MANUAL

Duraflex Closed Loop Smart Refill Unit

INSTALLATION, COMMISSIONING & OPERATION MANUAL

ARUS300, ARUS550, ARUS300DP, ARUS550DP
ARUS300HLI, ARUS550HLI, ARUS300DPHLI, ARUS550DPHLI

FlowQuip
Piped Equipment Specialties

Table of Contents

1. Introduction

Thankyou forchoosingto install an Duraflex Smart Refill automatic pressurisation and backflow prevention unit. Please read and follow these instructions carefully to ensure system is installed and set up correctly.

Application Overview

The Duraflex Smart Refill Automatic Pressurisation Unit is designed to provide a safe means of adding water to a commercial or industrial heating or cooling circulating water system. The Duraflex Smart Refill provides a physical air-break in the water feed and fully complies with AS 3500.1, Back-flow prevention design requirements.

The Duraflex Smart Refill is designed to maintain correct system water pressure. Minor system pressure losses are common, and may be due to slight leaks, air venting, etc. The Duraflex Smart Refill continuously monitors the circulating water pressure and triggers a re-pressurization cycle if pressure drops below a low set point. Water is added until system pressure reaches normal operating level.

The Duraflex Smart Refill features an active water loss monitoring function. Water volume added is recorded, and a message is displayed, showing the average water loss per day.

Duraflex Smart Models Refill and Specifications

This manual covers the following Duraflex Smart models:

Model Number	Nom press. kPa	Max height M *	No. floors **	Flow L/min	Pumps	Pump power kW	Supply volt	Run current	Power supply	Inlet / Outlet fittings	Min/Max w /press kPa	0-volt alarm relays	RJ485 BMS
ARUS300	320	18	5	12	Single	0.37	240	2.2	10A GPO	15mm M	120 -750	Std	N/A
ARUS550	500	36	10	16	Single	0.55	240	6.2	10A GPO	15mm M	120 -750	Std	N/A
ARUS300DP	320	18	5	12	Dual	0.37^	240	2.2	10A GPO	15mm M	120 -750	Std	N/A
ARUS550DP	500	36	10	16	Dual	0.55^	240	6.2	10A GPO	15mm M	120 -750	Std	N/A
ARUS300HLI	320	18	5	12	Single	0.37	240	2.2	10A GPO	15mm M	120 -750	Std	Std
ARUS550HLI	500	36	10	16	Single	0.55	240	6.2	10A GPO	15mm M	120 -750	Std	Std
ARUS300DPHLI	320	18	5	12	Dual	0.37^	240	2.2	10A GPO	15mm M	120 -750	Std	Std
ARUS550DPHLI	500	36	10	16	Dual	0.55^	240	6.2	10A GPO	15mm M	120 -750	Std	Std

* Maximum system height is vertical distance between the boiler/chiller plant and the highest point of the circulating system.

** Maximum number of floors allowed above plant.

^ Dual pump models – only a single pump runs at any time. Pumps alternate at each fill cycle.

Correct Model Selection

Static height

Static height is the vertical rise height in meters, measured between the outlet of the Duraflex Smart Refill and the highest point in the circulating pipework. There would typically be an air bleed valve at this point. The static height of the system sets the required system operating pressure. Each 10M of static system height requires an extra 100 kPa added to the operating pressure to overcome the pressure required to lift circulating water to the highest point. 300 series models are suitable for up to 18M vertical height or 5 floors. The larger 550 series models are suitable for up to 36M vertical height or 10 floors.

A simple way to determine the system static height is to count the number of floor levels the plant is serving and multiply this by 3.5. This value is entered into the Duraflex electronic program during system set up.

Dual pump models

Dual pump Duraflex Smart Refill models provide the assurance of having a duty/standby back-up in the case of pump failure. A single pump operates during a system refill cycle.

Pump selection alternates with each pump start, to provide even wear and to ensure both pumps are operational. Should a fault be detected in one of the pumps, a warning alarm is raised, and the faulty pump is locked out. Operation continues with the functional pump only.

No-volt alarm relays

Each Duraflex Smart Refill unit incorporates 3 no-volt relays designed to switch an external control signal in the event of a system fault. Installer can program relays to be normally open / close on alarm or normally closed / open on alarm.

NOTE: Maximum switching voltage across relays is 24V. Do not connect to a 240V switching circuit.

As supplied, relay functions are as follows:

Relay 1: High system pressure alarm

Relay 2: Low system pressure alarm

Relay 3: General unit alarm – includes excessive system water usage, pump over current, no water flow.

High Level Interface / BMS capable

HLI models incorporate an electronic control system with an RJ485 connection which allows the Duraflex Smart Refill to be connected to a building BMS system using industry standard MODBUS interface. HLI system allows building managers to remotely monitor system performance including, average daily water loss, total volume of water added, current system pressure, pump run hours etc.

Warnings

Please read the following installation details carefully as they are intended to ensure that this product is set up correctly and performs to optimal levels. A system correctly set up and properly maintained, will provide a long and trouble-free service life. Failure to install the unit in accordance with the installation instructions may result in equipment damage or faulty operation which may not be covered under warranty conditions. The following must be observed:

- The Duraflex Smart Refill must be installed in accordance with local plumbing and electrical requirements.
- Non-return valves, pressure reducing valves and RPZ valves must not be installed between the Duraflex Smart Refill and the heating/cooling system. These devices will cause operational failure of the unit.
- The Duraflex Smart Refill must not to be used for water pressure boosting applications.
- This product must only supply a single heating / cooling circulating system.
- Install the Duraflex Smart Refill in a dry undercover area, away from elements of the weather. Min / max ambient temperature is 4° to 40°. Installation indoors is preferred and recommended.
- The Duraflex Smart Refill must not be installed in areas subject to direct sunlight as internal components may degrade prematurely due to overheating.
- Do not install in areas where ambient temperatures may drop below 4°C. Water may freeze inside internal header tank causing damage.
- The Duraflex Smart Refill must not be installed near storage of flammable liquids or corrosive substances.
- Do not install in coastal areas subject to sea spray.
- Do not install in areas subject to dust or moisture. Do not allow dirt or debris to accumulate on the
- metalwork housing.

