February 2021

RMC Reliance® VALVES

# Octave Ultrasonic Water Meters

# Installation Manual

AN RWC BRAND

1800 810 803
1800 062 669
sales@rmc.com.au
rmc.com.au

AN RWC BRAND
Reliance Worldwide Corporation (Aust.) Pty. Ltd.
27-28 Chapman Place, Eagle Farm QLD 4009,
Australia | ABN 71 004 784 301

# Table of Contents

## Octave Ultrasonic Water Meter Installation Manual


| | |
|---|---|
| **Introduction** | |
| General and Safety | 1 |
| Items Included With Order | 1 |
| Supplied Documentation | 1 |
| Unpacking and Inspection | 1 |
| System Description and Measurement Method | 1 |
| Notes | 2 |
| Counter Flanges | 2 |
| Start-up | 2 |
| **Technical Information** | |
| Digital Display | 3 |
| Mechanical Data | 3 |
| Performance Specifications | 3 |
| Outputs | 4 |
| Dimensions | 5 |
| **Installation** | |
| Handling the Flow Meter | 6 |
| General Installation – Location and Position | 6 |
| Polymeric Octave Installation – General Instructions | 8 |
| Stainless Steel Installation | 10 |
| **Electrical Outputs** | |
| Open Drain Dual Output | 16 |
| Dry Contract Dual Output | 17 |
| SSR Dual Output | 18 |
| Analog Output (4-20mA) | 20 |
| Indoor Installation | 20 |
| Outdoor Installation | 21 |
| Modbus Output | 22 |
| M-Bus Output | 23 |
| **Module Replacement / Mounting Manual** | |
| Instructions | 24 |

# Introduction

## General and Safety

- Do not install, operate or maintain this flow meter without reading, understanding and following the factory supplied instructions. Otherwise, injury or damage may result.
- Read these instructions carefully before beginning installation and save them for future reference.
- Observe all warnings and instructions marked on the product.
- Consider handling and lifting instructions to avoid damage.
- If the product does not operate normally, refer to the service instructions or to a qualified ARAD service engineer.
- There are no operator-serviceable parts inside this product.

## Items Included With Order

- One Octave ultrasonic flow meter, size as indicated on the packaging box, pieced together into a complete compact system (flow tube plus electronics).
- One output module, either digital or analog (based on the customer's order).

## Supplied Documentation

- Condensed installation and user manual.
- Report of factory meter settings.
- Certificate of calibration data.

## Unpacking and Inspection

- This product has been thoroughly inspected and tested before shipment and is ready for operation.
- After carefully unpacking the meter, inspect for shipping damage before attempting to install. If any indication of mechanical damage is found, immediately contact the responsible transportation service and your local Arad Ltd. representative.

## System Description and Measurement Method

- The Octave's measurement method is based on an ultrasonic, transit-time, dual-beam sensors which determines the length of time it takes an ultrasonic sound wave to travel the distance between the two sensors located on the meter's body. The sensors function as both the sender and the receiver, each one alternating these functions so that the ultrasonic wave travels both with and against the direction of the flow. Since the ultrasonic wave travels slower against the flow than with the flow, the time difference of two waves traveling with and against the flow leads to determining the velocity of the water.
- The Octave Ultrasonic Flow Meter is a battery-powered precision flow meter designed for linear, bidirectional flow measurement of water.
- Flow measurement values can be transferred through the standard comminucation – digital or analog output.
- The Octave can be set up for a wide range of applications.

# Introduction

## Notes

- For proper flow measurements, the Octave's measuring tube should be completely full at all times. Non-wetted sensors show loss of signal. Though this will not cause damage to the meter, it will, however, not measure flow and display zero.
- Flow direction: The Octave is a bidirectional flow meter. Note the indicating arrow on the Octave's display for forward and backward flows.
- In case of direct sunlight exposure, it is recommended to keep the lid closed, though no direct damage will occur with the lid open.
- Do not expose the Octave to excessive vibration. To avoid vibration, support the pipeline on both side of the meter.
- Ambient working temperature: -25 to +55ºC.
- Water working temperature: 0.1 to +50ºC.
- NMI approved to zero upstream and zero downstream straight length of pipe.
- To avoid measuring errors due to air in the flow tube, observe the following precautions:
  - Since air collects at the highest point of the system, installation of the flowmeter should be at the lowest point.
  - Always install control valves downstream of the meter in order to avoid cavitation.
  - Never install the meter on a pump suction side in order to avoid cavitation.

## Counter Flanges

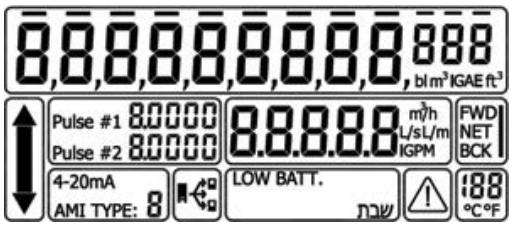
- Refer to the standard dimensional drawings for flange spacing, accommodating for the thickness of gaskets.
- Install meter in line with the pipe axis. The flange faces must be parallel to each other.
- Permissible length deviation: Lmax – Lmin 0.5mm (0.02").

## Start-up

- Check that the meter has been installed correctly (as per this manual).
- Check that the flow rate and volume units are correctly preprogrammed on the display.
- Check that the output module is correctly attached.

# Technical Information

## Digital Display




| | |
|---|---|
| Flow Direction | System Error |
| Flow Rate Units | Output Mode |
| Accumulator Mode | Volume Units |
| Communication Mode | Pulse Resolution |
| Low Battery Alert | |


### Sleep Mode

After 24h (or according to any default choosen) of empty pipe line/ pipe without water the meter will switch to sleep mode.

