



CLA-VAL e-FlowMeter

Vortex Flow Meter

User Manual





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1 INTRODUCTION

1.1 PRECAUTIONS BEFORE STARTING



Before use, please connect to our website www.cla-val.ch to:

- Download and install the USB driver on your PC [Refer to the driver USB installation manual (LIN006UE)]
- Download and install the latest version of the product software on your PC
- Check that the product has the latest firmware version

1.2 DEFAULT CALIBRATION AND SET TIME



: By default, the e-FlowMeter is factory calibrated according to the DN and the valve model requested see chapter 4.3 « Flow Parameters Factory Calibrated ». But it is possible to change some parameters, for examples values of the 4 mA, 20 mA, pulse weight and pulse width by using the e-FlowMeter Software available on our website www.cla-val.ch

1.3 GENERAL DISCLAIMER

In accordance with our policy of continuous development and improvement, CLA-VAL Europe reserves the right to modify or improve these products at any time without prior notice. CLA-VAL Europe assumes no liability or responsibility for any errors or omissions in the content of this document.

1.4 ENVIRONMENTAL PROTECTION

Help to preserve and protect the environment. Recycle used batteries and accessories.

1.5 TYPOGRAPHY

Throughout this manual, following typographical conventions and symbols have been adopted to help readability:

- a. **"Bold"**: Menu, command, tab and button.
- b. ***BOLD ITALIC***: Important information.
- c. **(1)**: Reference numbers of images.
- d. www.cla-val.ch: Internet address.



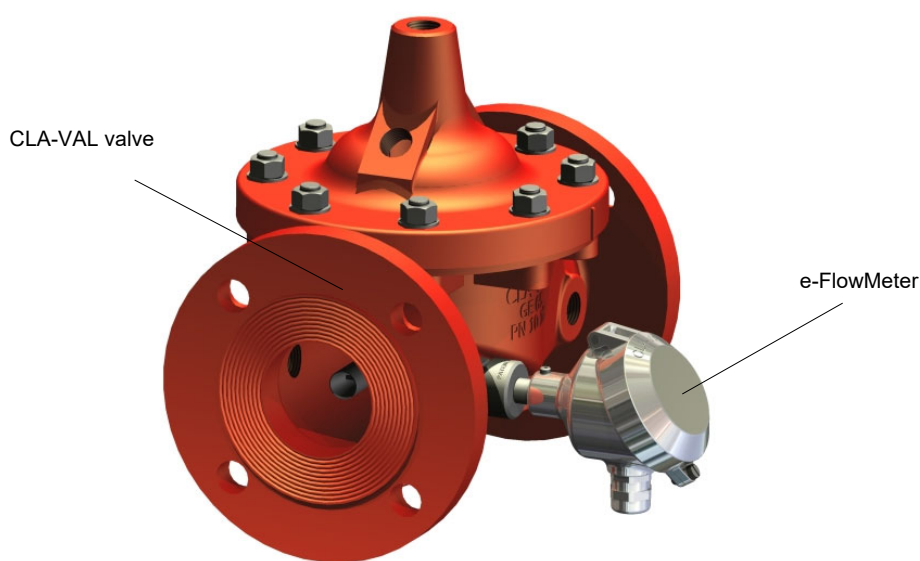
- e. : Some tips.



- f. : Warning!

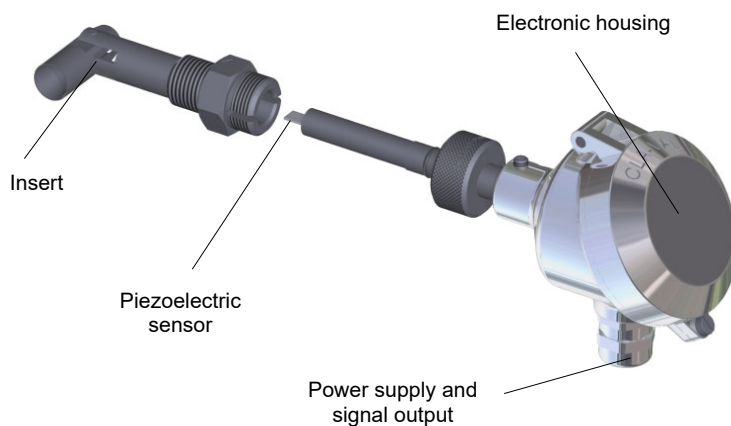
2 OPERATION OF THE E-FLOWMETER

The CLA-VAL e-FlowMeter is a vortex shedding insertion flow meter designed to be factory assembled or retrofitted into a CLA-VAL Automatic Control Valve to provide accurate flow measurement data without the need to install a separate meter. Configured to be installed in the inlet tapping of a CLA-VAL Automatic Control Valve, the e-FlowMeter can be used in valves directly downstream of a turbulent flow such as elbows, valves or reducers. The e-FlowMeter employs an innovative and patented swivel mechanism allowing the meter to be inserted into tappings as small as 1/2".



The e-FlowMeter measures and transmits flow information as a 4-20 mA signal, digital pulse or pulse. It can be directly connected to a SCADA system, various market loggers or products in the CLA-VAL e-Line range.

e-FlowMeter

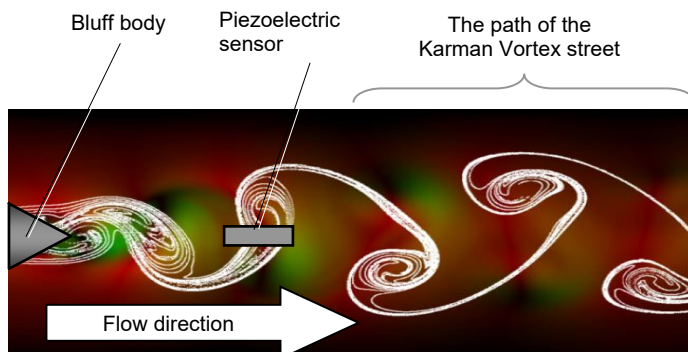


See chapter 3 «Installation of the e-FlowMeter» for installation

Karman Vortex Street

The e-FlowMeter is a vortex shedding insertion flow meter, based on the phenomenon of generating an alternating series of vortices called «Karman vortex street».

