Model 804 Electromagnetic Insertion Flowmeter Installation Manual

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As part of our policy of continuous development, we reserve the right to alter, without prior notice, all specifications, designs, prices, and conditions of supply for all our equipment.

Hazard Severity Levels

This manual applies *Hazard Severity Levels* to the safety alerts; these three levels are described in the sample alerts below.

⚠ DANGER

DANGER – limited to the most extreme situations to identify an imminent hazard, which if not avoided, will result in death or serious injury.

⚠ WARNING

Warnings identify a potentially hazardous condition, which if not avoided, could result in death or serious injury.

⚠ CAUTION

Cautions identify a potential hazard, which if not avoided, may result in minor or moderate injury. This category can also warn you of unsafe practices.

NOTICE

Notices alert you to conditions that may cause damage to the instrument or cause property damage.

A NOTE emphasizes a point, provides a useful tip, or provides additional information.

Hazard Symbols

The equipment and this manual use symbols used to warn of hazards. The symbols are explained below.

Hazard Symbols	
Warnings and Cautions • Symboles de sécurité Warnungen und Vorsichtshinweise • Advertencias y Precauciones	
	The exclamation point within the triangle is a warning sign alerting you of important instructions in the instrument's technical reference manual. Ce symbole signale l'existence d'instructions importantes relatives au produit dans ce manuel. Das Ausrufezeichen in Dreieck ist ein Warnzeichen, das Sie darauf aufmerksam macht, daß wichtige Anleitungen zu diesem Handbuch gehören. Esta señal le advierte sobre la importancia de las instrucciones del manual que acompañan a este producto.

General Warnings

Before installing, operating, or maintaining this equipment, it is imperative that all hazards and preventive measures are fully understood. While specific hazards may vary according to location and application, heed the following general warnings:

⚠ WARNING

Avoid hazardous practices! If you use this instrument in any way not specified in this manual, the protection provided by the instrument may be impaired.

⚠ AVERTISSEMENT

Éviter les usages périlleux! Si vous utilisez cet instrument d'une manière autre que celles qui sont specifiées dans ce manuel, la protection fournie de l'instrument peut être affaiblie; cela augmentera votre risque de blessure

⚠ WARNING

The installation and use of this product may subject you to hazardous working conditions that can cause you serious or fatal injuries. Take any necessary precautions before entering a worksite. Wear appropriate personal protection equipment. Install and operate this product in accordance with all applicable safety and health regulations, and local ordinances.

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1 Introduction

The Type 804 electromagnetic insertion flow meter is designed to accurately measure the velocity of water flowing within a water pipe by means of penetrating the pipe wall through a gland fitting. When combined with pipe dimensional information, the volumetric flow of water is calculated.

This document is the installation manual for the Teledyne Type 804 Electromagnetic Insertion Flowmeter. For reasons of safety when dealing with pressurised drinking water pipes, the device should be installed by qualified personnel only.

Operating instructions for the Type 804 and its associated software are covered in a separate document.

1.1 Operating Principle

The sensor operates using Faraday's Law of Induction; briefly, this Law states that a conductor (in this case, water) moving through a magnetic field (created by the sensor) will generate an electromotive force (voltage measured by the electrodes on the side of the sensor). The magnitude of this signal is a function of the speed of the water; the precise nature of this function is derived during the calibration process at time of manufacture and may be verified and updated during scheduled service intervals as required. Important points to note:

- The generated voltage is small—of the order of μV—and carries no health or safety risk
- Because the measurement signal is so small, the instrument is sensitive to stray electrical signals and ground loops, so it is important to ensure that the system and pipe are properly grounded.
- The instrument relies on a minimum level of conductivity in the water but is not sensitive to increases in conductivity above that level. The minimum conductivity required is 20μS/cm, compared to typical drinking water values of 50 – 500μS/cm.

1.2 Flow Calculation

$$Q = A \times V \times F_i \times F_p \times U_s$$

Where:

Q Flow rate (in chosen units)

A Internal cross-sectional area of pipe, calculated from pipe diameter (m^2)

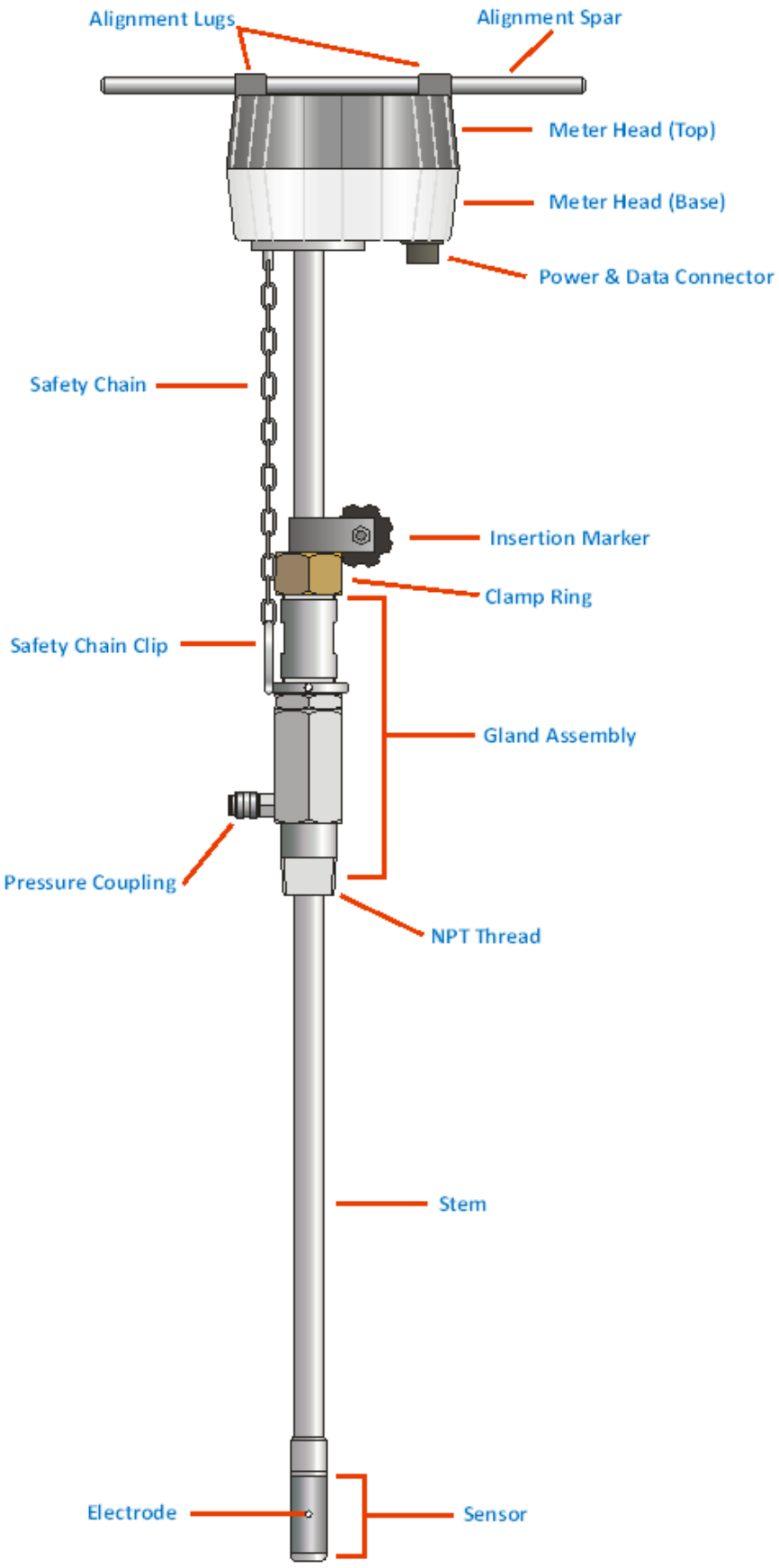
V Water Velocity measured by sensor (m/s)

