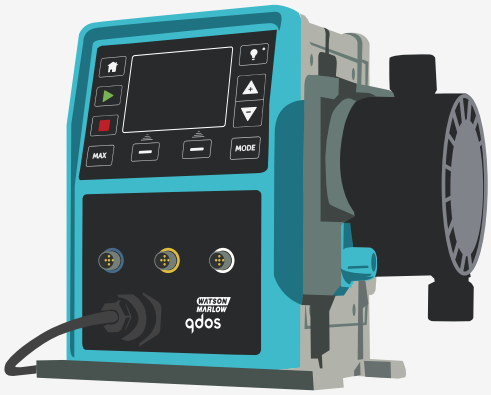
INSTRUCTIONS FOR USE

Machine Designation - **all model variants** of:

- qdos 20 Pump
- qdos 30 Pump
- qdos 60 Pump
- qdos 120 Pump
- qdos CWT Pump



Date of publication: 16 February 2024

Version of publication: 11

ORIGINAL INSTRUCTIONS

1 Preface

1.1 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 manner which has not been specified in these instructions, then the protection provided by the equipment may be impaired.

1.2 Translation of the original instructions

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

Table of contents

2 Introduction to the document

2.1 User groups

These instructions are for the safe use of all model variants of the Watson-Marlow qdos 20, 30, 60, 120 and/or qdos CWT pumps during the products life cycle by a:

Responsible person	Individual designated by the users organisation, responsible for the installation, safe use and maintenance of the product.
Operator	Person operating the product for its **intended use.**

An operator must be trained by a **Responsible Person** prior to performing a hazardous operation.

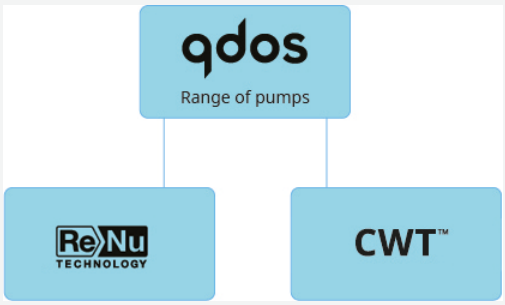
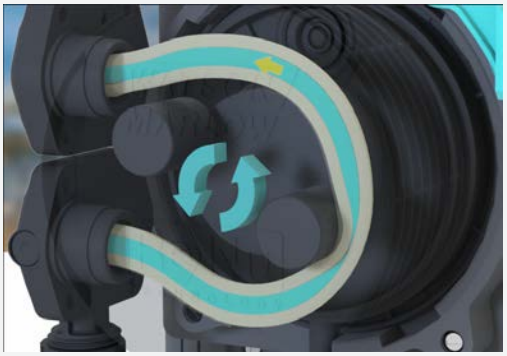
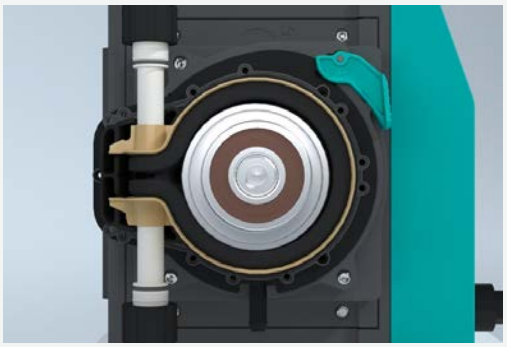
2.2 Information types

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

Glossary definitions	Words in **bold** 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** ▶. See "5.5.4.2.1 Control panel overview" on page 39 for a list of buttons.
On screen text	Words in **Bold And Blue** are prompts that are displayed on the pump screen. For example, **Control Settings**.
On screen header	Words in **BLUE AND BOLD UPPER CASE** are the header as displayed at the top of the pump screen. For example, **MAIN MENU**.
Note	**NOTE1** Body text of note

2.3 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 tubing** inside.	
CWT	CWT refers to a range of pumpheads with an **element** inside.	

2.4 Trademarks

- Watson-Marlow, Qdos, ReNU and CWT are registered trademarks of Watson-Marlow Limited.
- ReNu™ and CWT™ are registered trademarks of Watson-Marlow Limited.
- PROFIBUS® is a registered trademark of PROFIBUS and PROFINET International (PI).
- Viton® is a registered trademark of Dupont Dow Elastomers L.L.C.

2.5 Acronyms

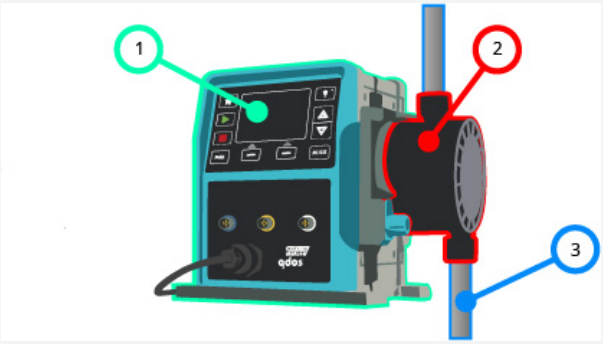
Table 1 - Acronym list	
EPDM	Ethylene propylene diene monomer
GF	Glass fibre reinforced
HMI	Human Machine Interface
MSDS	Material Safety Data Sheet
NBR	Nitrile rubber
PA	Polyamide
PA6	Nylon 6
PC	Polycarbonate
PEEK	Polyether ether ketone
PFPE	Perfluoropolyether
POM	Polyoxymethylene
PP	Polypropylene
PPE	Personal Protective Equipment
PPS	Polyphenylene sulfide
PS	Polystyrene
PVCu	Poly Vinyl Chloride
PVDF	Polyvinylidene fluoride or polyvinylidene difluoride
RMS	Root Mean Squared
TPU	Thermoplastic Polyurethane

3 Introduction: Product

3.1 General description

A Watson-Marlow qdos pump, provides a flow rate of **fluid** by **positive displacement**.

The pump is connected to a process fluid path. Fluid flows through this fluid path. General illustration provided below. Exact arrangement will vary by model.

1. Pump drive	
2. Pumphead	
3. Fluid path	

3.2 Intended use

All model variants of the qdos range of pumps are designed for the controlled movement of fluid, in ordinary safe locations, except those fluids or applications listed for prohibited use.

3.2.1 Prohibited use

- Environments that require explosion proof certification.
- With fluids not chemically compatible (2).
- 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.

NOTE2	A procedure for checking chemical compatibility is provided in "19 Chemical compatibility" on page 202.

4 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.

4.1 Safety symbols

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.

	**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 of these symbols indicate 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**	This symbol identifies that an appropriate safety instruction should be followed or a potential hazard exists.

4.1.1 Instructions for renewing safety symbols

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

4.2 Safety signals

Signals indicate a possible **hazard**.

4.2.1 Signals: With risk of personal injury

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

⚠ WARNING

The WARNING signal word 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 CAUTION signal word 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

4.2.2 Signals: With risk of equipment or property damage only

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

NOTICE

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

Hazard information—Information to explain:

- What could happen
- How to avoid hazard

4.3 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

5 Product overview

This section provides a product overview with summary specification. Detailed specification is provided in the appendix.

5.1 Pump models

A qdos 'pump' is a combination of two main components, a 'Drive' and a 'Pumphead'

5.1.1 Drive—Variations

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>

5.1.2 Drive—General arrangement

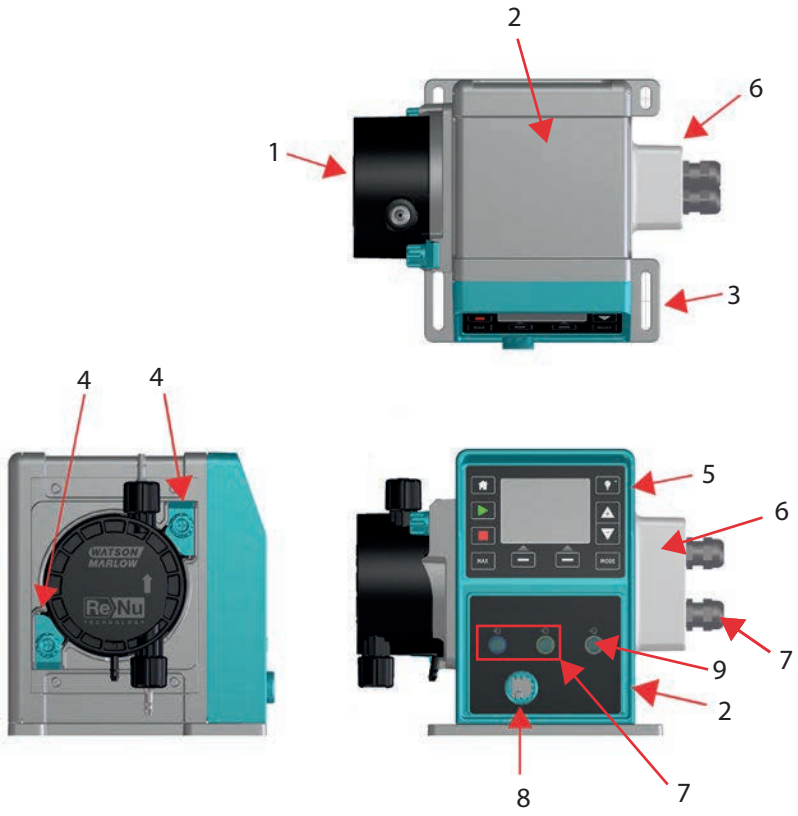


Figure number	Description	Comment
1	ReNu or CWT pumphead	Left Hand version shown
2	Drive	qdos 30 shown
3	Mounting plate	
4	Pumphead retaining clamps	qdos 30 shown
5	HMI (Display and Key pad)	Not available on Remote model
6	Relay module	Model option (Universal, Universal+)
7	Control cable connections	**Standard pump** (not relay module variant)
8	Power cable	Not detachable
9	Pressure sensor connection (3)	Not available on Remote or Manual model

NOTE3	The pressure sensor connection is for a Watson-Marlow pressure sensor for use with PROFIBUS, Universal, and Universal+ models. The pressure sensor will be available for purchase in 2023.

5.1.3 Pumphead—Variations

<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 5 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>

The following table provides a list of current pumpheads based on model and type:

Pumphead	Control model exception
ReNu 20 PU	Not available on Remote model
ReNu 20 SEBS	
ReNu 30 Santoprene	
ReNu 30 SEBS	
ReNu 60 Santoprene	
ReNu 60 SEBS	
ReNu 60 PU	
ReNu 120 Santoprene	
CWT 30 EPDM	

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

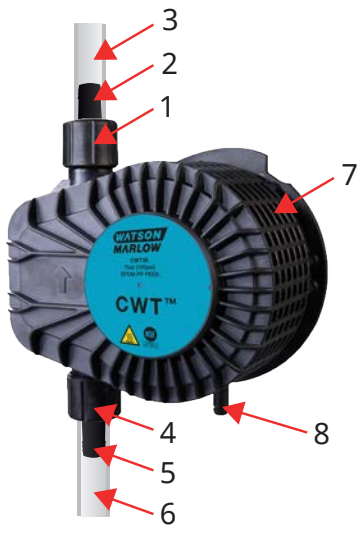
Drive	Standard pump (4) configuration		Alternative pumphead which may be fitted to the drive	
Drive	**Pumphead**	**Maximum pressure (4)**	**Pumphead**	**Maximum pressure (4)**
qdos 20	ReNu 20 SEBS	7 Bar / 100 psi	CWT 30 EPDM	9 Bar / 130 psi
	ReNu 20 PU	4 Bar / 60 psi		
qdos 30	ReNu 30 SEBS	7 Bar / 100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

NOTE4	It is only possible to purchase a complete pump as a **standard pump** configuration.

NOTE5	All pressures stated in these instructions are Root Mean Squared (RMS) gauge pressures

5.1.4 Pumphead—General arrangement

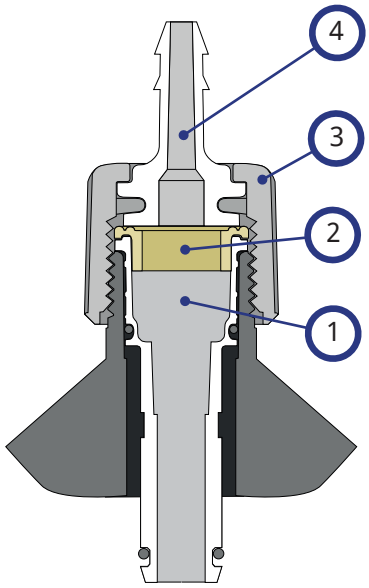
The general arrangement of a pumphead is provided in the picture below:



1	Pumphead **discharge** head port	Pumphead fluid path
2	Discharge hydraulic connector	Pumphead fluid path
3	Discharge interface tubing (optional accessory)	Pumphead fluid path
4	Pumphead **inlet** head port	Pumphead fluid path
5	Inlet hydraulic connector	Pumphead fluid path
6	Inlet interface tubing (optional accessory)	Pumphead fluid path
7	PFPE lubricant located inside the pumphead	—
8	Safety overflow	—

5.1.5 Pumphead—General arrangement of connections

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



1	Pumphead head port	Pumphead fluid path
2	Pumphead to hydraulic connector seal	Pumphead fluid path
3	Hydraulic connector	Pumphead fluid path
4	Connection collar	

5.1.6 Food applications

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 (6)/60/120 Santoprene	×	×	×	×	×	×	×
CWT 30 EPDM	×	×	×	×	×	×	×

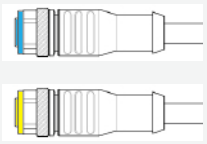
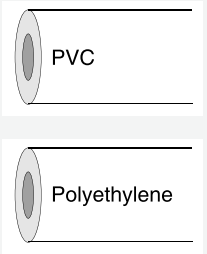
FDA Regulation 21 CFR								
Pumphead	**Aqueous foods**	**Acidic foods (pH<4.5)**	**Alcoholic foods (<20% alcohol)**	**Alcoholic foods (>20% alcohol)**	**Dairy**	**Fatty foods**	**Repeated use**	**Infant formula and human milk**
ReNu 20 PU	✓	✓	✓	×	✓	✓	✓	✓
ReNu 20/30 (6)/60	✓	✓	✓	✓	✓	✓	✓	✓
ReNu 30 (6)/60/120	✓	×	✓	×	✓	×	✓	×
CWT 30 EPDM	×	×	×	×	×	×	×	×

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	×	×

NOTE6 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.

5.2 Accessories

The qdos range is available with the following Watson-Marlow accessories

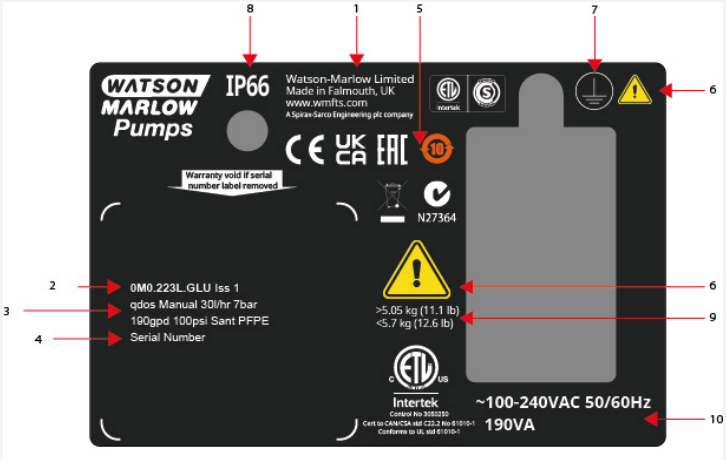
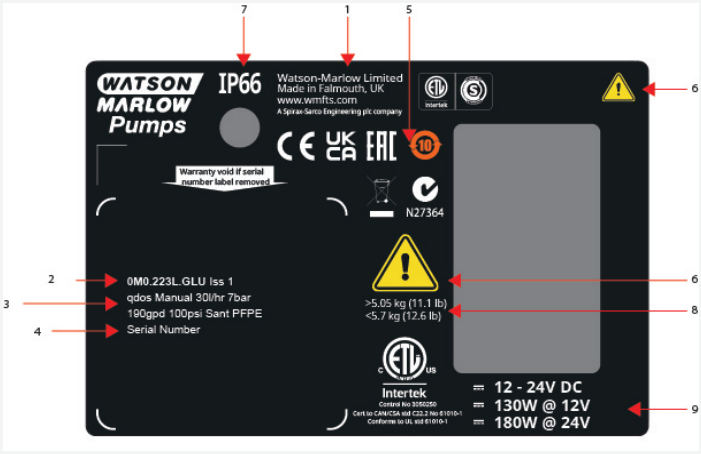
Input and output control cables	
HMI cover	
Hydraulic connectors to connect the pumphead to the fluid path: (compression, hose barb, threaded)	
Interface tubing for fluid connection between the pump and process	

Further information such as part numbers for ordering are provided in "17.1 Spare parts" on page 177.

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

5.3 Product labels

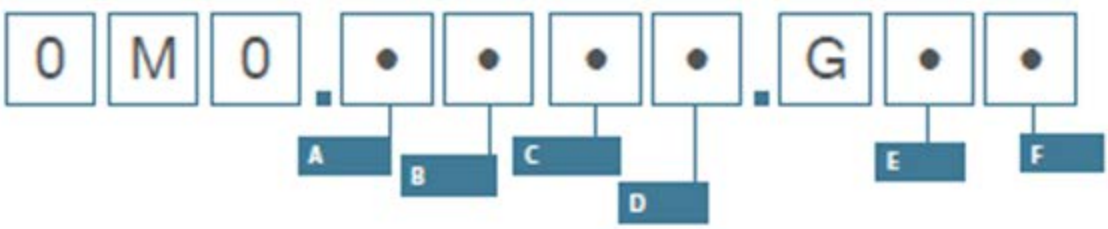
A nameplate is fixed to the rear of the pump. There are 2 versions, based upon power supply:

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

1	Manufacturer details	
2	Product code	
3	Product name	
4	Serial number	
5	Compliance symbols	
6	Safety symbols	
7	Earth symbol	AC Power supply model only
8	Ingress protection (IP) rating	
9	Weight range of product	
10	Power supply requirement	

5.4 Product code guide

The product model may be identified from its product code using this guide.



Pump part numbers					
A	**B**	**C**	**D**	**E**	**F**
Model	**Fluid path material**	**Model**	**Digital I/O type**	**Pumphead orientation** (7)	**Plug options**
1: qdos 20	2: Santoprene	1: Remote	**Manual, Remote and PROFIBUS models** L: **Standard pump** variant	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
			Universal and Universal+ models L: Open collector outputs, 5 – 24V DC inputs R: Volt free 110V AC 30V DC relay contacts		C: Swiss
					D: India, South Africa
					B: Brazil
					V: 12-24V DC

NOTE7	The pumphead side location is required when ordering. The left/right perspective assumes the user is looking at the front of the pump. The pump in "5.5.2.2 Dimensions" on page 35 is considered a pumphead located to the left

5.5 Specification overview

5.5.1 Performance

5.5.1.1 Maximum speed and flow rate

The flowrate of the pump is based upon a combination of the drive model, control model and the pumphead which may be fitted to the drive.

The maximum speed and flow rate is provided in the table below.

		Model: (Manual, PROFIBUS, Universal, Universal+)			Model: Remote		
		Speed	Flow rate (8)			Flow rate (8)	
Drive	Pump head	RPM	ml/min	US GPH	RPM	ml/min	US GPH
qdos 20	ReNu 20 SEBS	55	333	5.30	55	333	5.30
	ReNu 20 PU	55	460	7.29	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 Santoprene	125	1000	15.85	×	×	×
	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	5.28	×	×	×
	ReNu 20 PU	55	460	7.29	×	×	×

NOTE8	Flowrates are based on pumping water at 20 °C. The flowrate can vary with **inlet** and **discharge** pressure, see "20.1 Performance" on page 212 for more information.

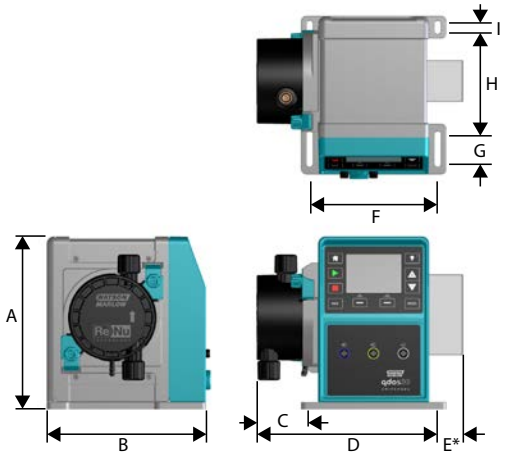
5.5.2 Physical specification

5.5.2.1 Environmental and operating conditions

Ambient temperature range	4 °C to 45 °C (39.2 °F to 113 °F)
Humidity (non-condensing)	80 % up to 31 °C (88 °F), decreasing linearly to 50 % 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 (9)	SEBS pumpheads: 40 °C (104 °F) Santoprene pumpheads: 45 °C (113 °F) PU pumpheads: 45 °C (113°F)
Environment	Indoor and limited outdoor (10)
Ingress protection	IP66, NEMA4X, NEMA 250 (11)

NOTE9	Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in "19 Chemical compatibility" on page 202.
NOTE10	Under certain conditions the pump is suitable for limited outdoor use. Contact your Watson-Marlow representative for advice.
NOTE11	Protection of drive to NEMA 250 with the HMI cover (optional accessory) installed

5.5.2.2 Dimensions



Model	A	B	C	D	E [12]	F	G	H	I
Qdos 20	234 mm (9.2″)	214 mm (8.4″)	104.8 mm (4.1″)	266 mm (10.5″)	43 mm (1.7″)	173 mm (6.8″)	40 mm (1.6″)	140 mm (5.5″)	10 mm (0.4″)
Qdos 30	234 mm (9.2″)	214 mm (8.4″)	71.5 mm (2.8″)	233 mm (9.2″)	43 mm (1.7″)	173 mm (6.8″)	40 mm (1.6″)	140 mm (5.5″)	10 mm (0.4″)
Qdos 60	234 mm (9.2″)	214 mm (8.4″)	104.8 mm (4.1″)	266 mm (10.5″)	43 mm (1.7″)	173 mm (6.8″)	40 mm (1.6″)	140 mm (5.5″)	10 mm (0.4″)
Qdos 120	234 mm (9.2″)	214 mm (8.4″)	104.8 mm (4.1″)	266 mm (10.5″)	43 mm (1.7″)	173 mm (6.8″)	40 mm (1.6″)	140 mm (5.5″)	10 mm (0.4″)
Qdos CWT	234 mm (9.2″)	214 mm (8.4″)	117.9 mm (4.6″)	290.9 mm (11.5″)	43 mm (1.7″)	173 mm (6.8″)	40 mm (1.6″)	140 mm (5.5″)	10 mm (0.4″)

NOTE12	Optional relay module.

5.5.2.3 Weight

Drive [13]	4.1 to 4.8 kg (9 lb 1 oz to 10 lb 9 oz)
Pumphead [13]	0.95 to 2.2 kg (2 lb 2 oz to 4 lb 14 oz)

NOTE13	The weight depends upon model, see "20 Product specification and equipment ratings" on page 211 for detailed weights by model.

5.5.3 Electrical power specification

	Alternating Current	DC (Direct Current)
Supply voltage	100-240 V 50/60 Hz	12-24 V DC
Maximum voltage fluctuation	±10 % of nominal voltage	NA
Over voltage category	II	NA
Power consumption	190 VA	130 W (12V DC) 180 W (24V DC)

5.5.4 Control specification

5.5.4.1 Speed increment

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)			

5.5.4.2 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	—	✓	—	—	—

Control methods (14)	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 output	—	✓	—	✓	L
Alarm output	—	✓	—	✓	L
Four configurable relay outputs	—	—	—	—	R
Remote fluid recovery	—	✓	—	✓	✓

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	—	—	✓	—	—

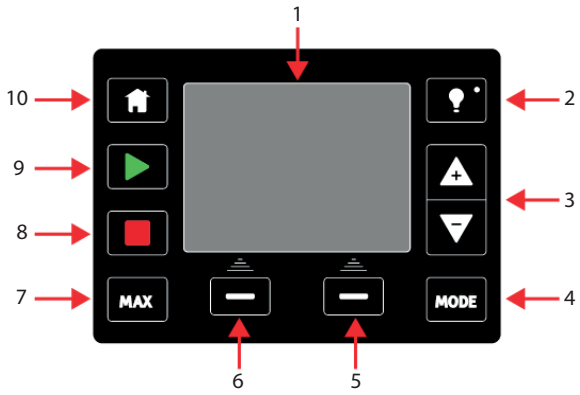
NOTE[14]

The L and R in the table above, refer to the Universal and Universal+ Control model variant

- L: Standard
- R: Option: Relay module

5.5.4.2.1 Control panel overview

The control panel is a TFT display with keys. It is available on all models, except the Remote model. The control panel is referred to as a HMI in these instructions with the layout and features provided below:



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 timer
3	+/- Keys	These keys are used to change programmable values, or move the selection bar up or down in the menus.
4	Mode	The **MODE** key changes modes or mode settings (15)
5	Right hand function	Perform the function displayed directly above the function key.
6	Left hand function	Perform the function displayed directly above the function key.
7	MAX	This key will run the pump at maximum speed when in manual mode. This is useful for priming the pump.
8	STOP	This key will stop the pump in any control mode, when pressed at any time.
9	START	This 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 (Analog, PROFIBUS, or during analog controlled fluid recovery) 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 (15).

NOTE15	If the **MODE** or **HOME** key is pressed while changes to settings are being made, these changes will not be saved.

6 Storage

6.1 Storage conditions

- Storage temperature range: -20 °C to 70 °C (-4 °F to 158 °F)
- Indoors
- Not in direct sunlight

6.2 Shelf life

Store pumphead in original packaging, until ready for use.

Pumphead type	Shelf life (16)
ReNu	2 years
CWT	3 years

NOTE16	The pumphead shelf life is written on the label on the side of the box.

7 Lifting and carrying

7.1 Product still in original packaging

⚠ CAUTION

The pump weighs up to 5.70 kg (12.6 lb) depending upon model. The weight of the pump could cause a foot injury if dropped. Wear steel toe cap safety boots when lifting and moving the pump.