When the fluid encounters an obstacle placed in the axis of fluid flow, it divides and creates small vortices alternating on either side downstream of the obstacle. The frequency of vortex shedding, or generation of vortices is directly proportional to fluid velocity. These detached vortices generate variable pressure zones that are detected in the form of short bursts of pressure, using a measuring sensor placed downstream of the obstacle.



Frequency measurement

The frequency of pressure surges or generation of vortices is counted using a piezoelectric crystal encapsulated in the sensor head. The latter is connected by 2 wires to the circuit board for signal processing.

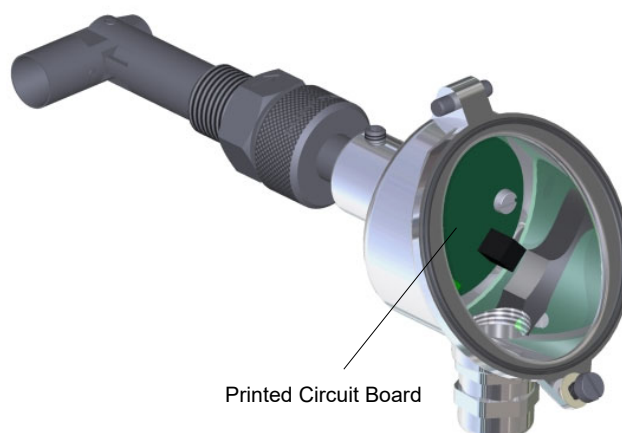
Measurement cylinder orientation

Upon insertion of e-FlowMeter in the valve, the measurement cylinder is oriented parallel to the direction of flow. After inserting the CLA-VAL tool which allows 90 degree rotation of the measurement cylinder, it is locked in position by the piezoelectric sensor insert. This unique 90 degree swivel mechanism makes it possible to increase the length of the measurement cylinder up to 40 mm allowing stabilization of the fluid. This unique design allows it to be inserted into a valve body tapping of 1/2".

Signal processing and output information



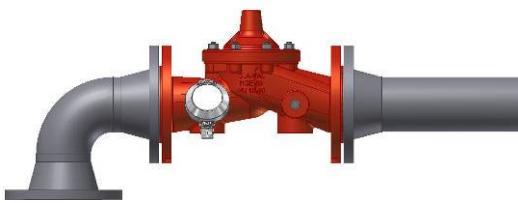



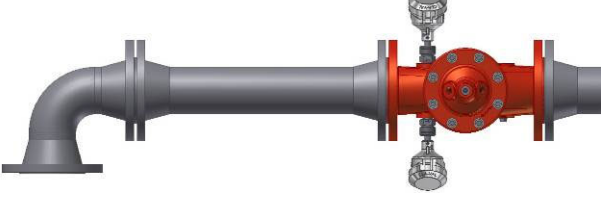

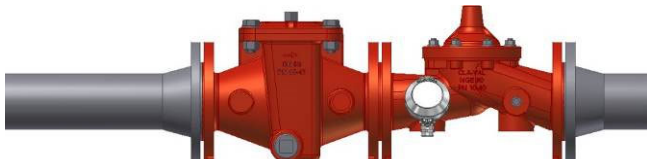

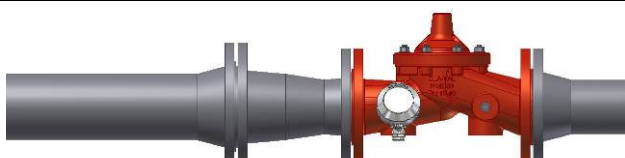
Existing Vortex flow meters operate in turbulent steady flow defined by a Reynolds number exceeding 5'000. This flow regime establishes stable and easily detectable «Karman vortex street» using unsophisticated electronics. Velocities are detected, in general, above 0.5 m/s.

Through the innovative electronic card developed by CLA-VAL, e-FlowMeter can measure flow from a velocity of 0.1 m/s to obtain an accurate signal. This is then converted to 4-20 mA, pulse or digital pulse to suit the desired application.



3 INSTALLATION OF THE E-FLOWMETER

3.1 INSTALLATION LOCATIONS

| Optimum Installations | Unacceptable Installations |
|--|--|
|  <p><u>In Inlet Tapping</u></p> |  <p><u>In Outlet Tapping</u></p> |
|  <p><u>Downstream of an Elbow (Vertical rise)</u></p> |  <p><u>Downstream of double Elbows</u></p> |
|  <p><u>(Directly) Outside Elbow</u></p> |  <p><u>Inside of an Elbow</u></p> |
|  <p><u>≥ 5 Pipe Diameters</u></p> |  <p><u>1 to 5 Pipe Diameters</u></p> |
|  <p><u>Directly upstream of a CLA-VAL H-Strainer (1)*</u></p> |  <p><u>On discharge of a Pump</u></p> |
|  <p><u>Pipe Reducer Upstream</u></p> | |

*(1) Needs a special calibration, contact CLA-VAL

3.2 INSTALLATION INSTRUCTIONS

- 1- All installations, adjustments and maintenance should be carried out by a competent person.
- 2- Do not exceed the maximum ratings given in the specifications and printed on the label.
- 3- The electrical connections should be made as described in the user's manual.
- 4- Before all maintenance operations, shut down the power supply.

⚠: DO NOT ATTEMPT TO OPEN THE PRODUCT AS THIS WILL INVALIDATE THE WARRANTY!

