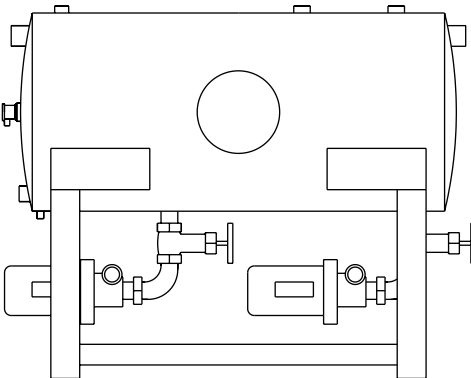


**Series III**  
**Condensate Recovery Unit**  
**Installation and Maintenance Instructions**

---



- 1. General safety information*
- 2. General product information*
- 3. Installation*
- 4. Wiring diagrams*
- 5. Operation and commissioning*
- 6. Maintenance*
- 7. Spare parts*
- 8. Fault finding*



# 1. General safety information

Safe operation of these units can only be guaranteed if they are properly installed, commissioned and maintained by a qualified person in compliance with the operating instructions. All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

## Isolation

Consider whether closing isolating valves will put any other part of the system or personnel at risk. Dangers might include: isolation of vents, protective devices or alarms. Ensure isolation valves are turned off in a gradual way to avoid system shocks.

## Pressure

Before attempting any maintenance consider what is or may have been in the pipeline. Ensure that any pressure is isolated and safety vented to atmospheric pressure before attempting to maintain the product, this is easily achieved by fitting Spirax Sarco depressurisation valves type DV (see separate literature for details). Do not assume that the system is depressurised even when a pressure gauge indicates zero.

## Temperature

Allow time for temperature to normalise after isolation to avoid the danger of burns and consider whether protective clothing (including safety glasses) is required.

## Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

## Disposal

The product is recyclable. No ecological hazard is anticipated with the disposal of this product providing due care is taken. EXCEPT;

### PTFE:

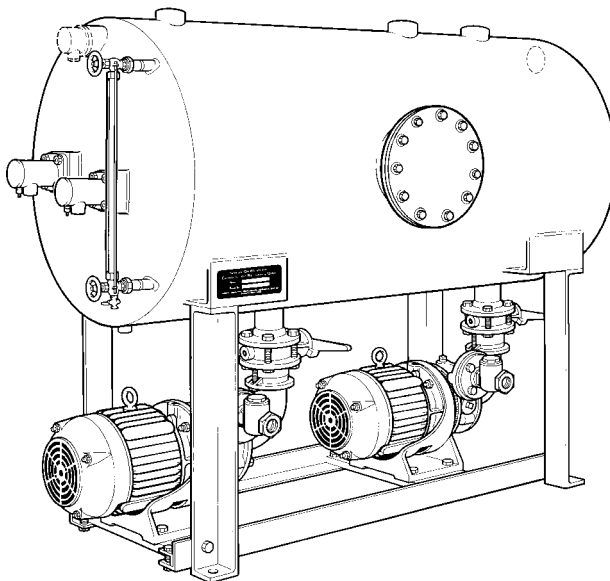
- Can only be disposed of by approved methods, not incineration.
- Keep PTFE waste in a separate container, do not mix it with other rubbish, and consign it to a landfill site.

### Viton:

- Can be land filled, when in compliance with National and Local regulations.
- Can be incinerated, but a scrubber must be used to remove Hydrogen Fluoride, which is evolved from the product and with the compliance to National and Local regulations.
- Is insoluble in aquatic media.

## — 2. General product information —

Fig. 1 Series III with galvanised receiver (Single or duplex pumps)



### 2.1 General description

The Spirax Sarco condensate recovery units are designed to handle hot condensate, which is commonly returned for use as boiler feedwater. They can handle quantities up to 34 000 kg/h at 98°C with pump delivery heads up to 30 - 35 metres. A unit comprises of three main parts:- receiver, pump/pumps and control gear.

#### Standards

This product fully complies with the requirements of the European Machinery Directive 98/37/EC, European Low Voltage Directive 72/73/EEC and European Electromagnetic Compatibility Devices Directive 89/336/EEC. This product is not a pressurised vessel and therefore does not need to comply with the European Pressure Equipment Directive 97/23/EC.

