



User Guide: Pegasus 2 (Pressure control system)



Warning: This manual contains important safety and operating information. Please read, understand, and follow the instructions in the manual.

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1 SYSTEM DOCUMENTATION AND SUPPORT OF PRODUCT

1.1 DOCUMENTATION AND TECHNICAL SUPPORT

Thank-you for choosing a HWM device. We trust it will provide you with many years of service.

The Pegasus 2 system is designed to control the outlet pressure from a clean-water pressure reducing valve.

This user-guide provides details of each component of the Pegasus 2 system and also the system itself, (including alternative configuration options). It provides details of how to install the product in a stand-alone mode and also (optional) integration with the HWM DataGate system, providing on-line viewing of pressure measurements.

This user-guide covers the following models:

<u>Model Number(s)</u>	<u>Description</u>
C163C/*/*/*/*	Pegasus 2 Controller unit
C163S/*/*	Pegasus 2 Solenoid unit
C163F/*/*/*/*	A kit of individual units plus additional components to make a complete Pegasus 2 system.

Note: The part-number structure is also shared with the “Sentinel 2” family of models. For Sentinel 2, refer to the Sentinel 2 user-guide.

Note: The system periodically has new features and changes released, thus you may observe slight changes in layout from those shown in this manual. Additionally, views can vary depending on what user-role you have been given and its permissions.

HWM provides support of the Pegasus 2 system by means of our customer support webpages: (Note: Customer registration is required to access).

<https://www.hwmglobal.com/help-and-downloads/>

Should you have any questions that are not covered by this manual or the system’s online help, please contact the HWM Technical Support team on +44 (0) 1633 489479, or email cservice@hwm-water.com

1.2 SAFETY

Before continuing, please read the “Safety Warnings and Approvals Information” document supplied with the product.

2 OVERVIEW

2.1 INTRODUCTION

Pegasus 2 is a system, provided by HWM-Water, that is designed to control the outlet pressure of a pressure reducing valve (PRV) within a clean-water supply pipe network. This section gives an overview of Pegasus 2, the equipment that is required to use it, and other (optional) system elements.

The system is designed to control pressure reducing valves that are designed and manufactured by 3rd party suppliers. Therefore, only general details of PRV valve construction are included in this manual.

Pressure control can be either:

- Continuous control:
i.e. Incremental adjustment of pressure, between a maximum and minimum;
The Pegasus 2 product is ideal for this situation.
or
- 2-point control:
i.e. Automatic switching between two pre-set pressure levels.
The Sentinel 2 product is ideal for this situation.
... It is a simplified product, based on the Pegasus 2.
It does not use the Solenoid Box; a Hydroswitch unit is used.
(Refer to the Sentinel 2 manual for further details).

Pegasus 2 allows incremental adjustment of the PRV output pressure to closely follow a pre-determined pressure profile.

The pressure profile can be based on:

- The time of day, or
- The flow rate (demand) of water, or
- Both of the above.

The pressure profiles are defined by a set of tables within the unit. The tables can be entered manually during installation. Pegasus 2 can also communicate with a central server that is used to store its measurement data. The server can be configured to analyse the effectiveness of the Pegasus 2 pressure control and (if required) remotely update the unit's pressure profiles.

The system also offers a fail-safe mode, where it can operate the PRV at a fixed outlet pressure when certain fault conditions occur (e.g. detection of a sensor failure).

A Pegasus 2 system offers:

- Real-time clock.
- Water resistant housing with IP68 protection (totally submersible).
- Battery life of up to 5 years in normal operating conditions; batteries are replaceable (see section 7).
- A manual over-ride option to assist with installation and tests.
- A built-in data-logger.
- Communication via a communications cable to the USB port of a laptop PC.
- Communication using a connection over radio to the cellular phone network.
- Optional integration with a remote server for data storage and remote adjustment.

The Pegasus 2 system typically consists of the following parts:

- A Control Box unit.
- A Solenoid Box unit.
- A cable linking the Control Box to the Solenoid Box.
- A HWM mechanical actuator.
- An accessory kit for plumbing-in the Pegasus 2 system to work with the PRV. (HWM can supply standard kits containing coloured plastic tubing, a 3-way manual valve, quick-connect fittings).
- Hanging brackets.
- Cables for sensors (transducers or meters).
- An antenna for communication over the mobile cellular network (For optional server integration).
- (Optional / If required) External battery.
- A USB Communications cable (an accessory required for on-site installation, programming, and data retrieval).

The system contains several transducers for measurement of water pressure. These may be built-in (for direct connection to the system via water pipes) or (where external transducers employed) attached via cables.

The system operates from internal batteries or (optional) using an additional external HWM battery unit (see opposite).

Where supplied, the external battery power is used to extend the battery life of the system.



Caution: (Pegasus 2 compatibility with Pegasus Plus)

The Pegasus 2 System REPLACES previous generations of HWM pressure control systems, known as Pegasus and Pegasus Plus.

Pegasus 2 control box and solenoid box units are not compatible with Pegasus or Pegasus Plus units; the units cannot be used inter-changeably or mixed.

The Pegasus 2 (complete system) can replace a Pegasus or Pegasus Plus (complete system), depending on the model numbers and settings of the units.

Existing sensors and pipework may be compatible, and may be re-used with a Pegasus 2 installation if in good condition.

The cable between the Control Box and Solenoid box is incompatible between old systems and Pegasus 2.

The Pegasus Plus USB Communications cable is also compatible with Pegasus 2.

The Pegasus 2 system controls the PRV by means of hydraulic actuation. It therefore contains several solenoid valves which are controlled by the unit. These require connection to various points in the water supply and PRV.

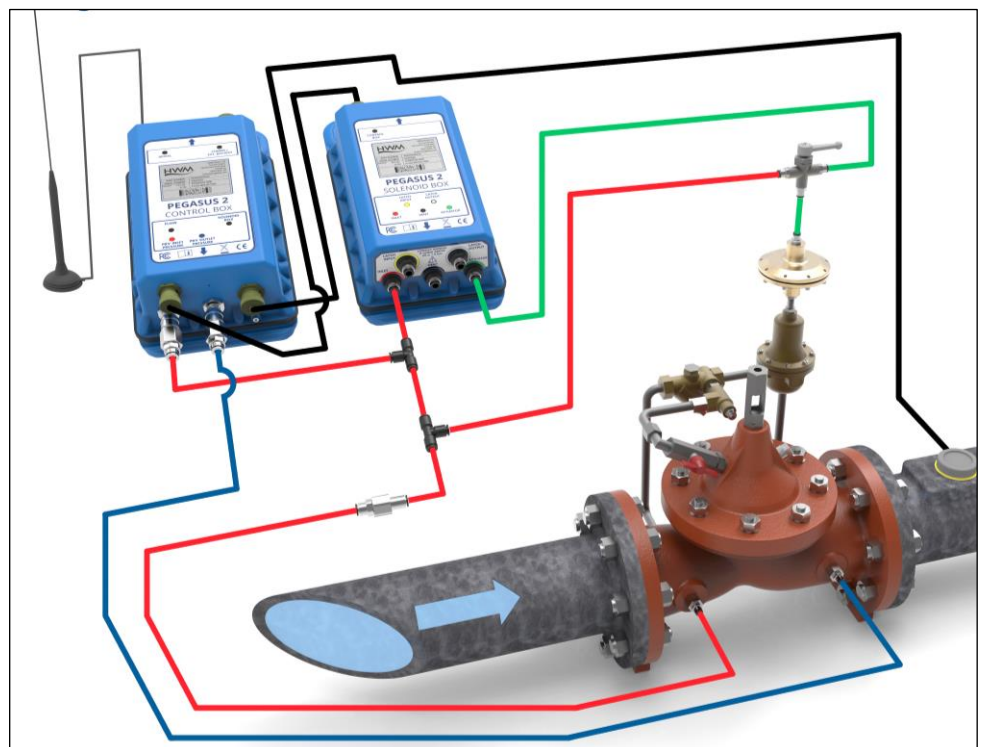
An example of a PRV with Pegasus 2 system installed is shown opposite.

Several configuration alternatives exist, depending on the required system behaviour.

The model number of each unit must be selected to match the requirements of the installation.

In addition, the standard

configurations must not be used in high pressure situations (>90 meters) to prevent damage to the system components. An alternative system configuration (plumbing scheme) must be used.





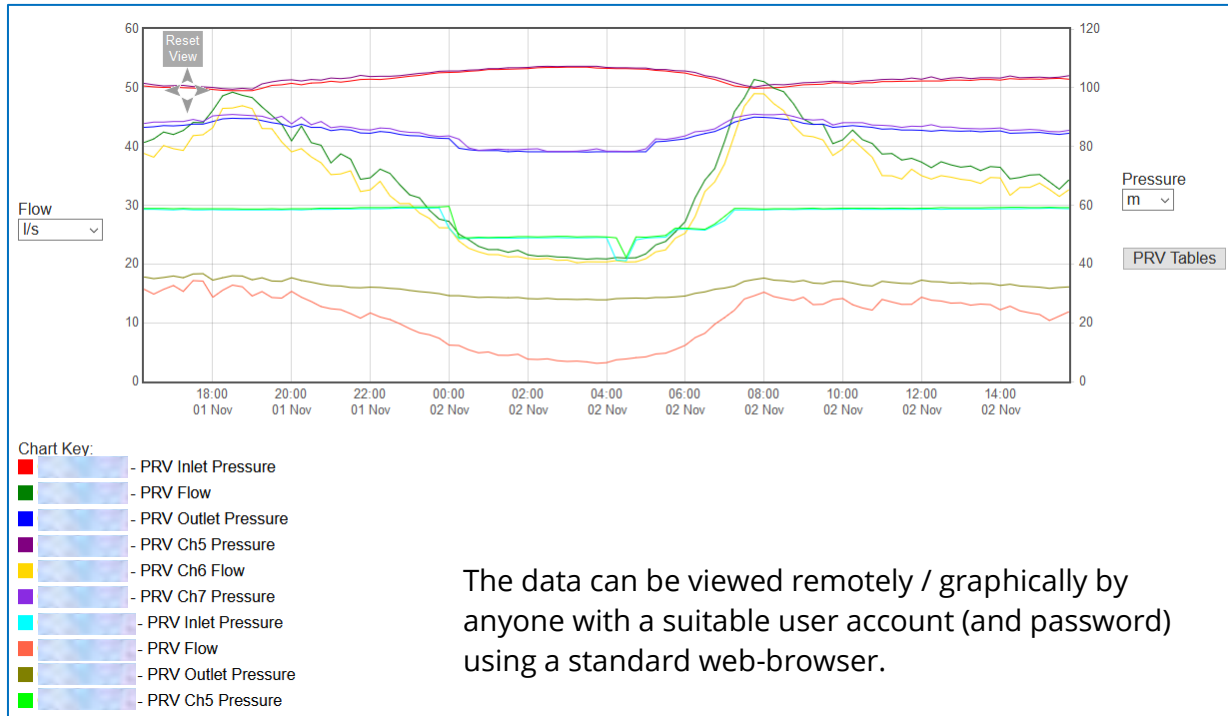
An example installation accessory kit, the actuator, and brackets are shown above and opposite.



2.2 SERVER INTEGRATION OPTION: DATAGATE AND PRESSVIEW WEBSITES

When integrated with HWM's DataGate server, the Pegasus measurement data can be stored on the server every time the unit makes a call-in.

The data can be viewed remotely / graphically by anyone with a suitable user account (and password) using a standard web-browser.



The PressView website allows the Pegasus 2 data to be combined with pressure measurements made (by another HWM logger device) some distance down-stream of the PRV (e.g. at a "critical point"). Both the local and remote measurements can be assessed by the server, and (whenever an adjustment is needed) revised pressure profiles sent to the Pegasus 2 unit. PressView supports both "Learning" and "Active" (closed loop) modes of operation. These features are not covered further in this document; refer to the User-Guide for PressView for more details.

The Pegasus 2 can also send any fault notifications (alarms) to the server for forwarding to interested parties.

2.3 COMMUNICATING WITH PEGASUS 2

To communicate with the Pegasus 2 system a communications cable is required (part-number COMAE or COMAEUSB) to connect the Control Box to a PC.

The PC also requires a HWM software utility called “Installation and Diagnostic Tool”, or more commonly known as IDT (PC version).

IDT is introduced in this section but relevant parts of it will also appear at places elsewhere in the manual.

2.3.1 Download of IDT (PC version)

IDT (PC version) can be downloaded from the HWM Customer Support website, or from the following webpage:

<https://www.hwmglobal.com/idt-support/>

Note: The user has to be registered by HWM and have a password to gain access).

Once installed, an icon will be available on the PC desktop similar to that shown opposite:



Launching the program will result in IDT loading and an initial screen, as shown.

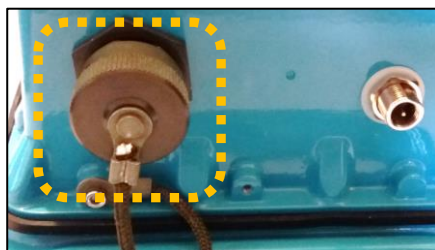
To read the Pegasus 2 device a Comms cable must first be fitted.



2.3.2 Connecting the Comms Cable

A cable of the type COMAE/USB is shown opposite.

Attach the Comms cable to the “COMMS / EXT.BATTERY” connector of the Pegasus 2 Control Box.

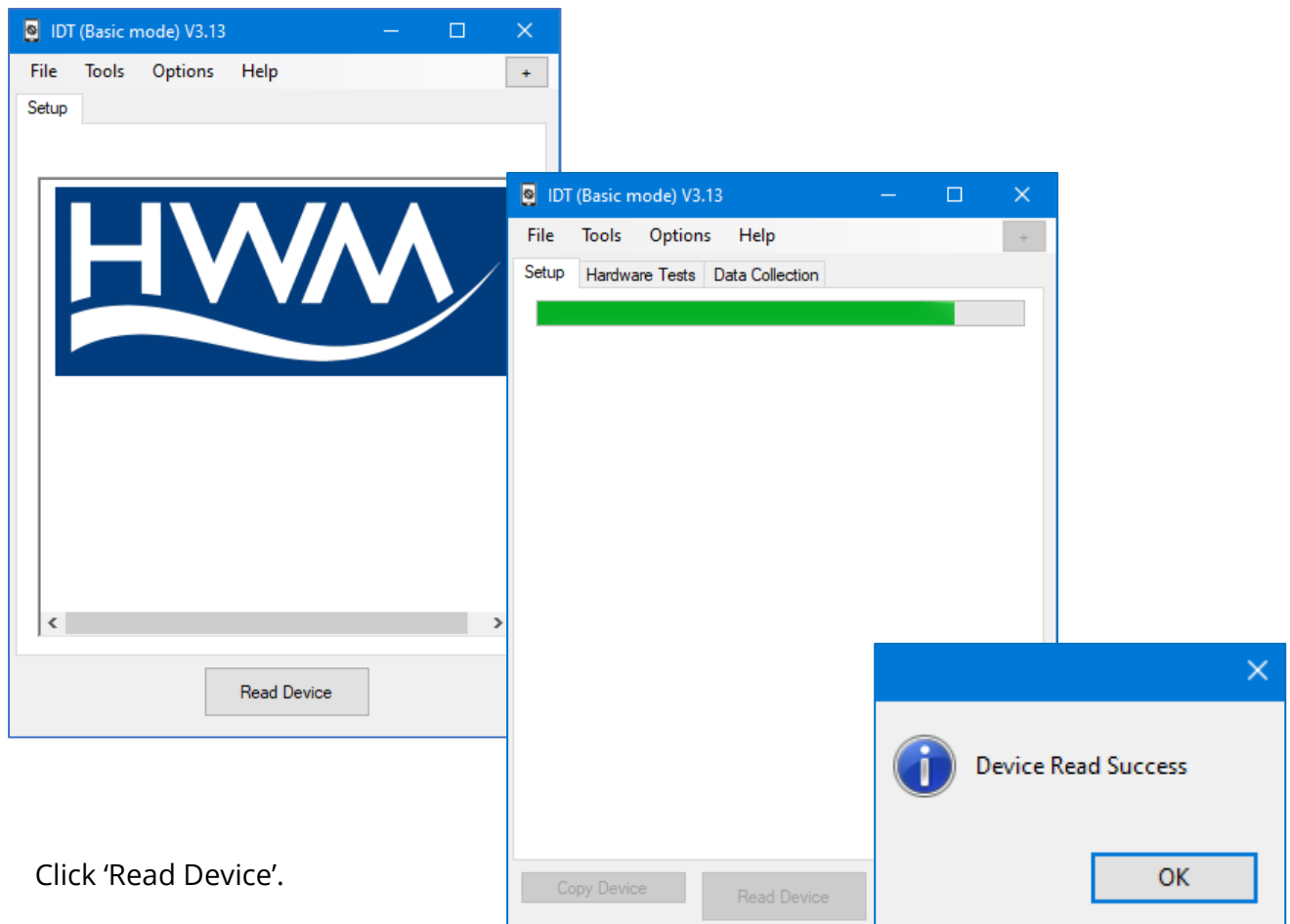


Connect the other side of the connector to the PC.



It is now possible to communicate with the Pegasus 2 system using IDT.

2.3.3 Loading Pegasus 2 settings into IDT



Click 'Read Device'.

A progress bar will show across the top of the page. When completed, an information box will appear stating 'Device Read Success'. Click "OK" to clear the box.

The IDT-PC program now **stores a copy** of the unit's program (settings) in the "current program" memory area. This copy can be edited.

The unit itself is not updated with any of the program changes unless the user later saves the settings stored in IDT back to the Pegasus 2 Control unit by clicking on the "Setup Device" button in IDT.

Setup Device

Some buttons in IDT will however issue commands to Pegasus that can change its operation immediately; others are to control operations of the IDT program.

IDT will now display 4 tabs.

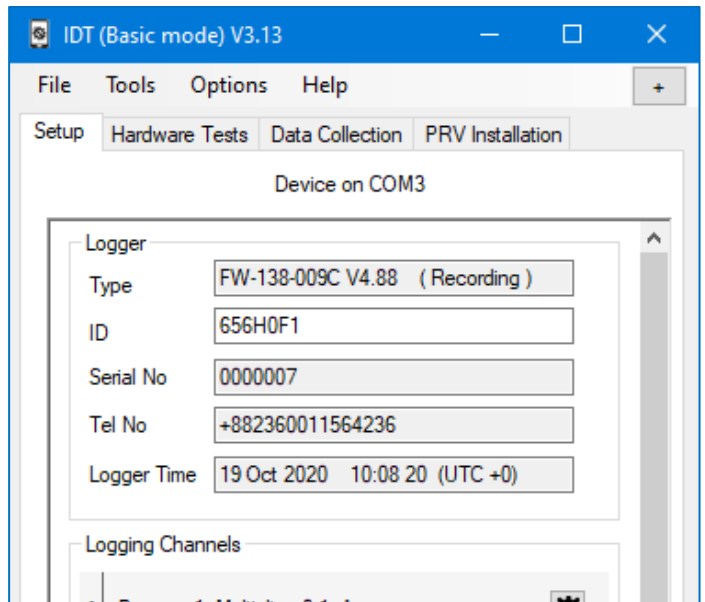
Within any tab, information is divided into various areas, or “panels”.

The “Setup” tab is used for displaying:

- Details of the Pegasus 2 unit.
- The current program settings of the unit.

The panel labelled “Logger” shows:

- The software version running on the unit (here it is shown as V4.88).
- Whether the logger built into the unit is:
 - (Stopped).
 - (Waiting).
 - (Recording).
- The control unit's serial number.
- The telephone number of the device does not depend on the SIM card fitted to the unit.
- The logger date and time ... this is the *local time* for wherever the logger is installed. The offset of local time from GMT (or UTC) is shown in brackets.



Any greyed-out fields indicates the user cannot adjust them, typically for factory-set parameters. Any non-greyed areas indicate the user can edit the field.

The user can insert a “Site-ID” for this location, which is in the format of a 7-digit reference number.

Other panels (not shown here) follow-on, with settings for various areas of the unit's functionality.

The “Hardware Test” / “Data Collection” / “PRV Installation” tabs shown in the above image provide access to information, settings and control functions available in Pegasus 2 and will be explained later in this manual.

e.g. The “PRV Installation” tab is used during installation.

It can provide live transducer data or manual over-ride controls for various components of the system.

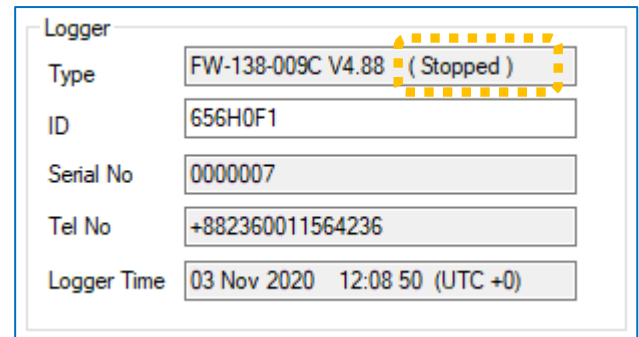
2.3.4 Saving settings from IDT into Pegasus 2

When Pegasus is shipped from the factory it is put into a “Shipping Mode” (see section 7.1.2); most functions are deactivated, including the built-in logger, but the unit will detect communications from the IDT tool.

After reading (copying) the current program settings into IDT, the user can modify them (as explained within this manual) and then update the Pegasus by writing back the settings into the unit. This action can also be used to **activate** the built-in logger.

The *running status* of the built-in logger is shown on the top line of the Logger panel (within the setup tab), as shown. Here, it is shown as “Stopped”.

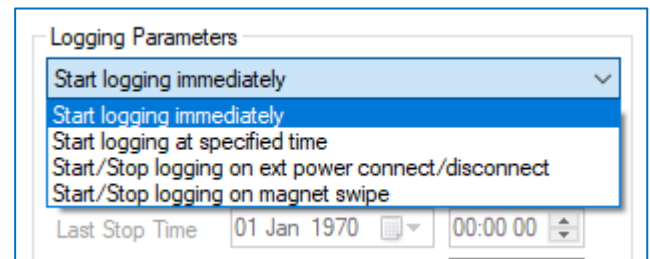
The process of writing settings into a stopped logger will cause it to *schedule a re-start*.



Logger

Type	FW-138-009C V4.88 (Stopped)
ID	656H0F1
Serial No	0000007
Tel No	+882360011564236
Logger Time	03 Nov 2020 12:08 50 (UTC +0)

The re-start timing is determined by a setting within the Setup tab. Select “Start Logging immediately”.



Logging Parameters

Start logging immediately (selected)

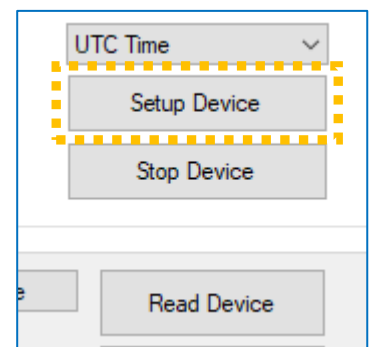
Start logging at specified time

Start/Stop logging on ext power connect/disconnect

Start/Stop logging on magnet swipe

Last Stop Time 01 Jan 1970 00:00 00

Scroll to the bottom of the Setup tab and click the “Setup Device” button.



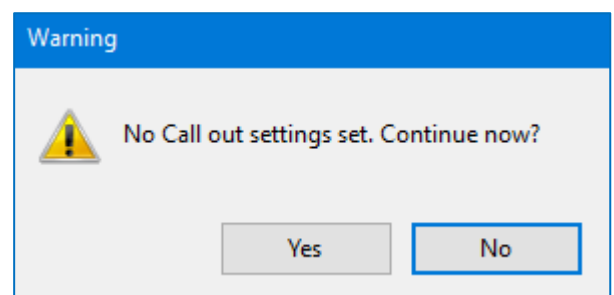
UTC Time (dropdown)

Setup Device (highlighted)

Stop Device

Read Device

IDT may warn you that there may be some unintended errors in your settings (e.g. see opposite); Since we have not yet set these parameters but will do so later, click “Yes”.

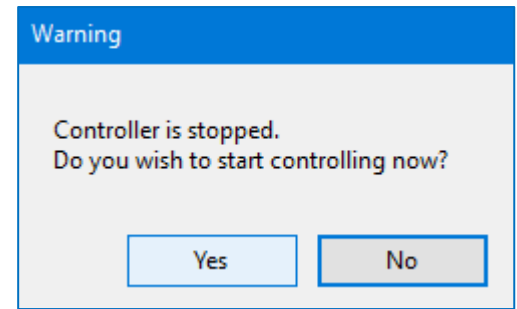


Warning

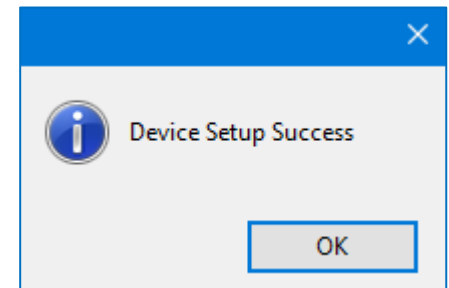
No Call out settings set. Continue now?

Yes No (highlighted)

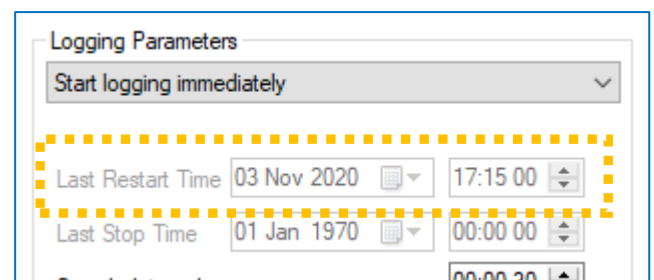
If the PRV control function of Pegasus has not yet been started, IDT will ask if you wish to start it now. Since we have not yet set these parameters but will do so later, click “No”.



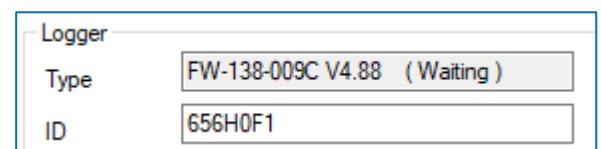
IDT reports that the unit has been given the new settings successfully.



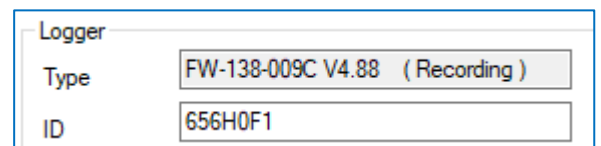
The logger functions have been set to start at a convenient time.



The logger is “Waiting” for the recording start time to arrive.

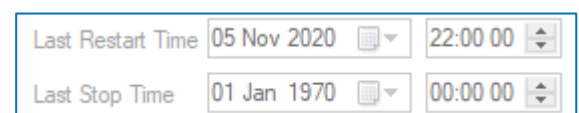


The logger will later begin “Recording”; this is its regular repetitive task.



Note: The states for the built-in logger (Stopped, Waiting, Recording) have no effect on the PRV controller operation.

“Last Stop Time” and “Last Restart Time” show when the logger was last stopped and re-started, respectively.



2.4 PEGASUS 2 CONTROL BOX – DESCRIPTION

Pegasus 2 control box is a combination of a PRV controller and a built-in data-logger.

2.4.1 Logger functions

At the appointed time, the built-in logger will go into the state of “Recording” and begin repetitive logging.

The logger should be set to periodically sample the sensors employed by the PRV controller, but additional sensors can be optionally included in the built unit. These must be requested at the time of ordering; refer to the model-number scheme (shown later).

After taking several measurement samples, some statistical functions can be optionally applied to produce a datapoint that is logged (saved); a “point measurement” (a single data sample) can alternatively be saved. The rate at which these are recorded is known as the “log period”, which is always a multiple of the “sample period”.

The datapoints are stored in the memory of the unit. The unit calls into the cellular data network in order to contact the server; the data is then uploaded.

An installer can also download a copy of the data into the IDT tool for analysis on-site.

The logger can be programmed to monitor data for certain patterns or conditions and to send a message to the server if it should detect a match. Commonly, this is used for setting a condition to be detected by the unit that can be an indication of an “alarm”.

The logger makes measurements (as described above) into an area of memory which is referred to as the “primary recording”. If the logger has the feature enabled, it can also be set to occasionally save data into a “secondary recording” memory area, sampled at a higher frequency. This is not available on all supplied units and must be arranged through your sales representative before placing an order; it has implications concerning expected battery life of the unit.

2.4.2 PRV Control functions

The unit is shipped from the factory in a low-power mode referred to as “Shipping mode” (see section 7.1.2). The PRV controller is shipped in a nonactive state, (shown within IDT as “No Control”). The installer must activate PRV control at a suitable point during installation by putting the device into the “Start Control” state.

The state of the PRV controller operation has no effect on the built-in logger operation.

Operation of the system is described later, in section 2.9.

2.4.3 Controller Description

The Control Box unit directs the operation of the Solenoid Box unit. It contains inputs from all transducers, from which it makes decisions about how the system should respond to the current operating conditions.

The Control Box, shown opposite, contains:

- A quick-release connector for a water-pressure transducer (or an electrical interface for an external transducer) that measures the inlet side of the PRV (upstream pressure).
- A quick-release connector for a water-pressure transducer (or an electrical interface for an external transducer) that measures the outlet side of the PRV (downstream pressure).
- An electrical interface for a flow meter. This measures the rate of flow of water through the PRV.
- An electrical interface to the Pegasus 2 Solenoid Box.
- A connector for attachment of an Antenna for the cellular data network.
- A connector for communications and the external battery power option.
- (Optional) additional interfaces; 0 up to a maximum of 2.
e.g. An interface for other sensors or a Hydroswitch unit.