Storage

If this product is not to be installed immediately on receipt, ensure that it is stored in its original packaging in a dry environment away from extreme hot or cold ambient temperatures.

2. Installation and System Requirements

Unpacking

Before unpacking the Duraflex Smart Refill, check external packaging for any signs of damage. If damage is evident, please photograph and email with a report to: sales@flowquip.co.nz

When unpacking the Duraflex Smart Refill, identify that the following items are present.

- Duraflex Smart Refill unit
- Wall mount bracket - supplied loose.
- 10 x fixing screws - 8g x 25mm needle point self-tapper.
- Cabinet key - cable tied to unit mains power cord.
- Installation, commissioning and operation instructions.

Observe Minimum Distance Requirements Around The Unit

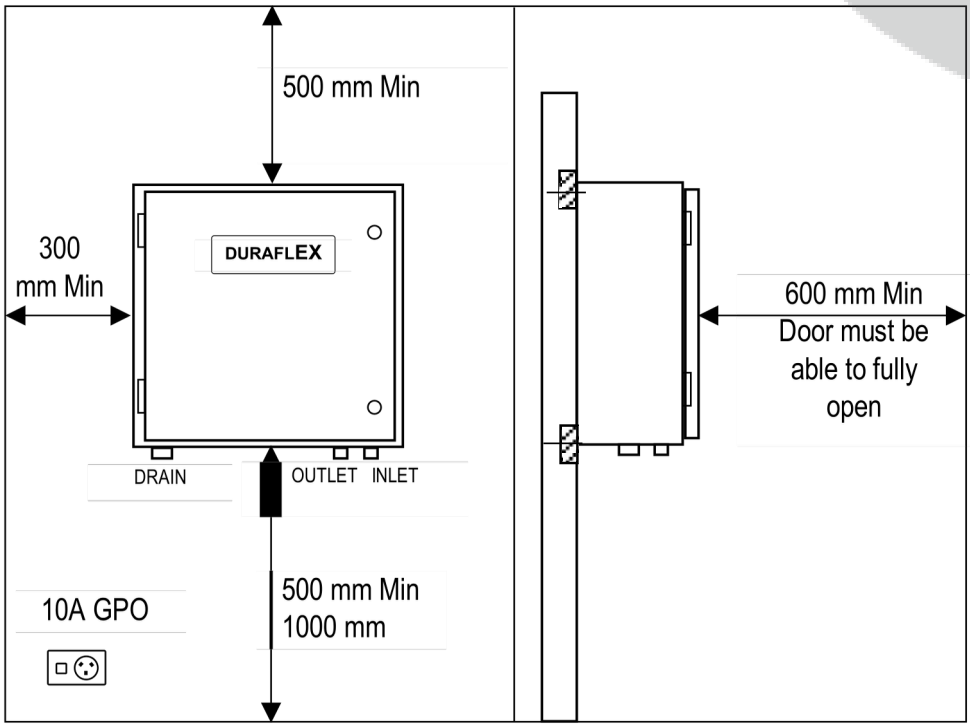


Diagram 1. Clearances required around Duraflex Smart Refill Unit

WATER SUPPLY

An external 15mm water isolation shutoff valve is required with a water pressure of 120 – 750 kPa.

NOTE: If a bypass hose is to be used for the system fill, then a pressure limiting valve must be installed inline, set at or below the maximum system design pressure.

ELECTRICAL SUPPLY

The Duraflex Smart Refill is supplied with a 1.2M flex cord and 10A plug. A 10A GPO is required.

D RAI NAG E

The inbuilt header tank incorporates a 40mm PVC overflow drain. Drainage connections are to be in accordance with local authority requirements.

3. Installing the Duraflex Smart Refill

Mounting The Duraflex Smart Refill Module

- The Duraflex Smart Refill must be installed vertically with water and drain connections located at the base of the module. The Duraflex Smart Refill will not operate if installed in any other orientation.
- The Duraflex Smart Refill is designed to be fixed to a wall. Ensure wall construction is sufficiently strong to support the weight of an operating system with a full water tank. Weight of an operating unit is between 32 and 38 Kg depending on the model. Install trimming noggins as required to provide fixing for mounting screws. Refer to Diagram 2.
- The Duraflex Smart Refill must be installed with side panels plumb and top panel level.

