



User Manual

Flow Meter – Vortex

Model: FLV



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Notices

Please read this manual in full and carefully observe the notes and instructions before and during installation, operation and maintenance. The manufacturer cannot be held liable for any damage which occurs as a result of noncompliance with this manual.

Do not tamper with device. Should the device be tampered with in any manner other than a procedure which is described and specified in this manual, the warranty is cancelled and the manufacturer is exempt from liability.

The product is designed exclusively for the described application. Use of this product in conditions not specified in this manual or, contrary to the instructions provided by the manufacturer, is considered improper handling of the product and will void your warranty. The manufacturer will not be held liable for any damages resulting from improper use of the product.

This manual should be read carefully by relevant personnel and the end user. This manual should be kept with the product and be made available as needed. **Once you install or use the product, you accept that you have read, understood and complied with this manual.**

Compressed Air Alliance endeavours to make the content of this manual correct, but is not responsible for omissions or errors and the consequences caused. In case of any doubts or questions regarding this manual or the product, please contact Compressed Air Alliance.



Warnings

Ignoring the warnings can lead to serious injury and/or cause damage!

When handling, operating or carrying out maintenance on this product, personnel must employ safe working practices and observe all local health & safety requirements and regulations.

Improper operation or maintenance of this product could be dangerous and result in an accident causing damage to machinery or injury or death.

The manufacturer cannot anticipate every possible circumstance which may represent a potential hazard. The warnings in this manual cover the most common potential hazards and are therefore not all-inclusive. If the user employs an operating procedure, an item of equipment or a method of working which is not specifically recommended by the manufacturer they must ensure that the product will not be damaged or made unsafe and that there is no risk to persons or property.

NEVER CHANGE ORIGINAL COMPONENTS WITH ALTERNATIVES.



Compressed Air Safety

Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death.

- Do not exceed the maximum permitted pressure.
- Only use pressure rated installation materials and parts.
- Avoid getting hit by escaping air or bursting parts.
- The system must be pressure-less during maintenance work.



Electrical Safety

Any contact with energised parts of the product, may lead to an electrical shock which can lead to serious injuries or even death. The user shall take all measures necessary to protect against electrical shock.

Consider all regulations for electrical installations.

The system must be disconnected from any power supply during maintenance work.

Any electrical work on the system is only allowed by authorised qualified personal.

Storage and transportation

- Make sure that the transportation temperature of the sensor is between -10°C to 60°C (14°F to 140°F).
- Please make sure that the storage temperature of the sensor is between -10°C to 50°C (14°F to 122°F) and the humidity is <90%, no condensation. Avoid direct UV and solar radiation during storage.

Cleaning

If you need to clean the sensor it is recommended to use a clean, dry cloth. For stubborn marks, use distilled water or isopropyl alcohol only.

Please note: contamination on the sensor tip will affect calibration and accuracy of the sensor. Removal of the contamination may not fix the issue.

Disposal

Electronic devices are recyclable material and do not belong in the household waste. The product, accessories and its packing material must be disposed according to local statutory requirements.

About Flow Meters

Flow meters are very popular for measuring compressed air and gas systems. They can provide real time information to help keep your system under control and highlight any unusual activity.

Benefits of monitoring flow include:

- Improve system efficiency
- Reduce system maintenance
- Reduce operating and energy costs
- Increase system understanding and operation
- Identify changes in system performance
- Identify non-productive air demand and leakage
- Identify peak and average demand

Types of Flow Meters

There are a variety of flow meter technologies including thermal mass, pitot tube, vortex and venturi. In compressed air and gas systems it is important to avoid creating pressure drops or restrictions that will decrease system performance and increase operating costs. Examples of flow meters that cause pressure drops are differential pressure plate and venturi meters.

Vortex Meters

Vortex meters are widely used in industrial processes, manufacturing, chemical, petrochemical, power engineering, etc.

The Vortex flow meter is perfectly suited for measuring flow and consumption of inert gases and steam, no matter how heavily contaminated.