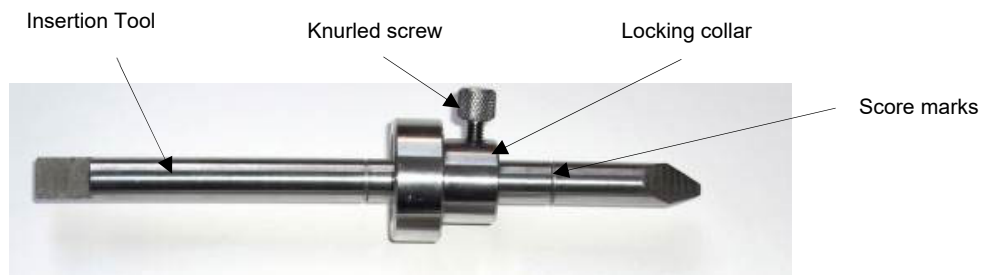
3.3 INSTALLATION AND REMOVAL

3.3.1 MATERIALS REQUIRED FOR INSTALLATION

3.3.1.1 Insertion Tool

⚠ The insertion tool is not provided with the e-FlowMeter.

The insertion tool is needed for the installation and removal of the e-FlowMeter in a CLA-VAL valve. It allows the rotation of the measurement cylinder in the right position.



The insertion tool with a length of 165 mm is used for e-FlowMeter sizes 1,2a and 2b, the insertion tool with a length of 368 mm is used for e-FlowMeter sizes 3 and 4.

3.3.1.2 Power supply for pulse and digital pulse output

There are 2 ways to power the e-FlowMeter for the pulse output. The first is 5 VDC, the second is 6-24 VDC with stabilized power supply, battery, turbine e-Power MP or IP. 3 mA minimum are required (see schematic chapter 3.3.4).

3.3.1.3 Power supply for 4-20 mA output

The voltage needed is 8 - 32 VDC, 20 mA minimum are required. Take care that the loop is closed to obtain a signal 4-20 mA.

3.3.1.4 Cabling

The e-FlowMeter has a 3 or 10 meter cable with 12 wires of 0.22 mm² supplied and attached as a factory standard. If additional lengths of cable are needed, the connections should be made with 0.22 mm² or larger wire and may need to be shielded in some environments where high electrical noise may exist. If using shielded cable, one end of the shielding should be connected to an earth, such as piping system fitting, etc.

3.3.2 INSTALLATION



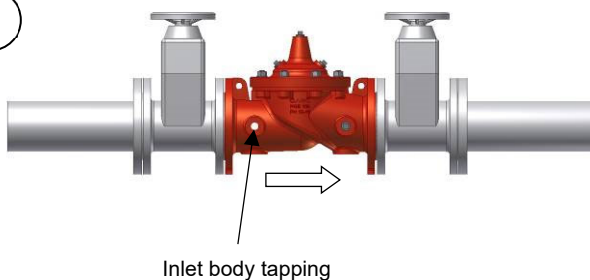
CARE OF THE EQUIPMENT!

The tip of the flow sensor is a precision-built part of the equipment and must be handled with care.

When the flow sensor is not installed, sensor must be protected by the yellow protection cap.

Physical damage to the flow sensor affects the performance and invalidates the warranty.

1



Inlet body tapping



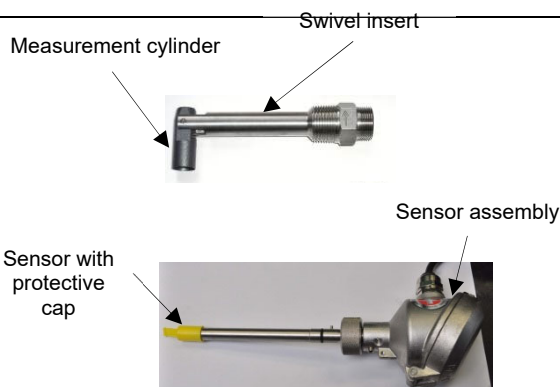
IMPORTANT !

- Isolate the control valve using main line isolation valves.
- Bleed pressure from the valve.
- Remove body plug from valve inlet. If both inlet body tappings are used for the pilot system, consult CLA-VAL factory for correct modification instructions.

2

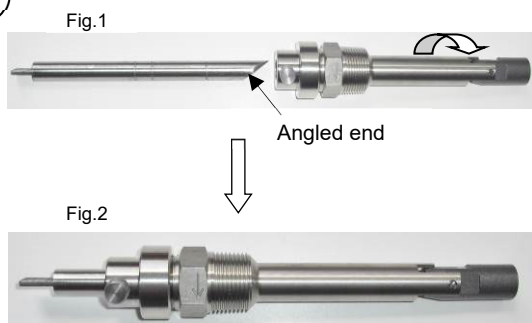


e-FlowMeter delivered in 2 parts: A and B



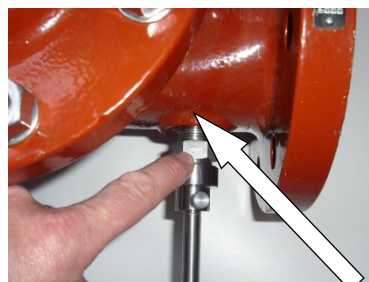
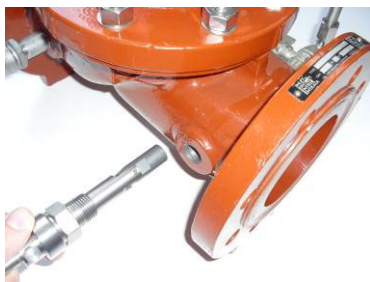
3

Mounting part A



- Straighten the measurement cylinder as illustrated (Fig.1).
- Screw locking collar to the end of the swivel insert assembly.
- Insert angled end of the tool provided as shown, until it stops. Then tighten knurled screw. Apply Teflon® tape to threads of the insert.

