titan

INSTRUCTION MANUAL

metraflow

Breakthrough Flowmeter Technology

Ultrasonic Flowmeter Range

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1 General

The Titan Metraflow flow meter represents a new generation of through bore, time of flight ultrasonic flowmeters that uses patented breakthrough technology to offer a wide ranging yet accurate meter. It is ideal for any application which requires a truly non-contact high purity fluid path with a single unbroken, high quality PFA tube being the only contact material with the fluid to be measured.

The user must make sure that the flowmeter selected is suitable for the application and that the chemical compatibility, temperature and pressure requirements are within the Metraflow's operating range. Please check the model number before proceeding.

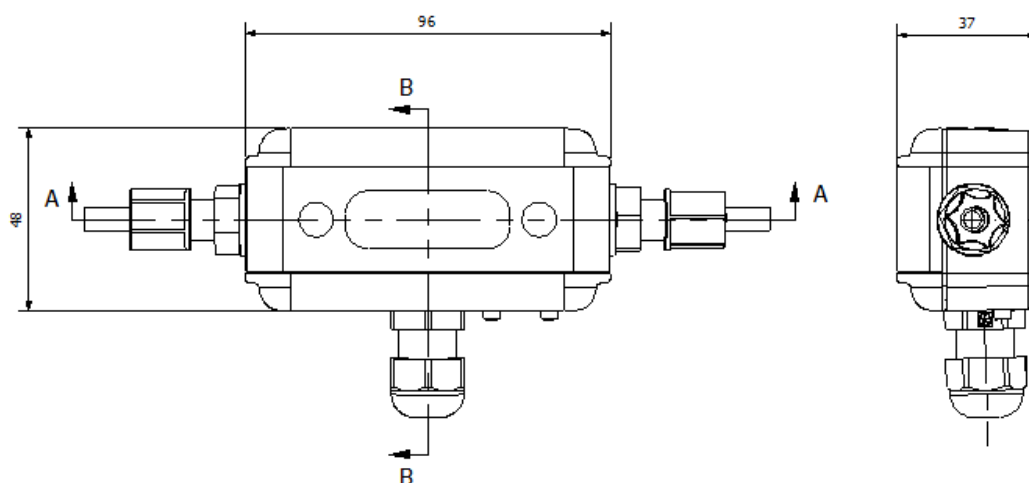All meters can be programmed and monitored via the USB connection.

NOTE: THE METER IS NOT HYGIENICALLY CLEANED

2 Order codes

240-020 1/8" PFA tube	20 to 1000 ml/min	20 Bar	60°C
240-025 1/4" PFA tube	100 to 5000 ml/min	13 Bar	60°C

3 Installation

Dimensions:
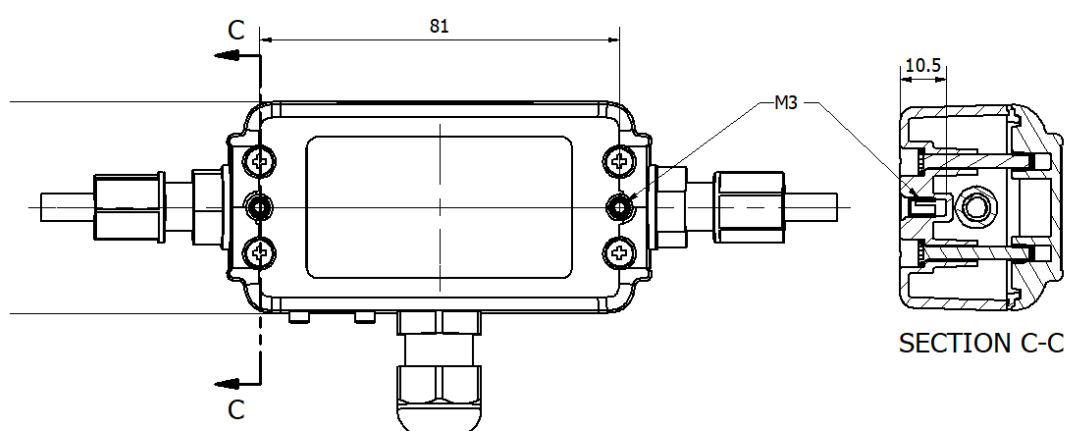

Connections:

Standard units supplied with:

- 150mm PFA hose ends
- 1.0m length 8 way cable

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WARNING: DO NOT DISCONNECT THE PIPE FITTINGS ON THE UNIT AS THIS WILL DAMAGE THE ULTRASONICS!!
THE METRAFLOW HAS A FIXED SINGLE UNBROKEN TUBE WHICH IS HELD IN PLACE WITHIN THE HOUSING
CONNECTION TO THE FLOWMETER IS TO BE MADE ONLY VIA CUSTOMER FITTINGS TO THE TUBE ENDS
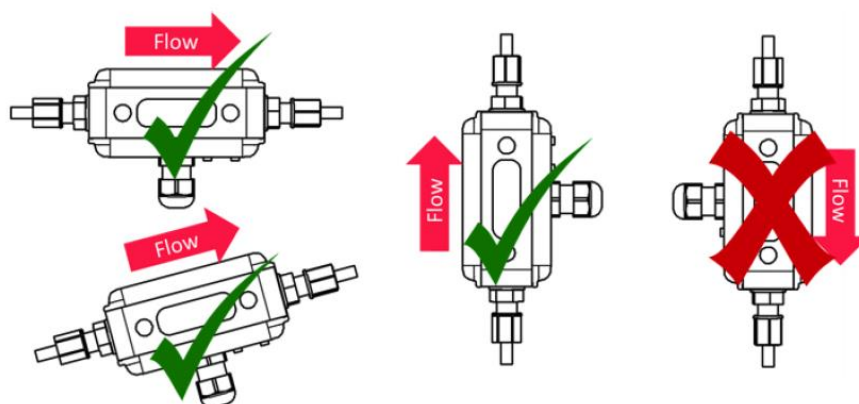
Mounting and Orientation:

Mounting can be done using two M3 threaded ports on the rear of the flow meter

Position the meter either in a horizontal pipe or if in a vertical pipe with the flow in an upward direction. This will ensure that any bubbles automatically clear the meter.

In a horizontal pipe confirm that the system has no air trapped in it. If vertical is not possible, an angle of more than 10 degrees from the horizontal may be acceptable.

Due to Titan's ultrasound algorithms used, straight upstream and downstream pipes are not necessary. It is however, good practice to install the device well away from valves, regulators elbows and other components that could cause random turbulence or gas break-out on the fluid entering or leaving the

meter. As a guide, 10 pipe diameters upstream and 5 pipe diameters downstream are recommended. If necessary use spacer blocks and mounting clips to raise the pipe work away from surfaces. It is good practice to use upstream and downstream isolating full bore ball valves to facilitate easy meter installation or removal.

The Metraflow must be installed in a positive pressure system. Ensure that there is enough back pressure on the flowmeter to keep any gas in solution. We recommend 500mbar plus two times the fluid vapour pressure.

