time, you may be asked to select a user language. To change the language:

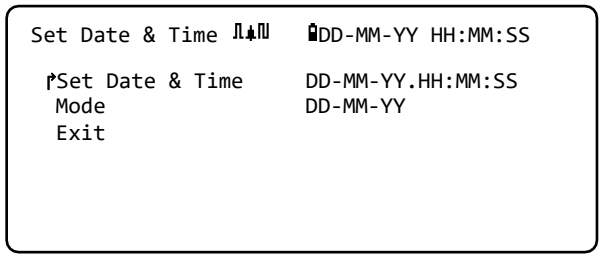


1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press ENTER key. With ‚System' selected in the OPTIONS menu, press the ENTER key.
2. Use the UP/DOWN arrow keys to select ‚Language'. Press the ENTER key.
3. Use the UP/DOWN arrow keys to scroll through the available options.
4. With the required language highlighted, press the ENTER key.
5. Use the UP/DOWN arrow keys to select ‚Save Setup & Exit'. Press the ENTER key.

The selected language is now active for all screens.

4.5.3 Setting Date & Time



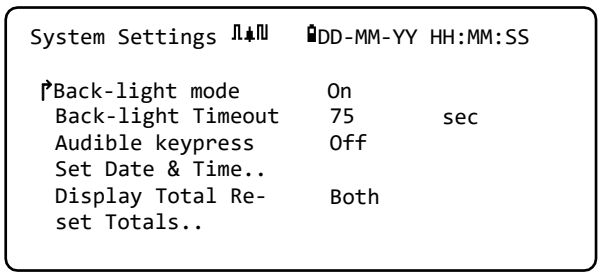


1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. With ‚System' selected in the OPTIONS menu, press the ENTER key.
2. Use the UP/DOWN arrow keys to select ‚Set Date & Time'. Press the ENTER key.
   Das SET DATE & TIME menu ist displayed.
3. The instrument is configured to display dates in DD-MM-YY format. Proceed to step 6 unless you prefer to use MM-DD-YY format.
4. Use the UP/DOWN arrow keys to select ‚Mode'. Press the ENTER key.
5. Use the UP/DOWN arrow keys to choose the required format: DD-MM-YY or MM-DD-YY. Press the ENTER key. The date and time format will immediately be updated.
6. Use the UP/DOWN arrow keys to select ‚Set Date & Time'. Press ENTER. A flashing cursor appears under the first date number. Enter the date and time sequence in DD-MM-YY-HH-MM-SS format then press the ENTER key.
7. Scroll down and select ‚Exit' then Press the ENTER key to return tot eh MAIN menu.

NOTE: If you make a mistake when entering the data press the DELETE +/- key to move the cursor back to the number you wish to change, then continue. If you enter an invalid number an 'ERR: invalid date or time' or 'Badly formatted date or time' error message is displayed on the second line of the screen. If this occurs repeat the Set Date & Time procedure.

4.5.4 Enabling/Disabling the Backlight

When the backlight is on, the display lights up for a few seconds each time a button is pressed. If the backlight is not required it is recommended that you disable it to prolong the battery discharge time.



1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. With ‚System' selected in the OPTIONS menu, press the ENTER key.
2. Use the UP/DOWN arrow keys to select ‚Back-light mode'. Press the ENTER key.
3. Use the UP/DOWN arrow keys to scroll through the available options: On/Timed/Off.
4. With the chosen mode selected, press the ENTER key.
5. If you selected ‚Timed', use the UP/DOWN arrow keys to select to ‚Back-light Timeout'. Press the ENTER key.
6. Use the keypad to enter the required timeout interval (5-120 s) ein. Press the ENTER key.
7. Select ‚Save Setup & Exit' then press the ENTER key to return to the OPTIONS menu.
8. Select ‚Exit' then press the ENTER key to return to the MAIN menu.

5 Using the Quick Start Menu

If you want to perform a 'one-off' flow reading at a particular pipe location the Quick Start menu pro-vides the quickest way to set up the ExactSonic II system and access the FLOW READING screen.
If the point at which you intend to take the measurement is likely to require regular monitoring it is best to set it up as a „Site" within the ExactSonic III, which then stores the site parameters (see under 6).

Before you can use the ExactSonic III you need to obtain the following details (this information will be re-quired when setting up the Quick Start menu):

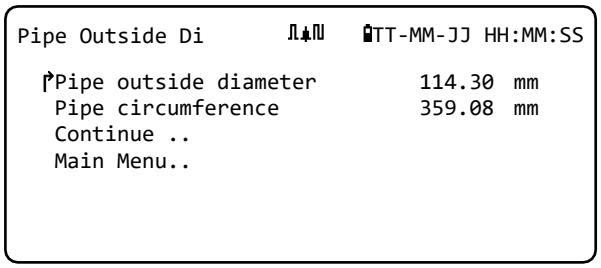
- pipe outside diameter
- pipe wall thickness and material
- pipe lining thickness and material
- type of fluid
- fluid temperature

5.1 Entering the Site Data

1. Select ‚Quick Start' from the MAIN Menu and press ENTER. You will then be presented with a series of screens in which to enter the data mentioned above.

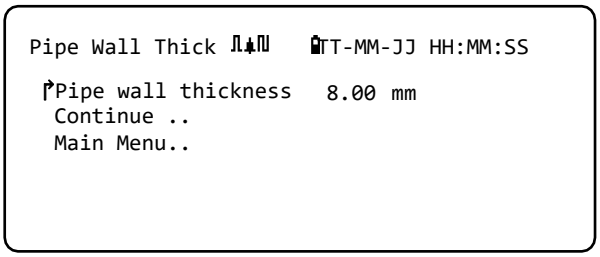
2. Enter the pipe outside diameter dimension (15 - 2000 mm or its circumference (47.1 – 6283.2 mm). When you enter one value the other is cal-culated from it.

   Select CONTINUE and press the ENTER key.



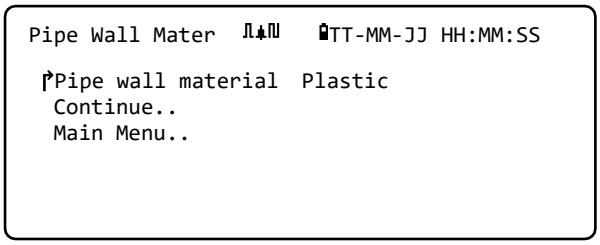
3. Enter the pipe wall thickness dimension (0.5 - 50 mm).

   Select CONTINUE and press the ENTER key.



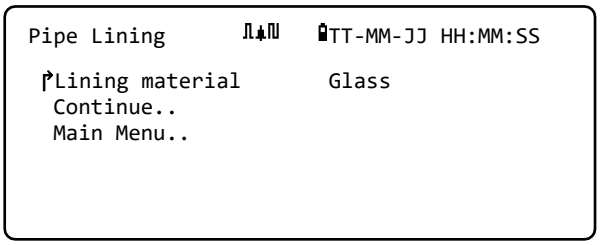
4. Choose the pipe wall material: ‚Plastic/Cast Iron/Ductile Iron/Copper/Brass/ Concrete/Glass/Other (m/s) Mild Steel/S'less Steel 316/S'less Steel 303'.
   If the material is not listed, select ‚Other (m/s)' and enter the propagation rate of the pipe wall material in m/s.

   Select CONTINUE and press the ENTER key.



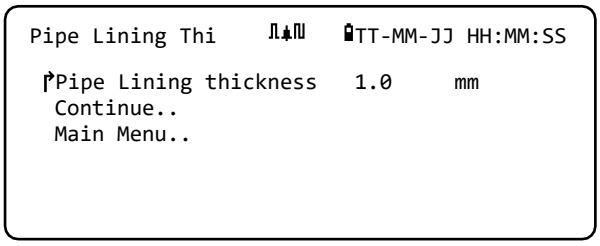
5. Choose the pipe lining material from the following options: ‚None/Rubber/Glass/Epoxy/Concrete' If the material is not listed, select ‚Other (m/s)' and enter the propagation rate of the pipe lining material in m/s.

   Select CONTINUE and press the ENTER key.



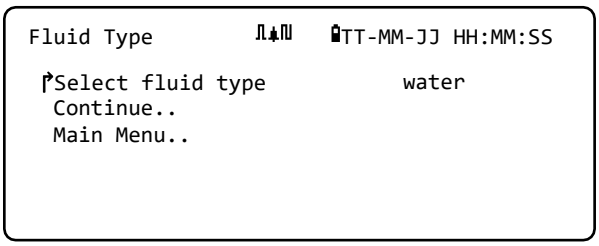
6. If no lining material was entered, go to step 7. Otherwise, enter the lining thickness (0 - 40 mm).

   Select CONTINUE and press the ENTER key.



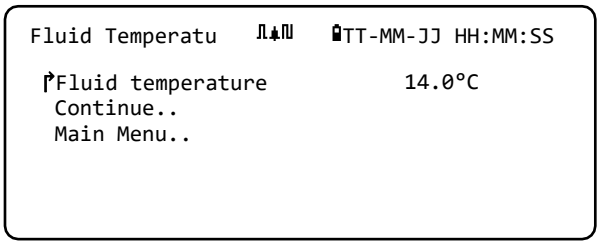
7. Select the fluid type from the following options: ‚Water/ Glycol/water 50% / Glycol/water 30 % / Lubricating oil/Diesel/Freon/Others (m/s)'. If the fluid is not listed, select ‚Others (m/s)' and enter the propagation rate of the fluid in m/s.

   Select CONTINUE and press the ENTER key.

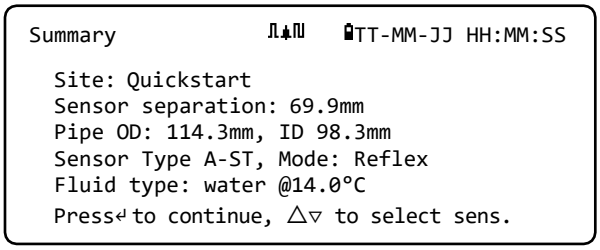


8. Enter the fluid temperature (-30 – 135.0 °C) at the point the sensor is installed.

   Select CONTINUE and press the ENTER key.



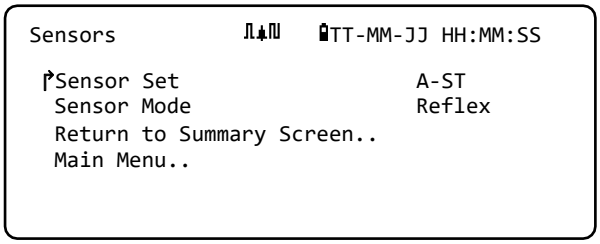
9. The SUMMARY screen is displayed. This displays a summary of the entered parameters and informs you of the type of sensor to be used, the mode of operation and the distance to set up between the sensors.wird geöffnet.
   In this example, A-ST (A standard) sensors are recommended, operating in the ‚Reflex' mode, spaced at 69.9 mm apart.