4



- Screw swivel insert into the valve and orient arrow marked on the hexagonal section to point downstream and parallel to the direction of flow.



IMPORTANT !

- Swivel insert assembly must be parallel to the direction of flow.

5



Fig.1



Fig.2



Fig.3

- a) Loosen knurled screw and remove locking collar from tool. Remove tool and insert opposite end into the assembly. (Fig.1 & 2)

- b) Turn gently until tool engages. Then push firmly until score mark is flush with the face of the swivel insert assembly. (Fig.3)

6

Mounting part B

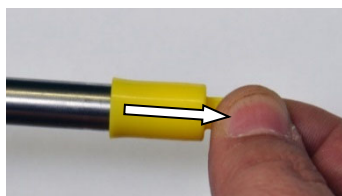


Fig.1



Fig.2



Fig.3

Pin

Headless screw

- a) Remove insertion tool. Remove the protection cap by pulling upright. (Fig.1)
 b) Reassemble e-FlowMeter by inserting the sensor assembly. (Fig.2)
 c) Guide for the pin is positioned in the groove as show.(Fig.3) Fully engage the sensor assembly and tighten the knurled nut. **HAND TIGHT ONLY.**
 d) To orient the sensor assembly, loosen the headless screw (Fig.3), orient the assembly as required then and tighten the headless screw. **Proceed in accordance with wiring diagrams.**

3.3.3 REMOVAL INSTRUCTIONS

1



IMPORTANT !

- a) Isolate the control valve using main line isolation valves.
- b) Bleed pressure from the valve before removing the e-FlowMeter
- c) Disconnect power to all electronic devices on valve, including e-FlowMeter

2



Fig.1

- a) Hand loosen the knurled lock from straight threads (Fig.1)



Fig.2

- b) Remove the e-FlowMeter sensor / head assembly by pulling straight outward (Fig.2), taking extra care to protect the sensor tip.

3



Fig.1



- a) Orient the installation tool as shown on picture and insert into the threaded swivel insert. (Fig.1)



Fig.2



- b) Push the tool with light force to orient the measurement cylinder. (Fig.2)



Fig.3



- c) Slide installation tool straight out, then rotate 180° (Fig.3).



Fig.4



- d) Push the tool to straighten the measurement cylinder, and then secure the installation tool in place with locking collar in locked position (Fig.4)



Fig.5

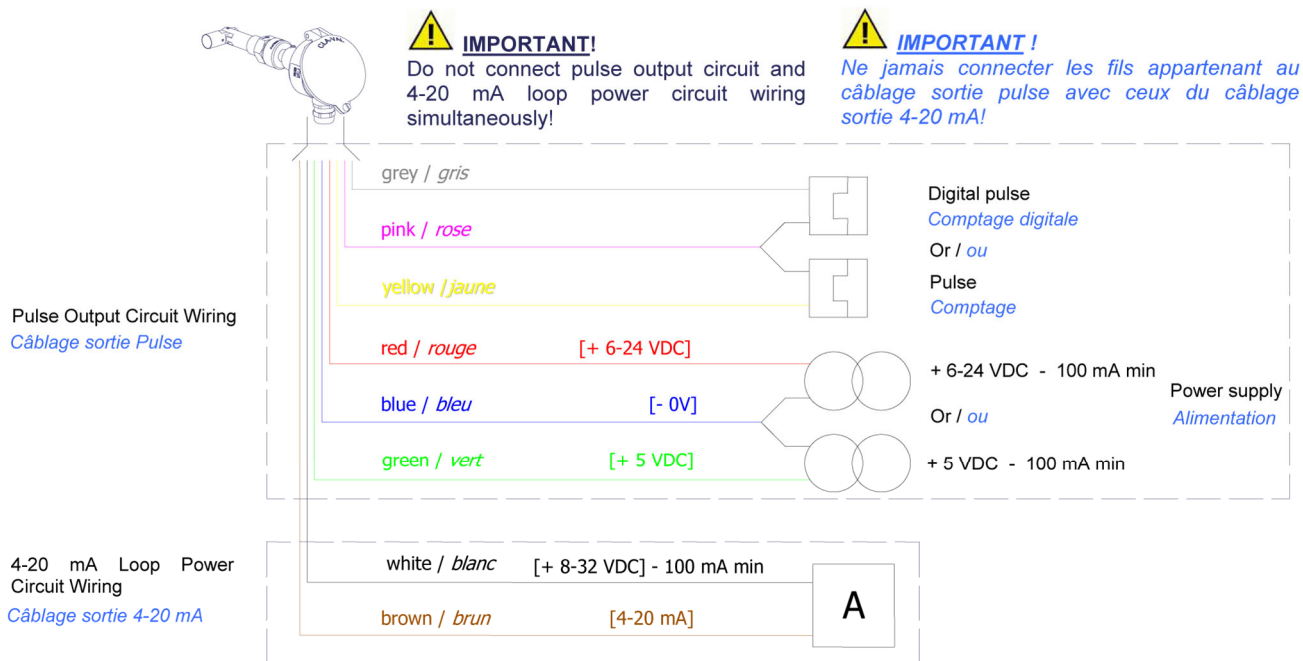
- e) Unscrew and remove threaded swivel insert from the valve tapping with the measurement cylinder straightened.(Fig.5)