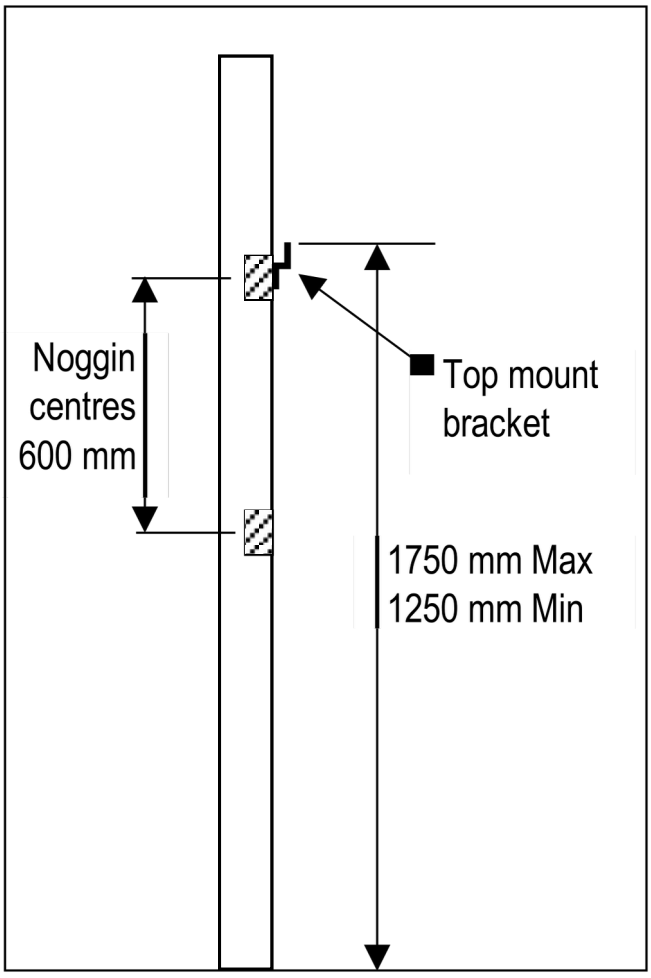


Diagram 2. Mounting support bracket

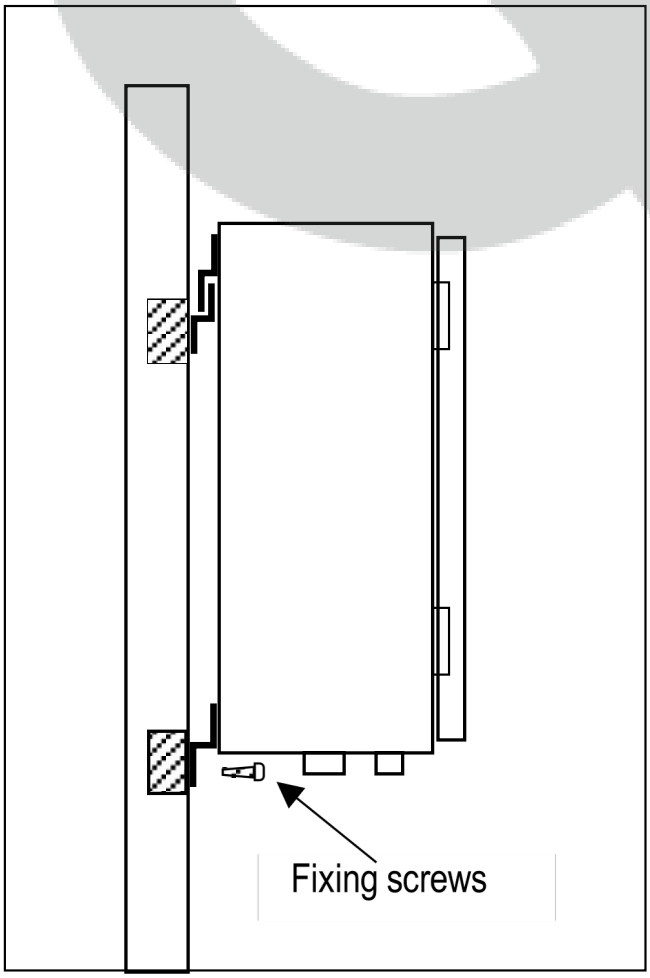


Diagram 3. Lift module onto wall bracket

Mount wall bracket

Screw support bracket to wall. Bracket must be installed level. Ensure bracket projecting lip is facing upwards. Refer to Diagram 2 & 3.

Lift Duraflex Smart Refill onto wall bracket

Lift Duraflex Smart Refill module and hook upper rear bracket onto the wall bracket. Refer to Diagram 3.

Allow wall bracket to hold the weight of the module. Fit retaining screws through bottom unit bracket into the wall.