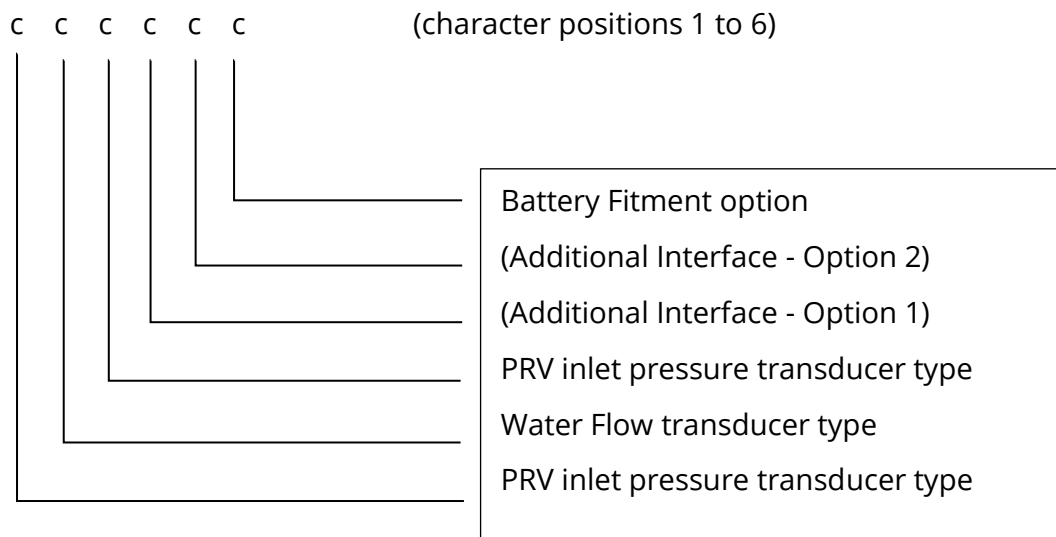
The front of the Control Box includes a part-number, an example of which is shown opposite:



The part-number describes the content of the unit, as follows ...

<u>Model Number(s)</u>	<u>Description</u>
C163C / * / * / * / *	Pegasus 2 Controller
	(Reserved by HWM for other options).
	Electrical options.
	Pegasus 2 Control Box unit.

"Electrical options" is a 6-character field, as follows:



Pressure input (key):

- 3 – External Pressure sensor (electrical interface).
- 6 – Internal Pressure sensor (10-bar) with quick-release connector for water.

Water Flow input (key):

- 1 – Digital Flow (Meter pulse) Input.
- Maximum of 128 pulses / second from a volt-free output.

Additional Options (key):

- 0 – (Option Not Fitted).
- H – HydroSwitch interface (alternatively can be used as a digital Status output).
- I – Electrical Interface (I2C).
- M – Electrical Interface (Modbus).
- 5 – Analogue (4-20mA) Flow input (Passive).
- S – Status Input.

Battery Fitment options (key):

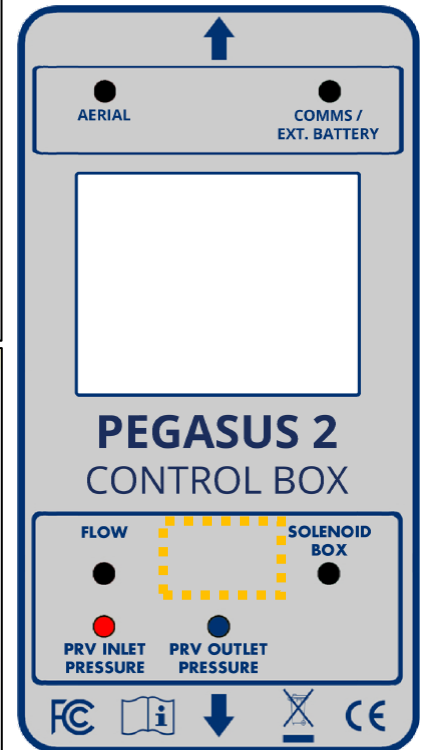
- F – Fitted internally and also connected (standard).
- D – Fitted internally but disconnected.
- S – Shipped separately.
- E – Empty. (Fixings for internal battery are supplied, but no battery).
- N – (Nothing supplied: No internal battery. No fixings).

The Front of the Control Box is labelled to show the position of each of the standard connectors.

Non-standard connectors (for additional options fitted) are not labelled; refer to the model number and part-number guide (above).

An example of a unit with internal pressure sensors and a Hydroswitch interface is shown opposite.

(The Hydroswitch interface, shown in dotted lines, is unlabelled).



2.5 SOLENOID BOX - DESCRIPTION

The Solenoid Box operation is directed by the Control Box unit.

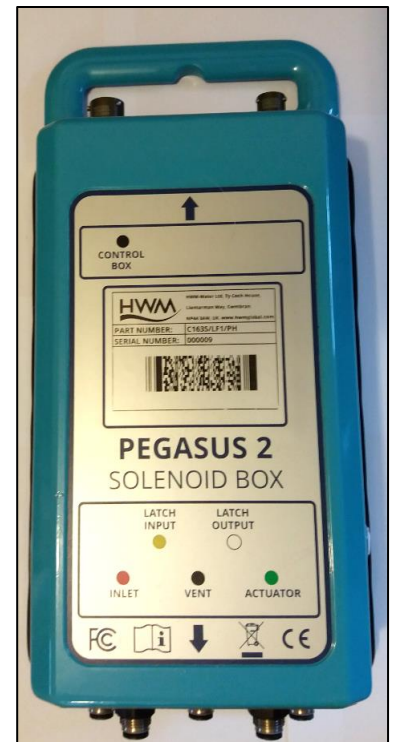
The Solenoid Box receives instructions from the Control Box via an interconnecting cable. The Solenoid box contains a set of solenoids which are connected to internal pipework. The pipework also connects to various water hose connectors presented on one side of the unit; these are for making connections to the external plumbing.

Each connector is labelled according to its standard use.

The Solenoid Box, shown opposite, contains:

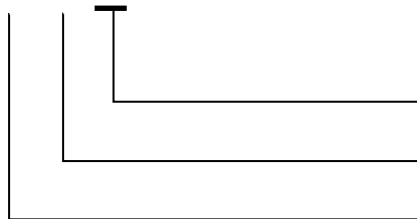
- A set of hose connectors for connection to water-pipes required for the installation.
- An electrical interface to the Pegasus 2 Solenoid Box.
- (Optional) additional interfaces for Hydros witch units.; (0 up to a maximum of 2).
- An (optional) additional internal solenoid, known as a “latching solenoid”.

The front of the Control Box includes a part-number, an example of which is shown below:



The part-number describes the content of the unit, as follows ...

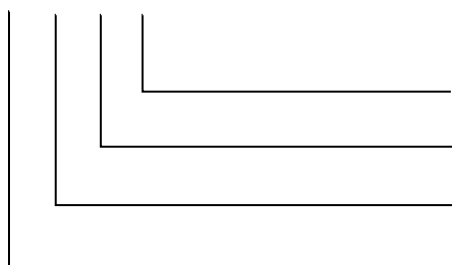
<u>Model Number(s)</u>	<u>Description</u>
C163S/ * / *	Pegasus 2 Controller



(Reserved by HWM for other options).
Fitted options.
Pegasus 2 Solenoid Box unit.

“Fitted options” is a 4-character field, as follows:

c c c c (character positions 1 to 4)



(reserved)
Hydros witch (number of interfaces).
Battery Fitment option.
Solenoid type.

Solenoid type (key):

- L – Latching Solenoid (standard); referred to as a “Latching unit”.
- N – Latching solenoid is absent; referred to as a “Non-latching unit”.

Battery Fitment options (key):

- F – Fitted internally and also connected (standard).
- D – Fitted internally but disconnected.
- S – Shipped separately.
- E – Empty. (Fixings for internal battery are supplied, but no battery).
- N – (Nothing supplied: No internal battery. No fixings).

Hydroswitch interfaces (key):

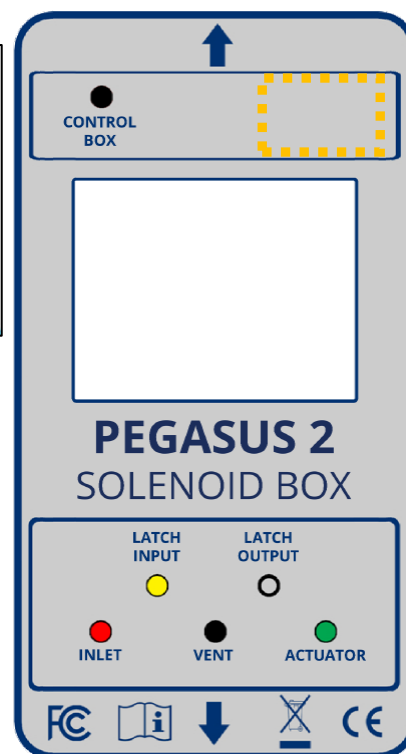
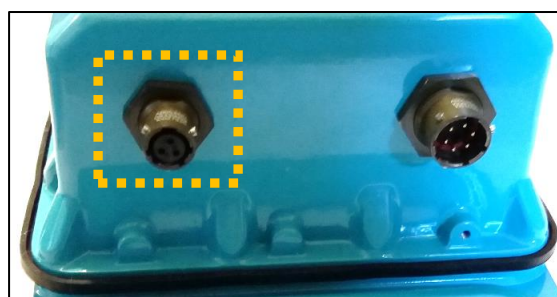
- 0 – (none).
- 1 – 1 Interface
- 2 – 2 Interfaces

The Front panel of the Solenoid Box is labelled to show the position of each of the standard connectors.

Non-standard connectors (for additional options fitted) are not labelled; refer to the model number and part-number guide (above).

An example of a unit with one (optional) Hydroswitch interface is shown opposite.

(The Hydroswitch interface, shown in dotted lines, is unlabelled).



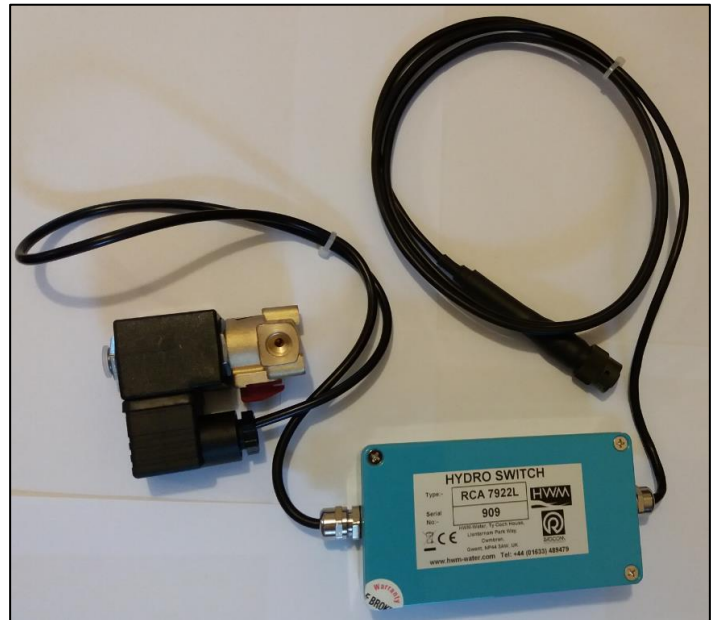
2.6 HYDROSWITCH - DESCRIPTION

The Hydroswitch, shown opposite, is an optional expansion to the Pegasus 2 system. It is a boxed unit with a 3-port latching solenoid valve attached via a cable.

The unit has a built-in cable with a water-proof connector.

The Hydroswitch is powered by its own internal batteries. Its operation is directed by the Pegasus 2 unit to which it is connected.

The Hydroswitch does not form part of the basic Pegasus 2 system but may be required for certain types of installation.



Note: Pegasus 2 does not provide software support for Hydroswitch on initial release of the product.

Refer to your sales representative for the latest information on availability.

2.7 MECHANICAL ACTUATOR

In order to control the outlet pressure of a PRV the Pegasus 2 system is required to modify the PRV behaviour so that it produces downstream water pressure which follows the programmed pressure profile closely. This is achieved with the help of the HWM Mechanical Actuator, shown opposite.

The actuator consists of a diaphragm sandwiched between two concave plates. The one side of the actuator has threaded rod which has been drilled through its length to form a tube. Inside the tube is a plunger which is in contact with the diaphragm. On the other side of the diaphragm, the actuator forms a sealed chamber which can be inflated (or deflated) using hydraulic pressure; hydraulic pressure is supplied through a water-pipe connection, as shown below (via the green hose). The actuator therefore converts an applied hydraulic pressure into the mechanical position of the plunger. The end of the plunger exits the thread.



A PRV normally has its pressure regulated via some control mechanism (which may include a pilot valve), with its outlet pressure being set mechanically; Typically, this is by the manual adjustment of a setting screw which acts on a spring.

The actuator used within a Pegasus 2 system replaces the setting screw. It allows the Pegasus 2 to adjust the PRV pressure.



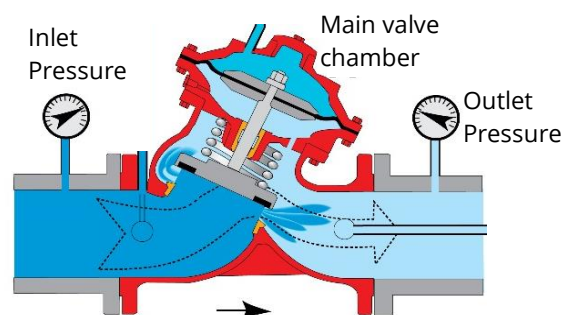
2.8 SUMMARY OF PRV FUNCTION (PILOT OPERATED)

(Readers familiar with PRVs controlled by pilot valve operation may skip to section 2.9).

2.8.1 Main valve

The main components of a Pressure Reducing Valve (PRV) are shown opposite.

A plunger within the valve body is able to close onto the valve seat (closing off water flow) or open (allowing water flow). Depending on the position of the plunger, the flow has a variable restriction. The restriction reduces the outlet pressure when water is flowing. The plunger position is influenced by the water pressure on both the inlet and outlet sides of the valve seat, internal springs acting on the plunger, and also the position of a diaphragm which is attached to stem of the plunger.



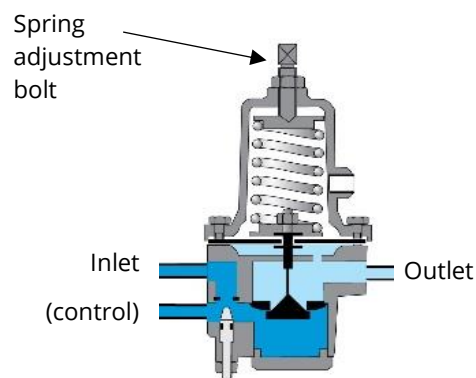
Valve Open (flowing condition)

The diaphragm changes position in a manner dependent on the difference in pressure either side it. The pressure on the diaphragm is usually under control of components external to the main valve body, including a pilot valve.

2.8.2 Pilot Valve operation

A typical pilot valve is shown in the diagram opposite.

It is constructed with a plunger which has its stem connected to a diaphragm. The position of the plunger is dependent on any forces acting either side of the diaphragm; the force on the lower side being provided by water pressure and the force on the upper side being provided by the compression of a spring. The spring compression can be adjusted by means of an adjustment bolt which re-positions the top seat of the spring.



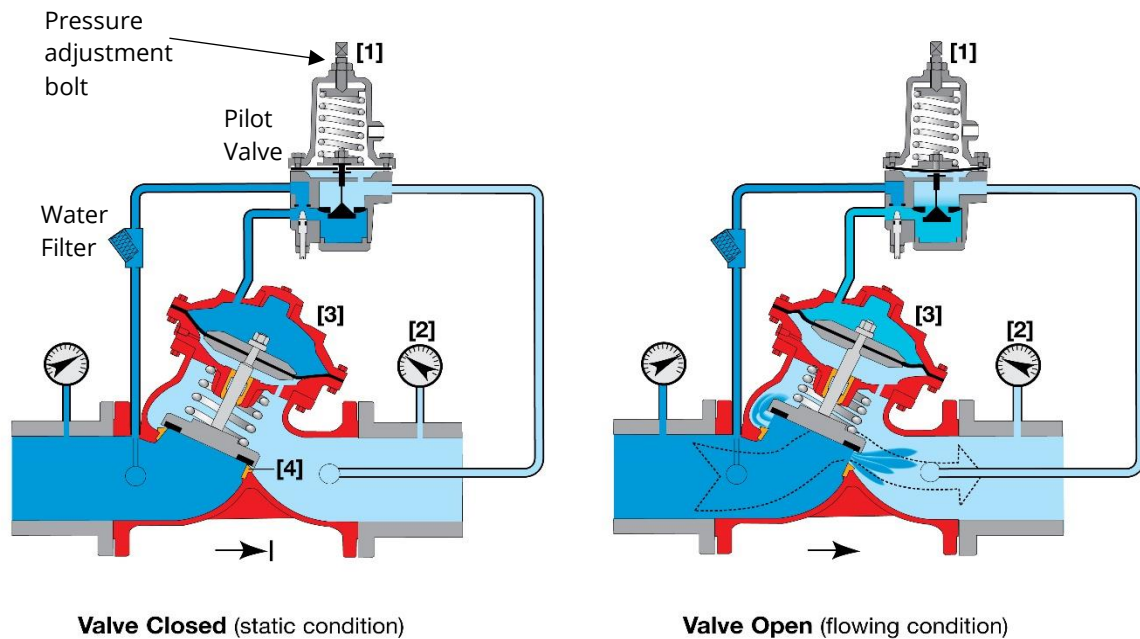
The water flowing into the pilot valve via the inlet port is restricted. This is typically done by a needle valve which may be either internal to the pilot valve or external to it (within the pipe feeding upstream water to the inlet of the pilot valve).

When the pilot valve opens, some of the water flows across the valve (due to pressure difference) and leaves via the outlet port. A 3rd port is available, used for control of the main valve.

The needle valve is sometimes referred to as a "speed control". It prevents damage to the PRV by limiting the speed of change to volume of water in the PRV upper chamber.

2.8.3 Pilot operated pressure reducing valve

A pilot operated pressure reducing valve automatically and accurately reduces downstream water pressure to a specific, adjustable value.



The Pressure Reducing Pilot [1] senses downstream pressure [2] and in real time modulates the top chamber of main valve [3] to maintain a constant downstream pressure.

In no-flow static conditions, should the downstream pressure start rising above the pilot setting, the pilot closes, shutting the main valve [4] to maintain the allowable downstream pressure.

The upstream water is connected to the Pressure Reducing Pilot [1], which is subsequently connected to the top chamber of the main valve [3]. If this pressure is such that the Pilot remains closed, the upstream pressure is the same as the top chamber of main valve pressure. The pressure is balanced, and the valve is closed by the tension in the spring.

Note: The pilot set point is adjusted by turning the pilot adjustment bolt and is not dependent on upstream pressure.

Increasing spring force sets a higher output pressure.

Reducing spring force sets a lower output pressure.

However, if the upstream water pressure in the Pressure Reducing Pilot [1], does allow the Pilot to open, the water exits the valve and becomes downstream water, but more importantly, the pressure in the top chamber of the main valve [3] is now less than the upstream pressure. This pressure differential causes the valve to open.

2.9 PRV FUNCTION (UNDER PEGASUS 2 CONTROL)

2.9.1 Pegasus 2 Mechanical Actuator

The HWM Pegasus 2 includes the HWM mechanical actuator, which attaches to the top of the pilot valve, replacing the adjustment bolt.

Pegasus 2 is able to control the spring force by adding or removing water from the upper chamber of the actuator. This operates a rod internal to the device (the stem of the plunger) which connects to the seat of the spring.

Pegasus 2 adds or removes small quantities of water to the actuator, allowing fine control of the position of the upper end of the spring (between set limits); the limits are adjustable. The procedure for installing the actuator and setting its limits is covered in sections 4.12 and 4.13.

The pilot setting can therefore be continuously adjusted by Pegasus 2, thereby allowing control of the downstream water pressure.

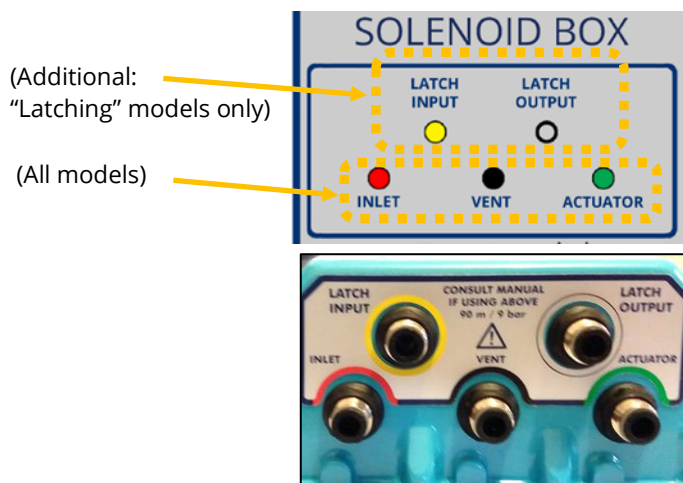


2.9.2 Pegasus 2 System options: (Basic and “Latching” models)

All Pegasus 2 systems contain ports labelled “Actuator”, “Inlet” and “Vent”. These are connected to the internal solenoid valves and are required for modulating the PRV output pressure between the maximum and minimum pressures via use of the actuator. Basic models (also known as “non-latching” models) contain only these ports.

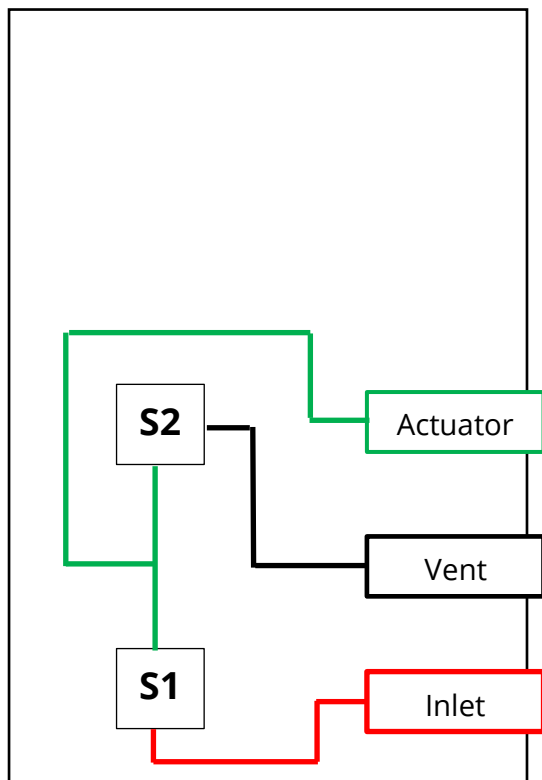
Pegasus 2 systems are also available with an additional solenoid; these are known as “Latching” models.

These models contain an additional two ports, labelled “Latch input” and “Latch Output”. The ports are connected to the additional solenoid valve and can be utilised to give some additional control over the PRV behaviour under certain conditions.

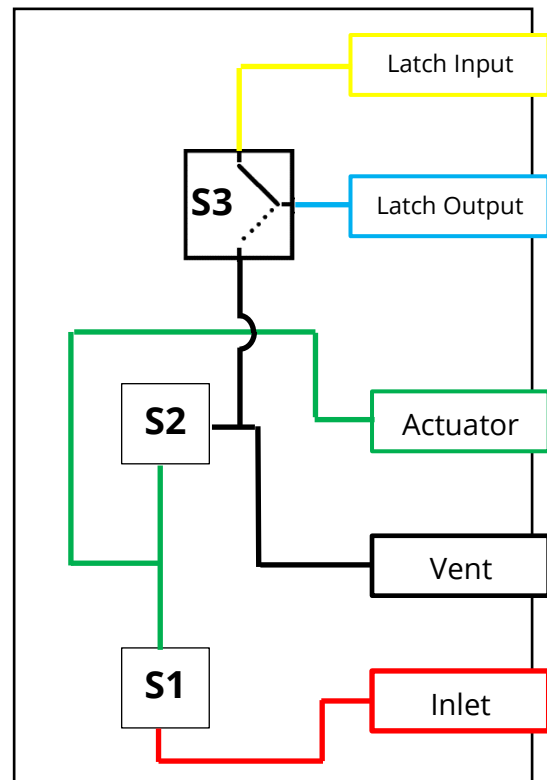


The differences in the two types of Solenoid box (latching vs non-latching) is illustrated in the diagrams below:

Non-latching versions:



Latching versions:



S1 and S2 are 2-port valves which are normally sealed. An electronic pulse to one of the valves momentarily actuates it and allows a small quantity of water to flow through it.

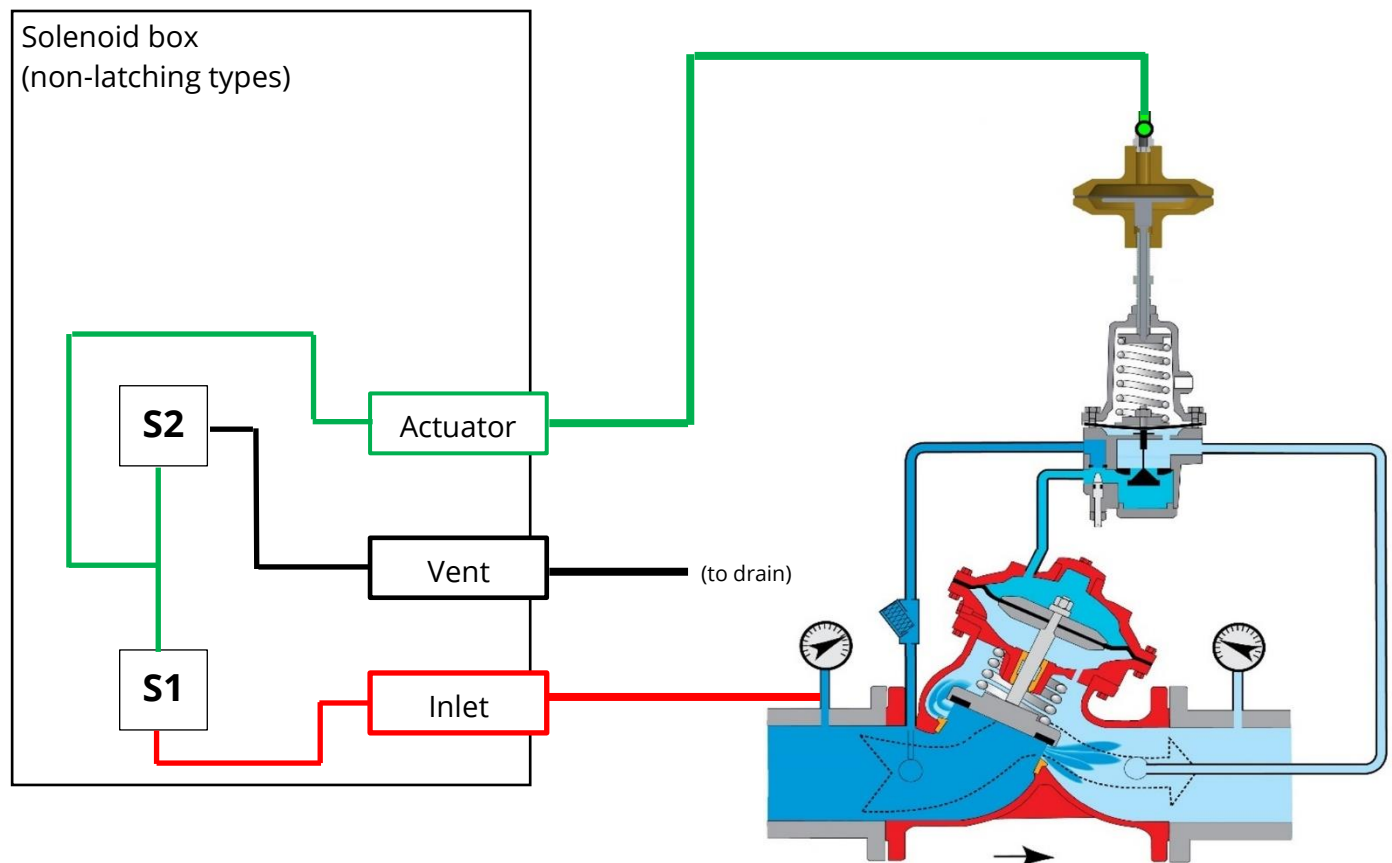
S3 (where fitted) is a 3-port valve with a common port. An electronic pulse to the valve can change its state and allows water to flow between the common port and one of the other ports; The remaining port becomes sealed.

The Solenoid box ports are colour-coded to assist with identifying their connection. It is possible for the installer to similarly use coloured pipes.

2.9.3 Theory of operation (continuous pressure modulation)

The plumbing of a simple Pegasus 2 installation is illustrated below:

It uses a “non-latched” model version.



The Inlet port connects to the upstream side of the PRV (as long as its pressure is below 90m), which provides pressurised water for the system to use.