The Metraflow can be operated entirely from a computer using the USB connection. This gives local computer display and an NPN pulse output only. This may not be acceptable in situations where remote operation or further functions are required. The unit will work with systems from Windows XP onwards. Connect to the computer with the supplied 1.0m cable or any suitable USB lead. Do not exceed 5 Meters as this may cause data loss. Run the 1 Meter multicore output cable to a suitable terminal box or instrument. This cable can be lengthened if required, up to 20m.
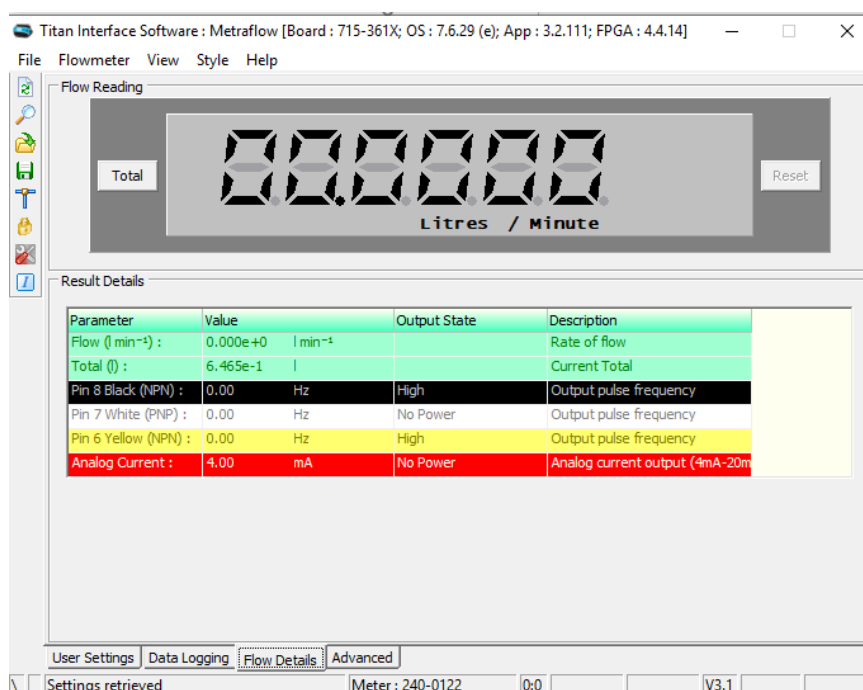
The cable assignments are displayed below:

Wire Colour ("PIN")	Assignment	System
Brown	+10 to 24VDC (>15V for analog outputs)	Power
Blue	0V	Ground
Yellow (PIN6)	NPN Transistor	Input/Output
White (PIN7)	PNP Transistor	Input/Output
Black (PIN8)	NPN Transistor	Input/Output
Red	4-20mA	Analog output (mA)
Orange	0-5 or 0-10 Vdc	Analog output (V)
Green	Analog Common Ground	Analog ground

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4 Setup

Before use, download and install Titan Interface Software from memory stick or website.
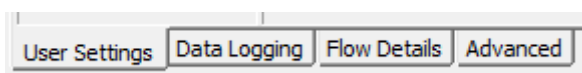
The Metraflow ultrasonic flowmeter should be setup using the USB interface and a suitable computer. Below is a screen shot of the Configuration screen as it typically opens with the flowmeter connected.
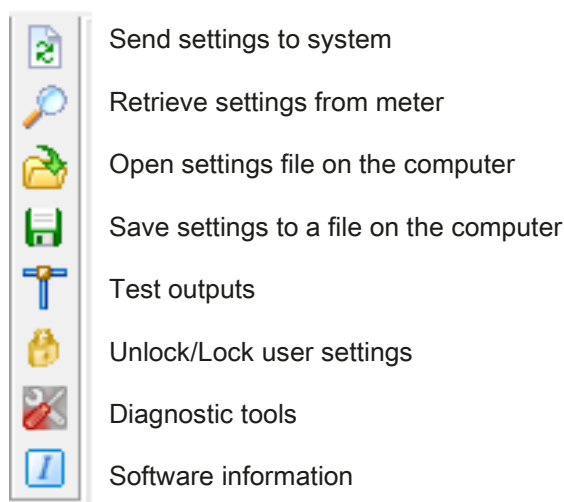

When connected the software should automatically load the settings the meter has been configured. This can be checked by clicking the Check Settings Icon:
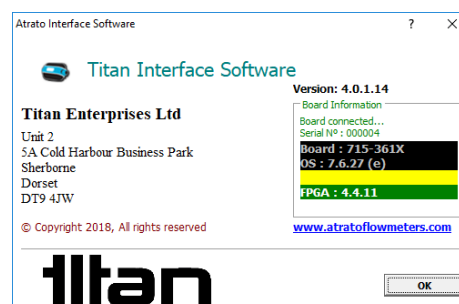
The four tabs at the bottom of the display operate windows for configuration and are: "User Settings", "Data Logging" "Flow Details" and "Advanced".

Major Functions of the flowmeter are governed by the Control buttons to the left of the interface window:

Send settings to system

Retrieve settings from meter

Open settings file on the computer

Save settings to a file on the computer

Test outputs

Unlock/Lock user settings

Diagnostic tools
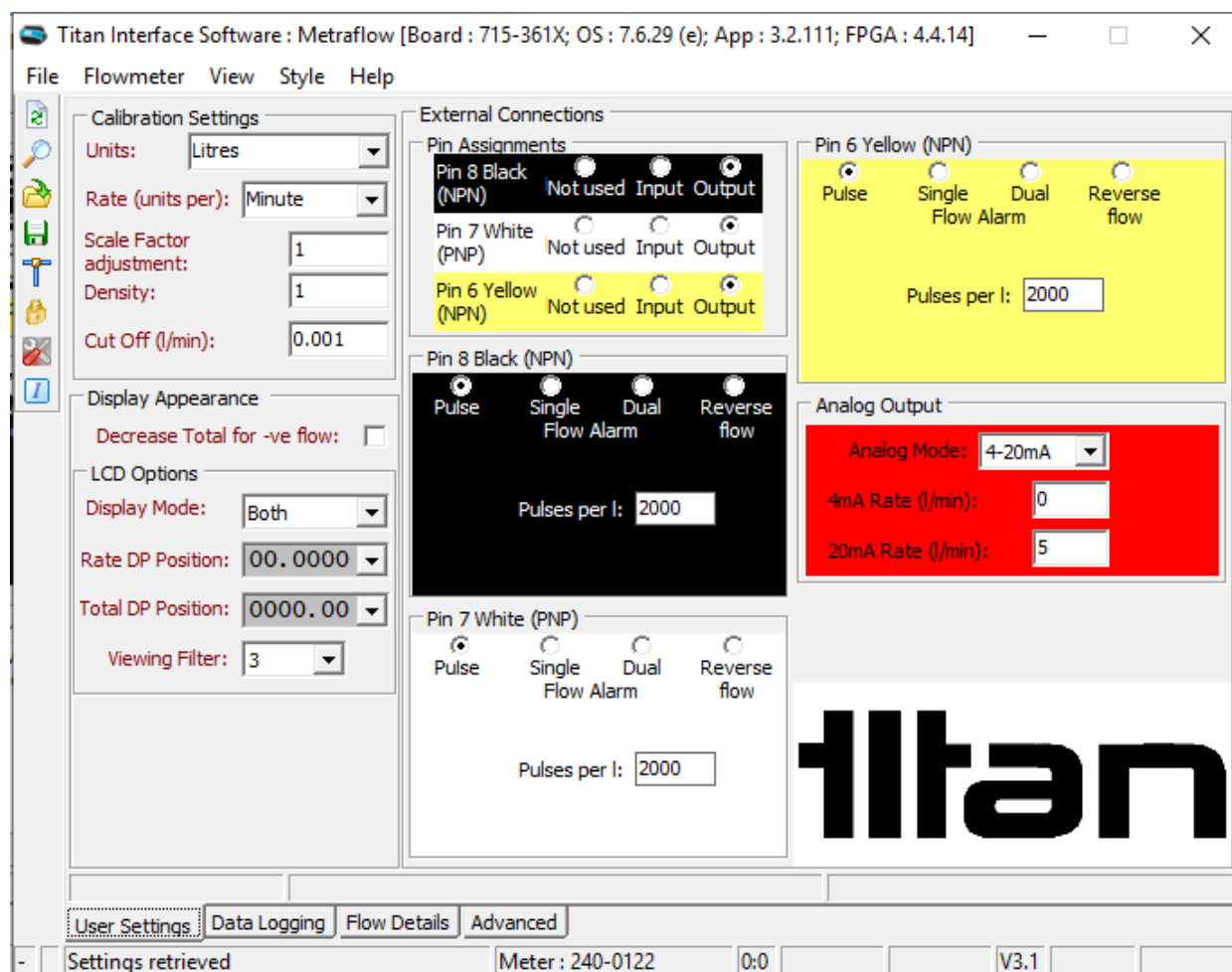
Software information

The Software information panel has details including the flowmeter serial number and software versions currently running on the meter.