4. Connect water supply, drainage, and feed to circulating circuit

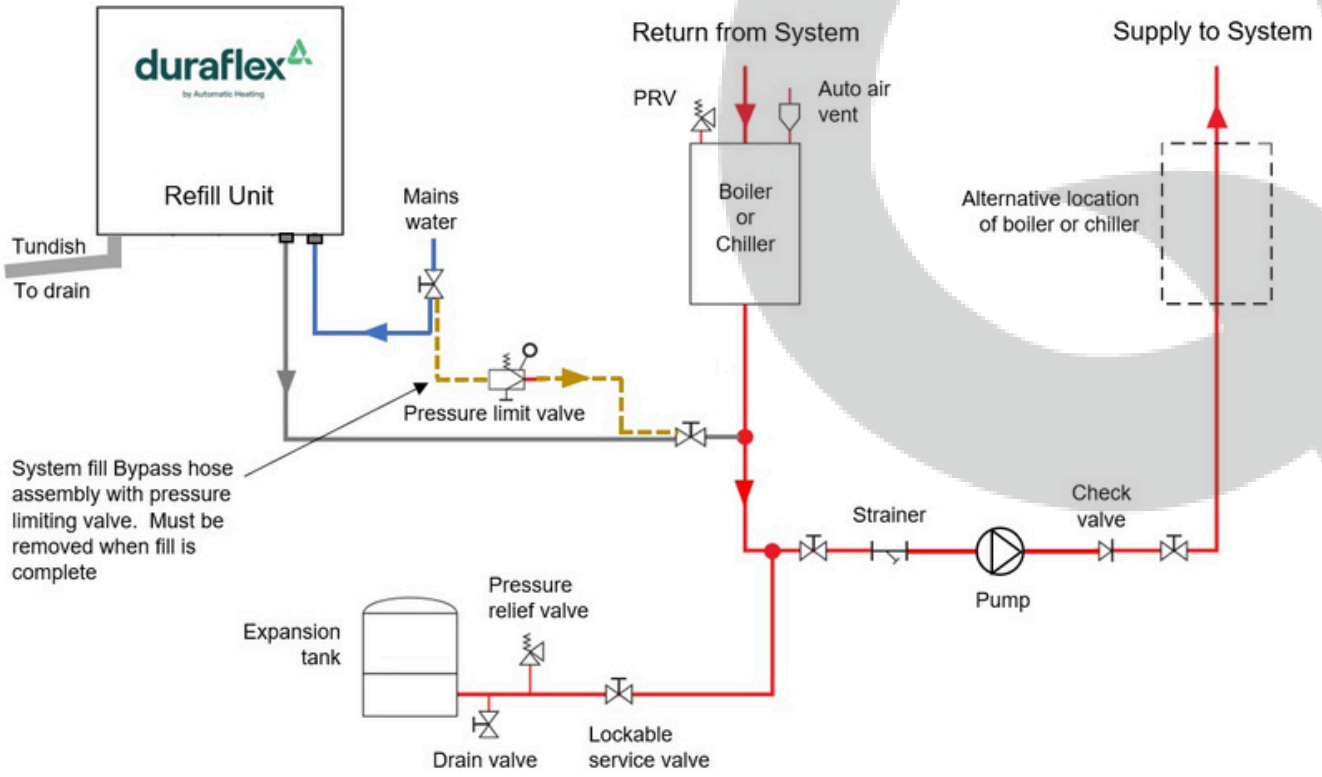


Diagram 4. Typical pipework connection to Duraflex Smart Refill

CONNECTION PIPE SIZING

For satisfactory system pressure measurement, connecting pipework flow resistance should be kept to a minimum.

Incoming mains water feed pipework: ARUS 300 models: 20 mm copper preferred.
15 mm copper may be used if water pressure is greater than 250 kPa.
ARUS 550 models: 20 mm copper.

Feed pipework from Refill Unit to system: All models: 20 mm copper minimum.
Do not use flexible hose couplings.

IMPORTANT NOTES RE INSTALLATION

- Feed from the Duraflex Smart Refill to circulating system must be located before the suction end of the circulating pump. The Duraflex Smart Refill will not read system pressure correctly if connection point is incorrect.
- For satisfactory system operation, the expansion tank sizing and charge pressure must be set correctly.
  The Duraflex Smart Refill controller will automatically calculate the correct expansion tank sizing and charge pressure. Installer must confirm the settings are correct.

5. System Commissioning

System Operating Pressure - Principles

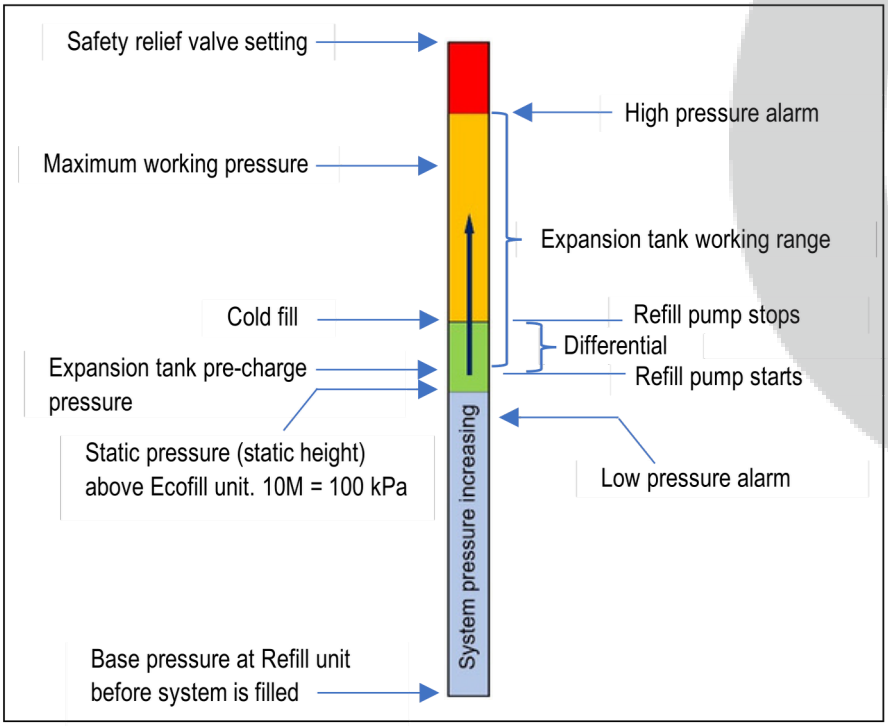


Diagram 5. Graphic depiction of system critical operating pressure points

Duraflex Smart Refill Automatic Operating Parameter Set-Up

The Duraflex Smart Refill controller features an inbuilt, automatic parameter setting function which accurately calculates and sets the operating pressure set points, alarm trigger points, pump run times etc. The commissioning technician is required to enter some basic system data at the commencement of system set-up and the Duraflex Smart Refill will do the rest.

Notes re filling circulating system

- Mains water supply pipework must be flushed prior to connecting inlet pipe to the Duraflex Smart Refill.
- The Duraflex Smart Refill is designed to be capable of filling a circulating system without the need of a filling bypass hose. Large circulating systems may take a considerable amount of time to fill. The Duraflex Smart Refill has a fill time-out of 24 hours after which filling will stop. Timer can be reset at any time before or after time-out is reached with a single button press. Filling a system using the Duraflex Smart Refill provides safe feed pressure and allows accurate measurement of volume of water added.
- Should a bypass hose be used, a temporary connection is made between the incoming water supply valve and the water feed supply to the system (see diagram 4). A pressure limiting valve must be installed inline to ensure feed water pressure does not exceed safe system working pressure. Bypass hose must be removed after initial fill.