## Mechanical Data

| PERFORMANCE SPECIFICATIONS | | |
|---|---|---|
| Maximum Working Pressure | 16 bar | |
| Liquid Temperature | 0.1 up to 50 º C | |
| Precision Class | ISO 4064 rev.2014, Accuracy class 2 | |
| Configuration | Compact - The display is built in to the unit | |
| Power Source | 2 D size Li-battery: up to 15 years life time | |
| Environmental Protection | IP 68, Ambient operation temp. -25ºC up to +55ºC | |
| Volume Display Options | 1. Net (Forward less reverse) | 3. Reverse only |
| | 2. Forward only | 4. Forward & reverse alternating |
| Data Logger | Volumes and alarms data (48KB, 4130 data points) | |
| Connections | 1½-2" threaded: with couplings to NPT/ BSP | |
| | 2"-12" flanged: flanges according to ISO, BS 10 and ANSI 150 | |
| Severity levels | Mechanical class M1 | |
| | Electromagnetic environment class E1 | |
| Pressure Loss | ΔP 0.16 bar | |

# Technical Information

## Outputs

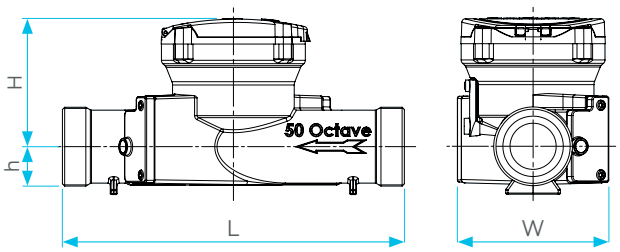
| OUTPUT INFORMATION | |
|---|---|
| Analog Output | The Analog Output shows the currently measured flow rate.<br>This output is a 4 – 20 mA current loop (the end user must supply power to the unit).<br>The Analog Output is programmable for forward and reverse flow (see Operation Manual for more details).<br>The 20mA point is programmable per customer request (To any flow lower than the max flow of the meter). |
| Digital (pulse) Output | The Digital (pulse) Output is an open drain transistor output that provides pulse per quantity with these options:<br>**1.** Two scaled forward and/or reverse mode pulses<br>**2.** One scaled forward pulse and one alarm frequency output<br>**3.** Measuring units of the output can be programmed different than displayed units<br>Pulse resolution will be shown on the display for each pulse separately. |
| Dry Contact | **Output The Dry Contact Output is a dual mechanical relay output that provides pulse per quantity with these options:**<br>**1.** Two scaled forward and/or reverse mode pulses<br>**2.** One scaled forward pulse and one alarm frequency output<br>**3.** Measuring units of the output can be programmed different than displayed units<br>Pulse resolution will be shown on the display for each pulse separately.<br>Onsite power supply of 5-35 VDC is needed. |
| SSR (Solid State Relay) | **The SSR is a dual electronic relay output that provides pulse per quantity with these options:**<br>**1.** Two scaled forward and/ or reverse pulses<br>**2.** One scaled forward and one alarm frequency output<br>**3.** Measuring units of the output can be programmed different than displayed units<br>Pulse resolution will be shown on the display for each pulse separately.<br>Onsite power supply of 5-35 VDC is needed. |
| Encoder Output | The Encoder Output is a serial communication protocol utilizing UI1203 or UI1204 (Sensus protocol).<br>Additional pulse output is available as an option. |
| Modbus Protocol Output / M-Bus | The Modbus Protocol Output has the following available functions:<br>**1.** Alarms (battery, empty pipe)<br>**2.** AMR serial number<br>**3.** Real Time Clock (RTC)<br>**4.** Volume units<br>**5.** Flow rate units<br>**6.** Current flow<br>**7.** Flow direction<br>**8.** Forward and reverse volumes<br>**9.** Flow and volume resolution |
| Output Extension Cable | 5m extension cable for installation in pits and vaults |

# Technical Information

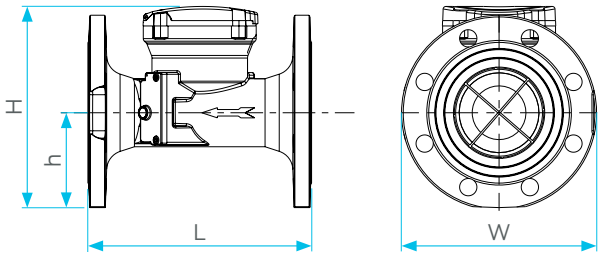
## Dimensions

| MODEL | | OCTAVE ULTRASONIC WATER METER | | | | | | | | | | STAINLESS STEEL | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Size | mm | 40 Threaded | 50 Threaded | 50 | 65 | 80 | 100 | 150 | 200 | 250 | 300 | 50 | 80 | 100 | 150 |
| | inch | 1 ½ Threaded | 2 Threaded | 2 | 2.5 | 3 | 4 | 6 | 8 | 10 | 12 | 2 | 3 | 4 | 6 |
| L - Length without couplings (mm) | | 300 | 300 | 200 | 200 | 225 | 250 | 300 | 350 | 449 | 499 | 200 | 225 | 250 | 300 |
| W - Width (mm) | | 113 | 113 | 165 | 185 | 200 | 220 | 285 | 340 | 406 | 489 | 165 | 200 | 220 | 285 |
| H - Height (mm) | | 155 | 155 | 194 | 210 | 210 | 223 | 282 | 332 | 383 | 456 | 194 | 210 | 223 | 282 |
| h - Height (mm) | | 35 | 35 | 40 | 90 | 90 | 103 | 140 | 165 | 203 | 245 | 40 | 90 | 103 | 140 |
| Weight (kg) – Cast Iron Body | | | 8 | 9 | 11.5 | 13 | 15 | 32 | 45 | 68 | 96 | | | | |
| Weight (kg) – Polymer Body | | 1.4 | 1.45 | | | | | | | | | | | | |
| Weight (kg) – Stainless Steel body | | | | | | | | | | | | 6 | 7 | 9.5 | 16 |

### Threaded




### Flanged



# Installation

## Handling the Flow Meter

Important handling information:

- Do not lift the Octave by the electronic housing.
- Do not carry the Octave by its lid.
- Do not place the Octave on the electronic housing.
- When handling the Octave, avoid hard blows, jolts or impacts.

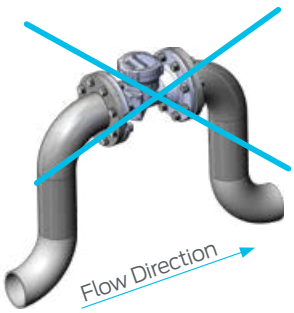
## General Installation – Location and Position

**Note:** The Octave needs to operate with downstream back pressure of minimum 0.5-0.7 Bar. Do not install the meter with a fully open downstream pipe (with no back pressure).