NOTE: Do not press the ENTER key until the correct transducers are fitted and connected to the instrument. If the data contains a mistake, press the DELETE key to return tot he MAIN Menu and restore the previous settings.

10. If you prefer to use a different configuration, press the UP/DOWN arrow keys to select a different sensor set and mode.

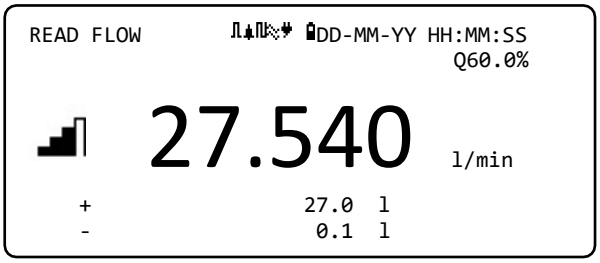
NOTE: The SENSORS screen will be displayed automatically if the entered pipe OD and/or temperature are not valid for the currently selected sensors.



5.2 Attaching and Connecting the Transducers

1. Fit the designated sensors to the pipe using the appropriate guide rails as described under chapter 4.2. Take great care to set the separation distance as accurately as possible.
2. Connect the red and blue coaxial cables between the sensors and the instrument, ensuring that the red connector on the instrument is connected to the 'upstream' sensor.

5.3 Taking a Flow Reading



1. Once the transducers have been fitted and connected press the ENTER key.
2. This will take you to the FLOW READAING screen via a signal-checking screen.
3. Check that the indicated signal strength on the left of the screen is at least 2 bars (ideally 3 or 4). If less than 2 bars are shown it indicates there could be a problem with the transducer spacing, alignment or connections; or it could be due to an application problem.
4. The Q value indicates the signal quality and should have a value of 60% or greater.

5.4 Flow Monitoring

From the READ FLOW, or VELOCITY screen you can:

- Switch to the READ VELOCITY display by pressing key 4 ‚Velocity‘.
- Switch back to the READ FLOW display by pressing key 8 ‚Flow‘.
- Switch between valid screens every 10 seconds by briefly pressing key 0. Pressing 0, 4, 8 or 9 stops this action.
- Enter the ZERO-FLOW screen by a long press of the 0 key.
- Change the display units by pressing key 7 ‚Units‘.

5.5 Total Flows

The flow value indicated on the READ FLOW screen is the instantaneous flow rate, which in some applications may vary over a period of time. Average flow rates are therefore often required in order to get a better understanding of an application’s true performance. This is simply achieved by noting the total flow over a specific period (for example 30-60 minutes) and then calculating the average flow rate over that period of time. By default, the READ FLOW screen shows both the forward and reverse flow totals.

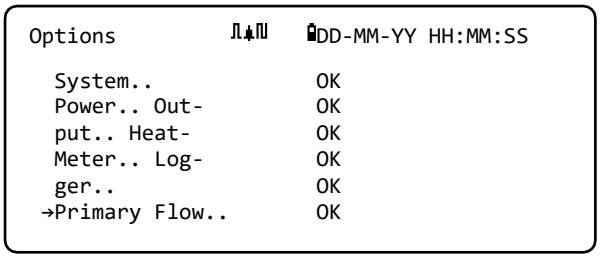
To change the totals display:

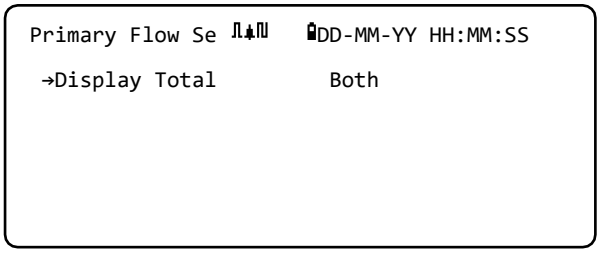
1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key.

2. Use the UP/DOWN arrow keys to select ‚Primary Flow' and press the ENTER key. The PRIMARY FLOW screen is displayed.

3. Select ‚Display Total ' and press the ENTER key. Use the UP/DOWN arrow keys to scroll through the available options: Both / None / Fwd Total / Rev Total.
4. With the required display option selected, press the ENTER key.

5. Select ‚Exit' and press the ENTER key to return to the Menu OPTIONS.





6. Select ‚Exit' and press the ENTER key to return tot he MAIN Menu.

5.5.1 Calculating the Average Flow

To calculate the average flow, wait for the allotted monitoring period to expire then divide the indicated total volume by the time taken. This will give you the average flow in m/s, gals/hour or whatever units you select.
Note that in a bi-directional flow situation you must calculate the difference between the indicated positive and negative flow totals before carrying out the average flow rate calculation.

5.5.2 Resetting Totals

1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. With ‚System' selected in the OPTIONS menu, press the ENTER key.

   Alternatively, from a READ FLOW / VELOCITY screen, press the SYSTEM key (2). The SYSTEM SETTINGS menu is displayed.

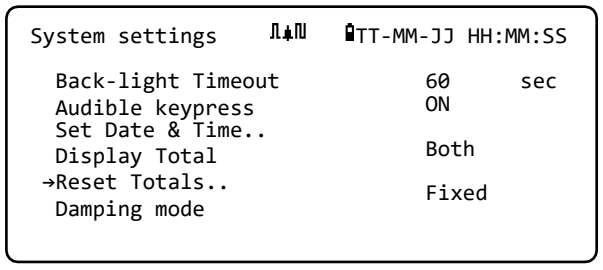
2. Select ‚Reset Totals' and press the ENTER key.

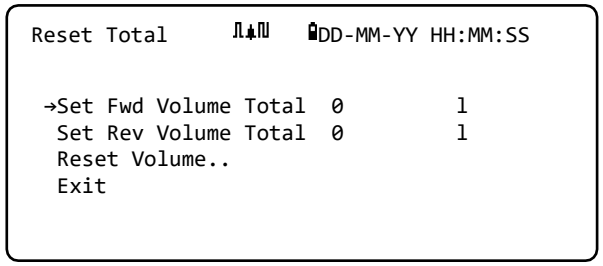
3. Enter the code 71360. The RESET TOTAL screen is displayed.

4. Set the reset values for ‚Fwd Volume Total' and ‚Rev Volume Totoa' as required. The totals can be set to any value, but most commonly the reset value will be zero.

5. Select ‚Reset Volume'.

6. Select ‚Yes' to confirm the action (or ‚No' to cancel).





7. If ‚Yes' was selected, the total will be reset and the word „Done.." appears against the quantity that was reset.

8. Reset the remaining quantity of required.

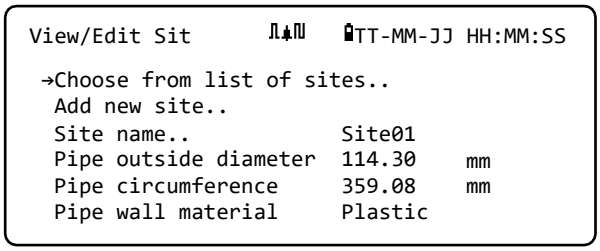
9. Select ‚Exit' and press the ENTER key to return tot he MAIN Menu.

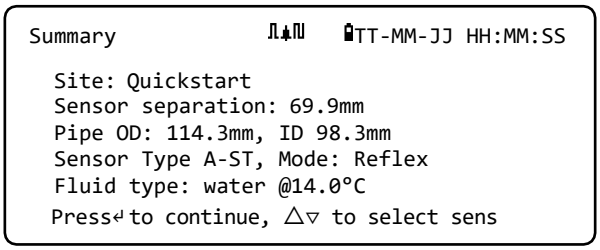
6 Managing Named Sites

If you want to monitor a particular site location frequently you can set up a named 'Site' to store the installation details, such as pipe dimensions and material, required to set-up the ExactSonic III system. These can then be recalled later when revisiting that particular location.
The instrument can store up to 12 sites, the first site is reserved for QUICK START and cannot be re-named; subsequent sites are initially named ‚EmptySite1' through to ‚EmptySite11'.

6.1 Selecting an Existing Site

1. Select 'View / Edit Site Data' from the MAIN menu.
2. Select ‚Choose from list of sites'.
3. Use the UP/DOWN arrow keys to select the required site and press the ENTER key. The stored parameters are retrieved from memory and displayed on-screen.
4. Scroll down through the menu list and enter or change any data that might have changed since the last time the site was accessed. Changes are saved automatically only when entering the READ FLOW screen.
5. Select ‚Read flow using selected sensor' or ‚Read flow using recommended sensor'.
6. The SUMMARY screen now displays some of the parameters you may have entered and informs you of the type of sensor to be used, the mode of operation and the distance to set up between the sensors.
   In this example, it recommends type A-ST (A standard) sensors operating in the „Reflex" mode spaced at 67.4 mm apart.





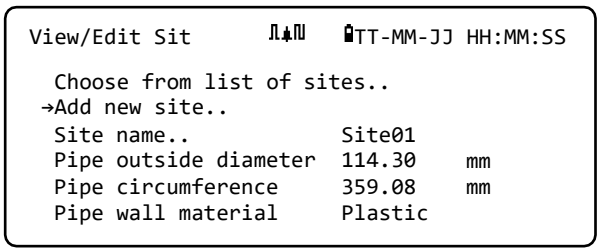
NOTE: The SENSORS screen can be entered by pressing either of the scroll keys. This allows the type and mode of the sensors being used to be selected. Ensure that the sensors are connected properly (see 3.1.1).

7. Press the ENTER key to display the READ FLOW screen.

NOTE: Do not press the ENTER key until the transducers are fitted and connected to the instrumenrt.

6.2 Adding a New Site

1. Select 'View / Edit Site Data' from the MAIN menu.
2. Select ‚Add new site'.
3. Edit the site name.
4. Press the ENTER key.