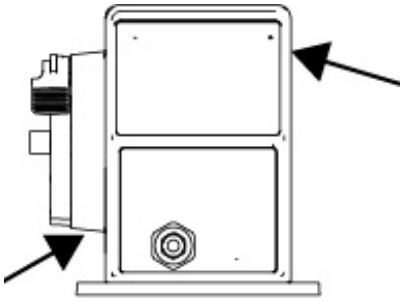
Lift and carry the product using the procedure below :

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 original 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:



8 Unpacking your pump

8.1 Components supplied with your 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
6	Hydraulic connector pack	Pumps comes with the following hydraulic connector sets (2 x packs) or each type provided in "8.1 Components supplied with your pump" above
7	Product safety leaflet (not pictured)	
8	2 x 1/2" NPT cable glands (not pictured)	Only supplied with the Relay Module version of the Universal or Universal+ models

Supplied Hydraulic Connection Set (2 packs)			Qdos 20	Qdos 30	Qdos 60	Qdos 120	Qdos CWT
Material	Fitting	Sizes					
Polypropylene	Metric compression fittings	Set of four sizes: 6.3x11.5 mm, 10x16 mm, 9x12 mm, 5x8 mm	✓	✓	✓	✓	✓
	barb/threaded fittings	1/4" hose barb, 3/8" hose barb, 1/4" BSP, 1/4" NPT					
	threaded fittings	1/2" BSP					
	threaded fittings	1/2" NPT					
	Hose barb	1/2" hose barb				✓	
PVDF	Imperial Compression fittings (17)	Set of 2 sizes (1/4" x 3/8" and 3/8" x 1/2")	✓	✓	✓	✓	✓
	barb/threaded fittings	1/4" hose barb, 3/8" hose barb, 1/4" BSP, 1/4" NPT					
	threaded fittings	1/2" BSP					
	threaded fittings	1/2" NPT					
	Hose barb	1/2" hose barb					

NOTE17	Imperial compression fittings are only suppled with qdos pumps with a US plug option (product code ending in an A).

8.2 Unpacking, inspection and packaging disposal

Procedure

1. Carefully remove all parts from the packaging. When lifting the product use the procedure in "7 Lifting and carrying" on page 42.
2. Check that all components in "Components supplied" are present (see "8.1 Components supplied with your pump" on the previous page).
3. Inspect components for damage in transit.
4. If anything is missing or damaged, contact your Watson-Marlow representative immediately.
5. Dispose of the packaging according to local procedures.
    - Outer carton: corrugated cardboard (recyclable).
    - Inner tray: paper (recyclable).

9 Installation overview

The installation section, is provided in the following order.

1. Installation: Part 1 (Physical)
2. Installation: Part 2 (Electrical power)
3. Installation: Part 3 (Fluid path)
4. Installation: Part 4 (Control system connections and wiring)
5. Installation: Part 5 (Setting the pump up (general))
6. Installation: Part 6 (Setting the pump up (specific - control system))

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

- 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: Part 1 (Physical)

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 physical (this section) and electrical installation ("11 Installation: Part 2 (Electrical power)" on page 55) 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 Location

The product may only be installed such that it cannot exceed its environmental and operation limits.

10.2.1 Environmental and operating conditions

The pump is designed for use in the following environment and operating conditions:

Ambient temperature range	4 °C to 45 °C (39.2 °F to 113 °F)
Humidity (non-condensing)	80 % up to 31 °C (88 °F), decreasing linearly to 50 % at 40 °C (104 °F)
Maximum altitude	2,000 m, (6,560 ft)
Pollution degree of the intended environment	2 (19)
Noise	<70 dB(A) at 1 m
Maximum fluid temperature (18)	SEBS pumpheads: 40 °C (104 °F) Santoprene pumpheads: 45 °C (113 °F) PU pumpheads: 45 °C (113 °F)
Environment	Indoor and limited outdoor (19)

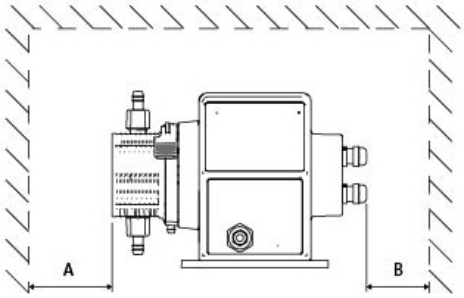
NOTE18	Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in "19 Chemical compatibility" on page 202.
NOTE19	Under certain conditions the pump is suitable for limited outdoor use. Contact your Watson-Marlow representative for advice.
NOTE20	Protection of drive to NEMA 250 with the HMI cover (optional accessory) installed.

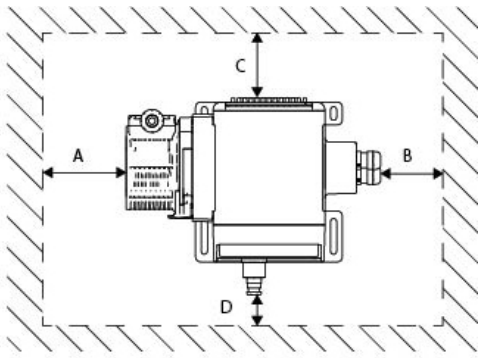
10.2.2 Area around the product—not enclosed

NOTE[21]	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.

Installation clearances are provided in the illustrations and explanation table below:.



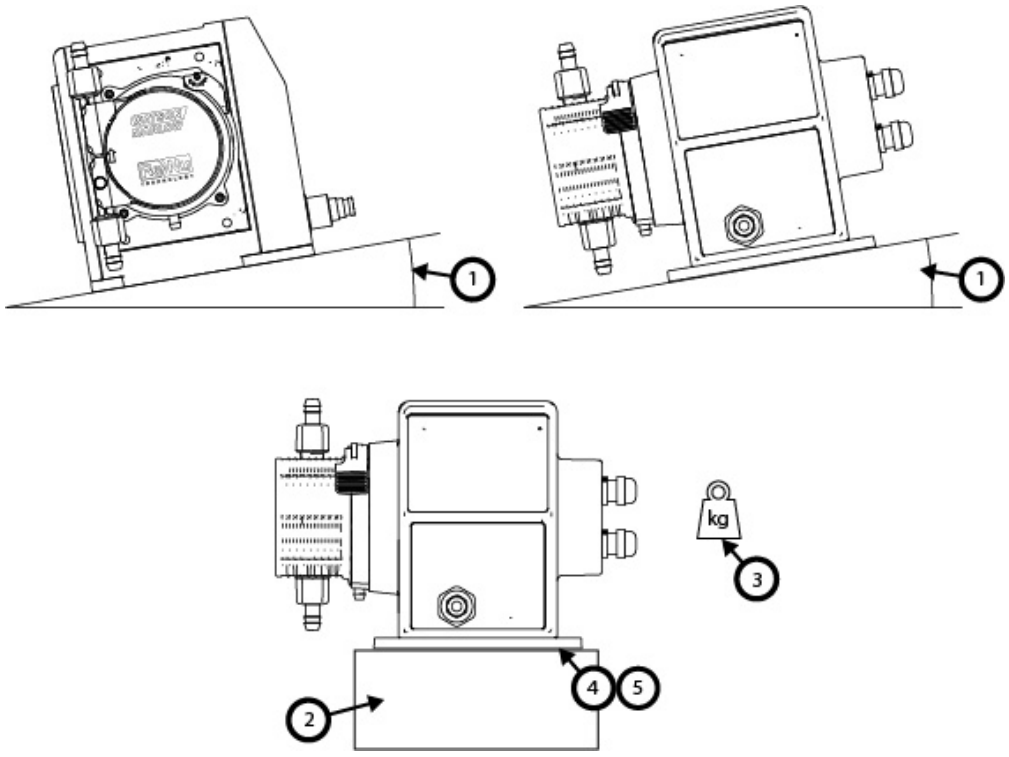


	Minimum clearance	Comment
A	200mm	Install and remove the pumphead
B	User to define	User to define: The minimum clearance is based on the • Bend radius of users cables • Room to install and remove control cables for Relay Module optioned pumps
C	25mm	Additional clearance will be needed to Access the back of the pump for : • Information (serial number, product name) • Carry out an Earth bond test Update the software using a USB connection
D	40mm (PROFIBUS model 115mm)	The clearance is based upon a pump with a door at point D that can be opened or closed to the front of the pump. Additional clearance will be required for the : • Installation of control cables • Operate and view the screen and keypad.

10.3 Mounting

10.3.1 Surface and orientation

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



On a surface :

1. Install the pump on a surface which does not exceed a slope of 20° from horizontal

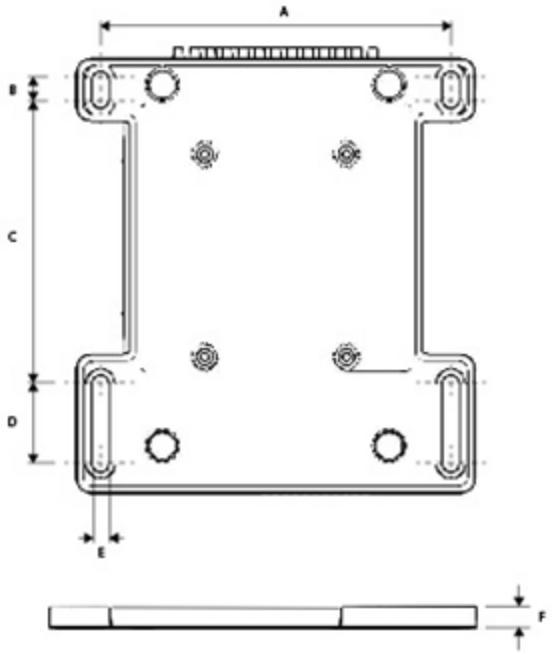
> **NOTICE**
>
> An excessive mounting slope can cause poor lubrication, resulting in damage to the pump though accelerated wear. Install the pump on a surface which does not exceed a slope of 20° from horizontal

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.
    - Ensure the pump is at a comfortable height for operation
3. Rated to support full weight of complete assembly and pumped product
4. 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.

5. Chemically compatible with the fluids being pumped

10.3.2 Anchorage (bolting down the pump)



Dimension	Measurement
A	214 mm (8.4 ”)
B	173 mm (6.8 ”)
C	40 mm (1.6 ”)
D	140 mm (5.5 ”)
E	10 mm (0.4 ”)

10.4 HMI Cover

The HMI cover is illustrated by the picture below :

Follow the procedure below for the installation of the HMI cover

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

10.5 Other accessories

The procedure for the installation of other accessories such as the input/output control cables, hydraulic connectors, are provided when relevant during further installation sections.

11 Installation: Part 2 (Electrical power)

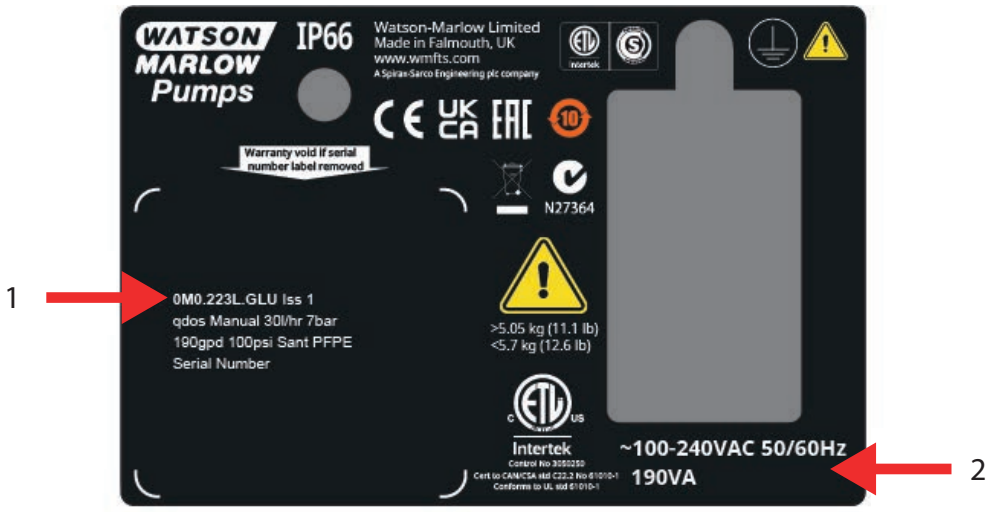
11.1 Identification of electrical power required

Pumps models are available in two power model options:

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

The power supply requirement of a specific model may be checked by looking at the power supply listed on the nameplate of the pump (2), or checking the product code (1).

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
AC Power consumption	190 VA

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 plug is not IP66 rated. Install plug in IP66 rated enclosure when using pump in applications requiring IP66 rating.

Country	Cable specification	Plug specification
US cable/plug (Part numbers ending in 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 (Part numbers ending in U)	2950 mm length. 3 core, yellow/green, brown, blue. BS EN 50525-2-21.	5 A, 250 V AC with replaceable fuse 5A. BS 1363/A.
South Africa/India cable/plug (Part numbers ending in 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 (Part numbers ending in 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 (Part numbers ending in K)	2950 mm length. 3 core, yellow/green, brown, blue. ÖVE K40a, HD22.	10 A, 250 V AC. AS/NZS 3112.

Country	Cable specification	Plug specification
EU cable/plug (Part numbers ending in 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 (Part numbers ending in 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 (Part numbers ending in 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 "10 Installation: Part 1 (Physical)" on page 48
- 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
Power consumption	130 W (12V DC) 180 W (24V DC)

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

The blade fuse it not IP66 rated. An IP66 blade fuse must be installed in place of the supplied blade fuse, where an IP66 rating is required.

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 20 A 32V fuse in IP31 blade fuse holder. M8 ring terminals (pre-fitted to cable)

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 "10 Installation: Part 1 (Physical)" on page 48
- 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 pre-fitted M8 Ring terminals.
    - 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: Part 3 (Fluid path)

12.1 Fluid path system 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.

12.1.1 Overpressure safety device

A Watson-Marlow pump operates by positive displacement. Should a blockage or restriction occur, the pump will continue to operate until either of the following occur :

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

Install an overpressure safety device which can automatically activate in an overpressure event. This device should:

- Be able to be set to a pressure which is lower than the pressure rating of the system
- Be able to stop the pump or divert the fluid to a safe location upon being triggered
- Have a fail safe feature

12.1.2 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.

12.1.3 Isolation and drain valves

Isolation and drain valves must be installed in the fluid path. This is necessary for the following reasons.

- The pumphead replacement procedure requires the fluid path to be isolated, and parts of the fluid path drained prior to being disconnected.
- Other procedures require the pump to be removed from service, such as due to a fault. This will require the isolation and draining of parts of the fluid path
- Prevent unintentional flow when the pump is stopped and in the event of any of the following:
    - Leaks from the pumphead or fluid path
    - Pumphead or fluid path failure
    - Wear of the pumphead components

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

Do not fit valve on drain port of pumphead.

12.1.4 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.

12.1.5 Piping vibration

A Piping Vibration and Integrity Assessment (piping vibration audit) of the qdos pump installation should be undertaken.

12.2 Pre-Fluid path installation requirement checklist

Carry out the following pre-fluid path installation check.

- Ensure then pump has been physically installed in accordance with "10 Installation: Part 1 (Physical)" on page 48
- Ensure then pump has been electrically installed in accordance with "11 Installation: Part 2 (Electrical power)" on page 55
- Ensure a overpressure safety device, non-return valves, isolation valves, drain valves, and **inlet**/**discharge** pipework have been installed and tested in the system in accordance with "12.1 Fluid path system requirements" on page 63. Do not fit valve on drain port of pumphead.

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

12.3 Installing the pumphead for the first time

The first time installation procedure differs from the replacement pumphead procedure provided in "17 Maintenance" on page 176. In addition the first time installation procedure of the pumphead depends on qdos model:

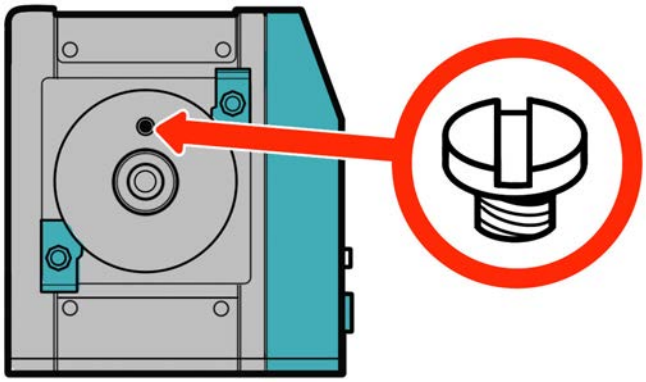
Follow the correct procedure based on pump model and time of installation.

12.3.1 First time pumphead installation: qdos ReNu 30: all models variants

12.3.1.1 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.

12.3.1.2 Fit 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.

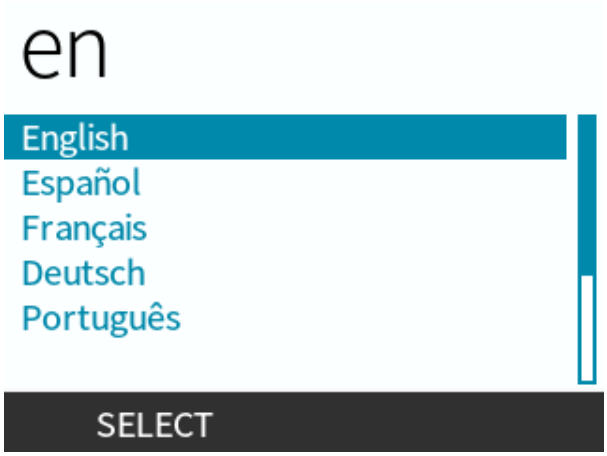
The pump will go into its first time start up sequence. The Watson-Marlow Pumps logo displays for three seconds.

12.3.1.2.1 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.

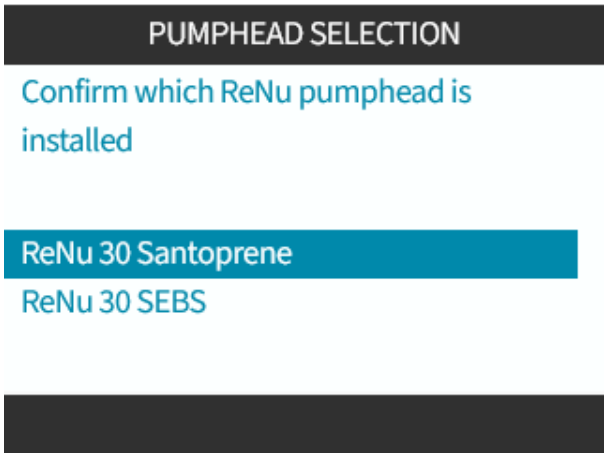
Procedure

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

12.3.1.2.2 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.

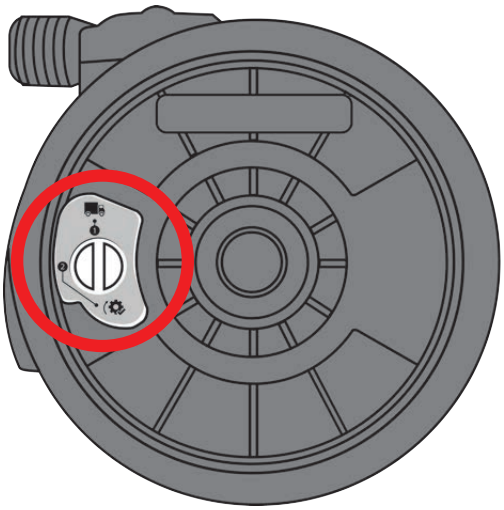
If not: Isolate the pump from the electrical supply. Tighten clamps further by hand, reconnect the power supply then repeat steps 4 to 6.

12.3.2 First time pumphead installation: (qdos ReNu 20, 60, 120 and qdos CWT all models variants)

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.

12.3.2.1 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.

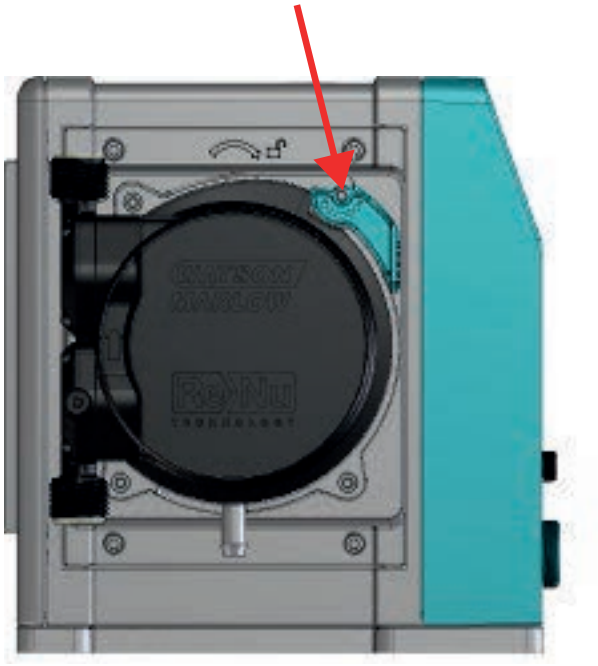
12.3.2.2 Fit the ReNu 20, ReNu 60, ReNu 120 or CWT pumphead

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.

Procedure

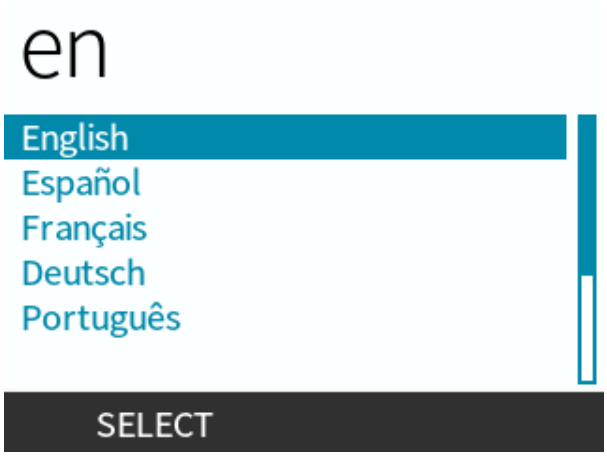
2. Hold the pumphead with the arrow pointing upwards.
3. Align pumphead with pump drive shaft and slide into position on pump housing.
4. Rotate pumphead in clockwise direction approximately 15° to engage retaining lugs.
5. Lock pumphead into position by hand using pumphead locking lever. Do not use 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

12.3.2.2.1 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.

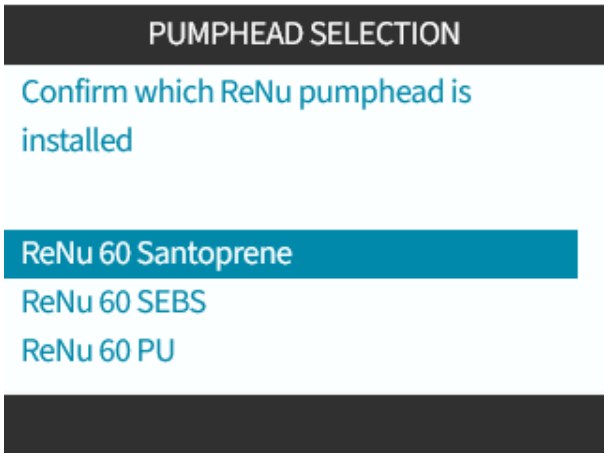
Procedure

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

12.3.2.2.2 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 Connecting the pumphead to the fluid path for the first time

With the pumphead installed, the next step is to connect to fluid path for the first time. This is a multi part procedure which is provided in the following sections

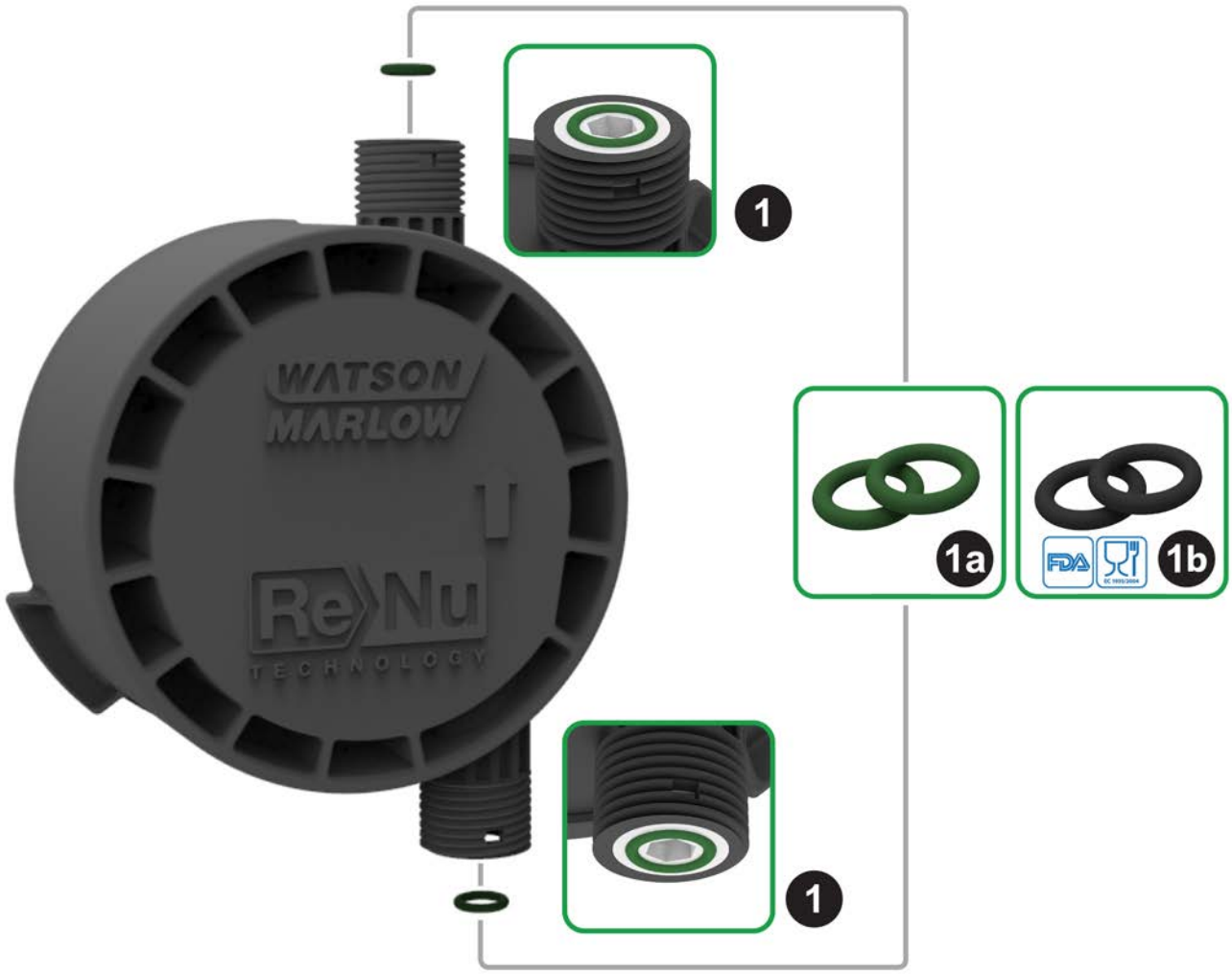
- Step 1: Check the seals in the pumphead ports
- Step 2: Choose the connector type to be used
- Step 3: Follow the procedure for the connector type
- Step 4: Connect the pumphead safety overflow

If the pumphead has already been connected to the fluid path, follow the replacement connection procedure in "17 Maintenance" on page 176. The installation procedure depends on model: Follow the procedure for your model.

12.4.1 Step 1 Check the seals in the pumphead ports

12.4.1.1 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 EPDM1 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[22]	If the EPDM seals are to be used, ensure these are chemically compatible with the pumped fluid. Chemical compatibility information is provided in "19 Chemical compatibility" on page 202.