#### Certification

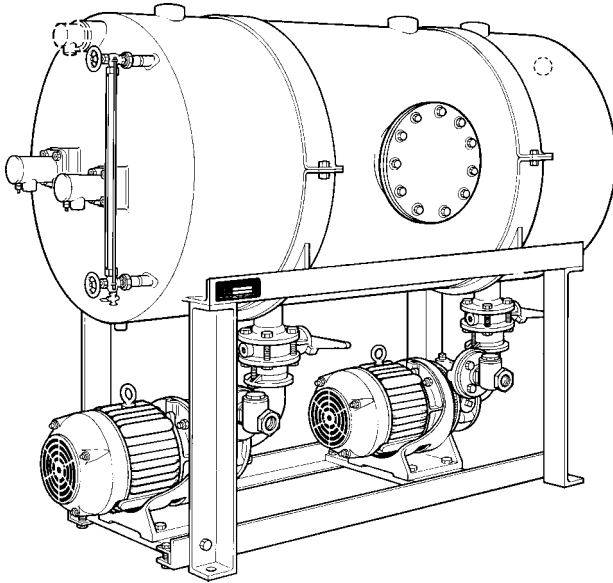
The product is available with material certification to EN 10204 2.1 and EN 10204 2.2.

#### Note:

For additional information see the following Technical Information Sheets:

- Product information TI-P089-07.
- Dimensions TI-P089-03 and TI-P089-04.
- Sizing TI-P089-05 and TI-P089-06.

**Fig. 2 Series III with copper receiver (Single or duplex pumps)**



## **2.2 Construction**

### **Receiver**

Mild steel receivers are hot dip galvanised after manufacture and mounted in a galvanised steel frame with plated fastenings. Copper receivers are mounted in lined cradles. Both types are fitted with an inspection cover and adequately sized vent, overflow, drain and two inlet connections screwed BSPT. They are pressure tested to 2.1 bar.

Water level gauges complete with brass shut-off and drain cocks can be provided as an extra.

### **Pumps**

Pumps are constructed of cast iron fitted with mechanical seals and gunmetal impellers specially developed for operation under conditions of extremely low NPSH to handle boiling condensate with the minimum of flooded suction. They are close-coupled to TEFC motors having class F insulation (Class B temperature rise) motor enclosure rating IP55 minimum and running at 2850 rpm (50 Hz).

### **Control gear**

Receivers are fitted with a magnetic switch float level control. The single unit uses this to operate a single pump designed to discharge at the rate of 1.5 times the maximum condensate rate shown on the pump sizing chart (T1-P089-05).

The cascade unit uses two pumps, each rated at 1.1 times the maximum rate shown on the sizing chart (T1-P089-06).

The control panel incorporates a selector switch which allows the duty pump to take precedence in handling the load. If it is unable to cope with any peak load then the cascade method of control brings in the stand-by pump. This arrangement effectively provides automatic changeover in the event of pump electrical or mechanical failure.

Electrical equipment is suitable for 380/415 volt 3 phase 50 Hz 4-wire supply. Control equipment is installed in a separate IP55 rated metal enclosure. Interconnecting wiring is not included.

Connections for BMS interface are provided to monitor pump run condition and common fault motor trip/high level alarm.

# 3. Installation

**Note:** Before actioning any installation observe the 'Safety information' in Section 1.

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended installation:

**3.1 On receipt of the unit,** check to ensure that all the equipment has been received and is undamaged. Items sent loose are placed in a separate carton for safety.