F_i Insertion Factor adjustment based on position of sensor within pipe

F_p Adjustment factor based on the velocity profile within the pipe

U_s Units conversion factor to convert m^3/s into chosen flow units

1.3 Identifying Parts of the Type 804



The device is available in two versions, differing in length to suit a wide range of pipe sizes. The precise dimensions of each version are discussed in Section 1.4. However, the various parts of each system are similar as described below:

Alignment Spar	30 cm long steel spar, which should be inserted through the **Alignment Lugs** on the Meter Head Top. Use the Spar to twist the meter in the valve before fully tightening the Clamp Ring to ensure that the meter is aligned with the flow direction. To assist with this alignment procedure, there is an arrow on the label on the Meter Head Top; this should be set to indicate the direction towards which the water is flowing. When new, the Alignment Spar is supplied clipped to the Stem.
Meter Head Top	The Meter Head is an IP68, (10 m for 72 hours) with connector mated (housing made from polycarbonate reinforced ABS plastic (PC-ABS). The Meter Head contains all the measurement electronics and internal battery pack.
Meter Head Base	Together with the Top, the Meter Head Base forms the IP68 electronics housing. It also mounts to the Stem, contains the Power and Data Connector, and the securing point for the Safety Chain.
Power & Data Connector	The instrument is fitted with a 10-way Souriau connector (connection details given in Section 4.2). The mating connector and cable supplied with the instrument contains an electrical link, which effectively switches the instrument on when the connector is mated, and off again when disconnected. Note that this connector must be mated to ensure the IP68 integrity of the device.
Safety Chain	The Safety Chain is crucial for the safe operation of the device. Water pipes can operate at high pressure, and whilst the Gland Assembly has been tested to hold the instrument in position at up to 20 Bar of pipe pressure, it relies on clamping friction only. The Safety Chain will ensure that the device is prevented from being ejected (possibly at high speed) from the pipe in the event that the clamping friction in the gland is reduced for any reason (or during removal). Once the device is in position, the Safety Chain should be attached to the Safety Chain Clip. Please refer to Section 2.4 for further details.
Safety Chain Clip	Together with the Safety Chain itself, this forms the critical backup safety system to prevent the device being ejected from the pipe under pressure. It should not be removed from the device for any reason.
Insertion Marker	Once the correct insertion distance for the device has been measured or calculated (see Section 2.3.3) the insertion marker may be moved to the correct position, so that it meets the top of the Clamp Ring when the probe is inserted. This ensures the probe sits at the correct position in the pipe, and also that when the device is removed from the pipe for any reason, it may be easily inserted back to the correct distance afterwards.
Clamp Ring	The Brass Clamp Ring is used to tighten the Gland Assembly against the Stem and hold the instrument at the correct insertion distance within the pipe. It should not be completely tightened until the Alignment Spar has been used to set the correct orientation. The nut requires a $1^{5}/_{8}$" or adjustable wrench.
Gland Assembly	The Gland Assembly consists of multiple stainless steel, brass and plastic parts, combined with nitrile O-rings, which act together to grip and provide a waterproof seal around the Stem. It also features an NPT thread on the bottom to allow mounting of the whole product into a suitable ball valve fitting on the water pipe. Note that when supplied, the Gland Assembly is pushed to the end of the Stem, providing protection for the Sensor during transit. Further protection is provided by a yellow protective cap, which should be removed from the NPT thread before attempting to insert the probe. The Gland Assembly should be tightened into the ball valve using a $1^{5}/_{8}$" or adjustable wrench.

NPT Thread	The instrument is supplied as standard with a 1" NPT thread for screwing into the appropriate ball valve on the pipe. The thread should be wrapped with PTFE tape to ensure smooth and waterproof connection.
Pressure Coupling	The Gland Assembly is fitted with a 1/8" NPT Quickfit pressure coupling, which allows the hydraulic pressure within the pipe to be measured by an independent device, if required.
Stem	The stainless-steel Stem is 19mm diameter and is polished smooth when supplied. Obviously, the length varies according to the model, but in all cases, it is important to ensure that the Stem is straight and undamaged before inserting into the pipe. Severe scratches or damage to the stem may compromise the ability to form an adequate O-ring seal within the Gland Assembly and may therefore result in leakage.
Sensor	The Sensor is a solid-state element, assembled and potted with epoxy to ensure rigidity and durability. As well as measuring the flow of water, the sensor is also fitted with a thermistor which allows measurement of water temperature in the pipe. The sensor is covered with WRAS approved PVC and is 21mm in diameter. Note that although the sensor is durable and protected by a stainless-steel tip, care should be taken when inserting and withdrawing the probe not to scratch it or damage it against the inside of the ball valve or the sides of the pipe.
Electrodes	A pair of electrodes can be seen on the sides of the Sensor—it is the voltage differential between these electrodes as the water flows past them that allows the product to measure the speed of that flow. Note that the electrodes work best when their surface has been slightly oxidised; although they are pre-conditioned before leaving the factory, you may notice an improvement in measurement stability after the first few hours of use, as the surface of the electrodes stabilises further. Conversely, you may also notice a temporary increase in signal noise after aggressive cleaning.

⚠ WARNING

The Safety Chain and Safety Chain Clip prevent the device being ejected from the pipe under pressure. Attach the Safety Chain to the Safety Chain Clip, and do not remove the Safety Chain Clip from the device.

NOTICE

The Power and Data Connector must be properly connected to ensure the IP68 integrity of the device.

NOTICE

Severe scratches or damage to the stainless-steel stem may compromise its ability to form an adequate O-ring seal within the Gland Assembly, resulting in leakage.