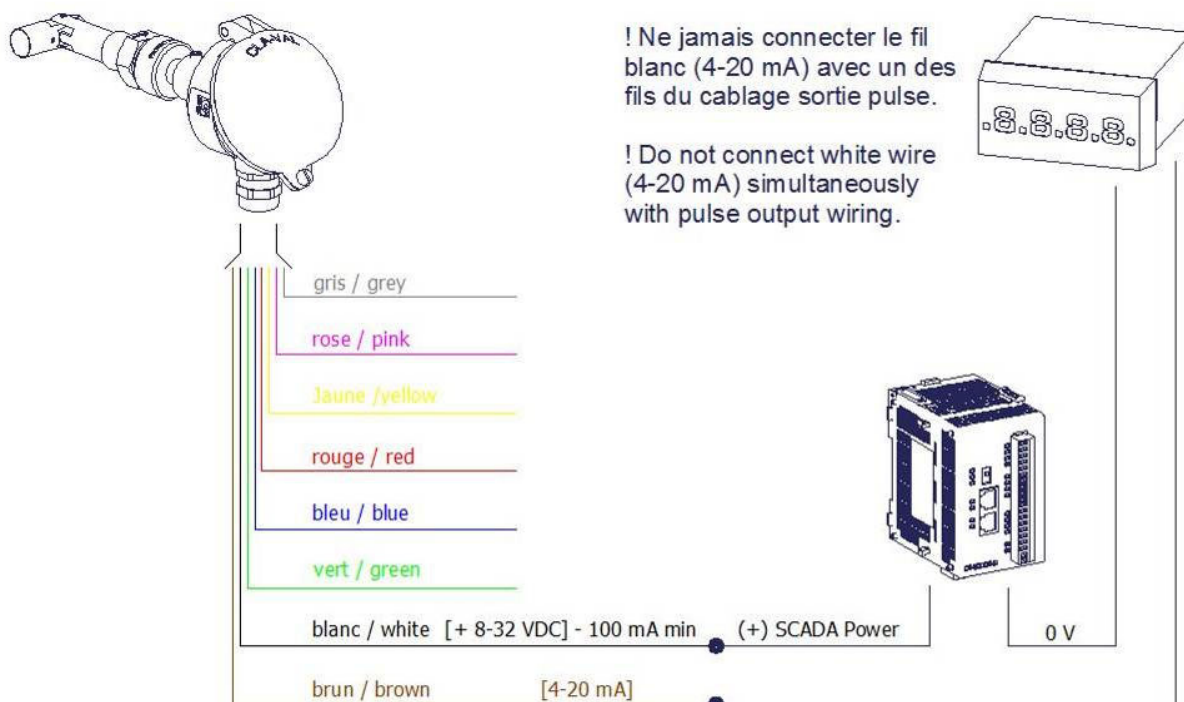
Insert body plug into tapping while servicing the e-FlowMeter

3.3.4 E-FLOWMETER WIRING

3.3.4.1 Standard wiring



3.3.4.2 Wiring example: 4-20 mA output



4 SPECIFICATION

4.1 CALIBRATION

The e-FlowMeter is factory calibrated according to the part number. The calibration is specific to the type and size of the valve. The calibration has been set according to the CLA-VAL IT050 quality test.

4.2 TECHNICAL DATA



Power supply:
(recommended
CLA-VAL turbine power source)

Power protection:

Connection:
Repeatability:

Electrical Specifications

4-20 mA Mode:

- Voltage: 8-32 VDC (e-Power IP)
- Consumption: 4-20 mA

Mode voltage pulse or digital pulse:

- 5 VDC (e-Power MP with super capacitor)
- 6 - 24 VDC
- Consumption: 3 mA

4-20 mA Mode:

- Over Voltage: max. 40 VDC
- Inversion: max. 40 VDC

Pulse or Digital Pulse Mode:

a) Voltage 5 VDC:

- Over Voltage: max. 5.5 VDC
- Inversion: unprotected

b) Voltage: 6 - 24 VDC:

- Over Voltage: max. 40 VDC
- Inversion: max. 40 VDC

1 cable of 12 wires 0.22 mm²

< 1 %



Valve size and model: (mm)

Operating pressure:

Temperature range:

Protection:

Software interface:

Calibration

Other Specifications

NGE 65 - 600 / GE 65 - 400 (Note: NGE 65 and NGE 80 factory tapped ½")

- PN 25 bar standard
- - 10°C to + 80°C (electronics only)
- IP68
- Plug & Play / NT / 2000 / XP / Vista / Win 7 (32 & 64 bit)
- Factory standard



Loss of signal:

Default Modes

- After 30 seconds (default), the 4-20 mA signal is 4 mA (default) or pulse mode frequency = 0

4.3 FLOW PARAMETERS FACTORY CALIBRATED

| | | | | | | | | | | | | | | |
|----------------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|
| Valve DN (mm) | 50 | 65 | 80 | 100 | 125 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 600 |
| Flow at 20 mA (l/s) | 12 | 20 | 35 | 50 | 75 | 110 | 200 | 310 | 445 | 600 | 785 | 980 | 1225 | 1770 |
| Pulse weight (liter) | 10 | 10 | 10 | 10 | 10 | 100 | 100 | 100 | 100 | 100 | 1000 | 1000 | 1000 | 1000 |

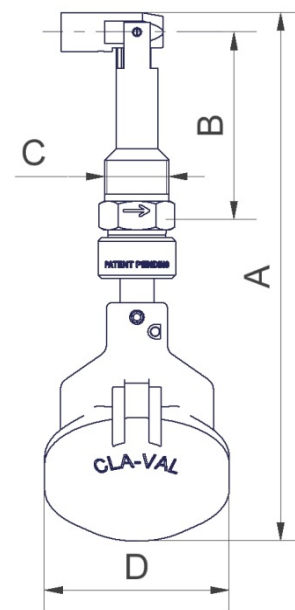
Note: The default flow at 4 mA = 0 l/s, Pulse width = 62.5 ms

All these values could be changed using e-FlowMeter Software (see chapter 6.3 « 4-20 mA, Pulse and Pulse Digital Output Configuration »).