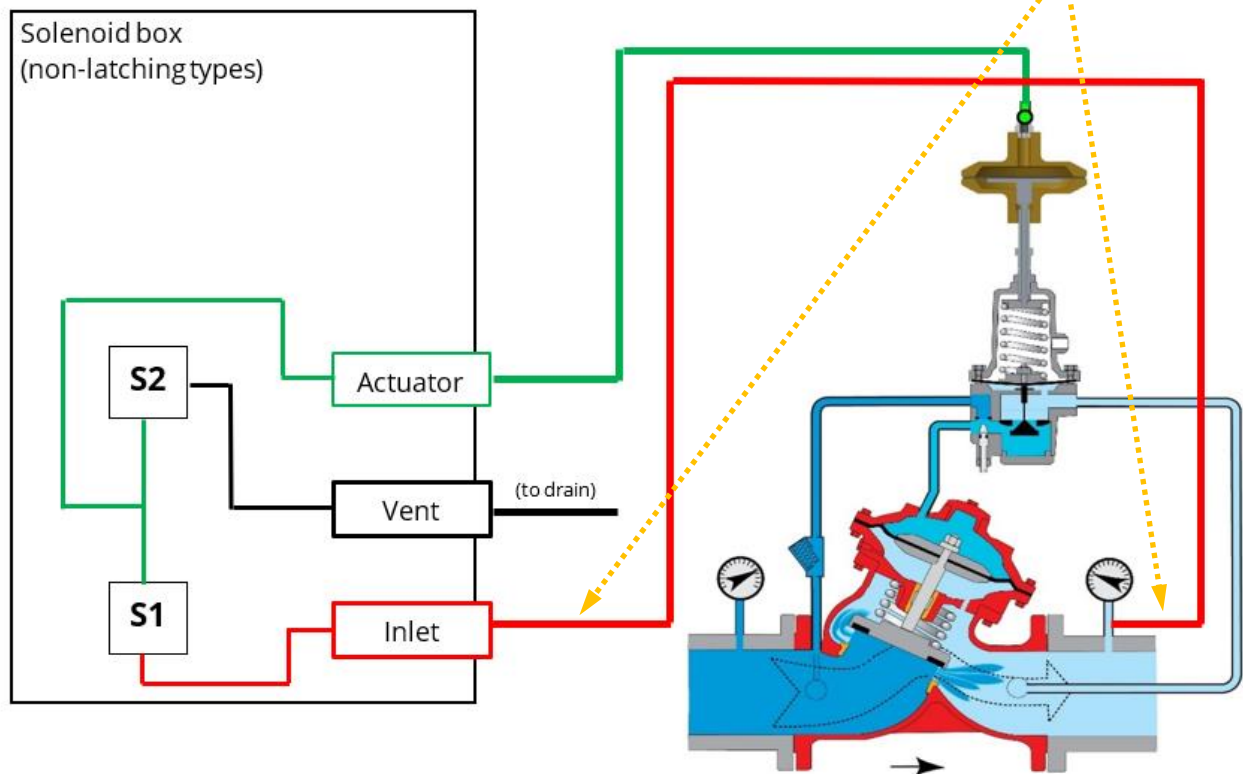
The controller can pulse solenoid valve S1 to slightly inflate the upper chamber of the HWM mechanical actuator. This increases the outlet pressure.

The controller can pulse solenoid valve S2 to slightly deflate the upper chamber of the HWM mechanical actuator. This decreases the outlet pressure. A small amount of water is discharged to the vent port, where it should be piped away from Pegasus to drain at a suitable location.

The Pegasus 2 actuator and the Solenoid box components may become damaged if the pressure feed into the unit is excessive (greater than 90m). In this situation, it is often possible to use Pegasus 2 safely by plumbing the Solenoid box unit into the PRV outlet to obtain water at a lower pressure, as shown below:

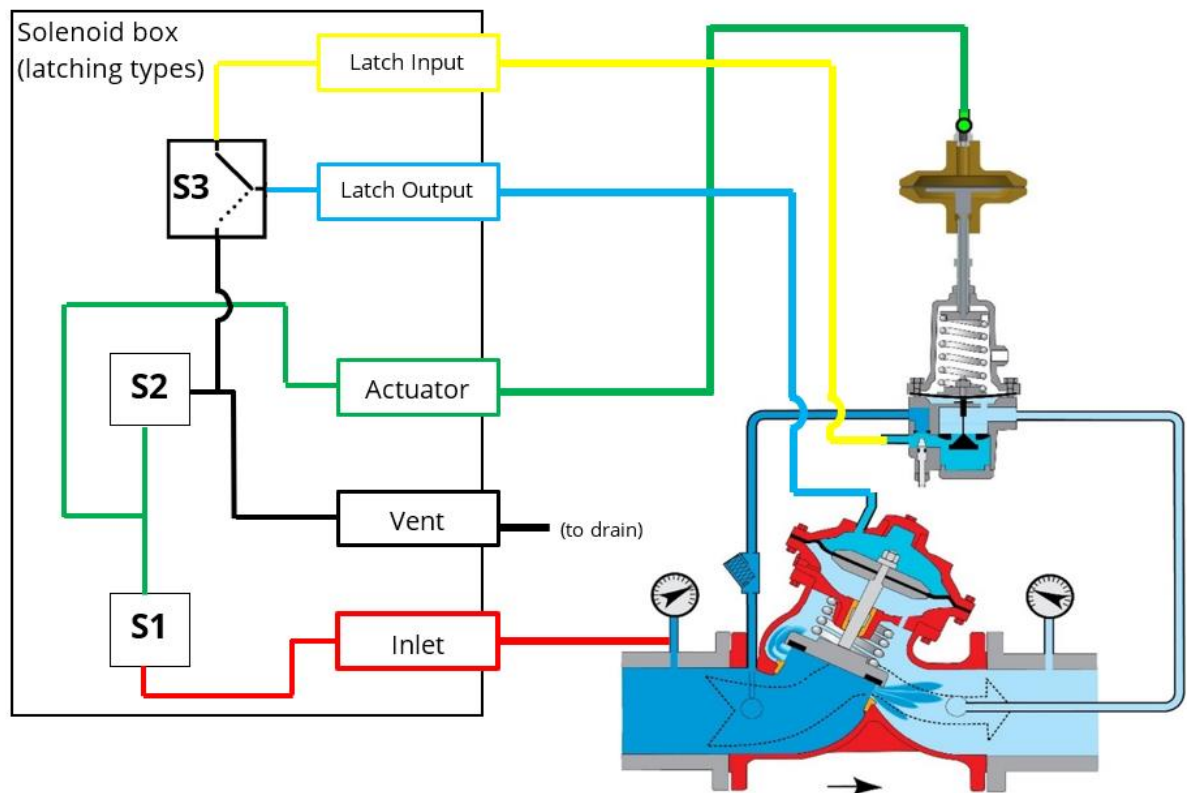
Caution:

When PRV inlet pressure exceeds 90m, an alternative installation is required... Use the downstream water pressure for the Pegasus inlet port instead, as shown.



2.9.4 Theory of operation (Continuous pressure modulation + Latch)

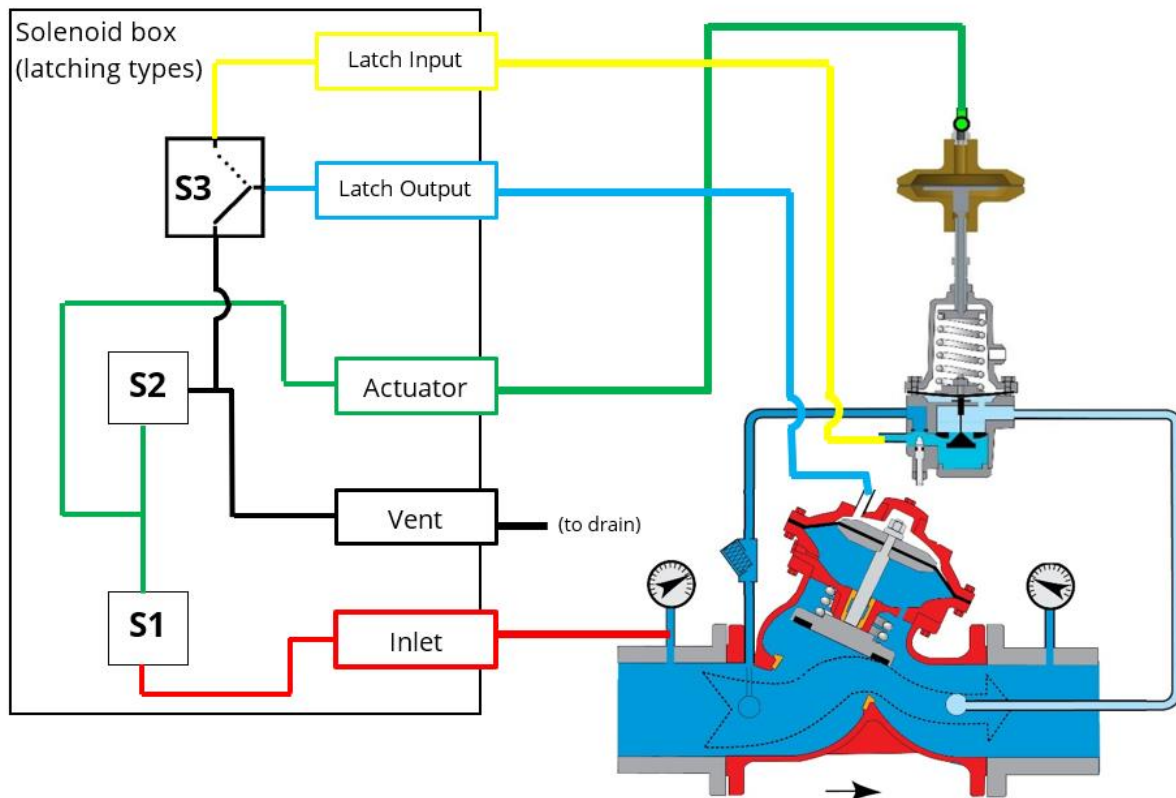
Continuous pressure modulation can be similarly implemented using a latched model version when plumbed into the PRV as shown below, provided the relay S3 is not operated.



The connection between the pilot valve and the upper chamber of the PRV simply passes through the Latch solenoid, rather than being directly connected.

Whilst S3 is in the position shown, operation is identical to that previously described for the non-latched model.

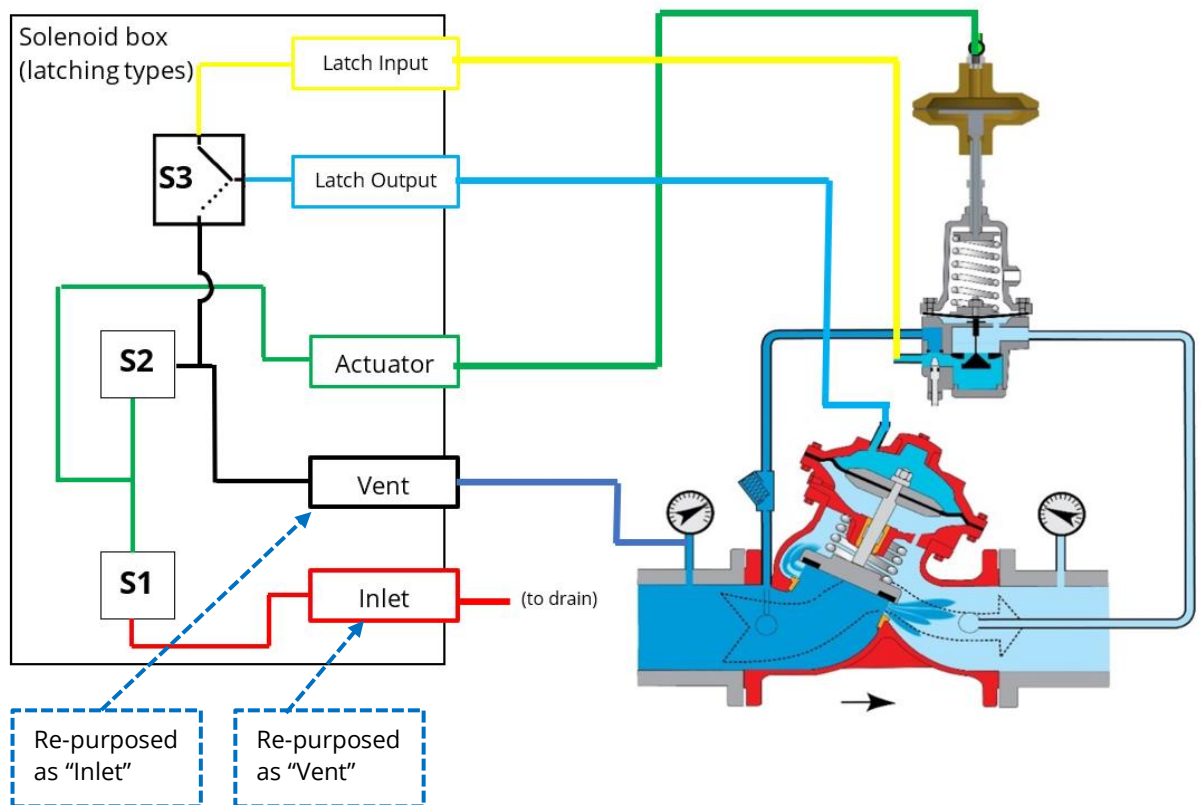
When the solenoid Latch (S3) is activated, the valve is switched over (by an electronic pulse) to a new position; it maintains its new position until de-activated (requiring another electronic pulse).



With the valve now in its new position, the Latch Input side is sealed and therefore has no water flow. Water from the upper chamber of the PRV is discharged through the port labelled "Latch out" to the Pegasus 2 port labelled "Vent" (and subsequently to a drain). The upper chamber of the PRV empties, allowing the PRV to open fully, so that the water flows through the PRV at maximum flow rate; This gives minimum pressure loss across the PRV.

This installation configuration is used to implement the function of **"Latch on high unreachable"** within Pegasus. It is designed to improve the PRV output pressure in situations where Pegasus is unable to drive the outlet pressure sufficiently high by controlling the pilot valve alone.

There is an alternative way to plumb a **modified Pegasus 2** into a PRV installation, as illustrated below:



The Pegasus 2 Vent and Inlet ports **are re-purposed** by swapping over their functions and plumbing. This also requires a change to the electronic configuration of the unit's function for solenoids S1 and S2.

This is used to implement a function of **"Latch on low unreachable"** using a modified Pegasus 2.

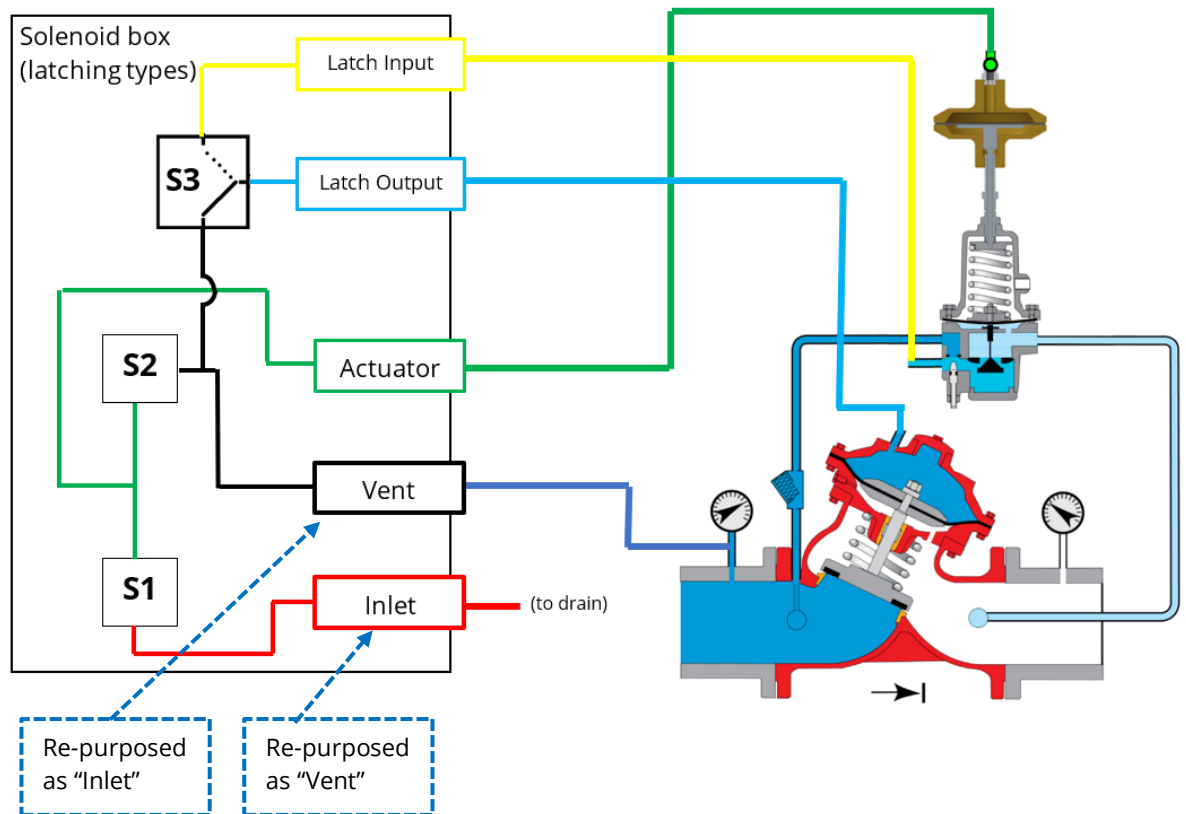
Note: Use of a Pegasus 2 modified and installed in this manner is very rare; it shuts off the supply of water. it requires specialised knowledge *not covered in this manual*. Refer to your sales representative for more details if this feature is required.

With the Latch solenoid in the position shown above, the water pressure supplied through the port labelled "Vent" (which is re-purposed as the inlet port) is used to slightly inflate the mechanical actuator when S2 is given a short electronic pulse.

A short electronic pulse to solenoid valve S1 will slightly deflate the mechanical actuator by discharging a small volume of water through the port labelled "Inlet" (which is re-purposed as the Vent port).

The modified Pegasus 2 can therefore finely control the outlet pressure.

When the Latch is activated, the valve is switched over (by an electronic pulse) to a new position; it maintains its new position until de-activated (requiring another electronic pulse).



With the valve now in its new position, the Latch Input side is sealed and therefore has no water flow. The upper chamber of the PRV is inflated by water flowing into the Pegasus 2 port labelled "Vent" (which is re-purposed as the inlet port). This causes the PRV to fully close so that the water flows through it at its minimum flow rate (and therefore maximum pressure loss).

Note: The two preceding diagrams show pressurised water being supplied by from tapping into the PRV inlet side. Where this pressure is excessive for Pegasus 2 internal components, it is sometimes possible that it can be supplied from the PRV outlet side (downstream pressure).

3 CONFIGURATION OPTIONS (DIAGRAMS)

The following sections illustrate some of the possible installation configurations that are achievable using the basic Pegasus 2 system.

3.1 KEY TO COMPONENTS WITHIN THE DIAGRAMS

To assist understanding of the diagrams, details of the various other components surrounding the PRV are shown below.

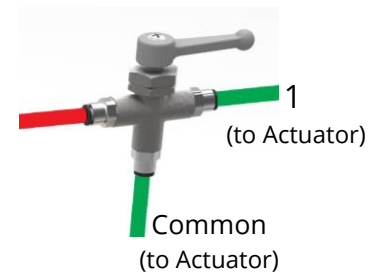
Inlet water filter

Prevents foreign bodies entering Pegasus 2.



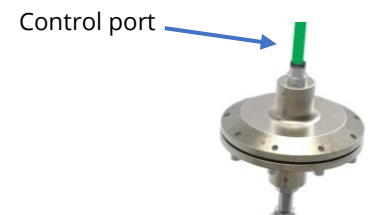
3-way valve

The 3-way valve provides a means to manually switch between control by the Pegasus2 system or an alternative setting (typically used to be able to manually drive the PRV pilot to the setting required for maximum downstream pressure).



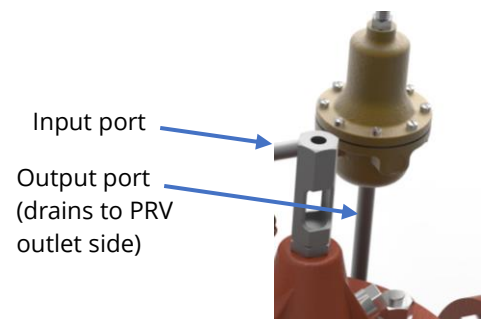
HWM mechanical actuator

Provides a means to adjust the setting of the pilot valve.



Pilot valve

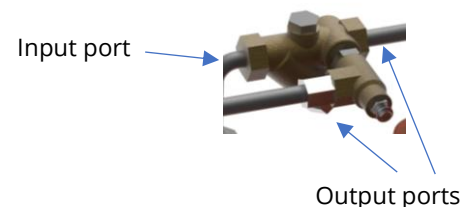
The pilot valve is shown here with 2-ports.



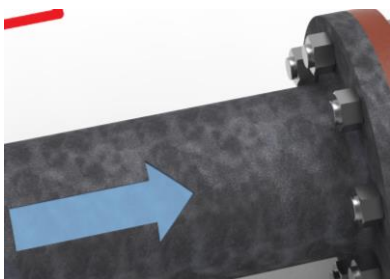
Needle valve

The needle valve is shown here (with 1 input port, 2 output ports).

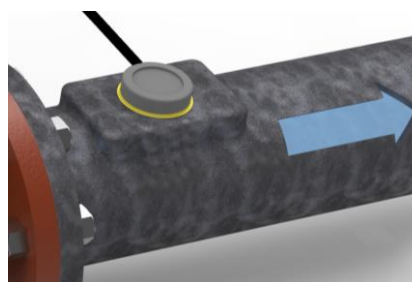
The needle valve provides a restrictor that slows down the water flow into the pilot valve and upper chamber.



Inlet pipe to the PRV



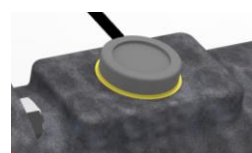
Outlet pipe from the PRV



Flow meter

The diagrams shows a flow meter (fitted within pipework of the outlet side).

The Pegasus 2 system provides models that can interface with various types of flow meters (e.g. Pulse or analogue).

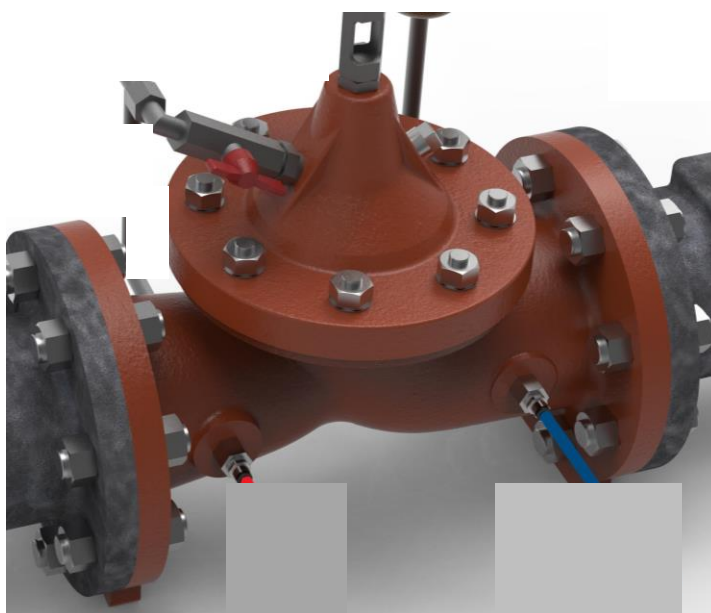


Pressure Reducing valve

The upper chamber is shown with 2 ports; one is closed-off and the other has a service valve fitted.

Closing the service valve seals the upper chamber, preserving its existing volume of fluid and therefore approximately maintaining the existing output pressure.

Opening the service valve allows the volume of fluid to be returned to the control of the pilot valve and other control components.



The main valve body has ports on the inlet side and the outlet side. These can be used to monitor the inlet and outlet pressure as well as providing access points to tap into the water at both these pressures.

Pegasus 2 Solenoid box

The Pegasus 2 solenoid box is shown opposite.

The Inlet and Actuator connections are always plumbed into the system.

The vent port connection to a drain is omitted from certain drawings in this manual for simplicity.

The unit has an electrical connection to the Control box.



Pegasus 2 Control box

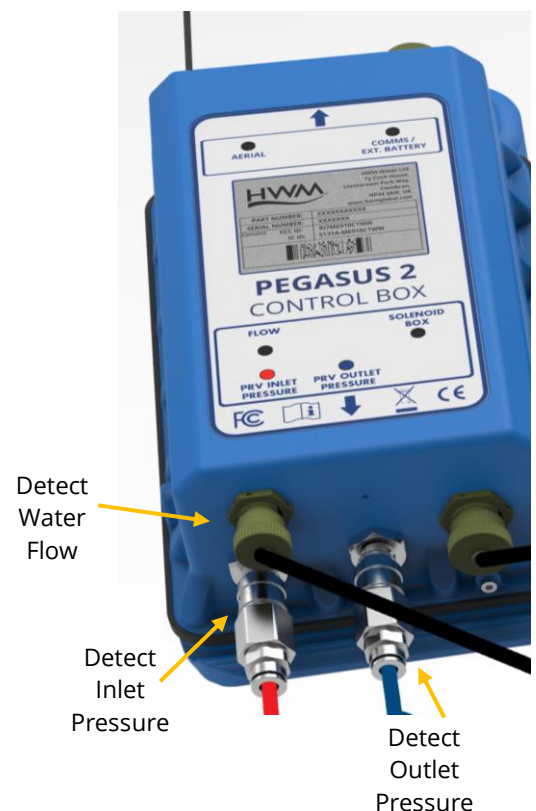
The Pegasus 2 control box is shown opposite.

The unit receives water flow information from a flow meter (not supplied) via the connector labelled "Flow".

The unit receives upstream water pressure information via the connection labelled "PRV Inlet Pressure". This could be either via a plumbed-in connection to the water (for a unit which has an internal pressure transducer) or via an electrical connection (where external pressure transducers are used).

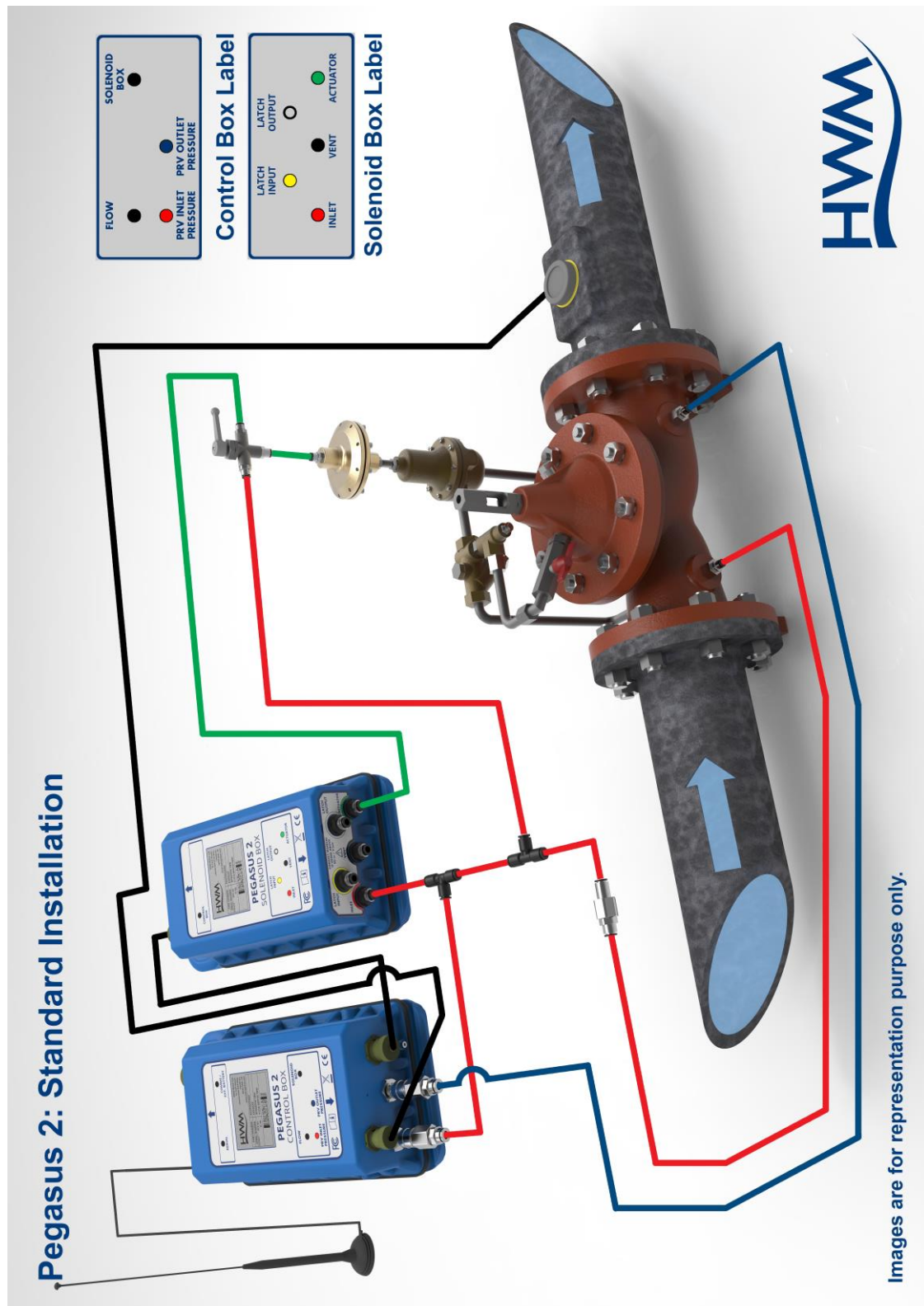
The unit receives downstream water pressure information via the connection labelled "PRV Outlet Pressure". This could be either a plumbed-in connection to the water (for a unit which has an internal pressure transducer) or via an electrical connection (where external pressure transducers are used).

The unit has an electrical connection to the Solenoid box. It also has an electrical connection to an Antenna.

