Reference manual

Qdos® pumps (20, 30, 60, 120, CWT) 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

- Watson-Marlow®, Qdos®, CWT®, and ReNu® are registered trademarks of Watson-Marlow Limited.
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- 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 products 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 organisations control measures, such as working procedures and suitable Personal Protective Equipment.
- Approve water as a cleaning agent for use if required. See section: 19
- Train an operator:
    - Prior to performing a hazardous operation.
    - To operate, clean, or do maintenance tasks on the product, as required by the users organisation

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:

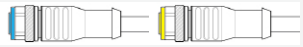
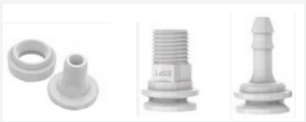
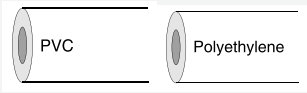
Glossary definitions	Words in **bold and light blue** are defined in the glossary.
Model variations	These instructions cover multiple models. Where instructions apply only to specific models, brackets ( ) are used.
Select button	Words highlighted in BLACK indicate the option on the screen selected by 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 % in dosing. The unique ReNu® pumphead achieves cost savings through minimal maintenance downtime.

2.1 Qdos Range—Introduction

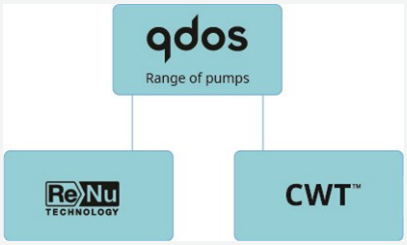
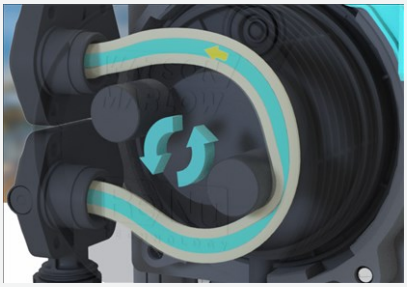
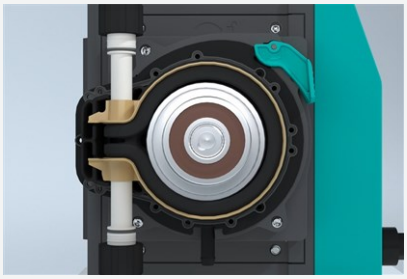
The Watson-Marlow Qdos range includes the following items:

Pump	Picture
Qdos and CWT peristaltic metering pumps	
Accessories: Drive	
Input and output control cables	
HMI cover	
Accessories: Fluid path—Hydraulic connectors	
Hydraulic connectors to connect the pumphead to the fluid path (Compression, Threaded, Hose Barb).	
Accessories: Fluid path—Interface tubing	
Fluid path interface tubing, for use with metric compression hydraulic connectors.	

Accessories: Fluid path—Accessory Kits	
A Qdos Pressure Sensing Kit is a fluid path accessory. Referred to as 'Pressure Sensing Kit' in this Reference Manual.	
A Qdos Hose Connector Kit is a fluid path accessory. Referred to as 'Hose Connector Kit' in this Reference Manual.	

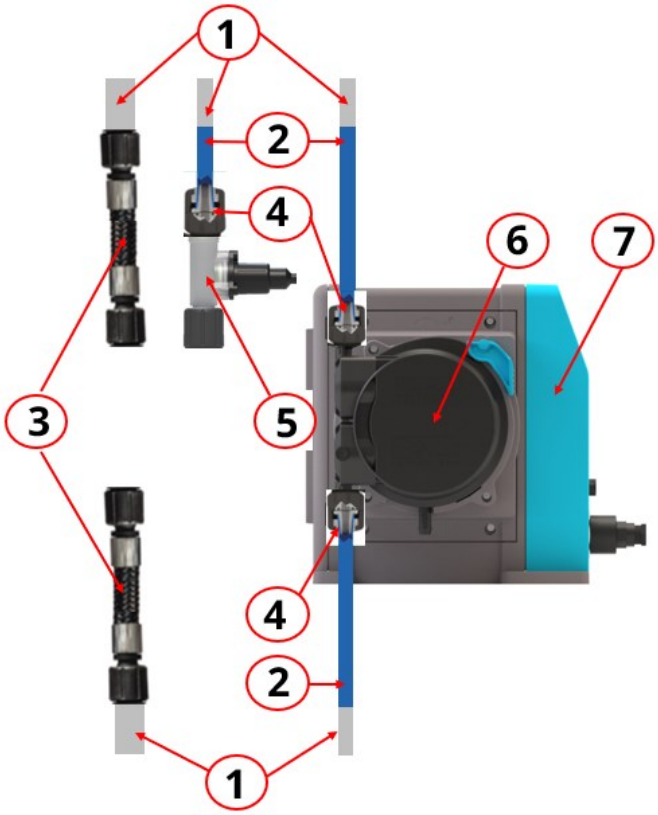
2.2 Qdos Range—Terminology

The following terminology is used in these instructions.

Qdos	Qdos refers to the entire Qdos range of pumps or pumpheads.	
ReNu	ReNu refers to a range of pumpheads which use **peristaltic pump tubing** inside.	
CWT	CWT refers to a range of pumpheads with an **element** inside.	

2.3 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:** Watson-Marlow Qdos interface tubing	For use with metric compression hydraulic connectors only
3	**Fluid Path:** Hose Connector Kit	May be mounted on inlet or discharge
4	**Fluid Path:** Hydraulic connectors	
5	**Fluid Path:** Pressure Sensing Kit	Mounted on discharge only, Hydraulic connectors or Hose Connector Kit may be mounted on top
6	**Fluid Path:** Pumphead	Multiple variations. A Qdos pump model is a combination of a pumphead and drive
7	Drive	

2.4 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:

2.4.1 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 22.

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: 20.6.2.2.1

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.
- Permeation of certain chemicals through the PTFE liner of the Hose Connector Kit
    - Full information is provided. See section: 22.2.3.3.1

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
- Permeation of chemicals through the PTFE hose liner of the Hose Connector Kit
- Operating environment

In the event of product damage due to chemical incompatibility. The product must be removed from service by a responsible person. See section: 20.5.2.1.1

For more information on checking chemical compatibility. See section: 22

3.7 Permeating chemicals—Hose Connector Kit

Certain chemicals may permeate through the Polytetrafluoroethylene (PTFE) hose liner of the Hose Connector Kit. In addition, chemicals containing halides, may permeate through the hose and form an acid on the exterior surfaces from exposure to moisture in the atmosphere.

In either case the permeating chemicals or the acid created may:

- Attack the exterior materials of construction of the product or Qdos pump the hose installed on
- Become a chemical hazard on the exterior surfaces of the product or Qdos pump the hose installed on

Full information is provided. See section: 22.2.3.3.1

4 PRODUCT OVERVIEW—PUMP

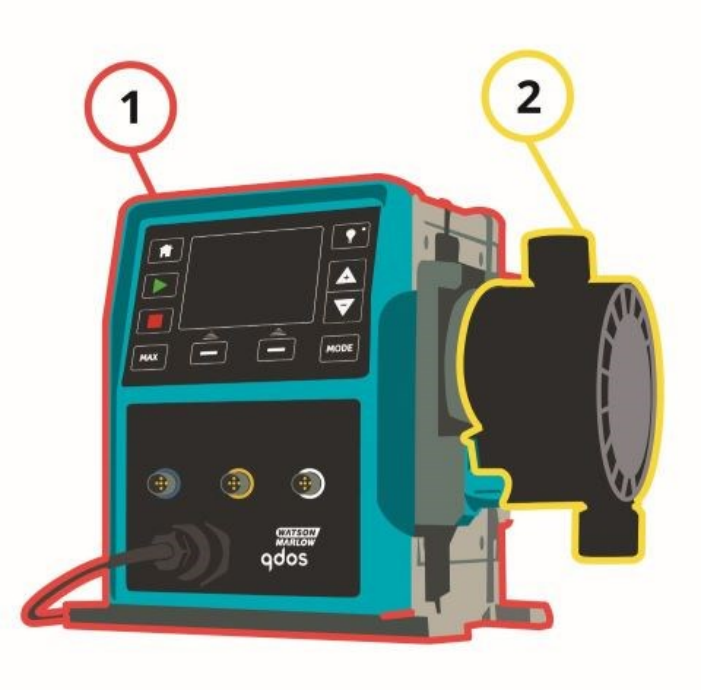
This chapter provides a product overview and summary specification. Installation specific specification is provided in the relevant installation chapter.

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 Variations—Drive

A Qdos drive is available in the following variations

<table>
<tr><td>Drive model</td><td>5 drive models (20, 30, 60, 120, CWT)</td></tr>
<tr><td>Pumphead mounting variations</td><td>2 pumphead mounting variations (left or right)</td></tr>
<tr><td>Control models</td><td>5 control models for each drive model:
<table>
<tr><th>Manual</th><th>Remote</th><th>PROFIBUS</th><th>Universal</th><th>Universal+</th></tr>
<tr><td>  </td><td>  </td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>For manual control</td><td>For remote control</td><td>For PROFIBUS control</td><td>For analog control</td><td>For analog control</td></tr>
</table></td></tr>
<tr><td>Universal and Universal+ Control model variant</td><td>Universal and Universal+ control models are available in two further variants
<table>
<tr><td>L</td><td>Standard: with M12 input/output connections</td><td>  </td></tr>
<tr><td>R</td><td>Option: with Relay module</td><td>  </td></tr>
</table></td></tr>
<tr><td>Power supply variant</td><td>2 power supply variants are available for each drive model
Alternating Current (AC): 100 – 240V AC 50/60 Hz
Direct Current (DC): 12 – 24V DC</td></tr>
</table>

4.1.2 General arrangement—Drive

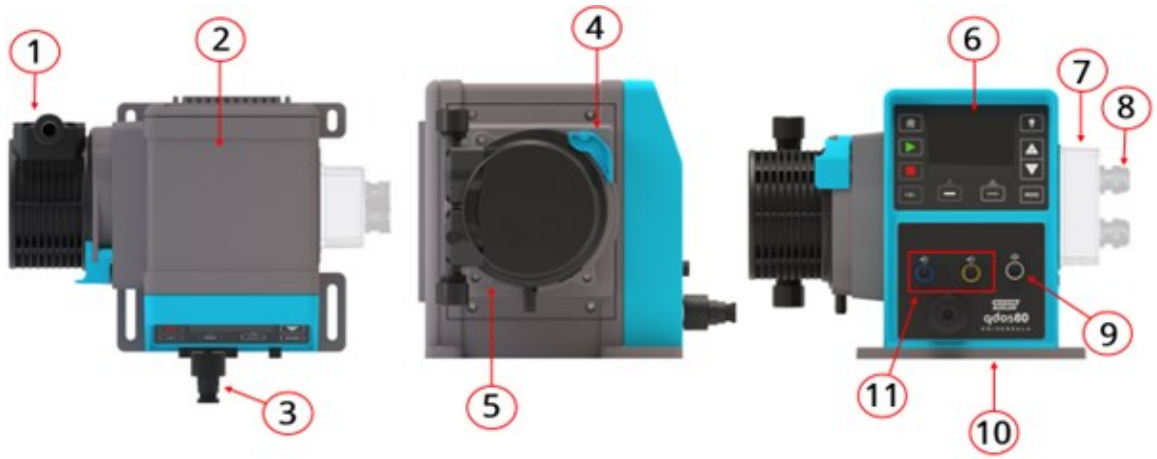
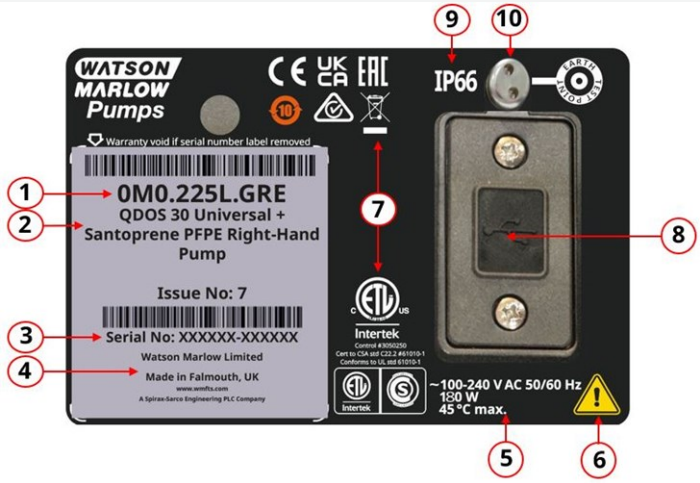


Figure number	Description	Comment
1	Pumphead	Left hand version shown
2	Drive	Qdos 60 shown
3	Power cable	Not detachable
4	Upper pumphead retaining lever	Qdos 60 shown
5	Lower pumphead retaining clamp (2)	Qdos 30 only
6	HMI (Display and Key pad)	Not available on Remote model
7	Relay module variant	Model option in place of M12 connectors for (Universal, Universal+)
8	Control cable connections	Relay module variant
9	Pressure Sensing Kit connection	Not available on Remote or Manual model
10	Mounting plate	Pump must be secured to surface
11	Control cable connections	Not relay module variant

NOTE 2	A Qdos 30 features an upper and lower retaining screw clamp. All other models feature an upper retaining lever only

4.1.3 Product marking—Drive

A nameplate is fixed to the rear of the drive. There are 2 versions, based upon power supply:

100 – 240V AC power supply model nameplate:	
12 – 24 V DC power supply model nameplate:	

Item	Description	Item	Description
1	Product code	6	Safety symbols
2	Product name	7	Compliance symbols
3	Serial number	8	USB socket cover: See section: 20.4
4	Manufacturer details	9	Ingress protection (IP) rating
5	Power supply requirement	10	Earth bond test point (3)

NOTE 3	AC Power supply model only

4.1.4 Variations—Pumphead

<table>
<tr><td>Pumphead model</td><td>Pumpheads are available in 5 models:
ReNu 20
ReNu 30
ReNu 60
ReNu 120
CWT 30</td></tr>
<tr><td>Pumphead type</td><td>There are 4 different pumphead types.
<table>
<tr><th>Pumphead</th><th>Application</th><th>Picture of pumphead</th></tr>
<tr><td>ReNu SEBS</td><td>Wide range of chemical compatibility. Optimised for sodium hypochlorite and sulphuric acid applications</td><td>  </td></tr>
<tr><td>ReNu Santoprene</td><td>General purpose with great chemical compatibility across a range of applications</td><td>  </td></tr>
<tr><td>ReNu PU</td><td>Optimised for oil-based polymers and aliphatic hydrocarbons</td><td>  </td></tr>
<tr><td>CWT EPDM</td><td>Extended consumable life with great chemical compatibility across a range of applications</td><td>  </td></tr>
</table></td></tr>
</table>

4.1.4.1 Pumphead to drive interchange

It is possible to install different pumpheads on some drive models, except the Remote model, in accordance with this table:

Drive	Standard pump configuration		Alternative pumphead which may be fitted to the drive	
Drive	**Pumphead**	**Maximum pressure (4)**	**Pumphead**	**Maximum pressure (4)**
Qdos 20	ReNu 20 SEBS	7 Bar / 100 psi	CWT 30 EPDM	9 Bar / 130 psi
	ReNu 20 PU (5)	4 Bar / 60 psi		
Qdos 30	ReNu 30 SEBS	4 Bar / 60 psi		
	ReNu 30 Santoprene	7 Bar / 100 psi (10 Bar / 145 PSI) (6)		
Qdos 60	ReNu 60 Santoprene	7 Bar / 100 psi		
	ReNu 60 SEBS	4 Bar / 60 psi		
	ReNu 60 PU	5 Bar / 70 psi		
Qdos 120	ReNu 120 Santoprene	4 Bar / 60 psi	ReNu 60 Santoprene	7 Bar / 100 psi
			ReNu 60 SEBS 60	4 Bar / 60 psi
			ReNu 60 PU	5 Bar / 70 psi
Qdos CWT	CWT 30 EPDM	9 Bar / 130 psi	ReNu 20 SEBS	7 Bar / 100 psi

NOTE 4	All pressures stated in these instructions are Root Mean Squared (RMS) gauge pressures.

NOTE 5	A Qdos 20 PU pumphead is not available on a remote model.

NOTE 6	Qdos 30 Santoprene can operate up to a maximum discharge pressure of 10 Bar (145 PSI), however flow rate and pumphead life will be affected.

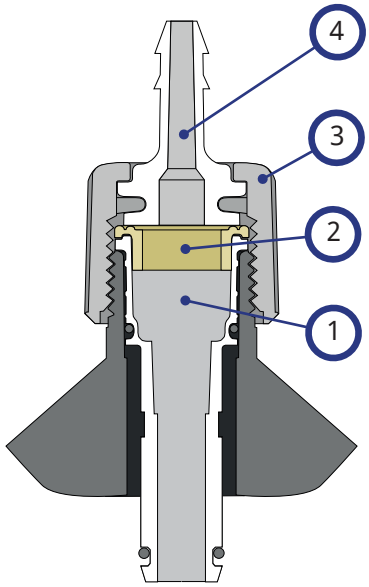
4.1.5 General arrangement—Pumphead

The general arrangement of a pumphead is provided in the picture below:

Item	Name	Normally wetted by pumped fluid?
1	Pumphead **discharge** port	Yes
2	Discharge hydraulic connector	Yes
3	Discharge fluid path	Yes
4	Pumphead **inlet** port	Yes
5	Inlet hydraulic connector	Yes
6	Inlet process fluid path	Yes
7	PFPE lubricant located inside the pumphead	No
8	Safety overflow	No

4.1.6 General arrangement—Pumphead fluid path connections

The general arrangement of the pumphead connections are shown below. The exact arrangement will vary with model.



Item	Name	Normally wetted by pumped fluid?
1	Pumphead port	Yes
2	Pumphead to hydraulic connector seal	Yes
3	Connection collar	No
4	Hydraulic connector	Yes

4.1.7 Food and beverage applications—Pumphead

EC1935/2004							
Pumphead	**Aqueous foods**	**Acidic foods (pH<4.5)**	**Alcoholic foods (<20% alcohol)**	**Alcoholic foods (>20% alcohol)**	**Dairy**	**Fatty foods**	**Repeated use**
ReNu 20 PU	✓	✓	✓	×	✓	✓	✓
ReNu 20/30/60 SEBS	✓	✓	✓	✓	✓	×	✓
ReNu 30 [7]/60/120 Santoprene	×	×	×	×	×	×	×
CWT 30 EPDM	×	×	×	×	×	×	×

FDA Regulation 21 CFR								
Pumphead	**Aqueous foods**	**Acidic foods (pH<4.5)**	**Alcoholic foods (<20% alcohol)**	**Alcoholic foods (>20% alcohol)**	**Dairy**	**Fatty foods**	**Repeated use**	**Infant formula and human milk**
ReNu 20 PU	✓	✓	✓	×	✓	✓	✓	✓
ReNu 20/30 [7]/60	✓	✓	✓	✓	✓	✓	✓	✓
ReNu 30 [7]/60/120	✓	×	✓	×	✓	×	✓	×
CWT 30 EPDM	×	×	×	×	×	×	×	×

NOTE[7]	The ReNu 30 pumpheads require the EPDM o-rings to be installed, to achieve the food certification listed above. Ensure the EPDM o-rings are chemically compatible with the pumped fluid.

4.1.8 Product marking—Pumphead

All pumpheads for the Qdos range have the following information labels

Item	Description	Item	Description
1	Product name	5	Safety symbol: Hot surface
2	Material of Construction: Pumphead tubing and pumphead port	6	Safety symbol: Potential hazard follow a safety instruction: In this specific instance—Check chemical compatibility (See section: 22)
3	Material of Construction: Internal lubricant	7	Pressure valve setting (8)
4	Maximum discharge pressure		

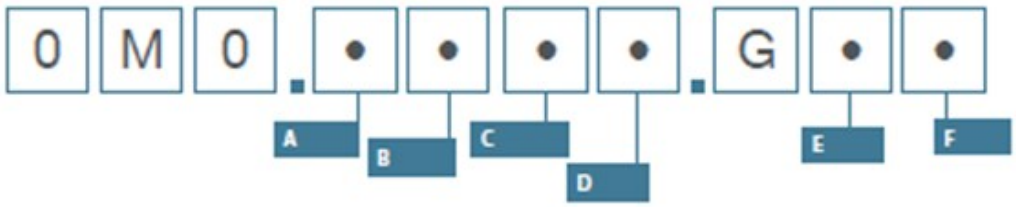
NOTE [8]	The pressure valve must be set on Qdos 20, 60 and 120 pumpheads during installation or removal. Qdos 30 and CWT pumpheads do not have a pressure valve.

4.1.9 Product code—Pumphead

Pumpheads			
Image	**Description**		**Product code**
	ReNu Santoprene pumphead (PFPE lubricant)	Qdos30	0M3.2200.PFP
		Qdos60	0M3.3200.PFP
		Qdos120	0M3.4200.PFP
	ReNu SEBS pumphead (PFPE lubricant)	Qdos20	0M3.1800.PFP
		Qdos30	0M3.2800.PFP
		Qdos60	0M3.3800.PFP
	ReNu PU pumphead (PFPE lubricant)	Qdos20	0M3.1500.PFP
		Qdos60	0M3.3500.PFP
	CWT EPDM pumphead (PFPE lubricant)	Qdos CWT	0M3.5700.PFP
	CWT FKM pumphead (PFPE lubricant)	Qdos CWT	0M3.5900.PFP

4.1.10 Product code—Pump

The pump product model may be identified from its product code using this guide at time of manufacture.



Pump part numbers					
A	B	C	D	E	F
Model	Pumphead	Drive Variant	Digital I/O type	Pumphead orientation (10)	Power plug
1: Qdos 20	2: Santoprene	1: Remote	L: See NOTE (9) R: See NOTE (9)	L: Left	A: US
2: Qdos 30	5: PU	3: Manual		R: Right	E: European
3: Qdos 60	7: EPDM	4: Universal			U: UK
4: Qdos 120	8: SEBS	5: Universal+			K: Australia
5: Qdos CWT™		7: PROFIBUS			R: Argentina
					C: Swiss
					D: India, South Africa
					B: Brazil
					V: 12-24V DC

NOTE [9]	L: Standard pump variant (**Manual, Remote and PROFIBUS models**) L: Open collector outputs, 5 – 24V DC inputs (**Universal, Universal+ models**) R: Relay module, Volt free 110V AC 30V DC relay contacts (**Universal, Universal+ models**)

NOTE [10]	Left and right is relative to viewing the HMI at the front of the pump.

4.2 Specification—Pump

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

4.2.1 Performance

4.2.1.1 Maximum speed and flow rate

The maximum speed and flow rate [(11)] is provided in the table below.

		Model: Manual, PROFIBUS, Universal, Universal+			Model: Remote		
		Speed	flow rate 1		Speed	flow rate 2	
Drive	Pumphead	RPM	ml/min	USGPH	RPM	ml/min	USGPH
Qdos 20	ReNu 20 SEBS	55	333	5.30	55	333	5.30
	ReNu 20 PU	55	460	7.29	×	×	×
	CWT 30 EPDM	125	500	7.93	×	×	×
Qdos 30	ReNu 30 Santoprene	125	500	7.93	125	500	7.93
	ReNu 30 SEBS	125	500	7.93	125	500	7.93
Qdos 60	ReNu 60 Santoprene	125	1000	15.85	125	1000	15.85
	ReNu 60 SEBS	125	1000	15.85	125	1000	15.85
	ReNu 60 PU	125	1000	15.85	125	1000	15.85
Qdos 120	ReNu 120 Santoprene	140	2000	31.70	140	2000	31.70
	ReNu 60 SEBS	125	1000	15.85	×	×	×
	ReNu 60 PU	125	1000	15.85	×	×	×
Qdos CWT	CWT 30 EPDM	125	500	7.93	125	500	7.93
	ReNu 20 SEBS	55	333	5.30	×	×	×
	ReNu 20 PU	55	460	7.29	×	×	×

NOTE[11]	flow rates are based on pumping water at 20 °C with a 0 bar.g **inlet** and **discharge** pressure. All pressures stated in these instructions are Root Mean Squared (RMS) gauge pressures.

4.2.1.2 Maximum inlet pressure

For all models the maximum **inlet** pressure is: 2 bar

4.2.1.3 Maximum discharge pressure

		Maximum Discharge [12] Pressure	
Drive	**Pump Head**	**Bar**	**PSI**
Qdos 20	ReNu 20 SEBS	7	100
	ReNu 20 PU	4	60
	CWT 30 EPDM	9	130
Qdos 30	ReNu 30 Santoprene [12]	7 (10 [13])	100 (145 [13])
	ReNu 30 SEBS	4	60
Qdos 60	ReNu 60 Santoprene	7	100
	ReNu 60 SEBS	4	60
	ReNu 60 PU	5	70
Qdos 120	ReNu 120 Santoprene	4	60
	ReNu 60 Santoprene	7	100
	ReNu 60 SEBS	4	60
	ReNu 60 PU	5	70
Qdos CWT	CWT 30 EPDM	9	130
	ReNu 20 SEBS	7	100
	ReNu 20 PU	4	60

NOTE[12]	Discharge pressure is the maximum pressure at the pumphead **discharge** port that the pump can provide a flow rate against. Pressure is measured as RMS (Root Mean Squared) gauge pressure.

NOTE [13]	Qdos 30 Santoprene can operate up to a maximum discharge pressure of 10 Bar (145 PSI), however flow rate and pumphead life will be affected.

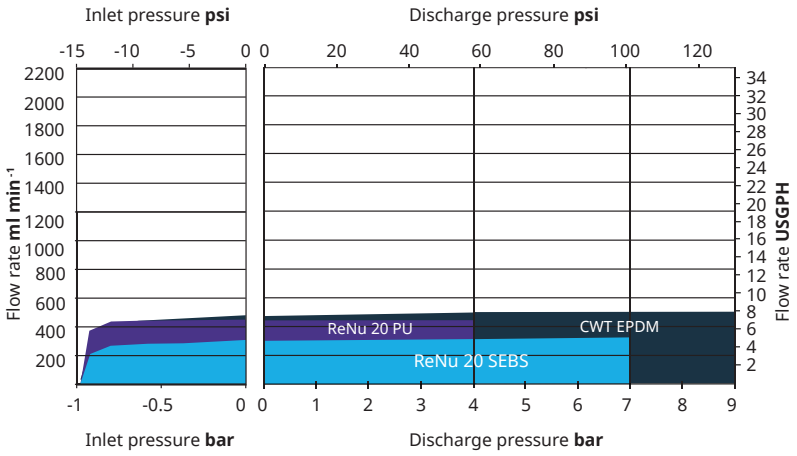
4.2.1.4 Performance curves

The performance curves in this section are based on the maximum speed of a **standard pump** configuration. The performance curves for those drives which can have alternative pumpheads fitted from standard are not shown.

4.2.1.4.1 QDOS 20

Performance curve pump speed: 55 rpm (ReNu 20 SEBS, ReNu 20 PU), 125 rpm (CWT 30 EPDM)

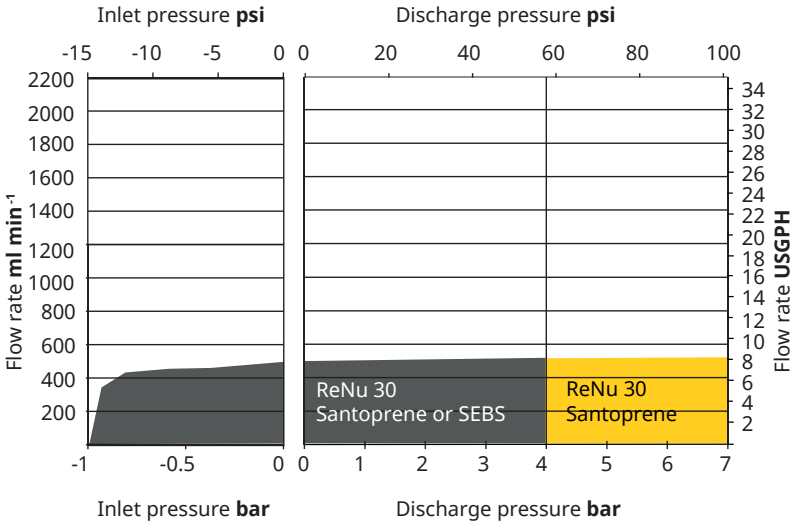
Fluid: Water at 20 °C



4.2.1.4.2 QDOS 30

Performance curve speed: 125 rpm

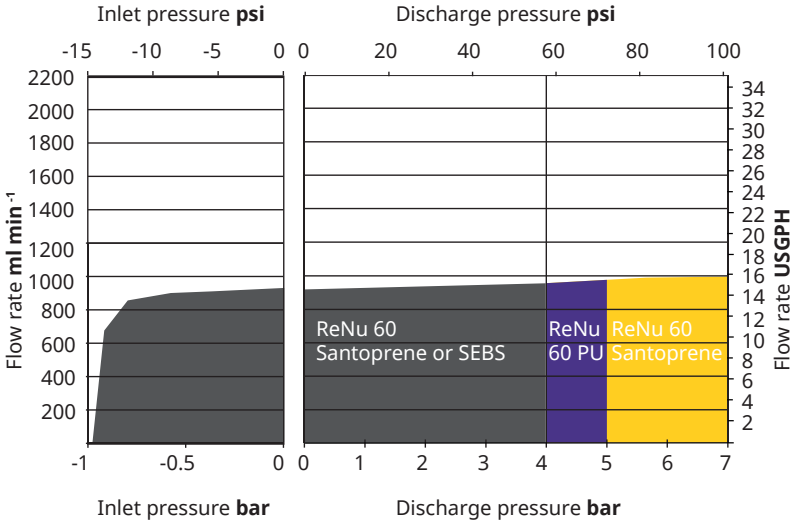
Fluid: Water at 20 °C



4.2.1.4.3 QDOS 60

Performance curve pump speed: 125 rpm

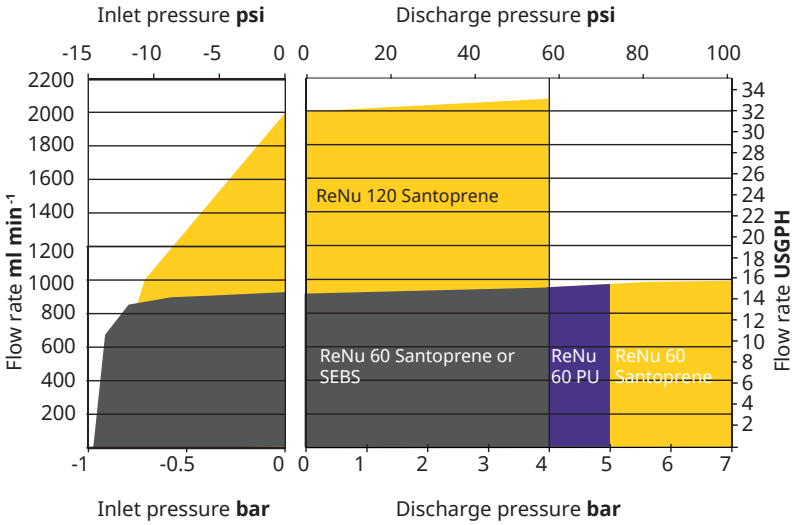
Fluid: Water at 20 °C



4.2.1.4.4 QDOS 120

Performance curve pump speed: 125 rpm (ReNu 60 SEBS, ReNu 60 Santoprene, ReNu 60 PU), 140 rpm (ReNu 120 Santoprene)

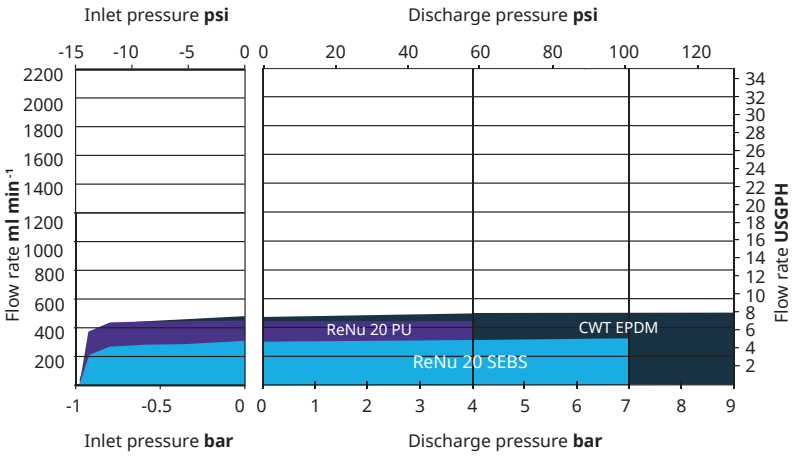
Fluid: Water at 20 °C



4.2.1.4.5 CWT

Performance curve pump speed: 55 rpm (ReNu 20 SEBS, ReNu 20 PU), 125 rpm (CWT 30 EPDM)

Fluid: Water at 20 °C



4.2.2 Physical specification

4.2.2.1 Environment and operating conditions

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

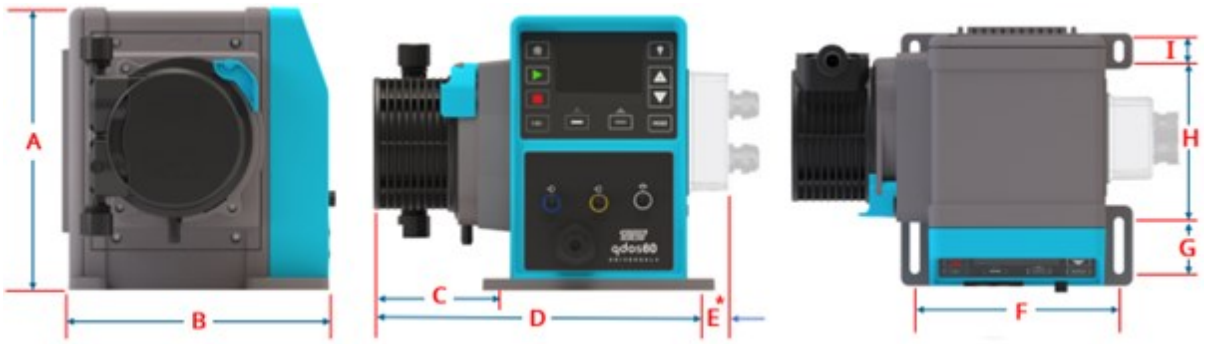
Ambient temperature range	5 °C to 45 °C (41 °F to 113 °F)
Maximum humidity (non-condensing)	Maximum relative humidity 80 % for temperatures up to 31 °C (88 °F), decreasing linearly to 50 % relative humidity at 40 °C (104 °F).
Maximum altitude	2,000 m (6,560 ft)
Pollution degree of the intended environment	2
Noise	<70 dB(A) at 1 m
Maximum fluid temperature (14)	SEBS (15) pumphead: 40 °C (104 °F) Santoprene pumphead: 45 °C (113 °F) PU pumphead: 45 °C (113 °F) Pressure Sensing Kit (15): 45 °C (113 °F) Hose Connector Kit (15): 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 (16)
Ingress protection rating	IP66 to BS EN 60529, Meets the requirements of NEMA 4X

NOTE 14	Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in section 22.

NOTE 15	If using a SEBS pumphead with a Pressure Sensing Kit or Hose Connector Kit the lower temperature of 40 °C (104 °F) applies.

NOTE 16	**AC power:** 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. **DC power:** Neither the power cable blade fuse or fuse holder are IP66 or NEMA 4X rated. In applications requiring IP66 or NEMA 4X, the portion of the power cable containing the blade fuse holder must be installed in a corresponding rated enclosure.

4.2.2.2 Dimensions—Pump



Dimensions					
Dimension	Qdos 20 (17)	Qdos 30	Qdos 60	Qdos 120	Qdos CWT (18)
A	234 mm (9.2 ")				
B	214 mm (8.4 ")				
C	104.8 mm (4.1 ")	71.5 mm (2.8 ")	104.8 mm (4.1 ")	104.8 mm (4.1 ")	117.9 mm (4.6 ")
D	266 mm (10.5 ")	233 mm (9.2 ")	266 mm (10.5 ")	266 mm (10.5 ")	290.9 mm (11.5 ")
E (19)	43 mm (1.7 ")				
F	173 mm (6.8 ")				
G	40 mm (1.6 ")				
H	140 mm (5.5 ")				
I	10 mm (0.4 ")				

NOTE 17	With a ReNu 20 pumphead fitted.

NOTE 18	With a CWT pumphead fitted.

NOTE 19	Relay module versions

4.2.2.3 Weight

The unpacked weight range of the Qdos range is shown in the tables below.

4.2.2.3.1 WEIGHT—DRIVE

Model	Qdos 30 drive		Qdos 20, 60, 120 and CWT drive	
	kg	lb	kg	lb
Manual	4.1	9.04	4.6	10.14
Remote	4.0	8.82	4.5	9.92
Universal	4.1	9.04	4.6	10.14
Universal+	4.1	9.04	4.6	10.14
PROFIBUS	4.1	9.04	4.6	10.14
Universal 24 V relay	4.3	9.48	4.8	10.58
Universal+ 24 V relay	4.3	9.48	4.8	10.58
Universal 110 V relay	4.3	9.48	4.8	10.58
Universal+ 110 V relay	4.3	9.48	4.8	10.58

4.2.2.3.2 WEIGHT—PUMPHEAD

Pumphead	Product code	Kg	Ibs
ReNu 20 PU	0M3.1500.PFP	0.98	2.16
ReNu 20 SEBS	0M3.1800.PFP	1.10	2.43
ReNu 30 Santoprene	0M3.2200.PFP	0.80	1.76
ReNu 30 SEBS	0M3.2800.PFP	0.80	1.76
ReNu 60 Santoprene	0M3.3200.PFP	0.80	1.76
ReNu 60 SEBS	0M3.3800.PFP	0.80	1.76
ReNu 60 PU	0M3.3500.PFP	0.80	1.76
ReNu 120 Santoprene	0M3.4200.PFP	0.80	1.76
CWT 30 EPDM	0M3.5700.PFP	2.20	4.85

4.2.3 Electrical power specification and ratings

4.2.3.1 Alternating Current (AC) models

AC supply voltage / frequency	~100-240 V 50/60 Hz
Overvoltage category	II
Maximum voltage fluctuation	±10 % of nominal voltage
Rated power	180 W

4.2.3.2 Direct Current (DC) models

	DC (Direct Current)
Supply voltage	12-24 V DC
Rated power	130 W (12V DC) 180 W (24V DC)

4.2.3.2.1 DC POWER SUPPLY INPUT CHARACTERISTICS

DC power supply option - input characteristics					
Parameter input supply	Limits			Units	Comment
	Minimum	Nominal	Maximum		
Operating limits at cable ring terminals	10.4		32.0	V DC	At full discharge /charge
Maximum input current		15.2		A	At 10.5V/130W
Maximum input current		9.5		A	At 24V/200W
Inrush current		17		A	No Load
Inrush current duration		20		mS	
Efficiency @ ring terminals	87	91	95	%	100W@10/12/24V
Typical Qdos pump power required	5		120	W	Qdos 20, 30, 60, 120, CWT
Maximum input power			200	W	Qdos 20, 30, 60, 120, CWT

4.2.3.3 Limits of intermittent operation

For applications that require the pump to be started and stopped regularly, ANALOG, CONTACT or PROFIBUS control should be used. There is no limit to the number of start/stop cycles using these control methods.

The pump is not designed to be power cycled (turned on and off) as a regular method of starting and stopping the pump.

4.2.3.3.1 POWER CYCLES PER HOUR

Specification	Value
Maximum number of power cycles (pump turned on/off) per hour	20

NOTICE

Do not power cycle the pump either manually or by using the auto restart feature for more than 20 power cycles per hour. This will reduce the operating life of the product.

4.2.4 Control specification

4.2.4.1 Speed adjustment and motor range

The speed increment depends on the control model, and operating mode of the pump. This information is summarised in the table below.

Control methods	Manual	PROFIBUS	Universal	Universal+	Remote
Manual speed adjustment range	3333:1 (Qdos 20)				
	5000:1 (Qdos 30)				
	10000:1 (Qdos 60)				
	20000:1 (Qdos 120)				
	5000:1 (Qdos CWT)				
Minimum driveshaft adjustment speed increment (Dependent upon the operating mode and chosen flow unit)	0.007	0.1	0.003	0.003	0.078
4-20mA resolution			1600:1		
PROFIBUS speed resolution		550:1 (Qdos 20)			
		1250:1 (Qdos 30)			
		1250:1 (Qdos 60)			
		1400:1 (Qdos 120)			
		1250:1 (Qdos CWT)			

4.2.4.2 Control feature summary table

Operational modes	Manual	Remote	PROFIBUS	Universal	Universal+
Manual	✓	—	✓	✓	✓
PROFIBUS	—	—	✓	—	—
Contact	—	—	—	✓	✓
4-20mA	—	✓	—	✓	✓
Fault reporting	✓	✓	✓	✓	✓

Features	Manual	Remote	PROFIBUS	Universal	Universal+
Numerical flow display	✓	—	✓	✓	✓
Numerical speed display	✓	—	✓	✓	✓
Fluid level monitor	✓	—	✓	✓	✓
Max (**prime**)	✓	—	✓	✓	✓
Auto restart (after power restored)	✓	✓	✓	✓	✓
Fluid recovery	✓	—	✓	✓	✓
Leak detection	✓	✓	✓	✓	✓
3.5” (88.9mm) colour TFT display	✓	—	✓	✓	✓
LED Pump status icons	—	✓	—	—	—

Security	Manual	Remote	PROFIBUS	Universal	Universal+
Keypad lock	✓	—	✓	✓	✓
PIN lock to protect set up	✓	—	✓	✓	✓

PROFIBUS	Manual	Remote	PROFIBUS	Universal	Universal+
Speed set point	—	—	✓	—	—
Speed feedback	—	—	✓	—	—
Flow calibration function	—	—	✓	—	—
Hours run	—	—	✓	—	—
Revolution counter	—	—	✓	—	—
Leak detection	—	—	✓	—	—
Low fluid level alarm	—	—	✓	—	—
Diagnostic feedback	—	—	✓	—	—

Control methods [20]	Manual	Remote	PROFIBUS	Universal	Universal+
Input/Output options	—	L	L	L or R	L or R
Manual control capability	✓	—	✓	✓	✓
4-20mA input	—	✓	—	✓	✓
4-20mA input two point calibration	—	—	—	—	✓
4-20mA output	—	✓	—	—	✓
Contact input (pulse/batch)	—	—	—	L or R	L or R
Run stop input	—	✓	—	✓	✓
Run status open collector output	—	✓	—	L only	—
Alarm open collector output	—	✓	—	L only	—
Two configurable open collector outputs [21]	—	—	—	—	L only
Two configurable relay outputs [21]	—	—	—	R only	—
Four configurable relay outputs [21]	—	—	—	—	R only
Remote fluid recovery	—	✓	—	L only	L only
Pressure sensor input (Pressure Sensing Kit purchased separately)	—	—-	✓	✓	✓

NOTE 20	L: Standard pump variant (**Manual, Remote and PROFIBUS models**) L: Open collector outputs, 5 – 24V DC inputs (**Universal, Universal+ models**) R: Relay module, Volt free 110V AC 30V DC relay contacts (**Universal, Universal+ models**)

NOTE 21	Configurable outputs, including Run status and Alarm output.

4.2.4.3 Start up defaults

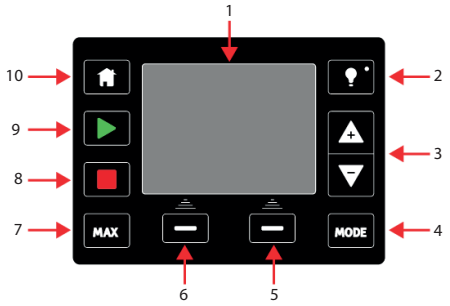
The values in this section are for either a new pump, or a pump which has been restored to default using the general settings sub menu. A user should always set up the pump using the HMI for the application.