4.4 DIMENSIONS

| e-FlowMeter sizes | | 1 | 2a | 2b | 3 | 4 |
|--|---|------|------|------|-----|-----|
| NGE Valves sizes (mm) | | 65* | - | 125 | 250 | 400 |
| | | 80* | | 150 | 300 | 450 |
| | | 100 | | 200 | 350 | 500 |
| | | | | | | 600 |
| GE Valves sizes (mm) | | 50 | 100 | - | 200 | 300 |
| | | 65 | 150 | | 250 | 400 |
| | | 80 | | | | |
| Overall length (mm) | A | 225 | 240 | 275 | 335 | 455 |
| Insertion length (mm) | B | 58 | 70 | 108 | 165 | 287 |
| Pipe thread R (ISO 7-1) | C | 1/2" | 3/4" | 3/4" | 1" | 1" |
| Overall width (mm) | D | 85 | 85 | 85 | 85 | 85 |
| Clearance from wall or other obstruction | | 254 | 266 | 304 | 361 | 483 |

*NGE 65 mm and NGE 80 mm to be factory tapped 1/2" instead of standard 3/8" tapping.



5 MAINTENANCE AND REPAIR

5.1 ROUTINE MAINTENANCE

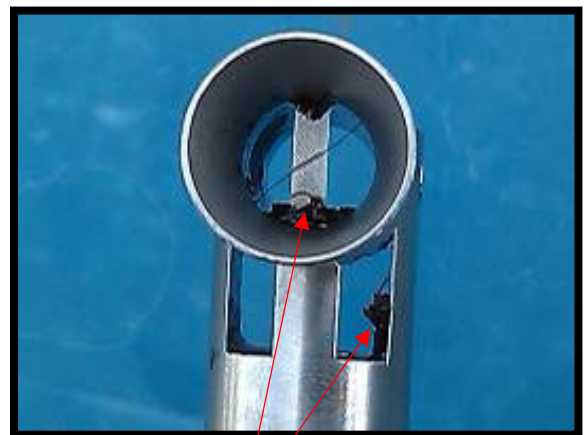
The e-FlowMeter does not have any moving mechanical parts and so is not affected by fatigue wear from mechanical stress. The system should be inspected routinely for leaks. It is recommended the equipment be turned off during inspection.

5.2 CLEANING DEBRIS FROM MEASUREMENT CYLINDER

If the reading from the e-FlowMeter begins to act in an unreliable manner, then the measurement cylinder should be inspected and cleaned out to ensure proper operation.

Procedure:

- 1) Close the shut-off valves to stop the flow of water.
- 2) Disconnect all wiring.
- 3) Go through the removal steps (chapter 3.3.3 «Removal instructions») to remove the e-FlowMeter from the Control Valve, using the Insertion Tool.
- 4) With the sensor still removed from the threaded insert, inspect the measurement cylinder; look specifically for debris caught on the bluff body, as shown on the figure.
- 5) Use pick or small screw driver and tweezers to remove all of the debris from the measurement cylinder, bluff body and anywhere else that is has accumulated.
- 6) Reinstall e-FlowMeter according to chapter 3.3.2 «Installation».



Debris

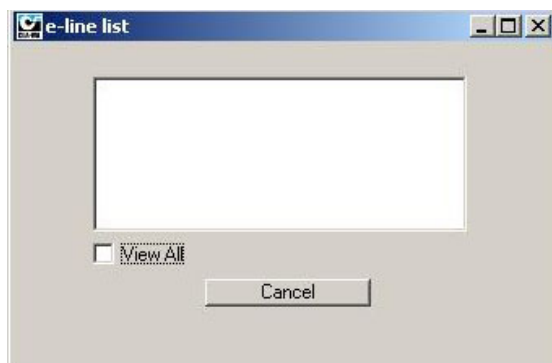
5.3 DEALING WITH SENSOR TIP DAMAGE

If the sensor tip is bent, broken or damaged in the course of the handling or installation, the e-FlowMeter will not function properly. The sensor should be straight with respect to the sleeve. Since it is designed to sense micro-motion, if the sensor is forced to enough to detect the movement with the naked eye, it may have been damage. In that case, contact CLA-VAL Customer Service.

6 SOFTWARE AND FIRMWARE

6.1 CONNEXION PC / E-FLOWMETER

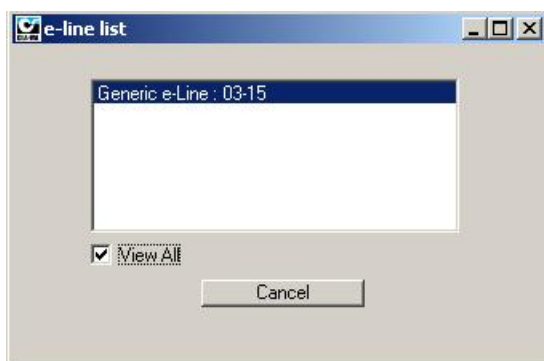
When launching the e-FlowMeter Software, if no e-FlowMeter is connected to your PC, the list allowing e-Line product multi-connection is empty (see image below), select **"Cancel"**.



If you are connected to one or more e-FlowMeter or other e-Line products, click on **"View All"** and select the product line you wish to connect to.

If your e-Line product is not up to date on the multi-connection, the e-Line product list remains empty. Click on **"View All"**. The e-Line product is visible under **"Generic e-Line"** (see image below). Select the line to communicate with the e-Line product.