In addition to the basic condensate recovery unit, additional standard items include:-

**a. Single pump units**

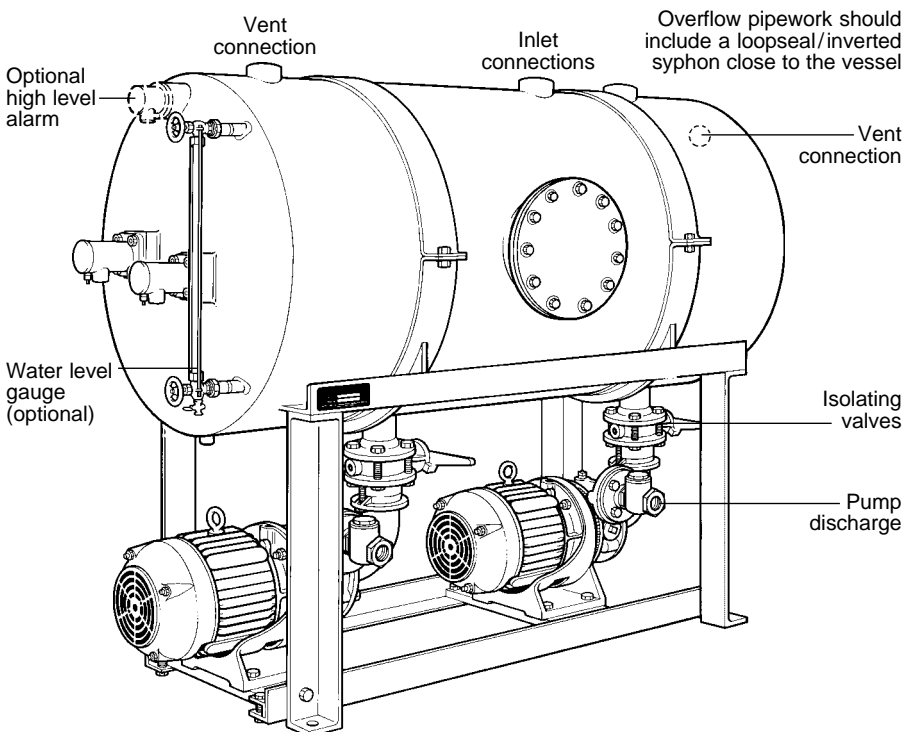
- 1 x Control panel
- 1 x Level switch
- 1 x Set of parts for level gauge glass (when specially ordered)

**b. Double pump units**

- 1 x Control panel
- 2 x Level switches
- 1 x Set of parts for level gauge glass (when specially ordered)

**3.2 Fitting:** Single or duplicate motorpumps are mounted under the receiver and have individual suction pipework, incorporating an isolating valve and resilient coupling. Pump deliveries are fitted with non-return valves screwed BSPT. With duplicate pumps, both discharges are on the same side of the unit.

**Note:** It is recommended that a lockshield valve should be fitted in the delivery pipework so that, in the event of the system head being substantially less than the unit head, the valve may be adjusted to increase the system head, thus reducing possible cavitation and noise.



**Fig. 3 Shown - Series III with copper receiver having duplex pumps**

**3.3 Check** materials, pressure and temperature and their maximum values. If the maximum operating limit of the product is lower than that of the system in which it is being fitted, ensure that a safety device is included in the system to prevent overpressurisation.

**3.4 Determine** the correct installation situation and the correct direction of fluid flow.

**3.5 Remove** protective covers from all connections.

**3.6 Installation** - Position the unit on the floor and bolt it down, ensuring that sufficient space is left for insertion and withdrawal of the level control (see TI-P089-03 to TI-P089-07).

**3.7 Piping** - Pipework connected to the receiver and pump(s) must be free from all stresses such as could be caused by expansion and inadequate support. A union should be fitted directly after the pump discharge non-return valve to simplify maintenance and a fullway valve in the delivery pipework so that the unit may be isolated and the system head adjusted to match the pump discharge head, if required.

**3.8 Level control** - The level control is supplied in three pieces:-

- a. Float
- b. Float rod
- c. Level control body

**Note:** Full mounting and service instructions are supplied with each level control.

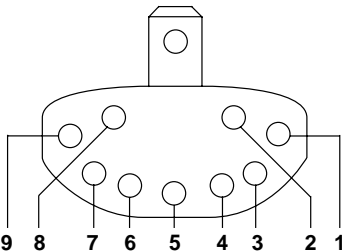
- Remove the securing split pins from the float and rod, assemble and then replace the split pins.

**Note:** The two stop pins in the multi-hole limit plate (part of the level control head) have been pre-set and should not require adjustment.