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

NOTE[23]	These seals are not required when using 1/2 inch connectors: • 0M9.401H.P03 • 0M9.401H.P04 • 0M9.401H.F03 • 0M9.401H.F04

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

Check these seals are present and fully seated in groove.

12.4.2 Step 2: Choose the connector type to be used

The second step is to select the connectors to be used. There are 3 main types of hydraulic connector.

Hose barb	
Threaded fitting	
Compression Fittings	

The selection of the connector for the application is based upon

- Type of connection required
- Size of connection required
- Chemical compatibility of connection

The availability of the connectors based on size, type, material, and pumphead fitment is provided in the table below:

Hydraulic Connection Pack			Qdos 20	Qdos 30	Qdos 60	Qdos 120	Qdos CWT
Material	**Fitting**	**Sizes**					
Polypropylene	Metric compression fittings	6.3x11.5 mm 10x16 mm 9x12 mm 5x8 mm	✓	✓	✓	✓	✓
	Barb/threaded fittings	1/4” hose barb 3/8” hose barb 1/4” BSP 1/4” NPT	✓	✓	✓	✓	✓
	Threaded fittings	1/2” BSP	✓	-	✓	✓	✓
		1/2” NPT	✓	-	✓	✓	✓
	Hose barb	1/2” hose barb	✓	✓	✓	✓	✓
PVDF	Imperial Compression fittings	Set of 2 sizes (1/4” x 3/8” and 3/8” x 1/2”)	✓	✓	✓	✓	✓
	Barb/threaded fittings	1/4” hose barb 3/8” hose barb 1/4” BSP 1/4” NPT	✓	✓	✓	✓	✓
	Threaded fittings	1/2” BSP	✓	-	✓	✓	✓
		1/2” NPT	✓	-	✓	✓	✓
	Hose barb	1/2” hose barb	✓	✓	✓	✓	✓

12.4.3 Step 3: follow the procedure for the connector type

The installation procedure differs depending upon the connection type, follow the procedure for that specific connection type in sections below. Where there are any differences due to model type this is explained in the procedure

12.4.3.1 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.

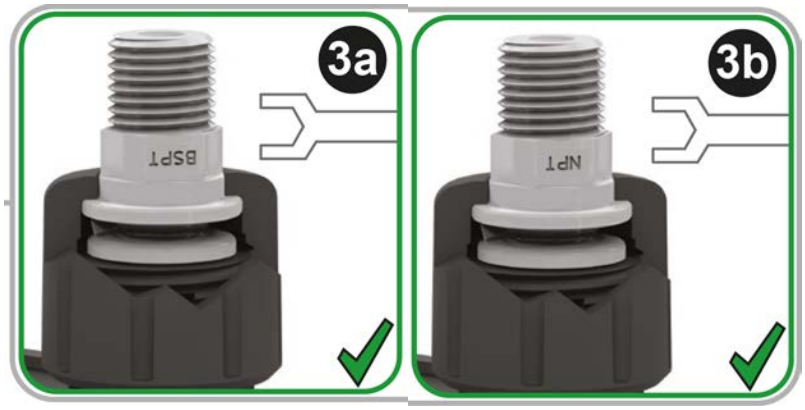
Procedure

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.

12.4.3.2 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.

12.4.3.3 Fitting compression fittings

Procedure

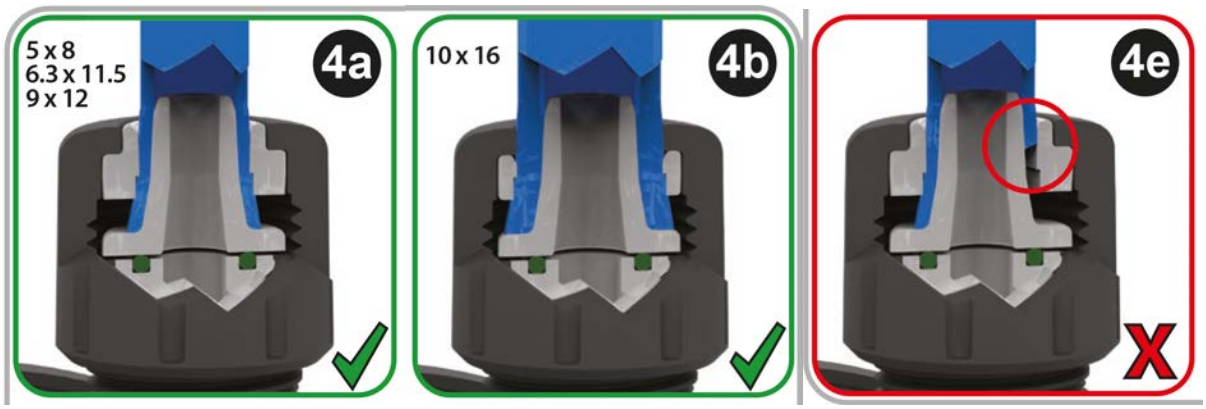
1. Select correct compression fittings for the size of Watson-Marlow interface tubing to be used.

⚠ WARNING

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

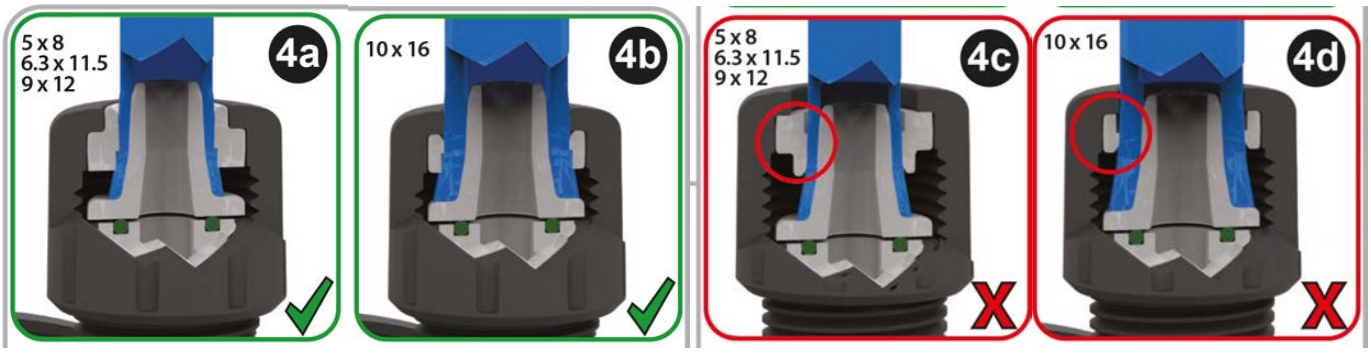
Procedure

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.



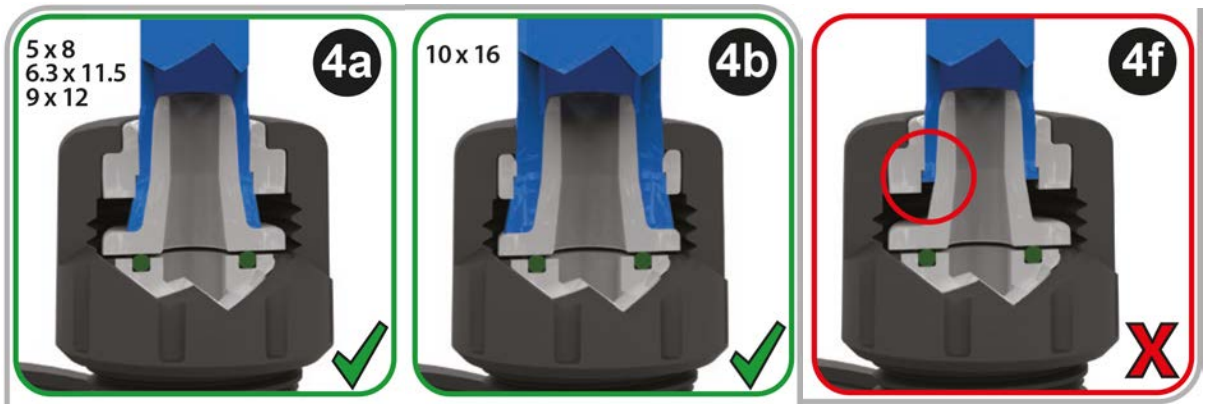
Procedure

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.



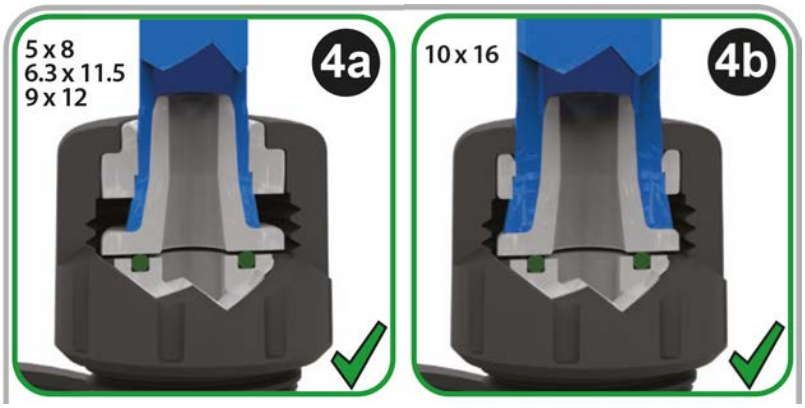
Procedure

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 head port seal and tighten onto the pump head. As illustrated in the images below.

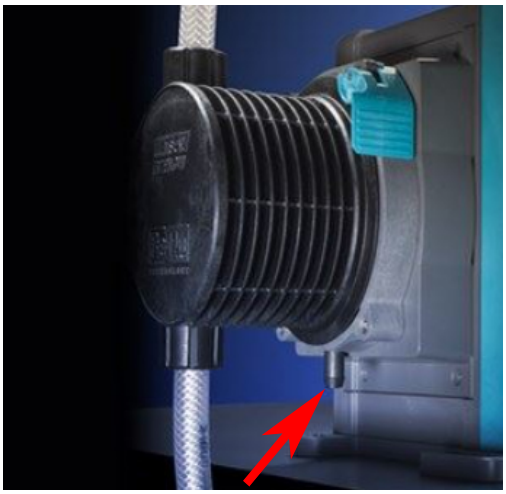


Procedure

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

12.4.4 Step 4: 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

13 Installation: Part 4 (Control connections and wiring)

The information in this section, is not applicable to the manual model. Manual model users should carry on to "14 Installation: Part 5 (setting up the pump (General and security))" on page 101.

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 ("15 Installation: Part 6 (Setting up the pump (control settings))" on page 117)

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 (24)	

Accessory		
3	Watson-Marlow Pressure sensor connection (25)	

NOTE24	Option for Universal and Universal+ models

NOTE25	Option for PROFIBUS, Universal and Universal+ models for connection to a Watson-Marlow Pressure Sensor. Pressure sensor not currently for sale, to be released 2023.

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

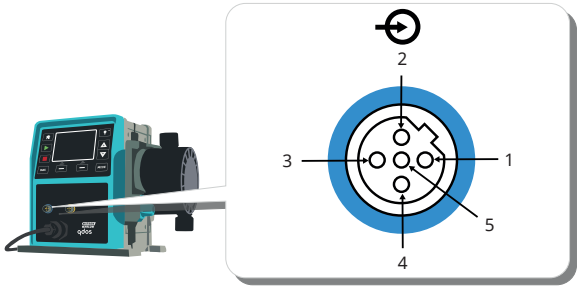
Connection to control system for the Remote model and Standard Universal/Universal+ models is via input and output connections on the front of pump, as illustrated in the image below.

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.

13.2.1 Input connection

13.2.1.1 Input connection pin assignment

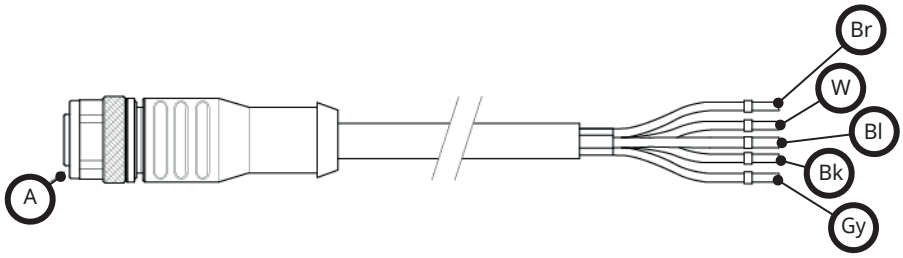


Pin No.	Function	Specification	Referenced to	Input lead colour
1	Run/stop	Min. 5 V, Max. 30 V	Connect 5-24 V DC supply to stop (referenced to pin 4). Alternatively, connect pin 5 of the output connector to this pin via normally open switch.	Brown
2	External Contact Reserved	Min. 5 V, max .30 V	Pulse 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 (26)	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

NOTE26	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

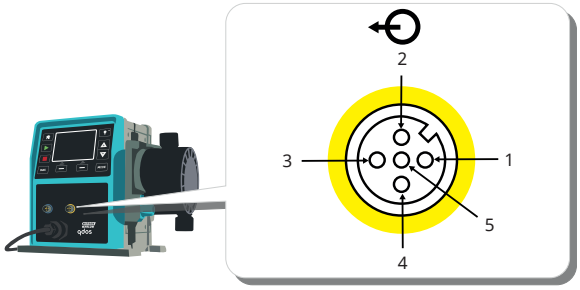
The Universal+ model can be calibrated by the user to control speed proportionally or inversely proportional to input mA signal.

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

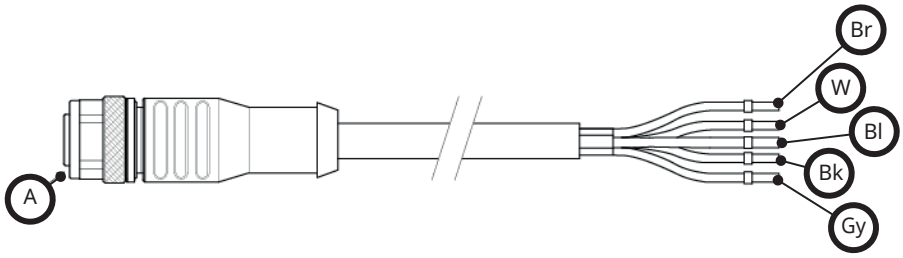
13.2.1.4.1 Output connection pin assignments



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

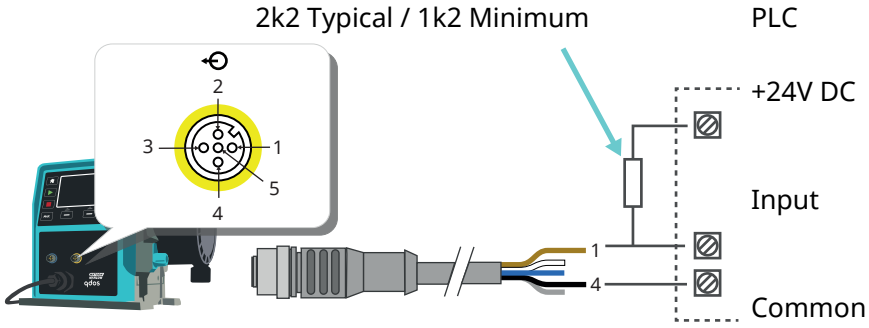
Output lead length: 3 m (10 ft)

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 below needs to be sized correctly for the application to prevent damage to the pump transistors.

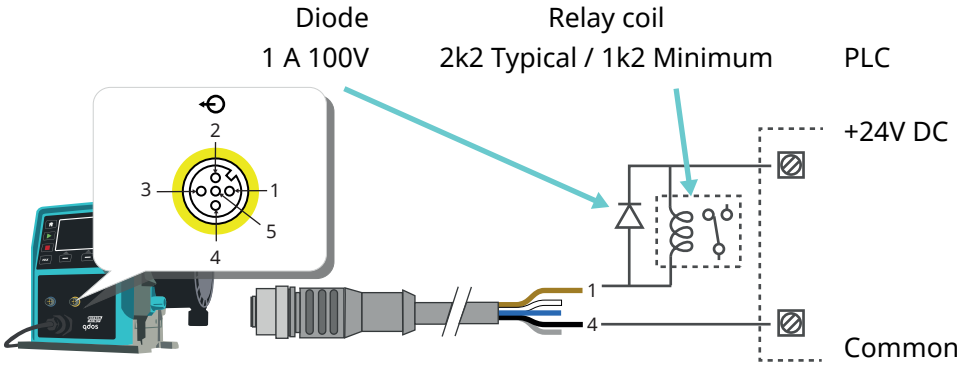


NOTE27	Diagram depicts Run Status Output.

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 below needs to be sized correctly for the application to prevent damage to the pump transistors.



NOTE[28]	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 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[29]	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	0.05-1.31 mm^2 (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	1

NOTE30	Two ½" cable glands provided

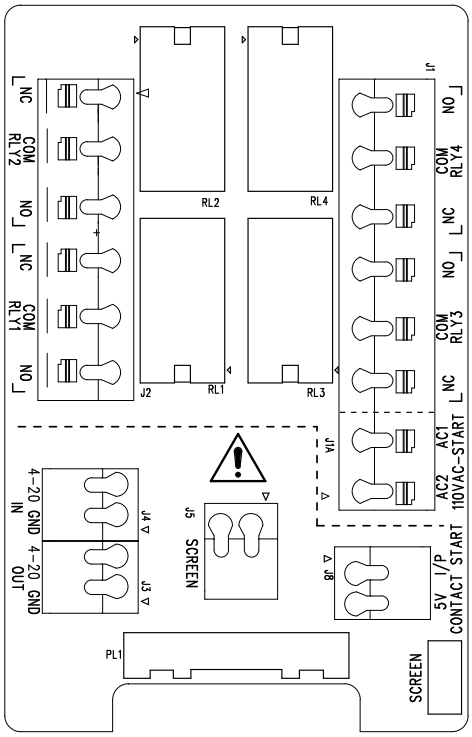
NOTE31	More than 8 conductors per cable may be awkward to handle.

13.3.3 Relay module PCB layout

Module variants:

- Universal = 2 terminal blocks, 2 relays with 2 output options
- Universal+ = 4 terminal blocks, 4 relays with 4 output options

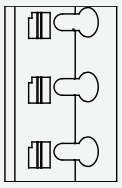
The Universal+ PCB layout is illustrated by the image below



Refer to this diagram for terminal connector naming and location.

NOTE[32]	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.

13.3.4 Relay module terminal connectors

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.	3. N/C 2. C 1. N/O	

General Alarm output (J2)	
	RLY1
The default for Relay 1 is General Alarm, on Universal+ models this output (1) can be configured in the control settings menu.	

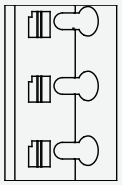
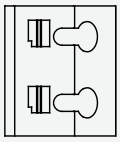
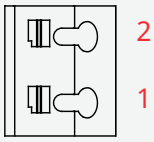
Table 15 – Run status output (J2)		
	RLY2	
Connect the output device to the C (common) terminal of the relay connector and either the N/C (normally closed) or N/O (normally open) terminal as required. This relay coil is energised when the pump is running. The default for output 2 is run status, on Universal+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

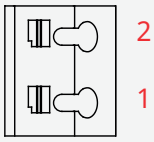
Table 16 – Output 3 and 4 (J1)
Two additional relay outputs are provided on the Universal+relay model of the pump. These outputs are inactive by default, the function of the output must be configured in the control settings menu.

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	

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	

See also "15.1.6 Control settings 4-20 mA Output (Universal+ model only)" on page 124

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.

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

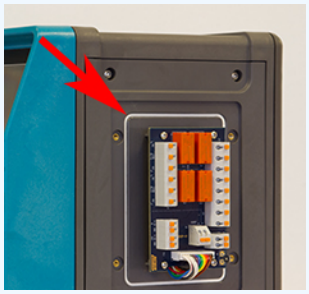
13.3.5 Control cable installation

Procedure

1. 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.

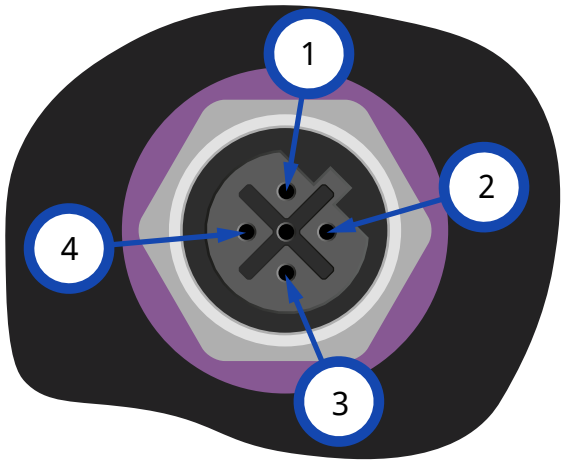
13.4.1 PROFIBUS connection

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 (Recommended not to exceed 1.5 Mbit/s in most applications)

NOTE[33]	Faster bus speeds than 1.5 Mbit/s may be achieved depending on network installation. Follow PROFIBUS installation guidelines for optimal performance

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.

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.

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

NOTE[35]	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.

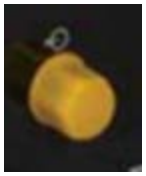
The maximum bit rates achievable are shown in the table below.

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 sensor control connection (Models: PROFIBUS, Universal, Universal)

PROFIBUS, Universal and Universal+ modules have a pressure sensor connection installed on the front panel for a new accessory available 2023:

The connection will come fitted with a yellow cap, as illustrated in the image below. To protect the product do not remove the cap until a control cable can be connected.



14 Installation: Part 5 (setting up the pump (General and security))

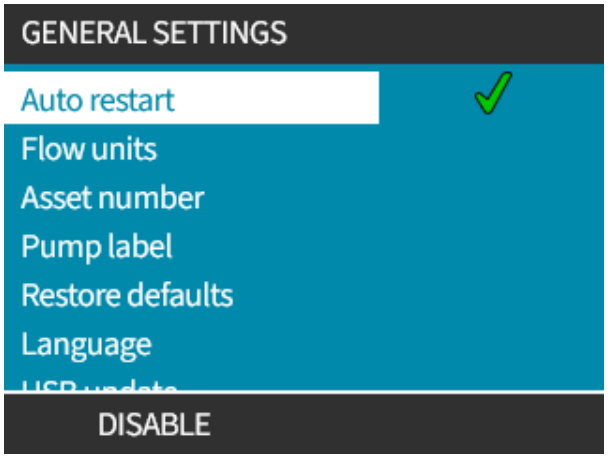
14.1 General settings (Models: Manual, PROFIBUS, Universal and Universal+)

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.
Language	Set display language of pump.

To change view/edit pump settings:

Procedure

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



14.1.1 GENERAL SETTINGS > Auto restart

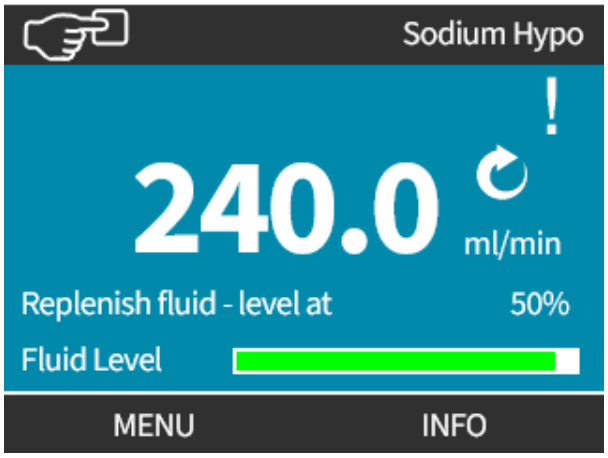
This pump offers an auto restart feature. When enabled, the feature will allow the pump to return to the operating state (mode and speed) it was in when power was lost.

Example pumping scenarios using auto restart	
Before power loss	**After power loss**
Pump running 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 ! symbol will be displayed in the top right corner when auto-restart is enabled as illustrated below



NOTE[36]	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 anytime.

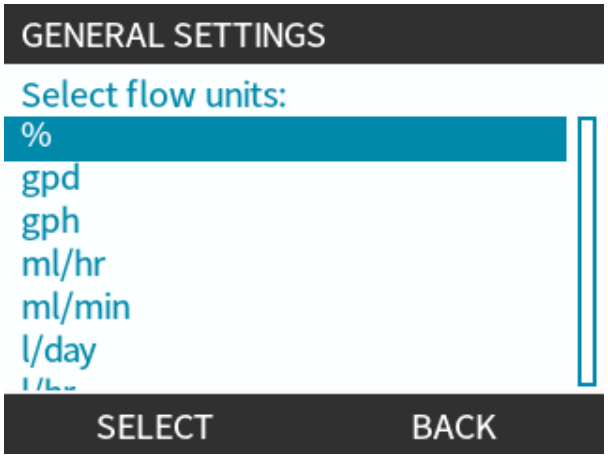
For applications that require the pump to be started and stopped regularly, ANALOG, CONTACT or PROFIBUS control should be used. The pump is not designed to be operated for more than 20 starts per hour using the auto-restart feature as a method of control.

14.1.2 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.



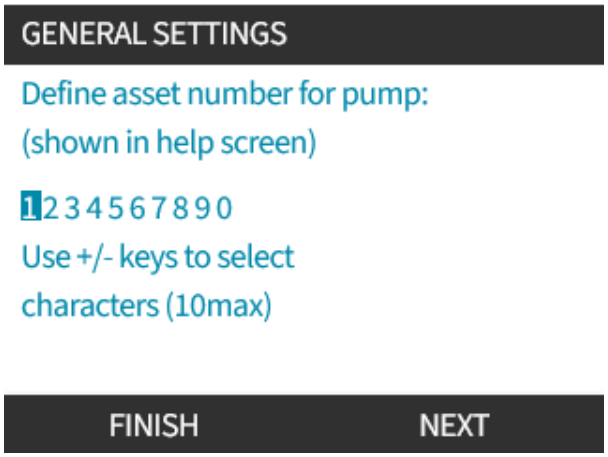
14.1.3 GENERAL SETTINGS > Asset number

To define/edit the asset number:

Procedure

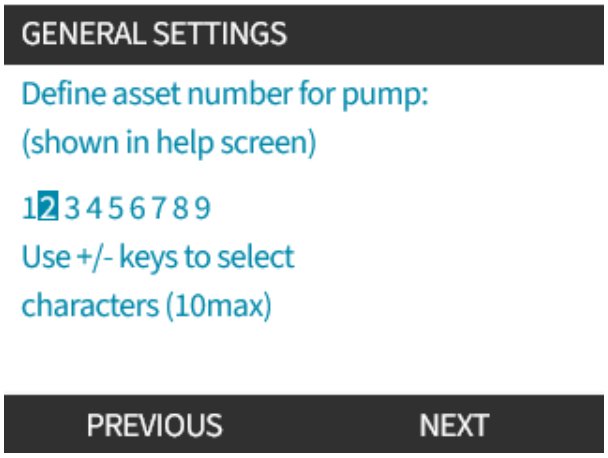
1. Highlight **Asset Number** option
2. SELECT [−].
3. Use **+/-** keys to highlight characters for editing.
   Available characters: 0-9, A-Z, and SPACE.