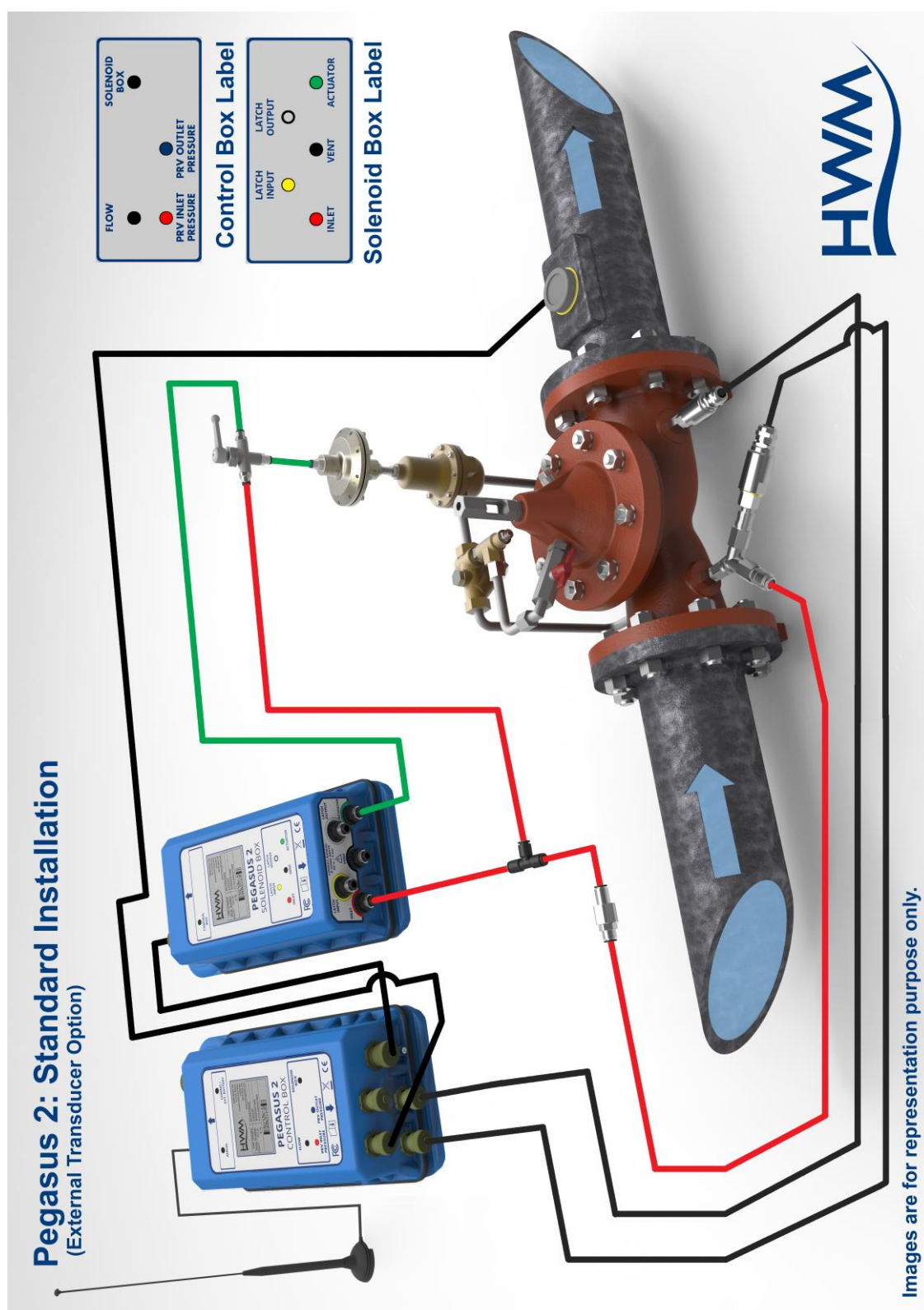


3.2 STANDARD INSTALLATIONS: CONTINUOUS PRESSURE CONTROL

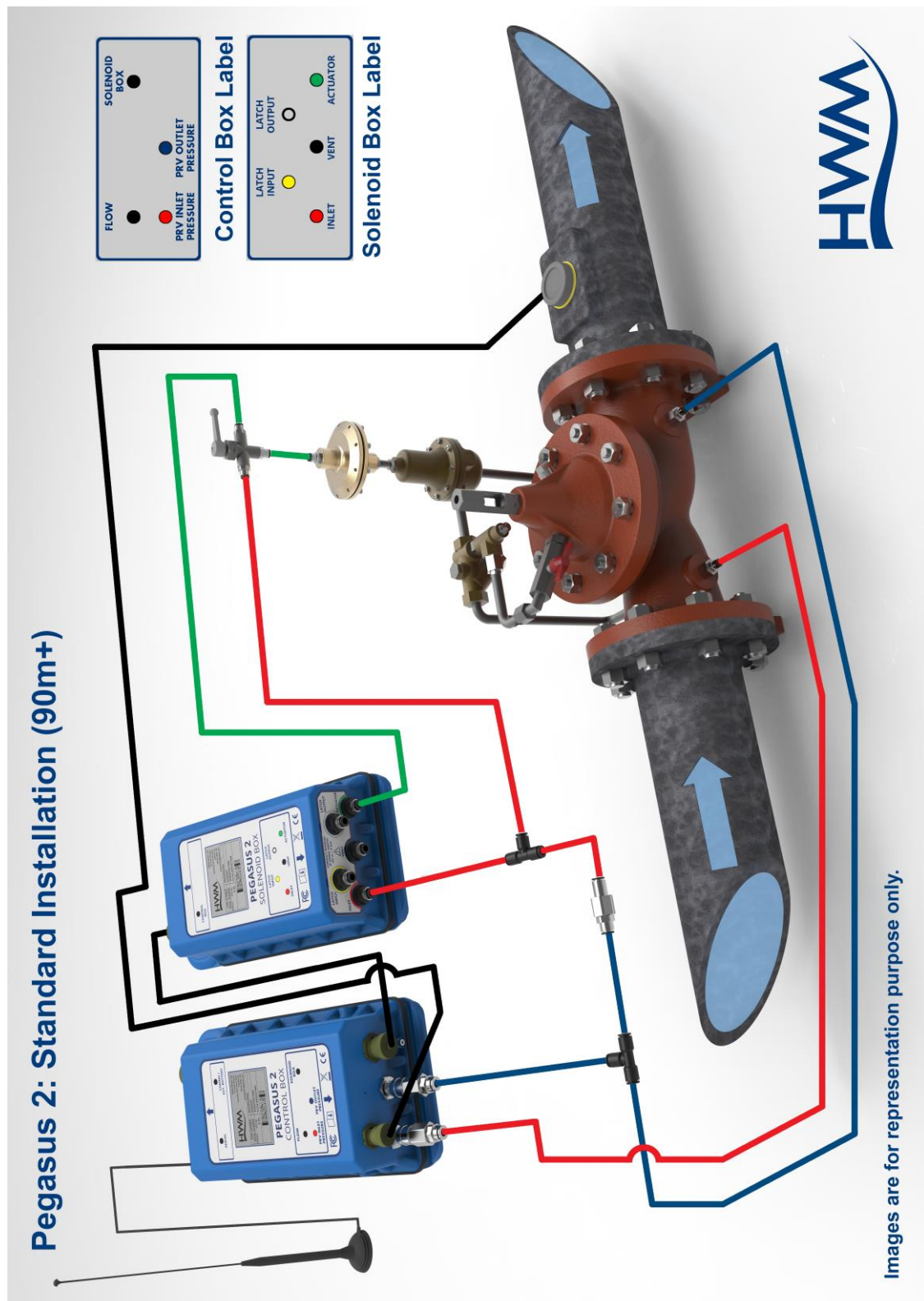
3.2.1 Using: internal transducers (Pressure in < 90m)



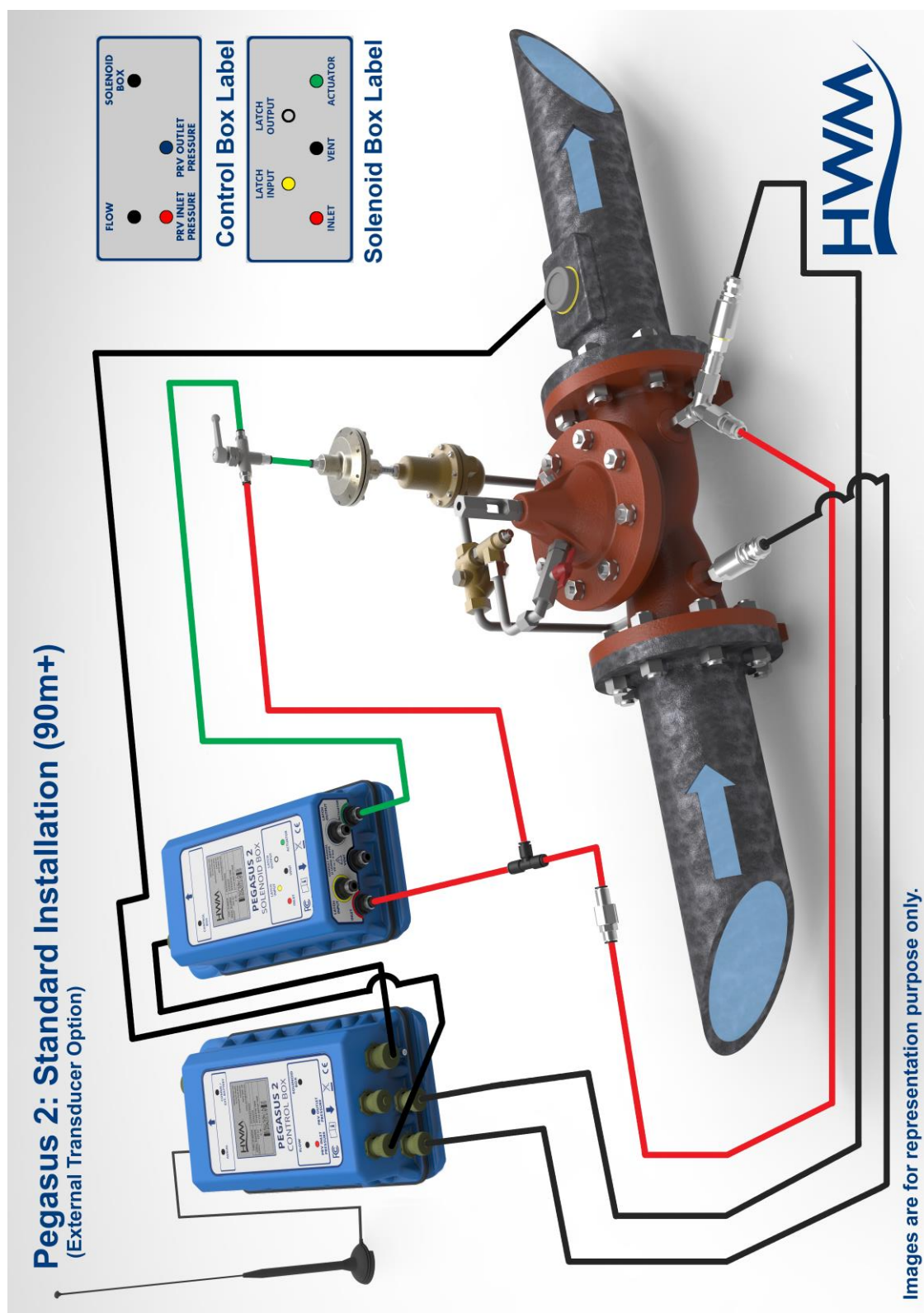
3.2.2 Using: external transducers (Pressure in < 90m)



3.2.3 Using: internal transducers (Pressure in > 90m)

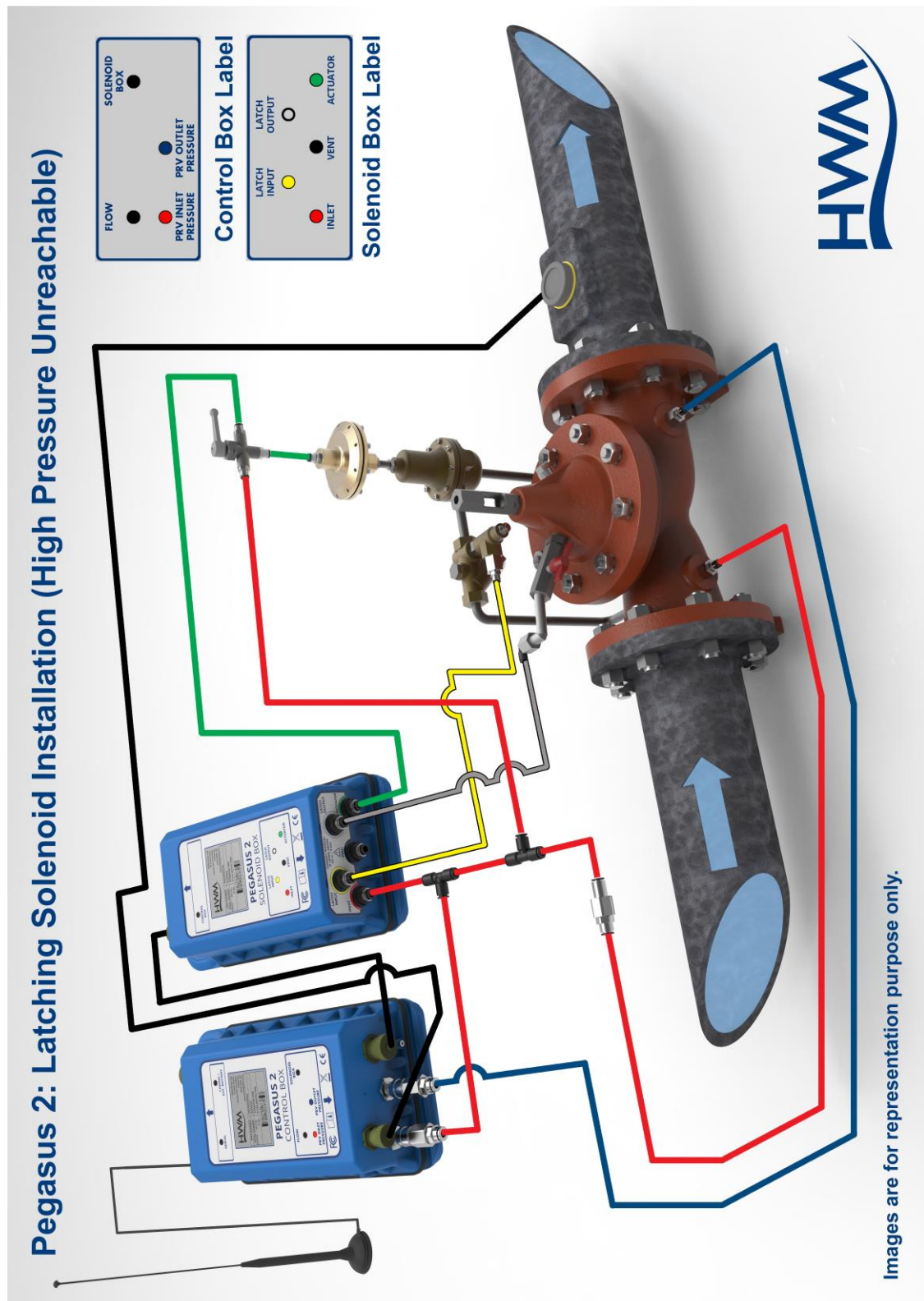


3.2.4 Using external transducers (Pressure in > 90m)

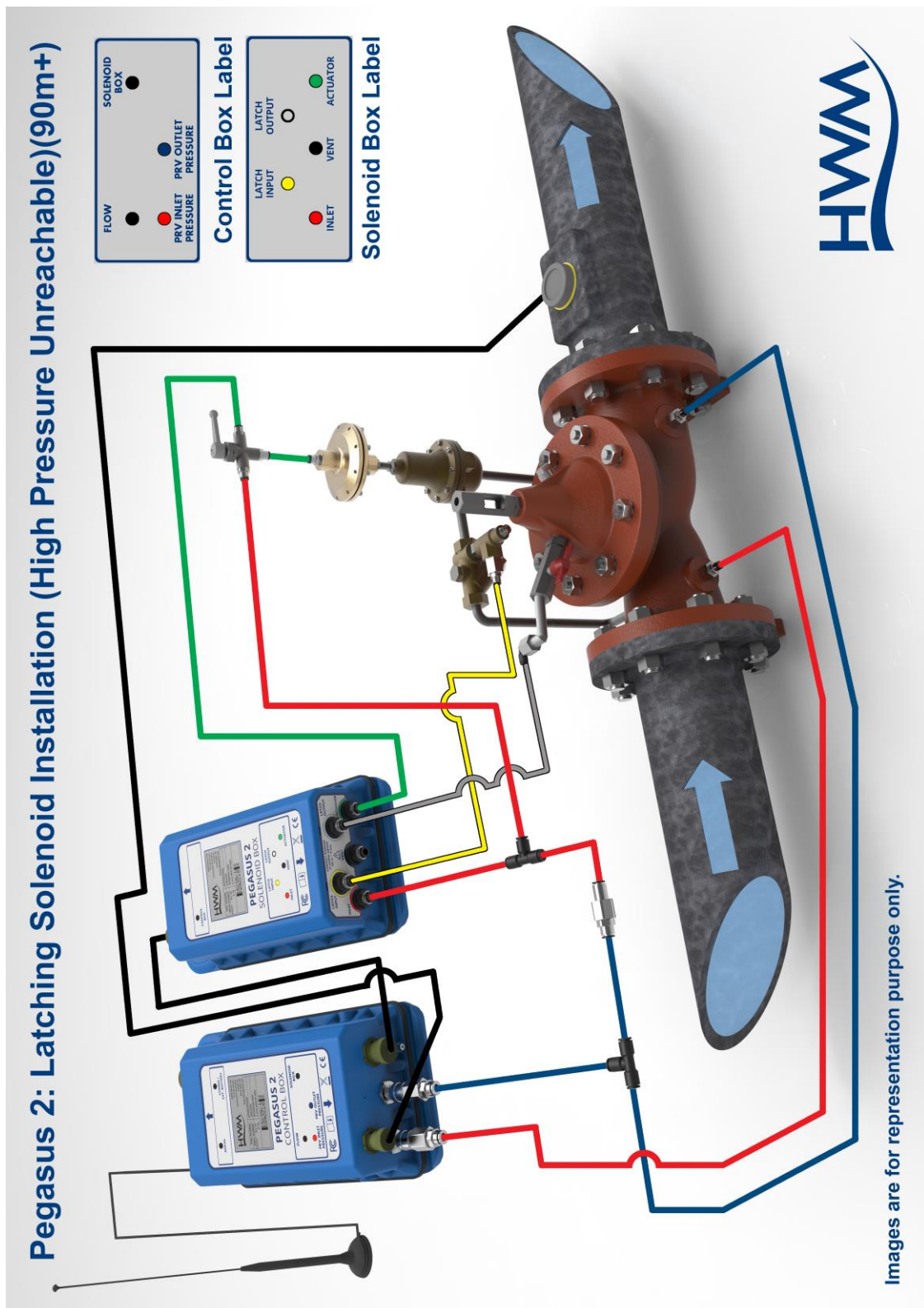


3.3 STANDARD INSTALLATION + HIGH PRESSURE UNREACHABLE

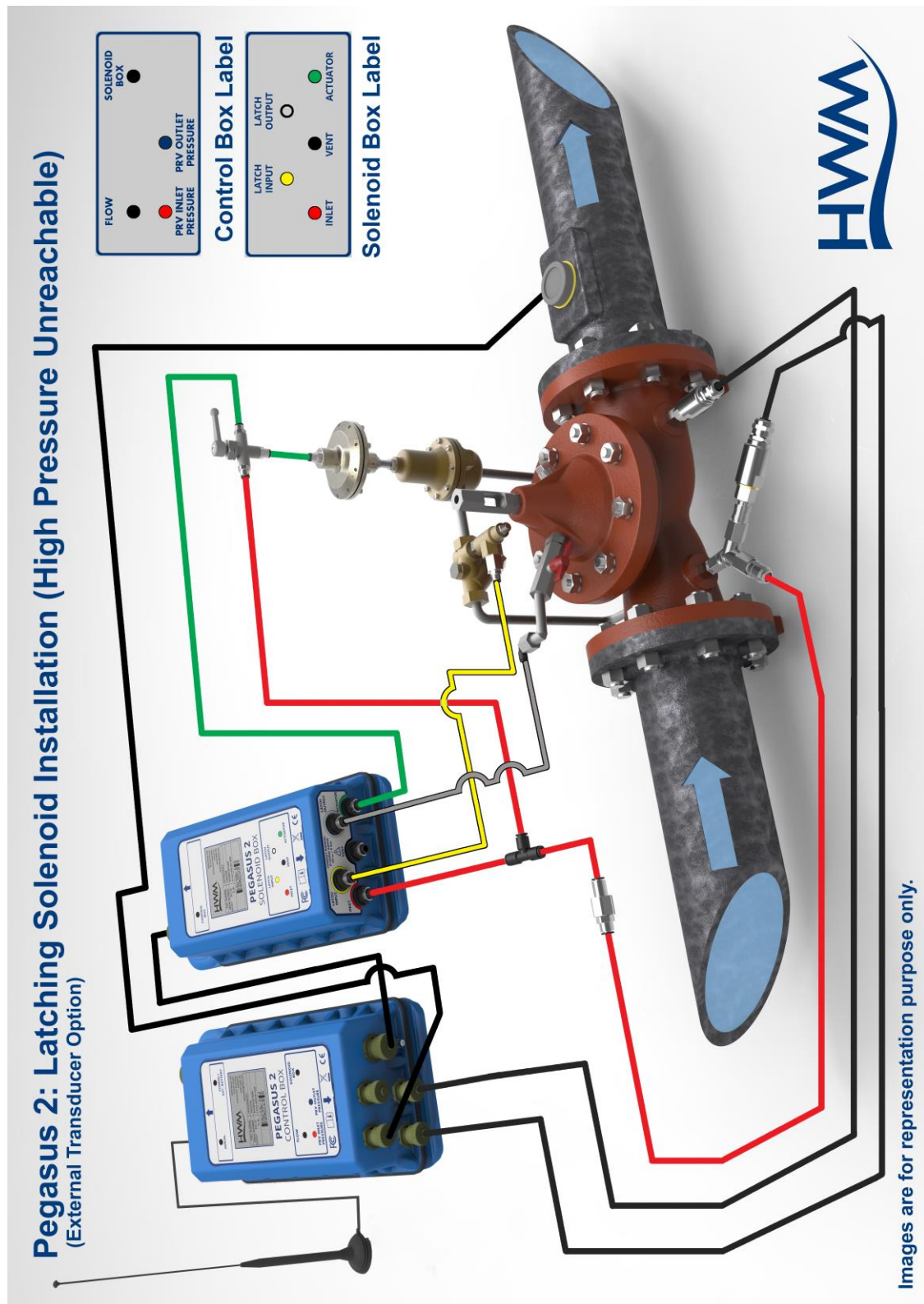
3.3.1 Using: Latch solenoid / internal transducers (Pressure in < 90m)



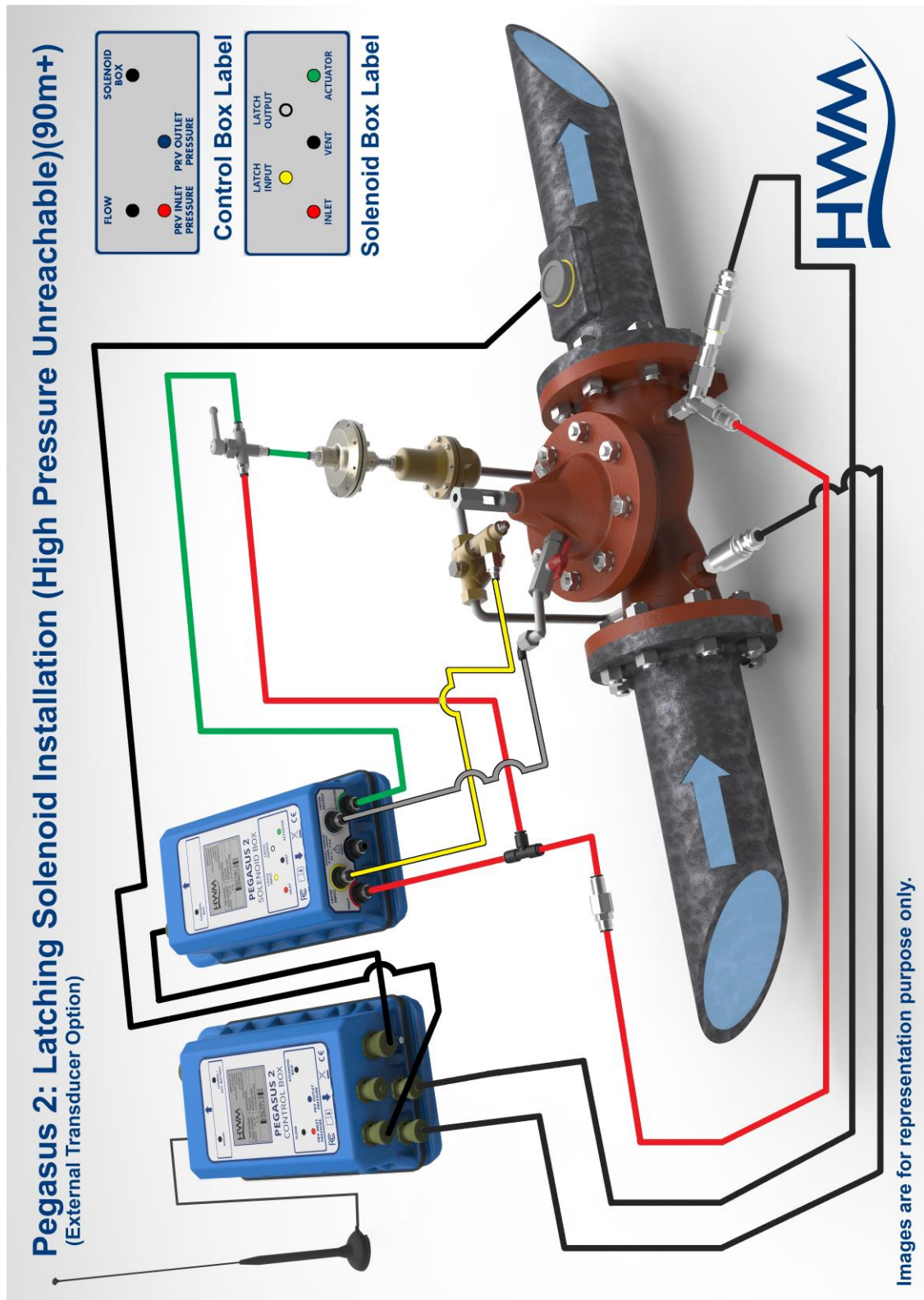
3.3.2 Using: Latch solenoid / external transducers (Pressure in > 90m)



3.3.3 Using: Latch solenoid / internal transducers (Pressure in < 90m)



3.3.4 Using: Latch solenoid /external transducers (Pressure in > 90m)



3.4 (OTHER INSTALLATION OPTIONS)

3.4.1 Latch on Low pressure unreachable

Latch on Low pressure unreachable configuration shuts off water if pressure drops).

It requires specialised knowledge of how to change the Pegasus 2 functionality for this type of installation. It also re-purposes the water connectors to be used for a different plumbing scheme.

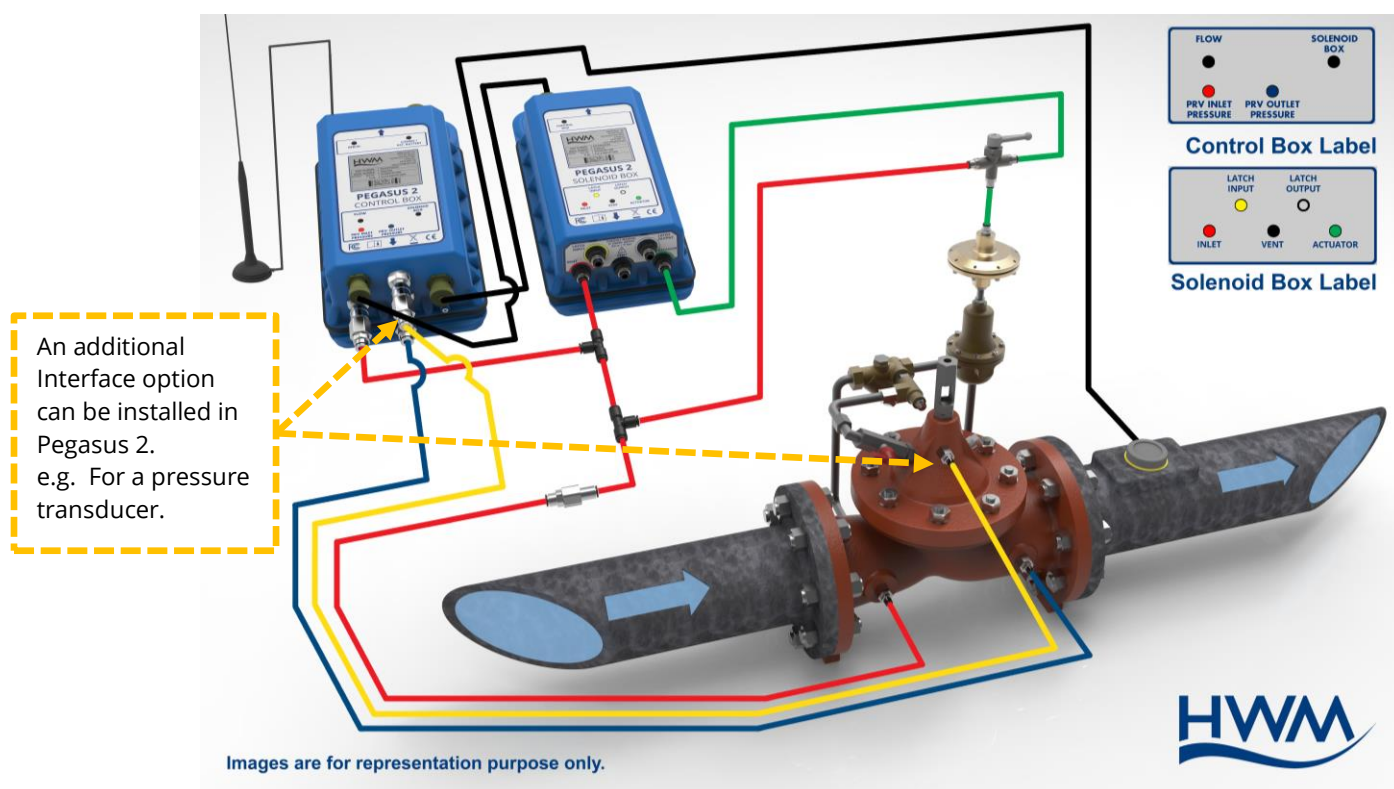
Details are not given here; refer to your HWM sales representative for assistance with selection of and installation of the required functions.

3.4.2 Models with additional Data Logging interfaces

Pegasus 2 includes data-logger functions. It is able to monitor various (optional) transducers in addition to the (non-optional) pressure transducers. The interface for the transducer must be ordered by selecting the appropriate model part-number; it is fitted and enabled at the time of manufacture.