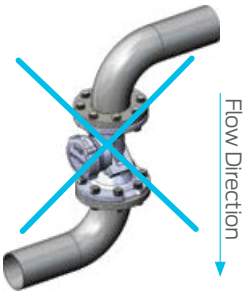
Due to the high sensitivity of ultrasonic measuring principals, it is recommended that a testable backflow device is installed downstream of the meter to provide hydraulic stability. The recommended backflow device should be installed between 2 and 10 pipe diameters from the meter outlet. Failure to do so may result in movement within the measuring chamber leading to backflow measurement. RWC is unable to support backflow diagnostics where this advice is not followed.

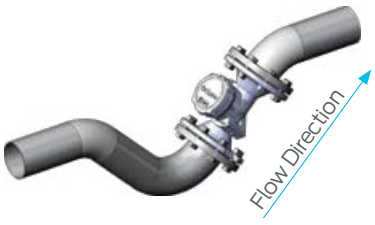
**Recommended Installation**


**Conditional Installation**




**Wrong Installation**




**Recommended:** If this is not the highest point in the system or a hydraulic jump has been installed to keep the flow meter full.

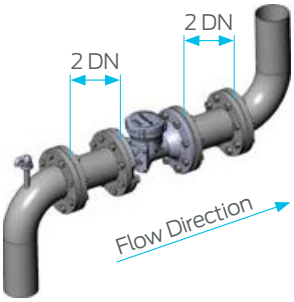
**Not recommended:** If this is the highest point in a system or if pipeline and/or flow meter is subject to being emptied between uses avoid this installation.

# Installation

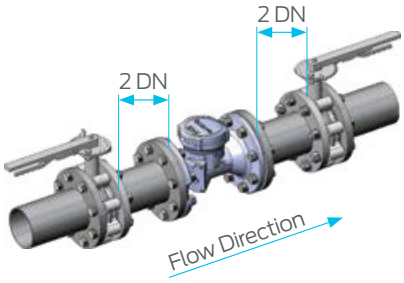
**The Following Examples are Arad's Recommendations For Achieving Top Performance**

- When installing the Octave downstream of any hydraulic component (valve, pump) the recommended installation requirements are no less than the drawings recommendations. For upstream and downstream straight pipes please use as much as installation site will allow (the longer the better).
- When installing Pressure Breaker after the meter – the pipe length should be at least 2 pipe diameter (the longer the better).
- NMI approved to zero upstream and zero downstream straight length of pipe.

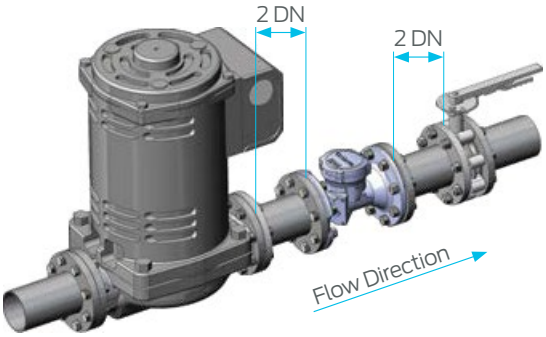
### Two pipe diameters before and after elbows (90°)



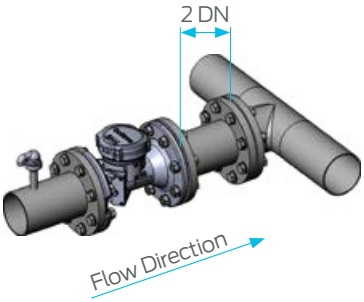

### Minimum of two pipe diameters before and after



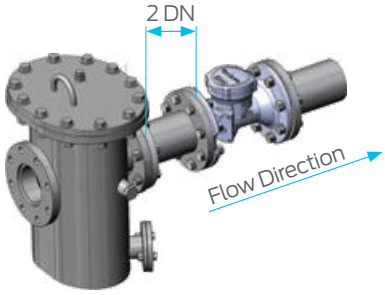

### Minimum of ten pipe diameters after pumps



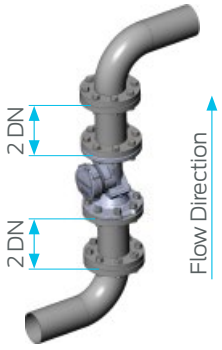

### Minimum of two pipe diameters before T connections




### Minimum of two pipe diameters after strainers




### Two pipe diameters before and after elbows (90°) in vertical installations



# Installation

## Polymeric Octave Installation – General Instructions

Please follow the general instructions for water meters (Check Valve, upstream and down stream and system flushing on new installations).

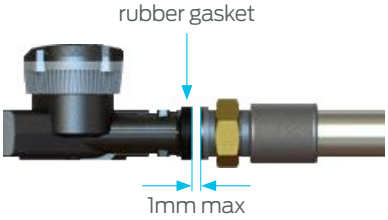
**Existing and new installations**

1. It is recommended that the meter will NOT be installed in the middle of the system, so the meter will not suffer from the load of all the installed fixtures.

2. It is recommended that at least one side of meter will be connected to a PVC (or plastic) pipe.

3. Please make sure that the end connections are parallel and inline to each other.

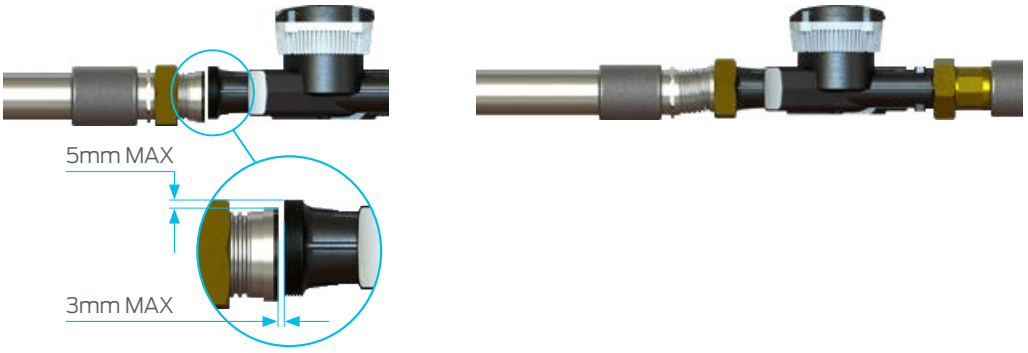
4. When using standard tail piece, please use rubber gaskets only (not fiberglass)! After adding the gaskets the gap between the end connection and the meter should not exceed 1mm.
   - Please unscrew the end connection in order to keep the recommended distance.
   - Please do not use force in order to close the gap.
   - Please don't do any welding while the meter is connected to the pipe.