NOTE37	Any previously defined asset number will be displayed on screen to allow editing



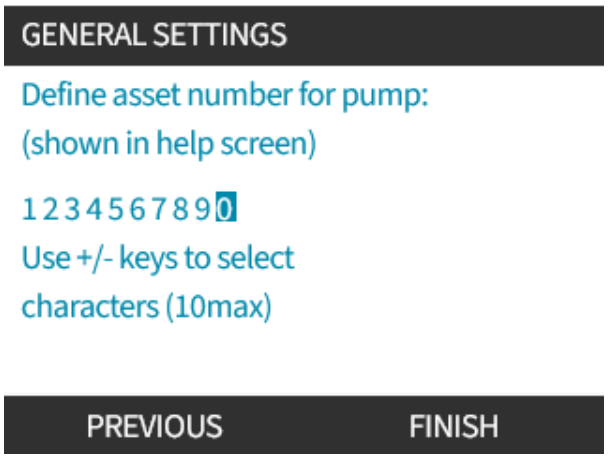
Procedure

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

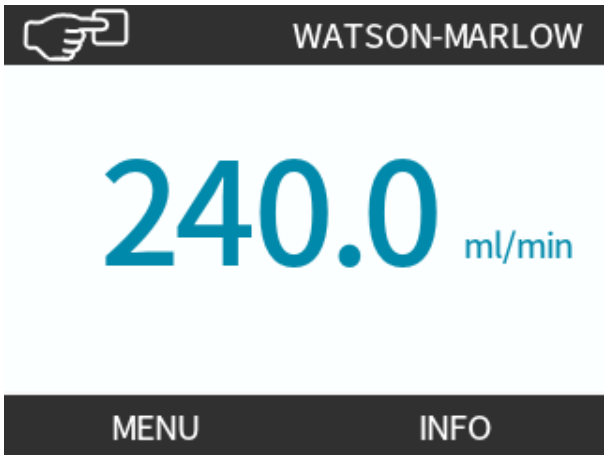


Procedure

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



14.1.4 GENERAL SETTINGS > Pump label



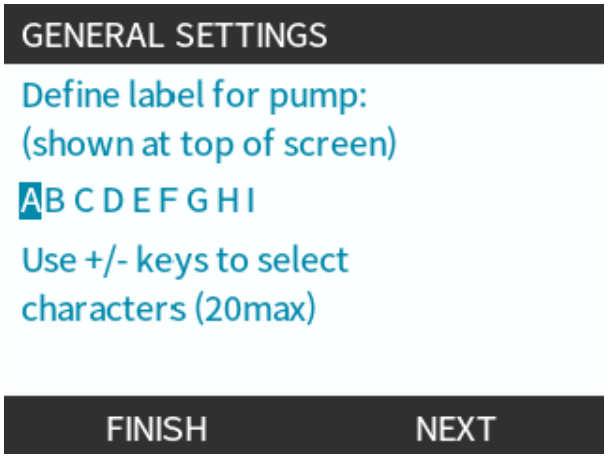
To define/edit the pump label:

Procedure

1. Highlight **Pump Label** option
2. SELECT −.
3. Use **+/-** keys to highlight characters for editing.

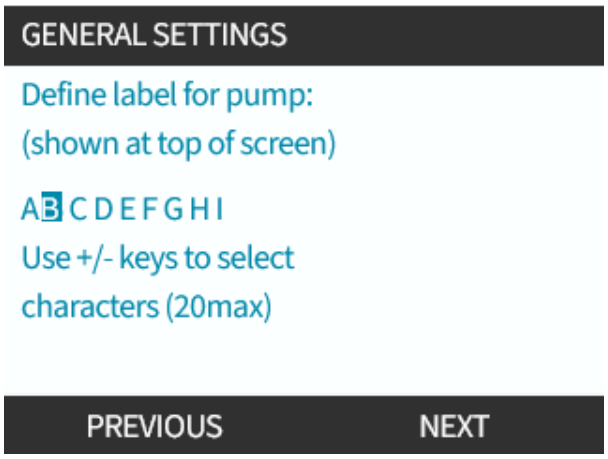
   Available characters: 0-9, A-Z, and SPACE.

NOTE38	Any previously defined pump label will be displayed on screen to allow editing. 'WATSON-MARLOW' displayed by default.



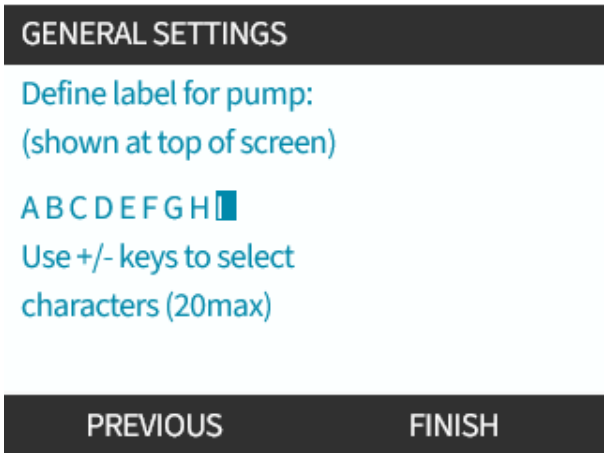
Procedure

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



Procedure

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

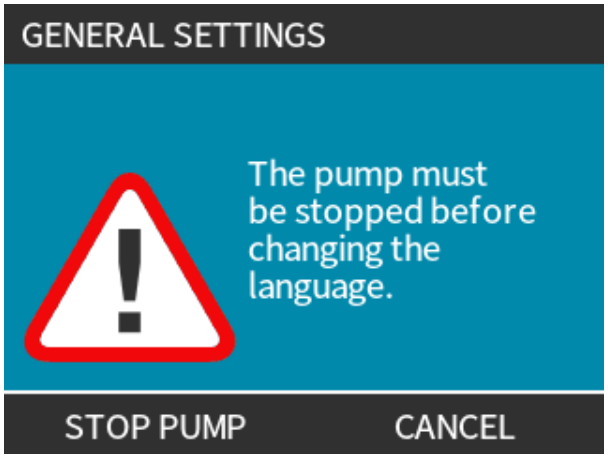


14.1.5 GENERAL SETTINGS > Language

To define/edit display language:

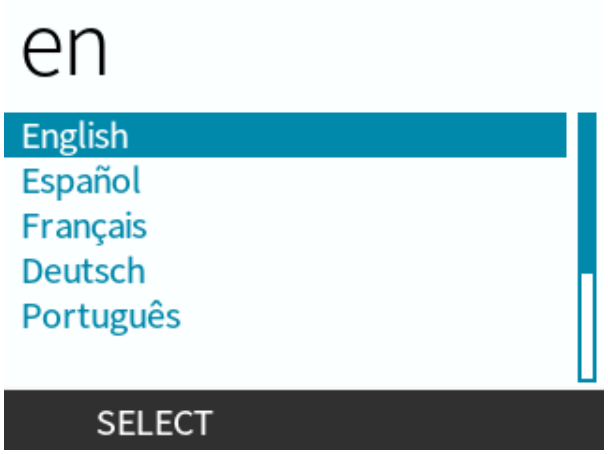
Procedure

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.

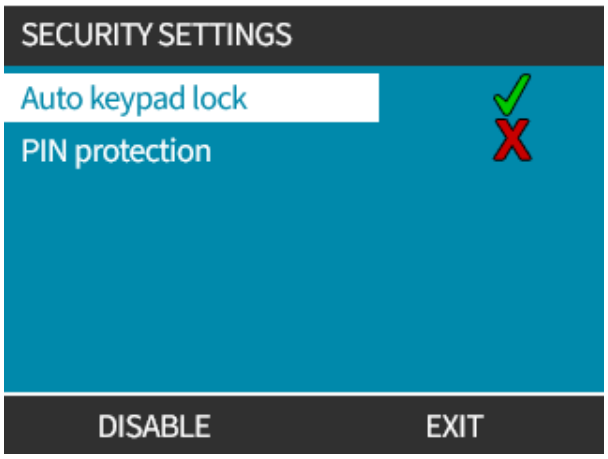
14.2 Security settings (Models: Manual, PROFIBUS, Universal and Universal+ only)

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



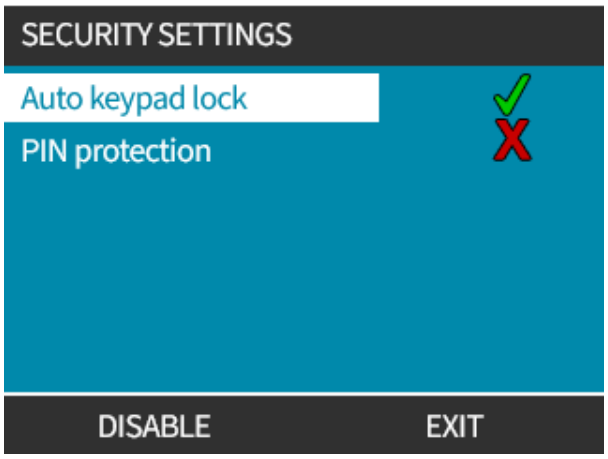
14.2.1 Security settings > Auto keypad lock

To enable the Auto keypad lock:

Procedure

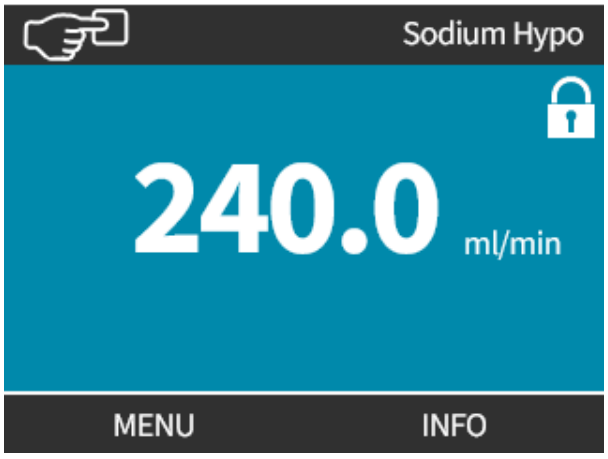
1. Highlight **Auto Keypad Lock** option
2. ENABLE.

Status symbol displays



Procedure

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



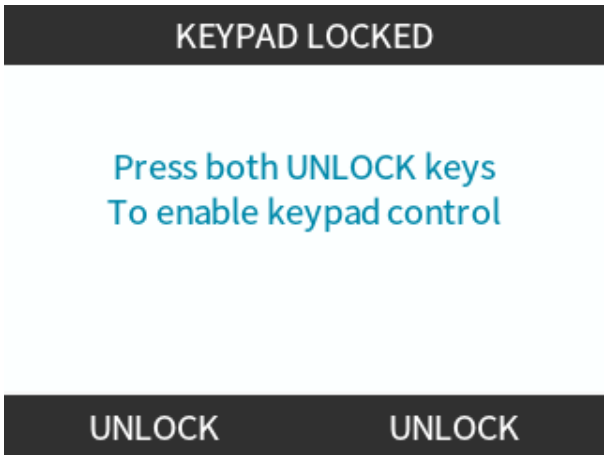
When **Auto Keypad Lock** enabled; a message displays if any key is pressed [39].

NOTE39	**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.

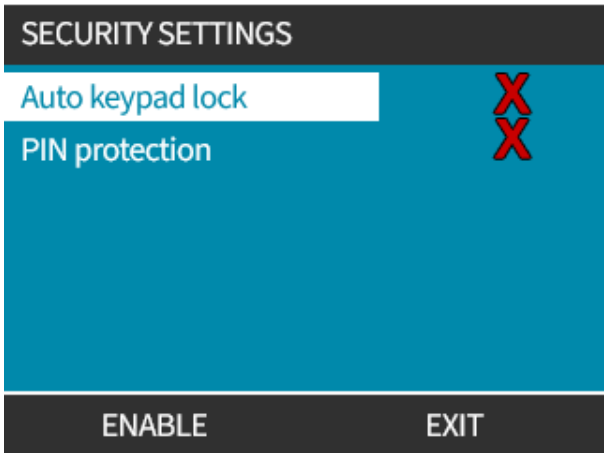


To disable the Auto keypad lock:

Procedure

1. Highlight **Auto Keypad Lock** option
2. DISABLE

   Status symbol displays.



14.2.2 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

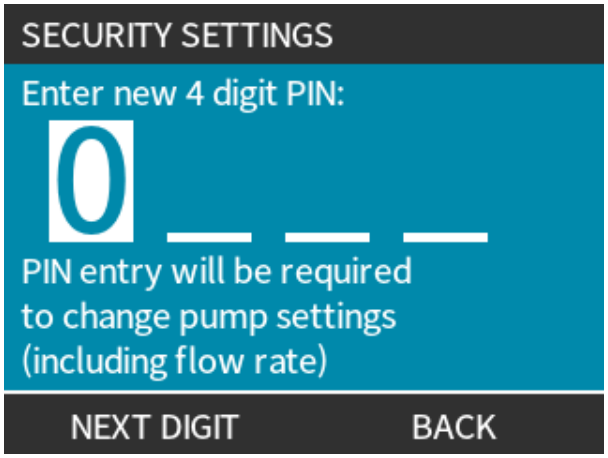
1. Highlight **PIN Protection** option
2. DEACTIVATE −

   Status symbol ✗ displays.

Define four digit number for your PIN

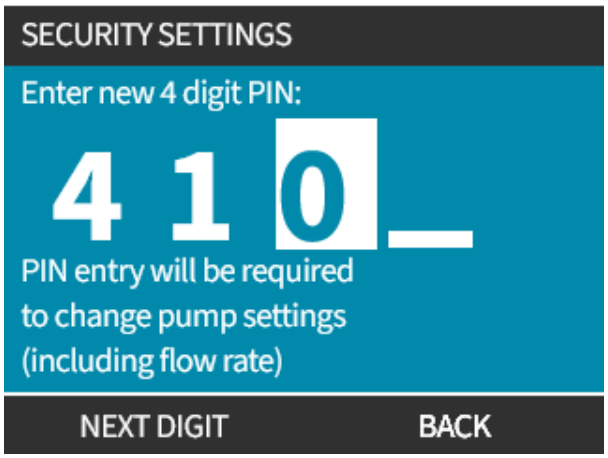
Procedure

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.

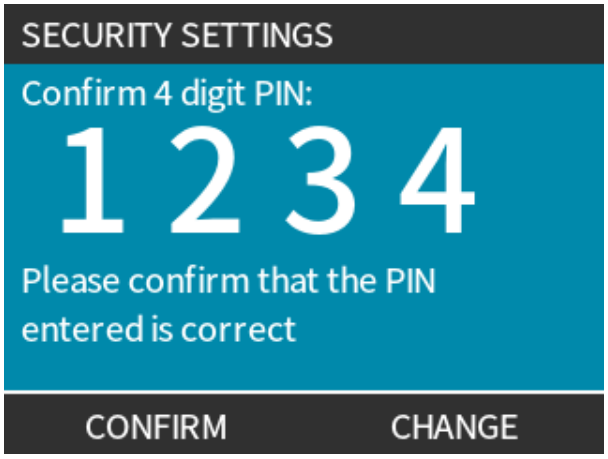


Procedure

4. Check number entered is correct, then CONFIRM.

   or

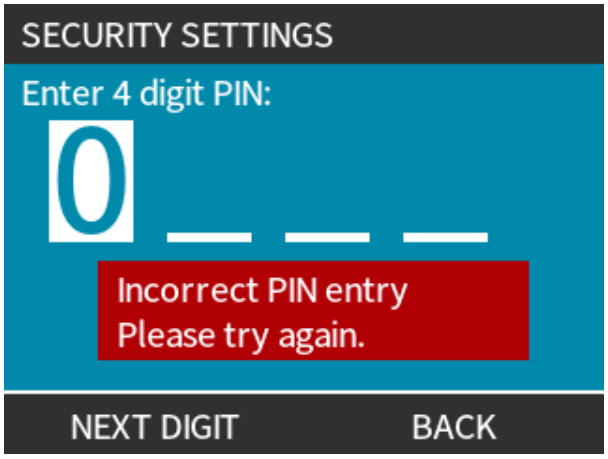
   CHANGE to return to **PIN Entry**.



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

Forgotten PIN:

Contact Watson-Marlow for PIN reset instruction.



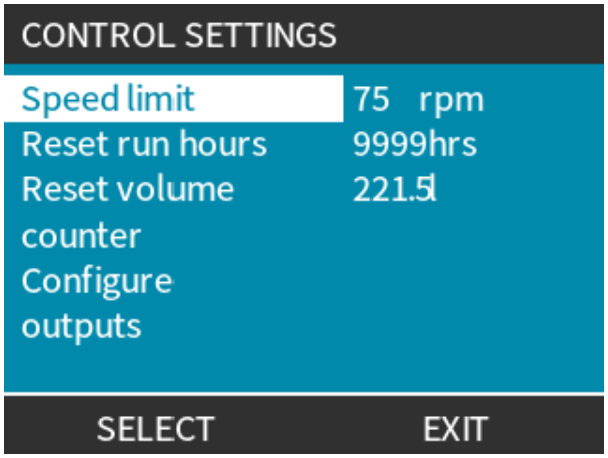
15 Installation: Part 6 (Setting up the pump (control settings))

15.1 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

Procedure
To change view/edit pump control settings:

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



15.1.1 Control settings > Speed limit

The maximum pumphead speed limit may be change. This limit is dependent on the pumphead which is fitted to the drive unit.

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)

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

NOTE40	This speed limit will be applied to all operating modes.

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

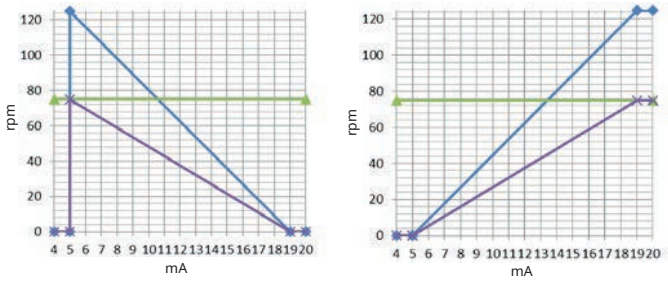


Figure 1 - The effect of a 75 rpm speed limit on user-defined 4-20 mA response profiles

	Calibrated 4-20 mA
	user_max_flow
	recalibrated

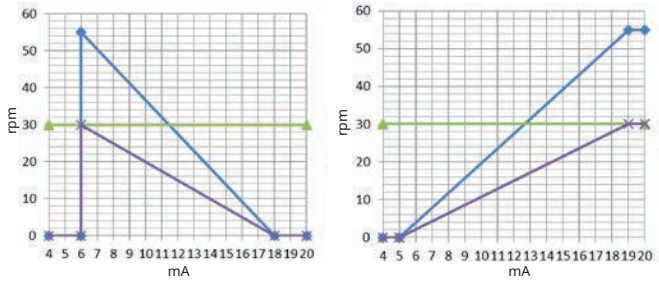


Figure 2 - The effect of a 30 rpm speed limit on user-defined 4-20 mA response profiles

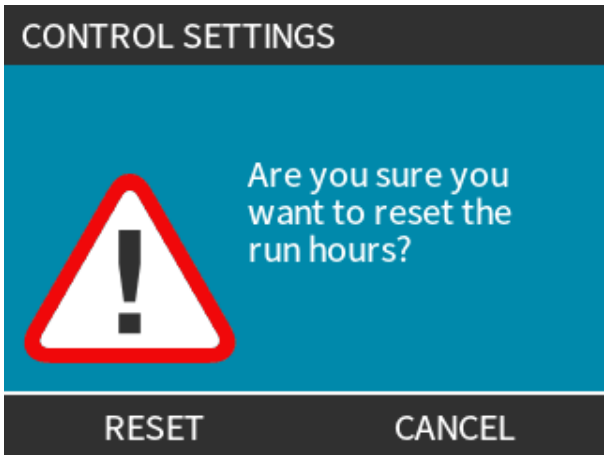
	Calibrated 4-20 mA
	user_max_flow
	recalibrated

15.1.2 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

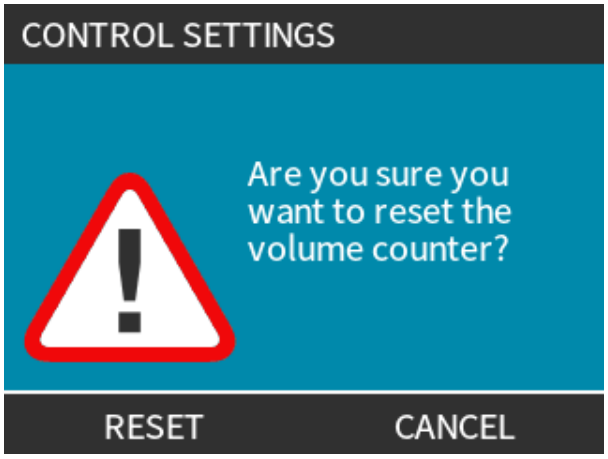
1. Choose **Info** from **HOME** screen.

15.1.3 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.

15.1.4 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:

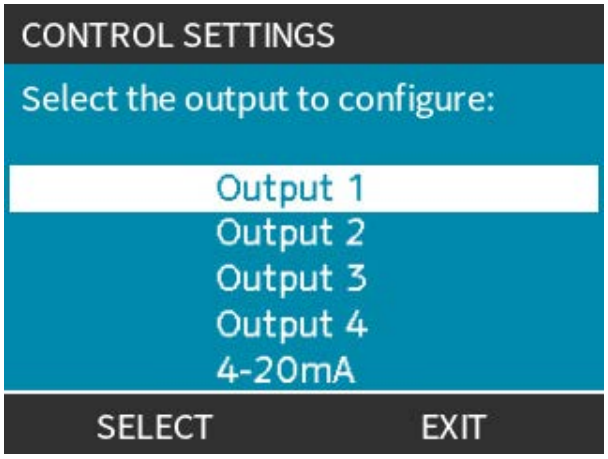
- High for alarm
- Low for healthy

Recommended to invert output for fail safe operation.

15.1.5 Control settings > Configurable outputs - Universal+ model

Procedure

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

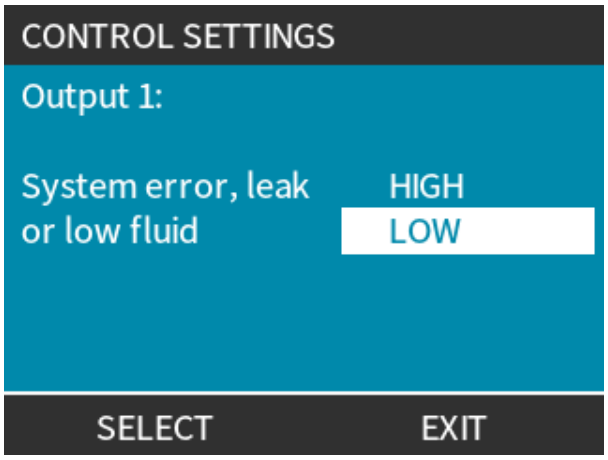


Choose pump status of chosen option:

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

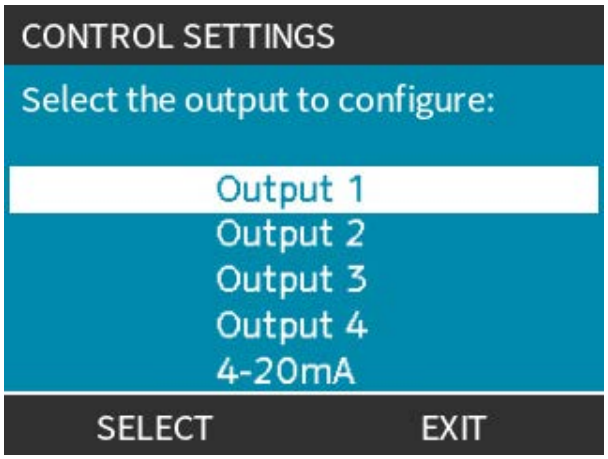
   EXIT [▬] to cancel

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

To configure 4-20 mA output response:

Procedure

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



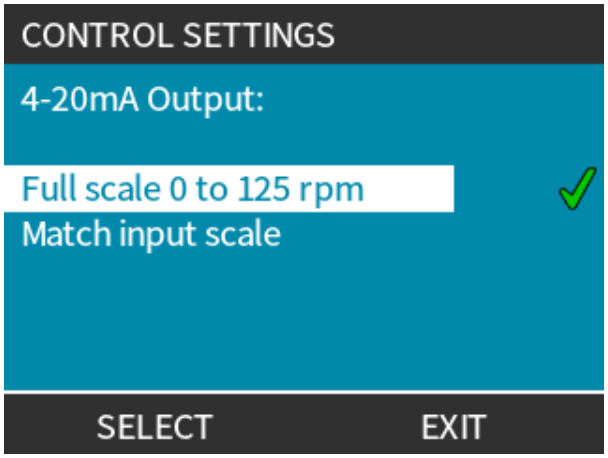
Choose output option:

Procedure

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

   Tick symbol ✓ indicates current setting

6. SELECT ▬.



Full scale – 4-20 mA output is based on pumps full speed range.

0 rpm	Maximum rpm
4 mA	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.

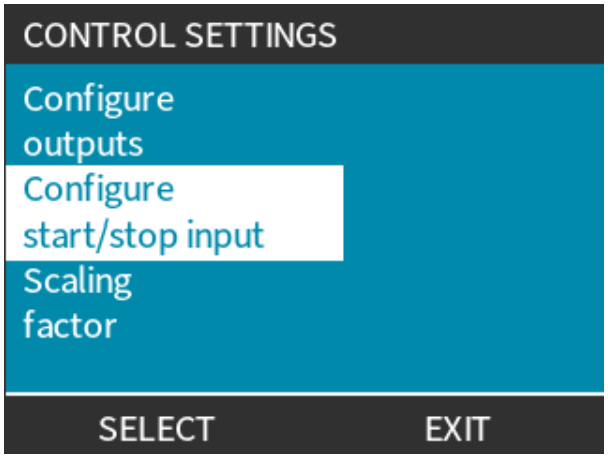
This function will match both the mA and the rpm scales

15.1.7 Control settings > Configurable Start/Stop input

To configure 4-20 mA output response:

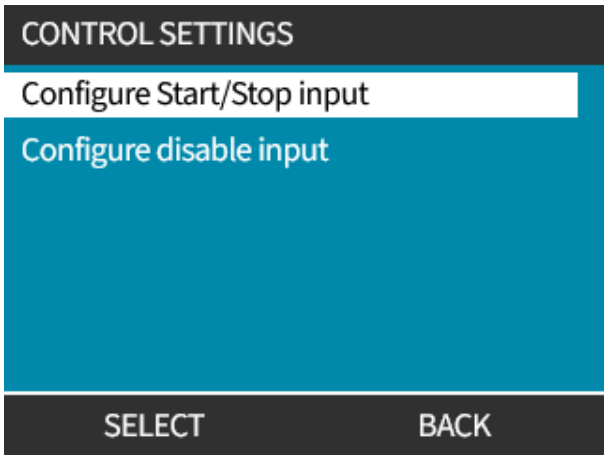
Procedure

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



Procedure

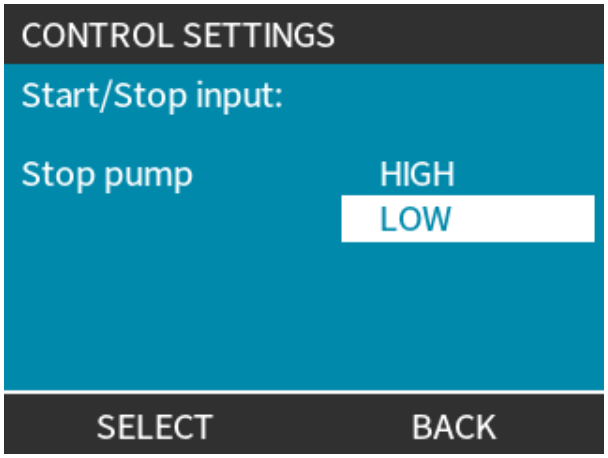
3. Highlight **Configure Start/Stop Input** option
4. SELECT −.



