User Guide: Sentinel 2

(2-point Pressure control system)

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

MAN-163-0004-C April 2024

TABLE OF CONTENTS

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 Sentinel2 system is designed to control the outlet pressure from a clean-water pressure reducing valve.

This user-guide provides details of the Sentinel2 system components. 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:

Model Number(s)	Description
C163C/*/*/*/S*	Sentinel2 Controller unit
C163F/*/*/*/S*	A kit including the Sentinel2 Control box plus additional components to make a complete Sentinel2 system.

Accessories	Description
RCA7922L	Hydroswitch with solenoid.

Note: The part-number structure is similar to the Pegasus2 family of models. Pegasus 2 has its own 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 Sentinel2 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.

WARNING: This equipment should be installed, adjusted, and serviced by qualified water industry maintenance personnel familiar with the construction and operation of the equipment and the hazards involved. Failure to observe this precaution could result in damage to the water network.

1.3 Operating Temperature

Refer to the Datasheet or your sales representative for guidance on the storage and operating temperature range of the device. Ensure the unit is within the operating temperature range prior to installation or setup.

1.4 USE OF CELLULAR NETWORKS – IMPORTANT NOTES

Availability of SMS

Most Sentinel2 models include the ability to communicate to a server via use of the cellular data network. This is usually via the regular data network (which gives internet access). Alternatively, the SMS (Short Message Service) messaging can be used; in most cases this will be as a fall-back if the logger is temporarily unable to access the regular data network. If configured for SMS use, the logger uses the available **2G network**.

Important: 2G (GPRS) services, which carry the SMS messaging system, are slowly being turned off around the globe. Once 2G is switched off, the SMS services available within the logger will no longer be able to function. Unless deactivated in the logger settings, the logger will continue to try, wasting battery power. Therefore, check with your cellular network operator for their switch off date before setting the logger to use the SMS backup service or any other feature requiring SMS use.

To deactivate the use of the SMS system, any related SMS settings must be removed (switched off or deleted). Refer to the IDT User Guide for details of SMS settings. Any modified settings must be saved to the logger.

Note: For use of SMS services, both the logger and the cellular network provider must support SMS. In addition, the SIM card fitted inside the logger must support SMS use. (Check with your SIM supplier if required).

Logger identity when using SMS

When using the cellular data network, the logger identity is included with the data within the message. However, when using the SMS system, the identity is the calling number (from the SIM card). Thus, when using any SMS services, these two numbers (IDT setting of logger telephone number and SIM telephone number) must match.

1.5 VIEWING DATA

To view Sentinel2 data **remotely**, a viewing tool (website) is used. Various websites are available.

- Sentinel2 is most frequently used with the PressView website, which is for use with pressure control applications.
- Data produced by the built-in logger can also be seen on the DataView website.

Data from the Sentinel2 unit can also be viewed **locally** using IDT during a site visit.

Refer to the training materials available for your viewing tool and also the IDT user-guide for further information.

1.6 IDT – SOFTWARE TOOL (FOR DEVICE PROGRAMMING AND TESTS)

A software tool, known as "IDT" (Installation and Diagnostic Tool), provides a user-interface to the Sentinel2. It can be used for checking or making adjustments to the setup of the unit, for assisting with installation of the system, and also for testing the operation of the unit within its installed site.

Choosing which version to use

Prior to IDT being able to perform its functions, it has to 'connect to' the Sentinel2; this simply means that the two end devices (Sentinel2 software and IDT software) are able to communicate with each other over a working communications path.

IDT is available in three versions:

- IDT for PCs having a Windows-operating system.
- IDT for mobile devices (phones and tablets) having an Android operating system.
- IDT for mobile devices (phones and tablets) having an (Apple) iOS system.

The latter two are referred to as the 'IDT app', whereas the first is referred to as 'IDT (PC)".

1.6.1 IDT (PC version)

Refer to the IDT (PC version) User-Guide (MAN-130-0017) for details of how to prepare your PC for communicating with the Sentinel2. The user-guide also gives details of how to use IDT for many settings, including those of the built-in logger; many of these are required for use by the PRV controller.

The functions exclusive to the PRV control aspects of Sentinel2 are covered in this user-guide.

1.6.2 IDT app (mobile device version)

Refer to the IDT app User-Guide (MAN-2000-0001) for details of how to prepare your mobile device (Android-based Tablet) for communicating with the Sentinel2. The user-guide also gives details of how to use IDT for many settings, including those of the built-in logger; many of these are required for use by the PRV controller.

The functions exclusive to the PRV control aspects of Sentinel2 are covered in this user-guide.

2 OVERVIEW

2.1 INTRODUCTION

Sentinel2 is a system that is used to control the outlet pressure of a pressure reducing valve (PRV) within a clean-water supply pipe network. The Sentinel2 includes built-in data logger functionality. This section gives an overview of Sentinel2, 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. Only general details of PRV valve construction are included in this manual, and any images are for illustration purposes only.

Pressure control can be:

- 2-point control:
  i.e. Automatic switching between two pre-set pressure levels (High and Low). The Sentinel2 product is ideal for this situation.
  or
- Continuous control:
  i.e. Incremental adjustment of pressure, between a maximum and minimum; The Pegasus2 product is ideal for this situation.
  (Refer to the Pegasus 2 manual for further details)

Sentinel2 switches the PRV output pressure to either a High or Low setting based on a pre-determined pressure profile.

The 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 settings or tables within the unit. Tables can be entered manually during installation. Sentinel2 can also communicate with a central server that stores its measurement data. The server can be used for remotely analysing the effectiveness of the pressure control and (if required) remotely update the unit's settings. (This is achieved via PressView web software).

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).

The Sentinel2 system typically consists of the following parts:

- A Control Box unit.
- A Hydroswitch unit.
- A HWM mechanical actuator.
- An accessory kit for plumbing-in the Sentinel2 system to work with the PRV. (HWM can supply standard kits containing coloured plastic tubing, a 3-way manual valve, quick-connect fittings).
- Hanging bracket.
- Cables for sensors (transducers or meters).

- An antenna for communication of data over the mobile cellular network (For server integration).
- External battery (optional / if required).
- A USB Communications cable (an accessory required for on-site installation, programming, and data retrieval).

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

Sentinel 2 compatibility with Sentinel Plus

The Sentinel2 system replaces previous generations of HWM pressure control systems, known as Sentinel Plus.

Existing sensors and pipework may be compatible and may be re-used with a Sentinel2 installation if in good condition; Discuss with your HWM sales representative if required.

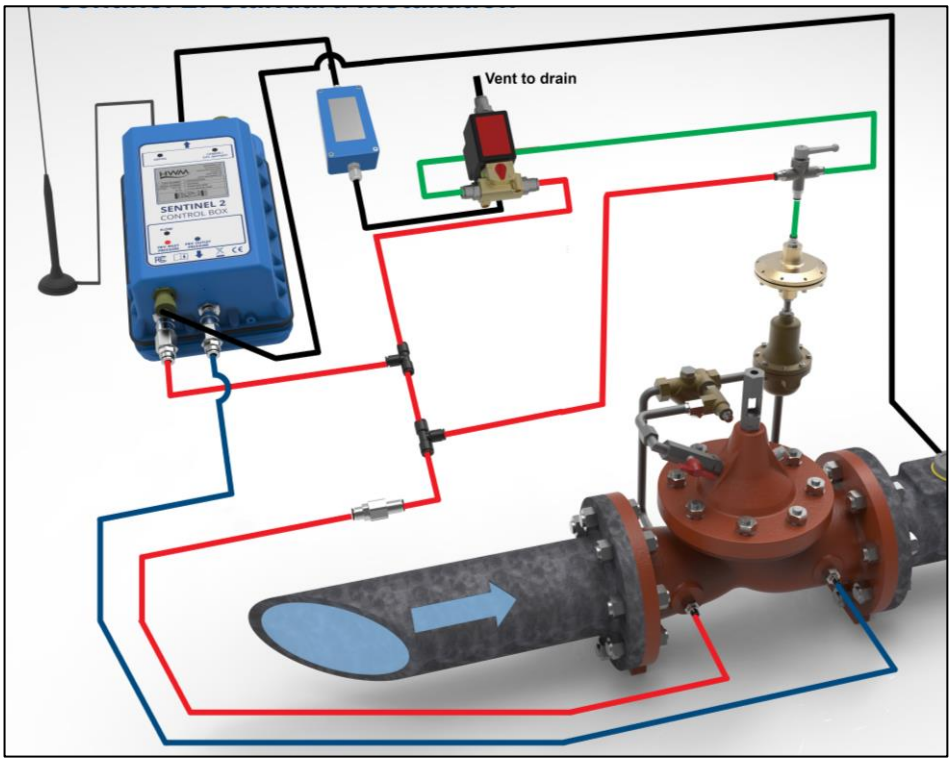
The USB Communications cable is compatible between Sentinel Plus and Sentinel2 systems.

The Sentinel2 system controls the PRV by means of hydraulic actuation. It can monitor upstream pressure, downstream pressure, and flow through the PRV. It may therefore require connection to various points in the water supply and PRV.

An example of a PRV with Sentinel2 system installed is shown opposite.

Several plumbing configurations exist, depending on upstream and downstream pressures. Configuration also dependent on the parameters that need to be logged.

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

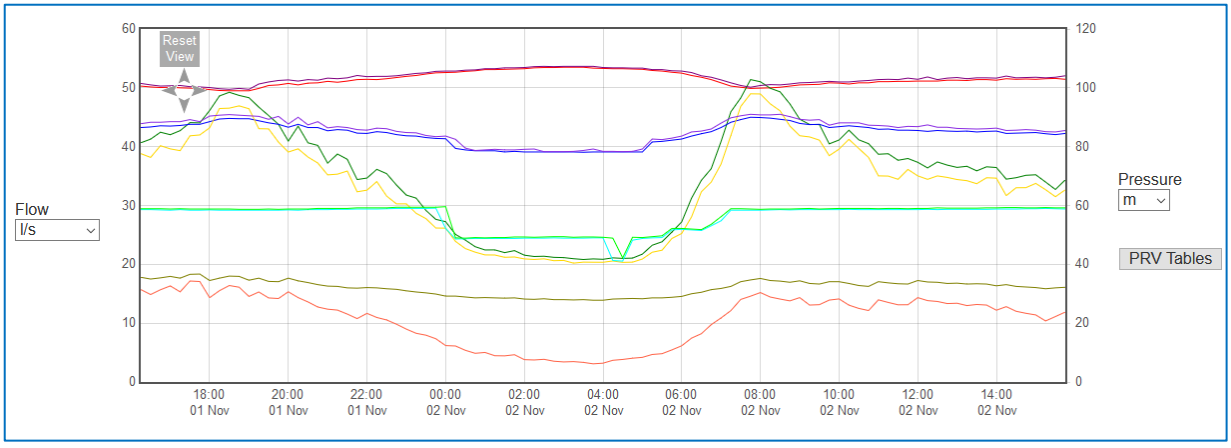


An example of the standard installation accessory kit, plus the actuator, and brackets are shown above and opposite.

2.2 SERVER INTEGRATION OPTION: DATAGATE AND PRESSVIEW WEBSITES

When integrated with HWM's DataGate server, the Sentinel 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 data is viewed in PressView.



The PressView website allows the Sentinel2 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 a user, and (whenever an adjustment is needed) revised pressure profiles can be sent to the Sentinel unit. This feature is not covered further in this document; refer to the User-Guide or instructions for PressView for more details.

The Sentinel2 can also send any fault notifications (alarms) to the server for forwarding to interested parties.

2.3 COMMUNICATIONS INTERFACE AND PROGRAMMING CABLES

To communicate with the Sentinel2, a programming cable is required, which connects to the COMMS interface on Control Box.

The COMMS interface connector and a communications cable are shown below.

The connector used for communications also include the connections required for fitting an external battery (see section 2.6). The connector of the communications cable will only include the pins required for communications purposes. To use the communications cable, temporarily remove any existing connector, and re-connect it when finished. Alternatively, an adaptor (Y-cable) can be temporarily inserted to be able to support using both Communications and External Battery functions together.

Attach the Comms cable to the logger, and then complete the connection to the IDT host using one of the methods described in section 2.4

Examples of suitable programming cables are given below:

- COM AEUSB (USB to RS232 comms cable).
- CABA2075 (direct USB comms cable).

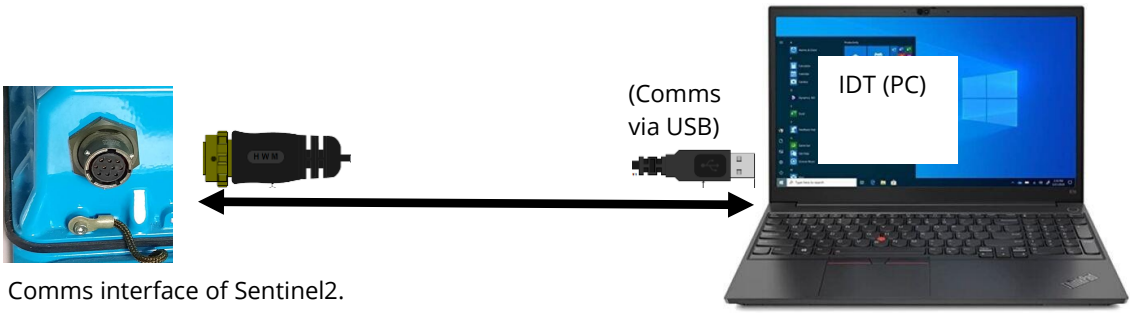
2.4 COMPLETING THE COMMUNICATIONS PATH

Select an appropriate cable and connect it to the COMMS connector of the Sentinel2, as described in section 2.3. The USB-A end of the programming cable should be used to connect to the IDT host by using one of the following methods:

2.4.1 IDT - used with a PC (& Windows).

Prior to use, the PC should have the IDT (PC version) programming tool installed.

The USB-A end should be plugged directly into a USB-A port of the PC (or to USB-B or USB-C port via a suitable adaptor). Refer to the diagram below.



Comms interface of Sentinel2.

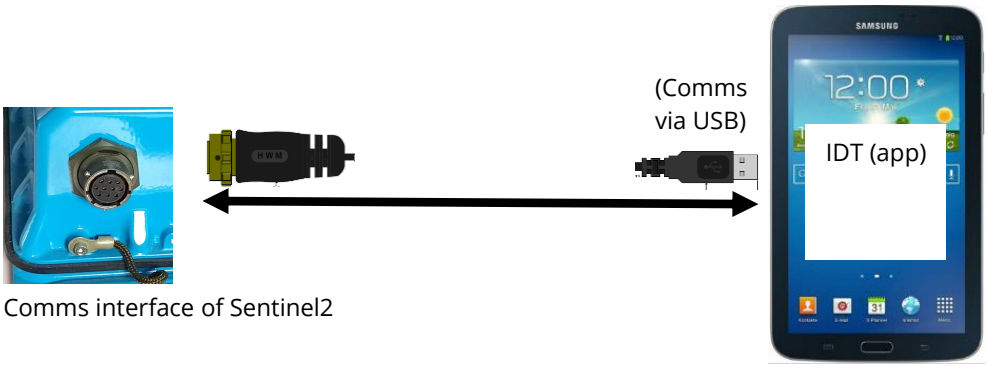
Personal Computer

2.4.2 IDT app - used with a Tablet (Android) / USB option

Certain Android-based Tablet devices (which must have an available USB port) are able to use this method. (For known compatible devices, contact your HWM representative).

Prior to use, the mobile device should have the IDT app software installed.

The USB-A end should be plugged directly into a USB-A port of the tablet (or to a USB-B or USB-C port via a suitable adaptor). Refer to the diagram below.



Comms interface of Sentinel2

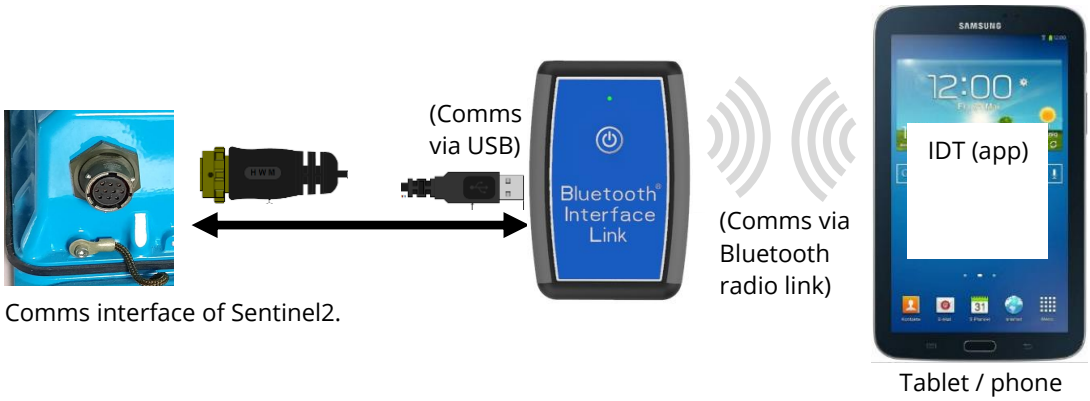
Tablet device

This connection method is only compatible with the COM AEUSEB (USB to RS232) comms cable.

2.4.3 IDT app - used with a Mobile phone or Tablet / Bluetooth option

Certain mobile phone or tablet devices (which must be Android or iOS-based and support Bluetooth radio) are able to use this method. (For latest information about known compatible devices, contact your HWM representative).

Prior to use, the mobile device should have the IDT app software installed.



Comms interface of Sentinel2.

Tablet / phone

The connection path (refer to the diagram above) makes use of a communications adaptor known as the HWM 'Bluetooth Interface Link'.

Connect the Sentinel2 end of the communications cable to the COMMs connector. Then the USB-A end of the cable should be plugged into the USB-A port of the Bluetooth Interface Link unit. The device should be turned on during use.

The IDT app is required to be paired to the Bluetooth Interface Link unit prior to communication with Sentinel2.

The Bluetooth Interface Link handles protocol translations and flow control of messages between the Sentinel2 (via the comms cable) and the radio link.

2.5 SENTINEL 2 SYSTEM KITS

Sentinel2 ***systems*** can be ordered using a system ***kit part-number***.

A kit part-number is used merely for the purpose of ordering several system components under a single part-number. No components will be labelled with the kit part number; Each item will be labelled using its regular part-number (as described within sections that follow).

Please discuss any requirements for ordering Sentinel2 as a system kit with your sales representative.

2.6 EXTERNAL BATTERY (OPTION)

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 or more frequent communications with the host server.

The battery connection has to be removed whenever the communications cable is fitted; they share the same connector. Be sure to re-connect the battery prior to leaving the unit.

Always use HWM supplied batteries to ensure compatibility and safety.

(For situations where the use of an external battery is required, seek the advice of your HWM representative).

2.7 SENTINEL 2 CONTROL BOX – DESCRIPTION

Sentinel2 control box is a combination of a PRV controller and a built-in data-logger.

The unit is shipped from the factory in a low-power mode referred to as "Shipping mode". The **logging functions** have to be activated (see section 2.7.1) at an appropriate point during installation (see section 4.22).

Similarly, the unit is shipped from the factory with the **PRV Control function** in an inactive ('No Control') state. The PRV Control function should be made active (see section 2.7.2) at an appropriate point during installation (see section 4.22).

Although both controllers (logger and PRV) can be started or stopped independently, both need to be running for correct operation. Confirm this before leaving an installation site.

2.7.1 Logger functions & Logging running state

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

The logger will periodically sample any 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 (see section 2.7.3).

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 occasionally 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 additional data into a "secondary recording" memory area, (e.g., data 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.

Logging Running state:

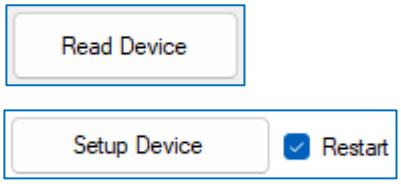
The description (above) is only applicable while the logging functions are in a running state of 'Recording'. However, the logger can be in one of the following states:

- **Stopped.**
  (Also known as 'Shipping Mode').
  The logger is dormant, awaiting activation.
- **Waiting.**
  This is a transitional state, where the logger is no longer dormant, but is waiting for an appropriate time to start logging; logging start is aligned with the nearest convenient clock-time.
- **Recording.**
  The logger is operating its repetitive logging cycle and other programmed tasks.

Further information is provided in the IDT user-guides. They are summarised here.

The **logging functions** of Sentinel2 are usually set to begin 'immediately' upon being 'activated' (e.g. for first-time use).
IDT is used for the activation. However, IDT (PC) and IDT (app) behave slightly differently in use. To activate the logger functions:

- The **IDT (PC version)** must first be used to **read** the logger's program into the PC memory.
  Then (possibly after some changes are made) the user must **manually save** the settings to the unit, using the 'Setup Device' button.



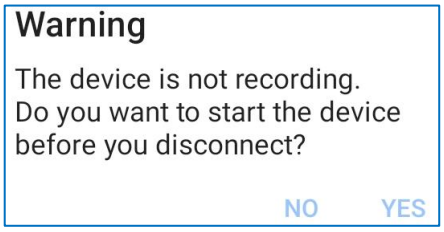
  During the process, the program is saved and then read-back into IDT, along with the latest logger status; this will temporarily be 'waiting'. Also, IDT makes some checks for potential issues with logger setup and (if any are found) prompts the user to consider if the issue needs to be addressed.