Check header tank float valve operation

1. Open both Internal water service valves.
2. Remove Duraflex Smart Refill top enclosure cover so header tank, float valve and tank overflow can be viewed.
3. Check float arm moves freely and float does not touch sides of tank. Rotate inlet thread slightly to adjust if required.
4. Turn water valve on. Check water flow into header tank.
5. Check float valve shuts off with water level at correct level. Water level should be approx. 100mm from top edge of tank. Refer to Diagram 6.

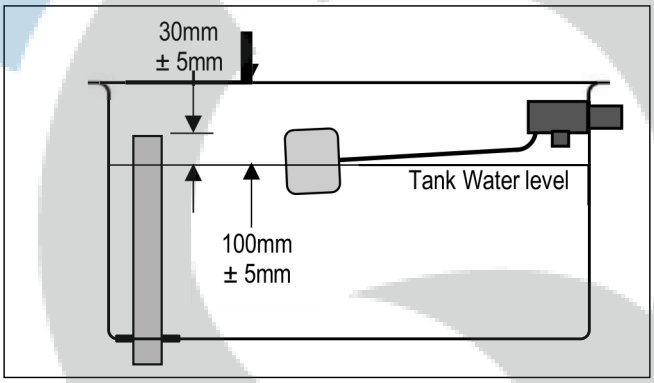
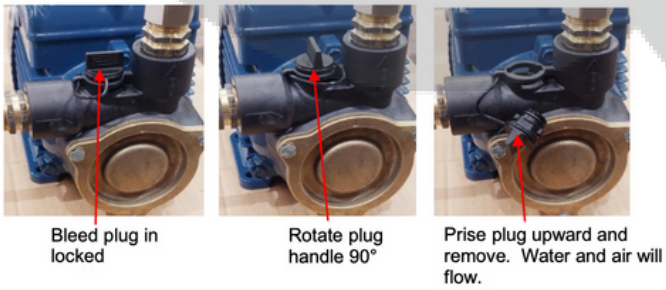


Diagram 6. Correct water level in header tank

Bleed air from pump(s)

- Air must be bled from the pump(s) prior to system fill. See instructions below.
- NOTE: For dual pump systems, both pumps must be bled



Prior to Powering up the Duraflex Smart Refill

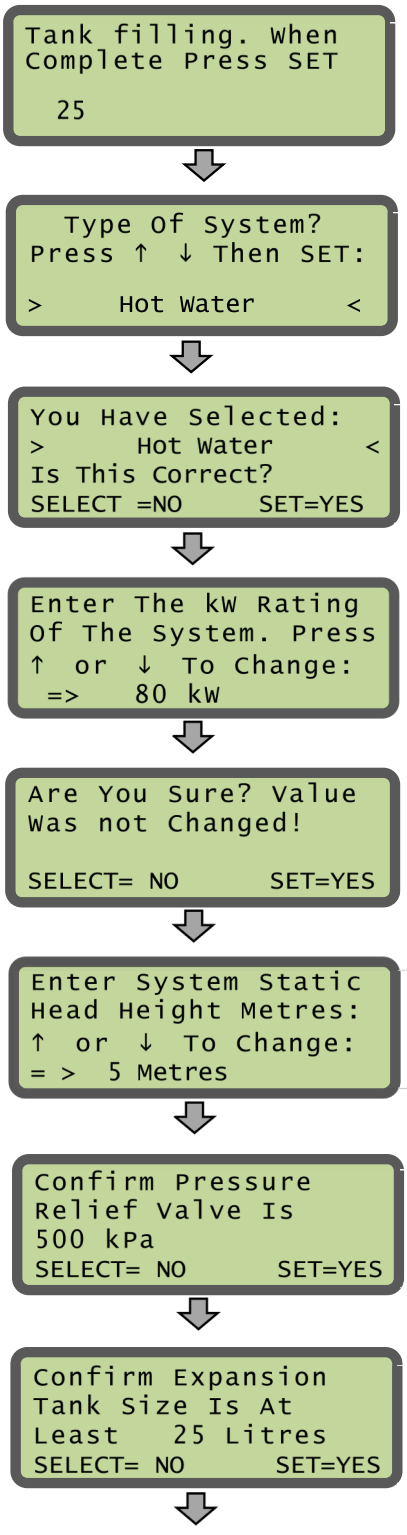
The Duraflex Smart Refill automatic parameter set up program requires the installer to enter certain critical system data. Before beginning the system programming, ensure that you have the following information ready to enter. Record in boxes below.

1. System type – either chilled water, hot water, or condenser water system .....
2. Kilowatt rating of boiler / chiller .....
3. System static height. Count the number of floors above the refill unit. Typically, allow 3.5M per level ..
4. Pressure relief valve rating .....
5. Expansion tank rated volume .....
6. Expansion tank pre-charge pressure .....

6. Programming System Parameters

Turn on power supply

Display screen will show the following messages. Follow steps as indicated.



Number at the bottom of screen counts down to 0. When header tank is full, press SET to advance to next screen.

Installer is asked to enter the system type. 3 choices are offered: Hot Water, Chilled Water, and Condenser. Use up and down arrow buttons to change. Press SET to confirm.

Installer is asked to confirm choice of system type. Press SET to confirm.

IMPORTANT: Ensure correct value is entered.

