

Flowmaster

Portable Flow and Pressure Tester

OPERATION MANUAL AND MAINTENANCE MANUAL

MODEL Flo-Cal 250, EMF-300 and 400

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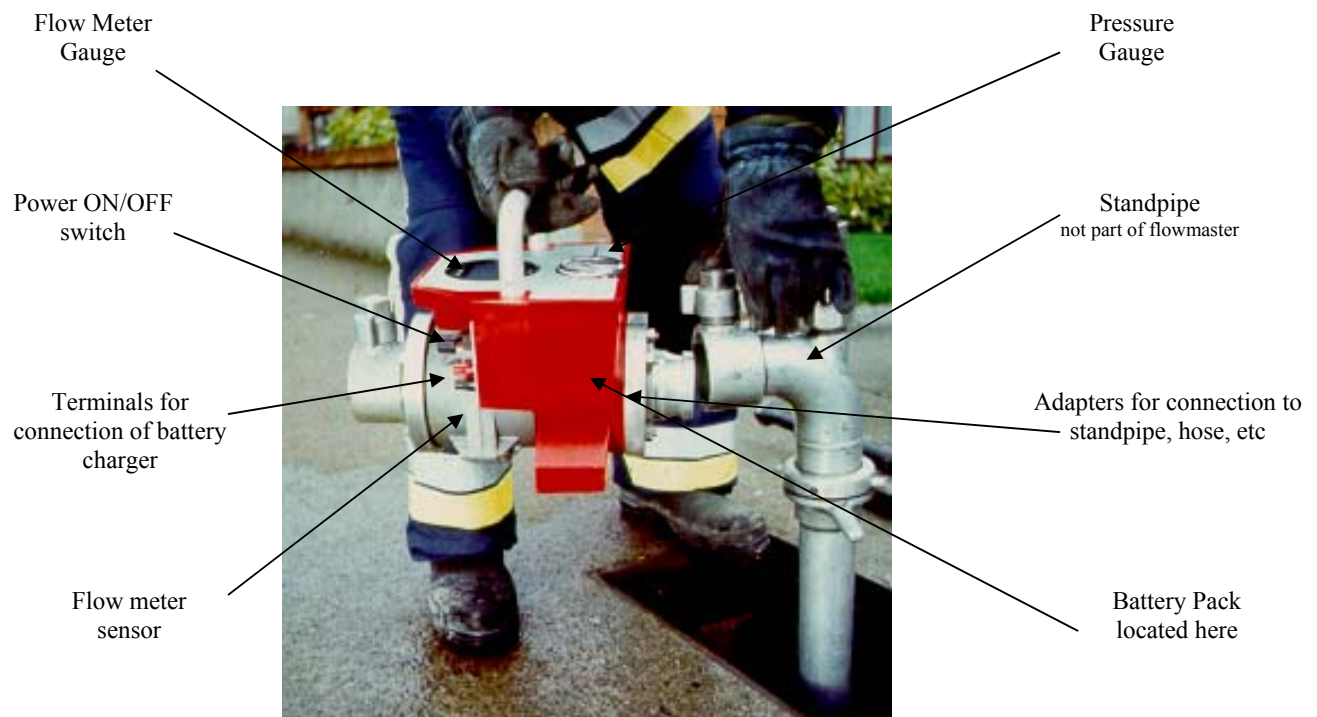
TSI Flowmeters Ltd.
24 Rockdale, Mountrath Road, Portlaoise, Co. Laois, Ireland.
Tel: +353-87-235-2107 Fax: +353-502-63852
Email: info@tsi.ie Web: www.tsi.ie

1. Getting to Know Your Flowmaster

This portable flow and pressure tester was developed in conjunction with UK and Irish Fire Brigades to meet the need for professional and easy appraisal of available pressure and flow at the service point.

The main features of the TSI *Flowmaster* are:

- Measures static pressure, residual pressure, instantaneous flow, total flow.
- Fully portable
- Easy to use - simply attach to the fire hydrant outlet.
- There are no moving parts in the sensor - eliminating breakdowns.
- Easy to read digital display.
- Convenient carrying handle.
- Powered by internal, rechargeable battery pack.
- Robust and durable.



