Reference manual

Qdos® H-FLO pump and accessories

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0 PREFACE

0.1 Disclaimer

The information contained in this document is believed to be correct but Watson-Marlow accepts no liability for any errors it contains and reserves the right to alter specifications without notice.

If the product is used in a way that is not intended or described in these instructions, the protection, performance, and/or lifespan may be negatively affected.

0.2 Translation of the original instructions

This reference manual has originally been written in English. Other language versions of this reference manual are a translation of the original instructions.

0.3 Trademarks

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- PROFIBUS® and PROFINET® are registered trademarks of PROFIBUS and PROFINET International (PI).
- EtherNet/IP is a registered trademark of ODVA, Inc.
- Viton® is a registered trademark of Dupont Dow Elastomers L.L.C.

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1 INTRODUCTION TO THE DOCUMENT

1.1 User groups

These instructions are for the safe use of all model variants of the Qdos range of items during the product's life cycle by a:

Responsible person	A person, competent in their area of expertise, in or acting on behalf of the user’s organisation responsible for: Product application selection, installation, safe use of the product by operators, cleaning, maintenance, troubleshooting, or decommissioning.
Operator	Competent person operating the product for its intended use.

1.2 Responsibility

Prior to an **intended task**, a responsible person must use these instructions to:

- Ensure the product is suitable for an intended task.
- Do a risk assessment to identify hazards, and methods to reduce risks, in accordance with the user organisation's control measures, such as working procedures and suitable Personal Protective Equipment.
- Approve water as a cleaning agent for use if required. See section: 26.
- Train an operator to perform a hazardous task.

The product must only be used by persons who have read and understood these instructions prior to an intended task.

1.3 Information types

Specific non-safety information is presented throughout these instructions in the following format.

Glossary definitions	Words in **bold and light blue** are defined in the glossary.
Model variations	These instructions cover multiple models. Where instructions apply only to specific models, brackets ( ) are used.
Select button	Words highlighted in BLACK indicate the option on the screen selected by pressing −.
Button on pump	Words in **BLACK AND BOLD UPPER CASE** indicate the name of a button on the pump. For example, **START** ▶.
On screen text	Words in **Bold And Dark Blue** are prompts that are displayed on the pump screen. For example, **Control Settings**.
On screen header	Words in **DARK BLUE AND BOLD UPPER CASE** are the header as displayed at the top of the pump screen. For example, **MAIN MENU**.
Note (1)	**NOTE 1** Body text of note.

2 QDOS RANGE—OVERVIEW

The Qdos® range of peristaltic chemical metering and dosing pumps cut costs through higher precision metering, with an accuracy of ±1 % and repeatability of ±0.5 %. The unique ReNu® pumphead achieves cost savings through minimal maintenance downtime.

Qdos H-FLO pump delivers the same outstanding accuracy and reliability as other Qdos pumps but for higher flow rates, with a high chemical compatibility through a range of pumpheads.

2.1 Qdos Range—Introduction

The Watson-Marlow Qdos range includes the following items:

Pump	Picture
H-FLO peristaltic metering pumps	
Accessories: Fluid path—Hydraulic Connectors	
Hydraulic Connectors to connect the pumphead to the fluid path. Hydraulic connectors may be attached to a pumphead or Pressure Sensing Kit.	
Accessories: Fluid path—Accessory Kits	
A Qdos H-FLO Pressure Sensing Kit is a fluid path accessory, referred to as 'Pressure Sensing Kit' in this Reference Manual.	

2.2 Qdos Range—General arrangement

A Watson-Marlow Qdos pump, provides a flow rate of **fluid** by **positive displacement** through a fluid path. General illustration provided below.

Item group number	Item group name	Comment
1	**Fluid Path:** User organisations connections and pipework	
2	**Fluid Path:** Hydraulic Connectors	
3	**Fluid Path:** Pressure Sensing Kit	Mounted on discharge only. Hydraulic Connectors aremounted on top.
4	**Fluid Path:** Pumphead	Multiple variations. A Qdos pump model is a combination of a pumphead and drive.
5	Drive	

2.3 Qdos Range—Intended use

All items of the Qdos range, are designed for the controlled chemical [(1)]metering of fluid, in accordance with this reference manual or an addendum or supplement to this reference manual, in ordinary safe locations, except those environments or applications listed as prohibited use:

2.3.1 Prohibited use

- Environments that require explosion proof certification.
- Installations, environmental or operating conditions which are beyond the specifications provided in these instructions.
- Applications which are directly life sustaining.
- Applications within a Nuclear Island.
- All radioactive applications involving high energy radiation, including gamma radiation.

NOTE [1]	A procedure for checking chemical compatibility is provided in section 29.

3 SAFETY

This section provides general safety information for the safe use of the product. Safety information relevant to a specific task is provided when relevant to the task.

3.1 Safety symbols

The following safety symbols may be used on a Qdos product range item, packaging and/or in these instructions:

	**Hot surface**	This symbol indicates that the marked item can be hot and should not be touched without taking precautions.
	**PPE required**	This symbol indicates Personal Protective Equipment must be worn prior to a task.
	**Hazardous voltage**	This symbol indicates that hazardous voltages are present where a risk of electrical shock exists.
	**Rotating parts** (either symbol)	Either symbol indicates rotating parts which should not be touched without following a safety instruction.
	**Risk of explosion**	This symbol indicates that there is a risk of explosion if the pump is misused in a specific manner.
	**Potential hazard** (either symbol)	Either symbol indicates a safety instruction must be followed or potential hazard exists.

The instruction documentation must be consulted in all cases where any safety symbol is shown to find details of potential hazards and actions to avoid.

3.1.1 Instructions for renewing safety symbols

If the safety symbols become accidentally damaged through improper handling of the product, contact your local Watson-Marlow representative for information on obtaining replacements.

3.2 Safety alerts

Safety alerts indicate a possible **hazard**.

3.2.1 Safety alerts—With risk of personal injury

Safety alerts indicating risk of a personal injury are presented when relevant to a task in this format:

WARNING

The word WARNING indicates a hazard. Risk of serious injury or death exists if hazard not avoided. Equipment or property damage may also occur.

A safety symbol indicates a hazard with personal injury risk.

Hazard information—Information to explain:

- What could happen
- How to avoid hazard

CAUTION

The word CAUTION indicates a hazard. Risk of minor or moderate injury exists if hazard not avoided. Equipment or property damage may also occur.

A safety symbol indicates a hazard with personal injury risk.

Hazard information—Information to explain:

- What could happen
- How to avoid hazard

3.2.2 Safety alerts—With risk of equipment or property damage only

Safety alerts indicating risk of equipment or property damage only are presented when relevant to a task in this format:

NOTICE

The word NOTICE indicates a hazard. Risk of equipment or property damage only.

Hazard information—Information to explain:

- What could happen
- How to avoid hazard

3.3 Personal protective equipment (PPE)

The following minimum PPE will be required during specific tasks:

1. Safety glasses
2. Safety boots
3. Gloves chemically compatible with the chemicals being pumped

A risk assessment by a responsible person must be undertaken to identify:

- Suitability of PPE for the application
- If additional PPE is required prior to use or for specific tasks

3.4 Product damage—Remove from service

In the event of product damage: Do not continue to use the product. The product must be removed from service by a responsible person. See section: 27.6.2.2.1.

3.5 Flammable liquids

The product is prohibited from installation or operation in explosive atmospheres. If the product is to be used for the pumping of flammable liquids, a responsible person must do a risk assessment to ensure an explosive atmosphere could not occur by any activity involving: installation, operation, maintenance or decommissioning of the product.

The risk assessment should consider all risks, including, but not limited to:

- Leaks or spillage of the flammable liquid during:
    - Installation of all components of the fluid path
    - Removal of the fluid path, or other decommissioning activity.
- Operating any item in the Qdos range to the point of failure, such as an overpressure event, resulting in:
    - Flow of flammable liquid into the operating environment.
    - Chemical incompatibility with pump materials of construction becoming exposed to the flammable liquid
    - Flow of flammable liquid through the pumphead safety overflow, into the process safety overflow system
- Ignition and spread of fire due to a leak, spillage, or other escape of the flammable liquid into the process area.

The above list is not exhaustive. The purpose of the list is to provide additional guidance which a person unfamiliar with Qdos range of products, may not otherwise consider.

3.6 Chemical contact with exterior surfaces of the product

The exterior surfaces of the product must be examined for harmful effects, in the event of chemicals coming into contact due to:

- Spillage of the pumped fluid
- Operating environment

In the event of product damage due to chemical incompatibility. The product must be removed from service by a responsible person.

For more information on checking chemical compatibility. See section: 29.

4 PRODUCT OVERVIEW—PUMP

This chapter provides a product overview and summary specification. Installation specific specification is provided in the relevant installation chapter.

4.1 Pump models

A Qdos 'pump' is a combination of two main components:

- A Qdos drive
- A ReNu pumphead

The model variation, general arrangement, and features of each of these components is explained in the following sub-sections.

1. Pump drive	
2. Pumphead	

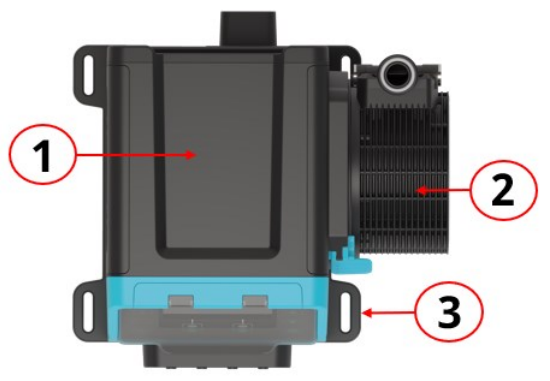
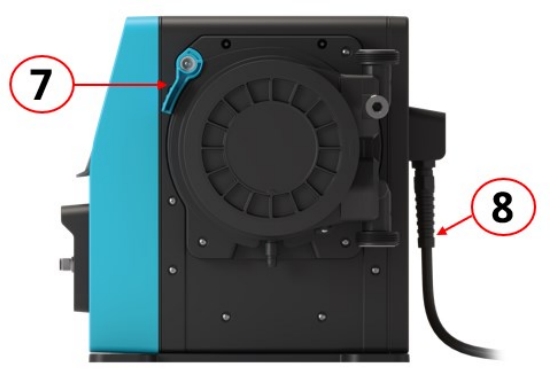
4.1.1 Drive: Model variations

Qdos H-FLO drive is available in the following model variations:

<table>
<tr><th>Item</th><th>Variation</th></tr>
<tr><td>Pumphead mounting variations</td><td>2 pumphead mounting models (left or right)</td></tr>
<tr><td>Control models</td><td>6 control models:
Manual only control
Manual model (digital start/stop only)
Manual, or Analogue or Digital control
Universal
Universal+
Manual, or Network control
PROFIBUS
EtherNet/IP
PROFINET</td></tr>
<tr><td>Control connections</td><td>2 types of input and output control connections:
M Type: with M12 control connections
T Type: with user wired cable gland connections
<table>
<tr><th>Name</th><th>Description</th><th>Location</th><th>Models</th><th>Product code</th></tr>
<tr><td>M type</td><td>with M12 control connections</td><td>  </td><td>Manual
Universal
Universal+
PROFIBUS
EtherNet/IP
PROFINET</td><td>Product codes containing the letter M</td></tr>
<tr><td>T type</td><td>with user wired cable gland connections</td><td>  </td><td>Option only for
Universal
Universal+</td><td>Product codes containing the letter T</td></tr>
</table></td></tr>
</table>

4.1.2 Drive: General arrangement

The general arrangement of a DriveSure drive is illustrated below.

Number	Description	Picture
1	Drive	
2	Pumphead	
3	Baseplate	
4	HMI cover (shown open, resting on top of drive)	
5	HMI screen	
6	Control connections	
7	Pumphead locking lever	
8	Power cable	

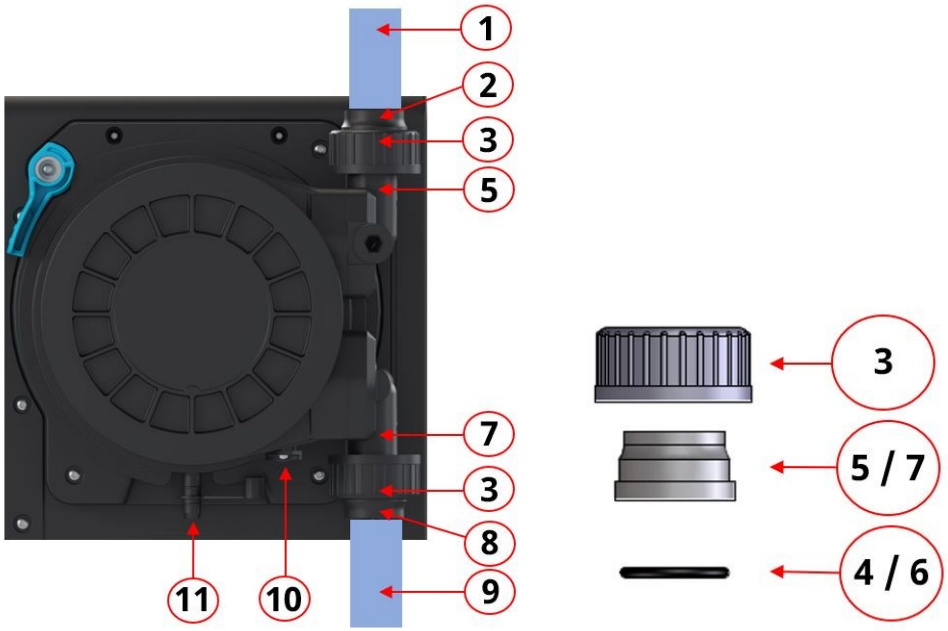
4.1.3 Pumphead: Model variations

There are 2 different pumphead types.

Pumphead	Application
ReNu SEBS	Optimised for sodium hypochlorite, and sulphuric acid applications
ReNu Santoprene	General purpose with great chemical compatibility across a range of applications

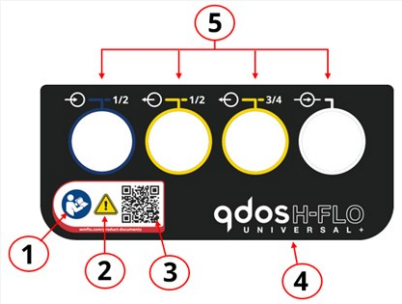
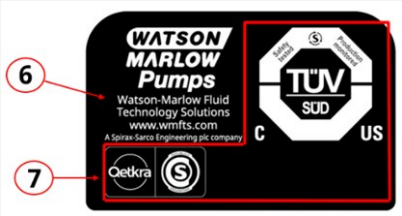
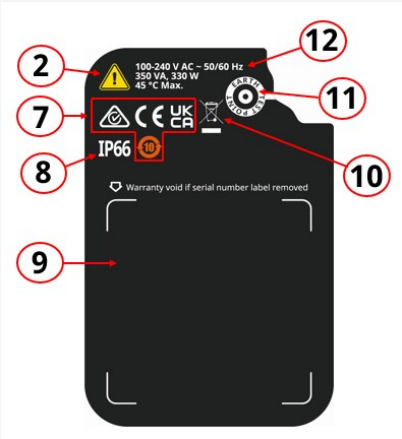
4.1.4 Pumphead: General arrangement

The general arrangement of a pumphead, with exploded view of the pumphead to fluid path connector is provided in the images below.



Number	Name	Normally wetted by pumped fluid?
1	Discharge fluid path	Yes
2	Discharge fluid connector, PVC-U	Yes
3	Connection collar, PVC-U	No
4	Pumphead discharge fluid connection port o-ring	Yes
5	Pumphead discharge fluid connection port	Yes
6	Pumphead inlet fluid connection port o-ring	Yes
7	Pumphead inlet fluid connection port	Yes
8	Inlet fluid connector, PVC-U	Yes
9	Inlet fluid path	Yes
10	Pumphead drain	No
11	Safety overflow	No

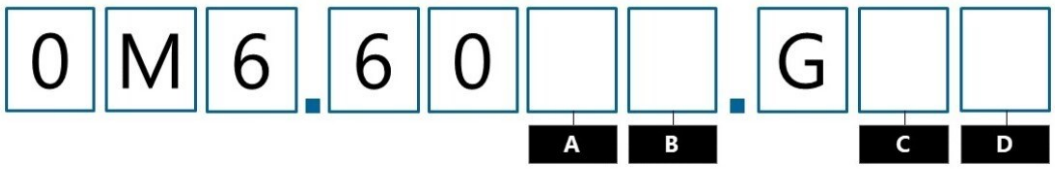
4.2 Product labels

Number	Name	Picture
1	Symbol: refer to these instructions	
2	Safety symbol	
3	QR code for instructions	
4	Product Range/Model	
5	Control connection labels	
6	Product manufacturer	
7	Compliance symbols	
8	Ingress protection rating	
9	Product serial number label location	
10	Disposal Symbol (not household waste)	
11	Earth bond test point	
12	A/C Power supply requirements	

4.3 Product code guide

The product model may be identified from its product code. The drive and pumphead each have a separate product code. These product codes are explained in the subsections below.

4.3.1 Drive product code



A	B	C	D
Model	Input/Output connectors	Pumphead orientation	Power plug
3: Manual 4: Universal 5: Universal+ 7: PROFIBUS 8: EtherNet/IP 9: PROFINET	M: M12 connectors T: User-wired cable gland connectors	L: Left R: Right	A: US B: Brazil C: Swiss D: India, South Africa E: European K: Australia R: Argentina U: UK Z: China

4.3.2 Pumphead product code

Description	Product code
ReNu 150 pumphead Santoprene	0M3.6200.PFP
ReNu 300 pumphead Santoprene	0M3.7200.PFP
ReNu 300 pumphead SEBS	0M3.7800.PFP
ReNu 600 pumphead Santoprene	0M3.8200.PFP

4.4 Specification

4.4.1 Performance

4.4.1.1 Flow rate and discharge pressure [2], [3]

Flow rates in the table below are based on pumping water at 20 °C in a 0 bar inlet and discharge pressure application.

Pumphead	Flow rate				Discharge pressure [2], [3]	
	Min.		Max.		Max.	
	L/h	USGPH	L/h	USGPH	Bar	PSI
ReNu 150 Santoprene	0.12	0.032	150	39.62	7	102
ReNu 300 Santoprene	0.12	0.032	300	79.36	5	73
ReNu 300 SEBS	0.12	0.032	300	79.36	4	58
ReNu 600 Santoprene	0.12	0.032	600	158.5	2.5	36

Refer to the performance chart in the next section, for a graphical representation of the flow rate versus application pressure under certain conditions.

NOTE [2] All pressures in this reference manual are RMS (Root Mean Squared) gauge pressures.

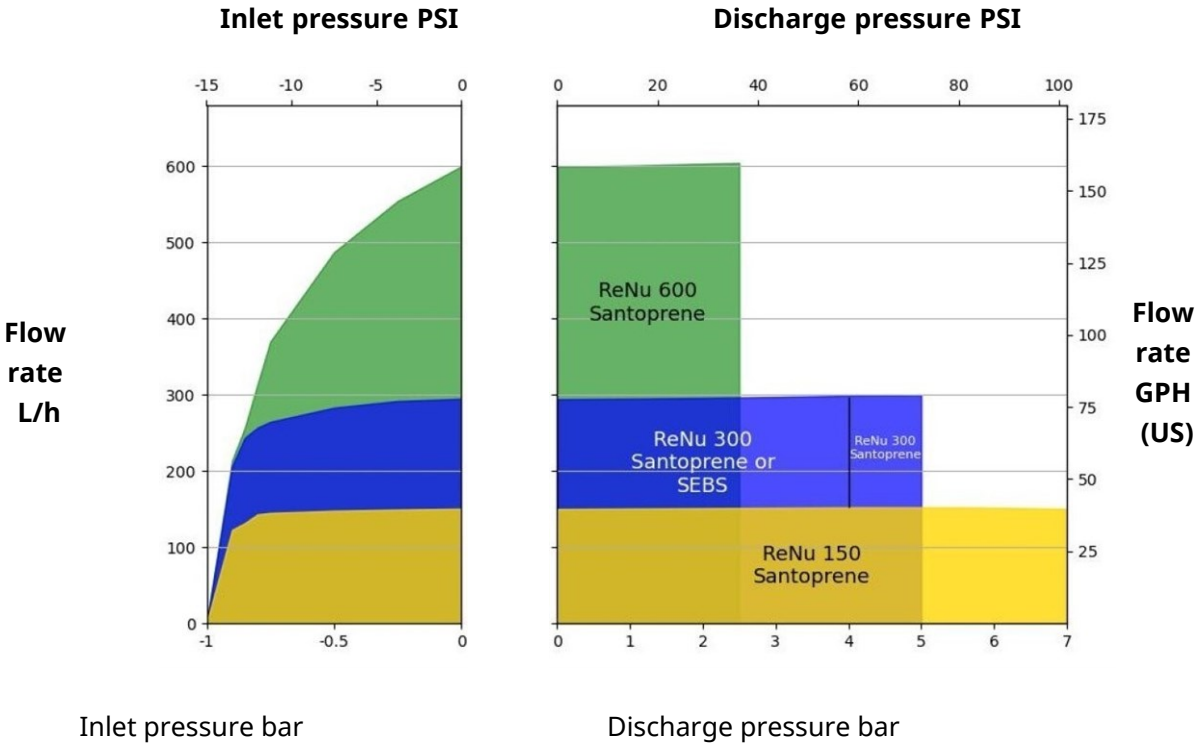
NOTE [3] If you use a Watson-Marlow H-FLO Hydraulic Connector (PVC-U) at an ambient or fluid temperature of more than 37 °C (101.5 °F), maximum discharge pressure must be decreased as follows:

Temperature		Pressure	
(°C)	(°F)	(bar)	(PSI)
37	98.6	7.0	101.5
38	100.4	6.8	98.6
39	102.2	6.5	94.3
40	104.0	6.2	89.9
41	105.8	6.0	87.0
42	107.6	5.9	85.6
43	109.4	5.7	82.7
44	111.2	5.6	81.2
45	113.0	5.4	78.3

4.4.1.2 Performance curve

The performance curve demonstrates the impact of inlet and discharge pressure, on the flow rate from the pump, under the following conditions:

- Pumping water at 20 °C
- Maximum pumphead speed (rpm)



4.4.2 Physical specification

4.4.2.1 Environmental and operating conditions

Item	Specification
Ambient temperature range	5 °C to 45 °C (41 °F to 113 °F) (4)
Maximum humidity (non-condensing)	Maximum relative humidity 80 % for temperatures up to 31 °C (88 °F), decreasing linearly to 50 % relative humidity at 40 °C (104 °F).
Maximum altitude	2,000 m, (6,560 ft)
Pollution degree of the intended environment	2
Noise	<70 dB(A) at 1 m
Maximum fluid temperature (4), (5)	SEBS pumpheads: 40°C (104 °F) (5) Santoprene pumpheads: 45°C (113 °F) (5)
Environment	Suitable for use in an indoor or covered area, which is a dry or **wet location**, up to the ingress protection rating (6)
Ingress protection	IP66, NEMA4X

NOTE 4

If you use a Watson-Marlow H-FLO Hydraulic Connector (PVC-U) at an ambient or fluid temperature of more than 37 °C (101.5 °F), maximum discharge pressure must be decreased as follows:

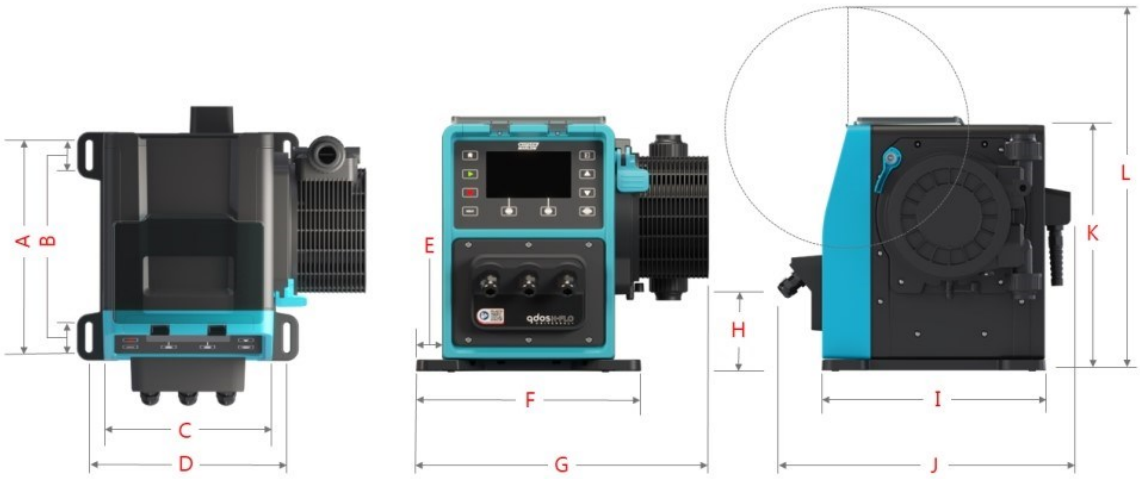
Temperature		Pressure	
(°C)	(°F)	(bar)	(PSI)
37	98.6	7.0	101.5
38	100.4	6.8	98.6
39	102.2	6.5	94.3
40	104.0	6.2	89.9
41	105.8	6.0	87.0
42	107.6	5.9	85.6
43	109.4	5.7	82.7
44	111.2	5.6	81.2
45	113.0	5.4	78.3

NOTE 5

Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in section 29.3.

NOTE [6]	The power cable plug is not IP66 or NEMA 4X rated. In applications requiring IP66 or NEMA 4X, the power plug must be installed in a corresponding rated enclosure.

4.4.2.2 Dimensions



A		B		C		D		E		F	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
276.0	10.866	35.0	1.378	224.0	8.819	260.0	10.236	33.7	1.327	291.5	11.476
G		**H**		**I**		**J**		**K**		**L**	
mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
380.0	14.961	118.7	4.673	334.3	13.161	394.2	15.520	332.3	13.083	482.0	18.976

4.4.2.3 Weight

4.4.2.3.1 DRIVE: M TYPE

Model	Weight	
	kg	Ibs
Manual	11.6	25.57
Universal	11.7	25.79
Universal+	11.7	25.79
PROFIBUS	11.7	25.79
EtherNet/IP	11.7	25.79
PROFINET	11.7	25.79

4.4.2.3.2 DRIVE: T TYPE

Model	Weight	
	kg	Ibs
Universal	11.8	26.01
Universal+	11.8	26.01

4.4.2.3.3 PUMPHEAD

Model	Weight	
	kg	Ibs
ReNu 150 pumphead Santoprene	2.6	5.73
ReNu 300 pumphead Santoprene	2.6	5.73
ReNu 300 pumphead SEBS	2.6	5.73
ReNu 600 pumphead Santoprene	2.6	5.73

4.4.3 Electrical power specification

Item	Specification
Power supply voltage/Frequency	Alternating Current (~100 V to 240 V AC 50/60 Hz)
Maximum voltage fluctuation	±10 % of nominal voltage
Overvoltage category	II
Rated power	350 VA, 330 W

4.4.4 Control specification

4.4.4.1 Speed increment

Item	Specification
Speed adjustment range	1900:1
Minimum drive shaft adjustment speed increment	0.1
4-20 mA resolution (7)	1860:1

NOTE 7	4-20 mA resolution is only applicable to the Universal and Universal+ models

4.4.4.2 Control feature summary table

The control features of a Qdos pump are summarised in the table below.

Operational modes	Manual	Universal	Universal+	EtherNet/IP	PROFIBUS	PROFINET
Manual	•	•	•	•	•	•
Bus Network Communication				•	•	•
Contact mode		•	•			
4-20 mA		•	•			
Fault reporting	•	•	•	•	•	•

Security	Manual	Universal	Universal+	EtherNet/IP	PROFIBUS	PROFINET
Keypad lock	•	•	•	•	•	•
PIN lock to protect set up	•	•	•	•	•	•

Features	Manual	Universal	Universal+	EtherNet/IP	PROFIBUS	PROFINET
RFID pumphead detection	•	•	•	•	•	•
Revolution counter	•	•	•	•	•	•
Flow calibration	•	•	•	•	•	•
Run hours	•	•	•	•	•	•
Advanced diagnostics				•	•	•
Numerical flow display	•	•	•	•	•	•
Numerical speed display	•	•	•	•	•	•
Fluid level monitor	•	•	•	•	•	•
Max (prime)	•	•	•	•	•	•

Control methods	Manual	Universal	Universal+	EtherNet/IP	PROFIBUS	PROFINET
Auto restart (after power restored)	•	•	•	•	•	•
Fluid recovery	•	•	•	•	•	•
Leak detection	•	•	•	•	•	•
5” (127 mm) colour TFT display	•	•	•	•	•	•
Manual control capability	•	•	•	•	•	•
4-20 mA input & calibration		•	•			
4-20 mA output			•			
Contact input (pulse/batch)		•	•			
Pressure		•	•	•	•	•

Control methods	Manual	Universal	Universal+	EtherNet/IP	PROFIBUS	PROFINET
sensor input (pressure sensor purchased separately)						
Manual speed adjustment range*	1900:1	1900:1	1900:1	1900:1	1900:1	1900:1
Minimum drive shaft adjustment speed increment	0.1	0.1	0.1	0.1	0.1	0.1
4-20 mA resolution		2184:1	2184:1			
Run stop input	•	•	•			
Run status output		•	•			
Alarm output		•	•			
Four configurable relay outputs		•	•			
Remote fluid recovery input		•	•	•	•	•
*Speed adjustment range depends upon pumphead chosen, maximum shown						

4.4.4.3 Start up defaults

Option	Default
Auto Restart	OFF
Auto Keypad Lock	OFF
Pin Protection	OFF
Asset Number	123465789A
Label for Pump	WATSON-MARLOW
Mode: Manual	Manual
Run Hours	0
Volume Counter (L)	0
Analog Scaling Factor	1.00
Flow calibration value	32.29
Floating ground	Disabled

4.5 HMI Overview

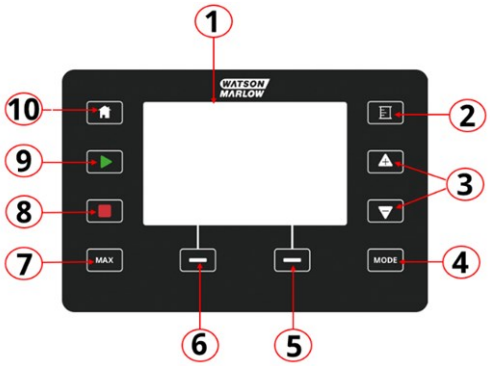
The HMI is a TFT display with keys. The keys are used to access the menus to configure or operate the pump.

Information relating to the HMI key and menus is explained in the table below:

Item	Method
Select button	Words highlighted in BLACK indicate the on screen options selected by pressing ▬ soft key.
Button on pump	Words in **BLACK AND BOLD UPPER CASE** indicate the name of a key on the pump. For example, **START**.
On screen text	Words in **Bold And Blue** are prompts that are displayed on the pump screen. For example, **General Settings**.
On screen header	Words in **BLUE AND BOLD UPPER CASE** are the header as displayed at the top of the pump screen. For example, **MAIN MENU**.

4.5.1 HMI layout

A summary of the key function is provided below:



Number	Name	Summary
1	Colour TFT display	HMI display with backlight.
2	Flow calibration	Key activates flow calibration mode.
3	**+/-** Keys	Keys are used to change programmable values or move the selection bar up or down in the menus.
4	**MODE** (8)	When the **MODE** key is pressed the MODE menu is shown.
5	Soft key 2	Perform the function displayed directly above the key.
6	Soft key 1	Perform the function displayed directly above the key.
7	**MAX**	Key will run pump at maximum speed when in manual mode. This is useful for priming the pump.
8	**STOP**	Key will stop the pump in any control mode, when pressed at any time.
9	**START**	Key will: • Start the pump at the set speed when in manual mode or during flow calibration. • Deliver a contact dose when in CONTACT mode. In all other control modes this key will not start the pump.
10	**HOME** (8)	When the **HOME** key is pressed it will return user to HOME screen which displays the last known operating mode.

NOTE 8	If the **MODE** or **HOME** key is pressed while changes to settings are in progress, these changes will not be saved.

4.5.2 HOME screen

The HOME screen is the main screen showing the last selected operating mode in Manual Mode. This screen is accessed using the **HOME** key.

An example of a HOME screen in Manual Mode is shown below.

Home Screen: (Manual mode)

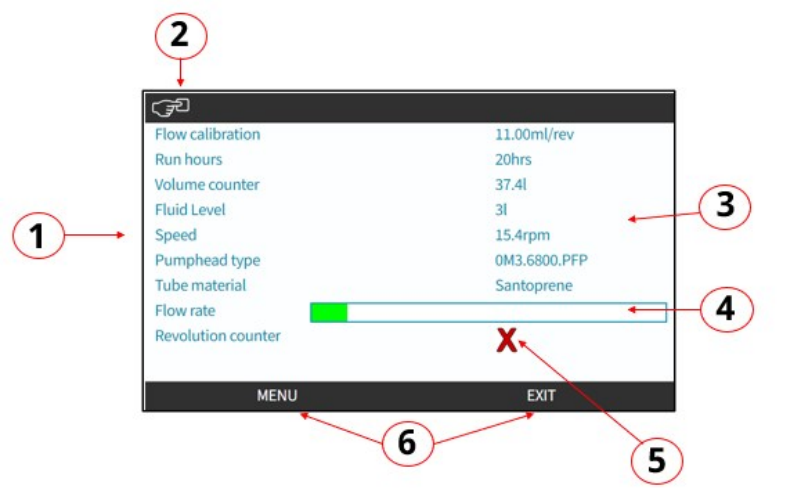
Item	Description
1	Indicates menu selection.
2	Indicates network is connected (EtherNet/IP shown)
3	Displays pump label
4	Indicates keypad lock is enabled
5	Indicates pump is in Auto Restart mode (when Auto restart is enabled)
6	Displays pump speed and units
7	Indicates MENU and INFO options accessible by using soft keys
8	Progress bar only displayed if the Fluid level monitor or Revolution counter features are enabled
9	Indicates pump running status ■ The pump displays a RED STOP ICON when it is in a manually stopped condition. In this state the pump will not start unless the **START** ▶ key is pressed. ❚❚ The pump displays a RED PAUSE ICON when it is receiving a remote stop input whilst in a standby condition. The pump is placed in a standby condition by pressing the **START** ▶ key in manual mode, or by selecting Analog mode. In this state the pump will respond to a change in state of the start/stop input and may start automatically when it receives a control signal. When the pump is running it displays a turning icon to indicate a pumping state.

4.5.3 INFO screen

The INFO screen should inform the user of the configuration of the drive. It is accessible even when PIN protection is active. The INFO screen is accessible from the home screen of the drive in any mode using the **INFO** key.

An example of the INFO screen is shown below.

INFO Screen: (Manual mode)



Item	Description
1	User selected features.
2	Menu selection.
3	User set values and items
4	Visual flow rate bar
5	Visual indication if revolution counter is enabled or disabled
6	Indicate MENU and EXIT options accessible by using soft key

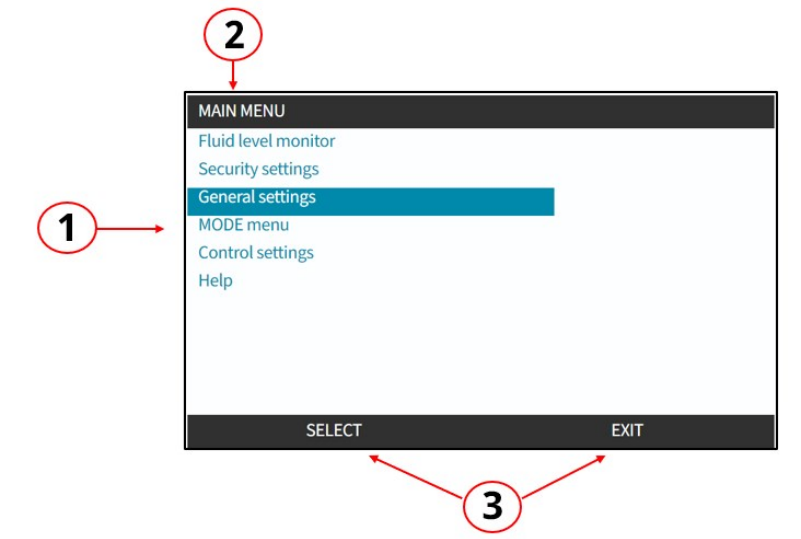
The features available on screen will be dependent on the drive model.

4.5.4 MAIN MENU overview

The MAIN MENU is the highest level menu. All features, functionality and settings are accessible through this menu and subsequent sub-menus.

The MAIN MENU screen is shown below.

MAIN MENU Screen:



Item	Description
1	User selected sub menus.
2	Menu selection.
3	SELECT and EXIT options accessible by using soft keys.

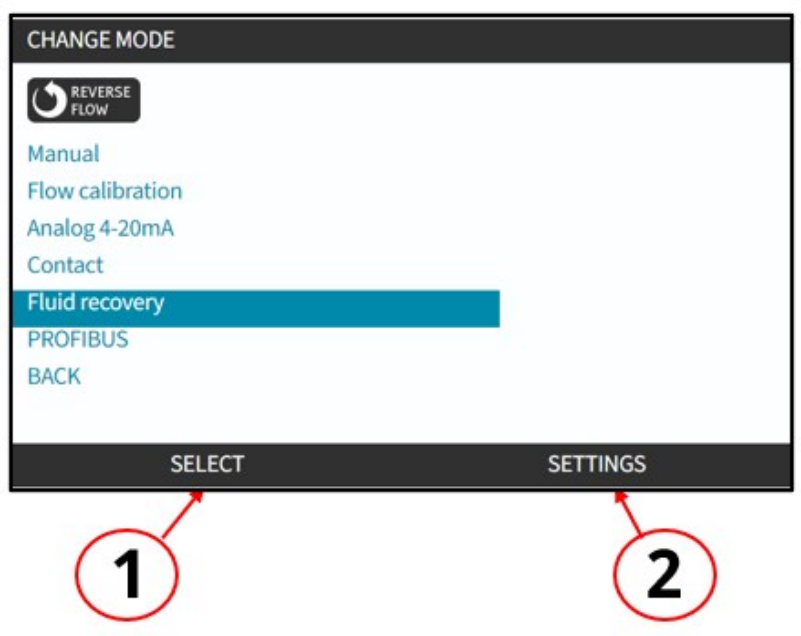
The main menu contains the following sub menus:

Sub menu	Summary
Fluid level monitor	Menu used to set up and view the inlet vessel fluid level.
Security settings	Menu used to control the access to the pump, such as PIN protection
General settings	Menu used to make general settings such as language, flow units, asset number, restore defaults etc
MODE menu	Menu used to change the mode of the pump, such as manual, analog or network mode
Control settings	Menu used to set control settings such as pumphead speed limit, reset run hours, configure inputs and outputs.
Help	Menu used to display help, such as a link to these instructions, the asset number, or software version.

4.5.5 MODE MENU overview

The MODE menu lists the available modes. Access to the MODE menu is through Soft Key 1 when the option is highlighted. If required, the settings will be available through Soft Key 2 when the option is highlighted.

MODE MENU Screen:



Item	Description
1	SELECT enables access to selected mode
2	SETTINGS allows configuration of selected mode.

The MODE menu contains the following sub menus.

Mode	Summary	Model exception
Manual (default)	Allows pump to be operated manually (Start/Stop/Speed)	Pump can also be operated via Start/Stop input
Flow calibration	flow rate is calibrated to the pump	All models
Analog 4-20 mA	Pump speed is controlled by an Analog signal	Universal and Universal+ only
Contact mode	Pump will meter a specific dose of fluid when an external signal is received, or operator presses the green **START** ▶ button.	Universal and Universal+ model only
PROFIBUS	Allows data exchange	PROFIBUS only
EtherNet/IP	Allows data exchange	EtherNet/IP only
PROFINET	Allows data exchange	PROFINET only
Fluid Recovery	Allows pump to operate in reverse to recover fluid from discharge line. (9)	All models

NOTE 9	If pump is set to run in reverse in either PROFIBUS, EtherNet/IP, PROFINET, or Analog mode, all alarm and warning levels are disabled.

5 PRODUCT OVERVIEW—ACCESSORIES

This chapter provides a product overview and summary specification. Installation specific specification is provided in the relevant installation chapter.

5.1 Accessories—Drive

Accessories—Drive		
Image	**Description**	**Product code**
	Qdos H-FLO Control cable - General I/O M12A 8W Cable Straight F Connection, 3m (10ft) Length, Unshielded 24AWG	0M9.603Z.0CF (10)
	Qdos H-FLO Control cable - General I/O M12A 8W Cable Right-Angled F Connection, 3m (10ft) Length, Unshielded 24AWG	0M9.603Z.0DF (10)
	Qdos control cable for manual model, M12A 5 Pin Yellow Insert, 3 m (10 ft) Length	0M9.203Y.000 (11)
	Qdos and H-FLO Software Update USB flash drive (12) Kingston MicroDuo 3C	0M9.000U.000

NOTE [10]	The M12 8W (8 wire) control cable is for the Universal/Universal+ models only.

NOTE [11]	The control cable for use with the manual model features a 5 pin female M12 connector. This 5 pin connector will connect to male 4 pin, M12 connector of the manual model. The 5th pin (centre) is not used.

NOTE [12]	The Qdos Software Update USB flash drive contains both a USB A and USB C connection for use with either Qdos or H-FLO pumps. The USB flash drive contains software for updating pumps for use with a Pressure Sensing Kit that do not have the required software version installed. For more information, see section 5.3.7.

5.2 Hydraulic Connectors

5.2.1 Hydraulic Connectors supplied with pump or spare drive

The following Hydraulic Connectors [14] are supplied with a pump or spare drive.

Supplied Hydraulic connection pack (2 of each item) with drives			
Image	**Description**	**Size**	**Comment**
	Qdos H-FLO Fluid connector (Hydraulic Connection), PVC-U 3/4'' NPT (F) [13] **Product code:** 0M9.601H.U03	Female, 3/4'' NPT thread (F)	Supplied as a pair (2 packs) with all pumps or spare drives, which have a US power plug (product code ending in an A).
	Qdos H-FLO Fluid connector (Hydraulic Connection), PVC-U Rp 3/4'' [13] **Product code:** 0M9.601R.U03	Female, Rp 3/4''	Supplied as a pair (2 packs) with all pumps or spare drives, except product codes which have a US power plug (product code ending in an A).

NOTE [13]	Metal threaded fittings cannot be used to connect to Watson-Marlow H-FLO Hydraulic connectors.

NOTE [14]

If you use a Watson-Marlow H-FLO Hydraulic Connector (PVC-U) at an ambient or fluid temperature of more than 37 °C (101.5 °F), maximum discharge pressure must be decreased as follows:

Temperature		Pressure	
(°C)	(°F)	(bar)	(PSI)
37	98.6	7.0	101.5
38	100.4	6.8	98.6
39	102.2	6.5	94.3
40	104.0	6.2	89.9
41	105.8	6.0	87.0
42	107.6	5.9	85.6
43	109.4	5.7	82.7
44	111.2	5.6	81.2
45	113.0	5.4	78.3

5.3 Pressure Sensing Kit

The Pressure Sensing Kit is a Qdos accessory for monitoring and providing warnings and alarms relating to discharge pressure.

5.3.1 Model suitability—Pressure Sensing Kit

A Pressure Sensing Kit is suitable for use with the following drive models:

- Universal
- Universal+
- PROFIBUS
- EtherNet/IP
- PROFINET

Manual model pumps do not feature a pressure sensor connection.

5.3.2 Features—Pressure Sensing Kit

The Pressure Sensing Kit has the following features:

- Real-time gauge pressure monitoring by a 4-20 mA signal.
- Pre-calibrated (15) pressure sensor.
- Configurable Minimum and Maximum pressure alarms and warnings between a range of 0.00 and 15.00 Bar (0.0 to 217.5 PSI). Alarms can be set to stop the pump or be disabled.
- Remote acknowledgement of alarms for PROFIBUS, EtherNet/IP, and PROFINET models. (16)
- Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes).
- Additional data for accurate flow estimation.
- Flow verification (proves injection valve functioning).
- Accuracy +/- 4% at 15 bar (217.5 PSI).
- Selectable option for average or raw data to trigger alarm and warning levels.
- Pressure in either bar or PSI units.

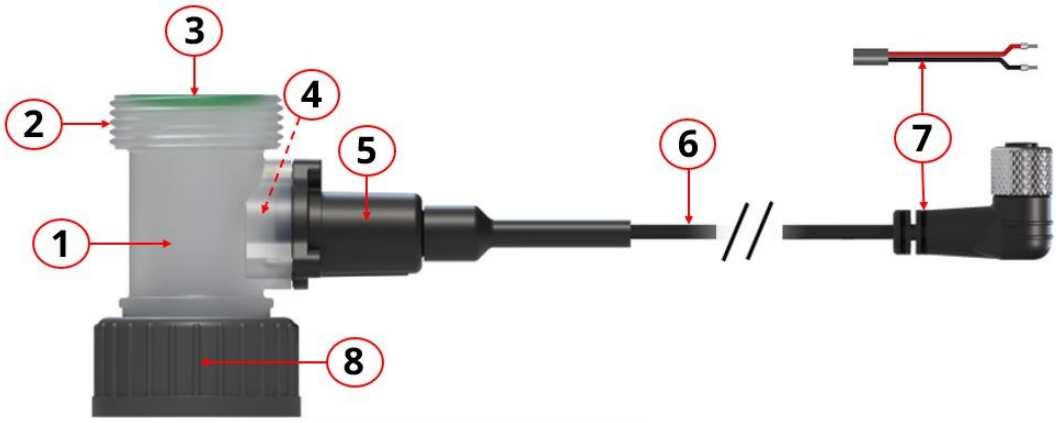
NOTE 15	The Pressure Sensing Kit is pre-calibrated during production and cannot be re-calibrated.

NOTE 16	For Universal and Universal+ models, an "acknowledge" command cannot be sent remotely. The ACKNOWLEDGE − key must be pressed locally on the pump in order to clear a pressure alarm.

5.3.3 Intended mounting—Pressure Sensing Kit

Intended mounting—Pressure Sensing Kit	
Pressure Sensing Kit	A Pressure Sensing Kit is intended to be mounted directly onto the discharge (top) port of a Qdos pumphead.

5.3.4 General arrangement—Pressure Sensing Kit



Item	Description	Normally wetted by pumped fluid?
1	Pressure sensor T-piece	Yes
2	Outlet: Discharge connection [17] for attachment of a Hydraulic Connector or Hose Connector Kit	Yes
3	Outlet: Fluid connector seal [18]	Yes
4	Inside: Pressure sensor T-seal (sensor to pressure sensor T-piece)	Yes
5	Pressure sensor housing, with environmental seal	No
6	Control cable, integrated	No
7	M12 control cable connector or user wired cable gland connections	No
8	Inlet: Qdos pumphead connection collar (female) [17]	No

NOTE [17]	Items 2 and 8 are the same thread size as a H-FLO pumphead.

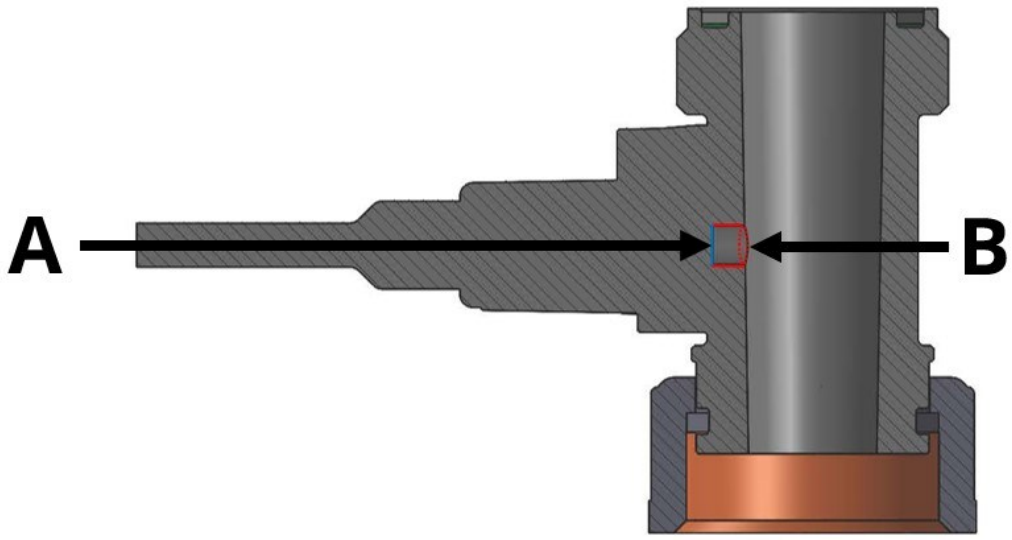
NOTE [18]

The Pressure Sensing Kit comes with the following seals based on product code:

Pressure Sensing Kit fluid path connection seals		
Description	Product code	Seals supplied
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT	FKM (Viton) seal pre-installed in Pressure Sensing Kit
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA	

5.3.4.1 Recess—Pressure Sensing Kit

A Pressure Sensing Kit measures pressure using a pressure sensing element located at point A in the following illustration:

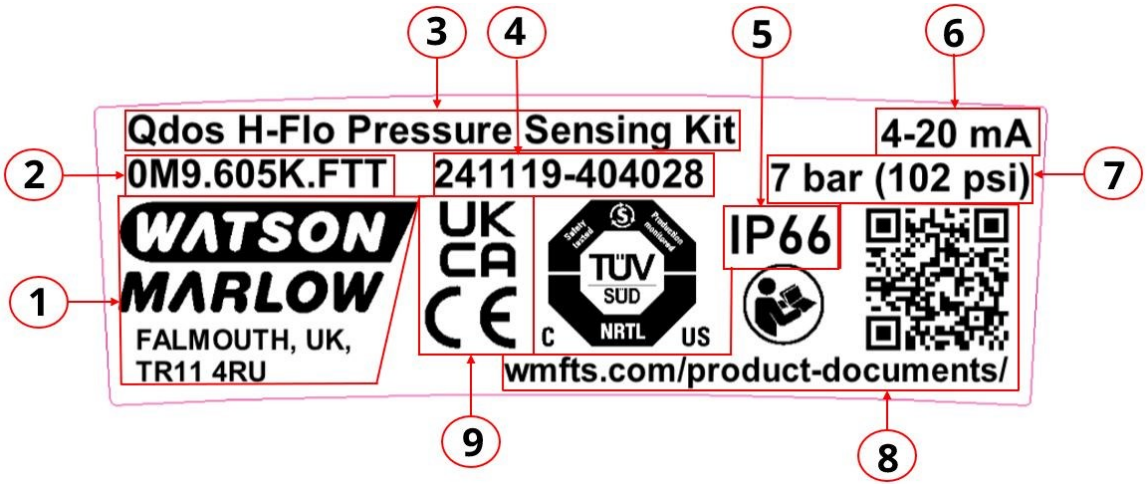


The Pressure Sensing Kit has a recess, shown as point B, with the following dimensions.

Dimensions of Pressure Sensing Kit recess	
Diameter	6.0 mm (0.236")
Depth	5.7 mm (0.224")

Inaccurate pressure sensing could occur if the recess becomes obstructed, or partially blocked, by fluids that solidify or congeal, or due to particles in the pumped fluid.

5.3.5 Product marking—Pressure Sensing Kit



Item	Description	Item	Description
1	Manufacturer details	6	Control signal output range
2	Product code	7	Maximum rated pressure. See section: 5.3.17.1
3	Product name	8	Safety symbol: Potential hazard, refer to these instructions with QR code link and website address
4	Serial number	9	Compliance symbols
5	Ingress protection (IP) rating		

5.3.6 Product code—Pressure Sensing Kit

Pressure Sensing Kit	
Description	**Product code**
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA

5.3.7 Required pump software version for use with a Pressure Sensing Kit

CAUTION

Failure to ensure pump has correct software version, may result in incorrect operation of products.

A Pressure Sensing Kit must only be installed onto a pump using the following software version:

Product name	Product code	Pump (all models)	Required software version
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT	H-FLO	v1.60.01 or above
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA		

The following information is provided in this reference manual:

- How to check the software version installed on the pump. See section: 27.4.1
- Recommended [19] USB flash drives for a software update. See section: 27.4.2
- Preparation of a USB flash drive. See section: 27.4.3
- How to download the latest software. See section: 27.4.4
- How to update the software on the pump using a USB flash drive. See section: 27.4.6

NOTE [19]	A Qdos Software Update USB flash drive accessory (Product code: 0M9.000U.000) is available for purchase, which contains the required software version for the updating of pumps prior to the installation of a Pressure Sensing Kit.

5.3.8 Control settings menu overview—Pressure Sensing Kit

Set up the Pressure Sensing Kit from the **Pressure Sensor Settings** sub-menu of the **CONTROL SETTINGS** menu.

The following settings can be adjusted:

- Alarm and warning levels:
  - Alarm maximum pressure level.
    - When this level is triggered the pump will stop, unless this feature is disabled.
  - Warning maximum pressure level.
  - Warning minimum pressure level.
  - Alarm minimum pressure level.
    - When this level is triggered the pump will stop, unless this feature is disabled.
- Sensor delay time for minimum levels only:
  - Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes).
- Disabling of Alarm (20) levels:
  - The purpose of this feature is to allow a user to decide if they want to just monitor the pressure or force the pump to stop if alarm levels are triggered.
- Trigger signal type — Averaged pressure signal trigger or raw pressure signal trigger.

NOTE 20	Warning levels cannot be disabled.

5.3.9 Defaults and configurable range

The defaults and configurable range is provided in the table below.