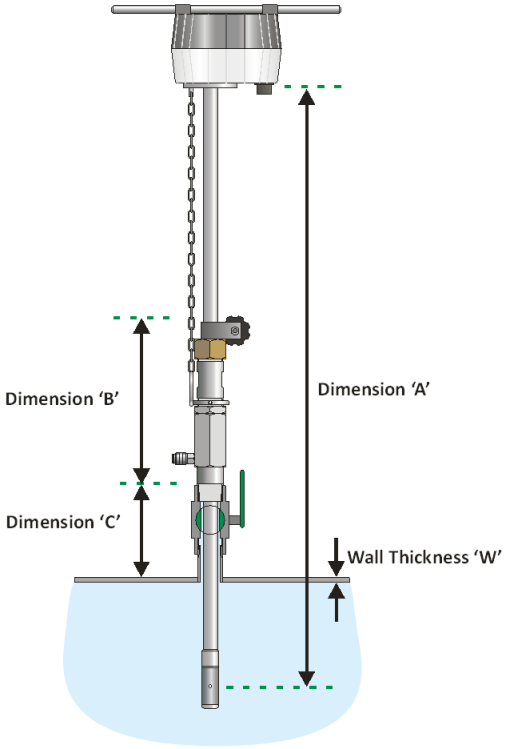
NOTICE

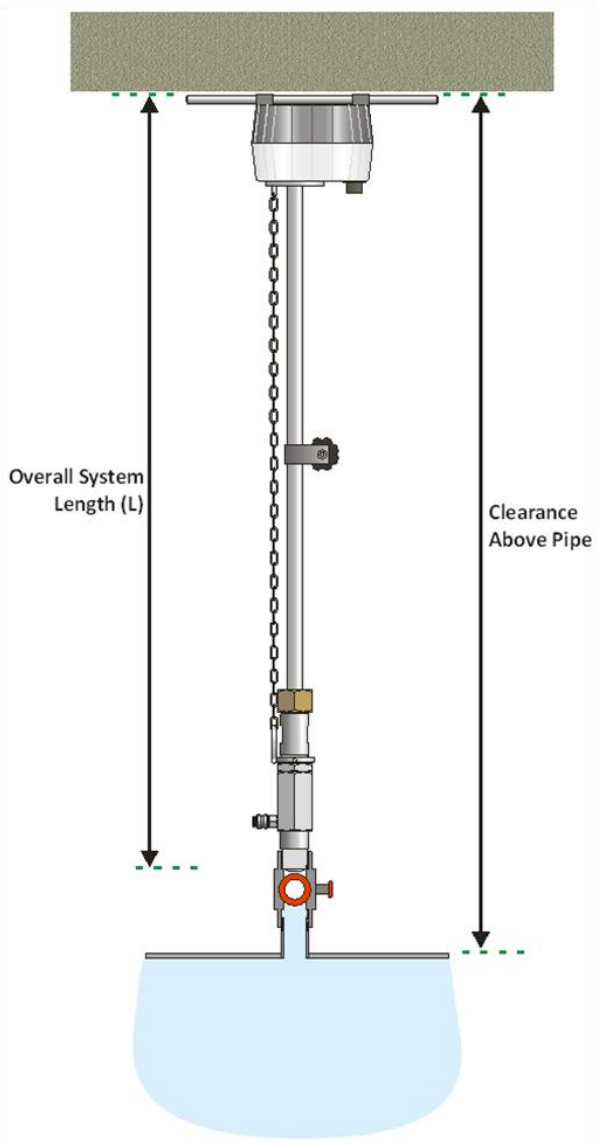
When inserting and withdrawing the senor probe, be careful not to scratch it or damage it against the inside of the ball valve or the sides of the pipe.

1.4 Type 804 Critical Dimensions

	Key	300 mm shaft length	500 mm shaft length
Sensor Diameter		21 mm	21 mm
Fitting		1" BSP	1" BSP
Overall Length	L	798 mm	978 mm
Stem Length	A[1]	660 mm	840 mm
Gland Length	B	215 mm	215 mm
Valve Length	C[2]	120 mm	120 mm
Max Insertable Length	A-(B+C+10)[3]	315 mm	495 mm
Required Clearance	L+C	918 mm	1098 mm

1 to mid-point of sensor – nominal measurement point
2 example only – to be verified on site
3 assumed wall thickness of 10mm – to be verified on site





1.5 Configure App

The Configure App has been designed to set up the Type 804. Used through a dedicated interface cable, this windows program displays the configurable parameters in widows, with drop down option menus where appropriate, allowing you to change parameters as required.

The program will also calculate the following fields, Insertion and Profile factors, estimated battery life and the number of Pulses Per Volume flow based on other parameters programmed into the unit. These calculated parameters will be updated whenever a linked parameter is changed, but the 'Update Instrument' button must be used to upload those changed parameters into the instrument.

See the separate Operating Manual – Configure Software manual.

To use the new Calculated Fields with Configure, you must have firmware version 0804719B19 or higher.

2 Type 804 Installation

The Type 804 Insertion Flowmeter measures the speed of the water passing over the sensor part of the device. To convert this speed measurement into volumetric flow, we assume that the flow profile within the pipe is laminar; deviations from true laminar flow may result in errors in the volumetric calculation outside the performance limitations specified for the product. To minimise such errors, the device should be installed in accordance with ISO 7145:1982 standard, *"Measurement of fluid flow in closed conduits. Velocity area methods. Method of measurement of velocity at one point of a conduit of circular cross section."*

Critical aspects of this standard apply to the position of the sensor within the pipe, in terms of both its linear distance relative to obstructions/events up and down stream of the installation point, and its insertion position within the diameter of the pipe.

Note that it is possible for advanced users to use the Type 804 to map the flow profile in non-laminar installations, and therefore to define their own Flow Calculation (Section 1.2) based on the precise installation characteristics of their site. This is not covered in this manual.

2.1 Linear Distance Recommendations

ISO 7145:1982 has the following recommendations for choosing a suitable insertion point for the meter. Note that all distances are given as a multiple of internal pipe diameter (D).

In all cases the device should be positioned a minimum of 5 x D upstream from any obstruction / event.

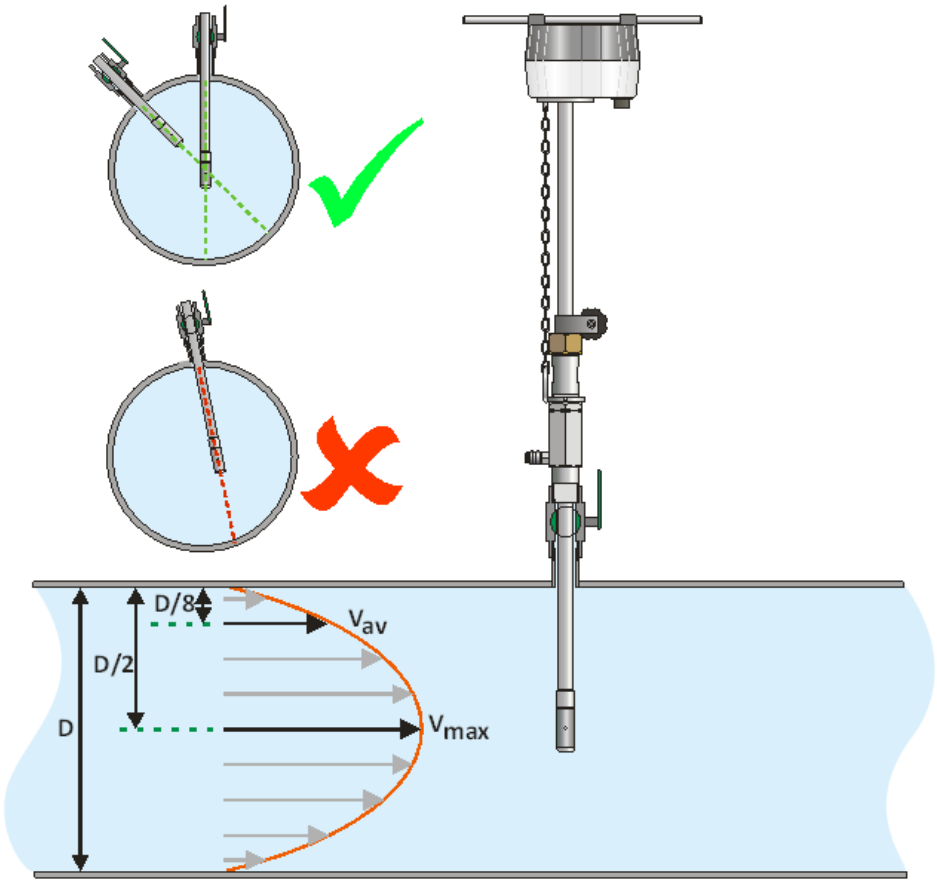
The influence of the obstruction will depend on the type of obstruction, and also on the choice of sensor insertion distance (½ x D or $^1/_8$ x D – see Section 2.2).