Picture 1: Description of main components of the Flowmaster

2. Specifications

• General

- Weight 12.0 kg including battery pack & instantaneous adaptors.
- Dimensions 390 (L) x 240 (W) x 210 (H) mm.
- Power Internal Battery Pack. DC 12V @ 400 mA.
- Case Material Corrosion resistant LM25 aluminium.
- Operating Temp.: -10°C ~ +50°C.
- Adaptors 2.5" BSP or BS Instantaneous. (4.0" BSP for Flowmaster 400)
- Colour Firemen Red & anodised aluminium.

• Flowmeter

- Type: Electromagnetic.
- Range: 30 - 3,000 lpm, up to 5,000 lpm possible.
- Resolution: 50 ~ 750 l/min \pm 15 l/min
750 l/min ~ \pm 2%
- Standard Functions: Flow reading
Totaliser reading
- Casing Material: Corrosion resistant ADC6-12 (JIS) aluminium (anodised).
- Pressure rating: 49 bar
- Digital LCD display gauge:
 - 4 digits
 - 17.6mm high digits
 - Analog bar graph
 - Internal backlighting

• Pressure Gauge

- Type: Bourdon Tube.
- Range: 0 ~ 10 bar, \pm 1%. (0-7, 0-15, 0-20, 0-25 bar also supplied)
- Dial: Analog type, 60 mm dial.

• Battery Pack

- Battery Type: Valve regulated rechargeable lead acid.
- Rated Capacity: 2.4 Ah (10 hours continuous operation).
- Recharging: Mains operated recharger is supplied.

3. *Flowmaster* Operation

The pressure gauge does not need a power source to operate. Pressure measurements can be made with the flow meter in the OFF position.

The *Flowmaster* is ready to measure flow as soon as battery power is applied. Turn on the *Flowmaster* by pressing switch to “1” position. The *Flowmaster* can also be powered using an external 12 V DC power source. The mains battery charger supplied with the *Flowmaster* can be used when the battery capacity is close to full.

Following power_on, the flow meter begins a self test sequence lasting approximately 5 seconds and then automatically enters flow measurement mode. The typical flow meter display in flow measurement mode is as shown below.

Flow meter display when ready for flow measurement, water is filling the pipe but is not flowing



Flow meter display when ready for flow measurement, water is filling the pipe and is flowing



Flow meter display when ready for flow measurement and there is no water in the pipe. Note the flashing symbols on the left side of the flowmeter gauge.



Picture 2: Typical readouts on digital display.

The *Flowmaster* is now ready to make both flow and pressure measurements.

3.1 Power-on Sequence*

The *Flow meter backlight* LEDs will turn on first and after a few moments the display is as shown on right.

The *flow meter* is in self-test mode and will proceed through the sequence shown here prior to entering flow measurement mode.



Flow meter type and software version



Flow meter ID number
(always 1 for stand_alone versions)



Flow measurement mode.



Picture 3: Typical power on sequence

* Any other power-on sequence may indicate a fault. Consult with manufacturer.