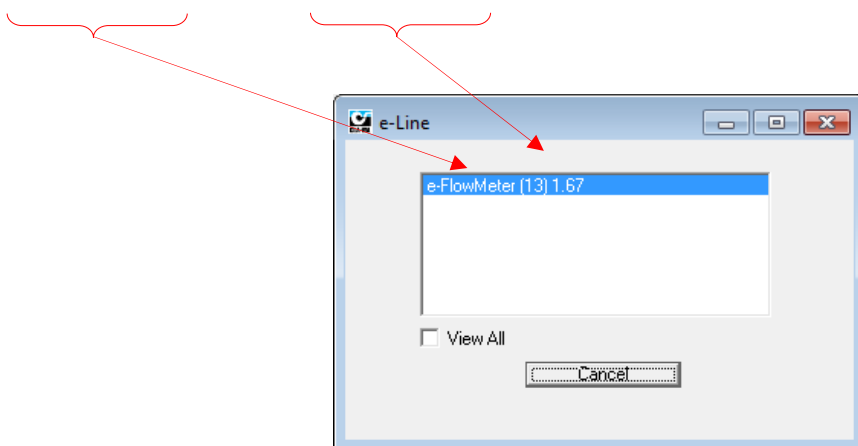
In order to display the name and serial number of the e-Line product in the e-Line List, a firmware update is required (see Chapter 6.2 "Firmware Update [Internal Software]").



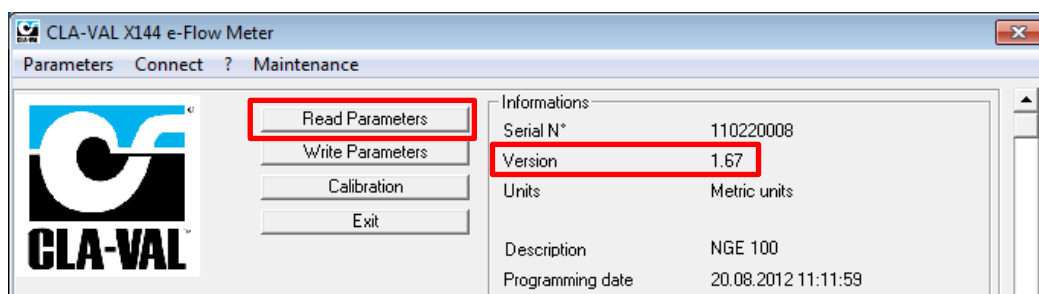
6.2 FIRMWARE UPDATE (INTERNAL SOFTWARE)

1. The e-FlowMeter must be powered.
2. Connect the connection cable to the USB port of your computer.
3. Connect the e-FlowMeter to the connection cable.
4. Open the e-FlowMeter software (latest version).
5. A selection window appears:

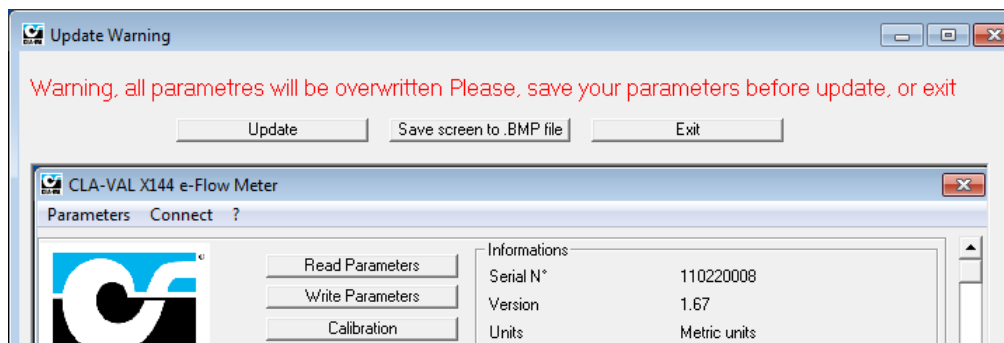
The name of product and the Firmware version are displayed



6. Click on the e-FlowMeter line, the software opens.
7. Click on **"Read parameters"**: retrieve information about the device and set the output parameters.
8. Check that the e-FlowMeter has the latest firmware version available via our website www.cla-val.ch.

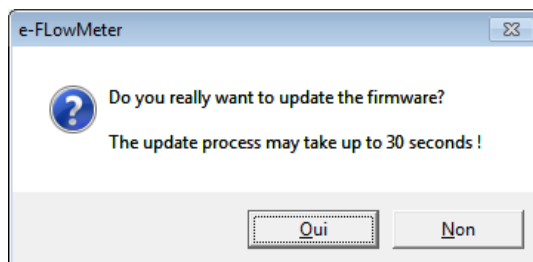


9. If yes, go directly to the next chapter.
10. If no, select **"Firmware update"** in the **"Parameters"** tab.



11. Click **"Save screen to .BMP file"** to save an image of the e-FlowMeter calibration settings on your computer.

12. Click "**Update**" to update the Firmware, the following window appears:

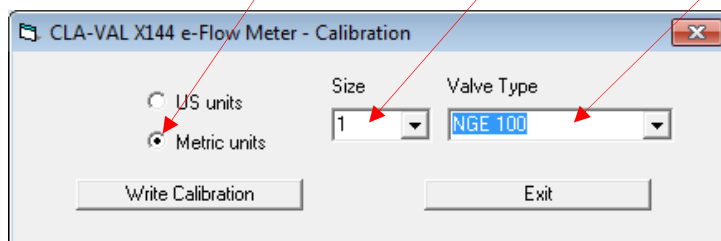


13. **Open** the **corresponding** "hex" file, previously downloaded from our website www.cla-val.ch.

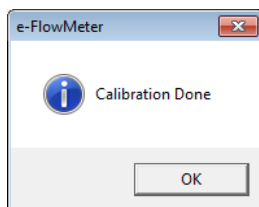
14. **Then** click on "**Read parameters**" in order to view the firmware version update.

15. **Calibrate** the e-FlowMeter by choosing "**Metric units**", select the size and the model of the valve (see chapter 4.4 « Dimensions » for more information).