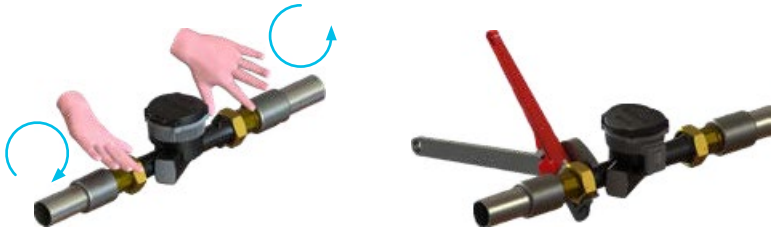
# Installation

5. If it is not possible to use plastic connections on one side of the meter, please consider the use of our flexible couplings. These couplings were especially developed for the Polymeric Octave Meters.

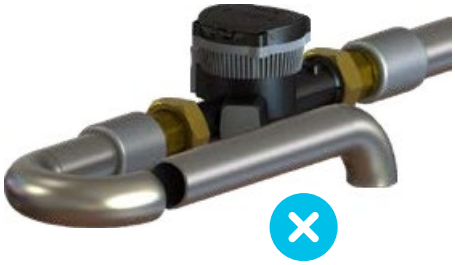
   You will need to use this coupling only on one side of the meter – please install the coupling on the outlet, if possible – as described in the below diagrams.



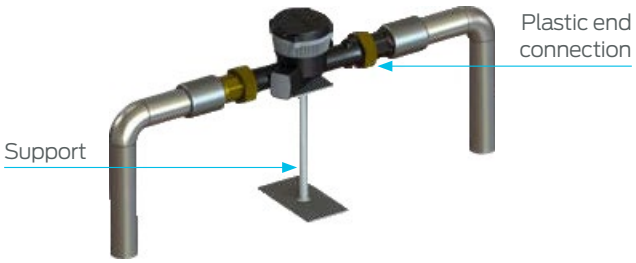

6. Please start to tighten the end connections by hand. Final tightening will be with no more than 100Nm torque.



7. Please don't do any welding while the meter is connected to the pipe.



8. In case it is not possible to use plastic end connections (at least on one side), please support the meter as shown in the drawing below.



# Installation

## Stainless Steel Installation

### Installation Method #1

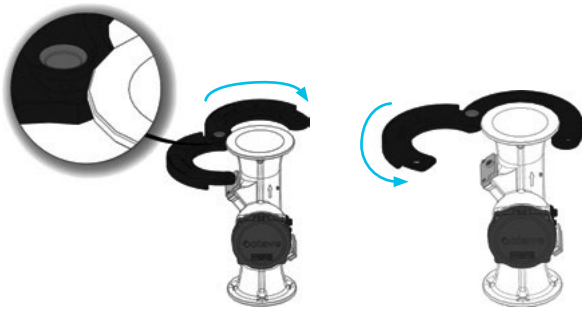
If flanges were previously installed on the Octave, proceed to step 4.

### Step 1

1. Place the meter vertically on one of its ends.

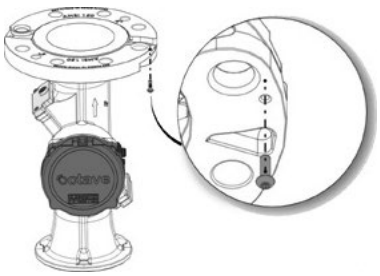
2. Hold the floating flange in a way that the standard marking is facing up.

3. Assemble the floating flange on the meter so its ribs are located between the meter's ribs and the upper end.

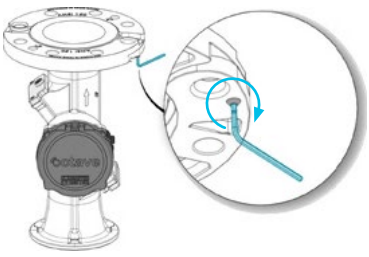


### Step 2

1. Insert M5 bolt as shown.



2. Seal the floating flange by screwing the attached M5 bolt at the designate thread.

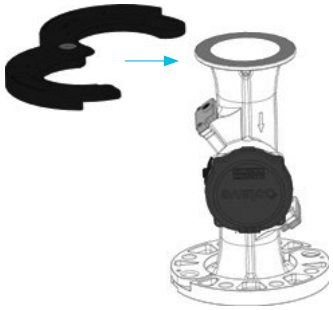


# Installation

### Installation Method #1

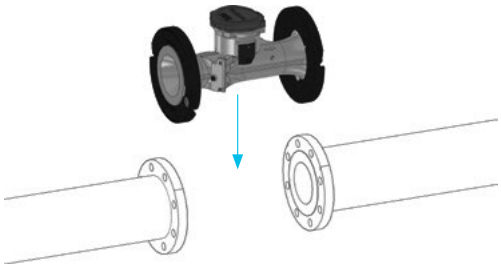
## Step 3

1. Turn the meter over and repeat steps 1 to 2 for the other side of the meter.



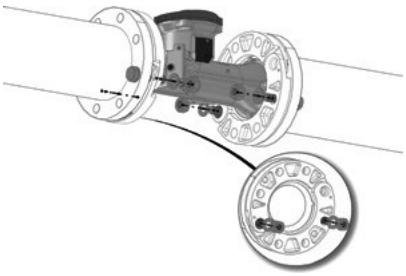
## Step 4

1. Lower the meter into the pipeline.



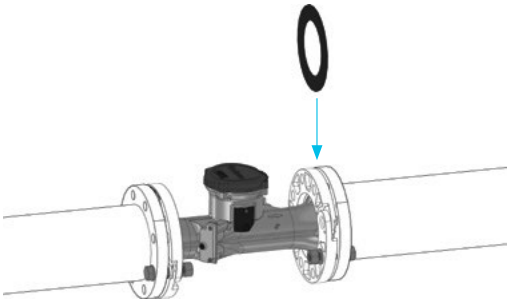
2. Connect the floating flanges two lowest bolts to the pipeline flanges.