To modify the configuration click "User Settings" tab at the bottom of the screen and ensure the system is unlocked for editing .

When modifications are completed press the Send Settings to Meter Icon, before closing the Interface software to ensure the changes are written into the meters PCB.

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Screen shot of the "User Settings screen:

Titan Interface Software : Metraflow [Board : 715-361X; OS : 7.6.29 (e); App : 3.2.111; FPGA : 4.4.14]

File   Flowmeter   View   Style   Help

Calibration Settings

Units: Litres

Rate (units per): Minute

Scale Factor adjustment: 1

Density: 1

Cut Off (l/min): 0.001

Display Appearance

Decrease Total for -ve flow: ☐

LCD Options

Display Mode: Both

Rate DP Position: 00.0000

Total DP Position: 0000.00

Viewing Filter: 3

External Connections

Pin Assignments

Pin 8 Black (NPN)   Not used   Input   Output

Pin 7 White (PNP)   Not used   Input   Output

Pin 6 Yellow (NPN)   Not used   Input   Output

Pin 8 Black (NPN)

Pulse   Single Flow Alarm   Dual   Reverse flow

Pulses per l: 2000

Pin 7 White (PNP)

Pulse   Single Flow Alarm   Dual   Reverse flow

Pulses per l: 2000

Pin 6 Yellow (NPN)

Pulse   Single Flow Alarm   Dual   Reverse flow

Pulses per l: 2000

Analog Output

Analog Mode: 4-20mA

4mA Rate (l/min): 0

20mA Rate (l/min): 5

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User Settings | Data Logging | Flow Details | Advanced

Settings retrieved   Meter : 240-0122   0:0   V3.1

Multiple Window Operation:

To aid set up whilst operating the meter it is possible to detach the Flow Details and Advanced windows by dragging and dropping the bottom tabs away from the main window. This allows the user to view those tabs whilst adjusting the User Settings.

The Flow Details window may be further reduced or expanded using the minimise and maximise icons respectively in the top right hand of the window

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User Settings Tab:

Calibration Settings

This section specifies the units you wish the meter to operate in.

Units: A drop down menu offers the choice of - Litres, cc, gms, kg, US gallon, Imperial gallon or Custom units i.e. blank.

Rate (units per): This is the time base for the flow rate and has the option of Second, Minute or Hour.

Scale Factor Adjustment: This is a fine tune adjustment on the signal to compensate for errors introduced by erratic flow or other system irregularities

Density: The flowmeter is fundamentally a volumetric device but a density figure can be entered here if one of the mass units are selected. Caution must be used however as there is no temperature/density correction.

Cut Off: Flow values below this level will be set to zero.

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Display Appearance:

The down arrows select the various display functions:

Decrease Total for -ve flow: The meter will not register negative flow unless this box is checked.

For reverse flow the rate will show a "-" sign before the rate and the total will be reduced accordingly. One of the transistor outputs (PNP or NPN on Pin 6, 7 or 8) could be configured to give a logic level when reverse flow is detected.

Pulses are only output on reverse flow, when this box is selected.

Display Mode: The down arrow selects from the various display and Metraflow functions.

The options are:

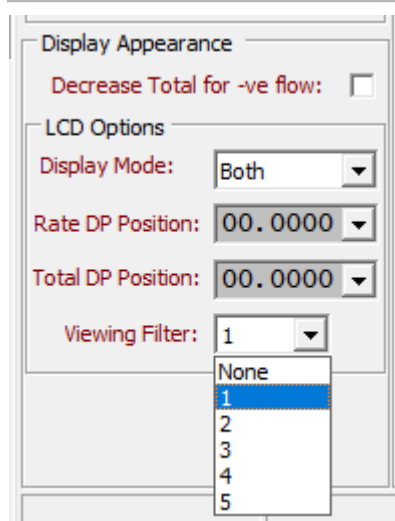**Rate** – The display will show flow rate only.

Total – The display will show total flow only.

Both – The display can be cycled from rate to total using the left hand button on the Meter or the left button in the Flow Details window on the Interface. A remote input can be configured to perform this function (See: Pin Assignments).

Rate DP Position: Use the drop down menu to choose the required decimal point position.

Total DP Position: Use the drop down menu to choose the required decimal point position.
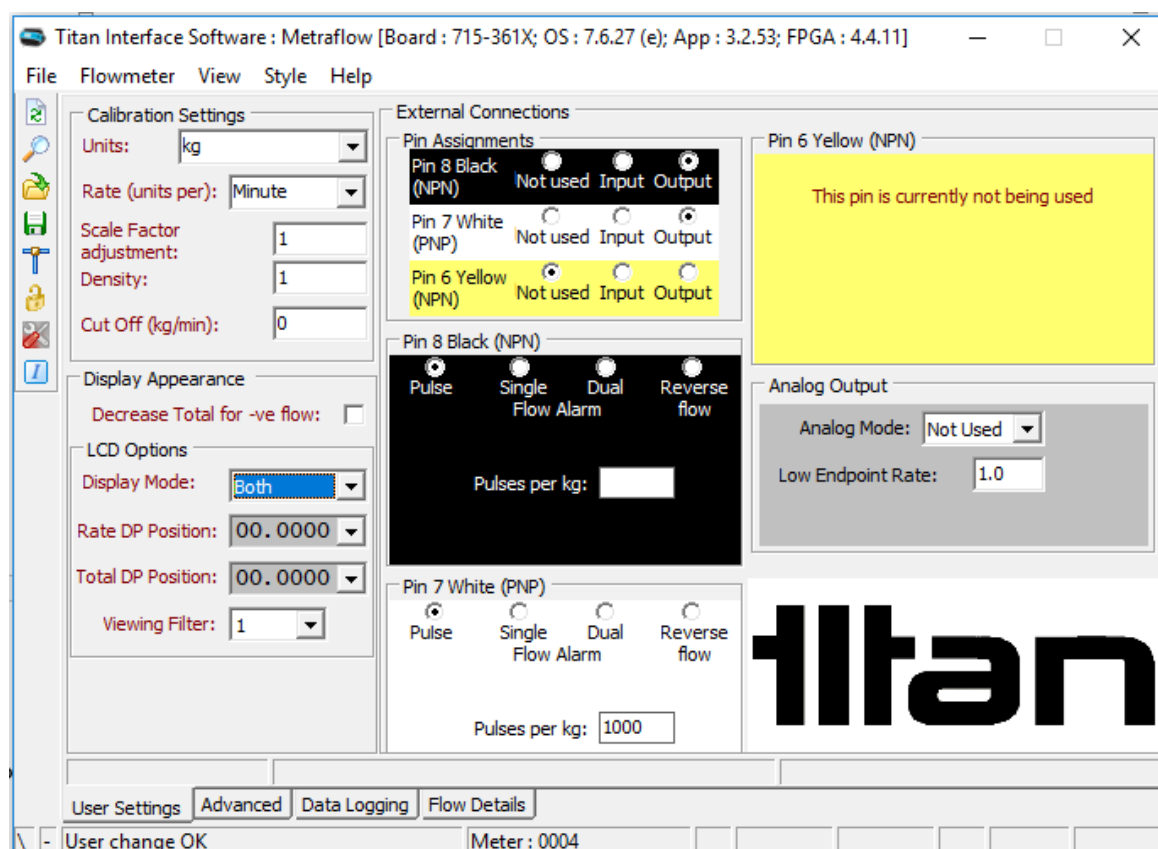
If the decimal point is set too low and the display value exceeds the setting capacity the display will show "oF"
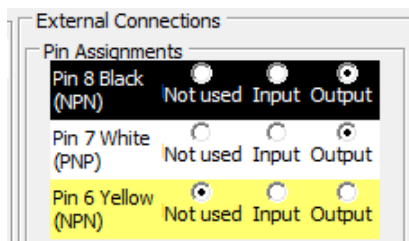
Viewing Filter: This prevents the display, flow switches and analog outputs from jittering with irregularities in the flow from, for example, a peristaltic pump. The increments are arbitrary with the degree of damping approximately doubling with each level. Increments go up to 5, which may take up to a minute to stabilise.