Procedure

5. Use **+/-** keys to highlight options [(41)]
6. SELECT ▬.

NOTE41	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 ▬.

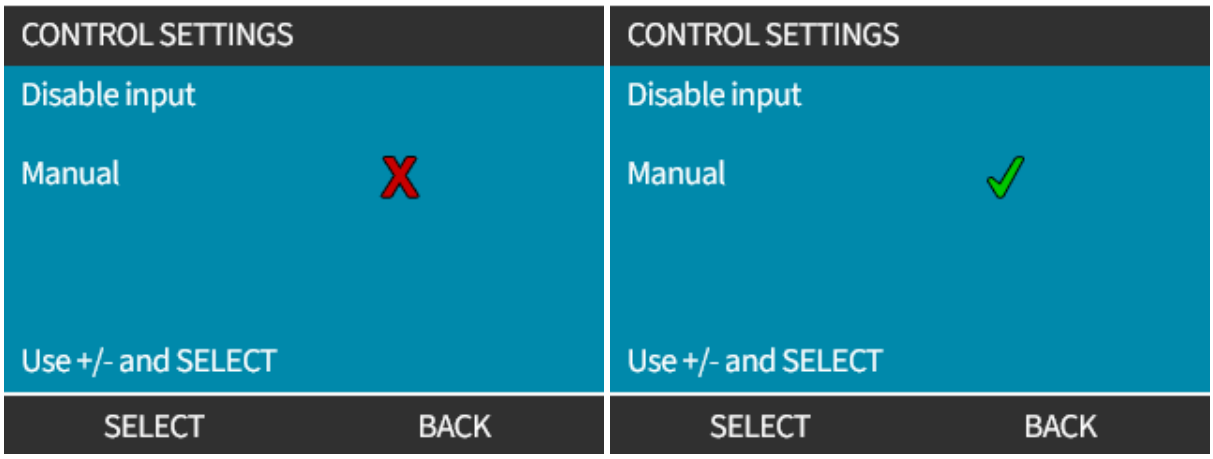
Manually override remote/automatic control of pump:

Procedure

1. Use **+/-** keys to change from ✗ to ✓ (42), (43)
2. SELECT −

NOTE[42]	Only disables remote stop in manual mode. Remote stop cannot be disabled in analog mode.

NOTE[43]	Pump will not accept remote control until remote/automatic control is re-enabled via pump menu settings.

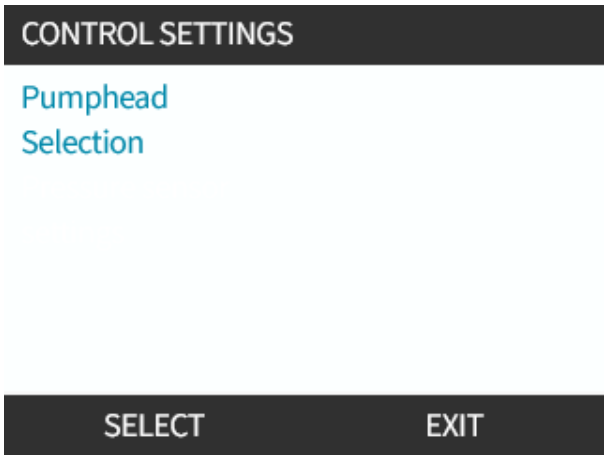


15.1.8 Control settings Pumphead selection

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 −.



15.1.9 Change mode (Manual, PROFIBUS, Universal and Universal+ only)

NOTE44	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	

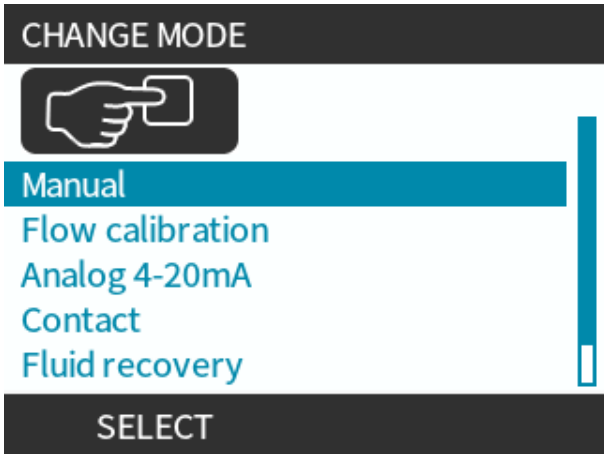
To access the **CHANGE MODE** menu:

Procedure

1. Press **MODE** key

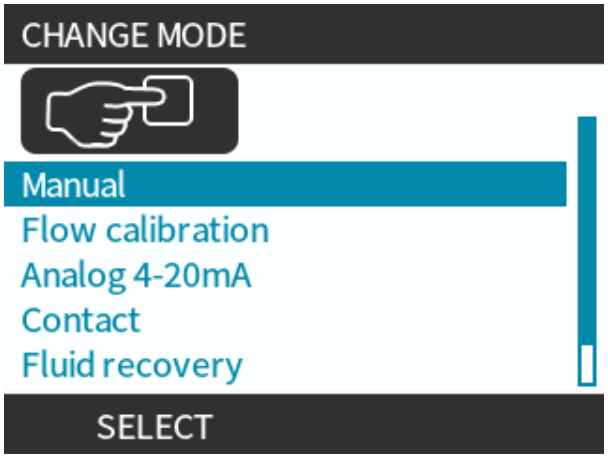
   or

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



Procedure

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



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

Recalibrate:

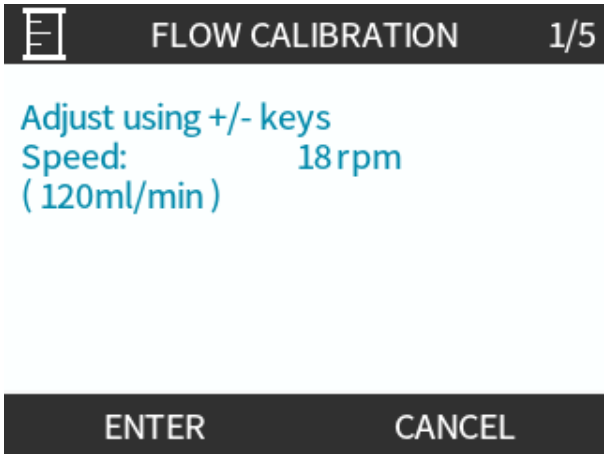
- After changing pumphead
- After changing process fluid
- After changing any connecting pipework.
- Periodically to maintain accuracy.

This pump displays flow rate in ml/min.

To calibrate pump flow:

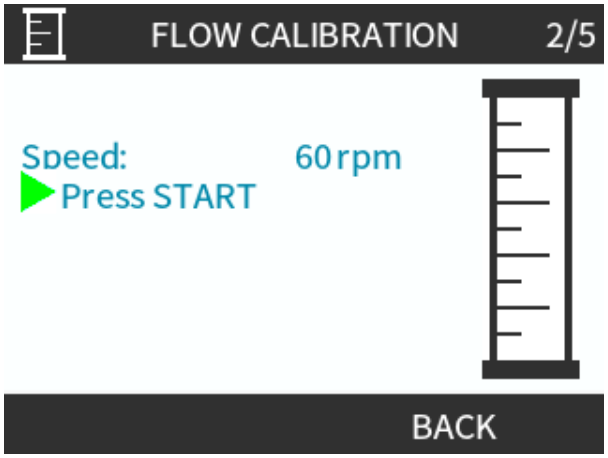
Procedure

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



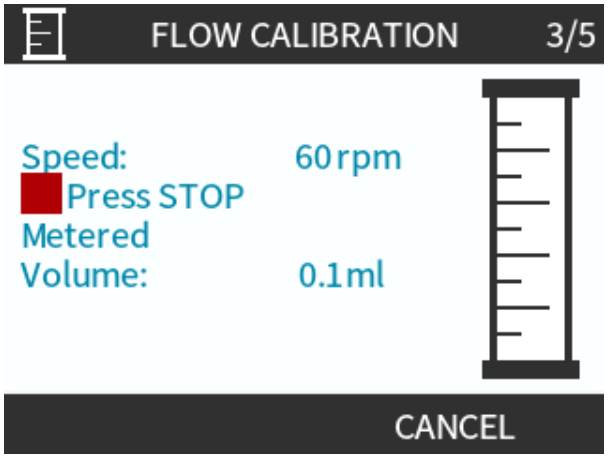
Procedure

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



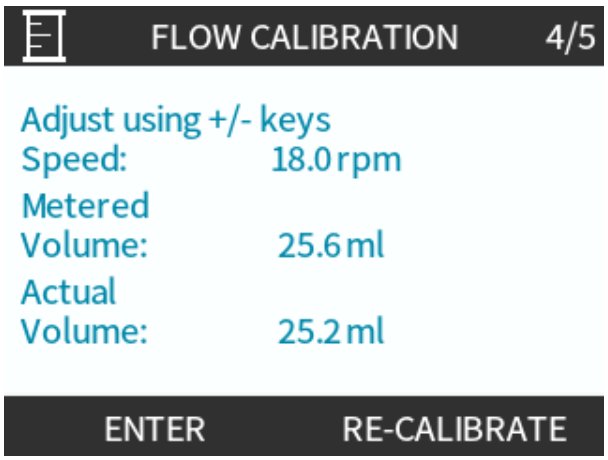
Procedure

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



Procedure

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

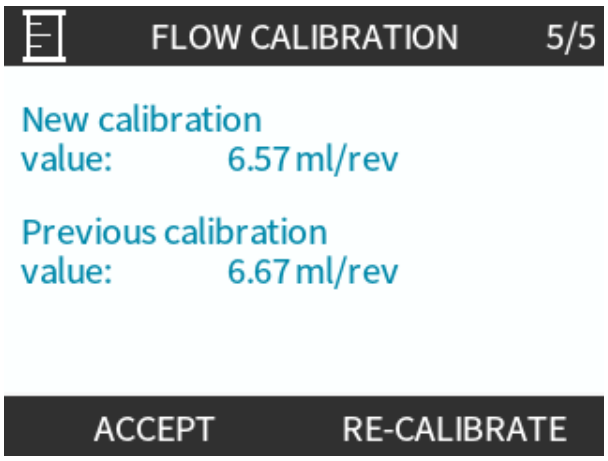


Procedure

7. Pump now calibrated.
8. ACCEPT

   or

   RECALIBRATE to repeat procedure.



Procedure

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

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

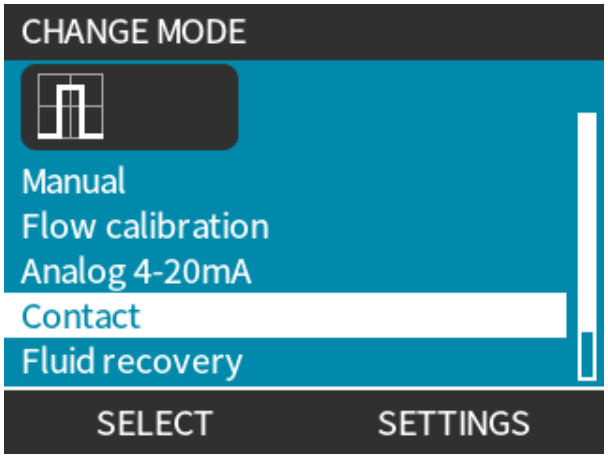
Contact Mode:

- 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

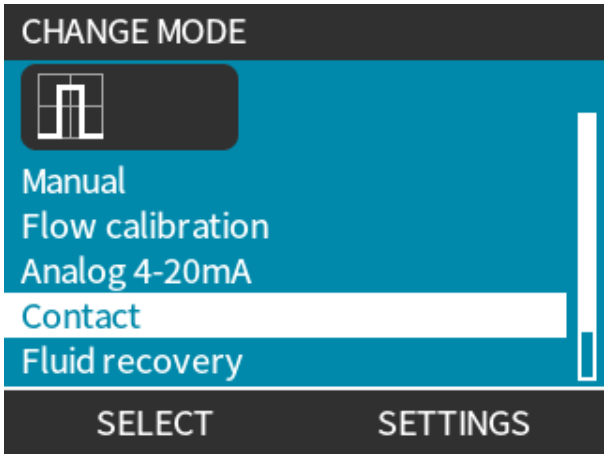
1. SETTINGS −
2. Enable **Contact Mode**



Configure Contact mode

Procedure

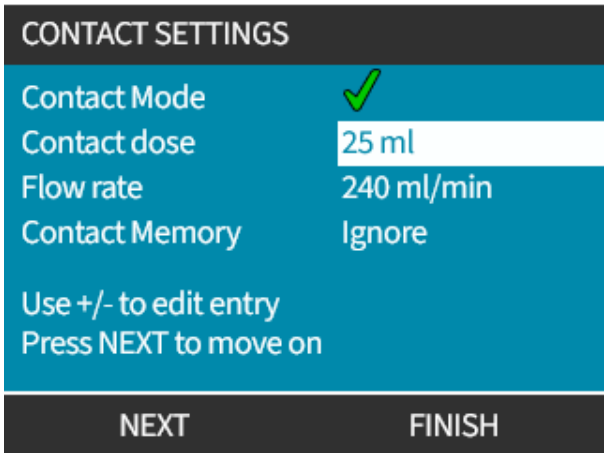
3. Highlight **Contact**
4. SELECT −



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 ▬

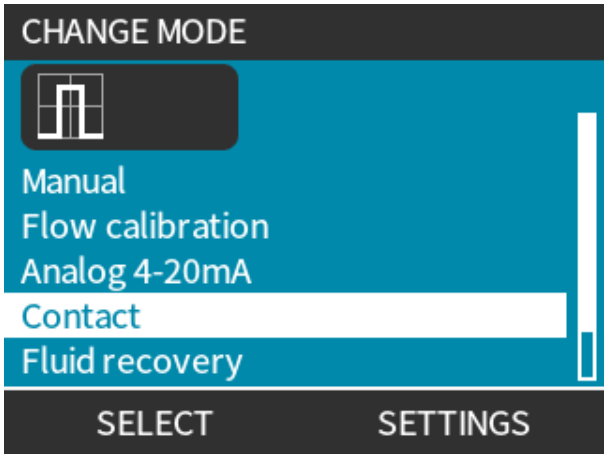
Contact mode settings	
Contact dose	Volume of fluid dispensed when external voltage pulse is received at input pin 2, or the green start button is pressed.
Flow rate	Determines time taken to complete each dose.
Contact memory	Determines pump behaviour in response to pulses received while a dose is in 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

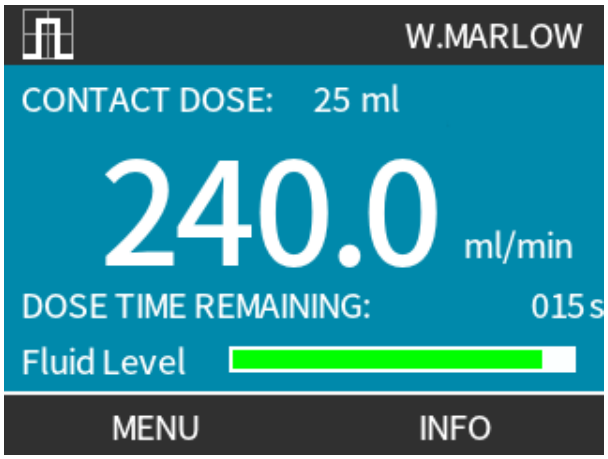


Procedure

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.



15.1.9.2.1 Manual dosing

Press **START** ▶ key to activate a single pre-configured dose.

NOTE45	Manual dosing only available when not dosing automatically via external voltage pulse.

15.1.9.2.2 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.

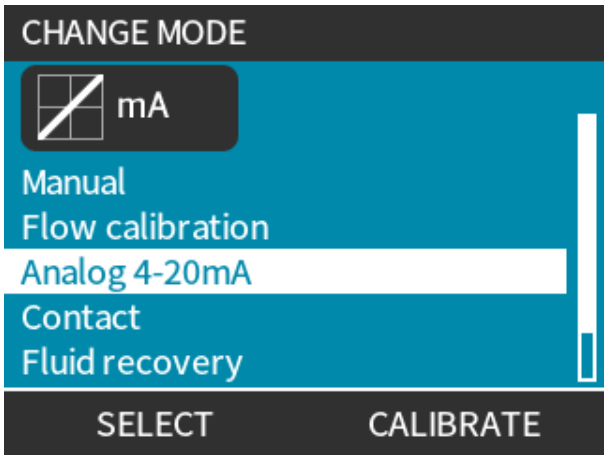
15.1.9.2.3 Calibrate the pump for 4-20 mA control (Universal+ only)

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

To calibrate:

Procedure

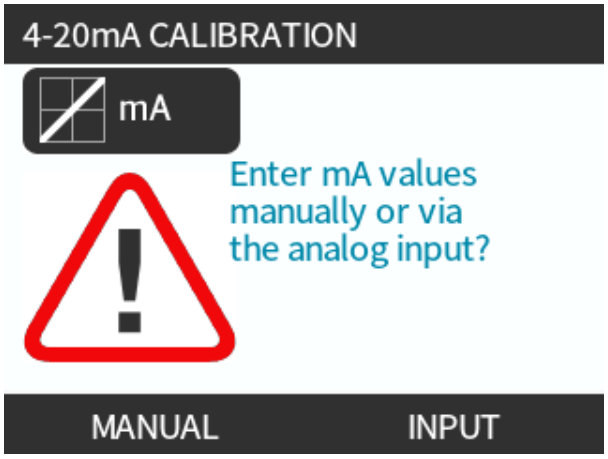
1. Press **MODE** button
2. Use **+/-** keys to scroll to **Analog 4-20 MA**
3. CALIBRATE [−].



Procedure

4. Choose calibration method:
   - MANUAL [−] method—Enter value using **+/-** keys.

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

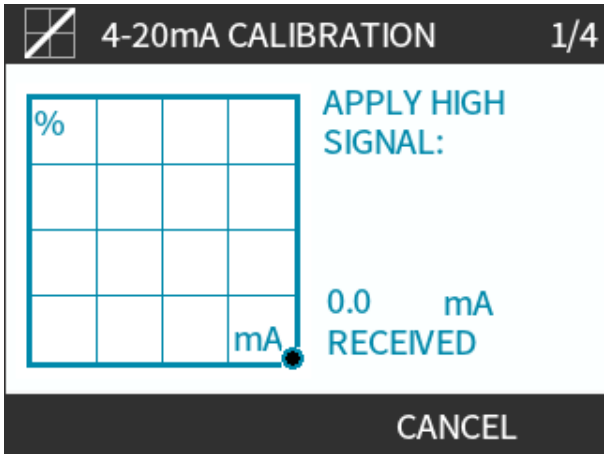


Setting a high signal

Procedure

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

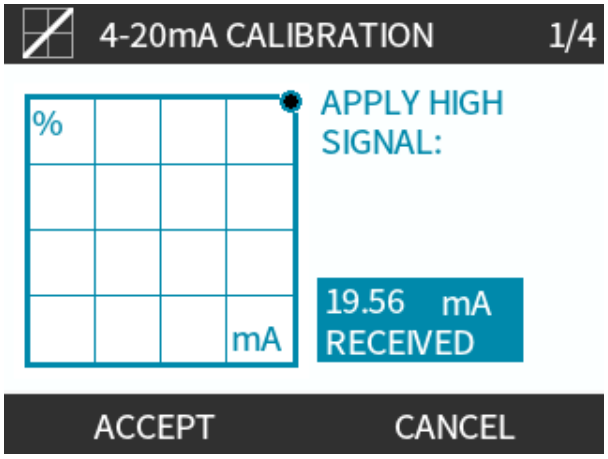
   INPUT —Send high signal input to pump.



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.

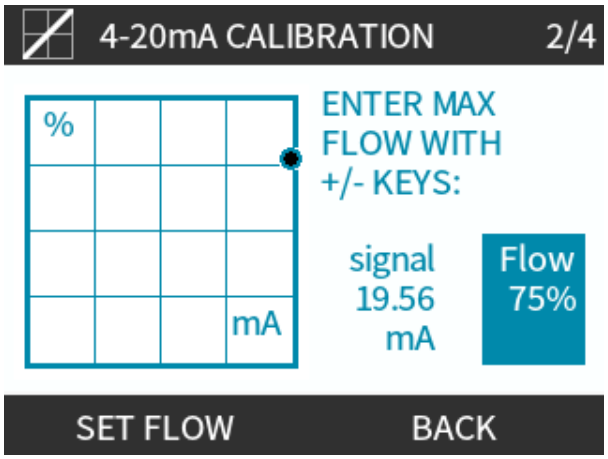


Setting high flow calibration

Procedure

7. Use **+/-** keys to scroll to choose flow rate:
   - Select SET FLOW [−]

     Or
   - Or BACK [−] to return to previous screen.



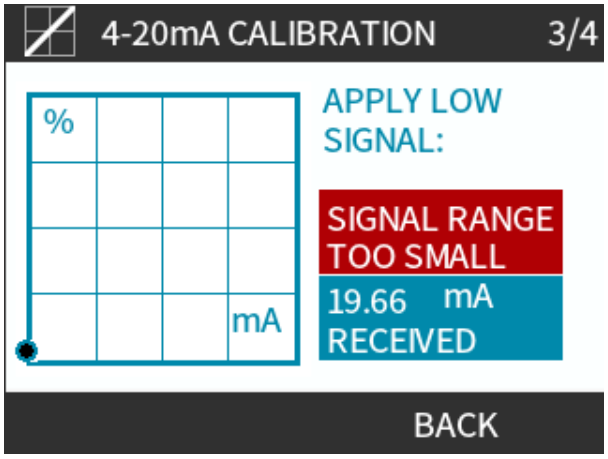
Setting a low signal

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

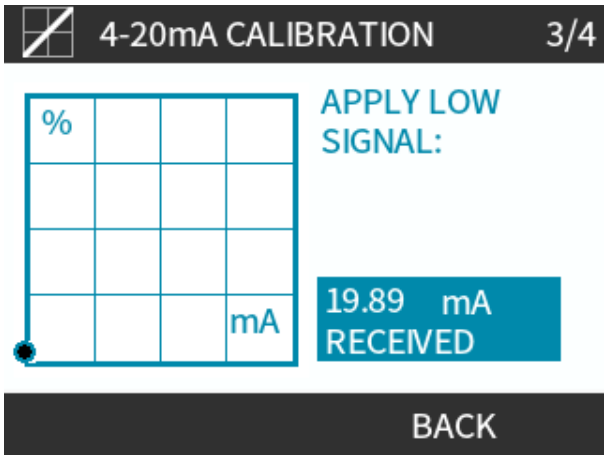
   Or

   CANCEL − to return to previous screen.

Setting low flow calibration

Procedure

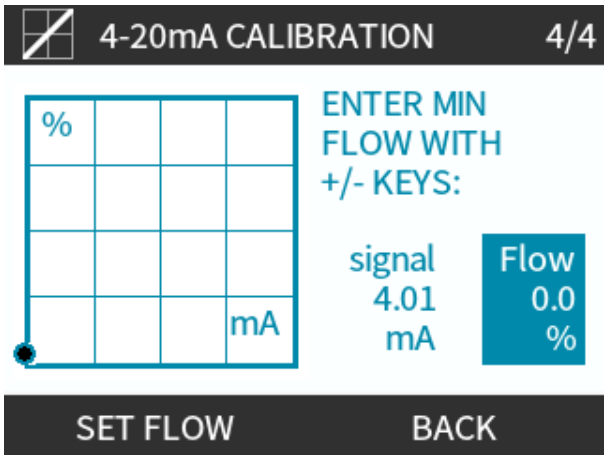
10. Use **+/-** keys to choose flow rate:
    - SET FLOW
      Or
    - BACK to return to previous screen.



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

Procedure

- CONTINUE to start in proportional mode
  Or
- MANUAL to continue in manual mode.



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

Flowrate 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.

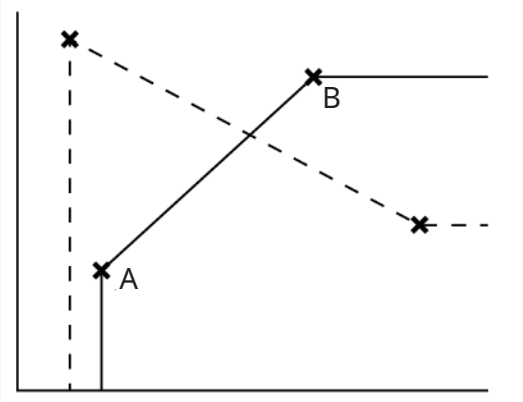
Flowrate	
	mA

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

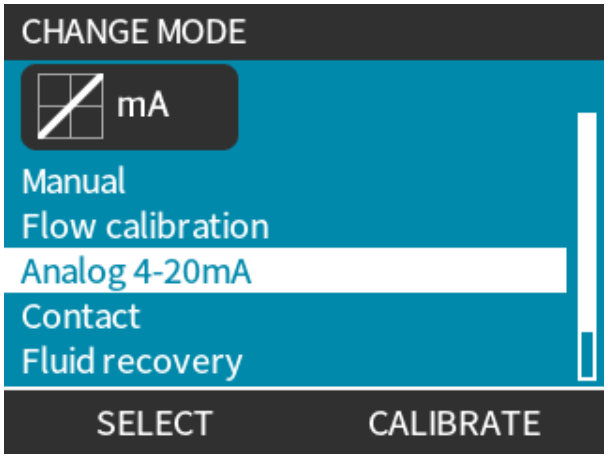
Table 38 - Key to	
A	4.1 mA, 0 rpm
B	(qdos20)—19.8 mA, 55 rpm
B	(qdos30, qdos60, qdos® CWT™)—19.8 mA, 125 rpm
B	(qdos120)—19.8 mA, 140 rpm

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

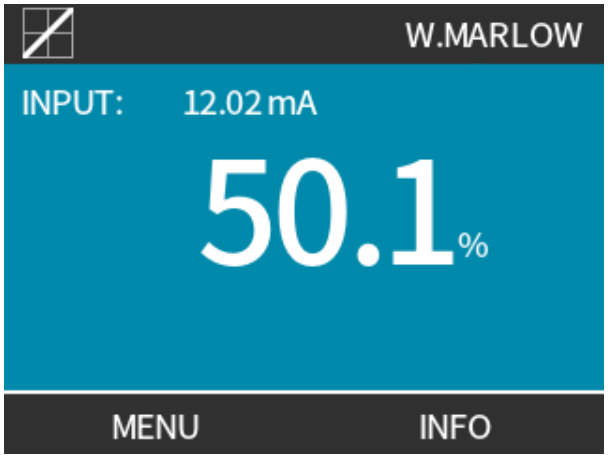
1. Press **MODE** button
2. Use **+/-** keys to scroll to Analog 4-20 mA
3. SELECT



With Analog 4-20 mA mode enabled:

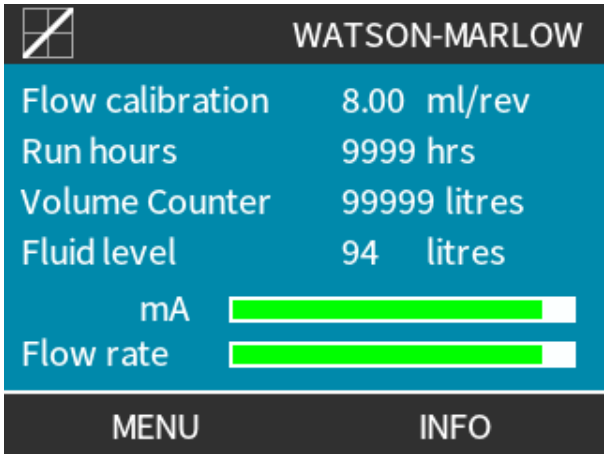
Procedure

- 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.