   **Note:** the nuts should be tightened only one rotation to prevent the bolts from sliding out.



## Step 5

1. Insert a gasket between the floating flange and the pipeline flange.

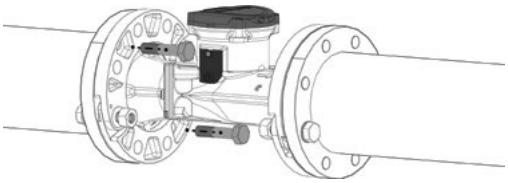


# Installation

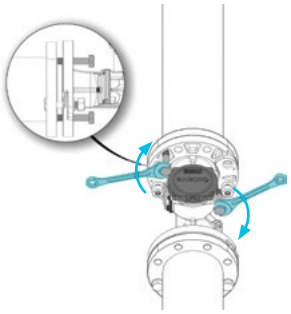
### Installation Method #1

## Step 6

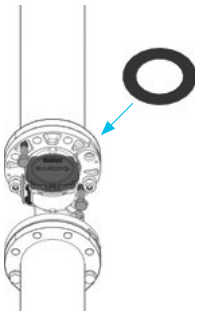
1. In order to easily insert a gasket, screw two “pushing” bolts at the floating flange designate threads.



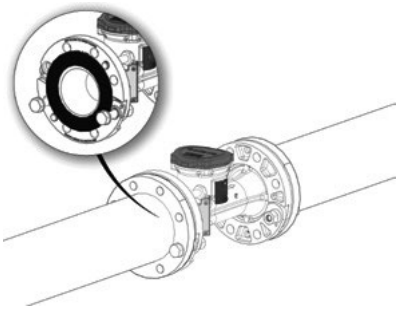
2. Tighten the bolts in order to enlarge the gap between the meter and the pipeline.



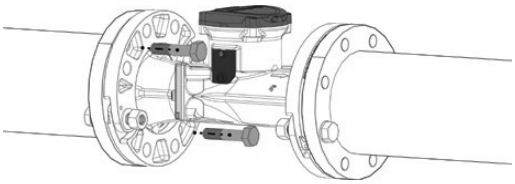
3. Insert a gasket between the floating flange and the pipeline flange.



4. The gasket will then sit between the flanges as shown.

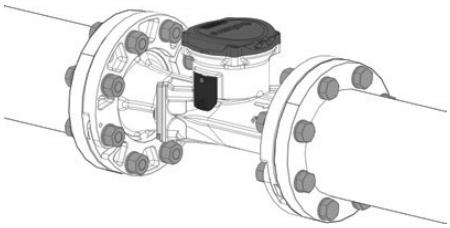


5. Unscrew the "pushing" bolts from the designated threads.



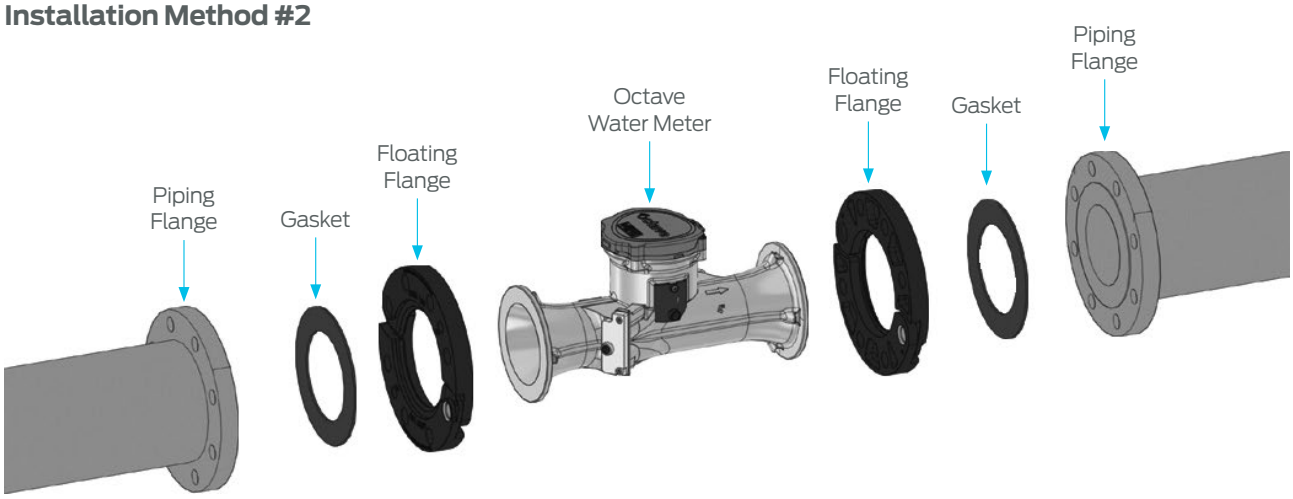
## Step 7

1. Install the remaining nuts and bolts to the flanges and tighten them all the way.



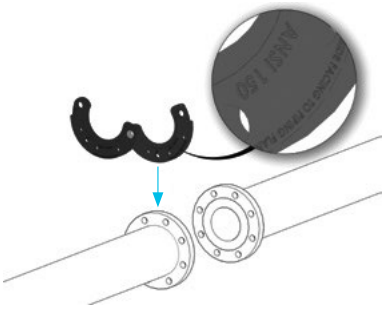
# Installation

### Installation Method #2



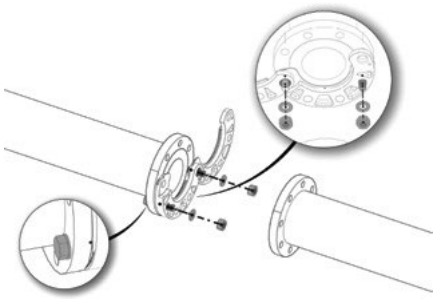

## Step 1

1. Place the first floating flange on the pipeline in a way that the standard marking is facing to the pipeline and the threads are vertical.



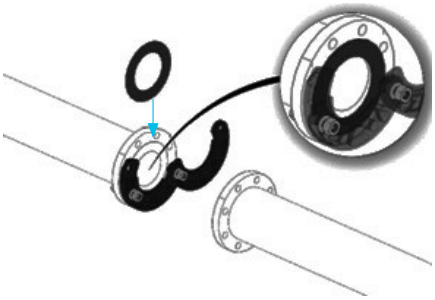
2. Connect floating flanges two lowest bolts to the pipeline flanges.