Pressure Sensing Kit—Defaults and configurable range				
Name	**Default**		**Configurable range**	
Sensor delay [23]	1 minute (01:00 in mm:ss)		0 second to 30 minutes (00:00 to 30:00 mm:ss)	
Trigger signal type	Raw signal		Average or raw signal	
Alarm maximum pressure level	10.00 bar	145.0 PSI	0.00 to 15.00 [21] bar or disable option [22]	0.00 to 217.5 [21] PSI or disable option [22]
Warning maximum pressure level	10.00 bar	145.0 PSI		
Warning minimum pressure level	0.00 bar	0.0 PSI		
Alarm minimum pressure level	0.00 bar	0.0 PSI		

NOTE [21]	The maximum rated pressure of a Qdos H-FLO pump is 7.00 bar (101.5 PSI). But the maximum alarm or warning level can be set to up to 15.00 bar (217.5 PSI) to allow for short-term peak pressures.

NOTE [22]	Warning levels cannot be disabled.

NOTE [23]	Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes).

5.3.10 Screen explanation and action due to levels

5.3.10.1 Warning levels—HMI display

When the pump reaches either the Warning maximum pressure level or Warning minimum pressure level, the pump will display an orange banner at the top of the active screen.

5.3.10.2 Warning levels—Pump behaviour

The pump will behave in the following manner upon a warning level being triggered:

- Pump will display a warning but not stop operating.
- Pump will show a flashing warning banner if the pressure is intermittently higher or lower than the maximum or minimum warning level. This can occur because of short-term changes in peak pressure.

  The warning banner will clear automatically when the warning threshold is no longer met.
- The triggering of a level can be used to produce an output from the pump, depending on the model:

Model	Output
Universal	Control Setting: General alarm
Universal+	Control Setting: General alarm, or Pressure Warning/Alarm (24)
PROFIBUS, EtherNet/IP, PROFINET	Network parameter, sent through network

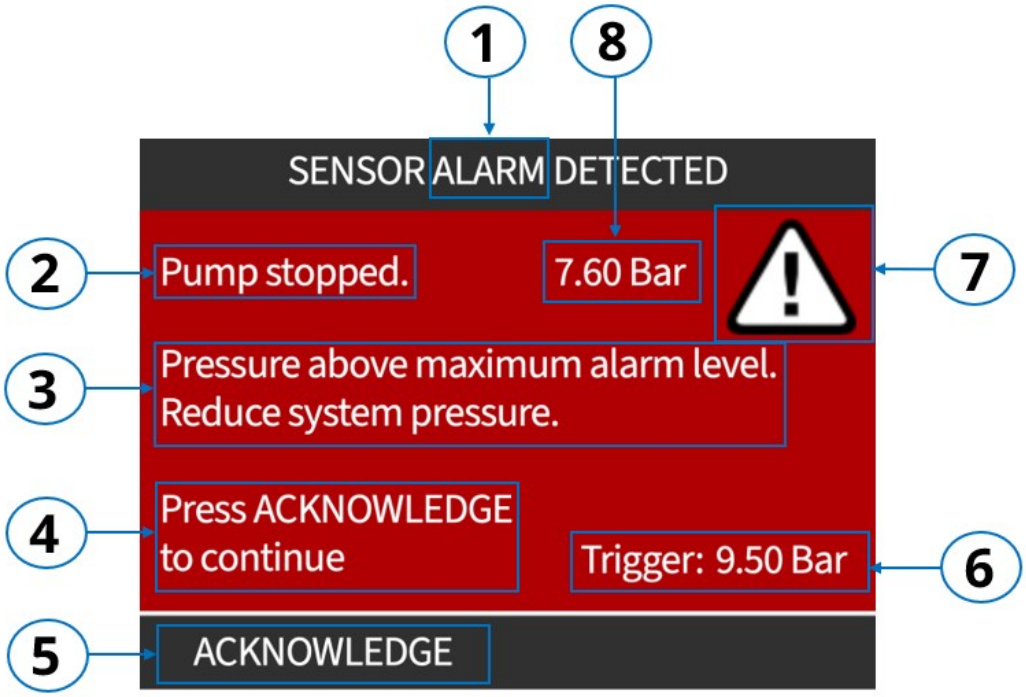
NOTE 24	It is not possible to differentiate between a pressure warning or pressure alarm using the pressure warning/alarm control setting.

5.3.10.2.1 WARNING LEVEL BEHAVIOUR WHEN PRESSURE LEVEL ALARMS ARE DISABLED

The maximum setting range for a warning level is 0 to 15.00 bar (0 to 217.5 PSI). If the pressure alarm maximum level is disabled, and the system pressure is greater than 15.00 bar (217.5 PSI), a warning will not be displayed or signalled as an output.

5.3.10.3 Alarm levels—HMI screens displayed on pump

Unless the alarms have been disabled, when the pressure reaches either the Alarm maximum pressure level or Alarm minimum pressure level, the pump will display the alarm screen and stop.



Item	Screen will display
1	Type of level: Alarm.
2	Message that the pump is now stopped.
3	Explanation of which alarm level has been triggered, and action required.
4	Next step to be taken after the required action of Item 3 has been completed.
5	The ACKNOWLEDGE key prompt. Press ACKNOWLEDGE to complete the acknowledge action.
6	The pressure shown is the most extreme value (maximum or minimum) since the level trigger.
7	Safety symbol: Follow the safety instruction using Items 3, 4, and 5.
8	Live process pressure (averaged). Levels can be set to trigger based on either an averaged or raw signal, but an averaged pressure will always be displayed on the home, alarm, or warning screens.

5.3.10.4 Alarm levels—Pump behaviour

The behaviour of the pump depends on mode of the pump and whether or not the pressure alarms have been disabled.

5.3.10.4.1 CONTACT MODE

An alarm level does affect the contact dose memory of a H-FLO pump. If a H-FLO pump is in contact mode with a dose in progress, then the current dose will be disregarded when an alarm level is reached. This does not affect the dose if only a warning level has been triggered.

5.3.10.4.2 PRESSURE ALARMS NOT DISABLED

The pump will stop upon an alarm level being triggered and display the screen shown in section 5.3.10.3.

The triggering of a level can be used to produce an output from the pump, depending on the model:

Model	Output
Universal	Control Setting: General alarm
Universal+	Control Setting: General alarm, or Pressure Warning/Alarm (25)
PROFIBUS, EtherNet/IP, PROFINET	Network parameter, sent through network

NOTE 25	It is not possible to differentiate between a pressure warning or pressure alarm using the pressure warning/alarm control setting.

To restart the pump:

- First, correct the reason for the alarm pressure level trigger. Power cycling of the pump will not clear the alarm. The reason for the pressure alarm trigger must be corrected.
-

Model of pump	Action
Universal and Universal+	Press ACKNOWLEDGE (26).
PROFIBUS, EtherNet/IP, and PROFINET	Use network parameters to remotely acknowledge, or press ACKNOWLEDGE.

  The pump will return to the home screen in a stopped state. Manual mode will require the **START** key to be pressed. All other modes will re-start based on the control signals to the pump.

For Alarm minimum pressure levels, if the pressure is still below the minimum alarm level when the sensor delay time has elapsed, the pump will stop again.

NOTE [26]	For Universal and Universal+ models, an "acknowledge" command cannot be sent remotely. The ACKNOWLEDGE key must be pressed locally on the pump in order to clear a pressure alarm.

5.3.10.4.3 PRESSURE ALARMS DISABLED

It is possible to disable the Pressure Sensing Kit alarms. See section 24.1.7.3.

If the alarms are disabled, the pump will not stop running. During this time, pressure will still be shown on the home screen, and the warning levels will remain active.

The maximum setting range for a warning level is 0 to 15.00 bar (0 to 217.5 PSI). If the pressure alarm maximum level is disabled, and the system pressure is greater than 15.00 bar (217.5 PSI), a warning will not be displayed or signalled as an output.

5.3.11 Pressure display on home screen

The Pressure Sensing Kit displays pressure [(27)] on home screen when in the following mode:

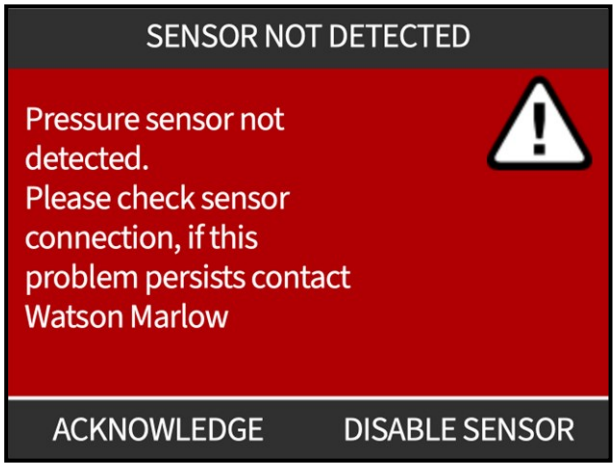
- Manual mode
- Analog mode
- Contact mode
- PROFIBUS mode
- EtherNet/IP mode
- PROFINET mode

NOTE [27]	The pressure displayed on the home screen is an averaged pressure. Without averaging, the process pressure may be difficult to read when pressure fluctuates. Levels can be set to trigger based on either an averaged or raw signal, but an averaged pressure will always be displayed on the home, alarm, or warning screens.

5.3.12 mA signal versus pressure

Pressure is based on an mA signal as follows:

mA signal	Displays as	Comment
≤ 3.70 mA	---	Out of range [28]
>3.71 to 4.00 mA	0.00 bar (0.0 PSI)	≤ 0.00 bar (0.0 PSI)
>4.01 to 20.00 mA	0.00 bar to 20.00 [29] bar (0.0 PSI to 290.1 [29] PSI)	
>20.01 to 20.99 mA	20.00 bar (290.1 PSI)	≥ 20.00 bar (290.1 PSI)
≥ 21.00 mA	---	Out of range [28]

NOTE [28]	When the sensor is out or range (≤ 3.7 or ≥ 21.0 mA), or if the sensor cable is removed from the pump, the following screen will be displayed if the pump is running or attempts to run:  The Pressure Sensing Kit can be disabled if required. See section: 5.3.15

NOTE [29]	The Pressure Sensing Kit contains a 4 - 20 mA pressure sensor which can measure pressure up to 20.00 bar (290.1 PSI). However the Pressure Sensing Kit itself must not be used in applications where the peak pressure can exceed 15.00 bar (217.5).

5.3.13 Pressure Sensing Kit functions not available during certain operating modes

The following Pressure Sensing Kit functions are not available in the following operating MODES:

Mode	Effect on Pressure Sensing Kit function
Fluid recovery mode (Manual or Remote)	All alarm and warning levels are disabled when the motor is running. When the pump is stopped, the following levels still function: • Alarm maximum pressure level • Warning maximum pressure level

Mode	Effect on Pressure Sensing Kit function
Pump running in reverse in either PROFIBUS, EtherNet/IP, PROFINET, or Analog mode	All alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse.

Mode	Effect on Pressure Sensing Kit function
Flow Calibration	During flow calibration the following levels are disabled: • Warning minimum pressure level • Alarm minimum pressure level

5.3.14 Output of pressure alarms, warnings and signals

5.3.14.1 Output of Alarms and Warnings

The triggering of a level can be used to produce an output from the pump, depending on the model:

Model	Output
Universal	Control Setting: General alarm
Universal+	Control Setting: General alarm, or Pressure Warning/Alarm (30)
PROFIBUS, EtherNet/IP, PROFINET	Network parameter, sent through network

NOTE [30]	It is not possible to differentiate between a pressure warning or pressure alarm using the pressure warning/alarm control setting.

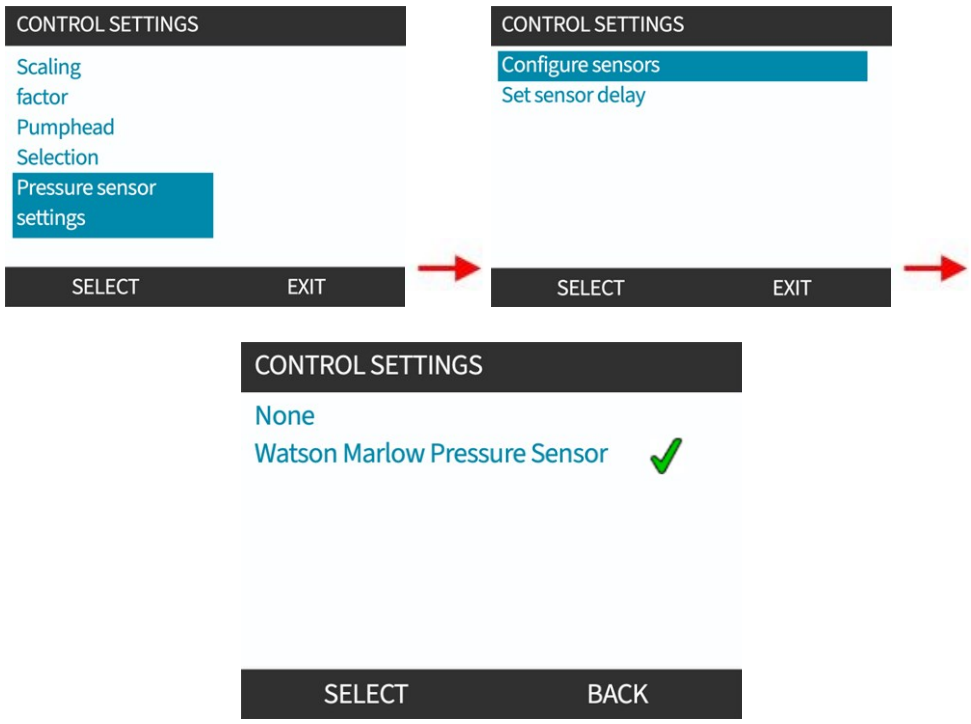
5.3.14.2 Output of the 4-20 mA signal

The mA signal of the Pressure Sensing Kit can be outputted by a Universal+. See section: 15.4.4.2. This output signal is raw data, there is no averaging or other change to the data received by the sensor to the pump.

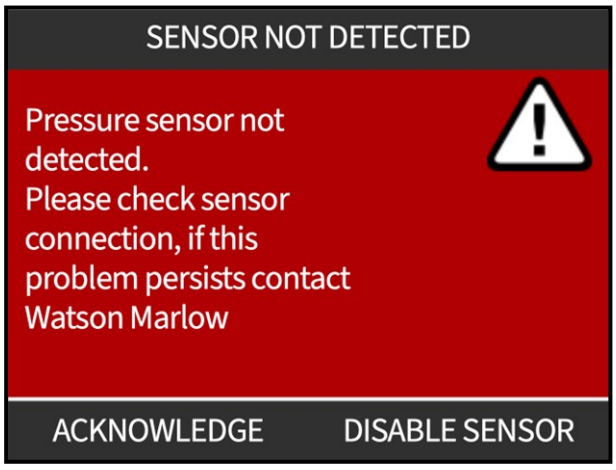
5.3.15 Disabling of a Pressure Sensing Kit

A Pressure Sensing Kit can be disabled in two ways:

1. By selecting "None" in the following menu path: Control settings>Pressure sensor settings>Configure Sensors.



2. By pressing DISABLE SENSOR when the mA signal is outside of the range (≤ 3.7 or ≥ 21.0 mA).



You can also disable the alarm levels (maximum and minimum) so that the pump will not be forced to stop: see section 24.1.7.3. During this time, pressure will still be shown on the home screen, and the warning levels will remain active.

5.3.15.1 Warning level behaviour when pressure level alarms are disabled

The maximum setting range for a warning level is 0 to 15.00 bar (0 to 217.5 PSI). If the pressure alarm maximum level is disabled, and the system pressure is greater than 15.00 bar (217.5 PSI), a warning will not be displayed or signalled as an output.

5.3.16 Using floating ground with a Pressure Sensing Kit

When using a Pressure Sensing Kit, the Analogue 2 reference/pass through (floating ground) must be disabled. This is disabled by default on all models.

The terminology of "Analogue 2 reference/pass through (floating ground)" is used in the control chapter. This function is called "4-20 mA Input 2" in the HMI.

For more information on enabling or disabling floating ground, see section 15.4.6.

5.3.17 Specification

This chapter provides a product overview and summary specification. Installation specific specification is provided in the relevant installation chapter.

Where specification is not provided, the Qdos pump specification applies (covers entire Qdos range). See section: 4.4

5.3.17.1 Pressure—Pressure Sensing Kit

The maximum rated pressure on a continuous basis is 7.00 bar (101.5 PSI) for a Qdos pump. (31) The purpose of being able to set a pressure higher than 7.00 bar (101.5 PSI) is to allow for short-term peak pressures in excess of the maximum rated pressure. The Pressure Sensing Kit can physically withstand short term peak pressures in the range of -1.00 (32) to 15.00 Bar (-14.5 to 217.5 PSI).

NOTE[31]

If you use a Watson-Marlow H-FLO Hydraulic Connector (PVC-U) at an ambient or fluid temperature of more than 37 °C (101.5 °F), maximum discharge pressure must be decreased as follows:

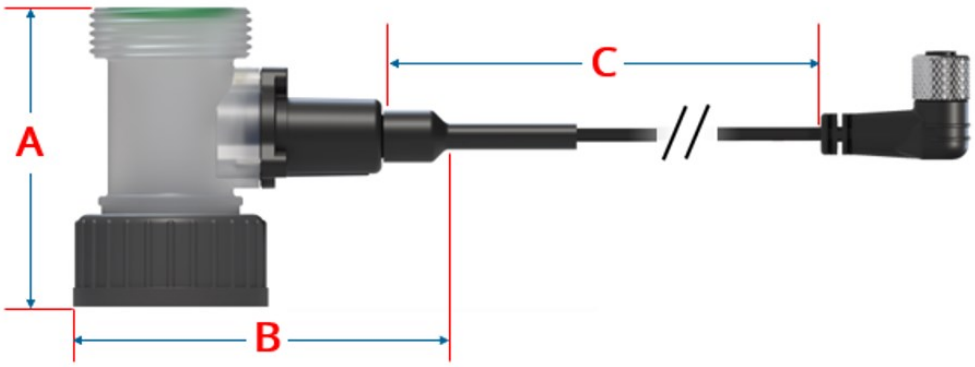
Temperature		Pressure	
(°C)	(°F)	(bar)	(PSI)
37	98.6	7.0	101.5
38	100.4	6.8	98.6
39	102.2	6.5	94.3
40	104.0	6.2	89.9
41	105.8	6.0	87.0
42	107.6	5.9	85.6
43	109.4	5.7	82.7
44	111.2	5.6	81.2
45	113.0	5.4	78.3

NOTE [32]

The Pressure Sensing Kit is suitable for operation to -1.00 Bar (-14.5 PSI), however the pressure will always be displayed as 0.00 Bar even in the rare scenario where a discharge pressure is in the range of -1.00 to 0.00 Bar (-14.5 to 0.0 PSI).

The Pressure Sensing Kit is not designed for use on the inlet side of the pump, and the pressure range of -1.0 to 0.0 Bar should not be confused with inlet pressure which is commonly in the -1.0 to 0.0 Bar (-14.5 to 0.0 PSI) range for a positive displacement pump (i.e fluid lift on inlet side).

5.3.17.2 Dimensions—Pressure Sensing Kit



Model	A		B		C	
	mm	in	mm	in	mm	in
H-FLO Pressure Sensing Kit (all versions)	81	3.19	95	3.74	500	19.7

5.3.17.3 Weight—Pressure Sensing Kit

Model name	Product code	Kg	Ibs
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT	0.125	0.276
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA	0.135	0.298

6 STORAGE

6.1 Storage conditions

The storage conditions of all items in the Qdos range are:

- Storage temperature range: -20 °C to 70 °C (-4 °F to 158 °F)
- Indoors
- Not in direct sunlight
- Humidity (non-condensing): 80 % up to 31 °C (88 °F), decreasing linearly to 50 % at 40 °C (104 °F).

6.2 Shelf life

6.2.1 Shelf life—Pumphead

Store pumphead in original packaging, until ready for use.

Pumphead type	Shelf life [33]
ReNu	2 years

NOTE [33]	The pumphead shelf life is written on the label on the side of the box.

7 LIFTING AND CARRYING

7.1 Product in packaging

The drive and pumphead are not supplied in the same packaging. The weight is as follows:

7.1.1 Packed Weight

7.1.1.1 Drive: M type

Model	Packed weight	
	kg	Ibs
Manual	14.8	32.63
Universal	14.9	32.85
Universal+	14.9	32.85
PROFIBUS	14.9	32.85
EtherNet/IP	14.9	32.85
PROFINET	14.9	32.85

7.1.1.2 Drive: T type

Model	Packed weight	
	kg	Ibs
Universal	15.0	33.07
Universal+	15.0	33.07

7.1.2 Procedure—Lifting and carrying product in packaging

CAUTION

The packaged pump weighs up to 15.0 Kg (33.07 lb) depending upon model. The weight of the pump could cause a foot injury if dropped. Wear designated personal protective equipment when lifting and moving the pump.

Lift and carry the product using the procedure below:

1. Observe, the upright symbol on the packaging. 
2. Use two hands to lift the package at a time, in accordance with local health and safety procedures, keeping the product upright at all times.

7.2 Product removed from packaging

If the product has been removed from the packaging:

- Do not lift the pump by the top of the HMI.
- Obey the following safety signals

CAUTION

Do not place or move the drive, by holding the driveshaft. The driveshaft has edges which may cause a laceration.

CAUTION

Lifting or moving the pump with the pumphead installed may result in the pumphead disengaging from the drive and falling. Do not lift or move a pump with the pumphead installed. See section: 27.5.2.3 to remove pumphead

8 UNPACKING AND INSPECTION

8.1 Components supplied—Drive

8.1.1 Drive

The drive will come with the following items included within the packaging

- Chosen model of drive unit
- 2 x Fluid connectors (3/4" Female Parallel thread in a PVC-U) in either Rp or NPT (34)
- 2 x Connection collars (PVC-U)
- Power cable (non- detachable) with regional power plug
- 3 x cable glands for T type only control connection models (35)
- Safety information leaflet with QR code to these instructions
- Declaration of Conformity

NOTE 34	If the MODE or HOME key is pressed while changes to settings are in progress, these changes will not be saved.
NOTE 35	The 3 control connection cable glands are only supplied with the type T models.

8.2 Components supplied—pumphead

A pumphead will come with the following items included within the packaging:

- Chosen model of pumphead
- Pumphead port seals (pre-fitted)

Hydraulic Connectors are not supplied with replacement pumpheads. If replacement Hydraulic Connectors are required, these items must be ordered separately. See section: 27.5.1.2

8.3 Components supplied—Accessories

8.3.1 Components supplied—Pressure Sensing Kit

The Pressure Sensing Kit will come with the following items included within the packaging:

- Chosen model of Pressure Sensing Kit
- Fluid path seals based upon the following table

Pressure Sensing Kit fluid path connection seals		
Description	**Product code**	**Seals supplied**
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT	FKM (Viton) seal pre-installed in Pressure Sensing Kit
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA	

- Safety information leaflet with QR code to these instructions
- Software update document
- Declaration of Conformity

8.4 Unpacking, inspection and packaging disposal

Procedure

1. Carefully remove all parts from the packaging. When lifting the product use the procedure in section 7.
2. Check that all components in "Components supplied" are present (See section: 1).
3. Inspect components for damage in transit.
4. If anything is missing or damaged, contact your Watson-Marlow representative immediately.
5. Recycle or dispose of the packaging provided in the following table according to local procedures:

Packaging material by item		
Packaging item	**Drive**	**Pressure Sensing Kit**
Outer carton	Cardboard	Cardboard
Inner carton	Cardboard	—
Protective caps	High density polyethylene (HDPE)	—
Document protection bag	Polyethylene (PE)	—

9 INSTALLATION—CHAPTER OVERVIEW

9.1 Using the HMI for installation

The use of the HMI will be required to set up the pump or Pressure Sensing Kit during installation. Review the HMI overview of screens, key operation and menus (See section: 4.5) prior to carrying out an installation task.

9.2 Installation chapter structure

Each of the installation chapters are divided into three main parts:

1. Part 1: Installation requirements, specification, and information for the chapter
2. Part 2: Installation procedures for the chapter
3. Part 3: Chapter specific HMI set up instructions

9.3 Installation sequence—Pump, and Pressure Sensing Kit

To install a pump, and Pressure Sensing Kit, or at the same time follow the sequence below below:

1. Installation—Chapter 1: Location and mounting
2. Installation—Chapter 2: Electrical power
3. Installation—Chapter 3: Fluid path
4. Installation—Chapter 4: Overview: Control

This chapter is divided into sub chapters depending on model:

- Installation—Sub-Chapter 4A: Control (Model: Manual)
- Installation—Sub-Chapter 4B: Control (Model: Universal and Universal+)
- Installation—Sub-Chapter 4C: Control (Model: PROFIBUS)
- Installation—Sub-Chapter 4D: Control (Model: EtherNet/IP)
- Installation—Sub-Chapter 4E: Control (Model: PROFINET)

Follow the installation in the specific sequence above—The instructions have been written in a specific order to ensure pump has:

- Is suitably located and mounted ready for installation of a Pressure Sensing Kit
- Electrical power prior to the first time pumphead installation procedure.
- A pumphead installed prior to set up using the HMI.
- Control connections installed prior to set up using the HMI

9.4 Installation sequence of Pressure Sensing Kit for pumps already installed

A Pressure Sensing Kit which has been purchased at the same time as a pump, should be installed using the installation sequence in section 9.3

If a Pressure Sensing Kit is to be installed after the pump has already been installed, follow the sequence below:

WARNING

There can be harmful chemicals in the fluid path that can cause serious injury or damage to equipment if spilled. Wear PPE and follow your organisations procedures when removing the fluid path.

1. Ensure there is enough space around the pump to physically mount the Pressure Sensing Kit. See section: 10. If it will be necessary to remove and remount the pump to create more space follow the procedures in section 27.6.2.2
2. Stop the pump
3. Turn off the control signals to the pump.
4. Isolate the pump from electrical power
5. Release pressure in fluid path. Remove fluid path and drain down in accordance with your organisation's procedure for this step
6. Remove the Hydraulic Connector . See section: 27.5.2
7. Mount the Pressure Sensing Kit on to the pump. See section: 12.4.6
8. Determine and if necessary do a software update of the pump. See section: 27.4
9. Enable the pressure sensor in the HMI control settings, then use control settings to configure all features. See section: 24 This step is necessary for all models including PROFIBUS, EtherNet/IP and PROFINET.
10. For Universal and Universal+ models, check floating ground is disabled in control settings. See section: 15.4.6
11. If using a PROFIBUS, EtherNet/IP or PROFINET pump configure the network parameters
12. Reconnect the fluid path.
13. Reconnect the power supply
14. Check there are no leaks from the fluid path.
15. Check the pump operates as expected in response to the control system and system pressure

10 INSTALLATION—CHAPTER 1 (LOCATION AND MOUNTING)

This chapter provides information to locate and install a Qdos pump, considering the later installation chapters. The installation of the Pressure Sensing Kit and onto the pump is provided in the fluid path installation chapter. Information relating to ensuring there is adequate clearance to install these accessory kits is provided in this chapter.

10.1 Conceptualisation

A pumphead is pictured in all illustrations in this chapter for conceptualisation of the final installation. A pumphead should only be installed after location and mounting (this chapter) and electrical installation (next chapter) have taken place.

10.2 Environment and operating conditions

All items of the Qdos range are designed for use in the following environment and operating conditions:

Ambient temperature range	5 °C to 45 °C (41 °F to 113 °F) [36]
Maximum humidity (non-condensing)	Maximum relative humidity 80 % for temperatures up to 31 °C (88 °F), decreasing linearly to 50 % relative humidity at 40 °C (104 °F).
Maximum altitude	2,000 m (6,560 ft)
Pollution degree of the intended environment	2
Noise	<70 dB(A) at 1 m
Maximum fluid temperature [36], [37]	SEBS [38] pumphead: 40 °C (104 °F) Santoprene pumphead: 45 °C (113 °F) Pressure Sensing Kit [38]: 45 °C (113 °F)
Environment	Suitable for use in an indoor or covered area, which is a dry or **wet location**, up to the ingress protection rating [39]
Ingress protection rating	IP66, NEMA 4X

NOTE [36]

If you use a Watson-Marlow H-FLO Hydraulic Connector (PVC-U) at an ambient or fluid temperature of more than 37 °C (101.5 °F), maximum discharge pressure must be decreased as follows:

Temperature		Pressure	
(°C)	(°F)	(bar)	(PSI)
37	98.6	7.0	101.5
38	100.4	6.8	98.6
39	102.2	6.5	94.3
40	104.0	6.2	89.9
41	105.8	6.0	87.0
42	107.6	5.9	85.6
43	109.4	5.7	82.7
44	111.2	5.6	81.2
45	113.0	5.4	78.3

NOTE [37]	Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in section 29.

NOTE [38]	If using a SEBS pumphead with a Pressure Sensing Kit, the lower temperature of 40 °C (104 °F) applies.

NOTE [39]	The power cable plug is not IP66 or NEMA 4X rated. In applications requiring IP66 or NEMA 4X, the power plug must be installed in a corresponding rated enclosure.

10.3 Intended mounting overview

A simple overview of mounting the Qdos range is provided in this section. Full specification requirements for mounting are provided in the following sub-sections.

10.3.1 Intended mounting—Pump overview

Intended mounting—Pump	
Qdos pump	A Qdos pump is intended to be mounted to a flat horizontal surface.

10.3.2 Intended mounting—Pressure Sensing Kit

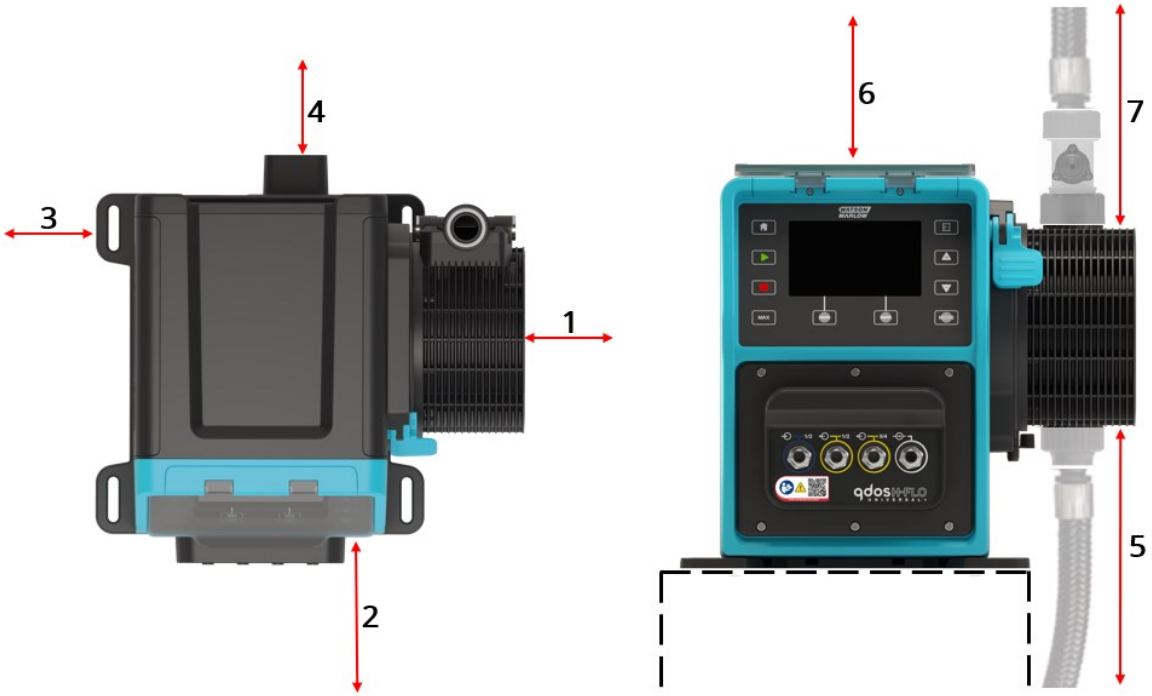
Intended mounting—Pressure Sensing Kit	
Pressure Sensing Kit	A Pressure Sensing Kit is intended to be mounted directly onto the discharge (top) port of a Qdos pumphead.

10.4 Intended mounting—Pump

10.4.1 Area around the product—Not enclosed [40]

NOTE [40]	If the pump is to be installed inside an enclosure, contact your Watson-Marlow representative for advice.

The pump must always be accessible to facilitate additional installation, operation, maintenance, and cleaning. Access points must not be obstructed or blocked.



<table>
<tr><th>Number</th><th>Minimum clearance</th><th>Explanation</th></tr>
<tr><td>1</td><td>200 mm (7.87”)</td><td>Install and remove the pumphead (right hand pumphead mounting shown)</td></tr>
<tr><td>2</td><td>100 mm (3.94")

PROFIBUS, EtherNet/IP, PROFINET models = 115 mm (4.53")</td><td>The clearance is based upon a pump with a door at point 4 that can be opened or closed to the front of the pump.

Additional clearance will be required for the:
Installation of control cables
Open and close the HMI cover
Operate and view the screen and keypad.
The clearance is based upon a pump with the optional HMI screen cover accessory installed

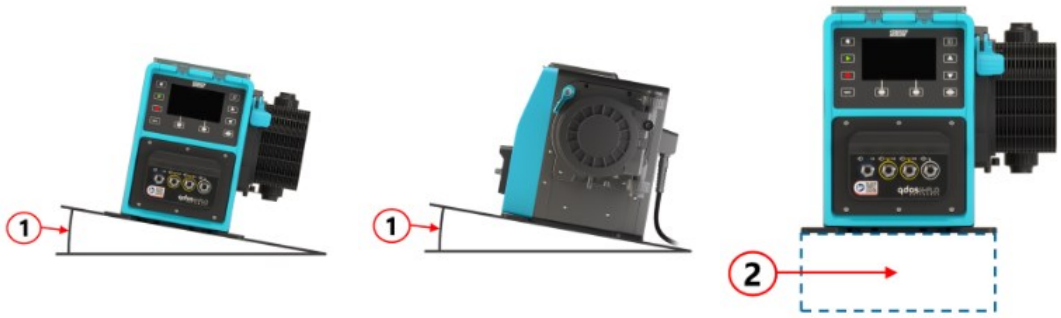
Additional clearance maybe required for the:
Installation of control cables</td></tr>
<tr><td>3</td><td>100 mm (3.94”)</td><td>Access pump mounting bolts</td></tr>
<tr><td>4</td><td>1000 mm (39.37”)</td><td>The minimum clearance is based on the
Bend radius of power cable
Additional clearance will be needed to access the back of the pump for:
Information (serial number, product name)
Carry out an Earth bond test</td></tr>
<tr><td>5</td><td></td><td>The clearance depends on item to installed as<table><tr><th>Item to be installed</th><th>Minimum dimension</th></tr><tr><td>Hydraulic Connector only</td><td>45mm (1.75") (41)</td></tr></table></td></tr>
<tr><td>6</td><td>200 mm (7.87”)</td><td>Clearance for opening and closing HMI cover</td></tr>
<tr><td>7</td><td>see explanation table</td><td>The clearance depends on item to be item to be installed:</td></tr>
</table>

<table>
<tr><th>Number</th><th>Minimum clearance</th><th>Explanation</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Items to be installed</th><th>Minimum clearance</th></tr>
<tr><td>Hydraulic Connector only</td><td>45 mm (1.75") (41)</td></tr>
<tr><td>Pressure Sensing Kit, with Hydraulic Connector on top</td><td>127 mm (5.0") (41)</td></tr>
</table>
The clearances above are for installation, removal, and minimum bend radius.
</td></tr>
</table>

NOTE [41]	Additional clearance will be need based upon a user organisation system design to: • Attach and remove pipework • Bend radius of pipework

10.4.2 Surface and orientation

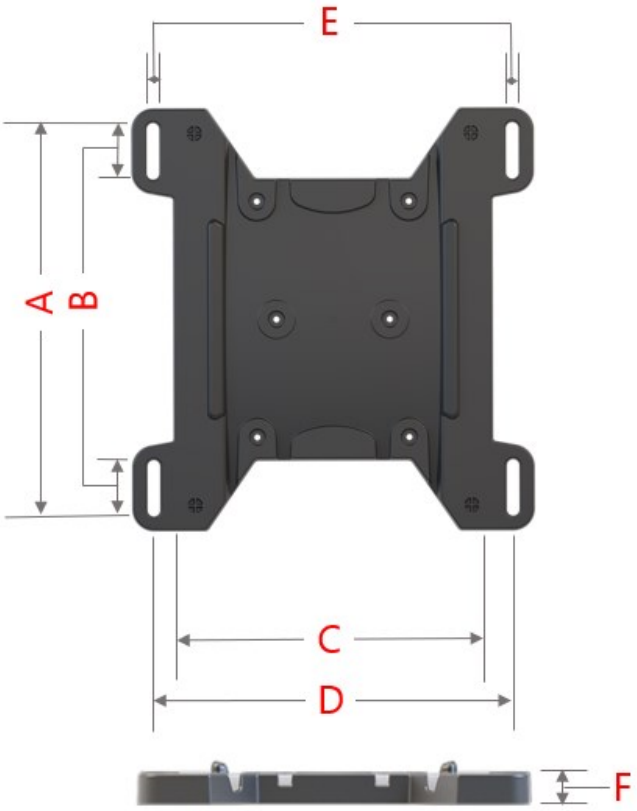
The pump must be installed in accordance with the illustrations and explanations table below:



Number	Information
1	Install the pump on a level surface. **NOTICE** A mounting slope can cause poor lubrication, resulting in damage to the pump though accelerated wear. Install the pump on a level surface
2	With a surface mounting (such a plinth): • Suitable to ensure that the fluid path inlet connections has adequate space to be installed and removed. • Suitable to ensure that the pump is at a comfortable height for operation • Rated to support full weight of complete assembly and pumped product • Chemically compatible with the fluids being pumped • Free of vibration **NOTICE** Excessive vibration can cause poor lubrication, resulting in damage to the pump though accelerated wear. Install the pump on a surface free from excessive vibration.

10.4.3 Pump mounting dimensions

The dimensions for mounting the pump are provided by the illustration and table below



Letter	Dimension	
	mm	in
A	276	10.87
B	35	1.38
C	224	8.82
D	260	10.24
E (42)	11	0.43
F	14	0.55

NOTE 42	The mounting slots are designed to accommodate an anchorage fixing not larger than a M8 bolt with a minimum 15 mm OD M8 flat washer.

10.4.4 Procedure—Placing and mounting the pump

Do not mount the pump with the fluid path already installed. The pump must first be placed in its mounting location prior to the installation of the fluid path.

1. Ensure the surface on which the pump is to be mounted is ready.
2. Place the drive on the surface to be mounted.

CAUTION

Do not place or move the drive, by holding the driveshaft. The driveshaft has edges which may cause a laceration.

If the pump will be mounted to the surface follow these additional steps

3. Tighten anchorage fixings evenly until the drive is securely fixed. Do not overtighten.
4. Check the drive is mounted securely and cannot be moved easily.

10.5 Mounting—Accessories

Do not fit any devices or accessories other than those tested and approved by Watson-Marlow.

The procedure for the installation the HMI cover is provided in the next section. A procedure for the installation of the following items is provided when relevant in further installation chapter:

- Input/output control cables
- Hydraulic Connectors
- Accessory kits
    - Pressure Sensing Kit

11 INSTALLATION—CHAPTER 2 (ELECTRICAL POWER)

11.1 Part 1: Chapter installation requirements, specification, and information

11.1.1 Power specification requirements

Only connect to an earthed single phase power supply which meets the specification in the table below:

Item	Specification
Power supply voltage/Frequency	Alternating Current (~100 V to 240 V AC 50/60 Hz)
Maximum voltage fluctuation	±10 % of nominal voltage
Overvoltage category	II
Rated power	350 VA, 330 W

If the quality of the AC power supply cannot be guaranteed, we recommend the use of appropriate commercial electrical supply stabilising equipment.

11.1.2 External devices

11.1.2.1 Overcurrent protection

Use an appropriate protected circuit in accordance with local regulations. The recommended overcurrent protection varies with power supply voltage.

Voltage	Amperage
230 V AC	2 A
115 V AC	4 A

11.1.2.2 Electrical power supply disconnection (isolation)

The power cable is fitted with a power plug. The power cable and power plug are specific to the product code, based upon the geographical use of the pump. The power plug is the electrical power supply disconnection device. The power plug is non locking, for connection to a corresponding geographical socket-outlet.

During electrical power installation, the pump must be positioned so that the disconnecting device is easy to reach and operate when required for electrical power isolation.

WARNING

The power plug is not IP66 or NEMA 4X rated. Install the power plug in a socket outlet with an enclosure rating matching the application ingress protection rating requirement.

11.2 Part 2: Chapter installation procedures

11.2.1 Chapter pre-installation checklist

At this stage of the installation sequence, the pump should be physically installed, with no power, and the fluid path or control system not yet connected.

Prior to electrical power installation, carry out the following pre-installation check to ensure:

- Pump has been installed in accordance with section 10.
- All requirements of part 1 of this chapter have been met.
- Power cable is not damaged.
- Supplied AC power plug and corresponding socket outlet is correct for your Country/Region/Facility.

If there is a problem with any of the pre-installation checklist items, do not proceed to the installation procedures in this chapter, until the matter is resolved.

11.2.2 Earth continuity testing using the earth bond test point

Earth continuity from the power plug to the pump must be tested at the earth bond test point located on the back of the pump identified by this symbol:

NOTICE

Do not perform an earth continuity test using the motor shaft instead of the earth bond test point, as high current will damage the motor. Always use the earth bond test point to perform earth continuity testing

11.2.3 Procedure: Connecting to the power supply

1. Complete the pre-installation checklist provided in section 11.2.1.
2. Ensure the power cable plug socket outlet is isolated from the power supply.
3. Ensure the electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
4. Connect the power cable plug to the power plug socket outlet.
5. Turn on the power supply to the power plug socket outlet. The pump will immediately receive power and the HMI screen will illuminate.

11.2.4 Testing of electrical power and first time pump start up

When the pump is turned on for the very first time a leak detection message will appear. This is because the pumphead has not yet been installed.

For the purposes of testing the electrical power to the pump, this message indicates the pump is receiving power.

The procedure for installing the pumphead for the first time is provided in section 95.

12 INSTALLATION—CHAPTER 3 (FLUID PATH)

This chapter only provides installation related information. Overview or general information relating to fluid path items, such as normally wetted items of the pumphead, or hydraulic connection thread sizes is not provided in this chapter. Reference links are provided to such sections when relevant:

12.1 Introduction

The fluid path includes the normally wetted parts of the following two main groups of items:

Group	Normally wetted parts of a:
Watson-Marlow Qdos range items	• Pumphead • Hydraulic Connectors • Pressure Sensing Kit
User organisation's fluid path system items	• Process fluid path (inlet and discharge pipework) • Ancillary devices (overpressure safety device, non-return valve, isolation and drain valves.

Information on the connection of the Watson-Marlow Qdos range items to a Qdos pump is provided in the sections of this chapter.

12.2 Fluid path information for Watson-Marlow Qdos range items

Overview or general information relating to fluid path items, such as normally wetted items of the pumphead, or hydraulic connection thread sizes are not provided in this chapter.

This information can be referenced in other parts of this manual using the links in the table below:

Item	Wetted items	Information, Overview and Specification
	Chemical compatibility item group section	Product overview section
Hydraulic Connectors	See section: 29.2.3.2	See section: 27.5.1.2
Pressure Sensing Kit	See section: 29.2.3.3	See section: 5.3

12.3 User organisation's fluid path system item requirements

A Watson-Marlow pump should be installed into a fluid path system with specific ancillary devices to ensure safe operation. These requirements are detailed in the sections below.

All devices, connections or pipework must be:

- Chemically compatible with the pumped fluid
- Have a specification rating higher than that of the application.

12.3.1 Overpressure safety device

A Watson-Marlow pump operates by positive displacement. Should a blockage, restriction, or failure of the pumping system pressure control occur, the pump will continue to operate until an over pressure event takes place, resulting in any of the following:

- The pumphead tubing or element, or ancillary device may rupture, leak or otherwise fail
- The fluid path system, pipework or ancillary device, may rupture, leak or otherwise fail
- The drive may fail

If the pumping system can create an overpressure event, an overpressure safety device must be installed.

The over pressure safety device must:

- Only operate in response to an overpressure event.
- Be connected as close as possible to pumphead discharge (43) port
- Be easily accessible for inspection, maintenance, or repair
- Only be adjustable with a tool
- Installed such that, the discharged fluid flows (44), away from personnel and equipment to avoid injury, or contamination hazards to the equipment or environment.
- It shall have sufficient discharge capacity to ensure that the pressure will not exceed 1.1 × maximum pumphead rated pressure or the working pressure of the system, whichever of the two ratings is lower (45).
- Not be installed with an isolation valve located between the overpressure safety device and the pumphead discharge (43) port

NOTE 43	Whilst typically, an overpressure event occurs on the discharge side of the pump, an over pressure device should also be installed on the inlet side of the pump if there could be a positive pressure acting on the inlet, which could result in an overpressure event.

NOTE 44	If the pump will be operated in reverse, such as when using the fluid recovery feature, the inlet side becomes the discharge side of the pump. In this scenario, the overpressure safety device must be installed, such that it may operate when required, in either direction of flow.

NOTE 45	If using the Pressure Sensing Kit, the Alarm maximum pressure level trigger point should be set lower than or the same as, the over pressure safety device activation point, to ensure both devices will operate as expected.

12.3.2 Non-return valve

Install a non-return valve in the **discharge** fluid path as close as possible to the pumphead. This is to prevent pressurised chemical backflow in the event of a pumphead, tube or element failure. If the pump is to be operated in reverse, the non-return valve will need to be bypassed during this operation, to avoid becoming a blockage.

12.3.3 Isolation and drain valves

Isolation and drain valves must be installed in the fluid path in the following scenarios:

- Where it is not practical to drain the entire fluid path during:
  - Pumphead tubing or element replacement
  - Where procedures require the pump to be removed from service, such as due to a fault
- The pump will act like a valve when stopped, preventing fluid from flowing through the pumphead.
  - As the tubing, element, or pumphead wears, there can be flow through the pumphead (which would be a normally closed fluid path). In applications where unintentional flow through the pumphead, cannot be tolerated or would create a hazard, then isolation valves must be installed.

Valves must be opened before the pump starts and closed after the pump has stopped.

12.3.4 Inlet and discharge pipework

Inlet and **discharge** pipes should:

- Be as short as possible
- Be as direct as possible
- Follow the straightest route
- Use bends of large radius

With the largest diameter bore tube that will fit with your process.

12.3.4.1 Flow calibration

In order to carry out a flow calibration, the discharge pipework system will need to be designed to allow pumping into a graduated container near the pump.

12.3.5 Piping vibration

Peristaltic pumps produce a pulsation which results in vibration of the peristaltic tubing and fluid path.

A Piping vibration and integrity assessment should be undertaken to determine the level of vibration suitable for the installation.

12.4 Chapter installation procedures

12.4.1 Safety—After product installation

CAUTION

After installation of the fluid path, do not lift or move the pump by holding the Hydraulic Connectors, interface tubing, Pressure Sensing Kit. This will create stress on the fittings and create unsafe handling conditions when moving the pump. If the pump must be moved, remove these items.

12.4.2 Fluid path installation sequence

This section provides information on installation of fluid path items for the first time. Do not use this section to replace a pumphead or fluid path item, as a check for chemical residue must take place.

The installation sequence of the fluid path items, such as the pumphead, will depend on which of these items will be installed.

12.4.2.1 Sequence

- PROCEDURE 1: Install the pumphead on to the drive.
- PROCEDURE 2: Connect the pumphead safety overflow.
- PROCEDURE 3: Check the seals in the pumphead ports.
- PROCEDURE 4: This step will depend on whether a Pressure Sensing Kit is to be installed:
-

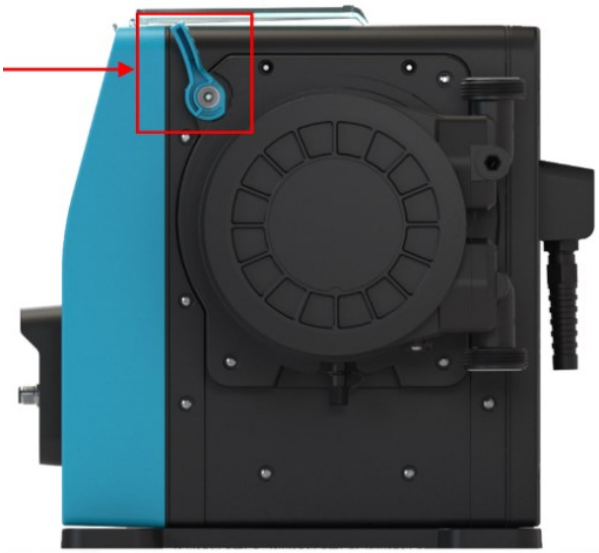
PROCEDURE	Item	Comment
4A	Pressure Sensing Kit	• Install after pumphead, followed by a Hydraulic Connector.
4B	Hydraulic Connector	• Install after pumphead if a Pressure Sensing Kit is not to be installed.

12.4.3 PROCEDURE 1—First time H-FLO pumphead installation

The first time installation procedure differs from the replacement pumphead procedure provided in section 27.5.2.3.

The installation procedure shown below is for a right hand pump. A left-hand pump has an identical procedure.

1. Isolate the power supply to the drive.
2. Ensure pumphead locking lever illustrated in the image below is set to enable the pumphead to be fitted.



NOTICE

The pumphead locking lever is not designed to be loosened or tightened with a tool. Always operate the lever by hand.

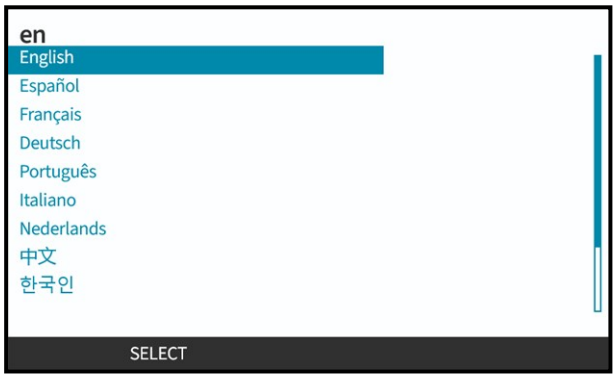
3. Align pumphead with pump drive shaft and slide into position on pump housing.
4. Rotate pumphead in clockwise direction approximately 15°.
5. Ensure retaining lugs engage.

6. Check that the embossed arrow on pumphead is pointing upwards.

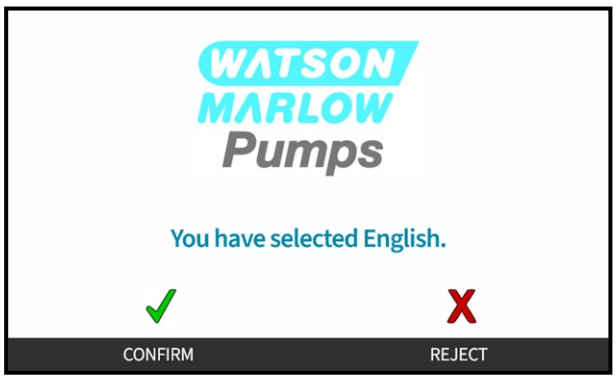
7. Lock pumphead into position by hand using pumphead locking lever. Do not use a tool.
8. Apply electrical power to pump. Pump will enter into its first time start up sequence and the Watson-Marlow logo will display for three seconds.

9. The screen below will be displayed to allow selection of the on screen text language.

Use **+/-** keys to highlight required language.



10. Press SELECT ▬ to choose language.
11. Press CONFIRM ▬ to continue.



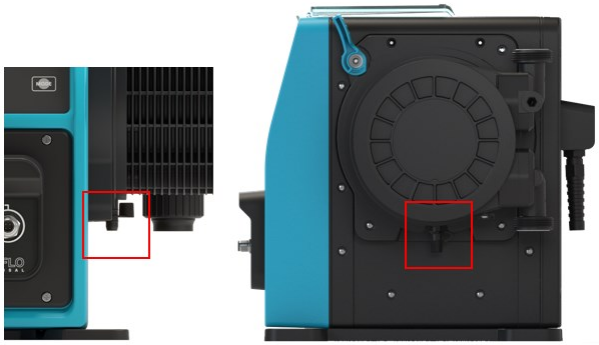
12. To change your selection, press REJECT ▬.
13. Press start and run pumphead for a few revolutions.
14. Stop pump.
15. Isolate the pump from the electrical power supply.
16. Check the locking lever is still correctly locked in position.

If not:

- Isolate pump from electrical supply
- Lock lever into position
- Repeat steps 14 to 16

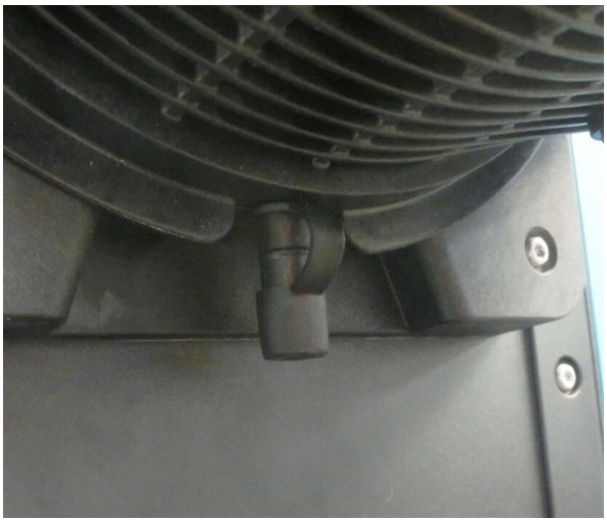
12.4.4 PROCEDURE 2—Connect the pumphead safety overflow

All pumphead models have a hose barb safety overflow, as illustrated below



In the unlikely event of a leak detection sensor failure, the safety overflow provides a safe leak path for mixture of fluid and lubricant.