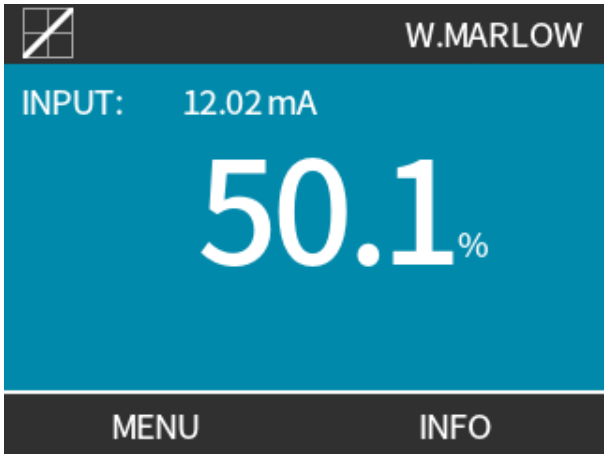
15.1.9.4 Analog Scaling Factor

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

To select Analog 4-20 mA mode:

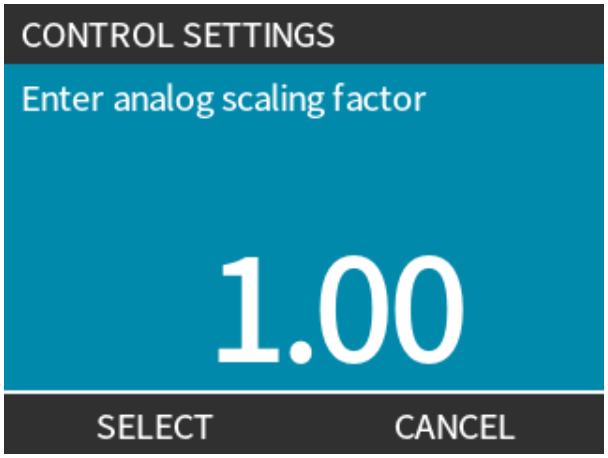
Procedure

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



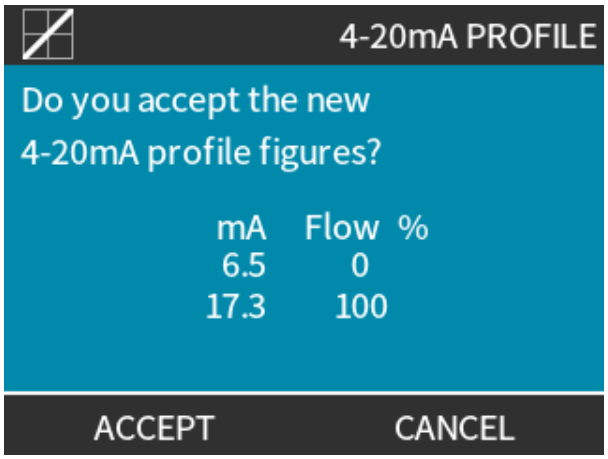
Procedure

3. SELECT −



Procedure

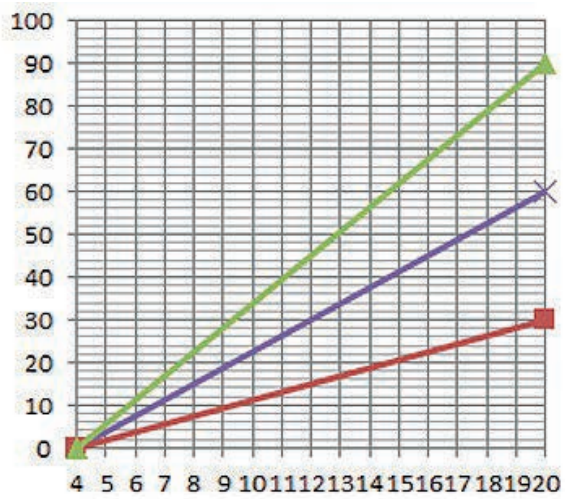
4. ACCEPT − to confirm new **4-20mA Profile Figures**.



NOTE[46]

- 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.

Flowrate %



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

NOTE47	Scaling factor will never cause pump to exceed speed limit.

15.2 PROFIBUS mode

This section provides instructions on how to:

- Enable PROFIBUS mode
- Configure PROFIBUS communication settings
- Detailed information for PROFIBUS parameters

NOTE48	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.

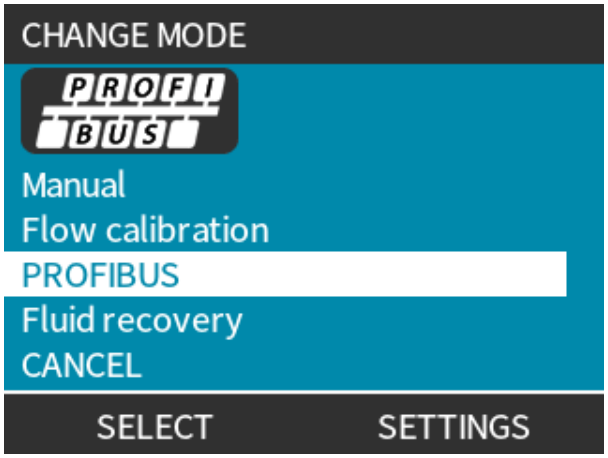
15.2.1 Setting PROFIBUS mode

NOTE49	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

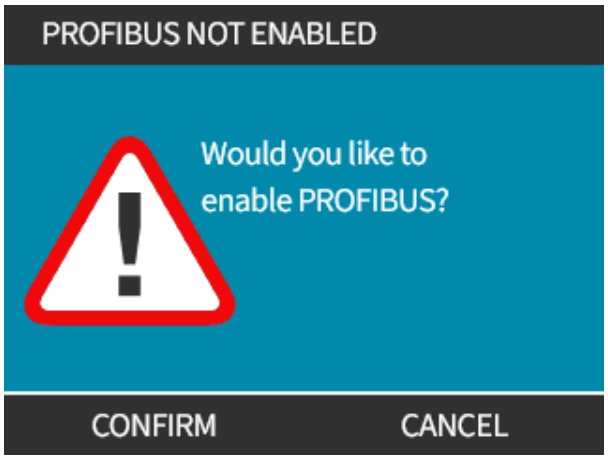


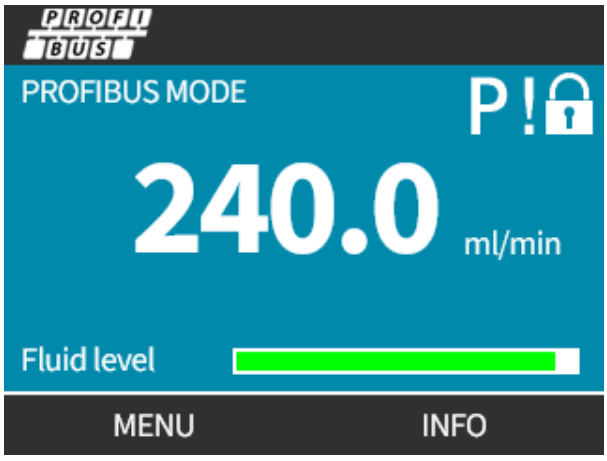
If PROFIBUS not enabled:

Procedure

4. Pump will prompt to CONFIRM to enable PROFIBUS.

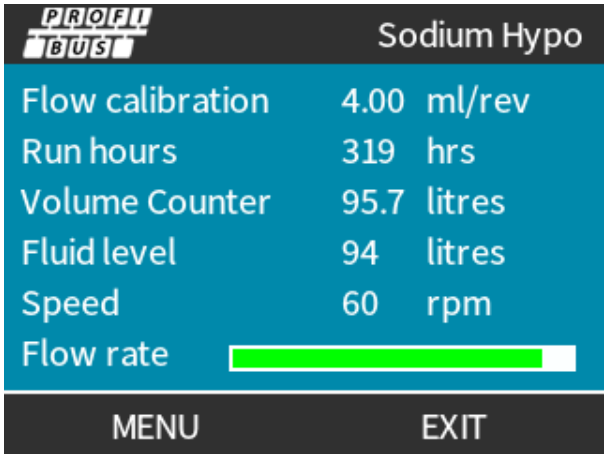
   PROFIBUS home screen shows white P icon to indicate data exchange.





Procedure

5. Pressing INFO function key displays further information.



15.2.2 Assigning the PROFIBUS station address at the pump

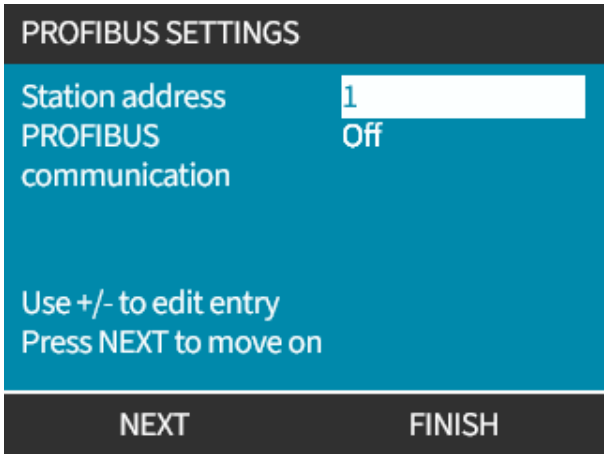
Station address:

- 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



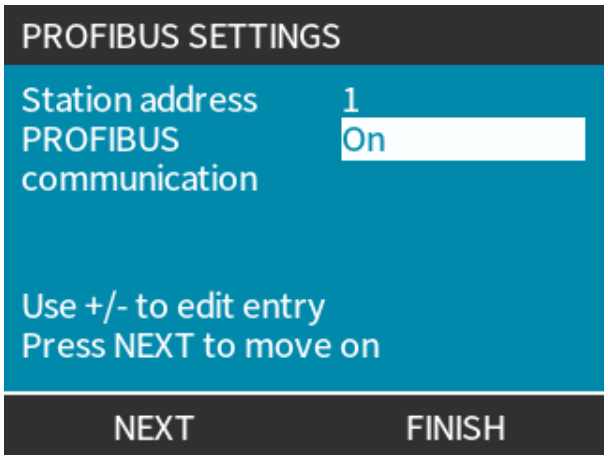
Procedure

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.

15.2.3 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

15.2.4 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	Direction (0= CW, 1= CCW)
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	Not used
7	Fluid Level Reset
8-15	Reserved

15.2.5 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.

15.2.6 Set Flow Calibration

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

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

NOTE50	Value is only used if bit 5 of Control Word is enabled.

15.2.7 Cyclic Data Read (from pump to master)

Cyclic 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	High pressure alarm
32 bit	Byte 25, 26, 27, 28	Low pressure alarm

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	Reserved
15	Reserved

15.2.7.1 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.

15.2.7.2 Hours Run

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

15.2.7.3 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	59

NOTE[51]	A = Start of Dose / B = End of Dose.

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

15.2.7.4 Read Flow Calibration

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

15.2.8 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.

NOTE[52]	Dataflow to/from pump may need to be byte-reversed, due to differences of handling data between suppliers of master devices.

```
The GSD file, filename: WAMA0E7D.GSD
;
;***************************************************************************
;* ======================================================================= *
;* *
;* Watson-Marlow Bredel Pumps *
;* Bickland Water Road *
;* Falmouth *
;* Cornwall *
;* TR11 4RU *
;* Tel.: +44(1326)370370 *
;* FAX.: +44(1326)376009 *
;* *
;* ======================================================================= *
;* Filename: WAMA0E7D.GSD *
;* GSD file version 3 from 2013-09-24 *
;* ----------------------------------------------------------------------- *
;* *
;***************************************************************************
#Profibus_DP
GSD_Revision = 3
Vendor_Name = “Watson Marlow”
Model_Name = “Qdos Profibus Pump”
Revision = “Version 3.00”
Ident_Number = 0x0E7D
Protocol_Ident = 0
Station_Type = 0
FMS_supp = 0
Hardware_Release = “V1.00”
Software_Release = “V1.00”
Redundancy = 0
Repeater_Ctrl_Sig = 0
24V_Pins = 0
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
Module=”WM Pump, 3/14 word out/in” 0x62,0x5D
1
EndModule
```

15.2.9 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)

15.2.10 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

15.2.11 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)

15.2.11.1Set 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.

15.2.11.2Fail Safe

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

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

NOTE53	If no bits set or invalid bit pattern is set, default fail safe behaviour stops pump.

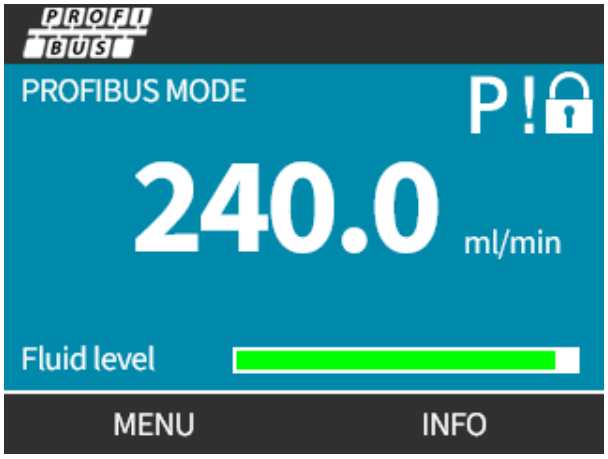
Hex	Description
0x00	The pump will stop
0x01	Continue driving using last demanded speed
0x02	Continue driving using fail safe speed
0x03 - 0x07	Reserved

15.2.11.3Fail 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.

15.2.12 Master Slave communications sequence

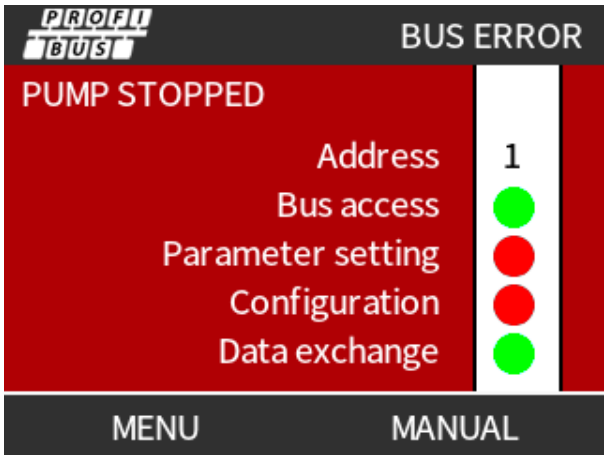
In PROFIBUS mode, the screen below is displayed, the P indicates data exchange is happening.



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.



The screen will state running or stopped, depending on how the user has set up the fail-safe function within the PROFIBUS GSD file (see "15.2.8 PROFIBUS GSD file" on page 153). The **MODE** button gives access to the PROFIBUS settings and the station address. When menus are accessed the pump continues to run in PROFIBUS mode.

If the **MODE** or **MENU** button 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.

16 Operation

16.1 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.

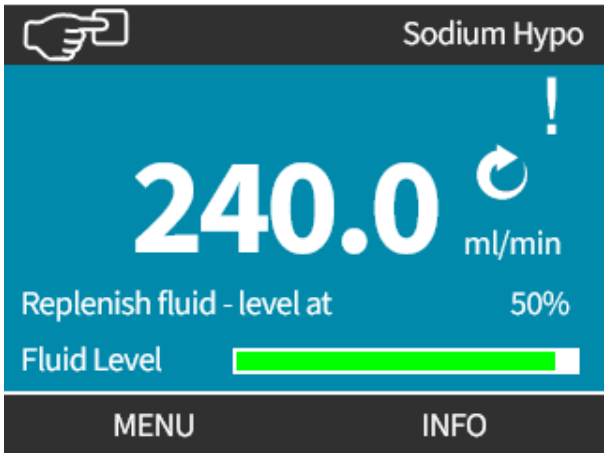
16.2 Safety

16.2.1 Hazards that may occur during operation

The following hazards may occur during operation of the pump.

16.2.1.1 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.



16.2.1.2 Risk of burns

⚠ CAUTION

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

16.3 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.

16.4 Pump operation (Models: Manual, PROFIBUS, Universal, Universal)

16.4.1 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.

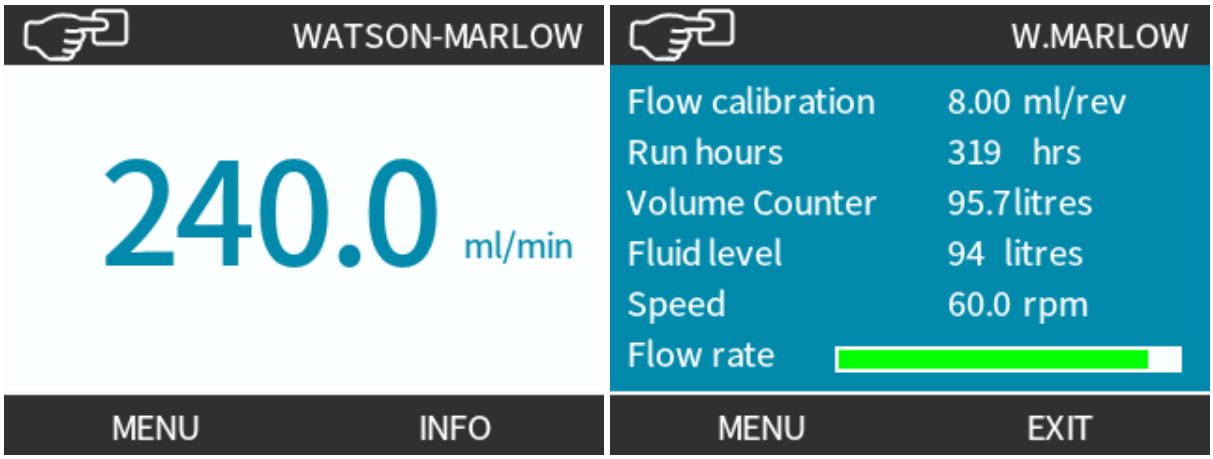
16.4.2 Understanding and using menus and modes

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

To access **MAIN MENU**:

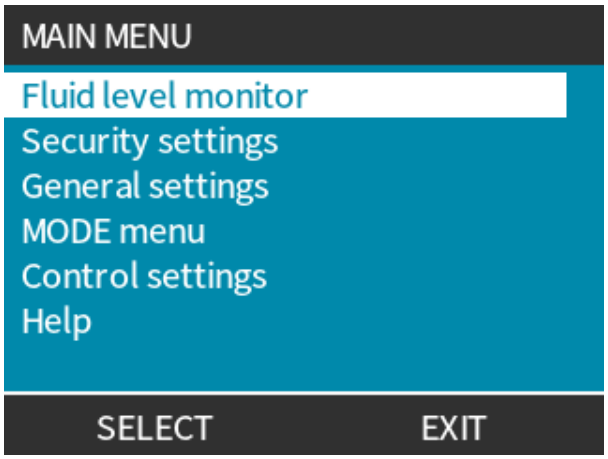
Procedure

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 −.

16.4.2.2 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 flowrate 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.

16.4.3 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.

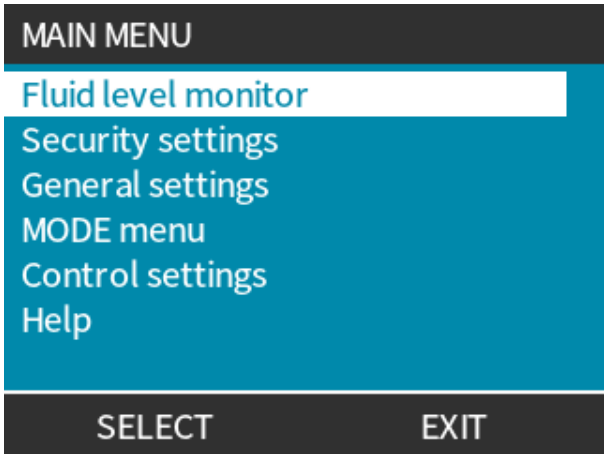
- When fluid level is estimated at zero pump will stop.
- Fluid level monitor accuracy will improve with regular pump calibration.

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.

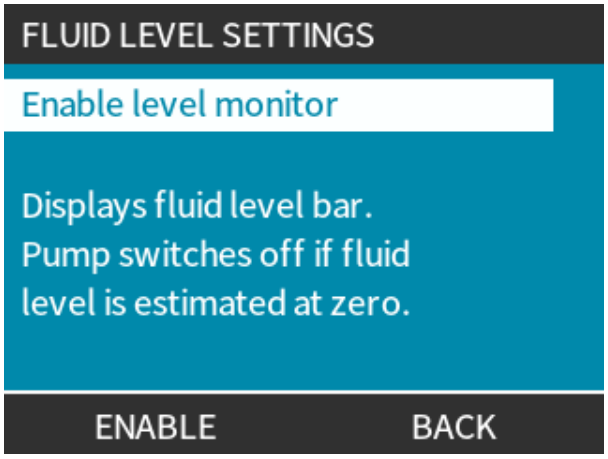


To activate/deactivate Fluid level monitor:

Procedure

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

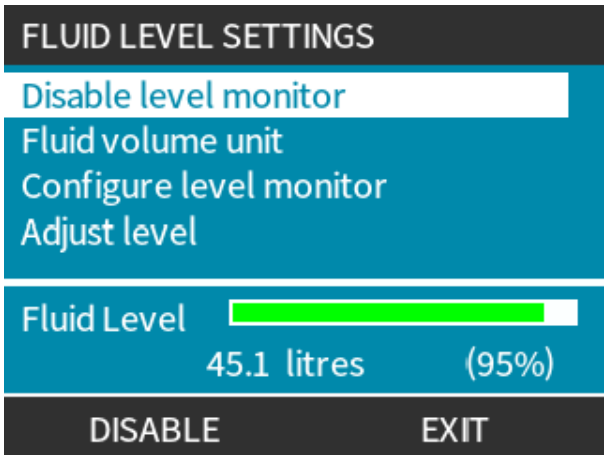
   Fluid volume level will display on **HOME** screen.



Procedure

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

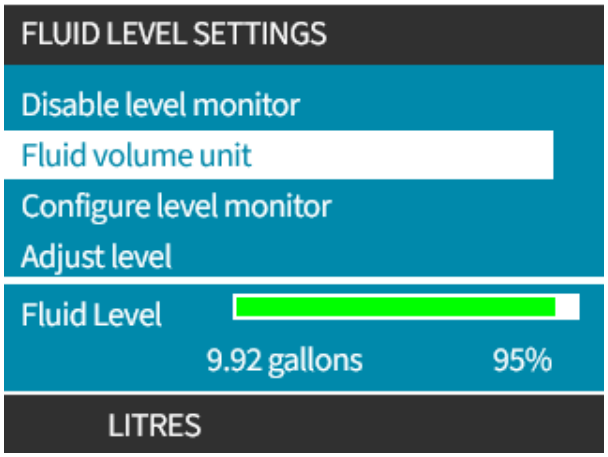
   Fluid volume level will no longer appear on the **HOME** screen.



To change Fluid volume unit of measure:

Procedure

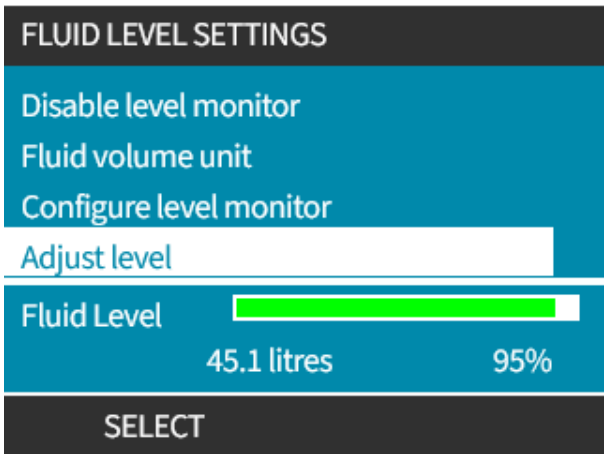
4. Choose **Fluid Volume Unit**
5. Use [ ] key to toggle US GALLONS or LITRES



To configure the level monitor:

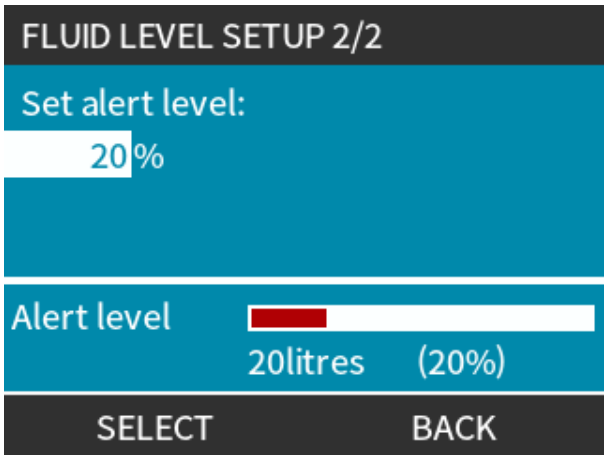
Procedure

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



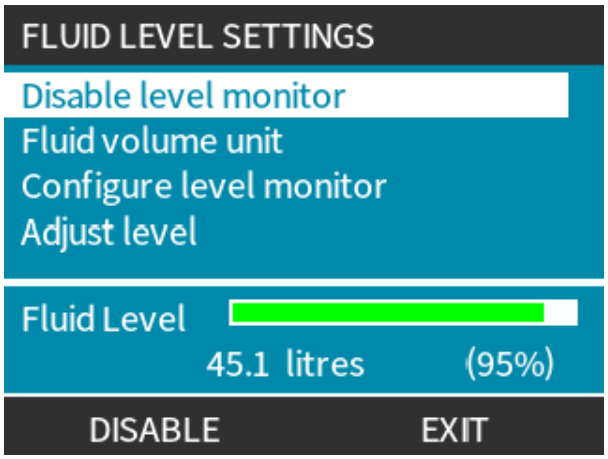
Procedure

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



Procedure

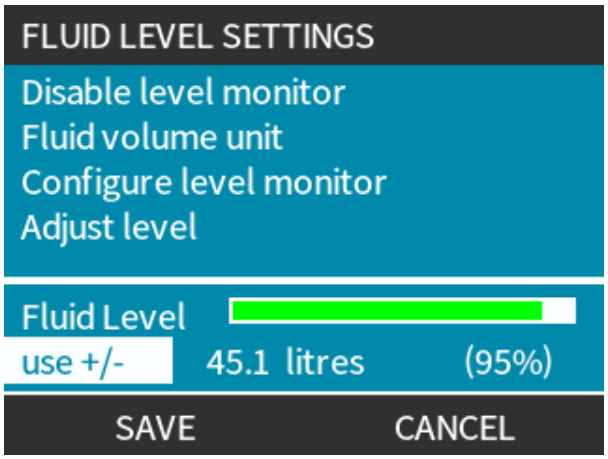
11. SELECT to return to **FLUID LEVEL SETTINGS**.