   **Note:** the nuts should be tightened only one rotation to prevent the bolts from sliding out.



## Step 2

1. Insert a gasket between the floating flange and the pipeline flange.

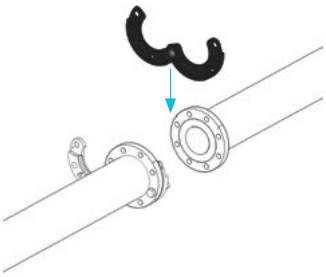


# Installation

### Installation Method #2

## Step 3

1. Place the second floating flange on the pipeline in a way that the standard marking is facing to the pipeline and the threads are horizontal.

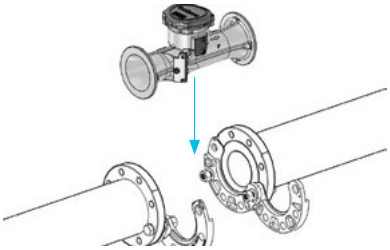


2. Connect floating flanges two lowest bolts to the pipeline flanges.

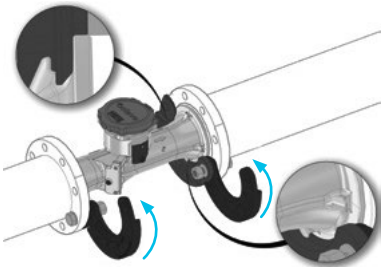
   **Note:** the nuts should be tightened only one rotation to prevent the bolts from sliding out.

## Step 4

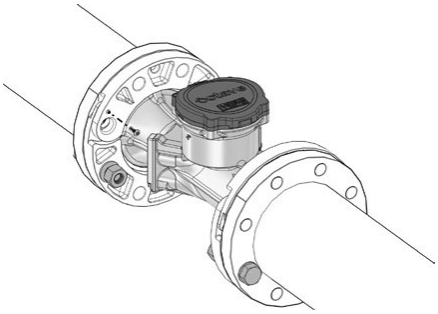
1. Lower the meter to the pipeline.



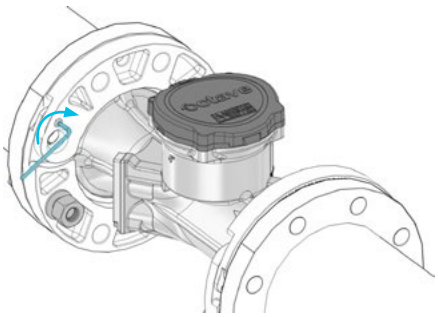
2. Close the floating flanges.



3. Insert M5 bolt as shown.



4. Seal the floating flange by screwing the attached M5 bolt at the designate thread. Repeat actions 3 to 4 for the other side of the meter.

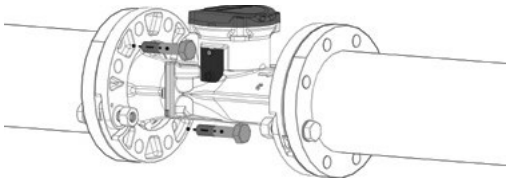


# Installation

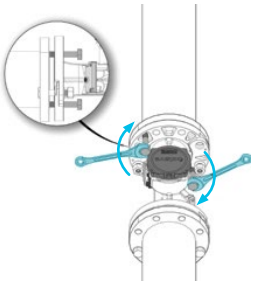
### Installation Method #2

## Step 5

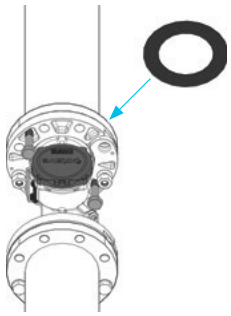
1. In order to easily insert a gasket, screw two "pushing" bolts at the floating flange designate threads.



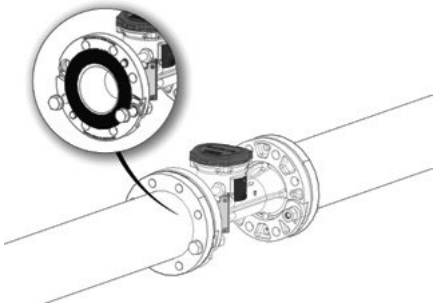
2. Tighten the bolts in order to enlarge the gap between the meter and the pipeline.



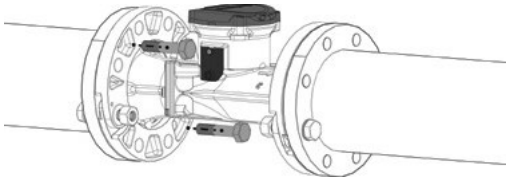
3. Insert a gasket between the floating flange and the pipeline flange.



4. The gasket will then sit between the flanges as shown.

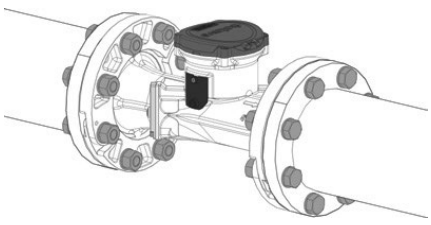


5. Unscrew the “pushing” bolts from the designated threads.



## Step 6

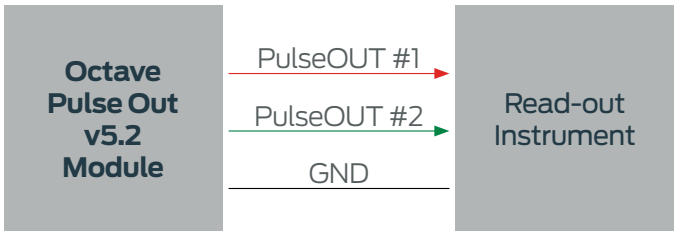
1. Install the remaining nuts and bolts to the flanges and tighten them all the way.