Obstruction	Device should be positioned a minimum of these multiples of D downstream of the obstruction	
	½ x D Insertion	$^1/_8$ x D Insertion
90° Bend	25	50
Convergence (up to 36°)	10	30
Divergence (up to 28°)	25	55
Gate Valve (fully open)	15	30
Butterfly Valve (fully open)	25	45

2.2 Installation Recommendations

In a fully developed laminar flow (which should be achieved if the guidelines in Section 2.1 have been observed), ISO 7145:1982 indicates that there will be a parabolic flow profile, with maximum velocity V_{max} at the centre of the pipe (½ of pipe diameter), and average velocity V_{av} at $^1/_8$ of the internal pipe diameter. The Type 804 will perform the correct volumetric flow calculation provided the correct insertion factor is set in the instrument as described in the Setup and Operating manual.

Note that the probe must be inserted and aligned with the diameter\centre of the pipe. Although it need not be vertical, depending on space constraints, it must not be inserted along an arc other than the diameter.



A transducer position at ⅞ pipe diameter can also be used if the clearance height above the pipe is an issue. The Configure App will compute insertion and profile factors for this position.

⚠WARNING

The installation and use of this product may subject you to hazardous working conditions that can cause you serious or fatal injuries. Take any necessary precautions before entering a worksite. Wear appropriate personal protection equipment. Install and operate this product in accordance with all applicable safety and health regulations, and local ordinances.

Knowledge of the internal pipe diameter is critical for two reasons:

a) So that the correct cross-sectional area can be used for the volumetric flow calculation (Section 1.2).
b) So that the probe can be inserted into the correct position within the pipe.

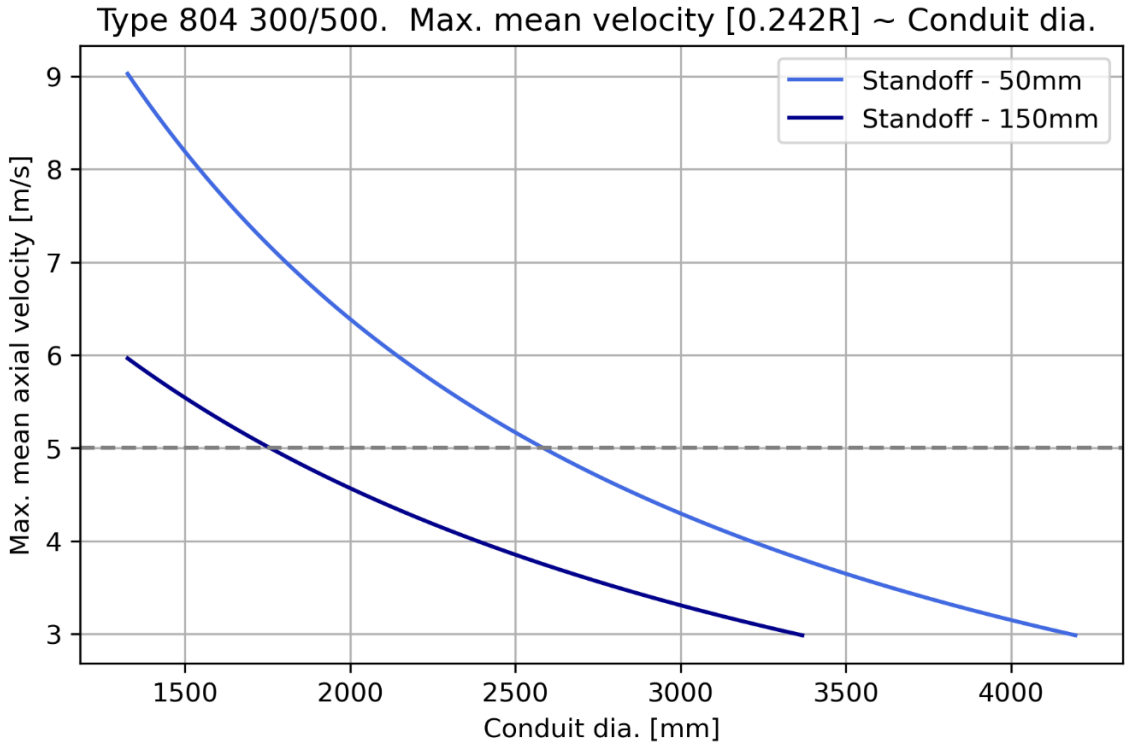
Note that in order to achieve point (b) above, it is also necessary to measure the offset distance of the ball valve; this is the distance between the top of the ball in the valve, and the inner surface of the pipe.

The simplest method of determining these values is by assuming that the pipe conforms to its nominal specification; some examples are given in Section 3 for different pipe sizes and materials. A tape measure or similar can then be used to measure the distance between the top of the ball in the valve and the outer surface of the pipe. The Offset Distance is therefore this measured value, plus the wall thickness of the pipe (also given in Section 3).

Errors in either the cross-sectional area of the pipe (from Internal Diameter) or the insertion point (½D or ⅛D) can lead to significant errors in flow calculation.

2.3 Maximum Flow Rates

The following plots show the maximum flow rates recommended for the Type 804 to avoid noise generated by vortex induced vibration effecting the flow readings in 'normal, laminar' flow within a pipe. These are indicative plots for an insertion of ⅛ pipe diameter for 300 / 500 insertion length and 700 / 1000 insertion length standard Type 804s.



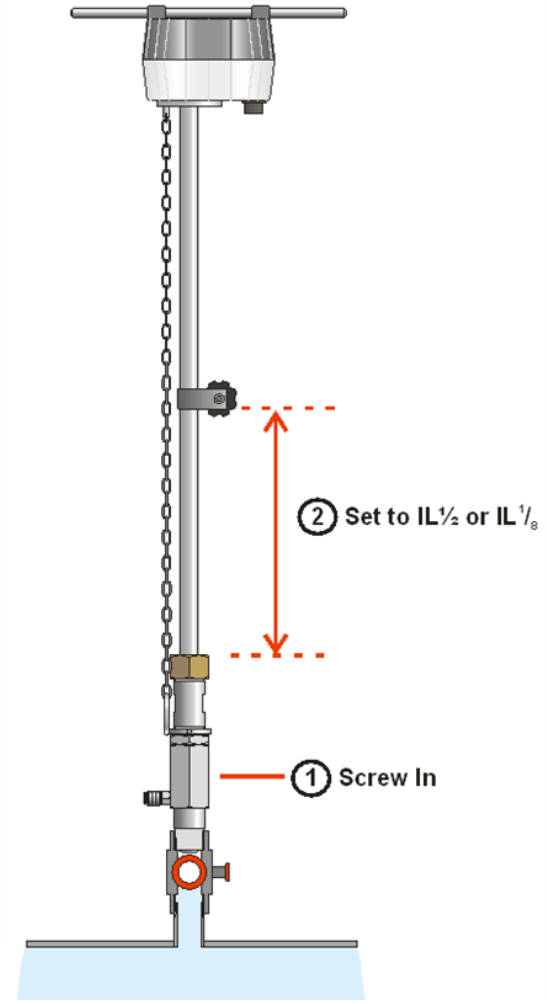
The plots above are defined by
BS 1042-2.2: 1983 | ISO 7145:1982