Pump general defaults			
Flow rate	• Qdos120: 960 ml/min • Qdos60: 480 ml/min • Qdos30: 240 ml/min • Qdos20: 120 ml/min • Qdos20 PU: 158.4 ml/min • Qdos® CWT™: 300 ml/min	**Pump status**	Stopped
Calibration	• Qdos120: 16 ml/rev • Qdos60: 8 ml/rev • Qdos60 PU: 8.8 ml/rev • Qdos30: 4 ml/rev • Qdos20: 6.67 ml/rev • Qdos20 PU: 8.8 ml/rev • Qdos® CWT EPDM™: 4.9 ml/rev	**Flow unit**	ml/min
Backlight	30 minutes	**Pump tag**	WATSON-MARLOW
Auto restart	Off		

Pressure Sensing Kit Defaults		
Sensor delay	1 minute (01:00 in mm:ss)	
Trigger signal type	Raw signal	
Alarm maximum	10.00 Bar	145.0 PSI
Warning maximum	10.00 Bar	145.0 PSI
Warning minimum	0.00 Bar	0.0 PSI
Alarm minimum	0.00 Bar	0.0 PSI

4.2.5 Control panel overview

A summary of the key function is provided below:



Item	Name	Summary
1	Colour TFT display	After 30 minutes of no keypad activity, the HMI display will dim to 50 % brightness
2	Backlight	The **BACKLIGHT** key restores full power to the display and resets the 30 minutes brightness time
3	+/- Keys	Keys are used to change programmable values or move the selection bar up or down in the menus.
4	**MODE**	When the **MODE** key is pressed the MODE menu is shown. (22)
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**	When the **HOME** key is pressed it will return the user to the last known operating mode (22).

NOTE[22]	If the **MODE** or **HOME** key is pressed while changes to settings are in progress, these changes will not be saved.

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**
	Input lead, M12 IP66, 3 m (10 ft) length	0M9.203X.000
	Output lead, M12 IP66, 3 m (10 ft) length	0M9.203Y.000
	HMI protective cover	0M9.203U.000
	Qdos and H-FLO Software Update USB flash drive [(23)] Kingston MicroDuo 3C	0M9.000U.000

NOTE [23]	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 the software for the updating of pumps for use with a Pressure Sensing Kit which do not have the required software version installed. For more information see section 5.5.7

5.2 Hydraulic connectors

5.2.1 Hydraulic connectors supplied with pump or spare drive

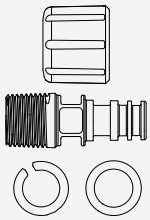
The following Hydraulic connectors are supplied with a pump or spare drive.

Supplied Hydraulic connection pack (2 of each item) with pumps or spare drives			
Image	**Description**	**Size**	**Comment**
	Metric —Polypropylene (PP) compression fittings; For use with Qdos Interface tubing. **Product code:** 0M9.221H.P01	Set of four sizes: • 6.3x11.5 mm • 10x16 mm • 9x12 mm • 5x8 mm	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).
	1/2” Hose barb, polypropylene (PP) **Product code:** 0M9.401H.P05	to fit 1/2" internal diameter hose/tube	Supplied as a pair (2 items) with a 120 model pump or spare drive model, in addition to compression fittings.
	Imperial [(24)]— PVDF compression fittings **Product code:** 0M9.001H.F20	Set of two sizes: • 3/8'' x 1/4" • 1/2'' x 3/8''	Supplied as a pair (2 packs) with pumps or spare drives, which have a US power plug (product code ending in an A).

NOTE [24]	Imperial compression fittings cannot be used with Watson-Marlow Qdos interface tubing or PTFE tubing

5.2.2 Accessory Hydraulic connectors

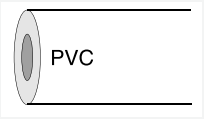
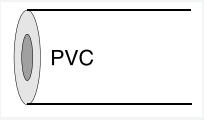
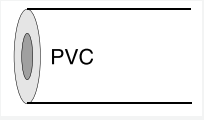
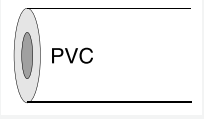
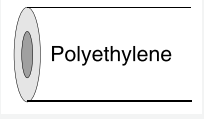
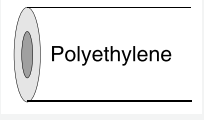
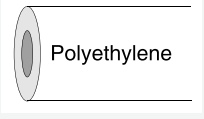
The following Hydraulic connectors may be purchased as an accessory.

Accessory Hydraulic connectors - All models			
Image	**Description**	**Product code**	**Material**
	Hydraulic connection pack (2 items), PVDF, 1/2 ” hose barb	0M9.401H.F05	PVDF
	Hydraulic connection pack (2 items), polypropylene barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.P02	PP
	Hydraulic connection pack (2 items), PVDF barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.F02	PVDF
Accessory Hydraulic connectors - Qdos 20, 60 and 120 models only (25)			
	Hydraulic connection (25) pack (2 complete items), polypropylene, threaded fittings, 1/2 ” BSP	0M9.401H.P03	PP, with FKM seals
	Hydraulic connection (25) pack (2 complete items), polypropylene, threaded fittings, 1/2 ” NPT	0M9.401H.P04	PP, with FKM seals
	Hydraulic connection (25) pack (2 complete items), PVDF, threaded fittings, 1/2 ” BSP	0M9.401H.F03	PVDF, with FKM seals
	Hydraulic connection (25) pack (2 complete items), PVDF, threaded fittings, 1/2 ” NPT	0M9.401H.F04	PVDF, with FKM seals

NOTE 25	The 1/2" hydraulic connectors are not suitable for use with Qdos 30 or CWT pumpheads.

5.3 Interface tubing

Watson-Marlow fluid path interface tubing is designed specifically for use with the Watson-Marlow metric compression fitting pack. There are 2 materials, 2 sizes for each material, and 2 lengths for each material to make 8 individual product offerings.

Interface tubing			
Image	**Description**	**Product code**	**Material**
	Interface tubing, PVC 6.3x11.5 mm, 2 m (6.5 ft) length	0M9.2222.V6B	PVC
	Interface tubing, PVC 10x16 mm, 2 m (6.5 ft) length	0M9.2222.VAD	PVC
	Interface tubing, PVC 6.3x11.5 mm, 5 m (16 ft) length	0M9.2225.V6B	PVC
	Interface tubing, PVC 10x16 mm, 5 m (16 ft) length	0M9.2225.VAD	PVC
	Interface tubing, polyethylene 9x12 mm, 2 m (6.5 ft) length	0M9.2222.E9C	PE
	Interface tubing, polyethylene 5x8 mm, 2 m (6.5 ft) length	0M9.2222.E58	PE
	Interface tubing, polyethylene 9x12 mm, 5 m (16 ft) length	0M9.2225.E9C	PE
	Interface tubing, polyethylene 5x8 mm, 5 m (16 ft) length	0M9.2225.E58	PE

5.4 Food and beverage applications—Accessories

Fluid path items	EC1935/2004	FDA Regulation 21 CFR
Interface tubing – PE and PVC	✓	✓
Hydraulic connection – hose barb fitting – PVDF , PP		
Hydraulic connection – metric compression fitting – PP		
Hydraulic connection – threaded fitting – PVDF		
Hydraulic connection – imperial compression fitting – PVDF	×	×
Pressure Sensing Kit	× (26)	× (26)
Hose Connector Kit	×	×

NOTE [26]	The Pressure Sensing Kit has a recess which makes it unsuitable for food and beverage applications. See section: 5.5.4.1

5.5 Pressure Sensing Kit

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

5.5.1 Model suitability—Pressure Sensing Kit

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

- Universal
- Universal+
- PROFIBUS

Manual and remote model pumps do not feature a pressure sensor connection.

5.5.2 Features and benefits—Pressure Sensing Kit

The Pressure Sensing Kit has the following benefits and features:

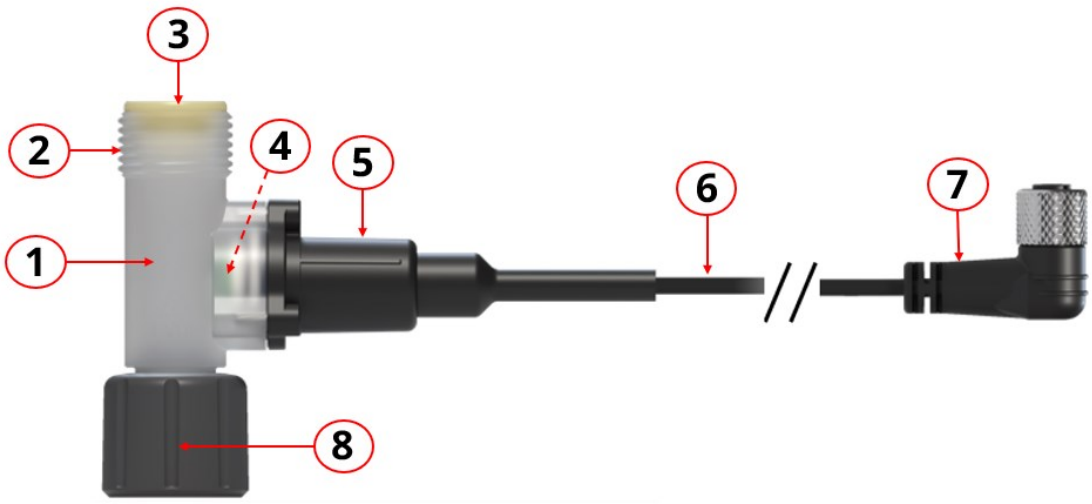
- Real time gauge pressure monitoring by a 4-20 mA signal
- Pre-calibrated [(27)] pressure sensor
- Configurable Minimum and Maximum pressure alarms and warnings between a range of 0.00 and 15.00 Bar (0.0 to 217.5 PSI). Alarms can be set to stop the pump or be disabled.
- Time delay feature to suspend 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 [27]	The Pressure Sensing Kit is pre-calibrated during production and cannot be re-calibrated.

5.5.3 Intended mounting—Pressure Sensing Kit

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

5.5.4 General arrangement—Pressure Sensing Kit



Item	Description	Normally wetted by pumped fluid?
1	Pressure sensor tee piece	Yes
2	Outlet: Discharge connection [28] for attachment of a hydraulic connector or Hose Connector Kit	Yes
3	Outlet: Fluid connector seal [29]	Yes
4	Inside: Pressure sensor tee seal (sensor to pressure sensor tee piece)	Yes
5	Pressure sensor housing, with environmental seal	No
6	Control cable, integrated	No
7	M12 control cable connector	No
8	Inlet: Qdos pumphead connection collar (female) [28]	No

NOTE [28]	Items 2 and 8 are the same thread size as a Qdos pumphead.

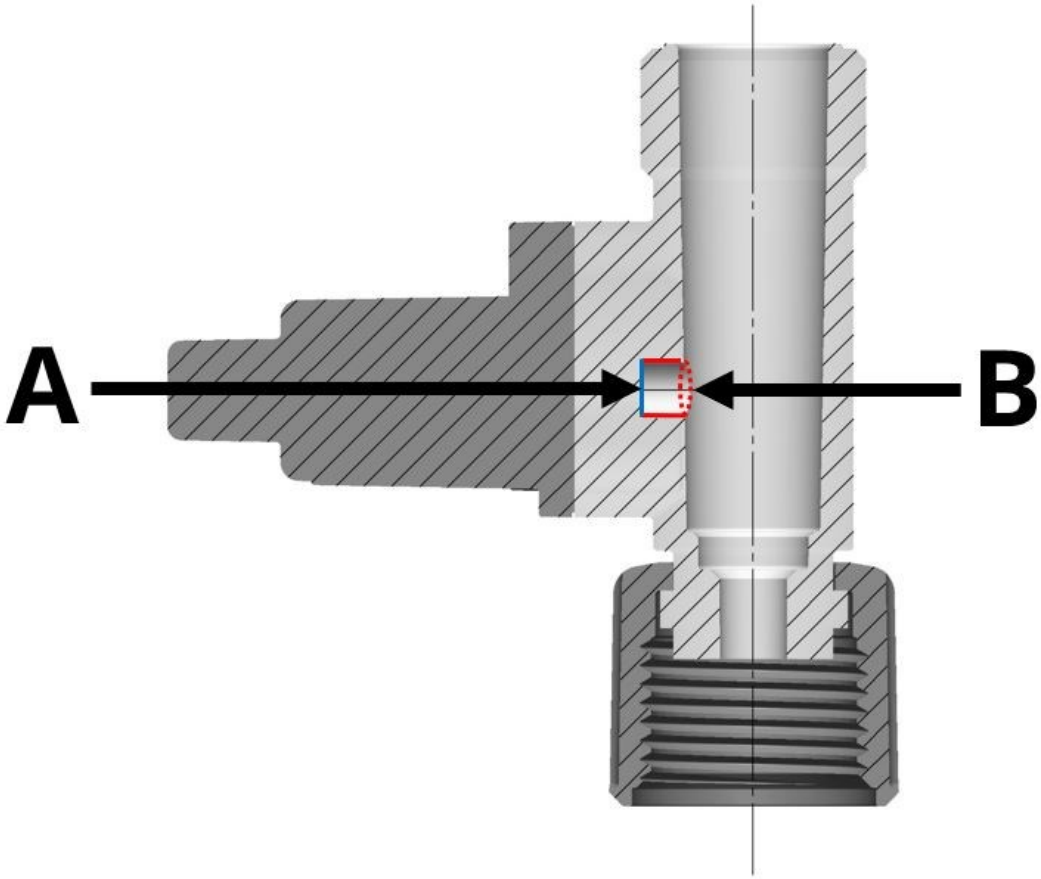
NOTE [29]

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 Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA	Santoprene, and SEBS supplied in packaging tray
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA	PU, and FKM, supplied in packaging tray

5.5.4.1 Recess—Pressure Sensing Kit

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

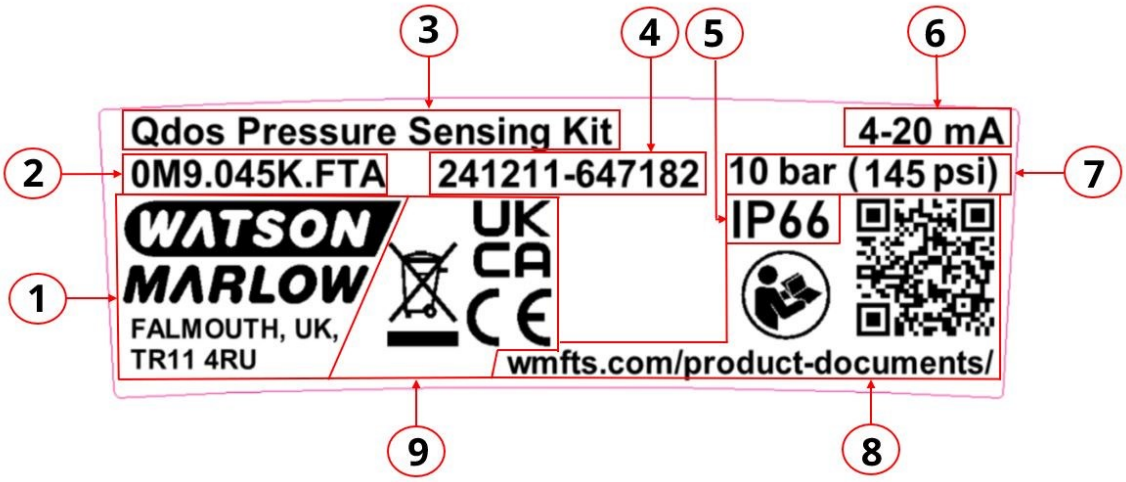


The Pressure Sensing Kit has a recess, shown as point B, with the following dimensions.

Dimensions of Pressure Sensing Kit recess	
Diameter	6.0 mm (0.236")
Depth	5.0 mm (0.197")

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.

5.5.5 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: 5.5.16.1
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		

5.5.6 Product code—Pressure Sensing Kit

Pressure Sensing Kit	
Description	**Product code**
Qdos Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA

5.5.7 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 Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA	Qdos 20, 30, 60, 120 or CWT	v1.41 or above
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA		

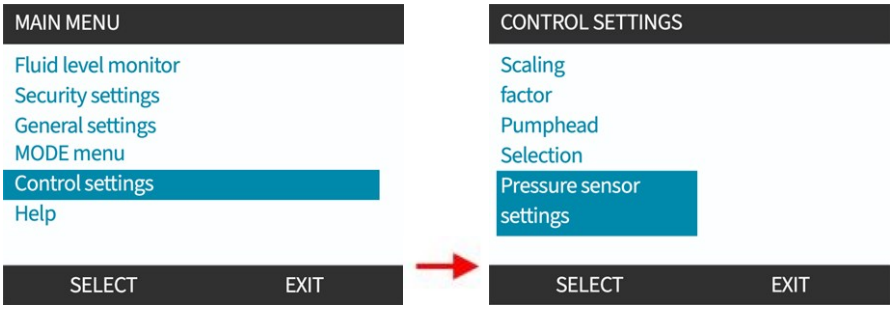
The following information is provided in this reference manual:

- How to check the software version installed on the pump. See section: 20.4.1
- Recommended [30] USB flash drives for a software update. See section: 20.4.2
- Preparation of a USB flash drive. See section: 20.4.3
- How to download the latest software. See section: 20.4.4
- How to update the software on the pump using a USB flash drive. See section: 20.4.6

NOTE [30]	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

5.5.8 Control settings menu overview—Pressure Sensing Kit

The set up of a Pressure Sensing Kit is from the pressure sensor settings sub-menu of the control settings menu.



The following settings can be made:

- 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 (31) 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 31	Warning levels cannot be disabled.

5.5.9 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 (34)	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 (32) Bar or disable option (33)	0.00 to 217.5 (32) PSI or disable option (33)
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 32	The maximum rated pressure of a Qdos pump is 10.00 bar (145.0 PSI) however the maximum alarm or warning level are configurable up to 15.00 Bar (217.5 PSI) to allow for short term peak pressures.

NOTE 33	Warning levels cannot be disabled.

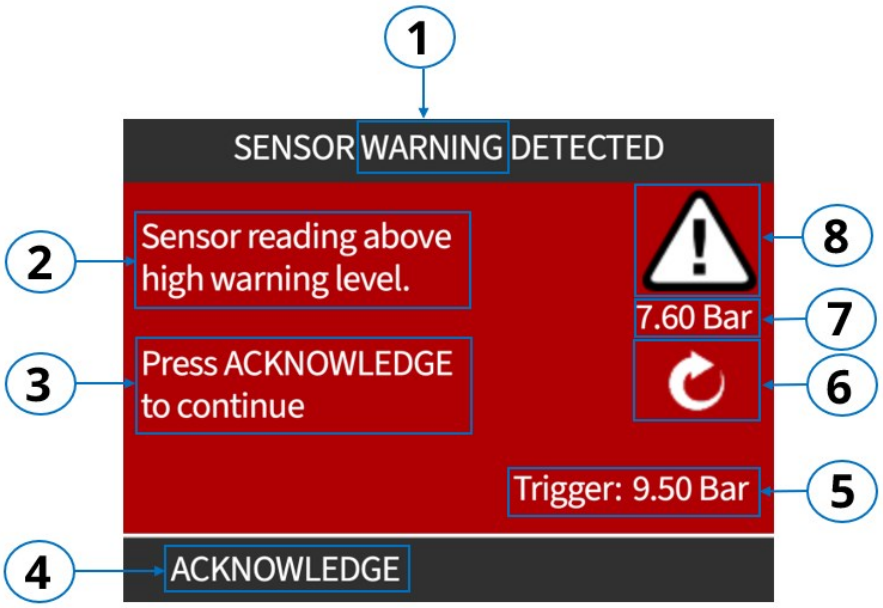
NOTE 34	Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes)..

5.5.10 Screen explanation and action due to levels

5.5.10.1 Warning levels—HMI display

When the pump reaches either the Warning maximum pressure level or Warning minimum pressure level

The pump will display the following screen:



Item	Screen will display
1	Type of level: Warning
2	Explanation of Warning and Warning name (Warning maximum pressure level or Warning minimum pressure level)
3	Action to be taken
4	ACKNOWLEDGE key prompt, press the key below to complete the acknowledg action.
5	The pressure shown is the most extreme value (maximum or minimum) since the level trigger.
6	If pump is running, the rotating symbol symbol will be displayed
7	Live process pressure (averaged). Levels can be set to trigger based on either an averaged or raw signal, however an averaged pressure will always be displayed on the home, alarm or warning screens.
8	Safety symbol: Follow the safety instruction using items 2, 3 and 4

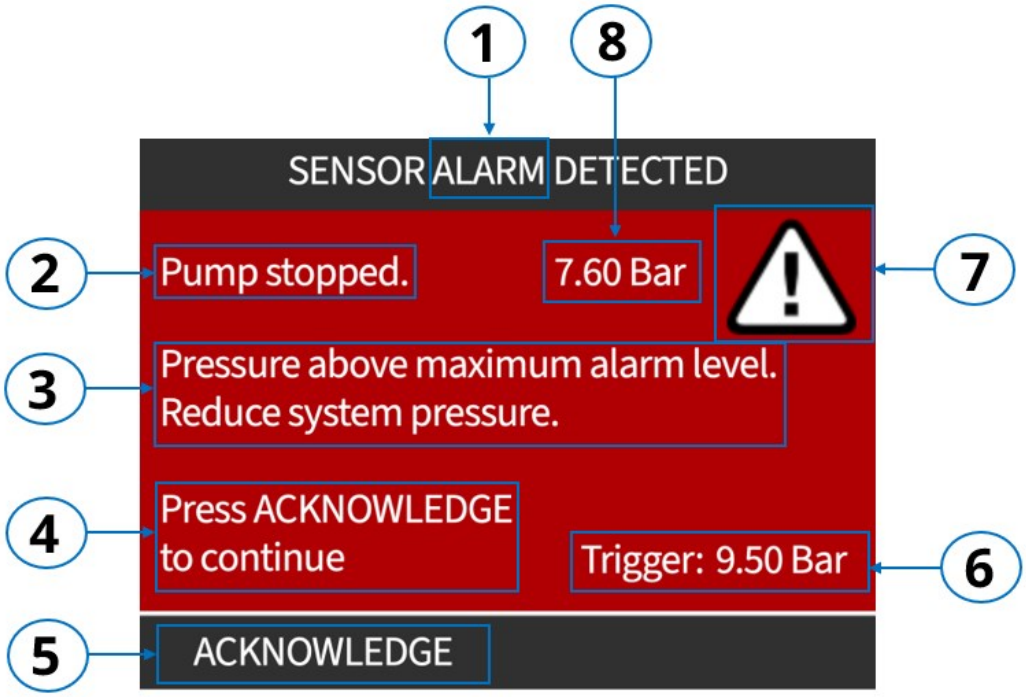
5.5.10.2 Warning levels—Pump behaviour

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

- Pump will display a warning but not stop operating. In order to clear the warning screen, an operator will need to press (35) the ACKNOWLEDGE key. There is a 1 minute delay before the next warning could display.
NOTE 35	The ACKNOWLEDGE key must be pressed locally on the pump. It is not possible to send an "acknowledge" command remotely for Universal and Universal+ pumps. PROFIBUS pumps do have an "remote error acknowledge" capability. See section: 17.5.4
- A warning will be triggered as an output, as a "general alarm" if set up to do so in the HMI.
- Status sent through network.

5.5.10.3 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. An alarm status will be sent by a PROFIBUS pump, or a Universal/Universal+ pump if set up within the HMI to do so (General alarm).



Item	Screen will display
1	Type of level: Alarm
2	Message that the pump is now stopped
3	Explanation of Alarm and Alarm name (Alarm maximum pressure level or Alarm minimum pressure level). ,
4	Action to be taken
5	ACKNOWLEDGE key prompt, push the key below 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, however an averaged pressure will always be displayed on the home, alarm or warning screens.

5.5.10.4 Alarm levels—Pump behaviour

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. An alarm status will be sent by a PROFIBUS pump, or a Universal/Universal+ pump if set up within the HMI to do so (General alarm).

An alarm level does not effect whether or not a contact dose, will be remembered by the pump.

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.
- Then press the ACKNOWLEDGE key (36)

  The pump will return to the home screen in a stopped state. Manual model pumps will require the **START** key to be pressed. All other models of pumps 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 36	The ACKNOWLEDGE key must be pressed locally on the pump. It is not possible to send an "acknowledge" command remotely for Universal,or Universal+, pumps. PROFIBUS pumps do have an "remote error acknowledge" capability. See section: 17.5.4

5.5.11 Pressure display on home screen

The Pressure Sensing Kit displays pressure [(37)] on home screen when in the following mode:

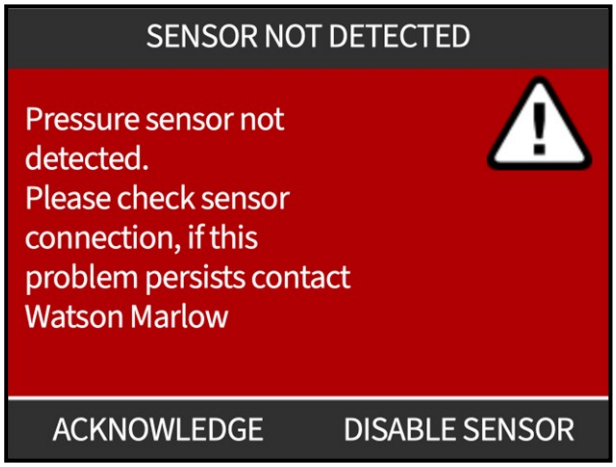
- Manual mode
- Analog mode
- Contact mode
- PROFIBUS mode

NOTE [37]	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, however an averaged pressure will always be displayed on the home, alarm or warning screens.

5.5.12 mA signal versus pressure

Pressure is based on a mA signal as follows:

mA signal	Displays as	Comment
≤ 3.70 mA	---	Out of range [38]
>3.71 mA to 4.00 mA	0.00 Bar (0.0 PSI)	≤ 0.00 Bar (0.0 PSI)
>4.01 to 20.00	0.00 Bar to 20.00 [39] Bar (0.0 PSI to 290.1 [39] PSI)	
>20.01 to 20.99	20.00 Bar (290.1 PSI)	≥ 20.00 Bar (290.1 PSI)
≥ 21.00 mA	---	Out of range [38]

NOTE [38]	When the sensor is out or range (≤ 3.7 or ≥ 21.0 mA) or if the sensor cable is removed from the pump, then the following screen will be displayed if the pump is running or attempts to run:  The Pressure Sensing Kit can be disabled if required.

NOTE [39]	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)

5.5.13 Pressure Sensing Kit functions not available during certain operating modes

The following pressure sensor 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
When pump is running in reverse in either PROFIBUS, or Analog mode.	All alarm and warning levels are disabled (all 4 levels)

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

5.5.14 Output of pressure alarms, warnings and signals

5.5.14.1 Output of Alarms and Warnings

Universal and Universal+ pumps can be configured to produce an output that the pump has reached either of the following:

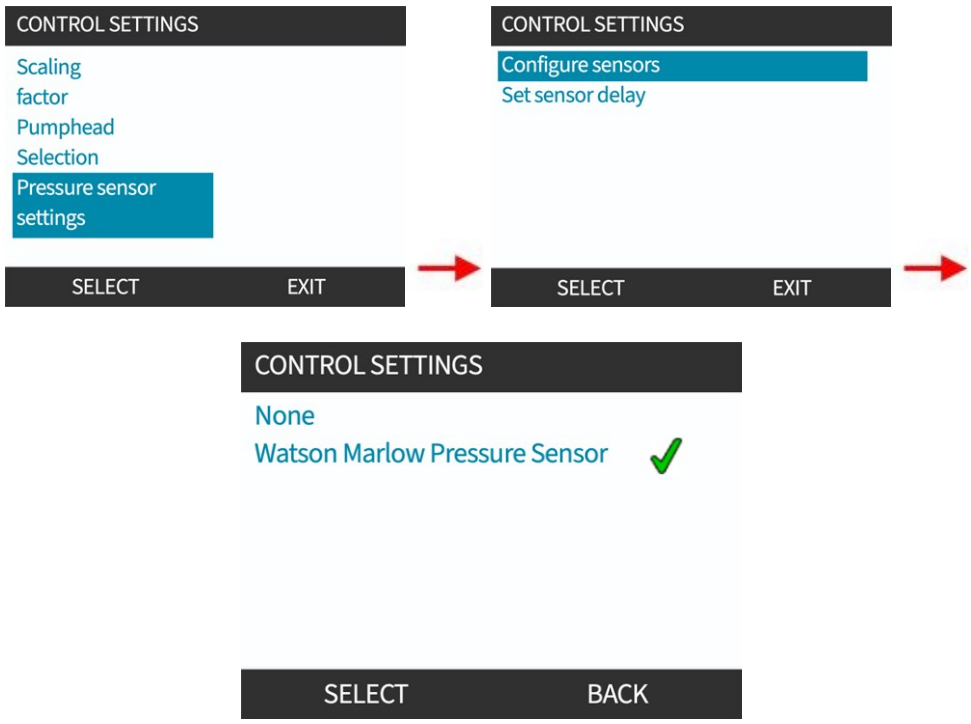
- Alarm maximum pressure level or Warning maximum pressure level
- Alarm minimum pressure level or Warning minimum pressure level

It is not possible to differentiate as to whether an Alarm only or Warning only level has been triggered, only that either a maximum or minimum level has been triggered.

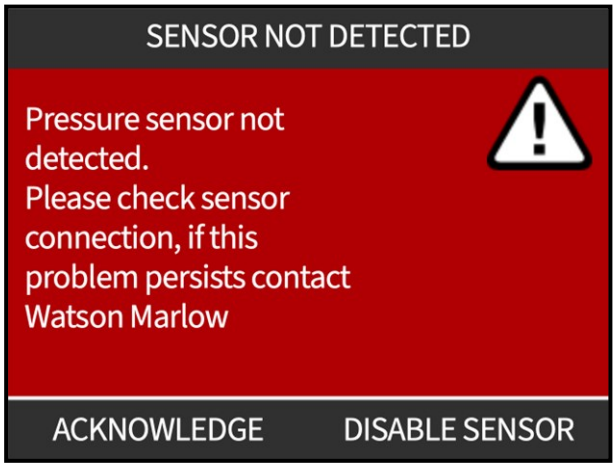
5.5.15 Disabling of a Pressure Sensing Kit

A Pressure Sensing Kit can be disabled in three ways

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



2. The alarm levels (maximum and minimum) can be disabled so that the pump will not be forced to stop. During this time, pressure will still be shown on the home screen, and the warning levels will remain active.
3. By pressing DISABLE SENSOR, when the mA signal is outside of the range (≤ 3.7 or ≥ 21.0 mA).



5.5.16 Specification

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

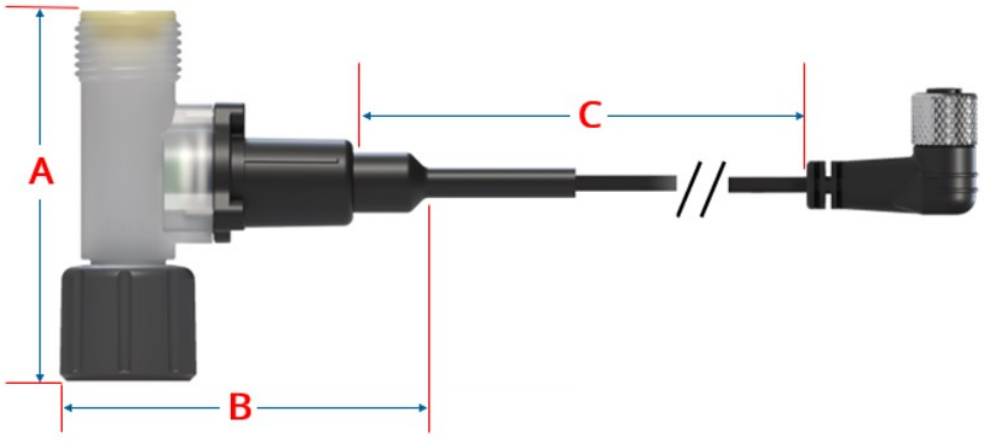
Where specification is not provided, the Qdos pump specification applies (covers entire Qdos range). See section: 4.2

5.5.16.1 Pressure—Pressure Sensing Kit

The maximum rated pressure on a continuous basis is 10.00 bar (145.0 PSI) for a Qdos pump. The purpose of being able to set a pressure higher than 10.00 bar is to allow for short term peak pressures in excess of the max. rated pressure. The Pressure Sensing Kit can physically withstand short term peak pressures in the range of -1.00 (40) to 15.00 Bar.g (-14.5 PSI.g to 217.5 PSI.g).

NOTE 40	The Pressure Sensing Kit is suitable for operation to -1.00 Bar.g (-14.5 PSI.g), however the pressure will always be displayed as 0.00 Bar.g even in the rare scenario where a discharge pressure is in the range of -1.00 to 0.00 Bar.g (-14.5 to 0.0 PSI.g) 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.g should not be confused with inlet pressure which is commonly in the -1.0 to 0.0 Bar.g (-14.5 to 0.0 PSI) range for a positive displacement pump (i.e fluid lift on inlet side)

5.5.16.2 Dimensions—Pressure Sensing Kit



Model	A		B		C	
	mm	in	mm	in	mm	in
Qdos Pressure Sensing Kit (all versions)	83	3.27	81	3.19	500	19.7

5.5.16.3 Weight—Pressure Sensing Kit

Model name	Product code	Kg	Ibs
Qdos Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA	0.075	0.165
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA	0.075	0.165

5.6 Hose Connector Kit

The Hose Connector Kit is a Qdos accessory for connecting the pump to the fluid path system.

5.6.1 Model suitability—Hose Connector Kit

A Hose Connector Kit is suitable for all Qdos pump models.

5.6.2 Features and benefits—Hose Connector Kit

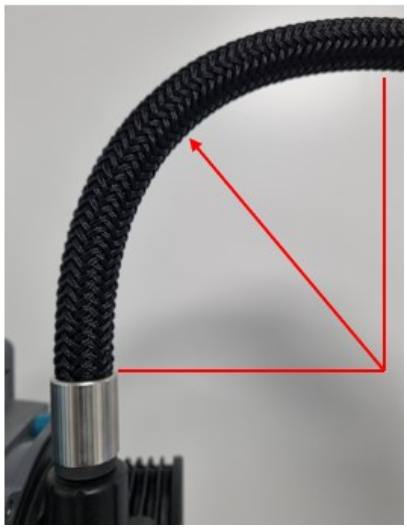
Key benefits are:

- Flexible and robust PTFE lined hose
- Supplied ready to connect to a Qdos pump and process line.
- Fully crimped and hydrostatically pressure tested solution
- Handles ambient temperature fluctuation

5.6.3 Intended mounting—Hose Connector Kit

A Hose Connector Kit may be installed either as a straight length or with a bend, on either the inlet or discharge side of the pumphead.

When a bend is required, the hose must not, at any time be bent below a minimum bend radius of 76 mm (3”). The measurement points for the bend radius are provided in the following picture.



5.6.3.1 Inlet side of pumphead

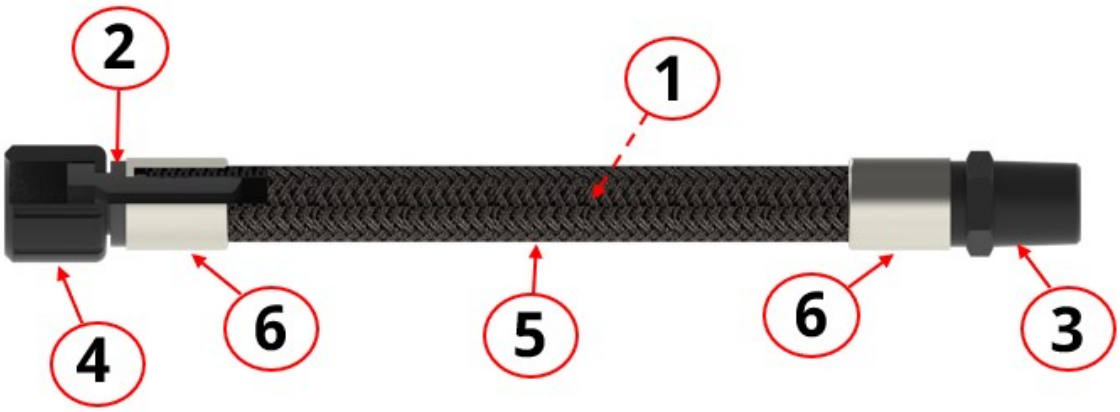
If a Hose Connector Kit will be used on the inlet side of the pump (bottom connection), the pump will need to be installed based upon one of the 3 methods below:

Mounting method		
1: On a plinth	2: Access hole in surface	3: Near edge of surface
		
Minimum clearance		
The pump must be located upon a plinth with a minimum height of 180 mm (7.09”) to the bottom of the pumphead fluid connection	The hose must be installed through an access hole with a minimum diameter of 50.8 mm (2.0”) to avoid vibration / chafing damage.	The pump must be placed close to the edge of a surface with a 19 mm (3/4”) minimum clearance between the hose and edge of the shelf.

5.6.3.2 Discharge side of pumphead

If the pump will be mounted where the height above the pumphead will be restricted, or a bend in the hose is required, then a minimum clearance of 180 mm (7.09”) will be required from the top of the pumphead fluid connector port.

5.6.4 General arrangement—Hose Connector Kit



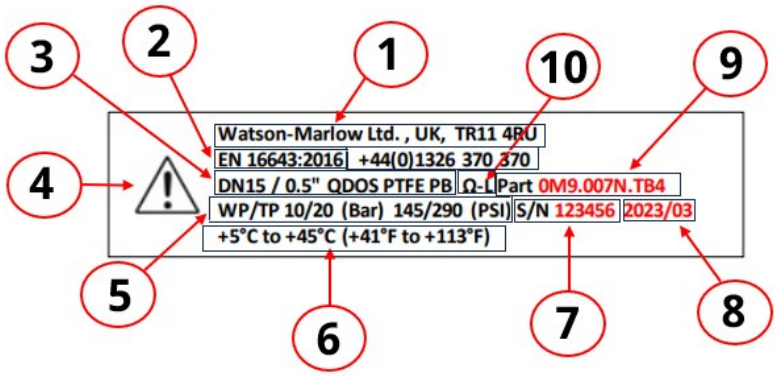
A Hose Connector Kit has the following general arrangement:

Item	Description	Normally wetted by pumped fluid?
1	Hose: Inner	Yes
2	Inlet: Qdos pumphead internal connector (41)	Yes
3	Outlet: ½" BSPT or ½" NPT , fluid path connector (male) (42)	Yes
4	Inlet: Qdos pumphead connection nut (female)	
5	Hose: Outer braid	
6	Ferrule (43)	

NOTE 41	The pumphead connector is designed to only be connected to a Qdos pumphead or Pressure Sensing Kit, which contains a proprietary sealing system for a safe connection to be made. Do not attempt to connect this connector of a Hose Connector Kit to any other piece of equipment.
NOTE 42	Either a ½" BSPT or ½" NPT connection is installed on the Hose Connector Kit, depending on product code.
NOTE 43	Stainless steel (304 1.4301) or Hastelloy (C276) ferrule material depending on product code.

5.6.5 Product marking—Hose Connector Kit

The hose ferrule is etched with the following information:



Item	Explanation
1	Watson-Marlow address and telephone number
2	European standard of product manufacturing
3	Product description (Hose bore and material)
4	Safety symbol: Follow a safety instruction in these instructions
5	Pressure: WP (maximum Working Pressure) / TP (Test Pressure), shown in Bar and PSI
6	Temperature range (shown in Centigrade and Fahrenheit)
7	Serial number (44)
8	Year of manufacture / quarter of year (44)
9	Product code (part number) (44)
10	Electrical properties: (Ω-L) Static-dissipative lining without electrical bonding

NOTE 44	Items 7, 8 and 9 vary due to product code or production

5.6.6 Product code—Hose Connector Kit

Hose Connector Kit	
Description	**Product code**
0.75 m (29.5″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½″ NPT male connector	0M9.007N.TB4
0.75 m (29.5″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules with ½″ BSPT male connector	0M9.007B.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½″ NPT male connector	0M9.006N.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½″ BSPT male connector	0M9.006B.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Hastelloy ferrules) with ½″ NPT male connector	0M9.006H.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Hastelloy ferrules) with ½″ BSPT male connector	0M9.006K.TB4

5.6.7 Earth bonding

PTFE may generate static charge in the bore of the hose when electrically non-conductive fluids (e.g. solvents, fuels) are flowing through the hose.

The PTFE hose liner and PTFE fittings are static dissipative. However, the fluid path connector must be connected to electrically bonded (earthed) system pipework to fully dissipate electrical charge. Alternatively, either metallic crimp ferrule can be used for a connection to electrical bonding (earthing).

Do not use the earth bond test point of the Qdos drive as an electrical bonding connection. The earth bond test point must only be used for testing of earth continuity from the power plug.

5.6.8 Connecting hoses together

A Hose Connector Kit is not designed to be connected together (daisy chained). Do not attempt to connect Hose Connector Kit together to make a longer hose.

5.6.9 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: 4.2

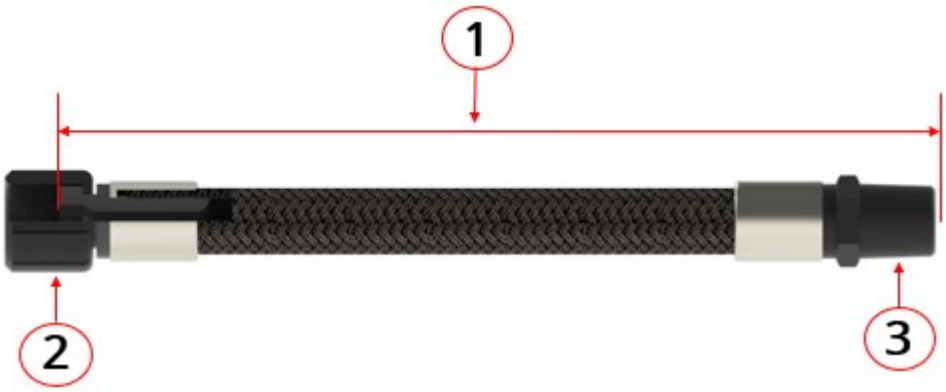
5.6.9.1 Internal diameter of fluid connections and hose

Item	Internal diameter
Fluid connectors	5.55 mm +/- 0.05 mm (0.219” +/- 0.002“)
Hose	13.55 mm +/- 0.05 mm (0.533“ +/- 0.002“).

5.6.9.2 Pressure—Hose Connector Kit

Pressure	Maximum Limit	
Inlet pressure	Inlet pressure (absolute)	0.10 bar.a (1.45 PSI.a)
	Inlet pressure (gauge)	-0.9 bar.g (-13.05 PSI.g)
Discharge pressure	Working pressure (gauge)	10 bar.g (145 PSI.g)
	Test pressure (gauge)	20 bar.g (290 PSI.g)

5.6.9.3 Dimensions—Hose Connector Kit



Dimensions	
1	Length
2	Qdos pumphead connection end [45]
3	process fluid path connection end 1/2" BSPT or ½" NPT [45]

NOTE [45]	The length of the hose, and connector thread type both depend on product code.

5.6.9.4 Weight—Hose Connector Kit

Model	Unpacked weight
0.75 m (29.5") long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½" NPT male connector	270.45 g (0.596 Ibs)
0.75 m (29.5") long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules with ½" BSPT male connector	270.45 g (0.596 Ibs)
1.5 m (59.1") long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½" NPT male connector	385.13 g (0.849 Ibs)
1.5 m (59.1") long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½" BSPT male connector	385.13 g (0.849 Ibs)
1.5 m (59.1") long Qdos PTFE-lined hose connector kit (Hastelloy ferrules) with ½" NPT male connector	381.63 g (0.841 Ibs)
1.5 m (59.1") long Qdos PTFE-lined hose connector kit (Hastelloy ferrules) with ½" BSPT male connector	381.63 g ((0.841 Ibs)

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 [46]
ReNu	2 years

NOTE[46]	The pumphead shelf life is written on the label on the side of the box.