- The IDT (mobile app version) also reads the logger's program into the phone's memory, but does so automatically, as soon as it has identified the unit.

  The user can choose to **manually** activate the logger (by tapping the Start Device button, found in the Device Information screen),

  or...

  The app will advise that the settings should be saved and that the device should be re-started following certain program changes or user actions (e.g., when trying to disconnect from the device).

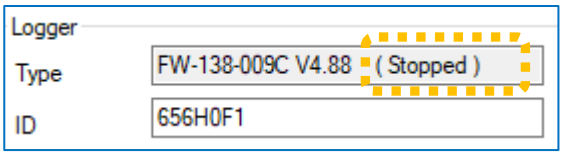


  (Unlike IDT (PC version) the IDT app saves settings progressively during use, rather than waiting for the user to manually initiate the save).

  The logging begins to be activated; It goes into the Waiting state for a short interval, after which it goes into the Recording state.

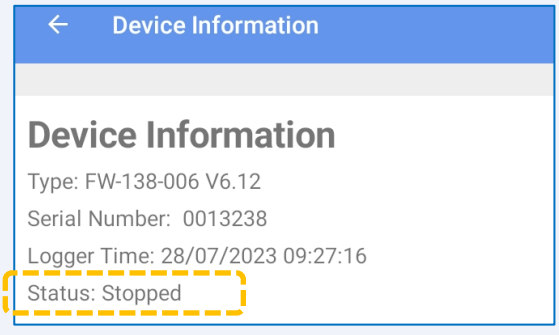
<u>Checking Logging Running state:</u>

In IDT (PC version), the *running status* of the built-in **logger** is shown within the Logger panel of the setup tab.



<u>IDT App users:</u>

The *running status* of the built-in **logger** is shown within the Device Information screen.



2.7.2 PRV Control functions & running state

PRV control is a separate activity to that of the built-in logger. The PRV controller samples various inputs and determines what action (if any) is required to modify the PRV output pressure.

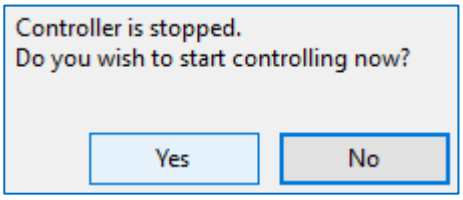
The PRV control can be in one of the following states:

- **No Control**
  The ***automatic*** PRV control process is stopped.
  The PRV control process can still accept manual adjustments from user interaction with IDT.
- **Resuming / Pausing.**
  This is a transitional state, which lasts fractions of a second.
  The user has requested automatic PRV control to begin, or to be paused, but the device requires a short preparation time.
- **Start Control.**
  This is when the PRV control is operating ***automatically***, periodically making new measurements and actioning any corresponding adjustments.

In IDT (PC version), the *running status* of the PRV control is indicated on buttons within the PRV installation tab.

Red = Automatic control stopped. (No Control)
Green = Automatic control running. (Start Control)

(The control state can be changed by clicking on the desired button. IDT may also suggest starting the controller).



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

Note: Operation of the system with a Pressure Reducing Valve is described later, in section 2.11.

IDT App users:

Equivalent controls and indications of the **PRV controller** are located as follows:
(main) → Test Device → PRV Installation.

(The control state can be changed by tapping on the desired button)

2.7.3 Controller Description

The Control Box unit directs the operation of the Hydroswitch unit. The standard configuration includes a flow transducer input which can be included as part of the decision-making process that determines the required pressure output. It also includes pressure measurement interfaces for both upstream and downstream water pressures. Other interface options can be included (at the time of ordering).

An example of a Sentinel2 Control Box is shown opposite.
It contains the following standard interfaces:

- A connector for attachment of an antenna for the cellular data network.
- An electrical MIL-spec connector for the Hydroswitch unit.
- A MIL-spec connector for communications and the external battery power option.
- A MIL-spec connector for flow data.
  This measures the rate of flow of water (if a water meter is available on site to connect to).
  (Can be used for control and/or logging purposes).

The example shown contains the following additional interface options (used for logging purposes only):

- A quick-release connector for a water-pressure transducer (or an electrical interface for an external transducer) that usually 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 usually measures the outlet side of the PRV (downstream pressure).

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

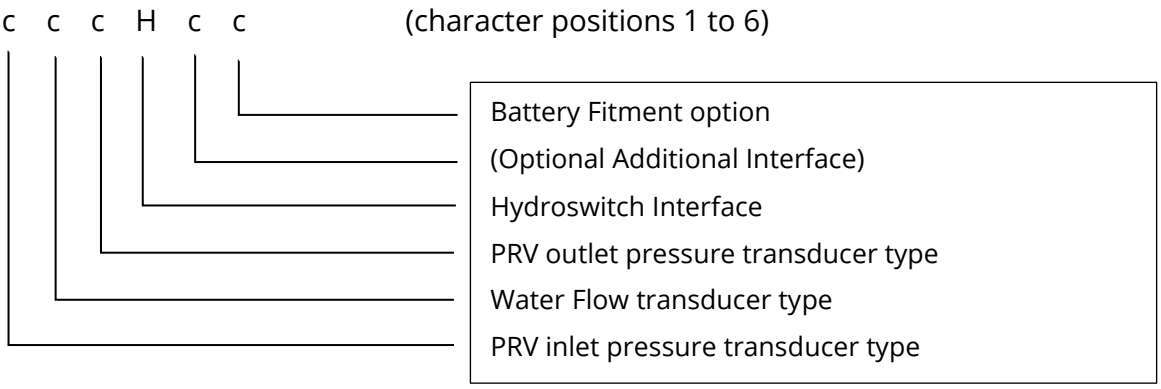
C163C/656H0F/1/UK1/SH

The part-number is useful to verify the interface content of the unit, summarised as follows ...

Model Number(s)	Description
C163C / * / * / * / S*	Sentinel2 Controller

- S* — (Reserved by HWM).
- * (first) — Electrical options.

"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 Inputs. Maximum of 128 pulses / second from a volt-free output.

Additional Options (key):

0 – (Option Not Fitted).
I – Electrical Interface (I2C).
M – Electrical Interface (Modbus).
5 – Analogue (4-20mA) Flow input (Passive).
S – Status Input.

Battery Fitment options (key):

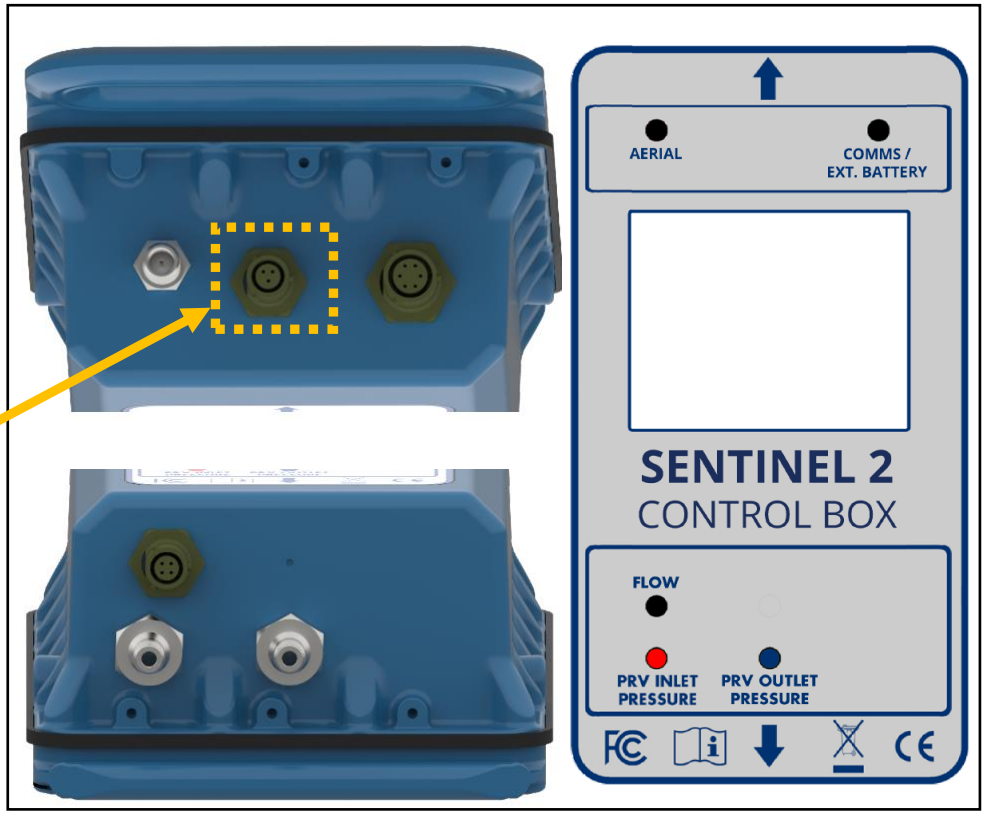
F – Fitted internally and also connected (standard).
D – Fitted internally but disconnected.
S – Shipped separately.
E – Empty. (Fixings for internal battery are supplied, but no battery).
N – (Nothing supplied: No internal battery. No fixings).

The Front of the Control Box shows standard position for various interfaces.
Additional options are not labelled; refer to the guidance given above.

An example of a Sentinel2 is shown opposite.

The unit includes the options of
a Flow interface and
2 internal pressure sensors.

(The unit includes a 3-pin connector for Hydroswitch).



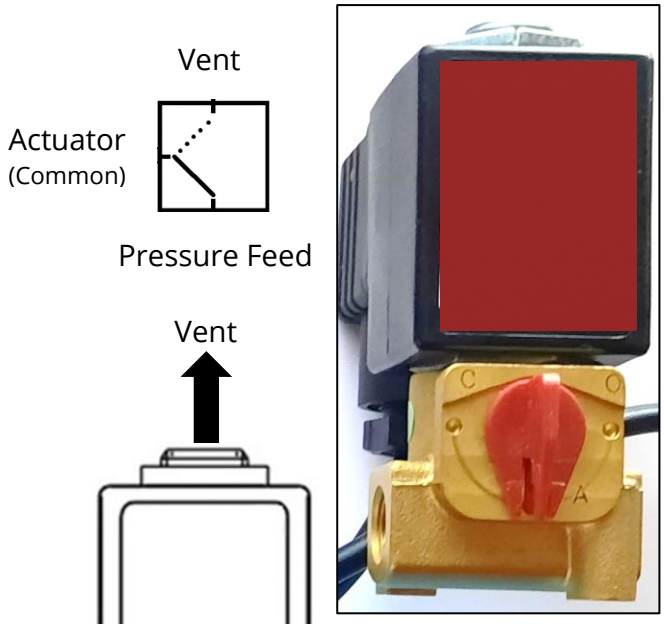
2.8 HYDROSWITCH - DESCRIPTION

The Hydroswitch, shown opposite, is a required part of the Sentinel2 system. It includes a 3-port latching solenoid valve attached via a cable.

The unit attaches to the control box via a built-in cable with MIL-spec connector.

The Hydroswitch is powered by internal batteries. Its operation is directed by the Sentinel2 Control Box but takes approximately 10 seconds to change.

The valve fitted to the Hydroswitch implements a path changeover between a common port and the other 2 ports, as shown opposite:

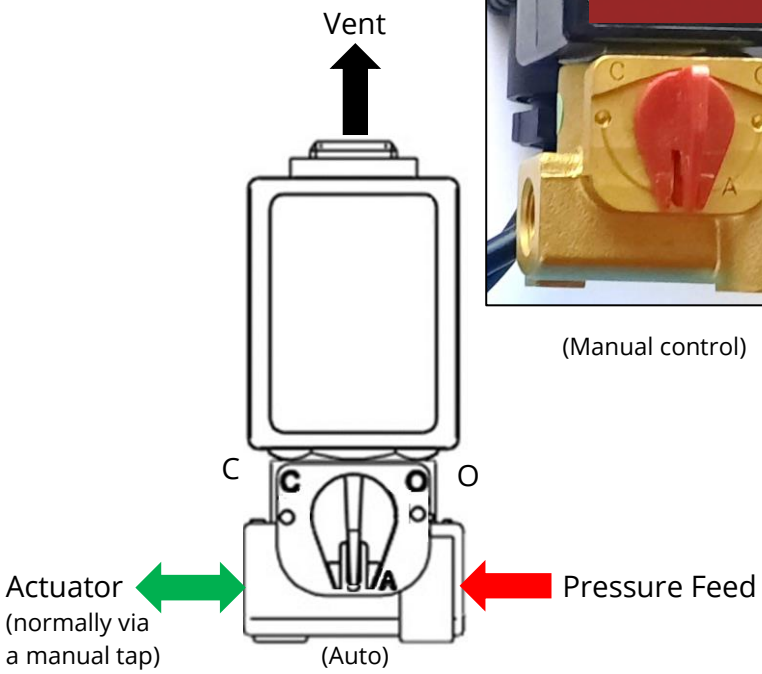


(Manual control)

The ports of the solenoid valve are not labelled; please refer to the diagrams opposite for standard port use.

The common port is normally connected to the actuator via a 3-way manual valve (tap).
The other 2 ports are connected to:

- Pressurised water (port shown as “Pressure Feed”) or
- Atmospheric air (port shown as “Vent”).



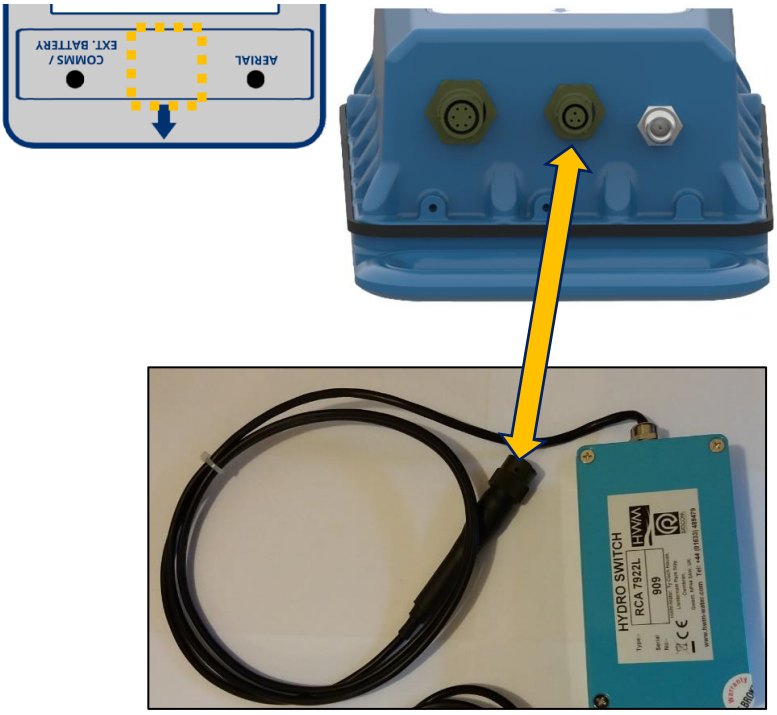
To change from "O" to "A", the manual override must be turned from "O" to "C" and then to "A" : " O → C → A".

Adapters must be fitted onto the valve prior to connecting the hoses.

When the Hydroswitch is disconnected from the control box it will (after 10 seconds) switch into its default state. This connects a path between the ports labelled Common and Pressure Feed in the above diagram. This default path is also the one that will be active if the Control Box battery fails or some additional fault condition.
The most common system configuration is to require the PRV to go to the high pressure condition should a fault exist in the control box. This will be the assumed requirement for the descriptions within this manual.

Note: Sentinel2 units can also be *factory configured* to support a low-pressure condition during a fault. This is non-standard and requires changes to installation plumbing and hidden software settings in the Control box. It will not be described in this manual. Please discuss any requirements with your HWM representative.

The diagram opposite shows how to connect the Hydroswitch to the 3-pin connector on the Sentinel2 Control box.

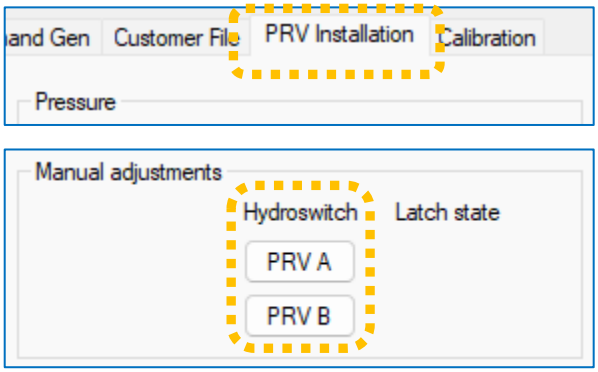


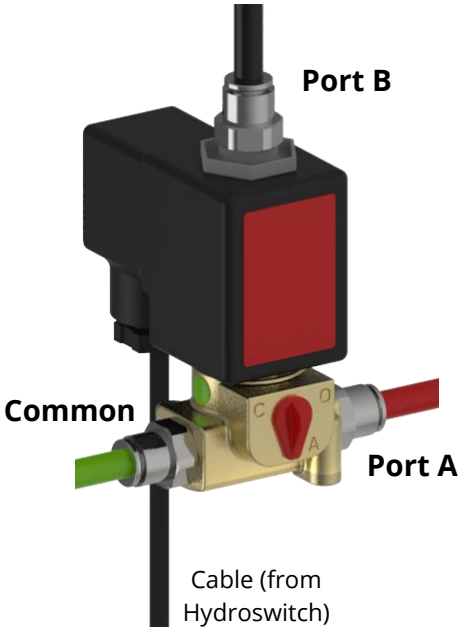
If required, the Hydroswitch can be tested prior to plumbing it into the system:

Connect the communications cable to the Sentinel2 and read the settings with IDT.

In the PRV Installation tab, locate the 'Manual adjustments' panel.
There are buttons to set the open path of the Hydroswitch.
(There is a 10 seconds delay during switching):

- Click PRV A button to open the path between Common and Port A. Port B becomes sealed.
- Click PRV B button to open the path between Common and Port B. Port A becomes sealed.



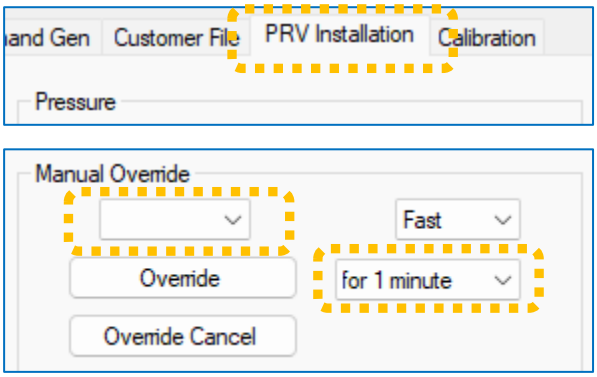


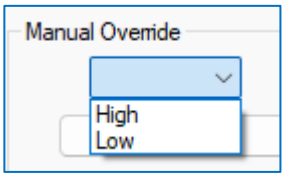
Check the valve is switching to confirm it is operating correctly.
(Note: If Control is running, any change lasts approximately 60 seconds).

A change of longer duration can also be made using the 'Manual Override' panel.

Add the desired duration, and then select the required open path:

- Select 'High' to open the path between Common and Port A. Port B becomes sealed.
- Select 'Low' to open the path between Common and Port B. Port A becomes sealed.





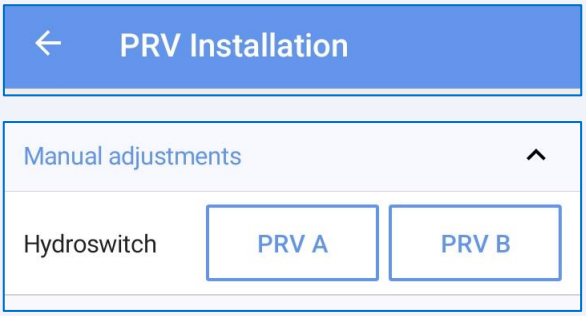
Click the Override button.
(The PRV 'Control' process must be running when using this control).

The Hydroswitch valve will (after 10 seconds delay) change to the desired path for the specified time. Then it will return to its previous state (if different).

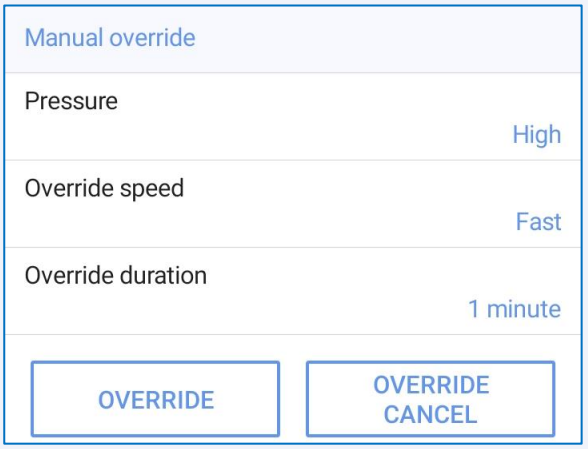
IDT App users:

For – Manual adjustment of Hydroswitch (PRV A & PRV B buttons)
– Manual Override

Equivalent controls are located as follows:
(main) → Test Device → PRV Installation.
Tap the 'Manual adjustments' line, if required, to reveal the Hydroswitch buttons.