3.2 Explanation of User Panel

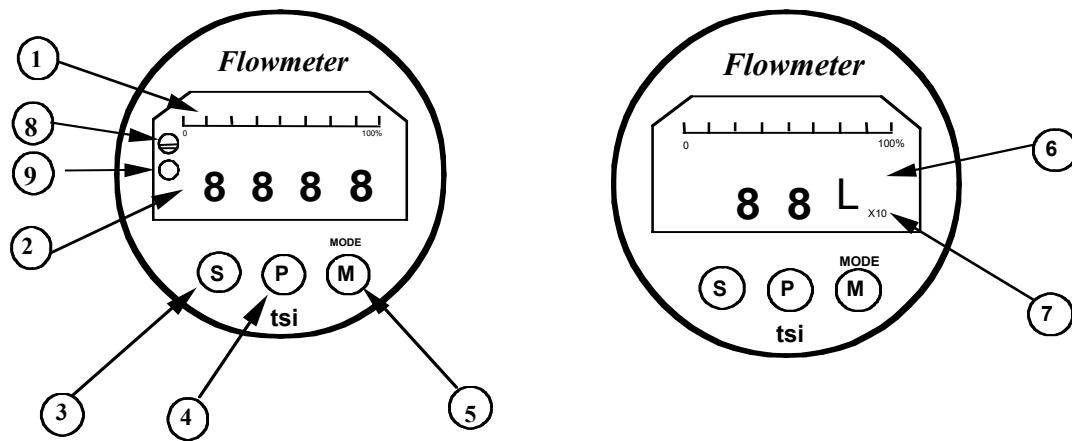



Figure 1: User panel Explanation

- (1) Bar graph display of flow reading.
- (2) Digit display of flow reading.
- (3) Set / Select switch.
- (4) Plus switch used to increment setting in calibration mode.
- (5) Mode / Minus switch:
 - Mode - selects between flow and totaliser operating modes.
 - Minus - decrements setting in calibration mode.
- (6) Indicates totaliser mode and volume.
- (7) Totaliser range extender:

No Display	Total as displayed.
X 10	Multiply displayed volume by 10 to get total.
X 100	Multiply displayed volume by 100 to get total.
- (8) Flashes on and off to indicate there is no water in the sensor.
- (9) Flashes on and off to indicate there may be dirt on the electrodes. Ignore this signal when there is no water in the sensor.

3.3 Totaliser Function

<p>Press M (mode) switch once, to enter totaliser mode.</p> <p>Display shows total litres flown since last reset.</p> <p>Press M again to re-enter flow measurement mode</p>		<p>Reset totaliser by pressing S and P switches simultaneously.</p> <p>Figure displayed will automatically reset to zero.</p>
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Picture 4: Totaliser.

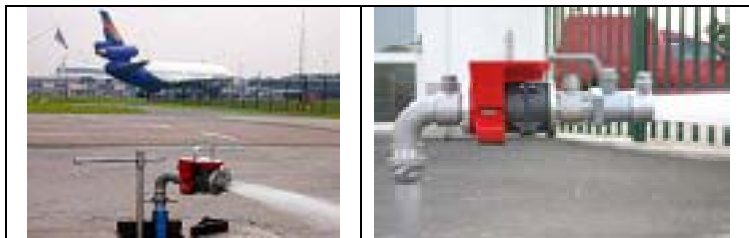
4. Using your Flowmaster

The Flowmaster provides flow and pressure measurement functions. One of its primary uses is for the testing of hydrants. The procedures used for testing hydrants vary and depend on individual user requirements.



Picture 5: Testing an underground hydrant using a standpipe and an example of flow readout and residual pressure reading. Photos courtesy of Essex County Fire and Rescue Service and Laois Fire Service.

The principal international standards for hydrant testing are The JOIFF Standard; “Guideline for flow and pressure testing of hydrants” and NFPA 291; “Fire flow testing and marking of hydrants”. The Flowmaster is an approved instrument meeting the instrument stipulations laid down in The JOIFF Standard and simplifies the measurement procedures outlined in NFPA 291. Please refer to these standards for further information



Picture 6: Flow testing at Manchester Airport with no attachment to outlet and flow testing with a ball valve to facilitate static and residual pressure measurements at Portlaoise Hospital. Photos courtesy of Manchester Airport and Portlaoise Hospital Service respectively

An operators guide for static and residual pressure measurements and for flow measurements is supplied on the following pages. This information is provided for guidance only. It is preferential that the Flowmaster user follow the guidelines provided by their organisation. A copy of The JOIFF Standard is available on request.



Picture 7: Inline use of Flowmaster and a Flowmaster with fittings for use with Hoselayers. Photos courtesy of Essex County Fire and Rescue Service and Greater Manchester Fire and Rescue Service respectively

OPERATOR'S GUIDE

Flow and Residual Pressure Measurement



1. Attach the *Flowmaster* to the standpipe and switch it on.



2. Attach valve, hose, etc. to create back pressure and to direct water to safe location.



3. Open hydrant fully so water is flowing.



4. Read flow (in l.p.m.) and pressure (in bar). When readings are taken, close hydrant fully.

Note 1: TSI Flowmeters recommend attaching a short length of hose. The short hose length will not restrict the flow rate, will enable measurement of residual pressure and water can be directed to a drain. Flow measurement can be taken without any attachment to the Flowmaster outlet.