6.2.2 Shelf life—Accessories

6.2.2.1 Shelf life—Hose Connector Kit

The Hose Connector Kit shelf life is 5 years when stored in the original packaging within the storage conditions provided in the section above.

7 LIFTING AND CARRYING

7.1 Product in packaging

7.1.1 Procedure—Lifting and carrying product in packaging

CAUTION

The packaged pump weighs up to 5.7 Kg (12.6 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 its original packaging, or when following the unpacking, inspection, or disposal procedure in the next section: Lift and carry a pump using the procedure below:

1. Observe, the upright symbol on the pump. 
2. Use two hands to lift the pump, with one hand under the pumphead mounting flange and the other hand on the casing, in accordance with local health and safety procedure always keeping the product upright. The lifting points indicated below:

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: 20.5.2.4 to remove pumphead

8 UNPACKING AND INSPECTION

8.1 Components supplied—Pump

Components supplied with a complete pump (drive and pumphead) are provided in the table below.

Item	Description	Comment
1	Pump drive unit	Qdos 30 shown (other models will vary in appearance)
2	Pumphead	ReNu 30 shown
3	Pumphead connection collars	
4	Pumphead port seals (pre-fitted)	Pumphead port seals are pre-fitted in pumpheads Qdos 30 (all pumpheads) — also comes with 2 x EPDM seals (optional, not fitted)
5	Power cable	Plug type varies with geographical model, no plug on 12-24 models

<table>
<tr><th>Item</th><th>Description</th><th>Comment</th></tr>
<tr><td>6</td><td>Hydraulic connector pack</td><td>Pumps comes with the following hydraulic connector sets (2 x packs)

Supplied Hydraulic Connection pack (2 of each item) with pumps or spare drives
<table><tr><th>Description</th><th>Size</th><th>Comment</th></tr><tr><td>Metric —Polypropylene (PP) compression fittings; For use with Qdos Interface tubing.

Product code:
0M9.221H.P01</td><td>Set of four sizes:
6.3x11.5 mm
10x16 mm
9x12 mm
5x8 mm</td><td>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).</td></tr><tr><td>1/2” Hose barb, polypropylene (PP)

Product code:
0M9.401H.P05</td><td>to fit 1/2" internal diameter hose/tube</td><td>Supplied as a pair (2 items) with a 120 model pump or spare drive model, in addition to compression fittings.</td></tr><tr><td>Imperial [47]— PVDF compression fittings

Product code:
0M9.001H.F20</td><td>Set of two sizes:
3/8'' x 1/4"
1/2'' x 3/8''</td><td>Supplied as a pair (2 packs) with pumps or spare drives, which have a US power plug (product code ending in an A).</td></tr></table>
<table><tr><td>NOTE [47]</td><td>Imperial compression fittings cannot be used with Watson-Marlow Qdos interface tubing or PTFE tubing</td></tr></table></td></tr>
<tr><td>7</td><td>Product safety leaflet (not pictured)</td><td></td></tr>
<tr><td>8</td><td>2 x 1/2" NPT cable glands (not pictured)</td><td>Only supplied with the Relay Module version of the Universal or Universal+ models</td></tr>
</table>

8.2 Components supplied—Replacement pumphead

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

- Chosen model of pumphead
- Pumphead port seals (pre-fitted)
- Additional Qdos 30 items
    - 2 x EPDM o-rings (in addition to the FKM o-rings pre-installed)
    - Vent screw

Hydraulic connectors are not supplied with replacement pumpheads. If replacement hydraulic connectors are required, these items must be ordered separately. See section: 20.5.1.2

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 Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA	Santoprene, and SEBS supplied in packaging tray
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA	PU, and FKM, supplied in packaging tray

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

8.3.2 Components supplied—Hose Connector Kit

The Hose Connector Kit will come with the following items included within the packaging:

- Chosen model of product
- Safety information leaflet with QR code to these instructions
- A combined Pressure Test Certificate and Declaration of Conformance

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: 8.1).
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	**Pump**	**Pressure Sensing Kit**	**Hose Connector Kit**
Outer carton	Cardboard	Cardboard	Cardboard
Inner tray	Paper	—	
Protective caps	High density polyethylene (HDPE)	—	High density polyethylene (HDPE)
Document protection bag	Polyethylene (PE)	—	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 during installation. Review the HMI overview of screens, key operation and menus (See section: 4.2.5) prior to carrying out an installation task.

The installation sections are provided in the following order.

1. Installation—Chapter 1: Location and mounting
2. Installation—Chapter 2: Electrical power
3. Installation—Chapter 3: Fluid path
4. Installation—Chapter 4: Control system connections and wiring
5. Installation—Chapter 5: HMI: Control settings menu
6. Installation—Chapter 6: HMI: General settings menu
7. Installation—Chapter 7: HMI: Security settings menu

Follow the installation in the order above. This is to ensure the pump:

- Is suitably located and mounted ready for installation of Hose Connector Kit
- Cannot topple over after installation of the pumphead.
- Cannot be tilted beyond 20 degrees (maximum slope of installation).
- Has electrical power prior to the first time pumphead installation procedure, and general set up of pump.

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 Hose Connector Kit 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.

NOTICE

The weight of the pumphead makes the drive unstable, resulting in the pump toppling over to one side. Always anchor the pump to its mounting surface prior to installation of the pumphead.

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)
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 (48)	SEBS (49) pumphead: 40 °C (104 °F) Santoprene pumphead: 45 °C (113 °F) PU pumphead: 45 °C (113 °F) Pressure Sensing Kit (49): 45 °C (113 °F) Hose Connector Kit (49): 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 (50)
Ingress protection rating	IP66 to BS EN 60529, Meets the requirements of NEMA 4X

NOTE 48	Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in section 22.

NOTE 49	If using a SEBS pumphead with a Pressure Sensing Kit or Hose Connector Kit the lower temperature of 40 °C (104 °F) applies.

NOTE 50	**AC power:** 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. **DC power:** Neither the power cable blade fuse or fuse holder are IP66 or NEMA 4X rated. In applications requiring IP66 or NEMA 4X, the portion of the power cable containing the blade fuse holder 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 anchored to a flat horizontal surface. 

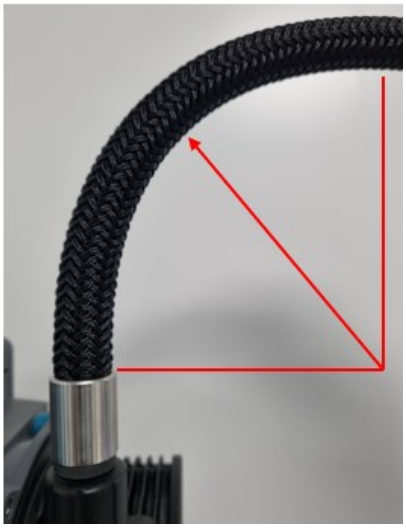
10.3.2 Intended mounting—Pressure Sensing Kit

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

10.3.3 Intended mounting—Hose Connector Kit

A Hose Connector Kit may be installed either as a straight length or with a bend, on either the inlet or discharge side of the pumphead.

When a bend is required, the hose must not, at any time be bent below a minimum bend radius of 76 mm (3”). The measurement points for the bend radius are provided in the following picture.



10.3.3.1 Inlet side of pumphead

If a Hose Connector Kit will be used on the inlet side of the pump (bottom connection), the pump will need to be installed based upon one of the 3 methods below:

Mounting method		
1: On a plinth	2: Access hole in surface	3: Near edge of surface
		
Minimum clearance		
The pump must be located upon a plinth with a minimum height of 180 mm (7.09”) to the bottom of the pumphead fluid connection	The hose must be installed through an access hole with a minimum diameter of 50.8 mm (2.0”) to avoid vibration / chafing damage.	The pump must be placed close to the edge of a surface with a 19 mm (3/4”) minimum clearance between the hose and edge of the shelf.

10.3.3.2 Discharge side of pumphead

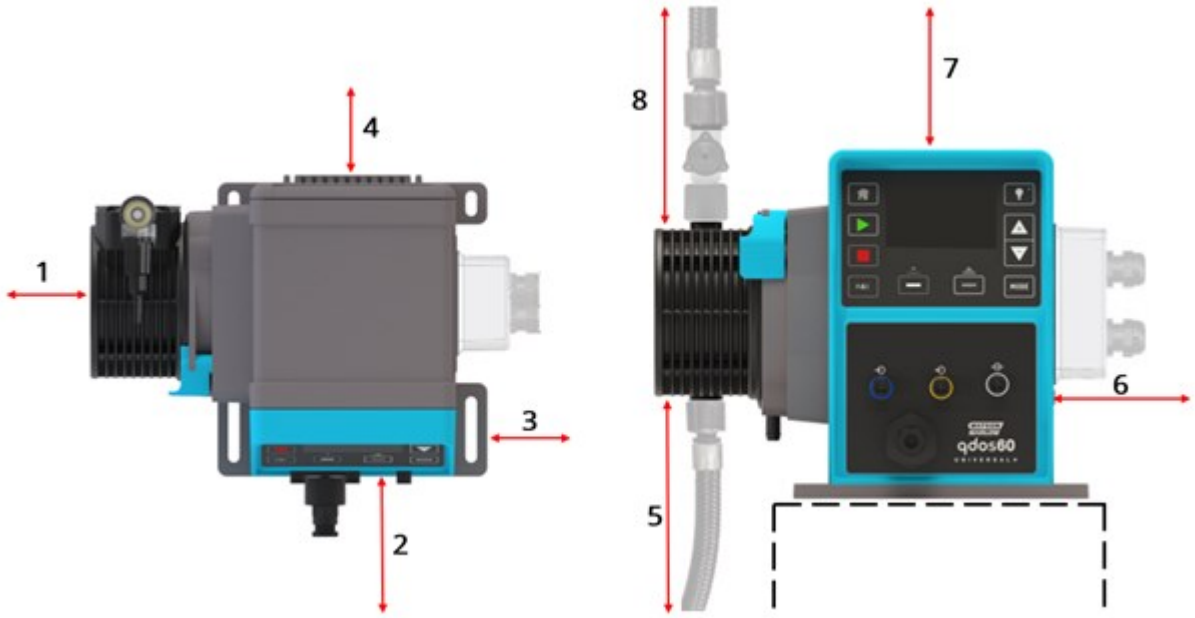
If the pump will be mounted where the height above the pumphead will be restricted, or a bend in the hose is required, then a minimum clearance of 180 mm (7.09”) will be required from the top of the pumphead fluid connector port.

10.4 Intended mounting—Pump

10.4.1 Area around the product—Not enclosed (51)

NOTE [51]	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.



Minimum installation clearances are provided in the illustrations and explanation table below:

<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 (left hand pumphead mounting shown)</td></tr>
<tr><td>2</td><td>120 mm (4.72”)</td><td>The clearance is based upon a pump with the optional HMI screen cover accessory installed

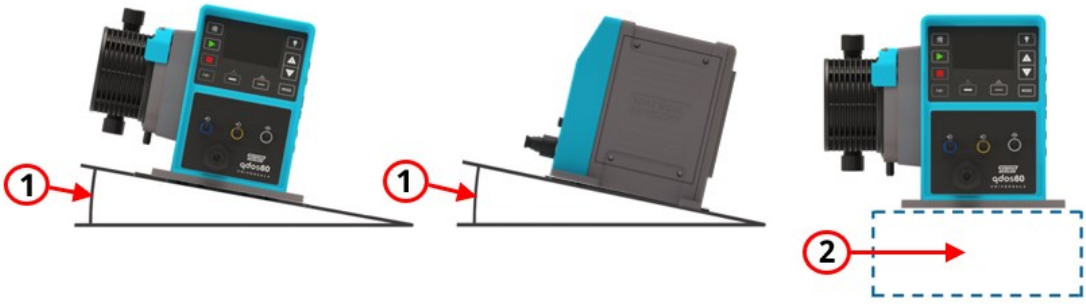
Additional clearance maybe required for the:
Installation of control cables</td></tr>
<tr><td>3</td><td>100 mm (3.94”)</td><td>Access pump mounting bolts</td></tr>
<tr><td>4</td><td>1000 mm (39.37”)</td><td>Access the back of the pump for:
Information (serial number, product name)
Carry out an Earth bond test</td></tr>
<tr><td>5</td><td>see explanation table</td><td>Clearance depends on item to be installed:<table><tr><th>Item to be installed</th><th>Minimum dimension</th></tr><tr><td>Hydraulic connector only</td><td>45mm (1.75") (52)</td></tr><tr><td>Hydraulic compression connector, with Watson-Marlow interface tubing</td><td>50.8 mm (2.0”) to achieve minimum bend radius of WM interface tubing.</td></tr><tr><td>Hose Connector Kit only</td><td>180 mm (7.09”)</td></tr></table></td></tr>
<tr><td>6</td><td>User to define for relay module model</td><td>The minimum clearance is based on:
Bend radius of user cables
Room to install and remove control cables for relay module</td></tr>
<tr><td>7</td><td>120 mm (4.72”)</td><td>Clearance for opening and closing HMI cover accessory if installed</td></tr>
<tr><td>8</td><td>see explanation table</td><td>Clearance depends on 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") (52)</td></tr>
<tr><td>Hydraulic compression connector, with Watson-Marlow interface tubing</td><td>50.8 mm (2.0”) to achieve minimum bend radius of WM interface tubing.</td></tr>
<tr><td>Pressure Sensing Kit, with Hydraulic connector on top</td><td>127 mm (5.0") (52)</td></tr>
<tr><td>Pressure Sensing Kit, with Hydraulic connector, and Watson-Marlow interface tubing</td><td>140 mm (5.5")</td></tr>
<tr><td>Hose Connector Kit only</td><td>180 mm (7.09”)</td></tr>
<tr><td>Pressure Sensing Kit and Hose Connector Kit</td><td>280 mm (11")</td></tr>
</table>
The clearances above are based upon installing, removing and minimum bend radius.
</td></tr>
</table>

NOTE [52]	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

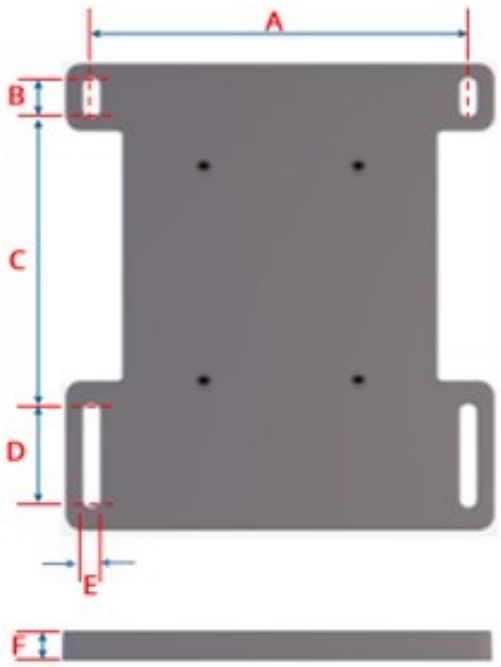
The pump must be installed in accordance with the illustrations and explanations table below:



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

A Qdos pump must be anchored to a surface. The dimensions of the baseplate for anchorage is provided in the picture and table below.



Item	Dimension	
	mm	in
A	173.0 mm	6.81
B	10.0 mm	0.39
C	140.0 mm	5.51
D	39.8 mm	1.57
E	8.2 mm	0.32
F	10.0 mm	0.39

NOTE [53]	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 and then anchored to the surface 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

4. Tighten anchorage fixings evenly until the drive is securely fixed. Do not overtighten.
5. 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
    - Hose Connector Kit

10.5.1 HMI Cover

The HMI cover is illustrated by the picture below :

Procedure

1. Check the pump casing surrounding the HMI is clean and free of debris
2. Press the frame of the HMI cover onto the pump casing surrounding the HMI
3. Check the HMI cover flap lifts up and down freely without loosening the frame of the HMI cover

11 INSTALLATION—CHAPTER 2 (ELECTRICAL POWER)

11.1 Identification of electrical power required

Pumps models are available in two power model options:

- 12–24 V DC
- 100–240 V AC (50/60 Hz)

Follow the installation information specific to your model.

11.2 Alternating current (AC) power

11.2.1 Power specification requirements

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

AC Supply voltage/frequency	~100-240 V 50/60 Hz
Overvoltage category	II
Maximum voltage fluctuation	±10 % of nominal voltage
Rated power	180 W

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

11.2.2 Protection device

Use an appropriate protection device, such a either a ground fault circuit interrupter (GFCI), Residual Current Device (RCD) or branch circuit protection device.

Recommended over-current protection	
230V AC	1 A
115V AC	2 A

11.2.3 Electrical isolation

The product does not come with an external supply isolation device.

Fit a suitable electrical supply isolation device, which is easily accessible during use, maintenance, or in the event of an accident or emergency.

11.2.4 Cable (wiring) specification

The power cable and plug is specific to the product code, based upon the geographical use of the pump. The power cable is not-detachable or user replaceable. If the cable becomes damaged contact your Watson-Marlow representative to discuss the repair of the pump at a Watson-Marlow service centre.

⚠ WARNING

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.

Country	Part number ending in	Cable specification	Plug specification
US cable/plug	A	2950 mm length. 3 core, green, black, white. UL 62, CSA 22.2 No.49.	15 A, 125 V AC. NEMA 5-15.
UK cable/plug	U	2950 mm length. 3 core, yellow/green, brown, blue. BS EN 50525-2-21.	5 A, 250 V AC with replaceable fuse: (5 A, BS 1362).
South Africa/India cable/plug	D	1850 mm length. 3 core, yellow/green, brown, blue. BS EN 50525-2-21.	16 A, 250 V AC. SANS 164/1, IS 1293.
Argentina cable/plug	R	2950 mm length. 3 core, yellow/green, brown, blue. ÖVE K41a, EN50525, IEC 60227.	10 A, 250 V AC. IRAM 2073.
Australia cable/plug	K	2950 mm length. 3 core, yellow/green, brown, blue. ÖVE K40a, HD22.	10 A, 250 V AC. AS/NZS 3112.
EU cable/plug	E	2950 mm length. 3 core, yellow/green, brown, blue. EN 50525-2-21.	16 A, 250 V AC. CEE (7) VII, IEC60884.
Swiss plug	C	2950 mm length. 3 core, yellow/green, brown, blue. ÖVE K40a, HD22.	10 A, 250 V AC. SEV 1011:2009, chapter SEV 6534/2.
Brazil plug	B	2950 mm length. 3 core, yellow/green, brown, blue. ÖVE K41a, EN50525, IEC 60227.	10 A, 250 V AC. IRAM 2073.

11.2.5 Pre-electrical installation requirement checklist

Carry out the following pre-electrical installation check. At this point in the full installation procedure, the fluid path or pumphead should not yet be installed.

- Ensure then pump has been physically installed in accordance with 1
- Ensure the power cable is not damaged
- Ensure that the supplied AC power plug is correct for your Country/Region/Facility.
- Ensure electrical isolation device if fitted and working

If there is a problem with any of the above do not carry on with the electrical installation and instruct that the pump is removed from service, until the pre-electrical installation requirements have been met.

11.2.6 Connect to AC Power supply

- Carry out the pre installation checks in the previous procedure
- Connect to AC power supply via the supplied AC power plug.

Do not apply mains power voltages to any of the control input terminals. The 5-24V voltage range must not be exceeded.

11.2.7 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 (⏚) is located on the back of the pump. The location is illustrated in the image below:

Do not use the earth bond for any other connection. Do not attempt to disassemble the Earth Bond test point

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 bearings. Always use the earth bond test point to perform earth continuity testing.

11.3 Direct current (DC) power

This section will provide information on connection to a 12-24V DC power supply for DC power supply models

11.3.1 Power specification requirements

Only connect to a DC power supply which meets the specification in the table below.

	DC (Direct Current)
Supply voltage	12-24 V DC
Rated power	130 W (12V DC) 180 W (24V DC)

11.3.1.1 DC power supply input characteristics

DC power supply option - input characteristics					
Parameter input supply	Limits			Units	Comment
	Minimum	Nominal	Maximum		
Operating limits at cable ring terminals	10.4		32.0	V DC	At full discharge /charge
Maximum input current		15.2		A	At 10.5V/130W
Maximum input current		9.5		A	At 24V/200W
Inrush current		17		A	No Load
Inrush current duration		20		mS	
Efficiency @ ring terminals	87	91	95	%	100W@10/12/24V
Typical Qdos pump power required	5		120	W	Qdos 20, 30, 60, 120, CWT
Maximum input power			200	W	Qdos 20, 30, 60, 120, CWT

11.3.2 Overcurrent protection

The power cable is fitted with a 20 A fuse. This fuse is a safety device, it must not be

- bypassed
- omitted
- changed for a different current rating

11.3.3 Electrical isolation

The product does not come with an external supply isolation device.

Fit a suitable electrical supply isolation device, which is easily accessible during use, maintenance, or in the event of an accident or emergency.

11.3.4 Power Cable (wiring)

11.3.4.1 Power cable specification

The power cable is non-detachable or user replaceable. If the cable becomes damaged contact your Watson-Marlow representative to discuss the repair of the pump at a Watson-Marlow service centre.

⚠ WARNING

Neither, the power cable blade fuse or fuse holder are IP66 or NEMA 4X rated. In applications requiring IP66 or NEMA 4X, the portion of the power cable containing the blade fuse holder must be installed in a corresponding rated enclosure.

Country	Cable specification
12-24 V plug (Part numbers ending in V)	2000 mm length. 2 core, red, black. UL CSA AWM I/II A/B Style 2587. 2 off 269G1 contact in housing. Fitted with Fuse (20 A, 32 V, ISO 8820-3) in IP31 blade fuse holder. Ring terminals (pre-fitted to cable) for m8 stud.

11.3.5 Pre-electrical installation checklist

Carry out the following pre-electrical installation check. At this point in the full installation procedure, the fluid path or pumphead should not yet be installed.

- Ensure then pump has been physically installed in accordance with 1
- Ensure the power cable is not damaged
- Ensure the electrical isolation device is installed, tested and ready for operation.
- Ensure overcurrent protection is installed, tested and ready for operation.

If there is a problem with any of the above do not carry on with the electrical installation and instruct that the pump is removed from service until the until the pre-electrical installation requirements have been met.

11.3.6 Connecting to a DC power supply

1. Carry out the pre installation checks in the previous procedure
2. Connect to DC power supply via the Ring terminals (pre-fitted to cable) for m8 stud.
    - Connect the red wire to positive (+)
    - Connect the black wire to negative (-)

If the pump is connected in reverse (reverse polarity), the pump will not power up. It will not create a hazard, correct connection polarity and continue.

11.4 Testing of electrical power and first time pump start up

11.4.1 Model: Remote

When electrical power is supplied to pump, all LED icons will illuminate for three seconds.

11.4.2 Model: Manual, PROFIBUS, Universal, Universal+

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 the next section.

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 • Watson-Marlow interface tubing • Pressure Sensing Kit • Hose Connector Kit
User organisations 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 is not provided in this chapter. Reference links are provided to such sections when relevant:

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: 22.2.3.4	See section: 20.5.1.2
Watson-Marlow interface tubing	See section: 22.2.3.2	See section: 20.5.1.3
Pumphead	See section: 22.2.3.6	See section: 4.1.4
Pressure Sensing Kit	See section: 22.2.3.5	See section: 5.5
Hose Connector Kit	See section: 22.2.3.3	See section: 5.6

12.3 User organisations 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 (54) port
- Be easily accessible for inspection, maintenance, or repair
- Only be adjustable with a tool
- Installed such that, the discharged fluid flows (55), 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 (56).
- Not be installed with an isolation valve located between the overpressure safety device and the pumphead discharge (54) port

NOTE 54	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 55	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 56	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 or Hose Connector 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.

NOTICE

After installation of the Hose Connector Kit, do not move the pump, this could damage the hose if the minimum bend radius is not maintained at all times. If the pump must be moved, remove the Hose Connector Kit in accordance with procedure 20.5.2.1.1.

12.4.2 Fluid path installation sequence

This section provides information on installation of a 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 this 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: The installation of this step will depend on whether a Pressure Sensing Kit or Hose Connector Kit is to be installed
-

PROCEDURE	Item	Comment
4A	Pressure Sensing Kit	• Install after pumphead, followed by a hydraulic connector or a Hose Connector Kit
4B	Hydraulic connector	• Install after pumphead, if a Pressure Sensing Kit, or Hose Connector Kit is not to be installed. • Hydraulic connectors cannot be installed onto a Hose Connector Kit. A hose connector kit is installed in place of a hydraulic connector.
4C	Hose Connector Kit	• Install after a Pressure Sensing Kit, in place of a hydraulic connector

12.4.3 PROCEDURE 1—Installing the pumphead for the first time

The first time installation procedure differs from the replacement pumphead procedure provided in section 20.5.2.4. In addition the first time installation procedure of the pumphead depends on Qdos model:

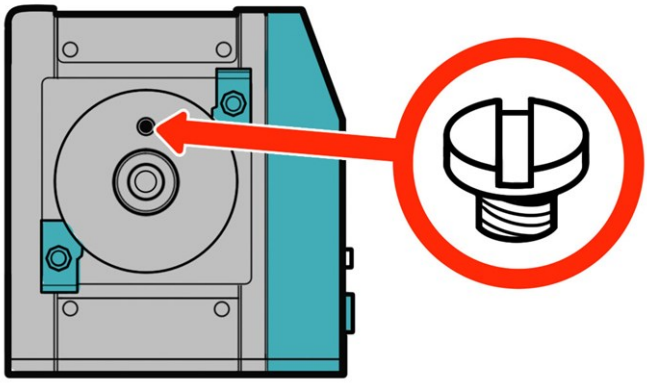
Follow the correct procedure based on pump model and time of installation.

12.4.3.1 PROCEDURE 1A—First time pumphead installation: Qdos ReNu 30: all models variants

12.4.3.1.1 CHECK QDOS 30 VENTING SCREW

A venting screw installation check should be carried out on all Qdos 30 pumps prior to the installation of the pumphead. The venting screw is supplied in the box with all Qdos 30 pumpheads.

From January 2020 all Qdos 30 pumps have a venting screw pre-installed as standard.



Follow the procedure below to check and install (if necessary) the venting screw.

Procedure

1. Check your pump has the venting screw fitted.
2. If not fitted, remove the venting screw from the pumphead package and install the screw with a flat blade screwdriver into the location illustrated in the image above.
3. If the venting screw is not fitted in a pump manufactured after January 2020 or you do not have venting screw contact your Watson-Marlow representative.

⚠ WARNING

If the venting screw is not fitted, the pump leak detection will not function when process pressures are less than 1 bar. This could result in fluid leaks from the pumphead being undetected during operation. Check and, if necessary, install a venting screw prior to installation of a Qdos 30 pumphead.

Do not remove or tamper with the venting screw.

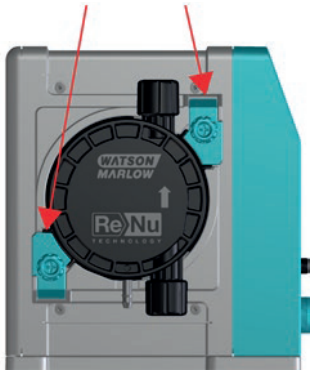
12.4.3.1.2 INSTALL THE QDOS 30 PUMPHEAD

The installation of a left hand pump is shown. A right hand pump has an identical procedure.

Follow the procedure below.

Procedure

1. Check the pumphead retaining clamps illustrated in the picture below are loose. If they are not loose, loosen by hand. Do not use a tool.



NOTICE

The pumphead retaining clamps are not designed to be loosened or tightened with a tool. Using a tool may result in breakage. Always tighten or loosen the clamps by hand.

Procedure

2. Hold the pumphead with the arrow pointing upwards.
3. Align pumphead with pump drive shaft and slide into position on pump housing.
4. Rotate pumphead in clockwise direction approximately 15° to engage retaining clamps.
5. Tighten the pumphead retaining clamps by hand. Do not use a tool.
6. Apply electrical power to pump.

The pump will go into its first time start up sequence. The Watson-Marlow Pumps logo displays for three seconds.

12.4.3.1.2.1 First time start up: Choose language

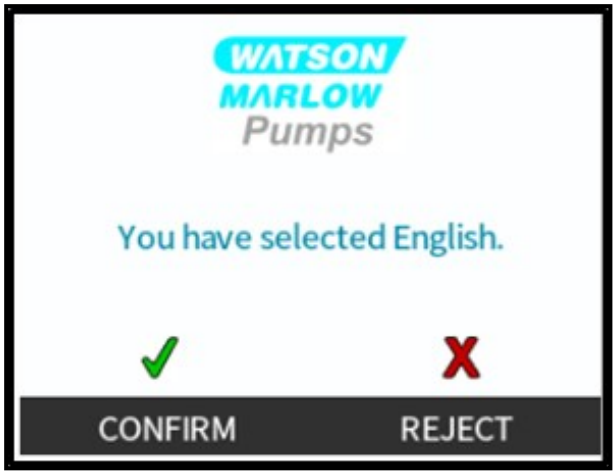
You will now be asked to select display language of all on screen text:

Procedure

1. Use **+/-** keys to highlight required language.
2. SELECT ▬ to choose.

Procedure

3. CONFIRM − to continue.



Procedure

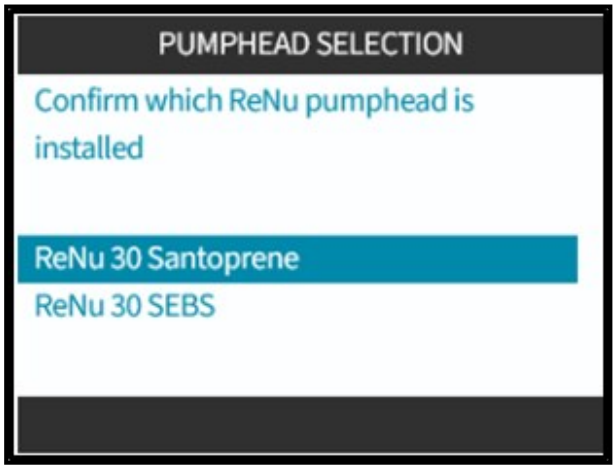
4. To change your selection, REJECT −.

5. Select the pumphead which has been fitted.

12.4.3.1.2.2 First time start up: Pumphead selection language

Procedure

1. Use **+/-** keys to highlight pumphead.



Procedure

2. Choose CONFIRM ▬ to continue.

Procedure

3. To change selection, REJECT ▬.
4. Press **START** ▶ and run pumphead for a few revolutions.
5. Stop pump.
6. Check the clamps are correctly locked in position.

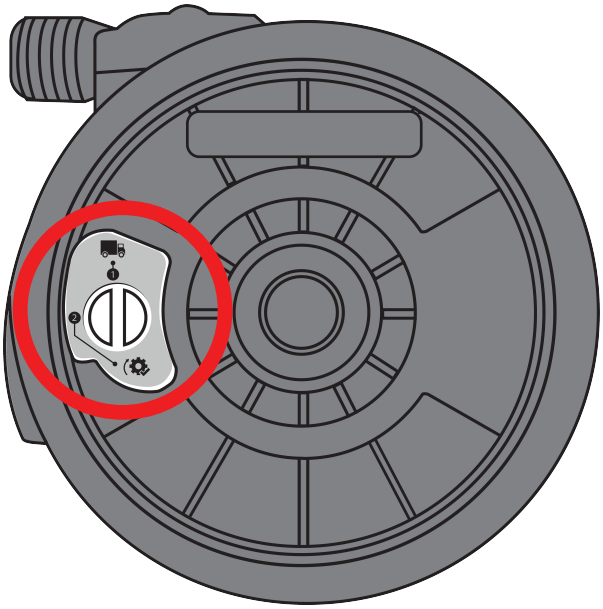
If not: Isolate the pump from the electrical supply. Tighten clamps further by hand, reconnect the power supply then repeat steps 4 to 6.

12.4.3.2 PROCEDURE 1B—First time pumphead installation (Qdos ReNU 20, 60, 120 and Qdos CWT)

A Qdos 20, 60 or 120 requires the pumphead pressure valve to be set to the in use position, prior to the installation of the pumphead. This is not a feature of CWT pumpheads, and this section may be skipped for CWT models.

12.4.3.2.1 RENU 20, RENU 60 OR RENU 120 LEAK DETECTOR SET-UP

A Qdos 20, 60 and 120 have a pressure valve in the pumphead, as illustrated in the image below.



Before installation of the pumphead, you must set the pressure valve in the pumphead, to ensure the leak detector will function correctly at all process pressures. Follow the procedure below.

Procedure

1. Turn pressure valve anti clockwise, from the transportation setting (⛟) to the 'in-use' position (⚙)

⚠ WARNING

If the pumphead pressure valve is not set to the in use position on a Qdos 20, 60 or 120 pumphead, the leak detection will not function when process pressures are less than 1 bar. This could result in fluid leaks of the pumped fluid, from the pumphead going undetected. Turn the pressure valve to the in use position prior to pumphead installation.

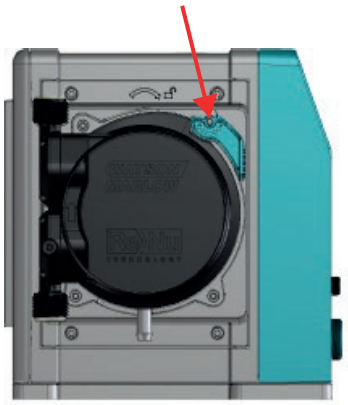
12.4.3.2.2 FIT THE RENU 20, RENU 60, RENU 120 OR CWT PUMPHEAD

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

Follow the procedure below.

Procedure

1. Ensure pumphead locking lever illustrated in the image below is set to enable the pumphead to be fitted.



NOTICE

The pumphead locking lever is designed to be loosened or tightened by hand. Do not use a tool to avoid damage.

Procedure

2. Hold the pumphead with the arrow pointing upwards.
3. Align pumphead with pump drive shaft and slide into position on pump housing.
4. Rotate pumphead in clockwise direction approximately 15° to engage retaining lugs.
5. Lock pumphead into position by hand using pumphead locking lever. Do not use a tool
6. Apply electrical power to pump. The pump will go into its first time start up sequence. The Watson-Marlow Pumps logo displays for three seconds

12.4.3.2.2.1 First time start up: Choose language

You will now be asked to select display language of all on screen text:

Procedure

1. Use **+/-** keys to highlight required language.
2. SELECT ▬ to choose.

Procedure

3. CONFIRM ▬ to continue.

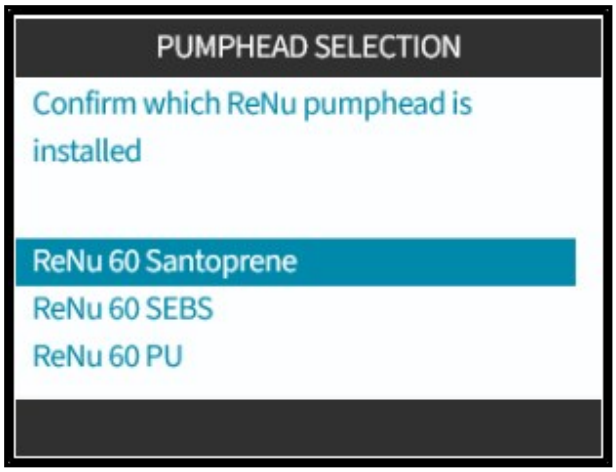
Procedure

4. To change your selection, REJECT ▬.
5. Select the pumphead which has been fitted.

12.4.3.2.2.2 First time start up: Pumphead selection language

Procedure

1. Use **+/-** keys to highlight pumphead.



Procedure

2. Choose CONFIRM ▬ to continue.

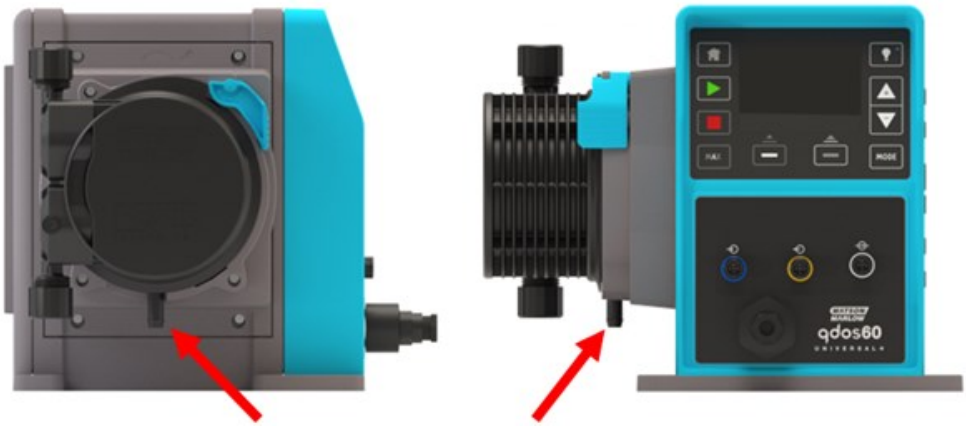
Procedure

3. To change selection, REJECT ▬.
4. Press **START** ▶ and run pumphead for a few revolutions.
5. Stop pump.
6. Isolate the pump from the electrical power supply.
7. Check the locking lever is still correctly locked in position.

If not: Isolate the pump from the electrical supply. Tighten clamps further by hand, reconnect the power supply then repeat steps 4 to 7.

12.4.4 PROCEDURE 2—Connect the pumphead safety overflow

The safety overflow of all pumphead models is a hose barb as illustrated by the image 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.

Do not block safety overflow of ReNu/CWT pumphead.

Do not fit a valve to the ReNu/CWT pumphead.

The safety overflow must be allowed to flow away from the pump into a system which is designed such that it is:

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

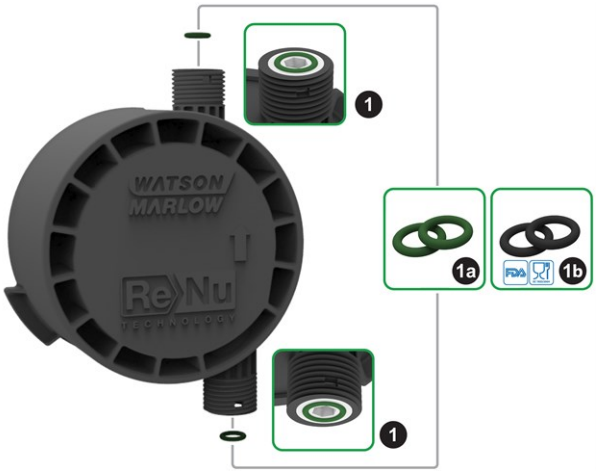
12.4.5 PROCEDURE 3—Check the seals in the pumphead ports

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
- Hose Connector Kit
- Hydraulic connector

12.4.5.1 Qdos 30: All model variants

Qdos 30 pumpheads are pre-installed with FKM (Viton) seals as illustrated by 1a in the image below. Check these seals are present and fully seated in groove.



To achieve FDA or EC1935 certification replace the two FKM (Viton®) seals fitted as standard in Qdos 30 pumphead, with the supplied EPDM [(57)] seals using the procedure below.

Procedure

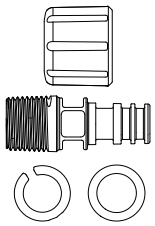
1. Remove FKM seals (1a) from pumphead ports (1)
2. Fit EPDM (1b) seals in pumphead ports (1). Ensure fully seated in groove.

NOTE [57]	If the EPDM seals are to be used, ensure these are chemically compatible with the pumped fluid. Chemical compatibility information is provided in section 22.

12.4.5.2 Qdos 20, 60, 120, CWT: All model variants

Qdos 20, 60, 120 and CWT are pre-installed with seals as illustrated by 1a in the image below, the seal material varies depending upon the pumphead type.

Check these seals [58] are present and fully seated.

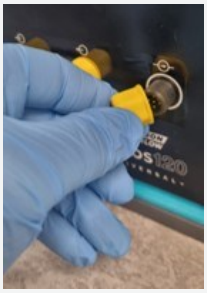
NOTE [58]	These seals are not required when using the following 1/2" hydraulic connectors :  • 0M9.401H.P03 • 0M9.401H.P04 • 0M9.401H.F03 • 0M9.401H.F04

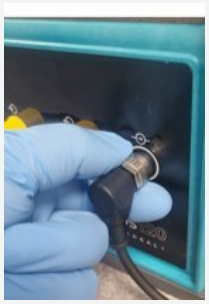
12.4.6 PROCEDURE 4A—First time installation of Pressure Sensing Kit onto pumphead

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.

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:

STEP 1	STEP 2	STEP 3
Place Pressure Sensing Kit on the pumphead with the sensor housing facing forward	Hand tighten collar in a clockwise direction until fully engaged with discharge port. Do not use a tool to tighten collar.	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
		

12.4.7 PROCEDURE 4B—First time installation of hydraulic connectors

The hydraulic connectors can be installed on either a

- Qdos pumphead
- Pressure Sensing Kit

The hydraulic connectors cannot be installed onto a Hose Connector Kit.

The installation procedure differs depending upon the connection type. Where there are any differences due to model type this is explained in the procedure

12.4.7.1 PROCEDURE 4B1: Fitting hose barb connectors

Procedure

1. Ensure the pump is electrically isolated
2. Detach desired hose barb from hydraulic connector pack.
3. Place connection collar over hose barb and place on top of the pumphead seal
4. Place and tighten the connection collars by hand onto pumphead.

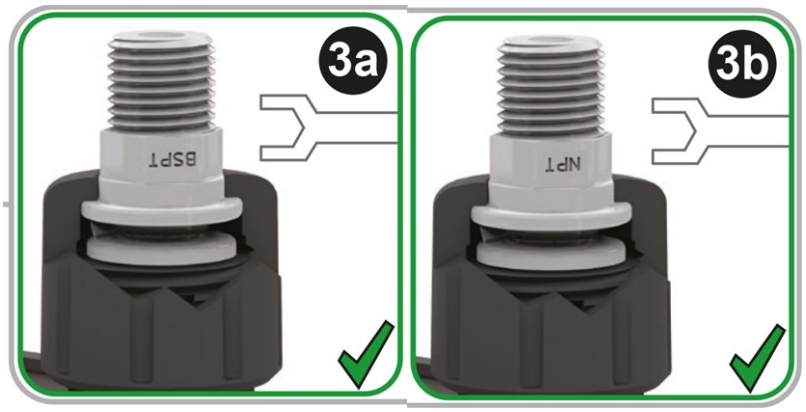
Procedure

5. Press tube onto hose barb until it reaches back face of hose barb.
6. Secure with suitable retaining clip.
7. Repeat procedure for other hose barb.
8. Check for leaks and tighten connection collar further if necessary.

12.4.7.2 PROCEDURE 4B2: Fitting threaded connectors

Procedure

1. For 1/4 inch threaded connectors, detach desired threaded connector from hydraulic connector pack 1. 1/2 inch connectors also available.
2. For 1/4 inch threaded connectors, place connection collar over threaded connector and place on top of the pumphead seal. For 1/2 inch threaded connectors, remove pumphead seal, insert double o-ring portion of 1/2 inch connector into fluid port.
3. Tighten connection collar onto pumphead by hand while holding the threaded connector with a tool (see table below)



Threaded connector	Tool	Figure reference
1/4 ” BSPT	14 mm spanner	(3a)
1/4 ” NPT	9/16 ” spanner	(3b)
1/2 ” BSPT	1/2 ” spanner	(3a)
1/2 ” NPT	13 mm spanner	(3b)

Procedure

4. Repeat procedure for other threaded connector.
5. Check for leaks and tighten connection collar further if necessary. The threaded portion of the connector will require an appropriate sealing method such as chemically compatible thread sealing tape to get a leak proof seal.