16. Click on "**Write Calibration**":



17. The following message appears:

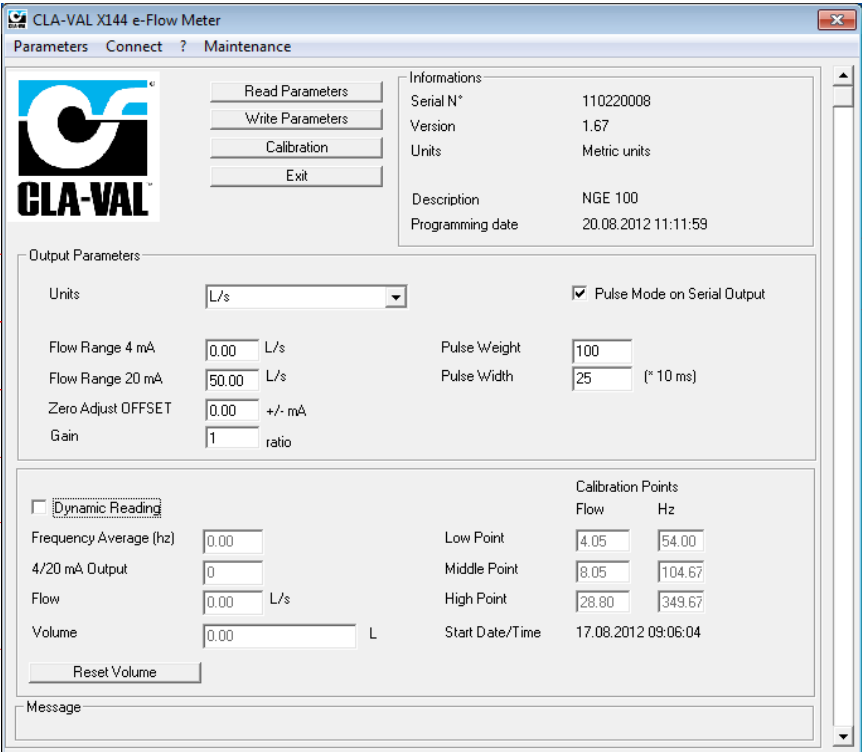


18. Click on "**OK**", the Firmware is updated.

6.3 4-20 MA, PULSE AND PULSE DIGITAL OUTPUT CONFIGURATION

The e-FlowMeter is factory calibrated. Calibration depends on the model and size of the valve (see chapter 4.3 « Flow Parameters Factory Calibrated » for the corresponding values). But if necessary, it is possible to change the 4-20 mA scaling or pulse weight and pulse width.

When starting e-FlowMeter Software, the window below appears:



Informations

Serial N° 110220008
Version 1.67
Units Metric units
Description NGE 100
Programming date 20.08.2012 11:11:59

Output Parameters

Units L/s ☒ Pulse Mode on Serial Output

Flow Range 4 mA 0.00 L/s
Flow Range 20 mA 50.00 L/s
Zero Adjust OFFSET 0.00 +/- mA
Gain 1 ratio

Pulse Weight 100
Pulse Width 25 (* 10 ms)

Dynamic Reading

☐ Dynamic Reading

Frequency Average (Hz) 0.00
4/20 mA Output 0
Flow 0.00 L/s
Volume 0.00 L

Calibration Points

| Flow | Hz |
|-------------------|--------|
| Low Point 4.05 | 54.00 |
| Middle Point 8.05 | 104.67 |
| High Point 28.80 | 349.67 |

Start Date/Time 17.08.2012 09:06:04

Reset Volume

Message

Informations: Display information: Serial number, Firmware version, calibration units (Metric units in l/s or US units in GPM), valve model and programming date.

Display unit: It is possible to change the display unit (l/s, GPM (Gallon Per Minute), GPH (Gallon Per Hour), Ml/d (Mega liter per day), m³/h, m³/min et CFS (Cubic Feet per Second) then click "**Write Parameters**".

4-20 mA output: Allow the 4 mA and 20 mA values to change, then click "**Write Parameters**".

Offset and Gain: If there are some special applications, use Offset and/or Gain to obtain a better measurement.

Output values: When "**Dynamic Reading**" is clicked, it shows the frequency measured by the piezoelectric sensor, 4-20 mA output, flow and volume. To put the volume to 0, click on "**Reset Volume**".

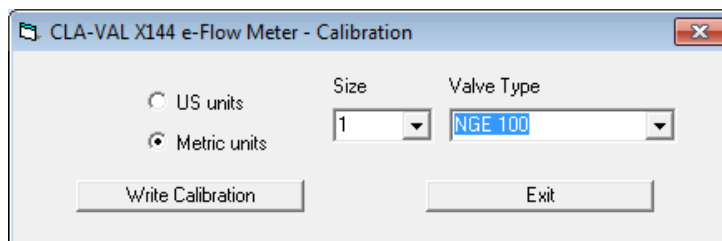
Pulse or digital pulse activation: If the "**Pulse Mode on Serial Output**" is ticked, the pulse output is activated, if it is disabled, the digital pulse is activated, then click "**Write Parameters**".

Pulse output parameters: In standard the pulse output is activated with a Pulse weight of 100 liter for valve size DN 150 mm and below, 1000 liter for valve size DN 150 mm and above. The Pulse Width is 250 ms (millisecond). Both values could be changed if necessary, then click "**Write Parameters**".

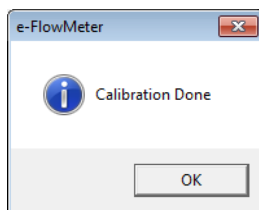
6.4 CALIBRATION

According to table from chapter 4.4 « Dimensions », an e-FlowMeter size covers more than 1 valve model. For example, it is possible to take an e-FlowMeter calibrated for a NGE 80 valve and to recalibrate for a NGE 100 valve. To do this:

- 1) Start the e-FlowMeter Software and click on "**Calibration**".
- 2) Select "**Metric units**", choose size of the e-FlowMeter then the model of the valve, in our case size 1 and NGE 100 then click on "**Write Calibration**":



- 3) The following message appears:



- 4) Click on "**OK**", the e-FlowMeter is calibrated.