Note 2: Flow reading is generally taken after dirt and debris in the water stream have been exhausted and the water is clear. This will typically take 10 to 20 seconds.

TSI Flowmeters Ltd, 24 Rockdale, Mountrath Road, Portlaoise, Co. Laois, Ireland.
Telephone +353-87-235-2107 E-mail info@tsi.ie Web www.tsi.ie

OPERATOR'S GUIDE

Static Pressure Measurement

- Attach *Flowmaster* to standpipe.
- Attach blank plug. Ensure bleed valve is open.
- Crack open the hydrant slowly. All air will be expelled from the standpipe when water begins to drain from the bleed valve. Close the bleed valve.
- Read static pressure (in bar).
- When reading is taken, close hydrant fully.
- Open the bleed valve to exhaust pressure from the meter and standpipe. Remove the blanking plug and progress to flow test.



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5. Trouble-shooting & Maintenance

5.1 Battery Maintenance

Battery pack operating time is 10 hours continuous usage. The batteries can be recharged at any time using the mains charger supplied. Connect the battery charger to the red and black terminals. **It is better to top up charge the batteries at regular intervals than to allow them to discharge fully.** The batteries can be left on continuous charge when the Flowmaster is not in use. The batteries have an operating life of four to five years and will need to be replaced thereafter. The operating time will reduce as the batteries age.

- Test for recharge requirement.

The flow measurement will become erratic if the battery voltage is too low. The readout may indicate zero even when water is flowing or the flow reading may vary considerably even though the flow stream is steady. Use a voltmeter to check the voltage level of the battery pack. If the voltage is less than 10 V DC then immediate recharging is necessary. If the voltage is less than 12 V DC then you will be able to use the *Flowmaster* for some time, but immediate top-up charging is recommended. If the batteries are allowed to over-discharge (battery voltage drops lower than 8 volts), they may not recover their original capacity and may need to be replaced.

- Charging the batteries.

Connect the battery charger to the *Flowmaster* **red** and **black** terminals. Please ensure correct polarity is observed. Plug the charger into mains. Please refer to the battery charger instruction manual located at end of this document.

5.2 Flowmaster Maintenance

The *Flowmaster* is practically maintenance free. Periodically charge the batteries and clean the electrodes (after use with oily water) to ensure trouble free operation of the flowmaster.

Please avoid dropping the *Flowmaster*. Please use your hands to operate the switches and avoid use of screwdrivers. Please keep abrasive chemicals away from the exterior of the *Flowmaster* and wash the inner tube with clean water after flowing foam or seawater.

The flow meter control electronics are in a waterproof compartment located beneath the display gauge. Please do not open this compartment. Breaking the seal will destroy the water-proof feature of this compartment and void warranty. Subsequent water ingress will damage the control electronics and lead to loss of flow measurement function.

- Cleaning Sensor Electrodes

The *Flowmaster's* flow gauge response is reduced if the electrodes are covered with a film of oil, dirt or rust. This can result in measurement error which is usually in the form of a lower than expected flow reading.

Clean the electrodes by brushing the inside of the pipe with a soft cloth or soft brush dipped in water. Use of a household handwash type dishwashing fluid is acceptable. If necessary, an alcohol or methanol based cleaning-agent may be used.

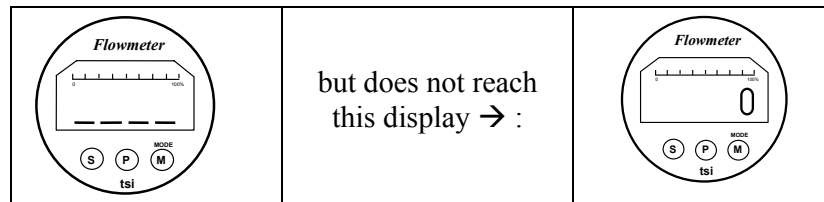
The electrodes should be cleaned periodically. The frequency of cleaning depends on the type of water being used. If clean tap water is used, then once a year is sufficient; if river water is used, then we recommend that they be cleaned every 6 months. If oily water has been used, then they should be cleaned immediately after use by running clean tap water.