12.4.7.3 PROCEDURE 4B3: Fitting compression fittings

Procedure

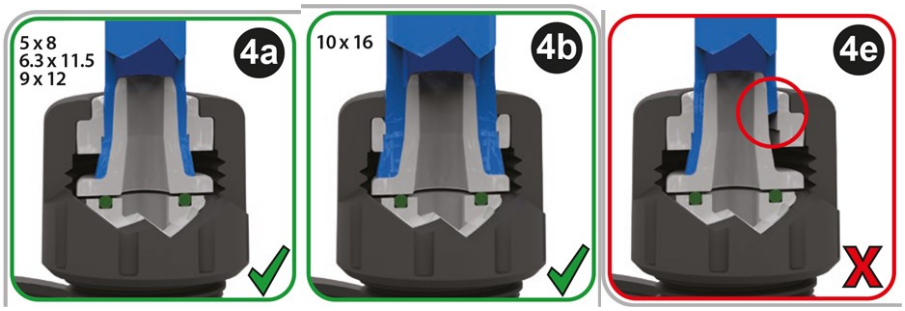
1. Select correct compression fittings for the size of Watson-Marlow interface tubing to be used.

⚠WARNING

Compression fittings may leak if used with the wrong interface tubing. Only use Watson-Marlow interface tubing with Watson-Marlow metric compression fittings.

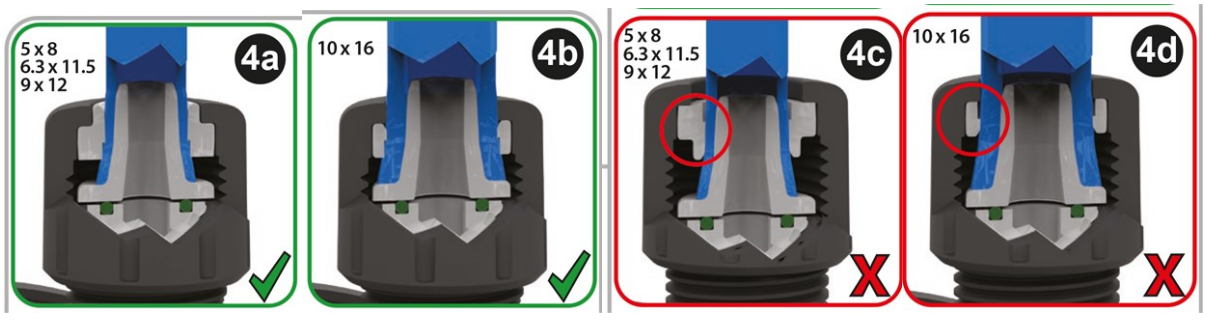
Procedure

2. Detach desired compression fitting from hydraulic connector pack.
3. Cut end of tubing so that it is square. As illustrated in the images below.



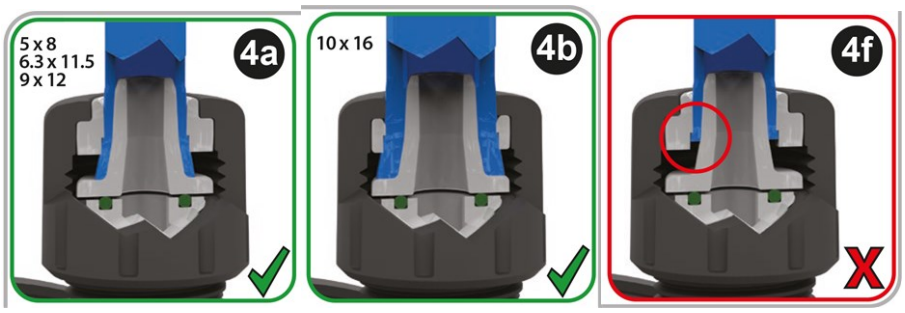
Procedure

4. Slide connection collar onto tube.
5. Slide compression ring onto tube ensuring inner step is facing cut end. As illustrated in the images below.



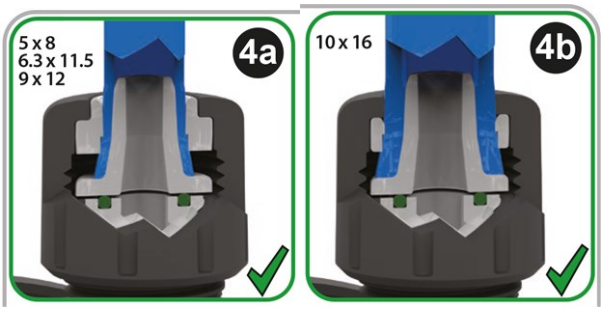
Procedure

6. Press tube onto cone until it reaches back face (it may be necessary to widen end of tube). As illustrated in the images below.



Procedure

7. Whilst continuing to hold the tube against back face of cone, slide compression ring and connection collar back down tube on top of pumphead port seal and tighten onto the pump head. As illustrated in the images below.

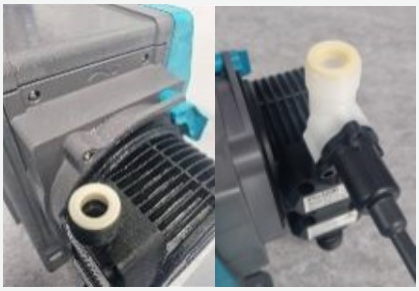


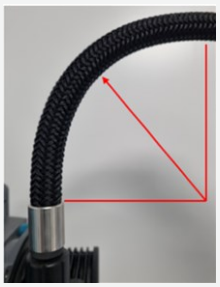
Procedure

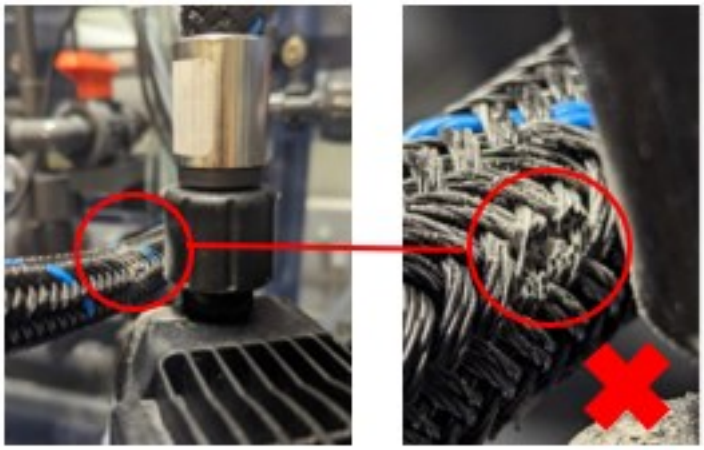
8. Repeat procedure for other connector.
9. Check for leaks and tighten connection collar further if necessary.

12.4.8 PROCEDURE 4C—First time installation of the Hose Connector Kit

The procedure for installation of a Hose Connector Kit is the same for both the discharge and inlet side of the pump.

1.	Isolate the pump from the power supply.	
2.	Connect the male fluid connector to the user organisations fluid path system first, by following sub steps 2.1 to 2.5. 1. Apply minimum 8 wraps of PTFE tape to thread. 2. Turn hose into the a tapered female connector, keeping control of the free end of the hose to prevent hose whip, until hand tight **CAUTION** ⚠ Ensure free end of hose is controlled during installation to avoid hose whip and personal injury. 3. Tighten further with a 24 mm – 15/16" spanner (wrench), ½ of a turn. Do not overtighten as fitting is made from PTFE 4. If any twist in the hose has taken place, during steps A to C, ensuring control of the hose, allow the hose to untwist. 5. Check the electrical bonding between the system pipework and hose ferrule is sufficient.	 
3.	Route the hose to the pump	
4.	Check the pumphead or Pressure Sensing Kit port seal is in place as shown by the picture and not damaged.	

		 (Qdos 20, 60, 120 and CWT model shown, Qdos 30 differs slightly in appearance)
5.	Place the Qdos Hose Connector Kit on to the pumphead or Pressure Sensing Kit and hand tighten the connection collar.	 
6.	Ensure that any bend radius of the hose exceeds the 76 mm (3”) minimum requirement. 	 

7.	Check the full length and routing of the hose to be sure there are no twists, kinks or rubbing of the hose against itself (for example when looped) or against another surface (for example: the edge of the access hole or a shelf). **NOTICE** Abrasion of the hose braid can be caused by high frequency rubbing against vibrating components on a pump, or other equipment Install the hose avoiding contact with itself and other surfaces. 
8.	Repeat this procedure forsteps 2 to 7 for a Hose Connector Kit if also used on the other side of the pump to the side which has just been installed.
9.	Bring pump into operation.
10.	During pump operation, check the Hose Connector Kit which have been installed, to ensure that they do not rub against either them selves or another item (for example: the edge of the access hole or a shelf.)
11.	Check for leaks from any connection. If leaks are present. Stop the pump, isolate from the power supply, tighten connections further, then repeat steps 9 to 11.

12.4.9 PROCEDURE 5—Connect to process fluid path

Procedures 1 to 4B prepare the pump to be connected to a process fluid path. The final step is to connect to the user organisations process fluid path.

A responsible person must connect the hydraulic connector, or Pressure Sensing Kit to the user organisations fluid path. Upon completion, a full check of the fluid path for leaks must be undertaken. Follow this generic procedure, a responsible person should modify this procedure in accordance with the user organisations policies.

1. Isolate the power supply to the device.
2. Ensure procedures 1 to 4B have been completed.
3. Connect to the user organisations fluid path in accordance with the user organisations policies.
4. Reconnect the power supply.
5. Operate the pump, checking for leaks at the fluid path connections. If leaks are present. Stop the pump, and rectify the problem.

13 INSTALLATION—CHAPTER 4 (CONTROL SYSTEM CONNECTIONS AND WIRING)

The information in this section, is not applicable to the manual model.

This chapter will only provide information on the control system connections and wiring. The set up of the control system is provided in the next installation section (14)

Refer to the correct control connection method for the model of pump.

13.1 Location of connections

A Qdos pump has the following control connections, depending on model variant.

Primary		
1	Front Input and Output connections	
2	Relay module option (59)	

Accessory		
3	Pressure Sensing Kit connection [60]	

NOTE [59]	Option for Universal and Universal+ models. M12 Pressure Sensing Kitconnection included on front panel.

NOTE [60]	Installed on all PROFIBUS, Universal and Universal+ models for connection to a Watson-Marlow Pressure Sensing Kit. Remote and manual models fo not feature a Pressure Sensing Kitconnection.

13.2 Front Input/Output connections (Models: Remote, Universal, Universal+)

Connection to control system for the Remote model and Standard Universal/Universal+ models is via input and output connections on the front of pump, as illustrated in the image below.

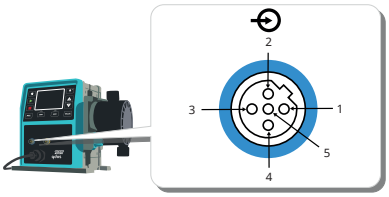
1.	Input connection	2.	Output connection
Specifications for input and output connections: • Male M12 connectors • Five pole • IP66 rated			

All input and output terminals are separated from mains circuits by reinforced insulation. These terminals must only be connected to external circuits that are also separated from mains voltages by reinforced insulation.

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

13.2.1 Input connection

13.2.1.1 Input connection pin assignment

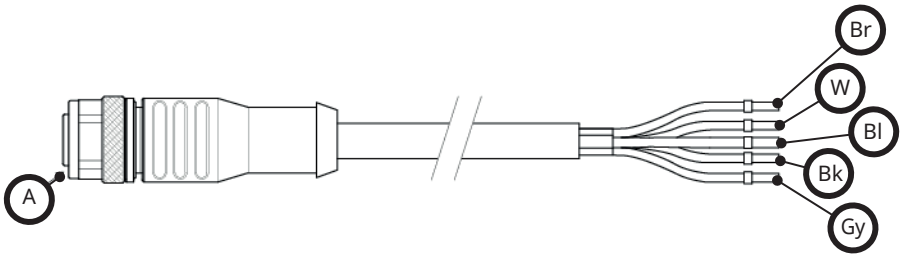


Pin No.	Function	Specification	Referenced to	Input lead colour
1	Run/stop	Min. 5 V, Max. 30 V	Connect 5-24 V DC supply to stop (referenced to pin 4). Alternatively, connect pin 5 of the output connector to this pin via normally open switch.	Brown
2	External Contact Reserved	Min. 5 V, max .30 V	Pulse 5-24 V 40 ms minimum pulse length (referenced to pin 4). Alternatively, connect pin 5 of the output to this pin via normally open switch.	White
3	4-20 mA	250 Ω input impedance 40 mA max. current 250 Ω load resistance 40 mA max. current	Referenced to GND	Blue
4 (61)	GND	Ground (0 V)		Black
5	Reverse operation (Remote fluid recovery)	Min. 5 V, max. 30 V	Connect 5-24 V DC supply to reverse the pump in analog mode	Grey

NOTE[61]	On DC versions of the pump the supply 0 V and input and output control Ground (0 V) are not galvanically isolated. The installer should check if external signal isolation is required.

13.2.1.2 Optional input cable

An input cable can be purchased as an accessory from Watson-Marlow. The specification of this cable is provided below.



A	Br	W	Bl	Bk	Gy
Blue insert	Brown	White	Blue	Black	Grey

Input lead length: 3 m (10 ft)

13.2.1.3 Example input wiring

Do not strap the control and mains cable together. Do not apply mains power voltages to any of the control input terminals. The 5-24V voltage range must not be exceeded.

13.2.1.3.1 REMOTE STOP

User configurable input via control settings menu:

Default—Apply voltage signal to STOP pump in all operating modes.

Status	Range	M12 input connector
STOP	+5 V to +24 V (default control setting)	Pin 1
Run	0 V	Pin 1

In manual and analog mode only, pump will start when signal removed

Option—pump will run until no signal to pin 1

Status	Range	M12 input connector
STOP	0 V	Pin 1
Run	+5 V to +24 V	Pin 1

The **MAX** key will work in manual mode regardless of the remote STOP input. This enables priming without having to change pump settings or disconnect the input cable

13.2.1.3.2 REMOTE CONTROL SPEED: ANALOG INPUT

Increase/decrease pump speed via rising/falling analog current control signal:

Range	M12 input connector
4-20 mA	Pin 3

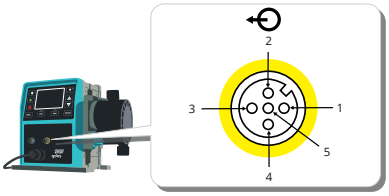
The Universal+ model can be calibrated by the user to control speed proportionally or inversely proportional to input mA signal.

4-20 mA circuit impedance: 250 Ω.

Do not invert the polarity of the terminals. If the polarity is inverted the motor will not run.

13.2.1.4 Output connection

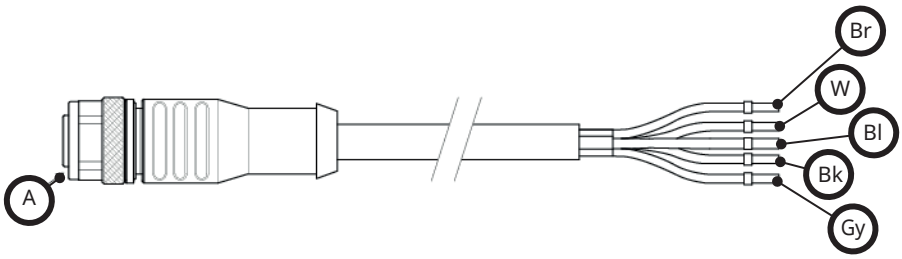
13.2.1.4.1 OUTPUT CONNECTION PIN ASSIGNMENTS



Pin No.	Function	Specification	Referenced to	Output lead colour
1	Run status output (Output 2)	Open collector output uncommitted (Function is configurable on Universal+ model.)		Brown
2	Alarm output (Output 1)	Open collector output uncommitted (Function is configurable on Universal+ model.)		White
3	Analog out	4-20 mA into 250 Ω	Pin 4	Blue
4	GND	Ground (0 V)		Black
5	Supply	Pin 5 supply voltage is 5 V with impedance of 2.2 k, this can be connected via a NO switch to input pin 1 or 2 to power the inputs.		Grey

13.2.1.4.2 OPTIONAL OUTPUT LEAD

An output cable can be purchased as an accessory from Watson-Marlow. The specification of this cable is provided below.



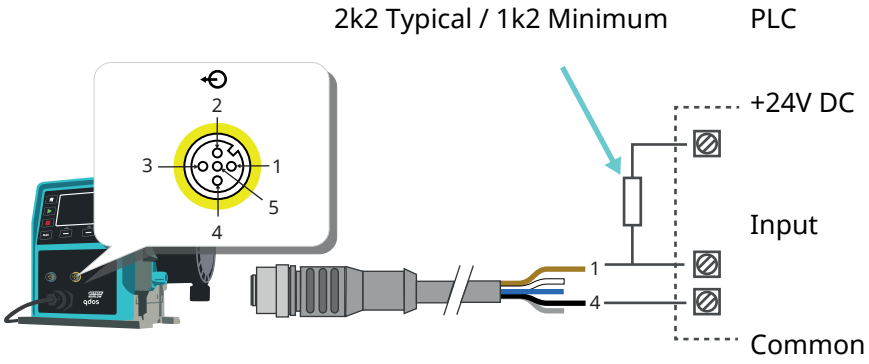
A	Br	W	Bl	Bk	Gy
Yellow insert	Brown	White	Blue	Black	Grey

Output lead length: 3 m (10 ft)

13.2.1.4.3 EXAMPLE OUTPUT WIRING

Do not strap the control and electrical power supply cable together. Do not apply mains power voltages to the terminals. The 5-24V voltage range must not be exceeded.

"pull up resistor" (Only applies to Pin 1 and Pin 2)
The resistor in the illustration (62) below needs to be sized correctly for the application to prevent damage to the pump transistors.

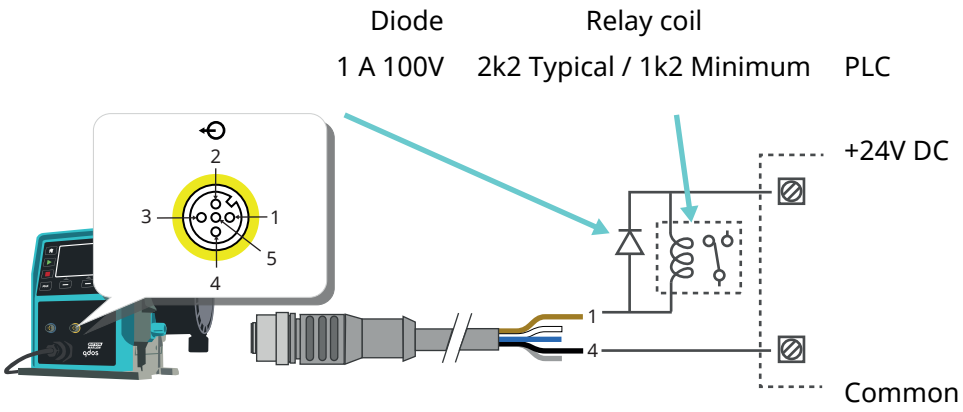


NOTE 62	Diagram depicts Run Status Output.

External relay (Only applies to Pin 1 and Pin 2)

Example wiring for an external relay, the N/O or N/C contacts could be used for any device.

The relay in the illustration [(63)] below needs to be sized correctly for the application to prevent damage to the pump transistors.



NOTE [63]	Diagram depicts Run Status output. The Alarm output must be wired in the same way except using the white wire from pin 2 instead of the brown wire from pin 1.

Alarm output

Pin 2, Output 1

This example requires external 24 V power for control. If connecting to a PLC, 24 V is usually available Alarm conditions are generated by system errors or leak detection.

Run Status Output

Pin 1, Output 2

This example requires external 24 V power for control. If connecting to a PLC, 24 V is usually available. This output changes state when the motor starts/stops.

Speed: Analog output (Models: Remote, Universal+)

An analog signal current within the range 4-20 mA into 250 Ω is available [(64)] between pin three and pin four of the output connector. The current is directly proportional to the pumphead rotation speed. 4 mA = zero speed; 20 mA = maximum speed.

On the Universal+ version there is also an option to match the scale of the 4-20 mA input if this has been reconfigured by the user. This option is available in the Control settings menu.

NOTE [64]	If the mA output is to be used for reading from a multimeter, a 250 Ω resistor is required in series.

13.3 Relay module—Option for Universal/Universal+

The relay module is a unique variant available for a Universal and Universal+ control model only. The relay module is mounted on the opposite side of the pumphead.

The general arrangement is shown below :

13.3.1 Relay module specifications

Relay terminal connections	
Relay contact rating	240 V AC 4 A
	30 V DC 4 A
Cover ingress rating	IP66 (NEMA 4X)
Cable gland rating	IP66 (NEMA 4X)

13.3.2 Control cable specification requirements

Cable section profile	Circular
Outside diameter to ensure ingress rating	9.5–12 mm
Cable conductors (65)	0.05-1.31 mm (30-16 AWG) stranded or solid
EMC protection	Use shielded control cable terminated to any of the provided Earth connections.
Minimum temperature rating	85 °C
Maximum cables per gland (66)	1

NOTE 65	More than 8 conductors per cable may be awkward to handle.

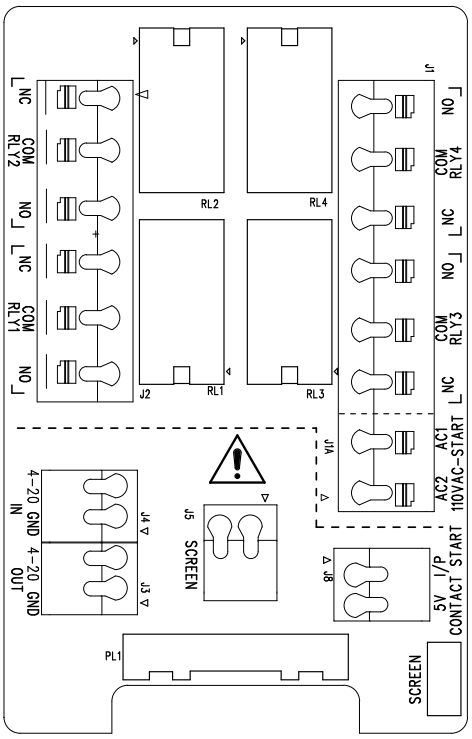
NOTE 66	Two ½" cable glands provided

13.3.3 Relay module PCB layout

Module variants:

- Universal = 2 relays with 2 output options
- Universal+ = 4 relays with 4 output options

The Universal+ PCB layout is illustrated by the image below.



Refer to this diagram for terminal connector naming and location.

13.3.4 Relay module terminal connectors

On DC versions of the pump the DC supply 0V and input and output control ground are not galvanically isolated. The installer should check if external signal isolation is required.

Keep 4-20 mA and low voltage signals separate from power supply (AC or DC).

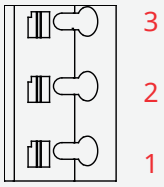
General Alarm output (J2)	
	RLY1
Connect the output device to the C (common) terminal of the relay connector and either the N/C (normally closed) or N/O (normally open) terminal as required. This relay coil is energised when the pump has an alarm condition. Note: Alarm conditions are generated by system errors. This alarm will not be operated for analog signal errors. The default for Relay 1 is General Alarm, on Universal+ models this output (1) can be configured in the control settings menu.	3. N/C 2. C 1. N/O  3 2 1

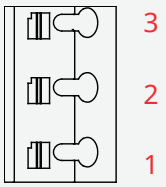
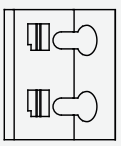
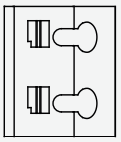
Table 15 – Run status output (J2)	
	RLY2
Connect the output device to the C (common) terminal of the relay connector and either the N/C (normally closed) or N/O (normally open) terminal as required. This relay coil is energised when the pump is running. The default for output 2 is run status, on Universal+ models this output (2) can be configured in the control settings menu.	3. N/C 2. C 1. N/O  3 2 1

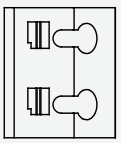
Table 16 – Output 3 and 4 (J1)
Two additional relay outputs are provided on the Universal+relay model of the pump. These outputs are inactive by default, the function of the output must be configured in the control settings menu.

Configurable remote stop or contact input (J8), 24 V logic input		
	Contact stop input	
If Analog 4-20 mA mode is selected then terminal J8 will be configured as a remote stop automatically. If Contact mode is selected then the input J8 will be configured as a contact input automatically.	J8 2. I/P 1. 5 V	 2 1

Remote stop logic 24 VDC (J8)
Connect a remote switch between the Stop/Contact terminal and the 5 V terminal of the Run/Stop I/P connector (J8). Alternatively a 5 V-24 V logic input may be applied to the Stop/Contact terminal, ground to the GND terminal of the adjacent 4-20 mA I/P connector (J3 or J4). PLC 24 V relay/solenoid driver outputs are not suitable due to the high input impedance of the Stop/Contact terminal. The sense of remote stop input can be configured in software using control settings menu. Remote stop is operational in manual and analog mode.

Contact
To operate the pump in contact mode the remote stop input must be set to "High".

Remote stop input (J1A), 110 V logic		
	110 VAC-Stop input	
Apply a signal of 85 VAC to 130 VAC across terminals AC1 and AC2 to stop the pump. Polarity is not important. In the default condition the pump will not run while this signal is applied. In manual and analog mode, the pump will start when the signal is removed. The input can be configured to act in the opposite way in the control settings menu. Note: This input is logical OR with the contact dose input. Contact If contact mode is enabled the pump will commence a contact dose when an AC input is applied across the terminals.	2. AC1 1. AC2	

Speed: analog input (J4)		
	Analog	
The analog process signal must be applied to the I/P terminal of the Analog connector (J4). Ground to the GND connector of the same terminal. In Analog mode the pump set speed will be proportional or inversely proportional to the analog input. 4-20 mA circuit impedance: 250 Ω. Max current 40 mA	2. GND 1. I/P	

Speed: analog output (J3) (Universal+ only)	
	4-20 mA
A current analog signal within the range 4-20 mA is available between the O/P (output) terminal and the GND terminal. The current is directly proportional to the pump speed. 20 mA = maximum speed, 4 mA = zero speed.	1. O/P
There is also an option to match the scale of the 4-20 mA input if this has been reconfigured by the user. This option is available in the Control settings menu.	2. GND
Earth shielding terminals	
A 4.8 mm spade terminal is supplied for earth shielding of cables. Earth can be connected to the terminal. There are also two spring clamp terminals for additional earth connection.	

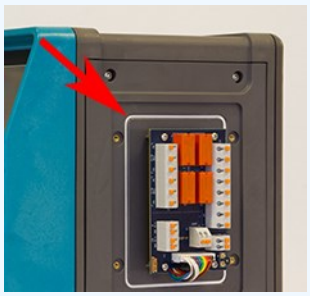
13.3.5 Control cable installation

Procedure

1. Isolate the pump from the power supply. Turn off any control signals on the cables to be installed. Remove four M3x10 Pozidriv screws from relay module cover in order shown.

2. Remove cover from drive.

   If cover adheres to drive housing, gently tap to free it. **Do not** prise off with tools.



3. Ensure gasket is retained within recessed channel on drive housing.

4. Unscrew sealing plugs from relay module cover using 21 mm spanner.

5. Fit new sealing washer onto supplied ½ ” NPT cable gland.

6. Screw supplied ½ ” NPT cable gland with new sealing washers into relay module cover.

7. Ensure cable gland retaining nut is properly seated.

8. Use 21 mm spanner to tighten gland to 2.5 Nm to ensure ingress rating.

   If different gland used, it must be IP66 rated.

9. Loosen, but do not remove the gland cap.

10. Insert control cable into loosened gland.
11. Pull through sufficient cable to reach the connectors required, leaving a little slack.
12. Strip the outer sheath as necessary.
13. Remove 5 mm of insulation from conductors. No tinning/ferrule required.
14. Whilst depressing sprung terminal button, push bare cable end into terminal.
15. Release terminal button to clamp wire.
16. Prepare the cable screen(s) by twisting a suitable length. The twisted length(s) shall ideally be sleeved to prevent shorting.
17. Secure the end of the cable screen to the Faston receptacles on the spade connector provided.
18. When all conductors in position replace the module cover.
19. Check gasket and replace if damaged.

IMPORTANT: Gasket ensures IP66 (NEMA 4X) protection.

20. Hold relay module cover in place. DO NOT disturb sealing strip.

21. Tighten four M3x10 Pozidrive screws to 2.5 Nm in order shown.

22. Use 21 mm spanner to tighten gland cap to 2.5 Nm to ensure ingress rating.

13.4 PROFIBUS connection

All PROFIBUS systems must be installed or certified by a PROFIBUS approved installation engineer.

13.4.1 PROFIBUS connection

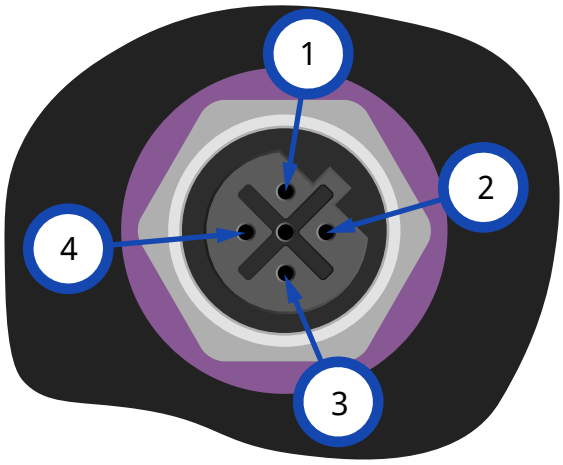
A PROFIBUS pump has a PROFIBUS connection on the front of the pump as illustrated by the image below:

PROFIBUS connector location
PROFIBUS connection specifications: • Female M12 connectors • Five pole • IP66 rated • Transmission speed—Product certified up to 12.5 Mbit/s (67) (Recommended not to exceed 1.5 Mbit/s in most applications)

NOTE[67]	Faster bus speeds than 1.5 Mbit/s may be achieved depending on network installation. Follow PROFIBUS installation guidelines for optimal performance

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

13.4.2 PROFIBUS connection pin assignment



PROFIBUS Pin assignments at pump		
Pin No.	**Signal**	**Function**
1	VP	+5 V supply for terminating resistors
2	RxD/TxD-N	Data line minus (A-line)
3	DGND	Data ground
4	RxD/TxD-P	Data line plus (B-line)

13.4.3 PROFIBUS wiring

Requirements:

Do avoid tight bends in the PROFIBUS signal cable [(68)].

All devices in bus system must be connected in a line.

IP66 rated T adaptor must be used to connect pump to PROFIBUS line Maximum 32 stations (including master, slaves and repeaters) are possible.

Both cable ends must be fitted with terminating resistor [(69)].

M12 socket provided for PROFIBUS installation are IP66 rated.

To maintain IP66 rated system—All PROFIBUS cables, T adaptors and terminating resistors used must be fitted with IP66 rated M12 industrial connectors.

NOTE [68]	Only use certified PROFIBUS cables and connectors. Follow PROFIBUS guidelines for correct installation.

NOTE [69]	If pump is last bus device connected to PROFIBUS cable; cable must be terminated using terminating resistor (PROFIBUS standard EN 50170). Resistor must be IP66 rated.

13.4.3.1 Max. length of type A bus cable (m)

The permissible overall length of the bus cabling will vary according to the required bit rate. If a longer cable or higher bit rate are required repeaters must be used.

Total stub length must not exceed 6.6 m.

The maximum bit rates achievable are shown in the table below.

Max. length of type A bus cable (m)	
Bit rate (Kbit/s)	**Max. length of type A bus cable (m)**
1500	200
500	400
187.5	1000
93.75	1200
19.2	1200
9.6	1200

13.5 Pressure Sensing Kit control connection (Models: PROFIBUS, Universal, Universal+)

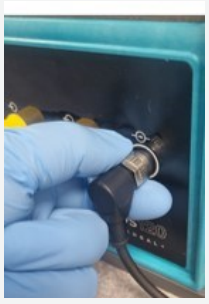
PROFIBUS, Universal and Universal+ modules have a Pressure Sensing Kitcontrol connection installed on the front panel:

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 pum	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 14.10 to set up the Pressure Sensing Kit using the control settings menu.

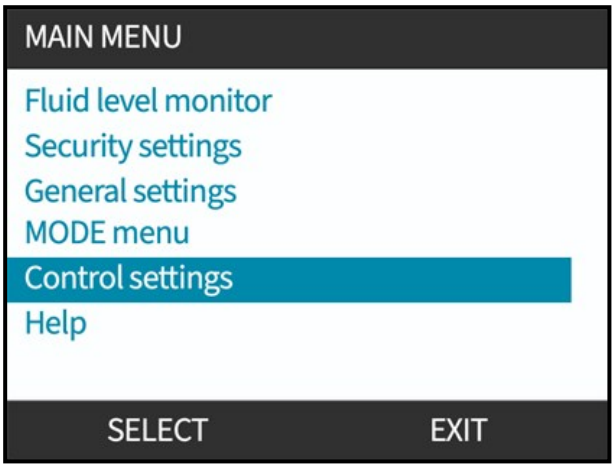
14 INSTALLATION—CHAPTER 5 (HMI: CONTROL SETTINGS MENU)

Control settings overview	
Speed limit	User defined maximum pump speed limit
Reset run hours	Zero’s run hours counter
Reset volume counter	Zero’s volume counter
Invert alarm logic - Universal model	Invert alarm output
Configure outputs	Allows user to define function of each output
4-20 mA Output (Universal+ model only)	Choose full scale 4-20 mA input or match input scaling to your 4-20mA input
Configure start/stop input	Define how input signal affects run status of pump or disable remote/automatic control
Scaling factor	Multiplies the speed by a chosen amount
Pumphead selection	Select pumphead material
Pressure sensor settings	Set up the Pressure Sensing Kit

14.1 Access control settings menu

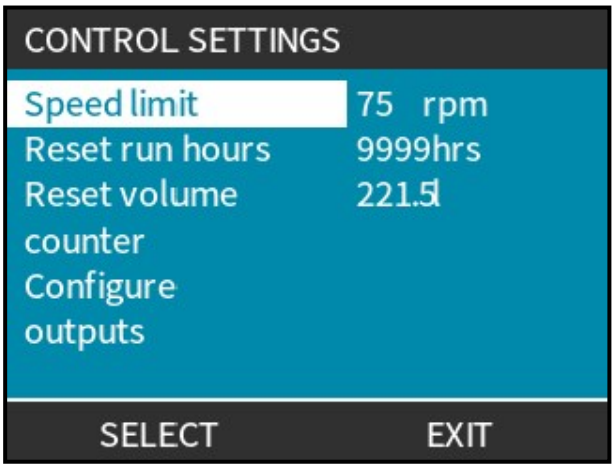
From the **MAIN MENU**

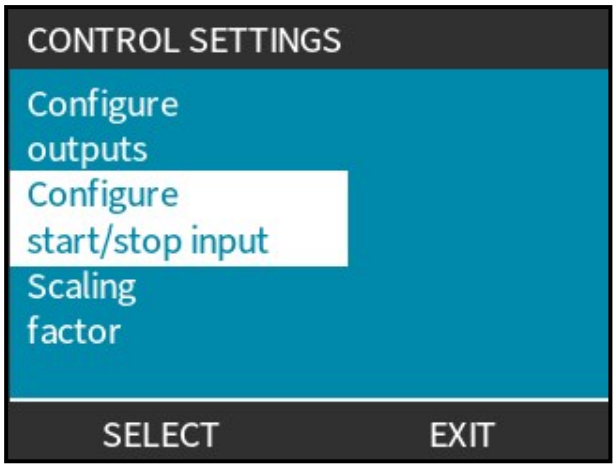
1. Use **+/-** keys to highlight **Control Settings**.
2. Press SELECT



Procedure
To change view/edit pump control settings:

1. Choose **Control Settings** from **MAIN MENU**.
2. Use the **+/-** keys to highlight options




CONTROL SETTINGS
Configure outputs
Configure start/stop input
Scaling factor
SELECT
EXIT

14.2 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. This speed limit will be applied to all operating modes.

Maximum pump speed				
Qdos20	**Qdos30**	**Qdos60**	**Qdos120**	**QdosCWT**
55 rpm (ReNu 20)	125 rpm	125 rpm	140 rpm (ReNu 120)	125 rpm (CWT)
125 rpm (CWT)			125 rpm (ReNu 60)	55 rpm (ReNu 20)

Applying speed limit automatically re-scales the analog speed control response

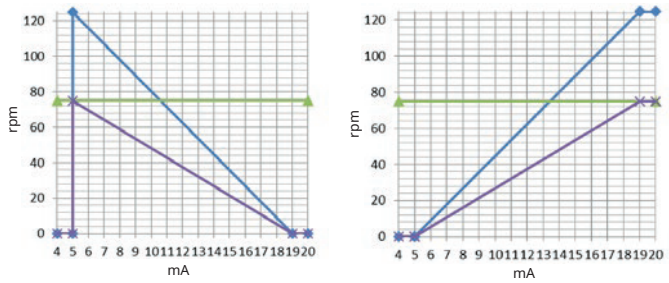


Figure 1 - The effect of a 75 rpm speed limit on user-defined 4-20 mA response profiles

	Calibrated 4-20 mA
	user_max_flow
	recalibrated

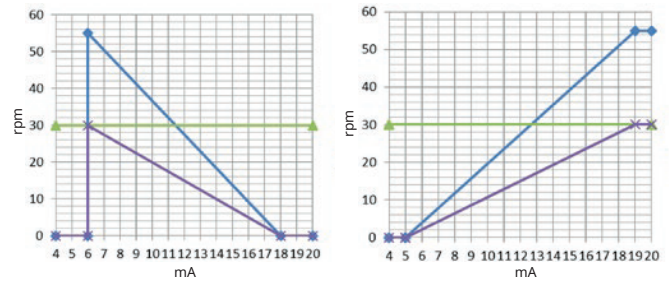


Figure 2 - The effect of a 30 rpm speed limit on user-defined 4-20 mA response profiles

	Calibrated 4-20 mA
	user_max_flow
	recalibrated

To reduce maximum speed limit:

Procedure
1. Highlight **Speed Limit Option**
2. SELECT −.
3. Use **+/-** keys to adjust values
4. Choose SAVE − to store new value

14.3 Control settings > Reset run hours

To zero run hours counter:

Procedure
1. Highlight **Reset Run Hours** option
2. SELECT −.
3. Choose RESET −.

To view run hours counter

Procedure
1. Choose **Info** from **HOME** screen.

14.4 Control settings > Reset volume counter

To zero volume counter:

Procedure
1. Highlight **Reset Volume Counter** option
2. SELECT −.
3. Choose RESET.

To view volume counter

Procedure
1. Choose **Info** from **HOME** screen.

14.5 Control settings > Invert alarm logic - Universal model

To invert alarm logic:

Procedure
1. Highlight **Invert Alarm Logic** option
2. SELECT −.
3. Choose ENABLE −.

Default setting:

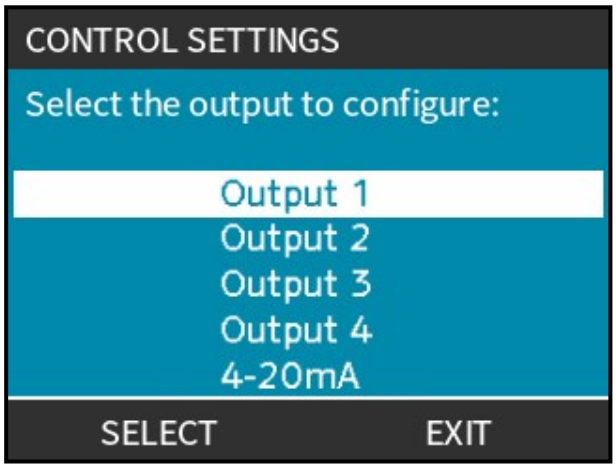
- High for alarm
- Low for healthy

Recommended to invert output for fail safe operation.

14.6 Control settings > Configurable outputs - Universal+ model

Procedure

1. Highlight **Configure Outputs** option
2. SELECT ▬.
3. Use **+/-** keys to highlight required option
4. SELECT ▬.



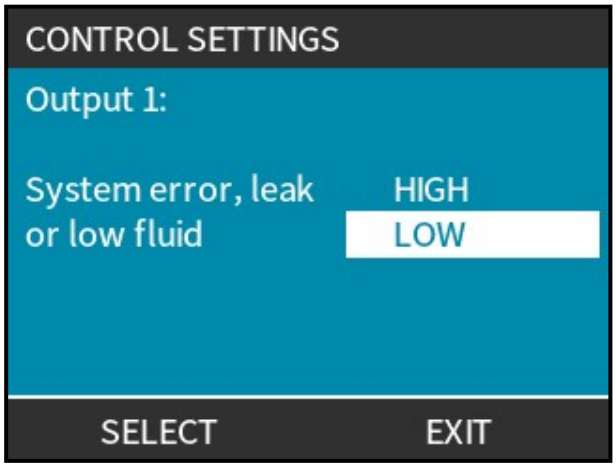
Choose pump status of chosen option:

Procedure

5. Use **+/-** keys to highlight required option

   Tick symbol ✓ indicates current setting

6. SELECT ▬.



Choose logic state of chosen output:

Procedure

7. Use **+/-** keys to highlight required option
8. SELECT −.

To store/reject settings:

Procedure

7. Choose SELECT − to program output

   or

   EXIT − to cancel

14.7 Control settings > 4-20 mA Output (Universal+ model only)

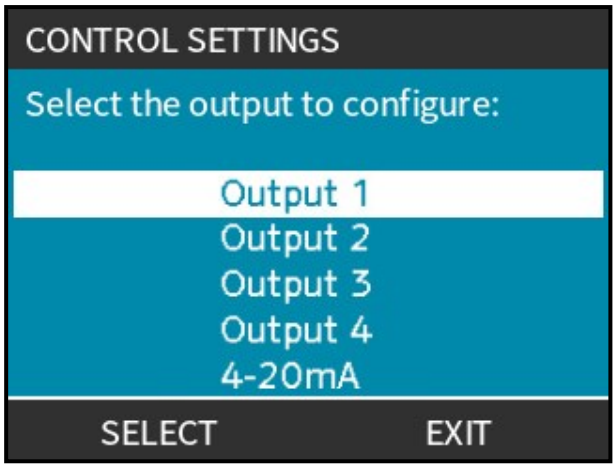
A Universal+ pump can provide a 4-20 mA output based on 2 options:

Name	Comment
Full scale 0 to 125 rpm	4-20 mA output is based on pumps full speed range. **0 rpm**: 4 mA; **Maximum rpm**: 20 mA
Match input scale	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

To configure 4-20 mA output response:

Procedure

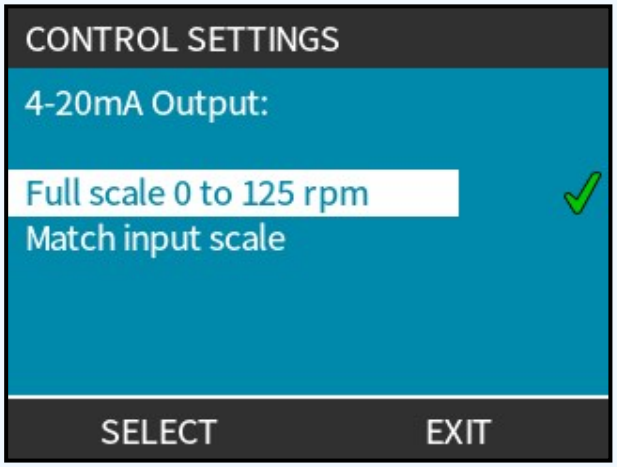
1. Highlight **Configure Outputs** option
2. SELECT −.
3. Use **+/-** keys to highlight **4-20mA**
4. SELECT −.