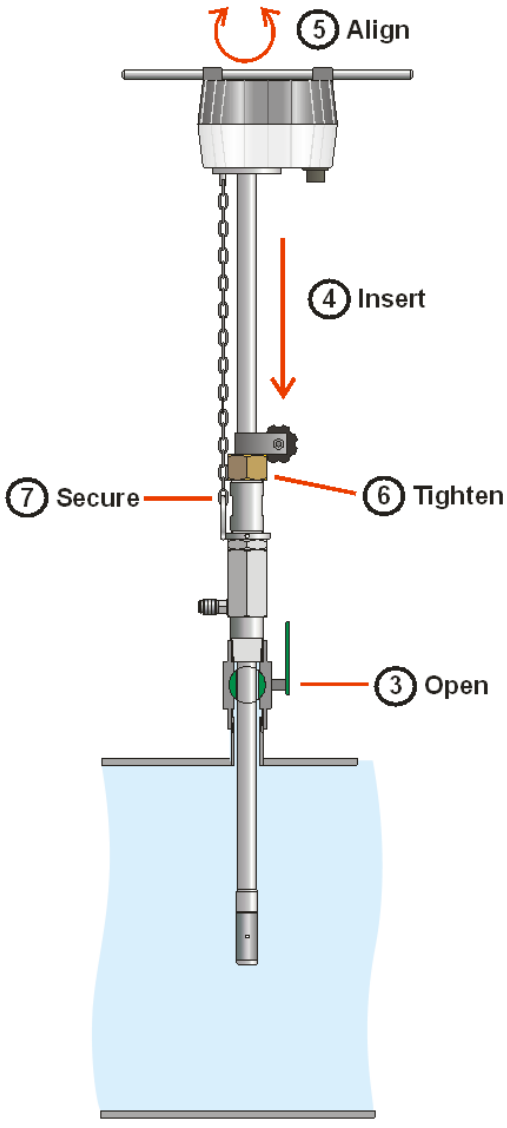
Measurement of fluid flow in closed conduits —
Part 2: Velocity area methods —
Section 2.2 Method of measurement of velocity at one point of a conduit of circular cross section

2.4 Inserting the 804 EM and 804 ExP

1) Fit the Type 804 into the ball valve, tightening the gland assembly using the tools as described in Section. Leave the Clamp Ring loose, to allow the probe to be free inserted.

2) With the Type 804 sensor resting against the ball valve, position the Insertion Marker so that the distance between its lower surface and the top of the Clamp Ring is equal to the required Insertion Length as calculated in the Section 2.3.3 above (IL½ or IL⅛).





3) Open the ball valve.

4) Push the Type 804 into the pipe until the Insertion Marker touches the Clamp Ring

5) Use the Alignment Spar to correctly align the Type 80 with the axis of the pipe.

6) Tighten the Clamp Ring to hold the instrument in position.

7) Finally, adjust the Safety Chain length using the Clip, to ensure that the instrument cannot be ejected from the valve.

3 Standard Pipe Specifications

The table below details some standard pipe diameters, which may be used if it is not possible to measure the internal pipe diameter as detailed in Section 2.3.2. Please note that these values are typical only, and Teledyne accepts no liability should the actual pipe dimensions differ from those shown below.

Do not use the pipe's Nominal Diameter (DN number) to calculate flow volume in the Model 804; this mistake can cause large errors in volumetric calculations. For example, in the case of a mild (black) steel pipe, a size DN250 is in fact 260.4mm internal diameter. If the nominal diameter value of 250mm were used instead of the typical value of 260.4mm, it would result in approximately 8% under-reading of flow.
Conversely, a DN350 pipe *of the same material* actually has a typical internal diameter of 339.6mm, which would lead to a 6% over-reading.

Typical Internal Diameters (mm) & Wall Thickness (mm) for a Range of Common Pipe Materials in Various Nominal Sizes (DN)							
Material	**HDPE (PE100 SDR11)**	**PVC**		**Mild Steel**	**Ductile Iron**		
Type	**PN16**	**PN10**	**PN16**	**PN16**	**Class 40**	**K9**	**K10**
DN90	72.6 (8.7)	81.4 (4.3)	76.8 (6.6)				
DN100				107.1 (3.6)	108.4 (4.8)	106.0 (6.0)	106.0 (6.0)
DN110	88.8 (10.6)	99.4 (5.3)	93.8 (8.1)				
DN125	100.8 (12.1)	113.0 (6.0)	106.6 (9.2)	131.7 (4.0)	134.4 (4.8)	132.0 (6.0)	132.0 (6.0)
DN140	113.1 (13.5)	127.8 (6.1)	121.4 (9.3)				
DN150				159.3 (4.5)	160.0 (5.0)	158.0 (6.0)	157.0 (6.5)
DN160	129.1 (15.5)	147.6 (6.2)	141.0 (9.5)				
DN180	145.2 (17.4)						
DN200	161.4 (19.3)	184.6 (7.7)	176.2 (11.9)	207.3 (5.9)	211.2 (5.4)	209.4 (6.3)	208.0 (7.0)
DN225	181.5 (21.8)	207.8 (8.6)	198.2 (13.4)				
DN250	201.9 (24.1)	230.8 (9.6)	220.4 (14.8)	260.4 (6.3)	262.4 (5.8)	260.4 (6.8)	259.0 (7.5)
DN300				309.7 (7.1)	313.6 (6.2)	311.6 (7.2)	310.0 (8.0)
DN315	254.4 (30.3)	290.8 (12.1)	277.6 (18.7)				
DN350				339.6 (8.0)	364.0 (7.0)	362.6 (7.7)	361.0 (8.5)
DN355		327.0 (14.0)					
DN400	323.0 (38.5)	369.4 (15.3)		390.4 (8.0)	413.4 (7.8)	412.8 (8.1)	411.0 (9.0)
DN450						462.8 (8.6)	461.0 (9.5)
DN500	403.8 (48.1)	461.0 (19.5)		492.0 (8.0)		514.0 (9.0)	512.0 (10.0)
DN600				592.4 (8.8)		615.2 (9.9)	612.8 (11.1)
DN630	508.7 (60.7)	581.0 (24.5)					
DN700				693.4 (8.8)		716.2 (10.9)	714.0 (12.0)
DN710	573.3 (68.4)	654.0 (28.0)					
DN800	646.1 (77.0)	738.0 (31.0)		793.0 (10.0)		818.6 (11.7)	816.0 (13.0)
DN900	726.8 (86.6)			894.0 (10.0)		919.2 (12.9)	916.8 (14.1)
DN1000	808.8 (95.6)			996.0 (10.0)		1021.0 (13.5)	1018.0 (15.0)

4 Electrical Connection

4.1 Power Requirements – Type 804 standard

The Type 804 is supplied with an internal 19Ah battery; a total of two can be fitted.

The Type 804 can also be powered from an external source. If external power is applied, it MUST be a regulated supply of 3.6 VDC. Voltage drop over a long cable should be taken into consideration; an absolute minimum of 3.1 VDC is required.

Connections – 804 EM

10 Way Connector [female on the device]	
Pin	Function
C	Power Ground
D	+3.6V DC
A	Pulse Out Ground
H	Pulse Output 2
B	Pulse Output 1
J	RS 232 RXD / RS485B (+'ve)
K	RS 232 TXD / RS485A (-'ve)
F	RS232 / RS485 Ground
G	Battery Switch
E	Link to Pin G to power unit

In May 2022 the Type 804 ExP (External Power) was introduced.

4.2 Power Requirements – Type 804 ExP

The Type 804 ExP is supplied with an internal 19Ah battery; only 1 battery can be fitted.

The Type 804 ExP can also be powered from an external source – 12 to 28 V DC.