- Remove the nuts from the 4 studs in the level control pad. Ensuring that the gasket is in place on the level control, push the float assembly through the hole, put the head into place on the 4 studs, cable entry is located at the bottom, then replace the nuts.
- If the level control has to be adjusted, isolate the electric supply, ensure that the receiver is empty and remove the level control. The operating differential may be adjusted by altering the position of the stops on the multi-hole limit plate.

The following table indicates the normal stop positions. These settings should be used if the stops are inadvertently removed or if a replacement float switch is to be fitted.

**Note:** Unit size is determined by the first character of the designation e.g. A2107C = A unit



**Fig. 4 Multi-hole limit plate**

Unit size	Pump	Stop position	
		Galvanised	Copper
A	Duty	2 - 9	2 - 9
	Stand-by	1 - 8	1 - 7
B	Duty	2 - 9	2 - 9
	Stand-by	1 - 8	1 - 8
C	Duty	2 - 9	2 - 9
	Stand-by		
D and E	Duty	1 - 9	1 - 9
	Stand-by		

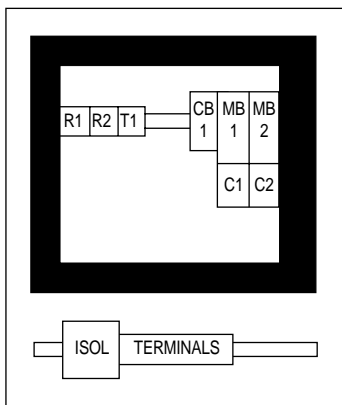
- After adjustment, offer the level control up to the receiver and, by moving the float, check the differential and make sure that it does not foul either the top or bottom of the receiver or that the movement is too small which will result in excessive cycling of the pump.

- 
- 3.9 High level switch (if fitted)** - This facility is available via a float switch located at a high level in the tank (See Section 2.2, Control gear).  
Terminals are provided in the control panel to wire back to. A common alarm LED on the panel has a dual purpose either H.L.A. (high level alarm) indication or pump trip.
- 3.10 Electrical wiring** - The standard unit is designed to operate from 380/415 volts, 3 phase, 50 Hz, 4 - wire supply **with fuses fitted by customer prior to control panel**.  
Typical wiring diagrams can be seen in Section 4, more detailed diagrams can be found enclosed in the control panel.  
To provide adequate electrical protection for the pump motors, all starters incorporate protection from single phasing. If starters are provided from other sources it is essential that this feature is included within their scope.  
The normal scope of supply does not include an emergency stop switch which can be included during the electrical installation.  
**It is important to note, that notwithstanding any instructions contained herein, the electrical circuit, wiring procedures and installation must meet any National or Local standards which are in force.**
- 3.11 Receiver connections** - Connect the receiver as shown in Technical Information Sheets: TI-P089-03 to TI-P089-07.  
The inlet should be furthest from the level control to reduce turbulence which may cause erratic operation. Ensure that the inspection cover is in place and sealed.  
**Remember the receiver is not a pressure vessel and must be vented to atmosphere. The vent pipework should be adequately sized and arranged to drain back to the receiver. The overflow should be via an inverted syphon close to the vessel and, if necessary, protected against freezing.**
- 3.12 Water gauge (if fitted)** - Screw the two bronze valve units into place, ensuring that the threads are sealed with PTFE sealing tape or similar. Leave the back nuts loose. The valve unit with the small tap on it is the bottom one. Loosen the gland nuts and carefully slide the gauge glass up into the top valve then down into the bottom one. Make certain that the whole assembly is square then tighten the back nuts and gland nuts, ensuring that no stress is put on the glass.