With built-in pressure and temperature sensors, all parameters of your gas or steam system are monitored in one unit, saving you install and maintenance costs.

Key features of the Vortex Flow Meter:

- No moving parts, making it both durable and easy to maintain.
- Ultra-high sensitivity vortex probe
- Turndown ratio well beyond traditional Vortex flowmeters
- Full digital signal processing for higher precision and better stability
- Full electrical isolation to filter out disturbances
- Vibration resistant
- All-welded construction for corrosion, high pressure and temperature resistance
- Integrated display

Specifications

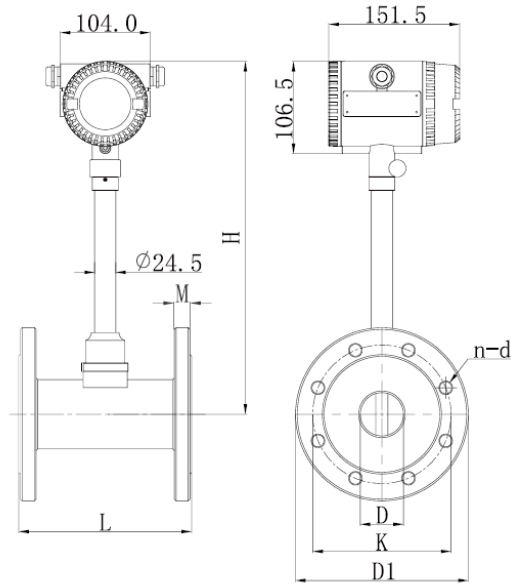
Vortex Flow Meter		
Technology	Karman vortex principle	
Medium	Inert Gases (see below) and steam	
Gas types	Air, Argon, Carbon Dioxide, Carbon Monoxide, Helium, Hydrogen, Natural Gas, Nitrogen, Nitrous Oxide, Oxygen, Sulfur hexafluoride (SF6)	
Gas Quality	Wet and dry gas Dry and clean gas	
Accuracy	Flow: $\pm(1.5\% \text{ reading} + 0.3\% \text{ full scale})$ <i>Accuracy is affected by the installation location, on-site conditions and contaminants such as oil, high humidity or other impurities</i>	
Measurement Ranges		
Flow Measurement	1.5 to 80 Nm/sec	5 to 24 ft/sec
Pressure Measurement	0 to 16 bar (1.6MPa, 232 psi) 0 to 63 bar (6.3 MPa , 913 psi)	
Gas Temperature Measurement	-40°C to +280°C	-40°F to +536°F
Outputs		
Output	Analog: 4 to 20mA / Pulse output Digital: RS485 Modbus / RTU	
Output Signals	Flow, consumption, pressure and temperature	
Power		
Power Supply	18 to 30V / 10W@24V	
Electrical Connection	1 x 5 pin M12, female	
EMC	According to IEC 61326-1	
Display & Data Logger		
Display	2.0" LCD with touch panel	

Vortex Flow Meter		
Data Logger	Not available	
Other Information		
Bi-directional	No	
Pipe Size	DN15 to DN300	
Process Connection	Flange	
Ambient Temperature	-40°C to +85°C	-40°F to +185°F
Installation Type	Permanent or temporary installation	
Calibration Frequency	Every 2 years	
Warranty Period	12 Months	
Reference Conditions	20°C, 1bar(a), ISO1217 (Programmable)	

Flow Range

Pipe Size		Flow Range (Nm ³ /h)		Flow Range (cfm)	
DN	Inches	Min Flow	Max Flow	Min Flow	Max Flow
15	1/2	1.0	50.9	0.6	30.0
20	3/4	1.7	90.4	1.0	53.2
25	1	2.6	141.3	1.5	83.2
32	1.25	4.3	231.5	2.5	136.3
40	1.5	6.8	361.7	4.0	212.9
50	2	10.6	565.2	6.2	332.7
65	2.5	17.9	955.2	10.5	562.2
80	3	27.1	1446.9	16.0	851.6
100	4	42.4	2260.8	25.0	1330.7
125	5	66.2	3532.5	39.0	2079.2
150	6	95.4	5086.8	56.2	2994.0
200	8	169.6	9043.2	99.8	5322.6
250	10	265.1	14130.0	156.0	8316.6
300	12	381.7	20347.2	224.7	11975.9