The Manual Override set of controls are also located on this screen.



2.9 Mechanical Actuator

In order to control the outlet pressure of a PRV the Sentinel2 system is required to modify the PRV behaviour so that it produces downstream water pressure which follows the programmed pressure profile. 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 bolt which acts on a spring.

The actuator used within a Sentinel2 system replaces the setting bolt. It allows the Sentinel2 to adjust the PRV pressure.

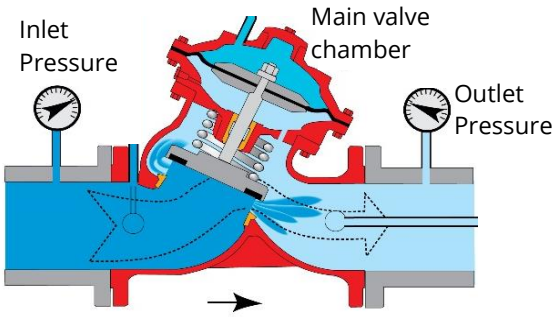
2.10 Summary of PRV Function (Pilot operated)

(Readers familiar with PRVs controlled by pilot valve operation may skip to section 2.11).

2.10.1 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.

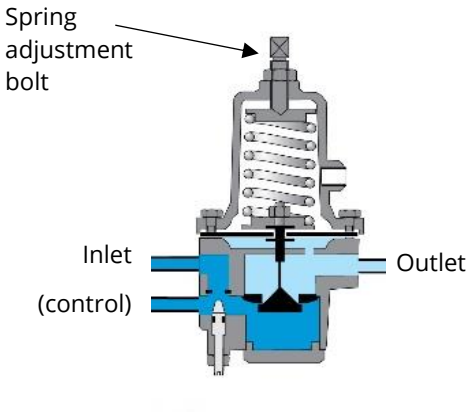


Valve Open (flowing condition)

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.

2.10.2 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.

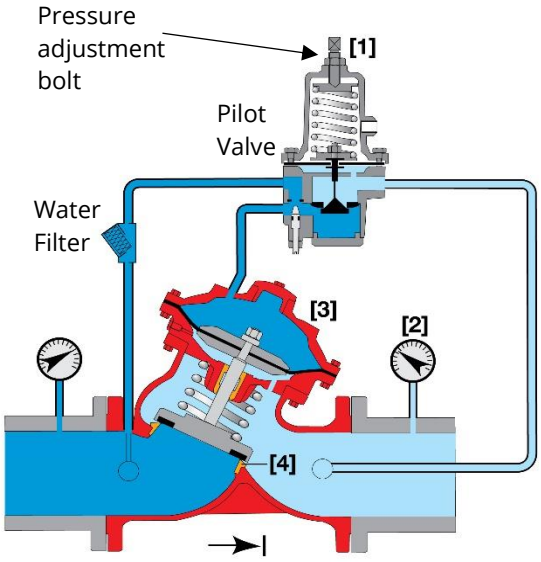
The water flowing into the pilot valve via the inlet port is restricted. This is typically done by a needle valve which may be either internal to the pilot valve or external to it (within the pipe feeding upstream water to the inlet of the pilot valve).

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.

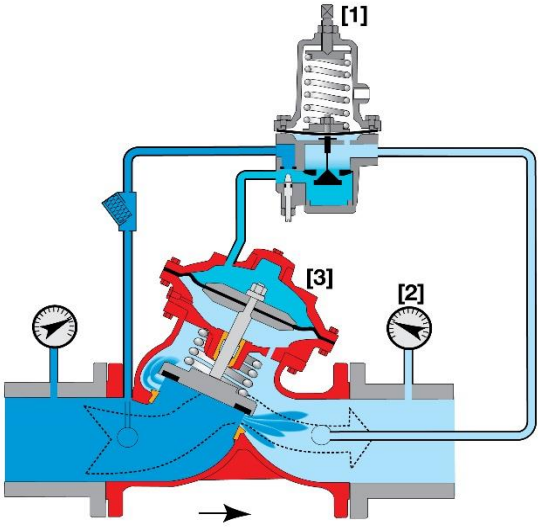
The needle valve is sometimes referred to as a “speed control”. It prevents damage to the PRV (and water network) by limiting the speed of change to volume of water in the PRV upper chamber.

2.10.3 Pilot operated pressure reducing valve

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



Valve Closed (static condition)



Valve Open (flowing condition)

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.

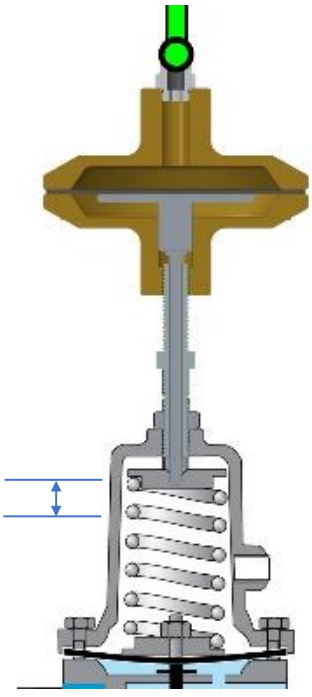
Note: The pilot set point is adjusted by turning the pilot adjustment bolt and is not dependent on upstream pressure.
Increasing spring force sets a higher output pressure.
Reducing spring force sets a lower output pressure.

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.

2.11 PRV Function (under Sentinel 2 control)

2.11.1 Sentinel 2 Mechanical Actuator

The Sentinel2 includes the HWM mechanical actuator, which attaches to the top of the pilot valve, replacing the adjustment bolt.



Sentinel2 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.

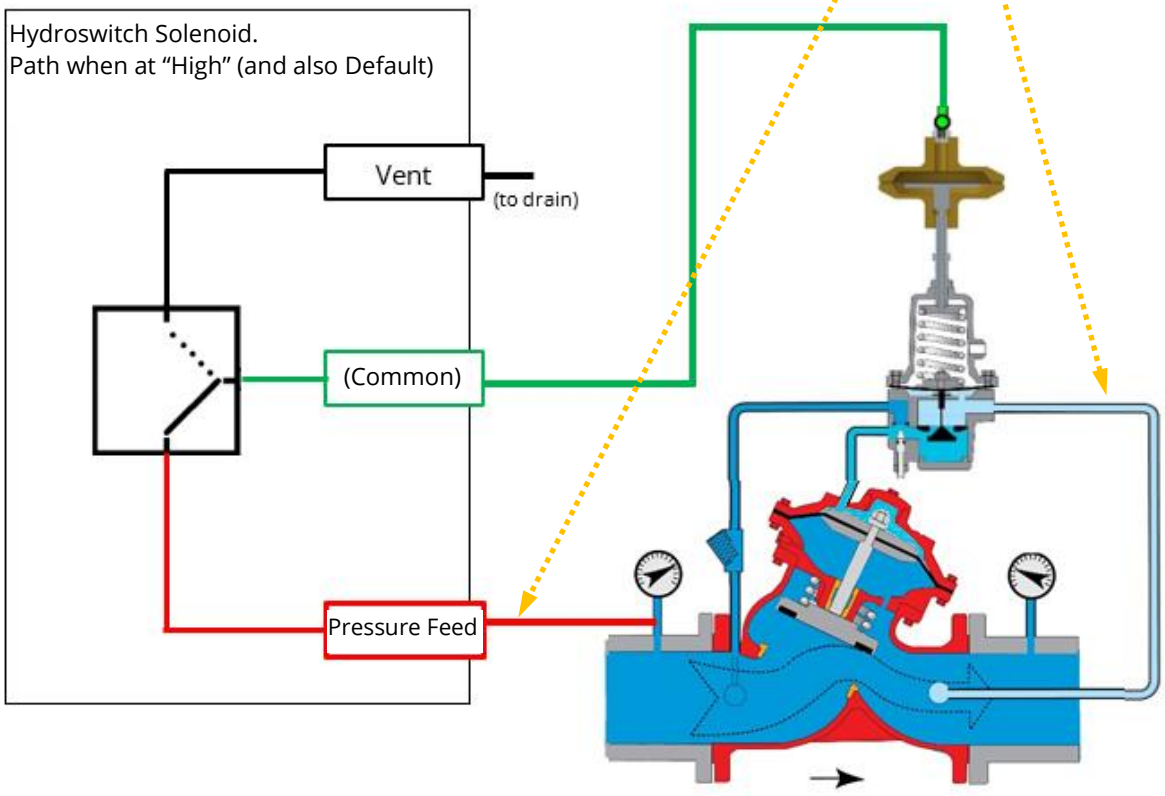
For 2-point pressure control, Sentinel controls the actuator to change the position of the upper end of the spring. It switches between set limits for either a “High” or a “Low” pressure; the limits are adjustable. The procedure for installing the actuator and setting its limits is covered in sections 4.11 and 4.12.

2.11.2 Theory of operation (2-point pressure modulation; High and Low)

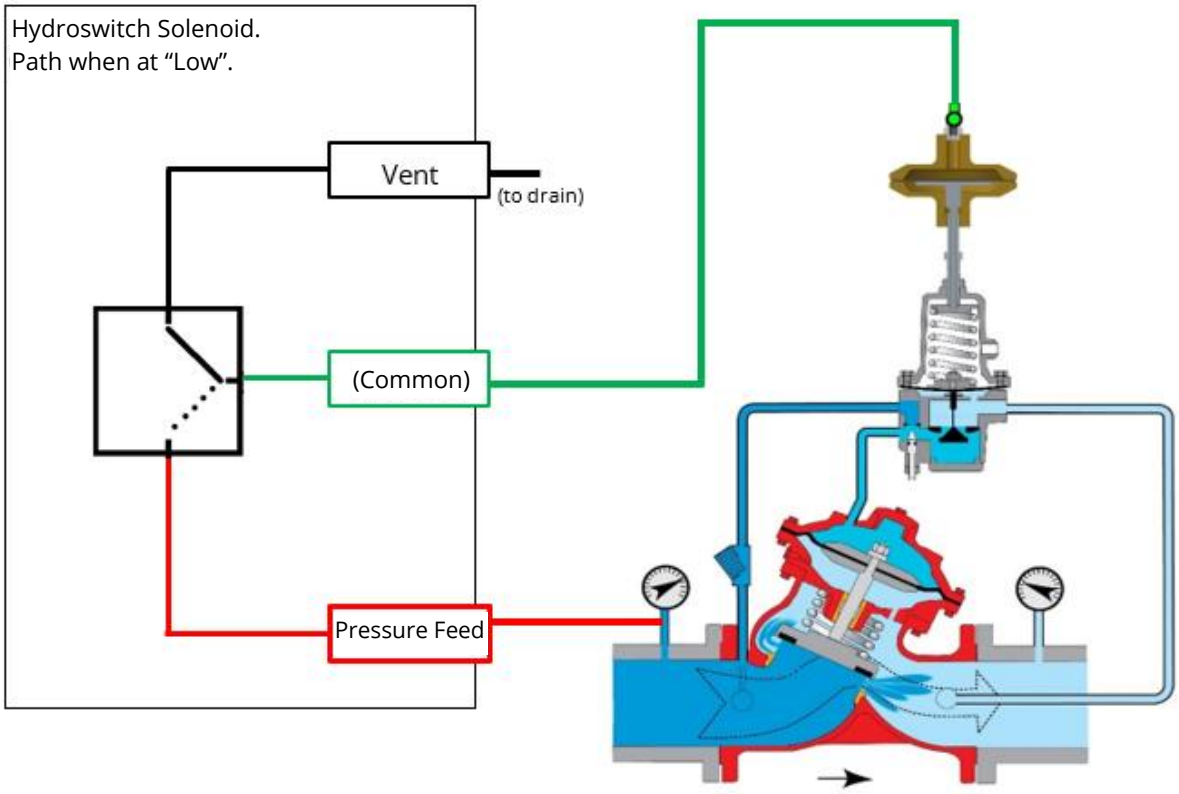
The plumbing of a Sentinel installation (hydraulic control circuit only) is illustrated below:

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

Caution:
When PRV inlet pressure exceeds 90m, an alternative installation is required...
Use the downstream water pressure for the Hydroswitch Pressure Feed port instead.



With the valve in the position shown (above), which is the "High" pressure position, the actuator has water pressure applied. The upper chamber of the actuator fills with water, which causes the plunger to depress the spring more. This causes the pilot valve to open more. This decreases the pressure in the lower part of the pilot valve (the PRV pilot rail). This leads to a decrease of pressure in the PRV upper chamber, which causes the main valve to become more open thereby increasing the downstream pressure.



With the valve in the position shown (above), which is the “Low” pressure position, the actuator has no water pressure applied, but instead is vented to atmospheric pressure. The water in the upper chamber of the actuator can escape via the vent pathway, which causes the plunger to depress the spring less. This causes the pilot valve to close more. This increases the pressure in the lower part of the pilot valve (the PRV pilot rail). This leads to an increase of pressure in the PRV upper chamber, which causes the main valve to become more closed thereby decreasing the downstream pressure.

Note: The actuator range of movement is limited by two mechanical end-stops which are adjusted during installation. These set the High pressure and Low pressure output from the PRV.

Caution: The PRV pilot rail must include a needle valve that limits the rate of change of the volume of fluid in the PRV upper chamber. The needle valve requires adjustment during commissioning of the system to allow PRV outlet pressure to change over a suitable period (several tens of seconds).
This is to prevent damage to the water network or other equipment due to sudden water pressure dips or surges, water-hammer, or other effects.

3 CONFIGURATION OPTIONS (DIAGRAMS)

The following sections illustrate some of the possible installation configurations that are achievable using the basic Sentinel2 system.

3.1 KEY TO COMPONENTS WITHIN THE DIAGRAMS

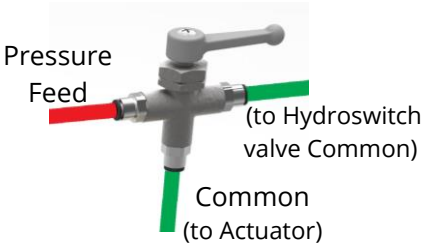
To assist understanding of the diagrams, details of the various other components surrounding the PRV are shown below.

Inlet water filter

Helps prevent blockages due to water quality.

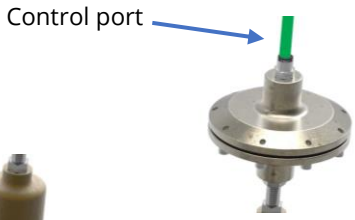
3-way valve

The 3-way valve provides a means to manually switch between control by the Sentinel2 system or an alternative setting (typically used to be able to manually drive the PRV pilot to give a High downstream pressure or safety override).



HWM mechanical actuator

Provides a means to set mechanical Maximum and Minimum on the pilot.



Pilot valve

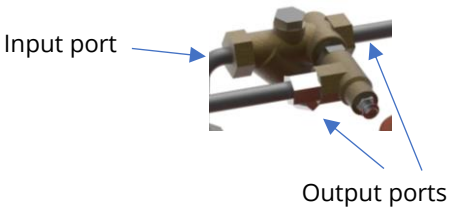
The pilot valve fitted to the PRV.

(Image shown is for illustration purposes only)

Needle valve

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

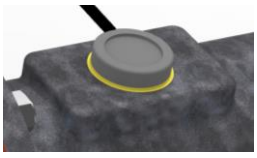
The needle valve is normally situated on the pilot rail.
(Image shown is for illustration purposes only)



Flow meter

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

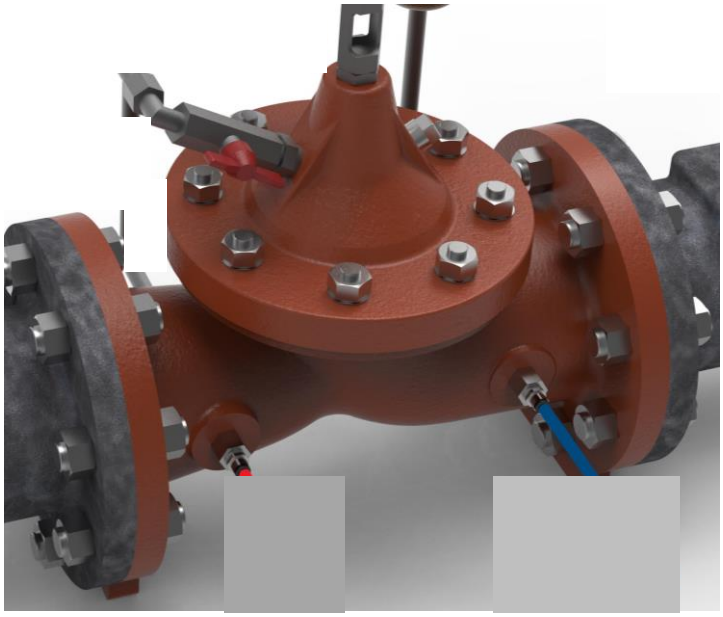
The Sentinel2 system provides models that can interface with various types of flow meters (e.g. Pulse or analogue).



Pressure Reducing valve (PRV)

The PRV can be fitted with pressure connectors to monitor the inlet and outlet pressure, sometime these access points are on the body of the PRV (as shown in the diagram) or on the pilot or pilot rail.

(Image shown is for illustration purposes only)



Sentinel 2 Control box

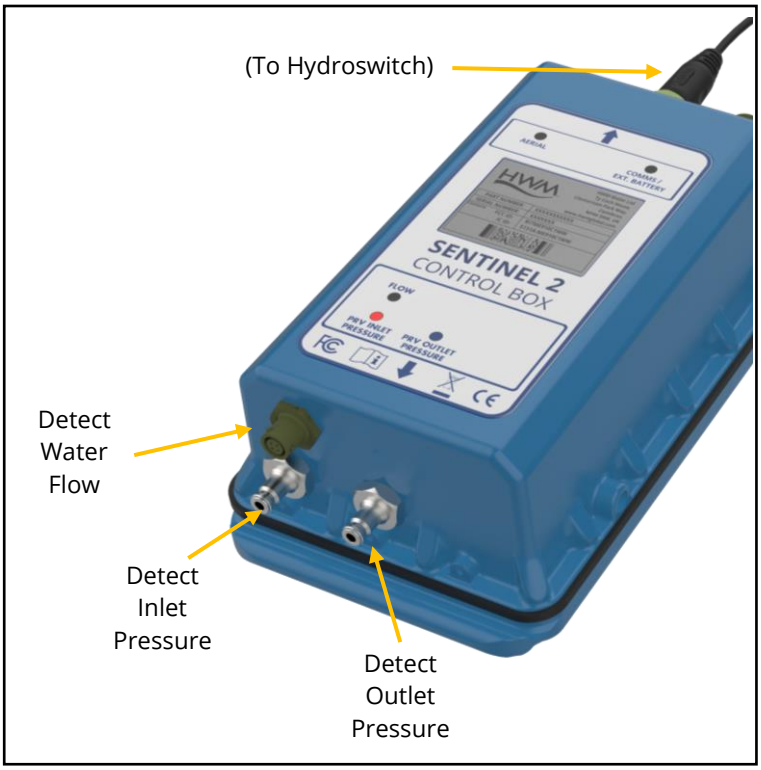
A Sentinel2 control box is shown opposite.

The unit has an interface for connection to the Hydroswitch unit.

The unit has an electrical connection to an Antenna (not shown).

The unit receives water flow information from a flow meter (not supplied) via a MIL-spec connector labelled “Flow”.

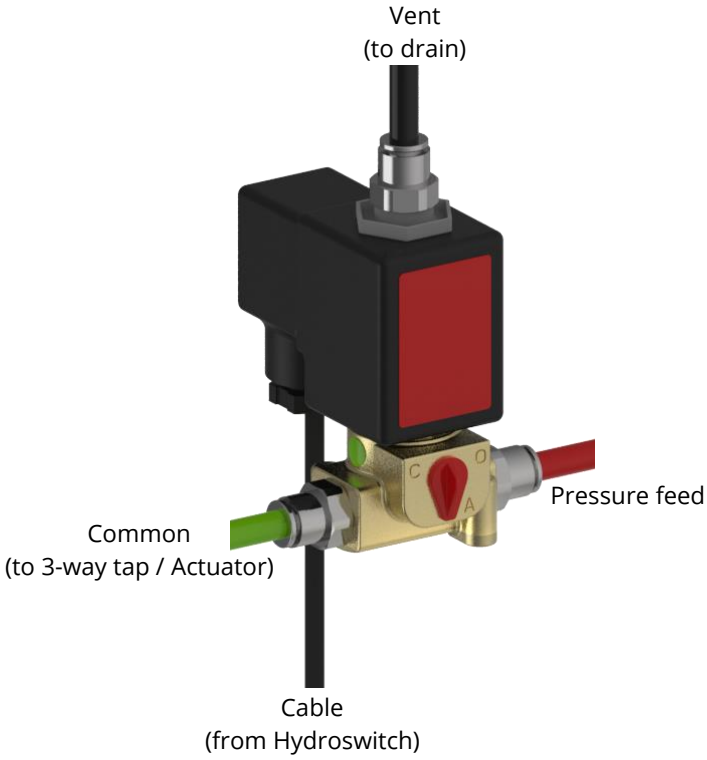
The unit receives upstream water pressure information via the connection labelled “PRV Inlet Pressure”. This could be either via a plumbed-in connection to the water (for a unit which has internal pressure transducers) or via a MIL-spec connector (for installations where external pressure transducers are being used).