Refer to your sales representative for assistance if required.

For example, it may be required that an additional pressure transducer be fitted so that the pressure within the upper chamber of the PRV can also be monitored and logged.



4 INSTALLATION PROCEDURE

The installer will be required to become familiar with the use of IDT as it is used at various parts of the installation process. (e.g. It is required in order to bleed air out of the system, test Pegasus 2 operation, and program a pressure profile).

Summary of system selection and Installation:

The system can be fitted to an operating PRV, however some flow pressure variation will be experienced whilst testing the system. Installation consists of various activities including:

- Choose a Pegasus2 system with suitable Control Box and Solenoid Box units (model numbers) for the PRV being controlled and monitored.
 - Pressure measurement transducers must be suitable for the pressure range of the PRV upstream and downstream pressures.
 - The interface for Flow measurements must be compatible with the flow meter.
 - To log additional parameters, select a model with additional interfaces.
 - Determine what the system should do when a fault is detected or the output pressure is unachievable. Select a model with an internal latch if required.
- Determine the most appropriate control method for the PRV (time, flow or combined time and flow).
- Select an appropriate connection scheme for the PRV and ensure pipes and accessories are available; Refer to the example installation diagrams within this guide.
- Choose suitable positions and mounting method for the equipment including the antenna; Fix in location and connect any cables.
- Attach a communications cable between Control Box and PC for set-up of the system.
- Program the required pressure profile and other settings into the Pegasus.
 - Read the current configuration.
 - Make any changes required to the on-screen settings.
 - Program the Pegasus with the on-screen settings.
 - Re-zero pressure transducers at atmospheric pressure (not water pressure).
- Fit the mechanical actuator onto the PRV pilot. Set the range of the actuator (required mechanical adjustment) to maximum and minimum required pressures.
- Plumb the Pegasus system into the PRV. Connect transducers.
- Activate the Pegasus to begin logging measurements and controlling the PRV.
- Test the operation of the system.
- Test communication with the central computer is OK (i.e. a call-in test).

4.1 POSITION CONTROL AND SOLENOID BOXES / LINK WITH CABLE.

The Pegasus 2 Control Box and Solenoid Box can be secured to a wall using optional brackets, shown opposite.

Ensure the wall and fixings used are able to bear the weight of the Pegasus 2 and any cables.

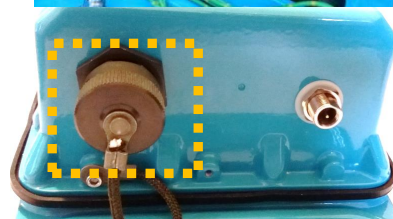
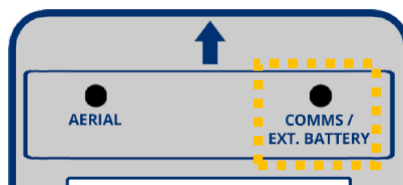
All cables should be routed and secured in a way that avoids stress being put on the connectors.

Attach the antenna to the connector labelled "Aerial".

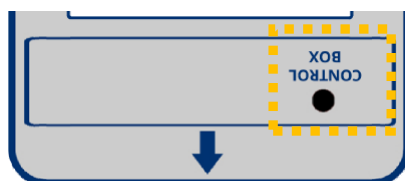
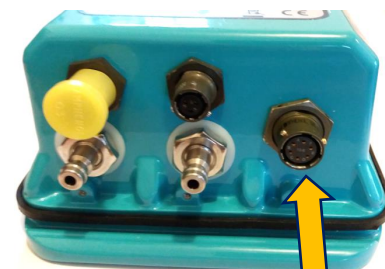
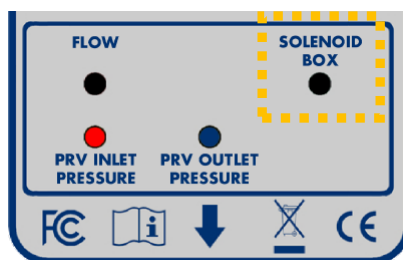
The bracket offers a potential mounting location for the antenna, as shown, although the installer should seek to find the optimal location for the antenna within the installation (see section 4.25).

If the system is to be installed with an external battery (optional, but sometimes required to increase the length of service of the system), mount it in a suitable location near the control box. It must be connected to the Control box via the connector labelled "Comms / Ext battery".

The external battery may be temporarily disconnected during parts of the installation (whilst the Comms cable is required to be used) but must be re-connected at the end of system installation.



Connect the Control box to the Solenoid box using the 6-way Pegasus 2 interconnection cable (p/n: CA-163-0004-* / length).



4.2 CONNECTION TO THE FLOW METER

Connection to the flow meter is required for any Pegasus 2 that uses a pressure profile that is dependent on flow (i.e. flow or combined time and flow).

For other situations it is optional, and will be used only by the data-logger functions.

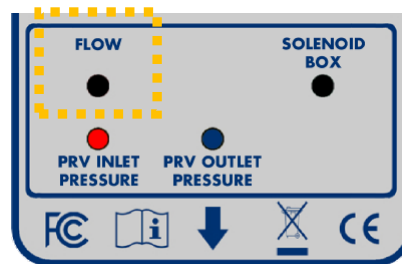
The water flow can be detected by a flow meter near the PRV. The Flow information is transferred to Pegasus 2 by means of an electrical interface in the Control Box.

Various hardware interfaces exist for collecting flow information, including:

- Collection of meter pulses (from a contact or a volt-free pulse output). This type of interface is suitable for supporting the PRV control functions. (Refer to section 6.1.1 for cable diagram).
- Analogue (4-20mA) input for connection to a compatible output of a flow meter. This type of interface is **unsuitable** for supporting the PRV control. It can be used as a logger interface option only.

Connect the Flow-meter end of the cable to the flow meter.

Then connect the cable to the Control box via the connector labelled "Flow".



4.3 CONNECT EXTERNAL PRESSURE TRANSDUCERS TO PEGASUS 2

Where the Pegasus 2 is supplied with external pressure transducers, these must be connected to the relevant electrical interface on the control box.

Determine which transducer will be used for measuring upstream pressure and which will be used for measuring downstream pressure. Check the range of each transducer is suitable for use (refer to the label on the cable of HWM supplied external transducers, as described in section 4.4).

Plug each transducer into the correct Pegasus 2 electrical interface:

- Be sure to connect the upstream pressure transducer to the connector labelled "PRV Inlet pressure".
- Be sure to connect the downstream pressure transducer to the connector labelled "PRV outlet pressure".

Ensure connectors are correctly fitted so that they are watertight.

4.4 CHECK / MODIFY PEGASUS 2 CHANNEL SETTINGS

In order for Pegasus 2 to operate correctly, the input channels must be set up, along with any calibration data and also various other settings.

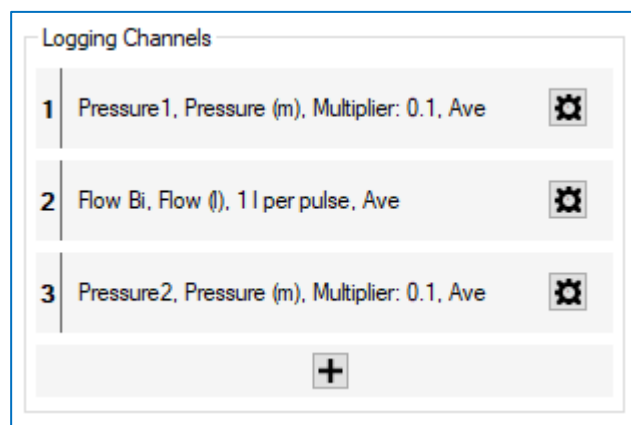
Select the Setup tab in IDT. Scroll to the “Logging Channels” panel.

This panel gives information regarding the type of interfaces for transducers fitted into the unit.

Electrical interfaces can sometimes be general-purpose in nature, so the unit has to be informed (by settings) of what type of transducers are attached. Also, it needs to be informed of how to interpret numeric readings into physical measurements.

The diagram opposite represents the transducers as inputs to a data-recorder which has several channels of recording memory. i.e. it is arranged as a set of “logging channels”.

The channels may be pre-configured by the factory prior to shipment, but the installer is responsible for confirming it is correctly configured to suit the installation site.



Channels can be added using the “+” button (e.g. if other optional interfaces are fitted).

To modify an already existing channel, click on the relevant settings (cog) button.



For Pegasus 2 to operate correctly, the channels must always be set to the following units of measure:

- Pressure: metres ... although inputs work in raw units of decimetres (1/10 m).
- Flow: litres per second.

For Pegasus 2 to operate with the DataGate and PressView websites, the unit must always be set up with data presented to the unit’s built-in logger using the following channels:

- Channel 1: PRV inlet pressure (upstream pressure).
Pegasus uses the “Pressure 1” type of interface for this connector.
- Channel 2: Flow.
Pegasus uses one of a set of interface types for this connector.
Each interface expects a voltage-free pulse output from the Flow meter.
 - Flow Bi (for a Bidirectional Flow meter)
 - Flow Uni (for a Unidirectional Flow meter)
- Channel 3: PRV outlet pressure (downstream pressure).
Pegasus uses the “Pressure 2” type of interface for this connector.

Example 1:

Setup of the pressure transducer for "PRV inlet pressure".

Note: The PRV inlet pressure is required by Pegasus 2 (and also PressView) to be mapped to "channel 1".

Clicking the cog button for channel "1" gives details of the source of measurements that will be used for the "channel 1" memory area. It should be modified if required.

In our example, the pressure transducer is internal and has a range of 0-10 bar (0-100m).

Note: The pressure range can be found from examination of the model number for internal transducers, or a calibration details label on the cable of external transducers supplied by HWM.

Our example unit, Pegasus2 unit has 4 available input transducers (input sensors):

- Pressure1: An internal pressure transducer (located at the port labelled "PRV inlet pressure").
- Flow Bi: An electrical interface for a flow meter that has a compatible electrical interface i.e. a volt-free pulse output.
- Pressure2: An internal pressure transducer (located at the port labelled "PRV outlet pressure").
- Temp Int: A transducer that can measure the internal temperature of the unit.

The "Input Sensor" drop-down selector is used to choose the electrical interface for the channel 1 logging memory area.

Select "Pressure1".

The "Sensor Type" drop-down selection box starts the configuration of how numerical measurements from this interface will be interpreted.

The pressure interface should be interpreted as a reading of "pressure".

Logging Channel Setup

Channel 1

Input Sensor: Pressure1

Sensor Type:

Input Multiplier: 0.1

Offset: 0.0

Recording Unit:

Logging Mode: Average

Accept Cancel

Logging Channel Setup

Channel 1

Input Sensor: << disabled >>

Sensor Type:

Input Multiplier: 0.0

Offset: 0.0

Recording Unit: m

Logging Mode: Average

Accept Cancel

Logging Channel Setup

Channel 1

Input Sensor: Pressure1

Sensor Type: Pressure

Input Multiplier: 0.1

Offset: 0.0

Recording Unit:

Logging Mode: Average

Accept Cancel

Selecting the above makes available the relevant units of measure for “pressure”.

Choose the unit of measure from the list available in the “Recording unit” selector.

Pegasus 2 and the PressView website both require the Recording unit to be “m” for correct operation. Select “m”.

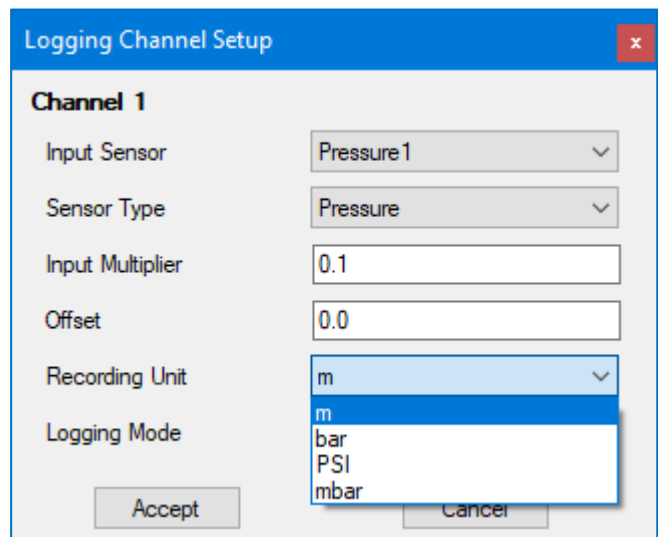
The appropriate scaling factors (multiplier and offset) are also required.

Offset is usually “0”.

For Pegasus 2, calibration factors for internal pressure transducers are applied in production, such that it each digit change represents a decimetre of pressure (1/10 of a metre).

Or, put another way, the number obtained when the interface is read has to be multiplied by 0.1 to convert it to metres (m, the selected recording unit).

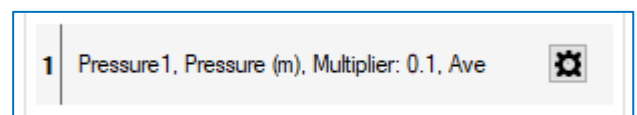
“Input multiplier” is therefore set “0.1”.



The “Logging Mode” should be set at “average” for Pegasus 2; this will smooth-out any noise (short fluctuations) in the readings and give a representative value of pressure.

When completed, click on “Accept” to update the configuration being stored the IDT-PC “current program” memory.

The channel settings are summarised in the “Logging Channels” panel.



Note: External pressure sensors supplied by HWM for use with Pegasus 2 will behave similarly once the calibration factors supplied on the label of the transducer cable have been applied. (i.e. They will measure in decimetres and require an Input multiplier of “0.1” when converting to metres).

Other pressure channels can similarly be checked or set up by first clicking the relevant setup icon.

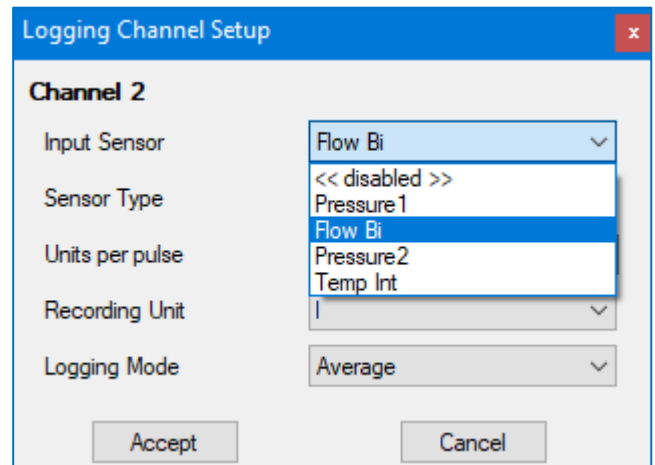
Example 2:

Setup of the interface for "Flow".

Note: The Flow input is required by Pegasus 2 (and also PressView) to be mapped to "channel 2".

Clicking the cog button for channel "2" gives details of the source of measurements that will be used for the "channel 2" memory area.

It should be modified if required.



The Flow input for Pegasus 2 PRV control is required to be a volt-free pulse input. This could be one of the following:

- Flow Bi (for a Bidirectional Flow meter), as in this example or
- Flow Uni (for a Unidirectional Flow meter)

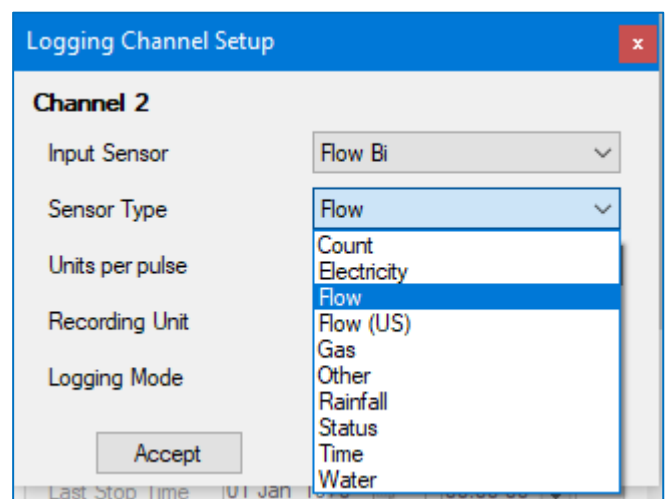
The "Input Sensor" drop-down selection box is used to choose the electrical interface for the channel 2 logging memory area.

Here we have selected "Flow Bi", which will work with a bi-directional flow meter.

The "Sensor Type" drop-down selection box starts the configuration of how numerical measurements from this interface will be interpreted.

The Flow interface should be interpreted as a reading of "Flow".

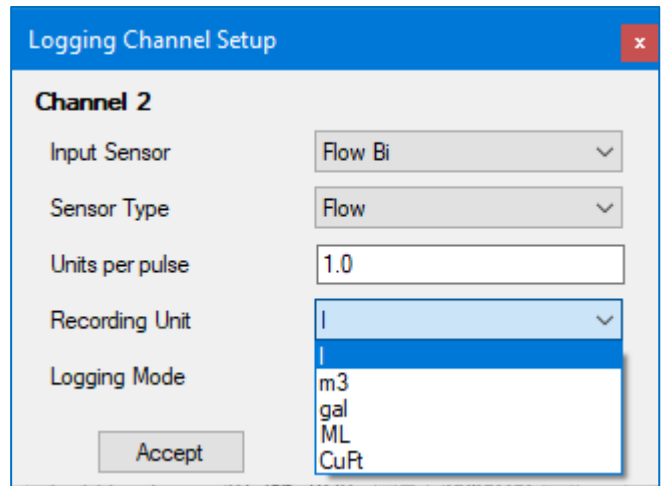
Selecting the above determines what units of measure are available for "Flow".



Choose the unit of measure next from the list available in the “Recording unit” selector.

Pegasus 2 and the PressView website both require the Recording unit to be “l” for correct operation.

Pegasus times the meter pulses and converts them into a “litres per second” measurement. Pegasus uses the units of litres / second as part of its evaluation of whether to adjust the PRV setting.



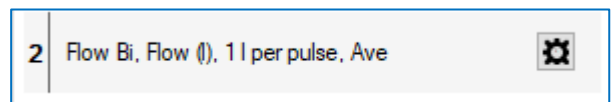
The appropriate scaling factor (Units per pulse) are also required.

e.g. If 1 pulse represents 10 litres, “Units per pulse” should be set to “10”.

“Logging Mode” should be set at “average” for Pegasus 2; this will smooth-out any noise (short fluctuations) in the readings and give a representative value of flow.

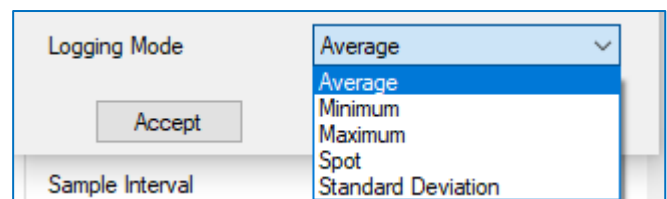
When completed, click on “Accept” to update the configuration being stored the IDT-PC “current program” memory.

The channel settings are summarised in the “Logging Channels” panel.



Note: Optional additional channels can be set in a similar manner to the 2 examples. Decide if any statistical filtering will be applied to the incoming channel data stream for creating datapoints in “logged data” memory.

- Average (of a set of measurements)
- Minimum (of a set of measurements)
- Maximum (of a set of measurements)
- Spot (a single measurement)

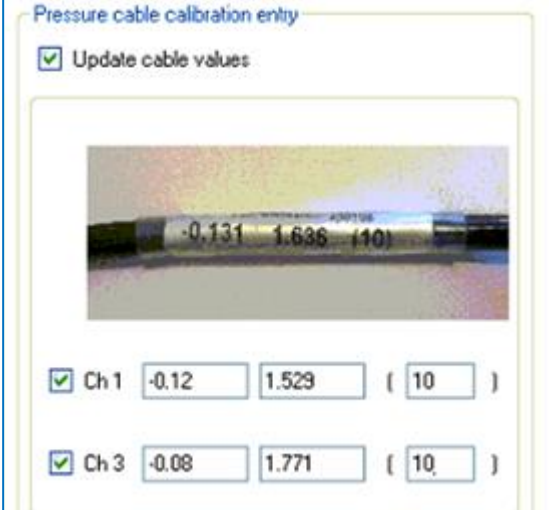


External Pressure Transducers – Entering Calibration coefficients

External pressure transducers from HWM have calibration coefficients that must be entered into IDT in order for Pegasus 2 to use them correctly.


Enter the values, as per the example opposite.

Note: The final number represents the *maximum pressure range* of the transducer (in bar).



Pressure cable calibration entry

☒ Update cable values



☒ Ch 1 -0.12 1.529 (10)

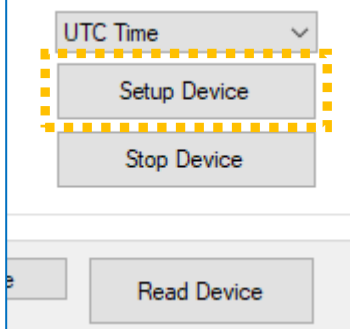
☒ Ch 3 -0.08 1.771 (10)

At this stage, it is important that the channel settings stored in the PC memory should be written into the Pegasus 2.

Scroll to the bottom of the Setup tab and click "Setup Device".

(The unit will now operate with the channels as set earlier).

Re-load the program into IDT by clicking the "Read Device" button.



UTC Time ▼

Setup Device

Stop Device

Read Device

4.5 RE-ZERO PRESSURE TRANSDUCERS

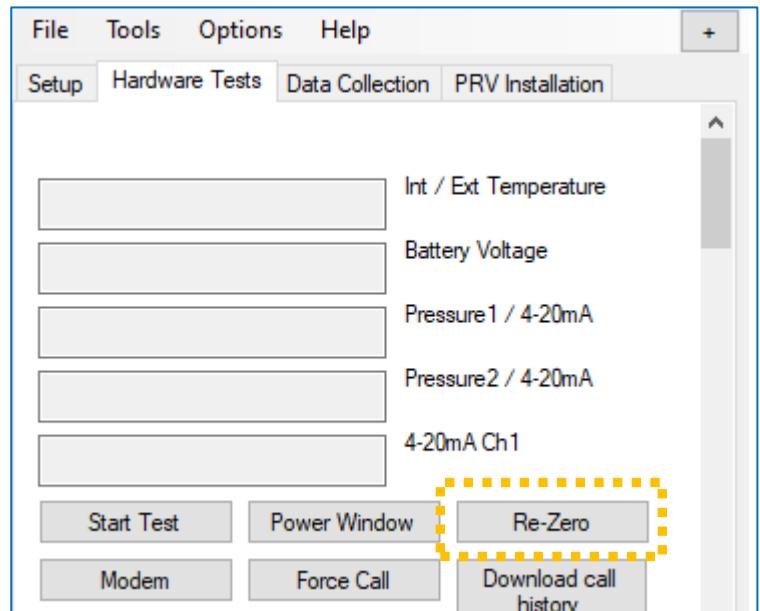
Ensure any external pressure transducers are connected to the Pegasus 2 at this stage.

- Be sure to connect the inlet pressure transducer to the connector labelled “PRV Inlet pressure”.
- Be sure to connect the outlet pressure transducer to the connector labelled “PRV outlet pressure”.

Ensure connectors are correctly fitted so that they are water tight.

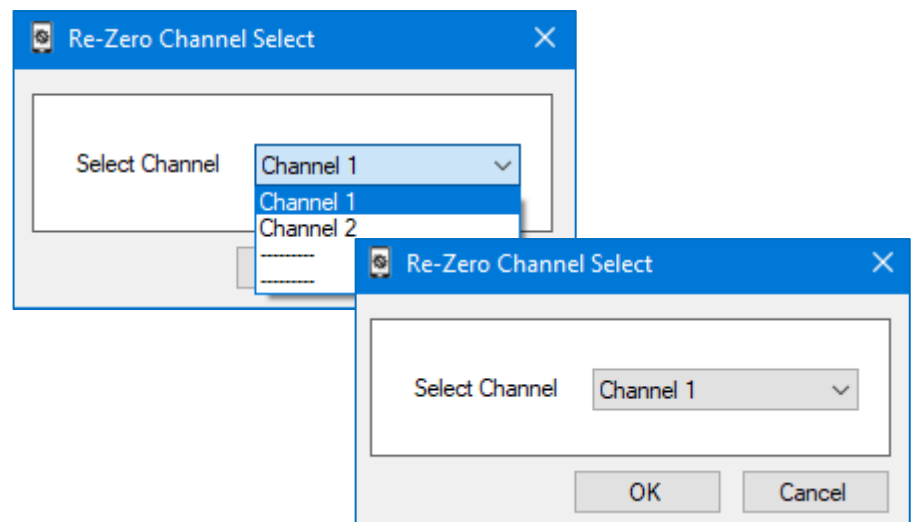
The transducers (internal or external) must now be re-zeroed whilst connected to **atmospheric pressure** (not water pressure).

Select the Hardware Tests tab in IDT and click the “Re-Zero” button.



Select the “PRV Inlet pressure” transducer by picking “Channel 1” on the drop-down control.

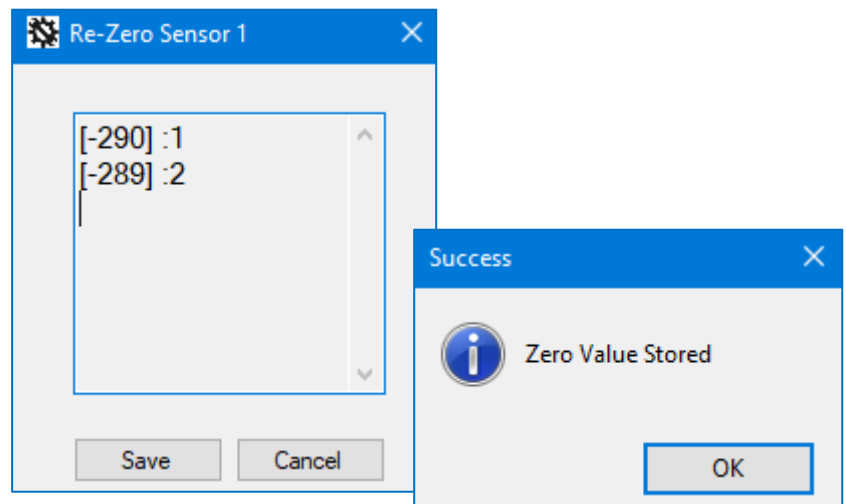
Then click “OK”.



This starts the re-zeroing process of the Pegasus 2, which repeatedly reads the numeric output from the transducer.

...Wait for this to stabilise (e.g. wait for 10 readings) and then click the "Save" button.

The value is stored.

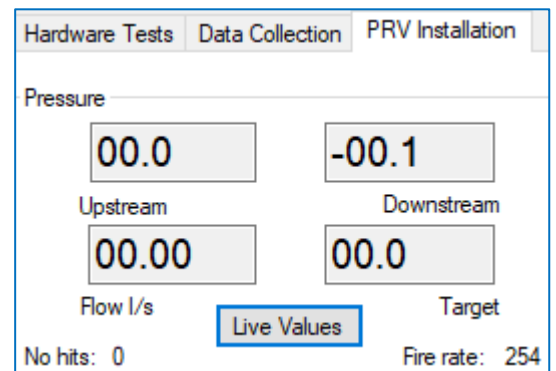


Repeat the process for the second pressure transducer. This is identical but requires selection of the "PRV Outlet pressure" transducer by picking "Channel 2" on the drop-down control.

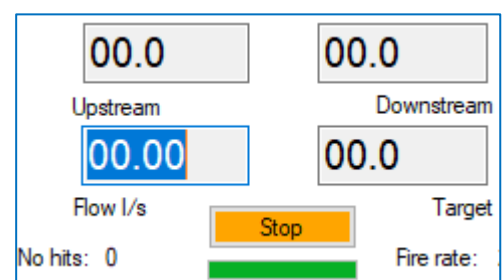
To verify the transducers are re-zeroed:

Select the PRV Installation tab and click on the "Live values" button.

The Upstream and Downstream pressure values should now read zero, or very close to zero.



... Click the "Stop" button to end the verification.



4.6 PREPARE THE PIPEWORK FOR THE PEGASUS 2

Accessory kits which include coloured hoses are available from HWM (ACT00* series accessory kits); Coloured hoses makes identification easier. A manual 3-way valve and quick-connect fittings are also available. Some of the items are shown below.



Use the installation diagrams to select the type of installation required:

- Standard installation where inlet pressure to PRV is less than 90m.
(Refer to diagram in section 3.2.1 for use with internal pressure transducers).
(Refer to diagram in section 3.2.2 for use with external pressure transducers).
- Standard installation where inlet pressure to PRV is more than 90m.
(Refer to diagram in section 3.2.3 for use with internal pressure transducers).
(Refer to diagram in section 3.2.4 for use with external pressure transducers).
- Installation for using latching solenoid for high pressure unreachable where the inlet to the PRV is less than 90m.
(Refer to diagram in section 3.3.1 for use with internal pressure transducers).
(Refer to diagram in section 3.3.2 for use with external pressure transducers).
- Installation for using latching solenoid for high pressure unreachable where the inlet to the PRV is more than 90m.
(Refer to diagram in section 3.3.3 for use with internal pressure transducers).
(Refer to diagram in section 3.3.43.2.4 for use with external pressure transducers).

Refer to the relevant diagram and cut the coloured pipe to the required lengths.