Dimensions



Sizing for PN16

Pipe Size		Measurement (mm)							
DN	Inches	D	D1	K	H	L	M	n	d
40	1.5	40	150	110	410	200	18	4	18
50	2	50	165	125	420	200	20	4	18
65	2.5	65	185	145	430	200	20	4	18
80	3	80	200	160	440	200	20	8	18
100	4	100	220	180	450	200	22	8	18
125	5	125	250	210	460	200	22	8	18
150	6	150	285	240	480	200	24	8	22

Flow Meter Pack

Each flow meter pack comes with:

- ✓ 1 x Vortex Flow Meter with flange connection
- ✓ Gaskets and bolts to suit the flow meter
- ✓ Data cable



Vortex Flow
Meter



Gaskets and
Fastening bolts



Data Cable

Optional Accessories

The following accessories are available for the flow meter. Talk to your local dealer or Compressed Air Alliance or pricing.



CALMS – Cloud-based Data
Acquisition and Analysis software

Installation Overview

Step 1 – Find a suitable section of pipe

- The sensor must be installed vertically or horizontally
- The sensor must be installed away from bends, edges, seams, changes in pipe size and other obstructions
- Do **NOT** install the sensor upside down

Step 2 – Cut out section of pipe

Step 3 – Fit flow meter

Step 4 – Wire the sensor (see '*Installation – Electrical*')

Step 5 (optional) – Connect the sensor to your SCADA or energy management system

Step 6 – Fill out the Commissioning Report (last page of this manual)

Tools and Equipment needed for installation

(not included with Flow Meter Pack)



Pipe Cutter



Welder



Wrench /
Spanner

Installation – Mechanical



WARNING!

- Incorrect installation can damage the sensor or cause it to work incorrectly.
- Avoid contact with corrosive gases

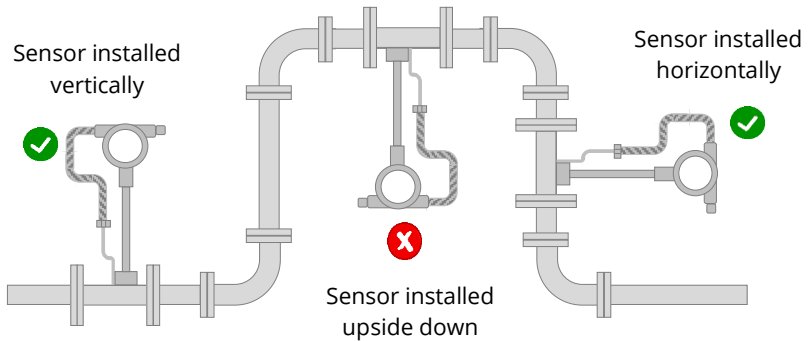


Notes

- **You need to maintain a minimum flow velocity of 1.5 Nm/s (5 ft/sec)** for the vortex flow meter to work correctly. Below this minimum velocity, the flow meter reading will be zero.
- **Before installing the sensor, make sure it is rated for your system** (refer to the “Specifications” section).
- Use of the product outside specified ranges or operating parameters can lead to malfunctions and may damage the product or system.
- Do not use this product in explosive areas.
- If there is strong vibration along the pipework, additional fixing measures will be needed. Too much vibration can damage the flow meter.
- Close attention should be paid to the installation location and contamination levels to ensure accuracy is maintained.
- The flow meter is **not** bidirectional. When installing and using the flow meter, please pay attention to the direction of gas / steam flow and the alignment of the sensor. The direction is indicated on the housing.
- The sensor is for indoor use only. If installed in an outdoor installation, the sensor must be protected from sun and rain.
- Only use pressure rated materials and parts when installing and maintaining the product.
- Do not disassemble the product.
- Please observe local and national regulations before/during installation and operation.
- The product must be installed properly and calibrated regularly, otherwise it may lead to inaccurate measurements.