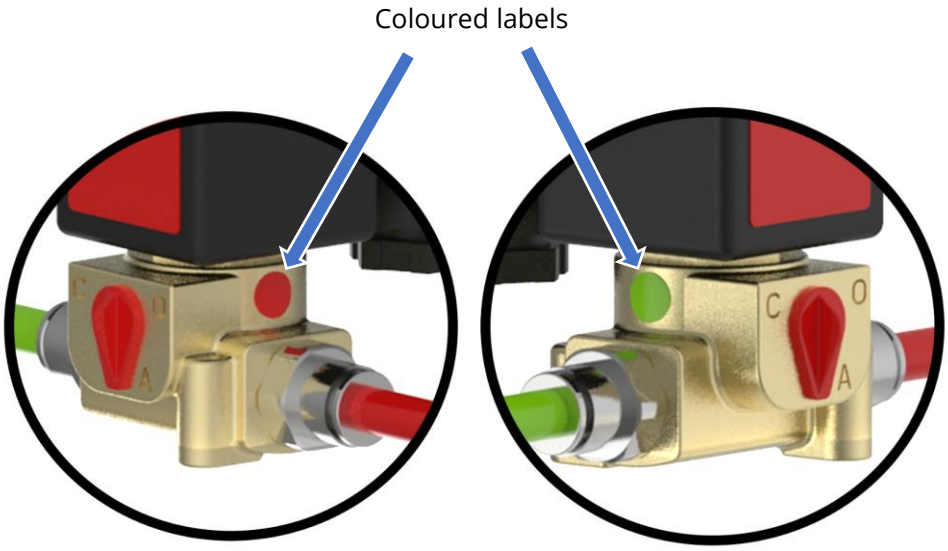
The unit receives downstream water pressure information via the connection labelled “PRV Outlet Pressure”. This could be either a plumbed-in connection to the water (for a unit which has an internal pressure transducer) or via an MIL-spec connector (where external pressure transducers are used).

Hydroswitch Valve

The Hydroswitch valve is a 3-way solenoid valve controlled by the output from the Hydroswitch. It is used to drive the HWM mechanical actuator.

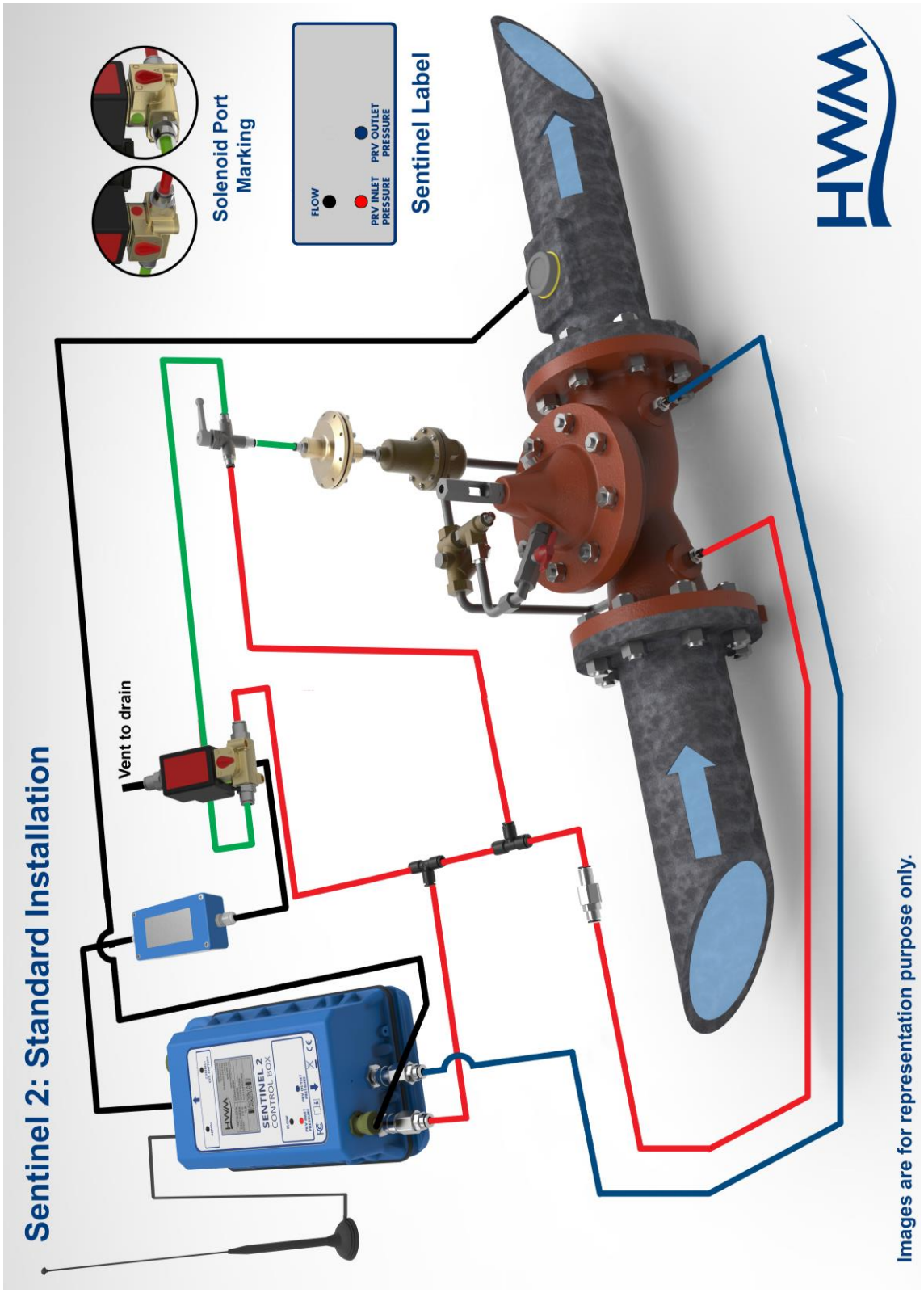


The Hydroswitch valve body is labelled (red and green dots) to assist in identifying the ports during installation.

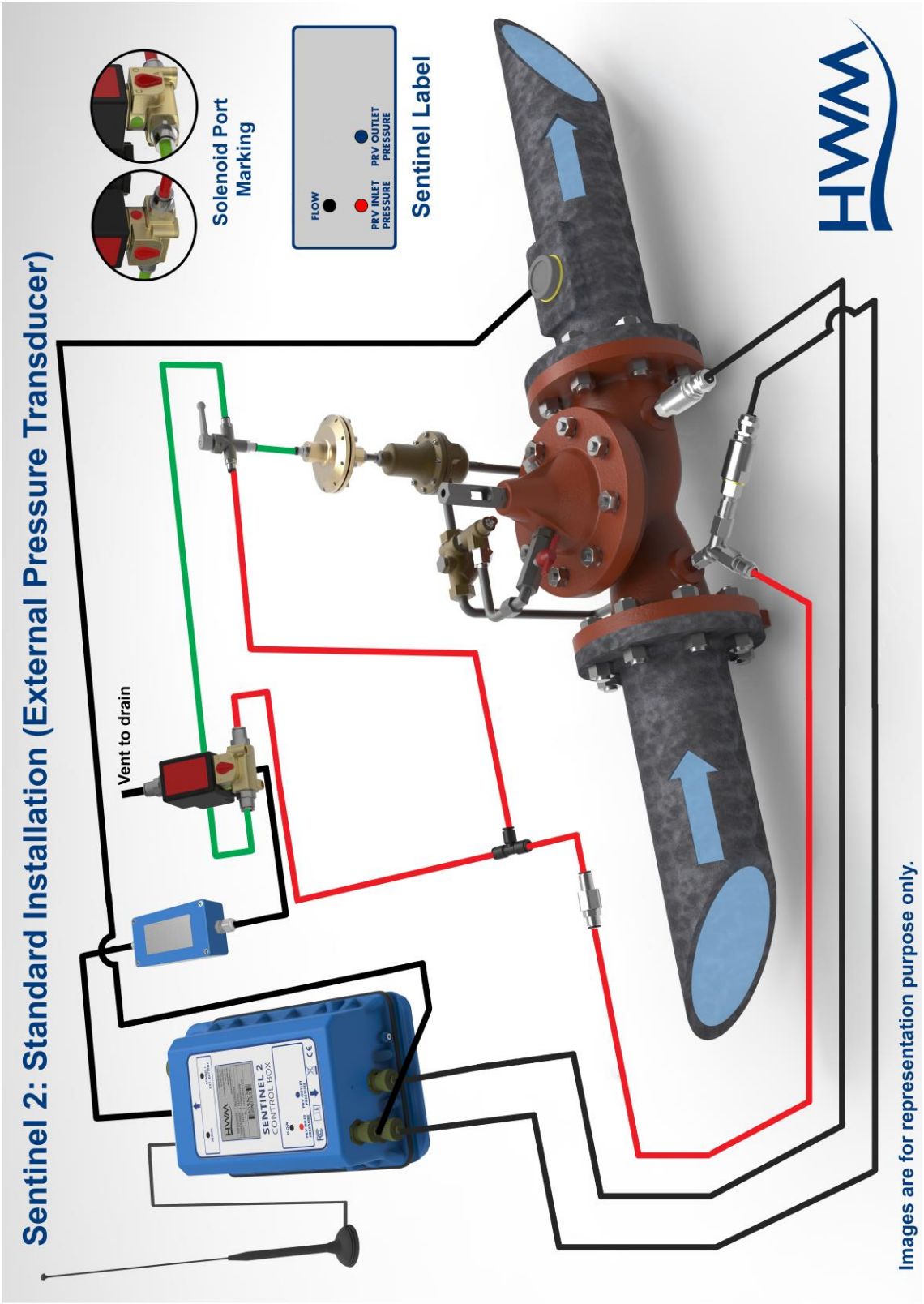


3.2 STANDARD INSTALLATIONS: 2-POINT PRESSURE CONTROL

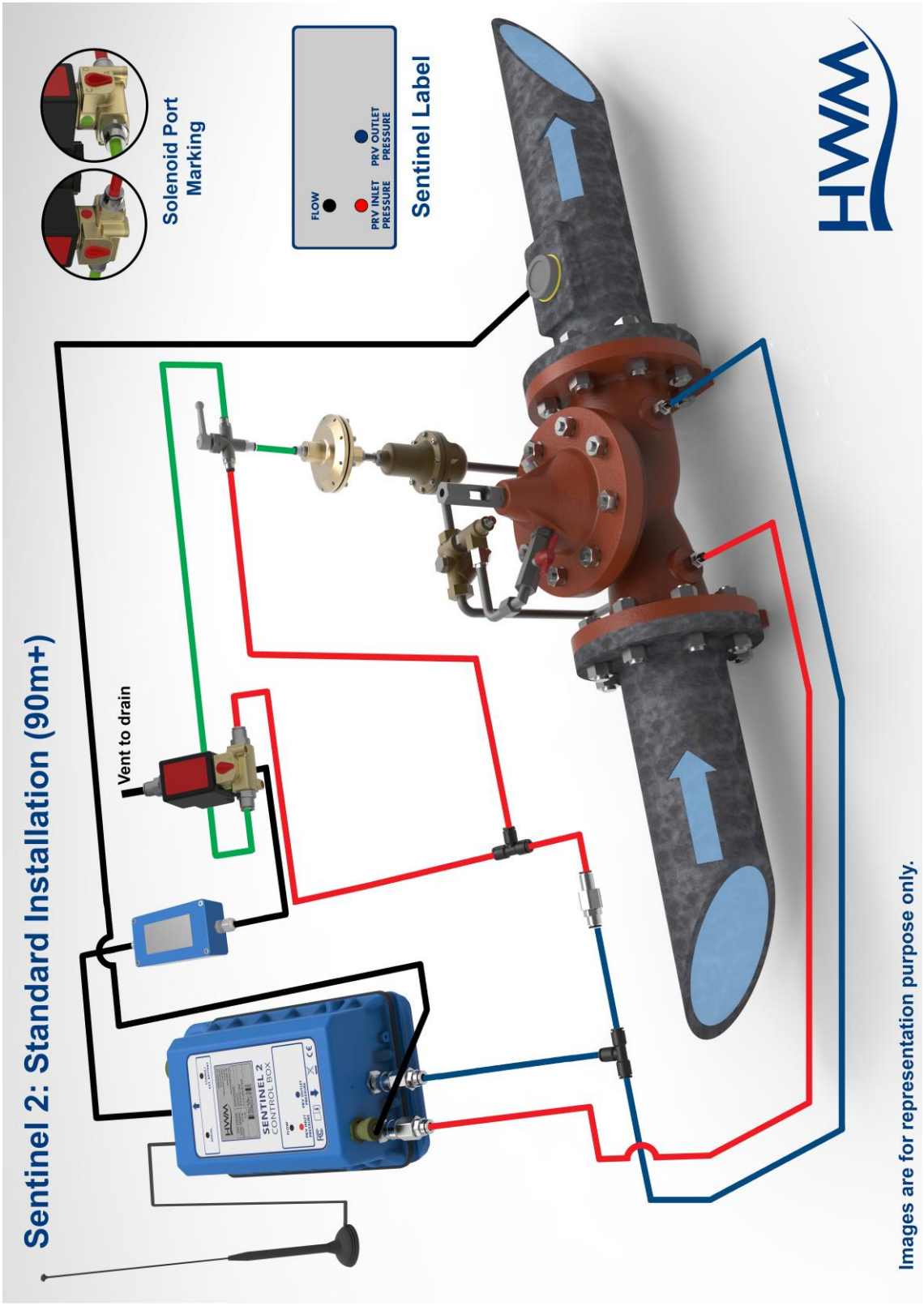
3.2.1 Using: internal transducers (Upstream pressure < 90 m)



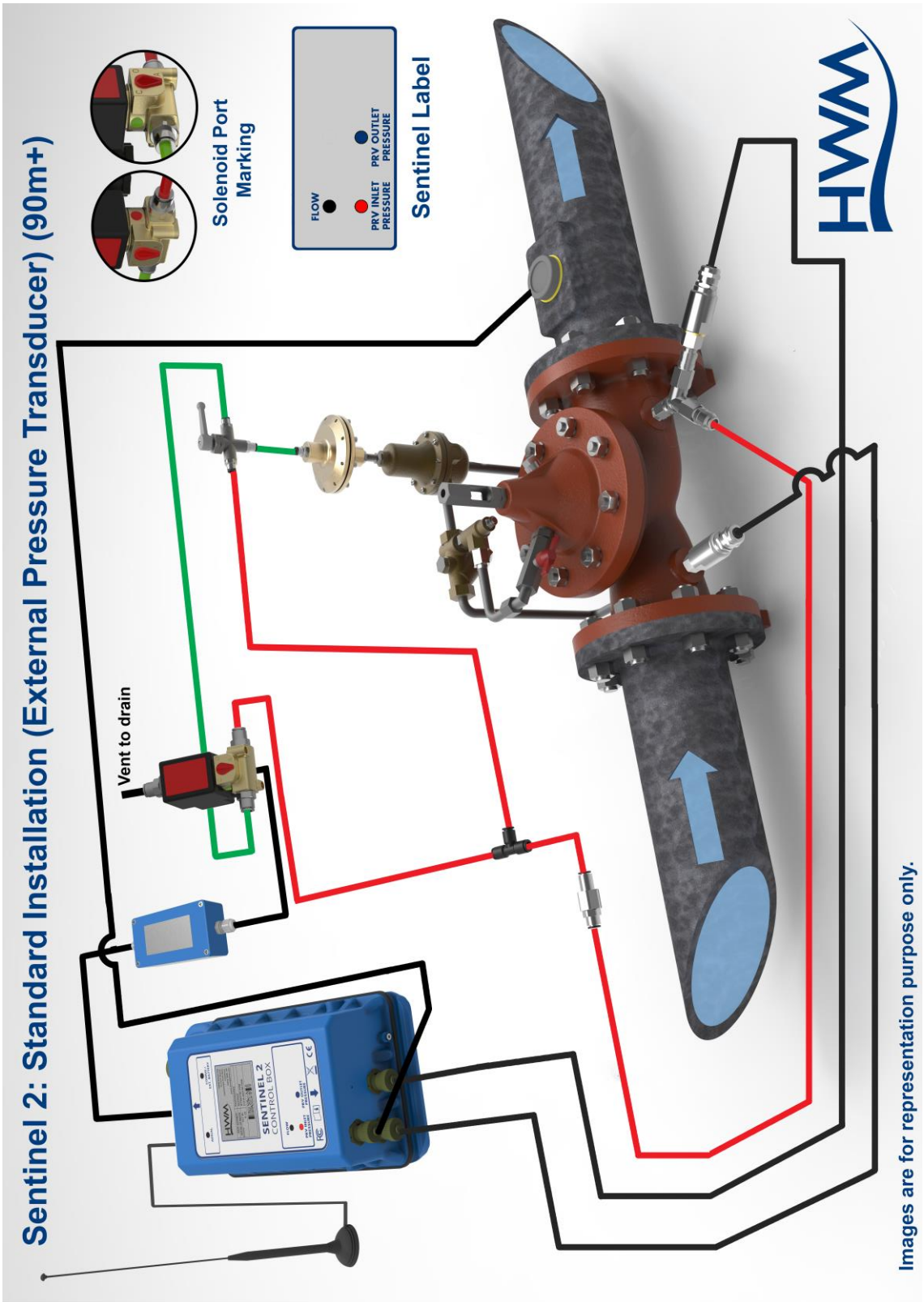
3.2.2 Using: external pressure transducers (Upstream pressure < 90 m)



3.2.3 Using: internal transducers (Upstream pressure > 90 m)



3.2.4 Using: external pressure transducers (Upstream pressure > 90 m)

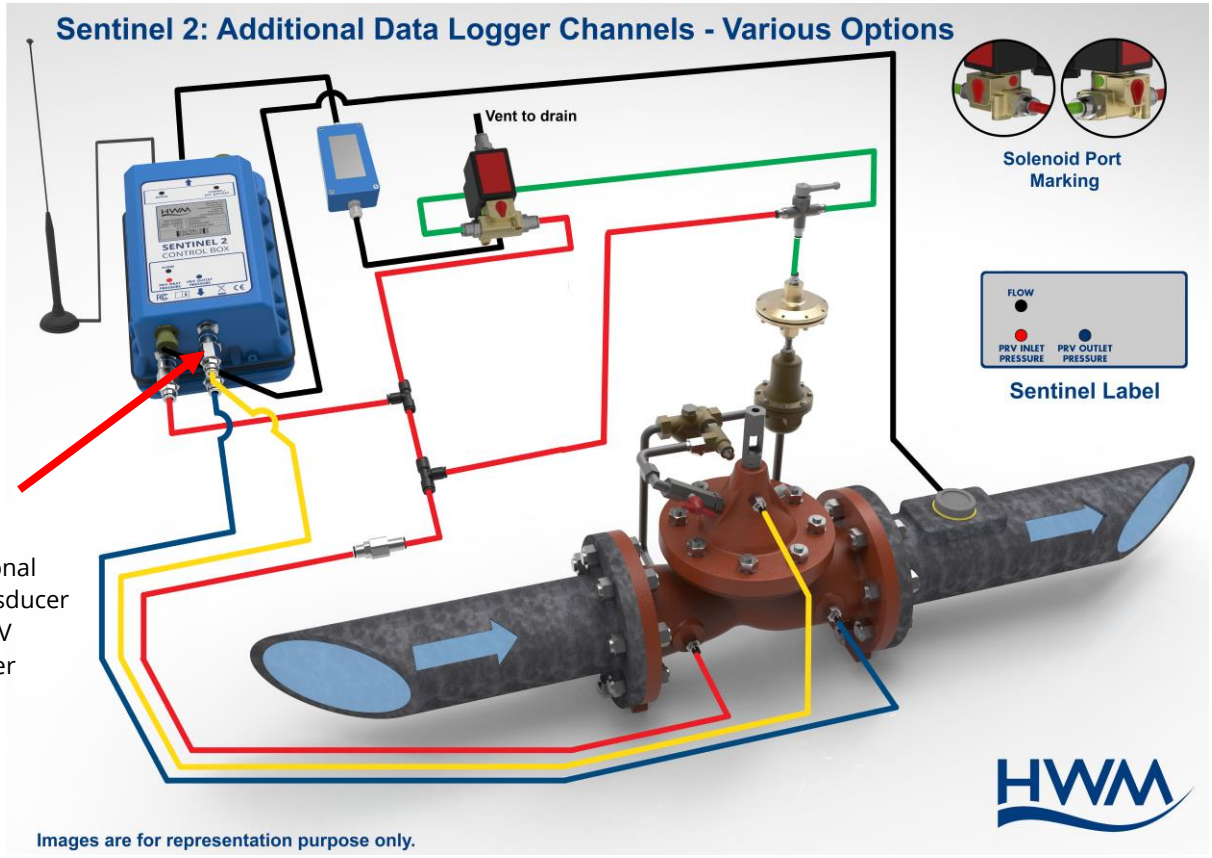


3.3 (Other Installation Options)

3.3.1 Models with additional Data Logging interfaces

Sentinel2 includes data-logger functions. Spaces are available to install additional interfaces for data-logging. These must be fitted and enabled at the time of manufacture. Select the appropriate model part-number; 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.