- Scale Adjustment

The *Flowmaster* is calibrated and the scale adjusted at the factory. Accurate measurements can be made immediately upon receipt of the unit. It is recommended that all measuring instruments are calibrated annually. If, perchance, the display does not seem to be accurate, then please check that the electrodes are clean.

5.3 Trouble-shooting

A) *Display goes through the Self-Test Sequence until this display:*



Then the Sensor part and the Display part are not in contact.

Action:

Check all cables are secure. If still not connected – please contact your local representative

* This condition may indicate that water ingress to the electronics compartment has damaged the control electronics. Please contact your local representative.

B) Erratic Display

Battery voltage is too low.

Action: Charge batteries.

C) *Power-on Self-test Sequence is ok but no reading when water is flowing:*

There are 3 possibilities:

- | | |
|---------------------------------|-------------------------------------------------------------------------------|
| 1- Batteries voltage is too low | Action: Charge or replace batteries |
| 2- No earth wire to battery | Action: Replace earth wire between battery negative terminal and red casting. |
| 3- Unit is faulty | Action: Return unit to Manufacturer |

C) *Unit will not charge or there are humming noises while trying to recharge:*

Action:

Faulty battery charger or batteries are over-discharged and cannot recover. Contact local representative for replacement charger or batteries. Generally speaking, if battery voltage falls below 6 volts DC, it will not recover.

6. Battery Charger Instruction Manual.

General Instruction Sheet CM Range 3 Stage Battery Chargers

This new range of battery chargers utilises the latest computer controlled technology designed to give greater charging control of Lead Acid batteries, with increased product reliability.

What follows is the procedure for the correct operation of the battery charger:

- 1) Make sure the charger is unplugged.
- 2) Connect the battery as determined by the charger leads. Red connector to positive (+) Black connector to negative (-).
- 3) Plug the charger in and switch ON.
- 4) During start up the charger will determine battery status and depending on the result will switch to either bulk charge mode (red indicator ON) or float charge mode (green indicator ON). Note, when the charger enters float charge mode the battery is 100% fully charged.
- 5) If neither of the indicators illuminate then unplug the charger, check the fuse in the plug, replace if necessary, plug back in and switch ON.

Features

Short Circuit Protection - Prevents damage to the charger if the dc output is short circuited, visual indication is by alternate flashing red and green indicators.

Reverse Polarity Protection - Prevents damage to the charger if the battery is accidentally connected in reverse, visual indication is by a continuous flashing red indicator.

High Temperature Protection - If the internal case temperature rises above a pre-determined level the system is designed to automatically shut down the charging current, thus reducing the case temperature. As the temperature reduces the charger will automatically turn up to the maximum charging current available. Simultaneous flashing of the red and green indicators will visually indicate high case temperatures.

Soft Start - On power up the system will enter a "soft start" mode. This facility checks for possible faults i.e. reverse battery connection, short circuit etc. before offering maximum charge current.

Constant Current Bulk Charge and 3 Stage Charging - Provides the fastest possible way to recharge a SLA battery without overcharging.

Constant Voltage Float - Compensates for self discharge, holding the battery at peak charge, ready for use. The battery can be left on charge until required without fear of overcharging.

Proportional Charging - Automatically, proportionally adjusts the second (constant voltage) stage length of charge based on the time taken to carry out the first (constant current) stage. This facility allows optimal charging by eliminating overcharging and compromise of fixed charge timers.

Operation

First stage - constant current (CC) mode. Visual indication: Red LED ON, Green LED off.

Second stage - constant voltage (CV) mode. Visual indication: As above.

Third stage - float charge mode. The battery will be maintained 100% charged. Visual indication: Green LED ON, Red LED off.

Note, On power up the charger will appear to be in "float" mode for a short period of time. This is to complete all checks as described in feature "soft start".