Choose output option:

Procedure

5. Use **+/-** keys to highlight required option



Tick symbol ✓ indicates current setting

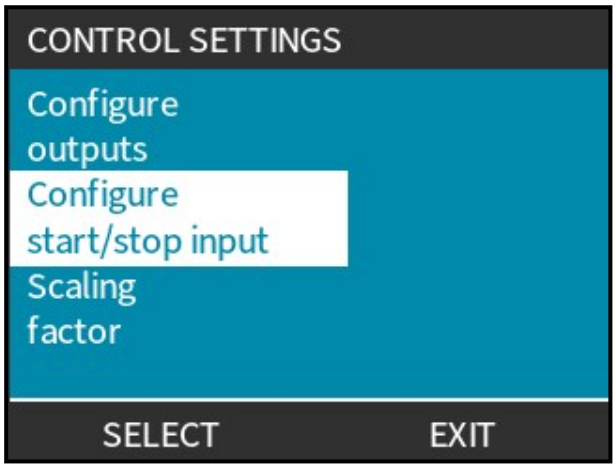
6. Press SELECT −.

14.8 Control settings > Configurable Start/Stop input

To configure 4-20 mA output response:

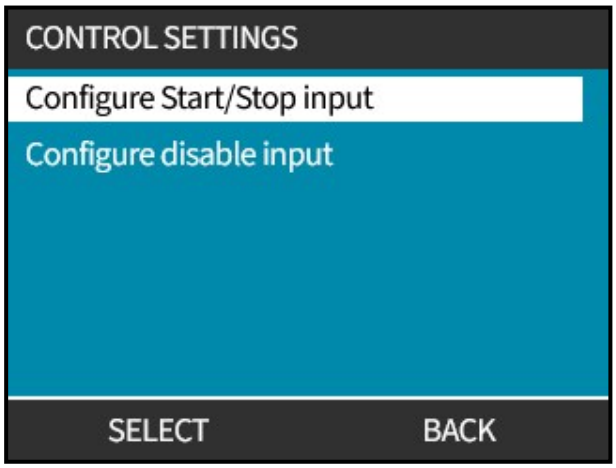
Procedure

1. Highlight **Configure Start/Stop Input** option.
2. SELECT −.



Procedure

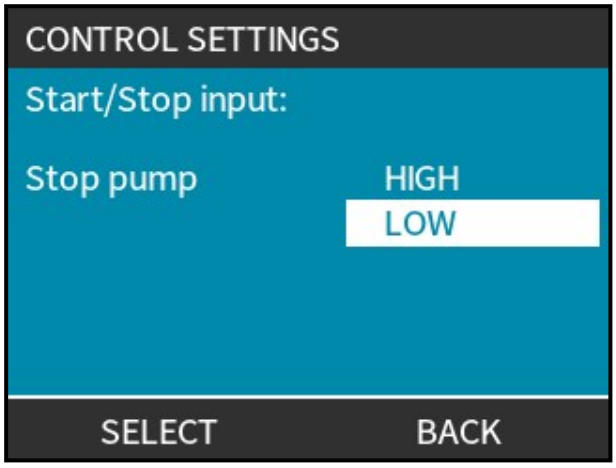
3. Highlight **Configure Start/Stop Input** option
4. SELECT −.



Procedure

5. Use **+/-** keys to highlight options [70]
6. SELECT −.

NOTE[70]	Low stop input recommended—pump will stop if input signal lost.



Disable remote/automatic control at pump:

Procedure

1. Highlight **Configure Disable Input** option
2. SELECT −.

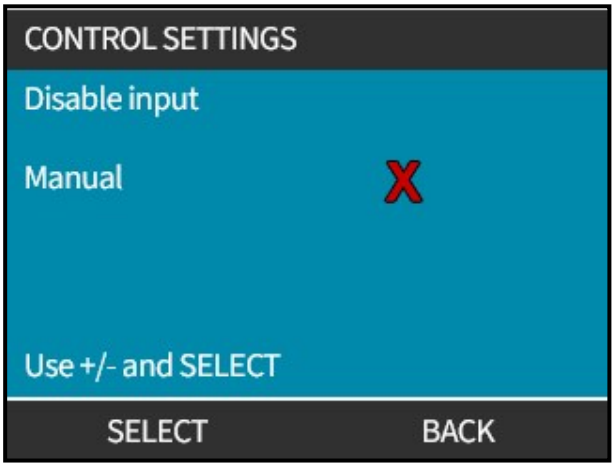
Manually override remote/automatic control of pump:

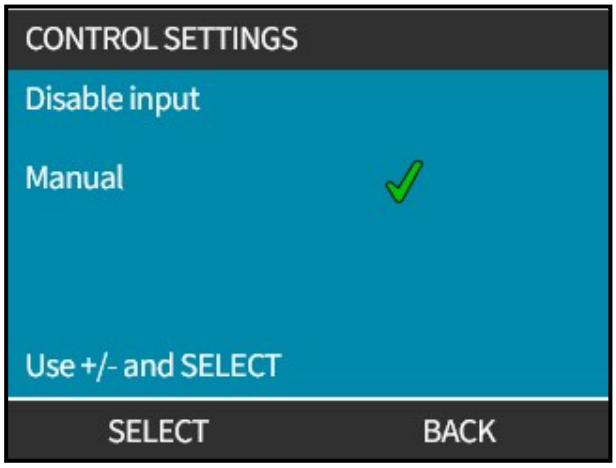
Procedure

1. Use **+/-** keys to change from ✗ to ✓ (71), (72)
2. SELECT −

NOTE[71]	Only disables remote stop in manual mode. Remote stop cannot be disabled in analog mode.

NOTE[72]	Pump will not accept remote control until remote/automatic control is re-enabled via pump menu settings.



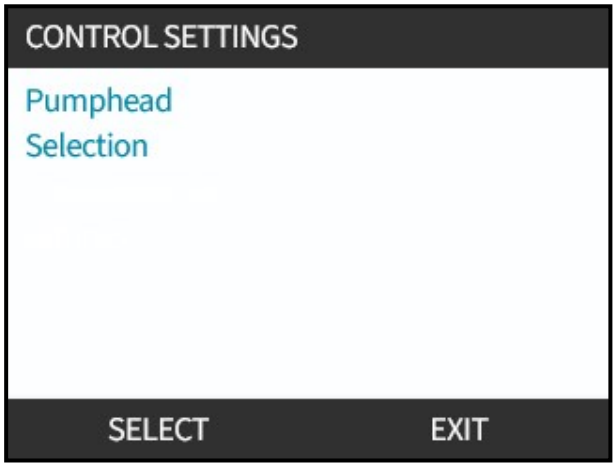


14.9 Control settings > Pumphead selection

To configure pumphead material selection (or confirm pumphead has replaced early)

Procedure

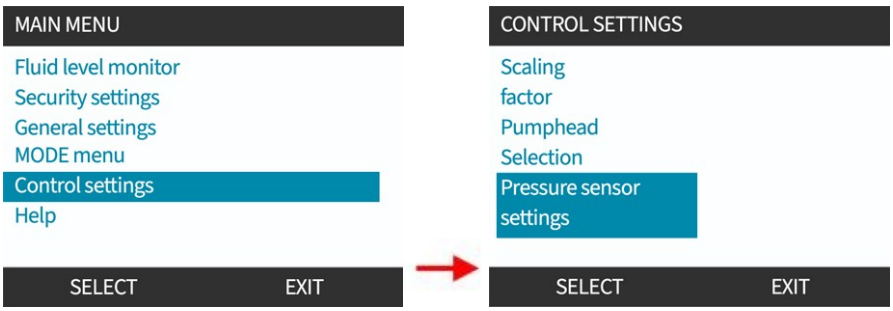
1. Highlight **Pumphead Selection** option
2. SELECT ▬.
3. Use **+/-** keys to highlight options.
4. SELECT ▬.



14.10 Control settings > Pressure sensor settings

14.10.1 Control settings menu overview—Pressure Sensing Kit

The set up of a Pressure Sensing Kit is from the pressure sensor settings sub-menu of the control settings menu.



The following settings can be made:

- 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 [(73)] 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 [73]	Warning levels cannot be disabled.

14.10.2 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 (76)	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 (74) Bar or disable option (75)	0.00 to 217.5 (74) PSI or disable option (75)
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		

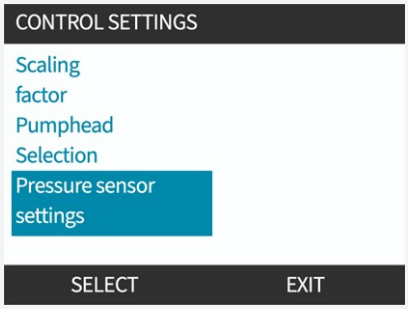
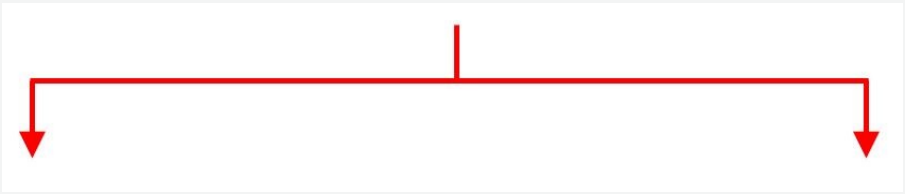
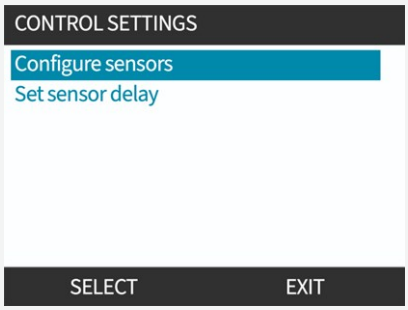
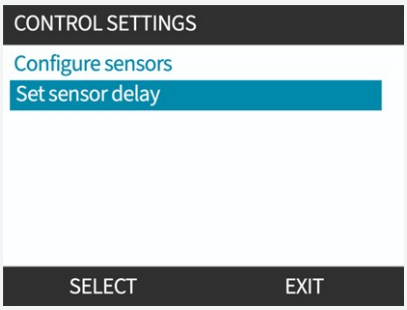
NOTE 74	The maximum rated pressure of a Qdos pump is 10.00 bar (145.0 PSI) however the maximum alarm or warning level are configurable up to 15.00 Bar (217.5 PSI) to allow for short term peak pressures.

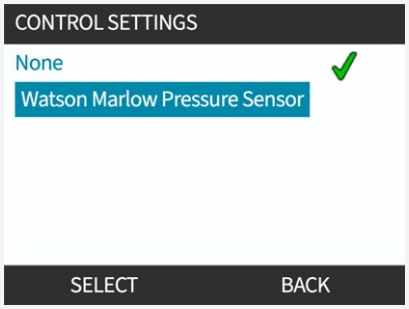
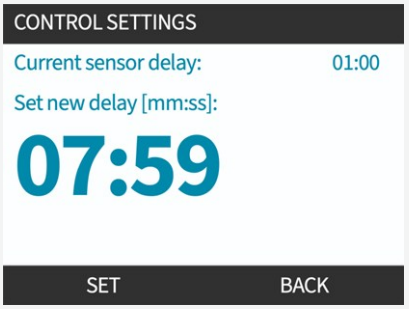
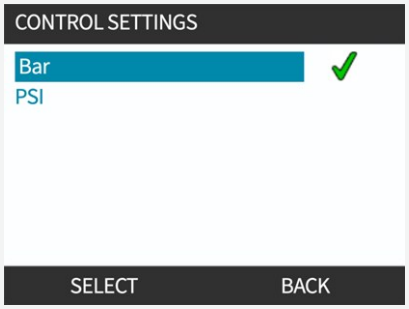
NOTE 75	Warning levels cannot be disabled.

NOTE 76	Time delay feature to suspend the minimum level trigger (alarm and warning) for a configurable period (0 to 30 minutes)..

14.10.3 Control settings sub-menu overview

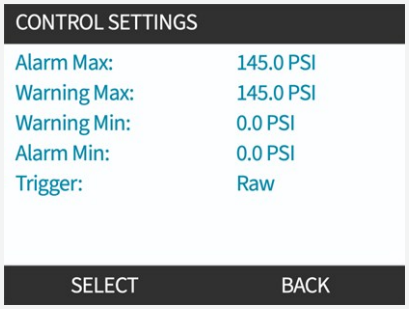
An overview of the set up of a Pressure Sensing Kit using the control settings sub-menus is provided in the following sequence:

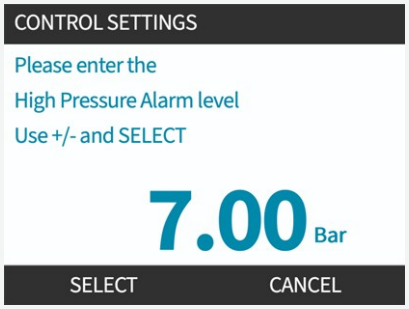
Sub-menu 1		
Pressure sensor settings is the first control settings sub-menu.		
		
The second sub-menu has two settings paths		
		
Sub-menu 2A		Sub-menu 2B
SELECT>Configure sensors to enter sub-menus 3A to 6		SELECT>Set sensor delay to enter sub-menu 3B
		

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

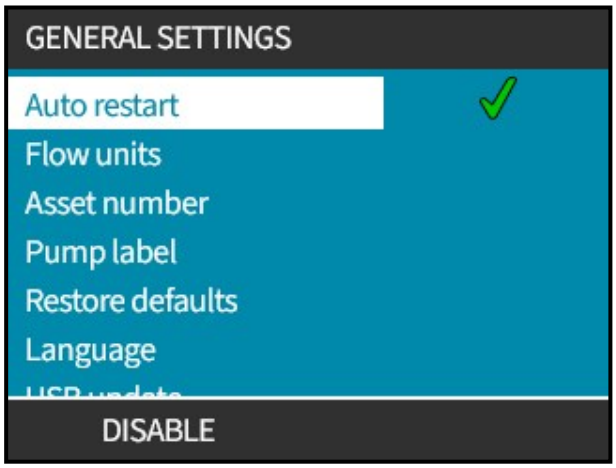
15 INSTALLATION—CHAPTER 6 (HMI: GENERAL SETTINGS MENU)

General settings overview	
Auto restart	Returns pump to previous operating state/mode after power loss.
Flow units	Set flow units display preference.
Asset number	User defined 10 digit alphanumeric number accessed via Help screen.
Pump label	User defined 20 digit alphanumeric label displayed on home screen header bar.
Restore defaults	Returns pump to its factory start up defaults. See section: 4.2.4.3
Language	Set display language of pump.
USB update	Update the software of pump using USB update media.

To change view/edit pump settings:

Procedure

1. Choose **GENERAL SETTINGS** from **MAIN MENU**.
2. Use **+/-** keys to highlight options



15.1 General settings > Auto restart

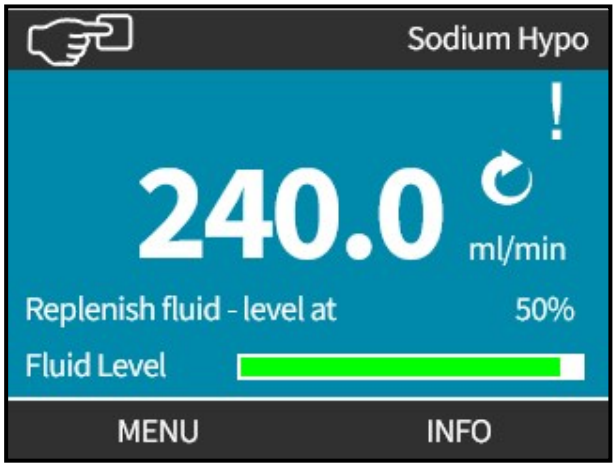
This pump offers an auto restart feature. When enabled, the feature will allow the pump to return to the operating state (mode and speed) it was in when power was lost.

Example pumping scenarios using auto restart	
Before power loss	**After power loss**
Pump running analog mode	Continue running proportional speed to analog input.
Pump running in manual mode	Continues running at same speed
Dosing	Dosing resumed—interrupted dose will be finished
Pulses	Any pulses in memory before power loss will be remembered. Pulses received during power loss will be lost.

Procedure

1. Press ENABLE/DISABLE − to toggle **Auto Restart** on/off.

The ! [77] symbol will be displayed in the top right corner when auto-restart is enabled as illustrated below



NOTE [77]	The ! symbol is also displayed when the pump is the Analog, PROFIBUS or contact mode. It is a warning that the pump can start at any time.

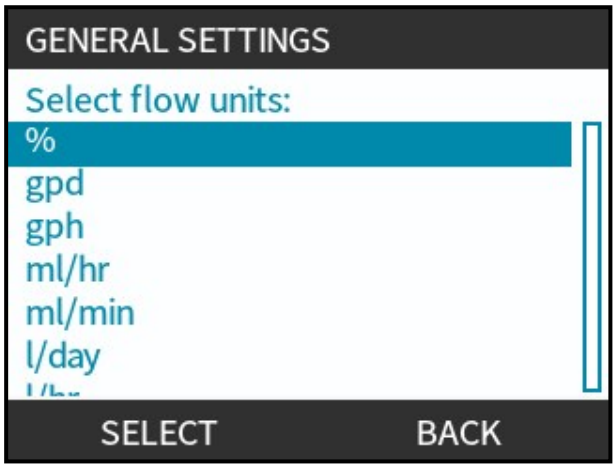
For applications that require the pump to be started and stopped regularly, ANALOG, CONTACT or PROFIBUS control should be used. The pump is not designed to be operated for more than 20 starts per hour using the auto-restart feature as a method of control.

15.2 General settings > Flow units

Set displayed Flow units for all pump display

Procedure

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



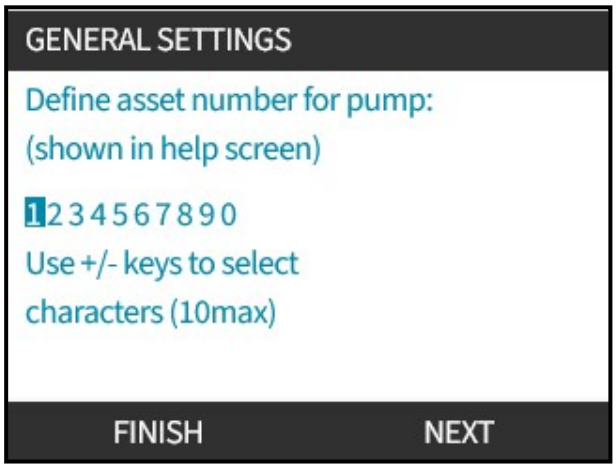
15.3 General settings > Asset number

To define/edit the asset number:

Procedure

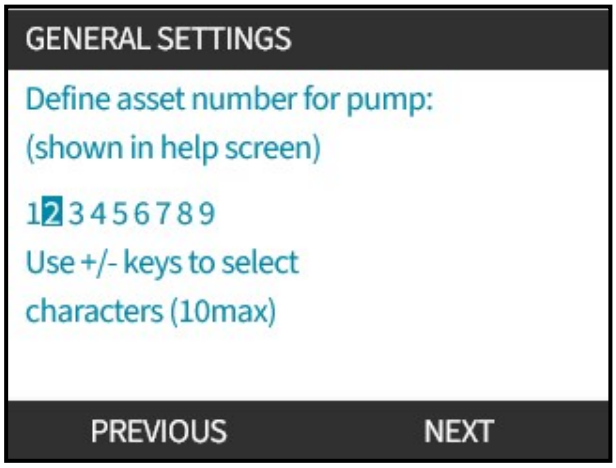
1. Highlight **Asset Number** option
2. SELECT ▬.
3. Use **+/-** keys to highlight characters for editing [78].
   Available characters: 0-9, A-Z, and SPACE.

NOTE [78]	Any previously defined asset number will be displayed on screen to allow editing



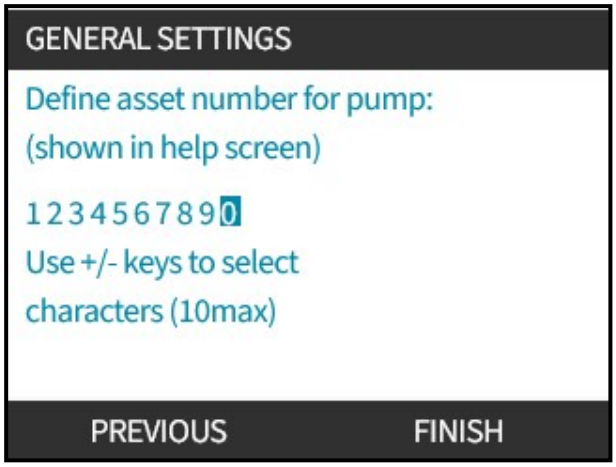
Procedure

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



Procedure

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



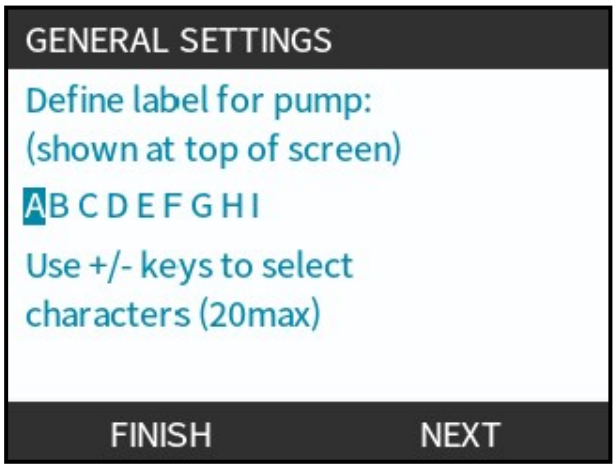
15.4 General settings > Pump label

To define/edit the pump label:

Procedure

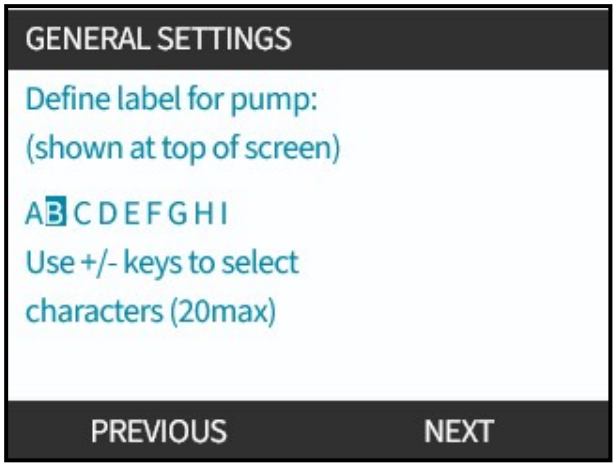
1. Highlight **Pump Label** option
2. SELECT −.
3. Use **+/-** keys to highlight characters for editing [79].
   Available characters: 0-9, A-Z, and SPACE.

NOTE [79]	Any previously defined pump label will be displayed on screen to allow editing. 'WATSON-MARLOW' displayed by default.



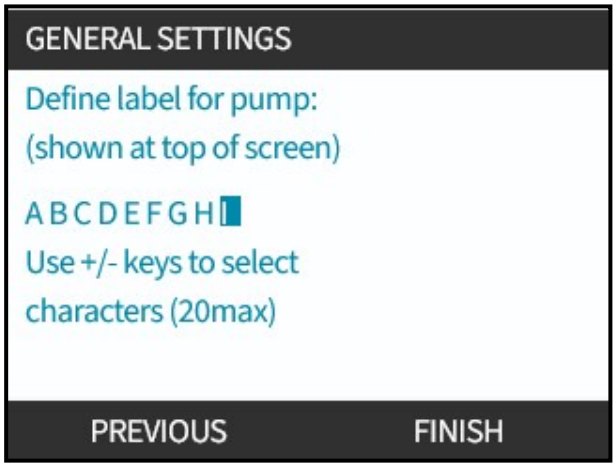
Procedure

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



Procedure

5. Choose FINISH [−] to save entry and return to general settings menu.



15.5 General settings > Restore defaults

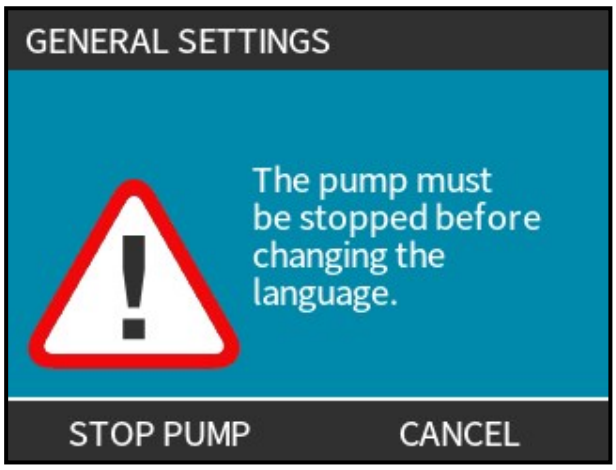
Returns pump to its default settings See section: 4.2.4.3

15.6 General settings > Language

To define/edit display language:

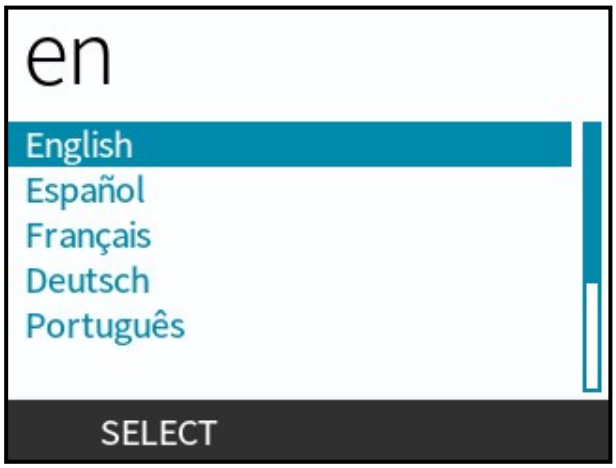
Procedure

1. Highlight **Language** option
2. SELECT ▬.
3. Stop pump



Procedure

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



Procedure

6. CONFIRM ▬ to continue.

   All display text will appear in chosen language.

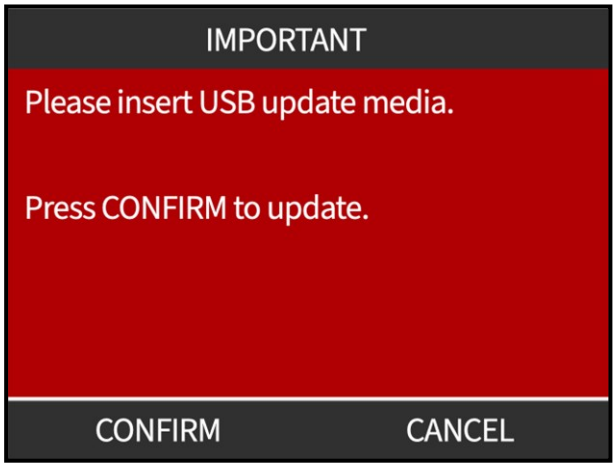
To cancel:

Procedure

7. REJECT − to return to the language choice screen.

15.7 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: 20.4.

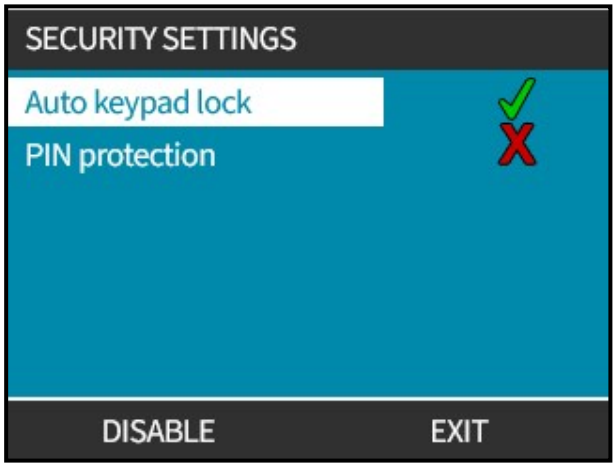
16 INSTALLATION—CHAPTER 7 (HMI: SECURITY SETTINGS MENU)

Security settings overview	
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 the menu.

To change view/edit pump security settings:

Procedure

1. Choose **Security Settings** from **MAIN MENU**.
2. Use the **+/-** keys to highlight options



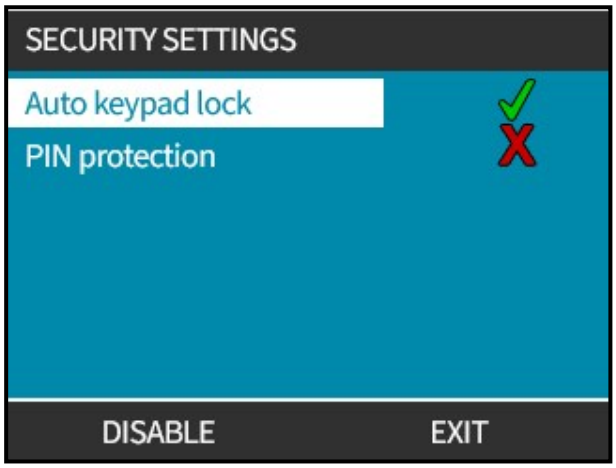
16.1 Security settings > Auto keypad lock

To enable the Auto keypad lock:

Procedure

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

Status symbol displays



Procedure

3. Padlock icon displays on home screen to indicate **Auto Keypad Lock** activated.

When **Auto Keypad Lock** enabled; a message displays if any key is pressed [(80)].

NOTE[80]	**STOP** ■ and **BACKLIGHT** keys will continue to function when **Auto Keypad Lock** enabled.

To access keypad functions:

Procedure

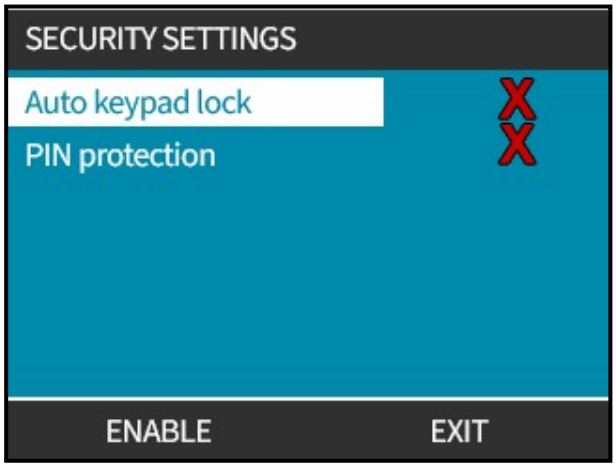
1. Simultaneously press two [−] [−] unlock keys together.

To disable the Auto keypad lock:

Procedure

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

   Status symbol ✗ displays.



16.2 Security settings > PIN protection

Once correct PIN has been entered all menu options can be accessed.

PIN protection re-activates after 20 seconds of no keypad activity.

Activate PIN protection:

Procedure

1. Highlight **PIN Protection** option
2. ACTIVATE [−].

   Status symbol ✓ displays

Deactivate PIN protection:

Procedure

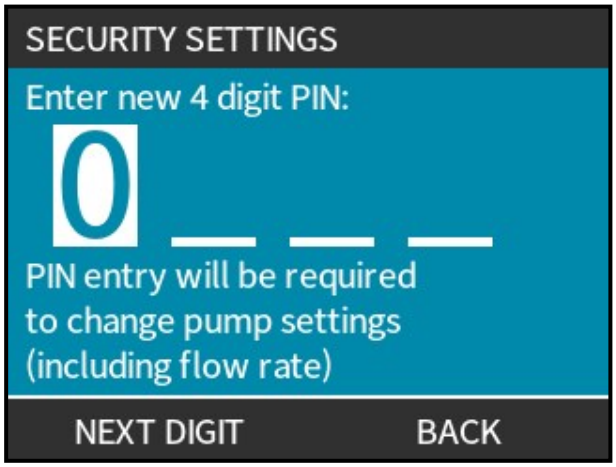
1. Highlight **PIN Protection** option
2. DEACTIVATE [−]

   Status symbol ✗ displays.

Define four digit number for your PIN

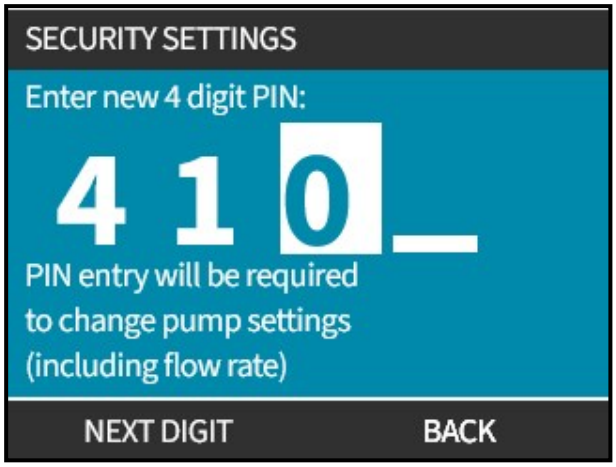
Procedure

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



Procedure

3. After selecting fourth digit press ENTER [−].

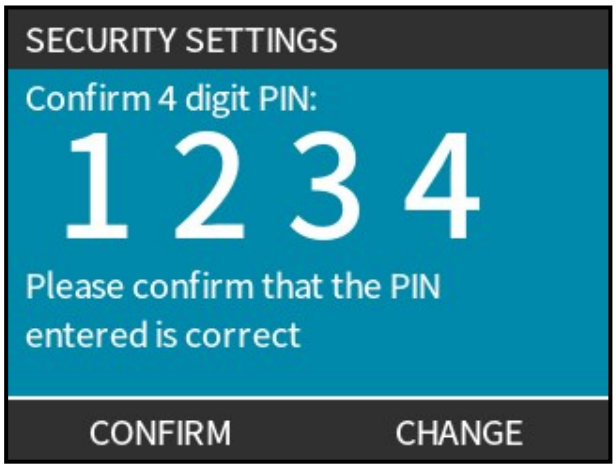


Procedure

4. Check number entered is correct, then CONFIRM [−].

   or

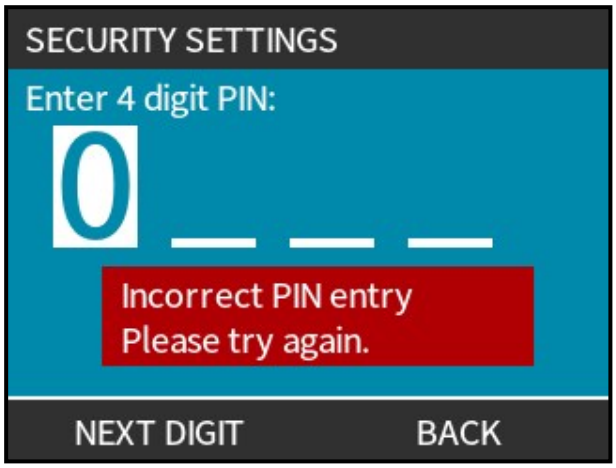
   CHANGE [−] to return to **PIN Entry**.



Procedure
Pressing **HOME** or **MODE** key at any time before confirming PIN will abort process.

Forgotten PIN:

Contact Watson-Marlow for PIN reset instruction.



17 USE THE HMI TO CHANGE MODE

Remote model does not feature selectable modes.

Change mode overview	
Manual (default)	Allows control via Start/Stop buttons
Flow calibration	Recalibration function to maintain accuracy
Analog 4–20mA (Universal and Universal+ only)	Variable analog signal provides accurate metering control
Contact mode (Universal+ only)	Intermittent on/off dosing with variable duration
PROFIBUS (PROFIBUS only)	Allows PROFIBUS data exchange
Fluid recovery	

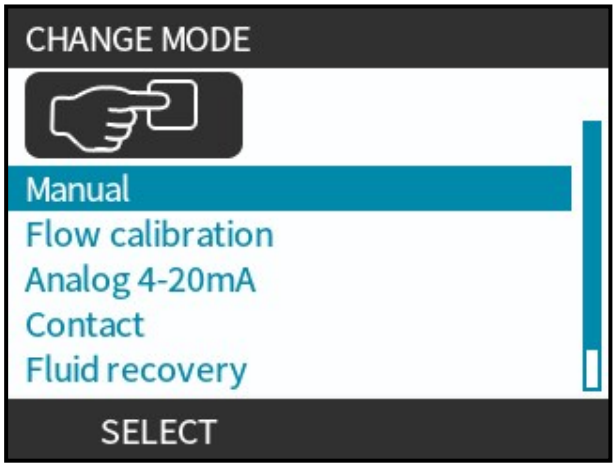
To access the **CHANGE MODE** menu:

Procedure

1. Press **MODE** key

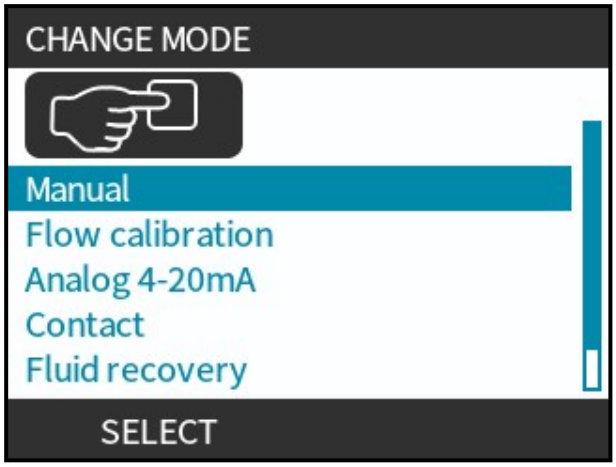
   or

   Choose **Mode Menu** from **MAIN MENU**.



Procedure

2. Use the **+/-** keys to highlight options.



17.1 Pressure Sensing Kit functions not available during certain operating modes

The following pressure sensor 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
When pump is running in reverse in either PROFIBUS, or Analog mode.	All alarm and warning levels are disabled (all 4 levels)

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

17.2 Change mode: Flow calibration (Manual, PROFIBUS, Universal and Universal+ only)

Recalibrate:

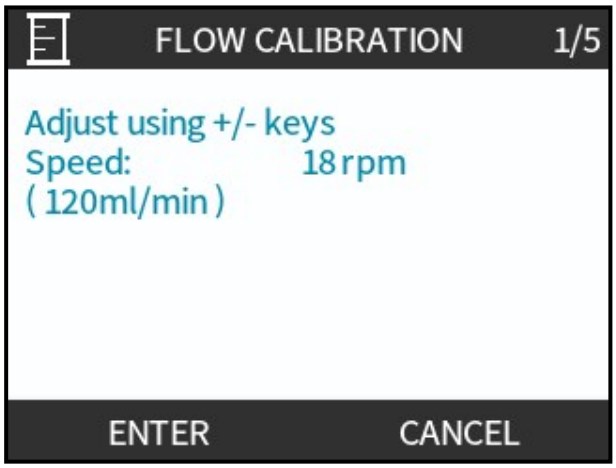
- After changing pumphead
- After changing process fluid
- After changing any connecting pipework.
- Periodically to maintain accuracy.

This pump displays flow rate in ml/min.

To calibrate pump flow:

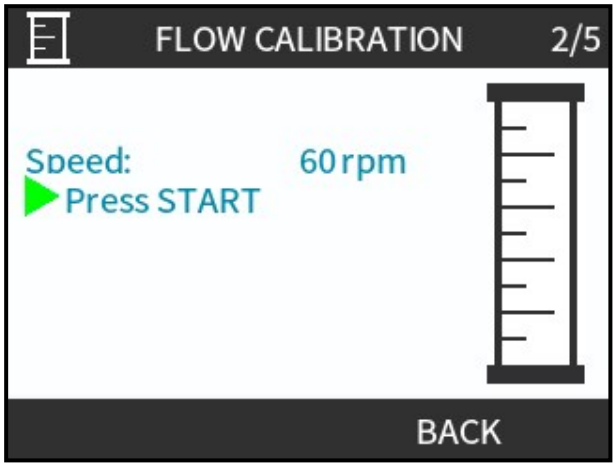
Procedure

1. Highlight **Flow Calibration**
2. SELECT −.



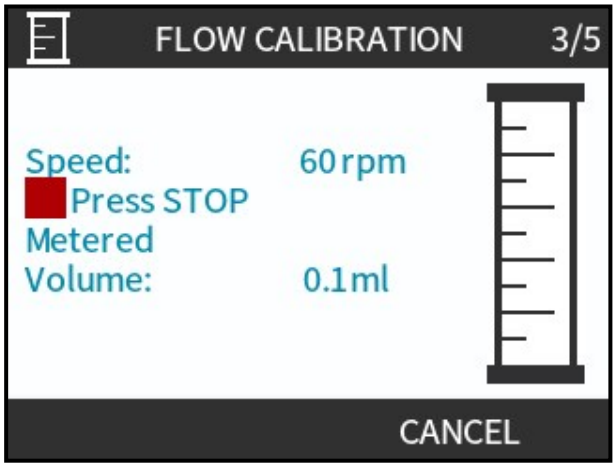
Procedure

3. Use **+/-** keys to enter maximum flow rate limit.
4. ENTER −.
5. Press **START** ▶ to begin pumping a volume of fluid for calibration.



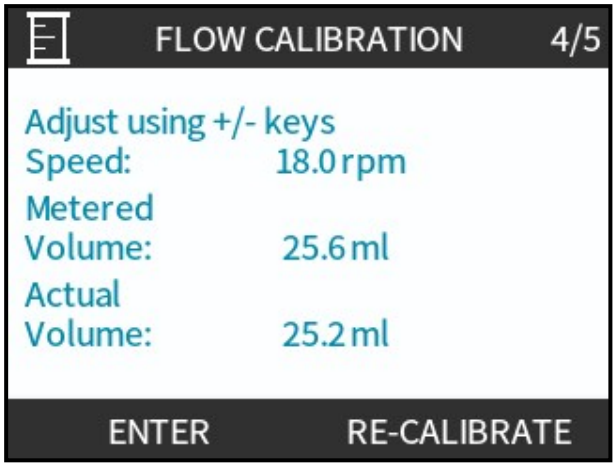
Procedure

5. Press **STOP** ■ to stop pumping fluid for the calibration.



Procedure

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

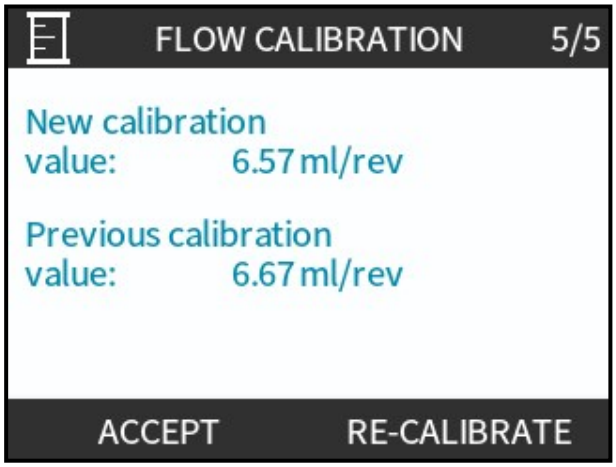


Procedure

7. Pump now calibrated.
8. ACCEPT −

   or

   RECALIBRATE − to repeat procedure.



Procedure

9. Press **HOME** or **MODE** to abort.

17.3 Analog 4-20 mA mode (Universal and Universal+ only)

flow rate proportional to external mA signal input received.

Universal pump will operate at:

- 0 rpm when 4.1 mA received.
- User defined maximum rpm when 19.8 mA received.

Universal+ pump:

- 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.