External Connections

In this section you can configure what functions you wish the output cables/pins to perform.
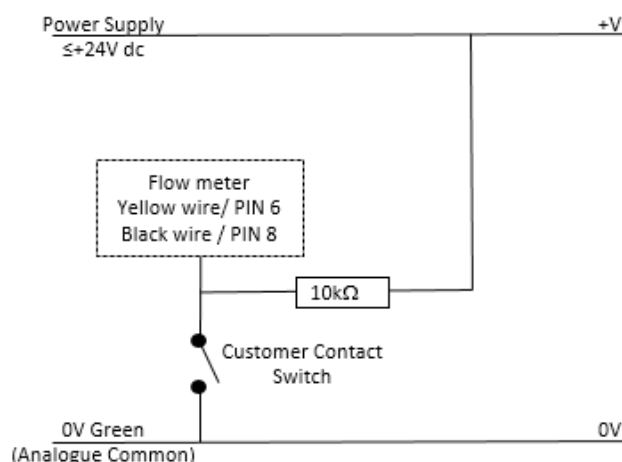
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Pin Assignments:

Each of the PIN Assignments can be adjusted as either an input or an output function. The operation to modify PIN 6, PIN 7 and PIN 8 are identical within the software, with the exception of the type of transistor pulse output. PIN 6 and PIN 8 are both NPN, whilst PIN 7 is a PNP type.

The options for each PIN (or wire colour), are: ⊙ *Not Used* ⊙ *Input* or ⊙ *Output*

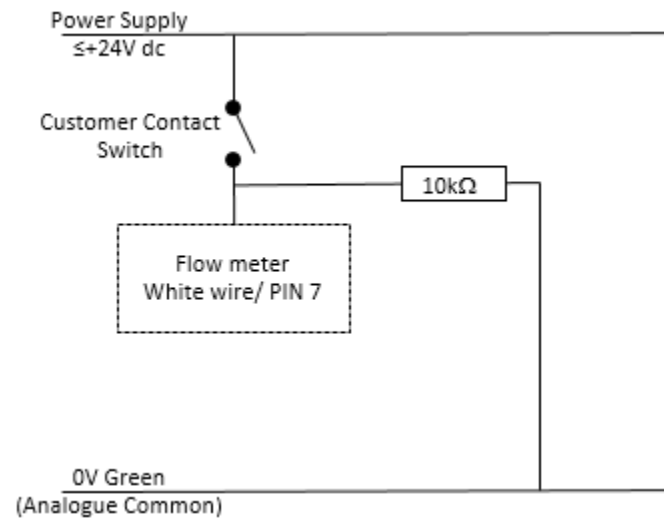Not used: The assigned PIN / WIRE is unused.

Input: Select this to use the PIN assigned as a TTL digital input for remote control, either for Resetting the Total Count or Resetting an Alarm.

When using electrical inputs for **PIN 6 Yellow and PIN 8 Black,** in input mode, the NPN (NFET) open drain output is disabled, and the input pin responds to an external input voltage which may be in the range of 0V to 30V. The logic threshold is at 2V so this input can be driven directly from a logic signal at TTL levels or CMOS at 3.3V or 5.0V levels. Alternatively, if this input is provided by a switch, then an example circuit is given below:

PIN 7: In input mode, the PNP (PFET) open drain output is disabled and the input PIN responds to an external input voltage which may be in the range of 0V to 30V. The logic threshold is at 2V so this input can be driven directly from a logic signal at TTL levels or CMOS at 3.3V or 5.0V levels.

Warning: because of the potential for conflict should the PNP output be activated accidentally, Titan Enterprises Ltd recommend a series resistor and Zener be fitted to safeguard any connected circuitry operating at logic levels. Alternatively, if this input is provided by a switch, then an example circuit is given below:
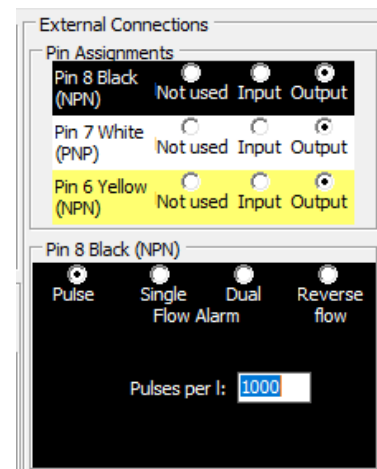
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WARNING:

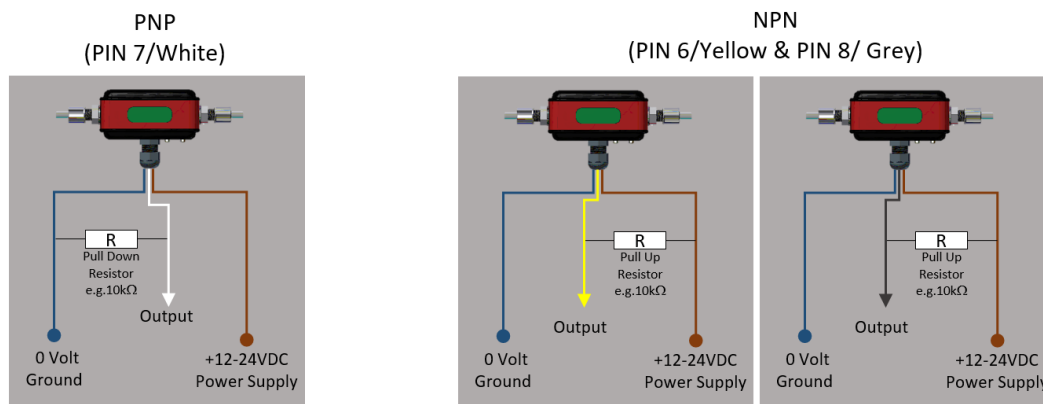**INCORRECT ELECTRICAL INSTALLATION CAN CAUSE DAMAGE TO USERS' ELECTRONICS**

Output: Select this to use the PIN/Wire colour assigned as a PULSE; FLOW ALARM (SINGLE OR DUAL) or REVERSE FLOW output signal.

PULSE: The Metraflow has two options for Pulse output configuration depending on which PIN/Wire colour is chosen:

- PIN 6 **Yellow** and PIN 8 **Black** are both NPN pulse outputs;
- PIN 7 **White** is a PNP.

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Example wiring for pulse output:

PNP
(PIN 7/White)

NPN
(PIN 6/Yellow & PIN 8/ Grey)

PULSE per: Enter the number of pulses per unit volume required. This figure can be adjusted to suit the application and the flow range required from the meter.
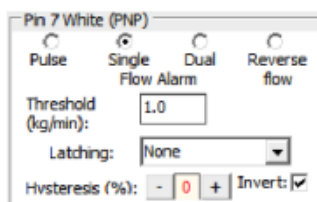
The maximum output frequency is 10 kHz. So care must be taken to ensure that this pulse rate is not exceeded.