Step 1 – Find a suitable section of pipe

- ✓ away from bends, edges, seams, changes in pipe size and other obstructions,
- ✓ at 90° to the pipe
- ✓ vertically or horizontally,
 - horizontal installation is recommended when the steam / gas contamination is relatively large
- Make sure the insertion location has enough room around the pipe to install the sensor.



- ✗ Do **NOT** install the sensor upside down. This can result in water and contaminants affecting the sensor. This can damage the sensor, result in incorrect measurements and void the warranty.

Choose insertion location, away from obstacles

To achieve and maintain the accuracy stated in the technical data, the sensor must be inserted away from bends, edges, seams, curve, changes in pipe size, control valves, etc.

For best results, choose a long, absolutely straight, section of pipe that is free of obstructions.

Pipe obstructions (eg bends, edges, seams, curves, changes in pipe size, control valves, etc) change the velocity of compressed air / gas / steam and/or create turbulence near the obstruction. Placing the sensor too close to the obstruction will result in inaccurate readings.



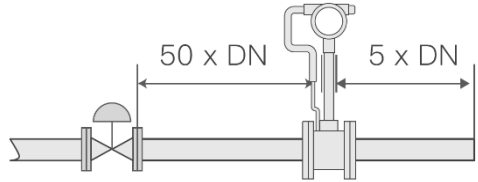
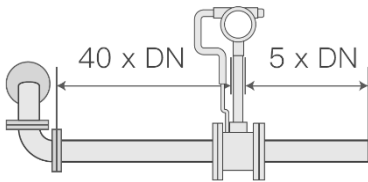
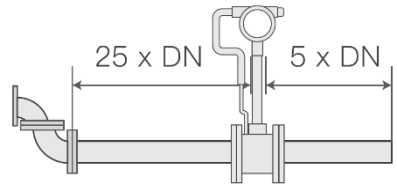
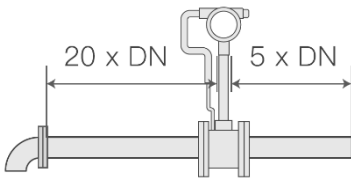
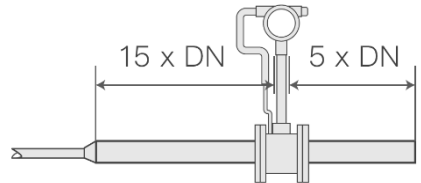
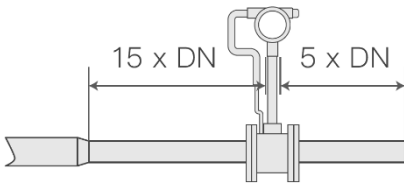
Notes

- Pay careful attention to the distance between the sensor's inlet and outlet sections and points of turbulence (eg bends, valves, etc). Make sure that the insertion location has enough straight pipe on either side of the sensor, as shown in the diagrams on the next page.
- Obstructions can cause counter-flow turbulence as well as turbulence in the direction of the flow.
- The diagrams below shows the **minimum** distances (in multiples of pipe diameters (DNs)) that the sensor must be installed away from bends, changes in pipe size and other obstructions.