Installer to enter the kW rating of the system. Press UP or DOWN buttons to change value. Press SET to confirm.

This screen will appear only if kW value was not changed from the default value in previous screen.

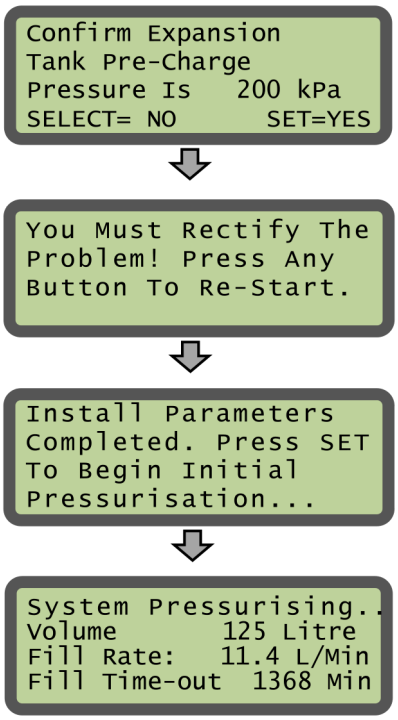
IMPORTANT: Ensure correct value is entered.

Installer to enter system static height in Metres. This the vertical height difference between the heater/chiller and the highest fixture.
Press UP or DOWN buttons to change value. Press SET to confirm.
If value is not changed, the previous screen will be displayed.

Based on the system data already entered, the controller has calculated the system critical pressure set points including the pressure relief valve rating. Installer asked to confirm that PRV with correct setting is installed. Press SET to confirm.

Based on the system data entered, the controller has calculated the correct expansion tank size and charge pressure. Installer asked to confirm that the correct sized expansion tank is installed.

Press SET to confirm.



IMPORTANT: For satisfactory system operation, expansion tank pre-charge pressure must be set correctly.

Calculated pre-charge pressure is displayed. Installer is asked to confirm if installed charge pressure is correct. Refer to section 6.2 for further information regarding expansion tank pre-charging.

If SELECT button is pressed, indicating a NO to question in previous screen, message is displayed.

Message is displayed to indicate all system inputs have been successfully entered and operating parameters have been automatically calculated and set. System is now ready to begin the initial system fill and pressurisation. Press SET to begin.

The Reflex Smart has begun the initial system fill and pressurisation.

System information displayed is described below.

Line 2	Volume	Number of litres fed into system. - Useful for determining volume of additives required.
Line 3	Fill Rate	Flow rate at which water is entering system.
Line 4	Fill Time-out	System fill cycle will time out after 1440 min. (24 hrs) Feed pump stops if system Operating pressure has not reached set point. Press UP arrow button to restart feed pump and reset countdown timer. Counter can be reset at any time.

System pressurisation

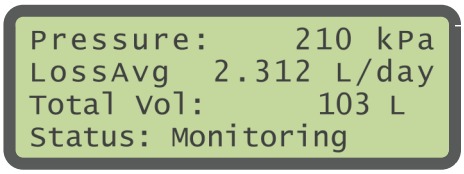
During system pressurization, the STATUS indicator light will flash green slowly.

When system pressure has reached operating set point, Duraflex Smart Refill feed pump is stopped, and a message is displayed:

Press SET to start normal system operation and monitoring mode.

Normal operating display

During normal system operation, the following screen is displayed. STATUS indicator shows green steady.



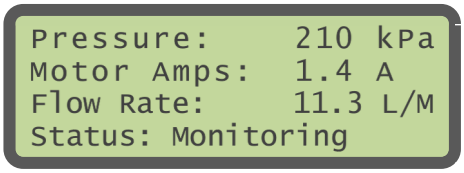
STATUS

Pressur	Current system hydraulic pressure.
e Loss Avg	The calculated volume of water which is being lost from the system each day. Value will not be displayed until next refill cycle is complete.
Total Vol	Total volume of water added to system since counter was last reset
Status	Displays current operating state

Viewing System settings

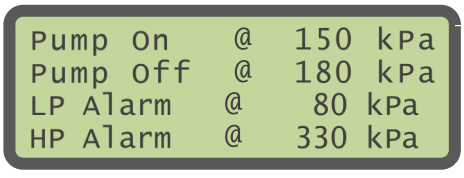
During the set-up procedure, the critical system operating pressure set points are calculated and set into the program. These can be viewed by scrolling through the following screens. Settings can be manually altered if required. See Manually Setting Parameters section below.

Press ▽ button. Display shows:



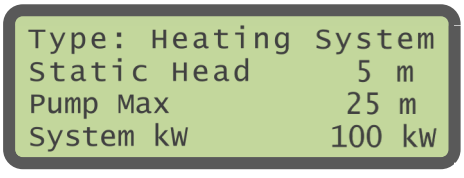
Pressure	Current system hydraulic pressure.
Motor Amps	The running current draw of the pump. When pump is stopped 0.0 A is displayed.
Flow Rate	The current water flow rate being pumped into the system. 0.0 A is displayed when pump stops.
Status	Displays current operating state

Press ▽ button again Display shows:



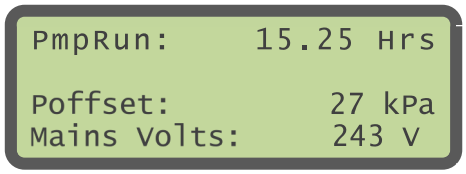
Pump On	Pressure set point when pump is turned on. Value automatically calculated and set.
Pump Off	Pressure set point when pump is turned off. Value automatically calculated and set.
LP Alarm	Pressure set point - low pressure alarm. Value automatically calculated and set.
HP Alarm	Pressure set point - high pressure alarm. Value automatically calculated and set.