The pumphead has a factory fitted rubber cap on the safety overflow, which is unplugged, but not removed during installation of the safety overflow.



During installation remove the rubber cap from the opening to allow the safety overflow pipework connected, without removing the rubber cap item completely.

The safety overflow must flow away from the pump into a system designed to:

- Be vented
- Allow no back flow, due to pressure or blockage
- Have sufficient capacity
- Be obvious to user that fluid can be seen flowing in the event of a safety overflow event

During installation remove the rubber cap from the opening to allow the safety overflow pipework connected, without removing the rubber cap item completely.

Do not block safety overflow of pumphead. Do not fit a valve to the pumphead. Do not discard the rubber safety cap.

12.4.5 PROCEDURE 3—Check the seals in the pumphead ports

Procedure 3 is a check that the pumphead port seals are seated correctly prior to Procedure 4, which covers the installation of either of the following:

- Pressure Sensing Kit
- Hydraulic Connector

The pumphead is pre-installed with seal material as illustrated by the image below, depending upon the pumphead type.

Check these seals are present and fully seated in groove.

12.4.6 PROCEDURE 4A—First time installation of Pressure Sensing Kit onto pumphead

The Pressure Sensing Kit must only be installed on the discharge port of the pumphead, using the following steps after procedures 1 to 3 have been completed:

CAUTION

Risk of pressure and corrosive fluid release. Do not use a tool to tighten the connection collar. Over-tightening can cause damage to the connecting thread, which can cause pumped fluids to be ejected. If corrosive fluids are in the pump, this can cause injury to persons.

STEP 1	STEP 2	STEP 3
Place Pressure Sensing Kit on the pumphead with the sensor housing facing forward.	Hand tighten connection collar in a clockwise direction until fully engaged with discharge port.	Remove yellow cap from Pressure Sensing Kit connection on pump.
		

STEP 4	STEP 5	STEP 6
Align cable connector key way with pump connector.	Place cable connector on pump connector and hand tighten collar clockwise until fully engaged.	Ensure control cable is routed such that there is no strain or sharp bends.

STEP 7
Install a hydraulic connector (See procedure: 12.4.7).

CAUTION

After installation of the Pressure Sensing Kit do not place external loads such as knocks or bumps on the Pressure Sensing Kit as this may result in breakage or leakage of the pumped fluid.

12.4.7 PROCEDURE 4B—First time installation of Hydraulic Connectors

The Hydraulic Connectors can be installed on either the:

- Pumphead
- Pressure Sensing Kit

Metal threaded fittings cannot be used to connect to Watson-Marlow H-FLO Hydraulic connectors.

To install a hydraulic connector

1. Stop the pump
2. Place connection collar over the hydraulic connector.
3. Connect the hydraulic connector to the process fluid path, in accordance with the user organisations procedures for pipework and connection fittings.

CAUTION

Metal threaded fittings cannot be used to connect to Watson-Marlow H-FLO Hydraulic connectors. A metal threaded fitting may damage the Watson-Marlow H-FLO hydraulic connector and create a leak of pumped fluid.

4. Hand tighten the connection collar to the pumphead or Pressure Sensing Kit.

CAUTION

Risk of pressure and corrosive fluid release. Do not use a tool to tighten the connection collar. Over-tightening can cause damage to the connecting thread, which can cause pumped fluids to be ejected. If corrosive fluids are in the pump, this can cause injury to persons.

5. Repeat previous steps for the other hydraulic connector.
6. Reconnect the power supply
7. Operate the pump, checking for leaks at the fluid path connections. If leaks are present, stop the pump and rectify the problem.

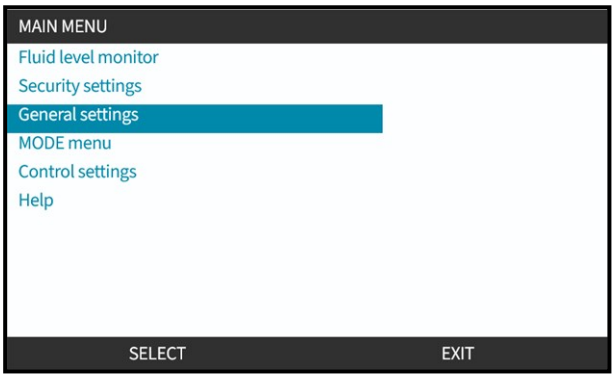
12.5 Chapter specific HMI set up

12.5.1 HMI—Setting the flow units: general settings>flow units

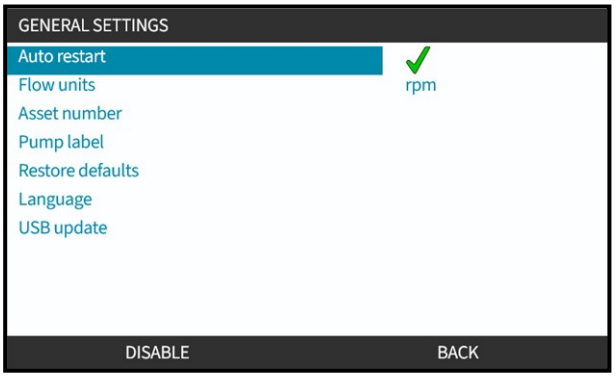
After the fluid path is installed the flow rate from the pump should be calibrated. Prior to fluid calibration the preferred flow units should be selected in general settings using the HMI.

From the **MAIN MENU**:

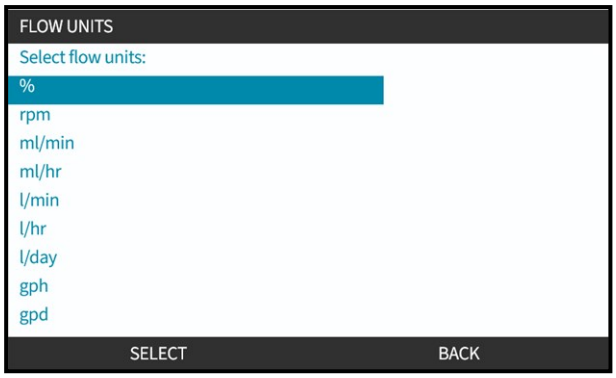
1. Use **+/-** keys to highlight **General Settings**.



2. Press SELECT.
3. Use the **+/-** keys to highlight **Flow Units** option.



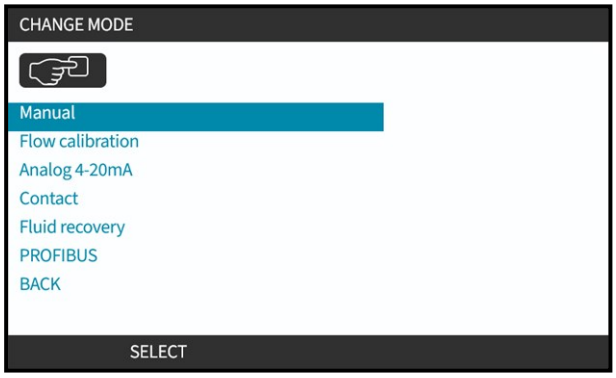
4. Press SELECT.
5. To set displayed flow units for all pump displays. Use the **+/-** keys to highlight preferred flow unit.

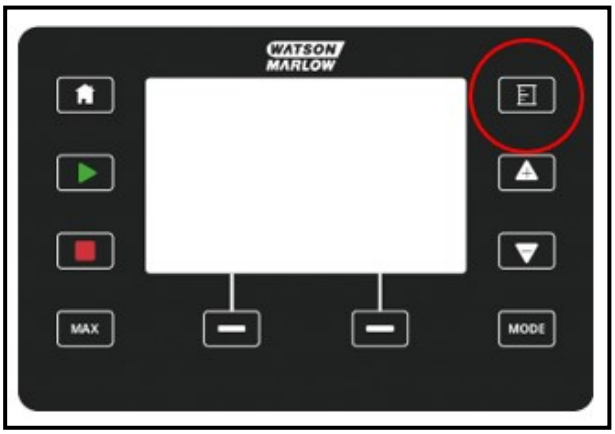


6. Press SELECT ▬ to store preference.

12.5.2 HMI—Calibrating the pump flow rate: MODE menu > Flow calibration

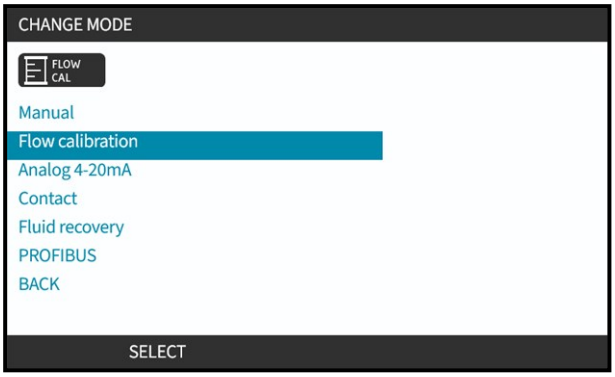
Flow calibration can be accessed from either the **MODE** Menu using the **+/-** keys, or using the **FLOW CALIBRATION** key.



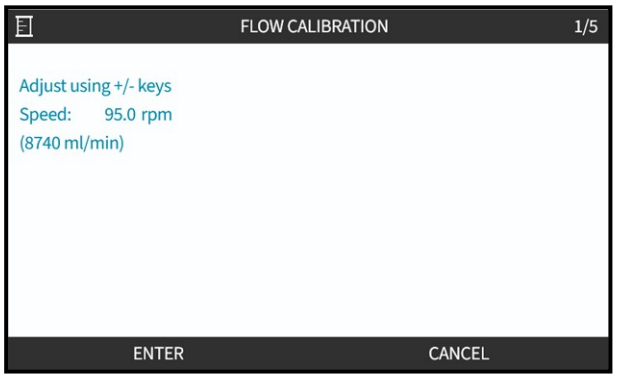


12.5.2.1 To calibrate pump flow rate:

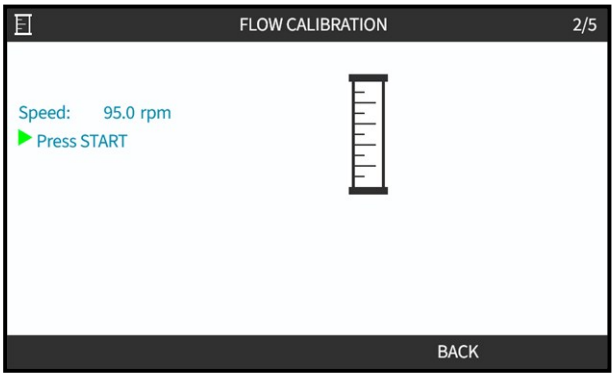
1. Enter the **FLOW CALIBRATION** menu from the **MODE** Menu by pressing SELECT.
2. Using the **FLOW CALIBRATION** key.



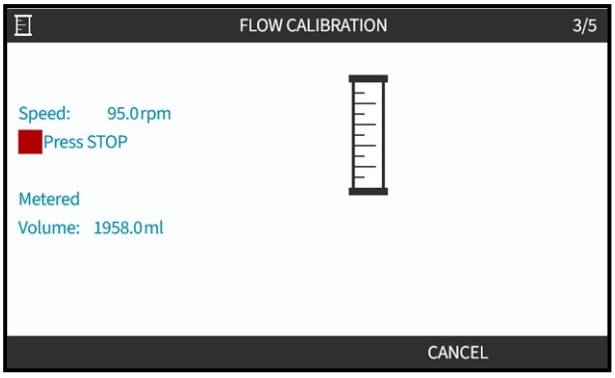
3. Use **+/-** keys to enter maximum flow rate limit.



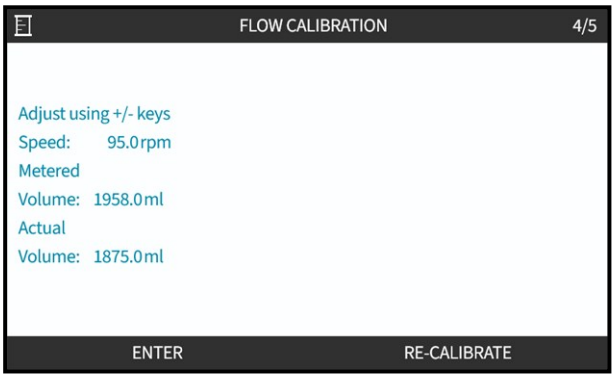
4. ENTER.
5. Press **START** to begin pumping a volume of fluid for calibration.



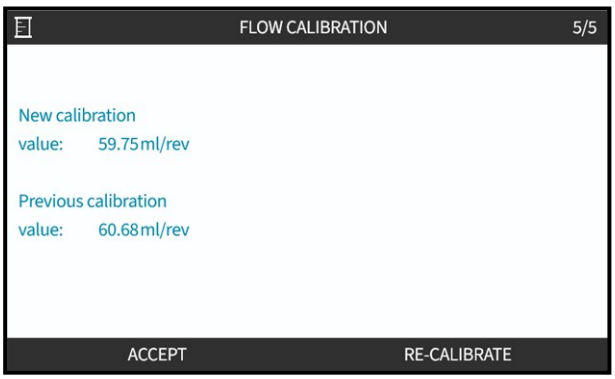
6. Press **STOP** to stop pumping fluid for the calibration.



7. Using the **+/-** keys enter the actual volume of fluid pumped.



8. Pump now calibrated. ACCEPT or RE-CALIBRATE to repeat procedure.



12.5.2.2 Abort flow calibration

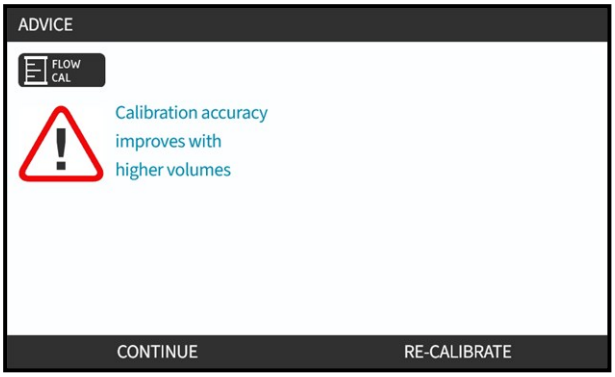
1. Press **HOME** or **MODE** to abort calibration.
2. This advice screen will be displayed.

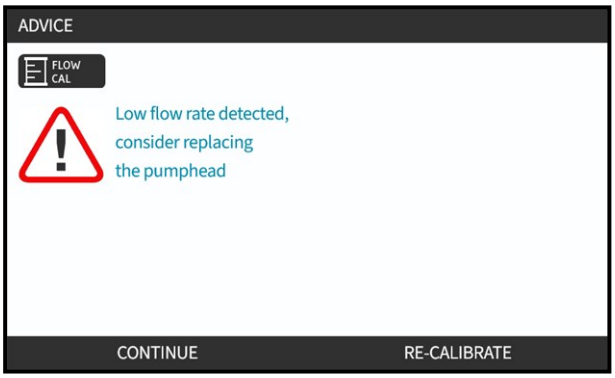
Press BACK ▬ or CONFIRM ▬ to continue.

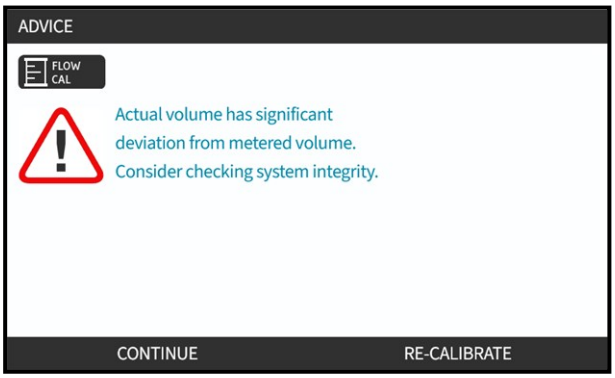
12.5.2.3 Troubleshooting flow calibration

The following advice screens may appear during calibration.

To clear, use either CONTINUE − or RE-CALIBRATE −.







13 INSTALLATION—CHAPTER 4 OVERVIEW: CONTROL

The control chapter is split into the following sub-chapters based upon model

Model	Sub-chapter	Section
Manual	4A	14
Universal, Universal+	4B	15
PROFIBUS	4C	16
EtherNet/IP	4D	17
PROFINET	4E	18

Follow the sub-chapter based upon your model.

13.1 Sub-Chapter wiring diagram key

The following key is used in all Chapter 4 sub-chapters.

Symbol	Action	Symbol	Action
▶	Start		Output
■	Stop		Input
	Start dose on rising edge		Analogue (4 – 20mA/0-10V) control

14 INSTALLATION—SUB-CHAPTER 4A: CONTROL (MODEL: MANUAL)

This section provides information on connection, input/output specification and relevant set up using the HMI of the Manual model only.

14.1 Part 1: Sub-Chapter installation requirements, specification, and information

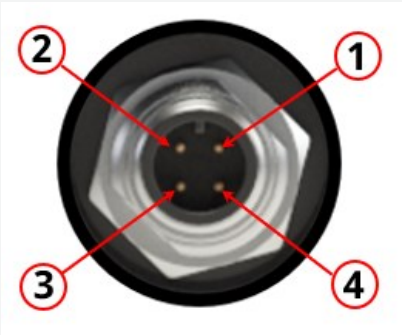
14.1.1 Control connections

14.1.1.1 Input/Output signal limits

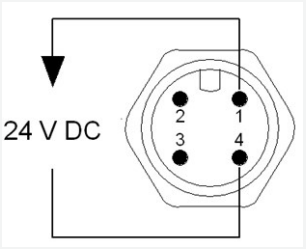
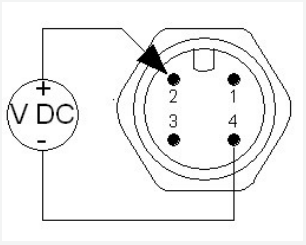
Parameter		Limits			Units	Comment
	Sym	Min	Nom	Max		
Digital Input voltage High	VD_{IH}	10.4		30	V	24V IEC 61131-2 Type 3
Digital Input Voltage Low	VD_{IL}	0		9.2		
Digital Input Abs Max voltage	VD_{in}	-60		60	V	
Digital Input current Limit	ID_{in}		2.25		mA	IEC 61131-2 Type 3

14.1.1.2 Overview—Control input: Start/Stop

A Start/Stop input connection is provided as an input connection for the manual model. All other models use a pressure sensor input connection in same location. It is not possible to use a pressure sensor with the manual model.

<table>
<tr><td>Location</td><td>The location of this connection is illustrated by the graphic below:
 
</td></tr>
<tr><td>Connector Specification</td><td>M12, Male, 4 Pin, A-code plug, IP66, NEMA4X</td></tr>
<tr><td>Control cable specification</td><td>Control cable for connecting to the manual model M12 input connector is available as a Watson-Marlow Accessory:
<table><tr><th>Image</th><th>Description</th><th>Product code</th></tr><tr><td>  </td><td>Qdos control cable for manual model, M12A 5 Pin Yellow Insert, 3m (10ft) Length</td><td>0M9.203Y.000 (46)</td></tr></table>
<table><tr><td>NOTE 46</td><td>The control cable for use with the manual model features a 5 pin female M12 connector. This 5 pin connector will connect to male 4 pin, M12 connector of the manual model. The 5th pin (centre) is not used.</td></tr></table></td></tr>
<tr><td>Pin out illustration</td><td> 
</td></tr>
</table>

14.1.1.3 Wiring information—Control input: Start/Stop

Function	Pin	Signal	Configurable	Wiring Diagram
START/STOP 	Pin 1	24 V DC	No	
	Pin 2 (+)	START/STOP  0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	
	Pin 3	No user connection	No	
	Pin 4 (-)	0 V Common	No	

14.2 Part 2: Sub-Chapter installation procedures

14.2.1 Sub-Chapter pre-installation checklist

Prior to installing the control connections and wiring carry out the following pre-installation check:

- Ensure the pump has been installed in accordance with previous installation chapters.
- Ensure all requirements of part 1 of this chapter have been met.
- Ensure the power cable is not damaged.
- The electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
- Ensure the control cable(s) are not damaged.
- Ensure items and tools for connection of the pump to the control system are to hand.

If there is a problem with any of the pre-installation checklist items, do not proceed to the installation procedures in this chapter, until the matter is resolved.

14.2.2 Control connection precautions

When following the procedures below or wiring the control cables to the pinouts on the M12 connectors

- Keep 4–20 mA and low voltage signals separate from power supply
- Only connect to external circuits, that are separated from mains voltages by reinforced insulation. All of the product input and output terminals are separated from mains circuits by reinforced insulation.
- Do not apply mains power voltages to any of the M12 control connection pins.

14.2.3 Installation of M12 control cables (M type)

14.2.3.1 Protective caps

The M12 control connections are covered with protective caps during manufacture.

If any of the connections will not be used for control, leave the protective caps in place of a control cable for added protection of the product. A picture of the cap is illustrated in the picture:

14.2.3.2 M12 control cable installation procedure

Follow the procedure below to connect the M12 control cables.

1. Isolate the pump from its power supply
2. Carry out any control system wiring using the information in part 1 of this chapter
3. Connect the M12 connector to the appropriate location on the pump
4. Turn the screw thread by hand until it is tight
5. Check the cable is secure
6. Reconnect the power supply to the pump

14.3 Part 3: Sub-Chapter specific HMI set up

The sub-sections below provide information on manual model only related set up of the pump using the HMI.

14.3.1 HMI—Setting the start/stop: control settings>input

A start/stop signal can be used to stop the pump using the remote stop feature. This will not affect the following operation:

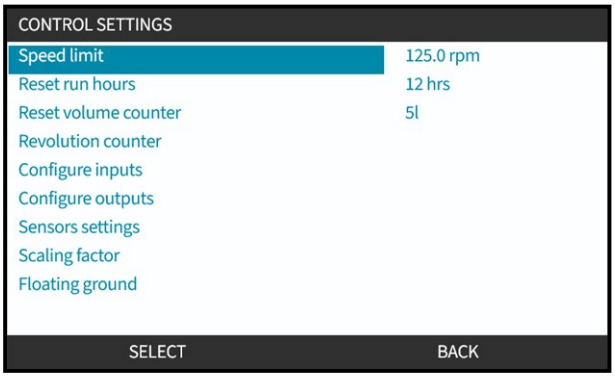
- Flow calibrations
- Max speed key operation
- Manual Fluid recovery

14.3.1.1 To configure start/stop: Polarity

The polarity of the voltage to start/stop can be set. A low polarity signal is recommended as the pump will stop if an input signal is lost.

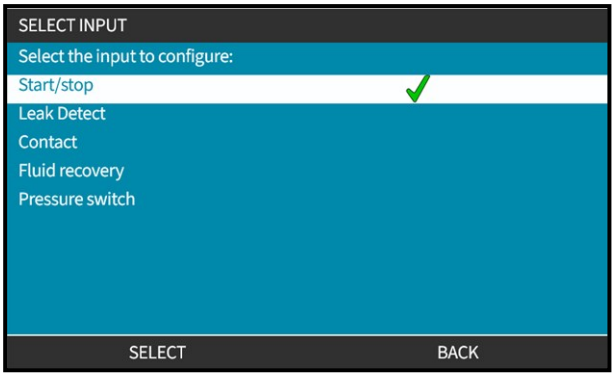
1. From the **MAIN MENU**, use **+/-** keys to highlight **Control Settings**.

2. Press SELECT.
4. Highlight **Configure Input** option.



5. Press SELECT.

6. Use **+/-** keys to highlight **Start/Stop**.



7. Press SELECT.
8. Use **+/-** keys to highlight options. Press SELECT to enable HIGH or LOW polarity.

14.3.1.2 To configure start/stop: Assign input

The start/stop cannot be assigned to any other input than #4.

15 INSTALLATION—SUB-CHAPTER 4B: CONTROL (MODELS: UNIVERSAL AND UNIVERSAL+)

15.1 Sub-Chapter overview

This section provides information on connection, input/output specification and relevant set up using the HMI of the Universal and Universal+ models only.

15.2 Part 1: Sub-Chapter installation requirements, specification, and information

15.2.1 Chemical metering: Analog: 4-20 mA, or Pulse?

Both a Universal and Universal+ pump can be used for chemical metering, using 2 primary automatic modes:

Mode	Explanation
Analog 4-20 mA	Continuously running in proportion to the flow, and at very low speeds is a much better solution than dosing at intervals (pulse) using contact mode. We recommend examining your process to identify whether a 4-20 mA signal can be used rather than a pulse. Where technology does not allow a 4-20 mA signal we recommend using a signal converter accessory. This can be used to change your pulse signal to a 4-20 mA signal, ideal for metering.
Pulse (contact mode)	Pulse dosing as an operation mode has its limitations due to the intermittent nature of this method. For example this would require enough pipework to ensure the solution is adequately mixed, or a mixing tank.

15.2.2 Connection type overview

There are two types of input and output control connections for the Universal and Universal+ models:

Name	Description	Location	Product code
M type	with M12 control connections		Product codes containing M
T type	with user wired cable gland connections		Product codes containing T

15.2.3 Control signal limits

The control signal limits are provided in the table below, this information applies to all Universal and Universal+ models (M and T types).

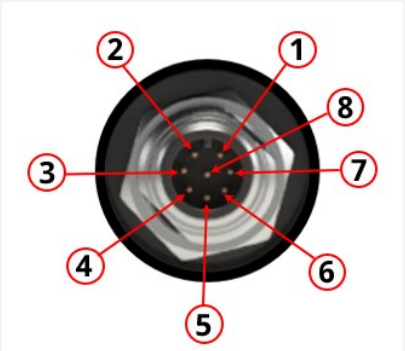
Parameter		Limits			Units	Comment
	Sym	Min	Nom	Max		
Digital Input voltage High	VD_{IH}	10.4		30	V	24V IEC 61131-2 Type 3
Digital Input Voltage Low	VD_{IL}	0		9.2		
Digital Input Abs Max voltage	VD_{in}	-60		60	V	
Digital Input current Limit	ID_{in}		2.25		mA	IEC 61131-2 Type 3
Analogue input measurement range	Iin	0		30	mA	
Analogue input Abs Max Current	IA_{in}	-0.01		33	mA	Internally limited to max voltage
M12 Output Relay Current	IL			1	A	Resistive load
M12 Output Relay switching Voltage	V_{OL}		24	60	VDC	
Terminal Output Relay Current	IL			5	A	Resistive load
Terminal Output Relay Switch Volts	V_{OL}			250	VAC	
Speed Output: 4-20 mA Hardware	Io	0		25	mA	±5%, 250R load To 0V common
Applied External Voltage: 4-20 mA		-30		+30	V	Fault condition
24V Supply			24		V	Up to 100 mA total

15.2.4 M type control connections

The M12 control connections vary by location, function, thread style, pin count and plug code.

15.2.4.1 Overview: Control input (Universal and Universal+)

The control input connection is featured on the Universal and Universal+ models only

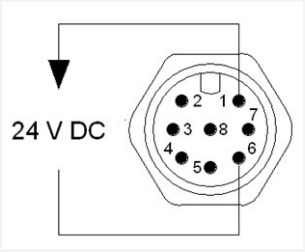
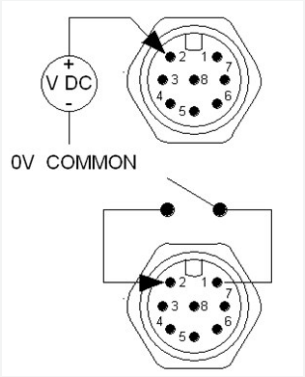
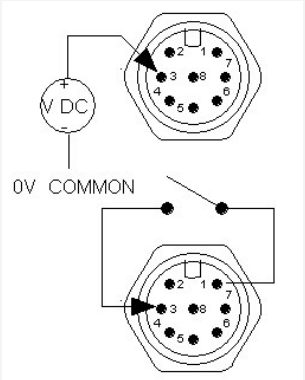
<table>
<tr><td>Location</td><td>This connection is located as illustrated by the graphic.
  </td></tr>
<tr><td>Specification</td><td>M12, Male, 8 Pin, A-code plug, IP66, NEMA4X</td></tr>
<tr><td>Control cable specification</td><td>Control cables for connecting to the Universal/Universal+ model M12 input connector are available as a Watson-Marlow Accessory:
<table><tr><th>Image</th><th>Item</th><th>Product code</th></tr><tr><td>  </td><td>Qdos H-FLO Control cable - General I/O M12A 8W Cable Straight F Connection, 3m (10ft) Length, Unshielded 24AWG</td><td>0M9.603Z.0CF</td></tr><tr><td>  </td><td>Qdos H-FLO Control cable - General I/O M12A 8W Cable Right-Angled F Connection, 3m (10ft) Length, Unshielded 24AWG</td><td>0M9.603Z.0DF</td></tr></table></td></tr>
<tr><td>Pin out illustration</td><td>  </td></tr>
</table>

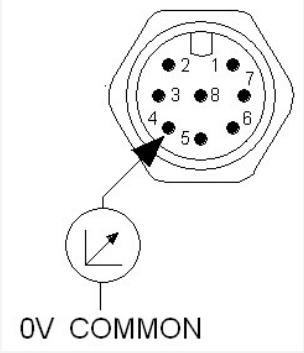
Pin lead colours

Pin No.	Output lead colour	Image
1	White	
2	Brown	
3	Green	
4	Yellow	
5	Grey	
6	Pink	
7	Blue	
8	Red	

15.2.4.2 Wiring Information—Control input (Universal only)

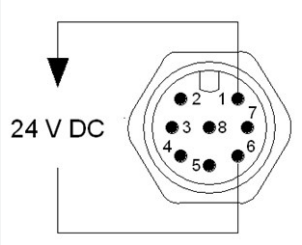
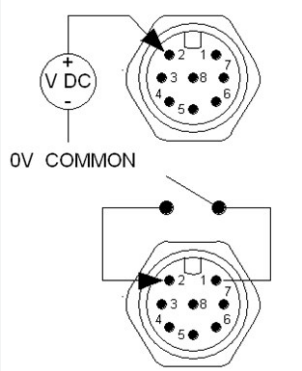
The following information applies to the Universal model only for the control input #1 connection.

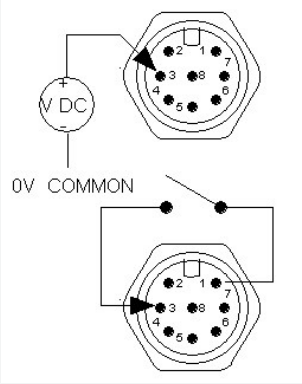
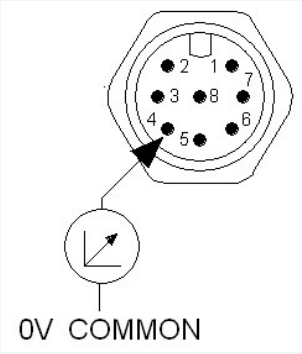
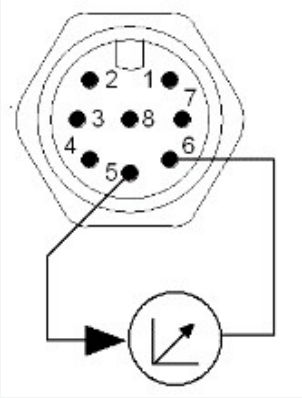
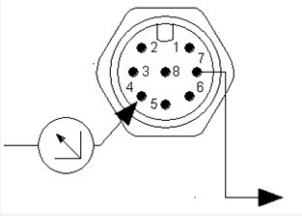
Function	Pin	Colour	Signal	Configurable	Wiring Diagram
	Pin 1	White	24 V DC	No	
INPUT 1 	Pin 2 (+)	Brown	INPUT 1  0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	
INPUT 2 	Pin 3 (+)	Green	INPUT 2  0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	

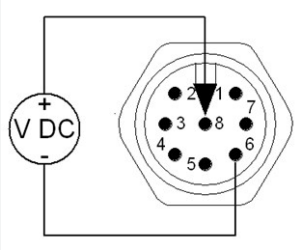
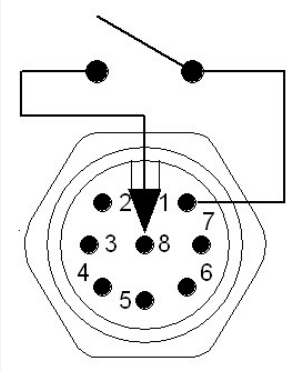
Function	Pin	Colour	Signal	Configurable	Wiring Diagram
ANALOG 1P	Pin 4 (+)	Yellow	4-20mA#1P 4 to 20 mA Positive Input	Yes [SPEED]	

15.2.4.3 Wiring Information—Control input (Universal+ only)

The following information applies to the Universal+ model only for the control input #1 connection.

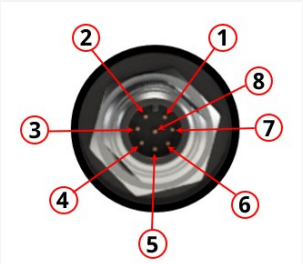
Function	Pin	Colour	Signal	Configurable	Wiring Diagram
	Pin 1	White	24 V DC	No	
INPUT 1	Pin 2 (+)	Brown	INPUT 1 0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	

Function	Pin	Colour	Signal	Configurable	Wiring Diagram
INPUT 2	Pin 3 (+)	Green	INPUT 2 0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	
ANALOG 1P	Pin 4 (+)	Yellow	4-20mA#1P 4 to 20 mA Positive Input.	Yes	
OUTPUT SPEED	Pin 5 (+)	Grey	4-20mA OUT Common shared connection with OUTPUT#1 Pin5	Yes	
	Pin 6 (-)	Pink	0 V Common	No	
ANALOG 1M	Pin 7 (+)	Blue	4-20mA#1M Analogue 1 - Reference/Pass through (Floating ground)	Yes	

Function	Pin	Colour	Signal	Configurable	Wiring Diagram
START/STOP	Pin 8	Red	START/STOP Stop = High 0 = [0 V to 9.2 V DC] ► 1 = [10.4 V to 30 V DC] ■ Stop = Low 0 = [0 V to 9.2 V DC] ■ 1 = [10.4 V to 30 V DC] ►	Yes	 

15.2.4.4 Overview—Control output #1 connection (Universal and Universal+)

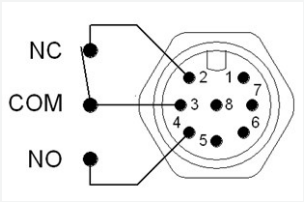
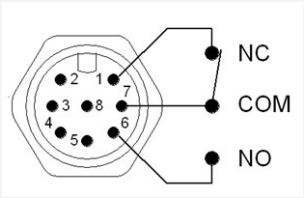
The control output #1 connection is featured on the Universal and Universal+ models only.

<table>
<tr><td>Location</td><td>This connection is located as illustrated by the graphic.
 
</td></tr>
<tr><td>Specification</td><td>M12, Male, 8 Pin, A-code plug, IP66, NEMA4X</td></tr>
<tr><td>Control cable specification</td><td>Control cables for connecting to the Universal/Universal+ model M12 input connector are available as a Watson-Marlow Accessory:
<table>
<tr><th>Image</th><th>Item</th><th>Product code</th></tr>
<tr><td>  </td><td>Qdos H-FLO Control cable - General I/O M12A 8W Cable Straight F Connection, 3m (10ft) Length, Unshielded 24AWG</td><td>0M9.603Z.0CF</td></tr>
<tr><td>  </td><td>Qdos H-FLO Control cable - General I/O M12A 8W Cable Right-Angled F Connection, 3m (10ft) Length, Unshielded 24AWG</td><td>0M9.603Z.0DF</td></tr>
</table></td></tr>
<tr><td>Pin out illustration</td><td> 
</td></tr>
</table>

Pin lead colours	**Pin No.**	**Output lead colour**	**Image**
	1	White	
	2	Brown	
	3	Green	
	4	Yellow	
	5	Grey	
	6	Pink	
	7	Blue	
	8	Red	

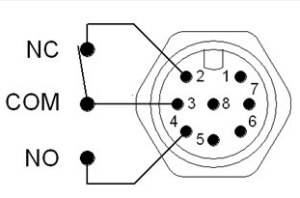
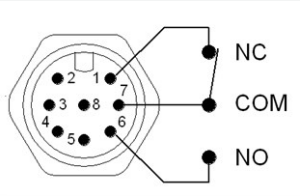
15.2.4.5 Wiring Information—Control output #1 connection (Universal only)

The following information applies to the Universal model only for the control output #1 connection.

Function	Pin	Signal	Configurable	Wiring Diagram
RELAY 1	Pin 2	RELAY1-NC 24 V 1 A DC Resistive	Yes	
	Pin 3	RELAY1-COM 24 V 1 A DC Resistive		
	Pin 4	RELAY1-NO 24 V 1 A DC Resistive		
RELAY 2	Pin 1	RELAY2-NC 24 V 1 A DC Resistive	Yes	
	Pin 7	RELAY2-COM 24 V 1 A DC Resistive		
	Pin 6	RELAY2-NO 24 V 1 A DC Resistive		
	Pin 5 (+)	No user connection		
	Pin 8 (-)	0 V Common	No	

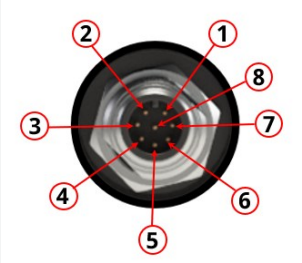
15.2.4.6 Wiring Information—Control output #1 connection (Universal+ only)

The following information applies to the Universal+ model only for the control output #1 connection.

Function	Pin	Signal	Configurable	Wiring Diagram
RELAY 1	Pin 2	RELAY1-NC 24 V 1 A DC Resistive	Yes	
	Pin 3	RELAY1-COM 24 V 1 A DC Resistive		
	Pin 4	RELAY1-NO 24 V 1 A DC Resistive		
RELAY 2	Pin 1	RELAY2-NC 24 V 1 A DC Resistive	Yes	
	Pin 7	RELAY2-COM 24 V 1 A DC Resistive		
	Pin 6	RELAY2-NO 24 V 1 A DC Resistive		
OUTPUT SPEED	Pin 5 (+)	4-20mA OUT Common shared connection with INPUT Pin5		
	Pin 8 (-)	0 V Common	No	

15.2.4.7 Overview—Control output #2 connection (Universal and Universal+)

The control output #2 connection is featured on the Universal and Universal+ models only.

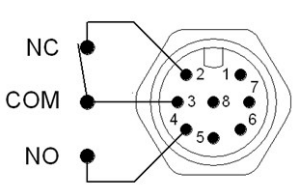
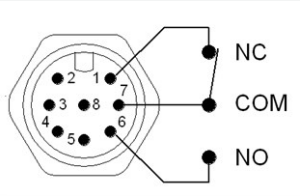
<table>
<tr><td>Location</td><td>This connection is located as illustrated by the graphic.
 
</td></tr>
<tr><td>Specification</td><td>M12, Male, 8 Pin, A-code plug, IP66, NEMA4X.</td></tr>
<tr><td>Control cable specification</td><td>Control cables for connecting to the Universal/Universal+ model M12 input connector are available as a Watson-Marlow Accessory:
<table>
<tr><th>Image</th><th>Item</th><th>Product code</th></tr>
<tr><td>  </td><td>Qdos H-FLO Control cable - General I/O M12A 8W Cable Straight F Connection, 3m (10ft) Length, Unshielded 24AWG</td><td>0M9.603Z.0CF</td></tr>
<tr><td>  </td><td>Qdos H-FLO Control cable - General I/O M12A 8W Cable Right-Angled F Connection, 3m (10ft) Length, Unshielded 24AWG</td><td>0M9.603Z.0DF</td></tr>
</table></td></tr>
<tr><td>Pin out illustration</td><td> 
</td></tr>
</table>

Pin lead colours

Pin No.	Output lead colour	Image
1	White	
2	Brown	
3	Green	
4	Yellow	
5	Grey	
6	Pink	
7	Blue	
8	Red	

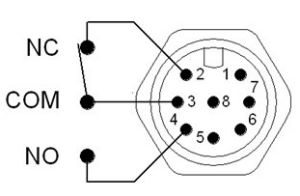
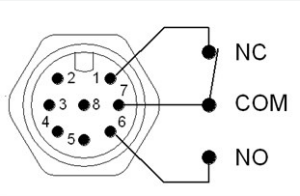
15.2.4.8 Wiring Information—Control output #2 connection (Universal only)

The following information applies to the Universal model only for the control output #2 connection.

Function	Pin	Signal	Configurable	Wiring Diagram
RELAY 3	Pin 2	RELAY3-NC 24 V 1 A DC Resistive	Yes	
	Pin 3	RELAY3-COM 24 V 1 A DC Resistive		
	Pin 4	RELAY3-NO 24 V 1 A DC Resistive		
RELAY 4	Pin 1	RELAY4-NC 24 V 1 A DC Resistive	Yes	
	Pin 7	RELAY4-COM 24 V 1 A DC Resistive		
	Pin 6	RELAY4-NO 24 V 1 A DC Resistive		
	Pin 5	No user connection	No	
ANALOG 2M	Pin 8	4-20mA#2M Analogue 2 -Reference/Pass through (Floating ground)	Yes	

15.2.4.9 Wiring Information—Control output #2 connection (Universal+ only)

The following information applies to the Universal+ model only for the control output #2 connection.

Function	Pin	Signal	Configurable	Wiring Diagram
RELAY 3	Pin 2	RELAY3-NC 24 V 1 A DC Resistive	Yes	
	Pin 3	RELAY3-COM 24 V 1 A DC Resistive		
	Pin 4	RELAY3-NO 24 V 1 A DC Resistive		
RELAY 4	Pin 1	RELAY4-NC 24 V 1 A DC Resistive	Yes	
	Pin 7	RELAY4-COM 24 V 1 A DC Resistive		
	Pin 6	RELAY4-NO 24 V 1 A DC Resistive		
	Pin 5	No user connection	No	
ANALOG 2M	Pin 8	4-20mA#2M Analogue 2 -Reference/Pass through (Floating ground)	Yes	

15.2.4.10 Overview—Control input: Pressure sensor (Universal and Universal+)

A pressure sensor input connection is provided, for use with the Watson-Marlow Pressure Sensing Kit on both the Universal and Universal+ models. It is not possible to use a third party pressure sensor.

Location	The pressure sensor input connection is located as illustrated by the graphic. 
Connector Specification	M12, Male, 4 Pin, A-code plug, IP66, NEMA4X.
Control cable specification	The Pressure Sensing Kit comes with a pre-installed control cable. No other control cable should be used with this connection.
Pin out information	No pin out information is provided. This pressure sensor connection must only be used with the Watson-Marlow Pressure Sensing Kit. Do not connect any other wires, or cables or attempt to wire to this connection.

15.2.5 T Type (user wired cable gland connections)

15.2.5.1 Overview—T-type connections

Location	The terminal board is located behind the input/ouput panel on T type models 
Connection Specification	IP66, NEMA 4X

	Parameter	Data	NOTE 1	NOTE 2
Control cable specification	Terminal Wire Size	24 AWG to 12 AWG	M2.5 Screw	
	Relay	SPCO	240 V 5 A AC resistive	
	Screen	0.25 Blade terminal connection	Optional cable EMC screen connection to pump Earth. Not a protective earth or earth bond test point.	Max 10 mA Max 50 V, with respect to 0 V
	Cable section profile	Round		
	Cable outside diameter to ensure ingressprotection rating	9.5 mm to 12 mm (0.374 in to 0.472 in)		
	Cable conductors	0.05 to 1.31 mm^2 (30 to 16 AWG) stranded or solid		
	Maximum temperature rating	85 °C (185 °F)		
	Maximum cables per gland	1		

15.2.5.2 Wiring information—T type connections

15.2.5.2.1 CONTROL SIGNAL LIMITS

The control signal limits are provided in the table below, this information applies to all Universal and Universal+ models (M and T types).

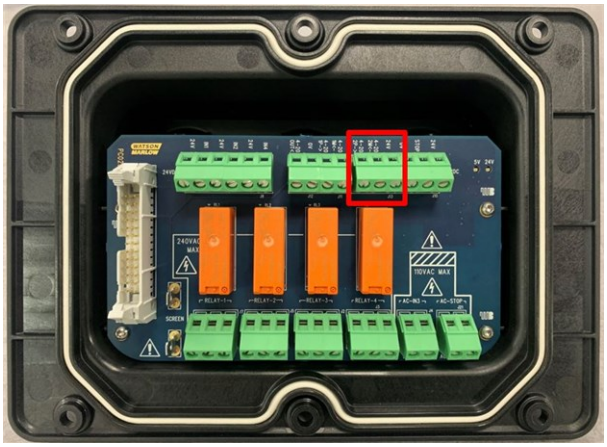
Parameter		Limits			Units	Comment
	Sym	Min	Nom	Max		
Digital Input voltage High	VD_{IH}	10.4		30	V	24V IEC 61131-2 Type 3
Digital Input Voltage Low	VD_{IL}	0		9.2		
Digital Input Abs Max voltage	VD_{in}	-60		60	V	
Digital Input current Limit	ID_{in}		2.25		mA	IEC 61131-2 Type 3
Analogue input measurement range	Iin	0		30	mA	
Analogue input Abs Max Current	IA_{in}	-0.01		33	mA	Internally limited to max voltage
M12 Output Relay Current	IL			1	A	Resistive load
M12 Output Relay switching Voltage	V_{OL}		24	60	VDC	
Terminal Output Relay Current	IL			5	A	Resistive load
Terminal Output Relay Switch Volts	V_{OL}			250	VAC	
Speed Output: 4-20 mA Hardware	Io	0		25	mA	±5%, 250R load To 0V common
Applied External Voltage: 4-20 mA		-30		+30	V	Fault condition
24V Supply			24		V	Up to 100 mA total

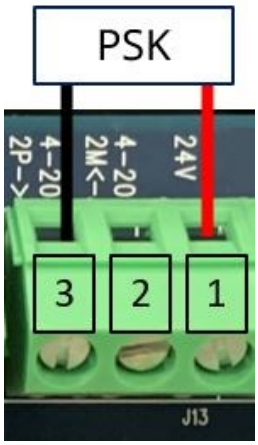
15.2.5.2.2 TERMINAL BOARD LAYOUT

The layout of the terminal is provided in the illustration below:

15.2.5.2.3 PRESSURE SENSING KIT WIRING T-TYPE MODELS

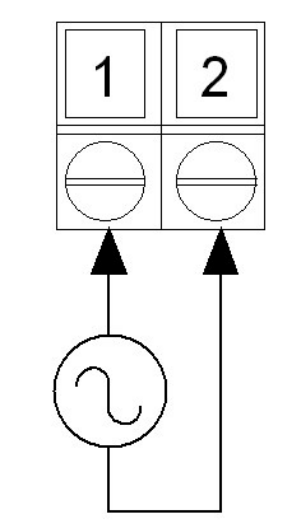
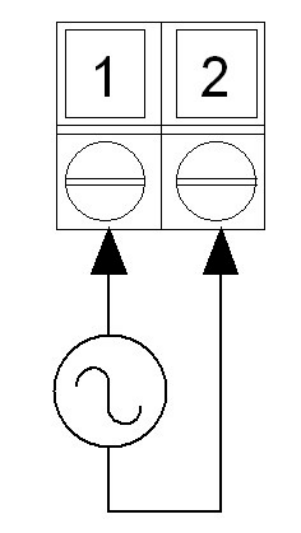
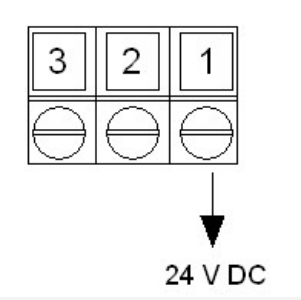
The T type Pressure Sensing Kit connects to junction J13 on the terminal board, as shown on the following images and table.