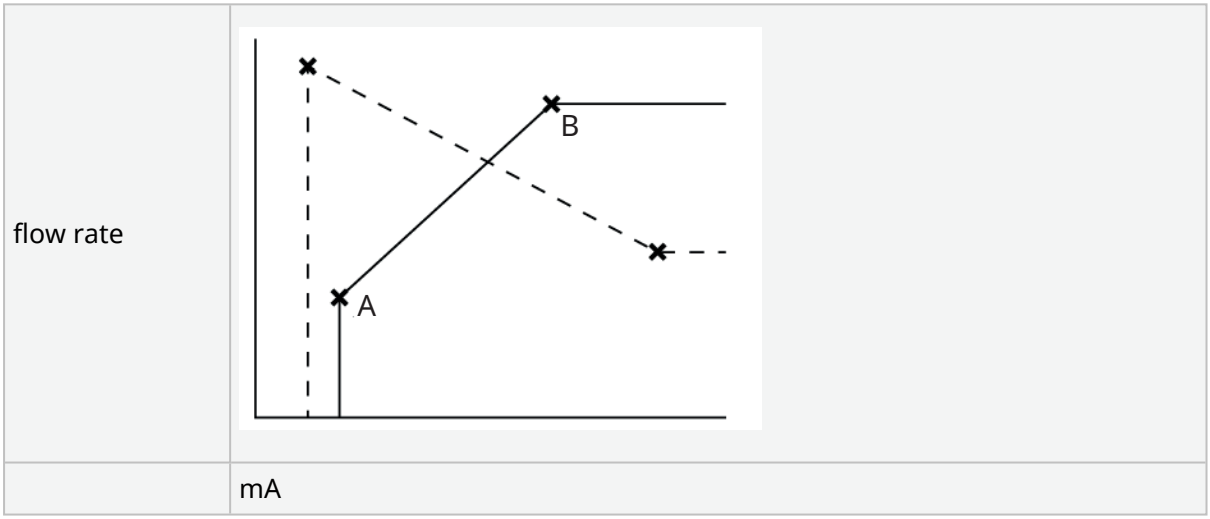


Figure 3 - The default mA/rpm values stored in the pump

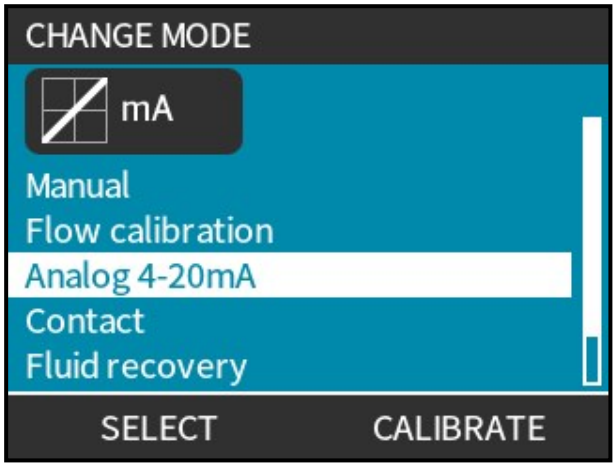
Table 38 - Key to figure	
A	4.1 mA, 0 rpm
B	(Qdos20)—19.8 mA, 55 rpm
B	(Qdos30, Qdos60, Qdos® CWT™)—19.8 mA, 125 rpm
B	(Qdos120)—19.8 mA, 140 rpm

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

To select Analog 4-20 mA mode:

Procedure

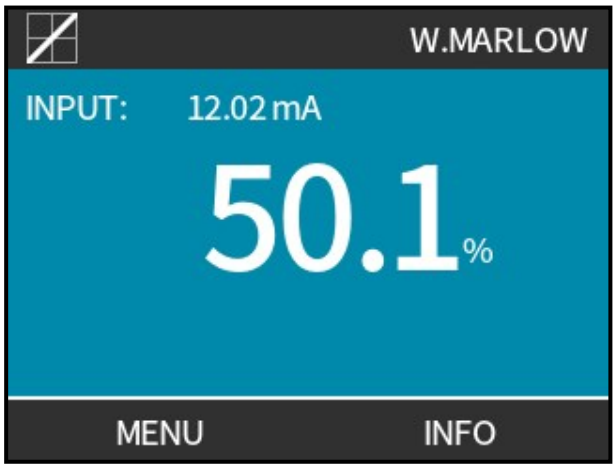
1. Press **MODE** button
2. Use **+/-** keys to scroll to Analog 4-20 mA
3. SELECT −



With Analog 4-20 mA mode enabled:

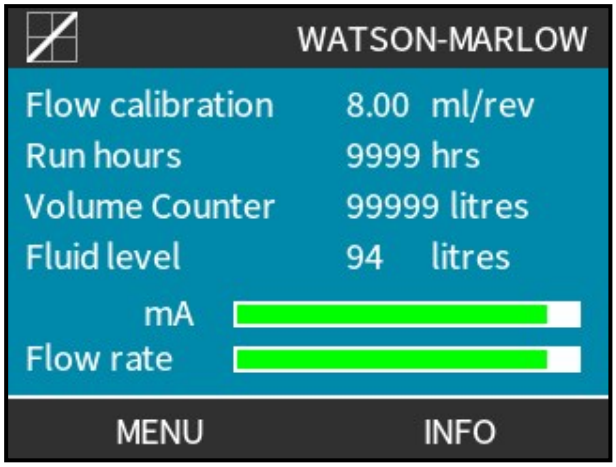
Procedure

- Current signal received by pump displayed on **HOME** screen.
- Press INFO − key to display more information.



Procedure

- Press INFO key again to display 4-20 mA calibration figures.

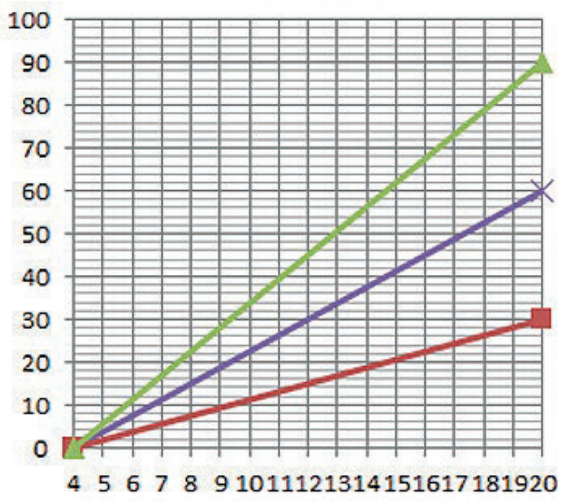


17.3.1 Analog Scaling Factor

Scaling Factor adjusts 4-20 mA profile using a multiplication factor.

- This will not alter stored A and B points, multiplication factor will re-scale 4-20 mA profile.
- To re-set original flow rates re-set multiplication factor to 1.00.
- 4-20 mA profile is linear relationship where y=mx+c the scaling factor alters gradient m.
- Speed limit function in control settings will also scale analog signal.
- Difference between scaling factor and speed limit is speed limit is global variable applied in all modes.
- Speed limit cannot exceed high flow rate set point (B).
- Speed limit function takes precedence over the scaling factor. Scaling factor will never cause pump to exceed speed limit.

flow rate %



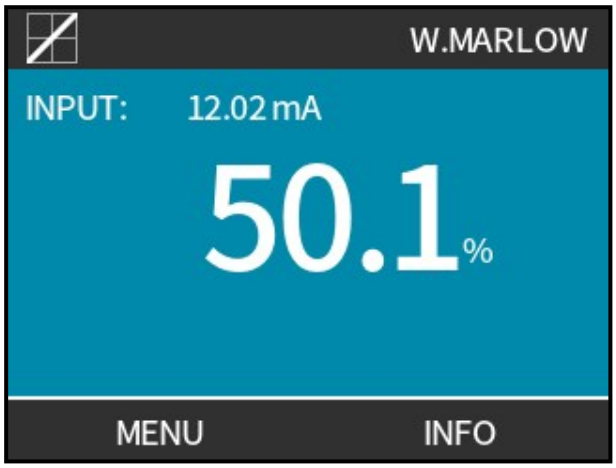
mA

	Original 4-20 mA profile
	Scaling factor of 0.5
	Scaling factor of 1.5

	mA	Flow (%)	Scaling factor	Output (%)
Qdos20	4-20	0-100	0.5	30
Qdos20	4-20	0-100	1.5	90

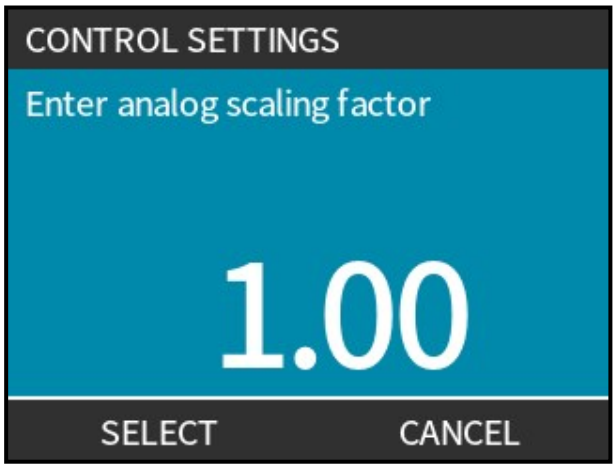
To select Analog 4-20 mA mode:

1. Press **+/-** from **HOME** screen to access scaling factor
2. Use **+/-** keys to enter multiplication factor:
   - 1.00 will not alter 4-20 mA profile
   - 2 will double flow rate output from mA signal
   - 0.5 will halve the output



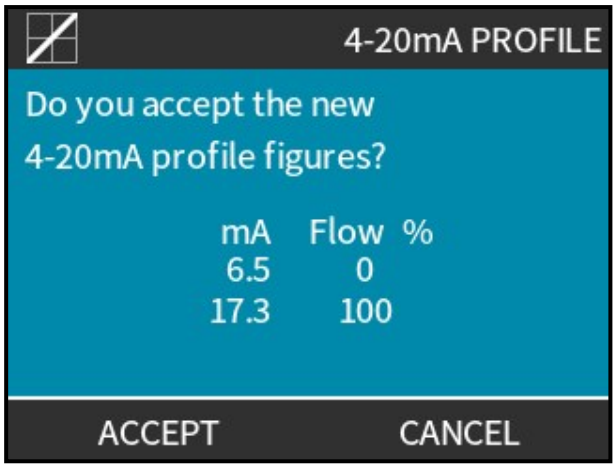
Procedure

3. SELECT −



Procedure

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



17.4 Change mode: Contact mode (All Universal and Universal+ models)

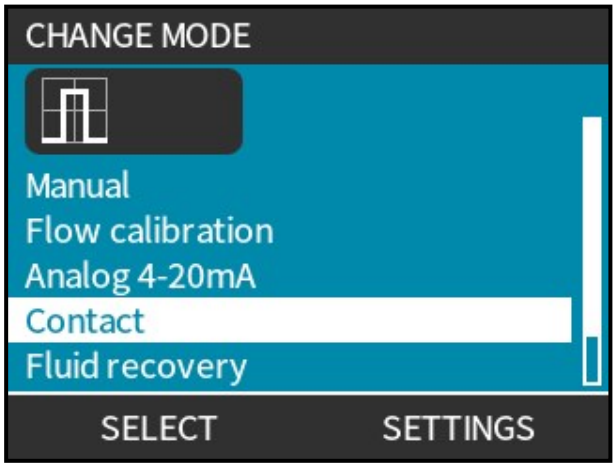
Contact Mode:

- Allows intermittent on/off dosing with variable duration controlled via external positive voltage pulse received by pump.
- Delivers a user defined dose volume when the **START** ▶ key is pressed.
- Turned off by default.

Enable Contact mode:

Procedure

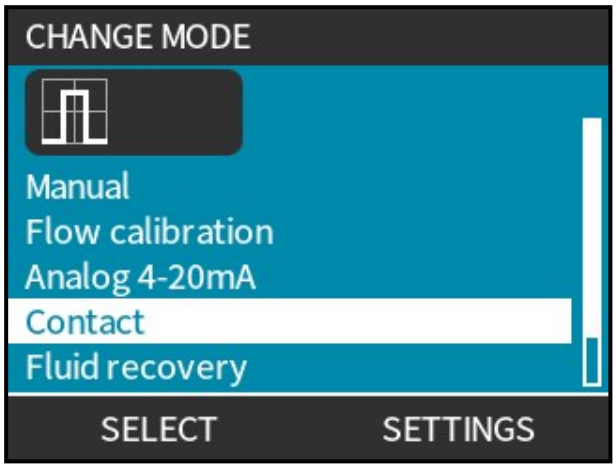
1. SETTINGS −
2. Enable **Contact Mode**



Configure Contact mode

Procedure

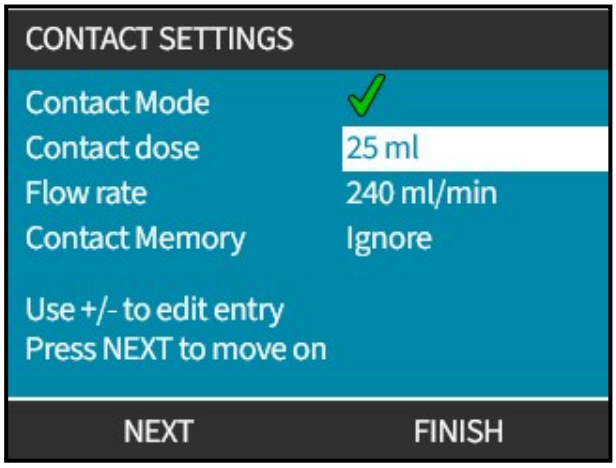
3. Highlight **Contact**
4. SELECT −



Procedure

5. Referring to table below, use **+/-** keys to enter a value for each setting.

   Choose NEXT − to cycle through settings



Save settings

Procedure

6. FINISH −
7. SAVE −

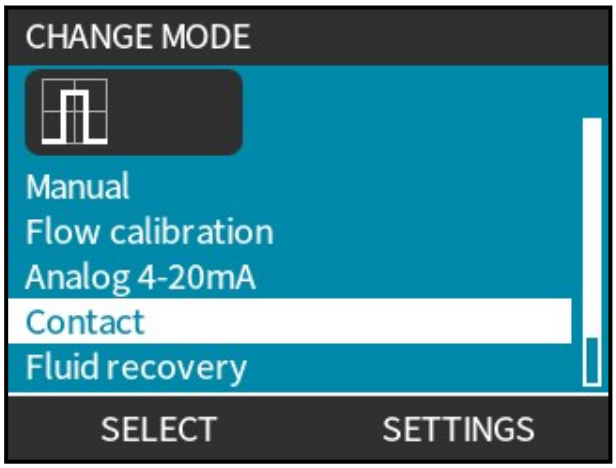
Contact mode settings	
Contact dose	Volume of fluid dispensed when external voltage pulse is received at input pin 2, or the green start button is pressed.
Flow rate	Determines time taken to complete each dose.
Contact memory	Determines pump behaviour in response to pulses received while a dose is in progress: • **Ignore**—pump will not store pulses. • **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.

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

View Contact mode home screen:

Procedure

1. Press **MODE** button
2. Highlight **Contact**
3. SELECT −



Procedure

4. The contact mode home screen will be displayed.

   Home screen displays:

   - 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.

17.4.1 Manual dosing

Press **START** ▶ key to activate a single pre-configured dose. Manual dosing only available when not dosing automatically via external voltage pulse.

17.4.2 Analog 4-20 mA mode

With the ability to operate at very low speeds, Analog 4-20 mA mode allows accurate metering of chemicals. Usually a better solution than dosing at intervals.

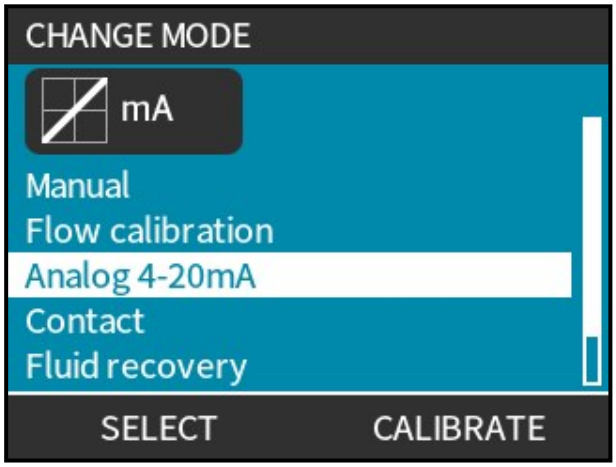
17.4.3 Calibrate the pump for 4-20 mA control (Universal+ only)

- Pump must be stopped.
- High and low signals must be within range.

To calibrate:

Procedure

1. Press **MODE** button
2. Use **+/-** keys to scroll to **Analog 4-20 MA**
3. CALIBRATE −.



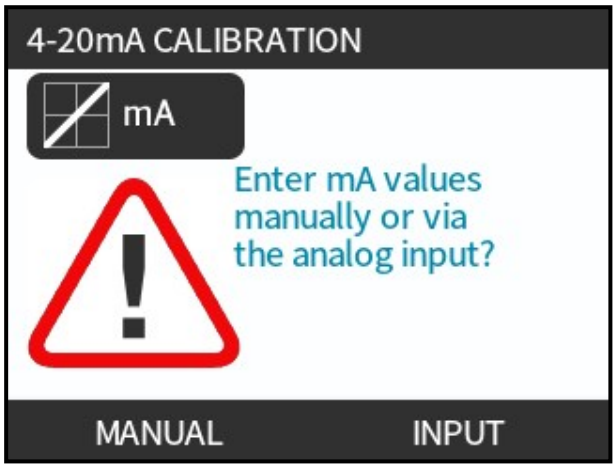
Procedure

4. Choose calibration method:

- MANUAL − method—Enter value using **+/-** keys.

  Or

- INPUT − method—Apply current signals electrically to analog input.

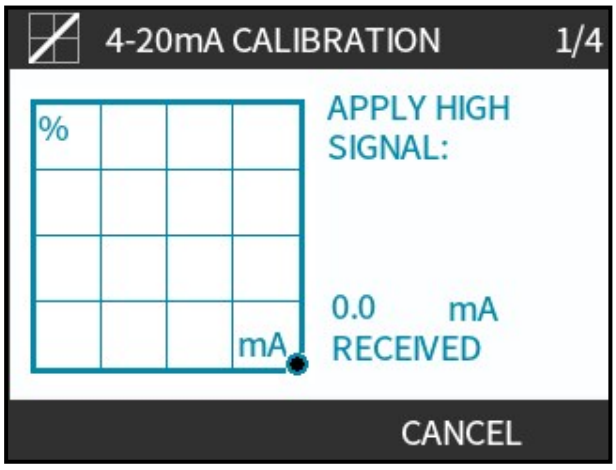


Setting a high signal

Procedure

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

   INPUT —Send high signal input to pump.



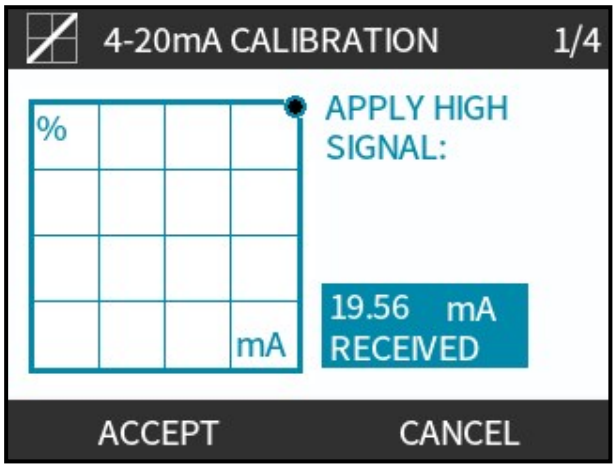
Procedure

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

- Press ACCEPT ▬ to set signal input

  Or

- CANCEL ▬ to return to previous screen.



Setting high flow calibration

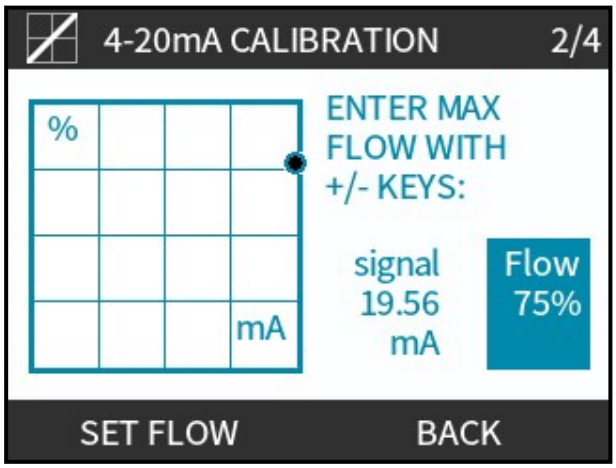
Procedure

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

- Select SET FLOW ▬

  Or

- Or BACK ▬ to return to previous screen.



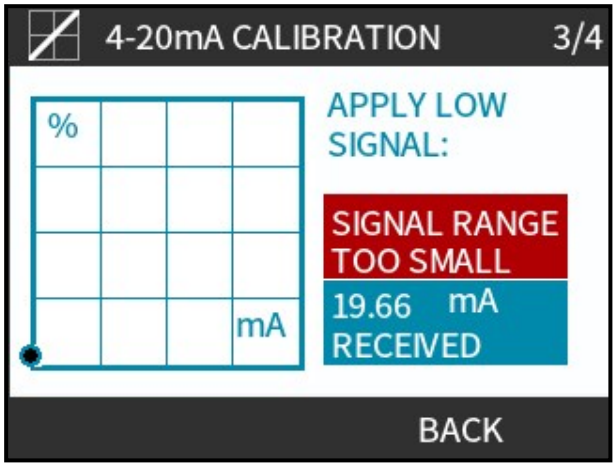
Setting a low signal

Procedure

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

   INPUT—Send low signal input to pump

   If range between low and high signal is less than 1.5 mA, error message displayed.



Procedure

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

   ACCEPT − to set signal input

   Or

   CANCEL − to return to previous screen.

Setting low flow calibration

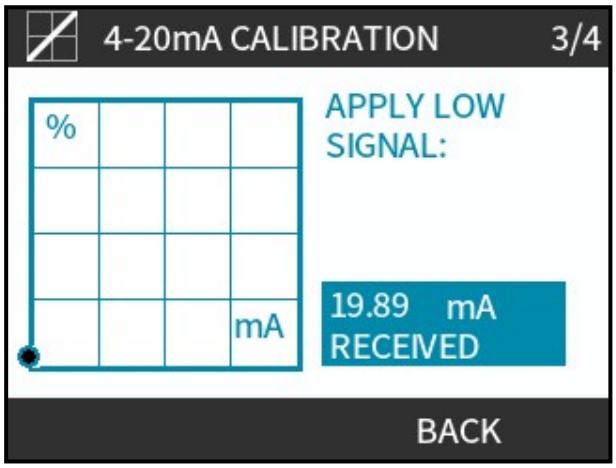
Procedure

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

- SET FLOW −

  Or

- BACK − to return to previous screen.



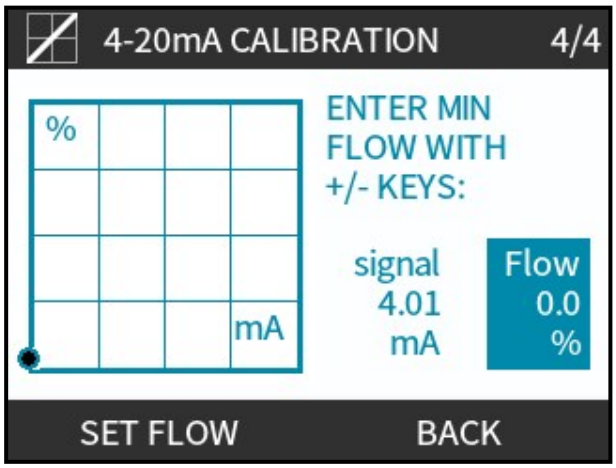
When all settings entered, the calibration confirmation screen is displayed:

Procedure

- CONTINUE − to start in proportional mode

  Or

- MANUAL − to continue in manual mode.



17.5 PROFIBUS mode

This section provides instructions on how to:

- Enable PROFIBUS mode
- Configure PROFIBUS communication settings
- Detailed information for PROFIBUS parameters.
- Use a Pressure Sensing Kit with a PROFIBUS pump

Data in this section is provided as reference material for a PROFIBUS network operator. Operating this pump under PROFIBUS control is beyond scope of this Instruction handbook. Consult your PROFIBUS network literature for further information.

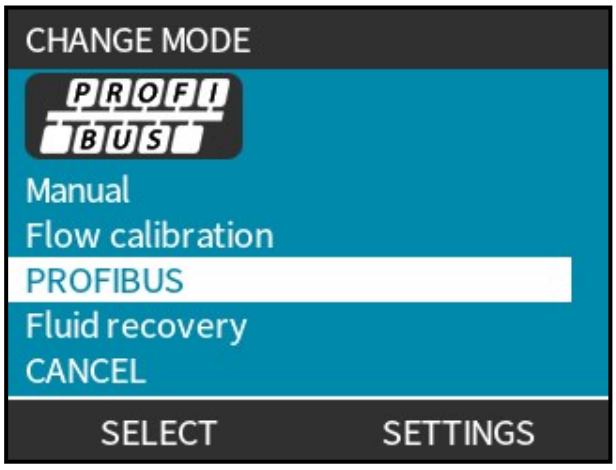
17.5.1 Setting PROFIBUS mode

Qdos PROFIBUS pump only requires station address to be set from pump.

To select PROFIBUS mode:

Procedure

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

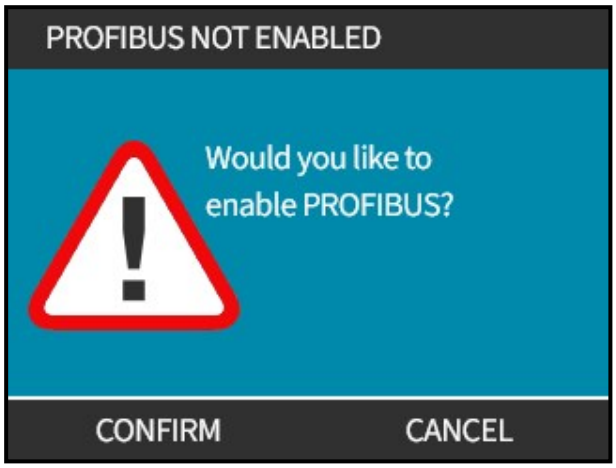


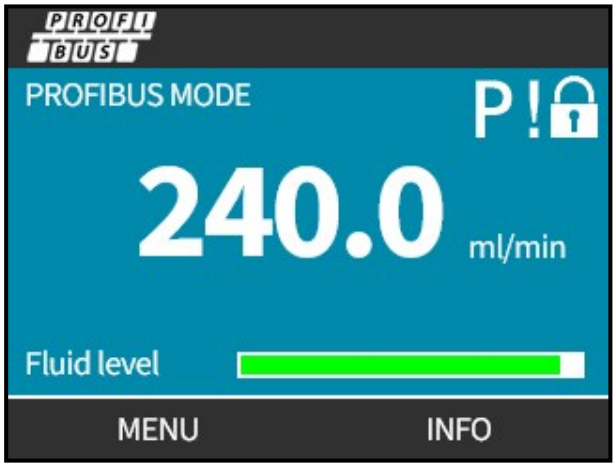
If PROFIBUS not enabled:

Procedure

4. Pump will prompt to CONFIRM [−] to enable PROFIBUS.

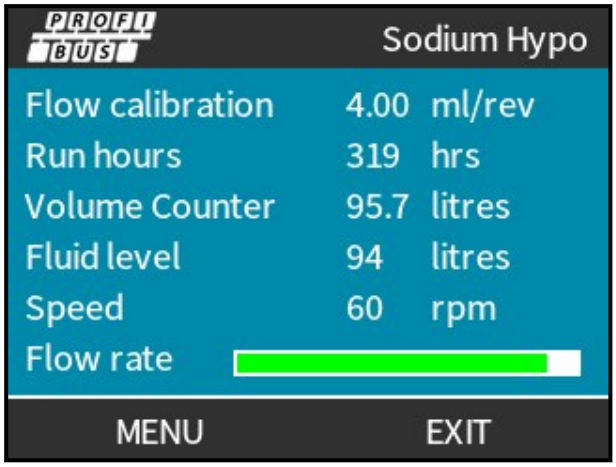
   PROFIBUS home screen shows white P icon to indicate data exchange.





Procedure

5. Pressing INFO function key displays further information.



17.5.2 Assigning the PROFIBUS station address at the pump

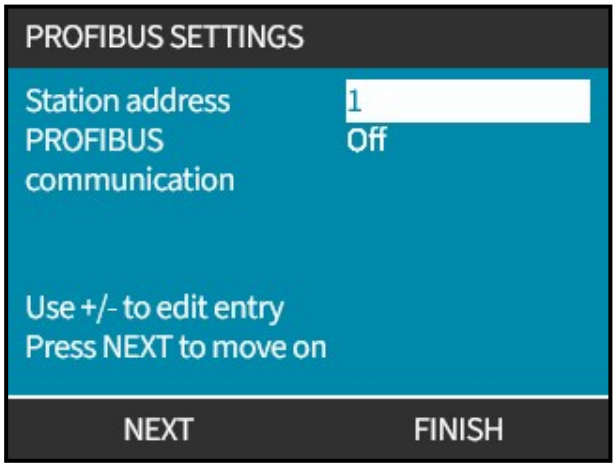
Station address:

- Set from PROFIBUS settings.
- Cannot be automatically assigned by master.

To select PROFIBUS mode:

Procedure

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



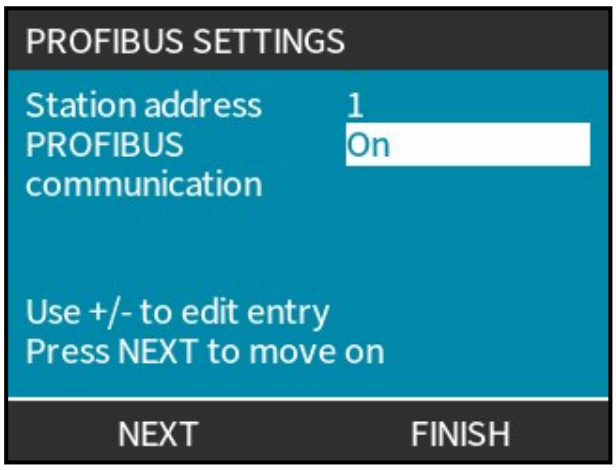
Procedure

4. Use **+/-** keys to alter station address, in range from 1 to 125. (126 is the default station address)
5. Choose:

- FINISH ▬ to set station address

  OR

- NEXT ▬ to enable/disable **PROFIBUS Communication**



Procedure

6. Use **+/-** keys to enable/disable PROFIBUS communication
7. FINISH ▬ store choice.

17.5.3 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

17.5.4 Cyclic Data Write (from master to pump)

Cyclic Data Write (from Master to pump)		
16 bit	Byte 1 (low), 2 (high)	Control Word
16 bit	Byte 3 (low), 4 (high)	Pumphead Speed Setpoint (unsigned)
16 bit	Byte 5 (low), 6 (high)	Set Flow Calibration in µl per revolution

Control Word	
Bit	Description
0	Motor running (1= Running)
1	Reverse (0= False, 1= True)
2	Motor revolution counter reset (1=Reset count)
3	Reserved
4	Enable User Parameter Min/Max Speeds (1= Enabled)
5	Enable Fieldbus master to set Flow Calibration (1= Enabled)
6	Remote error acknowledge
7	Fluid Level Reset
8-15	Reserved

17.5.5 Pumphead Speed Setpoint

Speed setpoint is 16-bit unsigned integer value representing speed of pump head in 1/10th of RPM.

For example, 1205 is 120.5 RPM.

17.5.6 Set Flow Calibration

This parameter is used to set flow calibration value from fieldbus interface.

Value [(81)] is 16-bit unsigned integer representing µl per revolution of pumphead.

NOTE [81]	Value is only used if bit 5 of Control Word is enabled.

17.5.7 Acyclic Data Read (from pump to master)

Acyclic data read (from pump to Master)		
16 bit	Byte 1, 2	Status Word
16 bit	Byte 3, 4	Pumphead Measured Speed (unsigned)
16 bit	Byte 5, 6	Hours Run
16 bit	Byte 10,9	Number of full motor revolutions
16 bit	Bytes 8,7	Reserved
32 bit	Byte 13, 14, 15, 16	Fluid Level
32 bit	Byte 17, 18, 19, 20	Unassigned
32 bit	Byte 21, 22, 23, 24	Pressure: Alarm maximum level active.
32 bit	Byte 25, 26, 27, 28	Pressure: Alarm minimum level active

Status Word	
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 for ReNu 20 PU
11	Low Setpoint- Out of range
12	High Setpoint- Out of range
13	Fluid level alert
14	Pressure: Warning maximum level active
15	Pressure: Warning minimum level active

17.5.7.1 Pumphead Speed

Pumphead speed is 16-bit unsigned integer value representing speed of pump head in 1/10th of RPM. For example, 1205 represents 120.5 RPM.

17.5.7.2 Hours Run

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

17.5.7.3 Number of full motor revolutions

- Counts down from FF for each complete motor revolution.
- Reset counter to FF by using bit 2 of control word.
- Motor relates to motor inside pump before gearbox ratio.
- Number of pumphead revolutions obtained by dividing number of motor revolutions by gearbox ratio of 29.55.

Table 30 - Byte / Hex to decimal					
	BYTE			HEX TO DECIMAL	
	10	9	→	10	9
A	FF	FF		65536	
B	FF	C4		65476	

Motor full revolutions	
A Minus B (82)	59

NOTE[82]	A = Start of Dose / B = End of Dose.

Pumphead revolutions	
Motor Revs	**Gearbox ratio**
59	29.55
Divide	
1.996 rpm	

17.5.7.4 Read Flow Calibration

Value is 16-bit unsigned integer representing µl per revolution.

17.5.8 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—WAMA0E7D.GSD—can be either be:

- Downloaded from Watson-Marlow website and installed.
- Typed into PROFIBUS master directly using a GSD editor program.

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

```
1  The GSD file, filename: WAMA0E7D.GSD
2  ;
3  ;*****************************************************************************
   ***
4  ;*
   ============================================================================== *
5  ;* *
6  ;* Watson-Marlow Bredel Pumps *
7  ;* Bickland Water Road *
8  ;* Falmouth *
9  ;* Cornwall *
10 ;* TR11 4RU *
11 ;* Tel.: +44(1326)370370 *
12 ;* FAX.: +44(1326)376009 *
13 ;* *
14 ;*
   ============================================================================== *
15 ;* Filename: WAMA0E7D.GSD *
16 ;* GSD file version 3 from 2013-09-24 *
17 ;* ---------------------------------------------------------------------------
   - *
18 ;* *
19 ;*****************************************************************************
   ***
20 #Profibus_DP
21 GSD_Revision = 3
22 Vendor_Name = “Watson Marlow”
23 Model_Name = “Qdos Profibus Pump”
24 Revision = “Version 3.00”
25 Ident_Number = 0x0E7D
26 Protocol_Ident = 0
27 Station_Type = 0
28 FMS_supp = 0
29 Hardware_Release = “V1.00”
30 Software_Release = “V1.00”
31 Redundancy = 0
32 Repeater_Ctrl_Sig = 0
33 24V_Pins = 0
34 9.6_supp = 1
```

```
19.2_supp = 1
45.45_supp = 1
93.75_supp = 1
187.5_supp = 1
500_supp = 1
1.5M_supp = 1
3M_supp = 1
6M_supp = 1
12M_supp = 1
MaxTsdr_9.6=60
MaxTsdr_19.2=60
MaxTsdr_45.45=60
MaxTsdr_93.75=60
MaxTsdr_187.5=60
MaxTsdr_500=100
MaxTsdr_1.5M=150
MaxTsdr_3M=250
MaxTsdr_6M=450
MaxTsdr_12M=800
Slave_Family = 0
Implementation_Type = “VPC3+S”
Info_Text=”PROFICHIP: PROFIBUS DPV0 - slave, Watson Marlow Qdos”
Bitmap_Device = “WAMA_1N”
Freeze_Mode_supp=1
Sync_Mode_supp=1
Fail_Safe=1
Auto_Baud_supp=1
Set_Slave_Add_supp=0
Min_Slave_Intervall=6
Modular_Station=0
Max_Diag_Data_Len=34
Max_User_Prm_Data_Len = 9
Ext_User_Prm_Data_Const(0)= 0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00,0x00
Module=”WM Pump, 3/14 word out/in” 0x62,0x5D
1
EndModule
```

17.5.9 Channel-related diagnostic data

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

Channel-related diagnostic block format	
Byte 26	Header
Byte 27	Channel type
Byte 28	Channel-related error code

Channel-related diagnostic data	
Channel-related diagnostic data	**Byte 3**
Global error	=0xA9 (General error)
Over current	=0xA1 (Short circuit)
Under voltage	=0xA2 (Under voltage)
Over voltage =0xA3 (Over voltage)	=0xA3 (Over voltage)
Motor stall	=0xA4 (Overload)
Over temp =0xA5 (Over temp)	=0xA5 (Over temp)
Tacho fault	=0xB1 (Device related 0x11)
Leak detected	=0xB2 (Device related 0x12)
Fluid level alert	=0xB3 (Device related 0x15)
Reserved	=0xA6 (Reserved)
Setpoint out of range- high	=0xA7 (Upper limit exceeded)
Setpoint out of range- low	=0xA8 (Lower limit exceeded)

17.5.10 Device-related diagnostic data

Device-related diagnostic data		
8 bit	Byte 1	Header Byte
16 bit	Byte 2, 3	Reserved
16 bit	Byte 4, 5	Reserved
16 bit	Byte 6, 7	Min Speed (unsigned)
16 bit	Byte 8, 9	Max Speed (unsigned)
32 bit	Byte 10, 11, 12, 13	Software Version Main CPU
32 bit	Byte 14, 15, 16, 17	Software Version HMI CPU
32 bit	Byte 18, 19, 20, 21	Software Version Flash
32 bit	Byte 22, 23, 24, 25	Software version PROFIBUS CPU

17.5.11 User Parameter Data

User parameter data is set by entering values into 'Ext_User_Prm_Data_ Const(0)' line of GSD file.

Values and relevant bytes are listed in tables below.

No further changes should be made to GSD file and Watson-Marlow accepts no responsibility for pump failures arising from changes to GSD file.

User Parameter Data									
Ext_User_Prm_Data_ Const[0]=	**0x00,**	**0x00,**	**0x00,**	**0x00,**	**0x00,**	**0x00,**	**0x00,**	**0x00,**	**0x00**
	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9

8 bit	Byte 1	Pre Assigned
8 bit	Byte 2	Reserved
8 bit	Byte 3	Min Speed (High byte of 16-bit unsigned)
8 bit	Byte 4	Min Speed (Low byte of 16-bit unsigned)
8 bit	Byte 5	Max Speed (High byte of 16-bit unsigned)
8 bit	Byte 6	Max Speed (Low byte of 16-bit unsigned)
8 bit	Byte 7	Fail Safe
8 bit	Byte 8	Fail Safe Speed (Low byte of 16-bit unsigned)
8 bit	Byte 9	Fail Safe Speed (High byte of 16-bit unsigned)

17.5.11.1 Set Min/Max 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 1/10th of pumphead RPM.
- If pump 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.

17.5.11.2 Fail Safe

Fail-safe user parameter sets correct course of action in event of PROFIBUS communications failure (83).

Fail-safe byte is configured as shown in following table.

NOTE83	If no bits set or invalid bit pattern is set, default fail safe behaviour stops pump.

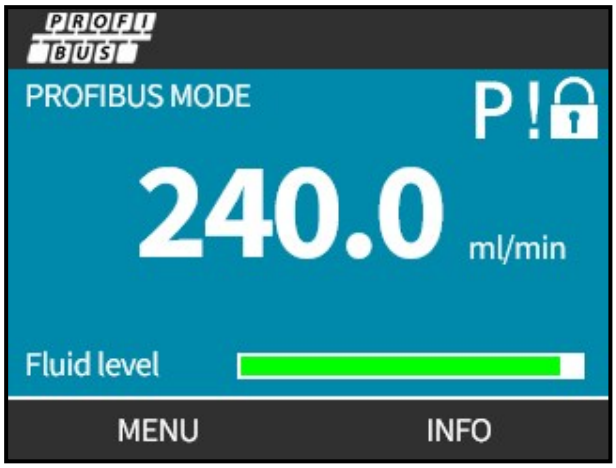
Hex	Description
0x00	The pump will stop
0x01	Continue driving using last demanded speed
0x02	Continue driving using fail safe speed
0x03 - 0x07	Reserved

17.5.11.3 Fail Safe Speed

Fail-safe speed parameter used to set speed pump is driven if PROFIBUS communications error occurs and fail-safe user parameter is defined in the GSD file.

17.5.12 Master Slave communications sequence

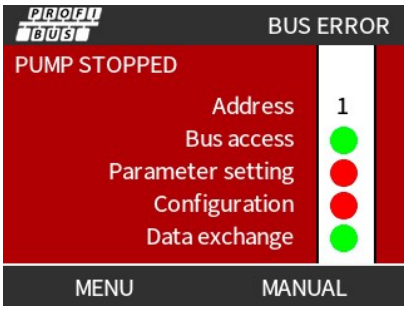
In PROFIBUS mode, the screen below is displayed, the P indicates data exchange is happening.



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 of 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

If data exchange is lost at any time, the following 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.



If fail safe is enabled, and the pump is running, the PUMP STOPPED message shown on the bus error screen will not be shown.

If the **MODE**or **MENU**button has been pressed, after five minutes of inactivity the pump will revert to the home screen and discard any unsaved changes, if there are still no communications then the bus error screen will be displayed.

When menus are accessed the pump continues to run in PROFIBUS mode.

18 OPERATION

18.1 Pre-operation check list

Ensure the pump has been installed correctly: Carry out the following pre-operation checks:

- Ensure the pump has been mounted to a surface.
- Ensure the power cable is not damaged.
- Ensure electrical isolation device if fitted and working.
- Ensure the pumphead has been installed.
- Ensure no leaks of fluid from any connection with the pump stationary.
- Ensure a fluid isolation valve on **inlet** and **discharge** is fitted and working.
- Ensure overpressure protection is fitted and working correctly.
- Ensure the pump language has been correctly set to your language.

If there is a problem with any of the above or there is any doubt that the installation of the pump has not been completed and tested, then do not proceed to operate the pump. Instruct that the pump is removed from service until the full installation is complete.

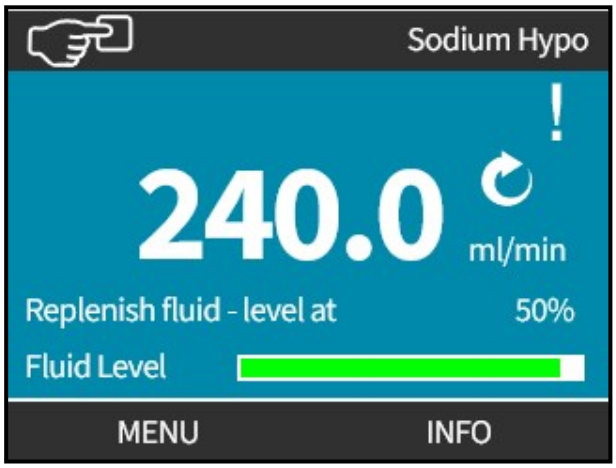
18.2 Safety

18.2.1 Hazards that may occur during operation

The following hazards may occur during operation of the pump.

18.2.1.1 Unexpected operation

All pump models may operate either in response to the control system (Analog, PROFIBUS or Contact mode) or because of the auto-restart feature (start-up following a power cut) being enabled. This expected behaviour is indicated as a warning on the screen using the ! symbol as illustrated in the image below.



18.2.1.2 Risk of burns

⚠ CAUTION

The exterior of the pump can get hot during operation. Stop the pump and let the pump cool before handling.

18.3 Limits of operation—Dry running

The pump can be **run dry** for short time periods, such as during priming or when there is fluid with pockets of gas.

NOTICE

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.

18.4 Pump operation (Models: Manual, PROFIBUS, Universal, Universal+)

18.4.1 Switching pump on in subsequent power cycles (Models: Manual, PROFIBUS, Universal and Universal+)

Subsequent power-up sequences jump from start-up screen to home screen:

- Pump runs power-on test confirming proper functioning of memory and hardware.
- Faults display as error codes.
- Watson-Marlow Pumps logo displayed for three seconds
- Home screen displayed.