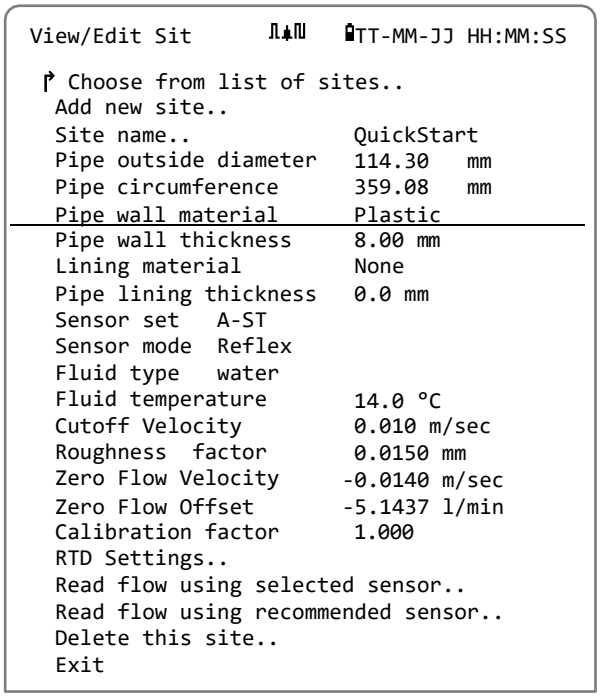
6.3 Changing a Site Name

To change a site name select 'View / Edit Site Data' and select 'Choose from list of sites' ‚Select the required site from the displayed list of current sites. Select the site name and press the ENTER key. You will be prompted to confirm your choice to modify the name or exit the process.

6.4 Editing Site Data

1. Having selected the appropriate site (see under 6.1), scroll through the menu list and enter/change the pipe, sensor and fluid parameters.
   - Pipe outside diameter
   - Pipe circumference
   - Pipe wall material
   - Pipe wall thickness
   - Lining material
   - Pipe lining thickness
   - Sensor set
   - Sensor mode
   - Fluid type
   - Fluid temperature

NOTE: If you select a different sensor set (e.g. A-St) when entering new site data you could receive an „INVALID" error message if the previous sensor set was operating at a temperature above 135 °C. If this occurs, ignore the warning as it will disappear when you enter a temperature in the correct range for new sensors.



2. When all the data is correct, choose one of the following options:
   a. Select ‚Read flow with selected sensors' to continue fitting the transducers you have specified in the site description and then open the FLOW READING screen.
   b. Select ‚Read flow with recommended sensors' to view the optimum sensors and configuration for the parameters you have specified specified in the site description.
   c. Select ‚Delete this site' to delete the site from the site list. You are prompted to confirm the action. Select ‚Yes' to continue with the deletion of ‚No' to cancel the action and keep the site. Press the ENTER key to continue.
   d. Select ‚Exit' to return tot he MAIN menu.

6.5 Calibration of the Instrument

The ExactSonic III is fully calibrated before it leaves the factory however, the following adjustments are provided to allow you to further 'fine tune' your instrument to suit local conditions and the user's application where necessary. Apart from the zero-flow offset adjustment, these are normally carried out only where the instrument is to be used in a permanent or semi-permanent location.

6.5.1 Adjusting the Zero Cutoff

This adjustment allows you to set a minimum flow rate (m/s) below which the instrument will indicate '0'. The default setting is 0.2 m/s but you may adjust this value if required.

1. Select ‚View / Edit Site Data' from the MAIN menu.
2. Use the UP/DOWN arrow keys to select ‚Cutoff Velocity'.Press the ENTER key.
3. Edit the value as required and then press theENTER key.
4. Scroll down to select ‚Exit' and press the ENTER key to return to the VIEW / EDIT SITE DATA menu.

6.5.2 Adjusting the Zero-Flow Offset (ZFO)

The ExactSonic III instrument operates by comparing the time taken to send an ultrasonic signal between two transducers in either direction. A zero-flow offset adjustment is provided to compensate for any inherent differences between the two sensors, noise pick-up, internal pipe conditions etc. It can be used to 'zero' the flow indication under no-flow conditions.

1. Stop the liquid flow.
2. With the instrument in FLOW READING mode, press and hold the 0 (zero) key for at least two seconds.
3. In the ZERO FLOW screen, set the damping time and the measurement time. The recommended measurement time should be in the region of 60 to 120 seconds, but much longer periods are possible if significant drift in measurements have been noted over a longer period.
4. Select ‚Continue..'.
5. On the SETTING ZFO screen, the ‚running average' is updated every second. When the measurement has completed, a loud ½ second beep will be heard and the countdown will stop.
6. You may now select ‚Set Zero Flow..' of desired. It should be noted that you may select this setting at any time before the measurement is complete if you are satisfied that the average reading is sufficiently accurate.

6.5.3 Adjusting the Calibration Vactor

Important and to consider: USE THIS FACILITY WITH CARE AND ONLY WHERE NECESSARY!

The ExactSonic III instrument is fully calibrated before leaving the factory and under normal circumstances does not require further calibration when used on site.
This facility can be used to correct the flow indication where unavoidable errors occur due to the lack of a straight pipe or where the sensors are forced to be fitted close to the pipe-end, valve, junction etc..
Any adjustment must be made using a reference flowmeter fitted in the system.

With the system running:
1. Stop the ExactSonic III totalizer and zero it (see under 5.5.2)
2. Start the ExactSonic III reading flow. Use the ExactSonic III totalizer to measure the total flow over a 30- to 60 minute period, and note the total flow indicated by the reference flow meter over the same period.
3. Calculate the % error between the ExactSonic III and reference meters. If the error is greater than ± 1% calibrate the ExactSonic III as detailed below.
4. Press the ENTER key and select ‚Yes' to confirm that you want to exit the READ FLOW screen. The MAIN menu is displayed.
5. Select ‚View / Edit Site Data'.

6. Use the UP/DOWN arrow keys to select ‚Calibration factor'. Press the ENTER key.
7. Change the calibration factor according to the error calculated in step 3. For example, if the ExactSonic III was reading 1% high, decrease the Calibration factor value by approximate this amount. Since that start value is 1.00, the calibration value should be 0.99. Conversely, if the reading is 1% low then increase the calibration factor to 1.01.
8. Press the ENTER key to apply the change and return to the VIEW/EDIT SITE DATA menu.
9. Scroll down to select ‚Read flow using selected sensor' and press the ENTER key.
10. Check the flow meaurement against the reference flow meter again.

6.5.4 Adjusting the Roughness Factor

The roughness factor compensates for the condition of the internal pipe wall, as a rough surface will cause turbulence and effect the flow profile of the liquid. In most situations it is not possible to inspect the pipe internally and the true condition is not known. In these circumstances experience has shown that the following values can be used:

Pipe material	Roughness factor
Non-ferrous metal Glass Plastics Light metal	0.01 mm
Drawn steel pipes: - Fine planed, polished surface - Plane surface - Rough planed surface	0.01 mm
Welded steel pipes, new: - Long usage, cleaned - Lightly and evenly rusted - Heavily encrusted	0.1 mm
Cast iron pipes: - Bitumen lining - New, without lining - Rusted / encrusted	1.0 mm

With the system running in FLOW READING mode:

1. Press the ENTER key and select ‚Yes' to confirm that you want to exit the READ FLOW screen. The MAIN menu is displayed.
2. Select ‚View / Edit Site Data'.
3. Use the UP/DOWN arrow keys to select ‚Roughness factor'. Press the ENTER key.
4. Change the roughness factor tot he pipe material and condition as described above.
5. Press the ENTER key to apply the change and return to the VIEW / EDIT SITE DATA menu.
6. Scroll down to select ‚Read flow using selected sensor' and press the ENTER key to return tot he READ FLOW screen.

6.5.5 Adjusting the Damping Factor

By averaging-out the flow rate over several seconds, the damping factor can be used to smooth out rapid changes in flow rate to prevent wild fluctuations in the displayed flow value.

1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. With ‚System' or ‚Primary flow' selected in the OPTIONS menu, press the ENTER key.
2. Use the UP/DOWN arrow keys to select ‚Damping Time'. Press the ENTER key.
3. Enter the value of the Damping Time (0 - 50 s) as required to remove any unwanted display fluctuations. Increasing the value applies a greater smoothing effect.
4. Press the ENTER key to apply the selection. Not all values of damping in the range are valid. The instrument will set the damping time to the nearest valid time, which may not be exactly as entered. Note that zero seconds is a totally undamped response.
5. Select the desired Damping Mode. Fixed mode strictly follows the damping period as initially described in this paragraph. Dynamic mode switches off damping if the magnitude of change in flow velocity exceeds a certain predefined value. Once the change in velocity drops below this threshold, damping time is reset to the value selected.
6. Return to the SYSTEM menu.
7. Select ‚Exit' and press the ENTER key to return tot he MAIN menu.

NOTE: If the damping factor is set too high the value displayed may appear stable but it may exhibit large step changes when the value is updated.

7 Logging Functions

This procedure shows you how to set up a basic logging session under manual start/stop control. Logged data is saved to the instrument's memory and can be copied to a USB flash drive as a CSV (Comma Separated Values) file at a later time. Date, Time, Flow Rate, Forward (+) and Reverse (-) totals, Velocity, Signal Q(quality), SNR and general signal status are logged automatically. Logging writes to internal memory, which may then be copied to a USB flash drive at a later date.

7.1 Manual Logging

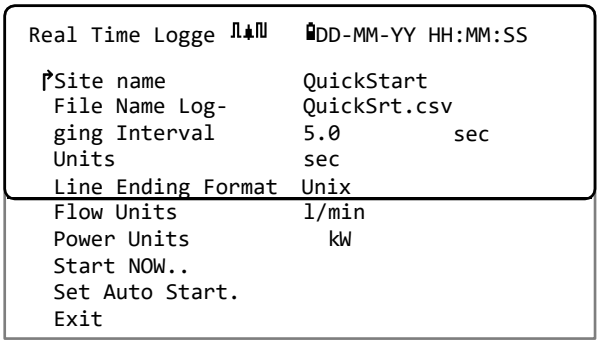
This procedure assumes that the ExactSonic III unit has been correctly installed and is operating in the FLOW READING mode.

1. Check that the indicated flow units are the same as those you want to appear on the logger output (e.g. l/min).

2. Press the ‚Logger function key (1)' to access the REAL TIME LOGGER screen.

3. Check that the site name is correct and make a note of the filename.

4. Select ‚Logging interval' and entert he required period (e. g. 5 minutes). Note that the minimum logging period is 5 seconds and the maximum is 28 days (4 weeks).



5. To start logging immediately, select ‚Start NOW'.

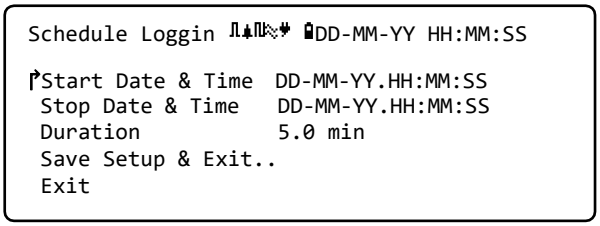
   NOTE: When logging is in proogress, this menu item becomes ‚STOP NOW'. Use this command to stop logging activity manually.

6. If a log already exists for the selected site, the current run will be appended to the existing data. Each time a new run is started, a new header will be observed in the CSV file.

7.2 Scheduling Logging

To set a schedule for data logging.