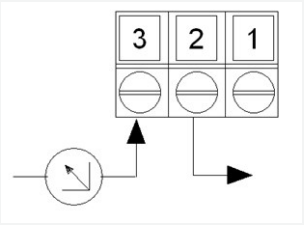
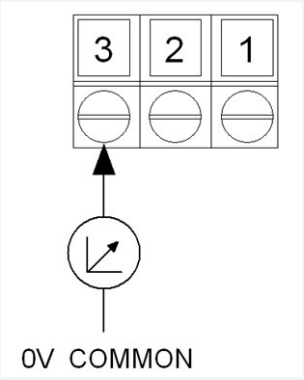
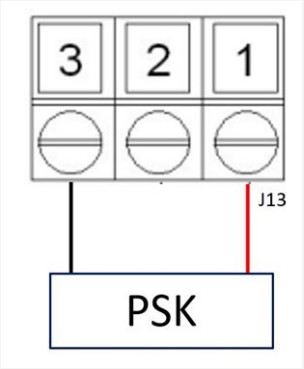
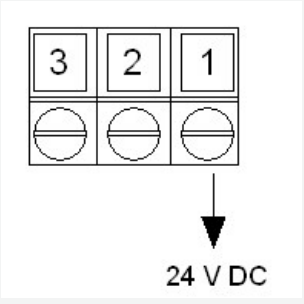


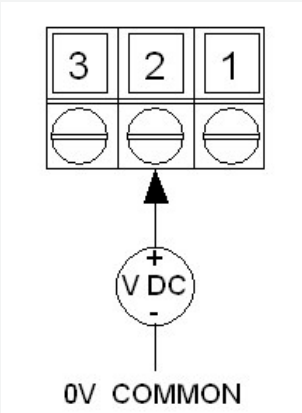
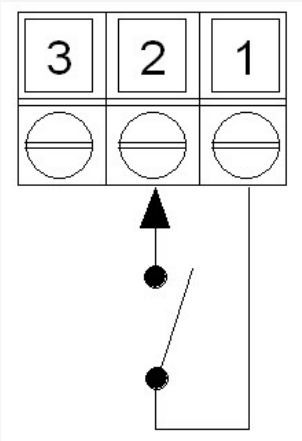


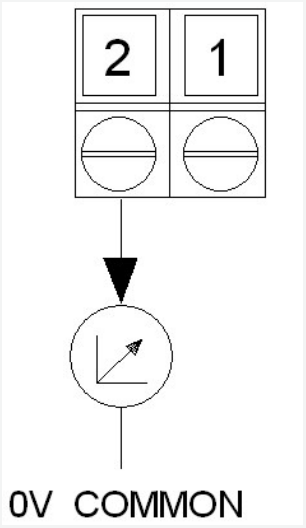
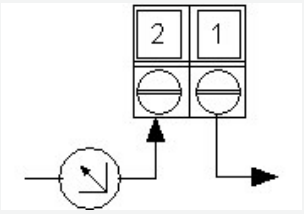
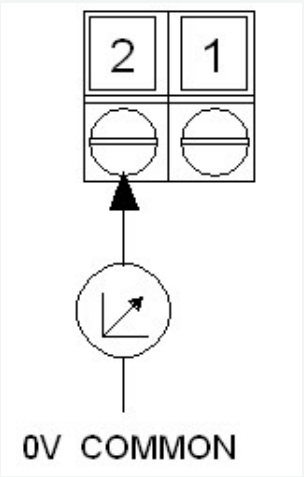
J13: Pressure Sensing Kit wiring			
Pin	**Name**	**Label**	**Comment**
3	Analogue 2, positive input, 4 to 20 mA	4-20 2P ->	connect black wire to pin 3 of J13, labelled 4-20 2P ->
2	Analogue 2, Reference/Pass through (Floating ground)	4-20 2M<-	Analogue 2 floating ground must be disabled in order to use the Pressure Sensing Kit. See section: 15.4.6
1	24 V	24 V	connect red wire to pin 1 of J13, labelled 24V

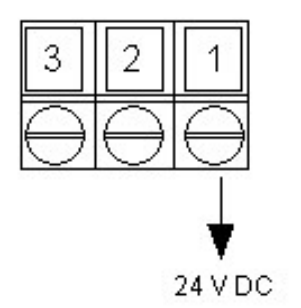
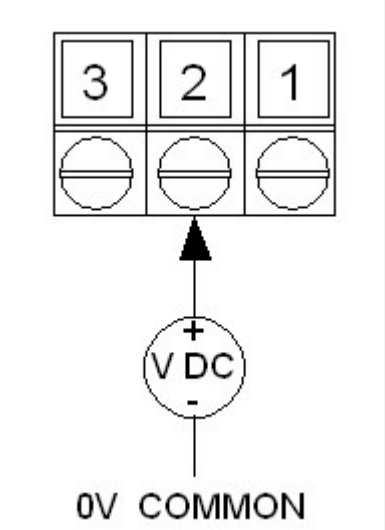
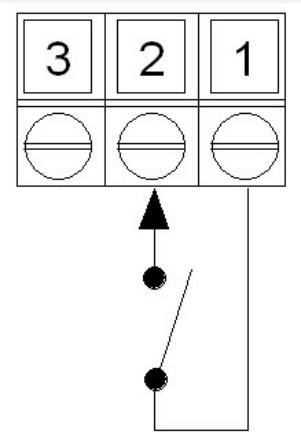
15.2.5.2.4 TERMINAL BOARD WIRING

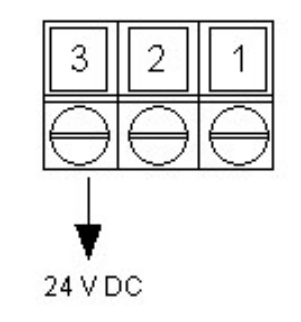
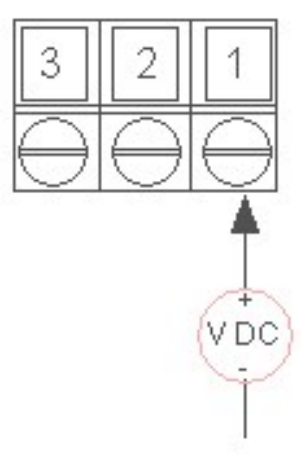
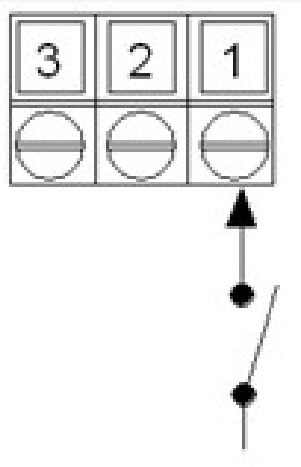
Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
STOP AC-INPUT	J21	Pin 1 (AC) Pin 2 (AC)	Stop = High 0 = [110 AC] ► 1 = [0 V AC] ■ Stop = Low 0 = [0 V AC] ■ 1 = [110 V AC] ►	Yes	
INPUT-3 AC-INPUT	J4	Pin 1 (AC) Pin 2 (AC)	Stop = High 0 = [110 AC] ► 1 = [0 V AC] ■ Stop = Low 0 = [0 V AC] ■ 1 = [110 V AC] ►	Yes	
ANALOGUE 2	J13	Pin 1	24 V DC * * up to 100 mA total	No	

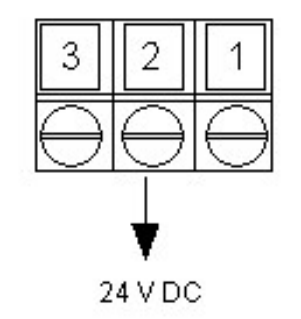
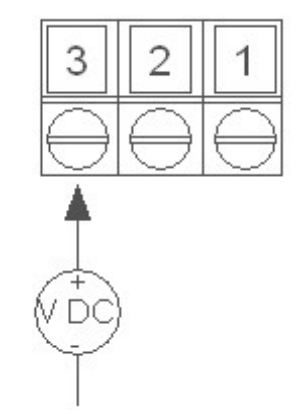
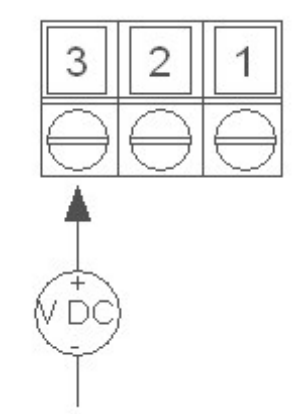
Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
		Pin 2 (-)	4-20mA#2M Analogue 2 - Reference/Pass through (Floating ground) Must be disabled when using Pressure Sensing Kit	Yes	 
		Pin 3 (+)	4-20mA#2P Analogue 2, positive input, 4 to 20 mA. [150R] = 	Yes	
START/STOP 	J10	Pin 1	24 V DC * * up to 100 mA total	No	

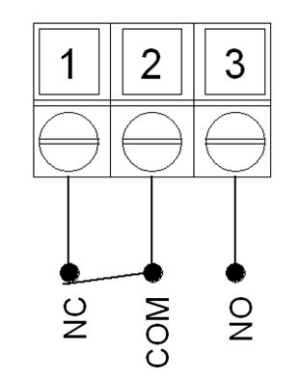
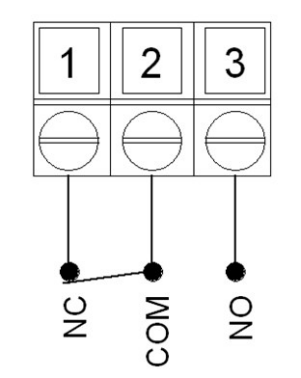
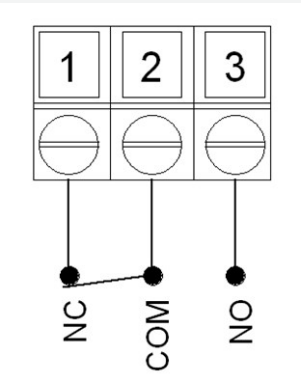
Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
		Pin 2	START/STOP  Stop = High 0 = [0 V to 9.2 V DC] ► 1 = [10.4 V to 30 V DC] ■ Stop = Low 0 = [0 V to 9.2 V DC] ■ 1 = [10.4 V to 30 V DC] ►	Yes	 
		Pin 3 (-)	0 V Common	No	
OUTPUT SPEED 	J12	Pin 1 (-)	0 V Common	No	

Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
		Pin 2 (+)	4-20mA OUT	Yes	
ANALOGUE 1M	J11	Pin 1 (-)	4-20mA#1M Analogue 1 - Reference/Pass through (Floating ground)	Yes	
ANALOGUE 1P		Pin 2 (+)	4-20mA#1P Analogue 1+ input 4 to 20 mA Positive Input. [150R] =	Yes	

Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
		Pin 1	24 V DC * * up to 100 mA total	No	
INPUT 1	J9	Pin 2 (+)	INPUT 1 0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	 

Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
		Pin 3	24 V DC * * up to 100 mA total	No	
INPUT 4	J8	Pin 1 (+)	INPUT 4 0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	 

Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
		Pin 2	24 V 100 mA DC	No	
INPUT 2		Pin 3 (+)	INPUT 2 0 = [0 V to 9.2 V DC] 1 = [10.4 V to 30 V DC]	Yes	
RELAY 1	J7	Pin 1	RELAY1-NO 240 V 5 A AC Resistive	Yes	
		Pin 2	RELAY1-COM 240 V 5 A AC Resistive		
		Pin 3	RELAY1-NC 240 V 5 A AC Resistive		

Function	TERMINAL Connector	Pin	Signal	Configurable	Wiring Diagram
RELAY 2	J5	Pin 1	RELAY2-NO 240 V 5 A AC Resistive	Yes	
		Pin 2	RELAY2-COM 240 V 5 A AC Resistive		
		Pin 3	RELAY2-NC 240 V 5 A AC Resistive		
RELAY 3	J2	Pin 1	RELAY3-NO 240 V 5 A AC Resistive	Yes	
		Pin 2	RELAY3-COM 240 V 5 A AC Resistive		
		Pin 3	RELAY3-NC 240 V 5 A AC Resistive		
RELAY 4	J3	Pin 1	RELAY4-NO 240 V 5 A AC Resistive	Yes	
		Pin 2	RELAY4-COM 240 V 5 A AC Resistive		
		Pin 3	RELAY4-NC 240 V 5 A AC Resistive		

15.3 Part 2: Sub-Chapter installation procedures

15.3.1 Sub-Chapter pre-installation checklist

Prior to installing the control connections and wiring carry out the following pre-installation check:

- Ensure the pump has been installed in accordance with previous installation chapters.
- Ensure all requirements of part 1 of this chapter have been met.
- Ensure the power cable is not damaged.
- The electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
- Ensure the control cable(s) are not damaged.
- Ensure items and tools for connection of the pump to the control system are to hand.

If there is a problem with any of the pre-installation checklist items, do not proceed to the installation procedures in this chapter, until the matter is resolved.

15.3.2 Control connection precautions

When following the procedures below or wiring the control cables to the pinouts on the M12 connectors

- Keep 4–20 mA and low voltage signals separate from power supply
- Only connect to external circuits, that are separated from mains voltages by reinforced insulation. All of the product input and output terminals are separated from mains circuits by reinforced insulation.
- M type: Do not apply mains power voltages to any of the M12 control connection pins.
- T Type: Do not apply mains power voltages to any of the terminals in terminal blocks (J8, J9, J10, J11, J12, or J13).

15.3.3 Installation of M12 control cables (M type)

15.3.3.1 Protective caps

The M12 control connections are covered with protective caps during manufacture

If any of the connections will not be used for control, leave the protective caps in place of a control cable for added protection of the product. A picture of the cap is illustrated in the picture:

15.3.3.2 M12 input/output control cable installation procedure

Follow the procedure below to connect the M12 control cables.

1. Isolate the pump from its power supply
2. Carry out any control system wiring using the information in part 1 of this chapter
3. Connect the M12 connector to the appropriate location on the pump
4. Turn the screw thread by hand until it is tight
5. Check the cable is secure
6. Reconnect the power supply to the pump

15.3.3.3 M12 Pressure Sensing Kit control cable connection

The Pressure Sensing Kit connection will come fitted with a yellow cap. To protect the product do not remove the cap until a control cable can be connected.

Do not apply mains power voltages to any of the M12 control connection pins.

To install the Pressure Sensing Kit onto the fluid path See section: 12.4.6

To electrically connect the Pressure Sensing Kit use the following procedure:

STEP 1	STEP 2	STEP 3	STEP 4
Remove yellow cap from Pressure Sensing Kit connection on pump.	Align cable connector key way with pump connector.	Place cable connector on pump connector and hand tighten collar clockwise until fully engaged.	Ensure control cable is routed such that there is no strain or sharp bends.

Use section 24.1.7 to set up the Pressure Sensing Kit using the control settings menu.

15.3.4 Installation of user wired control cables (T type)

15.3.4.1 Removal and refitting of front input and output panel

In order to connect the cables to the terminals of the input output circuit board, the pump module cover must be removed and re-installed after wiring. Follow the procedure below.

1. Isolate the pump from its power supply. Turn off any control signals on the cables to be installed.
2. Remove the six M3 x 10 Pozidrive screws from the module cover.

3. Remove the module cover from drive. Do not prise off with tools. Make sure gasket is retained within recessed channel of module cover.

4. Make sure that pre-fitted cable glands are properly seated, secure and have protective dust caps fitted.

5. Check that the gland nut is free to move. Use a 24 mm spanner if required and remove the protective dust caps.

6. Loosen, but do not remove the gland cap. Then insert control cable into loosened gland.
7. Pull through sufficient cable to reach the connectors required, leaving a little slack.
8. Strip the outer sheath as necessary.
9. Remove 5 mm of insulation from conductors. No tinning/ferrule required.
10. Insert bare cable end into the correct terminal.
11. Tighten down screw to clamp wire.
12. Prepare the cable screen(s) by twisting a suitable length. The twisted length(s) shall ideally be sleeved to prevent shorting.
13. Secure the end of the cable screen to the connector provided.
14. When all conductors are in position, tighten gland caps.
15. Check gasket and replace if damaged. Gasket ensures IP66 (NEMA 4X) protection.
16. Hold relay module cover in place and tighten six M3 x 10 Pozidrive screws.

15.4 Part 3: Sub-Chapter specific HMI set up

The sub-sections below provide information on control related set up of the pump using the HMI. Not all control settings or MODE menu items are explained here.

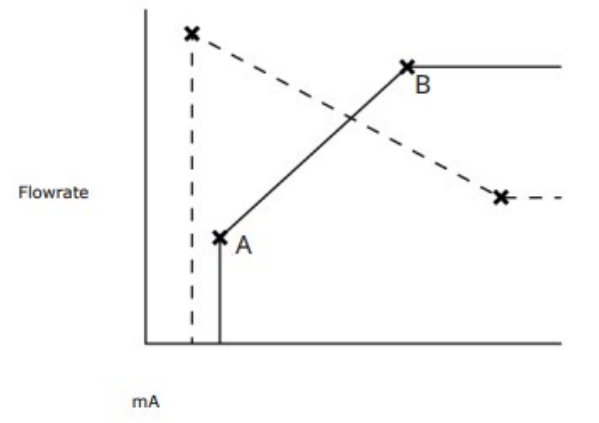
For full information on:

- Mode Menus: See section: 23
- Control settings: See section: 24

Section	Summary
Change mode>Analog 4-20 mA	Analog 4-20 mA mode provides a flow rate from the pump proportional to an external mA signal input received.
Change mode>Contact mode	Contact mode provides the ability to deliver a user defined dose volume between 0.1 mL and 999 L. The dose can be delivered manually or by analogue control.
Control settings>Configure inputs	Assign inputs, configure.
Control settings>Configure outputs	Assign outputs, configure.
Control settings>Scaling factor	Scaling Factor adjusts 4-20 mA profile using a multiplication factor.
Control settings>Floating ground	A single 4-20 mA signal could be connected to two or more pumps in series. This would allow both pumps to be controlled through one input signal whereby, if either of the pumps fail or is powered off, then the second pump would receive the control signal.
Control settings>Pressure Sensing Kit	Set up the Pressure Sensing Kit

15.4.1 CHANGE MODE>Analog 4-20 mA

In this operating mode the pump speed (flow rate) is proportional to external mA signal input received.

<table>
<tr><th>Model</th><th>Speed versus mA signal behaviour</th></tr>
<tr><td>Universal model</td><td>
<table>
<tr><th>Signal</th><th>Pump speed</th></tr>
<tr><td>4.1 mA</td><td>Minimum speed (0 rpm)</td></tr>
<tr><td>19.8 mA</td><td>Maximum speed (depends on pump head)</td></tr>
</table>
</td></tr>
<tr><td>Universal+ model</td><td>Relationship between external mA signal and flow rate determined by configuring two points A and B as shown in graph below.
 

Rate of flow can be proportional or inversely proportional to analog mA input</td></tr>
</table>

When mA signal greater than level point A and there is no STOP input, run status output will be energized as pump is running.

15.4.1.1 Effect of scaling factor

The 4-20 mA profile is a linear relationship where Y=mX+c. The scaling factor is a control setting that can be used to multiply the gradient (m) by a factor.

The scaling factor will not alter stored A and B points, set in Analog 4-20 mA mode.

For more information on the scaling factor setting see section 15.4.5

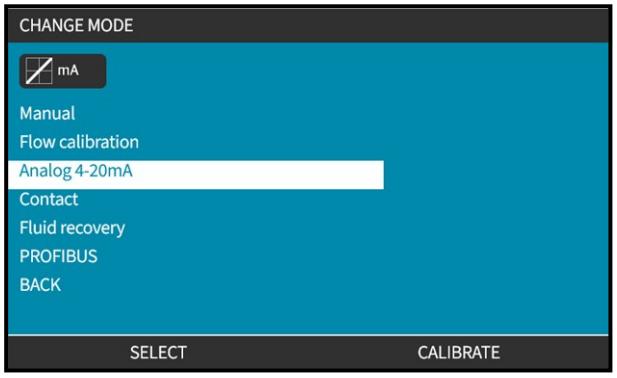
15.4.1.2 Effect of speed limit

The speed limit function in control settings will also scale the analog signal. The speed limit function takes precedence over the scaling factor. Speed limit cannot exceed high flow rate set point (B).

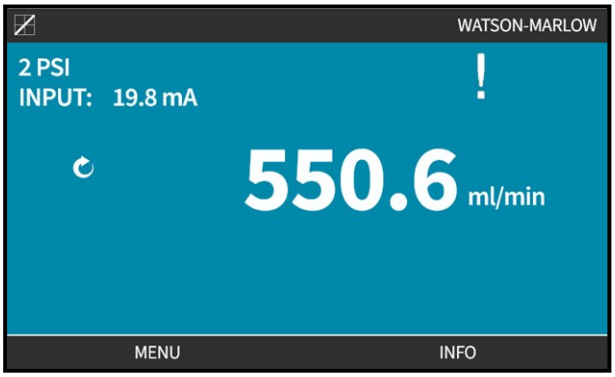
For more information on the speed limit setting see Section24

15.4.1.3 Select Analog 4-20 mA mode

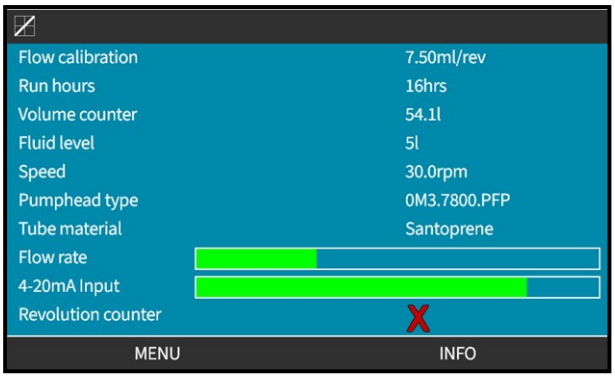
1. Press **MODE** button.
2. Use **+/-** keys to highlight **Analog 4–20 MA**.



3. SELECT
4. Once enabled, the current signal received by pump displayed on **HOME** screen.



5. Press INFO for more information including 4-20 mA calibration figures.



15.4.1.4 Calibrate the pump for 4-20 mA control (Universal/Universal+ only)

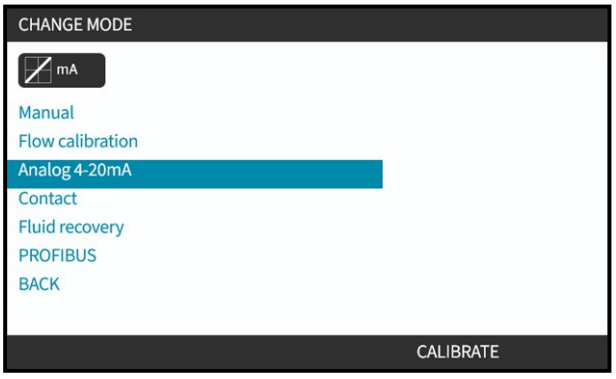
The Universal/Universal+ model can be calibrated for minimum and maximum speed versus minimum and maximum mA signal.

There are two methods in the procedure below:

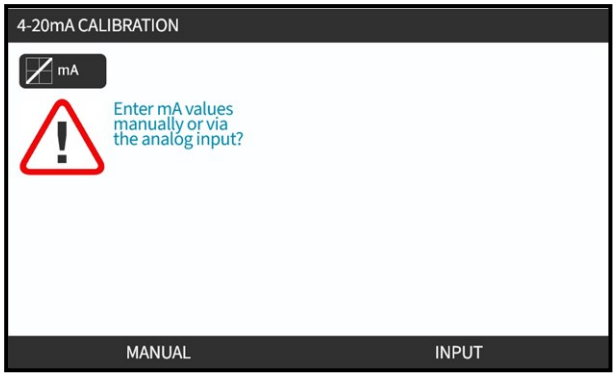
Method	Summary
Manual	Manually enter a signal figure using the **+/-** keys.
Input	Apply a signal, then select to confirm the figure. High and low signals must be within range.

To calibrate:

1. Stop the pump
2. Press **MODE** button
3. Use **+/-** keys to scroll to **Analog 4-20 MA**



4. CALIBRATE Choose calibration method:



MANUAL Enter value using **+/-** keys.

INPUT Apply current signals electrically to analog input.

15.4.1.4.1 SETTING A HIGH SIGNAL:

1. MANUAL Enter value using **+/-** keys.

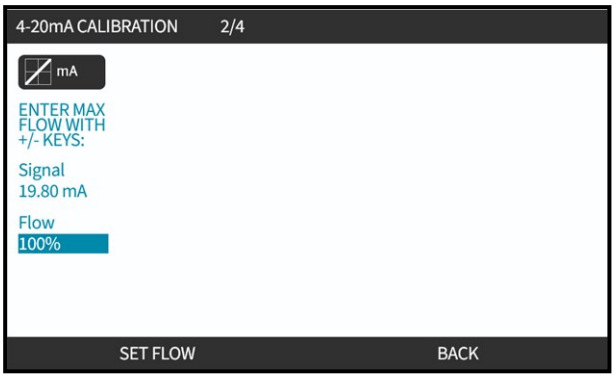
INPUT Send high signal input to pump.

2. ACCEPT option displays when high 4-20 mA signal is within tolerance:

Press ACCEPT to set input or, CANCEL to return to previous screen

15.4.1.4.2 SETTING HIGH FLOW CALIBRATION:

1. Use **+/-** keys to scroll to choose flow rate:



2. Select SET FLOW ▬ or, BACK ▬ to return to previous screen.

15.4.1.4.3 SETTING A LOW SIGNAL

1. MANUAL ▬ Enter value using +/- keys

INPUT ▬ Send low signal input to pump.

If range between low and high signal is less than 1.0 mA, error message displayed.

2. ACCEPT ▬ option displays when low 4-20 mA signal is within tolerance:

ACCEPT ▬ to set signal display or, BACK ▬ to return to previous screen.

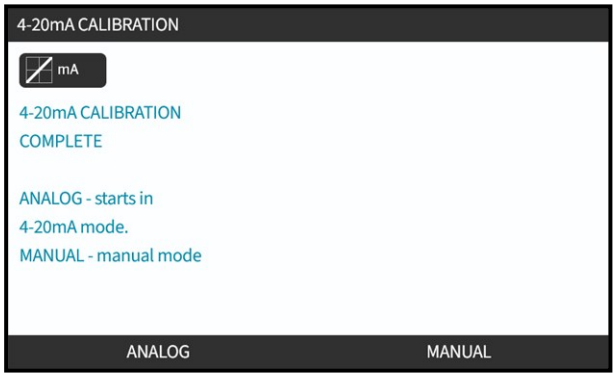
15.4.1.4.4 SETTING LOW FLOW CALIBRATION

1. Use **+/-** keys to choose flow rate:

2. Press SET FLOW − or BACK − to return to previous screen.

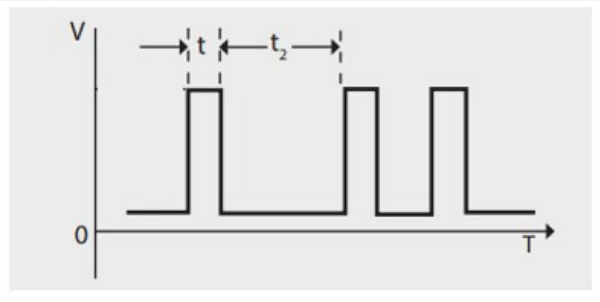
When all settings are entered, the calibration confirmation screen is displayed.

Select either ANALOG − to use proportional mode or, MANUAL − to use manual mode.



15.4.2 CHANGE MODE>Contact mode

Contact mode provides the ability to deliver a user defined dose volume between 0.1 mL and 999 L. This dose can be delivered by one of two methods:

<table>
<tr><th>Method</th><th>Summary</th></tr>
<tr><td>Manual dose</td><td>When the START key is pressed. This manual dose can only be delivered if an analogue does is not being delivered at the same time.</td></tr>
<tr><td>Analogue dose</td><td>Allows intermittent on/off dosing with variable duration controlled via external positive voltage pulse received by pump.
<table>
<tr><th colspan="2">Pulse specification</th></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td colspan="2">Time (T)</td></tr>
<tr><td>t:</td><td>40 ms (min) to 1000 ms (max)</td></tr>
<tr><td>t_2</td><td>> 1s</td></tr>
</table></td></tr>
</table>

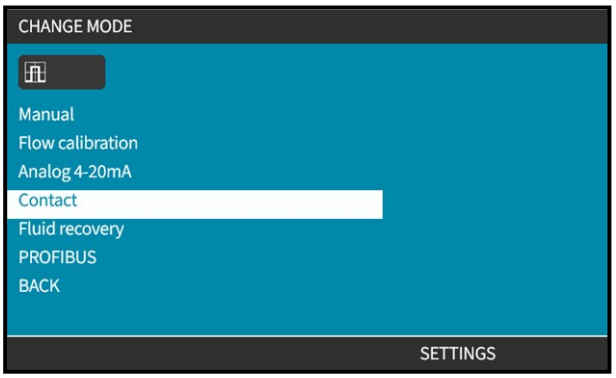
The following contact mode settings are available:

Item	Setting
Contact dose volume	Set the volume of liquid to be dosed between 0.1 mL and 999 L
Flow rate	Set the flow rate the dose will be produced (volume/flow rate = time). Doses which operate for less than 3 seconds are not recommended.
Contact memory	Set whether to ignore or add pulses. **Ignore pulses** — **If set to "ignore", pulses will be forgotten by the pump** Add pulses — If set to "add" Pulses received during dosing will be queued in memory. Queued pulses will activate dispensing when the current dose has finished. If pulses are buffered in memory the pump will not stop between doses.

15.4.2.1 Procedure: Enable and configure contact mode

15.4.2.1.1 ENABLE CONTACT MODE

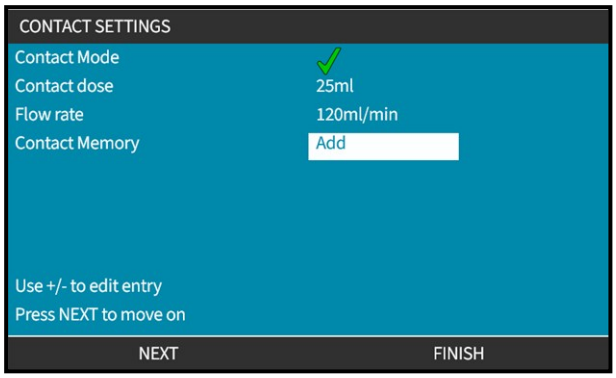
1. Highlight **Contact** from menu.



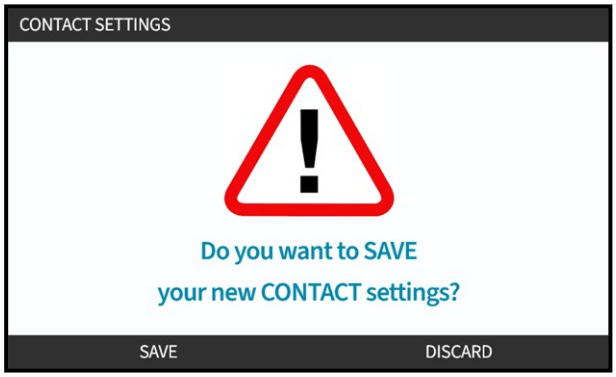
2. Press SETTINGS − to enable **Contact Mode** and allow editing of values.

15.4.2.1.2 TO CONFIGURE CONTACT MODE SETTINGS

1. Referring to the Contact Mode Settings table, use **+/-** keys to enter a value for each setting.
2. Choose NEXT ▬ to cycle through settings.



3. When complete, press FINISH ▬. Save screen will display.



4. Press SAVE ▬ to store data

   or

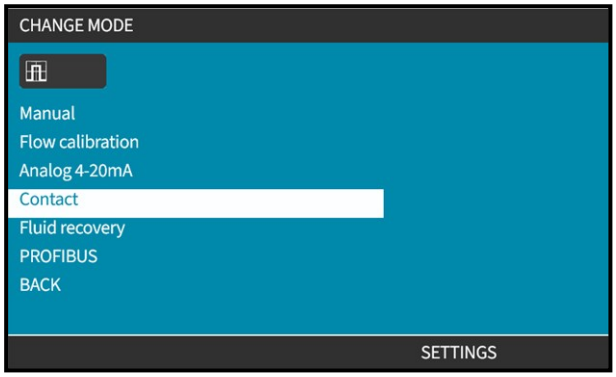
   Press DISCARD ▬ to return to previous page.

15.4.2.2 Procedure: View Contact home screen.

Once Contact mode is enabled and configured, easily view Contact mode home screen and settings via **MODE** button.

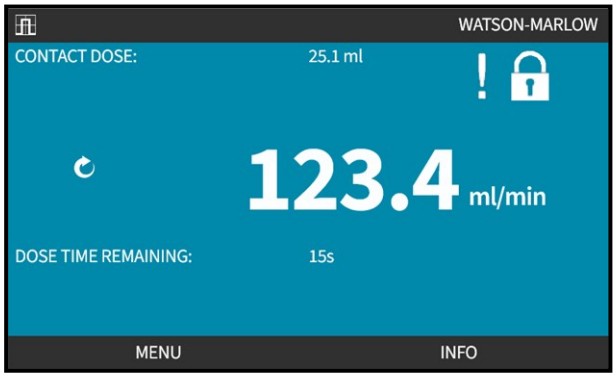
To view Contact mode home screen:

1. Press **MODE** key
2. Use **+/-** keys to highlight **Contact** option
3. Press SETTINGS.



The contact mode home screen will display.

- Contact dose
- Flow rate
- Dose time remaining for dose in progress.
  (Dose time only displayed on screen when dose time is between 3–999 seconds).



15.4.2.3 Contact mode>start/stop

The contact dose signal will trigger the drive to produce a dose based on the programmed flow rate and dose volume. This polarity of the voltage (high/low) which is used to trigger the dose, can be set. This is explained in section 15.

15.4.3 Control settings>Configure inputs

The following inputs [47] can be configured in control settings:

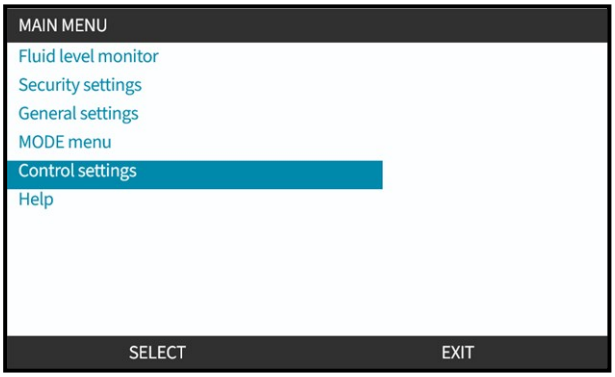
Item	Summary
Start/Stop	Configure polarity
Contact	Configure polarity, assign input
Fluid recovery	Configure polarity, assign input

NOTE 47	Input 1 and 2 may also be configured in relation to floating ground, as a sub-menu. This is explained in section 15.4.6

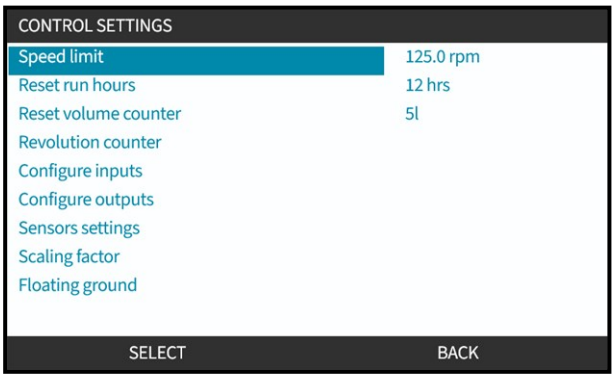
15.4.3.1 To configure inputs:

From the **MAIN MENU**

1. Use **+/-** keys to highlight **Control Settings**



2. Press SELECT.
3. Highlight **Configure Input** option.



4. Press SELECT.

15.4.3.2 To configure start/stop: Polarity

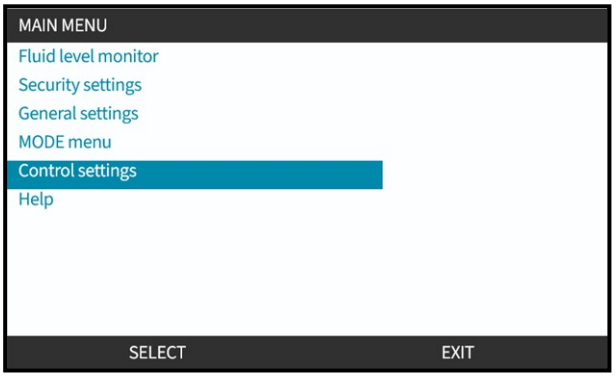
A start/stop signal can be used to stop the pump using the remote stop feature. This will not effect the following operation:

- Flow calibrations
- Max speed key operation
- Manual Fluid recovery

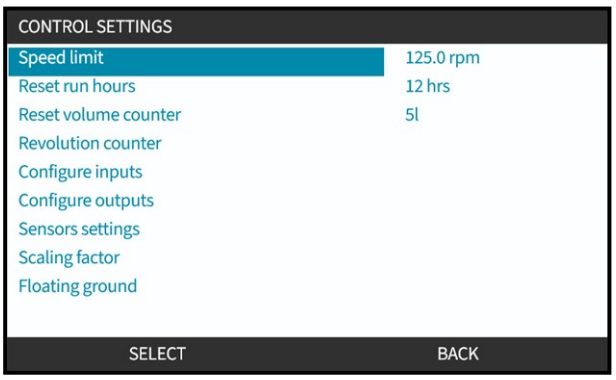
The polarity of the voltage to start/stop can be set. A low polarity signal is recommended as the pump will stop if an input signal is lost.

From the **MAIN MENU**

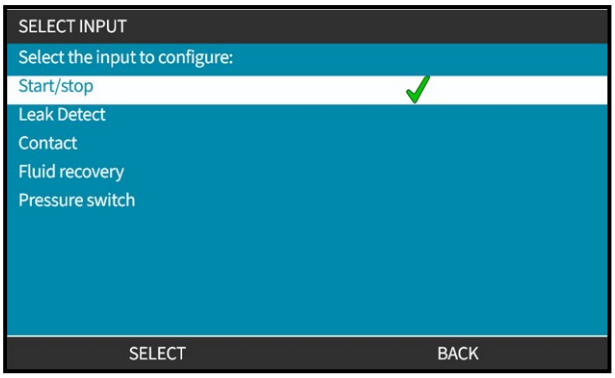
1. Use **+/-** keys to highlight **Control Settings**.



2. Press SELECT.
3. Highlight **Configure Input** option.



4. Press SELECT.
5. Use **+/-** keys to highlight **Start/Stop**.



6. Press SELECT −.
7. Use **+/-** keys to highlight options.
8. Press SELECT − to enable **HIGH** or **LOW** polarity.

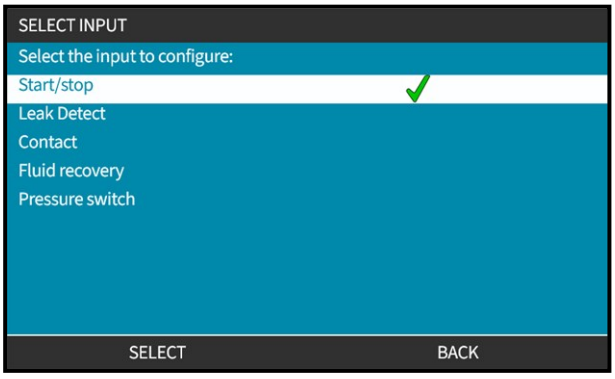
15.4.3.3 To configure start/stop: Assign input

The start/stop cannot be assigned to any other input than #4.

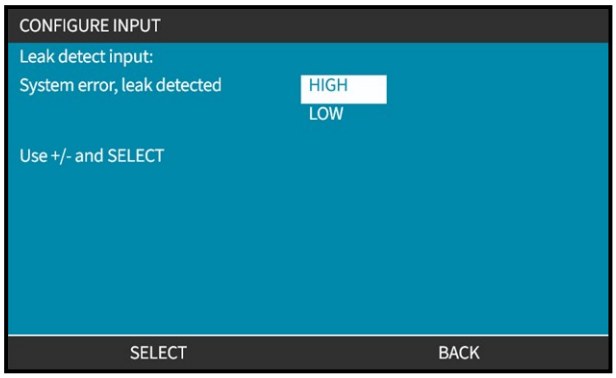
15.4.3.4 To configure Contact dose start trigger: Polarity

The polarity of the voltage to trigger the start of a contact dose can be set. A dose will only be delivered if the pump is in contact mode.

1. Use **+/-** keys to highlight **Contact** option.



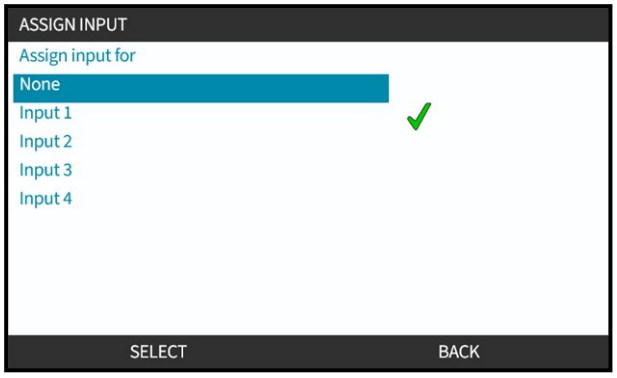
2. SELECT −.
3. Use **+/-** keys to highlight options.
4. SELECT − **HIGH** or **LOW** polarity.



15.4.3.5 To configure Contact dose: Assign input

The contact dose trigger can be assigned to be on any of the 4 inputs.

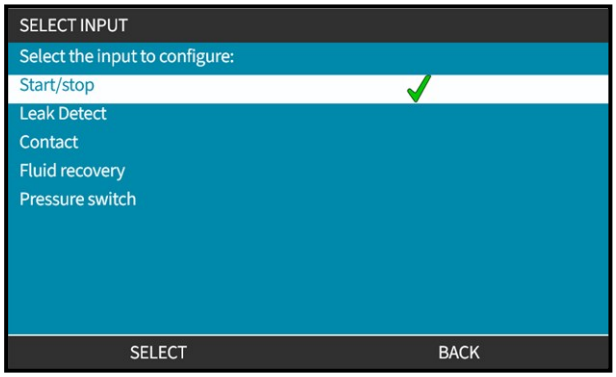
1. Highlight the desired input number.



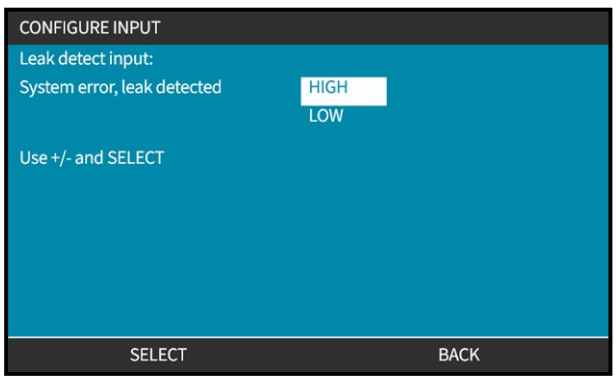
2. Press SELECT ▬ to configure.

15.4.3.6 To configure fluid recovery polarity

1. Use **+/-** keys to highlight **Contact** option.
2. SELECT ▬.



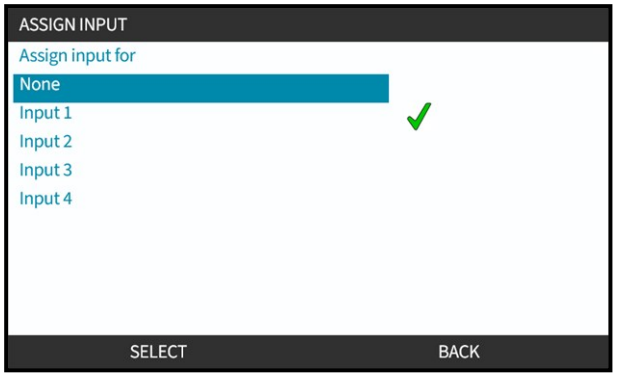
3. Use **+/-** keys to highlight options.
4. SELECT ▬ **High** or **Low** polarity.



15.4.3.7 To configure Fluid recovery: Assign input

Fluid recovery can be assigned to be on any of the 4 inputs.

1. Highlight the desired input number.

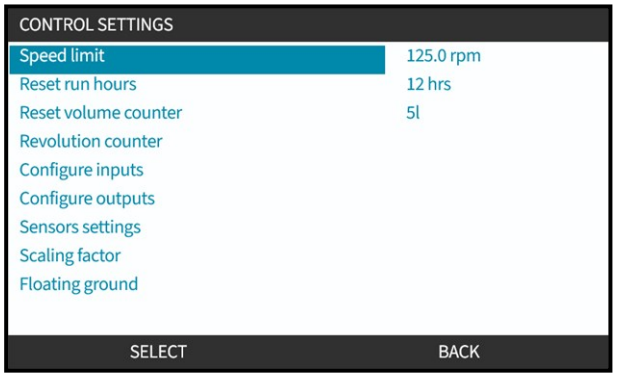


2. SELECT −.

15.4.4 Control settings>Configurable outputs

15.4.4.1 To configure outputs:

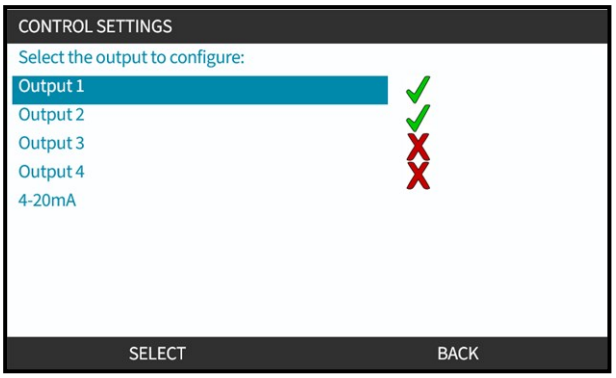
1. Highlight the **Configure Outputs** option.



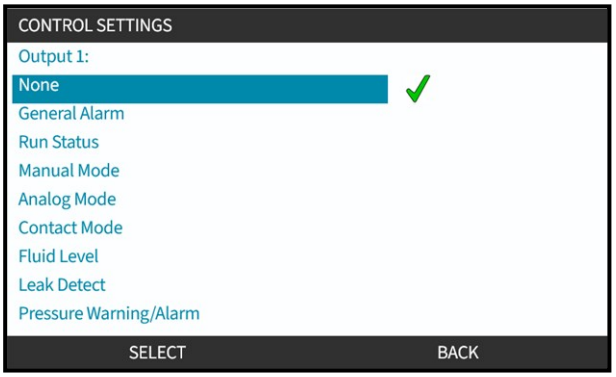
2. Press SELECT − to configure.

15.4.4.1.1 TO CONFIGURE OUTPUTS 1 TO 4:

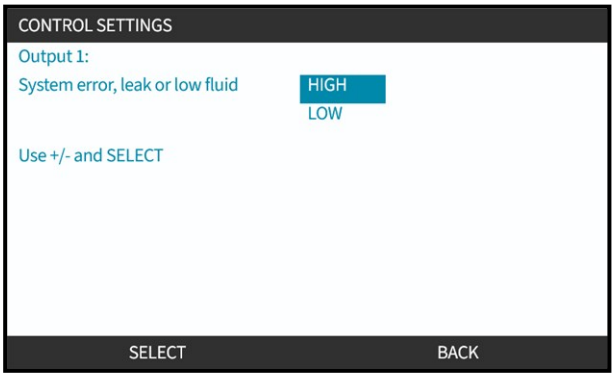
1. Use **+/-** keys to highlight output to configure.



2. Press SELECT ▬ to configure.
   Tick symbol ✓ indicates that the output has been assigned.
3. Use **+/-** keys to highlight required output option.



   Tick symbol ✓ indicates that the output has been assigned.
4. Press SELECT ▬.
5. Use **+/-** keys to highlight required logic status option as **HIGH** or **LOW**.



6. Press SELECT ▬ to program output or Press BACK ▬ to cancel.

15.4.4.2 Control settings 4 – 20 mA output (Universal+ model only)

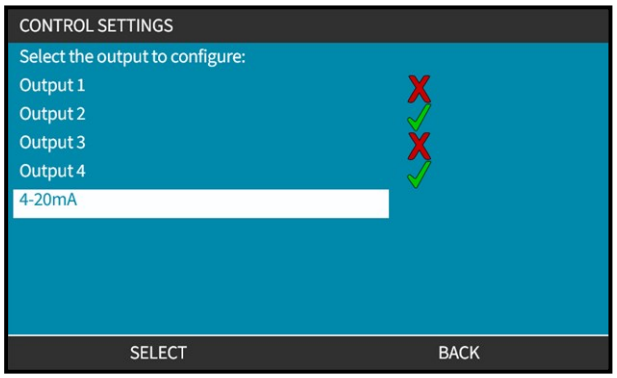
The Universal+ model only has a 4-20 mA output which can be configured. There are three options:

<table>
<tr><th>Scale</th><th>Explanation</th></tr>
<tr><td>Full scale</td><td>4-20 mA output is based on pumps full speed range.

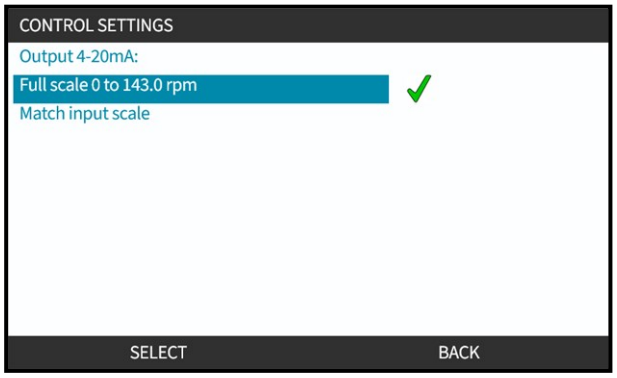
<table><tr><th>0 rpm</th><th>Maximum rpm</th></tr><tr><td>4 mA</td><td>20 mA</td></tr></table></td></tr>
<tr><td>Match input scale</td><td>4-20 mA output will scale to same range as 4-20 mA input.

Example: If the 4-20 mA input has been scaled to provide 4 mA=0 rpm and 20 mA=20 rpm then an input of 12 mA will result in a set speed of 10 rpm and an output of 12 mA. This function will match both the mA and the rpm scales.</td></tr>
<tr><td>Pressure Sensing Kit</td><td>Provides the same raw output of the Pressure Sensing Kit signal received by the pump.</td></tr>
</table>

1. Use **+/-** keys to highlight **4-20 MA** option



2. SELECT [−].
3. Use **+/-** keys to highlight required option.



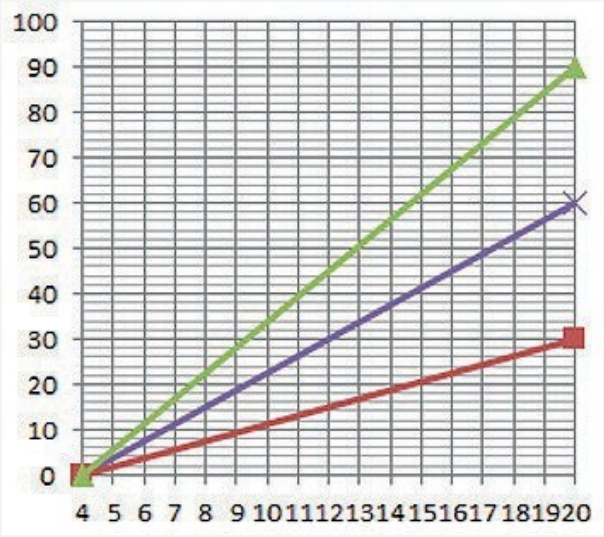
Tick symbol ✓ indicates current setting.

4. SELECT −.

15.4.5 Control settings>Scaling factor

The 4-20 mA profile is a linear relationship where Y=mX+c. The scaling factor is a control setting that can be used to multiply the gradient (m) by a factor.

Example shown in graph and table below:

<table>
<tr><td>flow rate %</td><td colspan="2"> 
</td></tr>
<tr><td></td><td colspan="2">mA</td></tr>
<tr><td colspan="2">Scaling factor</td><td rowspan="2">Effect on 4-20 mA profile</td></tr>
<tr><td>Scaling factor graph line colour</td><td>Scaling factor figure</td></tr>
<tr><td></td><td>1.50</td><td>Will increase flow rate (pump speed) by a factor of 1.50.</td></tr>
<tr><td></td><td>1.00</td><td>No effect (Original 4-20 mA profile)</td></tr>
<tr><td></td><td>0.50</td><td>Will decrease flow rate (pump speed) by a factor of 0.50.</td></tr>
</table>

15.4.5.1 Scaling factor versus speed limit

The speed limit function in control settings will also scale the analog signal. The speed limit function takes precedence over the scaling factor. The scaling factor will never cause pump to exceed speed limit.

The difference between scaling factor and speed limit is that the speed limit is a global variable applied in all modes.

For example

if the 4-20 mA profile is 0 % flow at 4 mA to 100 % flow at 20 mA and a speed limit of 33 rpm is applied, followed by a scaling factor of 0.5, then the output will be 30 %. If a scaling factor of 2 is applied in the same scenario then the output will be 33 rpm or 60 %, as the speed limit takes precedence over the scaling factor.

If you are using manual scaling it is recommended to not use speed limit to avoid confusion.

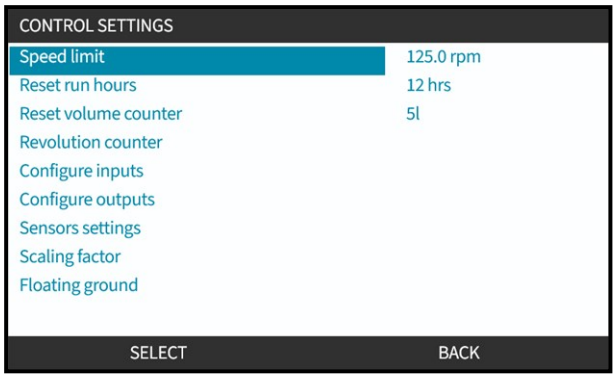
15.4.5.2 Effect on Analog 4-20 mA mode: A and B points

The scaling factor

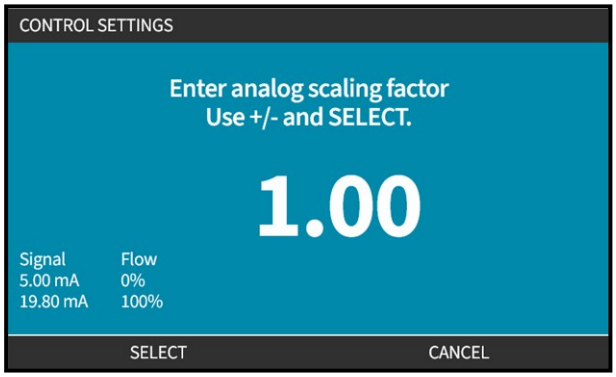
- Will not alter stored A and B points, set in Analog 4-20 mA mode
- Speed limit cannot exceed high flow rate set point (B).

15.4.5.3 To configure scaling factor:

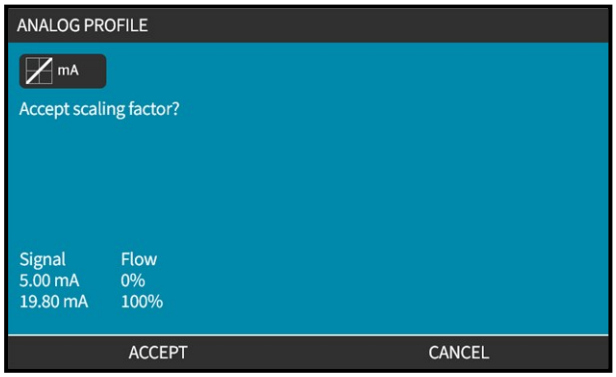
1. From the **MAIN MENU** use **+/-** to select **Control Settings**.
2. Use **+/-** keys to access **Scaling Factor**.



3. Use **+/-** keys to enter multiplication factor.
4. SELECT −.



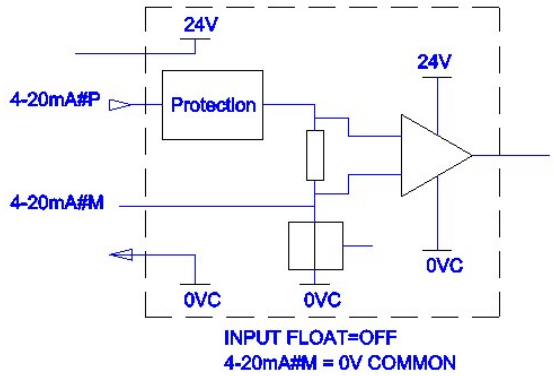
5. ACCEPT − to confirm new 4-20 mA Profile Figures

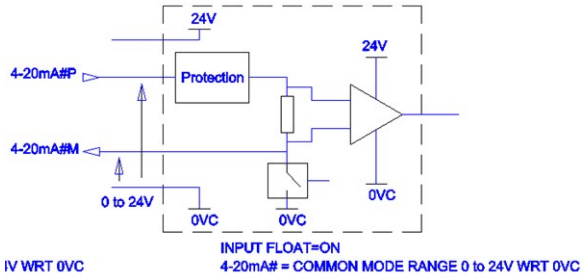


15.4.6 Control Settings>Floating ground

A single 4-20 mA signal could be connected to two or more pumps in series. This would allow both pumps to be controlled through one input signal whereby, if either of the pumps fails or is powered off, then another pump would receive the control signal.

Toggle	Action
Enabled	Floating ground
Disabled	Grounded at pump





Contact your local Watson-Marlow representative if more information is required.

15.4.6.1 Using floating ground with a Pressure Sensing Kit

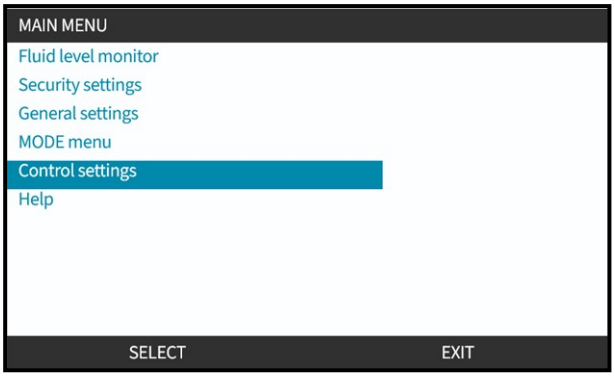
When using a Pressure Sensing Kit, the Analogue 2 reference/pass through (floating ground) must be disabled. This is disabled by default on all models.

The terminology of "Analogue 2 reference/pass through (floating ground)" is used in the control chapter. This function is called "4-20 mA Input 2" in the HMI.

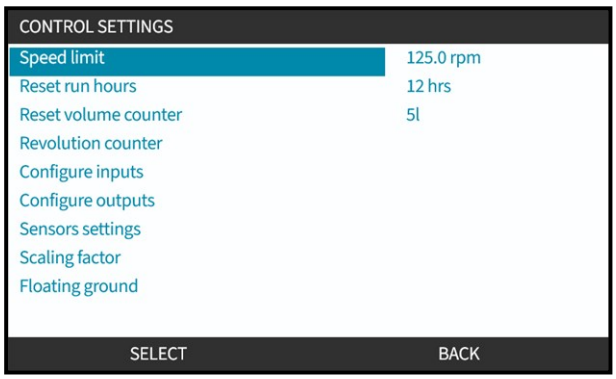
15.4.6.2 Set floating ground

From the **MAIN MENU**

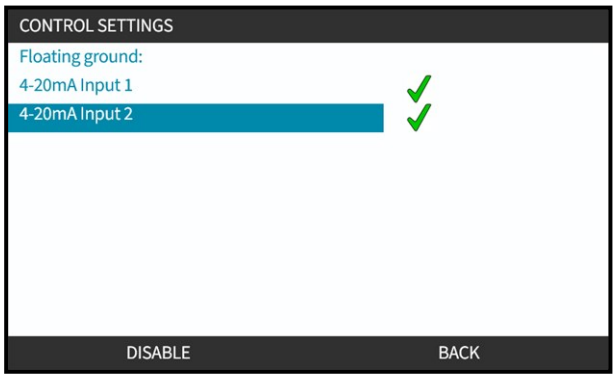
1. Use **+/-** keys to highlight **Control Settings**



2. Press SELECT
3. Highlight **Floating Ground** option.



4. Press SELECT
5. Use **+/-** keys to highlight required input
6. Press Soft Key 1 to ENABLE or DISABLE floating ground



7. Press BACK to display **CONTROL SETTINGS**.

15.4.7 Control settings>Pressure Sensing Kit

Use section 24.1.7 to set up the Pressure Sensing Kit using the control settings menu.