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

Procedure

12. Choose **Adjust Level** option.



Procedure

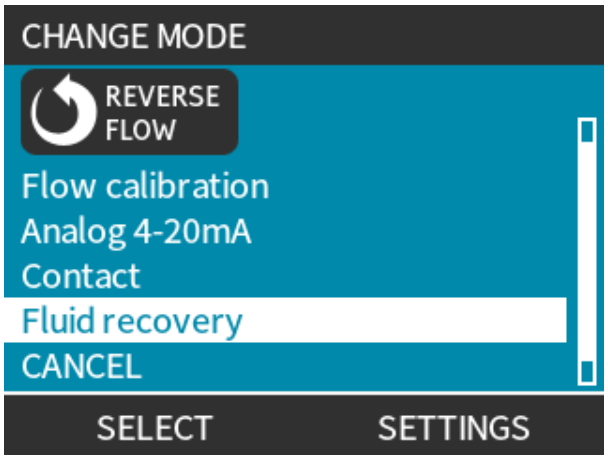
13. Use **+/-** keys set volume of fluid in container.

16.4.4 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.

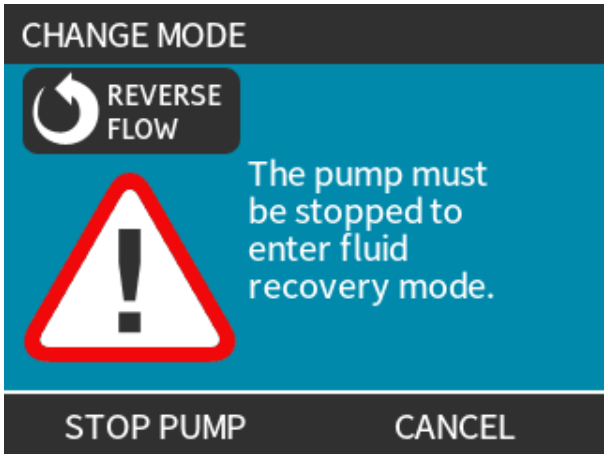
Procedure

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



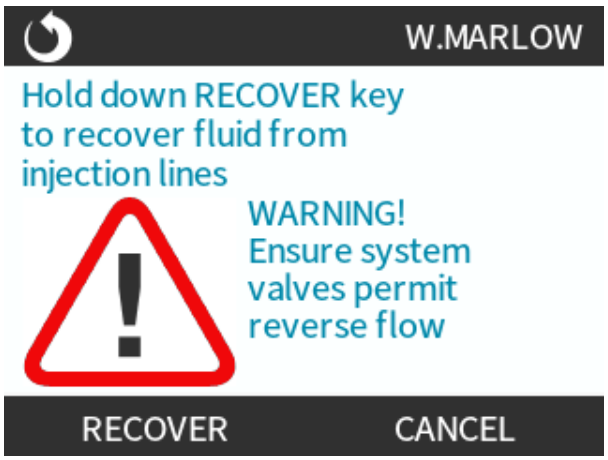
Procedure

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 [−].



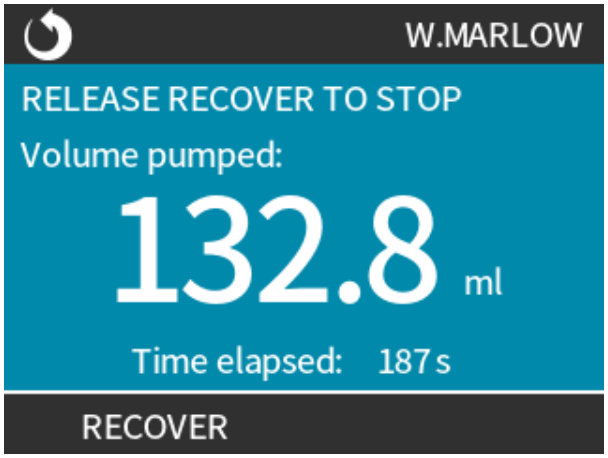
Procedure

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.

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

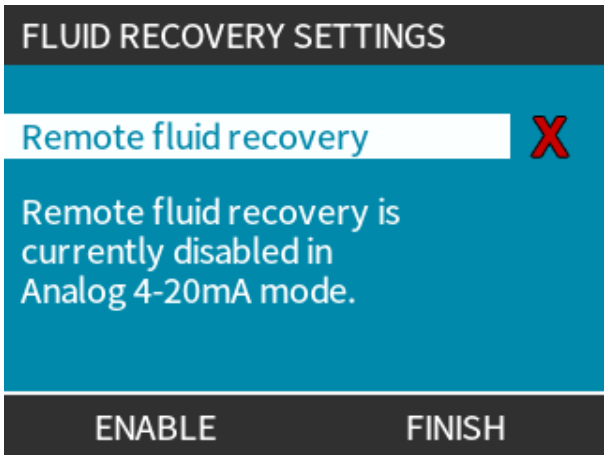
Remote fluid recovery should not be used for bulk fluid transfer.

16.4.5.1 Universal and Universal+ models

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

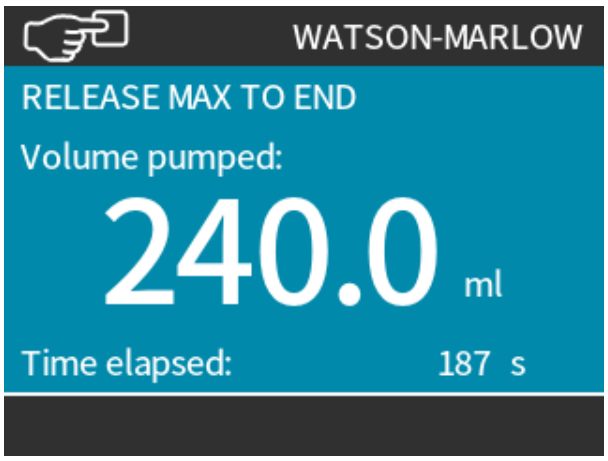
Procedure

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.



16.4.5.2 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.

16.5 Pump status overview

16.5.1 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

16.5.2 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:

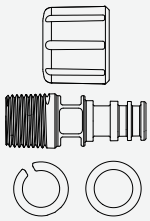
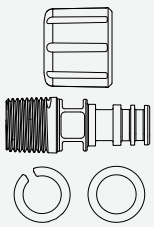
	Signal status
	Pump running
	Pump in standby condition
	Pump stopped

17 Maintenance

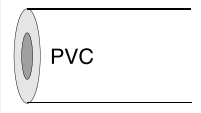
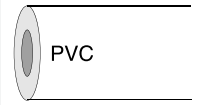
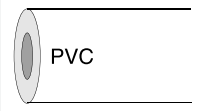
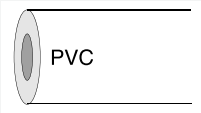
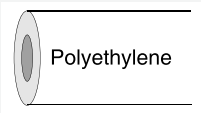
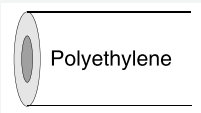
17.1 Spare parts

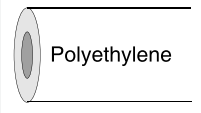
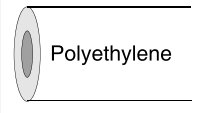
The table below provides a list of spare parts which may be used during installation, servicing or maintenance.

Pumpheads			
Image	**Description**		**Part number**
	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
	Change to CWT EPDM pumphead (PFPE lubricant)	qdos® CWT™	0M3.5700.PFP
	Qdos 30 pumphead clamp and screw (Pair)	qdos30	0M9.203C.000

Connectors		
Image	**Description**	**Part number**
	Hydraulic connection pack, polypropylene compression fittings— Metric - Set of four sizes: 6.3x11.5 mm, 10x16 mm, 9x12 mm, 5x8 mm for use with WM Interface tubing	0M9.221H.P01
	Hydraulic connection pack, pvdf compression fittings—Set of two sizes: 3/8'' x 1/4" and 1/2'' x 3/8''	0M9.001H.F20
	Hydraulic connection pack, polypropylene barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.P02
	Hydraulic connection pack, PVDF barb/threaded fittings, 1/4 ” hose barb, 3/8 ” hose barb, 1/4 ” BSP, 1/4 ” NPT	0M9.221H.F02
	Hydraulic connection pack, polypropylene, threaded fittings, 1/2 ” BSP (Only for ReNu 20, ReNu 60, ReNu 120 and CWT pumpheads. Not available for ReNu 30 pumpheads) Note: Remove the standard seal before fitting this connector.	0M9.401H.P03
	Hydraulic connection pack, polypropylene, threaded fittings, 1/2 ” NPT (Only for ReNu 20, ReNu 60, ReNu 120 and CWT pumpheads. Not available for ReNu 30 pumpheads) Note: Remove the standard seal before fitting this connector.	0M9.401H.P04
	Hydraulic connection pack, polypropylene, 1/2 ” hose barb	0M9.401H.P05
	Hydraulic connection pack, PVDF, threaded fittings, 1/2 ” BSP (Only for ReNu 20, ReNu 60, ReNu 120 and CWT pumpheads. Not available for ReNu 30 pumpheads) Note: Remove the standard seal before fitting this connector.	0M9.401H.F03
	Hydraulic connection pack, PVDF, threaded fittings, 1/2 ” NPT (Only ReNu 20, ReNu 60, ReNu 120 and CWT pumpheads. Not available for ReNu 30 pumpheads) Note: Remove the standard seal before fitting this connector.	0M9.401H.F04
	Hydraulic connection pack, PVDF, 1/2 ” hose barb	0M9.401H.F05

Connectors		
Image	**Description**	**Part number**
	Qdos solvent connector kit Note: PVCU Solvent connector in accordance with schedule 80 PVC 1/4 " nominal pipe, Dia 13.75 +/-0.05. Installation: Customer must choose a solvent weld product compatible with the fluid to be pumped, ensuring the full material interface length is welded.	0M9.001H.U90
	ReNu Connection Collar - Qty 2	0M9.001H.P00
	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
	ReNu 20, ReNu 60, ReNu 120 and CWT Santoprene head port seals	0M9.001R.M00
	ReNu 20, ReNu 60 SEBS head port seal	0M9.001R.B00
	ReNu 20, ReNu 60 PU head port seal	0M9.001R.A00

Tubing		
Image	**Description**	**Part number**
	Interface tubing, pvc 6.3x11.5 mm, 2 m (6.5 ft) length	0M9.2222.V6B
	Interface tubing, pvc 10x16 mm, 2 m (6.5 ft) length	0M9.2222.VAD
	Interface tubing, pvc 6.3x11.5 mm, 5 m (16 ft) length	0M9.2225.V6B
	Interface tubing, pvc 10x16 mm, 5 m (16 ft) length	0M9.2225.VAD
	Interface tubing, polyethylene 9x12 mm, 2 m (6.5 ft) length	0M9.2222.E9C
	Interface tubing, polyethylene 5x8 mm, 2 m (6.5 ft) length	0M9.2222.E58

Tubing		
Image	**Description**	**Part number**
	Interface tubing, polyethylene 9x12 mm, 5 m (16 ft) length	0M9.2225.E9C
	Interface tubing, polyethylene 5x8 mm, 5 m (16 ft) length	0M9.2225.E58

Accessories		
Image	**Description**	**Part number**
	Replacement baseplate	0M9.223M.X00
	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

17.2 Electrical maintenance

17.2.1 Drive maintenance

There are no replaceable or serviceable parts within the drive. If the pump drive is damaged remove the pump from service and contact your Watson-Marlow representative to discuss how the pump can be repaired. Do not attempt to remove the pump casing to inspect the internal parts within the drive.

17.2.2 Replacement of power cable

qdos pumps do not have detachable power cables. If the power cable becomes damaged, remove the pump from service and contact your Watson-Marlow representative to discuss how the pump can be repaired. Do not attempt to repair or replace the power cable.

17.2.3 Replacement of fuses

17.2.3.1 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.

17.2.3.2 Power cable fuse (AC power supply models: UK Model only)

The UK model contains a 5 A fuse in the power plug for the AC electrical supply models.

17.3 Pumphead maintenance

There are no user serviceable items within the pumphead. The pumphead can only be replaced.

Instructions for replacement of the pumphead are in this section:

17.3.1 Life of 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 flowrate 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.

These indications can be used to monitor the life of a pumphead. Hours counters and volume counters can be set inside the pump to warn when a pumphead is nearing the end of its life.

17.3.2 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.

⚠ WARNING

There can be harmful chemicals inside the pumphead that can cause serious injury or damage to equipment if spilled. Wear PPE and follow your organisations procedures when undertaking any task in this section.

17.3.2.1 Removing the pumphead

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 pumphead (protecting the pump from any process fluid spillages), by unscrewing the connection collars and gently pulling the connections off the pumphead ports. See illustration below.

Procedure

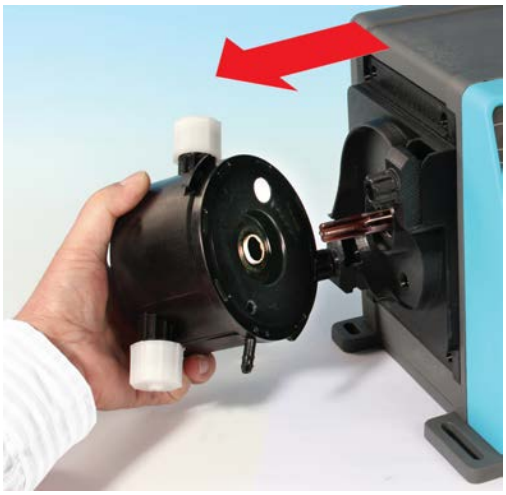
5. Fully loosen the two pumphead retaining clamps by hand. Do not use a tool.

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

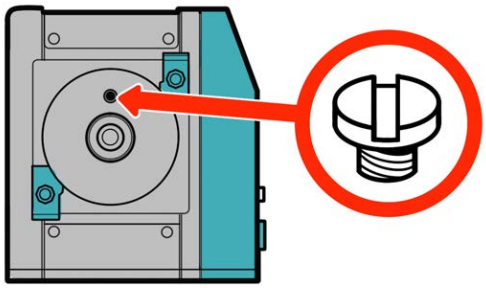
8. Safely dispose of the used pumphead according to local health and safety regulations for contaminated items.
9. Check the leak detect sensor and driveshaft are both clean and free from process chemical. If any evidence of chemical residue is found, remove the pump from service and contact your local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

17.3.2.2 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. 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.

17.3.3 Replacement of pumphead (Model qdos 20, 60, 120, CWT - All variants)

⚠ WARNING

There can be harmful chemicals inside the pumphead that can cause serious injury or damage to equipment if spilled. Wear PPE and follow your organisations procedures when undertaking any task in this section.

17.3.3.1 Removing the pumphead

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 pumphead (protecting the pump from any process fluid spillages), by unscrewing the connection collars and gently pull the connections off the pumphead ports. See illustration below.

Procedure

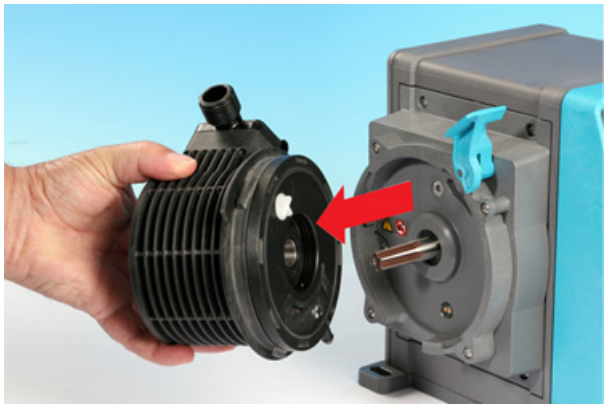
5. Release the pumphead locking lever.

Procedure

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

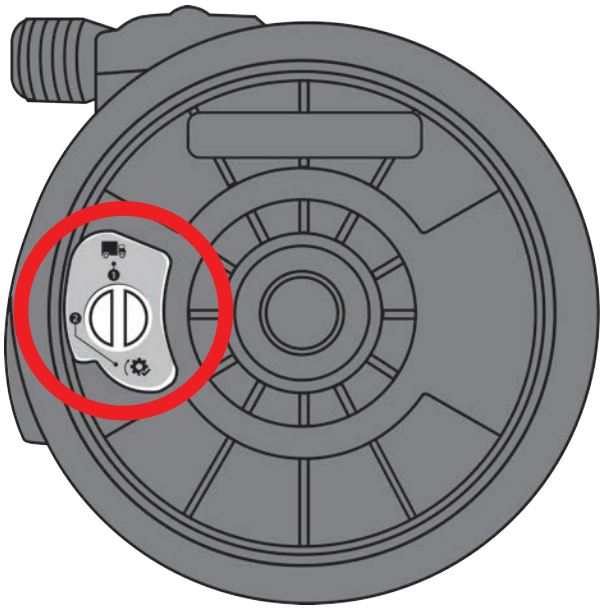
Procedure

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

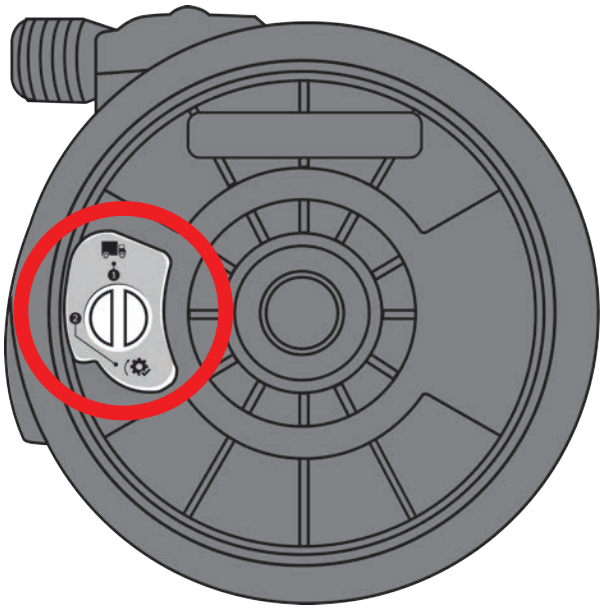
9. Safely dispose of the used pumphead according to local health and safety regulations for contaminated items.
10. Check the leak detect sensor and driveshaft are clean and free from process chemical. If any evidence of chemical residue is found, remove the pump from service and contact your local Watson-Marlow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

17.3.3.2 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.
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.

NOTICE

The pumphead locking lever is designed to be loosened or tightened by hand.

18 Errors, breakdown 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.

18.1 Errors

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

18.1.1 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

18.1.2 Manual, PROFIBUS, Universal, Universal+ 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	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

NOTE[54]	Signal out of range and Leak detected error screens report the nature of an external condition. They do not flash.

18.2 Error reporting

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

18.3 Breakdown

18.3.1 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:

18.3.2 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		

18.3.3 Leak detection procedure

As soon as a leak is detected either as a result of a message on the screen, the remote model icons, or due to observing a fluid leak from the pumphead. The following procedure must be immediately followed

1. Isolate the pump from electrical power
2. Remove the pump from service in accordance with the users organisations procedure
3. Determine the cause of the leak
4. Follow the procedure provided in maintenance to replace the pump head. This procedure includes an inspection for chemical residue.
5. Bring the pump back into service
6. Reconnect electrical power to the pump
7. Reset the leak detection message

⚠ WARNING

Operating the pumphead to the point of failure may result in a flow of chemicals into the pumphead to drive interface area, as a result of aggressive chemicals which are not compatible with the internal pumphead materials.

Chemicals could attack the materials in this area and enter the drive. The internal parts of the drive unit contain Aluminium which may react with some aggressive chemicals to form an explosive gas.

If you are pumping a chemical that may react with Aluminium to form an explosive gas, do not operate the pump to the point of pumphead failure. In addition, you must ensure the chemicals being pumped are chemically compatible with the materials in the pumphead to drive interface area: Drive casework, Drive casework seals, Drive shaft, Drive shaft seal.

In the event of a pumphead failure or a leak detection notification event. Stop the pump, remove from service and follow the pumphead replacement procedure in "17.3 Pumphead maintenance" on page 181.

18.4 Troubleshooting

18.4.1 Pumphead end of life

The pumphead will fail due to :

- Wear – The pumphead 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 rating of the pumphead.
- Chemical incompatibility – being used with chemicals which are incompatible with the pumphead fluid path which are normally wetted in normal use.
- Lubricant leak - The pump has been tilted with the pumphead fitted beyond 20 degrees.

18.4.2 Flowrate

The flowrate of the pump is dependent on :

- **Inlet** and **discharge** pressure
- Speed of the pump
- Viscosity of the fluid
- Condition of pumphead

Actual flow rates achieved may vary to those displayed on the screen because of changes in temperature, viscosity, **inlet** and **discharge** pressures, system configuration and pumphead performance against time.

For the highest accuracy it is advisable to calibrate the pump on a regular basis.

To determine the cause of the flowrate problem refer to the performance curves in "20.1 Performance" on page 212 and determine where on the curve the pump is operating to determine the cause of the problem.

18.4.3 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.

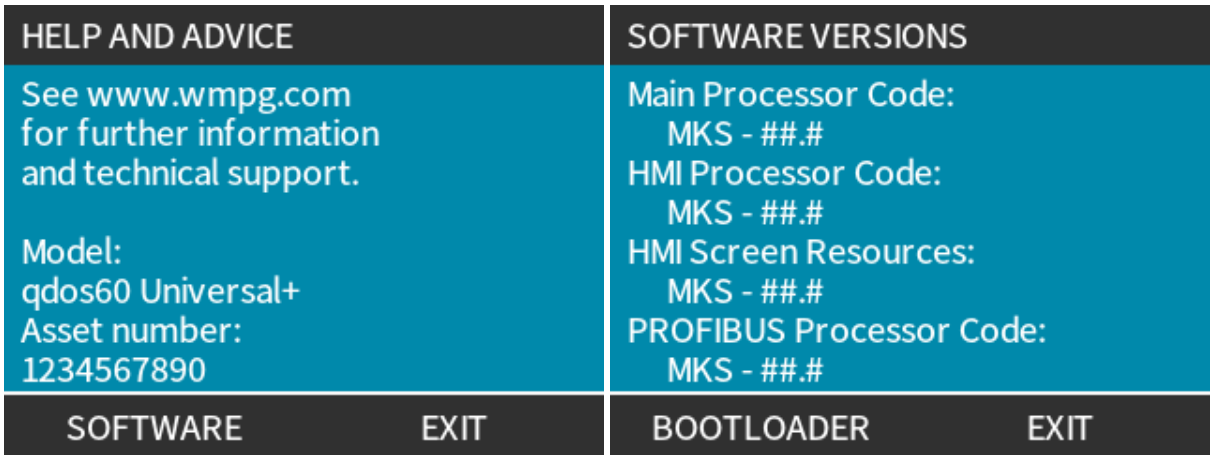
If the message constantly repeats after several pumphead installations, then there may be a leak detection sensor failure. Please contact your local Watson-Marlow representative to determine further leak detection troubleshooting or repair.

18.4.4 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.



18.5 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.

18.5.1 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

Phone: +44 1326 370370

Website: https://www.wmfts.com/

18.6 Warranty

Watson-Marlow Limited ("Watson-Marlow") warrants this product to be free from defects in materials and workmanship for three years from the date of shipment, under normal use and service.

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.

18.6.1 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.

18.6.2 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.

18.7 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.

19 Chemical compatibility

19.1 Chemical compatibility overview

Ensuring chemical compatibility is a key requirement in determining if the pumped fluid and the chemical environment the pump is operating in, is within scope of the **intended use** of the product.

Chemical compatibility analysis is based on which materials of construction would be in contact (wetted) with the fluid or environment, as represented by the 3 scenarios in this table

Scenario 1	Scenario 2	Scenario 3
Fluid Path (wetted by the pumped fluid in normal use)	Potential of being wetted due to environment or spillage	Potential of being wetted due to operating the pumphead to the point of failure
These materials of construction will come into contact with the process fluid during intended use	These materials of construction could become wetted due to a chemical spillage, cleaning or the environment the pump is operating in	These materials of construction will come into contact if the pumphead is operated to the point of failure
Pumphead: Fluid path • Internal tube or element • Pumphead ports • Pumphead port seals • Process: Fluid path • Pumphead hydraulic connections • Interface tubing	Drive: • Casework • Casework seals • Keypad • Driveshaft (55) • Driveshaft seals (55) Pumphead: • Casework • Pumphead ports • Connection collars	Pumphead: • Internal parts Pumphead to drive interface area (56) : • Drive shaft • Drive shaft seals • Drive casework • Drive casework seals

NOTE55	The pumphead is not sealed to the drive. The air of the environment in which the pump is operating can circulate between the pumphead and the drive (pumphead to drive interface area).

NOTE56	If the pumphead is operated to the point of failure and the pumphead internals are not chemically compatible with the pumped fluid, then the materials of construction in the pumphead to drive interface area will be exposed to the pumped fluid.

19.2 How to check chemical compatibility

Follow the individual procedures to check chemical compatibility for each of the 3 scenarios:

19.2.1 Scenario 1: Fluid Path (wetted by the pumped fluid in normal use)

Check the chemical compatibility of scenario 1: Fluid Path (wetted by the pumped fluid in normal use) using this procedure:

Procedure

1. Navigate to

   https://www.wmfts.com/en/support/chemical-compatibility-guide/

2. Read the information on the page
3. Search for the fluid or select from the list
4. Check the fluid is compatible using steps 5 to 7 below:

5. Check the Materials of construction of the pumphead: Fluid path	The Watson-Marlow chemical compatibility guide provides a combined check [57] of the three items of the pumphead: fluid path • Tube or fluid contacting element inside the pumphead • Pumphead ports • The pre-installed pumphead port seals For qdos 30 models this is based on FKM - Where EPDM seals are to be used instead, EPDM must be checked for compatibility instead.