E.g. 5 L/Min at 10 Kilohertz equals (10,000 x 60)/5 = 120,000.Therefore 120,000 pulses per litre is the maximum resolution for 5 litres per minute assuming maximum frequency output. If the meter is being used up to 1 L/Min the pulse output and so resolution could be increased to five times this, 600,000P/L.

It is possible to send a test signal at varying Hz for each of the pulse output PIN/Wires. Clicking opens a menu where you can choose a rate of Hz of pulse outputs which will be automatically sent for approximately 30 seconds.

NOTE: *ABOVE 1KHZ IT IS RECOMMENDED THAT THE SYSTEM WIRING IS REVIEWED TO ENSURE IT IS ADEQUATE FOR THE SAMPLING RATE.*
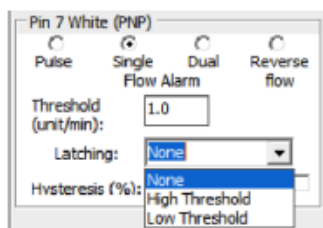
Flow alarm outputs

Single flow alarm: Checking this option opens up input boxes for THRESHOLD; LATCHING and INVERT.

Set the **Threshold** to the flow value you require the transistor to operate. The logic of operation can be adjusted with the **Invert** check box (see left).

The **Latching** box gives the user three options of None, High Threshold and Low Threshold.

- "None" will cause the alarm to be triggered when the threshold flow is met. The alarm state will then reset in accordance with the user set Hysteresis*.

- "High Threshold" will cause an alarm signal to Latch on when flow is seen above the set value.

- "Low Threshold" will cause an alarm signal to Latch on when flow is seen below the set value.

* Hysteresis (%): This is used when Latching is set to NONE to prevent "fluttering" of the alarm signal when flow is around the threshold level.

LATCHED alarms will remain active and the local display will show "LATCH" until they are reset. RESET LATCH ALARMS by either a signal input on one of the other Input/Output PINS, or by pressing and holding the left hand button on the local display on the flow meter for 3 seconds.

Note the alarm points are driven by the display value on the "flow reading" screen. Any changes to the filter value of the display will affect the response time of the alarm points so there are two adjustable parameters to ensure "fluttering" does not happen with small flow fluctuations - response time and hysteresis.

INVERT – This check box allows the user to invert the operation of the signal.

Invert: ☑ Checked – Alarm output logic HIGH.

For details see the Alarm logic table or hover mouse over the set point to see the action of the output with the chosen settings.

Dual flow alarm: Checking this will enable a range of flow to be entered. When the flow is outside/inside of this range the alarm will be triggered.
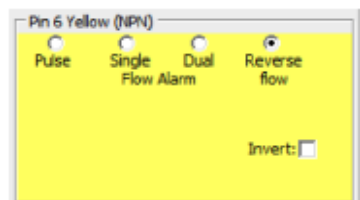
The remaining settings in the input box are the same as for single flow alarms.

- When no Latching is chosen the alarm will automatically reset in proportion to the user set Hysteresis.

- The Latched Alarm can be reset by a signal input on one of the other Input/Output PINS, or by pressing and holding the left hand button on the local display on the flow meter for 3 seconds.

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- The **Invert** checkbox will reverse the action of the alarm output. (See the Alarm Logic Table).

Reverse flow alarm:

This option allows the user to send a signal from the assigned wire/PIN when reverse flow is seen.
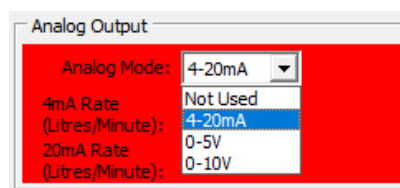Selecting **Invert** will reverse the action of the signal.

Alarm Logic Table

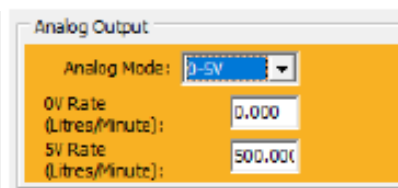| Flow Alarm	Latching	Invert	Alarm Action Below Threshold	Above Threshold
Single	None	Unticked	OFF	ON
Single	None	Ticked	ON	OFF
Single	High Threshold	Unticked	OFF	ON
Single	High Threshold	Ticked	ON	OFF
Single	Low Threshold	Unticked	ON	OFF
Single	Low Threshold	Ticked	OFF	ON
			In Range	Outside Range
Dual	None	Unticked	OFF	ON
Dual	None	Ticked	ON	OFF
Dual	Out of Range	Unticked	OFF	ON
Dual	Out of Range	Ticked	ON	OFF
			Forward Flow	Reverse Flow
Reverse Flow	n/a	Unticked	OFF	ON
Reverse Flow	n/a	Ticked	ON	OFF

Analog Output

There are four options on the drop down menu: Not Used, 4-20mA, 0-5 Volt and 0-10 Volt.

When an analogue output is assigned the appropriate wire will then be activated:

- 4-20mA – Pink Wire
- 0-5Vdc – Red
- 0-10Vdc – Red

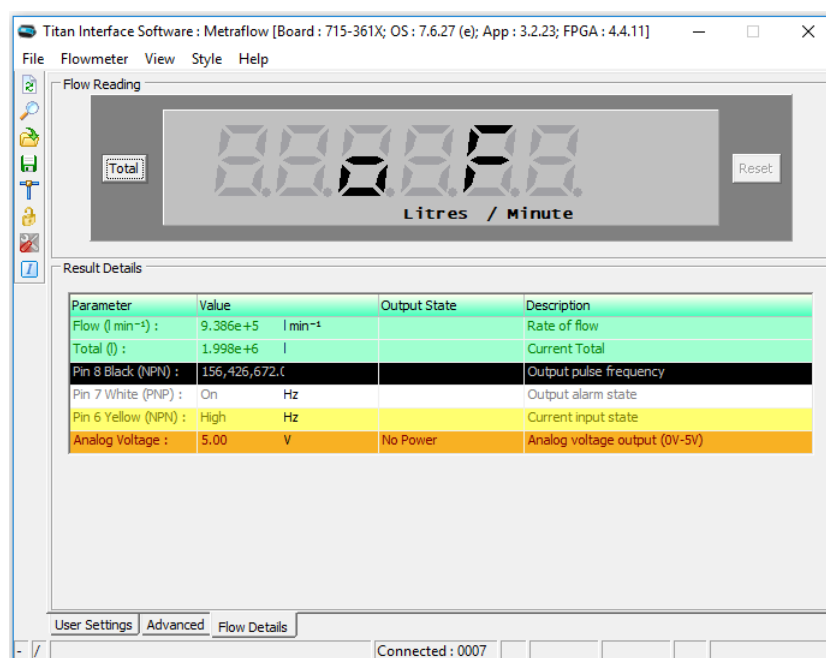4-20mA = RED wire   0-5V = ORANGE wire

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Once the selection has been made a further two boxes for entry of the analogue output at zero flow and full scale appear. These are numeric entries in the units and time base as selected in Calibration Settings.