16 INSTALLATION—SUB-CHAPTER 4C: CONTROL (MODEL: PROFIBUS)

16.1 Sub-Chapter overview

This section provides information on connection, input/output specification and relevant set up using the HMI of the PROFIBUS model only.

16.2 Part 1: Sub-Chapter installation requirements, specification, and information

16.2.1 PROFIBUS GSD file

Qdos PROFIBUS pump can be integrated into PROFIBUS DP V0 network using a General Station Data (GSD) file. File identifies pump and contains key data including:

- Communication settings.
- Commands it can receive.
- Diagnostic information it can pass to PROFIBUS master on interrogation.

The GSD file may be downloaded from the Watson-Marlow website from the link below:

Web address: *https://www.wmfts.com/en/literature/other-resources/software-and-devices/*

Dataflow to/from pump may need to be byte-reversed, due to handling data between suppliers of master devices.

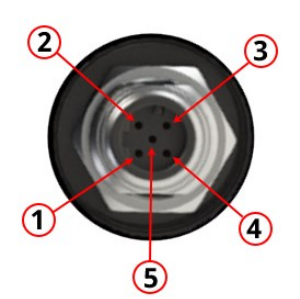
16.2.2 Control cable specification

A PROFIBUS specified cable, IP66 rated, with a M12 connector is required to connect and control a H-FLO PROFIBUS drive.

16.2.3 Control connections

The M12 control connections function by location, thread style, pin count and plug code vary.

16.2.3.1 Network connection

Overview	Two network connections are provided for the PROFIBUS models. Both connections have an identical function. Both PROFIBUS connectors are joined internally to allow flexible network configurations. If the pump is to be used at the end of a network, we recommend the use of a PROFIBUS termination plug for maximum network speed and robustness. To maintain ingress protection the termination plug must be IP66, NEMA 4X rated.	
Location	The connections are located as illustrated by the graphic. 	
Specification	M12, Female, 5 Pin, B-code socket, IP66, NEMA 4X	
Pin out illustration		
Pin out information	Pin	Signal
	1	PB-5V
	2	PROFIBUS Signal A
	3	PROFIBUS Signal B
	4	PB-0V
	5	Cable Screen

16.2.3.2 Control input: Pressure sensor

Overview	A pressure sensor input connection is provided, for use with the Watson-Marlow Pressure Sensing Kit. • It is not possible to use a third party pressure sensor
Location	The pressure sensor input connection is located as illustrated by the graphic. 
Specification	M12, Male, 4 Pin, A-code plug, IP66, NEMA 4X
Pin out information	No pin out information is provided. This pressure sensor connection must only be used with the Watson-Marlow Pressure Sensing Kit. Do not connect any other wires, or cables or attempt to wire to this connection.

16.2.3.3 Set up and using the Pressure Sensing Kit with PROFIBUS

With a PROFIBUS pump, the configurable settings of a Pressure Sensing Kit are set up in the HMI using the control settings menu. See section: 24.1.7

16.2.4 Units used in the PROFIBUS parameters

The following units are used in the PROFIBUS parameters

Name	Explanation	Example
DeciRPM	$1/10^{th}$ of an RPM	1205 deciRPM = 120.5 rpm
uL (microlitre)	$1/1000^{th}$ of a mL	1,000,000 uL/min = 1000 mL/min = 1 L/min

16.2.5 User parameter data

User Parameter Data									
Ext_User_Prm_Data_ Const [0]=	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
	Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

Byte 0	Pump model	
Byte 1	Head type	
Byte 2	Field bus minimum speed	High Byte
Byte 3	Field bus minimum speed	Low Byte
Byte 4	Field bus maximum speed	High Byte
Byte 5	Field bus maximum speed	Low Byte
Byte 6	Fail safe	
Byte 7	Fail safe speed	High Byte
Byte 8	Fail safe speed	Low Byte

16.2.5.1 Pump model

Hex	Description
0x00	QHF

16.2.5.2 Head type

Hex	Description	Product Code
0x00	ReNu 150 pumphead Santoprene / PFPE 7 bar (102 psi)	0M3.6200.PFP
0x03	ReNu 300 pumphead Santoprene / PFPE 5 bar (73 psi)	0M3.7200.PFP
0x04	ReNu 300 pumphead SEBS / PFPE 4 bar (58 psi)	0M3.7800.PFP
0x05	ReNu 600 pumphead Santoprene / PFPE 2.5 bar (36 psi)	0M3.8200.PFP

16.2.5.3 Set Minimum/Maximum speeds

Min/Max Speed parameters are used to set Min/Max speed from PROFIBUS interface:

- Values must only be used if matching bit in Control Word is enabled and not zero.
- Values are 16 bit unsigned in deci RPM (1/10th of pumphead RPM).
- If pump is required to operate at lower speed than user defined minimum speed parameter data, (bytes 3, 4) pump will operate at defined minimum speed.
- If maximum speed configured in user parameter data, pump is limited to this maximum speed even when master requests a higher rpm.

16.2.5.4 Fail safe

The fail-safe user parameter is used to set the correct course of action to take in the event of a PROFIBUS communications failure. The fail-safe byte is configured as shown in the following table (48).

NOTE 48	If no bits set or invalid pattern is set, default failsafe behaviour stops pump.

Hex	Description
0x00	No fail safe action
0x01	Continue running using the last speed set point
0x02	Continue running using the fail-safe speed

16.2.5.5 Fail safe speed

Fail-safe speed parameter used to set speed at which pump should be driven if a PROFIBUS communications error occurs and fail-safe user parameter is set to 0x02.

16.2.6 PROFIBUS data exchange

PROFIBUS data exchange	
Default address	126
PROFIBUS Ident	0x0E7D
GSD File	WAMA0E7D.GSD
Config	0x62, 0x5D (3 words out, 14 words in)
User parameter bytes	6

16.2.6.1 Cyclic Data Write (from Master to pump)

Data type	Byte order	Description
16 bit	Byte 1 (high), 2 (low)	Control Word
16 bit	Byte 3 (high), 4 (low)	Pumphead Speed Setpoint (unsigned)
16 bit	Byte 5 (high), 6 (low)	Set Flow Calibration in µL per revolution

16.2.6.1.1 PUMPHEAD SPEED SETPOINT

Speed Setpoint is 16-bit unsigned integer value representing speed of pumphead in deciRPM.

16.2.6.2 Control word

Control Word	
Bit	Description
0	Run
1	Reverse (0= False, 1= True) All pressure alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse.
2	Tacho count reset (1 = Reset count)
3	Reserved
4	Enable Fieldbus Min/Max Speeds (1 = Enabled)
5	Enable Fieldbus Flow Calibration (1= Enabled)
6	Remote error acknowledge
7	Reset fluid level
9-15	Reserved

16.2.6.3 Set Flow Calibration

This parameter is used to set the flow calibration value from the fieldbus interface. The value is a 16 bit unsigned integer representing µL per revolution of the pumphead [(49)].

NOTE [49]	This value is only used if bit 5 of the Control Word is enabled

16.2.6.4 Cyclic Data Read (from pump to master)

Data type	Byte order	Description
16 bit	Byte 1 (high), 2 (low)	Status word
16 bit	Byte 3 (high), 4 (low)	Pumphead measured speed
16 bit	Byte 5 (high), 6 (low)	Hours run
32 bit	Byte 7 (high), 8 (low) Byte 9 (high),10 (low)	Revolution count
16 bit	Byte 11(high),12 (low)	Flow calibration
32 bit	Byte 13 (high), 14 (low) Byte 15 (high) ,16 (low)	Fluid level
32 bit	Byte 17 (high), 18 (low) Byte 19 (high), 20 (low)	Unassigned
32 bit	Byte 21 (high), 22 (low) Byte 23 (high), 24 (low)	Alarm maximum pressure level active.
32 bit	Byte 25 (high), 26 (low) Byte 27 (high), 28 (low)	Alarm minimum pressure level active.

16.2.6.5 Status word

Status word information is provided in the table below:

Bit	Description
0	Motor running (1 = Running)
1	Global Error Flag (1 = Error)
2	Fieldbus Control (1 = Enabled)
3	Reserved
4	Over current error
5	Under voltage error
6	Over voltage error
7	Over temperature error
8	Motor stalled
9	Tacho fault
10	Leak detected or pumphead alert
11	Low Setpoint - out of range
12	Hight Setpoint – out of range
13	Reserved
14	Warning maximum pressure level active.
15	Warning minimum pressure level active.

16.2.6.6 Pumphead Speed

The pumphead speed is a 16-bit unsigned integer value representing speed of pump head in deciRPM.

16.2.6.7 Hours run

Hours run parameter is 16-bit unsigned integer representing whole hours of runtime.

16.2.7 Device-related diagnostic data

Device related diagnostic information is provided in the table below:

Bit type	Byte order	Description
--	Byte 1, 2, 3, 4, 5, 6	Mandatory Slave Byte
8 bit	Byte 7	Header byte
8 bit	Byte 8	Pump model
8 bit	Byte 9	Pump Head
16 bit	Byte 10 (high),11 (low)	Tube size
16 bit	Byte 12 (high),13 (low)	Minimum speed
16 bit	Byte 14 (high), 15 (low)	Maximum speed
32 bit	Byte 16 (high), 17 (low) Byte 18 (high), 19 (low)	Software version Main CPU
32 bit	Byte 20 (high), 21 (low) Byte 22 (high), 23 (low)	Software Version HMI CPU
32 bit	Byte 24 (high), 25 (low) Byte 26 (high), 27 (low)	Software Version HMI CPU
32 bit	Byte 28 (high), 29 (low) Byte 30 (high), 31 (low)	Software Version PROFIBUS CPU

16.2.8 Channel-related diagnostic data

Channel-related diagnostic blocks are always three bytes long in following format

Channel-related diagnostic block format	
Byte	Description
Byte 1	Header
Byte 2	Channel type
Byte 3	Channel-related error code

Channel-related error code	
Error description	Error code
Global error	0xA9
Over current	0xA1
Under Voltage	0xA2
Over Voltage	0xA3
Over Temperature	0xA5
Motor Stall	0xA4
Tacho Stall	0xB1
Leak detected	0xB2
Setpoint out of range - low	0xA8
Setpoint out of range - high	0xA7
Fluid level alert	0xB3

16.3 Part 2: Sub-Chapter installation procedures

16.3.1 Sub-Chapter pre-installation checklist

Prior to installing the control connections and wiring carry out the following pre-installation check:

- Ensure the pump has been installed in accordance with previous installation chapters.
- Ensure all requirements of part 1 of this chapter have been met.
- Ensure the power cable is not damaged.
- The electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
- Ensure the control cable(s) are not damaged.
- Ensure items and tools for connection of the pump to the control system are to hand.

If there is a problem with any of the pre-installation checklist items, do not proceed to the installation procedures in this chapter, until the matter is resolved.

16.3.2 Control connection precautions

When following the procedures below or wiring the control cables to the pinouts on the M12 connectors

- Keep 4-20mA and low voltage signals separate from power supply
- Only connect to external circuits, that are separated from mains voltages by reinforced insulation. All of the product input and output terminals are separated from mains circuits by reinforced insulation.
- Do not apply mains power voltages to any of the M12 control connection pins.

16.3.3 Installation of M12 control cables (M type)

16.3.3.1 Protective caps

The M12 control connections are covered with protective caps during manufacture

If any of the connections will not be used for control, leave the protective caps in place of a control cable for added protection of the product. A picture of the cap is illustrated in the picture:

16.3.3.2 M12 input/output control cable installation procedure

Follow the procedure below to connect the M12 control cables.

1. Isolate the pump from its power supply
2. Carry out any control system wiring using the information in part 1 of this chapter
3. Connect the M12 connector to the appropriate location on the pump
4. Turn the screw thread by hand until it is tight
5. Check the cable is secure
6. Reconnect the power supply to the pump

16.3.3.3 M12 Pressure Sensing Kit control cable connection

The Pressure Sensing Kit connection will come fitted with a yellow cap. To protect the product do not remove the cap until a control cable can be connected.

Do not apply mains power voltages to any of the M12 control connection pins.

To install the Pressure Sensing Kit onto the fluid path See section: 12.4.6

To electrically connect the Pressure Sensing Kit use the following procedure:

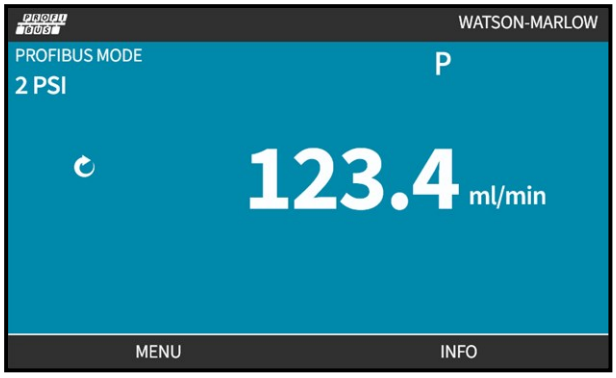
STEP 1	STEP 2	STEP 3	STEP 4
Remove yellow cap from Pressure Sensing Kit connection on pump.	Align cable connector key way with pump connector.	Place cable connector on pump connector and hand tighten collar clockwise until fully engaged.	Ensure control cable is routed such that there is no strain or sharp bends.

Use section 24.1.7 to set up the Pressure Sensing Kit using the control settings menu.

16.3.4 Master slave communications sequence

16.3.4.1 Data exchange

In PROFIBUS mode, the screen below is displayed, the P indicates data exchange is happening.

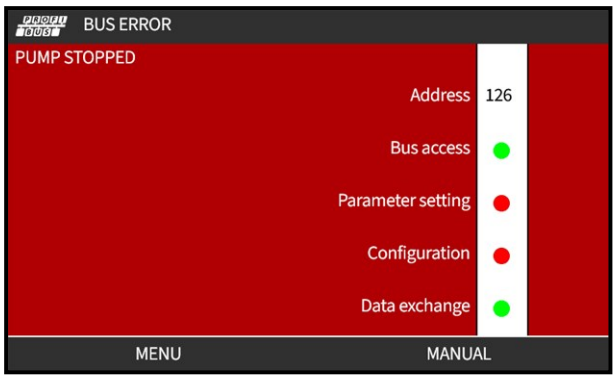


This screen will only be displayed after successful implementation of Master Slave communications, which always follow the sequence described below.

Master Slave communications sequence	
Power On Reset	Power ON/reset of Master or Slave
	↓
Parameterisation	Download parameters into the field device (selected during configuration by the user)
	↓
I/O configuration	Download of I/O configuration into the field device (selected during configuration by the user)
	↓
Data exchange	Cyclic data exchange (I/O data) and field device reports diagnostic

16.3.4.2 Loss of data exchange

If data exchange is lost at any time, the following **BUS ERROR** screen will be displayed.



The first red dot corresponds to the stage at which the error occurred, and subsequent stages will indicate a red dot because the communication sequence halted before this point.

The screen will state RUNNING or STOPPED, depending on how the user has set up the fail-safe function within the PROFIBUS GSD file.

The **MODE** button gives access to the PROFIBUS settings and the station address. When menus are accessed, the pump continues to run in PROFIBUS mode.

If the **MODE** or **MENU** button are pressed, after a period of inactivity, unsaved changes will be discarded and the pump will return to the home screen. If no more communication is received, the **BUS ERROR** screen will be displayed.

16.4 Part 3: Sub-Chapter specific HMI set up

The sub-sections below provide information on PROFIBUS only related set up of the pump using the HMI.

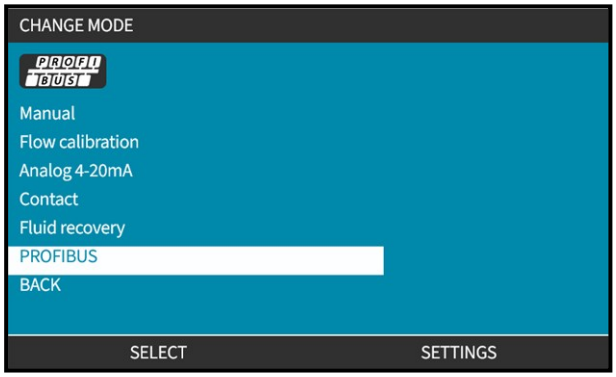
For full information on:

- Mode Menus: See section: 23
- Control settings: See section: 24

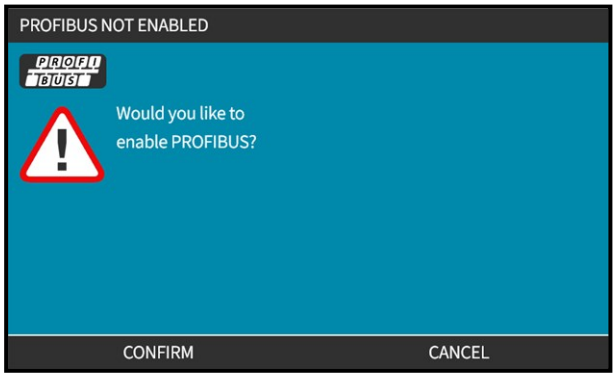
16.4.1 Procedure: Select and enable PROFIBUS

To select and enable PROFIBUS mode:

1. Press **MODE** key
2. Use **+/-** keys to highlight **PROFIBUS**
3. SELECT [−].

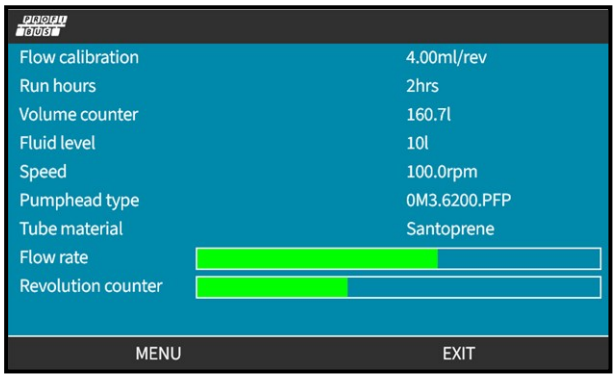


4. Press CONFIRM [−] to enable PROFIBUS



5. **PROFIBUS** home screen shows white icon P to indicate data exchange.

6. Pressing INFO displays pump information screen

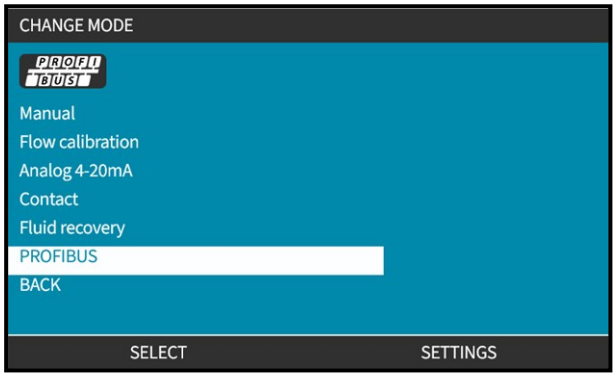


16.4.2 Procedure: Assigning the PROFIBUS station address at the pump

The station address cannot be automatically assigned by master.

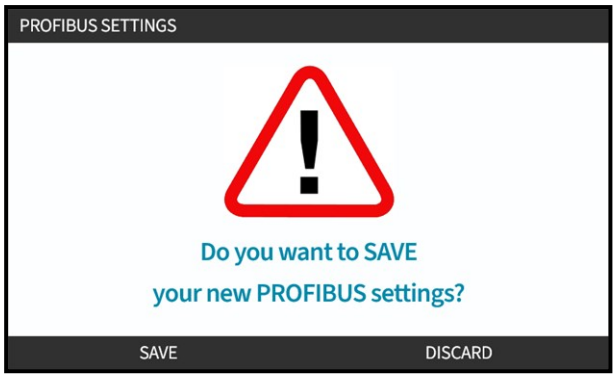
16.4.2.1 To assign PROFIBUS station address

1. Press **MODE** key
2. Use **+/-** keys to highlight **PROFIBUS**
3. SELECT [−].



4. Use **+/-** keys to edit station address.

5. Choose FINISH [−] to set station address
   or
   NEXT [−] to select **PROFIBUS Communication**
   When FINISH [−] is selected the save settings screen will be displayed:
6. Select SAVE [−] to store settings.



If changes are not saved, or after a period of activity the, unsaved changes will be discarded and the pump will return to the home screen.

17 INSTALLATION—SUB-CHAPTER 4D: CONTROL (MODEL: ETHERNET/IP)

This section provides information on connection, input/output specification and relevant set up using the HMI of the EtherNet/IP model only.

17.1 Part 1: Sub-Chapter installation requirements, specification, and information

17.1.1 EDS File

The EDS file may be downloaded from the Watson-Marlow website from the link below:

Web address: *https://www.wmfts.com/en/literature/other-resources/software-and-devices/*

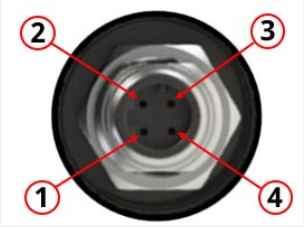
17.1.2 Control cable specification

A category 5e. shielded ethernet cable, IP66 rated, with a M12 connector is required to connect and control a H-FLO EtherNet/IP drive.

17.1.3 Connections

The M12 control connections function by location, thread style, pin count and plug code vary.

17.1.3.1 Network connection

Overview	Two network connections are provided for the EtherNet/IP model. Both connections have an identical function.	
Location	The connections are located as illustrated by the graphic. 	
Specification	M12, Female, 4 Pin, D-code socket, IP66, NEMA 4X	
Pin out illustration		
Pin out information	Pin .	Signal
	1	TDA+
	2	RDA+
	3	TDA-
	4	RDA-

17.1.3.2 Control input: Pressure sensor

Overview	A pressure sensor input connection is provided, for use with the Watson-Marlow Pressure Sensing Kit. • It is not possible to use a third party pressure sensor
Location	The pressure sensor input connection is located as illustrated by the graphic. 
Specification	M12, Male, 4 Pin, A-code plug, IP66, NEMA 4X
Pin out information	No pin out information is provided. This pressure sensor connection must only be used with the Watson-Marlow Pressure Sensing Kit. Do not connect any other wires, or cables or attempt to wire to this connection.

17.1.3.3 Set up and using the Pressure Sensing Kit with EtherNet/IP

With an EtherNet/IP pump, the configurable settings of a Pressure Sensing Kit are set up in the HMI using the control settings menu. See section: 24.1.7

17.1.4 EtherNet/IP parameters

17.1.4.1 Units used in the EtherNet/IP parameters

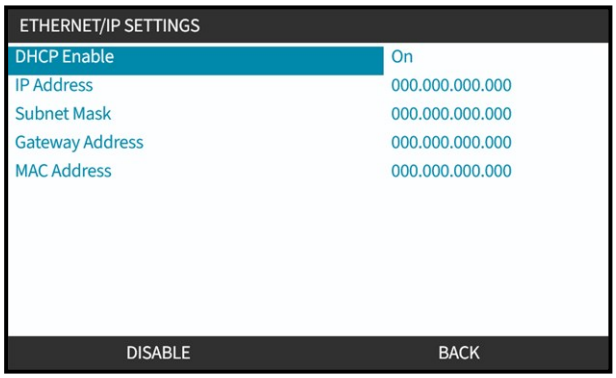
The following units are used in the EtherNet/IP parameters.

Name	Explanation	Example
DeciRPM	1/10th of an RPM	1205 DeciRPM = 120.5 rpm
uL (microlitre)	1/1000th of a mL	1,000,000 uL/min = 1000 mL/min = 1 L/min
DeciPSI (50)	1/10th of an PSI	1450 DeciPSI = 145 PSI = 10 Bar (50)

NOTE 50	Although the Pressure Sensing Kit can be set up to report in either PSI or bar, the network parameters are always reported in DeciPSI.

17.1.4.2 Network parameters

The network parameters for communication of the pump with the network, are pre-programmed during production:



The DHCP can be disabled, and the network parameters manually configured using the HMI. This is explained in section 17.3.2.

17.1.4.3 Cyclic parameters

The table below lists the EtherNet/IP cyclic parameters and the functionality available through the interface.

ADI	Name	Access	Type	Description
1	PumpControlBitfield	Write	UInt16	• Bit 0 = Set failsafe enable. Enables failsafe speed. If disabled, pump will stop in event of a communications loss. If enabled, pump will run at speed set in the “SetFailsafeSpeed” parameter. • Bit 1 = Set pump to run in reverse. If set, pump will run in reverse. Pump defaults to running forward. (51) **NOTE 51** All pressure alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse. • Bit 2 = Start pump. Set to 1 (true) to allow pump to run. 0 will stop pump. Note that Enable pump also needs to be set to 1. • Bit 3 = Enable pump. Set to 1 to allow pump to run. 0 will stop the pump and not allow it to run. • Bit 4 = Reset pump run hours to zero. Resets the run hours accumulator. • Bit 5 = Unused. • Bit 6 = Reset flow totaliser to zero. Set to 1 to reset pumphead revolution count. Set to 0 to allow pumphead revolution count to increment.
2	SetSpeed	Write	UInt16	Speed set in DeciRPM. Max speed depends on head type. See section: 17.1.4.5
3	SetSpeedLimit	Write	UInt16	Speed set in DeciRPM. Max speed

ADI	Name	Access	Type	Description
				depends on head type. See section: 17.1.4.5
4	SetFailsafeSpeed	Write	UInt16	If failsafe is enabled, pump will run continuously at selected speed in event of a communications loss.
13	FlowCal	Read	UInt32	Reports flow calibration value (µL/rev).
14	RunHours	Read	UDInt32	Reports number of hours pump has run.
15	Reserved	Read	DInt32	Reserved
16	SensorPressure	Read	DInt32	Reports sensor pressure in DeciPSI if the Pressure Sensing Kit is selected in HMI: see section 24.1.7.
17	PressureMinWarningSp	Read	DInt32	Displays pressure low warning band (Warning minimum level) set point in DeciPSI.
18	PressureMaxWarningSp	Read	DInt32	Displays pressure high warning band (Warning maximum level) set point in DeciPSI.
19	PressureMinAlarmSp	Read	DInt32	Displays pressure low alarm band (Alarm minimum evel) set point in DeciPSI.
20	PressureMaxAlarmSp	Read	DInt32	Displays pressure high alarm band (Alarm maximum level) set point in DeciPSI.
21	Reserved	Read	DInt32	Reserved
22	Reserved	Read	DInt32	Reserved
23	Reserved	Read	DInt32	Reserved
24	Reserved	Read	DInt32	Reserved
25	FlowTotaliser	Read	UDInt32	Displays totalised flow value (µL).
26	RevolutionCount	Read	UDInt32	Displays revolution count in full rotations.
27	PumpSpeed	Read	UInt16	Displays current pump speed set point (DeciRPM).
28	SpeedLimit	Read	UInt16	Displays current speed limit set point (DeciRPM).
35	PumpStatusBitfield	Read	USInt1	Bit 0 = Pump running in reverse. If set, pump is running in reverse for fluid recovery. (52)

ADI	Name	Access	Type	Description
				Bit 1 = Pump is currently running. If set, pump is currently running. **NOTE** [52] All pressure alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse.
38	PumpHead	Read	USInt1	Displays currently selected pumphead. See section: 17.1.4.5
64	ErrorAcknowledge	Write	BOOL1	Bit 0 = Acknowledge error. If set to 1, will acknowledge pump errors.
102	ErrorsWarningBitfield Byte 1	Read	Unit32	Bit 0 = Leak detected. Leak detect signal high, requires clearing and acknowledging before pump can resume. Bit 1 = Motor Stall error active. If set, pump has a motor stall error. Follow onscreen instructions. Bit 2 = Motor Speed error. If set, pump has a speed error. Follow onscreen instructions. Bit 3 = Over Current error. If set, pump has an over current error. Follow onscreen instructions. Bit 4 = Over voltage error. If set, pump has an over voltage error. Follow onscreen instructions. Bit 5 = Reserved Bit 6 = Reserved Bit 7 = Pressure Sensor error. If active, pressure sensor signal (mA) is outside of valid range (3.7 to 21 mA).
102	ErrorWarningsBitfield Byte 2	Read	Unit32	Bit 0 =Reserved Bit 1 = Reserved

ADI	Name	Access	Type	Description
				Bit 2 = Reserved Bit 3 = Reserved Bit 4 = Pressure sensor Alarm maximum level. If set, pressure sensor alarm maximum level is active. Bit 5 = Pressure Sensor Alarm minimum level. If set, pressure sensor Alarm minimum level is active. Bit 6 = Pressure Sensor Warning maximum level. If set, pressure sensor Warning maximum level is active. Bit 7 = Pressure Sensor warning minimum level. If set, pressure sensor Warning minimum level is active.
102	ErrorWarningsBitfield Byte 3	Read	Unit32	Bit 0 = Reserved Bit 1 = Reserved Bit 2 = Under Voltage error. Bit 3 = Over Temperature error. Bit 4 = Software Fault. If set, there is a software fault. Bit 5 = Hardware Fault. If high, there is an Inverter Gate Drive Fault. Bit 6 = Power supply over power error. If set, PSU power draw is too high. Bit 7 = Reserved.

17.1.4.4 Drive model enumeration table

Drive model	Abbreviation	Enum
Qdos H-FLO	QHF	1

17.1.4.5 Pumphead enumeration table

Description	Enum	Maximum speed (DeciRPM)
ReNu 150 pumphead Santoprene / PFPE 7 bar (102 psi)	01	1600
ReNu 300 pumphead Santoprene / PFPE 5 bar (73 psi)	04	1900
ReNu 300 pumphead SEBS / PFPE 4 bar (58 psi)	05	1620
ReNu 600 pumphead Santoprene / PFPE 2.5 bar (36 psi)	06	1900

17.1.4.6 Acyclic data records

The table below lists the EtherNet/IP acyclic parameters and the functionality available through the interface

ADI	Name	Access	Type	Description
37	PumpModel	Read	UInt8 (Enum)	Displays drive model.
63	Asset Number	Read	Unsigned8 array length 21 including NULL terminator (OctetString)	Read pump Asset number
108	Serial Number	Read	Char21	Reports pump serial number

17.2 Part 2: Sub-Chapter installation procedures

17.2.1 Sub-Chapter pre-installation checklist

Prior to installing the control connections and wiring carry out the following pre-installation check:

- Ensure the pump has been installed in accordance with previous installation chapters.
- Ensure all requirements of part 1 of this chapter have been met.
- Ensure the power cable is not damaged.
- The electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
- Ensure the control cable(s) are not damaged.
- Ensure items and tools for connection of the pump to the control system are to hand.

If there is a problem with any of the pre-installation checklist items, do not proceed to the installation procedures in this chapter, until the matter is resolved.

17.2.2 Control connection precautions

When following the procedures below or wiring the control cables to the pinouts on the M12 connectors

- Keep 4–20 mA and low voltage signals separate from power supply
- Only connect to external circuits, that are separated from mains voltages by reinforced insulation. All of the product input and output terminals are separated from mains circuits by reinforced insulation.
- Do not apply mains power voltages to any of the M12 control connection pins.

17.2.3 Installation of M12 control cables (M type)

17.2.3.1 Protective caps

The M12 control connections are covered with protective caps during manufacture

If any of the connections will not be used for control, leave the protective caps in place of a control cable for added protection of the product. A picture of the cap is illustrated in the picture:

17.2.3.2 M12 input/output control cable installation procedure

Follow the procedure below to connect the M12 control cables.

1. Isolate the pump from its power supply
2. Carry out any control system wiring using the information in part 1 of this chapter
3. Connect the M12 connector to the appropriate location on the pump
4. Turn the screw thread by hand until it is tight
5. Check the cable is secure
6. Reconnect the power supply to the pump

17.2.3.3 M12 Pressure Sensing Kit control cable connection

The Pressure Sensing Kit connection will come fitted with a yellow cap. To protect the product do not remove the cap until a control cable can be connected.

Do not apply mains power voltages to any of the M12 control connection pins.

To install the Pressure Sensing Kit onto the fluid path See section: 12.4.6

To electrically connect the Pressure Sensing Kit use the following procedure:

STEP 1	STEP 2	STEP 3	STEP 4
Remove yellow cap from Pressure Sensing Kit connection on pump.	Align cable connector key way with pump connector.	Place cable connector on pump connector and hand tighten collar clockwise until fully engaged.	Ensure control cable is routed such that there is no strain or sharp bends.

Use section 24.1.7 to set up the Pressure Sensing Kit using the control settings menu.

17.3 Part 3: Sub-Chapter specific HMI set up

The sub-sections below provide information on EtherNet/IP only related set up of the pump using the HMI.

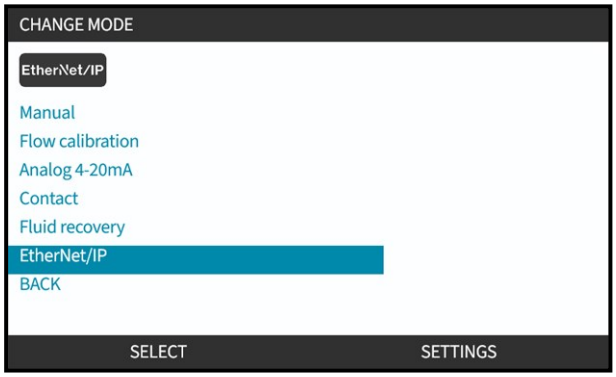
For full information on:

- Mode Menus: See section: 23
- Control settings: See section: 24

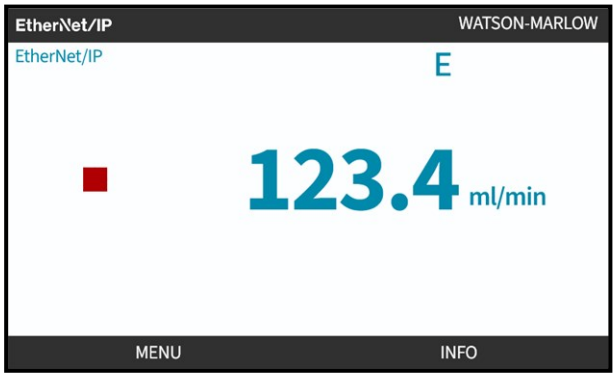
17.3.1 Procedure: Select EtherNet/IP mode using the HMI

To select EtherNet/IP mode:

1. Press **MODE** key
2. Use **+/-** keys to scroll to **EtherNet/IP**
3. SELECT −



4. Pump will display the **ETHERNET/IP** home screen



17.3.2 Procedure: Set IP address using the HMI

Configuring the IP address can be undertaken by two methods:

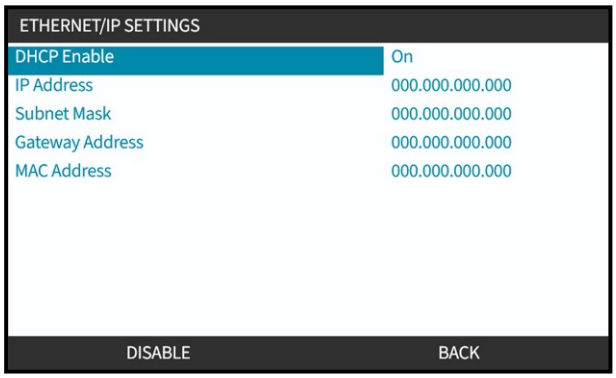
- Method 1: Set static IP Address (manual, DHCP disabled)
- Method 2: Set dynamic IP Address (automatic, DHCP enabled)

17.3.2.1 Procedure: Method 1: Static IP address.

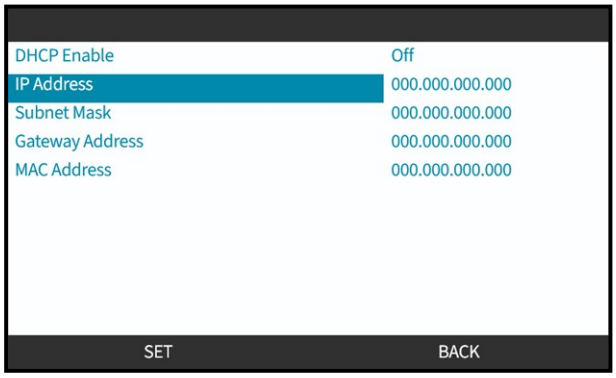
By default, DHCP is enabled. The means the drive will automatically receive an IP address when the drive is connected to a network.

If a static IP address is to be used, the DHCP must first be disabled. Follow the procedure to disable the DHCP and set a static IP address

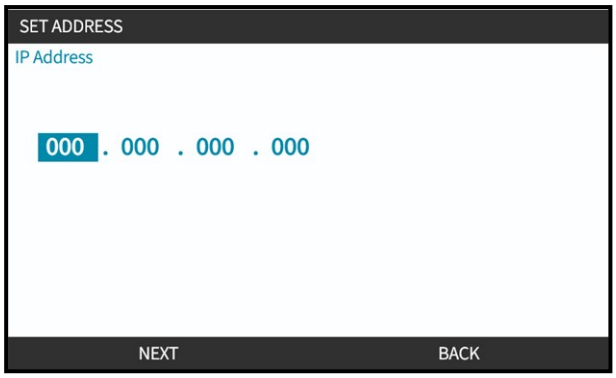
1. Highlight the **DHCP Setting**
2. Choose DISABLE −.



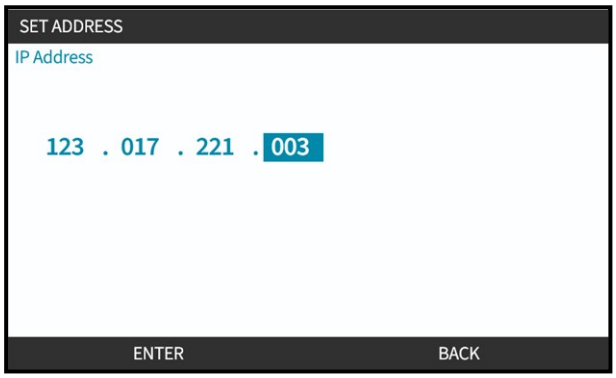
3. Select the **IP Address**
4. Press SET −



5. Use **+/-** keys to enter the highlighted values.
6. Use NEXT − to move to next value



7. When final value is entered, choose ENTER to commit setting.

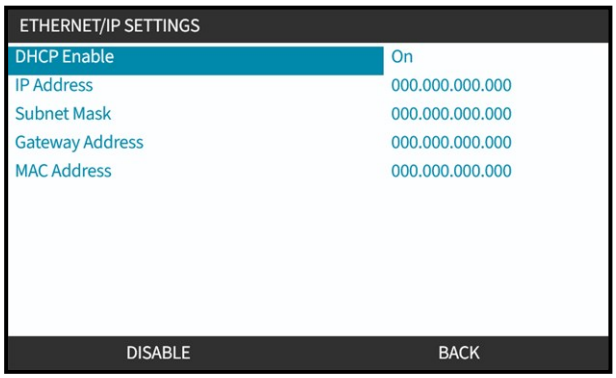


To set the **Subnet Mask** and **Gateway Address** repeat steps 3 to 7.

17.3.2.2 Procedure: Method 2: Set dynamic IP Address (automatic, DHCP enabled)

DHCP is enabled by default, it is only necessary to re-enable DHCP if it was previously disabled when an IP address was manually set.

1. Highlight the **DHCP Setting**
2. Ensure that DHCP is Enabled

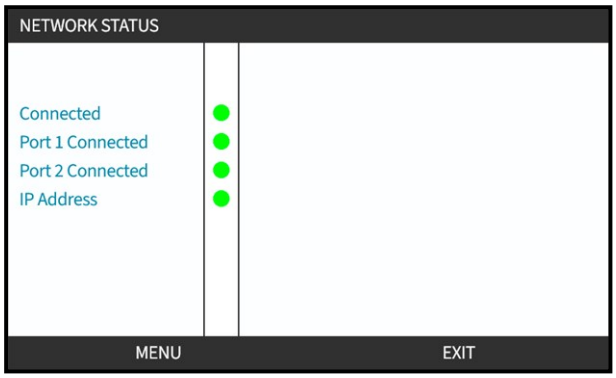


A DHCP server within the network will allocate the drive an IP address based on the MAC address.

17.3.3 Network status screens

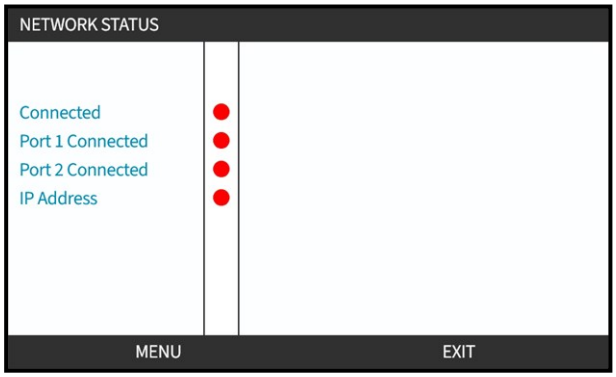
If the pump is not running and connections are made to ports, the IP address is assigned, and the drive is connected to master.

The status screen of this will be shown below:



If the pump is not running with no connections made to ports, the IP address is not assigned, and the drive is not connected to master.

The status screen of this will be shown below:



18 INSTALLATION—SUB-CHAPTER 4E: CONTROL (MODEL: PROFINET)

This section provides information on connection, input/output specification and relevant set up using the HMI of the PROFINET model only.

18.1 Part 1: Sub-Chapter installation requirements, specification, and information

18.1.1 GSDML File

The GSDML file may be downloaded from the Watson-Marlow website from the link below:

Web address: *https://www.wmfts.com/en/literature/other-resources/software-and-devices/*

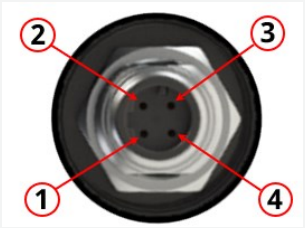
18.1.2 Control cable specification

A category 5e. shielded PROFINET cable, IP66 rated, with a M12 connector is required to connect and control a H-FLO PROFINET drive.

18.1.3 Connections

The M12 control connections function by location, thread style, pin count and plug code vary.

18.1.3.1 Network connection

Overview	Two network connections are provided for the PROFINET model. Both connections have an identical function.	
Location	The connections are located as illustrated by the graphic. 	
Specification	M12, Female, 4 Pin, D-code socket, IP66, NEMA 4X	
Pin out illustration		
Pin out information	Pin .	Signal
	1	TDA+
	2	RDA+
	3	TDA-
	4	RDA-

18.1.3.2 Control input: Pressure sensor

Overview	A pressure sensor input connection is provided, for use with the Watson-Marlow Pressure Sensing Kit. • It is not possible to use a third party pressure sensor
Location	The pressure sensor input connection is located as illustrated by the graphic. 
Specification	M12, Male, 4 Pin, A-code plug, IP66, NEMA 4X
Pin out information	No pin out information is provided. This pressure sensor connection must only be used with the Watson-Marlow Pressure Sensing Kit. Do not connect any other wires, or cables or attempt to wire to this connection.

18.1.3.3 Set up and using the Pressure Sensing Kit with PROFINET

With a PROFINET pump, the configurable settings of a Pressure Sensing Kit are set up in the HMI using the control settings menu. See section: 24.1.7

18.1.4 PROFINET Parameters

18.1.4.1 Units used in the PROFINET parameters

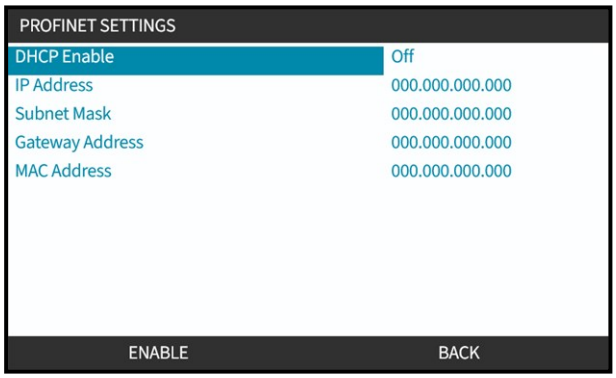
The following units are used in the PROFINET parameters

Name	Explanation	Example
DeciRPM	1/10th of an RPM	1205 deciRPM = 120.5 rpm
uL (microlitre)	1/1000th of a mL	1,000,000 uL/min = 1000 mL/min = 1 L/min
DeciPSI (53)	1/10th of an PSI	1450 DeciPSI = 145 PSI = 10 Bar (53)

NOTE 53	Although the Pressure Sensing Kit can be set up to report in either PSI or bar, the network parameters are always reported in DeciPSI.

18.1.4.2 Network parameters

The network parameters for communication of the pump with the network, are pre-programmed during production:



The DHCP can be disabled, and the network parameters manually configured using the HMI. This is explained in section 18.3.2.

18.1.4.3 PROFINET cycle time

Minimum device interval 32 ms.

18.1.4.4 Cyclic parameters

The table below lists the PROFINET cyclic parameters and the functionality available through the interface.

ADI	Name	Access	Type	Description	Module
2	Set pump speed (deciRPM)	Write	UInt16	Speed set in Deci RPM. Max speed depends on head type. See section: 18.1.4.6	Pump Control
3	Set pump speed limit (deciRPM)	Write	UInt16	Speed set in Deci RPM. Max speed depends on head type. See section: 18.1.4.6	Pump Control
4	Set failsafe speed (deciRPM)	Write	UInt16	If the failsafe is enabled, pump will run continuously at selected speed in the event of a communications loss.	Pump Control
13	Flow calibration (µL/rev)	Read	UInt32	Reports flow calibration value.	Pump Status
14	Run hours	Read	UInt32	Reports number of hours pump has run.	Pump Status
15	Reserved				
16	Sensor pressure (deciPSI)	Read	SInt32	Reports sensor pressure in DeciPSI if the Pressure Sensing Kit is selected in HMI: see section 24.1.7.	Pump Status
17	Pressure min warning setpoint (deciPSI)	Read	SInt32	Displays the Pressure low warning band (Warning minimum level) set point in DeciPSI.	Pump Details and data
18	Pressure max warning setpoint (deciPSI)	Read	SInt32	Displays the Pressure high warning band (Warning maximum level) set point in DeciPSI.	Pump Details and data
19	Pressure min alarm setpoint (deciPSI)	Read	SInt32	Displays the Pressure low alarm band (Alarm minimum level) set point in DeciPSI.	Pump Details and data
20	Pressure max alarm setpoint (deciPSI)	Read	SInt32	Displays the Pressure high alarm band (Alarm maximum level) set point in DeciPSI.	Pump Details and data
21	Reserved				
22	Reserved				
23	Reserved				
24	Reserved				
25	Total volume pumped (µL)	Read	UInt32	Displays totalised flow value.	Pump Status
26	Pump Head	Read	UInt32	Displays revolution count in full	Pump

ADI	Name	Access	Type	Description	Module
	revolution count			rotations.	Status
27	Current pump speed (deciRPM)	Read	UInt16	Displays current pump speed set point.	Pump Status
28	Pump speed limit (deciRPM)	Read	UInt16	Displays current speed limit set point.	Pump Status
38	Pump head	Read	UInt8 (Enum)	Displays currently selected pump head. See section: 18.1.4.6	Pump Details and Data
64	Acknowledge Error	Write	Unit8	Bit 0 = Acknowledge error. If set to 1, will acknowledge pump errors.	Errors and Warnings
101	Control bitfield	Write	Unit16	Bit 0 = Set fail safe enable, Enabled the failsafe speed. If disabled, pump will stop in the event of a communications loss. If enabled, pump will run at the speed set in the “SetFailsafeSpeed” parameter Bit 1 = Set pump to run in reverse. If set, pump will run in reverse. Pump defaults to running forward. (54) **NOTE** 54 — All pressure alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse. Bit 2 = Start pump, set to 1 (true) to allow pump to run. 0 will stop pump. NOTE that pump enable needs to be set Bit 3 = Enable pump, set to 1 to allow pump to run. Setting to 0 will stop pump and not allow pump to run. Bit 4 = Reset pump run hours to zero, Resets run hours accumulator Bit 5 = Reserved	Pump Control

ADI	Name	Access	Type	Description	Module
				Bit 6 =Reset flow totaliser to zero, set to 1 to reset Total volume pumped to 0. Set to 0 to allow Total volume pumped to accumulate Bit 7 = Reset revolution count to zero, set to 1 to reset Pump head revolution count to 0. Set to 0 to allow Pump head revolution count to increment.	
102	Error Bitfield byte 1	Read	Unit32	Bit 0 = Leak detected, Leak detect signal high requires clearing and acknowledging before pump can resume. Bit 1 = Motor Stall error active, If set, pump has a Motor Stall Error. Follow onscreen instructions Bit 2 = Motor Speed error. If set pump has a speed error. Follow onscreen instructions Bit 3 = Over Current error active. If set, pump has an over current error. Follow onscreen instructions Bit 4 = Over voltage error active. If set, pump has an over voltage error. Follow onscreen instructions Bit 5 = Reserved Bit 6 = Reserved Bit 7 = Reserved	Errors and Warnings
	Error Bitfield byte 2	Read	Unit32	Bit 0 = Pressure sensor max warning (Warning maximum) active, If set the pressure high warning (Warning maximum) is active Bit 1 = Pressure sensor min alarm (Alarm minimum) active, If set the pressure low alarm (Alarm minimum) is active Bit 2 = Reserved	Errors and Warnings

ADI	Name	Access	Type	Description	Module
				Bit 3 = Reserved Bit 4 = Pressure sensor max alarm (Alarm maximum) active, If set the pressure high alarm (Alarm maximum) is active Bit 5 = Pressure sensor min warning (Warning minimum) active, If set the pressure low warning (Warning minimum) is active Bit 6 = Reserved Bit 7 = Pressure sensor error active, if set pressure sensor error is active.	
	Error Bitfield byte 3	Read	Unit32	Bit 0 = Reserved Bit 1 = Under Voltage Error Bit 2 = Over Temperature Error Bit 3 = Software Fault. If set, there is a software fault Bit 4 = Hardware Fault. If high, there is an Inverter Gate Drive Fault. Bit 5 = Power supply over power error.	Errors and Warnings
103	Status bit field	Read	Byte	Bit 0 = Pump running in reverse. If set, pump is running in reverse for fluid recovery. (55) **NOTE** 55 — All pressure alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse. Bit 1 = Pump is currently running. If set pump is currently running.	Pump Status
109	Software Fault	Read	Bool	If set high, there is a software fault.	Errors and Warnings
110	Hardware	Read	Bool	If high, there is an Inverter Gate Drive	Errors and

ADI	Name	Access	Type	Description	Module
	Fault			Fault.	Warnings

18.1.4.5 Drive model enumeration table

Drive model	Abbreviation	Enum
Qdos Higher Flow	QHF	1

18.1.4.6 Pump Head enumeration table

Description	Enum	Maximum speed (DeciRPM)
ReNu 150 pumphead Santoprene / PFPE 7 bar (102 psi)	01	1600
ReNu 300 pumphead Santoprene / PFPE 5 bar (73 psi)	04	1900
ReNu 300 pumphead SEBS / PFPE 4 bar (58 psi)	05	1620
ReNu 600 pumphead Santoprene / PFPE 2.5 bar (36 psi)	06	1900

18.1.4.7 Acyclic parameters

The table below lists the PROFINET acyclic parameters and the functionality available through the interface

ADI	Name	Access	Type	Description	Module
37	Pump Model	Read	UInt8 (Enum)	Displays drive model.	N/A
63	Asset number	Read	Unsigned8 array length 21 including NULL terminator (OctetString)	Read pump Asset number	N/A
108	Pump Serial Number	Read	Char21	Reports pump serial number	N/A

18.2 Part 2: Sub-Chapter installation procedures

18.2.1 Sub-Chapter pre-installation checklist

Prior to installing the control connections and wiring carry out the following pre-installation check:

- Ensure the pump has been installed in accordance with previous installation chapters.
- Ensure all requirements of part 1 of this chapter have been met.
- Ensure the power cable is not damaged.
- The electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
- Ensure the control cable(s) are not damaged.
- Ensure items and tools for connection of the pump to the control system are to hand.

If there is a problem with any of the pre-installation checklist items, do not proceed to the installation procedures in this chapter, until the matter is resolved.

18.2.2 Control connection precautions

When following the procedures below or wiring the control cables to the pinouts on the M12 connectors

- Keep 4–20 mA and low voltage signals separate from power supply
- Only connect to external circuits, that are separated from mains voltages by reinforced insulation. All of the product input and output terminals are separated from mains circuits by reinforced insulation.
- Do not apply mains power voltages to any of the M12 control connection pins.

18.2.3 Installation of M12 control cables (M type)

18.2.3.1 Protective caps

The M12 control connections are covered with protective caps during manufacture

If any of the connections will not be used for control, leave the protective caps in place of a control cable for added protection of the product. A picture of the cap is illustrated in the picture:

18.2.3.2 M12 Input/output control cable installation procedure

Follow the procedure below to connect the M12 control cables.

1. Isolate the pump from its power supply
2. Carry out any control system wiring using the information in part 1 of this chapter
3. Connect the M12 connector to the appropriate location on the pump
4. Turn the screw thread by hand until it is tight
5. Check the cable is secure
6. Reconnect the power supply to the pump

18.2.3.3 M12 Pressure Sensing Kit control cable connection

The Pressure Sensing Kit connection will come fitted with a yellow cap. To protect the product do not remove the cap until a control cable can be connected.

