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OPERATING AND MAINTENANCE MANUAL

BRO-800

Reverse Osmosis Unit



Table of Contents:

1. Introduction
2. Safety Precautions
 - 2.1 General Safety Precautions
 - 2.2 Safety Headings
3. Labelling
4. General Plant Description
 - 4.1 Purpose
 - 4.2 Principle Process
 - 4.3 Process Flow
5. Process Description
 - 5.1 Pre-Filtration
 - 5.2 Reverse Osmosis (RO)
6. Technical Data
 - 6.1 Equipment Details
 - 6.2 Operating Parameters
7. System Requirements
 - 7.1 Plumbing
 - 7.2 Electrical
8. Operating Procedures
 - 8.1 Full System Start Up
 - 8.2 Full System Shut Down
9. Maintenance Information
 - 9.1 Maintenance Tasks
 - 9.2 Cartridge Filter – Element Replacement Procedure
 - 9.3 RO Element Replacement Sequence

1. Introduction

This operating and maintenance manual outlines a general overview, operation, maintenance and troubleshooting details vital to the sustained performance and understanding of your system.

NOTE: Before operating or servicing this system, this operating and maintenance manual must be read and fully understood. Keep it and other associated information regarding this system safe for future use.

2. Safety Precautions

2.1. General Safety Precautions

The system should be operated and maintained by trained personnel. Personnel must comply with this manual as well as the safety measures listed by their own employer. Water Purification Solutions cannot be held liable for any damages, injury or even death that may result from use of this system.

2.2. Safety Headings

The safety section of this manual outlines various safety headings throughout the manuals' text and are identified and defined as below:

NOTE: Indicates statements that provide further information and clarification.

CAUTION: Indicated statements that are used to identify conditions or practices that could result in equipment or property damage.

WARNING: Indicates statements that are used to identify conditions or practices that could result in injury or loss of life. Failure to follow these warnings could result in serious injury or even death.

3. Labelling

Do not remove any labelling of this system. These labels are used to warn against potential hazards as well as identify components

4. General Plant Description

4.1. Purpose

To reduce dissolved salt content of raw water for later use.

4.2. Principle Process

Reverse Osmosis (RO) is a form of high pressure hyper filtration where dissolved solids are removed from the supply stream to produce treated water (permeate) and waste water (concentrate). This is a continuous process running at a fixed flow rate.

4.3. Process Flow

Water is fed from a saline supply with minimal suspended matter, i.e. Pre-treated water, to the cartridge filter before being pumped through the reverse osmosis (RO) stage of the system where the dissolved salt content is reduced. The treated water (permeate) is fed into a holding tank and the concentrate to drain.

5. Process Description

5.1. Pre-Filtration

Raw water is fed through a pressurised line into the water treatment system.

The filtration stage of the system consists of a cartridge filter in which suspended matter larger than 5 micron is removed.

A solenoid valve is used to shut off the supply line when the holding tank has reached its top level or when the system is turned off.

5.2. Reverse Osmosis (RO)

Pre-filtered water is fed to the RO system by means of the horizontal centrifugal pump.

The pump is controlled by the following parameters, namely:

- Product tank high level, indicated by a float level switch.
- Raw supply tank low level, indicated by a float level switch.
- Low pressure condition, indicated by the pressure switch.
- Timer unit contact.

The RO system generates two streams of water, a purified stream (permeate) is directed to the product tank, while the concentrated stream is directed to the drain. A ball valve on the concentrate line allows for manual flushing of the RO system. Pressure indicators are fitted at strategic points to illustrate the systems operating pressure. Flow rate through the system can be monitored by the in-line rotameters on both the permeate and concentrate lines.

En route to the product tank, permeate passes a conductivity probe, which reads conductivity of the product water.

6. Technical Data

6.1. Equipment Details

Reverse Osmosis Pump

Tag :	P-1
Qty :	1
Model :	CHLF2-60
Duty :	0.625m ³ /hr @ 10 bar
Power :	0.75 kW

Cartridge Filter

Tag :	CF-1
Qty :	1

Material : Polypropylene
Dimensions : Ø 4.5" x 10" L
Elements : 5 µm, Melt Blown

Solenoid Valve

Tag : SV-1
Qty : 1
Model : ZS1DF13N4D16
Actuated : Electrically, DC24V
Pipe : ½" Orifice, 16mm

Reverse Osmosis Vessel

Tag : RO-1
Qty : 1
Model : 2.5", 1 Element, 300 PSI
Port Position : End Port
Element : ULP21-4021 (Vontron)