18.4.2 Understanding and using menus and modes

18.4.2.1 Main menu (Models: Manual, PROFIBUS, Universal and Universal+)

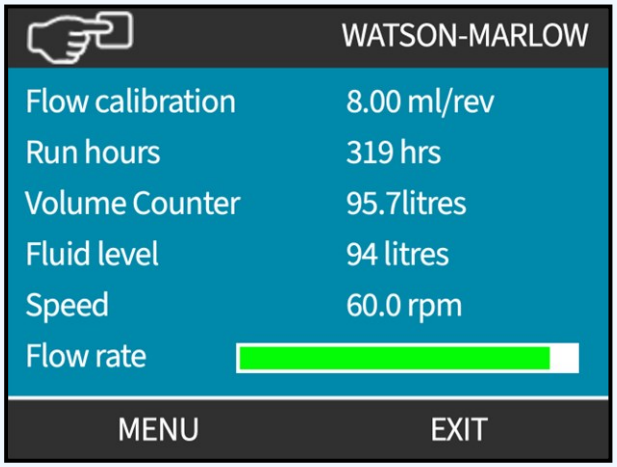
To access **MAIN MENU**:

Procedure

1. Choose MENU −:

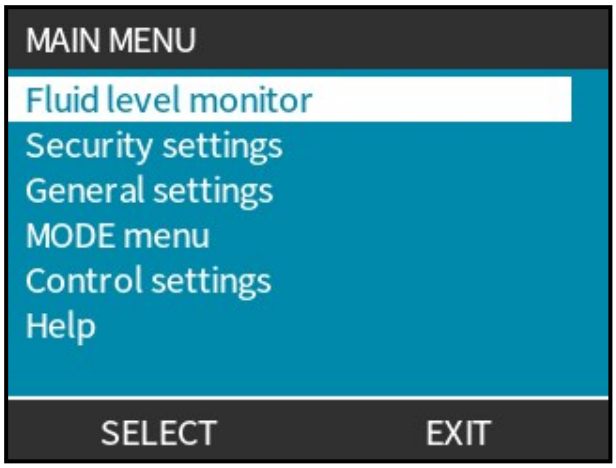
   a. From **HOME** screen

   b. From **INFO** screen.



Procedure

2. Use the **+/-** keys to highlight available options.
3. SELECT ▬ to choose an option.



To exit **MAIN MENU**:

Procedure

4. EXIT ▬.

18.4.2.2 Modes

The pump modes are:

Manual	In this mode the pump is operated manually (Start/Stop/Speed) Pump can also be operated via start/stop input, but only if it is enabled and only if it is a Universal or Universal+ pump
Flow calibration	In this mode the flow rate is calibrated to the pump
Analog 4-20mA	In this mode the pump speed is controlled by the Analog signal
Contact (All Universal and Universal+ models)	In this operating mode the pump will meter a specific dose of fluid when an external signal (pulse) is received or the operator presses the green **START** ▶ button. The dose volume is a user defined value between 0.1 ml and 999 l.
Fluid recovery	In this mode the pump may be operated in reverse to recover fluid from the **discharge** line. For example, to assist with draining down the system prior to maintenance.

18.4.3 Using the fluid level monitor (Models: Manual, PROFIBUS, Universal and Universal+)

All models except the remote model feature a fluid level monitor to monitor the fluid level (quantity) remaining in the **inlet** supply vessel during operation. When this feature is enabled, a 'progress' bar displayed on home screen indicates an estimated volume of fluid remaining in supply container.

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.

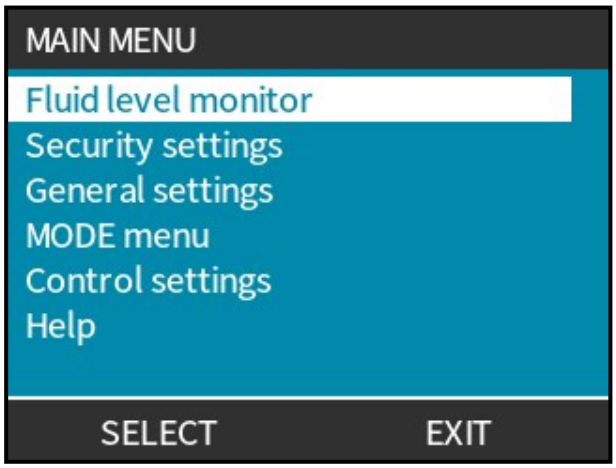
- When fluid level is estimated at zero pump will stop.
- Fluid level monitor accuracy will improve with regular pump calibration.

Fluid level monitor overview	
Enable level monitor	Activates feature
Disable level monitor	De-activates feature
Fluid volume unit	Choose US Gallons or Litres
Configure level monitor	Enter fluid container level and setup alarm threshold
Adjust level	Adjust fluid volume if different to maximum container volume

To configure Fluid level settings:

Procedure

1. Choose **Fluid Level Monitor** from **MAIN MENU**.
2. Use the **+/-** keys to highlight options.

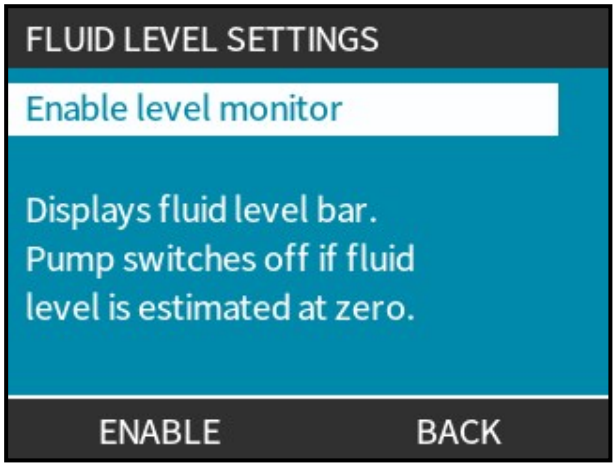


To activate/deactivate Fluid level monitor:

Procedure

1. Enable level monitor will already be highlighted.
2. ENABLE −

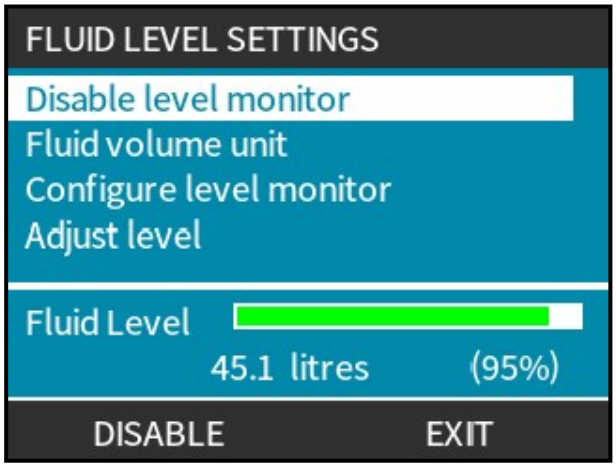
   Fluid volume level will display on **HOME** screen.



Procedure

3. Choose DISABLE − to deactivate the fluid level monitor.

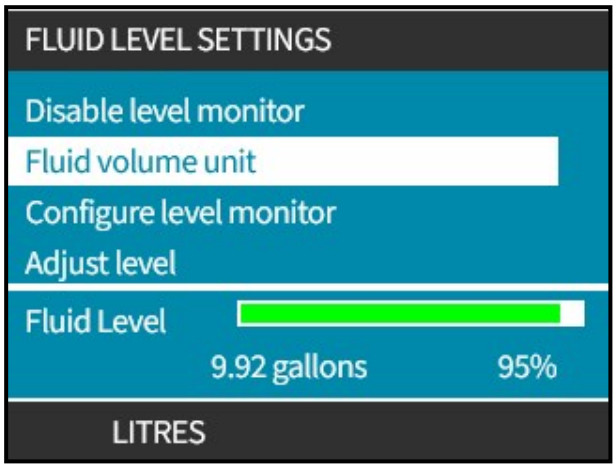
   Fluid volume level will no longer appear on the **HOME** screen.



To change Fluid volume unit of measure:

Procedure

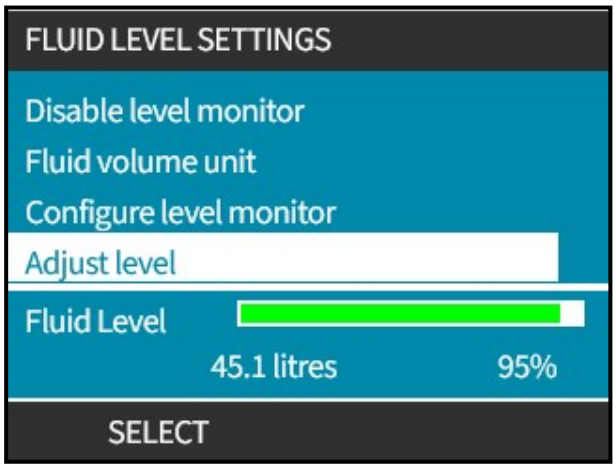
4. Choose **Fluid Volume Unit**
5. Use − key to toggle US GALLONS or LITRES



To configure the level monitor:

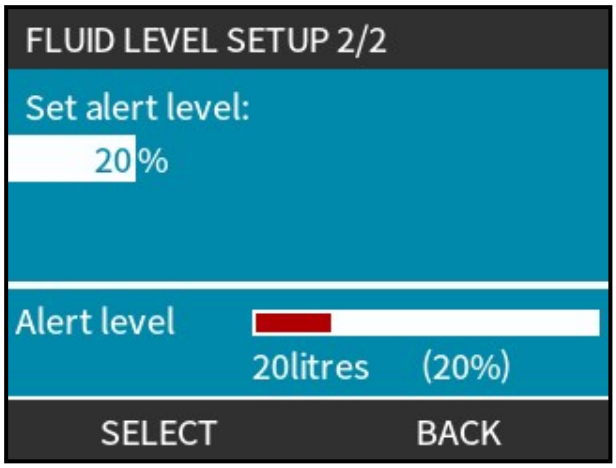
Procedure

6. Choose **Configure Level Monitor**
7. SELECT −
8. Use **+/-** keys to enter maximum volume of supply container.



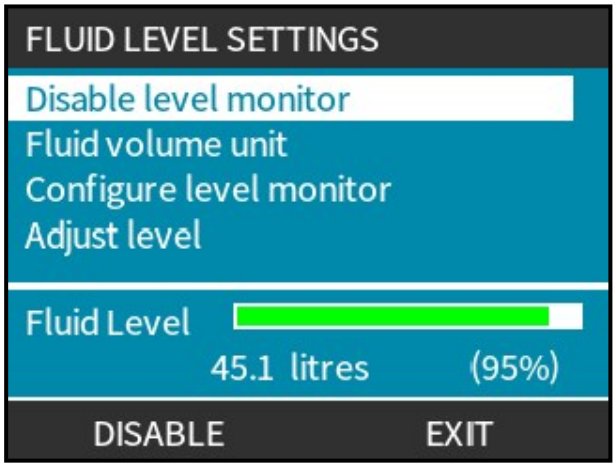
Procedure

9. NEXT −
10. Use **+/-** keys to set **Alert Level**.



Procedure

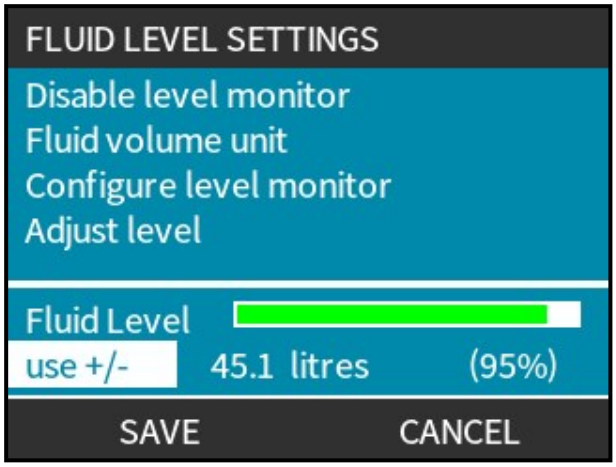
11. SELECT − to return to **FLUID LEVEL SETTINGS**.



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

Procedure

12. Choose **Adjust Level** option.



Procedure

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

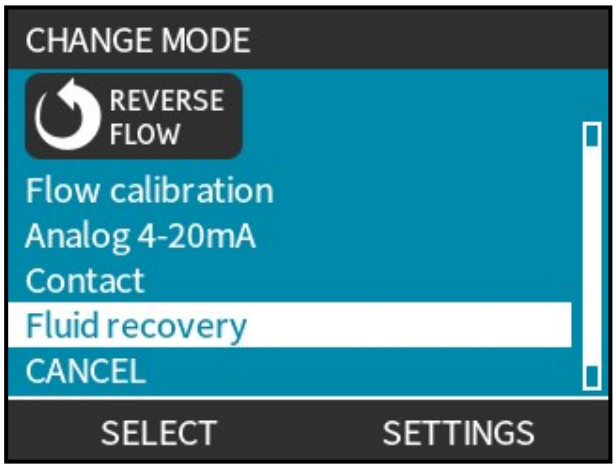
18.4.4 Using fluid recovery manual operation (Manual, PROFIBUS, Universal and Universal+ only)

In this operating mode, the pump can manually be operated in reverse for short periods to recover fluid/chemicals pumped. This is mainly used for maintenance purposes.

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

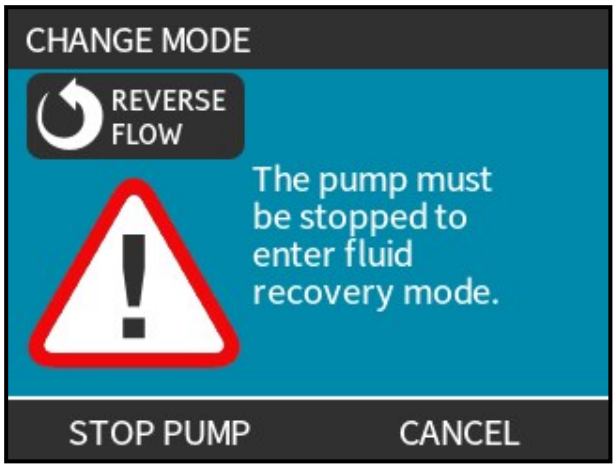
Procedure

1. Press the **MODE** key, using the **+/-** keys position the selection bar over the **Fluid Recovery Menu** option and press SELECT −.



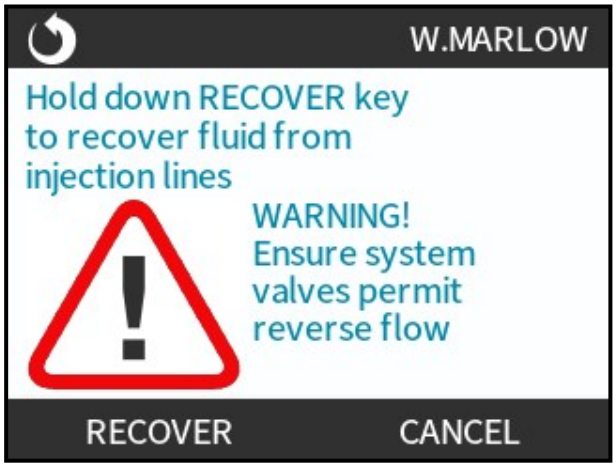
Procedure

2. If the pump is already running, then the following screen will be displayed. The pump must be stopped before it can be reversed to recover fluid. Press STOP PUMP −.



Procedure

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.



Procedure

3. Press and hold RECOVER [−] to start running the pump in reverse and recover fluid. The screen below will be displayed whilst RECOVER [−] is held down. As fluid is recovered the volume recovered and time elapsed will increase.

Procedure

4. Release RECOVER [−] to stop running the pump in reverse.

18.4.5 Remote fluid recovery using analog control (Remote, Universal and Universal+ models without relay modules)

Remote fluid recovery should not be used for bulk fluid transfer.

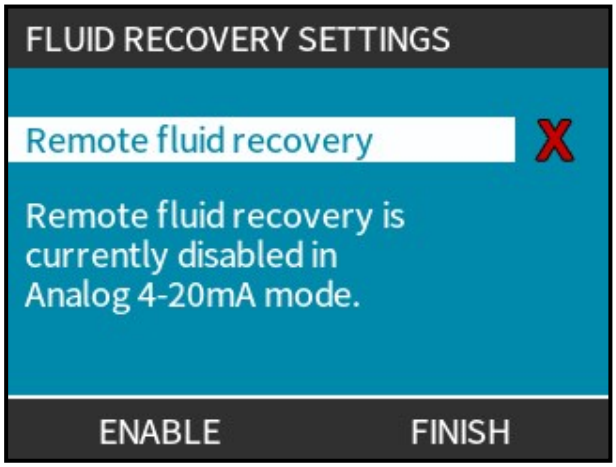
Mode	Effect on Pressure Sensing Kit function
Fluid recovery mode (Manual or Remote)	All Alarm and warning levels are disabled when the motor is running. When the pump is stopped, the following levels still function: • Alarm maximum pressure level • Warning maximum pressure level

18.4.5.1 Universal and Universal+ models

To run pump in reverse and recover fluid automatically in analog 4-20 mA mode:

Procedure

1. Press **MODE** key.
2. Use **+/-** keys to highlight **Fluid Recovery**
3. SETTINGS −
4. ENABLE −



Procedure

5. Once enabled, remote fluid recovery is ready for operation.

18.4.5.2 Remote, and Universal and Universal+ models

Remote fluid recovery must be operated in following sequence:

Procedure

1. Send remote stop signal (apply 5 - 24 volts to input pin 1).
2. Apply 5 - 24 volt to pin 5 of pump input.
3. Apply 4-20 mA to analog input. (Pump will run in reverse at speed proportional to analog signal)
4. Remove remote stop signal.
5. Apply remote stop signal when enough fluid recovered.
6. Remove voltage at pin 5 of pump inputs.
7. Remove remote stop signal when ready to run forwards again.

Reverse process can be used to switch the function off.

- When function is enabled, pump operation can be reversed in analog 4-20 mA mode by applying minimum 5 V to maximum 24 V to pin 5 of pump input.
- Pump will operate at reversed set speed proportional to 4-20 mA input applied to pin 3.
- Operating method allows for fluid recovery from delivery line.

18.5 Pump status overview

18.5.1 Screen Icons (Models: Manual, PROFIBUS, Universal, Universal+)

	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

18.5.2 Front cover LEDs (Model: Remote)

The remote pump has LED icons on the front panel to indicate its status. The location of these LED's is provided in figure below:

A description of the icons and definition of each error state is provided in the table below.

Status LEDs				
Status				4-20 mA
	Running	Remote stop	Change pumphead	4-20 mA signal
Power on	On			
4–20 mA in range	On			On
4–20 mA high	On			Flash
4–20 mA low	On			Flash
Remote stop		On		Status as above

LED key:

	Signal status
	Pump running
	Pump in standby condition
	Pump stopped

19 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.

19.1 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: 20.6.2.2.1

20 MAINTENANCE

20.1 Maintenance chapter—Scope

20.1.1 Servicing

There are no items in the Qdos range which require routine servicing, such as the adjustment of a mechanism or lubrication of parts.

20.1.2 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: 20.2
- Replacement of Watson-Marlow spare parts.
  - Qdos fluid path—Spare parts. See section: 20.5
  - Qdos drive—Spare parts. See section: 20.6
    - Replacement of the power plug fuse (84)
    - Updating of the pump software if instructed by WMFTS to do so. See section: 20.4

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 84	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 20.6.2.1 A Qdos drive does not contain replaceable internal fuses.

20.2 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
- Hose Connector Kit
    - Permeation of chemicals through a Hose Connector Kit. See section: 22.2.3.3.1
    - Inspection of the effectiveness of earth bonding of the hose to the system pipework.

In the event of product damage, the product must be removed from service by a responsible person.

20.3 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 20 degrees.

Once the product has reached its end of life, a responsible person must remove the product from service.

20.3.1 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: 22.3), 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

  To assist with monitoring the life of a pumphead, so that it may be changed prior to failure.

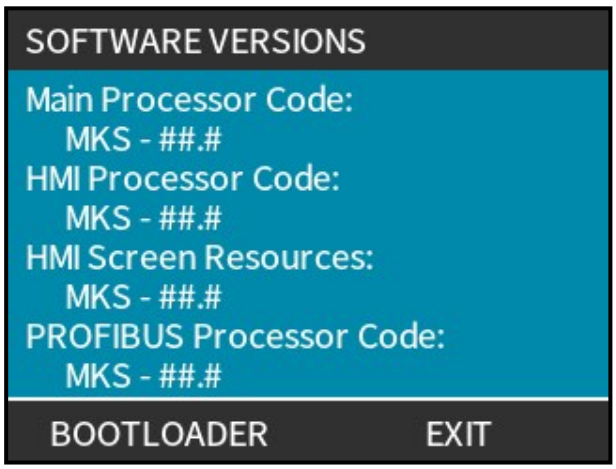
20.4 Software update

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 and then the pump re-programmed in accordance with the procedures in this reference manual.

20.4.1 How to check the software version installed on the pump

The pump software versions are shown on the software versions screen [(85)]:



NOTE [85]	The PROFIBUS Processor code is only shown on PROFIBUS models.

20.4.1.1 Procedure: Access SOFTWARE VERSIONS screen

The **SOFTWARE VERSIONS** screen is accessed from the **HOME** screen :

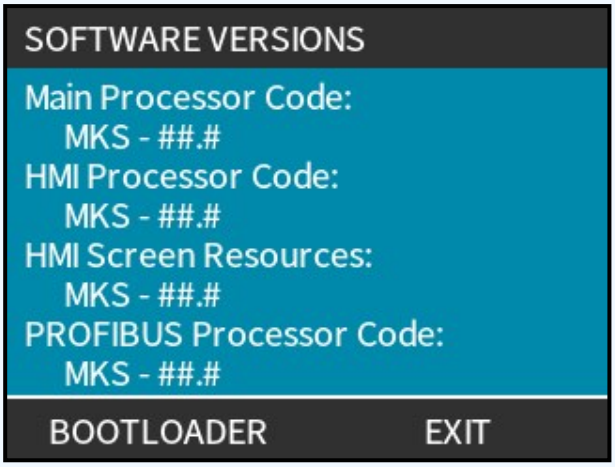
Procedure

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.



20.4.1.2 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 (86) -

NOTE 86	The PROFIBUS Processor code is only shown on PROFIBUS models

20.4.2 Recommended USB flash drives for a software update

A Qdos pump uses a Type A 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 A	Memory (GB)
SanDisk Cruiser	16
Lexar D40E	64
Lexar E32C	64
SSK (FDU050)	64
Lexar Jumpdrive D400	32
Kingston DataTraveler microDuo 3C	64, 128, 256

20.4.3 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_QDOS" and in a root directory (For example D:\WM_QDOS).

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.

20.4.4 How to download the latest software

Software can be downloaded from the following link on the Watson-Marlow website: https://www.wmfts.com/en/resources/software-and-devices/

If the software is in a ZIP file, download this ZIP file, then extract and place the software into folder titled "WM_QDOS" on the root of the USB flash drive. For example D:\WM_QDOS

20.4.5 Location of USB socket

A Qdos pump uses a Type A 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 USB cover on the rear of the pump:

20.4.6 How to update the software on the pump using a USB flash drive

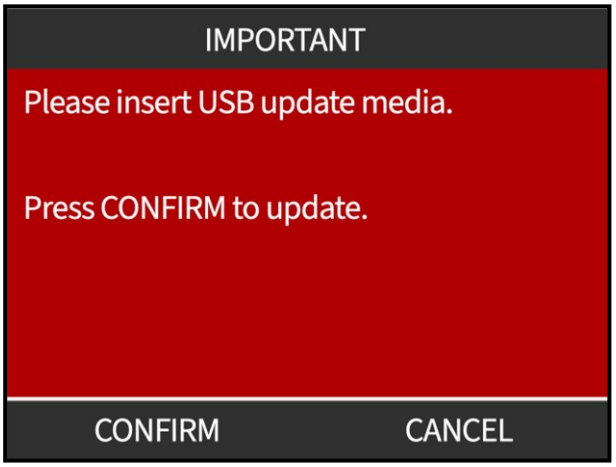
The updating of the software will require the pump to be isolated from the fluid path, the pump settings reset to default and then the pump re-programmed in accordance with the procedures in this reference manual.

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.

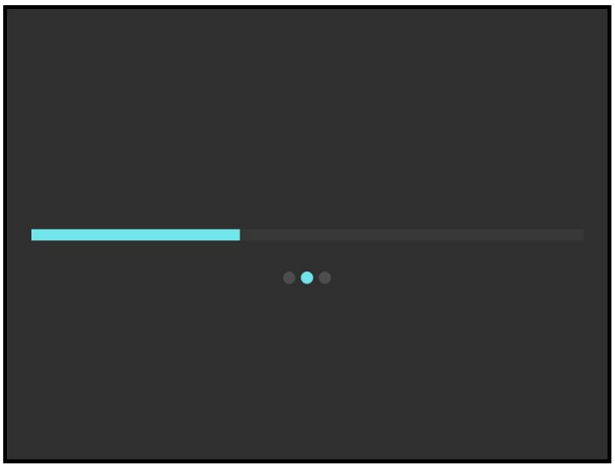
1. Ensure the pump requires a software update. See section 20.4. A software update must never be undertaken unless instructed by WMFTS. Using the pump with the incorrect software could create a hazard.
2. Ensure you have a suitable USB flash drive. See section: 20.4.2
3. Ensure the USB flash drive has been prepared. See section: 20.4.3
4. Ensure the software has been downloaded. See section: 20.4.4
5. Ensure the software has been placed in the WM_QDOS 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. Remove the two screws from the USB port cover on the rear of the pump. Carefully dislodge and remove the cover. Inspect the cover and seal to be sure it has not been damaged during removal.

9. Insert the USB flash drive into the USB socket.

10. Switch the power on to the pump.
11. From the HOME screen navigate to **MAIN MENU**>**General Settings**>**USB Update** to enter the USB update screen. See section: 15



12. 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 15 to 30 seconds.

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: 21.1

13. Check the software has been correctly updated by navigating to the **SOFTWARE VERSIONS** screen and checking the version codes have updated. See section: 20.4.1
14. Isolate power to the pump.
15. Remove the USB flash drive
16. Check the seal is intact and in place on the USB cover.
17. Tighten the two USB cover screws equally.
18. Restore power to the pump.
19. Reset the pump to factory default setting. **MAIN MENU**>**General Settings**>**Restore Defaults**. See section: 15
20. Re-program the pump to the required configuration using the relevant sections of this manual using partial control signals to the pump (as required).
21. Restore the fluid path to the pump.
22. Re-calibrate the flow of the pump.
23. Restore the full control signals to the pump.
24. Check operation of the pump is expected, prior to resuming normal service.

20.5 Fluid path—Spare parts, and replacement procedures

20.5.1 Replacement items

20.5.1.1 Pumpheads

Need to add H-FLO spare pumphead seals

Pumpheads			
Image	Description		Product code
	ReNu Santoprene pumphead (PFPE lubricant)	Qdos30	0M3.2200.PFP
		Qdos60	0M3.3200.PFP
		Qdos120	0M3.4200.PFP
	ReNu SEBS pumphead (PFPE lubricant)	Qdos20	0M3.1800.PFP
		Qdos30	0M3.2800.PFP
		Qdos60	0M3.3800.PFP
	ReNu PU pumphead (PFPE lubricant)	Qdos20	0M3.1500.PFP
		Qdos60	0M3.3500.PFP
	CWT EPDM pumphead (PFPE lubricant)	Qdos CWT	0M3.5700.PFP
	CWT FKM pumphead (PFPE lubricant)	Qdos CWT	0M3.5900.PFP

20.5.1.1.1 PUMPHEAD SEALS AND PARTS

20.5.1.1.1.1 All pumpheads

Pumphead seals and parts—Pack of 2 items		
Image	**Description**	**Product code**
	ReNu Connection Collar, Pack of 2 items	0M9.001H.P00

20.5.1.1.1.2 ReNu 30 pumpheads only

Pumphead seals and parts—Pack of 2 items		
Image	**Description**	**Product code**
	ReNu 30, pack of 2 FKM (Viton®) "O" Rings	0M9.221R.K00
	ReNu 30, pack of 2 EPDM "O" Rings. EC1935 and FDA accredited see section 6.2 for the specific standards.	0M9.221R.D00

20.5.1.1.1.3 ReNu 20, 60, 120 and CWT and Pressure Sensing Kit

ReNu 20, 60, 120, and CWT, and Pressure Sensing Kit—Pack of 2 items		
Image	**Description**	**Product code**
	ReNu 20, ReNu 60, ReNu 120 and CWT, and Qdos Pressure Sensing Kit (87) **Santoprene** pumphead port seals, pack of 2	0M9.001R.M00
	ReNu 20, ReNu 60, and Qdos Pressure Sensing Kit (87) **SEBS** pumphead port seals, pack of 2	0M9.001R.B00
	ReNu 20, ReNu 60, and Qdos Pressure Sensing Kit (87) **PU** pumphead port seals, pack of 2	0M9.001R.A00

NOTE 87	Qdos 20, 60, 120 and CWT pumphead port seals are interchangeable with the Pressure Sensing Kit fluid connector seal. The Pressure Sensing Kit has only 1 seal which may be changed. The extra seal could be a spare. .

20.5.1.2 Hydraulic connectors

20.5.1.2.1 HYDRAULIC CONNECTORS SUPPLIED WITH PUMP OR SPARE DRIVE

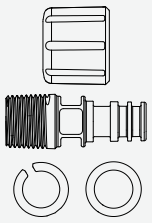
The following Hydraulic connectors are supplied with a pump or spare drive.

Supplied Hydraulic connection pack (2 of each item) with pumps or spare drives			
Image	**Description**	**Size**	**Comment**
	Metric —Polypropylene (PP) compression fittings; For use with Qdos Interface tubing. **Product code:** 0M9.221H.P01	Set of four sizes: • 6.3x11.5 mm • 10x16 mm • 9x12 mm • 5x8 mm	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).
	1/2” Hose barb, polypropylene (PP) **Product code:** 0M9.401H.P05	to fit 1/2" internal diameter hose/tube	Supplied as a pair (2 items) with a 120 model pump or spare drive model, in addition to compression fittings.
	Imperial [88]— PVDF compression fittings **Product code:** 0M9.001H.F20	Set of two sizes: • 3/8'' x 1/4" • 1/2'' x 3/8''	Supplied as a pair (2 packs) with pumps or spare drives, which have a US power plug (product code ending in an A).

NOTE [88]	Imperial compression fittings cannot be used with Watson-Marlow Qdos interface tubing or PTFE tubing

20.5.1.2.2 ACCESSORY HYDRAULIC CONNECTORS

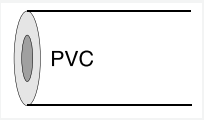
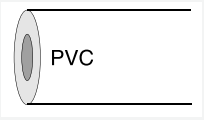
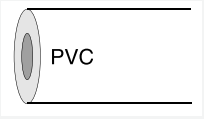
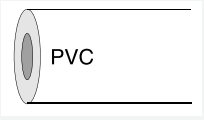
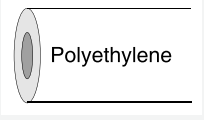
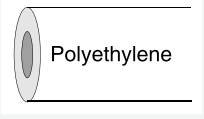
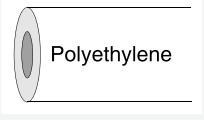
The following Hydraulic connectors may be purchased as an accessory.

Accessory Hydraulic connectors - All models			
Image	**Description**	**Product code**	**Material**
	Hydraulic connection pack (2 items), PVDF, 1/2 ” hose barb	0M9.401H.F05	PVDF
	Hydraulic connection pack (2 items), polypropylene barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.P02	PP
	Hydraulic connection pack (2 items), PVDF barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.F02	PVDF
Accessory Hydraulic connectors - Qdos 20, 60 and 120 models only (89)			
	Hydraulic connection (89) pack (2 complete items), polypropylene, threaded fittings, 1/2 ” BSP	0M9.401H.P03	PP, with FKM seals
	Hydraulic connection (89) pack (2 complete items), polypropylene, threaded fittings, 1/2 ” NPT	0M9.401H.P04	PP, with FKM seals
	Hydraulic connection (89) pack (2 complete items), PVDF, threaded fittings, 1/2 ” BSP	0M9.401H.F03	PVDF, with FKM seals
	Hydraulic connection (89) pack (2 complete items), PVDF, threaded fittings, 1/2 ” NPT	0M9.401H.F04	PVDF, with FKM seals

NOTE 89	The 1/2" hydraulic connectors are not suitable for use with Qdos 30 or CWT pumpheads.

20.5.1.3 Interface tubing

Watson-Marlow fluid path interface tubing is designed specifically for use with the Watson-Marlow metric compression fitting pack. There are 2 materials, 2 sizes for each material, and 2 lengths for each material to make 8 individual product offerings.

Interface tubing			
Image	**Description**	**Product code**	**Material**
	Interface tubing, PVC 6.3x11.5 mm, 2 m (6.5 ft) length	0M9.2222.V6B	PVC
	Interface tubing, PVC 10x16 mm, 2 m (6.5 ft) length	0M9.2222.VAD	PVC
	Interface tubing, PVC 6.3x11.5 mm, 5 m (16 ft) length	0M9.2225.V6B	PVC
	Interface tubing, PVC 10x16 mm, 5 m (16 ft) length	0M9.2225.VAD	PVC
	Interface tubing, polyethylene 9x12 mm, 2 m (6.5 ft) length	0M9.2222.E9C	PE
	Interface tubing, polyethylene 5x8 mm, 2 m (6.5 ft) length	0M9.2222.E58	PE
	Interface tubing, polyethylene 9x12 mm, 5 m (16 ft) length	0M9.2225.E9C	PE
	Interface tubing, polyethylene 5x8 mm, 5 m (16 ft) length	0M9.2225.E58	PE

20.5.1.4 Pressure Sensing Kit

20.5.1.4.1 SEALS

ReNu 20, 60, 120, and CWT, and Pressure Sensing Kit—Pack of 2 items		
Image	**Description**	**Product code**
	ReNu 20, ReNu 60, ReNu 120 and CWT, and Qdos Pressure Sensing Kit (90) **Santoprene** pumphead port seals, pack of 2	0M9.001R.M00
	ReNu 20, ReNu 60, and Qdos Pressure Sensing Kit (90) **SEBS** pumphead port seals, pack of 2	0M9.001R.B00
	ReNu 20, ReNu 60, and Qdos Pressure Sensing Kit (90) **PU** pumphead port seals, pack of 2	0M9.001R.A00

NOTE 90	Qdos 20, 60, 120 and CWT pumphead port seals are interchangeable with the Pressure Sensing Kit fluid connector seal. The Pressure Sensing Kit has only 1 seal which may be changed. The extra seal could be a spare. .

20.5.1.4.2 COMPLETE REPLACEMENT PRESSURE SENSING KIT

Pressure Sensing Kit	
Description	**Product code**
Qdos Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA

20.5.1.5 Hose Connector Kit

Hose Connector Kit	
Description	**Product code**
0.75 m (29.5″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½″ NPT male connector	0M9.007N.TB4
0.75 m (29.5″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules with ½″ BSPT male connector	0M9.007B.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½″ NPT male connector	0M9.006N.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Stainless Steel ferrules) with ½″ BSPT male connector	0M9.006B.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Hastelloy ferrules) with ½″ NPT male connector	0M9.006H.TB4
1.5 m (59.1″) long Qdos PTFE-lined hose connector kit (Hastelloy ferrules) with ½″ BSPT male connector	0M9.006K.TB4

20.5.2 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 Hose Connector Kit. See section: 20.5.2.1
- Removal and replacement of hydraulic connectors. See section: 20.5.2.2
- Removal and replacement of Pressure Sensing Kit. See section: 20.5.2.3
- Removal and replacement of pumphead. See section: 20.5.2.4

20.5.2.1 Item removal and replacement procedures—Hose Connector Kit

A Hose Connector Kit may need to be removed from a Pressure Sensing Kit or a pumphead in order to replace either of these items. In this instance, the full removal procedure need not be followed.

20.5.2.1.1 PROCEDURE—REMOVE INSTALLED QDOS HOSE CONNECTOR KIT

The procedure for removal of a Hose Connector Kit is the same for both the discharge and inlet side of the pump. Steps 2 to 6 should be repeated for each hose which will be connected on the inlet or discharge side of the pump.

Prior to starting the procedure:

- Read the procedure in full
- Do a risk assessment and determine suitable PPE
- Wear suitable PPE

1.	Isolate the pump from its mains power supply	
2.	Carefully release any pressure, and drain the fluid from the system to which the hoses are attached in accordance with your organisations procedure. **WARNING** Certain fluids permeate the PTFE liner and form a chemical hazard on the exterior of the hose. If a permeating fluid is being pumped wear appropriate PPE for the chemical hazard.	
3.	Disconnect the rotating connector end from pumphead first or Pressure Sensing Kit if installed. Prepare to catch any residual chemicals that may remain within the hose after draining of the fluid path into a suitable container. **CAUTION** Beware of any pre-load in the hose (bend or twist). Ensure loose ends of hose are controlled during hose removal on to avoid hose whip and personal injury.	 

	WARNING Beware of any residual chemicals which remain in the hose upon disconnection of either end of the hose assembly. Carefully drain any residual chemicals into a suitable container to avoid risk of an injury.	
4.	Disconnect the fixed end connector (male) from fluid path. Use a 24 mm [15/16" spanner (wrench) to loosen the connector. Prepare to catch any residual chemicals that may remain within the hose after draining of the fluid path into a suitable container **CAUTION** Beware of any pre-load in the hose (bend or twist). Ensure loose ends of hose are controlled during hose removal on to avoid hose whip and personal injury. **WARNING** Beware of any residual chemicals which remain in the hose upon disconnection of either end of the hose assembly. Carefully drain any residual chemicals into a suitable container to avoid risk of an injury.	
5.	Remove any residual PTFE tape from fluid path female connector. Inspect female connector to ensure it is suitable for a replacement Hose Connector Kit.	
6.	Ensure hose is drained of any residual chemicals into a suitable container then dispose of removed hose in accordance with local regulations.	
7.	Repeat steps 2 to 6 for a Hose Connector Kit if also used on the other side of the pump to the side which has just been installed	

20.5.2.1.2 INSTALL REPLACEMENT HOSE CONNECTOR KIT

To install a replacement Hose Connector Kit on either the inlet or discharge side of the pump, follows the same procedure provided during the fluid path installation chapter.See section: 12.4.8

20.5.2.2 Item removal and replacement procedures—Hydraulic connectors

20.5.2.2.1 PROCEDURE—REMOVE HYDRAULIC CONNECTORS

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.

20.5.2.2.2 INSTALL REPLACEMENT HYDRAULIC CONNECTORS

To install a replacement hydraulic connectors follow the same procedure provided during the fluid path installation chapter. See section: 12.4.7

20.5.2.3 Item removal and replacement procedures—Pressure Sensing Kit

Prior to removing a Pressure Sensing Kit remove:

- The Hose Connector Kit if installed. Follow procedure 20.5.2.1
- The hydraulic connectors if installed. Follow procedure 20.5.2.2.1

20.5.2.3.1 PROCEDURE—REMOVE INSTALLED QDOS PRESSURE SENSING KIT

Prior to starting the procedure:

- 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 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
Isolate the pump from its mains power supply	Rotate control cable connector collar anticlockwise until fully disengaged	Fit protective cover until ready to fit replacement Pressure Sensing Kit
		

STEP 4	STEP 5	STEP 6
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)
		

20.5.2.3.2 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

20.5.2.4 Item replacement procedures—Pumphead

Prior to removing the pumphead, the following items must be removed. Refer to the individual procedures:

- Procedure—Remove Hose Connector Kit. See section: 20.5.2.1.1
- Procedure—Remove Hydraulic connector. See section: 20.5.2.2.1
- Procedure—Remove Pressure Sensing Kit. See section: 20.5.2.3.1

20.5.2.4.1 REPLACEMENT OF PUMPHEAD (MODEL: QDOS 30 - ALL VARIANTS)

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.

20.5.2.4.1.1 Procedure: Removing a Qdos 30 pumphead

- 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.

Procedure

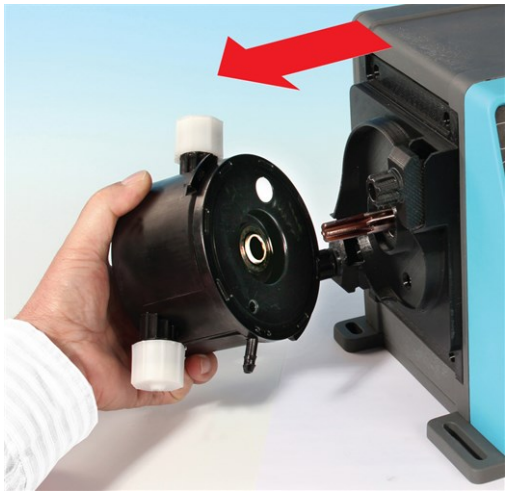
1. Stop the pump
2. Isolate the pump from electrical power.
3. Drain down the fluid path in accordance with your organisation’s procedure
4. Remove either the Hose Connector Kit or hydraulic connectors or the Pressure Sensing Kit depending on which item is installed on the pumphead.
    - Procedure—Remove Hose Connector Kit. See section: 20.5.2.1.1
    - Procedure—Remove Hydraulic connector. See section: 20.5.2.2.1
    - Procedure—Remove Pressure Sensing Kit. See section: 20.5.2.3.1
5. Fully loosen the two pumphead retaining clamps by hand. Do not use a tool.

Procedure

6. Disengage the pumphead from the retaining clamps by carefully detaching the pumphead from the pump housing and rotating it in an anti-clockwise direction by approximately 15°.

Procedure

7. Remove the pumphead from the pump housing.



Procedure

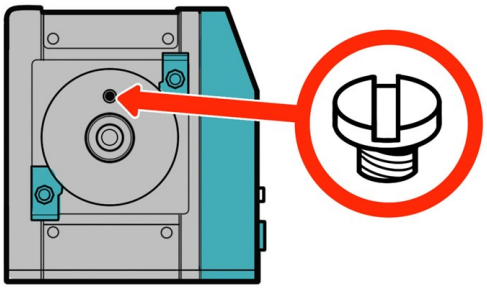
8. Safely dispose of the used pumphead according to local health and safety regulations for contaminated items.
9. Check the leak detect sensor and driveshaft are both clean and free from process chemical. If any evidence of chemical residue is found, remove the pump from service and contact your local Watson-Marlow representative for advice.

20.5.2.4.1.2 Fitting a new pumphead

Fitting a new pumphead is a similar procedure of the pumphead removal. This procedure is written based on a new pumphead which would not contain any previous chemical. Do not fit a used pumphead.

Procedure

1. Remove the new pumphead from its packaging.
2. Select and fit the correct pumphead seals for the application
3. A venting screw installation check should be carried out on all Qdos 30 pumps prior to the installation of the pumphead. The venting screw is supplied in the box with all Qdos 30 pumpheads. If not fitted, remove the venting screw from the pumphead package and install the screw with a flat blade screwdriver into the location illustrated in the image above.



From January 2020 all Qdos 30 pumps have a venting screw pre-installed as standard.

⚠ WARNING

If the venting screw is not fitted, the pump leak detection will not function when process pressures are less than 1 bar. This could result in fluid leaks from the pumphead being undetected during operation. Check and if necessary, install a venting screw prior to installation of a Qdos 30 pumphead.

Do not remove or tamper with the venting screw.

Procedure

4. Align the new pumphead with the pump drive shaft and slide into position on the pump housing.
5. Rotate the pumphead in a clockwise direction by approximately 15° to engage the retaining clamps.
6. Tighten the retaining clamps by hand, to secure the new pumphead into position.
7. Reconnect the electrical power to the pump, press start and run the pumphead for a few revolutions.
8. Stop the pump and isolate it from the power supply, then tighten the clamps further if necessary.
9. Check the retaining clamps are tight
10. Re-connect the input and output connections to the pumphead.
11. Reset the volume or hours counters to begin monitoring life of the replacement pumphead so that it can be changed prior to failure.