LED Protocol

Charger Status	LED Status
Bulk charge mode	Red - static ON
Float charge mode (charge complete)	Green - static ON
battery reversal detected	Red - flashing
High temperature detected	Red + Green flashing simultaneously
Short circuit	Red + Green flashing alternately
Open circuit	Red + Green static simultaneously

Limited Warranty

TSI Flowmeters Ltd., of 24 Rockdale, Mountrath Road, Portlaois, Co. Laois, Ireland (Warrantor), warrants to the original purchaser of the new fire protection equipment manufactured by Warrantor and to any person to whom such equipment is transferred, that such equipment shall be free from defects in materials and workmanship during the one (1) year period commencing upon the receipt of such equipment by the original purchaser thereof ("warranty period").

Warrantor's obligation under this warranty is specifically limited to replacing or repairing its fire protection equipment or parts thereof, which are shown by Warrantor's examination to be in a defective condition attributable hereunder to Warrantor. To qualify for this Warranty, alleged defective equipment MUST be returned to Warrantor at its above address, transportation charges prepaid, within a reasonable time after discovery of an alleged defect, and in no event later than thirty (30) days after the expiration of the warranty period. If, as a result of Warrantor's examination of returned equipment, Warrantor concludes that a product defect attributable hereunder to Warrantor exists, Warrantor shall cure such defect within a reasonable time, not to exceed forty-five (45) days after such examination. All expenses in curing such defect, except for transportation charges and shipping expenses incurred in delivering such equipment to Warrantor, shall be paid by Warrantor.

In the event that such equipment is found to be attributable hereunder to Warrantor and Warrantor is unable to provide replacement, or repair is not commercially practicable or cannot be timely made, Warrantor may elect to refund to claimant the purchase price of such equipment actually received by Warrantor, less reasonable depreciation, in complete discharge of its obligations hereunder. If Warrantor elects to comply with this warranty by means of such refund, as a condition precedent to such compliance, the claimant shall return such equipment to Warrantor free and clear of liens and other encumbrances.

THE ORIGINAL PURCHASER OF SUCH EQUIPMENT, AND PERSON TO WHOM SUCH EQUIPMENT IS TRANSFERRED, AND ANY PERSON WHO IS AN INTENDED OR UNINTENDED BENEFICIARY OF SUCH EQUIPMENT, SHALL NOT BE ENTITLED TO RECOVER FROM WARRANTOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR INJURY TO PERSON AND/OR PROPERTY RESULTING FROM ANY DEFECTIVE EQUIPMENT MANUFACTURED BY WARRANTOR.

Misuse or neglect (including failure to provide reasonable maintenance) of, or accident or unauthorised repairs or alterations to, such equipment, shall release and discharge Warrantor from any obligations under this warranty or otherwise.

WARRANTOR EXPRESSLY LIMITS WITH RESPECT TO SUCH EQUIPMENT ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE TO THE WARRANTY PERIOD. AFTER EXPIRATION OF THE WARRANTY PERIOD, WARRANTOR EXPRESSLY DISCLAIMS WITH RESPECT TO SUCH EQUIPMENT ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE. THERE IS NO WARRANTY OF ANY NATURE MADE BY WARRANTOR BEYOND THAT WHICH IS CONTAINED HEREIN.

Should Warrantor fail to meet with its obligations under this warranty, a claimant may sue Warrantor to secure its compliance with this warranty. No action to enforce this warranty or to otherwise secure recovery from Warrantor for any damages arising out of the fire protection equipment manufactured by Warrantor shall be commenced later than two (2) months from and after the date of the receipt of such equipment by the original purchaser thereof.

NO PERSON HAS AUTHORITY TO ENLARGE, AMEND, OR MODIFY THIS WARRANTY.

Warrantor reserves the right to change the parts or design of its products from time to time without notice, and with no obligation to maintain spare parts or to make corresponding changes in the products previously manufactured.