Rotameter

Tag : FLM-1
Qty : 1
Range : 100 - 1000 ℓ/hr
Thread : ½" F BSP

Rotameter

Tag : FLM-2
Qty : 1
Range : 16 - 160 ℓ/hr
Thread : ½" F BSP

Pressure Switch

Tag : PS-01
Qty : 1
Model : MPC06
Range : -0.5 - 6 ba

Pressure Switch

Tag : PS-02
Qty : 1
Model : MPC06
Range : -0.5 - 6 bar

Pressure Indicator

Tag : PI-01
Qty : 1
Model : 63mm, ¼" BSP, Bottom Entry
Range : 0-10 bar

Pressure Indicator

Tag : PI-02
Qty : 1

Model : 63mm, ¼" BSP, Rear Entry
Range : 0-10 bar

Conductivity Meter

Tag : Conductivity Meter
Qty : 1
Model : CM-230
Range : 0-199.9µS/cm

6.2. Operating Parameters

Cartridge Filtration

Service Flow Rate : 0.625 m³/hr
Max Operating Pressure : 6 bar
Element : 5 Micron (Ø4.5" x 10" L)
Replacement Intervals : When required (Minimum once a month)

Reverse Osmosis

Service Flow Rate : 0.125 m³/hr (permeate)
Max Operating Pressure : 10 bar
Element : ULP21-4021 (Vontron) x1
Replacement intervals : When required

7. System Requirements

7.1. Plumbing

System connections are as follows:

- From raw supply to system inlet : 1" PVC
- From permeate outlet to product tank : ½" PVC
- From concentrate outlet to drain : ½" PVC

NOTE: Ensure the diameter of pipeline can supply adequate flow with minimal head loss relative to pipe length.

NOTE: All municipal drain connections should not be connected together in a closed drain with any backpressure. i.e. drainage must be free flowing.

NOTE: The Brine from the RO has a high mineral content and should be delivered to drain or evaporation dam.

NOTE: We recommend that a qualified plumber installs the plumbing lines to and from the system

WARNING: The plumbing of this system is constantly under pressure during operation. Incorrect installation or operation of the system could result in serious injury or even death.

7.2. Electrical

The electrical supply required for the plant is 220V, 5A, 50Hz, single phase with Neutral and Earth.

NOTE: We recommend that a qualified electrician installs the electrical supply to the system.

WARNING: To reduce the risk of electrical shock, the incoming electrical supply must include a protective earth connection. Electrical shock can result in serious injury or even death. Ensure the system is isolated from the supply before any electrical work commences.

WARNING: Incorrect installation of the electrical supply can result in serious damage to the equipment but can also result in serious injury or even death

8. Operating Procedures

8.1. Full System Start Up

A full system start up is performed when the system has been shut down for an extended period of time or after commissioning.

- Ensure all supply valves from the raw supply are open.
- Attach a plug to the system and plug into wall socket. Flip the switch to the “ON” position at the wall.

NOTE: The pump will only start if the level switches are in the correct orientation, i.e. product tank is empty and there is sufficient supply pressure.

- Regulate MV-01 (just after pump) to allow for a slow flow.
- Regulate the control valve (CV-1) on the concentrate line and the manual valve (MV-2) on the permeate line to allow a concentrate flow of around 500ℓ/hr and a permeate flow of around 125ℓ/hr. Confirm with rotameters (FLM-1 & 2).
- Confirm RO pressure (PI-01 & 02) and flows (FLM-1 & 2). Ensure the correct flow and pressures as noted at last plant shut down, operating parameters (*Please refer to 6.2 Operating Parameters*).

8.2. Full System Shut Down

A full system shut down is performed if the plant is to be shut down for a period of three weeks or longer.

- Record all system operating parameters.
- Flip the switch to the “OFF” position at the wall.
- Ensure the following valve sequence is met:

MV-1 – Closed

MV-2 – Closed

CV-1 – Closed

9. Maintenance Information

9.1. Maintenance Tasks

Daily

- Maintain the system in a clean and tidy condition.
- Inspect the system for any leaks. If any, seal/repair them accordingly.
- Monitor the system for any abnormal conditions such as excessive noise, vibration or heat. If any present it should be reported and attended to immediately.
- Check and adjust flow rates as per operating parameters.
- Check operating parameters and complete Daily Operator Checklist

Monthly

- Replace cartridge filter element.

3-5 Years

- Replace Reverse Osmosis membrane, if required.

9.2. Cartridge Filter – Element Replacement Procedure

The cartridge filter (CF-1) has a 5 micron nominal pore size. This element will be required to be replaced periodically as the filter blinds with filtered matter. The filter element should be replaced every four weeks.

9.3. RO Element Replacement Sequence.

- Turn off the system by flipping the switch to the “OFF” position at the wall.
- Ensure that the supply water is isolated from the cartridge filter.
- Release any trapped pressure by pressing the air release valve on top of the housing before attempting to open.
- Use the housing spanner supplied to open the housing by turning the spanner in a clockwise manner. Once loosen turn the rest by hand.
- Dispose of the used element. Replace with a new element, ensuring that the elements bottom port is securely placed in the bottom port of the housing.
- Secure the housing by turning in an anti-clockwise manner.
- Reconnect the filter to the raw water supply.
- Turn on the system by flipping the switch to the “ON” position at the wall.

NOTE: Bleed off any trapped air by pressing the air release valve on top of the housing during start up.