1. Select ‚Set Auto Start' on the READ TIME LOGGER screen..



2. Select ‚Set Date & Time'. A flashing cursor will appear under the first date number. Enter the date and time sequence in *dd-mm-yy:hh-mm-ss* or *mm-dd-yy:hh-mm-ss* order depending on the current time and date format. Then press the ENTER key.

3. Select ‚Stop Date & Time' in the same way.

   NOTE: This must be later than the start time and provide at least a two minute buffer when exiting the SCHEDULE LOG SRECCN.

4. ‚Duration' shows the logging period calculated from the Start and Stop times.

5. Select ‚Save Setup & Exit' and press the ENTER key to return to the REAL TIME LOGGER screen.

7.3 Stopping Logging

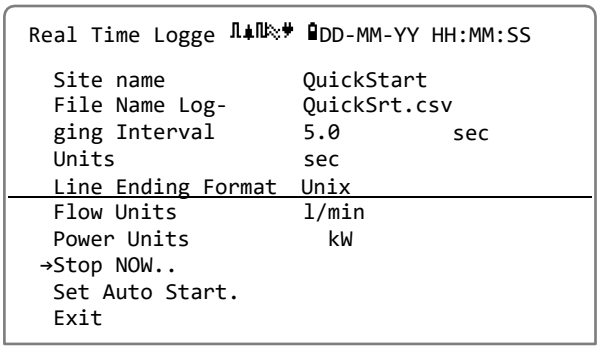
1. Press the ‚Logger function key (1)' to access the REAL TIME LOGGER screen.

2. Select ‚STOPP NOW' to cease logging.

   NOTE: The ‚STOPP NOW' option replaces the ‚START NOW' command when logging is active.

3. Confirm the action when prompted.

4. Select ‚Exit' to return tot he READ FLOW screen.



NOTE: The logged data will remain stored in the instrument`s memory and can be accessed at any time as described below.

7.4 Copying Logged Data to a USB Memory Stick

This procedure describes how to copy a stored log file to a USB memory stick.

1. Connect a suitable USB memory stick to the ExactSonic III USB socket (see under 3.1.1).

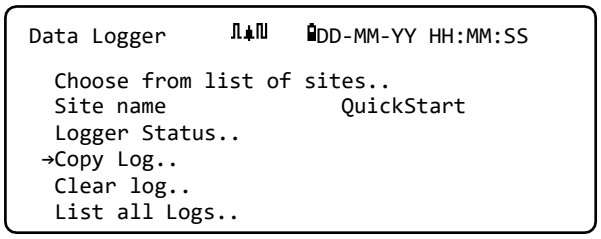
2. Access the MAIN menu.

3. Select ‚Data Logger' from the MAIN menu.

4. Select ‚Choose from list of sites' and select the name of the site to download.

5. When you are ready to begin downloading the log select ‚Copy Log'.

6. Logged data for the selected site will now be copied to the USB memory stick.



7. Upon completion select ‚Exit' to return tot he MAIN menu.

NOTE: : The logger uses an MS-DOS compatible 8.3 file name format for the CSV files. It may be possible that the name of the file is not exactly as you expect. Also note that for very large files the copy process may take some time, so please be patient. If the copy process take > 2 minutes, the unit may abort the copy. In this case, please contact Höntzsch company.

7.5 Clearing Log Files von Protokolldateien

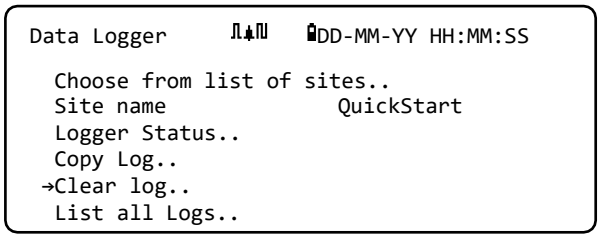
1. Access the MAIN menu.

2. Select ‚Data Logger' from the MAIN menu.

3. Select ‚Choose from list of sites' and select the name oft he site to clear.

4. Delete logged data fort he selected site by selecting ‚Clear log'.

5. Upon completion select ‚Exit' to return to MAIN menu.



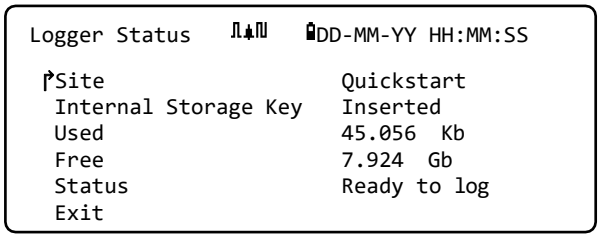
7.6 Logger Status

To view the current setup, memory usage and availability for data logging.

1. Access the MAIN menu.

2. Select ‚Data Logger' from the MAIN menu.

3. Select ‚Logger Status' (also accessed from the OPTIONS screen by selecting ‚Logger..').



8 Outputs

8.1 Current Loop Setup / Analog Output

The ExactSonic III allows you to set a current output between 0 mA and 24 mA. Standard ranges include 4-20 mA, 0-16 mA and 0-20 mA. The current range can be used to represent only positive flow, or negative flow ranging into positive flow, or simply negative flows.

In addition to this, you may set an out-of-band value to represent an error current. For example, with a 4-20 mA loop, it is common to use either 2.5 mA or 22.5 mA as an error current. Nevertheless, you may set the error current to be any value that is not within the valid measurement range. An error current can be used to indicate a number of causes including: exceeding a predetermined value, being under a predetermined value, being out-of-bounds (value is below the minimum or above the maximum), or a loss-of-signal condition. In addition, inhibiting the generation of an error current can be achieved by selecting the no error condition.

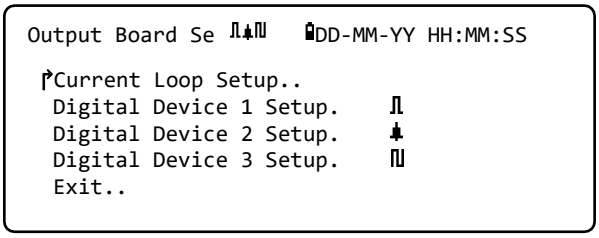
NOTE for TECHNICIANS: The 4-20 mA current output is set in hardware to be accurate to ±0.3 %. If you require greater accuracy than this or if there are known inaccuracies in the measurement system which may require compensation, then calibration values may be set at the low and high ends of the current loop range. These values are linearly interpolated over the range of the current loop.

The default current loop setting is OFF.

To change any of these settings:

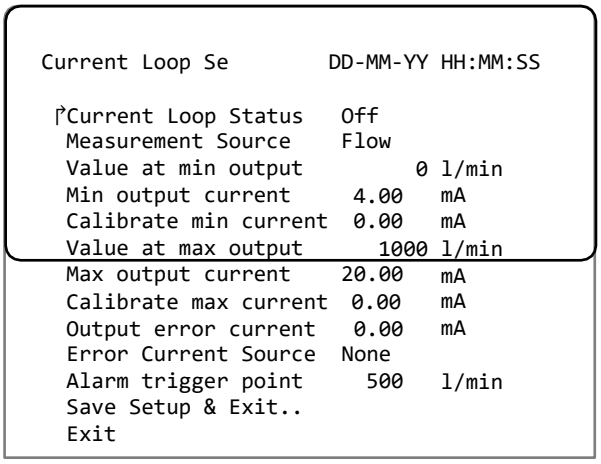
1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. With ‚Output' selected in the OPTIONS menu, press the ENTER key.

   Alternatively, from a READ FLOW / VELOCITY screen, press the ‚OUTPUTS key (3)'. The OUTPUT BOARD menu is displayed.



2. Use the UP/DOWN arrow keys to select ‚Current Loop Setup'. Press the ENTER key. The CURRENT LOOP SETUP menu is displayed.

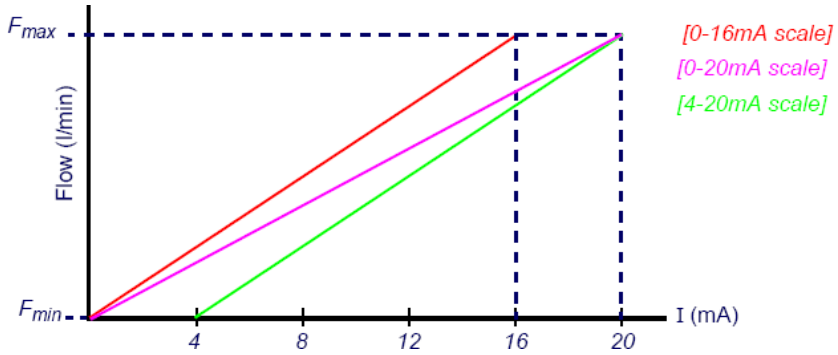
   Edit the settings as required (see next page). The 4-20 mA can be set to represent a particular flow range. It is also possible to enter a negative figure for the minimum output and this would enable a reverse flow to be monitored.



Setting	Flow Options (default)
Current Loop Status	Off/On
Measurement Source	Flow
Value at min output Metric Imperial US Imperial	 0 l/min 0 gal/min 0 US gal/min
Min output current	0.00 mA
Calibrate min current	0.00 mA
Value at max output Metric Imperial US Imperial	 2000 l/min 439.939 gal/min 528.344 US gal/min
Max output current	24.00 mA
Calibrate max current	0.00 mA
Output error current	2.50 mA
Error current source	Exceeds Value/Under Value/Signal Loss/Out of Bounds/None
Alarm trigger point Metric Imperial US Imperial	 2000 l/min 439.939 gal/min 528.344 US gal/min

8.1.1 Converting the Measured Current to Flow Rate

Assume the maximum flow rate is F_{max} (l/min) and the maximum flow rate is F_{min} '0' (l/min), as shown below.



To calculate the flow rate (l/min) for a measured current (mA) then:

0-20mA	0-16mA	4-20mA
Flow rate = $\frac{I \times (F_{max} - F_{min})}{20} + P^{min}$	Flow rate = $\frac{I \times (F_{max} - F_{min})}{16} + P^{min}$	Flow rate = $\frac{(I-4) \times (F_{max} - F_{min})}{(16)} + P^{min}$

8.2 Digital Outputs

The three digital outputs can each be set up to operate in one of three modes:
- Pulse Output (set to ‚Normally Open' or ‚Normally Closed')
- Alarm Output (set to trigger on ‚Rising' or ‚Falling' conditions)
- Frequency Output (with ‚High Frequency' and ‚Low Frequency')

The measurement source can be:
- Volume (not compatible with Frequency output)
- Flow (not compatible with Pulse output)
- Signal (not compatible with Pulse output)

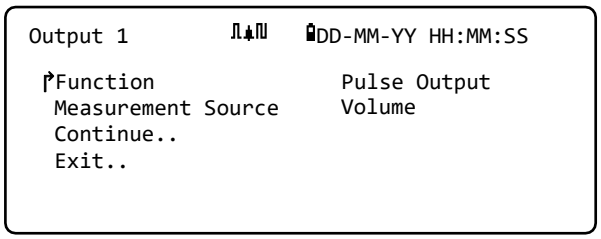
There are no limitations on the combinations of these modes and their assignment to each of the three outputs. For example, the digital outputs could be configured as three alarms attached to the same flow reading with different trigger points, or perhaps two alarms – both attached to Volume – and one frequency output connected to flow:

To configure any of the digital outputs:

1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER Key. With ‚Output' selected in the OPTIONS menu, press the ENTER key.