4.7 PREPARE THE PRV FOR PEGASUS PRESSURE TRANSDUCERS

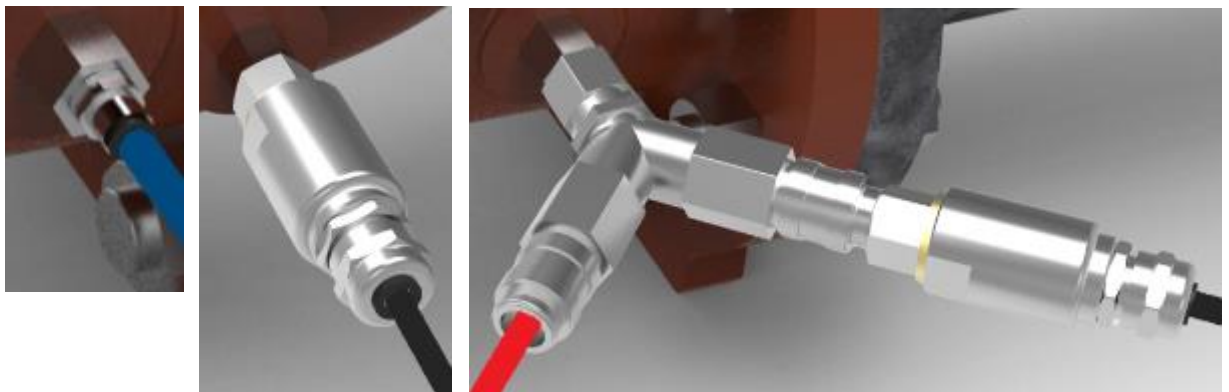
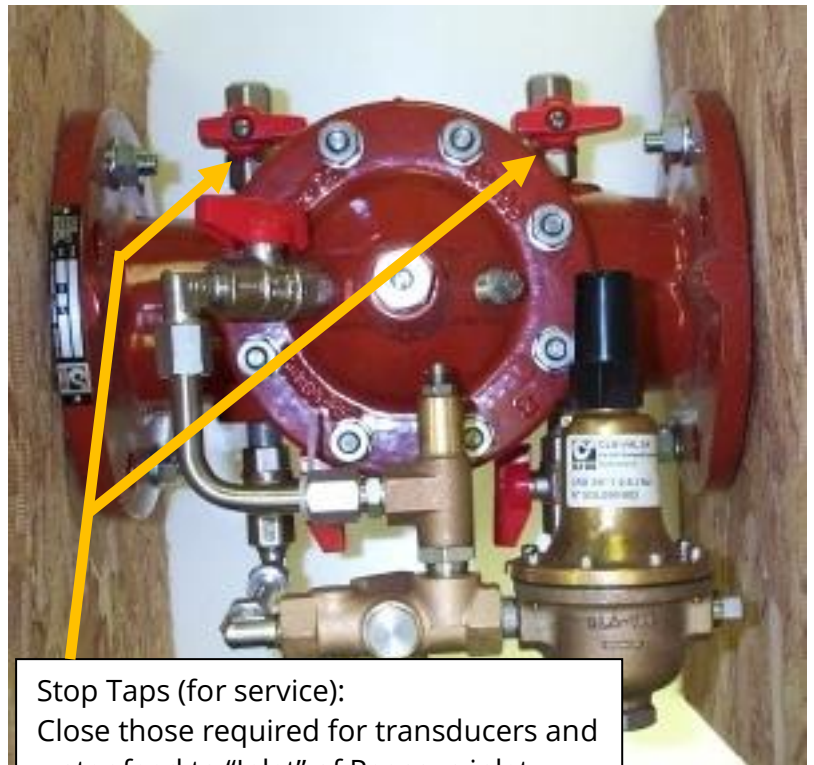
The PRV valve should be fitted with service taps that allow maintenance whilst the PRV is in operation.

An example is shown opposite.

Choose locations to be used for attaching the Pegasus pressure transducers and also the water feed to the Pegasus "Inlet" port.

Ensure these service taps are closed to allow work to proceed.

Fit Y-adaptors or quick-release connectors to the PRV, as required, to allow connection to Pegasus 2 at a later stage.



Do not fit any pressure transducers or hoses to the PRV at this stage.

4.8 CONNECT PEGASUS2 SIDE PIPEWORK

Pipes can be connected directly to the Pegasus2 Solenoid Box ports by pushing the end of the pipe into the port.

The pipes will be sealed and retained by the connector (until they are manually released, which requires pushing on the connector's ring whilst pulling the pipe away from the connector).



Where the Control box has internal pressure transducers, a quick-release adaptor is required to be fitted to the pipe-end before it can be attached.

Fit the adaptors to the end of the pipes (as required) and attach to the Control box.



Fit any T-adaptors that may be required.



Attach all 3 the pipe ends to the manual 3-port valve.

Attach the pipes from the 3-way valve to the Pegasus, but do not yet attach the pipe to the actuator.



If required, attach a pipe to the port labelled "VENT" and route it to a suitable drainage site.

4.9 CONNECT TRANSDUCERS AND BASIC CONTROL PIPEWORK ON PRV SIDE

Before proceeding, confirm that the pressure transducers are of a suitable pressure range, that the channels have been set up, and the transducers have been re-zeroed at atmospheric pressure.

Connect any **external** pressure transducers to the appropriate location on the PRV valve, ensuring that:

- The upstream side is connected to the “PRV Inlet Pressure” connector.
- The downstream side is connected to the “PRV Outlet Pressure” connector.

Connect any **internal** pressure transducers, by attaching the pipe quick-release connector to the appropriate location on the PRV valve.

- Ensure the upstream side is connected to the “PRV Inlet Pressure” transducer.
- Ensure the downstream side is connected to the “PRV Outlet Pressure” transducer.

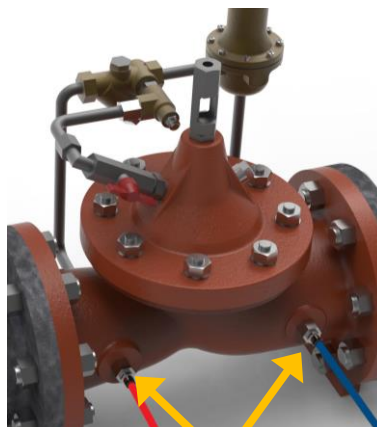
If not already attached, connect the water feed to the Solenoid box “Inlet” port. The water feed should come from the inlet side of the PRV if the pressure is below 90m; otherwise, the water feed should come from the outlet side of the PRV (which has a reduced pressure).

4.10 BLEED AIR FROM THE PIPEWORK

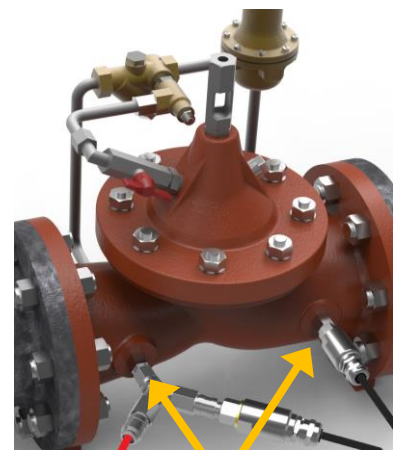
Move the manual 3-way valve into the middle position (all ports are sealed).

Open **only 2** of the PRV service valves:

Valves that connect water pressure to the 2 (internal or external) pressure transducers.



Open 2 service valves
(to internal transducers)



Open 2 service valves
(to external transducers)

Temporarily change the position of the 3-way manual valve, allowing water to enter the red pipe from the PRV service valve. Air and water should escape via the green pipe (which will be connected to the actuator ... at a later stage). Return the tap to its mid-position when the pipe has filled with water through that path.

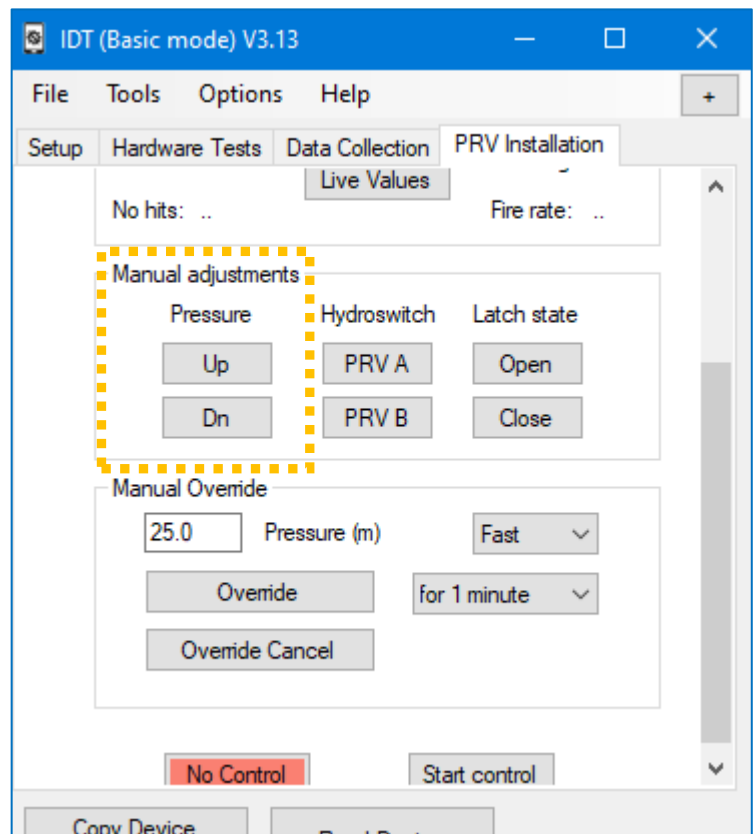
Where internal transducers are fitted, detach and then re-attach the pipes using the quick-release connectors at the Pegasus 2 side (several times). This will allow air to escape from the pipes via the quick-release connector and be replaced by water.

The 3-way manual valve should now be changed over to allow flow from the Actuator port on Pegasus 2 to the green pipe (that will be connected to the actuator at a later stage).

Use the manual controls within IDT to bleed air out of the pipework:

Click on the “Up” button several times to pulse the solenoid valve inside the Pegasus 2, allowing air and water to pass through the unit and fill first the red pipe (entering Pegasus) and then the green pipe (leaving Pegasus).

Return the tap to its mid-position when the pipe has been filled with water through that path.



4.11 TEST PRESSURE TRANSDUCERS

Select the PRV Installation tab of IDT.

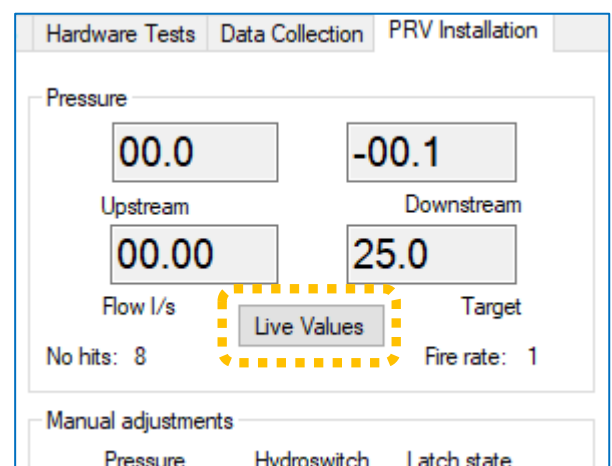
Click on the “Live Values” button.

The display will show readings for the following:

- Upstream Pressure (in metres)
- Downstream Pressure (in metres)
- Flow (in l/s)

Confirm the values are as expected.

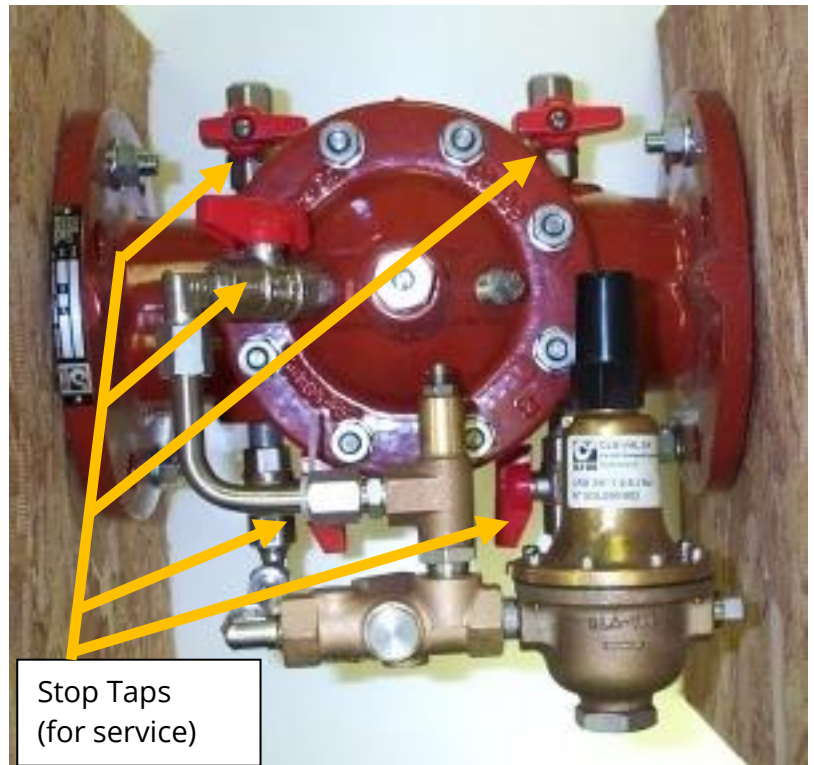
Click the button once more to stop displaying the readings.



4.12 PREPARING TO FIT THE ACTUATOR

Note: The following instructions assume that the valve is neither vented to the maximum (fully open), nor used to cut the water supply (fully closed) but is under the control of the fitted pilot valve.

It also assumes that the PRV is fitted with service stop-taps at the relevant ports on the valve, allowing the components surrounding the main valve to be serviced.



Ensure that the PRV is working properly before proceeding.

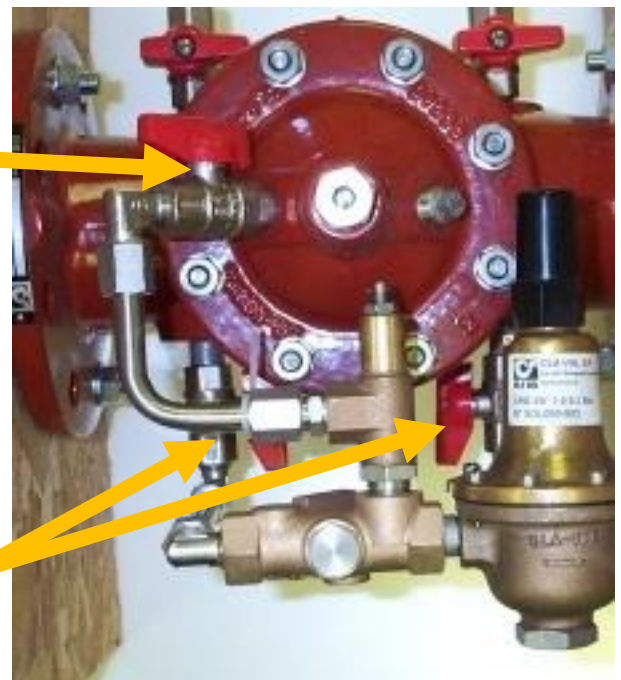
Lock the PRV top chamber by closing the valve to the top chamber, if possible.

Shut both the input and output path of the pilot valve together (at the same time).

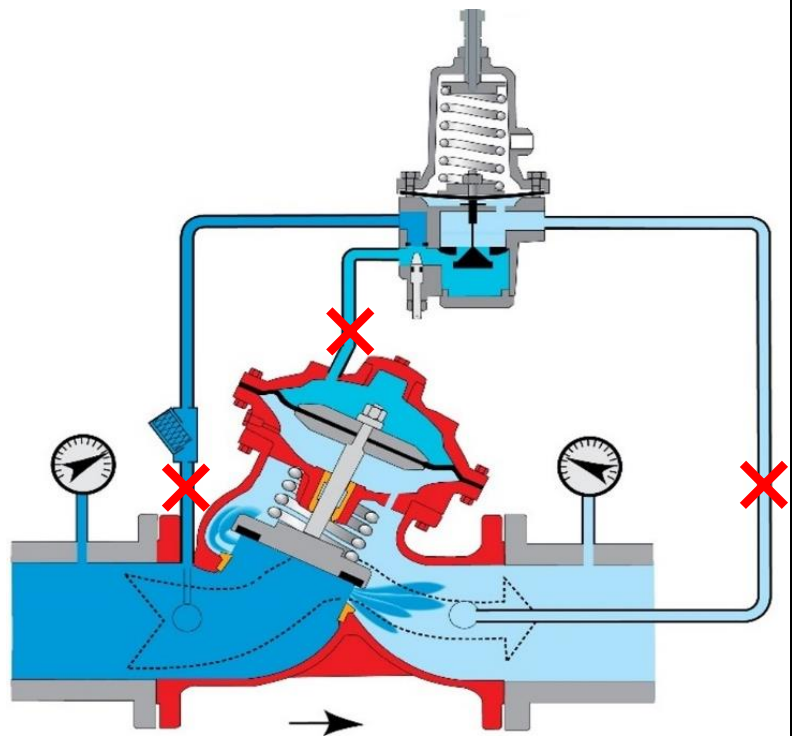
This will ensure that the volume of water contained in the pilot valve will remain constant; its diaphragm is locked in position.

Close PRV top chamber valve

Simultaneously close the input and output path to the pilot valve



Note: The upper chamber of the PRV valve is now locked in position. The output pressure is not regulated, and any variations in inlet pressure will affect the output pressure



4.13 FITTING AND ADJUSTING THE HWM MECHANICAL ACTUATOR

Ensure that the thread of the HWM mechanical actuator being used is the same type of thread as the existing adjustment bolt on the PRV pilot valve. (HWM can supply alternative threads if the actuator is unsuitable).

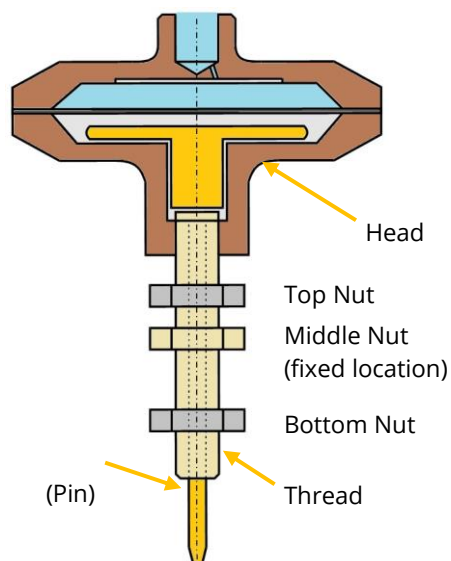
Screw the top nut and bottom nut towards the middle nut so that they are together (see picture).

Screw the actuator thread into the actuator head until it is finger tight. (Use the middle nut).

This moves the plunger to the top of the inside of the actuator upper chamber. The pin (lower part of the plunger) should now be fixed.

Note the depth into the pilot valve of the existing bolt. Also note the force required to turn it at that position.

Unscrew and remove the existing PRV pilot adjustment bolt. (see picture). Check the outlet pressure reading whilst removing the



bolt; the pressure should not change. If pressure drops at this point a valve is leaking.

Note: Use the Pegasus transducers and IDT to help set the actuator pressure settings (or a pressure gauge). (See section 4.11).

Screw the HWM mechanical actuator into the pilot of the PRV.

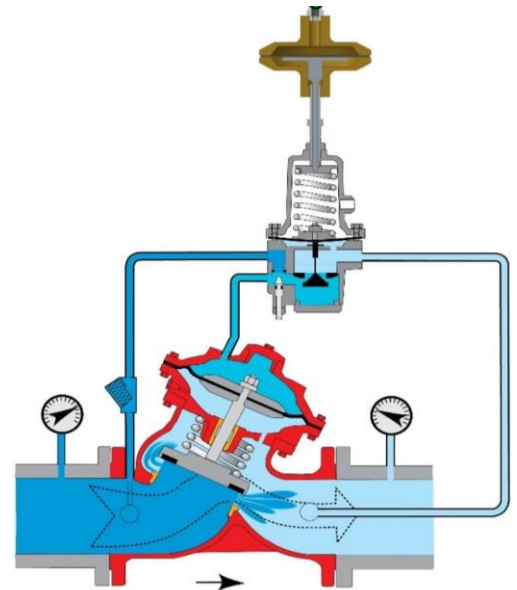
It should be positioned at approximately the same depth as the pilot bolt, which has just been removed.

Rotate the actuator to apply the same force that was applied by the (now removed) adjustment bolt.

Open both the input and output path of the pilot valve together (at the same time).

This will permit water to flow through the pilot valve; its diaphragm is no longer hydraulically locked in position.

Slowly open the PRV top chamber valve. The PRV will now return to pilot control, influenced by the actuator pin position.



Whilst checking the outlet pressure of the PRV, **set the maximum pressure** required by adjusting the position of the **actuator bolt**.

To do this, use the middle nut (fixed) on the actuator thread:

- Screw it clockwise / inwards to increase the output pressure.
- Screw it anticlockwise / outwards to decrease the output pressure.

Note: The pressure is required to be set to a value of 2m *above* the maximum pressure value used within the table of the profile that will be used to control the PRV operation.

Once the maximum pressure is achieved, tighten the bottom lock-nut on the actuator screw thread against the PRV pilot (see picture).

This will secure the maximum outlet pressure.



Whilst checking the outlet pressure of the PRV, **set the minimum pressure** required by adjusting the position of the **actuator head**.

To do this, hold the middle nut (fixed) on the actuator thread stationary, using a spanner, whilst rotating the actuator head.

- Screw it anticlockwise / outwards to decrease the output pressure.
- Screw it clockwise / inwards to increase the output pressure.

Note: The pressure is required to be set to a value of 2m *below* the minimum pressure value used within the table of the profile that will be used to control the PRV operation. (e.g. Below night-time pressure)

Once the minimum pressure is achieved, tighten the top lock-nut on the actuator screw thread against the underside of the actuator head (see picture).

This will secure the minimum outlet pressure.



Insert the green pipe (which connects the 3-way manual valve) into the top of the actuator head (as shown).

Move the valve to open the path between the pipe from Pegasus 2 port labelled "Actuator" through to the upper chamber of the actuator.



The Pegasus actuator is now installed. Any remaining air in the system will be dispersed as part of testing (see section 4.19).

4.14 LATCH OPTION - PREPARE THE PRV

(When installing Pegasus models that do not include a latch ... skip to section 4.19).

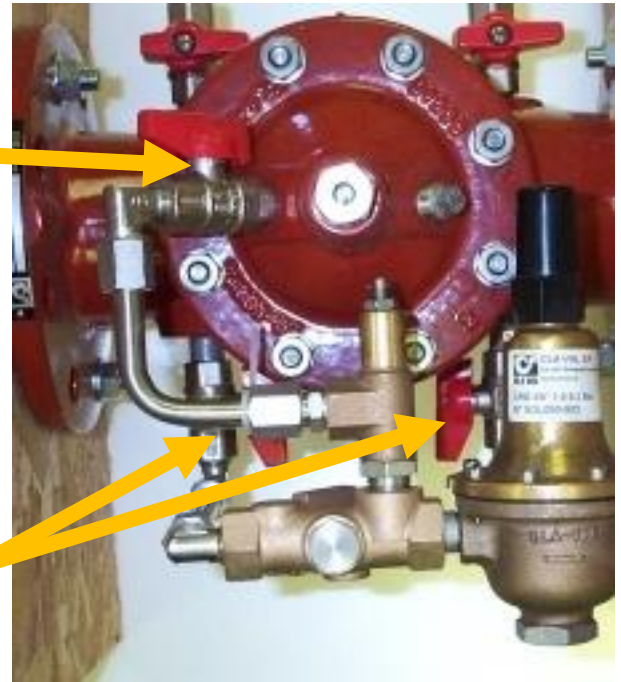
Lock the PRV top chamber by closing the valve to the top chamber, if possible.

Shut both the input and output path of the pilot valve together (at the same time).

This will ensure that the volume of water contained in the pilot valve will remain constant; its diaphragm is locked in position.

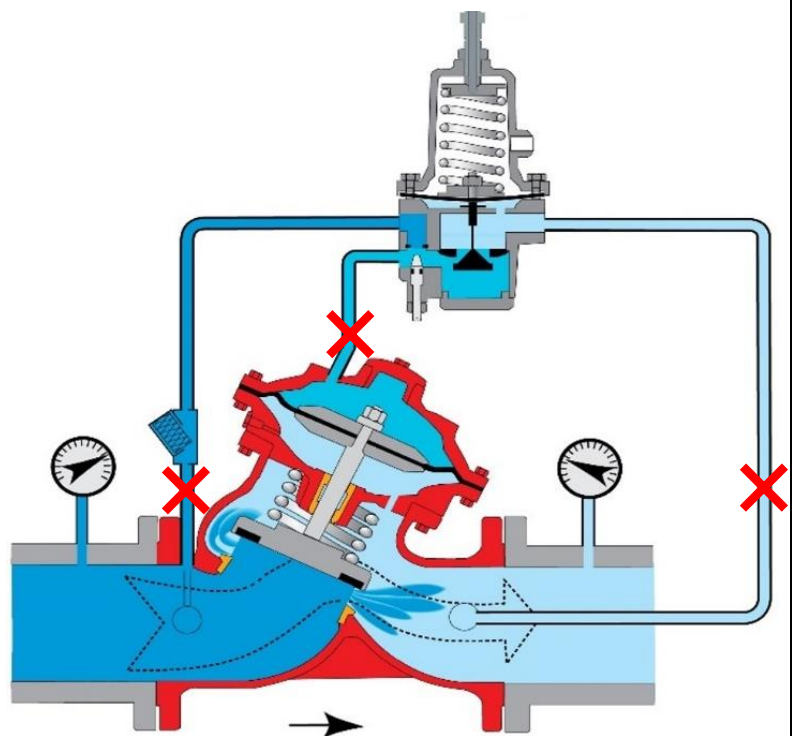
Close PRV top chamber valve

Simultaneously close the input and output path to the pilot valve

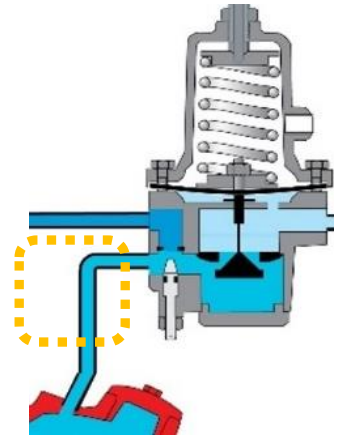


The two steps described above will allow work to commence on the pilot valve control pipework.

Note: The upper chamber of the PRV valve is now locked in position. The output pressure is not regulated, and any variations in inlet pressure will affect the output pressure.



For a “Latch when high pressure unachievable” operation, the Pegasus Latch ports need to break into and control the path between the upper chamber of the PRV and the pilot valve, as shown in the illustration opposite.



Dismantle the pipework on this part of the pilot control system and fix suitable adaptors to receive the plastic pipes from the Pegasus 2 latch ports.

4.15 LATCH OPTION - CONNECT LATCH PIPEWORK ON PEGASUS 2 SIDE

Cut the coloured pipes (yellow and grey) to a suitable length and insert them into the Pegasus 2 ports labelled “Latch Input” and “Latch Output” respectively.

Ensure any suitable couplings are added to the pipes for connection to the PRV and pilot valve connections.

4.16 LATCH OPTION - CONNECT LATCH PIPEWORK ON PRV SIDE

Fit the Pegasus 2 latch pipework to the PRV and pilot valve connections; Refer to the relevant installation diagram for guidance.

4.17 LATCH OPTION - BLEED AIR FROM THE PIPEWORK

Ensure the Latch state is “closed” (refer to section 4.18).

Open both the input and output path of the pilot valve together (at the same time). This will permit water to flow into and through the pilot valve, allowing it to re-fill. Air within the pilot valve and its control pipes can disperse to down-stream.

Slowly open the PRV top chamber valve. The PRV will now return to pilot control via the actuator setting, but there will be air in the pipework between the upper chamber of the PRV and the pilot valve (and also within the latch circuit of Pegasus). The air can be removed during testing / exercising of Pegasus latch, which allows the air to be expelled via the vent port of Pegasus 2 or via flow through the pilot valve.

4.18 LATCH OPTION - TESTING

Where fitted, the latch option can be tested (activated and deactivated) to switch the upper chamber of the PRV between being under control of the pilot valve, or being under control of the latched condition (emptying, in the case of a “Latch on high unreachable” installation).

The latch circuit can be manually switched using the Open and Close buttons within IDT.

Note: The buttons will not be shown if the unit's control is set to "No Latch".

- The latch state of “Open” causes the upper chamber of the PRV to connect to the Pegasus “Vent” port.
- The latch state of “Close” is normal operation under pilot control.

A target pressure can (if required) be temporarily set using the manual override section.

- Ensure the latch is closed.
- If required, click on “Start control” and wait until the button turns green; the PRV controller is now activated.
- Enter the target pressure in the manual override section.
- Click the “Override” button.
- Wait for the PRV to re-fill.
- Cancel the over-ride.

Hardware Tests

Data Collection

PRV Installation

Pressure

00.0

-00.1

Upstream

Downstream

00.00

25.0

Flow l/s

Live Values

Target

No hits: 8

Fire rate: 1

Manual adjustments

Pressure

Hydroswitch

Latch state

Up

PRV A

Open

Dn

PRV B

Close

Manual Override

25

Pressure (m)

Slow

Override

for 1 minute

Override Cancel

Start control

No Control

The latch should be switched between the open and closed states several times to ensure it is correctly working. Allow the PRV to respond and settle between switching states.

The Manual Override panel contains a selector to switch between “slow” (regular solenoid operation) and “fast” (accelerated solenoid operation) whilst the override is active. The setting may be changed to “fast” if to speed up pressure changes and may help to dispel trapped air.

4.19 TESTING THE ACTUATOR

Ensure the latch (if fitted) is in the Closed state to allow the PRV to be under the control of the pilot valve and Pegasus. Also ensure the PRV controller is activated. (See section 4.18 for guidance and diagram).

The actuator should be tested by switching between low, middle, and high pressures several times to ensure it is operating correctly.

This can be achieved by setting target pressures within the Manual Over-ride section and then clicking on the Override button. The system should move to the target pressure and stabilise. The pressure can be verified using an external pressure meter or by using the Pegasus 2 transducers with IDT.

To use the Pegasus 2 transducers, click the “Live Values” button. The display will update to show pressure and flow values. (Other buttons are disabled whilst this is operating; click on the “Stop” button to re-enable the other button controls).