NOTICE

The pumphead retaining clamps are not designed to be loosened or tightened with a tool. Using a tool may result in breakage. Always tighten or loosen the clamps by hand.

20.5.2.4.2 REPLACEMENT OF PUMPHEAD (MODEL QDOS 20, 60, 120, CWT - ALL VARIANTS)

20.5.2.4.2.1 Procedure: Removing a Qdos 20, 60, 120 or CWT pumphead

- 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.

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 either the Hose Connector Kit or hydraulic connectors or the Pressure Sensing Kitdepending on which item is installed on the pumphead.
    - Procedure—Remove Hose Connector Kit. See section: 20.5.2.1.1
    - Procedure—Remove Hydraulic connector. See section: 20.5.2.2.1
    - Procedure—Remove Pressure Sensing Kit. See section: 20.5.2.3.1

Procedure

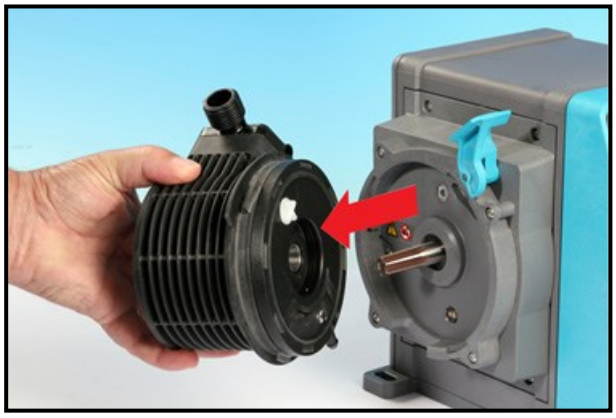
5. Release the pumphead locking lever.

Procedure

6. To disengage the pumphead from the drive, rotate it in a clockwise direction by approximately 15°.

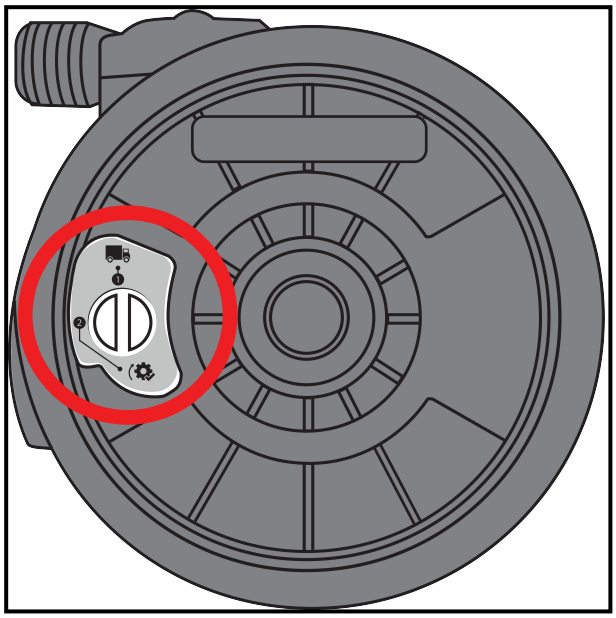
Procedure

7. Remove the pumphead



Procedure

8. Rotate the pressure valve in the pumphead back to the 'transport position' (This specific step is not required for CWT models).



Transport position	P>1 bar (15 psi)

Procedure

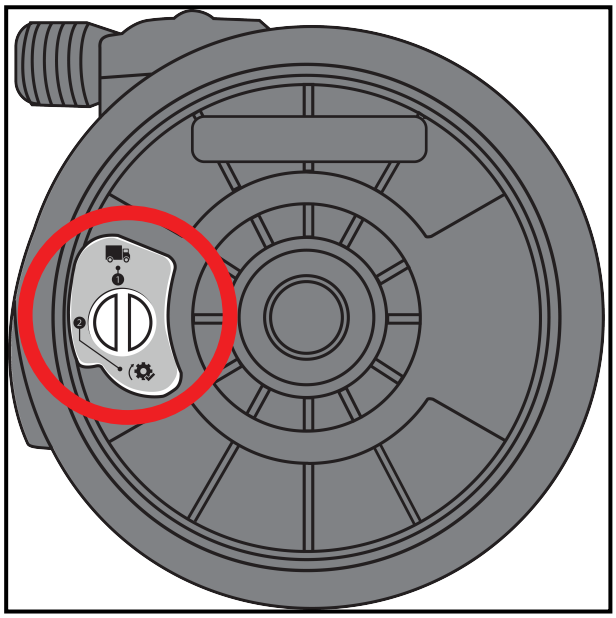
9. Safely dispose of the used pumphead according to local health and safety regulations for contaminated items.
10. Check the leak detect sensor and driveshaft are clean and free from process chemical. If any evidence of chemical residue is found, remove the pump from service and contact your local Watson-Marlow representative for advice.

20.5.2.4.2.2 Fitting a new pumphead

Fitting a new pumphead is a similar procedure of the pumphead removal. This procedure is written based on a new pumphead which would not contain any previous chemical. Do not fit a used pumphead.

Procedure

1. Remove the new pumphead from its packaging.
2. Turn pressure valve on pumphead to the 'in use' position (not specific step is not required for CWT models).



In use position

Procedure

3. Align the new pumphead with the pump drive shaft and slide into position on the pump housing.
4. Rotate the pumphead in an anti-clockwise direction by approximately 15° to engage the retaining lugs.
5. Lock the pumphead into position using the pumphead locking lever.

NOTICE

The pumphead locking lever is designed to be loosened or tightened by hand. Do not use a tool to avoid damage.

6. Connect the input and output connections to the pumphead.
7. Reconnect the electrical power to the pump
8. Confirm which pumphead has been fitted using the keys on the HMI
9. Press start and run the pumphead for a few revolutions.
10. Stop the pump and isolate it from the power supply, check the locking lever is in the locked position.
11. Re-connect the input and output connections to the pumphead.
12. Reset the volume or hours counters to begin monitoring life of the replacement pumphead so that it can be changed prior to failure.

20.6 Drive—Spare parts, and replacement procedures

20.6.1 Replacement items

20.6.1.1 Replacement of fuses

20.6.1.1.1 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.

20.6.1.1.2 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 20.6.2.1

20.6.1.1.3 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 20.6.2.1

20.6.1.2 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.

20.6.1.3 Replacement spare parts

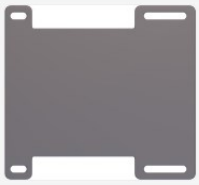
20.6.1.3.1 DRIVE

20.6.1.3.1.1 Complete drive

Contact your local WMFTS representative to determine the product code for ordering of a spare drive.

Certain hydraulic connectors are supplied with drive or replacement pump. See section: 20.5.1.2

20.6.1.3.1.2 Drive parts

Drive parts			
Image	**Description**		**Product code**
	Replacement baseplate		0M9.223M.X00
	Qdos 30 pumphead clamp and screw (Pair)	Qdos30 only	0M9.203C.000

20.6.1.3.2 ACCESSORIES—DRIVE

Accessories—Drive		
Image	**Description**	**Product code**
	Input lead, M12 IP66, 3 m (10 ft) length	0M9.203X.000
	Output lead, M12 IP66, 3 m (10 ft) length	0M9.203Y.000
	HMI protective cover	0M9.203U.000
	Qdos and H-FLO Software Update USB flash drive (91) Kingston MicroDuo 3C	0M9.000U.000

NOTE [91]	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 the software for the updating of pumps for use with a Pressure Sensing Kit which do not have the required software version installed. For more information see section 5.5.7

20.6.2 Pump or drive—Removal and replacement procedures

20.6.2.1 Replacement of fuses

20.6.2.1.1 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.

20.6.2.1.2 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.

20.6.2.1.3 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.

To replace this fuse:

1. Stop the pump and isolate the power to the power cable connection
2. Remove the blade fuse in the power cable fuse holder
3. Replace with a fuse specified to 20 A, 32 V, ISO 8820-3
4. Reconnect the power cable connection to the power source
5. Restore power to the power source
6. Check the pump has turned back on. If not repeat, steps 1 to 6, checking the fuse is installed correctly

20.6.2.2 Item replacement procedures—Pump

20.6.2.2.1 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 its mains power supply
2.	Carefully release any pressure, and drain the fluid from the system which attaches to the Hose Connector Kit or Pressure Sensing Kit or hydraulic connector depending on which item is installed.
3.	Remove the Hose Connector Kit or Pressure Sensing Kit or hydraulic connector depending on which item is installed.
4.	Remove the pumphead, following the procedure in section 20.5.2.4
5..	Determine if the pumphead safety overflow system will need to be removed in order to remove the pump. If required, follow your organisations procedures.
6.	Remove the control cables in accordance with your organisations 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.

20.6.2.2.2 INSTALL PUMP OR DRIVE

To install a new pump or Qdos drive, follow all relevant procedures in the installation chapters.

21 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.

21.1 Errors

The pump has an inbuilt function to report errors. The display of these errors will depends on the model:

21.1.1 Errors—Remote model

If an internal error occurs, depending on the error one of the following LED icons will be displayed on the front panel.

Error Indication (Remote only)					
Status				4-20 mA	
	Running	Remote stop	Change pumphead	4-20 mA signal	Error warning
Major drive fault: return pump to factory					On
A. Motor stalled/wrong speed: check process/system and switch on/off to reset		On			Flash
B. Voltage error: switch on/off to reset pump					Flash

21.1.2 Errors—Manual, Universal, Universal+, PROFIBUS, models

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**
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
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 50	Communication error	Attempt to reset by switching power OFF / ON. Or seek support

21.1.3 Error reporting

If any unexpected faults or failures are experienced report them to your Watson-Marlow representative.

21.2 Breakdown

21.2.1 Leak detection message (Models: Manual, PROFIBUS, Universal and Universal+ models)

If a leak is detected the pump will display the message provided on the following image:

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.

21.2.2 Leak detection message (Remote only)

If a leak is detected, the following LED icon will display:

LED icons (Leak detect)					
Status				**4-20 mA**	
	Running	Remote stop	Change pumphead	4-20 mA signal	Error warning
Pumphead requires changing			On		

21.2.3 Leak detection procedure

As soon as a leak is detected either as a result of a message on the screen, , 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 20.5.2.4.

21.3 Troubleshooting

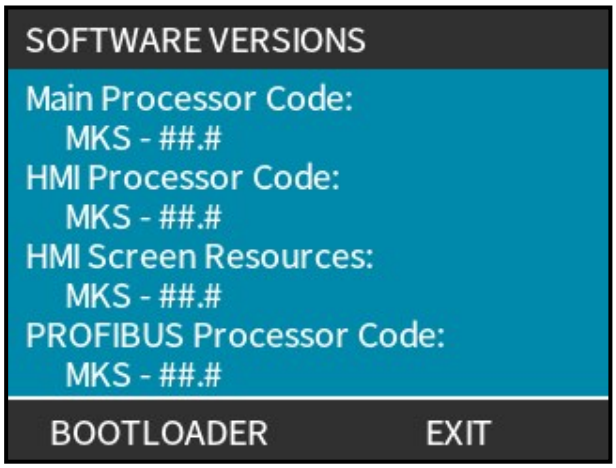
Problem	Possible cause	Solution
Reduced fluid flow	Leakage from fluid connectors	• Re-calibrate the pump • Check fluid connectors are suitable for the connection (size, chemical compatibility) • Check fluid connector tightness • Check pumphead end connection seals
	Low inlet pressure	• Increase fluid 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: 21.1	
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.	

21.4 General pump help (Manual, PROFIBUS, Universal and Universal+)

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.



21.5 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.

21.5.1 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/

21.5.2 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

21.6 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
Hose Connector Kit	2 years

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.

21.6.1 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.

21.6.2 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 and CWT 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.

21.7 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.

22 CHEMICAL COMPATIBILITY

22.1 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.

22.1.1 Chemical compatibility—Chapter structure

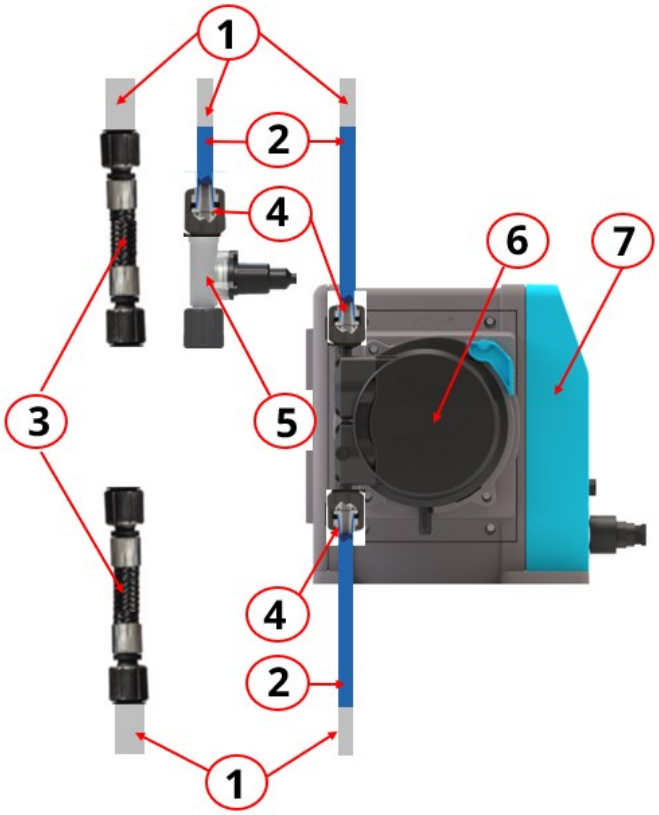
The first part of this chapter introduces the Material of Construction by item group concept with a list of items which are normally wetted or may become wetted in certain scenarios (spillage, operating the pumphead to the point of failure, etc).

The second part of this chapter provides a procedure to check chemical compatibility.

22.2 Materials of construction

22.2.1 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:** Watson-Marlow Qdos interface tubing	For use with metric compression hydraulic connectors only
3	**Fluid Path:** Hose Connector Kit	May be mounted on inlet or discharge
4	**Fluid Path:** Hydraulic connectors	
5	**Fluid Path:** Pressure Sensing Kit	Mounted on discharge only, Hydraulic connectors or Hose Connector Kit may be mounted on top
6	**Fluid Path:** Pumphead	Multiple variations. A Qdos pump model is a combination of a pumphead and drive
7	Drive	

22.2.2 Abbreviations

Abbreviations list	
EPDM	Ethylene propylene diene monomer
FKM	Fluorine Kautschuk Material
GF	Glass fibre reinforced
HMI	Human Machine Interface
MSDS	Material Safety Data Sheet
NBR	Nitrile rubber
PA	Polyamide / Nylon
PA6	Polyamide 6 / Nylon 6
PC	Polycarbonate
PE	Polyethylene
PEEK	Polyether ether ketone
PFPE	Perfluoropolyether
POM	Polyoxymethylene
PP	Polypropylene
PPE	Personal Protective Equipment
PPS	Polyphenylene sulfide
PS	Polystyrene
PTFE	Polytetrafluoroethylene
PVC	Poly Vinyl Chloride
PVDF	Polyvinylidene fluoride or polyvinylidene difluoride
RMS	Root Mean Squared
TPU	Thermoplastic Polyurethane

22.2.3 Materials of construction of item groups

22.2.3.1 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.

22.2.3.2 Item group 2—Qdos interface tubing

Qdos interface tubing is a Qdos range accessory which may be used to provide a flexible fluid path between the metric compression hydraulic connectors and the users 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.

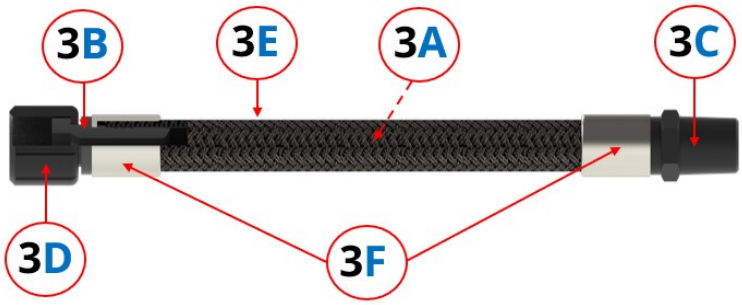
Item group 2—Interface tubing		
Description	**Product code**	**Material of construction**
Interface tubing, pvc 6.3x11.5 mm, 2 m (6.5 ft) length	0M9.2222.V6B	PVC
Interface tubing, pvc 10x16 mm, 2 m (6.5 ft) length	0M9.2222.VAD	PVC
Interface tubing, pvc 6.3x11.5 mm, 5 m (16 ft) length	0M9.2225.V6B	PVC
Interface tubing, pvc 10x16 mm, 5 m (16 ft) length	0M9.2225.VAD	PVC
Interface tubing, polyethylene 9x12 mm, 2 m (6.5 ft) length	0M9.2222.E9C	Polyethylene
Interface tubing, polyethylene 5x8 mm, 2 m (6.5 ft) length	0M9.2222.E58	Polyethylene
Interface tubing, polyethylene 9x12 mm, 5 m (16 ft) length	0M9.2225.E9C	Polyethylene
Interface tubing, polyethylene 5x8 mm, 5 m (16 ft) length	0M9.2225.E58	Polyethylene

22.2.3.3 Item group 3—Hose Connector Kit

Hose Connector Kit is a Qdos range item which may be used to provide a flexible fluid path between either the pumphead or the Pressure Sensing Kit and the user organisations fluid path pipework.

Some parts of the Hose Connector Kit ar:

- Normally wetted
- Not normally wetted but may become wetted by some scenarios



Item	Description	Material of construction	Normally wetted	Not normally wetted but may become wetted by some scenarios
3A	Hose: Liner	PTFE (92)	Yes	
3B	Qdos pumphead connector internal connector	PTFE (92)	Yes	
3C	½" BSP or ½" NPT, fluid path connector (male)	PTFE (92)	Yes	
3D	Qdos pumphead connection nut (female)	PP		Yes
3E	Hose: Outer braid	PP		Yes
3F	Ferrule (93)	Stainless steel (304 1.4301) or Hastelloy (C276)		Yes

NOTE 92	All PTFE material is anti-static. For the purposes of the chemical compatibility analysis PTFE and anti-static PTFE are interchangeable
NOTE 93	The ferrule material is dependent on selected product code.

22.2.3.3.1 PERMEATING CHEMICALS

Certain chemicals may permeate through the PTFE hose liner. In addition, permeating chemicals which contain halides, may form an acid on the exterior surfaces of the Hose Connector Kit from chemical reaction with moisture in the atmosphere.

The permeating chemicals or the acid created by the permeating chemicals may:

- Attack the exterior materials of construction of the product, resulting in product failure
- Create a chemical hazard to a Qdos pump, personnel or the operating environment

These events will be considered further during the chemical compatibility procedure.

22.2.3.3.1.1 List of permeating chemicals

A list of known permeating chemicals through the PTFE liner is provided below.

Not all of these chemicals are suitable for use with the Qdos pump range.

- 1-Butylene (liquid or gas)
- Alk-Tri
- Antimony Pentachloride
- Benzene Methyl
- Brake Fluid – Vegetable (wagner 21)
- Bromine (gas, liquid or bromine water)
- Butadiene Monomer
- Butane
- Butanediol
- Butyl Bromide
- Butylene Glycol permeate
- Caprolactam
- Carbon Tetrachloride
- Carbonyl Chloride (Phosgene)
- Chlorinated Phenol (Disinfectant)
- Chlorine (gas, liquid or chlorine water)
- Chlorine Dioxide
- Chlorine Trifluoride
- Chlorobenzene
- Chlorofluorocarbon
- Chloroform
- Chlorothene
- Crude Oil (Petroleum)
- Dichlorethane

- Dichlorobenzene (o and p)
- Dichlorodifluoromethane Sodium (Molten 98°C)
- Dichloroethane
- Dichloromethane
- Dichlorotetrafluoroethane
- Diethyl Ether
- Dimethyl Benzene
- Dimetyldichlorosilane
- Ethyl Benzene
- Ethyl Ether
- Ethyl Ketone
- Ethylene Bromide
- Ethylene Chloride
- Ethylene Dibromide (Trichloromonofluoromethane)
- Ethylene Dichloride
- Ferric Chloride
- Fluorine
- Freons (all types)
- Fuming Nitric Acid
- Fuming Sulphuric Acid
- Gasohol (containing 10% Methanol)
- Glacial Acetic Acid
- Hexane
- Hydrobromic Acid
- Hydrochloric Acid
- Hydrofluoric Acid
- Hydrofluosilicic Acid (Hydrofluorosilicic Acid)
- Hydrogen Bromide
- Hydrogen Chloride (HCl)
- Hydrogen Cyanide
- Hydrogen Fluoride (HF)
- Hydrogen Gas (H2)
- Hydrogen Sulfide (Hydrogen Sulphide)
- Iodine
- Isocyanates
- Lithium (Molten 181°C)
- Lithium Chloride
- Methane

- Methyl Benzene
- Methyl Bromide
- Methyl Chloride
- Methyl Chloroform
- Methyl Methacrylate
- Methylene Bromide
- Methylene Chloride
- Monochlorobenzene(Chlorobenzene, MCB)
- Monochlorodifluoromethane
- Monochlorotrifluoromethane
- Monofluorotrichloromethane (F-11)
- Naphtha (Petroleum, Crude)
- Naphthalene
- Nitric Acid - Fuming
- Nitrobenzene (AKA Oil of Mirbane)
- Nitromethane
- Orthodichlorobenzene
- Orthoxylene
- Paraxylene
- Perchloroethylene
- Phenol
- Phosgene (Gas & Liquid)
- Potassium (Molten 63°C)
- Propylene Oxide (1,2 Epoxy Propane)
- Prussic Acid
- Radioactive Materials (or Enviroments)
- Sodium Hypochlorite
- Sulfuric Acid – Fuming (Sulphuric Acid – Fuming)
- Sulphur Trioxide
- Tetrachlorodifluoroethane
- Tetrachloroethylene
- Tin (Molten 232°C)
- Toluene
- Trichloro-1, 1, 2 Ethane
- Trichloroethane
- Trichloroethylene
- Trichlorofluoromethane
- Trichloromethane

- Trichlorotrifluoroethane
- Trimethyl Propane
- Vinyl Chloride Monomer
- Vinylidene Chloride
- Xylene

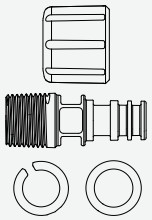
22.2.3.4 Item group 4—Hydraulic connector

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 organisations 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 pumps or spare drives			
Image	**Description**	**Size**	**Comment**
	Metric —Polypropylene (PP) compression fittings; For use with Qdos Interface tubing. **Product code:** 0M9.221H.P01	Set of four sizes: • 6.3x11.5 mm • 10x16 mm • 9x12 mm • 5x8 mm	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).
	1/2” Hose barb, polypropylene (PP) **Product code:** 0M9.401H.P05	to fit 1/2" internal diameter hose/tube	Supplied as a pair (2 items) with a 120 model pump or spare drive model, in addition to compression fittings.
	Imperial [(94)]— PVDF compression fittings **Product code:** 0M9.001H.F20	Set of two sizes: • 3/8'' x 1/4" • 1/2'' x 3/8''	Supplied as a pair (2 packs) with pumps or spare drives, which have a US power plug (product code ending in an A).

NOTE [94]	Imperial compression fittings cannot be used with Watson-Marlow Qdos interface tubing or PTFE tubing

Accessory Hydraulic connectors - All models			
Image	**Description**	**Product code**	**Material**
	Hydraulic connection pack (2 items), PVDF, 1/2 ” hose barb	0M9.401H.F05	PVDF
	Hydraulic connection pack (2 items), polypropylene barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.P02	PP
	Hydraulic connection pack (2 items), PVDF barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.F02	PVDF
Accessory Hydraulic connectors - Qdos 20, 60 and 120 models only (95)			
	Hydraulic connection (95) pack (2 complete items), polypropylene, threaded fittings, 1/2 ” BSP	0M9.401H.P03	PP, with FKM seals
	Hydraulic connection (95) pack (2 complete items), polypropylene, threaded fittings, 1/2 ” NPT	0M9.401H.P04	PP, with FKM seals
	Hydraulic connection (95) pack (2 complete items), PVDF, threaded fittings, 1/2 ” BSP	0M9.401H.F03	PVDF, with FKM seals
	Hydraulic connection (95) pack (2 complete items), PVDF, threaded fittings, 1/2 ” NPT	0M9.401H.F04	PVDF, with FKM seals

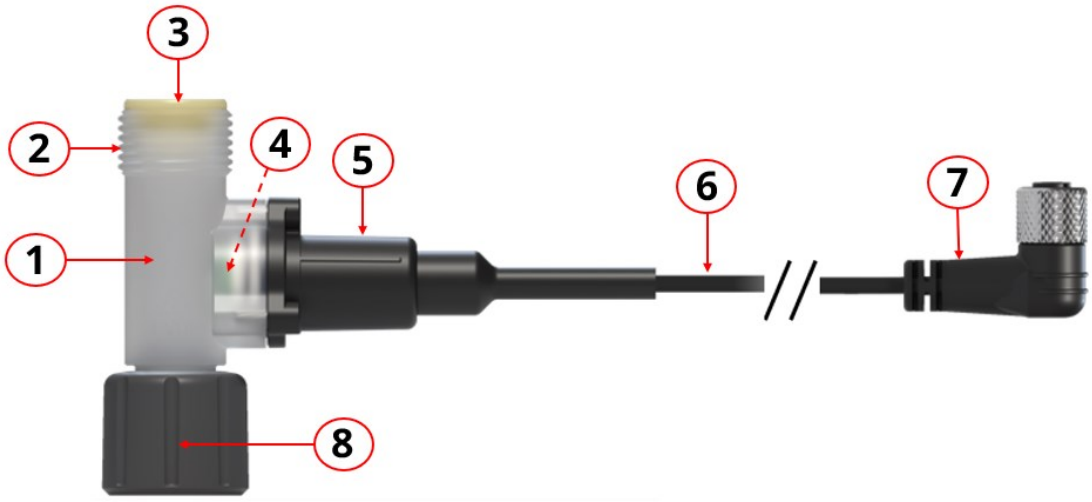
NOTE 95	The 1/2" hydraulic connectors are not suitable for use with Qdos 30 or CWT pumpheads.

22.2.3.5 Item group 5—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 or Hose Connector Kit 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 tee piece	PVDF	Yes	
2	Outlet: Discharge connection [(96)] for hydraulic connector or Hose Connector Kit	PVDF	No	
3	Outlet: Fluid connector seal [(97)]	Varies, see note [(97)]	Yes	
4	Inside: Pressure sensing element to tee 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 [(98)]
6	Control cable, integrated	Copper, PVC, PU	No	Yes
7	M12 control cable connector	Nickel plated brass, Nylon, PU	No	Yes
8	Inlet: Qdos pumphead connection nut (female)) [(96)]	Snap ring: PP Nut: PP 20% GF	No	Yes

NOTE [96]	Items 2 and 8 are the same thread size as a Qdos pumphead.

NOTE [97]

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 Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM	0M9.005K.FTA	Santoprene, and SEBS supplied in packaging tray
Qdos Pressure Sensing Kit for PU	0M9.045K.FTA	PU, and FKM, supplied in packaging tray

NOTE [98]	The internal seal inside the pressure sensor housing would not be wetted, if the fluid is chemically compatibale with item 4: The pressuse sensor to pressure sensor tee piece seal. For more information see section 22

22.2.3.6 Item group 6—Pumphead

This section is split further into items which are:

- Normally wetted
- Not normally wetted but may become wetted by some scenarios

22.2.3.6.1 ITEM GROUP 6A—NORMALLY WETTED

The pumphead has 3 main items which are normally wetted.

Pumphead	Normally wetted items		
	Tube or fluid contacting element	Pumphead ports	Fluid connection seals
ReNu 20 SEBS	SEBS	PVDF	SEBS (99)
ReNu 20 PU	TPU	PVDF	TPU (99)
ReNu 30 Santoprene	Santoprene	PP	FKM (fitted), EPDM also provided
ReNu 30 SEBS	SEBS	PP	FKM (fitted), EPDM also provided
ReNu 60 Santoprene	Santoprene	PP	Santoprene
ReNu 60 SEBS	SEBS	PVDF	SEBS (99)
ReNu 60 PU	TPU	PVDF	TPU (99)
ReNu 120 Santoprene	Santoprene	PP	Santoprene
CWT 30 EPDM	EPDM and PEEK	PP	Santoprene

NOTE[99]	Qdos 20 and Qdos 60 ReNu Pumpheads manufactured prior to April 2021 will have been supplied with Santoprene moulded seals only.

22.2.3.6.2 ITEM GROUP 6B—NOT NORMALLY WETTED BUT MAY BECOME WETTED BY SOME SCENARIOS

	Item	Material of construction		
	Item	**Qdos 30**	**Qdos 20, 60 and 120**	**Qdos CWT**
64B1: Pumphead enclosure	Pumphead enclosure	• PPS (GF) • 20 % GF PP PC • PA6 • 316 stainless steel	30 % GF Polyphenyl ether+PS PC PP 316 stainless steel (Noryl)	PPS (GF)
	Enclosure seals	NBR		EPDM, NBR
	Pumphead Ports	• SEBS: PP • Santoprene: PP	• SEBS: PVDF • Santoprene: PP • PU: PVDF	EPDM: PP
	Leak detection window	PC		
	Clamp ring	—		30 % PA (GF)
	Vent body	PP POM	30 % GF Polyphenyl ether+PS	—
	Vent springs	316 stainless steel	—	Vent springs
64B2: Pumphead internals	Rotor	PA6 (GF)		303 stainless steel
	Bearings	Steel		
	Internal baffle	—	POM	—
	Lubricant	PFPE based Lubricant		
64B3: Pumphead to drive interface area	Drive casework	20 % Glass Filled Polyphenyl ether / PS		
	Drive casework seals	Silicone sponge SE515		
	Keypad	Polyester		
	Driveshaft	Stainless steel 440C		

	Item	Material of construction		
	Item	**Qdos 30**	**Qdos 20, 60 and 120**	**Qdos CWT**
	Driveshaft seals	NBR		

22.2.3.7 Item group 7—Drive

The following drive items are Not normally wetted but may become wetted by some scenarios

	Item	Qdos 30	Qdos 20, 60, and 120	Qdos CWT
7B1: Drive enclosure	Drive enclosure	20 % Glass Filled Polyphenyl ether / PS		
	Drive casework seals	Silicone sponge SE515		
	Keypad/HMI	Polyester		
7B2: Pumphead to drive interface area	Drive enclosure casework	20 % Glass Filled Polyphenyl ether / PS		
	Drive case work seals	Silicone		
	Gearbox spigot cover	PPE		
	Drive shaft seal	NBR		
	Drive shaft	Stainless steel 440C		
7B3: Drive internals	Mixture	Mixture of materials, including Aluminium		

22.3 Chemical compatibility procedure

22.3.1 STEP 1

Using section 22.2, make a list of materials of construction that are normally wetted items during pumping and fluid transfer

22.3.2 STEP 2

Using section 22.2, 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 using a Hose Connector Kit, the exterior product surfaces, wetted by permeating chemicals or acids created by permeating chemicals containing halides, in the fluid path. See section 22.2.3.3.1
3. 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 6B3 and 7B2

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 6B3 : in section 22.2.3.6.2 and item group 7B2: in section 22.2.3.7)

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: 20.5.2.4).

22.3.3 STEP 3

Using the list of materials created in step 1 and 2, determine chemical compatibility:

- For items with a Watson-Marlow product code (100), 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 100	A combined check of the 3 normally wetted items (Item group 6A in section 22.2.3.6.1) of the pumphead is made using the pumphead name. • For Qdos 30 models this combined check is based on FKM seals. Where EPDM seals are to be used instead, EPDM must be checked for compatibility instead.

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 peristaltic tubing or element after a set number of tested revolutions prior to pumphead failure, to avoid contact with materials of construction which would not normally be wetted by the fluid path

22.3.4 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
- If using a Hose Connector Kit), a chemical hazard, on a Qdos pump, personnel or the operating environment as a result of the exterior product surfaces of the hose being wetted by an acid created by permeating chemicals containing **halides**
- Other hazards not listed here

22.3.5 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.

23 PRODUCT END OF LIFE, RECYCLING AND, AND DISPOSAL

23.1 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 20 degrees.

Once the product has reached its end of life, a responsible person must remove the product from service.

23.2 Product recycling and disposal

Materials of construction are provided in the Chemical Compatibility chapter (See section: 22.2) 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.

24 COMPLIANCE

24.1 Compliance marking on the product

24.1.1 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	EAC	EAC - conforms to all technical regulations of the Eurasian Customs Union

	The product conforms to the applicable Argentinian safety requirements		The product is certified to the Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use – Part 1: General Requirements • UL 61010-1:2012 Ed.3 +R:21Nov2018 • CSA C22.2#61010-1-12:2012 Ed.3 +U1;U2;A1
	The wetted parts of the pumphead (101) conform to the requirements of NSF 61		The Qdos Pressure Sensing Kit with product code (102): 0M9.005K.FTA is 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 101	The following pumpheads are not certified to NSF 61: • ReNu 20 (PU) • ReNu 60 (PU)

NOTE 102

Product code	Description
0M9.005K.FTA	Qdos Pressure Sensing Kit for Santoprene, SEBS and CWT EPDM

24.2 Standards

24.2.1 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

24.2.2 Standards—Pumphead

Pumphead standards - may apply only to some models	NSF61 (Not ReNu PU pumpheads).
	EC 1935/2004 and EU regulation 10/2011 certification FDA regulation 21CFR parts 170-199

24.2.3 Standards—Hose Connector Kit

Standard number	Title of standard
BS EN 16643:2016	Rubber and plastics hoses and hose assemblies - Non-bonded fluoroplastic lined (e.g. PTFE) hoses and hose assemblies for liquid and gaseous chemicals Specification
BS EN IEC UL 61010-1:2010+A1:2019	Safety requirements for electrical equipment for measurement, control, and laboratory use

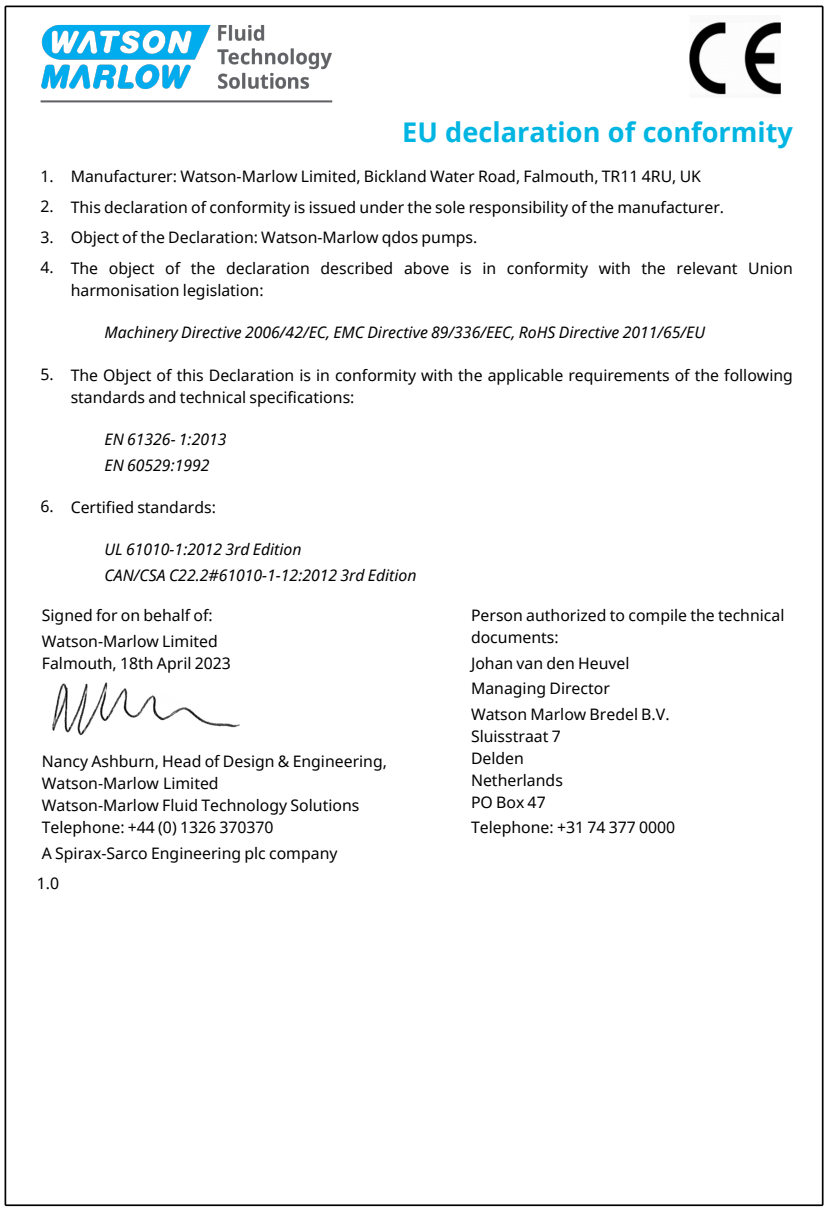
24.2.3.1 Specific testing as part of BS EN 16643:2016

Standard number	Title of standard
BS EN ISO 8031:2020	Rubber and plastics hoses and hose assemblies Determination of electrical resistance and conductivity
BS EN 1402:2021 clause 8.1 Proof Hold Test	Rubber and plastics hoses and hose assemblies. Hydrostatic testing

24.3 Documentation

24.3.1 Documentation—Pump

24.3.1.1 EU Declaration of Conformity



WATSON MARLOW Fluid Technology Solutions

CE

EU declaration of conformity

1. Manufacturer: Watson-Marlow Limited, Bickland Water Road, Falmouth, TR11 4RU, UK
2. This declaration of conformity is issued under the sole responsibility of the manufacturer.
3. Object of the Declaration: Watson-Marlow qdos pumps.
4. The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:

   Machinery Directive 2006/42/EC, EMC Directive 89/336/EEC, RoHS Directive 2011/65/EU

5. The Object of this Declaration is in conformity with the applicable requirements of the following standards and technical specifications:

   EN 61326- 1:2013
   EN 60529:1992

6. Certified standards:

   UL 61010-1:2012 3rd Edition
   CAN/CSA C22.2#61010-1-12:2012 3rd Edition

Signed for on behalf of:
Watson-Marlow Limited
Falmouth, 18th April 2023

Nancy Ashburn, Head of Design & Engineering,
Watson-Marlow Limited
Watson-Marlow Fluid Technology Solutions
Telephone: +44 (0) 1326 370370
A Spirax-Sarco Engineering plc company

1.0

Person authorized to compile the technical documents:
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Telephone: +31 74 377 0000

PB0462 **1**

24.3.1.2 UK Declaration of Conformity

WATSON MARLOW Fluid Technology Solutions

UK CA

UK declaration of conformity

1. Manufacturer: Watson-Marlow Limited, Bickland Water Road, Falmouth, TR11 4RU, UK
2. This declaration of conformity is issued under the sole responsibility of the manufacturer.
3. Object of the Declaration: Watson-Marlow qdos pumps.
4. The object of the declaration described above is in conformity with the relevant statutory requirements:

   Supply of Machinery (Safety) Regulations 2008, The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012.

5. The Object of this Declaration is in conformity with the applicable requirements of the following standards and technical specifications:

   EN 61326- 1:2013
   EN 60529:1992

6. Certified standards:

   UL 61010-1:2012 3rd Edition
   CAN/CSA C22.2#61010-1-12:2012 3rd Edition

Signed for on behalf of:
Watson-Marlow Limited
Falmouth, 18th April 2023

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Watson-Marlow Fluid Technology Solutions
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A Spirax-Sarco Engineering plc company

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PB0462 **2**

24.3.1.3 China—RoHS (Chinese language)

WATSON MARLOW Fluid Technology Solutions

CHINA

符合性证书

1. 制造商：Watson Marlow Ltd, Bickland Water Road, Falmouth, TR11 4RU, UK
2. 本符合性证书由制造商全权负责发布。
3. 声明的对象： Watson-Marlow qdos pumps.
4. 本声明的对象符合以下标准的适用要求

GB/T 26572-2011 - 电气和电子产品中某些受限物质的浓度限值要求
GB 4793.1-2007 / IEC EN 61010-1.2001-用于测量、控制与实验室用途的电气设备安全要求- 第1
GB/T 18268-1 / IEC EN 61326-1 - 用于测量、控制与实验室用途-- EMC 要求-- 第1 部分：一般要求
GB 4824-2013 / CISPR 11 - 工业、科学和医疗(ISM) 射频设备-- 扰动特性-- 测量的限制和方法

部件名称	有害物质					
	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)	铅 (Pb)
电源	o	o	o	o	o	o
驱动器 PCB	o	o	o	o	o	x
电机减速箱	o	o	o	o	o	o
外壳	o	o	o	o	o	o
泵头	o	o	o	o	o	o

本表是根据 SJ/T 11364 的规定进行编制
O: 表明该部件的所有均质材料中包含的上述危险物质均低于 GB/T 26572-2011 的限值要求
X: 表明该部件所用的均质材料中至少有一种有害物质高于 GB/T 26572-2011 的限值要求。

除非另有标记，所有封闭式产品及其部件的环保使用期限 (EFUP) 均以此处的符号为准。某些部件可能有不同的 EFUP（例如电池模块），因此会以相应的标记加以体现。环保使用期限仅在产品手册中规定的条件下运行时方才有效。

PB0462 3

24.3.1.4 China—RoHS (English language)

WATSON MARLOW Fluid Technology Solutions

CHINA

China RoHS

1. Manufacturer: Watson-Marlow Limited, Bickland Water Road, Falmouth, TR11 4RU, UK
2. This certificate of compliance is issued under the sole responsibility of the manufacturer.
3. Object of the Declaration: Watson-Marlow qdos pumps.
4. The Object of this Declaration is in conformity with the applicable requirements of the following standards

China RoHS II (Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products)"

GB 4793.1- 2007 / IEC EN 61010- 1.2001 - Safety requirements for electrical equipment for measurement, control, and laboratory use—Part 1: General requirements

GB/T 18268-1 / IEC EN 61326-1 - Electrical equipment for measurement, control and laboratory use—EMC requirements—Part 1: General requirements

GB 4824-2013 / CISPR 11 - Industrial, scientific and medical (ISM) radio-frequency equipment—Disturbance characteristics—Limits and methods of measurement

GB/T 26572- 2011 - Requirements on concentration limits for certain restricted substances in electrical and electronic products

Part name	Hazardous Substances					
	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)	Lead (Pb)
Power supply	o	o	o	o	o	o
Drive PCBs	o	o	o	o	o	x
Motor gearbox	o	o	o	o	o	o
Enclosure	o	o	o	o	o	o
Pumphead	o	o	o	o	o	o

This table is prepared in accordance with the provisions of S J/ T 11364

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572-2011

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement GB/T 26572-2011

The environmentally Friendly Use Period (EFUP) for all enclosed products and their parts is per the symbol shown here, unless otherwise marked. Certain parts may have a different EFUP (for example battery modules) and are so marked to reflect such. The environmentally Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.

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24.3.2 Documentation—Pressure Sensing Kit

An EU Declaration of Conformity is supplied in the box with the product.

24.3.3 Documentation—Hose Connector Kit

Standard number	Title of standard
ISO/IEC 17050-1:2004	Conformity assessment - Supplier's declaration of conformity - Part 1: General requirements (103)
BS EN 10204:2004, 3.1	Metallic Products: Types of Inspection Documents (104)

NOTE 103	A combined Pressure Test Certificate and Declaration of Conformance is provided in the box with the product.
NOTE 104	Upon request, a 3.1 material certificate, is available in electronic form (PDF), for each component. Contact your local Watson-Marlow representative for more information.

25 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. In this document also referred to as ReNu or CWT.

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