# Electrical Outputs

## Open Drain Dual Output

### Connections Diagram




### Cables

Signal connection polarity is mandatory!

| | Wire | Function |
|---|---|---|
| Long Cable | Red | PulseOUT#1 |
| | Green | PulseOUT#2 |
| | Black | GND |

### Output Characteristics

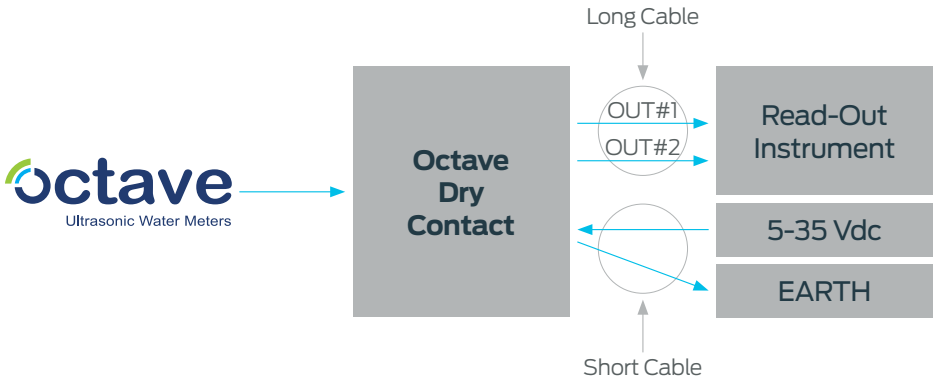
| OUTPUT TYPE | OPEN DRAIN |
|---|---|
| Cable Length – Supplied | 1.5/5 [meter] |
| Maximum Cable Length* | 500 [meter] |
| Maximum Applied Voltage | 35 [Vdc] |

* Cable Teldor PN 8005003101 or similar

# Electrical Outputs

## Dry Contact Dual Output

### Connections Diagram




### Cables

*Signal connection polarity is mandatory!

| | Wire | Function |
|---|---|---|
| Long Cable | Red + Orange | OUT#1 |
| | Black + Brown | OUT#2 |
| Short Cable* | Red | 5-35V+ |
| | Black | 5-35V- |
| | Yellow | Earth |

### Output Characteristics

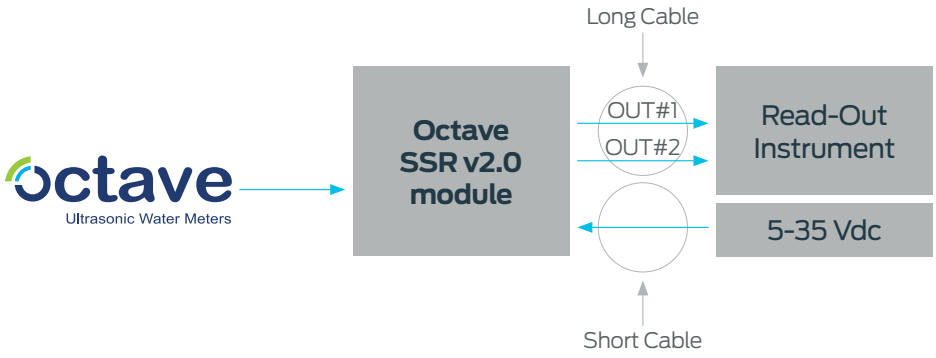
| OUTPUT TYPE | DRY CONTACT |
|---|---|
| Cable Length – Supplied | 1.5/5 [meter] |
| Maximum Cable Length* | 500 [meter] |
| Supply Voltage | 5-35 [Vdc] |
| Switching Power – Maximum | 15 [Watt] |
| Life Expectancy | $10^9$ [Cycles] |

* Cable Teldor PN 8005003101 or similar

# Electrical Outputs

## SSR Dual Output

### Connections Diagram




### Cables

*Signal connection polarity is mandatory!

| | Wire | Function |
|---|---|---|
| Long Cable | Red + Orange | OUT#1 |
| | Black + Brown | OUT#2 |
| Short Cable* | Red | 5-35V+ |
| | Black | 5-35V- |

*Optional

### Output Characteristics

| OUTPUT TYPE | BI-DIRECTIONAL SOLID STATE RELAY |
|---|---|
| On-Resistance – Maximum | 25 [Ω] |
| Minimum Pulse Width | 10 [msec] |
| Output current – Maximum | 120 [mA] |
| Total Power Dissipation – Maximum | 800 [mW] |
| Supply Voltage | 5-35 [Vdc] |
| Cable Length – supplied | 1.5 [meter] |
| Maximum Cable Length* | 500 [meter] |

* Cable Teldor PN 8005003101 or similar

# Electrical Outputs

## SSR Dual Output

The SSR module is powered by internal battery. External power supply in a range of 5-35Vdc could be used for certain Pulse parameters and Flow Rate combination. Pulse resolution or Pulse width are directly affect the internal battery lifetime.

The following setup examples showing the calculated internal battery lifetime for 10 and 5 years:

| 10 YEARS | NO. OF OUTPUTS | Q4 [m3/h] | PULSE RESOLUTION [m3/pulse] | PULSE WIDTH [msec] | CALCULATED BATTERY LIFETIME [YEARS] |
|---|---|---|---|---|---|
| DN-50 | 2 | 50 | 0.01 | 30 | 11.4 |
| | 2 | 50 | 0.01 | 30 | 11.4 |
| DN-80 | 2 | 80 | 0.01 | 20 | 10.7 |
| DN-100 | 2 | 125 | 0.01 | 12 | 11.4 |

| 5 YEARS | NO. OF OUTPUTS | Q4 [m3/h] | PULSE RESOLUTION [m3/pulse] | PULSE WIDTH [msec] | CALCULATED BATTERY LIFETIME [YEARS] |
|---|---|---|---|---|---|
| DN-50 | 2 | 50 | 0.01 | 7 | 5.1 |
| | 2 | 50 | 0.01 | 70 | 5.1 |
| DN-80 | 2 | 80 | 0.01 | 45 | 5.0 |
| DN-100 | 2 | 125 | 0.01 | 30 | 4.8 |

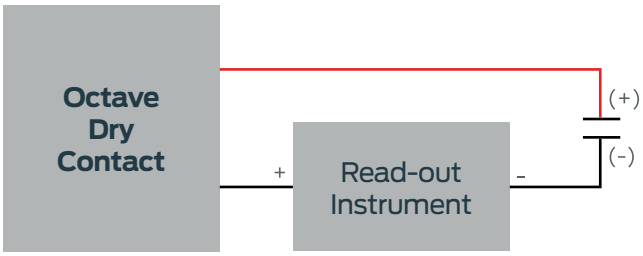
# Electrical Outputs

## Analog Output (4-20mA)

- The current output is a passive 4-20mA. Power needs to be supplied by the customer.
- 4mA is always "0" (zero) flow and the 20mA is programmable according to the customer requirements. (If the customer did not specify, the 20mA will be the maximum flow rate).