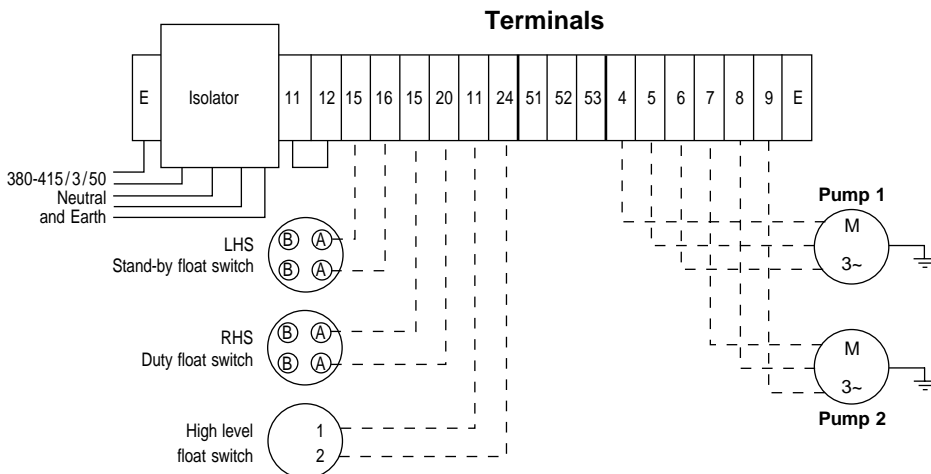


# 4. Wiring diagrams

## Series III duplicate pump control panel circuit diagram



**Backplate layout**

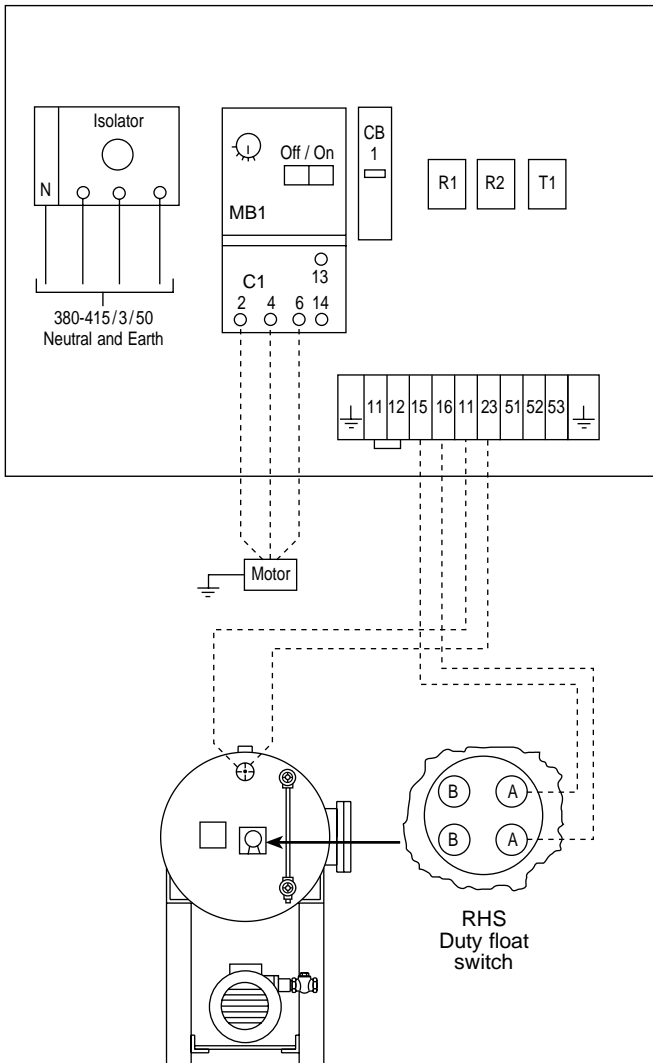


**Fig. 5**

**Notes:**

1. Volt free contacts:- 13 and 14 on contactor (normally open contacts).
2. Volt free contacts:- 51, 52 and 53 common fault alarm pump trip/H.L.A.
3. Remove link, and connect emergency stop to terminal block connections 11 and 12.

## Series III single pump control panel circuit diagram



**Fig. 6**

**Notes:**

1. Volt free contacts:- 13 and 14 on contactor (normally open contacts).
2. Volt free contacts:- 51, 52 and 53 common fault alarm pump trip/H.L.A.
3. Remove link, and connect emergency stop to terminal block connections 11 and 12.

## — 5. *Operation and commissioning* —

After installation or maintenance ensure that the system is fully functioning. Carry out tests on any alarms or protective devices.