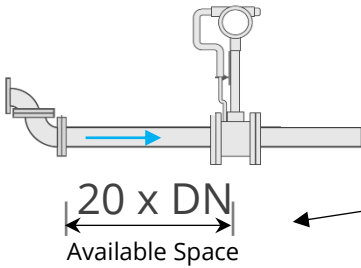


Correct Installation

Gas / Steam flow direction

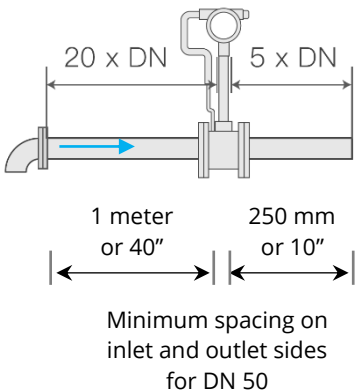
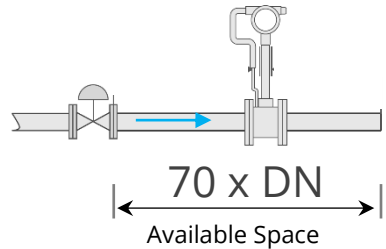


Examples



- To install a flow meter near 2 x 90° bends, you need at least 30 DN of space (25 DN on the inlet side + 5 DN on the outlet side, see diagram on previous page)
- Only 20 DN is available on the inlet side.
- Therefore the sensor should **not** be installed in this location

- To install a flow meter near a control valve or pressure regulator, you need at least 55 DN (50 DN on inlet side and 5 DN on outlet side, see diagram on previous page)
- This section of pipe has 70 DN
- Therefore the sensor **can** be installed in this location



A flow sensor will be installed on a section of pipe, just after a bend (as shown in the diagram on the left). The pipe has a DN of 50 (ie, it's a 2 inch or 50 mm pipe).

Therefore the sensor must be installed:

- Inlet side: 20 x DN from the bend
 = 20 x 2" = 40" or
 = 20 x 50mm = 1,000mm = 1 meter
- Outlet side: 5 x DN from any other obstruction
 = 5 x 2" = 10" or

Step 2 – Cut the Pipe



WARNING! Make sure the gas or steam is turned off and the pipe is depressurised before cutting.

Calculate the width of the pipe cut:

$$L = A + 2B + 2C$$

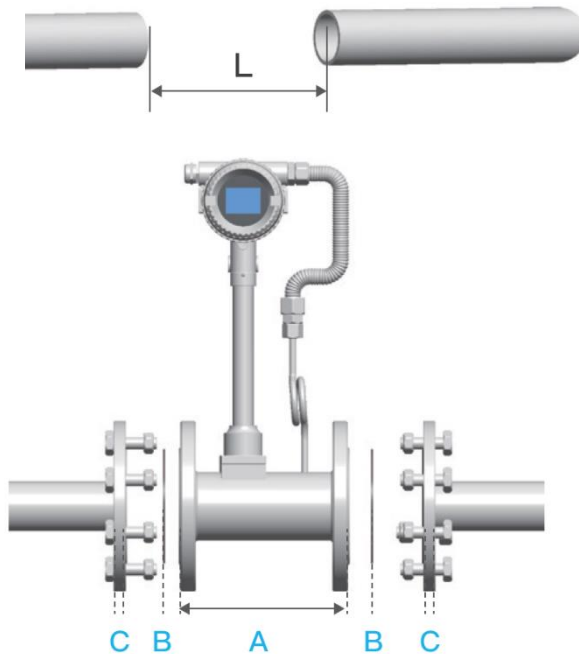
Where:

L = width of pipe section to be cut out

A = flow meter width (outer edges)