### Indoor Installation

#### Connections Diagram




#### Cables

*Signal connection polarity is mandatory!

| Wire | Function |
|---|---|
| Red | Current Loop + |
| Black | Current Loop - |

#### Output Characteristics

| OUTPUT TYPE | 4-20mA CURRENT OUTPUT |
|---|---|
| Supplied Cable Length | 1.5 [meter] |
| Maximum Cable Length* | 500 [meter] |
| Loop Supply Voltage | 12 - 24 [Vdc] |
| Output Impedance | 25 [MΩ] typ |

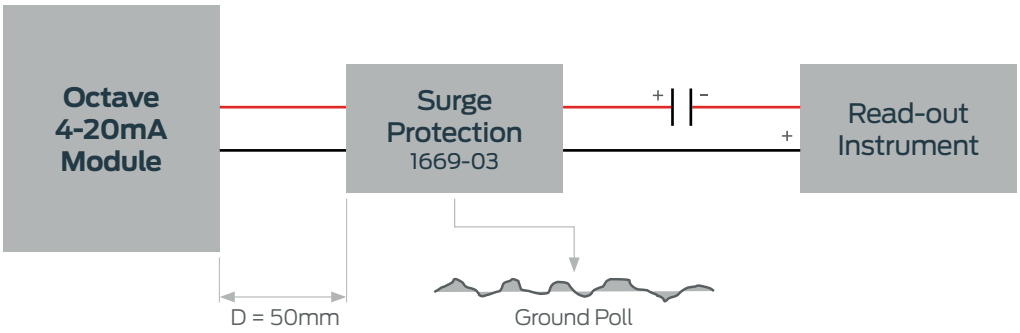
* Cable Teldor PN 8005003101 or similar

# Electrical Outputs

## Analog Output (4-20mA)

### Outdoor Installation

#### Connections Diagram




#### Cables

*Signal connection polarity is mandatory!

| Wire | Function |
|---|---|
| Red | Current Loop + |
| Black | Current Loop - |

#### Surge Protector

In regions with potential surge and lightnings it is suggested to add Surge Protector of type – Bourns 1669-03.

**Important: Assembly distance from the Octave 20-4mA module - no more than 100mm!**

- The protector wiring is AWG #20 (0.5 mm2).
- The solid colored red and black wires are to be connected to the 4-20mA modfule output, while the striped red/white and black/white wires (the 'protected' output) connect to the terminals of the field device.
- Minimize looping of the solid colored input and ground conductors to reduce field coupling of surges into the protected output.

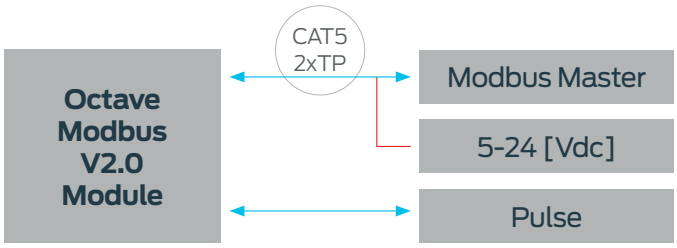
Grounding

- The protector body (stainless steel nipple) and green wire are electrically common.
- The green wire should connect to a grounding pole verifed by the elctricity local company.
- The green ground wire shuld be a 2.5 mm diameter at least.

# Electrical Outputs

## Modbus Output

### Connections Diagram




### Cables

| | Wire | Function |
|---|---|---|
| ModBus | Blue | D0/A/Tx+ |
| | White / Blue | D1/B/Tx- |
| | Orange | 5-24Vdc |
| | White/Orange | Ground |
| Pulse* | Red | Pulse Out |
| | Black | Ground |

*Optional

### Output Characteristics

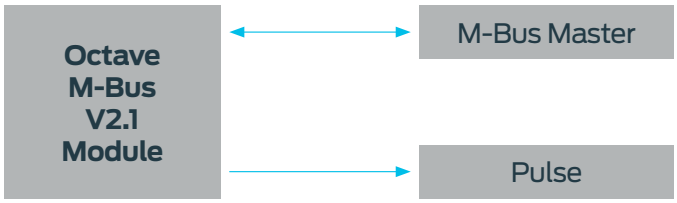
| OUTPUT TYPE | RS485 |
|---|---|
| Max Baud Rate | 9600 [BPS] |
| Max Power Consumption | 80 [mW] |
| Supply Voltage Range | 5 - 24 [Vdc] |
| Max Cable Length | 1000 [Meter] |

* Cable Teldor PN 8005003101 or similar

# Electrical Outputs

## M-Bus Output

### Connections Diagram




### Cables

| | Wire | Function |
|---|---|---|
| M-Bus | Red | BUSL1 |
| | Black | BUSL2 |
| Pulse* | Red | Pulse Out |
| | Black | Ground |

*Optional

### Output Characteristics

| OUTPUT TYPE | RS485 |
|---|---|
| Maximum Baud Rate | 9600 [BPS] |
| Maximum Power Consumption | 80 [mW] |
| M-Bus Voltage | 24 – 36 [Vdc] |
| Maximum Cable Length* | 3 [Meter] |

* Cable Teldor PN 8005003101 or similar

# Module Replacement / Mounting Manual

## Instructions

1. Properly dry the area of the connector.


2. Remove seal cover from the screw using tool with sharp edge.
3. Remove the screws using Allen key 3mm.
4. Remove the module/cover.
5. Properly dry again the area of the connector.
6. Make sure the module o-ring is in position.
   If not, Insert new o-ring into the module. The o-ring must be lubricated (silicone grease).

7. Attach module to the connector.


8. Tight both screws by hand only, using Allen key 3 mm to achieve symmetric o-ring pressure, **then apply the torque 2 N*m with torque wrench.**


9. Insert seal cover onto the screw.


RMC Reliance® VALVES

1800 810 803
1800 062 669
sales@rmc.com.au
rmc.com.au

AN RWC BRAND
Reliance Worldwide Corporation (Aust.) Pty. Ltd.
27-28 Chapman Place, Eagle Farm QLD 4009,
Australia | ABN 71 004 784 301