Press ▽ button again Display shows:



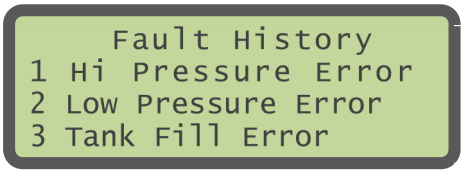
Type	System type. Manually selected during set-up.
Static Head	Value manually entered during set-up.
Pump Max	Maximum static head allowed for pump installed
System kW	Value manually entered during set-up.

Press ▽ button again Display shows:



PmpRun	Total pump run time. For dual pump system – total run time of both pumps.
Poffset	Offset value automatically applied to correct pressure displayed when pump is running.
Mains Volts	Current main power voltage.

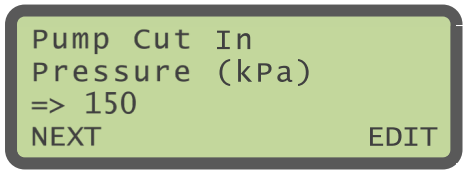
Press ▽ button again Display shows:



Fault History	Log of the three most recent faults recorded.

Manually configurable system parameters

To enter manual editing mode, press SELECT button and hold down for 5 seconds. Display shows:



Pump Cut In Pressure

Current cut in set point setting is displayed.

To manually change setting, press EDIT button.

Press UP or DOWN arrow buttons to increase or decrease setting.

Press NEXT button to accept change and move to next screen.

Each of the following manually editable settings screens are accessed and settings edited in the same way as described above. Screens displayed follow a sequential order. At the end of the sequence, you are asked if you wish to save any changes.

- To enter manual editing mode, press SELECT button and hold down for 5 seconds.
- To advance to the next screen, press NEXT button,
- To edit a screen setting, press SET button, then UP or DOWN arrow buttons to change.
- To save changes and leave Editing Mode, and hold SELECT button down for 5 seconds.

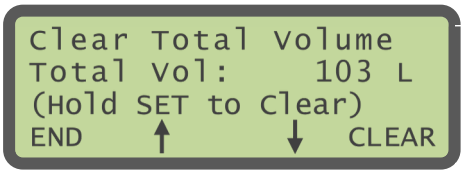
List of parameters

1. Pump cut in pressure
2. Pump cut out pressure
3. Low pressure alarm set point
4. High pressure alarm set point
5. System kW rating
6. System static head height
7. Pump 1 Status
8. Pump 2 Status
9. Manual test operation Pump 1
10. Manual test operation Pump 2
11. Pump 1 Run hours
12. Pump 2 Run Hours
13. Relay 1 Polarity
14. Relay 2 Polarity
15. Relay 3 Polarity
16. Max number of pump start allowed in 24 hours.
17. MODBUS RTU Slave address
18. MODBUS Baud rate
19. Model Number – Not accessible.
20. Factory reset – Not accessible.
21. Save settings instructions

Clearing Fault history log and Total volume record

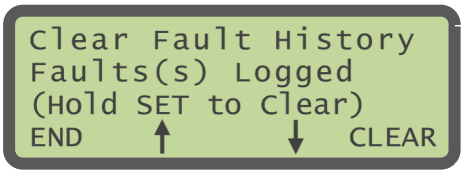
Fault history log and Total volume counter may be cleared if required. Press SET button and hold for 5 seconds.

Display shows:



Press and hold SET button to clear.

Press DOWN arrow button to advance to next screen.



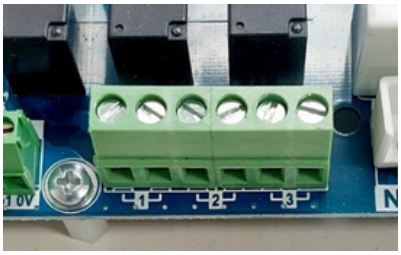
Press and hold SET button to clear.

Press and hold SELECT button to return to home page.

7. Connecting remote alarms and MODBUS

Remote monitoring using 0-volt dry contact relays

The Duraflex Smart Refill controller incorporates 3 x 0-volt dry contact relays. Terminal block is located near the centre of bottom edge of PCB. See below.



1. Before accessing control PCB, power supply to the unit must be disconnected.
2. Remove 6 screws retaining the front panel of controller housing. Swing cover forwards.
3. Identify the 6-way terminal block and note terminal markings. Terminal block is divided into 3 sets of 2 terminals.
4. Connect wiring as shown in Diagram 7. below.

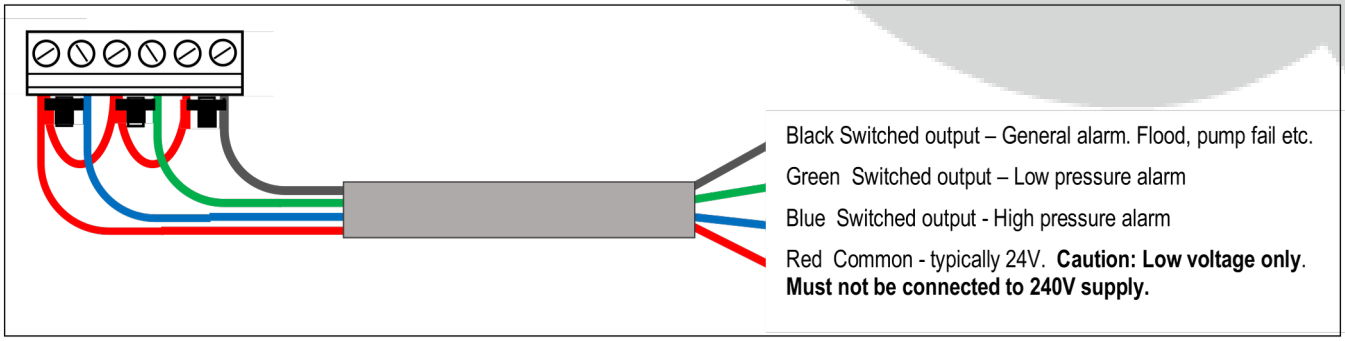


Diagram 7. Typical wiring connection for remote alarms

Relay outputs can be configured as NC-normally closed or NO-normally open. Refer to Manually configurable system parameters. Default setting is normally open.