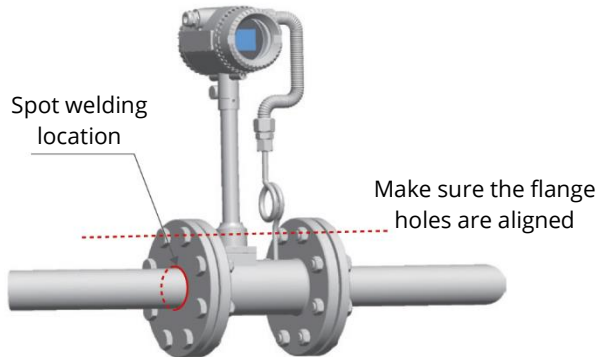
B = gasket thickness

C = flange thickness

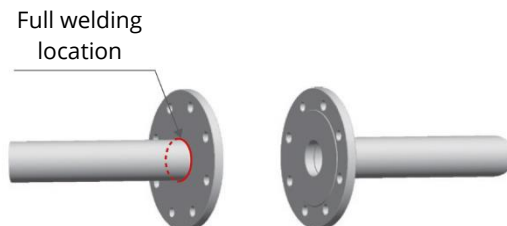


Step 3 - Fit Flow Meter

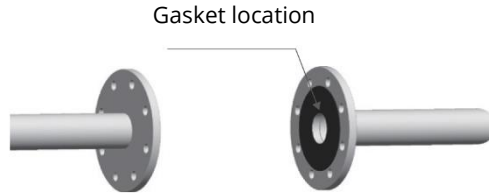
- Place the gaskets in the flange slots
- Clamp the vortex flowmeter and bolt the flowmeter.
- Spot weld the flange at the cut surface to confirm the flange is installed firmly



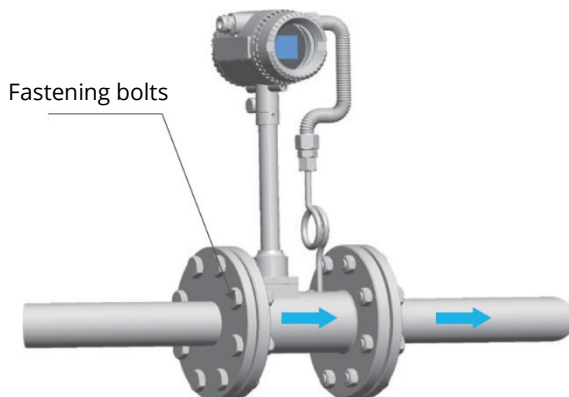
- Remove the vortex flowmeter and gasket and fully weld the left and right flanges



- After the weld has cooled, place a gasket on each side of the flange



- Clamp the flowmeter
 - Make sure the direction indicated on the flowmeter and the direction of gas / steam flow are the same.
- Fix the flowmeter with the fastening bolts,



Installation – Electrical



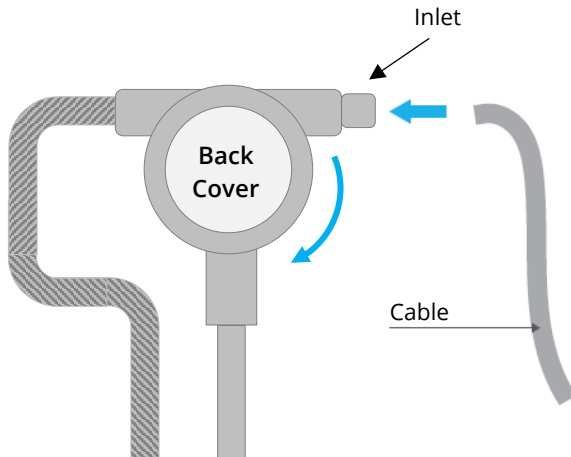
WARNING! Incorrect wiring can damage the sensor or cause it to work incorrectly.

Notes:

- Consider all local and national safety requirements and regulations for electrical installations.
- **The system must be disconnected from any power supply during installation and maintenance work.**
- Any electrical work on the system is only allowed by authorised and qualified personal.