Do not apply mains power voltages to any of the M12 control connection pins.

To install the Pressure Sensing Kit onto the fluid path See section: 12.4.6

To electrically connect the Pressure Sensing Kit use the following procedure:

STEP 1	STEP 2	STEP 3	STEP 4
Remove yellow cap from Pressure Sensing Kit connection on pump.	Align cable connector key way with pump connector.	Place cable connector on pump connector and hand tighten collar clockwise until fully engaged.	Ensure control cable is routed such that there is no strain or sharp bends.

Use section 24.1.7 to set up the Pressure Sensing Kit using the control settings menu.

18.3 Part 3: Sub-Chapter specific HMI set up

The sub-sections below provide information on PROFINET only related set up of the pump using the HMI.

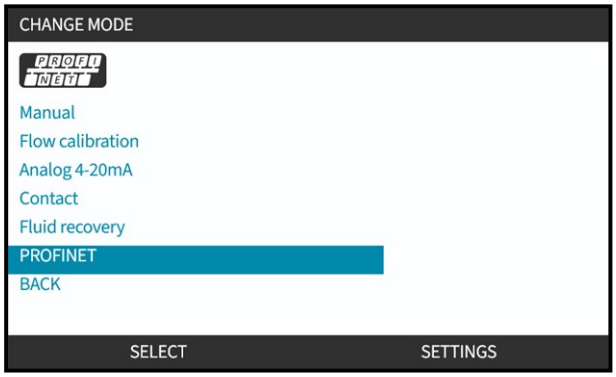
For full information on:

- Mode Menus: See section: 23
- Control settings: See section: 24

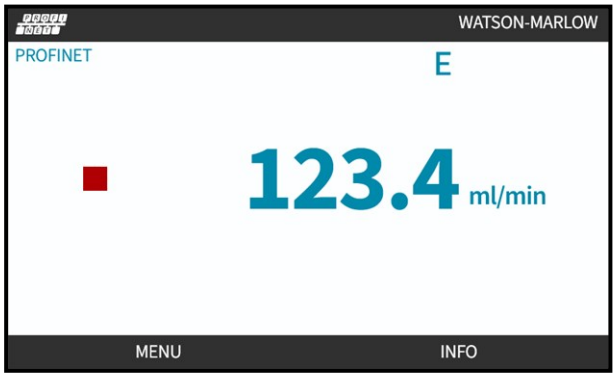
18.3.1 Procedure: Select PROFINET mode using the HMI

To select PROFINET mode:

1. Press **MODE** key
2. Use **+/-** keys to scroll to **PROFINET**
3. SELECT −.



Pump will display the PROFINET home screen



18.3.2 Procedure: Set IP address using the HMI

Configuring the IP address can be undertaken by two methods:

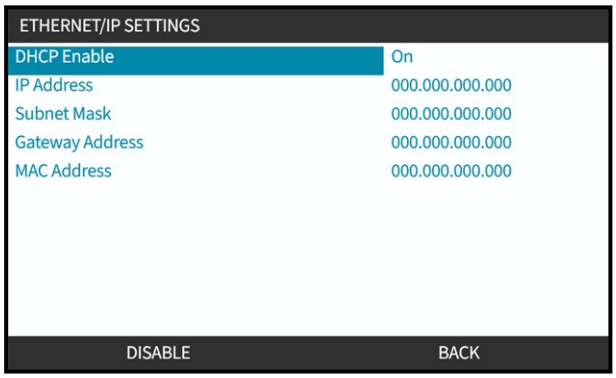
- Method 1: Set static IP Address (manual, DHCP disabled)
- Method 2: Set dynamic IP Address (automatic, DHCP enabled)

18.3.2.1 Procedure: Method 1: Static IP address.

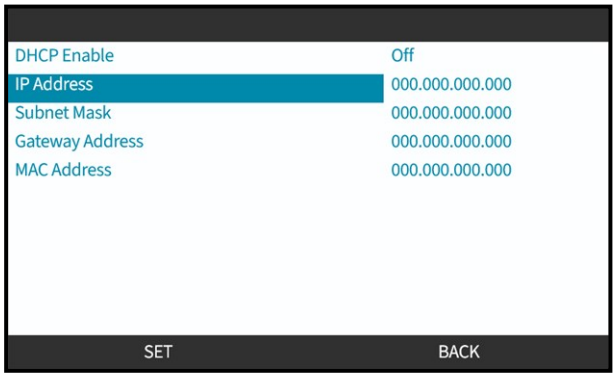
By default, DHCP is enabled. The means the drive will automatically receive an IP address when the drive is connected to a network.

If a static IP address is to be used, the DHCP must first be disabled. Follow the procedure to disable the DHCP and set a static IP address

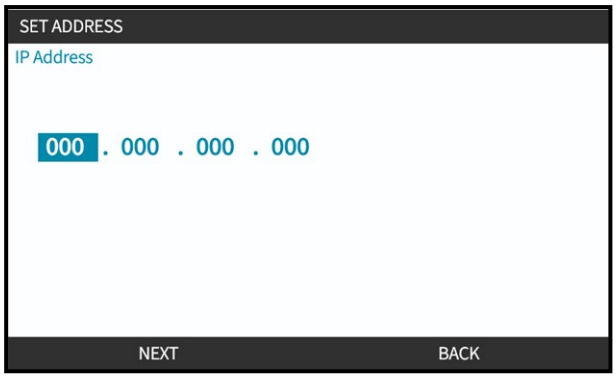
1. Highlight the **DHCP Setting**
2. Choose DISABLE −.



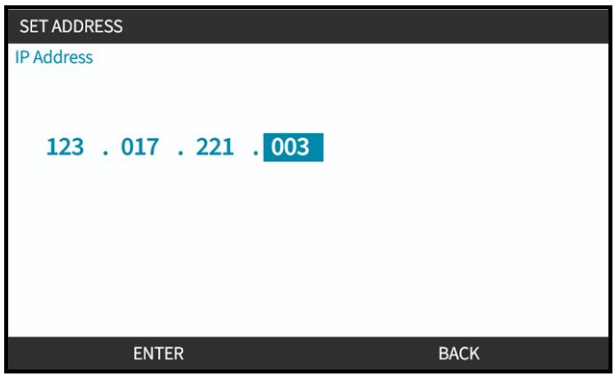
3. Select the **IP Address**
4. Press SET −.



5. Use **+/-** keys to scroll to enter the highlighted values.
6. Use NEXT − to move to next value



7. When final value is entered, choose ENTER − to commit setting.

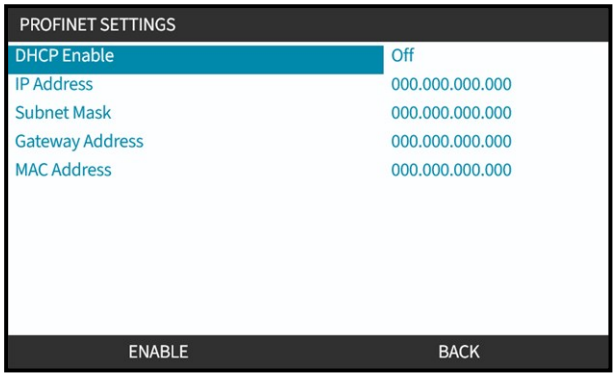


To set the Subnet mask and Gateway address repeat steps 3 to 7.

18.3.2.2 Procedure: Method 2: Set dynamic IP Address (automatic, DHCP enabled)

DHCP is enabled by default, it is only necessary to re-enable DHCP if it was previously disabled when an IP address was manually set.

1. Highlight the **DHCP Setting**
2. Ensure that DHCP is Enabled by pressing ENABLE −.
3. A DHCP server within the network allocates the drive an IP address based on the MAC address.

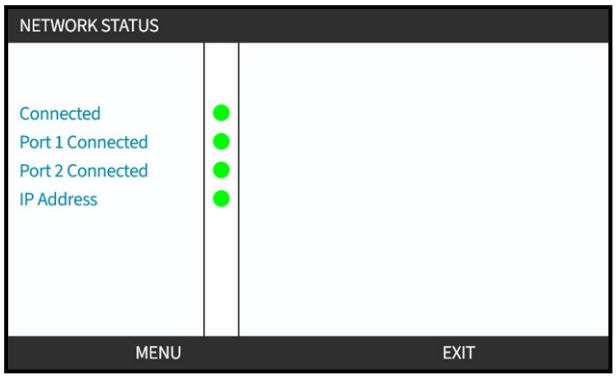


A DHCP server within the network will now allocate the drive an IP address based on the MAC address.

18.3.3 Network status screens

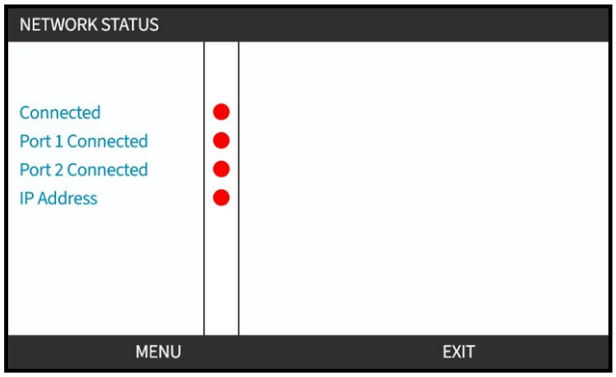
If the pump is not running and connections are made to ports, the IP address is assigned and the drive is connected to master.

The status screen of this will be shown below:



If the pump is not running with no connections made to ports, the IP address is not assigned and the drive is not connected to master.

The status screen of this will be shown below:



19 HMI SET UP: OVERVIEW

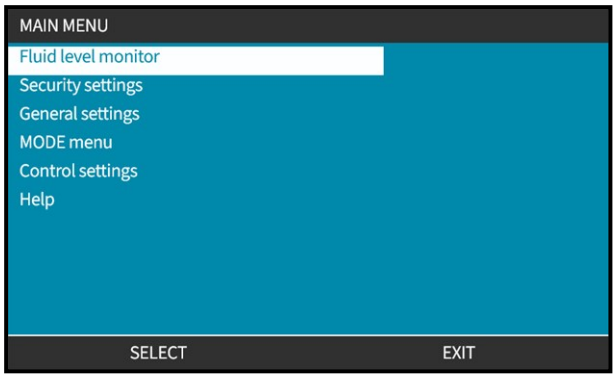
The set up of the HMI is split into the following sections based upon the main menu order:

- HMI: Fluid level monitor. See section: 20
- HMI: Security settings. See section: 21
- HMI: General settings. See section: 22
- HMI: Using the MODE menu. See section: 23
- HMI: Control settings menu. See section: 24

Follow the sub-chapter based upon your requirement.

20 HMI: FLUID LEVEL MONITOR

Fluid Level Monitor is accessed from the **MAIN MENU** using the **+/-** keys.



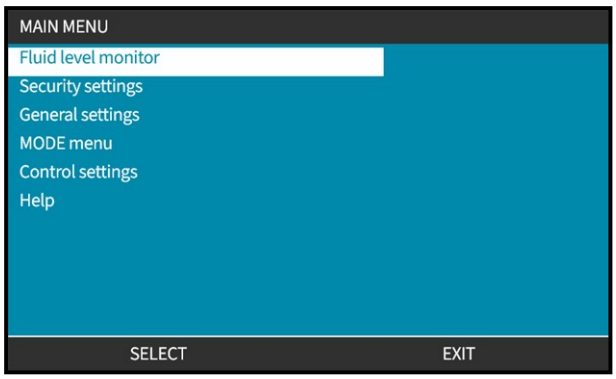
All models feature a fluid level monitor to monitor the fluid level (quantity) remaining in the inlet supply vessel during operation.

An overview of the fluid level monitor HMI submenu is provided in the table below:

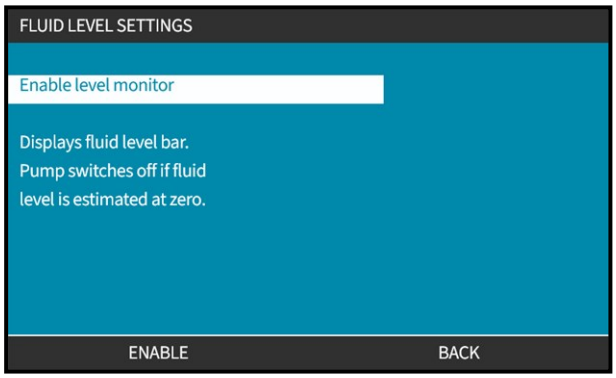
Fluid level monitor menu overview	
Enable level monitor	Activates feature. When this feature is enabled, a ‘progress' bar displayed on home screen indicates an estimated volume of fluid remaining in supply container. When fluid level is estimated at zero pump will stop
Disable level monitor	De-activates feature
Fluid volume unit	Choose US Gallons or Litres
Configure level monitor	Enter fluid container level and set up alarm output. To ensure pump does not run dry—An alarm output can be configured to trigger when a defined level of fluid is reached. Warning an operator to change/refill fluid supply container.
Adjust level	Adjust fluid volume if different to maximum container volume

20.1 To enable/disable the Fluid level monitor

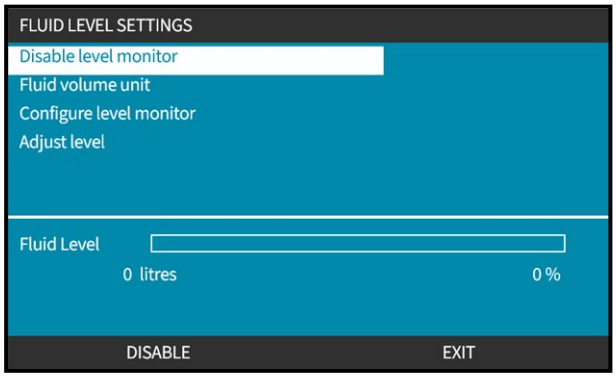
1. Choose **Fluid Level Monitor** from **MAIN MENU**.



2. Use the **+/-** keys to highlight options.
3. **Enable Level Monitor** will already be highlighted.
4. Press ENABLE −



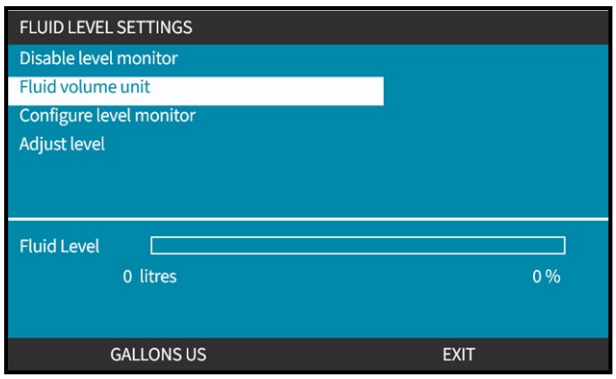
5. Fluid volume level will display on **HOME** screen
6. Choose DISABLE − to deactivate the fluid level monitor.



7. Fluid volume level will no longer appear on the **HOME** screen

20.2 To change fluid volume unit of measure:

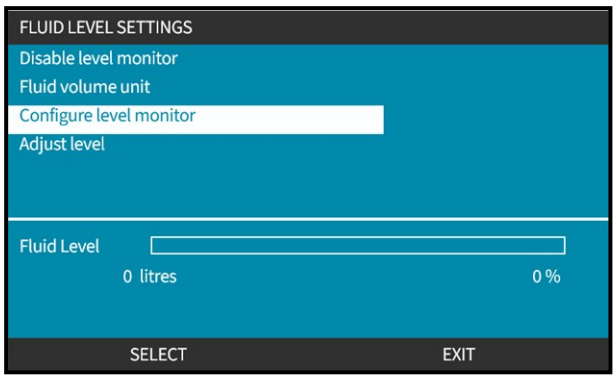
1. Choose **Fluid Volume Unit** from **FLUID LEVEL SETTINGS**.



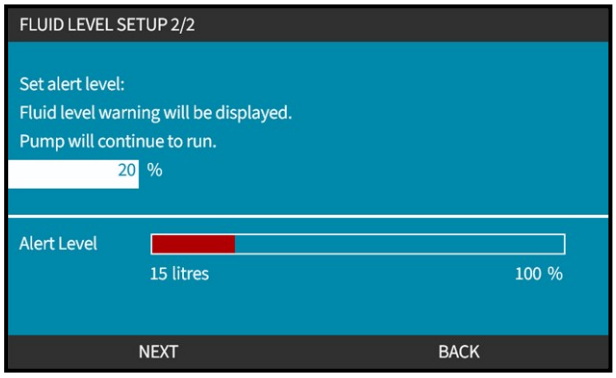
2. Use − key to toggle between US GALLONS or LITRES

20.3 To configure the level monitor:

1. Choose **Configure Level Monitor**



2. Press SELECT
3. Use **+/-** keys to enter maximum volume of supply container.
4. Press NEXT when correct amount is entered.
5. Use **+/-** keys to set **Alert Level**.

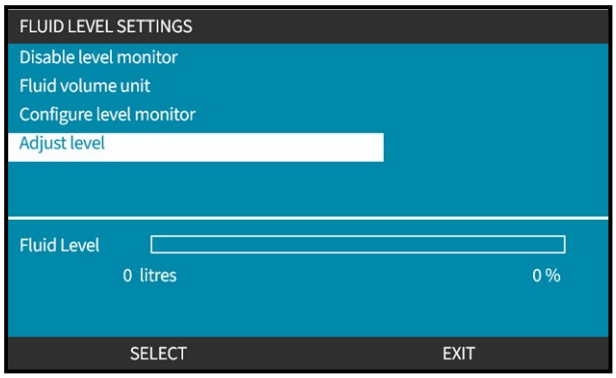


6. Press SELECT to return to **FLUID LEVEL SETTINGS**

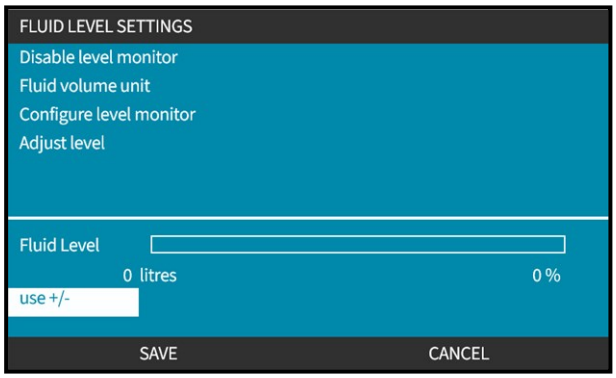
20.4 To adjust fluid volume if different to maximum container volume (e.g., after partial refill)

Accuracy of fluid level monitor will improve with regular calibration of the pump.

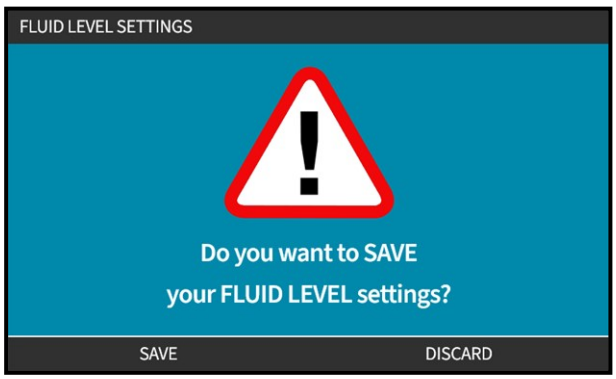
1. Choose **Adjust Level** from **FLUID LEVEL SETTINGS**.



2. Use **+/-** keys to set volume of fluid in container.



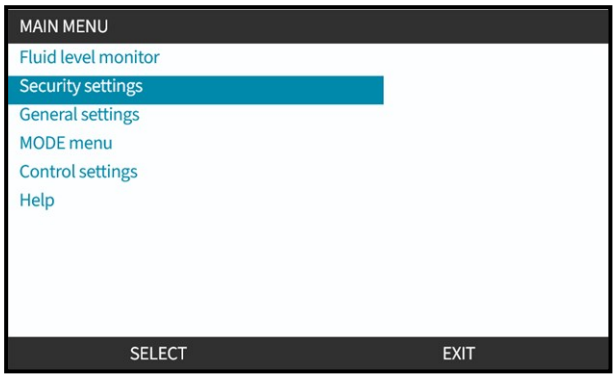
3. Press SAVE − to confirm setting.



21 HMI: SECURITY SETTINGS

21.1 Security settings overview

Security Settings are accessed from the **MAIN MENU** using the **+/-** keys.

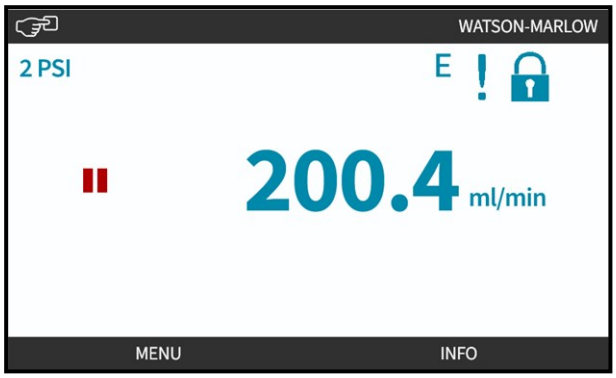


The following security settings may then be selected and adjusted. A summary is provided in the table below:

Security setting	Summary
Auto keypad lock	When active, keypad will lock after 20 seconds of inactivity.
PIN protection	When active, PIN protection will request a PIN before allowing any change of operating mode settings or entry to menu.

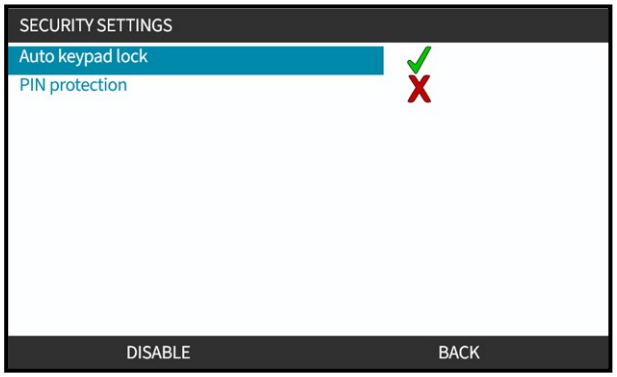
21.1.1 Security settings>Auto keypad lock

- When active, keypad will lock after 20 seconds of inactivity.
- When **Auto Keypad Lock** enabled; a message displays if any key is pressed
- **STOP**Key will continue to function when **Auto Keypad Lock** enabled.
- Padlock icon displays on home screen to indicate **Auto Keypad Lock** activated



21.1.1.1 To enable the Auto keypad lock:

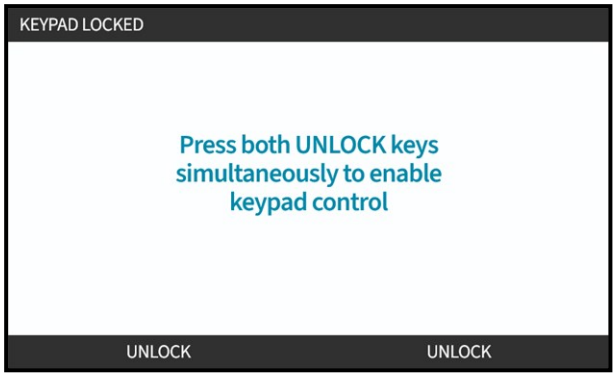
1. Highlight **Auto Keypad Lock** option
2. Press ENABLE



Status symbol ✓ displays

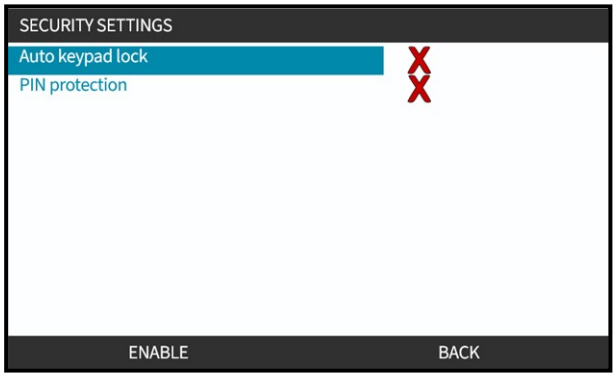
21.1.1.2 To access keypad functions:

1. Simultaneously press UNLOCK keys [−] [−] together.



21.1.1.3 To disable the Auto keypad lock:

1. Highlight **Auto Keypad Lock** option.
2. Press DISABLE [−]



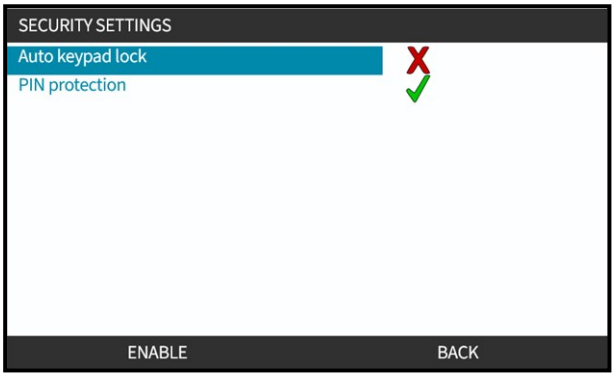
Status symbol ✗ displays.

21.1.2 Security settings>PIN protection

- When active, PIN protection will request a PIN before allowing any change of operating mode settings or entry to menu.
- Once correct PIN has been entered all menu options can be accessed.
- PIN protection re-activates after 20 seconds of no keypad activity.

21.1.2.1 Activate PIN protection:

1. Highlight **PIN Protection** option.
2. Press ENABLE

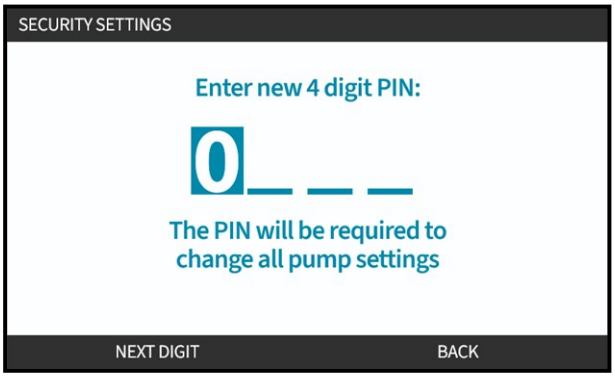


Status symbol ✓ displays.

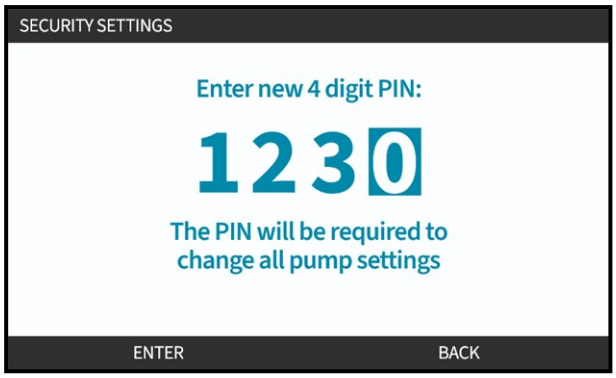
There is a 20 second delay before PIN protection is active.

21.1.2.2 Define four-digit number for your PIN:

1. Use **+/-** to select each digit from 0-9.
2. Use NEXT DIGIT key to cycle through digit entry locations

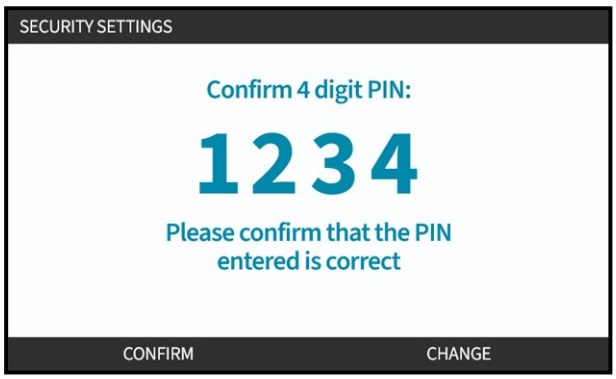


3. After selecting fourth digit press ENTER

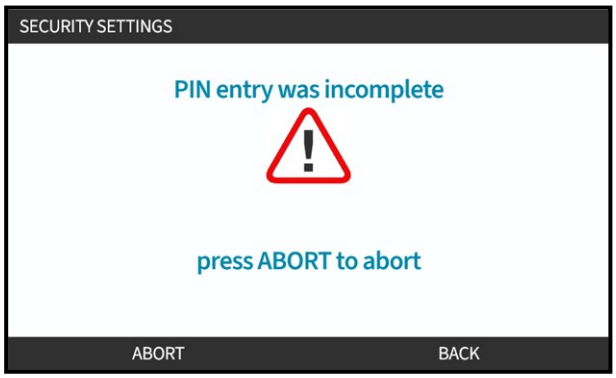


4. Check number entered is correct, then:

Press CONFIRM ▬ to store PIN. PIN protection will take 20 seconds before it becomes active.



Or press CHANGE ▬ to return to PIN Entry. Pressing **HOME** or **MODE** key at any time before confirming PIN will also abort process.

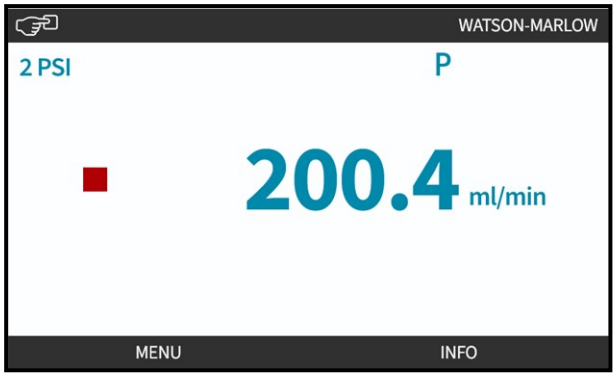


21.1.2.3 Use Security PIN to access pump:

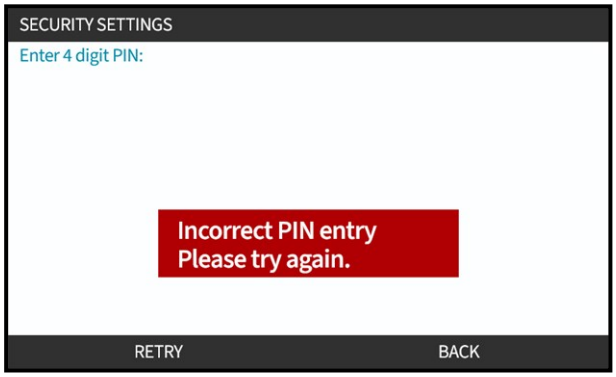
Enter the stored PIN to enable access

1. Use **+/-** to select each digit from 0-9.
2. Choose NEXT DIGIT ▬ key to cycle through digit entry locations.

If the PIN number is correct the HMI will display mode home screen.



If PIN number is incorrect the HMI will display the following screen.

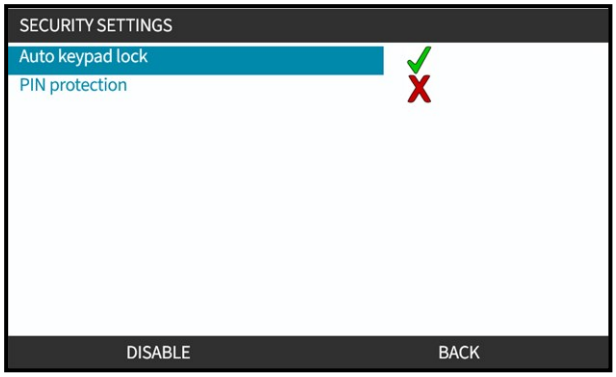


21.1.2.4 Forgotten PIN:

Contact your local Watson-Marlow representative for PIN reset instruction.

21.1.2.5 Deactivate PIN protection:

1. Highlight **PIN Protection** option
2. NEXT DIGIT −

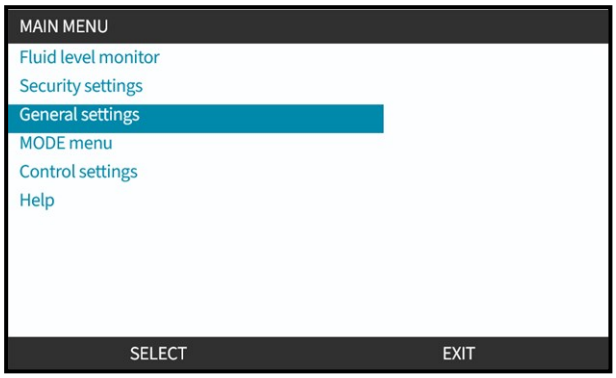


Status symbol ✗ displays.

22 HMI: GENERAL SETTINGS

22.1 General settings overview

General Settings are accessed from the **MAIN MENU** using the **+/-** keys.



The **GENERAL SETTINGS** menu contains the following sub menus

General setting	Summary
Auto restart	Returns pump to previous operating state/mode after power loss
Flow units	Sets flow units display preferences
Asset number	User defined 10 digit alphanumeric number which is also displayed in the help screen
Pump label	User defined 20 digit alphanumeric label displayed on home screen header bar
Restore defaults	Restores all pump default settings including calibration and default manual mode
Language	Sets display language of pump
USB update	Used to update the pump software

These sub-settings are explained in the following sub-sections.

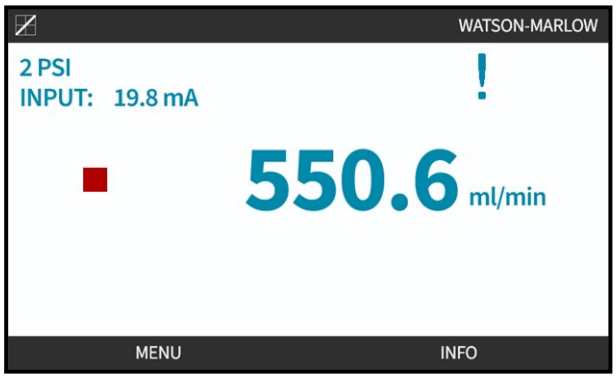
22.1.1 General settings>Auto restart.

This pump offers an auto restart feature. When enabled, the feature will allow the pump to return to the operating state (mode and speed) it was in when power was lost.

Example pumping scenarios using auto restart:

Before power loss	After power loss
Pump running in manual mode	Continues running at same speed
Pump running analog mode	Continues running proportional speed to analog input
Pumping running in contact mode	• Dosing resumed - interrupted dose will be remembered. • Any pulses stored in contact memory before power loss will be remembered. Pulses received during power loss will be lost
Network modes	Depends on configuration

The ! symbol will be displayed in the top right corner when auto-restart is enabled, as illustrated below.



Once enabled, the ! is shown in all modes, as a warning that the pump can start at any time.

22.1.1.1 Using Auto Restart versus Start/Stop control

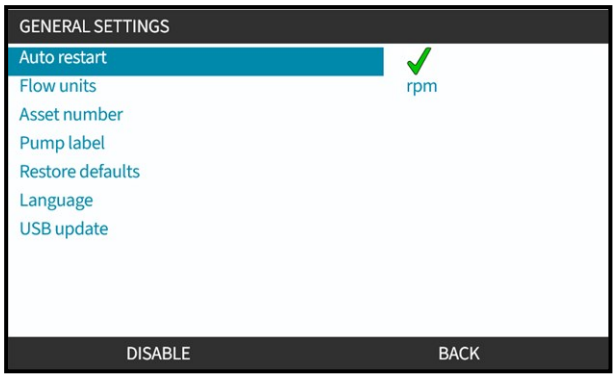
For applications that require the pump to be started and stopped regularly, START/STOP control should be used. The pump is not designed to be power cycled as a regular method of starting and stopping.

NOTICE

Do not power cycle the pump, either manually or by using the auto restart feature. This will reduce the operating life of the product.

22.1.1.2 To select Auto restart:

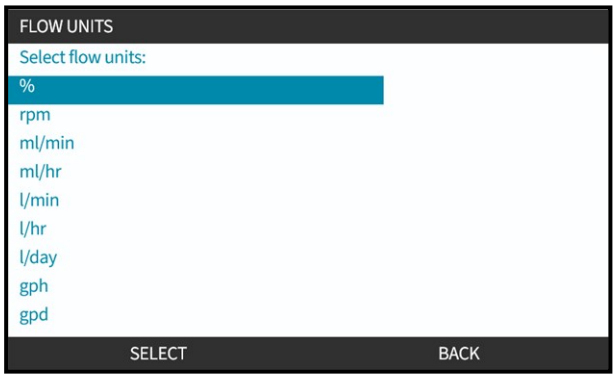
Press ENABLE/DISABLE ▬ to toggle Auto Restart on/off



22.1.2 General Settings>Flow units

Set displayed flow units for all pump displays.

1. Use the **+/-** keys to highlight preferred flow unit.
2. SELECT ▬ to store preference.

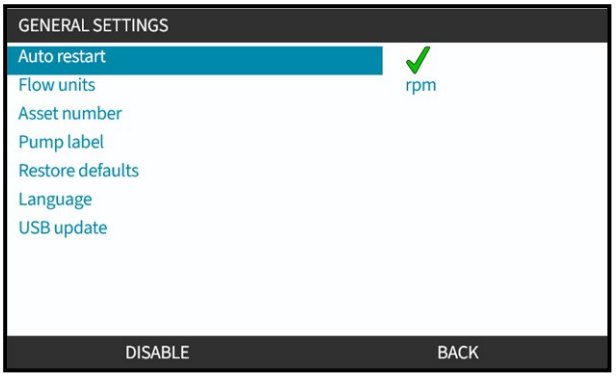


22.1.3 General Settings>Asset number

User defined 10 digit alphanumeric number which is also displayed in the help screen.

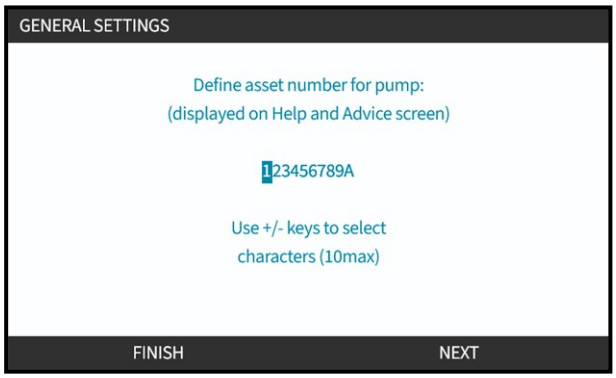
To define/edit pump asset number:

1. Highlight **Asset Number** option
2. SELECT −



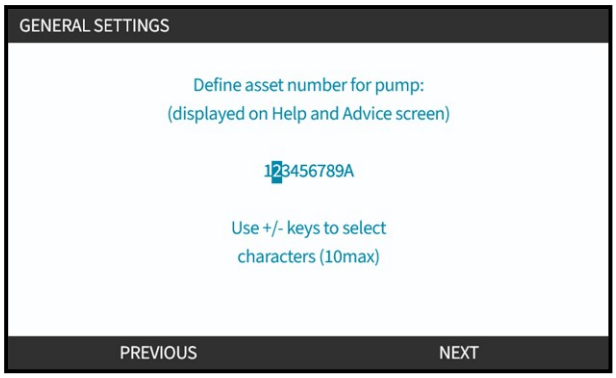
3. Use **+/-** keys to highlight characters for editing (56).

Available characters: 0-9, A-Z, and SPACE.

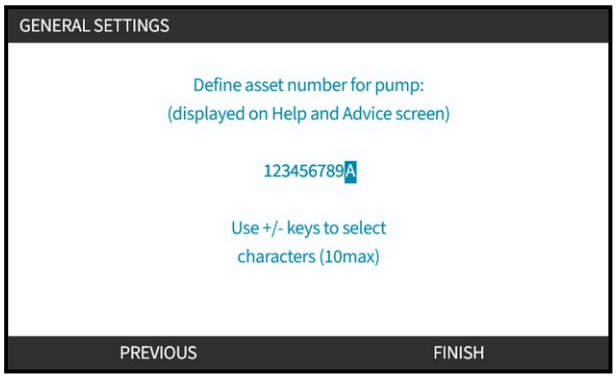


NOTE 56	Any previously defined asset number will be displayed on screen to allow editing.

4. Choose NEXT/PREVIOUS − to edit next/previous character.

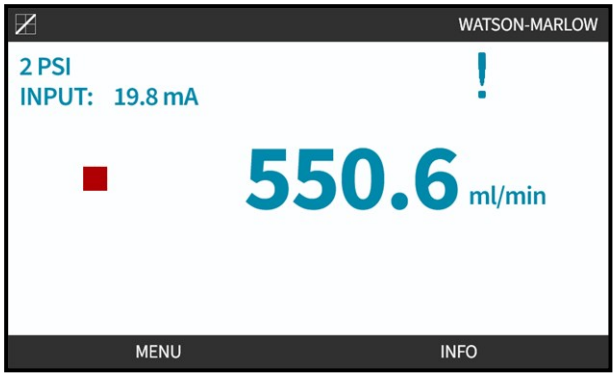


5. Choose FINISH − to save and return to **GENERAL SETTINGS** menu.



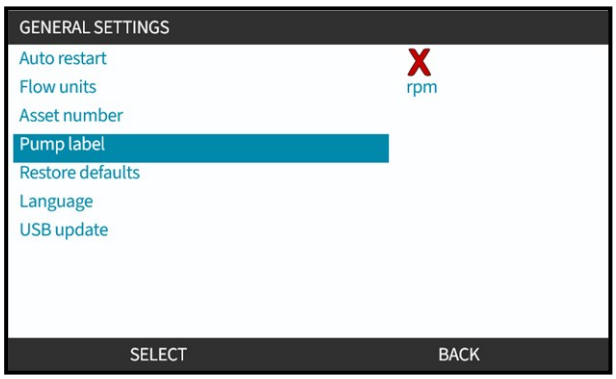
22.1.4 General Settings>Pump label

User defined 20 digit alphanumeric label displayed on home screen header bar in the right corner, as illustrated below.



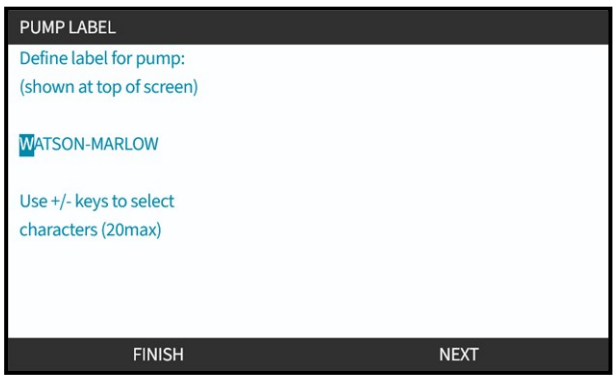
To define/edit the pump label:

1. Highlight **Pump Label** option.
2. SELECT −



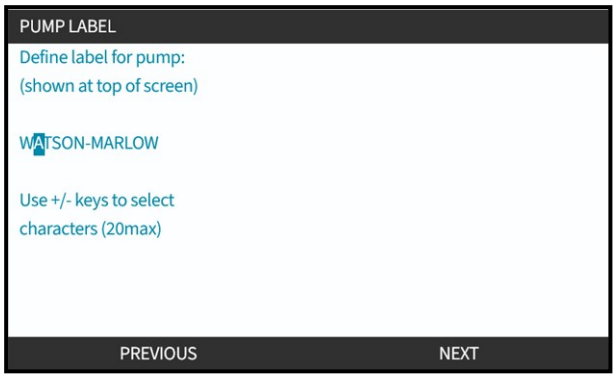
3. Use **+/-** keys to highlight characters for editing (57).

Available characters: 0-9, A-Z, and SPACE.

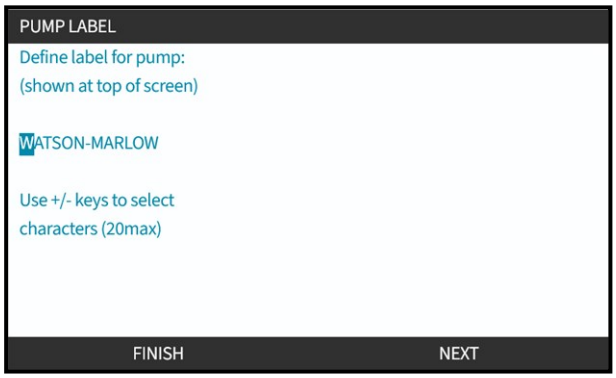


NOTE [57]	Any previously defined asset number will be displayed on screen to allow editing

4. Choose NEXT/PREVIOUS [—] to edit next/previous character.



5. Choose FINISH [—] to save entry and return to **GENERAL SETTINGS** menu.



22.1.5 General Settings>Restore defaults

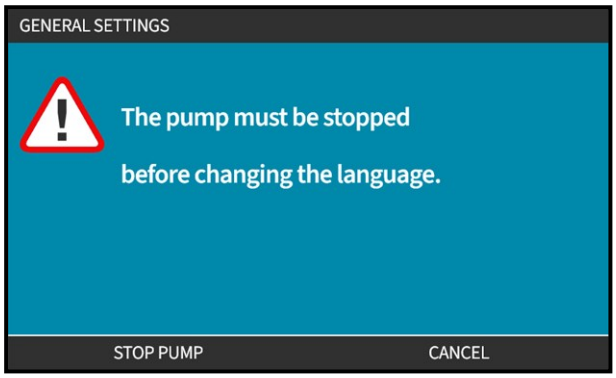
Restores all pump default settings including calibration and default manual mode

22.1.6 General Settings>Language

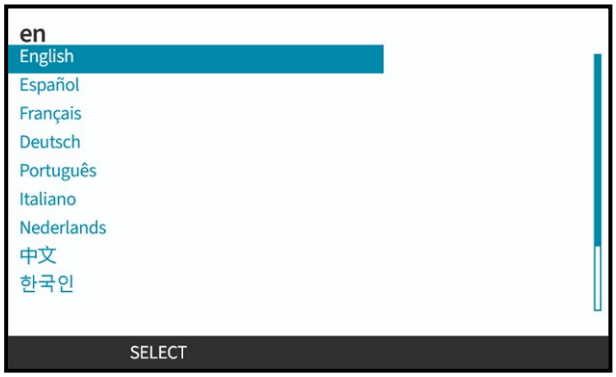
Sets display language of pump

To define/edit display language:

1. Highlight **Language** option.
2. SELECT
3. If the pump is running the screen below will show. STOP PUMP

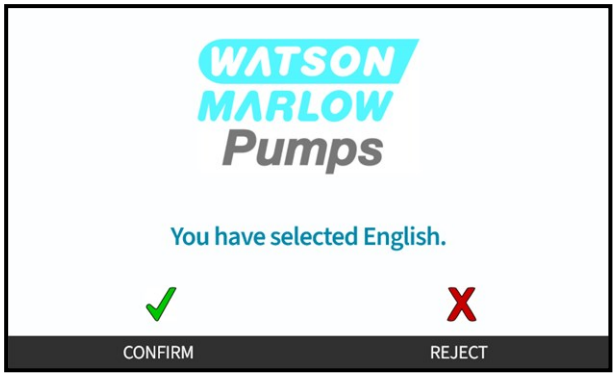


4. Use **+/-** keys to highlight required language.
5. SELECT.



6. CONFIRM to continue.

All display text will appear in chosen language.

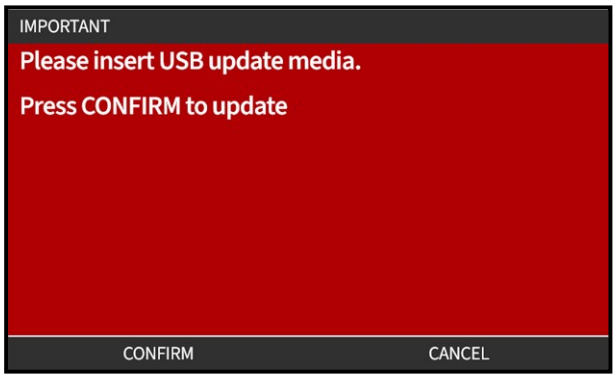


To cancel:

7. Choose REJECT ▬ to return to the language choice screen.

22.1.7 General Settings (USB update)

A USB flash drive update is undertaken using the CONFIRM ▬ key shown on the screen below:

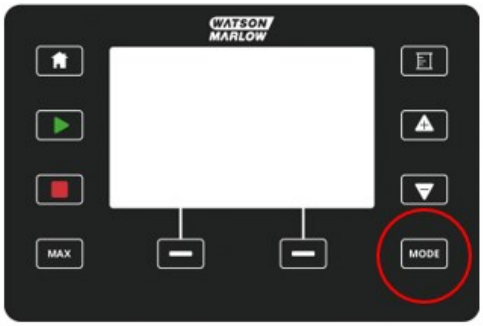


For full information on the updating of the pump software using USB update media : See section: 27.4.

23 HMI: USING THE MODE MENU

23.1 Mode menu overview

The **MODE MENU** can be accessed from either the **MAIN MENU** using the **+/-** keys, or using the **MODE** key.

Using MAIN MENU	Using MODE Key
	

The **MODE MENU** contains the following sub menus based upon model exception.

Mode	Summary	Model exception[1]
Manual	Allows pump to be operated manually (Start/Stop/Speed). If manual MODE is selected while the pump is running, the pump will continue to run at the speed of the previous MODE.	All models
Flow calibration	Flow rate is calibrated to the pump	All models
Analog 4-20 mA	Pump speed is controlled by an Analog signal	Universal and Universal+ only
Contact mode	Pump will meter a specific dose of fluid when an external signal is received, or operator presses the green **START** button.	Universal and Universal+ model only
PROFIBUS	Allows data exchange	PROFIBUS only
EtherNet/IP	Allows data exchange	EtherNet/IP only
PROFINET	Allows data exchange	PROFINET only
Fluid Recovery	Allows pump to operate in reverse to recover fluid from discharge line	All models

23.2 Pressure Sensing Kit functions not available during certain operating modes

The following Pressure Sensing Kit functions are not available in the following operating MODES:

Mode	Effect on Pressure Sensing Kit function
Fluid recovery mode (Manual or Remote)	All alarm and warning levels are disabled when the motor is running. When the pump is stopped, the following levels still function: • Alarm maximum pressure level • Warning maximum pressure level

Mode	Effect on Pressure Sensing Kit function
Pump running in reverse in either PROFIBUS, EtherNet/IP, PROFINET, or Analog mode	All alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse.

Mode	Effect on Pressure Sensing Kit function
Flow Calibration	During flow calibration the following levels are disabled: • Warning minimum pressure level • Alarm minimum pressure level

23.2.1 CHANGE MODE>Manual

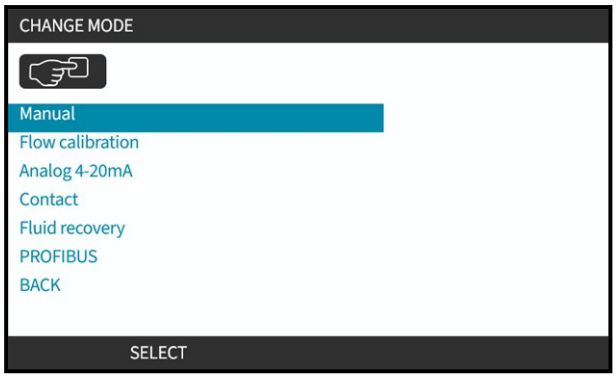
The manual mode is the default mode. Manual mode allows the drive to be operated from the HMI interface. In this mode the drive speed can be set from the keypad and the drive started and stopped from the keypad.

If manual MODE is selected while the pump is running, the pump will continue to run at the speed of the previous MODE.

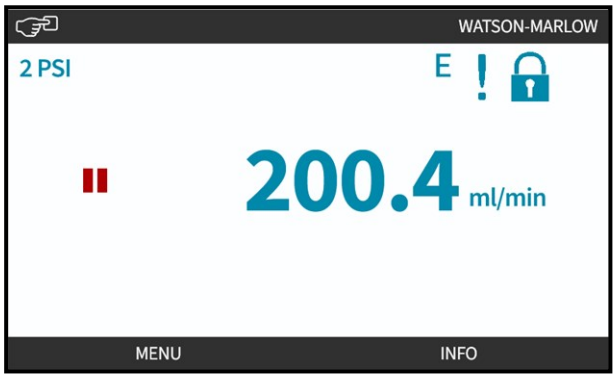
23.2.1.1 To access Manual mode:

From the **CHANGE MODE** menu

1. Use **+/-** keys to highlight **Manual** choice.

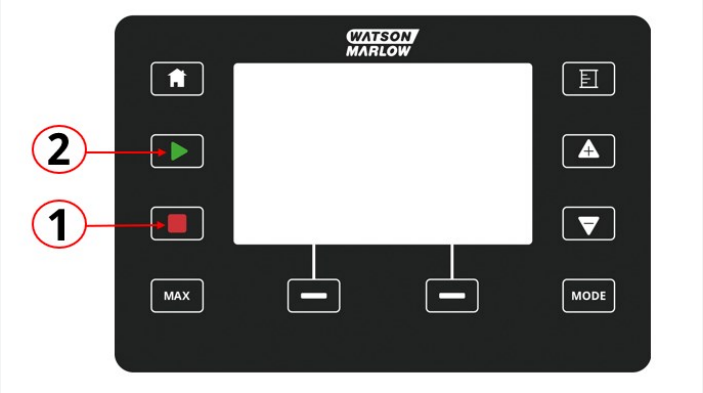


2. Press SELECT and **MANUAL** home screen will be displayed.



23.2.1.2 Starting and stopping the pump

The pump can be stopped or started using the **STOP** or **START** key.



Number	Name	Summary
1	STOP	Key will stop the pump
2	START	Key will • Start the pump at the set speed when in manual mode or during flow calibration. • Deliver a contact dose when in CONTACT mode. In all other control modes this key will not start the pump.