Additional Interfaces can be installed in Sentinel2.
e.g. An additional pressure transducer to monitor PRV upper chamber pressure.

4 INSTALLATION PROCEDURE

WARNING: This equipment should be installed, adjusted, and serviced by qualified water industry maintenance personnel familiar with the construction and operation of the equipment and the hazards involved. Failure to observe this precaution could result in damage to the water network.

The installer should 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 Sentinel2 and Hydroswitch operation, and program a Sentinel2).

Summary of system selection and Installation:

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

- Choose a suitable Sentinel2 unit (i.e., model number) for the PRV being controlled and any additional parameters that are required to be logged.
    - The interface for Flow measurements must be compatible with the flow meter. This is a required input for Flow-based pressure control.
    - Pressure measurement transducers must be suitable for the pressure range of the PRV upstream and downstream pressures.
    - To log additional parameters, select a model with the required interfaces.
- 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. Pay attention to the plumbing differences required if the upstream water pressure exceeds 90m.
- 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 Sentinel.
    - Read the current configuration.
    - Test the Hydroswitch prior to plumbing it into the PRV control.
    - Make any changes required to the on-screen settings.
    - Program the Sentinel2 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 Sentinel system into the PRV. Connect any transducers.
- Activate the Sentinel to begin logging measurements and controlling the PRV.
- Adjust the needle valve as required for gradual water pressure changes when switching between high and low pressures.
- Bleed and test the operation of the system.
- Test communication with the central computer is OK (i.e., a call-in test).

4.1 Position Control box and Hydroswitch / Connect.

The Sentinel2 Control Box can be secured to a wall using an optional bracket, shown opposite.

Ensure the wall and fixings used are able to bear the weight of the Sentinel2 and any cables.

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

4.1.1 Antenna

The bracket offers just one potential mounting location for the antenna, as shown.

The antenna will be connected to the connector labelled “Aerial”. However, choice of a suitable antenna, preparation for use, and the process of finding an optimal location for the antenna within the installation is a topic in its own right. (See section 4.21 for details).

4.1.2 Battery

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.

4.1.3 Hydroswitch

Connect the Hydroswitch to the Sentinel Control box. (Refer to section 2.8)

4.2 CONNECTION TO THE FLOW METER

Connection to the flow meter is required for any Sentinel2 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.

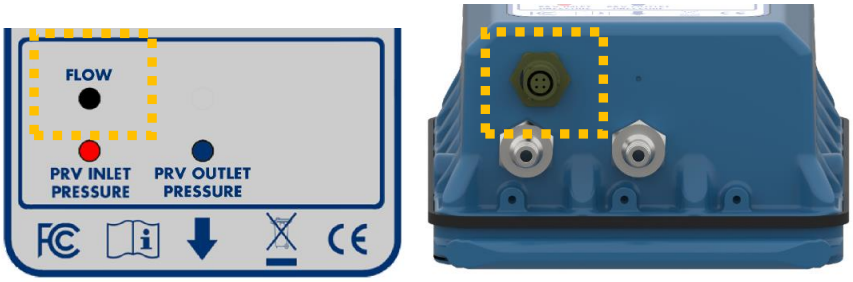
The water flow can be detected by a flow meter near the PRV. The Flow information is transferred to Sentinel2 by means of an electrical interface in the Control Box.

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 measurement interface option for logging purposes only.

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

Then connect the cable to the Control box via the 4-pin connector labelled “Flow”.



Note: Once the flow meter input has been set up using IDT, the flow rate can be tested using the same screen as used for testing pressure sensors (see section 4.14).

4.3 CONNECT EXTERNAL PRESSURE TRANSDUCERS TO SENTINEL 2

Where the Sentinel2 is supplied with external pressure transducers, these must be connected to the relevant MIL-spec connector 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 Sentinel2 MIL-spec connector:

- 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 SENTINEL2 CHANNEL SETTINGS

For Sentinel2 to operate, any input channels must be set up, along with any calibration data and also various other settings. These inform the unit of what type of transducers are attached and how to interpret numeric readings into accurate physical measurements (pressure and water flow).

Sentinel2 channels (where used) must always be set to the following units of measure:

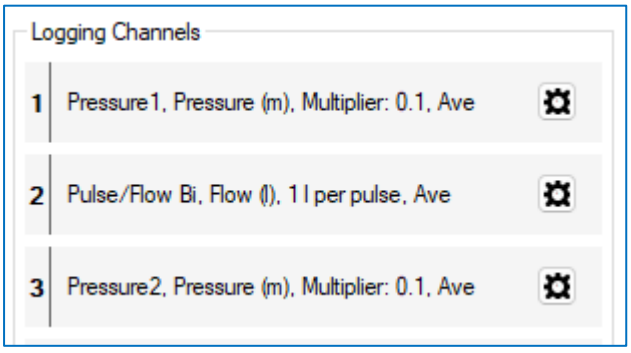
- Pressure: metres … although inputs work in raw units of decimetres (1/10 m).
- Flow: litres per second.

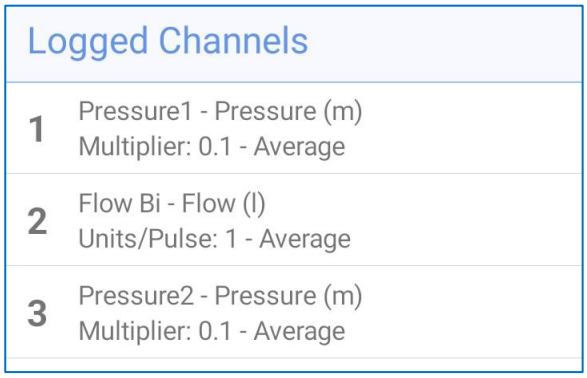
For Sentinel2 to operate correctly, (including use with the DataGate and PressView websites), the unit must always be set up with data presented to the built-in logger using the following channels:

- Channel 1: PRV inlet pressure (upstream pressure).
  Sentinel2 uses the "Pressure 1" type of interface for this connector.
- Channel 2: Flow.
  Sentinel2 uses one of a set of interface types for this connector.
  Each interface expects a voltage-free pulse output from the Flow meter.
  - Flow Uni (for a Unidirectional Flow meter)
  - Flow Bi (for a Bidirectional Flow meter)

  The unit counts meter pulses (fluid consumed) over a logged period (time) and converts the values into a "litres per second" measurement.
- Channel 3: PRV outlet pressure (downstream pressure).
  Sentinel2 uses the "Pressure 2" type of interface for this connector.

The diagrams below show a summary of channel settings required on Sentinel2.
The transducers are shown as inputs to a data-recorder which has several channels of recording memory. (They are arranged by IDT as a set of "logging channels").





i.e., Channel 1

- Must use the Pressure1 interface.
- It must interpret the numeric data as Pressure.
- The recording unit must be set to 'm'.
- The input multiplier must be set to 0.1 for internal pressure transducers.
  (Calibration factors are applied in production such that each digit change represents a decimetre (1/10m) of water pressure change.
  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)).
- Offset is set to 0.

Channel 2
- Must use the Flow Bi interface or the Flow-Uni interface; These may be shown as Pulse/Flow-Bi or Pulse/Flow-Uni on IDT.
- It must interpret the numeric data as Flow.
- The recording unit must be set to ' l ' (i.e., litres).
- The Units per Pulse must use the appropriate meter factor to convert to the site's meter pulses to litres.
  e.g. (1) If 1 pulse represents 10 litres, "Units per pulse" should be set to "10".
  (2) If 1 pulse represents 1 UK gallon, "Units per pulse" should be set to "4.54"; (This is the number of litres per 1 UK gallon).

Channel 3
- Must use the Pressure 2 interface.
- (All other settings must be set in a similar manner to Channel 1).

The "Logging Mode" of all channels should be set at "average" for Sentinel2; this will smooth-out any noise (short fluctuations) in the readings and give a representative value of pressure.

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.

The steps required for setup (or checking) of each of the logged channels is similar in nature to certain HWM loggers (e.g., Multilog2) and are described in the IDT user-guide; **Refer to the user-guide appropriate to the version of IDT you are using** for details (see section 1.6).

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

Ensure the channel settings are stored when finished.

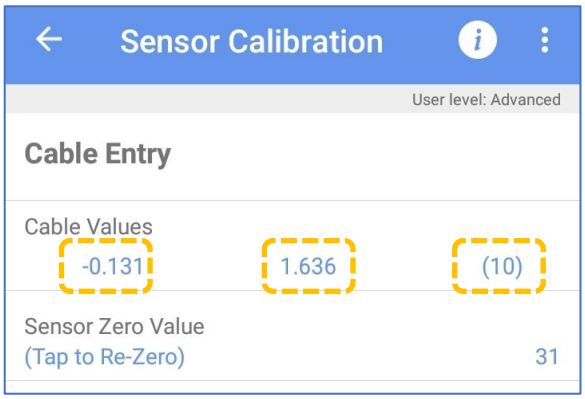
External Pressure Transducers – Entering Calibration coefficients

External pressure transducers from HWM have calibration coefficients (usually located on the cable).

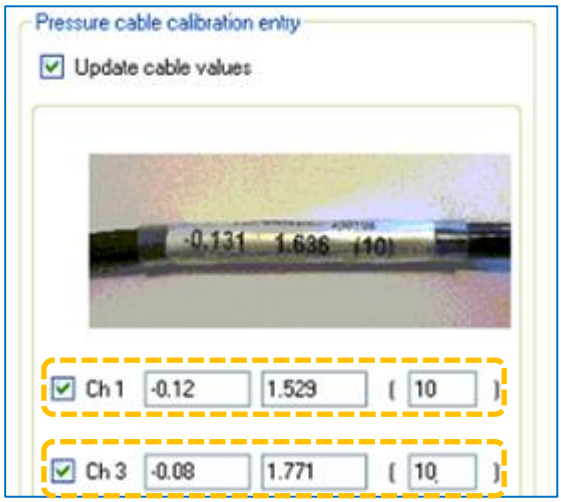
Note: The final number represents the *maximum pressure range* of the transducer, in bar.

The coefficients must be entered into IDT in order for Sentinel2 to use the pressure transducers correctly and obtain accurate measurements.

Enter the values, as per the examples shown below (including any negative symbols).



Note: Only one channel shown (above); repeat entry process for additional channel(s)



(Refer to the IDT user-guide for the required steps to do this).

At this stage, it is important that the channel settings stored in the PC memory should be written into the Sentinel2, and the device restarted (Use the Setup Device) button in IDT (PC version); the IDT app will automatically save and restart at the appropriate time). (The unit will now operate with the channels as set earlier).

4.5 Re-zero Pressure transducers

The transducers **(internal or external)** must now both be re-zeroed whilst in **atmospheric pressure.** (Refer to the IDT user-guide for the required steps to do this).

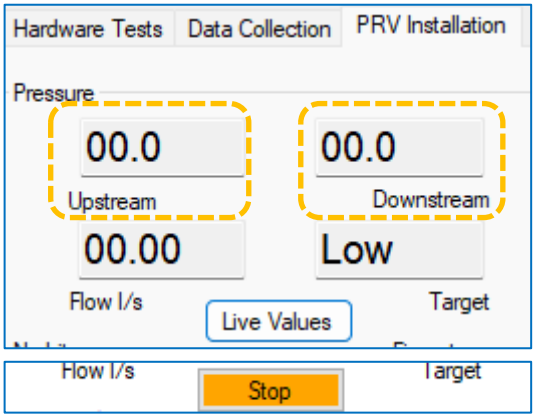
Note: During this operation, the sensors must be electrically connected, but **must not be connected to water pressure**.

To verify the transducers are re-zeroed, whilst still in atmospheric conditions:

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.

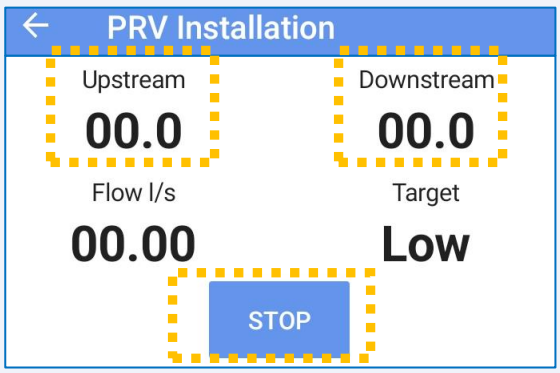
… Click the "Stop" button to end the verification.



IDT App users:

For – Check of Live Values of a pressure transducer
Equivalent controls are located as follows:
(main) → Test Device → PRV Installation.

Tap the Live Values / Stop button to start and end the display of live Pressure and Flow values.



4.6 PREPARE THE PIPEWORK FOR THE SENTINEL 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. The standard ACT002/STD kit is 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).

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

4.7 PREPARE THE PRV FOR SENTINEL WATER FEED / PRESSURE TRANSDUCERS

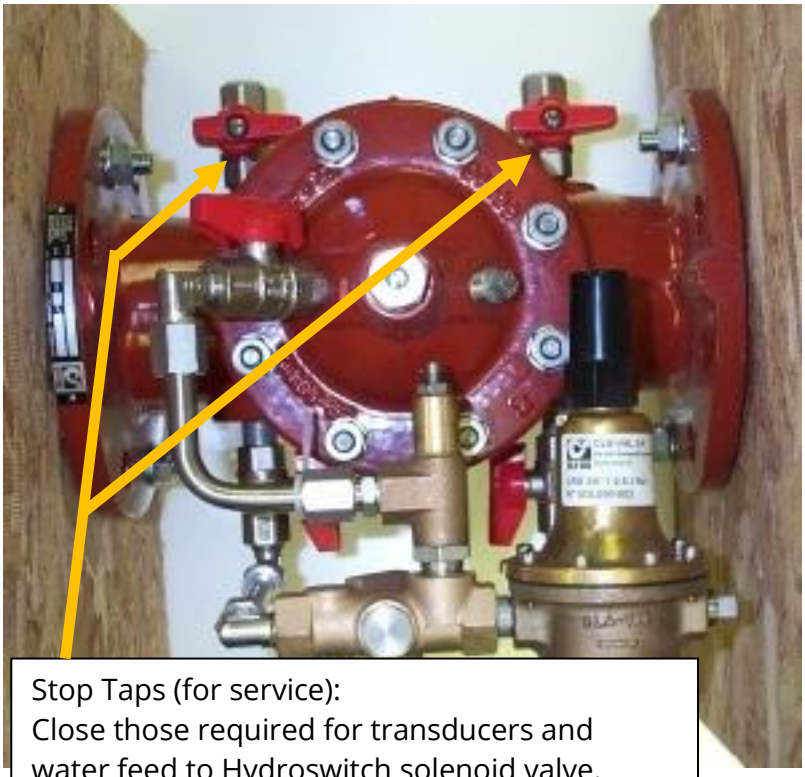
The PRV valve should be fitted with service taps that allow maintenance whilst the PRV is in operation.

An example is shown opposite.

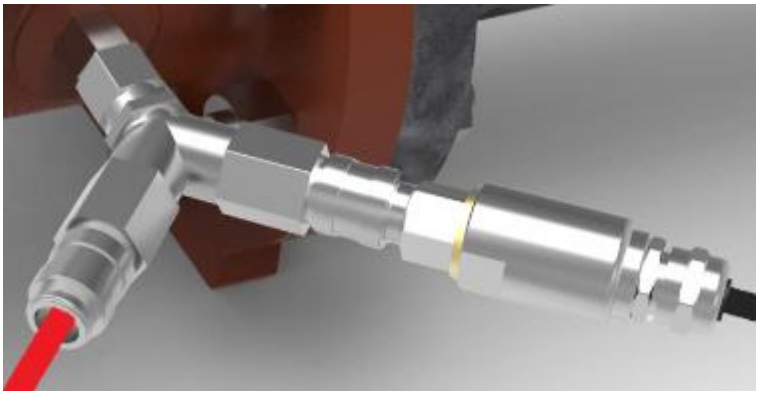
Choose locations to be used for attaching any Sentinel pressure transducers and also the water feed to the Hydroswitch inlet port.

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 Sentinel2 at a later stage.



Stop Taps (for service):
Close those required for transducers and water feed to Hydroswitch solenoid valve.



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

4.8 CONNECT SENTINEL SIDE PIPEWORK

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.

Pipes can be connected to the adaptors 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).

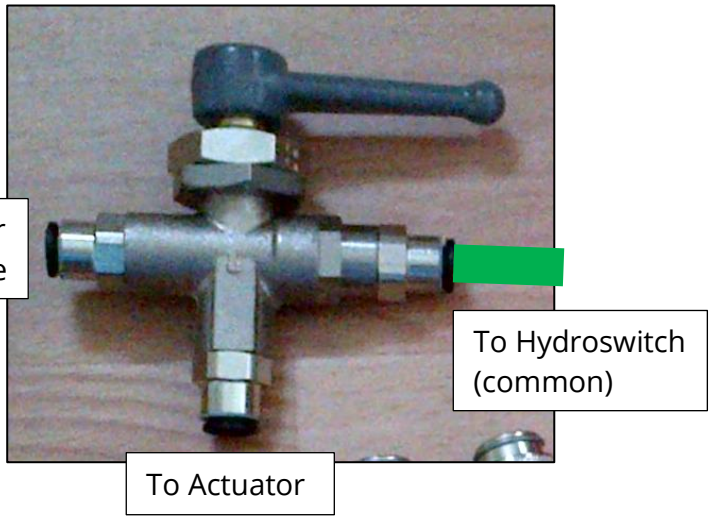
Fit the adaptors to the end of the pipes (as required) and attach to the Control box.

Fit any T or Y adaptors that may be required.

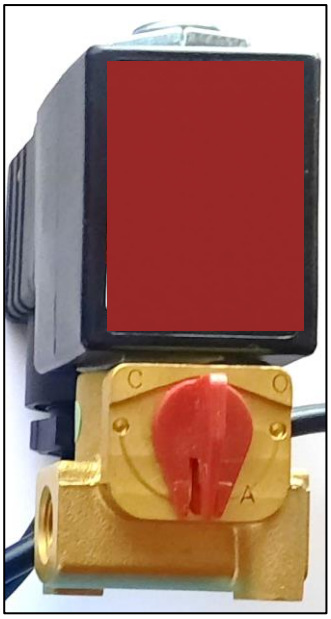
Attach all 3 the pipe ends to the manual 3-port valve.

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

Make sure the 3-way handle is pointing to the green control pipe (shown).



Fit adaptors as required to the 3-way valve of Hydroswitch.

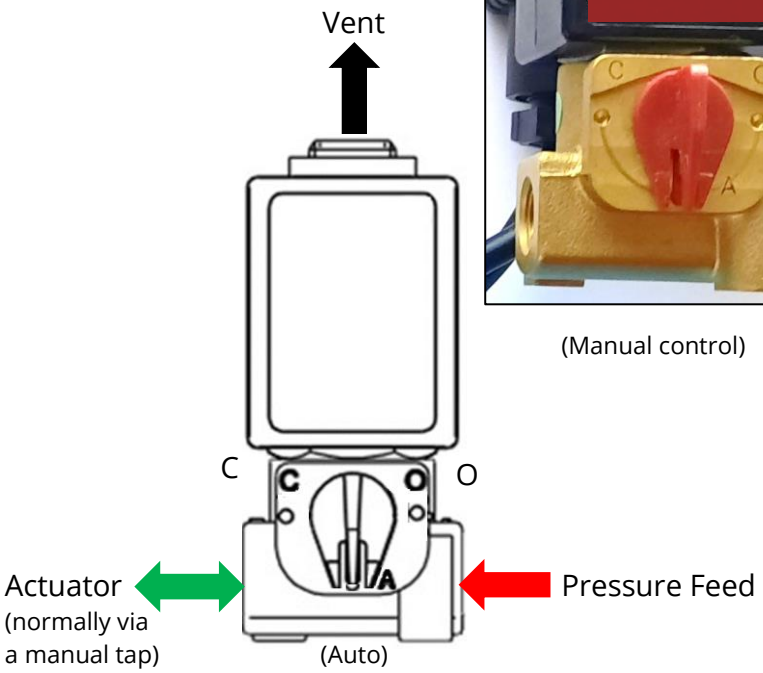


(Manual control)

Attach water pressure hose to the port shown as “Pressure Feed” in the diagram opposite.

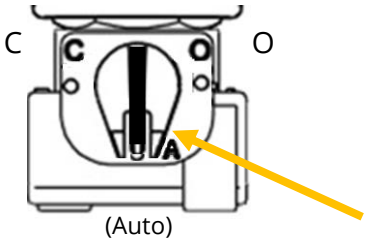
Attach a water hose to the port shown as “Vent” in the diagram opposite, and route to a suitable drainage point.