1. Ensure that the starter 'Hand/Off/Auto' switch is turned to the 'Off' position.
2. Fill the receiver to ensure that there are no leaks. **Note:** Open pump isolating valve(s) slowly, to safeguard pump mechanical seals and discharge valve(s).
3. Ensure that the emergency stop button is disengaged if fitted.
4. Press the panel system reset button.
5. Turn the 'Hand/Off/Auto' switch to 'Hand' to check the direction of rotation pump, anticlockwise looking from pump to motor, then switch 'Off' immediately. Repeat procedure if duplicate pumps are fitted.
6. Turn the 'Hand/Off/Auto' switch to 'Auto'. The selected pump should start when the receiver is full, and stop when the receiver empties.
7. With duplicate pump units, check that both units operate satisfactorily.
8. Check to see that the pump switches 'Off' automatically as the condensate level drops.
9. Operate emergency stop to confirm function if fitted. **Note:** The pump must not restart on release until the panel system reset button is pressed.
10. In the event of the system head being substantially less than the specified head, the valve in the delivery pipework should be adjusted to increase the system head thus reducing possible cavitation and noise.
11. Check for leaks and correct operation.

---

# 6. Maintenance

---

**Note:** Before actioning any maintenance observe the 'Safety information' in Section 1.

## 6.1 General pump removal

To remove a pump, close the isolating valve in the suction pipework, disconnect the electricity supply and proceed as follows:

- Loosen and remove clamp units on the pump sub-base.
- Disconnect the pump discharge pipework by breaking the union between the non-return valve and the full way valve.
- **Pumps fitted with screwed connection:**
  - 1 - Back off the elbow gland nut on the inlet side.
  - 2 - Pull the pump backwards to clear the inlet pipe from the elbow and remove the pump.
- **Pumps fitted with flanged connections:**
  - 1 - Remove the nuts securing the inlet flange to the pump.
  - 2 - Pull the pump backwards to clear the studs and remove the pumps.

## 6.2 Running the pump and routine maintenance

Make certain the pump is free by rotating the shaft. If the pump will not turn, remove the suction end cover to free the impeller. Check to see that the rotation is correct, i.e. anticlockwise when looking from the pump to the motor. Motor bearings are grease packed for life. Pumps are fitted with self-adjusting mechanical seals, which require no attention under normal conditions.

**Warning:** The pumps must not under any circumstances be run dry or damage to the mechanical seals will result.

## 6.3 Dismantling the pump for replacement

- For a Series 'U' close-coupled pump, see Section 6.5.
- For a Series 'S' centrifugal pump, see Section 6.6.

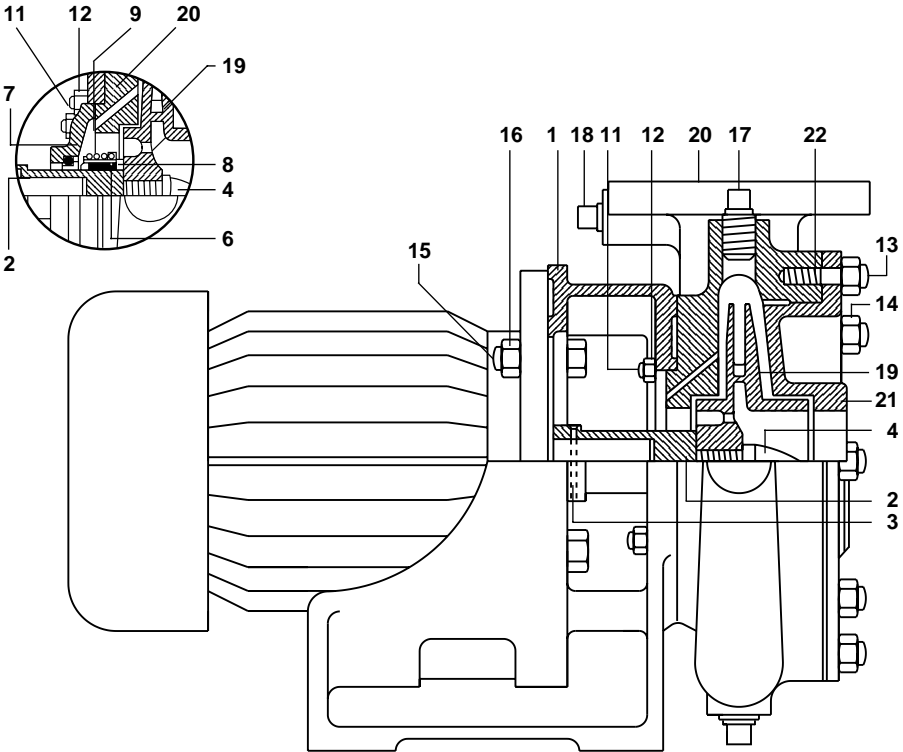
## 6.4 How to replace a pump:

- Position the pump on to the rails and line up with the inlet pipe/inlet elbow.
- Apply the clamp units loosely.
- Tighten the flange/inlet elbow.
- Pull the clamp bolts down hard.

## 6.5 Dismantling for replacement - Series 'u' close-coupled pump (refer to Figure 7)

- To dismantle, remove the suction end cover (21) from the volute casing (20) and unscrew the impeller nut (4, RH thread).
  - The impeller is secured by screwing on to the shaft extension (RH thread), and may be removed by passing a small rod through the priming plug hole at the top of the volute casing to lock the impeller, which can then be loosened by using a suitable spanner on the pump shaft extension. Once the thread is started, the rod locking the impeller, must be removed to avoid damage to the impeller which can then be unscrewed by hand.
  - The rotating element of the mechanical seal can now be withdrawn from the shaft and the stationary seat pulled from its rubber mounting. Should this prove difficult to remove, it will be necessary to dismantle the volute casing from the mounting bracket and take off the seal back plate.
  - Always fit a new mechanical seal. Ensure that no dirt or grit is present on either seal face and that the shaft is undamaged and free from burrs. The bore of the rotating seal element should be lightly lubricated with Swarfega or similar, to enable it to slide freely along the shaft.
- Caution:** Do not use oil or grease.

- If it is necessary to replace the shaft extension, tap out the drive pin with a drift, supporting the shaft to avoid damage to the motor bearings. If the shaft extension resists removal, heat it quickly to approximately 150°C (302°F) and pull off with a twisting motion. Clean both motor shaft and extension bore and apply Loctite Studlock 270 or similar before reassembly. Use a new drive pin. New gaskets should be fitted to suction cover and seal back plate during assembly.



**Fig. 7 Series 'U' close-coupled pump**

Item	Qty	Description
1	1	Pump adaptor
2	1	Shaft extension
3	1	Pin
4	1	Impeller nut
6	1	Mechanical seal
7	1	Seal housing
8	1	Seal retaining ring
9	1	Joint ring (seal housing)
11	as req'd	Stud (fixing 7 to 20. 20 to 1)
12	as req'd	Nut (fixing 7 to 20. 20 to 1 )

Item	Qty	Description
13	as req'd	Stud (fixing 21 to 20)
14	as req'd	Nut (fixing 21 to 20)
15	4	Bolt (fixing Motor to 1)
16	4	Nut (fixing Motor to 1)
17	2	Plug (priming drain)
18	1	Plug (pressure)
19	1	Impeller
20	1	Volute casing
21	1	Suction cover
22	1	Joint ring (V.E.C)

## 6.6 Dismantling for replacement

### Series 'S' centrifugal pump (refer to Figure 8)

- To dismantle, separate the volute (2) from the seal plate (3), unscrew the impeller bolt (? , RH thread), remove the impeller washer (5) and pull off the impeller (1).
- The rotating seal element can now be withdrawn from the shaft, and the stationary seat pulled from the rubber mounting in the seal plate.
- Always fit a new mechanical seal. Ensure that no dirt or grit is present on either seal face and that the shaft is undamaged and free from burrs.
- The bore of the rotating element should be lightly lubricated with Swarfega or similar to enable it to slide freely along the shaft. **Caution:** Do not use oil or grease.
- If it is necessary to replace the shaft extension, first detach the motor from the pump base, then tap out the drive pin with drift, supporting the shaft to avoid damage to the motor bearings. If the shaft extension resists removal, heat it quickly to approximately 150°C (302°F) and pull it off with a twisting motion. Clean both motor shaft and extension bore and apply Loctite Studlock 270 or similar before reassembly. **Always use** a new drive pin and volute joint ring.