   Alternatively, from a READ FLOW / VELOCITY screen, press the ‚OUTPUTS key (3)'. The OUTPUT BOARD menu is displayed.

2. Use the UP/DOWN arrow keys to select ‚Digital Device 1/2/3 Setup'. Press the ENTER key. The OUTPUT 1/2/3 menu is displayed.



3. Use the UP/DOWN arrow keys to select ‚Function'. Press the ENTER key.

4. Use the UP/DOWN arrow keys to scrol through the output types: ‚Pulse Output', ‚Alarm Output', ‚Frequency Output'. With the required output selected, press the ENTER key.

5. Edit the settings as required (see below).

Pulse Output		Alarm Output		Freq. Output	
Setting	**Option/default**	**Setting**	**Option/default**	**Setting**	**Option/default**
Quantity Per Pulse	Volume: 1000 m³	Direction	Rising / Falling	Low. Freq.	0 Hz
Pulse Duration	50 ms	Activation Level	Volume: 0.5 m^3 Flow: 30000 l/min Signal: 0.5	Low Value	Flow: 0.00 l/min Signal: 0
Contact Type	Normally Open/ Normally Closed	Deactivation Level	Volume 0.475 m^3 Flow: 28500 l/min Signal: 0.5	High Freq.	200 Hz
				High Value	Flow: 1000.00 l/min Signal: 1

8.2.1 Pulse Output

Select ‚Pulse Output' to measure volume and press ‚Continue'. Any other selection of Measurement Source will result in an error.

The default pulse width is set to 50ms which represents half of a one pulse cycle. A 50ms pulse width is required for most mechanical counters, but the width can be set as low as 10ms.

8.2.2 Volumetric Pulse

The quantity per pulse is usually set to a value that makes it easy to read an external pulse counter. For example, the value could be 10 litres per pulse, which means that for every 10 litres of fluid measured by the meter, a pulse is generated.
A minimum idle time equal to the pulse-width, follows the pulse. There is a maximum pulse rate and hence maximum volumetric flow that the pulse output can represent. A maximum of 10 pulses per second can be generated.

8.2.3 Alarm Output

An Alarm Output generates an alert when a predetermined value is exceeded or receded for Volume or Flow, or when Signal is lost or gained. When an alarm is activated, a message is generated on the status line and the corresponding output alarm symbol will flash.

1. Select ‚Output..' from the OPTIONS menu.

2. Use the UP/DOWN arrow keys to select ‚Digital Device 1/2/3 Setup'. Press the ENTER key. The OUTPUT 1/2/3 menu is displayed.

3. Use the UP/DOWN arrow keys to select ‚Function'. Press the ENTER key.

4. Use the UP/DOWN arrow keys to scroll through the output types. Select ‚Alarm Output'.

5. Use the UP/DOWN arrow keys to select ‚Measurement Source'.

6. Choose from ‚Volume', ‚Flow' or ‚Signal'.

7. Use the UP/DOWN arrow keys to select ‚Continue..'.

8. According to your choice in step 6, complete the alarm configuration as described in the following sections.

Volume Alarm

9. Use the UP/DOWN arrow keys to select ‚Direction'. You may select a ‚Rising' or ‚Falling' value (as volumes generally only rise until reset, ‚Rising' is the usual choice).

10. Use the UP/DOWN arrow keys to select ‚Activation Level'. Set the volume limit for an alarm on this output.

11. If required, set a ‚Deactivation Level' although this has no effect until the volume totals are reset.

12. Use the UP/DOWN arrow keys to select ‚Save Setup and Exit'.

Flow Alarm

9. Use the UP/DOWN arrow keys to select ‚Direction'. Select ‚Rising' to trigger an alarm when a certain flow is exceeded or ‚Falling' to trigger an alarm when a certain flow is not achieved.

10. Use the UP/DOWN arrow keys to select ‚Activation Level'. Set the flow limit for the alarm on this output.

11. Set a ‚Deactivating Level' (the value at which an alarm is cancelled).

    - If the direction is set to ‚Rising', the alarm is triggered when the flow exceeds the Activation Level. The Deactivation Level must be a value less than or equal to the Activation Level.

    - If the direction is set to ‚Falling', the alarm is triggered when the flow drops below the Activation Level. The Deactivation Level must be a value greater than or equal to the Activation Level.

12. Use the UP/DOWN arrow keys to select ‚Save Setup and Exit'.

About Negative Flows:
While operating on negatives flows is possible, it is not recommended because of the potential confusion it can cause.

A useful configuration of the alarm mode could be to set two outputs to Alarm Mode using the same Flow Measurement Source. One could be set to be an over-value alarm (no hysteresis) and one an under-value alarm (again, with no hysteresis). If the corresponding outputs are wired in parallel, then the resulting alarm will activate when flow is above a certain threshold OR when it is below a certain threshold.

Signal Alarm

The Signal alarm ties an output to the loss or reacquisition of a signal. When signal is lost the screen on the flow will read „----" instead of a valid flow number. Signal is deemed to have been lost when the power and SNR ratio is out-of-bounds for longer than the time set in the Signal Loss Time-out field of the PRIMARY FLOW screen (see under 10). The default value is 3 seconds. When the signal is lost it is deemed to have a value of zero, otherwise it has a value of 1. To generate an alarm when signal is lost set the Direction to ‚Falling' and set the Activation Level and the Deactivation Level to 0.5. These values are set automatically when ‚Signal' is selected as the ‚Measurement Source'.

8.2.4 Frequency Output

The output frequency is proportional to the flow rate within a specified frequency range of 0 – 200 Hz. With the exception of the ‚Measurement Source' being ‚Signal', it only makes sense to measure derivate quantities such as Flow. In theses cases, the instantaneous frequency is directly proportional to the instantaneous flow.

Both the lower and upper frequency as well as the values they represent can be set in the FREQ OUTPUT screen. It is usual to set the frequency range to the default of 0 and 200 Hz. At 0 Hz, the associated output switch is closed continuously. The lowest longest waveform period is 60 second, hence the lowest non-zero frequency that can be generated is 1/60 = 0.01667 Hz. The precision of the generated frequency averages ± 1%.

Generally, 0 Hz represents zero flow, so the only selection that needs to be made is the maximum flow to be accommodated at 200 Hz.

As mentioned in the previous section on Alarm Mode, the value of ‚Signal' can only be zero (no signal) or 1 (signal present). This could be used to generate an audible alarm if the signal is lost. To do this, set the lower frequency to be 100 Hz and lower value to be 0 and the upper value to be 1 at a frequency of 0 Hz. This will cause the output to be steady when a signal is present and to be 100 Hz when signal is lost.

9 NiMh Power Screen

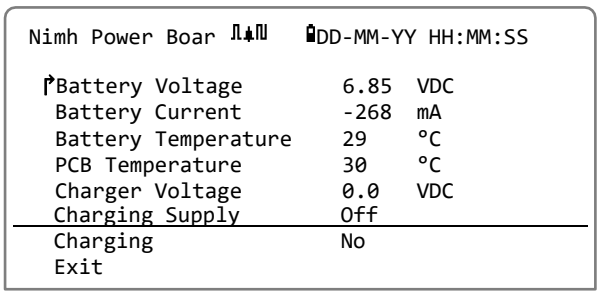
The NiMh power screen is for the monitoring and diagnosis of battery status only, for example, if it is suspected that the battery is not charging correctly. To view the screen:

1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. The OPTIONS screen is displayed.

2. Use the UP/DOWN scroll keys to select ‚Power..'. Press the ENTER key.

9.1 Power Checklist

When viewing the NIMH POWER BOARD SCREEN:



- Check to see if the **Charging Supply** is On (the adapter is connected) and that the **Charger Voltage** is 11 VDC or greater. This can also be checked in the status line at the top of the screen by the presence of a plug symbol if an external adaptor is plugged in.

- The battery charger uses a dedicated NiMH charging circuit. If the **Charging** field displays ‚Yes', then check the **Battery Current**. It should show a positive value of around 1800 mA or greater. If the current switches between zero and some intermediately large value it may indicate that the battery is approaching full charge, or the circuit is trying to ascertain if the battery is nearing end-of-life and needs to be replaced. If the battery is charging, the battery symbol in the status line at the top of the screen will cycle though various levels.

- When charging, the **Battery Voltage** will depend on the charge state. A nearly full battery will be in the region of 7.5 to 8.0 VDC.

- **Battery Temperature** should at no time exceed 65 ºC or approximately 150 ºF.

- If the charger is removed and the device is running on internal power, the battery current will read negative and should be in the region 250 to 300 mA depending on whether the backlight is on or off.

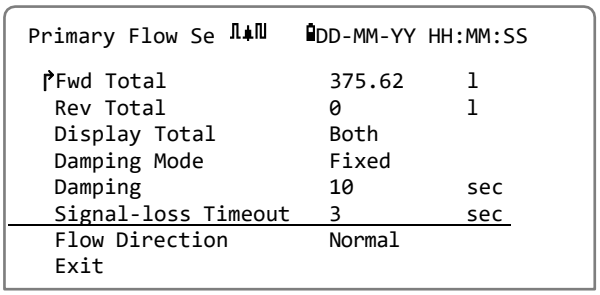
10 Primary Flow

The PRIMARYFLOW screen summarises the flow totals and provides options for their display on the FLOW READING screen. To view the PROMARY FLOW screen:

1. From the MAIN menu, use the UP/DOWN scroll keys to select ‚Setup Instrument'. Press the ENTER key. The OPTIONS screen is displayed.

2. Use the UP/DOWN scroll keys to select ‚Primary Flow'. Press the ENTER key. The PRIMARY FLOW screen is displayed.

The screen displays the forward and reverse flow totals: Fwd Total and Rev Total. If the totals need to be adjusted, please refer to 5.5.2.



To change the display of forward and reverse totals on the FLOW READING screen, select ‚Display Total'. The options are: ‚Both', ‚None', ‚Fwd Total' and ‚Rev Total)'.

Damping Time and **Damping Mode** are duplicates oft he setting found in the SYSTEM menu (see under 6.5.5).