Attach the water hose from the 3-way manual valve to the port shown as “Actuator (normally via a manual tap)” in the diagram opposite.



4.9 SET HYDROSWITCH VALVE INTO AUTO MODE

A manual override control is on the Hydroswitch valve.



Set manual control to “A” (Auto).
(Required for normal operation).

To change from "O" to "A", the manual override must be turned from "O" to "C" and then to "A" : " O → C → A".

4.10 CONNECT TRANSDUCERS AND CONTROL PIPEWORK ON PRV SIDE

Before proceeding, confirm that any 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.

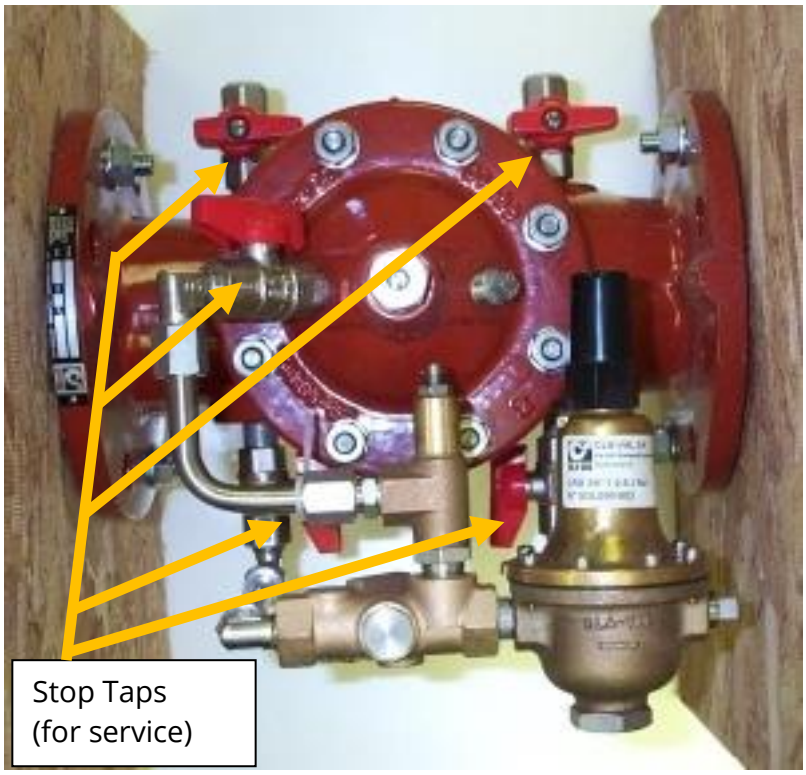
If not already attached, connect the water feed to the Hydroswitch.
The water feed should come from the inlet side of the PRV if the pressure is below 90m; otherwise, the water feed should come from the outlet side of the PRV (which has a reduced pressure).

Caution: Move the manual 3-way valve into the middle position (all ports are sealed). Do not attempt to pressurise or bleed the connected plumbing at this stage or high pressure water could be released from open pipe-ends.

4.11 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.

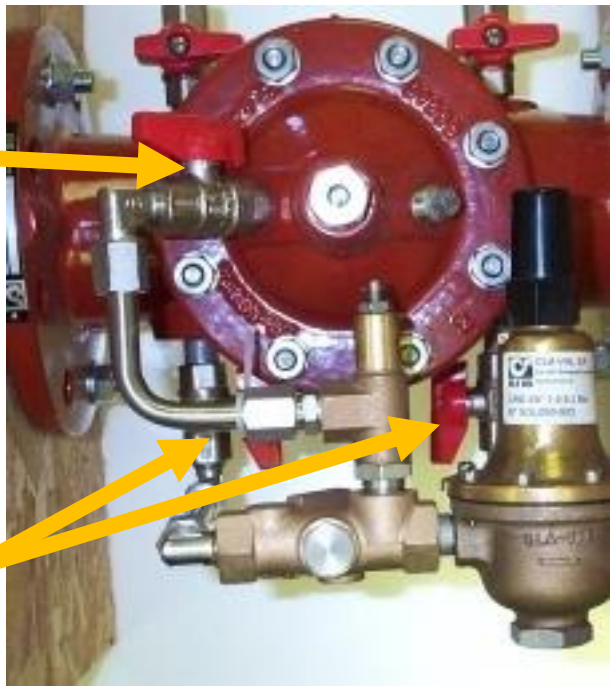
It also assumes that the PRV is fitted with service stop-taps at the relevant ports on the valve, allowing the components surrounding the main valve to be serviced.



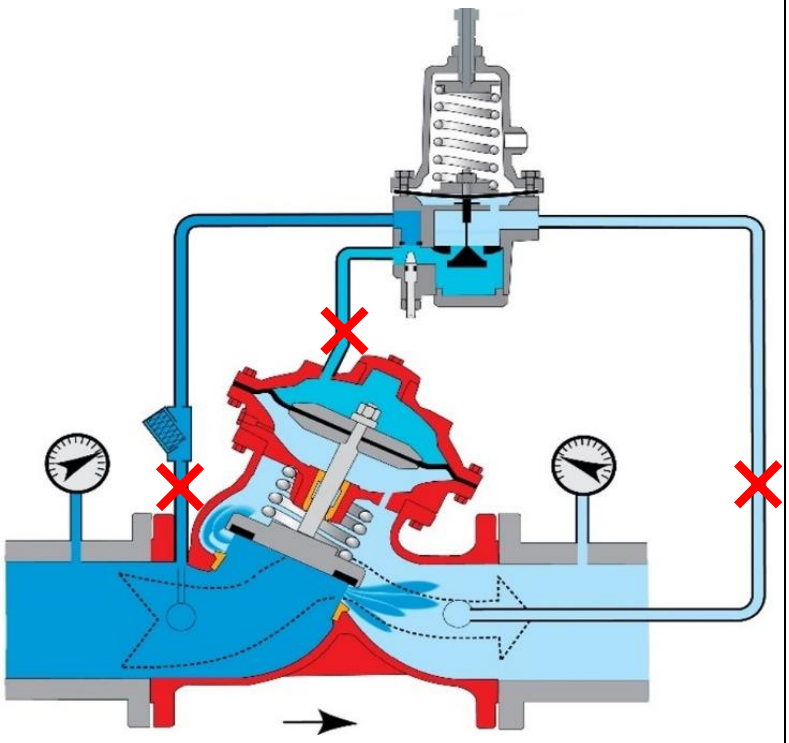
Ensure that the PRV is working properly before proceeding.

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

If your PRV has taps on the pipe rail, 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 remains constant; its diaphragm is locked in position.



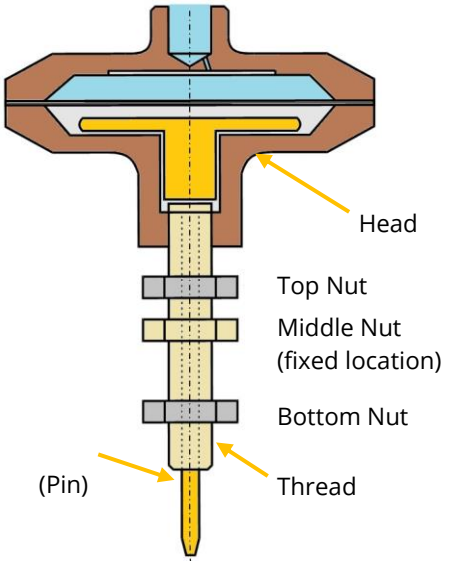
Note: The upper chamber of the PRV valve is now locked in position.
The output pressure is not regulated, and any variations in inlet pressure will affect the output pressure



4.12 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).



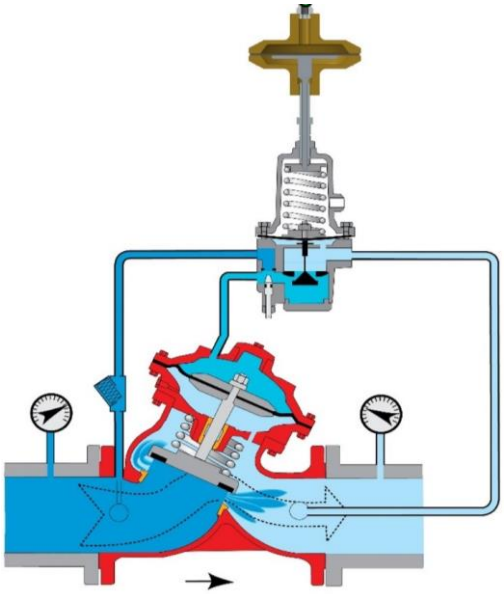
Screw the actuator thread into the actuator head until it is finger tight. (Use the middle nut).
This moves the plunger to the top of the inside of the actuator upper chamber. The pin (lower part of the plunger) should now be fixed.

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 a pressure gauge on the PRV outlet side.

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, if closed).
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.

The adjustment should be made slowly to avoid damage that could be caused by sudden changes to the water network pressure. Make sure you allow time for the PRV to settle its pressure after adjustment.
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.

The adjustment should be made slowly to avoid damage that could be caused by sudden changes to the water network pressure. Make sure you allow time for the PRV to settle its pressure after adjustment.
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).

The Sentinel actuator is now installed.

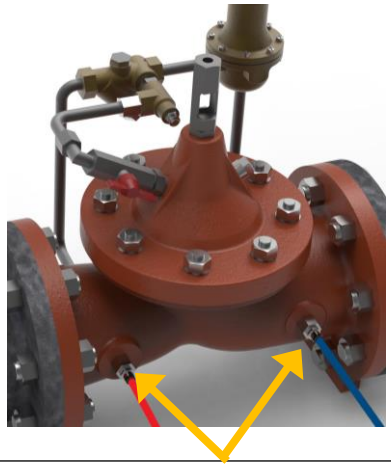
The current state of the system is that the actuator is holding the PRV pilot at the Minimum outlet pressure. The actuator chamber and Sentinel pipework are empty of water.

The 3-way tap is in the central (closed) position.

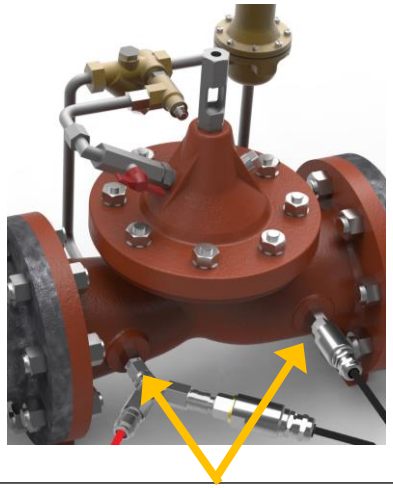
4.13 BLEED AIR FROM THE PIPEWORK AND ACTUATOR

Open the PRV service valve that provides the water supply to the Hydroswitch.

Open any additional PRV service valve that connects water pressure to any pressure transducers (internal or external).



Open service valve that provides Hydroswitch water feed and any that connect to internal transducers.



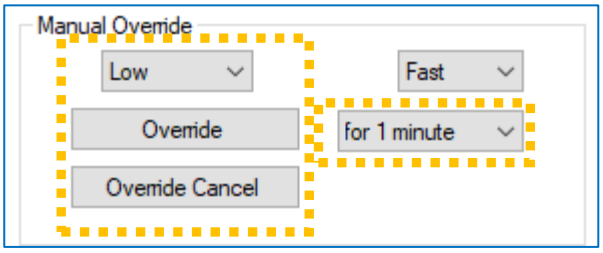
Open service valve that provides Hydroswitch water feed and any that connect to external transducers.

Where internal transducers are fitted, detach and then re-attach the pipes using the quick-release connectors at the Sentinel2 side (several times). This will allow air to escape from the pipes via the quick-release connector and be replaced by water.

Caution: Check the **needle valve** is set to limit the PRV pressure changes when the actuator switches between low and high.

Set the Sentinel to Override to a target pressure of Low for a suitably long duration (e.g. 30 mins). This will open the path between the 3-way tap and vent.

(The Fast / Slow control has no effect on Sentinel2 operation)



Change the position of the 3-way tap, allowing water to enter the red pipe from the PRV service valve. Air and water should escape into the actuator and its pipework. Move the tap to face the green pipe to allow water to escape towards the vent pipe. Repeat as necessary to bleed most of the air from the actuator.

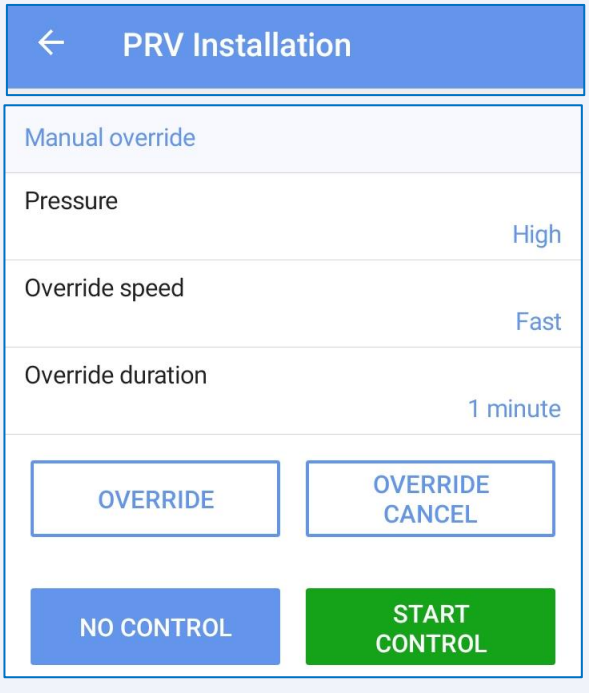
Finally leave the tap in a position which connects the solenoid valve pipe through to the actuator.

Use the Manual Override controls (shown above) to bleed air out of the pipework. This can be achieved by cycling between a target pressure of High and Low (several times) to allow air to bleed from the pipework.

IDT App users:

For – Manual Override set of controls
Equivalent controls are located as follows:
(main) → Test Device → PRV Installation.

(The 'Override speed' control has no effect on Sentinel2 operation)



4.14 Test Pressure transducers

If pressure transducers are fitted, select the PRV Installation tab of IDT.

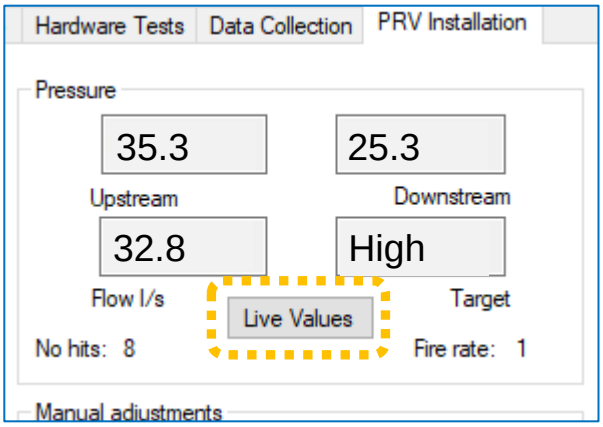
Click on the “Live Values” button.

The display will show readings for any fitted transducers. E.g.:

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

Confirm the values are as expected.

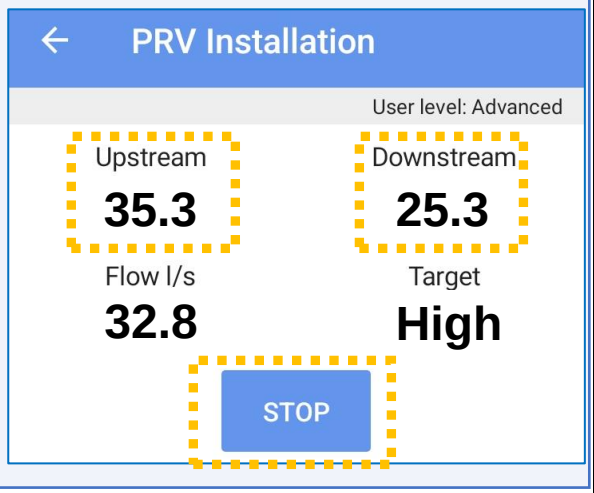
Click the button once more to stop displaying the readings.



IDT App users:

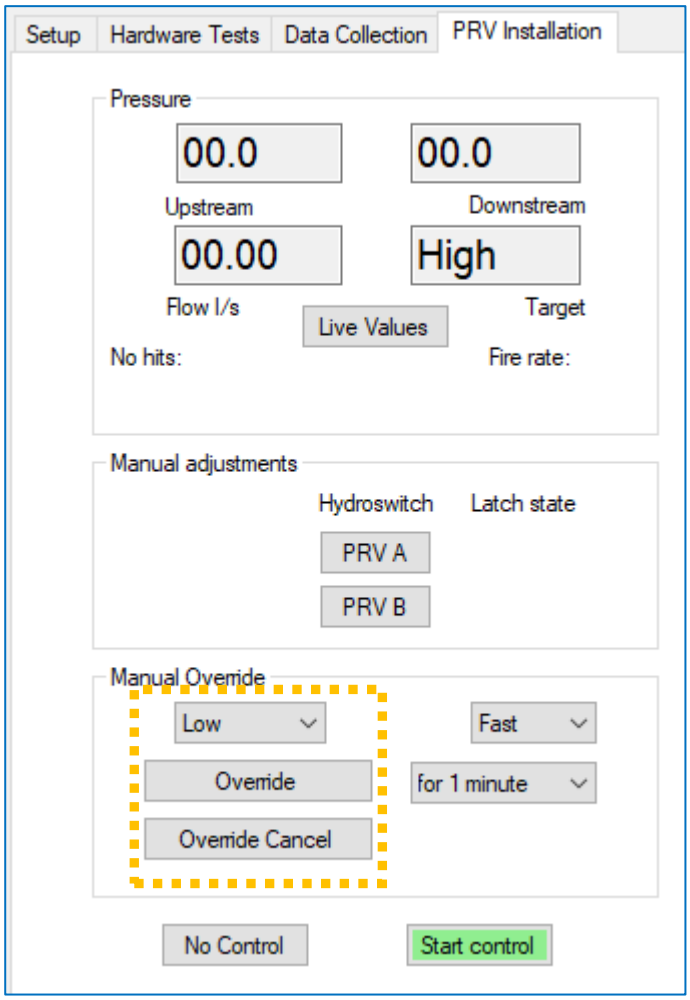
For – Check of Live Values of a pressure transducer
Equivalent controls are located as follows:
(main) → Test Device → PRV Installation.

Tap the Live Values / Stop button to start and end the display of live Pressure and Flow values.



4.15 Testing the Actuator and PRV Pressure change response

Ensure the PRV controller is activated. (Click on the Start Control button if it is not already green).



The PRV response to actuator changes should be tested by switching between Low and High pressures several times to ensure it is operating correctly and that the time the PRV takes to respond is suitable for the water network.

It is important that the pressure does not change too quickly to prevent damage to the PRV, pipe network, or downstream equipment and users (e.g., sudden water pressure surges and dips, water-hammer, or any other effects).

Adjust the needle valve within the pilot control to give the required response time and also ensure a smooth pressure transition when switching.

This can be achieved by setting a target pressure (High or Low) within the Manual Over-ride section, selecting the override time period for testing, and then clicking on the Override button. The system should gradually change to either the High or Low pressure settings and then stabilise.

The pressure can be verified using an external pressure meter or by using the Sentinel2 pressure transducers with IDT.

To use the Sentinel2 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).

IDT App users:

Equivalent controls are located as follows:
(main) → Test Device → PRV Installation.

(These controls have already been discussed; Refer to sections 4.13 and 4.14)

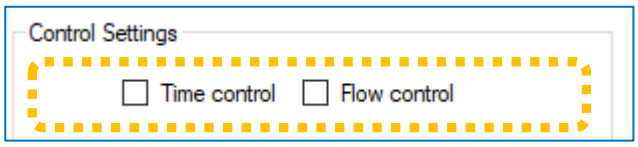
4.16 PRV Control Method and Settings

Sentinel2 provides 2-point pressure control; It is used to switch the output pressure for the PRV between either a High or Low pressure setting, with the needle valve of the pilot controlling the gradual downstream pressure changes between any transition in the target pressure.

The target pressure (either High and Low) is set in Sentinel2 using a pressure profile table, of which two types exist: **Time control** and **Flow control**.

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

The installer should enable one or both of the settings, as required.



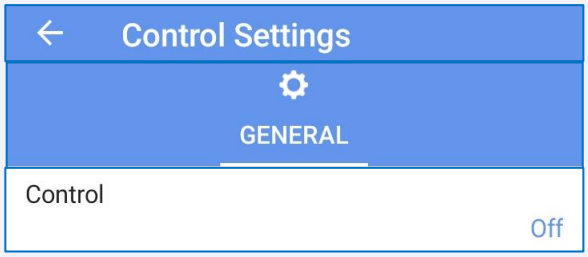
Note: If neither of the control settings are enabled the unit behaves as if PRV control is disabled; the PRV actuator setting remains fixed.

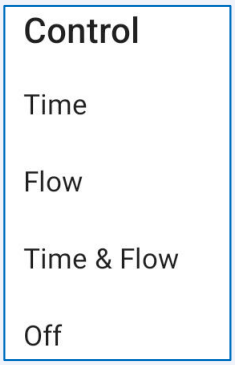
IDT App users:

Equivalent controls are located as follows:

(main) → Configure Device
→ Control Settings
→ General tab.