It is possible to send a test signal to the outputs of the meter using the Test Outputs Icon on the left hand side of the main screen. Clicking opens a menu where you can choose a % analogue output value which will be automatically sent for approximately 30 seconds.
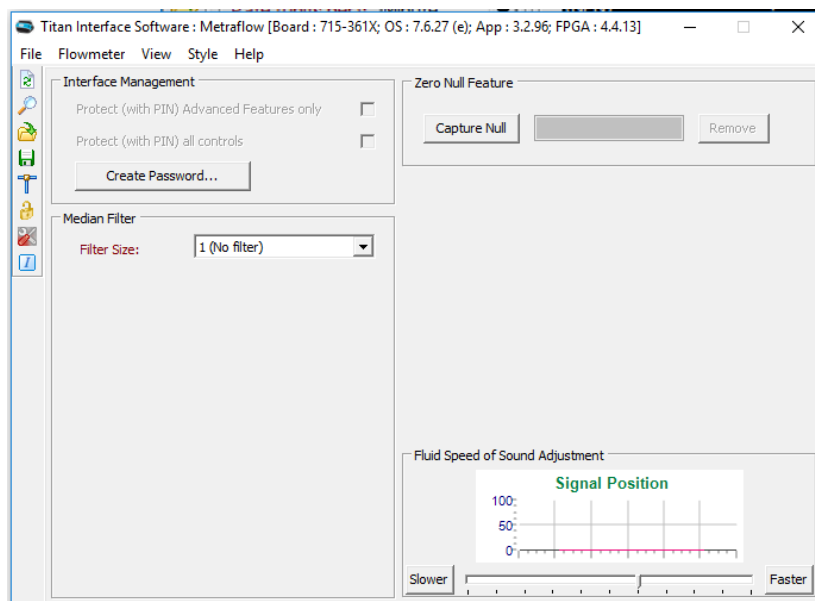
Flow Details Tab

The large display reflects the meter readings showing on the Metraflow LCD Display.
The RESULT DETAILS window below the large rate and total display shows the flow and total readings and the assignment of PIN6, 7 & 8 (yellow, white, black wires), whilst the meter is operational.

![metraflow logo]

Advanced User Tab

Interface Management:

This allows the operator to restrict access to the configuration of each meter.

Protect (with PIN) Advanced Features Only: Allows users to restrict access to advanced pages.

Protect (with PIN) all controls: Allows users to restrict all configuration modifications to the system.

To use these features it is first necessary to create a PIN. This is a four digit number in the range 0001 to 9999. Setting a value of 0000 tells the software there is no PIN and this is how to remove the PIN. After allocating a PIN these check boxes can lock all of the settings or just the advanced user.

If you forget your PIN please contact you supplier for the default value. Once entered, all the setting parameters remain visible. In the 'Help' menu, the user can 'Log On using PIN...' but the user will be prompted for the PIN prior to making any changes.
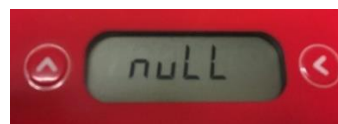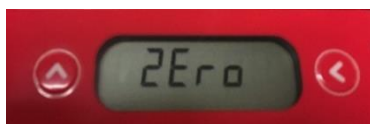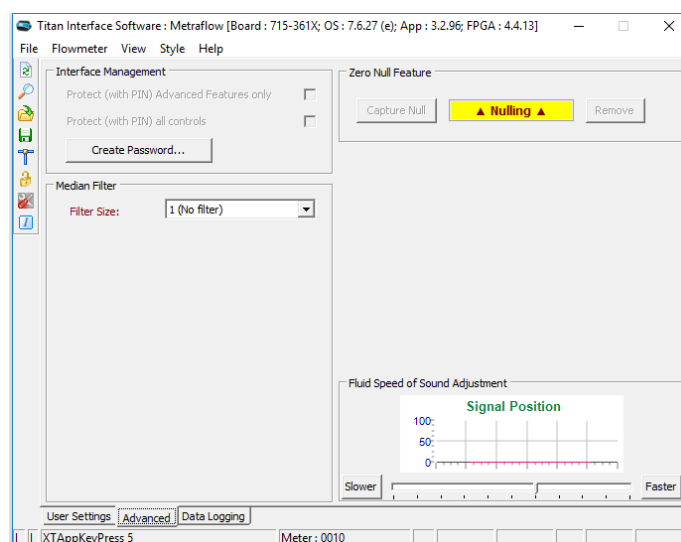
Zero Null Feature

There will always be a small amount of "background noise" due to ultrasound remaining within the tube between successive pings. This should be zeroed for best accuracy.

The noise affects low end performance and accuracy across the whole temperature range. The meter is calibrated at ambient temperature, typically 21 to 25°C. To zero the background noise, fill the meter with fluid under pressure at the desired metering temperature and use the Zero Null Feature:

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Capture Null:

This feature can be operated from the Titan Interface Software or using the Local Meter Display.

Stop the flow and operate the **Capture Null** button in the Advanced Tab of the User Interface Software or **press both buttons on the top of the meter simultaneously for 5 seconds**. The local display will change to a cycling "**zero**" "**null**" while the measurements are being taken and the Zero Null feature box in the software will change to state "Nulling".

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When the null measurement is complete the local display will revert to normal 000.00 as formatted and the software screen will show **"Nulled"**

This cannot be done if liquid is flowing. This zeroing will affect future calculations and the meter will give the best accuracy over the whole flow range for the temperature at which the system was zeroed. If the temperature of the tube changes, the position of the noise and its effect on the calculation will change. This is in the order of ±0.25 to 0.5% FSD if the system is not "zeroed" at the actual fluid running temperature. If measurements are required over a temperature range we would recommend stopping the flow and nulling the system at a mid-point in the desired temperature range. This will reduce the FSD error considerably.

After the unit is zeroed lower flows than specified can be registered but the accuracy is likely to be poor. To register these lower flows the "Cut off" in the "Calibrations settings box" should be set to just above 0.00 and at a flow rate above the point the meter records flow when none is happening but below the minimum flow specified for the meter. If it is set to 0.000 residual background noise will cause small readings even when there is no flow. If readings are seen, increase the value sequentially until no output is recorded, typically around 0.002 l/min.

REMOVING NULL: This can be done via the software using the **REMOVE** button in the Advanced Tab or resetting the flowmeter by cycling the power off and back on.
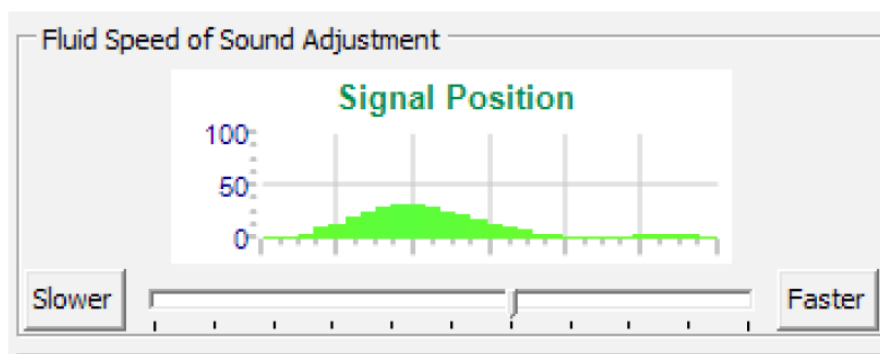
Fluid Speed of Sound Adjustment:

The Metraflow ultrasonic flowmeter is factory calibrated on clean water at about 20°C and therefore the window of calibration is based around the measured time of flight of the ultrasonic signal based on the speed of sound of water. When a fluid is used in the meter that has a significantly different speed of sound to that of water, the stable signal may move outside of the window causing the meter to read incorrect and unstable time of flight signals whilst the automatic ranging tries to find the correct position of the flow signal. In this scenario you can compensate this delay in response by manually adjusting the measurement window of the meter in the advanced tab feature for Fluid Speed of Sound Adjustment. A bar is seen in the graph indicating whether a strong signal is being measured. If a fluid has a faster speed of sound the user can click the FASTER button to adjust the measurement window a stronger signal point. A RED graphic is a very poor signal, ORANGE indicates a weak signal and GREEN is a good strong signal.
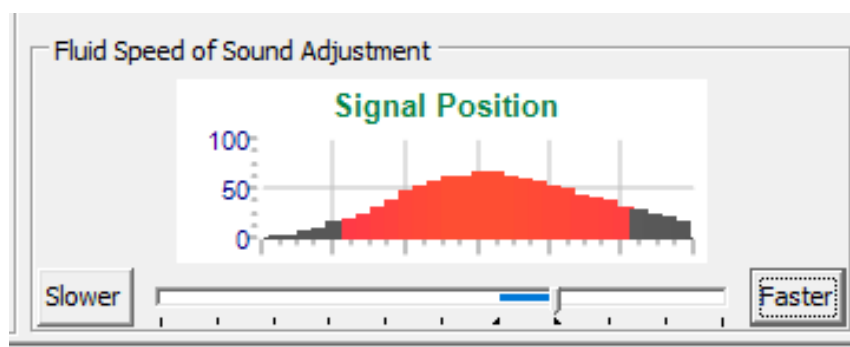
Once this signal adjustment is in place the meter will automatically look to that position when powered up, ensuring the most accurate measurement point is taken.