Signal-loss Timeout see under 8.2.4. Once a signal has been acquired, it is deemed to have been lost when the power and SNR ratio are insufficient for longer than the Signal Loss Timeout setting.

Flow Direction allows you to reverse the sensor directin assignments. Changing flow direction may result in a small difference in the magnitude of the reading observed (see under 6.5.2).

11 Maintenance and Repair

This instrument does not contain any user-serviceable parts. The following notes are provided as a guide to general equipment care.


WARNUNG

Do not disassemble this unit!
If the unit is defective, please send it back to
please return it to Höntzsch or the seller!

1. Ensure the ExactSonic III is switched off and disconnected from the mains, then wipe the exterior of the instrument with a clean, damp cloth or paper towel. The use of a solvent may damage the surface.

2. The instrument contains a rechargeable battery; dispose safely and in accordance with the local regulations in force in the country of operation.

3. Ensure all cables and connectors are kept clean and free from grease or contaminants. Connectors may be cleaned with a general-purpose cleaner if necessary.

4. Avoid the use of excessive grease/ultrasonic couplant on the sensors as this may impair the performance of the equipment. Excessive grease/couplant can be removed from the sensors and guide rails using an absorbent paper towel and a general-purpose solvent cleaner.

5. We recommend that the ultrasonic couplant is replaced on the sensors every 6 months, especially on pipes where the application is too hot to touch. If the signal level drops below 30 % this is also an indication that the sensors need re-greasing.

6. Regularly check all cables/parts for damage. Replacement parts are available from Höntzsch.

7. Ensure the person who services your instrument is qualified to do so. If in doubt, return the instrument to Höntzsch with a detailed report on the nature of any problem.

8. Ensure that suitable precautions are taken when using any materials to clean the instrument / sensors.

9. The instrument and sensors should be calibrated at least once every 12 months. Contact Höntzsch or your local service agent for details.

10. When returning product to Höntzsch make sure it is clean and please notify Micronics if the instrument has been in contact with any hazardous substances.

11. If the instrument was supplied with dust or dirt caps make sure they are re-fitted when the instrument is not in use.

12 Troubleshooting

12.1 Overview

If you have a problem with your flow monitoring system it can be due to any of the following:

Faulty instrument
If you suspect the instrument is faulty you can check it out using a test block as described under 12.4. This will establish that the instrument is functional and receiving a healthy signal from the connected transducers.

Incorrect setup
A low, or zero, signal could be caused by incorrect set-up such as:
- incorrect site data entered into the instrument
- incorrect or non-matching ultrasonic transducers selected for use
- incorrectly fitted transducers – lack of couplant applied, incorrect spacing, insecure attachment
- poor connections between the probes and the instrument

Application problem
If you are certain that the instrument is healthy and suitably set-up for the current site; and the probes are properly assembled and fitted correctly, there could be an application problem concerned with the site.

Check such conditions such as:

Poor pipe outer surface quality
- uneven surface preventing good surface contact with the transducer
- flaking paint (should be removed)
- variable air gap in concrete-covered pipes affecting the ultrasonic signal quality.

Poor internal pipe construction
- rough internal pipe walls affecting fluid flow (see roughness factor)
- internal welds positioned in the transducer signal path affecting the signal quality
- the 'drippings' in galvanised-dipped pipes or other irregularities interfering with the signal path

Incorrect probe location
- transducers located too close to bends or valves, disturbing the flow profile
- transducers located too close to insertion probes, disturbing the flow profile
- for horizontal pipework transducers should not be positioned on the top of the pipe

Poor fluid conditions within the pipe
- fluid contains bubbles, high particle density or sludge
- air in the top of the pipe

Low fluid flow within the pipe
- pipe obstructions
- malfunctioning valve not opening fully (or closed inadvertently)

Liquid content problems
- multiple liquid contents do not comply accurately to expected sound speed criteria
- very hot pipe almost turns water to steam and therefore exhibits the wrong speed characteristics - could be due to reduced pipe pressure
- flashover – liquid turns into a gas because of lower than required pressure

12.2 General troubleshooting procedure

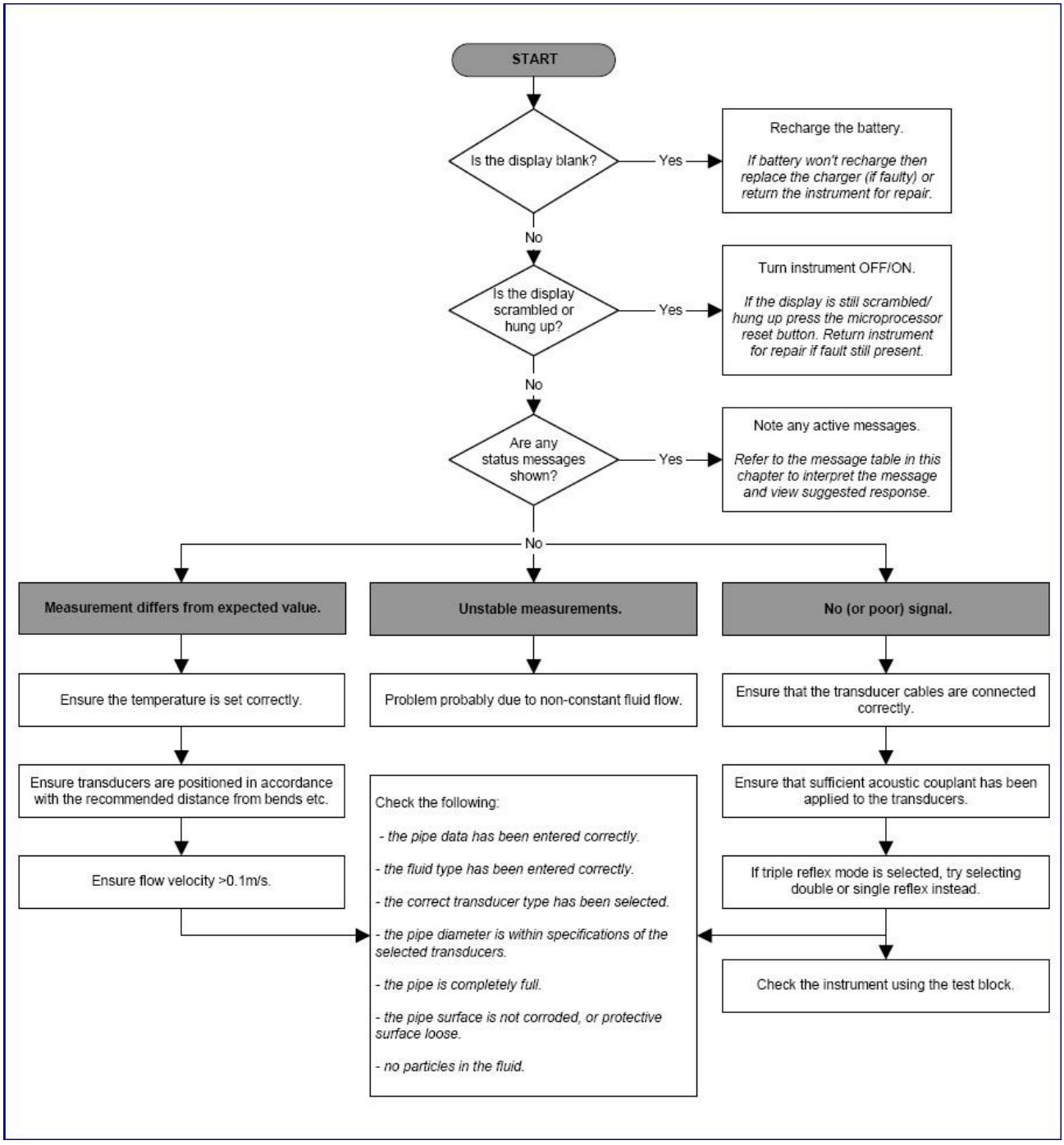


Figure 12.1 Troubleshooting chart

12.3 Warning and Status Messages

Warnings, errors and status messages appear on the second top line of the display. When there is more than one message to be displayed then the display will cycle between them. Urgent error may need user intervention and can only be cleared by pressing „delete" or the cause of the error being remedied. Status messages may be hidden until normal and urgent errors are redressed. Normal errors, such as „Code is invalid", are automatically removed after a period of time. All errors can be removed by pressing „delete" but with most serious and urgent errors, they may be generated again after a minute or so. Please check the response associated with the given error and perform any required actions before contacting your distributor.

FLOW RATE ERRORS AND MESSAGES	
No flow signal	***Interpretation:*** This message appears when the transducers cannot send or receive signals to each other. ***Response:*** Firstly check that all cables are connected, transducers are on the pipe correctly with sufficient couplant on the face. This condition could also be due to a partially empty pipe, aerated liquid, particulate content too high or when the condition of the pipe being measured is poor.
Flow Computation Fault	***Interpretation:*** An internal error occurred when computing flow. ***Response:*** Restart the ExactSonic III. If the problem persists, contact Höntzsch or the distributor. Press ‚delete' to remove this error.
Flow Velocits Out of Range	***Interpretation:*** The instantaneous flow velocity has, at least temporarily, exceeded a specified maximum. ***Response:*** This is an unusual condition. It is not fatal and may occur sporadically. If it persists, check your installation. Press ‚delete' to remove this error.
Separation distance impossible	***Interpretation:*** The calculated sensor separation was less than zero. ***Response:*** Check all the site parameters and the sensor chosen.

CURRENT LOOP AND DIGITAL OUTPUT ERRORS AND MESSAGES	
[measurement source] not compatible with [function]	***Interpretation:*** The [measurement source] chosen is not compatible with the desired output [function]. ***Response:*** Choose another (compatible) measurement source and / or function. (See under 8.2)
[internal] board failed to report.	***Interpretation:*** The [internal] board failed to respond to a discovery message and has been taken offline momentarily. ***Response:*** This error may be the result of a temporary computational overload. Go to the OPTIONS screen and check the board status. Try first to restart and if the error still persists, reset the ExactSonic III. If after reset, all boards do not report as „OK", note the failing board and call your distributor or Höntzsch.
Current loop open or short	***Interpretation:*** The current loop is either open circuit (not connected) or possibly a short circuit resulting in internal components overheating. ***Response:*** Either turn the current loop off if it not required, or connect it as needed. Ensure a suitable load is being placed on the current loop and it is not driving into a direct short circuit. The alarm can be cleared by pressing „delete", but if the condition is not rectified, it will return in approximately one minute.
Current loop alarm activated	***Interpretation:*** This message is for information only. It is generated when alarm conditions have been met for the current loop (see under 8.2.3). ***Response:*** Clear the alarm by deleting it and attend to the fault. Deleting the alarm does not stop the error current being generated as long as the fault remains.
Alarm on output [n] activated	***Interpretation:*** This message is informative only. It is generated when alarm conditions have been met for digital output [n]. (see under 8.2.3)

	Response: Clear the alarm by deleting it and attend to the fault. Deleting the alarm does not stop the output generating the alarm as long as the fault remains.
Error current out-of-bounds	***Interpretation:*** An attempt was made to define the error current within the normal working range of the current loop. For example, this error would be generated if the working range were 0 to 16mA and the error current was set to any value below 16mA. The instrument will try to redefine a valid error current. ***Response:*** Redefine the error current or change the working range if the calculated value is not desirable.
Error current invalid. Source disabled	***Interpretation:*** The entire range of the current loop (0 to 24 mA) has been defined as valid, so an error current is not possible. In this case the alarm function is disabled. ***Response:*** If an error current is required, redefine the working region to be a smaller range.