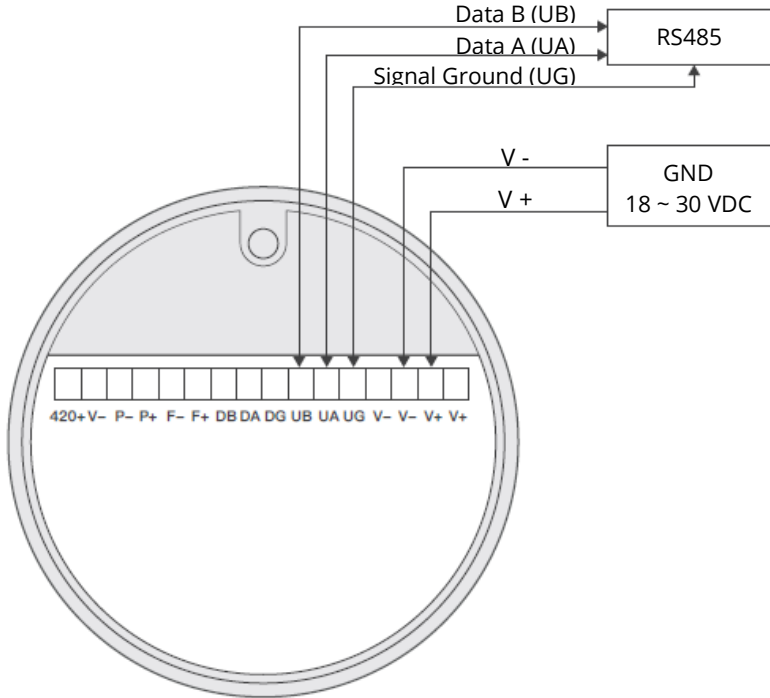
Unscrew the back cover (clockwise) to access the terminals

- The side with the LCD screen is the front
- The head can be rotated, please do not use the direction of the metal threaded pipe