Then if required, the user can enter a simple scaling factor on the User Settings tab, to accurately adjust the water calibration to that of the fluid being measured,.

Good signal strength and position:

Poor Signal strength and an adjusted speed of sound position:

Median Filter

This filter removes short term anomalies in the recorded flow e.g. an air bubble passing through. It should be used with caution as it is theoretically possible that over use of this feature could lead to incorrect results in certain circumstances. Under normal operating conditions the meter returns around 25 results per second and a regular occurrence at this frequency could be completely ignored thus causing problematic readings.
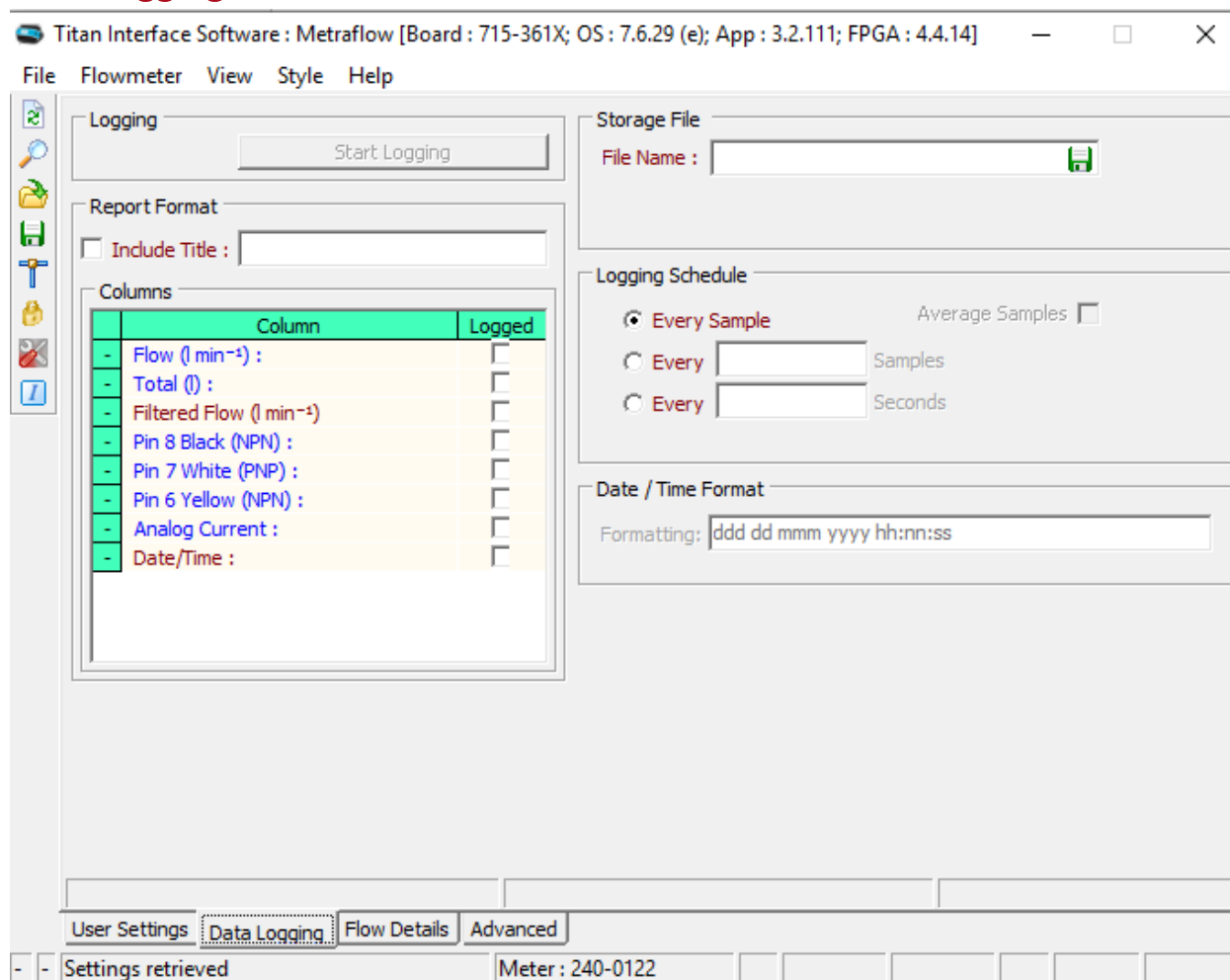
The filter is a moving window taking the middle number from an odd number of results selectable between 1 and 21. It is not an average or mean and it is designed to totally ignore one or more results. A simple example is shown below for a median value of "3".

Recorded flow	Used flow
0	0
1	1
1	1
2	2
2	2
3	2
0	3
3	3
4	4
4	4
4	4

2 3 0	0 2 3	2 is used
3 0 3	0 3 3	3 is used
0 3 4	0 3 4	3 is used

The seventh flow in the table above is zero. This could have been a small bubble passing through the flow meter bore which could completely absorb the ultrasound. The median filter completely ignores this reading and for the zero reading returns the value of 3 from the results either side. This filter is particularly useful at low flows where a small dip in value could drop a result below the internal cut off levels.

Data Logging Tab

The interface software allows the user to log the selected meter data on the PC when connected via the USB.

Storage File:

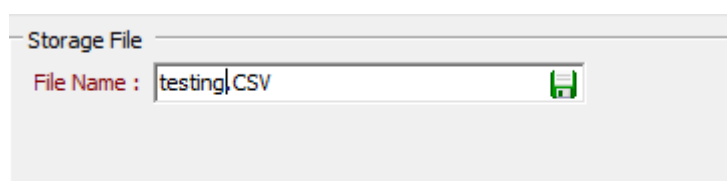Click on the disc icon ![disc icon] and create a\ file name in your chosen directory

NOTE: DO NOT USE SPACES IN THE FILE NAME

Once created click select and it will show in the text box.

NOTE: YOU MUST CLICK THE ICON FOR A NEW FILE TO BE CREATED – TYPING IN THE TEXT BOX DOES NOT CREATE A NEW FILE

Report Format:

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Here is where you chose which parameters you wish to log.

If you wish to have a title in the worksheet of the *.csv file, create one in the text box and tick the Include Title box.
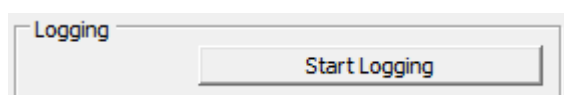
Logging Schedule:

You have the options to log every sample taken, every x number of samples or every x second of time.

Date / Time Format:

Choose your preferred format for the log file.