DATA LOGGING AND MESSAGES	
USB drive not inserted	***Interpretation:*** A USB drive must be inserted into the external port before the desired operation can proceed. ***Response:*** Insert a USB drive into the external port.
Could not copy CSV file	***Interpretation:*** An error occurred copying the CSV from the internal storage to the external flash drive. ***Response:*** **:** Try the operation again. If this fails, turn the ExactSonic III off and then on again. Select the site whose log you wish to obtain and attempt to copy the file again
Could not delete index file	***Interpretation:*** This file is an internal file which is associated with the CSV file for each site. The file could not be deleted. ***Response:*** Try the operation again. If this fails, turn the ExactSonic III off and then on again. Select the site whose log you wish to remove and attempt to clear the log again.
Could not delete CSV file	***Interpretation:*** The internal CSV file associated with the site could not be deleted. ***Response:*** Try the operation again. If this fails, turn the ExactSonic III off and then on again. Select the site whose log you wish to remove and attempt to clear the log again.
Badly formatted date or time	***Interpretation*** The format of the date and time field is invalid. ***Response:*** Re-enter the time and date in the correct format.
Date or time is out of bounds	***Interpretation:*** The scheduled date and time entered is more than a year in advance. ***Response:*** Re-enter a time and date that is not so far into the future.
Start time too close	***Interpretation:*** The scheduled logging start time must be at least two minutes into the future. ***Response:*** Re-enter a start time more than two minutes in advance of current time.
Logging period too short	***Interpretation:*** The minimum logging period for a scheduled start is 60 seconds. ***Response:*** Entered a logging stop time that is more than 60 seconds beyond the logging start time.
Start or stop time invalid	***Interpretation:*** The date entered is not valid. For example: 31 June or 30 February, or 25:00:00. ***Response:*** Enter a valid date and time.
Operation timed-out	***Interpretation:*** An internal error occurred, and the operation timed out. ***Response:*** Try the operation again and if the result is the same, try switching the ExactSonic III off and then on again. Retry the operation and if it is still failing then contact your distributor or return the item for repair.
Log drive full	***Interpretation:*** The internal storage is full. ***Response:*** Delete some logs (see under 7.5). Press ‚delete' to remove this error.

Stopping Logging	***Interpretation:*** The internal storage is full so logging will be stopped. ***Response:*** Delete some logs (see under 7.5). Press ‚delete' to remove this error.

BATTERY ERRORS AND MESSAGES	
Battery critically low	***Interpretation:*** The internal battery voltage is less than 6.1 volts. ***Response:*** Connect the external charger. Press ‚delete' to remove this error.
BATTERY EXHAUSTED! Shut down in [n] sec!	***Interpretation:*** The internal battery voltage is less than 5.25 volts. The ExactSonic III will perform a controlled shutdown in 15 seconds if an external charger is not connected. The time to shutdown is [n] seconds. ***Response:*** Connect the external charger. Press ‚delete' to remove this error.

SET-UP AND OTHER ERRORS AND MESSAGES	
Too many errors Too many urgent errors	***Interpretation:*** The ExactSonic III generated too many (urgent) errors as a result of a fault and some errors may not have been reported. ***Response:*** Respond tot he errors highlighted.
Poorly formatted error message	***Interpretation:*** Internal, NON- FATAL System error. ***Response:*** Delete the error. Take note of the current situation that lead to this error and report it when convenient.
Site DB is full	***Interpretation:*** The number of sites has exceeded the maximum of 12. ***Response:*** Delete a site as directed in chapter 6.
Site name illegal or duplicate	***Interpretation:*** Site names must be unique and contain eight or fewer characters comprising letters, numbers dashes or underscores. ***Response:*** Enter a site name that complies with the interpretation above. Note that names are case insensitive, for example, site ELY is a duplicate of site Ely.
RTD Board fault Power board fault Logger board fault Output Board fault Flow Board fault	***Interpretation:*** The respective board has not reported to the central controller in the last minute. ***Response:*** Try restarting the ExactSonic III. If the board is still reported as missing or faulty, call your distributor or return your device for repair. You may press ‚delete' to remove this error but some or all functionality may be lost if this error is persistent and you continue operate the device.
Limits are xx.x [text] to yy.y [text]	***Interpretation:*** The values entered were out of bounds for this setting. The smallest value allowed is xx.x and the largest is yy.y. Optional units [text] may accompany this message. If not, then it is implied that the units are those currently set. ***Response:*** Enter a value within the specified limits. Note that the limits quoted may be dependent on other parameters already set.
Site DB failure. Restoring default values.	***Interpretation:*** When reading parameters from the database, some site parameters appeared corrupted, so all parameters have been restored to initial values. ***Response:*** Re-enter parameters for this site. Press ‚delete' to remove this error.
Code is invalid	***Interpretation:*** Either the user or factory pin code is incorrect. ***Response:*** Try again.
Unknown product	***Interpretation:*** The board count for product does not match the product type specified. ***Response:*** This is a serious error. Restart the ExactSonic III. If the problem persists, contact your distributor or Höntzsch for further advice.
Illegal to edit or delete this information	***Interpretation****:* This field cannot be modified or deleted. This usually occurs when trying to edit or delete the Quickstart site. ***Response****:* None required.
ERR: unknown board type	***Interpretation:*** ExactSonic III internal error. The controller has attempted to request a board that does not exist.. ***Response:*** Reset the ExactSonic III to be safe. Record the conditions un-

	der which the error occurred and report them to the distributor when convenient.
Value out of bounds	***Interpretation:*** The values entered were out of bounds for this variable. This error is similar to the error "Limits are xx.x [text] to yy.y [text]". ***Response:*** Enter a valid value.
System Error [nnnn]	***Interpretation:*** A serious internal error occurred. This indicates and error condition that should not be possible. It may or may not be fatal. ***Response:*** Record the error number and conditions that lead to the error. Ideally turn the ExactSonic off then on. When convenient report the error number and conditions to your distributor.

12.4 Test Block

A test block is included with the ExactSonic III equipment to allow the transducers and inter-connecting cables to be functionally checked.

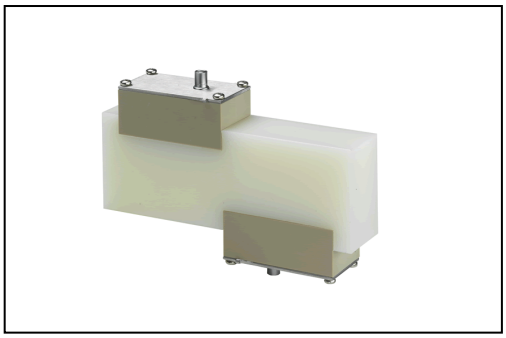


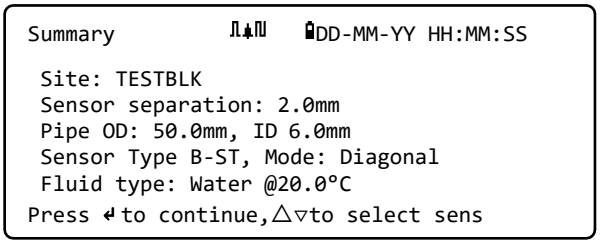
Figure 12.2 Test block

1. Switch ON the instrument.

2. Select ‚Quick Start' and enter the parameters shown in the table below for the appropriate transducer type (A or B):

Parameter	Sensors A	Sensors B
Pipe outside diameter	30.0 mm	50.0 mm
Pipe wall thickness	14.0 mm	22.0 mm
Pipe lining thickness	0.0	0.0
Pipe wall material	Plastic	Plastic
Fluid type	Water	Water
Mode	Diagonal	Diagonal
Temperature	20 °C	20 °C

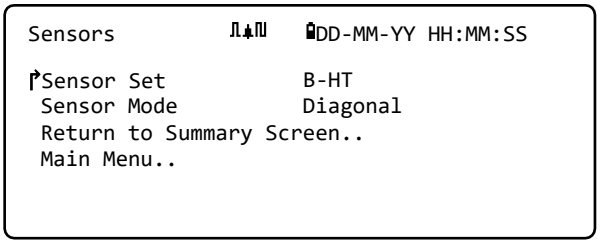
3. At the end of the Quick Start procedure (see under 5.1) the SUMMARY screen is displayed. Press the UP/DOWN arrow button. The SENSORS screen is displayed.



4. Use the UP/DOWN scroll keys to select ‚Sensor Set'. Press the ENTER key.

5. Select the appropriate sensor (the default will be ‚A') and press the ENTER key.

6. Use the UP/DOWN scroll keys to select ‚Sensor mode', choose ‚Diagonal' and press the ENTER key.



7. Select ‚Return to Summary Screen' and press the ENTER key.

8. Check that the 3 parameters displayed are correct.

9. Apply acoustic couplant to the sensors and attach them to the test block with the connectors positioned towards the centre of the test block as shown in Figure 12.2, and temporarily secure them in place using elastic bands or tape.

10. Connect the sensors to the ExactSonic III instrument using the cables provided (see Figure 3.2 and 4.1).

11. Press the ENTER key to display the FLOW READING screen.

12. Press the ‚SYSTEM key (2)' to display the SYSTEM SETTINGS screen.

13. Set **Damping** to at least 10 seconds.

14. Select ‚Save Setup & Exit' and press the ENTER key to return tot he READ FLOW screen.

15. The flow reading value displayed is not important. Ignore messages like ‚Flow Velocita Out Of Range' if they occur. The fact that a reading is obtained indicates that the instrument is functioning. The value may fluctuate but this is normal.

16. The signal strength indicator at the left of the display should show 3–4 bars. As a double check,press the ‚DIAGS' button and scroll down tot he Signal reading. For an A-sensor the value should be around 50 dB or lower. For a B-sensor the signal level should be around 45 dB or lower. In either case the average SNR value should be around 55 dB or lower.