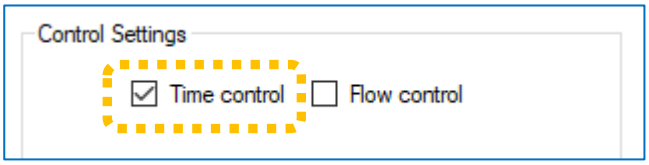
Tap the control line and make your required selection.





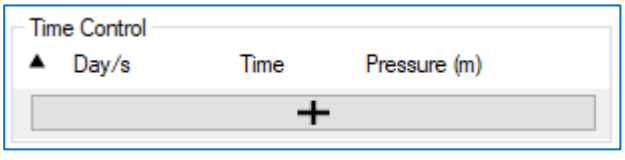
4.16.1 Setup of pressure control using a Time profile

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).



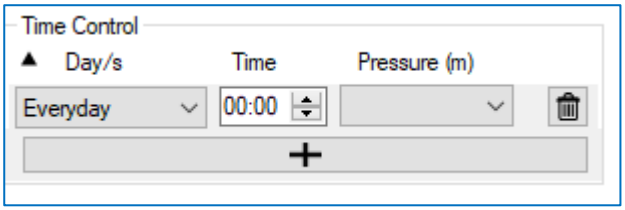
... A "Time Control" table will also appear.

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



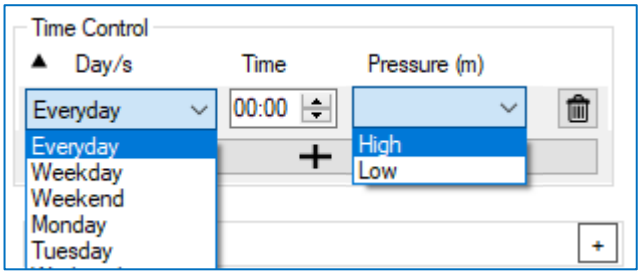
To enter a line into the table, click on the "+" button.

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



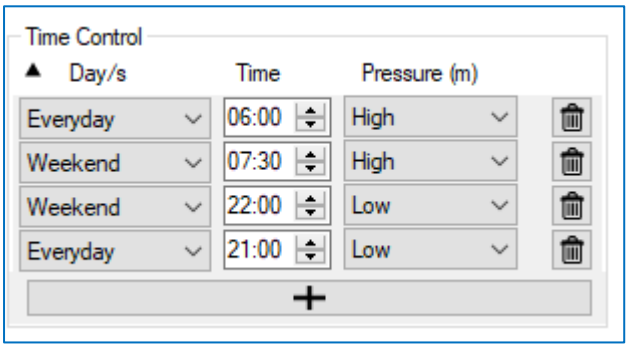
The Time Control pressure profile can be built as a table of choice of pressure setting (High or Low), and the changeover schedule.

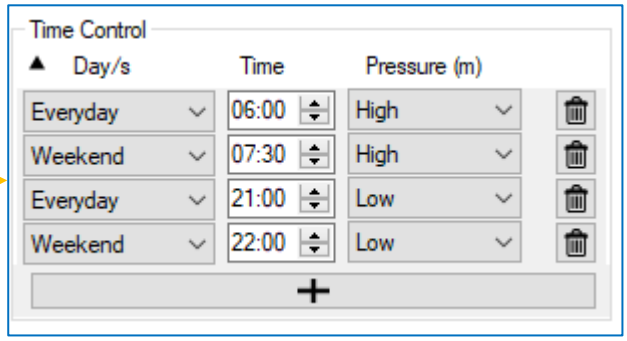
Each line requires selection of which day / set of days the setting will be relevant to and a start time. (Day selections can be mixed).



The Time Control profile of Sentinel2 causes a switch-over of the actuator to the new setting when reaching an entered time.

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.

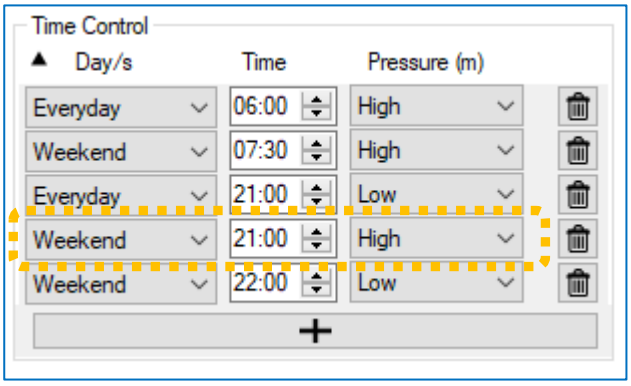




Confirm the settings match your expectations.
e.g. With the above settings, an additional line is required to ensure the weekend pressure remains High at 21:00.

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

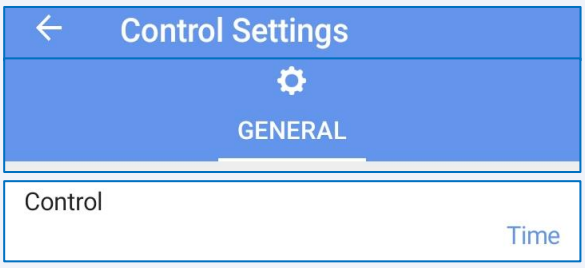
- "Saturday" will over-ride "Weekend" and "Everyday".
- "Weekend will over-ride "Everyday".

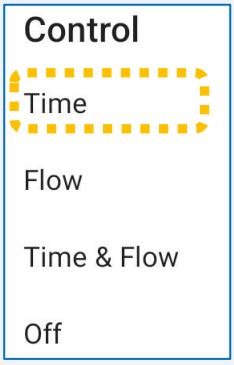


IDT App users:

Equivalent controls are located as follows:
(main) → Configure Device
→ Control Settings
→ General tab.

Tap on the control line and select 'Time'.



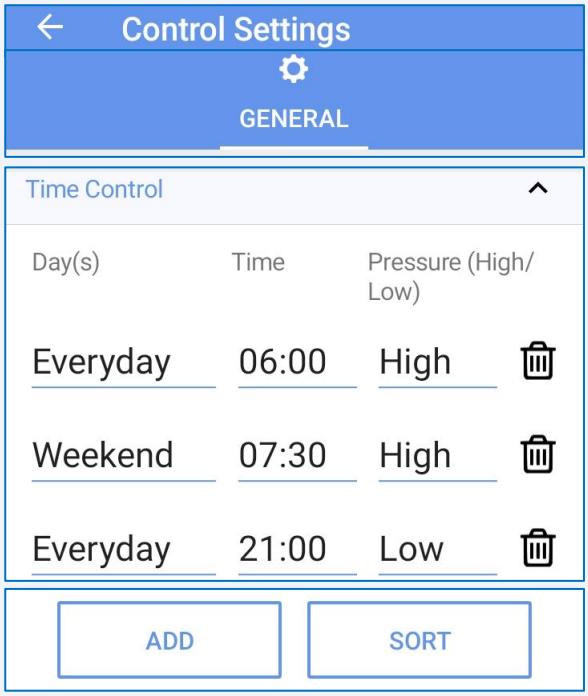


IDT App users: (Continued)

Tap the 'Time Control' line to reveal the settings, if hidden.

- Tap any field to edit the table.
- Tap 'ADD' to add a new line.
- Lines can be sorted by tapping on the 'Sort' button (ascending time).

Tap the Save button when finished.



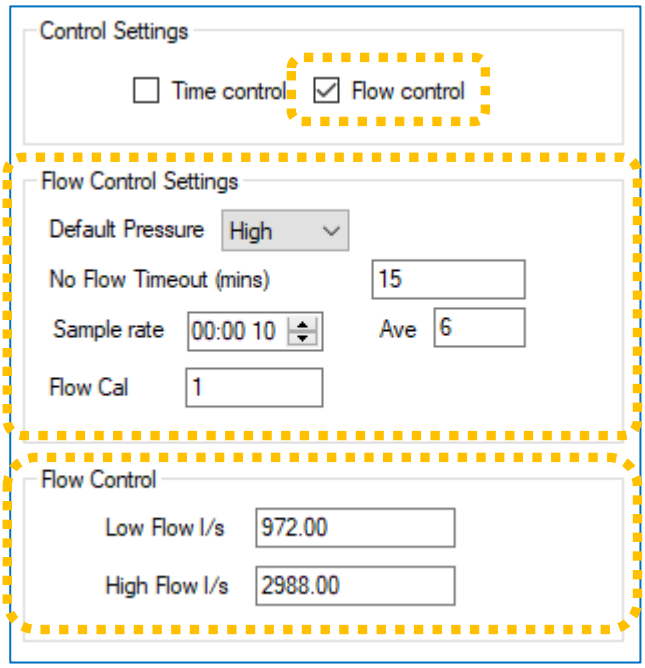
4.16.2 Setup of pressure control using a Flow profile

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

To use this feature, the Sentinel2 digital flow interface (meter pulse collection) is required to be connected to the meter-pulse output of a meter within the downstream side, close to the PRV.

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

... A "Flow Control" panel will also appear.

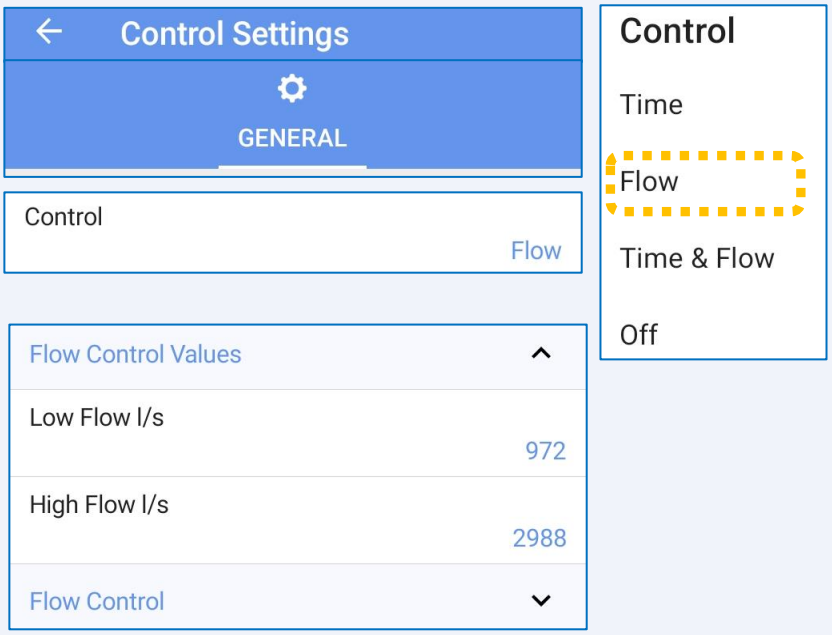


IDT App users:

Equivalent controls are located as follows:
(main) → Configure Device
→ Control Settings
→ General tab.

Tap on the control line and select 'Flow'.

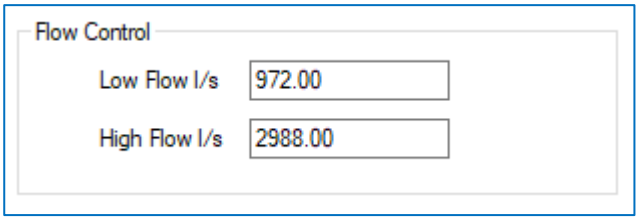
Once Flow is selected, additional controls become available.
(Tap the 'Flow Control Values' or 'Flow Control' line to reveal any hidden fields).



The general concept of Flow control is that Sentinel periodically makes an evaluation of the recent water demand to the downstream network and decides whether a High or Low pressure target is appropriate. It will then set the actuator to the required target pressure.

The "table" for 2-point flow control consists of just 2 values. These are the thresholds for making the switch:

- From High to Low pressure output ("Low Flow l/s" setting), and
- From Low to High pressure output ("High Flow l/s" setting)



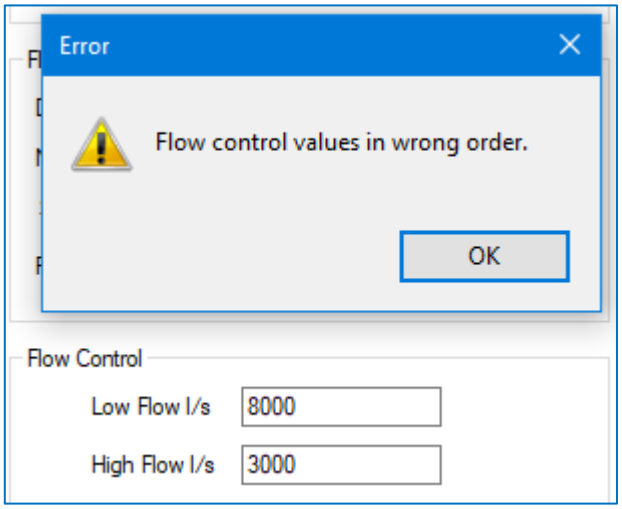
The most common use scenario for these settings is to reduce the PRV output pressure during times of low water demand, such as during the night. Conversely, the PRV should be switched to a higher output pressure when water demand increases, such as during the day.

There should be some strategy employed to prevent the PRV being driven into making chaotic (frequent) pressure changes:

- Make a careful consideration as to the difference that should exist between the Low and High thresholds, (this is commonly known as "hysteresis").
  Between the two thresholds there will be no change; crossing a threshold is required to initiate a change.
  If the Low Flow and High Flow settings are too close, frequent pressure changes could occur when the network flow is hovering around these values.

- Use the “Ave” setting (see below) to smooth out any over-reactiveness (increasing the value can delay any target pressure changes until water demand has consistently changed).

e.g. With the settings shown (above), pressure will be High when it increases past 2988 l/s and will change to Low when it falls below 972 l/s.



IDT will detect errors for certain situations, such as trying to program unworkable settings within the unit. (see opposite)

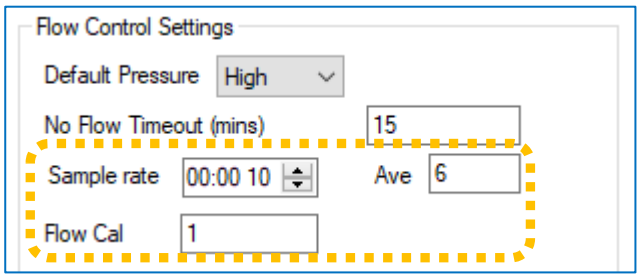
Note: The installer is responsible for choosing suitable values, based on both the network characteristics and the desired behaviour of the PRV.
(IDT does not give any warning if the installer has chosen inappropriate values for the characteristics of the network).

WARNING: This equipment should be installed, adjusted, and serviced by qualified water industry maintenance personnel familiar with the construction and operation of the equipment and the hazards involved. Failure to observe this precaution could result in damage to the water network.

IDT App users:

(See previous ‘IDT App users’ diagram for locating equivalent controls)

The lower part of the Flow Control Settings panel deal with data collection for making the evaluation.



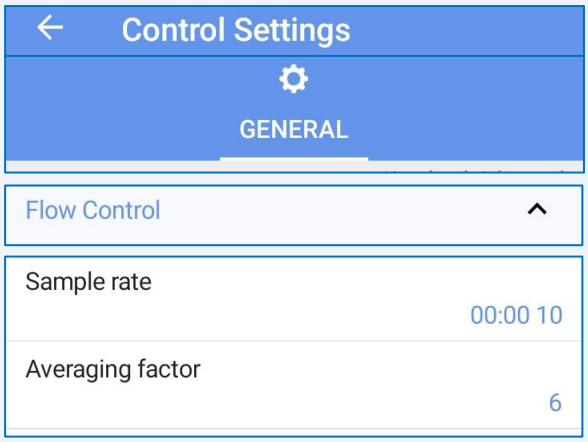
The “Sample Rate” determines how often a flow measurement sample is taken for evaluation, *for PRV controller purposes only*.

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

(“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. It does not require adjustment).

IDT App users:

Equivalent controls are located as follows:
(main) → Configure Device → Control Settings → General tab.

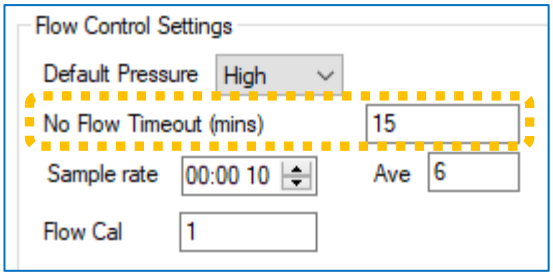


Tap the 'Flow Control' line to reveal the settings, if hidden.
(There is no 'Flow Cal' field available on the IDT app screen).

Settings for handling possible flow sensor issues

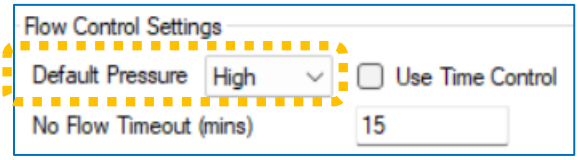
Since the pressure profile is dependent on Flow, certain settings in Sentinel2 define what should happen if a possible fault is detected with the Flow meter:

One condition that can register as a flow-sensor fault is when there are no flow pulses detected. This condition must exist for the time set in the "No Flow Timeout (mins)" field before it is recognised as a fault.

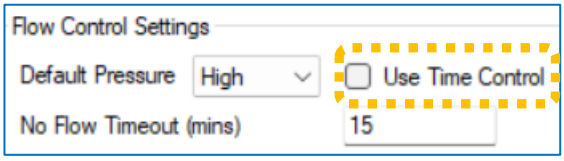


(No specific alarm is generated for this condition, but it is included in the messages delivered to the server during normal call-in).

If a fault is detected the target pressure will be as per the setting in the "Default Pressure" control.



However, when combined Time control and Flow control are enabled (see section 4.16.3) an additional control (called 'Use Time Control') becomes visible. If ticked, during a flow sensor fault the 'default pressure' setting is ignored, and the pressure is determined only by the Time Control settings.

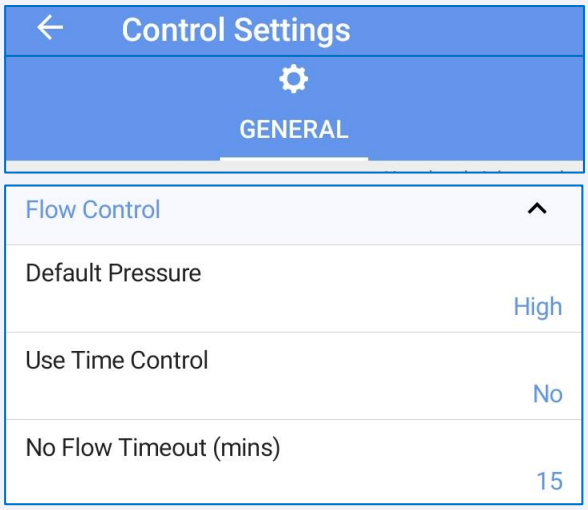


Note: The Time control settings must also contain valid settings for correct operation. If disabling Time Control settings, ensure the 'Use Time Control' setting is disabled first.

IDT App users:

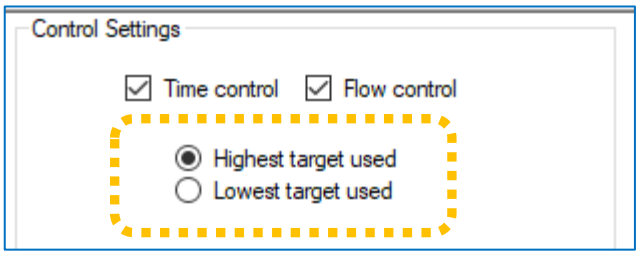
Equivalent controls are located as follows:
(main)→Configure Device→Control Settings →General tab.

Tap the 'Flow Control' line to reveal the settings, if hidden.
('Use Time Control' is only shown if both Time Control and Flow Control are in use).



4.16.3 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. Then continue to set up both options, as previously described (see sections 4.16.1 and 4.16.2).



... An additional choice becomes visible, (Which target should be used?)

With both options enabled, the controller has to evaluate both control methods in order to determine the target setting.

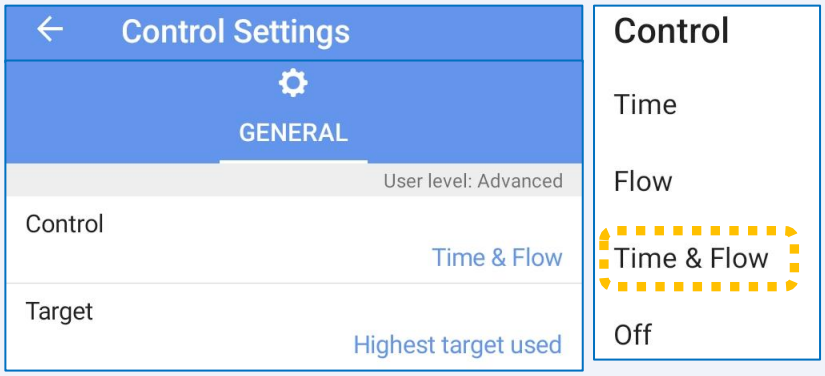
- It calculates a pair of candidate settings (one from each control method).
- The chosen option then determines whether the controller selects the highest or lowest of the candidate settings (if there happens to be a difference).