4.20PRV CONTROL METHOD AND SETTINGS

Pegasus 2 attempts to closely match downstream pressure with a current target pressure. The target pressure is set in a pressure profile, of which two types exist: Time control and Flow control.

Before considering how to enter and select profiles, a description is given of some common settings...

The output pressure of a PRV control is subject to some variation due to changes in output demand and also variations in upstream pressure. Even with pressure control these will result in variations in the outgoing pressure. Pegasus tries to adapt to changes and minimise the deviation from the current target pressure. The target pressure can also change from time to time (as defined in a target pressure profile).

Pegasus examines the current downstream pressure and compares it to the current target pressure every few seconds. Each time, it evaluates whether the actuator setting requires adjustment. Depending on how close output pressure is compared to the pressure target, it can either leave things as they are or change the volume of fluid in the actuator (by pulsing the up or down solenoids).

To overcome an excessive number of adjustments, a the “Deadband” field exists. This sets the tolerance that the output pressure is permitted to deviate from its target value and not require adjustment (+/- the entered value). This allows Pegasus to ignore minor temporary fluctuations in outgoing pressure.

e.g. If the controller is trying to maintain an output pressure of 23m and the deadband is set to 0.5m, the controller will not make any adjustments between the pressures of 22.5m and 23.5m.

Where a change is required, Pegasus will pulse either the up or down solenoid. Each time it does this, it uses a small amount of power.

If there are an excessive number of adjustments required per day, it can cause premature exhaustion of the battery. Pegasus monitors power use by solenoids does

Control Settings

☐ Time control ☐ Flow control

Deadband 0.5 Auto Limit 8.0

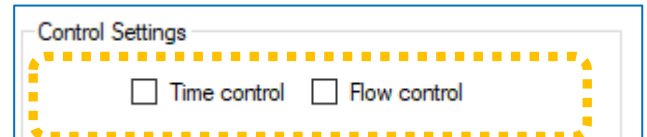
No Latch

Latch on unreachable duration (mins) 20

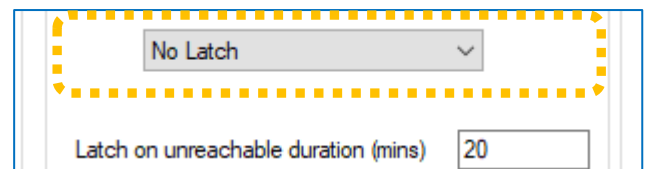
☐ Use External Power When Available

not exceed a limit. If the limit is exceeded, it will *automatically adjust* the Deadband limit (in 0.5m steps) so that it has to make fewer adjustments, thereby reducing power use. The adjustment of the Deadband continues until a level is found which results in an acceptable daily energy use. However, it does not do this without limitation; a maximum limit can be set in the “Auto limit” field. Where the field is left blank, Pegasus 2 defaults to a value of 8m.

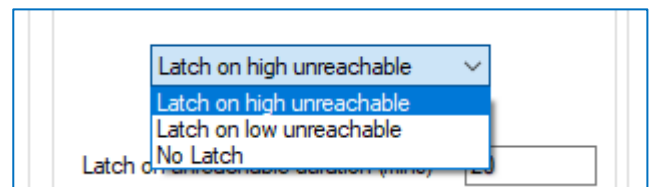
An area within the Control Settings defines which pressure profile tables will be used.



An area within the Control Settings defines whether any latch option the unit has installed is to be used.



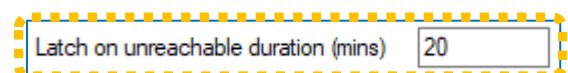
Options are shown opposite.



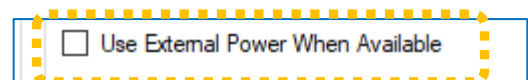
Caution: The “Latch on Low unreachable” setting exists but is rarely used. It requires a specially programmed Pegasus 2 control box to re-purpose the ports and irregular plumbing. It is used only in very rare cases where the aim is to **cut off** the water supply.

When the latch is activated by Pegasus, it will operate only for a certain duration.

Following the time period (set here), Pegasus de-activates the latched condition and returns to normal operation. It then tries to restore control according to the pressure profile in use.



When the “Use External Power When Available” option is checked, the solenoid box will share any external power provided to the Control box. (i.e. power from any external battery unit).



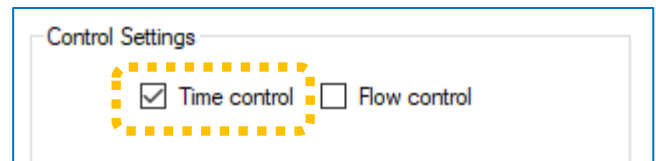
4.20.1 Setup of pressure control using a Time profile

To use a pressure profile that is based on time, tick the “Time control” option.

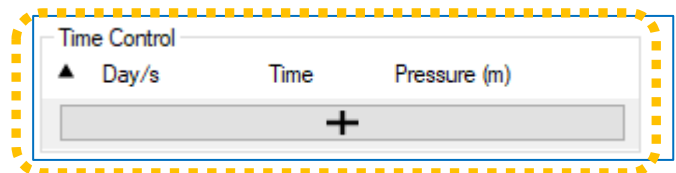
(With the “Flow Control” box un-ticked, flow does not participate in control decisions, but is still logged).

... A “Time Control” table will now appear following the main Control Settings panel.

Currently (in the illustration), the table is blank; there are no entries visible.



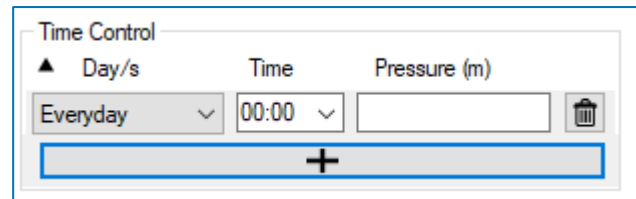
The 'Control Settings' panel is shown with a dashed yellow box highlighting the 'Time control' checkbox, which is checked. The 'Flow control' checkbox is unchecked.



The 'Time Control' panel shows a table with three columns: 'Day/s', 'Time', and 'Pressure (m)'. The table is currently blank, with a '+' button at the bottom to add a new entry.

To enter a line into the table, click on the “+” button.

... A new line is added, which can be edited with the required settings.
(The table has a capacity of up to 32 lines).



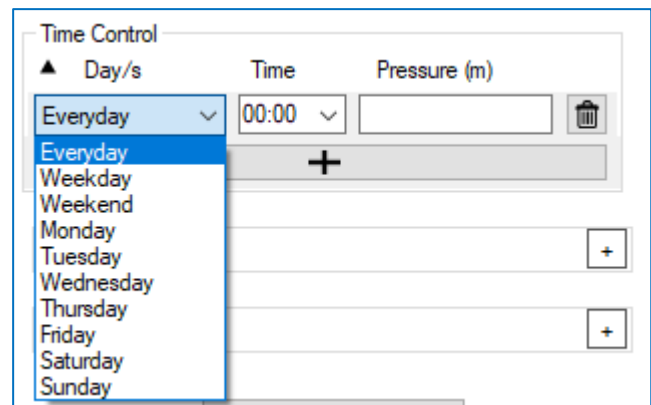
The 'Time Control' panel shows the table with one entry. The 'Day/s' column has a dropdown menu set to 'Everyday'. The 'Time' column has a dropdown menu set to '00:00'. The 'Pressure (m)' column is empty. A '+' button is at the bottom to add more entries.

The Time Control pressure profile can be built as a table of days, times, and pressures. Target pressure is always set using units of “m” (metres).

Each line requires a start time, and a selection of which day / set of days the setting will be relevant to.

The day selections can be mixed.

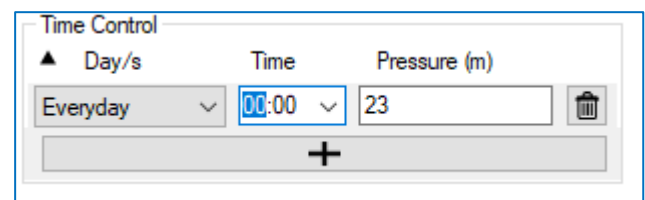
To enter a time, select either the hours or minutes digits and over-write them with your settings.



The 'Time Control' panel shows the table with one entry. The 'Day/s' column has a dropdown menu open, showing options: 'Everyday', 'Weekday', 'Weekend', 'Monday', 'Tuesday', 'Wednesday', 'Thursday', 'Friday', 'Saturday', and 'Sunday'. The 'Time' column has a dropdown menu set to '00:00'. The 'Pressure (m)' column is empty. A '+' button is at the bottom to add more entries.

The Time Control profile does not cause a step-change (an immediate switch-over) to the new target pressure when reaching an entered time. Rather, there is a linear interpolation between the target pressures stored the profile; the pressure change ramps up (or down) between each setting.

e.g. If the table requires 30m at 07:00 and 40m at 08:00, the target pressure at 07:30 will be 35m.



The 'Time Control' panel shows the table with one entry. The 'Day/s' column has a dropdown menu set to 'Everyday'. The 'Time' column has a dropdown menu set to '00:00'. The 'Pressure (m)' column has the value '23' entered. A '+' button is at the bottom to add more entries.

Lines can be added to IDT in any order. After the program has been saved to the device and read back, the profile can be checked; the lines will be re-sequenced according to time of change. Confirm the settings match your expectations.

The diagram illustrates how time control lines are re-sequenced based on their start times. On the left, the initial settings are as follows:

Day/s	Time	Pressure (m)
Everyday	06:00	40
Everyday	08:00	55
Everyday	21:00	55
Everyday	23:30	40
Weekend	10:00	50
Weekend	21:00	50

A yellow arrow points to the right, where the settings are re-sequenced by their start times:

Day/s	Time	Pressure (m)
Everyday	06:00	40.00
Everyday	08:00	55.00
Weekend	10:00	50.00
Everyday	21:00	55.00
Weekend	21:00	50.00
Everyday	23:30	40.00

A more specific setting made in the Day selection will over-ride a more general setting.

e.g.

- "Saturday" will over-ride "Weekend" and "Everyday".
- "Weekend will over-ride "Everyday".

With the settings as shown above:

- Most days have a target pressure of 55m between 8 a.m. and 9 p.m.
- On weekend days the target pressure ramps down from 55m to 50m (between 8 a.m. and 10 a.m.); it stays at 50m until 9 p.m.

4.20.2 Setup of pressure control using a Flow profile

To use a pressure profile that is based on Flow, tick the “Flow control” option.

... A “Flow Control Settings” panel will appear with additional options to set.

The “Flow Control Offset” should usually be set to “not enabled”.

... and a “Flow Control” table will be shown following the main Control Settings panel.

The table shown is blank; there are no entries. To enter a line into the table, click on the “+” button.

... A new line is added, which can be edited with the required settings. (The table has a capacity of up to 32 lines).

Control Settings

☐ Time control ☒ Flow control

Deadband Auto Limit

▼

Latch on unreachable duration (mins)

☐ Use External Power When Available

Flow Control Settings

Default Pressure

No Flow Timeout (mins)

Sample rate Ave

Flow Cal

Flow Control Offset

☐ Enabled Offset

Start

End

Flow Channel Limits

☐ Enabled Minimum

Maximum

Flow Control

Flow l/s ▲	Pressure (m)

+

Flow Control

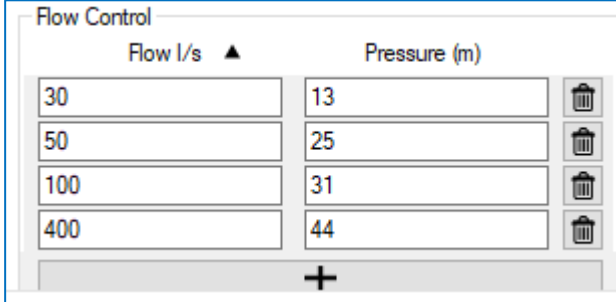
Flow l/s ▲	Pressure (m)

Enter the profile as Flow rate (in litres/second) vs the required PRV outlet pressure.

The Flow Control pressure profile can be built as a table of Flow-rate (in litres per second) and pressures (in metres).

The pressure profile is executed with linear interpolation between the pressures entered into the profile.

e.g. With the settings shown, pressure will be 19m at a 40 l/s flow rate.



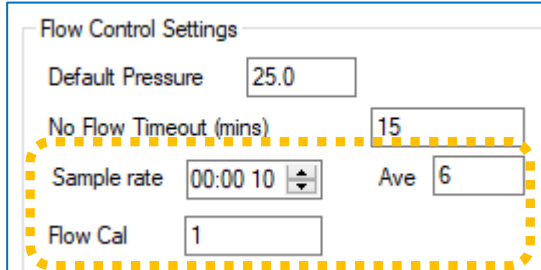
Flow l/s	Pressure (m)
30	13
50	25
100	31
400	44

The lowest entered flow rate defines the pressure when at that flow rate. It also defines the pressure for below that flow rate. Similarly, the highest entered flow rate defines the pressure when at that flow rate. It also defines the pressure for above that flow rate.

Where flow control is enabled, the system looks at the current flow through the PRV in order to decide upon a target pressure.

The "Sample Rate" determines how often a flow measurement sample is taken for evaluation, *for PRV controller purposes only*.

Some statistical function (average) is applied to smooth out any fluctuation in the measurements which cause rapid and chaotic changes to target pressures. Typically, the system samples every 10 seconds and uses the average from the last 6 measurements to arrive at a target pressure.



Flow Control Settings	
Default Pressure	25.0
No Flow Timeout (mins)	15
Sample rate	00:00 10
Ave	6
Flow Cal	1

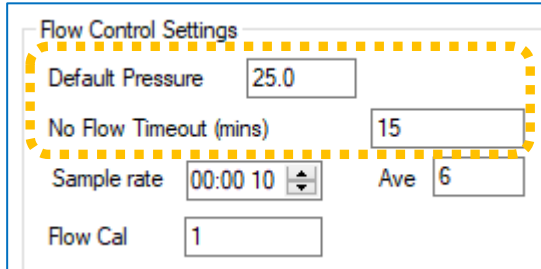
"Flow Cal" in the above picture is a repeat of the calibration setting of the Flow channel. (e.g. Units per pulse, for a flow pulse counter interface).

Since the pressure profile is dependent on Flow, certain settings in the Pegasus define what should happen if there is a fault detected in the Flow meter:

The target pressure will be the value (in metres) set in the "Default Pressure".

One condition that can register as a flow-sensor fault is when there are no flow pulses detected for a time period.

This condition must exist for the time set in the "No Flow Timeout (mins)" field before it is recognised as a fault.



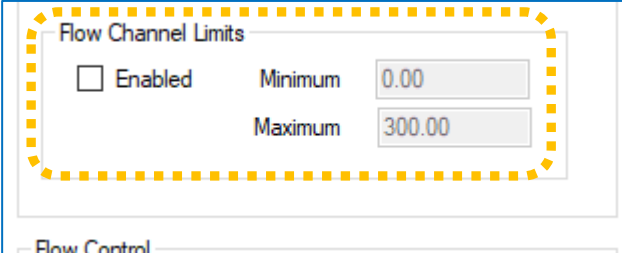
Flow Control Settings	
Default Pressure	25.0
No Flow Timeout (mins)	15
Sample rate	00:00 10
Ave	6
Flow Cal	1

It is also possible for an installer to define their own limits for detecting a possible flow problems.

It is possible for the installer to place upper and lower flow-rate boundaries on the *expected* PRV water flow. When outside of these limits, Pegasus will use the Default pressure setting as its target pressure.

This could also be used where a flow meter has an upper and lower limit of operation.

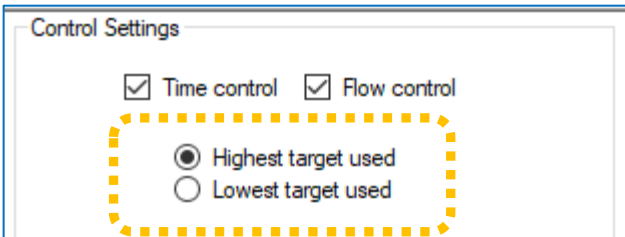
To use, enable the feature and enter the upper and lower values (in litres / second).

A screenshot of a software window titled "Flow Channel Limits". It contains a checkbox labeled "Enabled" which is currently unchecked. To the right of the checkbox are two input fields: "Minimum" with the value "0.00" and "Maximum" with the value "300.00". Below these fields is a label "Flow Control" with a horizontal slider bar. A yellow dashed rectangle highlights the "Enabled" checkbox and the two input fields.

4.20.3 Setup of pressure control using a combined Time and Flow profile

To use a pressure profile that is based on both time and Flow, tick both the "Time control" and "Flow control" options.

... An additional choice becomes visible, which is required to be set.

A screenshot of a software window titled "Control Settings". It contains two checked checkboxes: "Time control" and "Flow control". Below these is a yellow dashed rectangle containing two radio button options: "Highest target used" (which is selected) and "Lowest target used".

With both options enabled, the controller has to evaluate both tables in order to determine the target pressure.

- It calculates a pair of candidate target pressures (one from each profile table), using the regular process for each of the profiles.
- The chosen option then determines whether the controller works to meet the highest or lowest of the candidate values as its pressure target.

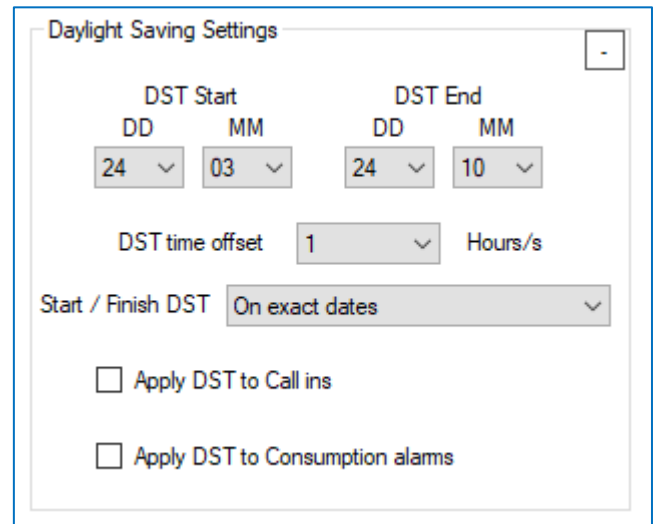
4.21 SETUP FOR ANNUAL TIME ADJUSTMENTS

Some countries have a scheme for adjusting the local time annually to make the most of available sunlight hours and for safety reasons. (e.g. British Summer Time, Daylight saving).

Since water usage patterns follow people's behaviour to some extent, it is possible for Pegasus to be programmed to adjust its local clock to match the scheme and therefore temporarily offset any time-related pressure profile.

The dates of "DST start" and "DST end" (Daylight Saving Time start / end) can be found within the Settings tab, along with a choice of the adjustment time offset within the start and end dates.

To disable the adjustment, set the DST time offset to 0 hours.

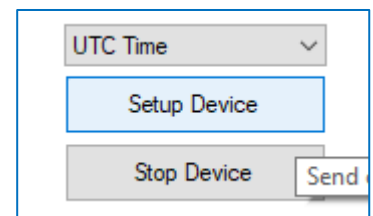


The screenshot shows a window titled "Daylight Saving Settings". It contains two date pickers: "DST Start" with DD (24) and MM (03) dropdowns, and "DST End" with DD (24) and MM (10) dropdowns. Below these is a "DST time offset" dropdown set to "1" with the unit "Hours/s". A "Start / Finish DST" dropdown is set to "On exact dates". At the bottom, there are two checkboxes: "Apply DST to Call ins" and "Apply DST to Consumption alarms", both of which are currently unchecked.

4.22 SAVE PROGRAM / ACTIVATING PEGASUS PRV CONTROL

For Pegasus to be able to control the PRV using the current program settings (held by the IDT program), IDT must send the settings to the unit, which must then store it.

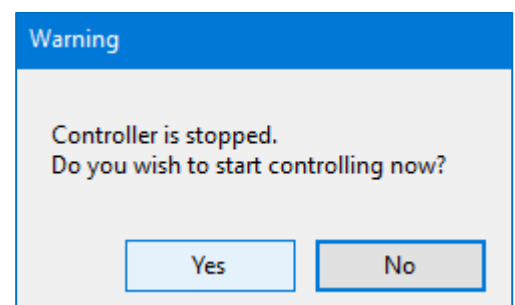
Click on the "Setup Device" button, found by selecting the "setup" tab and scrolling to the bottom.



The screenshot shows a panel with a "UTC Time" dropdown menu at the top. Below it are two buttons: "Setup Device" and "Stop Device". To the right of the "Stop Device" button is a "Send" button.

The process will proceed as described earlier in section 2.3.4. However, the installer must now ensure that Pegasus is fully activated.

i.e. Click on "Yes" when asked if you wish to start controlling now.



The screenshot shows a "Warning" dialog box with a blue header. The text inside reads: "Controller is stopped. Do you wish to start controlling now?". At the bottom, there are two buttons: "Yes" and "No".

Note: The user can also now pause control and (later) restart it without making any program changes. This can be done by using the buttons within the PRV Installation tab...

Click on the "No Control" button if you wish to pause automatic PRV control.

Click on the "Start control" button if you wish to un-pause automatic PRV control.

The screenshot displays the 'PRV Installation' tab of a control system. It features three main sections: 'Pressure', 'Manual adjustments', and 'Manual Override'. The 'Pressure' section shows upstream and downstream pressure readings, flow rate, and a target pressure. The 'Manual adjustments' section includes buttons for pressure (Up/Dn), hydroswitch (PRV A/PRV B), and latch state (Open/Close). The 'Manual Override' section allows for setting a pressure (m) and a duration (Slow/for 1 minute), with 'Override' and 'Override Cancel' buttons. At the bottom, two buttons, 'No Control' and 'Start control', are highlighted with yellow dashed boxes.

Hardware Tests	Data Collection	PRV Installation
Pressure		
00.0	-00.1	
Upstream	Downstream	
00.00	25.0	
Flow l/s	Live Values	Target
No hits: 8		Fire rate: 1
Manual adjustments		
Pressure	Hydroswitch	Latch state
Up	PRV A	Open
Dn	PRV B	Close
Manual Override		
25	Pressure (m)	Slow
Override	for 1 minute	
Override Cancel		
No Control	Start control	

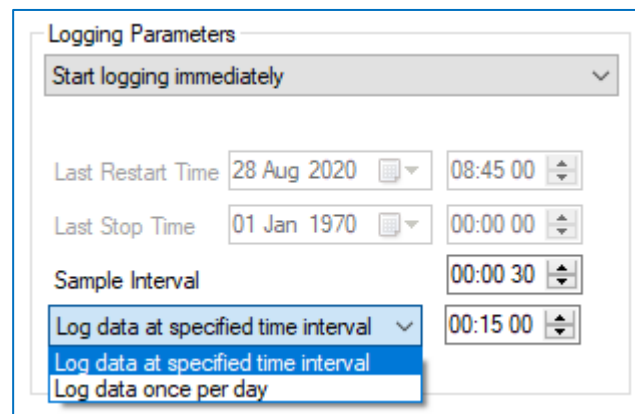
Caution: Be sure to un-pause the control before leaving the unit.

4.23 SETTING LOGGER STARTUP / MEASUREMENT SAMPLE RATES

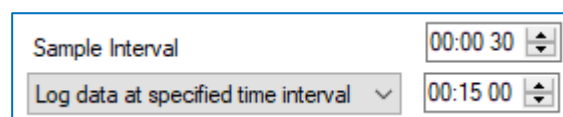
The “Logging Parameters” panel shows timing parameters for the logger functions within the Pegasus 2 control unit.

For Pegasus 2, the built-in logger should be set for the measurement interfaces to be logged frequently. Therefore, set to “Log data at specified time interval”.

(Some other HWM loggers require just one measurement a day; Pegasus will not operate correctly with this setting).



The “Sample Interval” is used to produce a set of data for the purpose of applying optional statistical functions (e.g. Average).

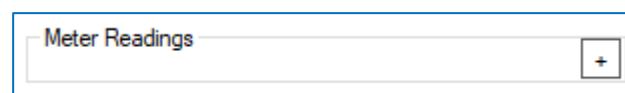


The “Log interval” is used to save a datapoint once any statistical functions have been applied to the latest set of measurements.

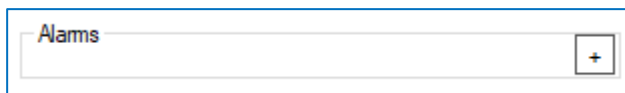
The settings shown here are typical for Pegasus operation.

Note: There are other settings in the Setup tab which are not relevant to PRV control. They are mentioned below for the purpose of completeness only.

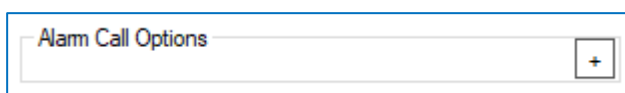
The “Meter Readings” settings are not relevant to PRV control.



The “Alarms” settings are not relevant to PRV control.



The “Alarm Call Options” settings are not relevant to PRV control.



4.24 SETUP OF DATA DELIVERY

Pegasus can be setup to call into the HWM DataGate server (over the mobile phone network) at specific times. During a call-in it will send measurement data or receive "remote programming commands".

The installer should setup Pegasus with the required schedule.

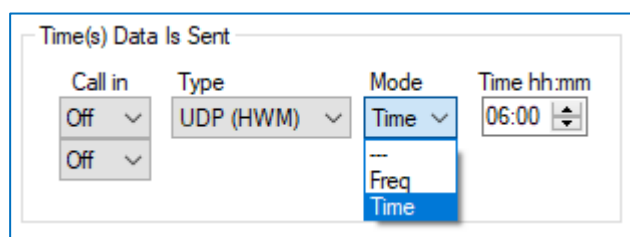
Note: If more than two call are required per day, an external battery pack will be required. Without an external battery providing power, Pegasus will restrict itself to two calls per day, maximum.

Unsent data will be stored in the unit and will be sent at next call-in.

4.24.1 Call-in times (schedule and protocol)

IDT displays a table for the setting of the call-in pattern.

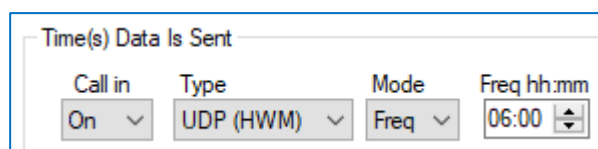
A selector on the first line determines if the unit will call-in at regular intervals (select a mode of "Freq") or at specific times (select a mode of "Time").



Call in	Type	Mode	Time hh:mm
Off	UDP (HWM)	Time	06:00

When Frequency is selected, it is not possible to add any additional lines to the table; just one exists.

The frequency is set by entering the required time interval between call-ins.

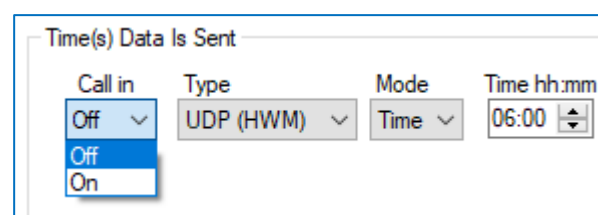


Call in	Type	Mode	Freq hh:mm
On	UDP (HWM)	Freq	06:00

When time is selected, additional lines will automatically be added if a line is enabled (by selecting "On") using the call-in control.

Set the time of the call-in at the end of the line.

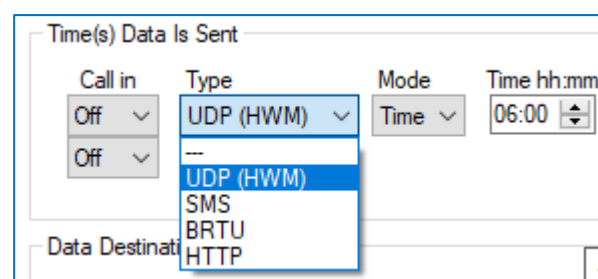
Times can be "deleted" by selecting a line to "Off".



Call in	Type	Mode	Time hh:mm
Off	UDP (HWM)	Time	06:00

Note: If no remote communication is required, set each 'Call in' drop box as 'Off'.

The protocol for sending in the data should also be selected. This should normally be UDP for correct operation of Pegasus.



Call in	Type	Mode	Time hh:mm
Off	UDP (HWM)	Time	06:00

Note: The unit may be set to generate a message to the server, often called an alarm. These may be set to make calls in addition to any schedule programmed here.

4.24.2 Destination

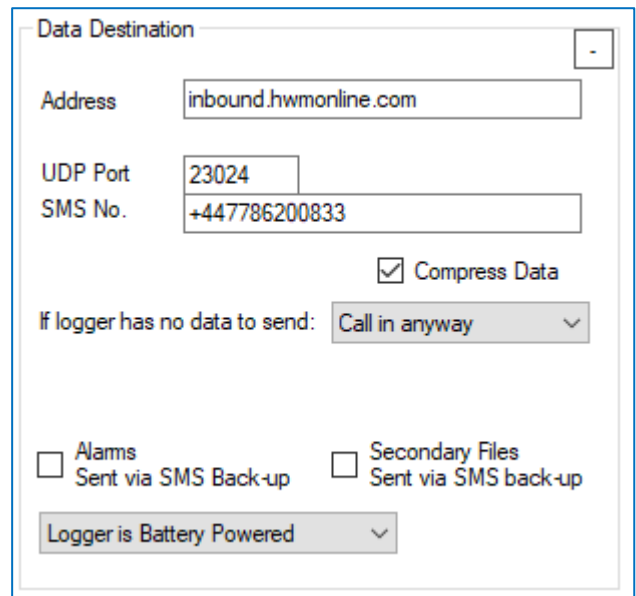
The unit needs to know details of the data destination so that it can send it to the correct server via the internet.

The installer can either put an internet address (IPv4) of the server in the “Address” field or use a URL.

In order to route the data to the server a UDP port-number is also required.

The server can also process messages sent via the SMS (text message) service.