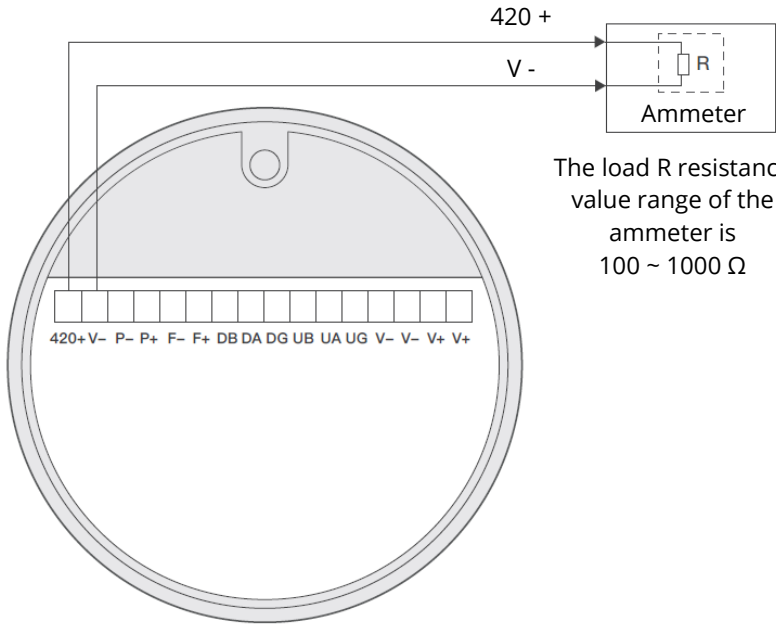


Wiring – Power and Modbus

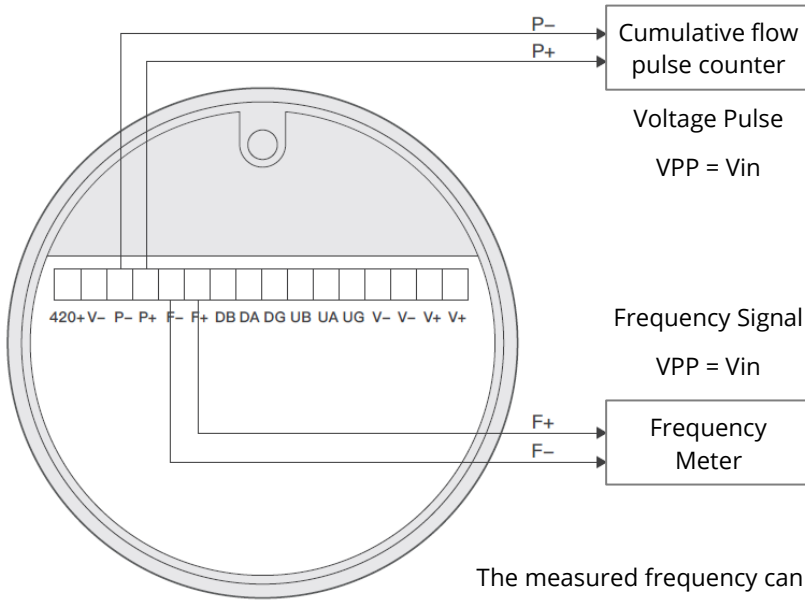
The Signal Ground (UG) is an optional terminal. It's use can increase electromagnetic compatibility, and increase signal anti-jamming capability.



Wiring – 4-20mA



Wiring – Pulse and Frequency



The measured frequency can be used to calculate the operating flow

$$ActFlow (m^3/s) = f (Hz) / K$$

Warranty

Compressed Air Alliance provides a 12-month warranty for all sensors. The warranty covers materials and workmanship under the stated operating conditions from the date of delivery. Please report any findings immediately and within the warranty time.

If faults occur during the warranty period Compressed Air Alliance will repair or replace the defective unit, without charge for repair labour and material costs but there is a charge for other services such as labour to remove or reinstall the instrument, transport and packing. Warranty repairs do not extend the period of warranty.

The following damage is excluded from this warranty:

- Improper use and non-adherence to the user manual.
- Use of unsuitable accessories.
- External influences (e.g. damage caused by vibration, damage during transportation, excess heat or moisture).

The warranty is cancelled when one of the following situations occurs:

- The user opens the measurement instrument

without a direct request written in this manual.

- Repairs or modifications are undertaken by third parties or unauthorised persons.
- The serial number has been changed, damaged or removed.

Other claims, especially damage occurring on the outside of the instrument (eg dents, marks), are not included unless responsibility is legally binding.

Calibration

The sensor is calibrated before delivery. The calibration date is printed on the certificate which is shipped with the sensor.

Flow Meters require calibration to remain accurate. The frequency of calibration depends greatly on the level of contamination within your system.

We recommend you calibrate the sensor every 2 years (provided the sensor is not exposed to relative humidity above 80%). Calibration is excluded from the product warranty. For more information, contact Compressed Air Alliance.

Trouble Shooting

My sensor isn't reading correctly

If your sensor is not reading the correct values, follow these steps.

1. Make sure the sensor is suitable for your system. Refer to the "*Specifications*" section for details.
2. Make sure the sensor is calibrated. Sensors should be calibrated every 2 years. Contact your local dealer or Compressed Air Alliance for calibration. Make sure the sensor is installed correctly. Refer to "*Installation - Mechanical*" section for more information. **Typical mechanical installation errors include:**
 - ✘ Installing sensor upside down
 - ✘ Installing sensor too close to bends and other obstructions
3. Make sure the sensor is wired correctly. Refer to "*Installation - Electrical*" section for more information.
4. Is your associated equipment compatible with the flow meter?
5. Is your associated equipment compatible with the flow meter output?

Still need help? Contact Compressed Air Alliance via email:

sales@compressedairalliance.com or phone (Australia): 1300 558 526

Commissioning Report

About the Sensor

Part Number (eg FLV100001)			
Serial Number			
Installed by		Installed Date	

Installation

Step	Task	Yes	NA	No	Comments	Sign
1	Flow meter installed in correct location and orientation? (refer to "Installation - Mechanical")					
2	Is the Flow Meter wired correctly? (refer to "Installation - Electrical")					
3	Modbus and 4-20mA settings checked?					
4	Readings (flow, velocity, consumption & temperature) visible on display					



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