IDT App users:

Equivalent controls are located as follows:
(main) → Configure Device
→ Control Settings
→ General tab.

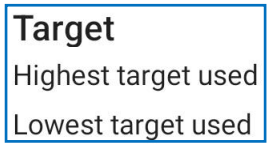
Tap on the control line and select 'Time & Flow'.

Continue to set up both options, as previously described.



An additional line, called 'Target' is available.

Tap the line. Then select the required option (Highest or lowest of the Flow and Time control tables).

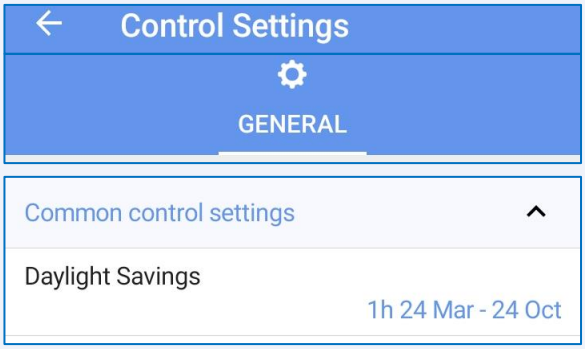


4.17 SETUP FOR ANNUAL TIME ADJUSTMENTS

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, it is possible for Sentinel to be programmed to adjust its local clock to match the scheme and thereby temporarily adjust effectivity times for any time-related pressure profile.
Refer to the IDT User Guide for details of how to set (or de-activate) this feature.

IDT App users:

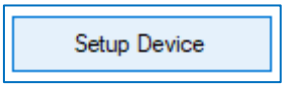
For convenience, the Daylight Savings control settings (as available on IDT Device settings screen, for loggers) are also shown within the PRV Control Settings screen; either can be used.



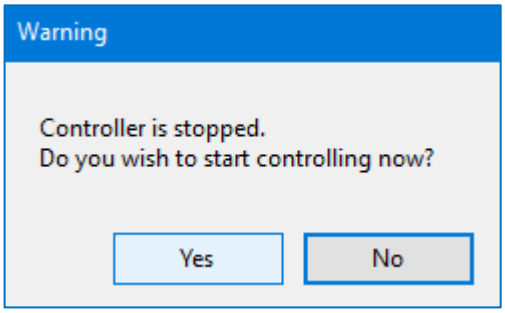
4.18 SAVE PROGRAM & ACTIVATE PRV CONTROL

For Sentinel2 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 within the "setup" tab.



The process will proceed as described in section 2.7.1. However, the installer must now ensure that Sentinel is fully activated.
Click on "Yes" when asked if you wish to start controlling now (see sction 2.7.2).



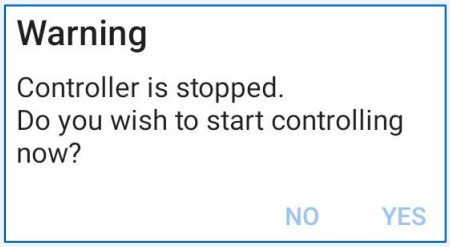
IDT App users:

Whilst setting up PRV control tables, the user will have buttons available to save the settings, when complete.

After tapping on 'Save', settings are saved to the device and the IDT app

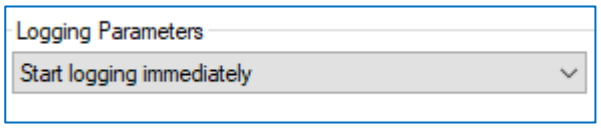
The IDT app checks if the PRV control is running. If it is not, then the user is prompted if it is required to start now.

Tap on 'Yes'; the control is re-started (see sction 2.7.2).

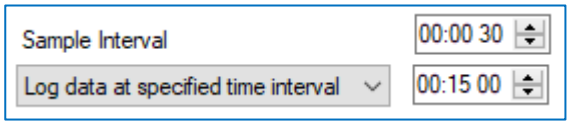


4.19 Setting Logger Startup / Measurement Sample Rates

Sentinel2 should be set to start logging immediately upon being activated.
(See also section 2.7.1).



The built-in logger should be set for measurement interfaces to be logged frequently. Therefore, set to "Log data at specified time interval".



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 the time interval between producing saved datapoints from the recently sampled set of data.
The settings shown here are typical for Sentinel operation. Refer to the IDT user-guide for steps required to make these settings.

4.20 Setup of Data Delivery

Sentinel2 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'.

Setup the Sentinel2 unit with the required call-in schedule.
(Refer to the IDT user-guide for details of each field that requires setup).

Note: If more than two call are required per day, an external battery pack will be required. Without an external battery providing power, Sentinel2 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.

Set up the Sentinel2 with the following:
(Refer to the IDT user-guide for guidance).

- Data destination settings (main) and fall-back / backup options.
  (The settings and SMS number required for your company's server will be provided by your **system administrator)**.
- Select whether data compression is required.
- When Sentinel2 operates with DataGate / PressView it should always be set to "Call in anyway" (if there is no data to send); This allows remote programming of the device (although if logging has been set correctly, there should always be logged data to send).
- Whether it is appropriate to use SMS messages as a fall-back if the regular communications path is unsuccessful.
- (The setting for whether mains or battery power is in use does not matter for Sentinel2; It automatically detects if an external battery is connected during its operation).
- SIM settings (Access parameters for the Network).

Save the settings when finished.

Note: Do not use any SMS features if your SIM or Cellular Network does not support SMS messages. Refer to the IDT user-guide advice on 2G network switch-off.

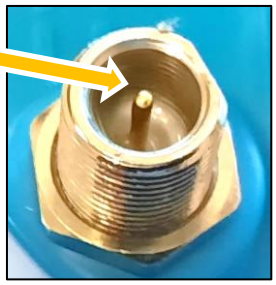
4.21 Antenna installation / Cellular Communications checks

4.21.1 Selection / Preparation / Initial Placement

An antenna should be selected to suit the available space in the chamber, allowing some space for it to be re-positioned (if required). Only use HWM-provided antenna with your logger, to ensure the radio interface meets approvals requirements (safety, etc). The Sentinel2 uses a metal "FME" style antenna connector.

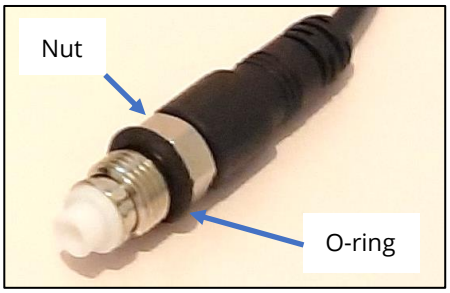
Prior to connecting the antenna, ensure that the connector is dry and clear of dirt and debris; trapped moisture or contaminants can impair the antenna performance. Clean if necessary.

Apply SG M494 silicon grease (or a HWM / FCS approved alternative) to the connector, as required.



The antenna connector has an O-ring included for protection against water and moisture ingress; it acts as a seal. Check that the O-ring is present and undamaged.

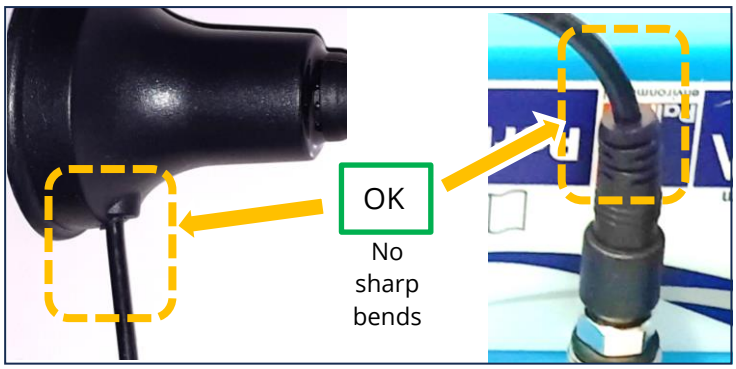
Ensure that the connector and O-ring are dry and clear of dirt and debris. Clean carefully if necessary.



Insert the antenna connector into the logger connection and ensure it is fully home. Tighten the connector correctly; the nut on the antenna should be finger tight, plus 1/4 turn.

No sharp bends should exist at the cable ends, or in the routing of the antenna cable.

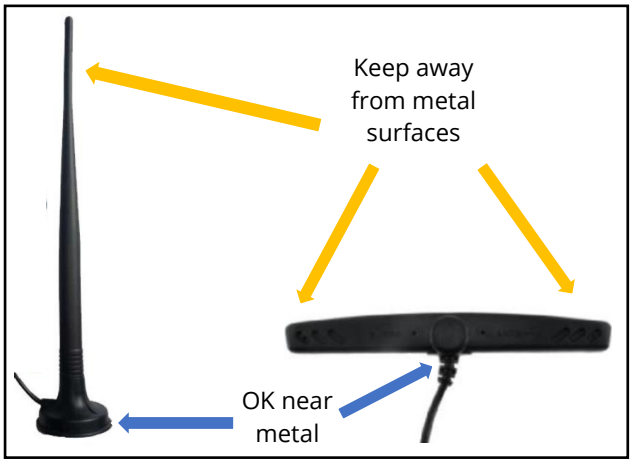
To avoid risk of crush damage to the antenna cable, check that no equipment is placed onto it. Similarly, cable ties fixing the cable in place should not be too tight.



The antenna should not be bent to fit the installation; if it is too big for the chamber, use a smaller type of HWM approved antenna.

When positioning the antenna, ensure that the radiating end of the antenna does not touch or go close to a metal surface.

The radiating element of the antenna should ideally be positioned in free air (free from obstructions).



Try to avoid placing the antenna in a location where it can be flooded. If this is unavoidable, then place it where the risk is at its minimum.

For equipment that is installed in a chamber below ground level, the antenna should be placed above ground level if possible. Where this is not possible, position it near to the top of the chamber.

Some general advice is given below:

Monopole Antenna

For most installations, a monopole antenna will give acceptable performance.

Installation Considerations:

- Always comply with any installation restrictions as per warnings in the documentation supplied.
- The antenna has a magnetic base to be used for mounting.
  For optimum performance, the antenna requires a “ground plane” (metal surface) at its base.
- When installing the antenna in large underground chambers it should be positioned close to the surface.
- Ensure that any chamber lid will not interfere with the antenna or cables when being opened/closed.
- This antenna is vertically polarised, it should always be installed in the vertical orientation.
- Never bend the radiating element of the antenna.
- The antenna can also be attached to an installation bracket mounted to an existing marker post.
- Where an antenna is held in place by magnets, ensure the weight of any cables does not excessively load the magnet so as to detach it from the installed location.
- Do not allow any equipment to rest on the antenna connector as crush damage to the connector or antenna cable can result.

For other antenna options and additional installation guidelines, refer to the documents available on the support webpage: https://www.hwmglobal.com/antennas-support/

4.21.2 Antenna / Communication checks

IDT should be used to check that the logger can connect to the cellular network and that the antenna is in the optimal position for the site.

- Choose a suitable antenna for the installation and decide on its initial position.
- Determine the network technology being used (i.e. 2G, 3G, 4G, etc) and then use the appropriate signal quality limits (refer to the IDT user-guide).
  (Details can be found in MODEM settings, which is a specialist subject.
  However, it is not necessary to inspect or modify these in most situations.
  During ‘signal tests’ IDT will provide additional information that can determine which guidelines tables to use for judgement of signal suitability.
  (CSQ value for 2G and 3G networks. RSRP and RSRQ values for 4G networks).

- Perform Network Signal tests (with the chamber lid closed) to confirm the logger connects to the mobile network and find the best location of the antenna. Re-position if required.
- Perform test calls to confirm the logger can communicate with the DataGate server via the internet and (if available and required) SMS.

(Details of use of IDT for making these tests are provided in the IDT user-guides).

Trouble-shoot a test-call failure if required, using the advice in the IDT app user-guide. Further information is given in the HWM Antenna Installation Guide (MAN-072-0001).

4.22 VERIFICATION OF THE CONFIGURATION.

It is recommended to check the settings in Sentinel to check the configuration has been correctly saved. Prior to leaving site.

Check the status is set to “Recording”.

Check the PRV controller Start control button is green.

4.23 PROTECTION FROM FROST

Where required, any 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 any required pressure transducers from frost, Sentinel2 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, if left unprotected in harsh conditions.

5 GRAPHING / DATA DOWNLOAD AND PREVIEW

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

- Viewed remotely.
- Optionally, be used by a user of the PressView system to fine-tune the performance of the Sentinel profile tables and settings.

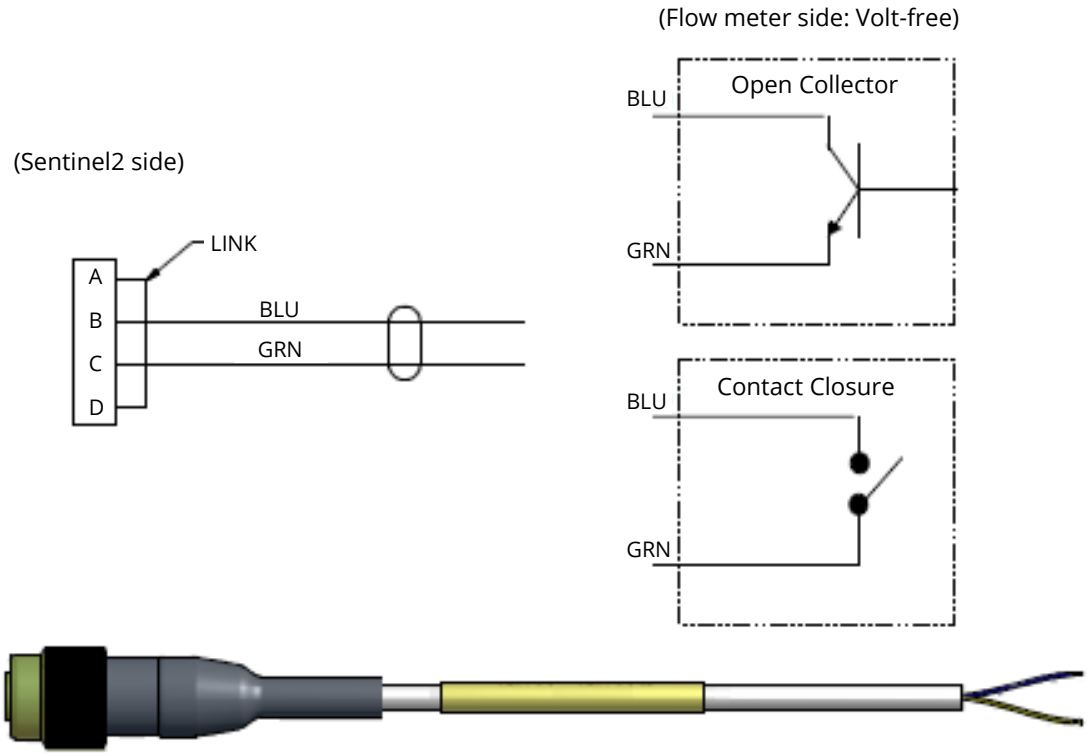
Data can also be downloaded from the unit into IDT for previewing locally.

For the steps required to download a range of data into IDT (for preview as a graph) refer to the IDT user-guide.

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.

Direct flow meter connections available on request.

7 MAINTENANCE, SERVICE AND REPAIR

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

Electronic controller

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.
- Batteries can be returned to HWM for disposal. To arrange the return, complete 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.

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).

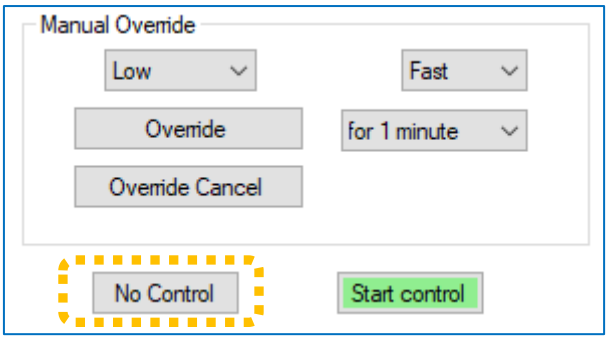
7.1.2 Putting the equipment into Shipping Mode

Before long term storage, moving an installed unit, or shipping for repair, the Sentinel2 unit should have the PRV control stopped and then it should be put into "Shipping mode". Be sure to upload any unsent data before this operation.

To stop the PRV control:

Read the current configuration of the Sentinel2 using IDT.

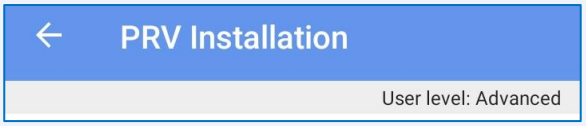
From within the "PRV Installation" tab, click on the "No Control" button.



Wait until the button has turned pink; PRV control process is now inactive.

IDT App users:

Equivalent controls are located as follows:
(main) → Test Device → PRV Installation

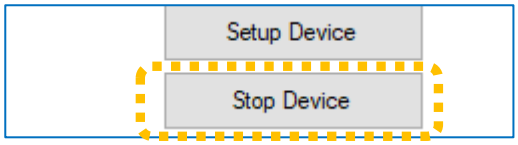


Tap on the 'No Control' button.

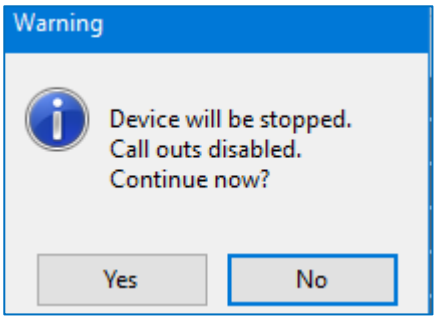
After a few seconds the button will change to red, indicating the PRV control process is now inactive.

To put the Sentinel2 into shipping mode:

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



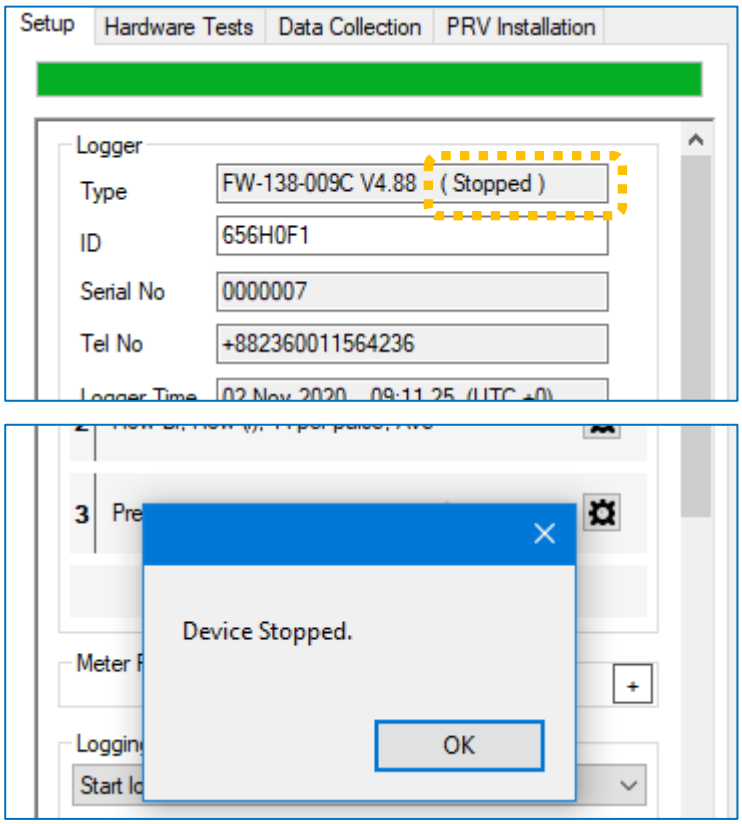
Click "Yes" when warned that calls will be stopped.



The unit will be re-programmed.

IDT will warn that the logger device has been stopped.

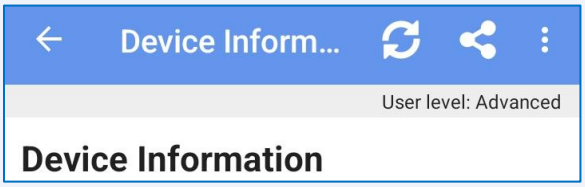
Click “OK” and confirm that the status of “(Stopped)” is shown at the top of the IDT Logger panel.



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

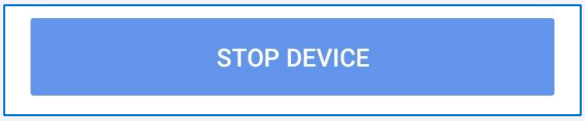
IDT App users:

Equivalent controls are located as follows:
(main) → Configure Device → Device Information



Tap on the ‘Stop Device’ line.

After several warning / confirmation messages, IDT will eventually inform that the device has been stopped; this refers to the logging functions.



HWM-Water Ltd.
Ty Coch House
Llantarnam Park Way
Cwmbran
NP44 3AW
United Kingdom
+44 (0)1633 489479
www.hwmglobal.com