23.2.1.3 Change pump speed in manual MODE

The pump speed is changed by

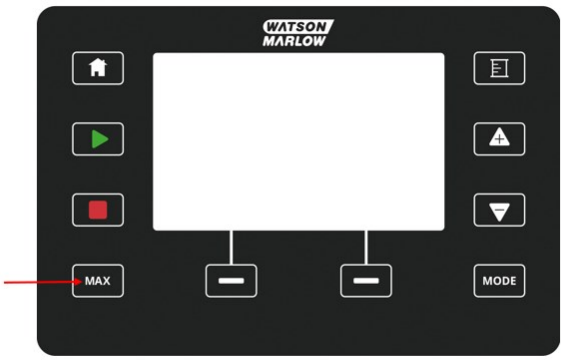
23.2.1.3.1 UP AND DOWN KEYS

Key	Action
	Pressing **UP ARROW** key to increase the drive set point speed by 0.1 rpm. • If held the set point speed increases using fast scrolling.
	Pressing **DOWN ARROW** key to decrease the drive set point speed by 0.1 rpm. • If held the set point speed decreases using fast scrolling.

Pressing and holding the **MAX** button, pump will run at the lower of two limits:

- Speed limit setting
- Maximum pump speed (set by pumphead RFID)

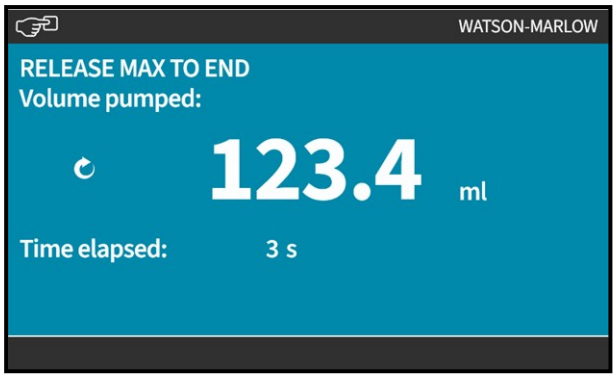
This function is useful for priming the pump.



23.2.1.3.2 MAX KEY

During operation a blue screen is displayed, which shows:

- The delivered volume in real time
- Running time in seconds, while holding the **MAX** key



23.2.2 CHANGE MODE>Flow calibration

Flow calibration should be undertaken:

- After first-time pumphead and fluid path installation
- After maintenance
- After changing pumphead
- After changing process fluid
- After changing any connecting pipework
- Periodically to maintain accuracy.

23.2.3 CHANGE MODE>Analog 4-20 mA (Models: Universal and Universal+)

See section: 15.4.1

23.2.4 CHANGE MODE>Contact mode (Models: Universal and Universal+)

See section: 15.4.2

23.2.5 CHANGE MODE>Fluid recovery

The fluid recovery mode allows pump to operate in reverse to recover fluid from discharge line. This is mainly used for maintenance purposes. The mode is feature of all models.

Fluid recovery can be undertaken as a manual operation or using analog signals (Universal, and Universal+ models only). Pump will operate at reversed set speed proportional to 4-20 mA input applied to configured pin.

WARNING

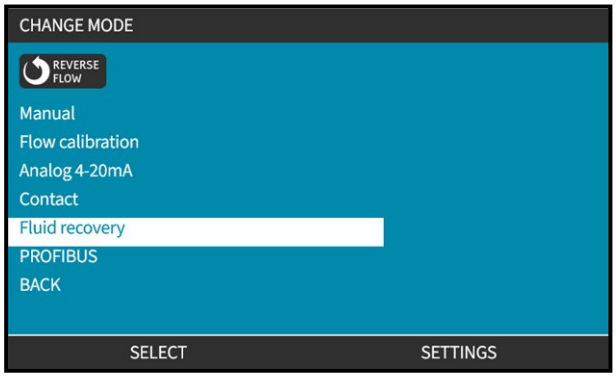
All pressure alarm and warning levels are disabled (all 4 levels) when the pump is running in reverse.

NOTICE

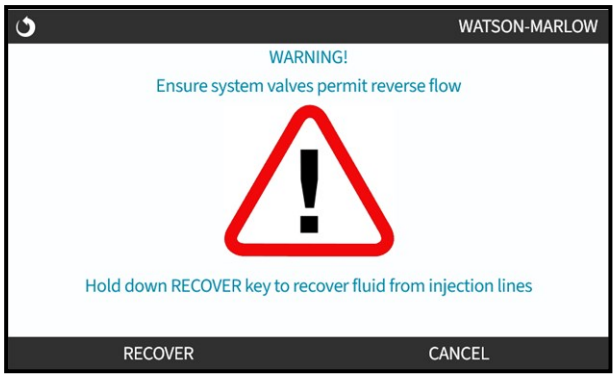
Remote fluid recovery should not be used for bulk fluid transfer. Operating the pump in reverse for long periods will significantly reduce life of the pumphead.

23.2.5.1 Fluid recovery: Manual operation

1. Stop pump
2. Press **MODE** key. Use **+/-** keys to highlight **Fluid Recovery Menu** option
3. Press SELECT [−].



4. An instruction is now displayed. There is a warning to ensure that your system design permits reverse flow. If the flow path has unidirectional valves installed, then reverse flow will not function and the pump will build up excessive pressure within the pipework.



5. Press and hold RECOVER ▬ to run the pump in reverse and recover fluid.

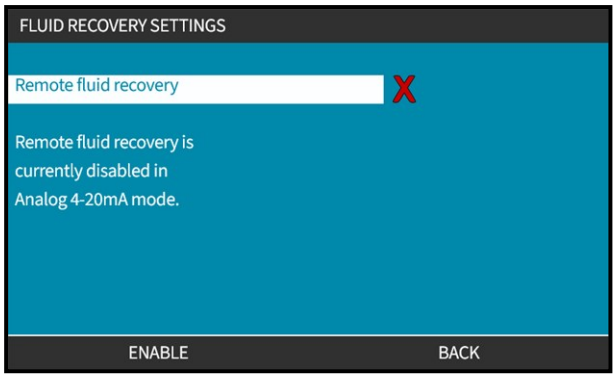
The screen below is displayed whilst RECOVER ▬ is held down. Fluid volume recovered and time elapsed will increase.

6. Release RECOVER ▬ to stop running pump in reverse

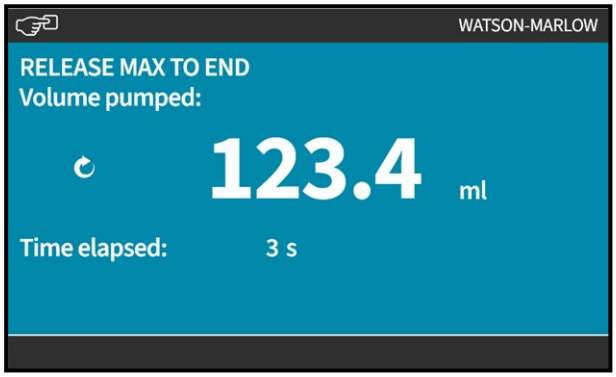
23.2.5.2 Fluid recovery: Analog control (Models: Universal and Universal+)

To run pump in reverse and recover fluid automatically in analog 4-20 mA mode:

1. Press **MODE** key.
2. Use **+/-** keys to highlight **Fluid Recovery**
3. SETTINGS ▬
4. ENABLE ▬



5. Once enabled, remote fluid recovery is ready for operation.



Remote fluid recovery must be operated in following sequence:

1. Configure an input for "remote fluid recovery"
2. Apply the remote stop signal
3. Apply the remote fluid recovery input
4. Remove the remote stop signal
5. Apply 4-20mA to the analog input (1). This will cause the pump to start
6. Apply remote stop signal when enough fluid has been recovered.
7. Remove the remote fluid recovery input
8. Remove the remote stop.

23.2.6 CHANGE MODE>PROFIBUS (Model: PROFIBUS)

See section: 16.4.1

23.2.7 CHANGE MODE>EtherNet/IP (Model: EtherNet/IP)

See section: 17.3.1

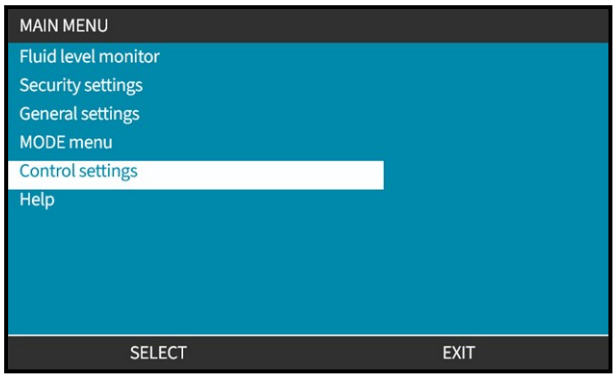
23.2.8 CHANGE MODE>PROFINET (Model: PROFINET)

See section: 18.3.1

24 HMI: CONTROL SETTINGS MENU

24.1 Control settings overview

Control Settings are accessed from the **MAIN MENU** using the **+/-** keys.



Control settings contain the following sub-menus depending on pump model:

Setting	Action	Pump model [58]
Speed limit	User defined maximum pump speed limit	All models
Reset run hours	Zeros run hours counter	All models
Reset volume counter	Zeros volume counter	All models
Revolution counter	Allows user to set pump to indicate when the pumphead is close to reaching user specified number of revolutions.	All models
Configure Inputs	Allows user to select and configure inputs	Manual, Universal and Universal+ models
Configure outputs	Allows user to define function of each output	Universal and Universal+ models
Configure outputs>4-20 mA Output	Choose full scale 4-20 mA input or match input scaling to your 4-20 mA input.	Universal+ only
Sensor settings	Set up the Pressure Sensing Kit	Universal, Universal+ , PROFIBUS, EtherNet/IP, PROFINET
Scaling factor	Multiplies the speed by a chosen amount	Universal+
Floating ground	A single 4-20 mA signal could be connected to two or more pumps in series. This would allow both pumps to be controlled through one input signal whereby, if either of the pumps fails or is powered off, then another pump would receive the control signal	Universal and Universal+

NOTE [58]	Not all **Control Settings** are available on all models.

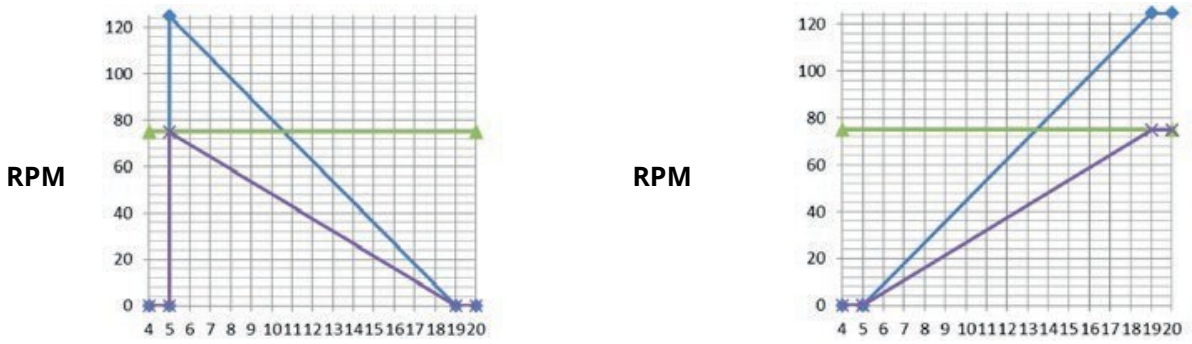
24.1.1 Control settings>Speed limit

The maximum pumphead speed limit may be changed. This limit is dependent on the pumphead which is fitted to the drive unit. The speed limit will be applied to all operating modes.

Description	Maximum speed (rpm)
ReNu 150 pumphead Santoprene / PFPE 7 bar (102 psi)	160
ReNu 300 pumphead Santoprene / PFPE 5 bar (73 psi)	190
ReNu 300 pumphead SEBS / PFPE 4 bar (58 psi)	162
ReNu 600 pumphead Santoprene / PFPE 2.5 bar (36 psi)	190

24.1.1.1 Effect on 4-20 mA profile (Model: Universal, Universal+)

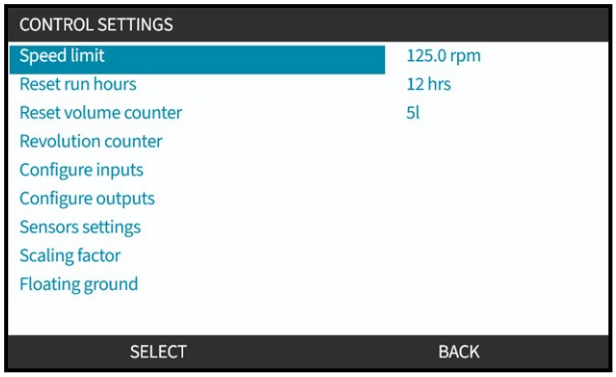
Applying speed limit automatically re-scales the analog speed control response. An example is shown below:



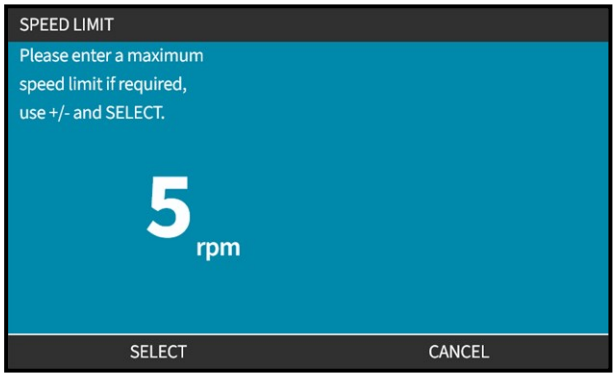
blue line	Calibrated 4-20 mA profile based on a 125 rpm speed limit
green line	User set 75 rpm speed limit
purple line	Re-calibrated 4-20 mA profile based on a 75 rpm speed limit

24.1.1.2 To change maximum speed limit:

1. Highlight **Speed Limit** option



2. Press SELECT.
3. Use **+/-** keys to adjust value
4. Choose SELECT to store new value. This speed limit will be applied to all operating modes.



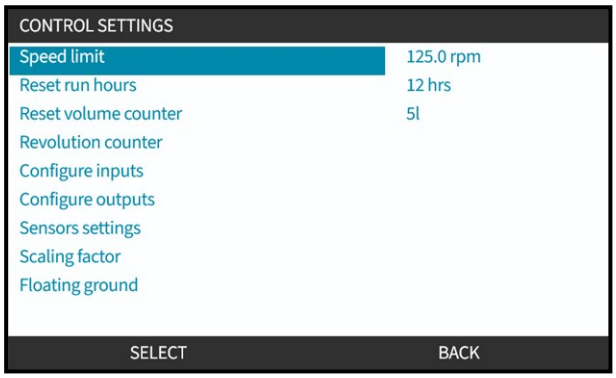
24.1.2 Control settings>Reset run hours

24.1.2.1 To view run hours counter

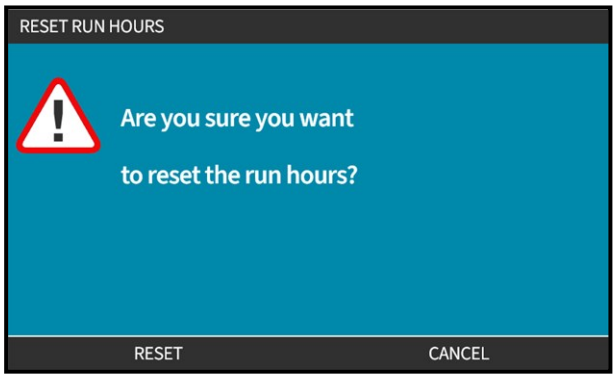
Choose **Info** from **HOME** screen.

24.1.2.2 To zero run hours counter:

1. Highlight **Reset Run Hours** option
2. Press SELECT −.



3. Choose RESET − and the following screen will be displayed.



4. Choose RESET − to continue

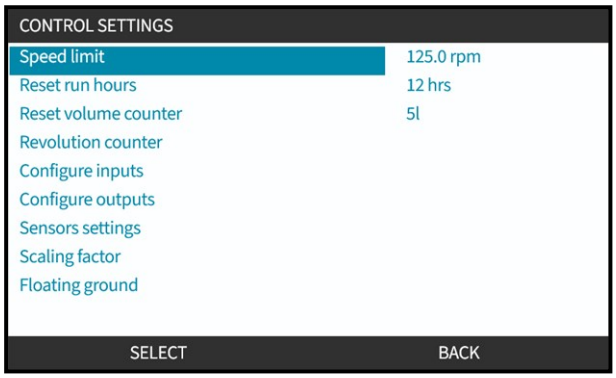
24.1.3 Control settings>Reset volume counter

24.1.3.1 To view volume counter

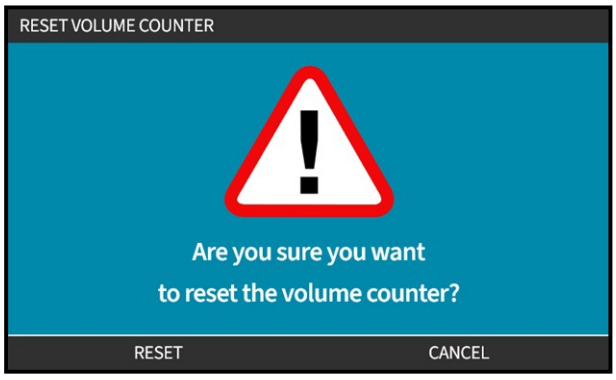
Choose **Info** from **HOME** screen.

24.1.3.2 To zero volume counter:

1. Highlight **Reset Volume Counter** option
2. Press SELECT.



3. Choose RESET and the following screen will be displayed.

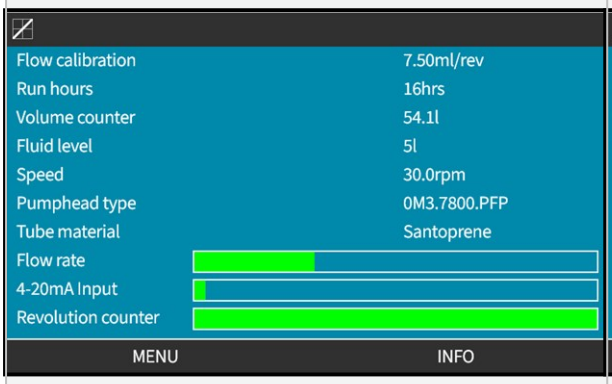
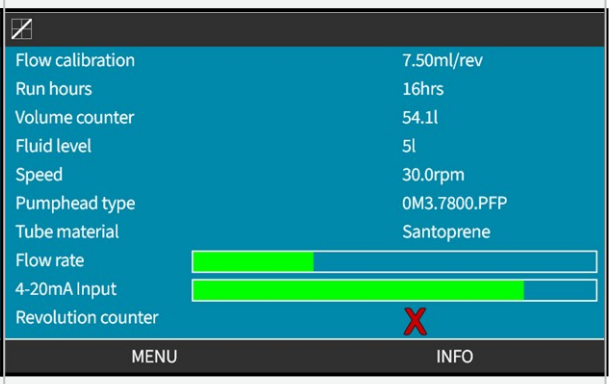


4. Choose RESET to continue

24.1.4 Revolution counter

The revolution counter allows a user to set the number of revolutions at which they would like to receive a warning to change the pumphead.

A revolution counter indicator bar is shown on the **INFO** screen when this feature is enabled. The indicator bar full in a green colour:

Revolution counter enabled	Revolution counter not enabled
	

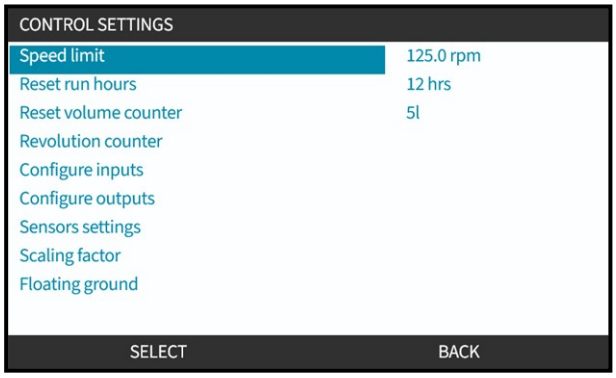
As the pumphead revolutions take place, the bar decreases until 80% of the revolutions have taken place. At this point the bar changes to red, and the following screen is shown:

Once the pumphead reaches the user set revolution count (100% used) the following screen will display:

In both cases of the red screen above, the pump will always continue to run. It will only stop if the STOP PUMP soft key is pressed.

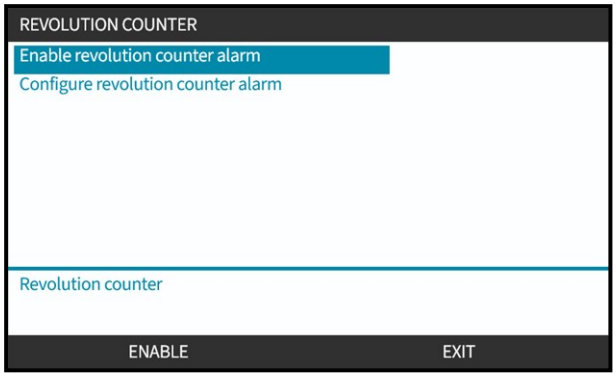
24.1.4.1 To select Revolution counter:

1. Highlight **Revolution Counter** option from the **CONTROL SETTINGS** menu
2. Press SELECT.



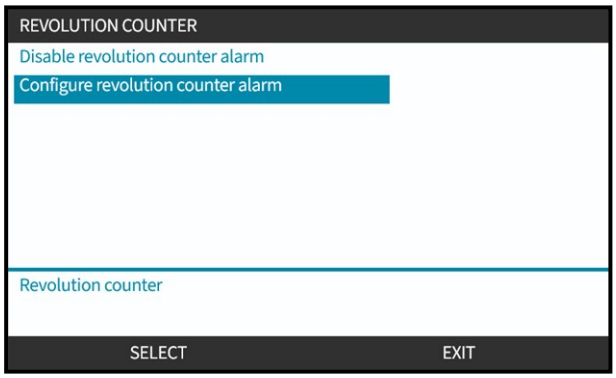
24.1.4.2 To enable: Revolution counter warning:

1. Use **+/-** keys to highlight **Enable Revolution Counter Warning** option
2. Press ENABLE

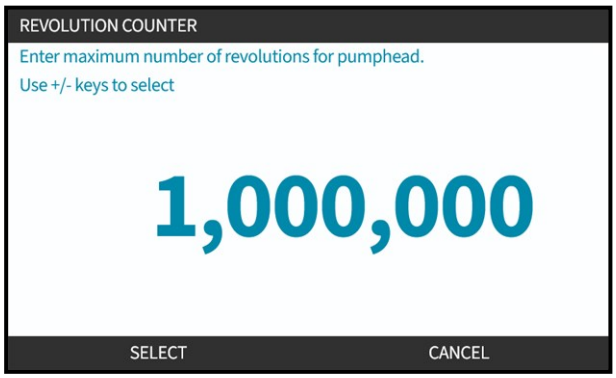


24.1.4.3 To configure: Revolution counter warning:

1. Use **+/-** keys to highlight **Configure Revolution Counter Warning** option
2. Press SELECT



Revolution count max limit setting screen is displayed



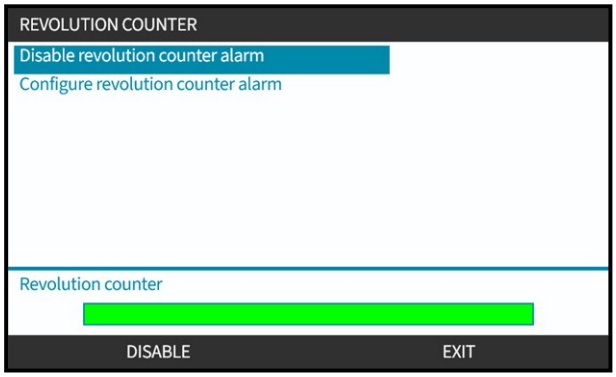
3. Use **+/-** keys to highlight characters for editing. Available characters: 0-9
4. Choose NEXT/PREVIOUS to edit next/previous character.
5. Use **+/-** keys to highlight characters for editing. Available characters: 0-9
6. Press FINISH to save the set value

24.1.4.4 To reset: Revolution counter:

1. Use **+/-** keys to highlight the **Reset Revolution Counter** option
2. Press SELECT to reset to zero

24.1.4.5 To disable: Revolution counter warning:

1. Use **+/-** keys to highlight **Disable Revolution Counter Warning** option
2. Press DISABLE.



24.1.5 Control settings>Configure inputs

See section: 15.4.3

24.1.6 Control settings>Configure outputs

See section: 15.4.4

24.1.7 Control settings > Pressure sensor settings

24.1.7.1 Control settings menu overview—Pressure Sensing Kit

Set up the Pressure Sensing Kit from the **Pressure Sensor Settings** sub-menu of the **CONTROL SETTINGS** menu.

The following settings can be adjusted:

- Alarm and warning levels:
    - Alarm maximum pressure level.
        - When this level is triggered the pump will stop, unless this feature is disabled.
    - Warning maximum pressure level.
    - Warning minimum pressure level.
    - Alarm minimum pressure level.
        - When this level is triggered the pump will stop, unless this feature is disabled.
- Sensor delay time for minimum levels only:
    - Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes).
- Disabling of Alarm (59) levels:
    - The purpose of this feature is to allow a user to decide if they want to just monitor the pressure or force the pump to stop if alarm levels are triggered.
- Trigger signal type — Averaged pressure signal trigger or raw pressure signal trigger.

NOTE [59]	Warning levels cannot be disabled.

24.1.7.2 Defaults and configurable range

The defaults and configurable range is provided in the table below.

Pressure Sensing Kit—Defaults and configurable range				
Name	**Default**		**Configurable range**	
Sensor delay [62]	1 minute (01:00 in mm:ss)		0 second to 30 minutes (00:00 to 30:00 mm:ss)	
Trigger signal type	Raw signal		Average or raw signal	
Alarm maximum pressure level	10.00 bar	145.0 PSI	0.00 to 15.00 [60] bar or disable option [61]	0.00 to 217.5 [60] PSI or disable option [61]
Warning maximum pressure level	10.00 bar	145.0 PSI		
Warning minimum pressure level	0.00 bar	0.0 PSI		
Alarm minimum pressure level	0.00 bar	0.0 PSI		

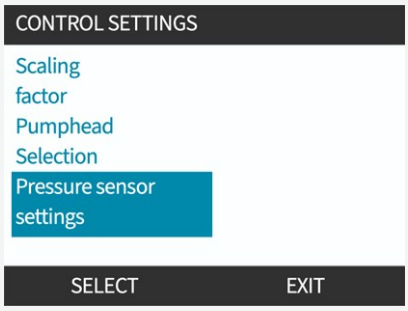
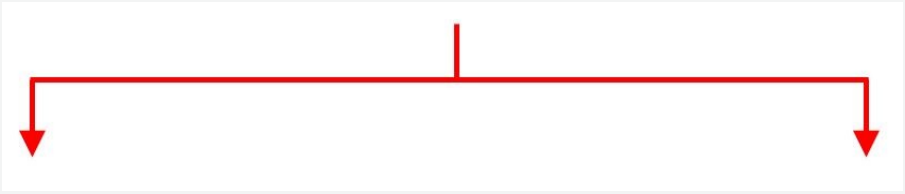
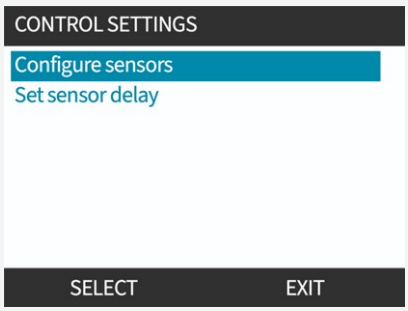
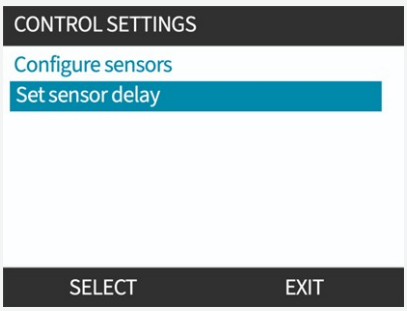
NOTE [60]	The maximum rated pressure of a Qdos H-FLO pump is 7.00 bar (101.5 PSI). But the maximum alarm or warning level can be set to up to 15.00 bar (217.5 PSI) to allow for short-term peak pressures.

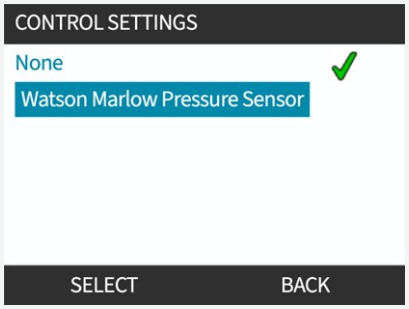
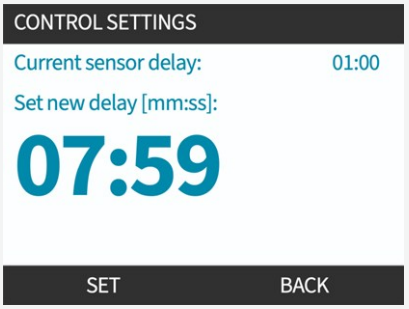
NOTE [61]	Warning levels cannot be disabled.

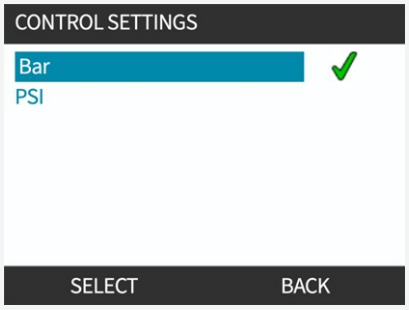
NOTE [62]	Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes).

24.1.7.3 Control settings sub-menu overview

An overview of the set up of a Pressure Sensing Kit using the control settings sub-menus is provided in the following sequence:

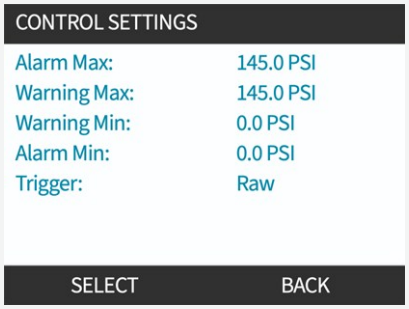
<table>
<tr><th colspan="3">Sub-menu 1</th></tr>
<tr><td colspan="3">Pressure sensor settings is the first control settings sub-menu.</td></tr>
<tr><td></td><td> 
</td><td></td></tr>
<tr><td colspan="3">The second sub-menu has two settings paths</td></tr>
<tr><td colspan="3">  </td></tr>
<tr><th>Sub-menu 2A</th><td></td><th>Sub-menu 2B</th></tr>
<tr><td>SELECT>Configure sensors to enter sub-menus 3A to 6</td><td></td><td>SELECT>Set sensor delay to enter sub-menu 3B</td></tr>
<tr><td> 
</td><td></td><td> 
</td></tr>
</table>

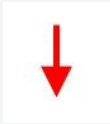
Sub-menu 3A SELECT>Watson-Marlow Pressure Sensor to enter sub-menus 4 to 6  		Sub-menu 3B Set sensor time delay, in minutes and seconds at start up.  End of sequence

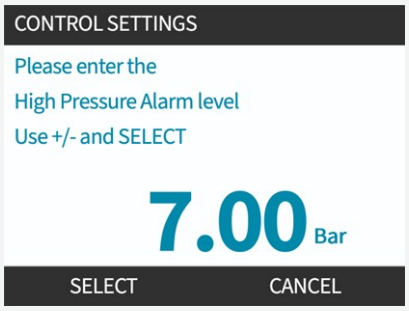
Sub-menu 4 SELECT the preferred pressure measuring units in Bar or PSI  		

Sub-menu 5

SELECT Minimum or Maximum, Alarm or Warning level





Sub-menu 6
The minimum and maximum alarm and warning levels or the disabling of the the alarms can be set using the **+/-** keys. To set the trigger point use the **+/-** keys to choose the value To disable alarm maximum, press the **+** key until 15.00 bar (217.5 PSI) is displayed, then press the **+** key again until **---** is displayed to disable the alarm. To disable alarm minimum, press the **-** key until 0.00 bar (0.0 PSI) is displayed, then press the **-** key again until **---** is displayed to diable the alarm

End of sequence

WARNING

If pressure sensing alarms are disabled, the pump will not stop running at a desired system pressure. In addition pressures which exceed 15.00 Bar (217.5 PSI) will not trigger a pressure maximum warning level.

Do not disable pressure sensor alarms if the application requires the pump to stop upon reaching a desired system pressure.

24.1.8 Control settings>Scaling settings

See section: 15.4.5

24.1.8.1 Control settings>Floating ground

See section: 15.4.6

25 OPERATION

25.1 Pre-operation checklist

Ensure the pump has been installed correctly: Carry out the following pre-operation checks to ensure:

- A responsible person has installed the pump in accordance with all installation chapters
- A responsible person has provided training on the automatic operation of the pump by the control system in all modes of pump operation.
- Power cable is not damaged
- The electrical power supply disconnecting device is easy to reach and operate for electrical power isolation when required.
- Installed control cable(s) are not damaged
- There are no leaks of fluid from any fluid path connection.
- Pump language has been correctly set to your language.

If there is a problem with any of the pre-installation checklist items, do not proceed to operate the pump, and instruct that the pump is removed from service, until the matter is resolved.

25.2 Safety

25.2.1 Hazards that may occur during operation

The following hazards may occur during operation of the pump.

25.2.1.1 Risk of burns

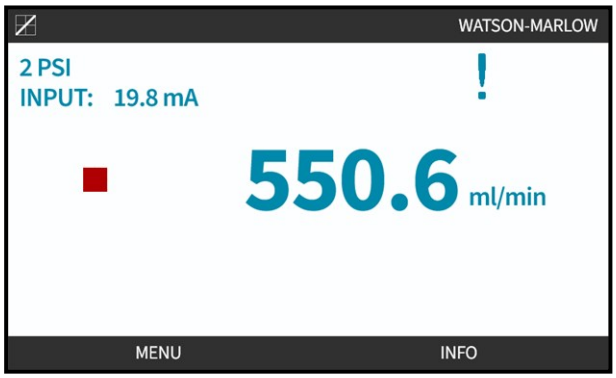
CAUTION

Risk of injury due to burns. The exterior of the pump can get hot during operation. Stop the pump and let the pump cool before handling.

25.2.1.2 Unexpected operation

All pump models may operate automatically either in response to the control system or because of the auto-restart feature (start-up following a power cut) is enabled.

This expected behaviour is indicated as a warning on the screen using the ! symbol as illustrated in the image below.



25.2.1.3 Limits of operation—Dry running

The pump can be run dry for short time periods, such as during priming (air bubbles) or when there is fluid with pockets of gas.

NOTICE

Risk of damage to the pump or pumphead. The pumphead is not designed to be run dry for extended periods of time. Dry running will generate excessive heat. Do not run the pump dry for extended periods.

25.3 Pump operation

The following operations are explained in this section.

- Switching the pump on and off in subsequent power cycles from first time installation.
- Changing pump MODE
- Starting and stopping the pump
- Change pump speed in manual MODE
- Using the **MAX** key in manual MODE

25.3.1 Using the HMI for operation

Refer to section 4.5 for an overview of the HMI to operate the pump.

25.3.2 Switching pump on in subsequent power cycles after installation

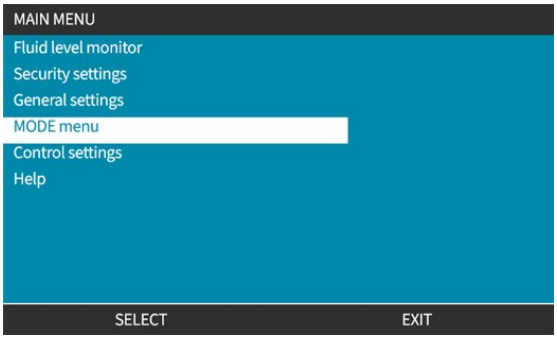
First time power up, required the language to be set. Subsequent power up sequences show the home screen. The following takes place during this sequence:

1. Pump runs power-on test confirming proper functioning of memory and hardware.
2. Faults display error codes, if any are present.
3. Watson-Marlow Pumps logo displayed for three seconds.
4. Home screen displayed.

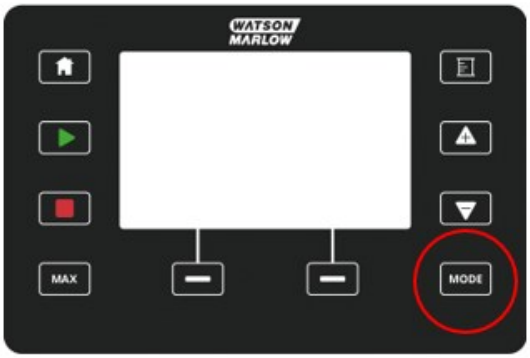
25.3.3 Changing pump operating MODE

To change the pump MODE, access the MODE Menu from either the **MAIN MENU** using the **+/-** keys, or using the **MODE** key.

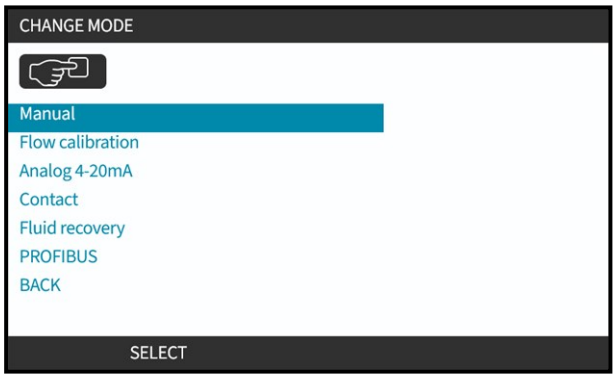
Using MAIN MENU



Using MODE Key

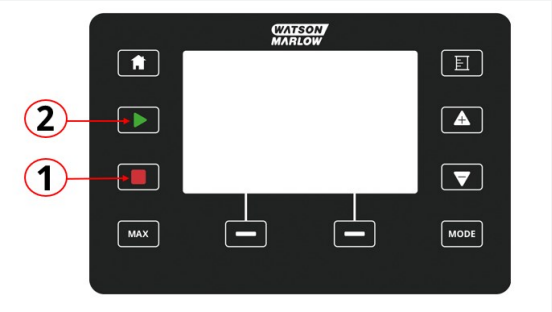


Press select to choose the operating MODE from the mode menu



25.3.4 Starting and stopping the pump

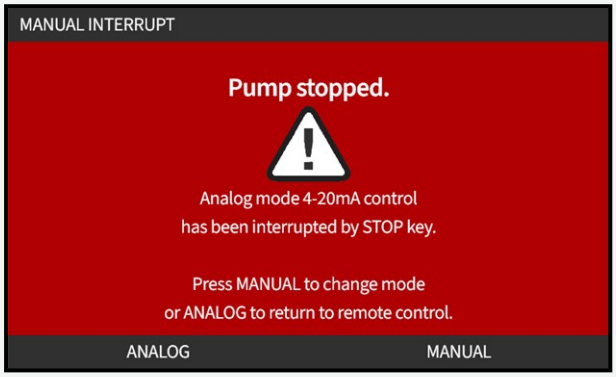
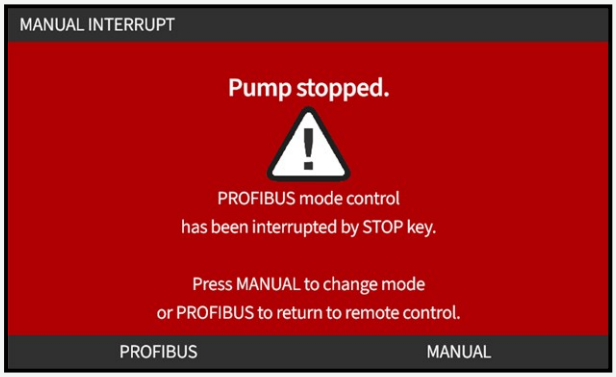
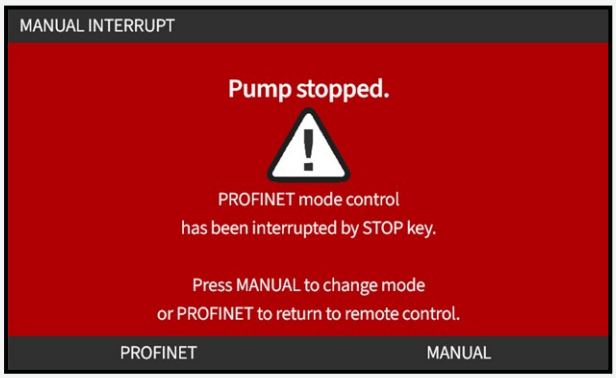
The pump can be stopped or started using the respective **STOP** or **START** key.

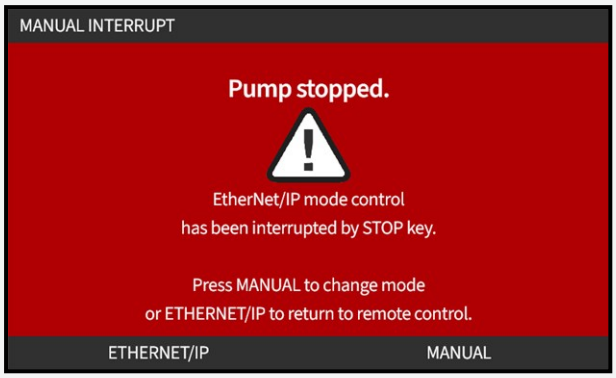
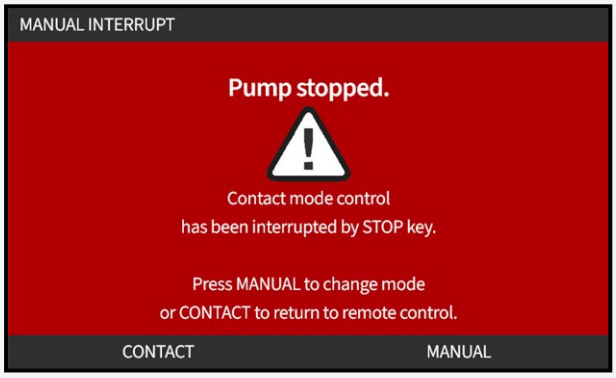


Number	Name	Summary
1	**STOP**	Key will stop the pump
2	**START**	Key will • Start the pump at the set speed when in manual mode or during flow calibration. • Deliver a contact dose when in CONTACT mode. In all other control modes this key will not start the pump.

25.3.4.1 Manual Interrupt screens

If the **STOP** key is pressed during pump operation, drive will stop and following messages will display, dependent on mode:

The Manual interrupt screen	Condition	Suggested action
	Analog mode 4 - 20 mA control interrupted by**STOP**key	Press MANUAL to change mode or ANALOG to return to remote control
	PROFIBUS mode control interrupted by **STOP** key	Press MANUAL to change mode or PROFIBUS to return to remote control
	PROFINET mode control interrupted by **STOP** key	Press MANUAL to change mode or PROFINET to return to remote control

The Manual interrupt screen	Condition	Suggested action
	EtherNet/IP mode control interrupted by **STOP** key	Press MANUAL to change mode or ETHERNET/IP to return to remote control
	CONTACT mode control interrupted by **STOP** key	Press MANUAL to change mode or CONTACT to return to remote control

25.3.4.2 Change pump speed in manual MODE

The pump speed is changed by:

25.3.4.2.1 UP AND DOWN KEYS

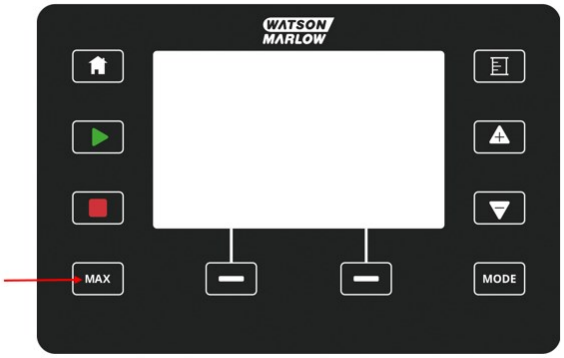
Key	Action
	Pressing **UP ARROW** key to increase the drive set point speed by 0.1 rpm. • If held the set point speed increases using fast scrolling.
	Pressing **DOWN ARROW** key to decrease the drive set point speed by 0.1 rpm. • If held the set point speed decreases using fast scrolling.

25.3.4.2.2 MAX KEY

Pressing and holding the **MAX** button, pump will run at the lower of two limits:

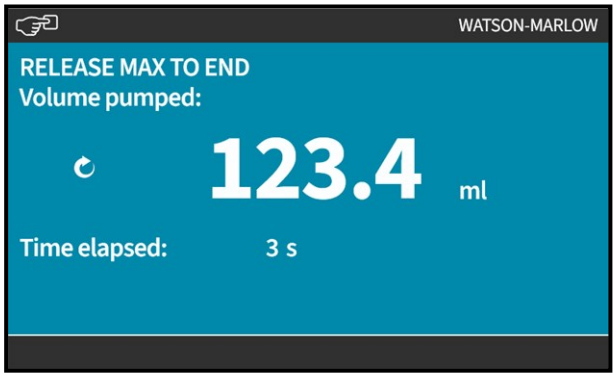
- Speed limit setting
- Maximum pump speed (set by pumphead RFID)

This function is useful for priming the pump.



During operation a blue screen is displayed, which shows:

- the delivered volume in real time
- running time in seconds, while holding the **MAX** key



26 CLEANING

Watson-Marlow confirm that fresh water is compatible with all exposed surfaces of the Qdos range of items. No other cleaning agents or chemicals are approved for use.

Responsible person must:

- Do a risk assessment to approve fresh water as suitable cleaning agent. Consider potential compatibility with:
  - process chemicals
  - residue or other material deposits on pump surfaces and installation area.
- Create a specific procedure for your application, using the general procedure provided below as guidance.

26.1 General procedure for guidance

Prior to starting the procedure:

- Read the procedure in full
- Do a risk assessment and determine suitable PPE
- Wear suitable PPE

1. Stop the pump
2. Isolate from power supply
3. Clean the product by wiping all exposed surfaces with a dry cloth or cloth dampened with water (as approved). Repeat until all residue has been removed.
4. Allow any remaining water to evaporate from surfaces
5. Reconnect the power supply
6. Bring pump back into operation

If product is not operating as intended after cleaning:

1. Stop the pump
2. Isolate power supply
3. Instruct a responsible person to remove from service. See section: 27.6.2.2.1

27 MAINTENANCE

27.1 Maintenance chapter—Scope

27.1.1 Servicing

There are no items in the Qdos range which require routine servicing, such as the adjustment of a mechanism or lubrication of parts.

27.1.2 Approved maintenance tasks

There are no replaceable parts inside a Qdos range item. Only the following maintenance tasks for the Qdos range are approved, to be undertaken by a responsible person or trained operator:

- Periodic inspection. See section: 27.2
- Replacement of Watson-Marlow spare parts.
  - Qdos fluid path—Spare parts. See section: 27.5
  - Qdos drive—Spare parts. See section: 27.6
    - Replacement of the power plug fuse (63)
    - Updating of the pump software if instructed by WMFTS to do so. See section: 27.4

No other maintenance activity or repair of a Qdos range item must be undertaken. If a Watson-Marlow spare part is not available, or the Qdos range item is damaged, the Qdos range item must be removed from service by a Responsible person.

Qdos pumps may be repaired by a Watson-Marlow approved service centre, contact your local WMFTS representative for further information.

NOTE 63	The fuse in either the: • Power plug of a UK model designed for AC power • Inside the power cable fuse holder of a DC model are not Watson-Marlow spare part, but may still be replaced by a user organisation. See section 27.6.2.1 A Qdos drive does not contain replaceable internal fuses.

27.2 Periodic inspection

Inspection of all items in the Qdos range product for damage, should take place periodically as required, by the users organisations inspection schedule.

Inspection for damage should include checks for:

- Loose parts or screws
- Secure connections (power cable, or control cables)
- Leaking fuid path items
- General damage to items
- Abrasion of cables of fluid path hoses/interface tubing due to incorrect installation or operation.
- Chemicals in the operating environment

In the event of product damage, the product must be removed from service by a responsible person.

27.3 Product end of life

Any item of the Qdos pump range may meet its end of life sooner than expected due to incorrect installation, improper use or product damage. Periodic inspection for product damage is a maintenance task.

A Qdos range item will fail due to :

- Wear – The Qdos range item has reached its normal end of life point due to wear of components.
- Overpressure – As a result of being subjected to a pressure greater than the maximum rated pressure.
- Chemical incompatibility – being used with chemicals which are incompatible with Qdos range item.
- Pumphead—Lubricant leak - The pump has been tilted with the pumphead fitted beyond 5 degrees.

Once the product has reached its end of life, a responsible person must remove the product from service.

27.3.1 Product end of life—Pumphead

The pumphead is a key consumable item. It is not possible for Watson-Marlow to predict the precise life of a pumphead due to multiple factors such as speed, chemical compatibility, pressure amongst other factors.

Either of the following are an indication of pumphead which is near its end of life:

- The flow rate drops from its normal rate of flow, which is otherwise unexplained (i.e not due to a change in fluid viscosity, or inlet pressure, discharge pressure, etc.)
- The pumphead begins to allow fluid to leak past it when stopped.

A responsible person must carry out a risk assessment to determine hazards, such as fluid leaks or chemical incompatibility with materials of construction (See section: 29.3), that may occur as a result of operating the pumphead to the point of failure.

The pump has the following features:

- Run hours counter
- Volume counter
- Revolution counter

  To assist with monitoring the life of a pumphead, so that it may be changed prior to failure.

27.4 Software update

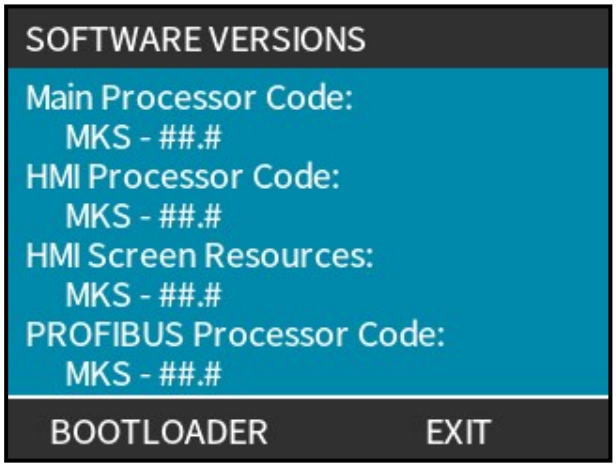
The updating of the pump software is not an activity which is routinely required. A user must only update the pump software by instruction from WMFTS.

The updating of the software will require the pump to be isolated from the fluid path, the pump settings reset to default [(64)] and then the pump re-programmed in accordance with the procedures in this reference manual.

NOTE [64]	When the pump settings are reset, all parameters and configuration changes are set to default. Make sure that you record the values of important settings and parameters, such as revolution counter and run hours, before doing software updates.

27.4.1 How to check the software version installed on the pump

The pump software versions are shown on the software versions screen [(65)]:



NOTE [65]	The PROFIBUS processor code is shown on PROFIBUS models. The IoBoard processor code is shown on PROFINET and EtherNet/IP models.

27.4.1.1 Procedure: Access SOFTWARE VERSIONS screen

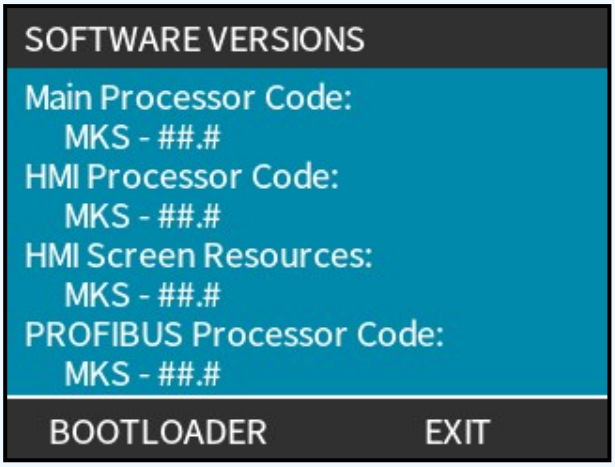
The **SOFTWARE VERSIONS** screen is accessed from the **HOME** screen :

Procedure

1. Enter the **HOME** screen.

2. Press MENU to access the **MAIN MENU**. Use **+/-** keys to highlight **Help**.
3. Press SELECT to enter the **HELP AND ADVICE** screen

4. Press SOFTWARE to enter the **SOFTWARE VERSIONS** screen.



27.4.1.2 Checking software version codes

To check the software version, compare the following codes on the **SOFTWARE VERSIONS** screen to see if they are the same or higher than the codes provided by a WMFTS instruction:

- Main processor code: MKS -
- HMI processor code: MKS -
- PROFIBUS processor code: MKS [(66)] -

NOTE [66]	The PROFIBUS processor code is shown on PROFIBUS models. The IoBoard processor code is shown on PROFINET and EtherNet/IP models.

27.4.2 Recommended USB flash drives for a software update

A H-FLO pump uses a Type C USB flash drive to update the software of the pump. The following USB flash drives have been tested by WMFTS and are confirmed suitable:

Recommended USB flash drive: Type C	Memory (GB)
Integral	16
Lexar D40E	64
Verbatim 181747	64
SSK (FDU050)	64
Lexar Jumpdrive D400	32
Kingston DataTraveler microDuo 3C	64, 128, 256

27.4.3 Preparation of the USB flash drive

The required file format of the USB flash drive is FAT32.

The folder name on the USB flash drive, must be titled "WM_QHF" and in a root directory (For example D:\WM_QHF).

If the folder is named in any other way, or located within another folder on the USB flash drive, the pump will NOT locate the software, resulting in failure of the pump software to update.