Connections – 804 ExP

10 Way Connector [male on the device]	
Pin	Function
C	OV_MS
D	12 to 28 V DC
A	Pulse Out Common
H	Pulse Output 2
B	Pulse Output 1
J	RS 232 RXD / RS485B (+'ve)
K	RS 232 TXD / RS485A (-'ve)
F	RS232 / RS485 Ground
G	Battery Switch
E	Link to Pin G to power unit

4.3 Grounding

Each installation is unique and with variations in pipe size, material, lining, corrosion prevention systems and general electrical noise all sites are specific to themselves. If noisy signals are experienced there are several things to try before contacting your service provider.

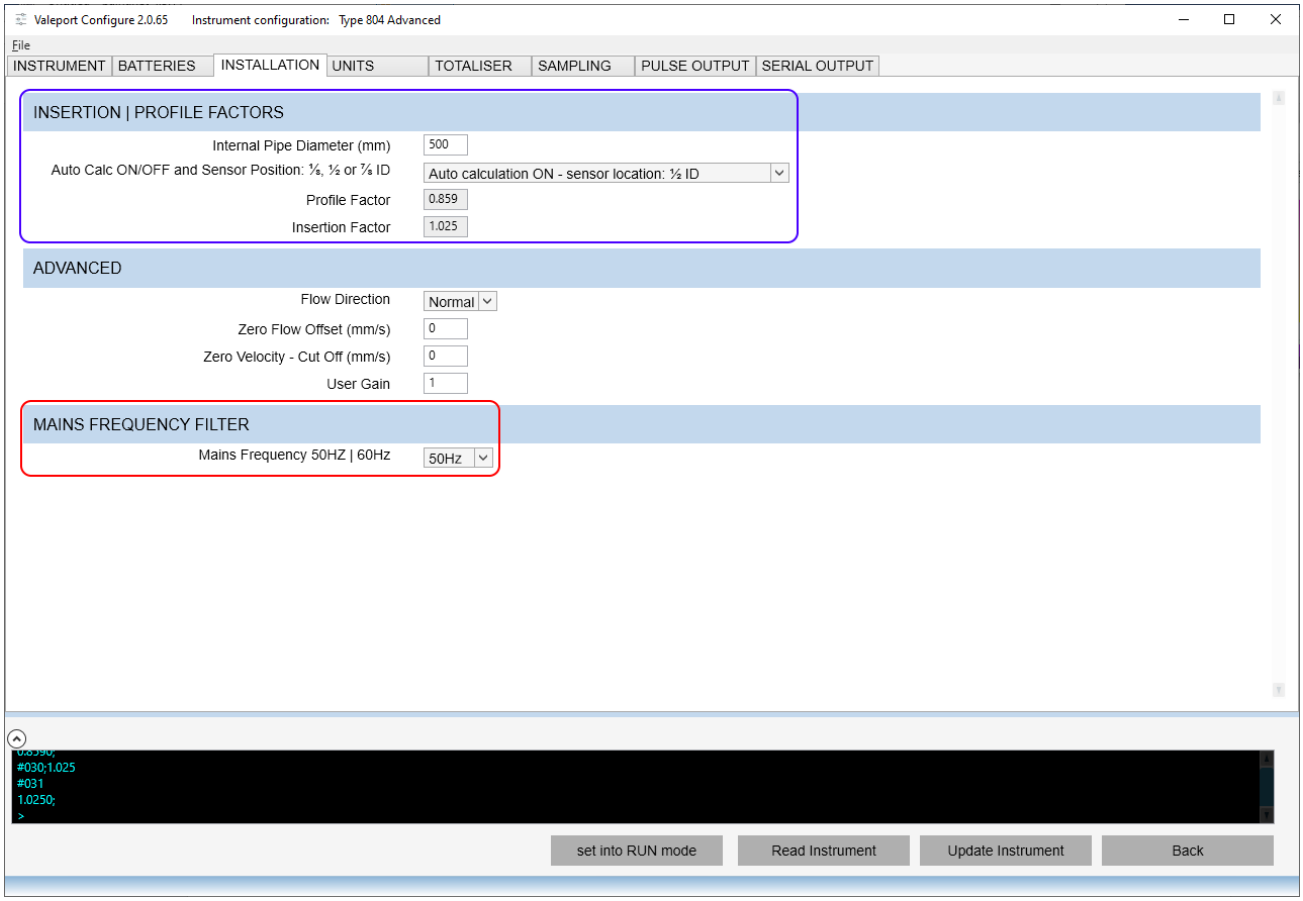
The stem provides the ground connection to the water in the pipe, which is critical to the flowmeter's operation. For best results, the Type 804 should be isolated from the pipe. There is an isolation layer in the gate valve attachment mechanism.

Do not connect the shield wiring of the cable at the customer end of the data cable; this is because the screen is connected to the stem internally. By correctly configuring the cable, a difference in DC potential between the two ends of the cable will be prevented.

Any external power provided—whether it be regulated 3.6 V DC for the standard unit or 12 to 28 V DC for the ExP variant—must supply 'clean' power.

If you are experiencing noisy 'data':

1. Insure there is sufficient stem in the water. If you are operating at ⅛ depth, try ½ — be sure to change your insertion and profile factors accordingly.
2. Check your mains frequency filter.



If the pipe is lined, check for a DC potential difference between the water and the pipe. The pipe should be earthed to the same potential as the water.

In some situations, bonding the spar to the pipe may help.

4.4 COMs Modes

Operating in RS232 COMs Mode

The HydrINS is fitted with a low power Isolated RS232 connection. It is recommended to use a transceiver fitted with internal charge pump to ensure good communication signals.

It is also recommended that the RS-232 Ground is connected to the comms ground at the user end.

Operating in RS485 COMs Mode

To change from RS232 to RS485 and vice versa, a hardware connection inside the electronics housing must be swapped from one socket to another. This is normally a factory setting, but a competent operator can perform the procedure — contact Teledyne for further information. This operation may invalidate your warranty.

The RS485 standard specifies the maximum voltage applied to the Driver output / Receiver input common mode voltage range is -7 / +12V.

The RS485 transceiver used in the Type 804 is designed for a low power battery system and, therefore, is limited to -7 / +10V. Most drivers are no more than 5V but please ensure the -7 / +10V limits are not exceeded.

> Ensure that an RS485 ground connection is made to the Type 804 unit to ensure that the RS485 signal is kept within the common mode limits.

Signals can drift off to high voltage levels if there are high static conditions or cables running parallel to the pipe. This same drift can be generated by static or leakage voltages from a laptop PC mains supply connected to the Type 804.

If such volatile conditions exist, it is also recommended to use a terminating resistor at the ‘customer end’ of the data cable to prevent the RS485+ input from floating.

5 Maintenance

5.1 General

The Type 804 should operate without the need for general maintenance. There are always exceptions to this; for example, where local conditions can result in deposits accumulating on the transducer and spar, regular inspection and cleaning may be required. When cleaning the spar, and especially the transducer, use a soft cloth and gently wipe away any deposit. If badly stained, a non-abrasive cleaner can be used on the spar but not the sensor.

If the deposit is 'hard' and is not removed by gentle wiping, please contact Teledyne for advice.

Rinse in freshwater before storing.

Cleaning

The flowmeter should be kept as clean as possible. On removal from the pipe, the shaft and sensor should be wiped clean using fresh water, and—if badly stained—a non-abrasive cleaner can be used on the spar but not the transducer.

Rinse in fresh water and remove the batteries if the flowmeter is to be stored for more than a month or is to be returned to Teledyne for service or calibration.