Accessories:

A1: Wooden Carry Case

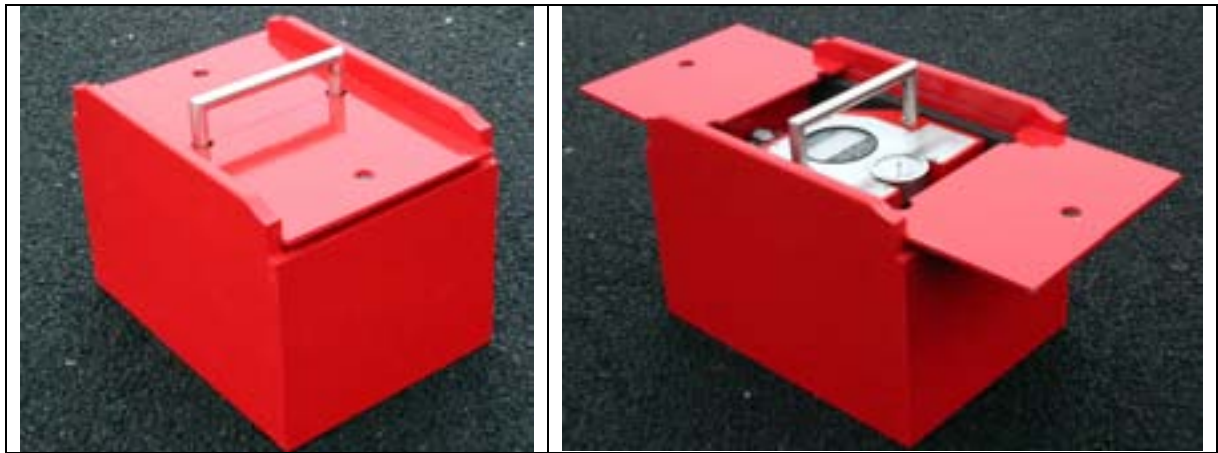


Figure A1: Water resistant wooden carry case for safe transportation of Flowmaster

A2: Flight Carry Case

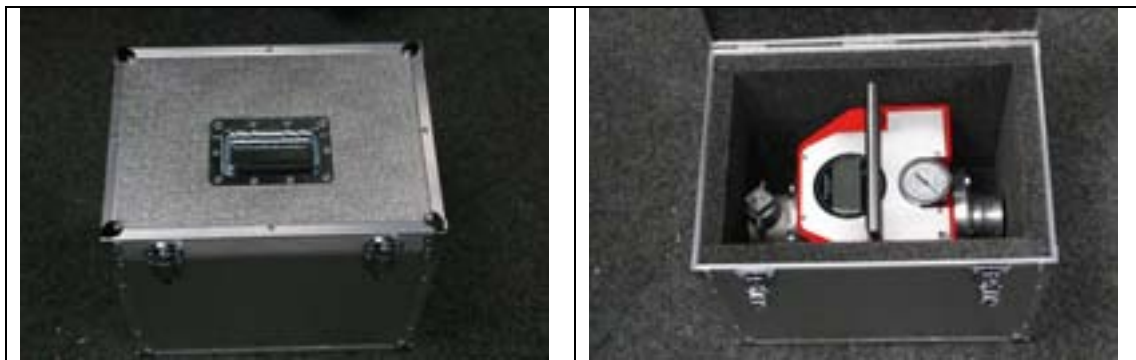


Figure A2: Aluminium flight carry case for safe shipment and transportation of Flowmaster

A3: Flow Monitoring System

The flow monitoring system provides a data logging function on a PC or laptop of the flow rates measured by the Flowmaster. The flow monitoring system consists of an RS485 to RS232 converter that interfaces the flow meter to the PC or laptop, cables and software to capture and display flow data.

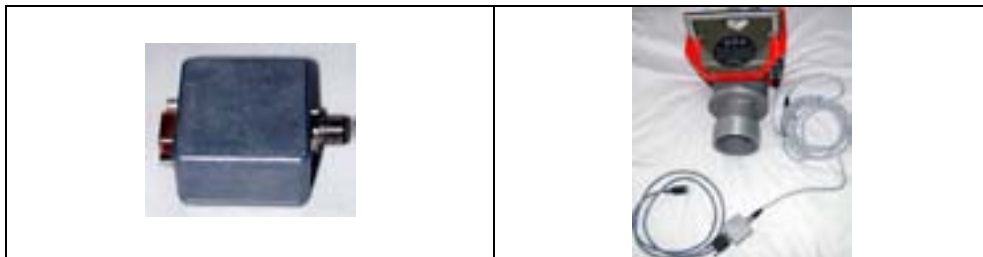


Figure A3: Interface for connecting the Flowmaster to a PC or Laptop

Typical software for use with the flow monitoring system is shown on next page.