Logging:

Once all the required parameters have been chosen and file created logging is started by Clicking the Start Logging Button

Local Display

The Metraflow has local indication which is mimicked on the user interface software FLOW DETAILS tab and limited PUSH BUTTON interface ability.
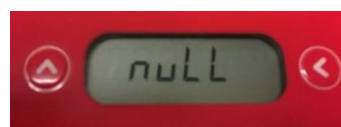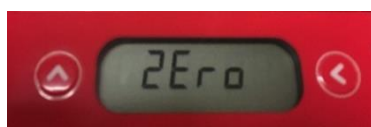

The left hand button scrolls between TOTAL and RATE on the display. Press and hold for 3 seconds to RESET a LATCHED ALARM.

Press the right hand button to RESET the TOTAL FLOW value.

Pressing both buttons simultaneously for 5 Seconds will operate the NULL feature (see Zero Null Feature). This must be done at no flow. The display will cycle "Zero" "null" while calculating

5 Technical Specification

Flow Range	20 to 1,000 millilitres per minute 100 to 5,000 millilitres per minute
Linearity	±0.5% FSD (*±1% reading)
Turndown	50:1
Repeatability	±0.1% plus ±0.02%FSD
Housing Rating	IP63
Temperature range	-10 to +60°C non condensing
Maximum Working Pressure	1/8" Tube: 27Bar @25°C; 20Bar @60°C 1/4" Tube: 17Bar @25°C; 13Bar @60°C
Process Connections	1/8" OD PFA Tube End 1/4" Tube OD PFA Tube End
Power	10-24VDC; 100mA typical (>15VDC required for analog outputs)
Outputs	• 2 x NPN Pulse (5kHz, 20mA Max.) – Configurable In/Out • 1 x PNP Pulse (10kHz, 20mA Max.) – Configurable In/Out • 4-20mA Analog Source (250mOhm Max.) • 0-5VDC Analog (14 bit resolution) • 0-10VDC Analog (12 bit resolution)
Software	Titan Interface Software: • Windows Based Software • USB to PC Connection • Parameter Configuration • Visual PC Display • PC Data-logging Capabilities • Measurement Filtering • Signal Strength Indicator • Advanced Features • Output Test Signals
Inputs	• 2 x NPN Pulse (5kHz, 20mA Max.) – Configurable In/Out • 1 x PNP Pulse (10kHz, 20mA Max.) – Configurable In/Out
Display	6 Digit LCD with annunciators
Connections	8 Wire 1 meter flying lead (PU jacket 32x0.1 conductors) Programming PC to Meter USB lead
Flow Measurement	Ultrasonic Time of Flight
Fluid Speed of Sound Range	Automatic Ranging to compensate for fluid speed of sound variation

*±1% Reading in isothermal conditions
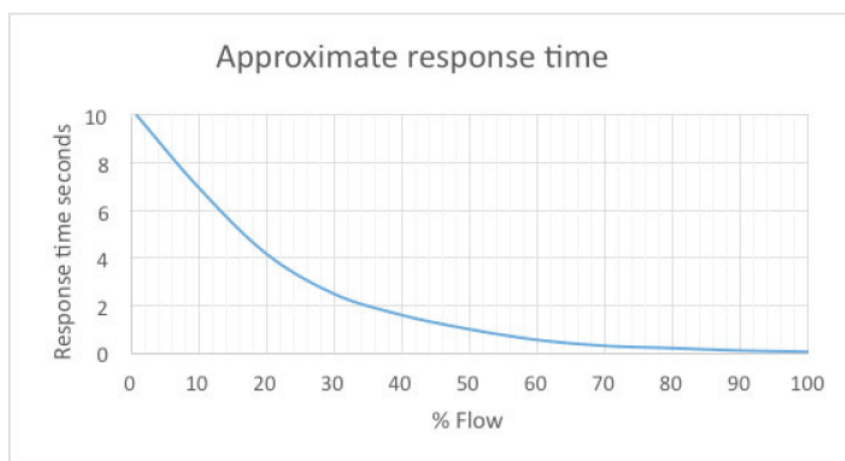
Low flow measurement and temperature effects

There will always be a small amount of "background noise" due to ultrasound remaining within the tube between successive signals.

The noise affects both the low end performance and accuracy across the whole temperature range. The meter is calibrated at ambient temperature, typically 21 to 25°C.

Details of how to compensate and improve the accuracy of the meter at different temperatures can be found in the Zero Null Feature in the previous section.

Response time

The response time of the meter is not constant and is slower with lower flow rates. At full flow it is in the order of 50ms but at lower flows several seconds. This improves repeatability for the digital outputs and is similar in effect to the viewing filter when using the analogue outputs.

Pulsating Flow

If the meter is subjected to heavy pulsations in the flow, for example from a diaphragm pump, it is recommended that a pressure regulator and a pulsation damper are installed upstream of the flowmeter. A length of flexible tubing with an in-line restrictor towards the end are often effective. The median filter should be set to 1 and it may be necessary to set the display filter to a high value. The Metraflow's internal cycle time is not adjustable, is independent of the response time and should this measurement period coincide with, or be close to, the pulsations in the flow, very large errors in the flow calculations will occur.

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Gas Entrainment or Modulating Fluids

Fluids which entrap gasses or seriously modulate the ultrasound will cause problems with the time of flight measurement. This might include viscous fluids being re-circulated from a small volume reservoir or Glycol type fluids.

Gasses seriously affect the ultrasound and should be avoided. It is recommended that the meter is always installed in a positive pressure system with a **back pressure of at least 0.5 Bar plus 2 times the fluid vapour pressure**. It is preferable to install the meter in a way that any trapped vapour can escape the flow measurement section. i.e. in a vertical line with the flow upwards.

The meters are calibrated on water at ambient temperature typically 21 to 25°C.

6 Troubleshooting

Symptom	Cause	Solution
No LCD Display	Power supply too low	Ensure >10VDC supply connected
Erratic Flow Reading	Too low a signal	Check Advanced Tab for signal strength
	Back Pressure inadequate	Increase Back Pressure to 500mbar + 2xvapor pressure of the liquid
	Gas in flow meter	Increase flow to purge line Ensure position optimum for ensuring no gas can be entrained in the flowmeter
Erratic or Cycling Flow Rates at constant liquid flow	Pulsating flow causing aliasing of the flow meter sampling in relation to the flow pulsation	Remove or Dampen pulsation to below 10Hz
Noisy flow reading at low flow	Gas in flow meter	Increase flow to purge line Ensure position optimum for ensuring no gas can be entrained in the flowmeter
Flow reading incorrect after period of shut down	Flow Signal incorrectly positioned	Reset the meter – power cycle
	Gas lock in pipe	Purge line with high flow and restart meter
Calibration incorrect	Zero set at wrong temperature	Remove Null by power cycling meter or using Titan Interface Software
Calibration incorrect at start up. After minutes of operation system corrects itself	Speed of sound of fluid significantly faster/slower than water	Check signal using Titan Interface Software and manually adjust to ensure meter starts up looking in correct time window.
No Pulse Output on Wire but output showing on Interface Software	Incorrect Wiring	Check Pull up or Pull Down resistor are wired correctly according to the diagrams in the manual
No Pulse Output on output or showing on Titan Interface Software	Reverse Flow	Check Settings installation If reverse flow is required to give a pulse output, check the Decrease Total for -ve Flow box in the User Settings

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Symptom	Cause	Solution
No analog output	Incorrect Configuration	Check correct configuration and wiring is used. Ensure Values in the range boxes are adequate for the flow being measured
	Voltage too low	Increase power to meter to >15VDC
Analog output not correct	Voltage too low	Increase power to meter to >15VDC
	Settings incorrect for Range	Use Titan Interface software to range the analog output flow min and max points

If you require further assistance please call +44 (0) 1935 812790 or email sales@flowmeters.co.uk

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