12.5 Reset

To reset the ExactSonic III, carefully insert a straightened paperclip into the pinhole located in the right-hand side of the instrument to operate the internal reset switch. Hold the paperclip perpendicular to the instrument while doing this.

NOTE: If the instrument is reset while logging, it is likely that at least some log data will be lost. In addition to this it may also be possible that some user settings may be corrupted. These settings will be reset to default value when the unit is repowered.

12.6 Diagnostics

This feature is designed for advanced users and is intended to provide information that will aid the user to diagnose problems – e.g. no signal strength. When operating in the FLOW READING mode you can access a diagnostics screen by pressing the ‚Diags' function key. This will display the operating values for the following parameters.

ETA (µs)	Value the instrument predicts will be the time in µsecs that it should take for the acoustic wave to propagate across a particular pipe size. This value is ascertained from the data entered by the user: pipe size, material, sensor set etc.
ATA (µs)	Value the instrument measures as the time taken for the acoustic wave to propagate across the pipe. It is used to see if the signal is being taken from the burst, at the correct time to get the strongest signal. This value is normally a few µs below the calculated µs value. If, however, this value is much greater than the calculated time then there is a problem with the set-up.
Upstream fluid time	The time the upstream wave spends in the fluid in µsecs.
Delta T (ΔT in ns)	The difference between the upstream and downstream time in nano-seconds.
Instantaneous Velocity (m/sec)	Instantaneous fluid velocity
Flow Acceleration (m/s²)	Flow acceleration in m/s² (change in flow velocity per unit of time)
Cut-off Velocity (m/sec)	The velocity below which the device displays the flow velocity „0" (see under 6.5.1)
Flow (m³/s)	Instantaneous volumetric flow in m^3/s to 3 decimal places
SNR (dB)	Signal to Noise ratio in decibels (dB). A strong signal will generally exhibit

	an SNR of greater than 45 dB. A good signal will generally exhibit an SNR of greater than 40 dB. SNR is literally the difference between the Signal level and the Noise level in dB.
Signal (dBV)	The unreferenced signal level (in dBV) of the received signal.
Noise (dBV)	The unreferenced background noise level (in dBV) of the received signal.
Gain (dBV)	The gain value (in dBV) represents the amount of amplification that the received signal has undergone before signal analysis is undertaken. A large gain figure can indicate that the ultrasonic signal is being strongly attenuated by something in its path. This could be because of the lack of couplant, poor sensor alignment or other factors.
Pipe Bore (mm)	The pipe bore (always in mm). (see under 5, 5.1 and 6.4)
Advanced Diagnostics..	Display the Advanced Diagnostics (see under 12.6.1)

12.6.1 Advanced Diagnostics

LFF (ns/m/sec)	Linear Flow Factor in nano seconds per metre per second.
Average Velocity (m/sec)	A rolling average raw velocity over the last 25 seconds.
Average ΔT (ns)	A rolling average ΔT over the last 25 seconds.
Reynolds Number	The calculated Reynolds number
Roughness factor (mm)	The current roughness factor (always in mm) – see under 6.5.4
Zero Flow Offset (m/sec)	The currently set zero flow offset velocity being used - see under 6.5.2.
Calibration factor	The currently set user calibration - see under 6.5.3.
Separation distance (mm)	The computed separation distance (always in mm) as seen on the SUMMARY screen before flow reading began.
Solid timet (µs)	The amount of time that the ultrasonic wave spends in solid materials.
Sensor Set	The type of sensor – see under 6.4
Sensor Mode	The current correction factor – see under 2, 6.4

13 Appendix

13.1 Technical Data

If you have a problem with your flow monitoring system, the reason may be one of the following:

GENERAL	
Flow Measurement Technique	Transit time
Flow Velocity Range	Minimum Velocity 0.2 m/s; Maximum Velocity 20 m/s: Bi-directional
Turn Down Ratio	100:1
Measuring uncertainty	±0.5 % to ±2 % of measured value for flow rate > 0.2 m/s and pipe inside diameter >75 mm ±3 % of measured value for flow rate > 0.2 m/s and pipe inside diameter 13-75 mm
Repeatability	±1.5 % of measured value or ±0.02 m/s whichever ist he greater
Measurement Period	1 second
Selectable Flow Units	VELOCITY: m/sec, km/hr, ft/sec, yd/sec, mi/hr. FLOW RATE: l/s, l/min, l/h, m³/s, m³/min, m³/h, Ml/s (million litres/s), Ml/min (million litres/min), Ml/hr (million litres/hour), Ml/day (millio litres/day), USgals/sec, USgals/min, USgals/h, USgals/day, Barrel/h, Barrel/day, ft³/sec, ft³/min, ft³/hr, MUSgal/hr (million US gallons/hr), MUSgal/day (million US gallons/day), Imp. Gals/sec, Imp. Gal/m, Imp. Gal/hr, Imp. Gal/day, Barrels/hr, Barrelsr/Tag
Selectable Volume Units	l, m³, Megalitre, Imperial gallons, US gallons, Oil Barrel (42 US gallons), ft³, Mega-US gallons
Total Volume	12 digits – forward and reverse

APPLICABLE FLUID TYPES	
Fluid Condition	Clean liquids that have less than 3 % by volume of particulate content. Applications include river water, sea water, potable water, demineralised water, glycol/water mix, hydraulic systems and diesel oil

APPLICABLE PIPE TYPES	
Pipe Materials	Any sonic conducting medium such as Stainless Steel, Copper, UPVC, PVDF, Galvanised Steel, Mild Steel, Glass, Brass. Including pipes lined with Epoxy, Rubber, Steel, Plastic (see below)
Pipe Dimension (OD)	13 ... 2000 mm
Pipe Wall Thickness	1 ... 75 mm (dependent on material)
Pipe Lining	Rubber, Glass, Epoxy, Steel, Plastic, Concrete
Pipe Lining Thickness	0 … 25 mm
Pipe Wall Temperature Range	Standard sensor operating temperature is -20°C to +135°C

TRANSDUCER SETS	
Temperature range	-20 °C to +135 °C

TEMPERATURE SENSORS	
Type	PT100 Class B 4 wire
Range	+2 to +180 ºC (36 to 356 ºF)
Resolution	0.1 ºC (0.2 ºF)
Minimum Delta t	0.3 ºC (0.5 ºF)

DATa LOGGER	
Data Logged	Log application details, time, date, flow rate, forward total, reverse total, flow velocity, signal Quality, signal SNR, signal status. Log data units are those selected when starting to log flow.
Data size	8 GB (>100,000,000 records)
Time Stamping	All Data points
No. Sites	12
No. Data points per Site	All free memory can be allocated to any site.
Programmable Logging Interval	5 secs to 28 days. Stop logging only when memory is full. Logged data copied to PC via USB BOM drive. CSV file can be imported to Microsoft™ Excel™ or other spreadsheet software.

LANGUAGES	
Standard supported languages	English, French, German, Spanish

OUTPUTS	
USB Interface	Supports most USB 2.0 BOM drives
Analog Output	User selectable in the range 0 to 24 mA. *Accuracy*: < 0.3 % of full scale with user compensation *Alarm current*: Any outside working range between 0 – 24mA. *Isolation*: 100V AC/DC. *Maximum Load*: 600 Ω @ 20 mA
Switched Output	Opto-isolated MOSFET relay. Max load voltage/current: 24 V DC or 24 V AC / 500 mA Isolation: 1 MΩ @ 100 V AC/DC. *Pulse mode* Pulse repetition rates: up to 50 pulses/sec (depending on pulse width). *Frequency mode* Max. pulse frequency: 200 Hz Flow at max. frequency: User selectable

ELECTRICAL SPECIFICATIONS

POWER SUPPLY	
Input Voltage	Nominal 12 VDC
Power Consumption	< 3.2 W with backlight on and current loop output @24mA, all outputs activated. < 20 W (when charging)

BATTERY	
Technology	5-cell NiMH
Capacity	4 Ah
Operating Time	Typically > 14 hours reading flow with backlight off, current loop off and alarms inactive >9 hours continuous with backlight on and current loop

	output @24 mA, all outputs activated.
Recharge Time	Typically < 2.5 Stunden.
Service Life	> 500 charge/discharge cycles

MECHANICAL SPECIFICATIONS

CARRYING CASE	
Rating	All components are contained in a hard-wearing carrying case with a protective moulded foam insert.

HOUSING	
Material	Flame retardant injection moulded ABS
Dimensions	264 mm x 168 mm x 50 mm
Weight (including Battery)	1.1 kg
Protection	IP54

KEYPAD	
Number of Keys	16

DISPLAY	
Format	240 x 64 pixel graphic display, high contrast black-on-white, with back-light
Viewing Angle	min. 30°, typically 40°

ENVIRONMENTAL	
Operating temperature	-20 °C to +50° C
Storage temperature	-25 °C to +65 °C
Operating humidity	90 % RF MAX at +50 °C
Charging temperature	0 °C to +40 °C

APPROVALS	
Safety	BS EN 61010
EMC	BS EN 61326 - 1:2006, BS EN 61326-2-3:2006

SHIPPING INFORMATION	
Box Dimensions	410 mm x 205 mm x 355 mm
Weight	7.5 kg
Volumetric Weight	5.7 kg

Subject to change without notice!

14 Declaration of conformity, Declaration of Incorporation

Wir, die Höntzsch GmbH & Co. KG
Gottlieb-Daimler-Str. 37
D-71334 Waiblingen
Deutschland

erklären in alleiniger Verantwortung, dass das Produkt

ExactSonic III
Clamp-On-Ultraschall-Durchflussmessgerät

auf das sich diese Erklärung bezieht, mit den folgenden Normen oder normativen Dokumenten übereinstimmt:

Richtlinie 2014/30/EG des Europäischen Parlaments und des Rates vom 26. Februar 2014 bezüglich der Annäherung der Gesetze der Mitgliedsstaaten bezüglich Elektromagnetischer Kompatibilität

Richtlinie 2014/35/EG des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Angleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen.

EN 61010-1:2010 Sicherheitsbestimmungen für elektrische Mess-, Steuer-, Regel- und Laborgeräte - Teil 1: Allgemeine Anforderungen

EN61326-1: 2013 Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 1: Allgemeine Anforderungen

EN61326-2-3: 2013 Elektrische Mess-, Steuer-, Regel- und Laborgeräte - EMV-Anforderungen - Teil 2-3: Besondere Anforderungen - Prüfanordnung, Betriebsbedingungen und Leistungsmerkmale für Messgrößenumformer mit integrierter oder abgesetzter Signalaufbereitung

Das nicht von der Höntzsch GmbH & Co. KG hergestellte Akkuladegerät entspricht der Richtlinie EN61204-3.

Waiblingen, 03.03.2023

Jürgen Lempp / Geschäftsführer