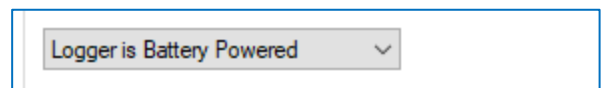
The SMS number is the destination “mobile phone number” for SMS messages to reach the server.



Note: The settings and SMS number required for your company’s server will be provided by your **system administrator**.

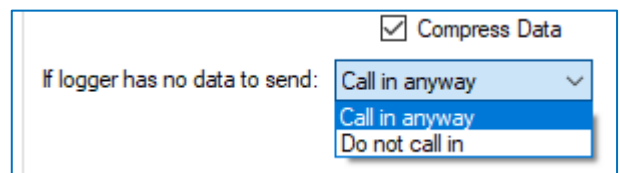
The remaining options in the “Data Destination” panel are related to potential power saving:

The setting for “Logger is Battery Powered” does not matter for Pegasus 2; It automatically detects if an external battery is connected during its operation.

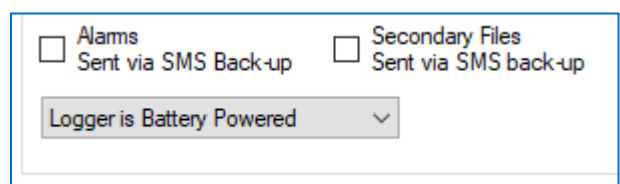


Data compression can be set to minimise length of messages and hence call times.

When Pegasus operates with DataGate / PressView it should always be set to “Call in anyway”; This allows remote programming of the device (although if logging has been set correctly, there should always be logged data to send).



Primary data channels (as described in this user-guide) will fall-back to being sent via SMS messages if the server cannot be reached by the mobile data network.

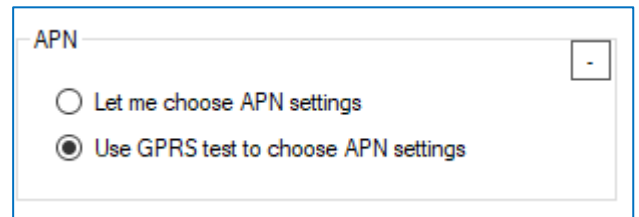


Tick the Alarms and Secondary Files (i.e. secondary data) if sending using the additional back-up method is also needed for these types of messages.

4.24.3 Setting Network access parameters

The unit needs to know how to connect to the internet using the mobile-phone data network. These details are set in the “APN settings”.

Either select the option to “Use GPRS test to choose APN settings” to allow automatic set-up ... or “Let me choose APN settings” to configure them manually.

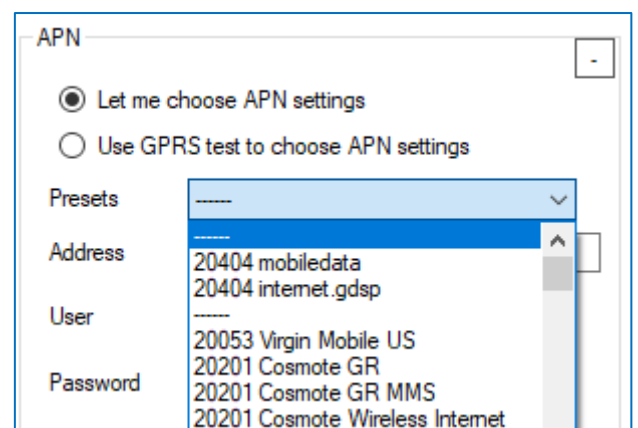


APN

☐ Let me choose APN settings

☒ Use GPRS test to choose APN settings

If the installer knows the type of SIM card fitted, the parameters may be selectable from one of the pre-sets known to IDT.



APN

☒ Let me choose APN settings

☐ Use GPRS test to choose APN settings

Presets: -----

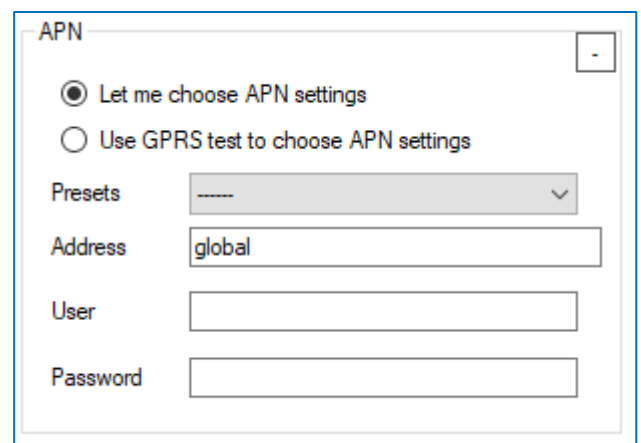
Address: 20404 mobiledata
20404 internet.gdsp

User: 20053 Virgin Mobile US
20201 Cosmote GR
20201 Cosmote GR MMS
20201 Cosmote Wireless Internet

Password: -----

Alternatively, the user can enter the parameters for their fitted SIM card.

If the connection requires authentication, enter the username and password for gaining access to the network connection.



APN

☒ Let me choose APN settings

☐ Use GPRS test to choose APN settings

Presets: -----

Address: global

User:

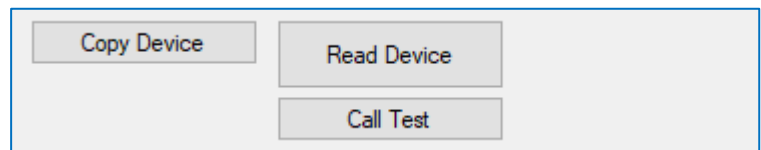
Password:

Note: The settings required will be provided by your **system administrator**.

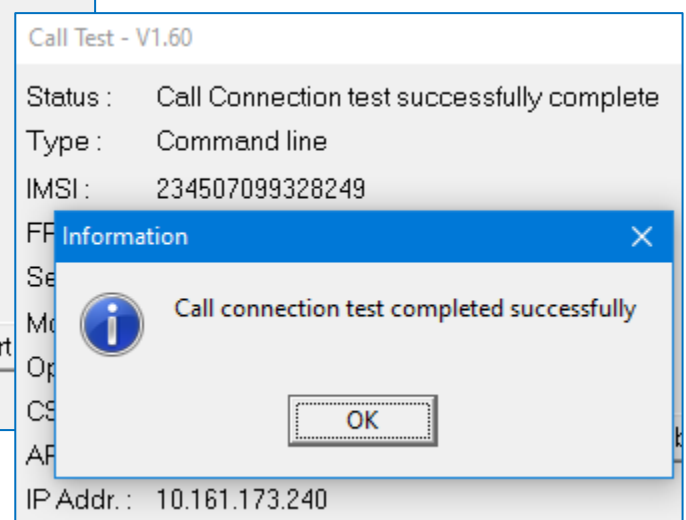
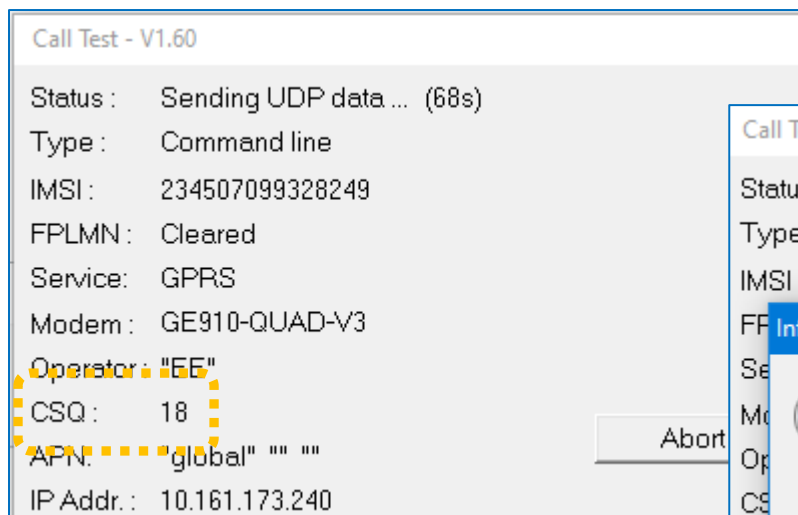
4.25 COMMUNICATIONS / ANTENNA LOCATION CHECK.

Communications over the cellular network can be confirmed by making a test call.

Click on the “Call Test” button, located at the bottom of the IDT program window.



The call test will proceed.



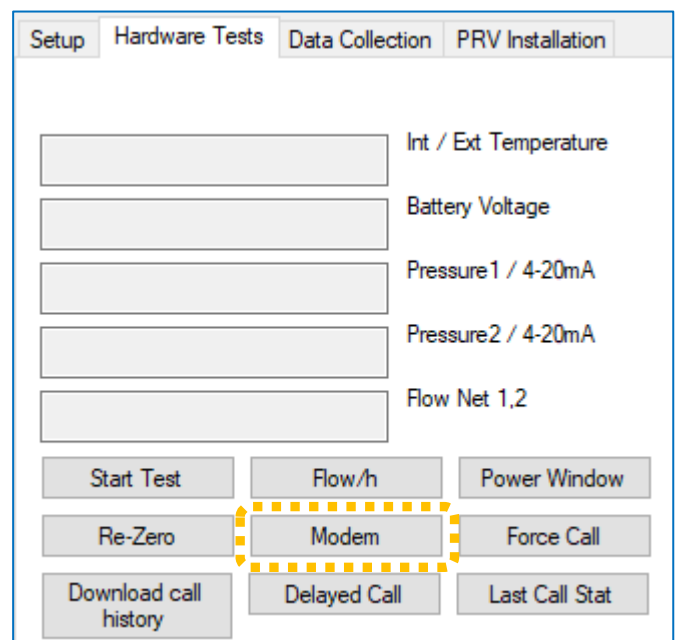
Confirm that a “Call connection test successfully complete” information box appears.

Note the parameter “CSQ”; this is an important indication of the signal strength with the antenna in the current position.

The best location for the antenna must now be found by comparing the CSQ value at various alternative locations.

Select the “Hardware tests” tab.

Then click on the “Modem” button.



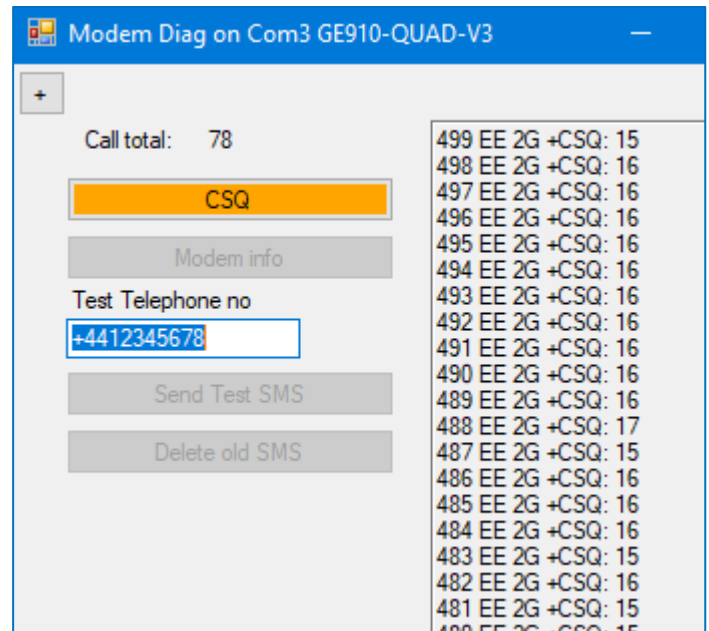
The modem is the cellular communications module built into Pegasus 2.

A new window will open with various types of modem tests.

Click on the "CSQ" button.

This measures the received signal strength, and a new measurement is made every few seconds.

CSQ values are in the range of 1 to 33. A higher number is better. The CSQ must be 7 or above to have any chance of communication.

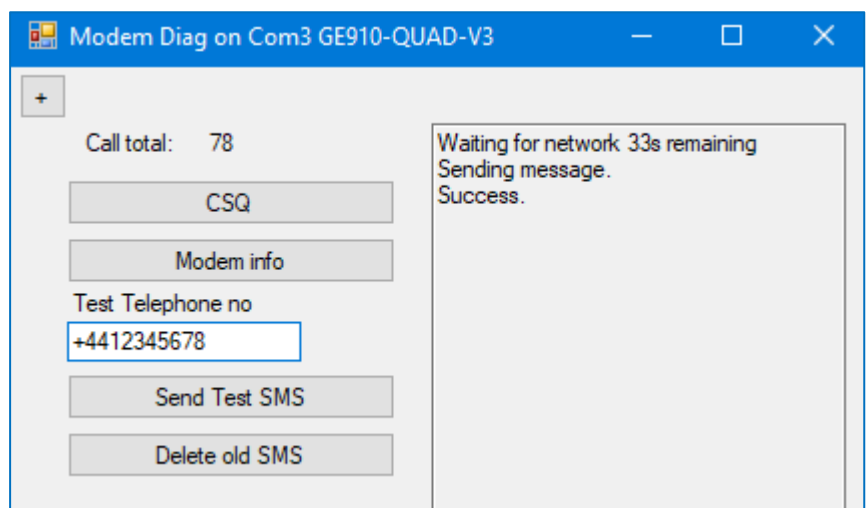


Move the antenna to various alternative locations to find the most suitable position. Stand well back from the antenna whilst the measurement is being made to ensure you are not blocking the signal.

To stop the test, click the CSQ button once more.

To check the sim card and modem are working, enter your mobile phone number into the 'Test Telephone no' box in international format as shown opposite.

Click the "Send Test SMS" button.



This will send a text to your phone confirming the phone number of the SIM and that calls can be made from the modem. If you fail to receive a text message this could indicate a sim or modem fault

4.26 VERIFICATION OF THE CONFIGURATION.

Ensure the program settings stored in IDT are transferred to the Pegasus; Click the Setup Device button, as described earlier.

It is recommended to check the settings in Pegasus to check the configuration has been correctly saved.

(i.e. Click the “Read device” button and confirm all settings are correct).

Check the status is also set to “Record”.

Check the PRV controller Start control button is green.

4.27 PROTECTION FROM FROST

Where required, the coloured tubing can be protected from frost with foam insulating pipe covers. These can be supplied upon request at additional cost or sourced locally from a hardware store.

To protect the pressure transducers from frost, Pegasus 2 has the option of being supplied with external transducers, rather than internal transducers. This removes the possibility of the column of water within the pressure hoses connecting to the internal transducers of the controller from freezing and potentially becoming damaged.

5 GRAPHING / DATA DOWNLOAD AND PREVIEW

Measurements are saved by the Logger functionality built-into Pegasus. Measurements are normally incrementally uploaded to the DataGate server so that they can be:

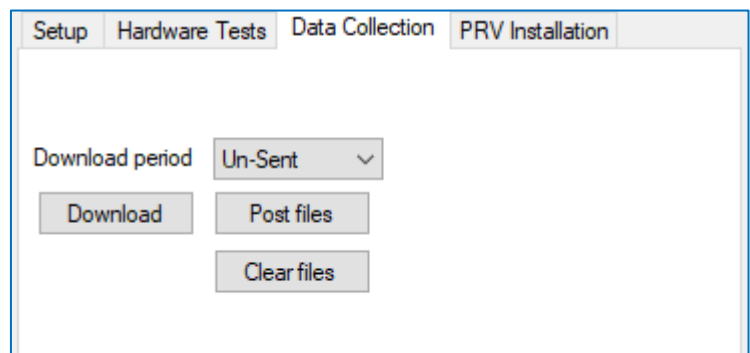
- Viewed remotely.
- Optionally, be used by the PressView system to fine-tune the performance of the Pegasus profile tables.

Data can also be downloaded from the unit into IDT for previewing locally.

5.1 MANUAL DOWNLOAD OF DATA INTO IDT / PREVIEW AS A GRAPH

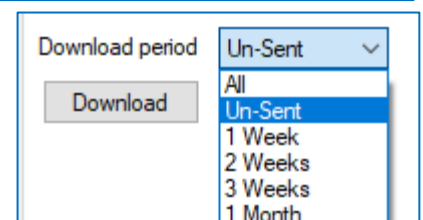
Select the
“Data Collection” tab.

This initially shows only a set of controls.

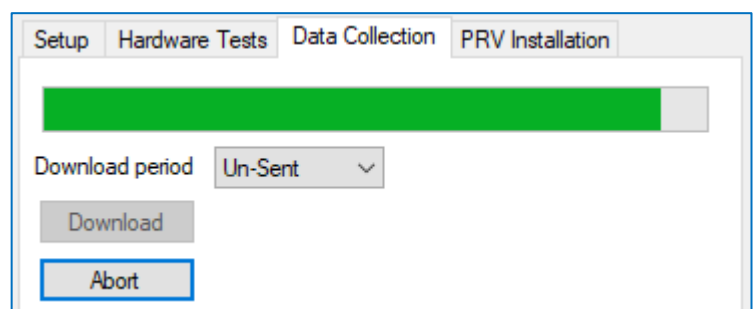


Choose a download period using the selector.

Then click on the “Download” button.



The data for the requested period
will be downloaded into a file within
the PC by the IDT program.

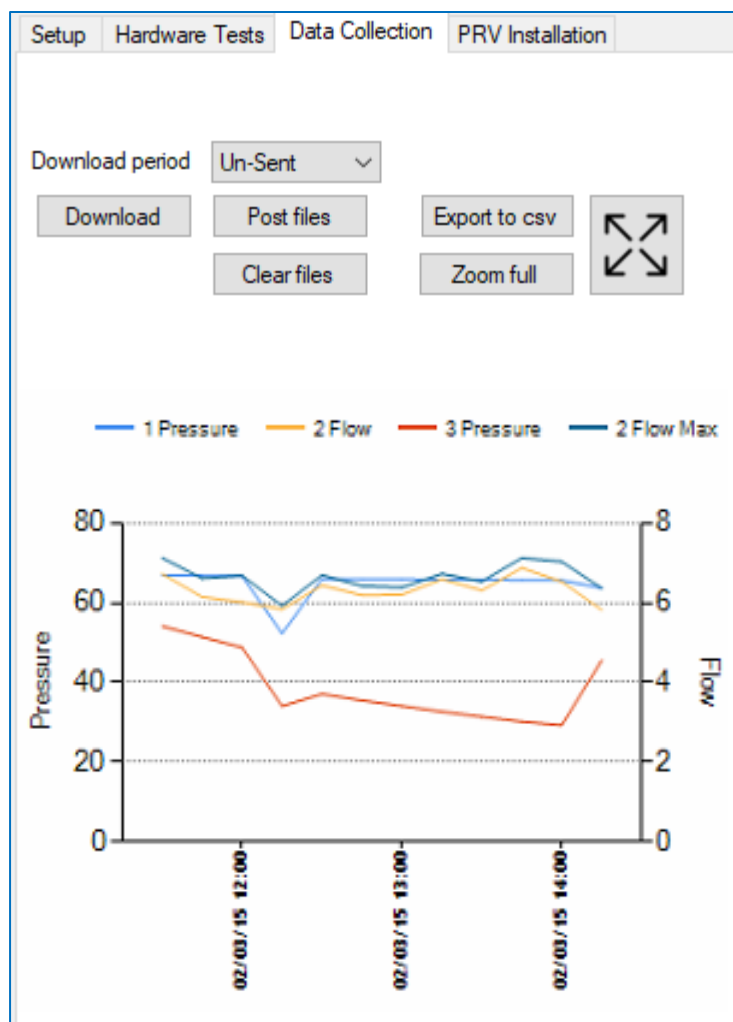


A graph will be displayed of the channels being logged.

To zoom to specific times/dates, click and drag over the part of the screen required.

Click the "Zoom Full" button to show all data once more.

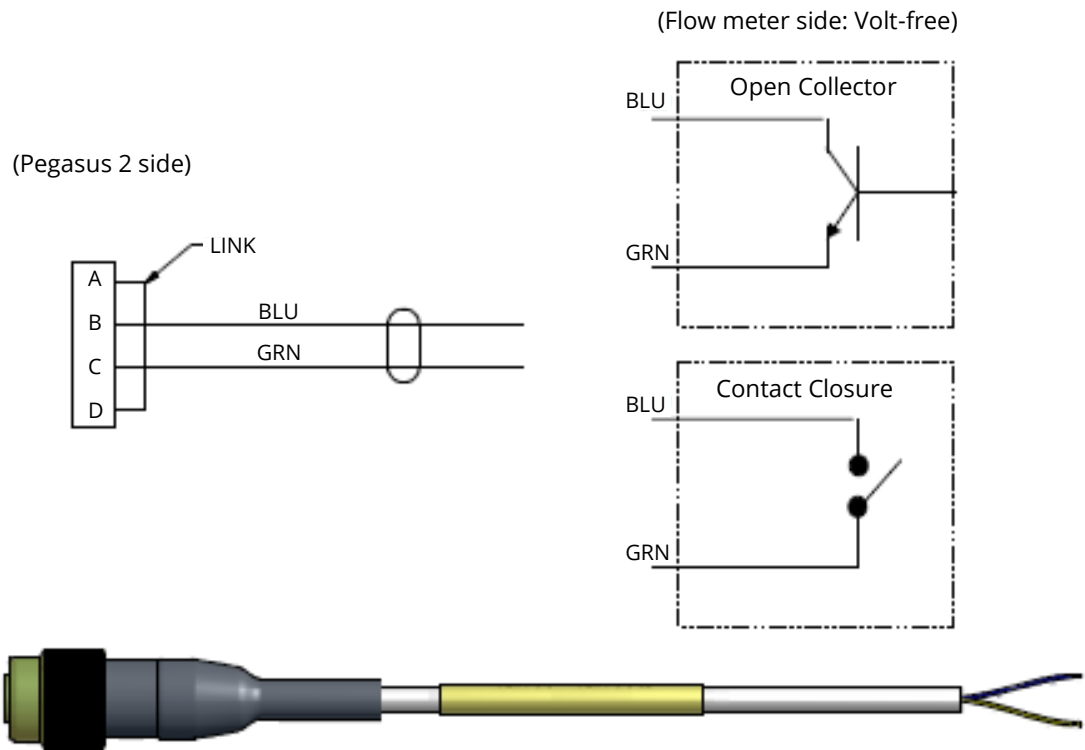
A larger display can be shown by clicking the button shown opposite.



6 CONNECTION INFORMATION

6.1.1 FLOW Meter connection / cable RAG 93

Flow meter pulse unit cable (RAG R93).



Connect the cable to the flow meter's volt-free pulse interface:

- Use the green wire as ground.
- Use the blue cable as signal.

7 MAINTENANCE, SERVICE AND REPAIR

Unauthorised servicing will void the warranty and any potential liability for “HWM-Water Ltd”.

Electronic controller

The controller is designed for continuous operation over the life of the batteries.

The power use from the internal battery is measured in order to determine when it is approaching end of life. Before the battery fails, the solenoids are switched to give a high-pressure from the PRV and a return to low pressure is prevented until the batteries have been replaced.

The built-in logger will continue to record data in its memory until the battery completely fails. The data logger cannot be downloaded after this condition occurs.

Batteries

- Only use batteries and parts recommended and provided by HWM.
- Batteries are replaceable by a HWM approved service centre or relevantly trained technician.

Antenna

- Only use antenna recommended and provided by HWM.
- For details of antenna options and part-numbers to order, refer to the following link:
<https://www.hwmglobal.com/antennas-support/>

SIM-card.

- SIM-cards are replaceable by a HWM approved service centre or relevantly trained technician.
- Only use consumable parts recommended and provided by HWM.

Hydraulic Components

- The hydraulic system consists of quick couplings, hoses and actuator that may require maintenance during the normal life of these products. To obtain these parts contact HWM-Water Ltd via your sales representative.

7.1.1 Return of product for Investigation, Service. Or Repair:

When returning product for investigation or repair, be sure to follow the instructions of your distributor to document why the product is being returned.

If returning to HWM, this can be done by completing the on-line RMA form:

<https://www.hwmglobal.com/hwm-rma/>

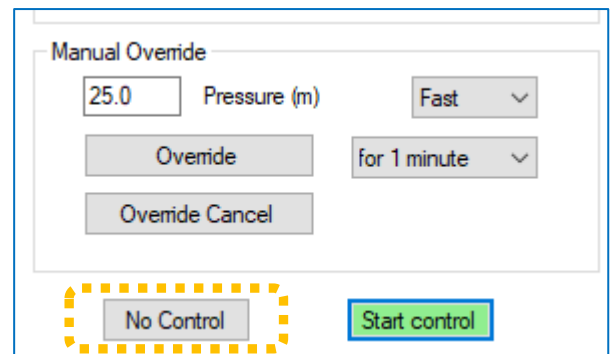
Refer to the Safety Warnings and Approvals Information for guidelines of the packing requirements. Prior to shipping, put the equipment into Shipping mode (see section 7.1.2).

7.1.2 Putting the equipment into Shipping Mode

Before long term storage, moving an installed unit, or shipping for repair, the Pegasus 2 unit should be put into “Shipping mode”. Be sure to upload any unsent data before this operation.

To put the Pegasus 2 into shipping mode:

- Read the current configuration of the Pegasus using IDT.



Manual Override

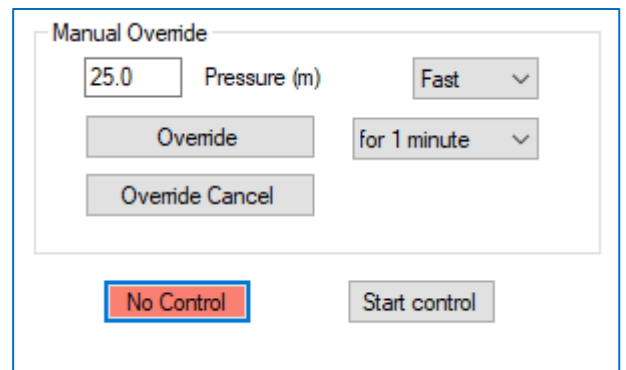
25.0 Pressure (m) Fast

Override for 1 minute

Override Cancel

No Control Start control

- From within the “PRV Installation” tab, click on the “No Control” button.



Manual Override

25.0 Pressure (m) Fast


Override for 1 minute

Override Cancel

No Control Start control

- Wait until the button has turned pink.

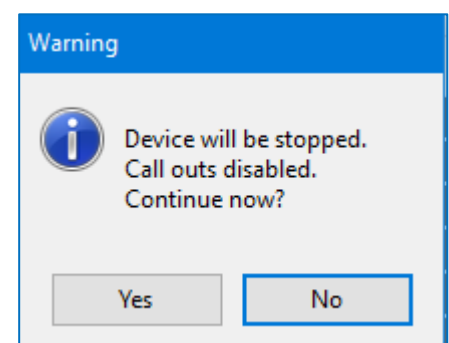
From within the “Setup” tab, scroll to the end of the settings panels and click on the “Stop Device” button.



Setup Device

Stop Device

- Click “Yes” when warned that calls will be stopped.



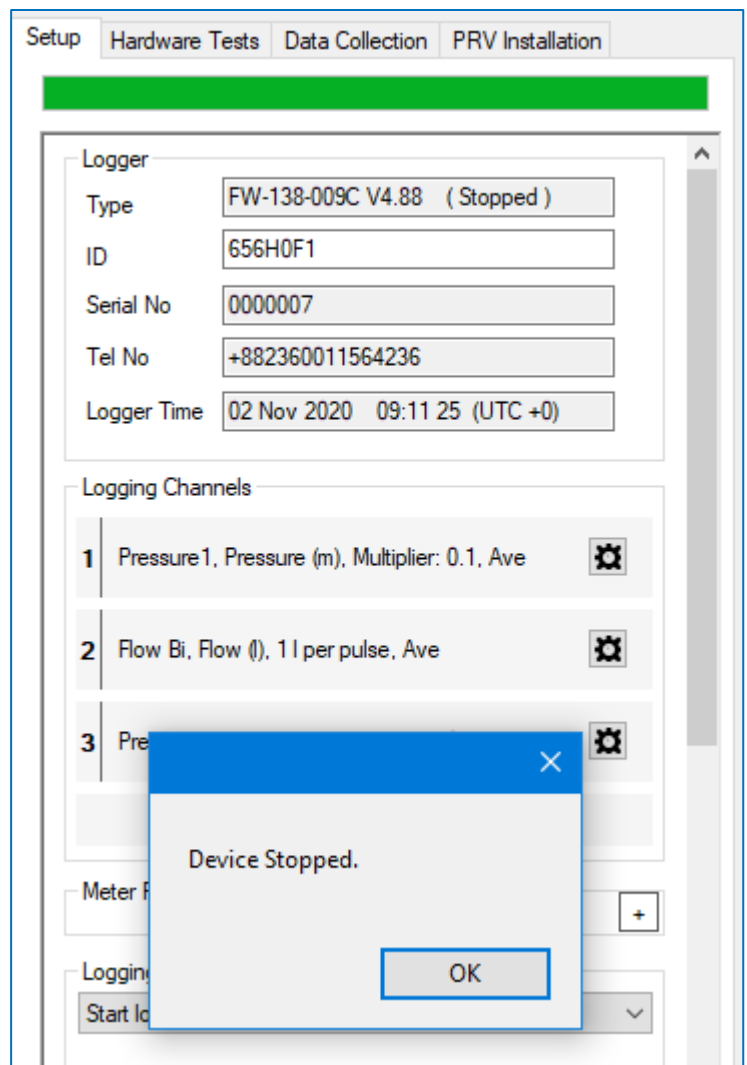
Warning

Device will be stopped.
Call outs disabled.
Continue now?

Yes No

- The unit will be re-programmed. IDT will warn that the logger device has been stopped.
- Click “OK” and confirm that the status of “(Stopped)” is shown at the top of the IDT Logger panel.

Note: The unit may now be re-packed for shipping or long-term storage.



7.2 WATER INGRESS

If Pegasus Solenoid box is subjected to water pressure exceeding 10 bar it is possible that internal damage may occur, and that water may enter the unit. The equipment may then fill with pressurised water. The unit contains a safety feature if this occurs. A pressure relief valve (see opposite) is fitted which may be activated by this fault condition.

The unit will also attempt to send an alarm to the server if it detects a high internal pressure.

If there is any evidence of water ingress into the unit, do not operate it, but return the unit for service and repair.





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