Remote monitoring via MODBUS

MODBUS cable is connected 3-way terminal block located at bottom LHS of PCB.

Monitoring functions available typically mirror functions accessible through the Duraflex Smart Refill control panel. Refer to 6. Programming System

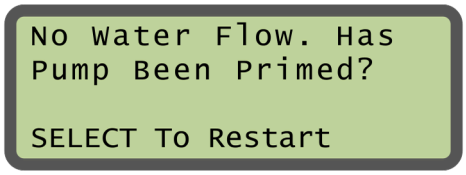
8. System Warnings and Fault Messages

Should anoperational fault occur,theSmartRefill controller will detect the fault condition and respond accordingly. A message will be displayed, defining the fault, and providing helpful suggestions. Certain faults will automatically clear once conditions normalise. Other faults require user intervention. If fault condition has been corrected, the fault flag can be cleared by either pressing SELECT button or switching mains power off and back on.

There are typically 2 classes of faults: Non-critical and critical.

- Non-critical faults will raise a warning alarm, but the system will continue to operate.
- Critical faults will disable the system and raise a warning alarm.

Typical Fault messages



No Pump Flow

Pump has started to run but no water flow was detected. Condition typically caused by a pocket of air inside pump housing. Remove pump bleed plug to purge air.

Tank Low Water Level

Condition typically caused by water supply tap turned off or very low water pressure. Message automatically clears when water level in tank rises.

Other fault conditions detected

Fault type / Message	Description	Status	Reset by
High water usage	Average water loss /day is above high threshold	Warning only	Automatic reset
Excessive water usage - Flood	Daily water loss is above excessive threshold	Unit disabled	Manual reset
Low system water pressure	System water pressure too low	Unit disabled	Manual reset
High system water pressure	System water pressure too high	Unit disabled	Manual reset
PCB Fuse Blown	PCB has detected fuse has blown	Unit disabled	Manual reset
Pressure Sensor	Pressure sensor reading out of range	Unit disabled	Manual reset
Mains Voltage too Low Mains	Mains supply voltage is too low	Temporarily disabled	Automatic reset
Voltage too High	Mains supply voltage is too high.	Temporarily disabled	Automatic reset
Pump 1 High or Low Current	Pump 1 running current is too high or too low	Unit disabled Unit	Manual reset
Pump 2 High or Low Current	Pump 2 running current is too high or too low	disabled Unit	Manual reset
Too Many Pump Starts	Number of Pump starts in 24 hrs exceeded limit	disabled	Manual reset

Contact FlowQuip for further assistance

SMARTFILL MODBUS RTU Communication Protocol V1.5

1. Transmission Format

Baud Rate:	Set in controller menu. 1200, 4800, 9600, 19200, 38400 and 115200 supported
Interface:	RS485, optically isolated, ground (G) must be connected
Bits:	8
Parity:	None
Stop bits:	1
Address:	Set in controller menu. 1-247 supported

2. Model Number

Model number	model			
1	ARU2_300			
2	ARU2_550			
3	ARU2_300DP			
4	ARU2_550DP			
5	ARU2_300HLI			
6	ARU2_550HLI			
7	ARU2_300DPHLI			
8	ARU2_550DPHLI			

2. Modbus RTU Map

Item	MODBUS Address	Type	Format	Descri ption
1	40201	IEEE FLOAT	Big Endian	Average daily water loss, litres
2	40203	IEEE FLOAT	Big Endian	Total volume added, Litres
3	40205	IEEE FLOAT	Big Endian	System Pressure, kPa
4	40207	IEEE FLOAT	Big Endian	Total pump run hours
5	40209	IEEE FLOAT	Big Endian	Cut in (pump start) pressure, kPa
6	40211	IEEE FLOAT	Big Endian	Cut out (pump off) pressure, kPa
7	41181	WORD		Model number
8	41182	WORD		Software revision x10. eg: 15 = version 1.5
9	41183	WORD		Fatal Fault code
10	41184	WORD		Warning fault code
11	41185	WORD		Fault log entry 1 (LATEST)
12	41186	WORD		Fault log entry 2
13	41187	WORD		Fault log entry 3 (OLDEST)

3. Error Codes

Fault Code	Descri pt i on	Fatal?	
0	No Fault		
1	Low pressure	No	
2	High pressure	No	
3	Top up volume too large	Yes	
4	Water tank error	No	
5	Fuse fault	Yes	
6	Pressure sensor error	Yes	
7	Mains voltage low	No	
8	Mains voltage high	No	
9	Pump 1 failure, low current	No	
10	Pump 1 failure, high current	No	
11	Pump 1 no flow detected	No	
12	Pump 2 failure, low current	No	
13	Pump 2 failure, high current	No	
14	Pump 2 no flow detected	No	
15	Too many pump starts in 24 hours	Yes	
16	Resume volume too large	Yes	
17	Low pressure warning	No	
32	Only 1 pump running in 2 pump model	No	
33	No pumps operational	Yes	