5.2 Battery Change

Replacing the batteries in a Type 804 should be carried out by Teledyne as part of a calibration and routine service or by an authorised service center. Please contact Teledyne for more information.

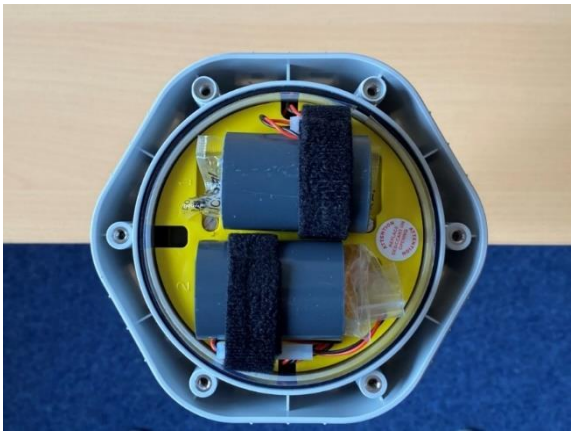
If a battery must be changed as a matter of urgency, please be aware that by opening the electronics housing the warranty for your Type 804 may be compromised. The following procedure should be followed very closely, and every precaution taken. It must be carried out in a clean workshop environment and never in the field.

Tools needed:

- 0.85Nm torque screwdriver
- Desiccant bag
- Type 804 Lithium battery
- Communication cable
- Valeport Configure software

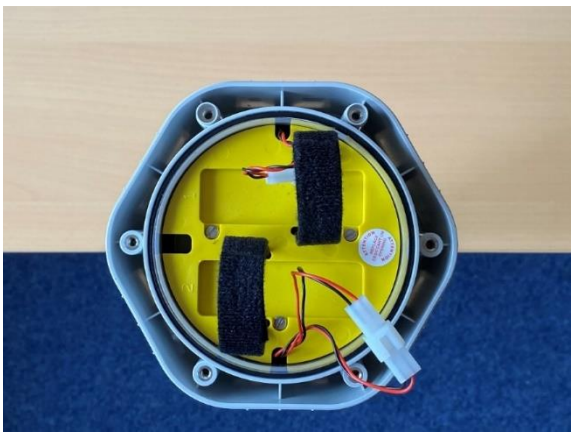
Battery Change Procedure

- Loosen the six screws around the lid using a 0.85Nm torque screwdriver.

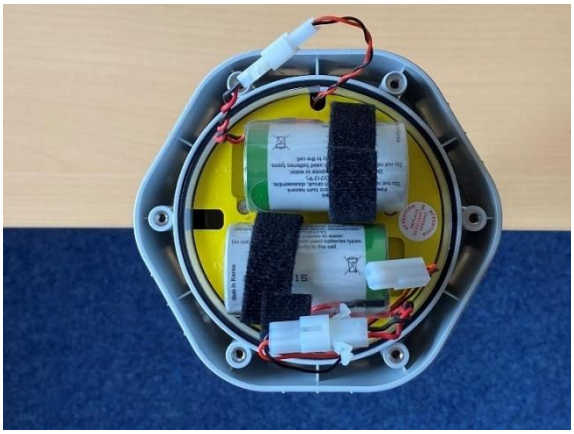


- If fitted, remove the false batteries and the desiccant bags.

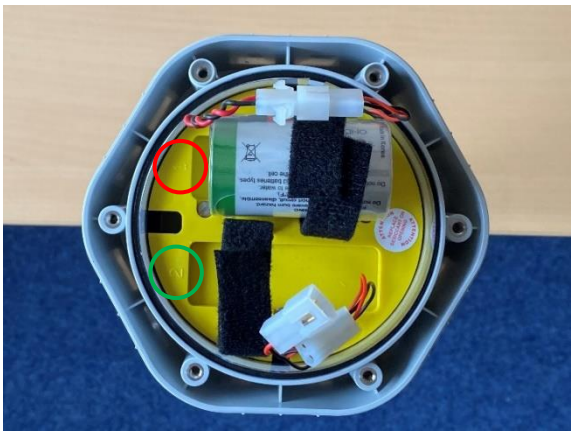
- If this is the first battery installation, you should have removed the items shown.
- Keep them safe in case the flowmeter is to be returned to Teledyne in the future without batteries fitted.



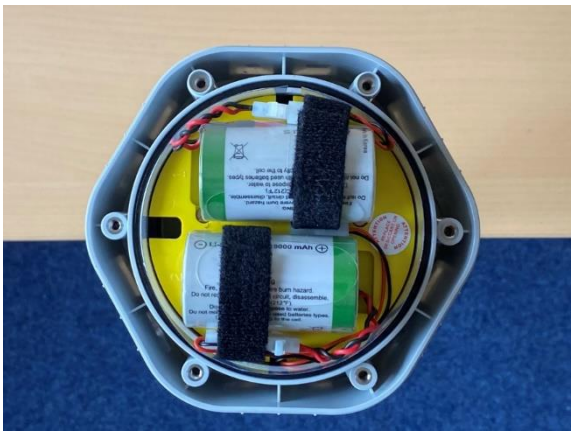
- As shown in the picture, the unit is set up to use external power with the lower two plugs connected.
- If external power is not to be used, disconnect the two plugs.



- Connect battery 1 and battery 2.



- If external power is to be used with a single back up, internal battery:
  - Fit one battery in slot 1.
  - Connect the two plugs associated with slot 2.
    (These are shown disconnected in the picture)



- If both internal batteries are to be fitted (no external power):
  - Connect the two batteries, and using the securing strap hold both battery and connector in place as shown.
  - Place the unused external power connector between the batteries.
  - Everything should be neatly inside the clear plastic band.

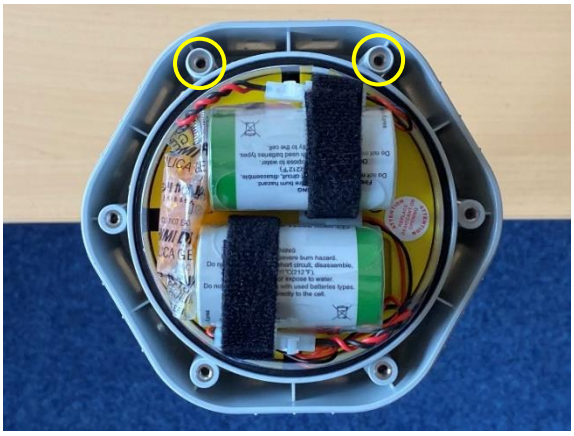
- Replace the desiccant bag.

- Make sure the O-rings are correctly set inside the sealing ring.
- Verify that the O-rings aren't pinched as the ring is put in place and the lid fitted.

- Make sure to correctly align the guide pins on the lid and the main body of electronics case.
- Close the lid and—using a 0.85Nm torque screwdriver—tighten the 6 screws.