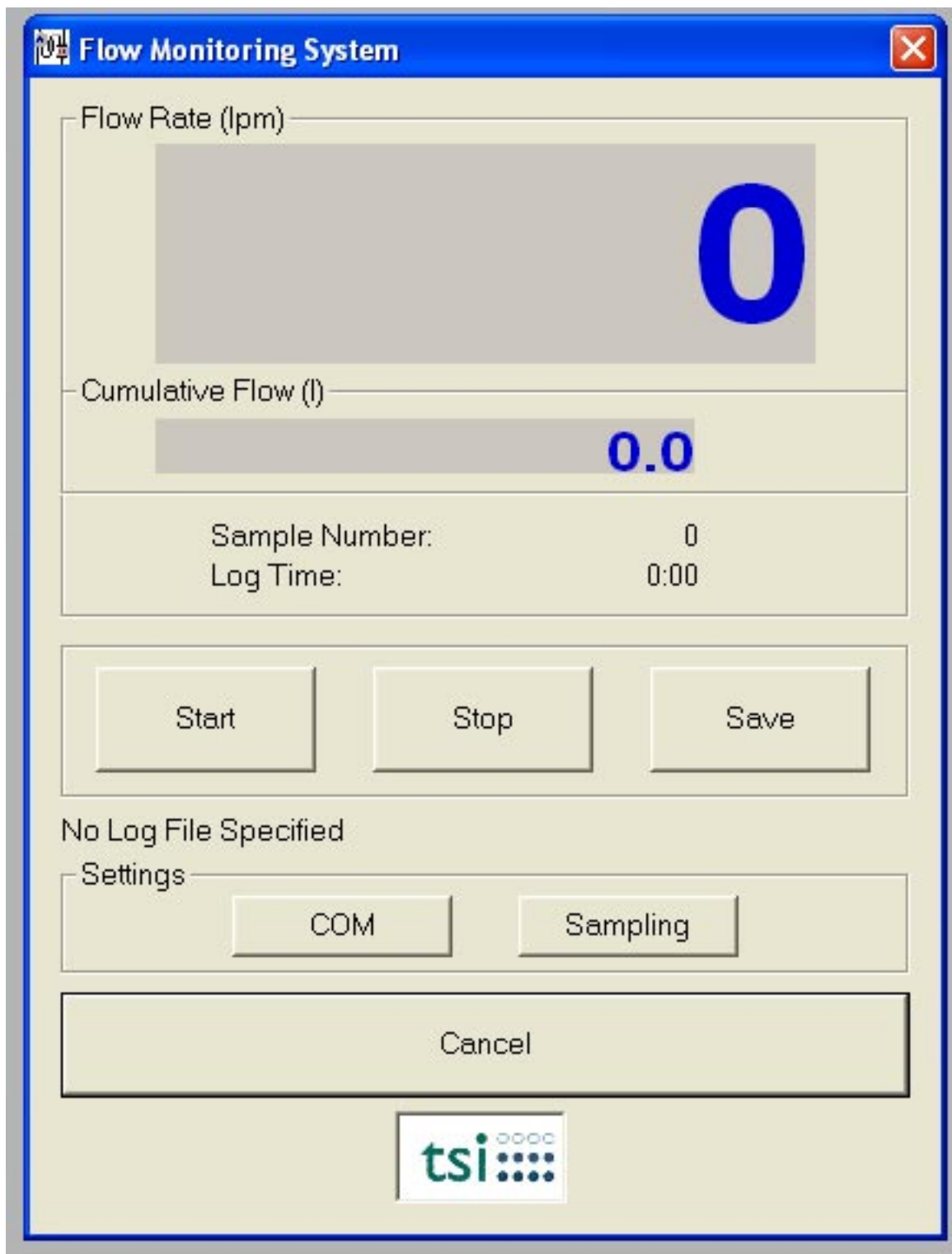


Figure A4: Flow monitoring software user interface.

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