27.4.4 How to download the latest software

Qdos software can be downloaded from the following link on the Watson-Marlow website: https://www.wmfts.com/en/resources/software-and-devices/

Download the ZIP file, then extract and place the software into folder titled "WM_QHF" on the root of the USB flash drive. For example, D:\WM_QHF.

27.4.5 Location of USB socket

A H-FLO pump uses a Type C USB flash drive to update the software of the pump.

The USB socket where the USB flash drive should be inserted is located on all models in the same location:

Behind the input/output panel on the front of the pump:

27.4.6 How to update the software on the pump using a USB flash drive

The updating of the software will require the pump to be isolated from the fluid path, the pump settings reset to default [(67)] and then the pump re-programmed in accordance with the procedures in this reference manual.

NOTE [67]	When the pump settings are reset, all parameters and configuration changes are set to default. Make sure that you record the values of important settings and parameters, such as revolution counter and run hours, before doing software updates.

NOTICE

During the software update step of the procedure below, it is important that the pump does not have a power interruption. Interrupting the power to the pump while the software is being updated could result in the pump software crashing. Do not update the pump if the power supply is not stable.

1. Ensure the pump requires a software update. See section 27.4. A software update must never be undertaken unless instructed by WMFTS. Using the pump with the incorrect software could create a hazard.
2. Ensure you have a suitable USB flash drive. See section: 27.4.2
3. Ensure the USB flash drive has been prepared. See section: 27.4.3
4. Ensure the software has been downloaded. See section: 27.4.4
5. Ensure the software has been placed in the WM_QHF folder on a root directory of the USB flash drive.
6. Isolate power to the pump.
7. Isolate the fluid path from the pump.
8. Isolate the control signals to the pump.

⚠WARNING

Risk of electric shock. 110 - 240 V AC voltage may be present on H-FLO T type (user wired) model control systems using these voltages. Always turn of the control signal to the pump prior to removing or reinstalling the input/output panel is removed.

9. Remove the 6 screws from the input/output panel.

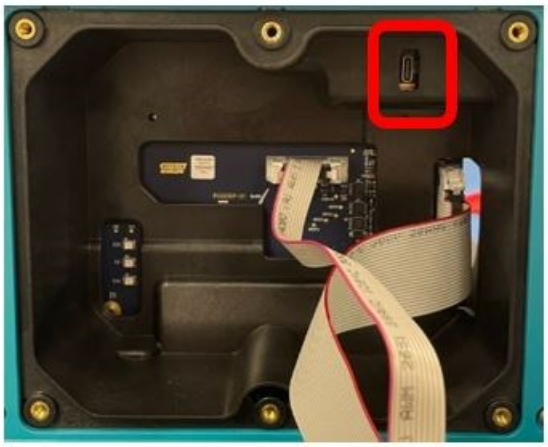
10. Remove the panel from drive and place down. Do not prise off with tools. Make sure gasket is retained within recessed channel of panel.

11. Check the control system wires or ribbon cable connections have not become detached from their connector.

⚠WARNING

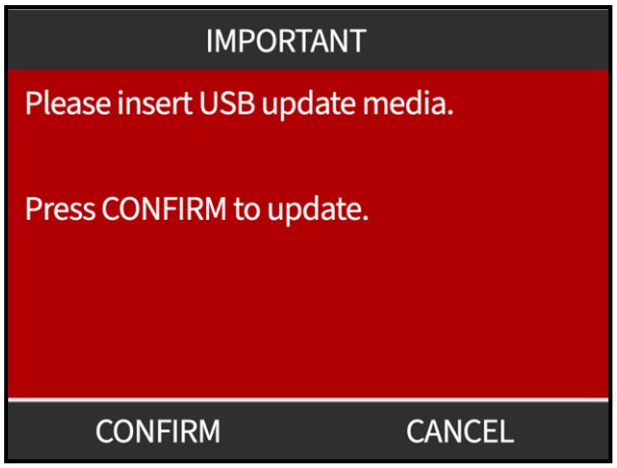
Risk of electric shock. 110 - 240 V AC voltage may be present on H-FLO T type (user wired) model control systems using these voltages. Check the control cable wires have not become loose.

12. Insert the USB flash drive into the USB socket.

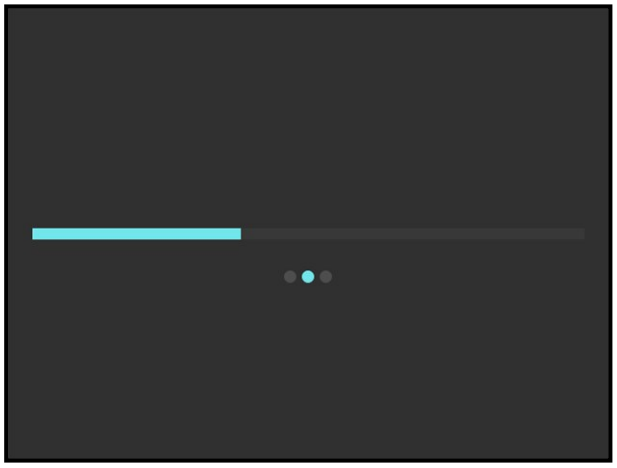


13. Switch the power on to the pump.

14. From the HOME screen navigate to **MAIN MENU**>**General Settings**>**USB Update** to enter the USB update screen.



15. Press CONFIRM to begin the software update. The pump will display a black screen with three dots and if the USB is accepted and has the correct files in the correct locations, a progress bar will begin to load across the screen.



The process will usually take between 4 to 5 minutes for U/U+ and 12 to 13 minutes for network pumps.

Upon completion of the USB update, the pump will return to the **HOME** screen in a stopped state.

If the USB has not been accepted, the pump will display the black screen with the 3 dots, but no progress bar. In this scenario, after approximately 5 seconds the pump will restart and display the **HOME** screen. If this occurs check the correct USB flash drive and/or folder name/location has been used, then repeat the previous steps of this procedure.

If the pump displays an error screen after the software update, refer to the error section to find solutions to the problem. See section: 28.1

16. Check the software has been correctly updated by navigating to the **SOFTWARE VERSIONS** screen and checking the version codes have updated. See section: 27.4.1

17. Isolate power to the pump. For H-FLO T type (user wired) models: Turn off the control signals to the pump.

⚠WARNING

Risk of electric shock. 110 - 240 V AC voltage may be present on H-FLO T type (user wired) model control systems using these voltages. Always turn of the control signal to the pump prior to removing or reinstalling the input/output panel is removed.

18. Remove the USB flash drive
19. Check the seal is intact and in place on the Input/Output panel.
20. Check the ribbon cable and control signal wires are secure in their connectors.
21. Tighten the six input/output panel screws equally.
22. Restore power to the pump.
23. Reset the pump to factory default setting. **MAIN MENU**>**General Settings**>**Restore Defaults**. See section: 22.1.5.
24. Re-program the pump to the required configuration using the relevant sections of this manual using partial control signals to the pump (as required).
25. Restore the fluid path to the pump.
26. Re-calibrate the flow of the pump.
27. Restore the full control signals to the pump.
28. Check operation of the pump is expected, prior to resuming normal service.

27.5 Fluid path—Spare parts, and replacement procedures

27.5.1 Replacement items

27.5.1.1 Pumpheads

Name	Part number
ReNu 150 Santoprene	0M3.6200.PFP
ReNu 300 Santoprene	0M3.7200.PFP
ReNu 300 SEBS	0M3.7800.PFP
ReNu 600 Santoprene	0M3.8200.PFP

27.5.1.1.1 PUMPHEAD SEALS AND PARTS

27.5.1.1.1.1 All pumpheads

Pumphead connection collars—Pack of 2 items		
Image	Description	Product code
	Qdos H-FLO Connection Collar, PVC-U 25 mm, Pack of 2 items	0M9.601R.U0E

27.5.1.1.1.2 ReNu 150, 300, 600 pumpheads and Pressure Sensing Kit

ReNu 150, 300, 600 and Pressure Sensing Kit—Pack of 2 items		
Image	Description	Product code
	ReNu 150 Santoprene, ReNu 300 Santoprene, ReNu 600 Santoprene,ReNu 300 SEBS, and Pressure Sensing Kit (68). **FKM** pumphead port seals, pack of 2	0M9.002R.K00

NOTE 68	ReNu 150 Santoprene, ReNu 300 Santoprene, ReNu 600 Santoprene, ReNu 300 SEBS pumphead port seals are interchangeable with the Pressure Sensing Kit fluid connector seal. The H-FLO Pressure Sensing Kit has only one seal that may be changed. The extra seal could be a spare.

27.5.1.2 Hydraulic Connectors

27.5.1.2.1 HYDRAULIC CONNECTORS SUPPLIED WITH PUMP OR SPARE DRIVE

The following Hydraulic Connectors [(70)] are supplied with a pump or spare drive.

Supplied Hydraulic connection pack (2 of each item) with drives			
Image	**Description**	**Size**	**Comment**
	Qdos H-FLO Fluid connector (Hydraulic Connection), PVC-U 3/4'' NPT (F) [(69)] **Product code:** 0M9.601H.U03	Female, 3/4'' NPT thread (F)	Supplied as a pair (2 packs) with all pumps or spare drives, which have a US power plug (product code ending in an A).
	Qdos H-FLO Fluid connector (Hydraulic Connection), PVC-U Rp 3/4'' [(69)] **Product code:** 0M9.601R.U03	Female, Rp 3/4''	Supplied as a pair (2 packs) with all pumps or spare drives, except product codes which have a US power plug (product code ending in an A).

NOTE [69]	Metal threaded fittings cannot be used to connect to Watson-Marlow H-FLO Hydraulic connectors.

NOTE [70]

If you use a Watson-Marlow H-FLO Hydraulic Connector (PVC-U) at an ambient or fluid temperature of more than 37 °C (101.5 °F), maximum discharge pressure must be decreased as follows:

Temperature		Pressure	
(°C)	(°F)	(bar)	(PSI)
37	98.6	7.0	101.5
38	100.4	6.8	98.6
39	102.2	6.5	94.3
40	104.0	6.2	89.9
41	105.8	6.0	87.0
42	107.6	5.9	85.6
43	109.4	5.7	82.7
44	111.2	5.6	81.2
45	113.0	5.4	78.3

27.5.1.3 Pressure Sensing Kit

27.5.1.3.1 SEALS

ReNu 150 Santoprene, ReNu 300 Santoprene, ReNu 600 Santoprene, ReNu 300 SEBS pumphead port seals are interchangeable with the Pressure Sensing Kit fluid connector seal. The H-FLO Pressure Sensing Kit has only one seal that may be changed. The extra seal could be a spare.

See section 27.5.1.1.1

27.5.1.3.2 COMPLETE REPLACEMENT PRESSURE SENSING KIT

Pressure Sensing Kit	
Description	**Product code**
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA

27.5.2 Fluid path—Removal and replacement procedures

Accessories must be removed from the pumphead prior to replacement of the pumphead. For this reason fluid path removal information is provided in this order:

- Removal and replacement of Hydraulic Connectors. See section: 27.5.2.1
- Removal and replacement of Pressure Sensing Kit. See section: 27.5.2.2
- Removal and replacement of pumphead. See section: 27.5.2.3

Prior to starting any procedures

- Read the procedures in full
- Do a risk assessment and determine suitable PPE
- Wear suitable PPE

WARNING

Beware of any residual chemicals which remain in the fluid path or fluid path items such as the pumphead or Pressure Sensing Kit upon disconnection. Carefully drain any residual chemicals into a suitable container to avoid risk of an injury.

27.5.2.1 Item removal and replacement procedures—Hydraulic Connectors

27.5.2.1.1 PROCEDURE—REMOVE HYDRAULIC CONNECTORS

Prior to starting any procedures

- Read the procedures in full
- Do a risk assessment and determine suitable PPE
- Wear suitable PPE

WARNING

Beware of any residual chemicals which remain in the fluid path upon disconnection. Carefully drain any residual chemicals into a suitable container to avoid risk of an injury.

Procedure

1. Stop the pump.
2. Isolate the pump from electrical power.
3. Drain down the fluid path in accordance with your organisation's procedure.
4. Remove the inlet and discharge fluid path connections from the pumphead (protecting the pump from any process fluid spillages), by unscrewing the connection collars and gently pulling the connections off the pumphead ports.

27.5.2.1.2 INSTALL REPLACEMENT HYDRAULIC CONNECTORS

To install a replacement Hydraulic Connector follow the same procedure provided during the fluid path installation chapter. See section: 12.4.7

27.5.2.2 Item removal and replacement procedures—Pressure Sensing Kit

Prior to removing the pumphead, the following must be removed. Refer to the individual procedures:

- Procedure—Remove Hydraulic Connector. See section: 27.5.2.1.1

27.5.2.2.1 PROCEDURE—REMOVE INSTALLED QDOS PRESSURE SENSING KIT

Prior to starting any procedures

- Read the procedures in full
- Do a risk assessment and determine suitable PPE
- Wear suitable PPE

WARNING

Beware of any residual chemicals which remain in the Pressure Sensing Kit upon disconnection. Carefully drain any residual chemicals into a suitable container to avoid risk of an injury.

STEP 1	STEP 2	STEP 3
Stop the pump	Isolate the pump from electrical power	Release pressure in fluid path. Remove fluid path and drain down in accordance with your organisation's procedure for this step.

STEP 4	STEP 5A: M type	STEP 5B: T Type
Identify where the Pressure Sensing Kit control cable is connected to the pump.	Remove the Pressure Sensing Kit control cable. **M type:** Rotate control cable connector collar anticlockwise until fully disengaged. Fit protective cover until ready to fit replacement Pressure Sensing Kit.	**T Type:** Follow the procedure 15.3.4 to remove the front input and output panel, remove the control cable, then refit the input and output panel.

STEP 6	STEP 7	STEP 8
Rotate collar in an anticlockwise direction until fully disengaged from discharge port.	Remove Pressure Sensing Kit from pumphead.	Check pumphead insert is in place and not damaged (replace if required).
		

27.5.2.2.2 INSTALL REPLACEMENT QDOS PRESSURE SENSING KIT

To install a replacement Pressure Sensing Kit, follow the same procedure provided during the fluid path installation chapter. See section: 12.4.6

27.5.2.3 Item replacement procedures—Pumphead

Prior to removing the pumphead, the following items must be removed. Refer to the individual procedures:

- Procedure—Remove Hydraulic Connector. See section: 27.5.2.1.1
- Procedure—Remove Pressure Sensing Kit. See section: 27.5.2.2.1

27.5.2.3.1 REPLACEMENT OF PUMPHEAD

In the section below, these instructions detail the removal and replacement of a left-hand mounted pumphead. Replacing the right-hand mounted pumphead is the identical procedure on the right-hand side.

WARNING

There can be harmful chemicals inside the pumphead that can cause serious injury or damage to equipment if spilled. Wear PPE and follow your organisations procedures when undertaking any task in this section.

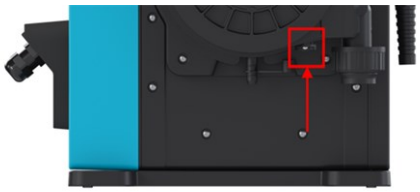
When the pumphead has failed. A leak detection will be triggered and the following screen displayed:

27.5.2.3.1.1 Removing—H-FLO pumphead

CAUTION

Risk of injury due to burns. The exterior of the pump and driveshaft can get hot during operation. Stop the pump and let the pump cool before handling.

1. Stop pump.
2. Isolate pump from electrical power.
3. Release pressure in fluid path and drain down fluid path in accordance with your organisation's procedure for this step.
4. Remove the fluid path connections and safety overflow connection, from pumphead ensuring that the pump is protected from any fluid spillages.
5. Fit safety overflow rubber cap to the safety overflow of the pumphead.
6. Release the pumphead locking lever by hand. Do not use tools to move the locking lever.
7. Disengage the pumphead from drive by rotating it in a clockwise direction by approximately 15°.
8. Remove the pumphead, being aware residual chemicals will remain inside the pumphead tubing/fluid connection ports, which will require draining, in accordance with your organisation's procedure for this step.
9. Check that the leak detect sensor and driveshaft are both clean and free from process chemical. If any evidence of chemical residue is found, remove pump from service and contact your local Watson-Marlow representative for advice.
10. If the pumphead had not failed, dispose of the pumphead in accordance with local regulations. If the pumphead failed, carry on to step 11
11. Drain the pumphead of chemicals and pumphead lubricant of residual chemicals in accordance with your organisations procedure for this step, by unscrewing the drain valve shown in the picture below:



12. Dispose of the pumphead in accordance with local regulations.

27.5.2.3.1.2 Fitting new pumphead

This procedure is written for a new pumphead which would not contain any previous chemical.

Do not fit a used pumphead.

1. Remove the new pumphead from its packaging and re-cycle in accordance with your organisation's procedures.
2. Align the new pumphead with the pump drive shaft and slide into position on the pump housing.
3. Rotate the pumphead in an anti-clockwise direction by approximately 15° to engage the retaining lugs.

4. Check that the embossed arrow on pumphead is pointing upwards.

5. Lock the pumphead into position with pumphead locking lever by hand. Do not use tools to move the locking lever.
6. Connect the input and output connections to the pumphead.
7. Reconnect the electrical power to the pump.
8. The RFID antenna will read the pumphead RFID label to confirm which pumphead has been fitted and the relevant advice screen will be displayed.
9. Do one of the following procedures dependent on the type of pumphead fitted.

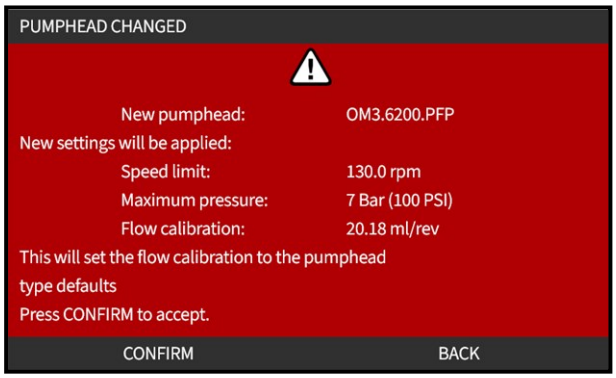
27.5.3 Pumphead of the same type

1. Press ACKNOWLEDGE.

2. When acknowledged, the home screen of current operating mode is displayed.
3. Bring pump back into operation.
4. Re-calibrate the flow, follow the flow calibration procedure in 105.

27.5.4 Pumphead of the different type

1. Press ACCEPT NEW HEAD.
2. **PUMPHEAD CHANGED** screen will be displayed.



3. Press CONFIRM.

NOTE: Analog calibration reset to default on Universal and Universal+ only.

4. Bring pump back into operation.
5. Re-calibrate the flow, by following flow calibration procedure in 105.

27.6 Drive—Spare parts, and replacement procedures

27.6.1 Replacement items

27.6.1.1 Replacement of fuses

27.6.1.1.1 DRIVE FUSE: INTERNAL

There are no user serviceable fuses located inside the drive casing. Do not remove, or disassemble the drive casing for any reason.

27.6.1.1.2 POWER CABLE FUSE (AC POWER SUPPLY MODELS: UK MODEL ONLY)

The UK model contains a fuse (5A, BS 1362) in the power plug of the AC power supply models. A procedure for replacement is provided in section 27.6.2.1

27.6.1.1.3 POWER CABLE FUSE (DC POWER SUPPLY MODELS)

DC power supply models contain a fuse (Blade, 20 A, 32 V, ISO 8820-3) located within the power cable fuse holder. A procedure for replacement is provided in section 27.6.2.1

27.6.1.2 Replacement of power cable

Qdos pumps do not have user detachable power cables. If the power cable becomes damaged, remove the pump from service and contact your WMFTS representative to discuss how the pump can be repaired. Do not attempt to modify, repair or replace the power cable.

27.6.1.3 Replacement spare parts

27.6.1.3.1 ACCESSORIES—DRIVE

Accessories—Drive		
Image	**Description**	**Product code**
	Qdos H-FLO Control cable - General I/O M12A 8W Cable Straight F Connection, 3m (10ft) Length, Unshielded 24AWG	0M9.603Z.0CF (71)
	Qdos H-FLO Control cable - General I/O M12A 8W Cable Right-Angled F Connection, 3m (10ft) Length, Unshielded 24AWG	0M9.603Z.0DF (71)
	Qdos control cable for manual model, M12A 5 Pin Yellow Insert, 3 m (10 ft) Length	0M9.203Y.000 (72)
	Qdos and H-FLO Software Update USB flash drive (73) Kingston MicroDuo 3C	0M9.000U.000

NOTE 71	The M12 8W (8 wire) control cable is for the Universal/Universal+ models only.

NOTE 72	The control cable for use with the manual model features a 5 pin female M12 connector. This 5 pin connector will connect to male 4 pin, M12 connector of the manual model. The 5th pin (centre) is not used.

NOTE 73	The Qdos Software Update USB flash drive contains both a USB A and USB C connection for use with either Qdos or H-FLO pumps. The USB flash drive contains software for updating pumps for use with a Pressure Sensing Kit that do not have the required software version installed. For more information, see section 5.3.7.

27.6.2 Pump or drive—Removal and replacement procedures

27.6.2.1 Replacement of fuses

27.6.2.1.1 DRIVE FUSE: INTERNAL

There are no user serviceable fuses located inside the drive casing. Do not remove, or disassemble the drive casing for any reason.

27.6.2.1.2 POWER CABLE FUSE REPLACEMENT (AC POWER SUPPLY MODELS: UK MODEL ONLY)

The UK model contains a fuse (5A, BS 1362) in the power plug of the AC power supply models.

To replace this fuse:

1. Stop the pump and isolate the power to the power plug socket
2. Remove the power plug from the power socket
3. Remove the fuse from the power plug
4. Replace with a fuse specified to 5A, BS 1362
5. Reconnect the power plug to the power plug socket
6. Restore power to the power plug socket
7. Check the pump has turned back on. If not repeat, steps 1 to 7, checking the fuse is installed correctly.

27.6.2.2 Item replacement procedures—Pump

27.6.2.2.1 PROCEDURE: REMOVAL OF QDOS PUMP FROM OPERATION.

- Read the procedure in full
- Do a risk assessment and determine suitable PPE
- Wear suitable PPE

WARNING

Beware of any residual chemicals which remain in the pumphead upon disconnection. Carefully drain any residual chemicals into a suitable container to avoid risk of an injury.

1.	Isolate the pump from the electrical power supply.
2.	Carefully release any pressure, and drain the fluid from the system which attaches to the Pressure Sensing Kit or Hydraulic Connector depending on which item is installed.
3.	Remove the Pressure Sensing Kit or Hydraulic Connector depending on which item is installed. See section: 27.5.2
4.	Remove the pumphead, following the procedure in section 27.5.2.3
5..	Determine if the pumphead safety overflow system will need to be removed in order to remove the pump. If required, follow your organisation's procedures.
6.	Remove the control cables in accordance with your organisation's procedure.
7.	Remove the pump from the pump mounting area. **CAUTION**  Do not place or move the drive, by holding the driveshaft. The driveshaft has edges which may cause a laceration.

27.6.2.2.2 INSTALL PUMP OR DRIVE

To install a new pump or Qdos drive, follow all relevant procedures in the installation chapters.

28 ERRORS AND TROUBLESHOOTING

This section will provide information on errors or a breakdown which may occur during operation, along with possible causes to assist with troubleshooting.

If the problem cannot be solved, information on how to seek technical support along with our comprehensive warranty is provided at the end of this section.

28.1 Errors

The pump has an inbuilt function to report errors. The display of these errors will depends on the model:

28.1.1 Errors

The following table provides a list of error codes which are displayed on the HMI screen, with a suggested action to resolve.

All error codes will generate an alarm condition, with the exception of error 20 and 21.

Error codes		
Error code	**Error condition**	**Suggested action**
Err	General error	Turn pump off. Seek support.
Er 0	FRAM write error	Attempt to reset by switching power OFF / ON. Or seek support.
Er 1	FRAM corruption	Attempt to reset by switching power OFF / ON. Or seek support
Er 2	FLASH write error during drive update	Attempt to reset by switching power OFF / ON. Or seek support.
Er 3	FLASH corruption	Attempt to reset by switching power OFF / ON. Or seek support.
Er 4	FRAM shadow error	Attempt to reset by switching power OFF / ON. Or seek support.
Er 9	Motor stalled	Stop pump immediately. Check pumphead and tube. Power OFF / ON may reset. Or seek support.
Er 10	Tacho fault	Stop pump immediately. Power OFF / ON may reset. Or seek support.
Er 14	Speed error	Stop pump immediately. Power OFF / ON may reset. Or seek support.
Er 15	Over current	Stop pump immediately. Power OFF / ON may reset. Or seek support.

Error codes		
Error code	**Error condition**	**Suggested action**
Er 16	Over voltage	Stop pump immediately. Check supply. Power OFF/ON may reset.
Er 17	Under voltage	Stop pump immediately. Check supply. Power OFF/ON may reset.
Er 20	Signal out of range	Signal out of range reports the nature of an external condition. Check analog control signal range. Trim signal as required. Or seek support.
Er 21	Over signal	Reduce the analog control signal.
Er 30	Overpower	Excessive power consumption. Turn OFF power supply. Check supply and system conditions.
Er 50	Communication error	Attempt to reset by switching power OFF / ON. Or seek support.

28.1.2 Error reporting

If any unexpected faults or failures are experienced report them to your Watson-Marlow representative.

28.2 Breakdown

28.2.1 Leak detection message

If leak detected, pump display following message:

28.2.2 Leak detection procedure

As soon as a leak is detected either as a result of a message on the screen, the remote model icons, or due to observing a fluid leak from the pumphead. The following procedure must be immediately followed

1. Isolate the pump from electrical power
2. Remove the pump from service in accordance with the users organisations procedure
3. Determine the cause of the leak
4. Follow the procedure provided in maintenance to replace the pump head. This procedure includes an inspection for chemical residue.
5. Bring the pump back into service
6. Reconnect electrical power to the pump
7. Reset the leak detection message

⚠ WARNING

Operating the pumphead to the point of failure may result in a flow of chemicals into the pumphead to drive interface area, as a result of aggressive chemicals which are not compatible with the internal pumphead materials.

Chemicals could attack the materials in this area and enter the drive. The internal parts of the drive unit contain Aluminium which may react with some aggressive chemicals to form an explosive gas.

If you are pumping a chemical that may react with Aluminium to form an explosive gas, do not operate the pump to the point of pumphead failure. In addition, you must ensure the chemicals being pumped are chemically compatible with the materials in the pumphead to drive interface area: Drive casework, Drive casework seals, Drive shaft, Drive shaft seal.

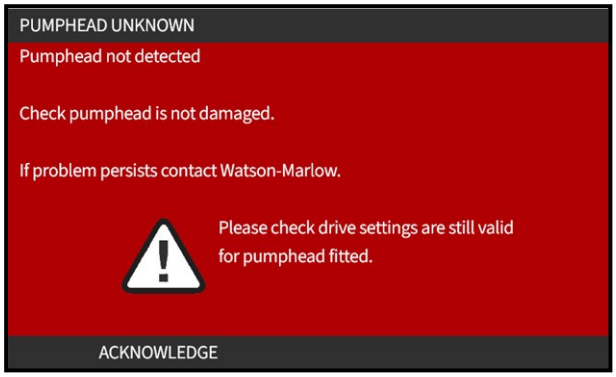
In the event of a pumphead failure or a leak detection notification event. Stop the pump, remove from service and follow the pumphead replacement procedure in section 27.5.2.3.

28.2.2.0.0.1 Pumphead NOT DETECTED

PUMPHEAD UNKNOWN screen displays warning to check pumphead is not damaged.

Previous pump head settings (Speed limit, pressure limit, analog calibration) are retained.

1. Remove and replace pumphead using the procedures in section 27.5.2.3.
2. Press ACKNOWLEDGE to continue with current configuration.



2. Bring pump back into operation.
3. Re-calibrate the flow, by following flow calibration procedure in 105.

28.3 Troubleshooting

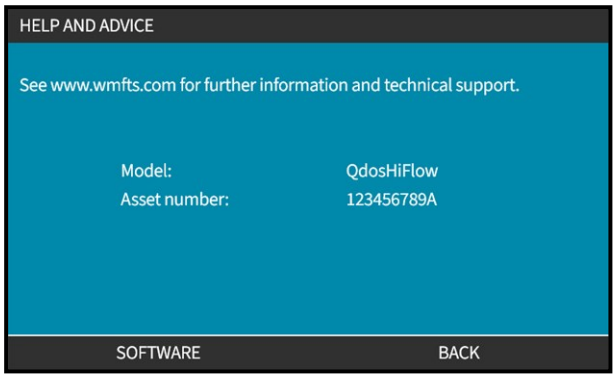
Problem	Possible cause	Solution
Reduced fluid flow	Leakage from fluid connectors	• Re-calibrate the pump • Check fluid connectors are suitable for the connection (size, chemical compatibility) • Check fluid connector tightness • Check pumphead end connection seals
	Low inlet pressure	• Increase fluid path bore • Decrease fluid path length • Decrease fluid viscosity • Check for fluid path restriction
Short life	Chemical incompatibility	Check chemical compatibility
	Discharge pressure too high	• Increase fluid path bore • Decrease fluid path length • Decrease fluid viscosity • Check for fluid path restriction
	Wear of Hose Connector Kit due to abrasion/vibration	• Ensure Hose Connector Kit cannot touch itself or any other item of equipment. • Check fluid connectors are secure
Pump error	Troubleshooting relating to an Error on a HMI screen is provided in section 28.1.	
Persistent leak detection message	If, after pumphead replacement, the leak detection message is repeated when the power is cycled, or after the leak detection reset button has been pressed, remove the pumphead, check that the mounting face is clean and free of debris and refit the pumphead, taking care to ensure it is correctly orientated with the arrow pointing upwards. If the message constantly repeats after several pumphead installations, then there may be a leak detection sensor failure. Please contact your local Watson-Marlow representative to determine further leak detection troubleshooting or repair.	

28.4 General pump help

The pump contains a help menu which provides information on the software in the pump. This information may be required when discussing technical support with Watson-Marlow as detailed in the section below.

Procedure

1. Select **Help** from the main menu to access the **HELP AND ADVICE** screens.



28.5 Technical support

Should you be unable to resolve the error or breakdown, or have another query please contact your Watson-Marlow representative for technical support.

28.5.1 Manufacturer

This product is manufactured by Watson-Marlow. For guidance or support of this product please contact:

Watson-Marlow Limited
Bickland Water Road
Falmouth, Cornwall
TR11 4RU
United Kingdom

Telephone: +44 1326 370370
Website: https://www.wmfts.com/

28.5.2 Authorised EU representative

Johan van den Heuvel
Managing Director
Watson Marlow Bredel B.V.
Sluisstraat 7
Delden
Netherlands
PO Box 47

Telephone: +31 74 377 0000

28.6 Warranty

Watson-Marlow Limited (“Watson-Marlow”) warrants this product to be free from defects in materials and workmanship based on the table below from the date of shipment, under normal use and service.

Warranty	
Item	**Period**
Qdos pump	3 years
Pressure Sensing Kit	1 year

Watson-Marlow’s sole responsibility and the customer’s exclusive remedy for any claim arising out of the purchase of any product from Watson-Marlow is, at Watson Marlow’s option: repair, replacement or credit, where applicable.

Unless otherwise agreed in writing, the foregoing warranty is limited to the country in which the product is sold.

No employee, agent or representative of Watson-Marlow has the authority to bind Watson-Marlow to any warranty other than the foregoing unless in writing and signed by a director of Watson-Marlow. Watson-Marlow makes no warranty of the fitness of its products for a particular purpose.

In no event:

i. shall the cost of the customer’s exclusive remedy exceed the purchase price of the product;
ii. shall Watson-Marlow be liable for any special, indirect, incidental, consequential, or exemplary damages, however arising, even if Watson-Marlow has been advised of the possibility of such damages.

Watson-Marlow shall not be liable for any loss, damage, or expense directly or indirectly related to or arising out of the use of its products, including damage or injury caused to other products, machinery, buildings, or property. Watson-Marlow shall not be liable for consequential damages, including, without limitation, lost profits, loss of time, inconvenience, loss of product being pumped, and loss of production.

This warranty does not obligate Watson-Marlow to bear any costs of removal, installation, transportation, or other charges which may arise in connection with a warranty claim.

Watson-Marlow shall not be responsible for shipping damage of returned items.

28.6.1 Conditions

- Products must be returned by pre-arrangement to Watson-Marlow, or a Watson-Marlow approved service centre.
- All repairs or modifications must have been made by Watson-Marlow Limited, or a Watson-Marlow approved service centre or with the express permission in writing of Watson-Marlow, signed by a manager or director of Watson-Marlow.
- Any remote control or system connections must be made in accordance to Watson-Marlow recommendations.
- All PROFIBUS systems must be installed or certified by a PROFIBUS approved installation engineer.
- All EtherNet/IP systems must be installed or certified by a EtherNet/IP approved installation engineer.
- All PROFINET systems must be installed or certified by a PROFINET approved installation

28.6.2 Exceptions

- Consumable items including tubing and pumping elements are excluded.
- Pumphead rollers are excluded.
- Repairs or service necessitated by normal wear and tear or by lack of reasonable and proper maintenance are excluded.
- Products which, in the judgement of Watson-Marlow, have been abused, misused, or subjected to malicious or accidental damage or neglect are excluded.
- Failure caused by electrical surge is excluded.
- Failure caused by incorrect or sub-standard system wiring is excluded.
- Damage by chemical attack is excluded.
- Ancillaries such as leak detectors are excluded.
- Failure caused by UV light or direct sunlight.
- All ReNu pumpheads are excluded.
- Any attempt to disassemble a Watson-Marlow product will invalidate the product warranty.

Watson-Marlow reserves the right to amend these terms and conditions at any time.

28.7 Returning pumps

Before returning products, they must be thoroughly cleaned/decontaminated. The declaration confirming this must be completed and returned to us in advance of the item being shipped.

You are required to complete and return a decontamination declaration stating all fluids that have been in contact with the equipment being returned to us.

On receipt of the declaration, a Returns Authorisation Number will be issued. Watson-Marlow reserves the right to quarantine or refuse any equipment that is not displaying a Returns Authorisation Number.

Please complete a separate decontamination declaration for each product and use the correct form that denotes the location you wish to return the equipment to.

A copy of the appropriate decontamination declaration can be downloaded from the Watson-Marlow website at https://www.wmfts.com/decon/

If you have any queries, then please contact your local Watson-Marlow representative for further assistance at www.wmfts.com/contact.

29 CHEMICAL COMPATIBILITY

29.1 Chemical compatibility—Overview

Chemical incompatibility with product materials of construction, could result in the creation of a hazard which would affect an item of the Qdos pump range, personnel or the operating environment.

A responsible person, must use this chapter, to determine if the product is suitable for the intended application in accordance with the user organisations policies and risk control methods.

29.1.1 Chemical compatibility—Chapter structure

The first part of this chapter introduces the Material of Construction by item group concept with a list of items which are normally wetted or may become wetted in certain scenarios (spillage, operating the pumphead to the point of failure, etc).

The second part of this chapter provides a procedure to check chemical compatibility.

29.2 Materials of construction

29.2.1 Identification of item groups

Materials of construction are grouped according to the picture and table below:

Item group number	Item group name	Comment
1	**Fluid Path:** User organisations connections and pipework	
2	**Fluid Path:** Hydraulic Connectors	
3	**Fluid Path:** Pressure Sensing Kit	Mounted on discharge only. Hydraulic Connectors aremounted on top.
4	**Fluid Path:** Pumphead	Multiple variations. A Qdos pump model is a combination of a pumphead and drive.
5	Drive	

29.2.2 Abbreviations

Abbreviation	Full name
FKM	Fluorine Kautschuk Material
HDPE	High Density Polyethylene
NBR	Nitrile rubber
PA6	Nylon 6
PC	Polycarbonate
PET	Polyethylene Terephthalate
PFPE	Perfluoropolyether
PP	Polypropylene
PPE	Personal Protective Equipment
PPS	Polyphenylene sulphide
PS	Polystrene
PVCu	Polyvinylchloride
PVDF	Polyvinylidene difluoride
SEBS	Styrene-ethylene-butylene styrene

29.2.3 Materials of construction of item groups

29.2.3.1 Item group 1—User organisation's fluid path pipework

A user's organisation's fluid path tubing or pipework may be single or multi material item.

- All items in this item group are normally wetted by the pumped fluid.
- The materials of construction of these items are specified by a users organisation.

29.2.3.2 Item group 2—Hydraulic Connector

A Hydraulic Connector is used either directly on a Qdos pumphead or on a Pressure Sensing Kit to connect to either Qdos interface tubing or a user organisation's fluid path pipework

- All items in this item group are normally wetted by the pumped fluid.
- The material of this item depends on the product code.

Supplied Hydraulic connection pack (2 of each item) with drives			
Image	**Description**	**Size**	**Comment**
	Qdos H-FLO Fluid connector (Hydraulic Connection), PVC-U 3/4'' NPT (F) (74) **Product code:** 0M9.601H.U03	Female, 3/4'' NPT thread (F)	Supplied as a pair (2 packs) with all pumps or spare drives, which have a US power plug (product code ending in an A).
	Qdos H-FLO Fluid connector (Hydraulic Connection), PVC-U Rp 3/4'' (74) **Product code:** 0M9.601R.U03	Female, Rp 3/4''	Supplied as a pair (2 packs) with all pumps or spare drives, except product codes which have a US power plug (product code ending in an A).

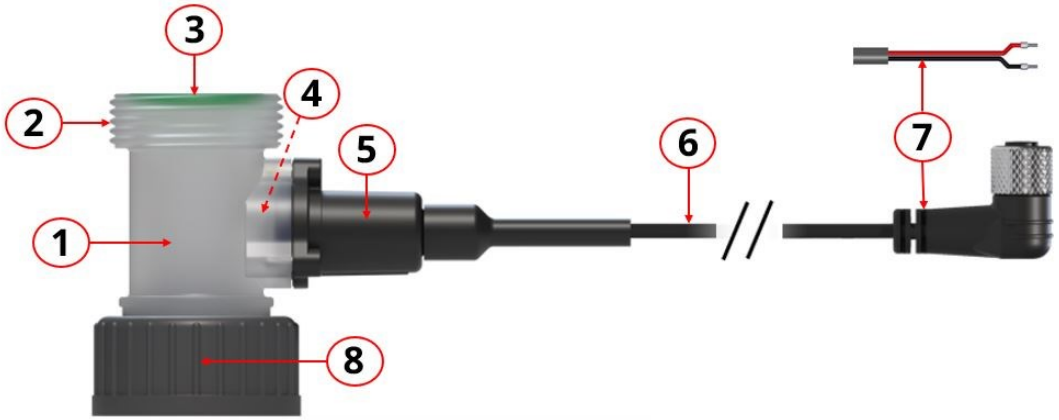
NOTE 74	Metal threaded fittings cannot be used to connect to Watson-Marlow H-FLO Hydraulic connectors.

29.2.3.3 Item group 3—Pressure Sensing Kit

A Pressure Sensing Kit is a Qdos range item which may be attached onto the top of a pumphead. A Hydraulic Connector may then be attached onto the Pressure Sensing Kit.

Some parts of the Pressure Sensing Kit are:

- Normally wetted
- Not normally wetted but may become wetted by some scenarios



Item	Description	Material of construction	Normally wetted by pumped fluid?	Not normally wetted but may become wetted by some scenarios
1	Pressure sensor T-piece	PVDF	Yes	
2	Outlet: Discharge connection (75) for Hydraulic Connector or Hose Connector Kit	PVDF	No	
3	Outlet: Fluid connector seal (76)	FKM	Yes	
4	Inside: Pressure sensing element to T-piece seal	FKM (Viton)	Yes	
	Inside: Pressure sensing element	Pressure sensor: Al_20_3 ceramic		
5	Pressure sensor housing with internal seal	Housing: PP 20% GF, Seal: Nitrile	No	Yes (77)
6	Control cable, integrated	Copper, PVC, PU	No	Yes

Item	Description	Material of construction	Normally wetted by pumped fluid?	Not normally wetted but may become wetted by some scenarios
7	M12 control cable connector or user wired cable gland connections	Nickel plated brass, Nylon, PU	No	Yes
8	Inlet: Qdos pumphead connection nut (female)) (75)	Snap ring: PP Nut: PVC	No	Yes

NOTE [75]	Items 2 and 8 are the same thread size as a Qdos pumphead.

NOTE [76]

The Pressure Sensing Kit comes with the following seals based on product code:

Pressure Sensing Kit fluid path connection seals		
Description	Product code	Seals supplied
Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+	0M9.605K.FTT	FKM (Viton) seal pre-installed in Pressure Sensing Kit
Qdos H-FLO Pressure Sensing Kit	0M9.605K.FTA	

NOTE [77]

The internal seal inside the pressure sensor housing would not be wetted, if the fluid is chemically compatible with item 4: the pressure sensor to pressure sensor T-piece seal. For more information, see section 29.

29.2.3.4 Item group 4—Pumphead

This section is split further into items which are:

- Normally wetted
- Not normally wetted but may become wetted by some scenarios

29.2.3.4.1 ITEM GROUP 4A—NORMALLY WETTED

Item	Material of construction	
	ReNu Santoprene pumphead	**ReNu SEBS pumphead**
Tubing	Santoprene	SEBS
Fluid connection port	Glass filled polypropylene	PVDF
Fluid connection port end plugs	Glass filled polypropylene	PVDF
Fluid connection port end seals	FKM	FKM

29.2.3.4.2 ITEM GROUP 4B—NOT NORMALLY WETTED BUT MAY BECOME WETTED BY SOME SCENARIOS

	Item	Material of construction
4B1: Pumphead enclosure	Connection Collar	PVCu
	Pump Head Body	20% GF PPE+PS
	Outer Track Cover	20% GF PPE+PS
	Clear Cover	PC
	Rotor Seal	NBR and Steel
	Seal Ring	Stainless Steel
	Rotor Core	20% GF PPE+PS
	Information Label	Polyester, PET
	Screws	Stainless Steel
	Washer	Stainless Steel
	Spring	Stainless Steel
	NBR Washer	NBR
	Button	Noryl
	Shaft Seal	NBR
	Drain Cap	20% GF PPE+PS/ Santoprene
	Overflow cap	Santoprene

	Item	Material of construction
4B2: Pumphead internals	Rotor Seal	NBR and Steel
	Seal Ring	Stainless Steel
	Rotor Core	20% GF PPE+PS
	Rotor	GF PA6/TPU
	Tube Baffle	HDPE
	Bearings	Steel
	O-Rings Seals	NBR
	Lubricant	PFPE based Lubricant
	Track inserts	PP
	Misc	Polyester, Loctite HY4090
4B3: Pumphead to drive interface area	Rotor Seal	NBR and Steel
	Seal Ring	Stainless Steel
	Rotor Core	20% GF PPE+PS
	O-Rings Seals	NBR
	Outer Track Cover	20% GF PPE+PS
	Clear Cover	PC
	Button	Noryl

29.2.3.5 Item group 5—Drive

The following drive items are Not normally wetted but may become wetted by some scenarios

	Item	Material of construction
5B1: Drive enclosure	Drive cosmetic casework & lock	GF PPE+PS
	Drive enclosure casework	Fire retardant GF PPE+PS
	Keypad/HMI	Polyester
	Leak detector housing	PC
	HMI Cover	PC
	Overlays	Polyester
	Cable glands	PA6
	O-rings	NBR, FKM
	Lock bushing	Polypropylene
	Drive case work seals	Silicone
	Screws	Stainless steel
	M12 input/output fittings	Zinc alloy, nickel plated, (M12 connector (M) model only)
	M12 O-rings	FKM (M12 connector (M) model only)
	Baseplate	20 % glass filled PPE/PS
5B2: Pumphead to drive interface area	Drive enclosure casework	Fire retardant GF PPE+PS
	Drive case work seals	Silicone
	Drive shaft seal	Santoprene
	Drive shaft	Stainless steel 440C
5B3: Information labels	Information labels	Polyester, PET
5B4A: Power cable (product code ending in A)	Outer sheath	PVC
5B4B: Power cable (product code ending in B, C, D, E, K, R, U, Z)	Outer sheath	PCP
5B3: Drive internals	Mixture	Mixture of materials, including Aluminium

29.3 Chemical compatibility procedure

29.3.1 STEP 1

Using section 29.2, make a list of materials of construction that are normally wetted items during pumping and fluid transfer

29.3.2 STEP 2

Using section 29.2, make a list of materials of construction that are: Not normally wetted but may become wetted by some scenarios:

1. Exterior product surfaces, wetted by spillage or leakage of chemicals in the fluid path or operating environment
2. If the pump is operated to the point that the pumphead tubing fails, resulting in spillage or leakage of the pumped fluid on to materials of construction such as the :
    - Pumphead internals
    - Pumphead to drive interface area. See item group 4B3 and 5B2

WARNING

Operating the pumphead to the point of failure may result in a flow of chemicals from the inside of the pumphead into the pumphead to drive interface area, as a result of aggressive chemicals which are not compatible with the internal pumphead materials.

Chemicals could attack the materials in this area and enter the drive. The internal parts of the drive unit contain Aluminium which may react with some aggressive chemicals to form an explosive gas.

If you are pumping a chemical that may react with Aluminium to form an explosive gas, do not operate the pump to the point of pumphead failure. In addition, you must ensure the chemicals being pumped are chemically compatible with the materials of construction in the pumphead to drive interface area: Drive casework, Drive casework seals, Drive shaft, Drive shaft seal. (See item group 4B3: in section 29.2.3.4.2 and item group 5B2: in section 29.2.3.5)

In the event of a pumphead failure or a leak detection notification event. Stop the pump, remove from service and follow the pumphead replacement procedure (See section: 27.5.2.3).

29.3.3 STEP 3

Using the list of materials created in step 1 and 2, determine chemical compatibility:

- For items with a Watson-Marlow product code (78), use the Watson-Marlow Chemical Compatibility Guide:

  https://www.wmfts.com/en/support/chemical-compatibility-guide/
- For products not purchased from Watson-Marlow, use supplier compatibility guides.

NOTE 78	A combined check of the 3 normally wetted items (Item group 4A in section 29.2.3.4.1) of the pumphead is made using the pumphead name.

If the item is not chemically compatible, or chemical compatibility cannot be determined, then either:

- Select another material, for example a different pumphead, or fluid connector.
- Reassess the intended operation. For example, replacing the pumphead after a set number of run hours or pumphead revolutions prior to pumphead failure, to avoid contact with materials of construction which would not normally be wetted by the fluid path

29.3.4 STEP 4

Using the chemical compatibility analysis created by step 3, Do a risk assessment to determine the effect, and risk control methods a responsible person may take as a result of product failure due to chemical incompatibility, and the resulting impact of this failure on a Qdos range item, personnel or the operating environment, such as a:

- Chemical hazard from release of chemicals
- Physical hazard from the release of pressure or material fragments
- Explosion, or fire hazard from release of flammable liquids
- Other hazards not listed here

29.3.5 STEP 5

Using the hazard analysis and identified risk control methods in step 4, a responsible person must decide if the product is suitable for installation and use, prior to the users intended application.

30 PRODUCT END OF LIFE, RECYCLING, AND DISPOSAL

30.1 Product end of life

Any item of the Qdos pump range may meet its end of life sooner than expected due to incorrect installation, improper use or product damage. Periodic inspection for product damage is a maintenance task.

A Qdos range item will fail due to :

- Wear – The Qdos range item has reached its normal end of life point due to wear of components.
- Overpressure – As a result of being subjected to a pressure greater than the maximum rated pressure.
- Chemical incompatibility – being used with chemicals which are incompatible with Qdos range item.
- Pumphead—Lubricant leak - The pump has been tilted with the pumphead fitted beyond 5 degrees.

Once the product has reached its end of life, a responsible person must remove the product from service.

30.2 Product recycling and disposal

Materials of construction are provided in the Chemical Compatibility chapter (See section: 29.2) to enable a responsible person to determine whether the product can be recycled or must be disposed of.

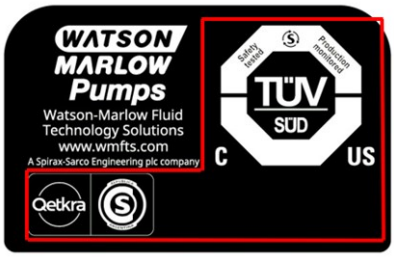
Recycle or dispose in accordance with the user organisations geographical waste regulations.

31 COMPLIANCE

31.1 Compliance marking on the product

31.1.1 Location of compliance marking—DRIVE

The product is marked to demonstrate compliance. These markings may be identified on the product in the location, illustrated by the pictures below:



31.1.2 Description of compliance marking

All markings of the Qdos range are listed, however some may apply only to some models or accessories.

CE	Complies with the applicable marking regulations, listed on the EU Declaration.	UKCA	Complies with the applicable marking regulations, listed on the UKCA Declaration.
	The pump or packaging cannot be handled as domestic waste. Dispose of the pump and packaging at an appropriate recycling centre for the recovery of electrical and electronic equipment		Complies to the applicable requirements of ACMA (Australian Communications and Media Authority)
	China RoHS - products contain substances above RoHS limits, and with the Environment Use Period of 10 years		

	The product conforms to the applicable Argentinian safety requirements		Certified by TUV to: Safety requirements for electrical equipment for measurement, control, and laboratory Use – Part 1: General requirements • IEC 61010-1:2010/AMD1:2016 • EN 61010-1:2010/A1:2019 • UL 61010-1:2012/R:2019-07 • CSA C22.2 No. 61010-1-12/AMD1:2018-11
	The ReNu 150, 300, 600 (Santroprene), ReNu 300 (SEBS), and the Qdos Pressure Sensing Kit with product codes (79): (0M9.605K.FTA and 0M9.605K.FTT) are certified for NSF/ANSI/CAN 61 and to NSF/ANSI/CAN 372 for lead free requirements. List of Compatible Chemicals: https://pld.iapmo.org/		

NOTE 79

Product code	Description
0M9.605K.FTA	Qdos H-FLO Pressure Sensing Kit
0M9.605K.FTT	Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+

31.2 Standards

31.2.1 Standards—Drive

EC standards	Safety requirements for electrical equipment for measurement, control and laboratory use: BS EN 61010- 1
	Degrees of protection provided by enclosures (IP code): BS EN 60529 amendments 1 and 2
	EN 61326-1:2013 Electrical Equipment for measurement control and laboratory use EMC requirements Part 1
Other Standards	UL 61010-1:2012 Ed.3 +R:21Nov2018
	CSA C22.2#61010-1-12:2012 Ed.3 +U1;U2;A1
	Meets the requirements of IEC 61010-1
	Radiated/conducted emissions: Meets the requirements of FCC 47CFR, Part 15
	Meets the requirements of NEMA 4X to NEMA 250

31.2.2 Standards—Pumphead

	The ReNu 150, 300, 600 (Santroprene), ReNu 300 (SEBS), are certified for NSF/ANSI/CAN 61 and to NSF/ANSI/CAN 372 for lead free requirements. List of Compatible Chemicals: https://pld.iapmo.org/

31.2.3 Standards—Pressure Sensing Kit

	The Qdos Pressure Sensing Kit with product codes (80): (0M9.605K.FTA and 0M9.605K.FTT) are certified for NSF/ANSI/CAN 61 and to NSF/ANSI/CAN 372 for lead free requirements. List of Compatible Chemicals: https://pld.iapmo.org/

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Product code	Description
0M9.605K.FTA	Qdos H-FLO Pressure Sensing Kit
0M9.605K.FTT	Qdos H-FLO Pressure Sensing Kit - Gland Version U and U+

31.3 Documentation

31.3.1 Documentation—Pump

Printed conformance documents are supplied within product packaging.

31.3.2 Documentation—Pressure Sensing Kit

An EU Declaration of Conformity is supplied in the box with the product.

32 GLOSSARY

B

Bold

Heavy typeface

D

Discharge

The line, pipe or connection containing fluid flowing out of the pumphead

Dry running

Running with gas in the pumphead

E

Element

The primary item inside a CWT pumphead, which acts against a track to transfer a fixed volume of fluid

F

Fluid

A substance that has no fixed shape and yields easily to external pressure; a gas or (especially) a liquid.

H

Halide

Binary chemical compound, of which one part is a halogen atom and the other part is an element or radical that is less electronegative (or more electropositive) than the halogen, to make a fluoride, chloride, bromide, iodide, astatide, or theoretically tennesside compound.

Hazard

Source of potential harm

I

Inlet

The line, pipe or connection containing fluid flowing into the pumphead

Intended task

Planning to use the product for a specific users organisations application, such as but not limited to: Product application selection, installation, safe use of the product by operators, cleaning, maintenance, troubleshooting or decommissioning

L

Lifecycle

The full life of the product from date of delivery of the product to end of life and disposal.

O

Operator

Competent person operating the product for its intended use.

P

Peristaltic pump tubing

A flexiable tube installed inside a ReNu pumphead, through which the pumped fluid is transferred as a result of a squeezing action of the tube between a rotor and track.

Positive displacement

The movement of a fixed amount of fluid, by trapping the fluid and forcing (displacing) that trapped volumen inot a discharge pipe or system

Prime

Draw fluid into the pumphead

Pump

The combination of drive and pumphead.

Pumphead

The component that provides the pumping action.

R

Responsible person

A person, competent in their area of expertise, in or acting on behalf of the user’s organisation responsible for: Product application selection, installation, safe use of the

product by operators, cleaning, maintenance, troubleshooting or decommissioning

Run dry

Running with gas in the pumphead

S

Standard pump

A specific combination of a drive and pumphead, whereby the model size number of the drive and pumphead match: For example: A Qdos 20 drive with a Qdos 20 ReNu pumphead

W

Wet location

Location where water or another conductive liquid may be present and is likely to cause reduced human body impedance due to wetting of the contact between the human body and the equipment, or wetting of the contact between the human body and the environment