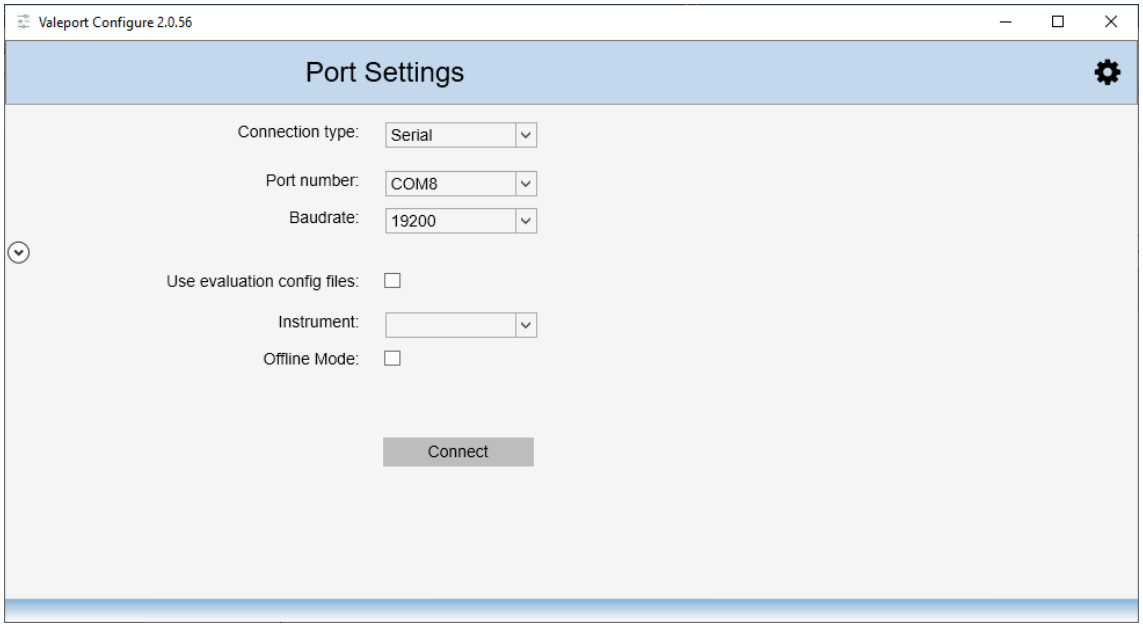
NOTICE

- Closing the lid and tightening its screws should be carried out with the greatest of care. Failure to reassemble the unit correctly will invalidate your warranty.

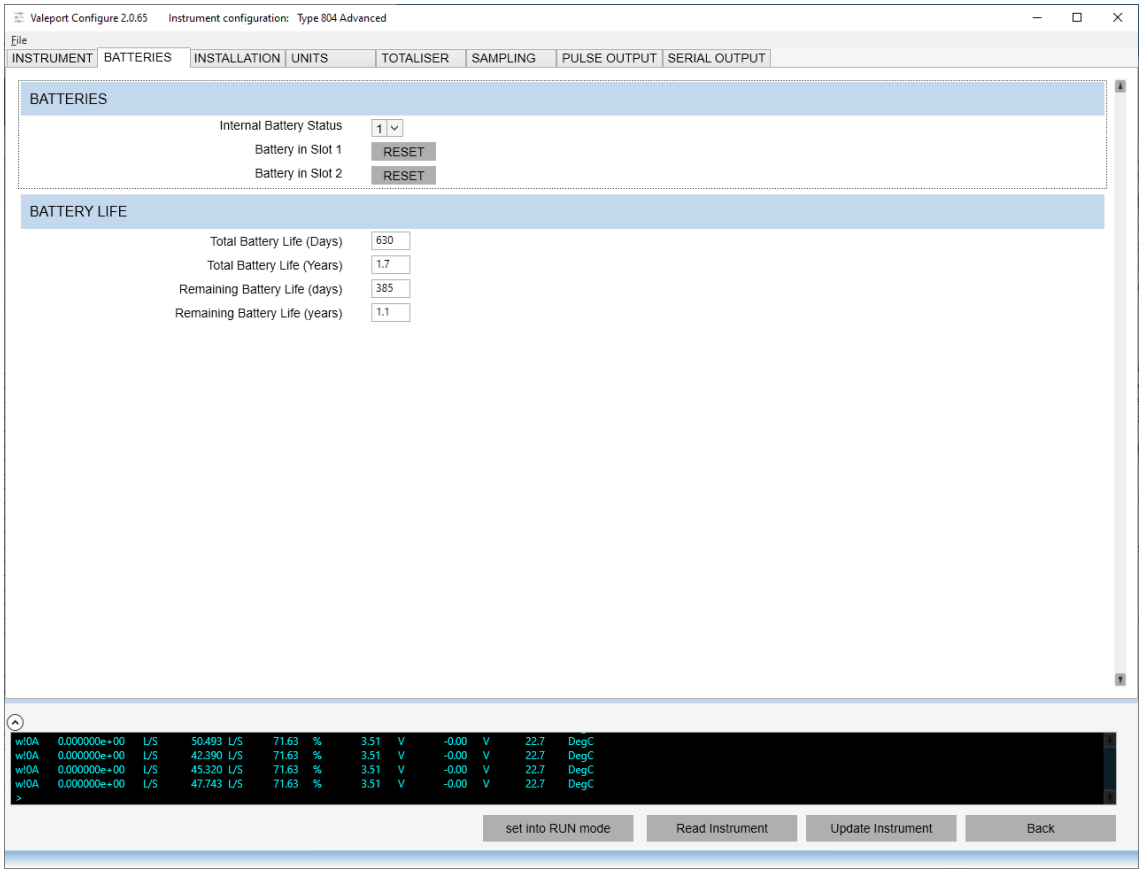


Reset the Battery Usage Using Valeport Configure

Select the correct COM port “Port number” and setting for your installation:



On “BATTERIES” tab, select the number of internal batteries, then click on “RESET” for each battery:



Check your battery life calculations and adjust settings such as cycle time and the number of samples observed to insure you have sufficient life to complete the survey or scheduled maintenance.

5.3 Passivation

Prior to calibration the Type 804 transducer assembly is ‘Passivated’. This process renders the stainless-steel of the transducers ‘passive;’ that is, it is the chemical process of making a material passive (non-reactive) in relation to another material prior to using the materials together. In this case, the two materials are the stainless-steel of the transducer and the water in the pipe.

This process is rigorously carried out in the factory after assembly and before calibration.

If the Type 804’s spar and transducer have been cleaned aggressively, this process should be carried out prior to redeployment.

The bottom 10 centimeter of the spar should be cleaned and rinsed. (Cif is a good cleaner to use.) The transducer should be carefully wiped with a soft cloth.

The head and bottom 1-2 centimeters of the spar should then be soaked in a 10% solution of Chemical Citri Surf (see photo of the label below), 500ml of citric acid to 5 liters of water.

The transducer and short section of the spar should be suspended in a vessel containing the acidic solution.

The process of soaking the spar and head in the solution should be carried out for 30 minutes. This will passivate the stainless steel of the transducer and spar.

Rinse under running tap water.

The head should then be left in a clean area to **air dry for at least 3 hours.** No further wiping or polishing of the transducer should take place.

If the citric acid solution is not available, then after cleaning, soaking in clean water for 24 to 48 hours may result in the same passivation process, but some experimentation may be required.

6 Certifications

Do not dispose in domestic household waste.
The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste, in compliance with the European Waste Electrical and Electronic Equipment Directive (WEEE, 2002/96/EC).
For instructions on how to return end-of-life equipment, producer-supplied electrical accessories, or auxiliary items for proper disposal please contact the supplier or importer. In the event a supplier cannot be reached, contact Teledyne ISCO customer service department at (866) 298-6174.

CE The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives.

Any changes or modifications to the product or accessories supplied, that are not authorised by Teledyne Instruments, could void the CE compliance of the product and negate your authority to operate it. This product has demonstrated CE compliance under conditions that include the use of shielded cables. It is important that you use shielded cables compliant with the product's conformance to protect from potential damage and reduce the possibility of interference to other electronic devices.

FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Canada

Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.