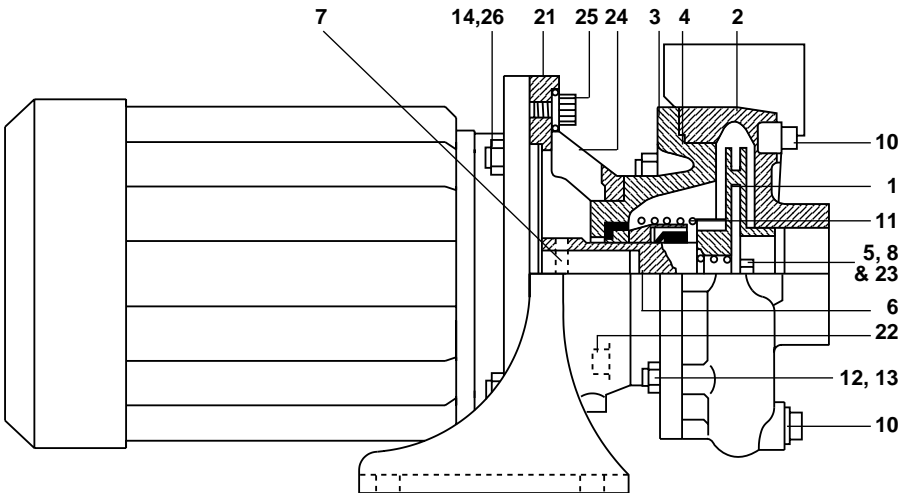


Fig. 8 Series 'S' pump

Item	Qty	Description
1	1	Impeller
2	1	Volute casing
3	1	Seal housing
4	1	Joint ring
5	1	Impeller washer
6	1	Shaft extension
7	1	Pin
8	1	Impeller key 5 mm sq
10	4	Vent / drain plug ¼" BSPT
11	1	Mechanical seal

Item	Qty	Description
12	4 or 8	Stud M8 x 20
13	4 or 8	Nut M8
14	4	Skt Hd cap screw M10 x 35
21	1	Pump adaptor
22	3	Skt Hd cap screw M8 x 18
23	1	Hex set screw M8 x 16
24	1	Guard adaptor
25	1	Skt Hd cap screw M8 x 10
26	4	Nut M10

---

## 7. Spare parts

---

In the event of spares being required, please contact, in the first instance,

Spirax-Sarco Ltd.,  
Charlton House,  
Cheltenham, Glos,  
GL53 8ER.  
Tel: 01242 521361.

Quoting the serial number of the condensate recovery unit.

---

## 8. Fault finding

---

Fault	Probable cause	Remedy
<b>Low capacity</b>	1. Incorrect direction of rotation.	1. Rotation should be anticlockwise looking from pump to motor. To reverse, change over two of the phase leads.
	2. Suction valve partially closed.	2. Open valve fully.
	3. Delivery valve partially closed.	3. Adjust valve by the required amount to prevent cavitation.
	4. Excessive temperature of condensate.	4. Check against temperature specified.
	5. Excessive friction loss in condensate return line to hot well.	5. Check that combined friction loss and static head do not exceed pump generated heat.
<b>Cavitation</b>	1. Suction valve partially closed.	1. Open valve fully.
	2. Insufficient pump discharge head.	2. Adjust delivery valve to increase head.
	3. Excessive condensate temperature.	3. Check against temperature specified.
	4. Impeller partially blocked.	4. Remove pump and clear impeller.
<b>Frequent cycling</b>	1. Float switch defective.	1. Remove and check that all parts operate freely.
	2. Float switch incorrectly set.	2. Adjust to give the required differential.
<b>Overload</b>	1. Delivery head too low	1. Adjust delivery valve to increase resistance. Do not close it completely.
	2. Incorrect motor wiring/ connections in terminal box.	2. Check connections against wiring diagram inside terminal.
	3. Incorrect rotation.	3. Check rotation is anticlockwise looking from pump to motor.
	4. Mechanical rub.	4. Check for blockage in pump.
	5. Overloads incorrectly set.	5. Reset to motor full load current.