NOTE57	The combined check may be verified using the individual materials of construction pumphead: fluid path table provided after this procedure ("19.2.1.1 Materials of construction - Pumphead: Fluid path" on page 206).

Procedure

6. Check the materials of construction of the Watson-Marlow hydraulic connectors.	Watson-Marlow Hydraulic connectors are available in Polypropylene or PVDF. Using the chemical compatibility guide choose a connection material which is both compatible and available in the size required with the pumped fluid.

Availability for Use: Hydraulic Connection Pack			Qdos 20	Qdos 30	Qdos 60	Qdos 120	Qdos CWT
Material	Fitting	Sizes					
Polypropylene	Metric compression fittings	Set of four sizes: 6.3x11.5 mm, 10x16 mm, 9x12 mm, 5x8 mm	✓	✓	✓	✓	✓
	barb/threaded fittings	1/4” hose barb, 3/8” hose barb, 1/4” BSP, 1/4” NPT	✓	✓	✓	✓	✓
	threaded fittings	1/2” BSP	✓		✓	✓	✓
	threaded fittings	1/2” NPT	✓		✓	✓	✓
	Hose barb	1/2” hose barb	✓	✓	✓	✓	✓
PVDF	Imperial compression fittings	Set of 2 sizes (1/4” x 3/8” and 3/8” x 1/2”)	✓	✓	✓	✓	✓
	barb/threaded fittings	1/4” hose barb, 3/8” hose barb, 1/4” BSP, 1/4” NPT	✓	✓	✓	✓	✓
	threaded fittings	1/2” BSP	✓		✓	✓	✓
	threaded fittings	1/2” NPT	✓		✓	✓	✓
	Hose barb	1/2” hose barb	✓	✓	✓	✓	✓

Procedure

7. Check the materials of construction of the interface tubing.

Watson-Marlow interface tubing is available in the following sizes for use with the Watson-Marlow metric hydraulic compression fittings only :

Using the chemical compatibility guide choose an interface material which chemically compatible and available in the size required.

Material	Size	
PVC	6.3x11.5 mm	✓
	10x16 mm	✓
Polyethylene	5x8 mm	✓
	9x12 mm	✓

If not using Watson-Marlow interface tubing, or if using Watson-Marlow imperial compression fittings, consult a chemical compatibility guide for the manufacturer of the interface tubing to be used.

Do not use Watson-Marlow PVDF compression fittings (metric or imperial) for a direct connection to any fluid path PTFE tubing, due to potential slip of the connection.

19.2.1.1 Materials of construction - Pumphead: Fluid path

The combined check in step 5 in the procedure above, may be verified using the Watson-Marlow chemical compatibility guide and the individual items in the table below

Pumphead	Tube or fluid contacting element	Pumphead ports	Fluid connection seals
ReNu 20 SEBS	SEBS	PVDF	SEBS (58)
ReNu 20 PU	TPU	PVDF	TPU (58)
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 (58)
ReNu 60 PU	TPU	PVDF	TPU (58)
ReNu 120 Santoprene	Santoprene	PP	Santoprene
CWT 30 EPDM	EPDM and PEEK	PP	Santoprene

NOTE[58]	Qdos 20 and qdos 60 ReNu Pumpheads manufactured prior to April 2021 will have been supplied with Santoprene moulded seals only.

19.2.2 Scenario 2: Potential of being wetted due to environment or spillage

If the pump will be exposed to chemicals, due to spillage or the environment the pump is operating in (for example corrosive gases), then chemical compatibliity of the materials of construction in" Materials of construction: Potential of being wetted due to environment or spillage" below should be checked for chemical compatibility using standard engineering chemical compatibility guides.

Materials of construction: Potential of being wetted due to environment or spillage					
Component	**qdos 20**	**qdos 30**	**qdos 60**	**qdos 120**	**qdos® CWT™**
Drive					
Drive casework	20 % Glass Filled Polyphenyl ether / PS				
Drive casework seals	Silicone sponge SE515				
Keypad	Polyester				
Drive shaft	Stainless steel 440C				
Drive shaft seals	NBR				
Pumphead					
Pumphead casework	Noryl	PPS	Noryl	Noryl	PPS
Pumphead ports	SEBS: PVDF PU: PVDF	SEBS: PP Santoprene: PP	SEBS: PVDF PU: PVDF Santoprene: PP	Santoprene: PP	EPDM: PP FKM: PP
Connection collars	PP				

⚠ WARNING

Chemicals could enter the pump as a result of spillage or the environment the pump is operating in, due to loss of ingress protection by chemicals which are incompatible with the Drive casework, Drive casework seals, Keypad, Drive shaft or Drive shaft seal provided in "19.2.2 Scenario 2: Potential of being wetted due to environment or spillage" above.

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, you must ensure the chemicals being pumped and the environment are chemically compatible with the Drive casework, Drive casework seals, Keypad, Drive shaft or Drive shaft seal provided in "19.2.2 Scenario 2: Potential of being wetted due to environment or spillage" above.

19.2.3 Scenario 3: Potential of being wetted due to operating the pumphead to the point of failure

If there is risk in a users organisation that the pumphead would be operated to the point of failure, or if the point of pumphead failure cannot be monitored, then a check of chemical compatibility of the materiasls in "19.2.3.1 Materials of construction that have the potential of being wetted when the tube or fluid contacting element fails" on the next page should be undertaken using standard engineering chemical compatibility guides.

19.2.3.1 Materials of construction that have the potential of being wetted when the tube or fluid contacting element fails

	Pump				
Component	**qdos 20**	**qdos 30**	**qdos 60**	**qdos 120**	**qdos® CWT™**
Pumphead					
Pumphead enclosure	30 % GF Polyphenyl ether+PS PC PP 316 stainless steel	40 % GF PPS 20 % GF PP PC PA6 316 stainless steel	30 % GF Polyphenyl ether+PS PC PP 316 stainless steel		40 % GF PPS
Pumphead enclosure seals	NBR	NBR	NBR		EPDM, NBR
Rotor	PA6	PA6	PA6		303 stainless steel
Leak detection window	PC				
Bearings	Steel				
Clamp ring	—				30 % GF PP
Internal baffle	POM	—	POM		—
Vent body	30 % GF Polyphenyl ether+PS	PP POM	30 % GF Polyphenyl ether+PS		—
Vent springs	316 stainless steel	316 stainless steel steel	316 stainless steel steel		—
Lubricant	PFPE	PFPE	PFPE		PFPE
Pumphead to drive interface area (59)					
Drive casework	20 % Glass Filled Polyphenyl ether / PS				
Drive casework seals	Silicone sponge SE515				
Keypad	Polyester				
Drive shaft	Stainless steel 440C				
Drive shaft seals	NBR				
Gearbox spigot cover	Noryl				
Drive internal parts	Aluminium (59)				

NOTE[59]	The materials of construction in the pumphead to drive interface area would only be wetted by the fluid in the event of operating the pumphead to the point of failure, and the fluid being incompatible with the pumphead internals in "19.2.3.1 Materials of construction that have the potential of being wetted when the tube or fluid contacting element fails" on the previous page, under a positive pressure on the **inlet** side of the pumphead.

NOTE[60]	The drive internal parts contain Aluminium. Some aggressive chemicals can react with Aluminium to produce an explosive gas.

⚠ 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 "17 Maintenance" on page 176.

20 Product specification and equipment ratings

20.1 Performance

20.1.1 Maximum speed and flowrate

The maximum speed and flowrate is provided in the table below.

		Model: (Manual, PROFIBUS, Universal, Universal+)			Model: Remote		
		Speed	Flowrate 1		Speed	Flowrate 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[61]	Flowrates 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.

20.1.2 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)			

20.1.3 Pressure

20.1.3.1 Maximum discharge pressure

		Maximum Discharge Pressure (62)	
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	7	100
	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

NOTE62	Discharge pressure is the maximum pressure at the pumphead **discharge** head port that the pump can provide a flowrate against. Pressure is measured as RMS (Root Mean Squared) gauge pressure.

20.1.3.1.1 Pressure: limits of operation

All models: Maximum **inlet** pressure: 2 bar

A qdos30 can be operated at **discharge** pressures of up to 10 bar (145 psi), however flow rate and pumphead life will be affected

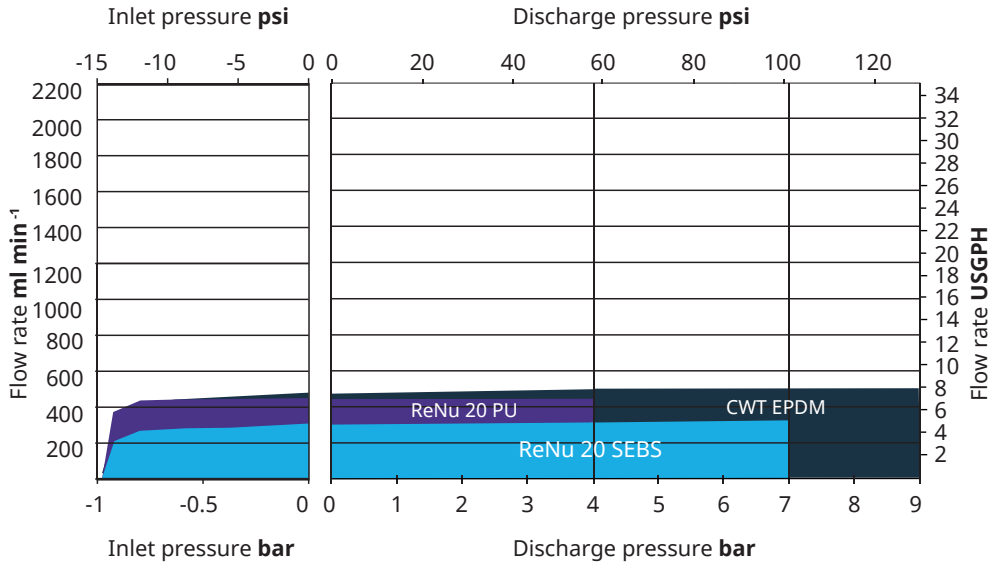
20.1.4 Performance curves

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.

20.1.4.1 Qdos 20

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

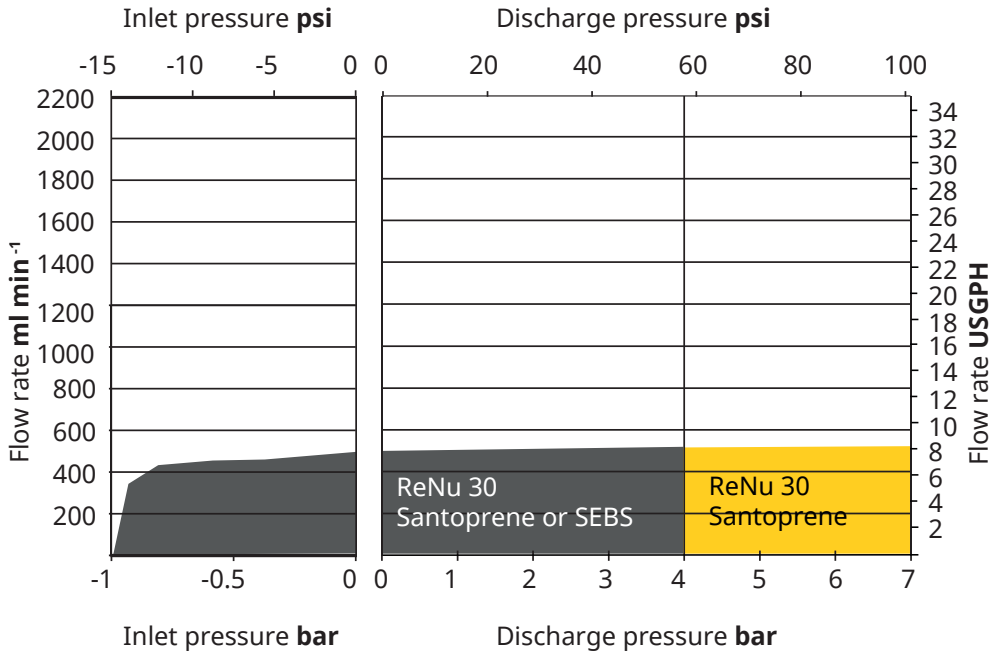
Fluid: Water at 20 °C



20.1.4.2 Qdos 30

Performance curve speed: 125 rpm

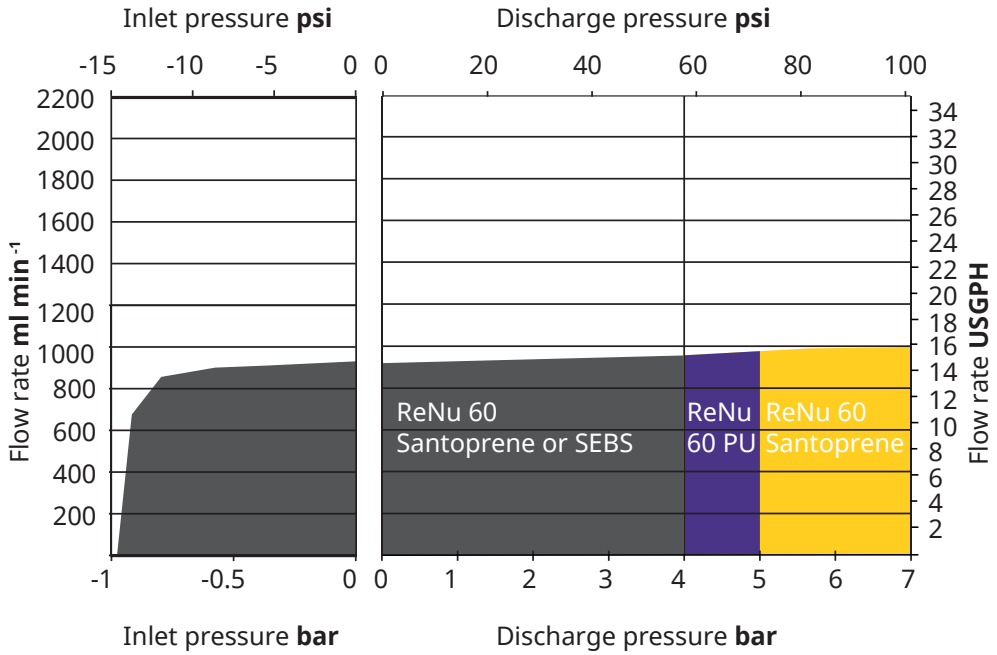
Fluid: Water at 20 °C



20.1.4.3 Qdos 60

Performance curve pump speed: 125 rpm

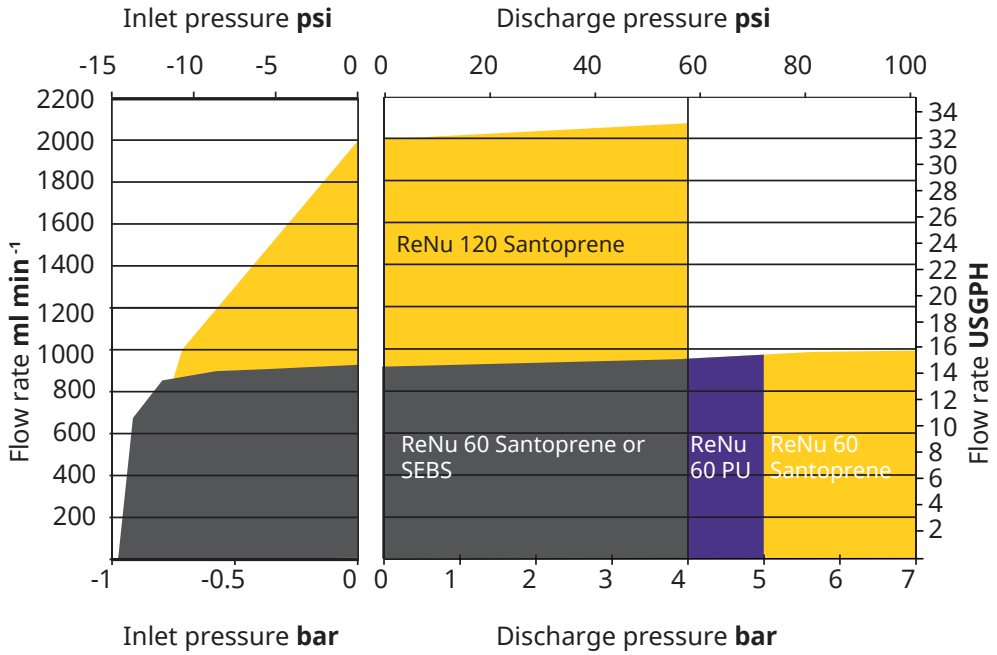
Fluid: Water at 20 °C



20.1.4.4 qdos 120

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

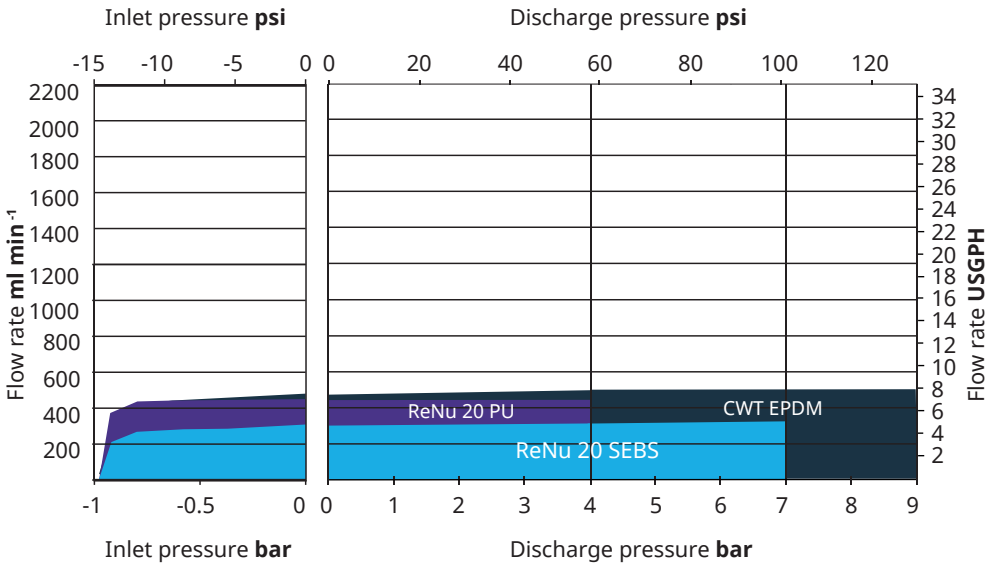
Fluid: Water at 20 °C



20.1.4.5 CWT

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

Fluid: Water at 20 °C



20.2 Environmental and operating conditions

20.2.1 Environmental and operating conditions

The pump is designed for use in the following environment and operating conditions:

Ambient temperature range	4 °C to 45 °C (39.2 °F to 113 °F)
Humidity (non-condensing)	80 % up to 31 °C (88 °F), decreasing linearly to 50 % at 40 °C (104 °F)
Maximum altitude	2,000 m, (6,560 ft)
Pollution degree of the intended environment	2 (64)
Noise	<70 dB(A) at 1 m
Maximum fluid temperature (63)	SEBS pumpheads: 40 °C (104 °F) Santoprene pumpheads: 45 °C (113 °F) PU pumpheads: 45 °C (113 °F)
Environment	Indoor and limited outdoor (64)

NOTE63	Chemical compatibility is dependent on temperature. A procedure for checking chemical compatibility is provided in "19 Chemical compatibility" on page 202.

NOTE64	Under certain conditions the pump is suitable for limited outdoor use. Contact your Watson-Marlow representative for advice.

NOTE65	Protection of drive to NEMA 250 with the HMI cover (optional accessory) installed.

20.3 Ingress protection (IP Rating)

Enclosure rating	IP66 to BS EN 60529 Meets the requirements of NEMA 4X to NEMA 250 (66)

NOTE66	NEMA 250 Requires the fitting of the HMI protective cover.

20.4 Power specification and ratings

20.4.1 Alternating Current (AC) models

AC Supply voltage/frequency	~100-240 V 50/60 Hz
overvoltage category	II
Maximum voltage fluctuation	±10 % of nominal voltage
AC Power consumption	190 VA

20.4.2 Direct Current (DC) models

	DC (Direct Current)
Supply voltage	12-24 V DC
Power consumption	130 W (12V DC) 180 W (24V DC)

20.4.3 Direct Current (DC) models

20.4.3.1 DC power supply option - 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 rated input current		15.2		A	At 10.5V/130W
Maximum rated 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 rated input power			200	W	qdos 20, 30, 60, 120, CWT

20.5 Limits of intermittent operation

For applications that require the pump to be started and stopped regularly, ANALOGUE, 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.

20.5.1 Power cycles per hour

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

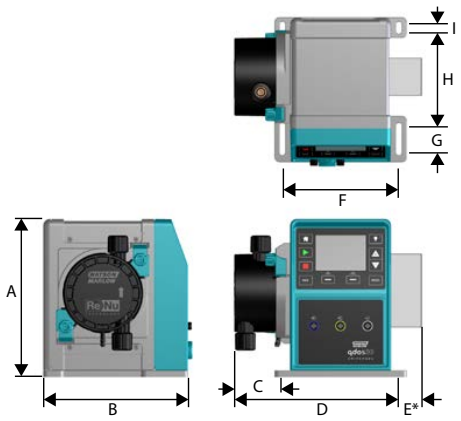
NOTICE

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.

20.6 Start up defaults

First-time start-up 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™: 4.9 ml/rev	Flow unit	ml/min
Backlight	30 minutes	Pump tag	WATSON-MARLOW
Auto restart	Off		

20.7 Dimensions



Dimensions					
Dimension	**qdos 20** [67]	**qdos 30**	**qdos 60**	**qdos 120**	**qdos CWT** [68]
A	234 mm (9.2")	234 mm (9.2")	234 mm (9.2")	234 mm (9.2")	234 mm (9.2")
B	214 mm (8.4")	214 mm (8.4")	214 mm (8.4")	214 mm (8.4")	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*—Optional relay modules	43 mm (1.7")	43 mm (1.7")	43 mm (1.7")	43 mm (1.7")	43 mm (1.7")
F	173 mm (6.8")	173 mm (6.8")	173 mm (6.8")	173 mm (6.8")	173 mm (6.8")
G	40 mm (1.6")	40 mm (1.6")	40 mm (1.6")	40 mm (1.6")	40 mm (1.6")
H	140 mm (5.5")	140 mm (5.5")	140 mm (5.5")	140 mm (5.5")	140 mm (5.5")
I	10 mm (0.4")	10 mm (0.4")	10 mm (0.4")	10 mm (0.4")	10 mm (0.4")

NOTE67	With a ReNu 20 pumphead fitted.

NOTE68	With a CWT pumphead fitted.

20.8 Weight

20.8.1 qdos 30

Weights - qdos 30				
Model	Drive		Drive with pumphead	
	kg	lb	kg	lb
Manual	4.1	9 lb	5.05	11 lb 2 oz
Remote	4.0	8 lb 13 oz	4.95	10 lb 15 oz
Universal	4.1	9 lb	5.05	11 lb 2 oz
Universal+	4.1	9 lb	5.05	11 lb 2 oz
PROFIBUS	4.1	9 lb	5.05	11 lb 2 oz
Universal 24V relay	4.3	9 lb 8 oz	5.25	11 lb 9 oz
Universal+ 24V relay	4.3	9 lb 8 oz	5.25	11 lb 9 oz
Universal 110V relay	4.3	9 lb 8 oz	5.25	11 lb 9 oz
Universal+ 110V relay	4.3	9 lb 8 oz	5.25	11 lb 9 oz

20.8.2 qdos 20, 60 and 120 fitted with ReNu pumpheads

Weights - qdos 20, 60 and 120				
Model	Drive		Drive with pumphead	
	kg	lb	kg	lb
Manual	4.6	10 lb 2 oz	5.7	12 lb 9 oz
Remote	4.5	9 lb 15 oz	5.6	12 lb 6 oz
Universal	4.6	10 lb 2 oz	5.7	12 lb 9 oz
Universal+	4.6	10 lb 2 oz	5.7	12 lb 9 oz
PROFIBUS	4.6	10 lb 2 oz	5.7	12 lb 9 oz
Universal 24 V relay	4.8	10 lb 9 oz	5.9	13 lb 0 oz
Universal+ 24 V relay	4.8	10 lb 9 oz	5.9	13 lb 0 oz
Universal 110 V relay	4.8	10 lb 9 oz	5.9	13 lb 0 oz
Universal+ 110 V relay	4.8	10 lb 9 oz	5.9	13 lb 0 oz

20.8.3 qdos CWT fitted with CWT pumphead

Weights - qdos® CWT™				
Model	Drive		Drive with pumphead	
	kg	lb	kg	lb
Manual	4.6	10 lb 2 oz	6.8	15 lb 0 oz
Remote	4.5	9 lb 15 oz	6.7	14 lb 13 oz
Universal	4.6	10 lb 2 oz	6.8	15 lb 0 oz
Universal+	4.6	10 lb 2 oz	6.8	15 lb 0 oz
PROFIBUS	4.6	10 lb 2 oz	6.8	15 lb 0 oz
Universal 24V relay	4.8	10 lb 9 oz	7	15 lb 7 oz
Universal+ 24V relay	4.8	10 lb 9 oz	7	15 lb 7 oz
Universal 110V relay	4.8	10 lb 9 oz	7	15 lb 7 oz
Universal+ 110V relay	4.8	10 lb 9 oz	7	15 lb 7 oz

21 Compliance and certification

21.1 Compliance markings on the product

All markings are listed, however some may apply only to some models.

CE	Complies with the applicable EC directives	UKCA	Complies with the applicable UK regulations
	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		C-Tick - device is compliant with applicable electromagnetic compatibility (EMC) requirements
	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 conform to the requirements of NSF 61		

21.2 Standards

21.2.1 Standards (AC mains power supply)

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
	EN61326-1:2013 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
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

21.2.2 Standards (12-24 V DC power supply)

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
	EN61326-1:2006 Electrical Equipment for measurement control and laboratory use EMC requirements Part 1
Other Standards	UL 61010-1
	CAN/CSA-C22.2 No 61010-1
	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
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

21.3 Product certification

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,
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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

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

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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

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.

22 List of tables and figures

22.1 List of tables

22.2 List of figures

23 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

H

Hazard

I

Inlet

The line, pipe or connection containing fluid flowing into the pumphead

Intended use

The use of machinery in accordance with the information provided in the instructions for use;

M

Maintenance

Personnel responsible for maintenance, servicing, performance monitoring or troubleshooting of the product

O

Operator

Person operating the product for its intended use.

P

Peristaltic tubing

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

Individual designated by the users organisation, responsible for the installation, safe use and maintenance of the product.

Run dry

running with gas in the pumphead

S

Signals