



Electrically Operated Steam Condensate Recovery & Pumping Sets

Installation, Commissioning, Fault
Checks & Maintenance Manual

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1. Running

1.1 Safety Precautions

Observe all site safety regulations and recommendations at all times.

- Do not leave equipment unattended with the controls enclosure door open and the mains supply power switched on.
- The open vent and overflow connections must not be fitted with isolation valves or capped or plugged.
- Under normal operating conditions, this equipment will have hot external surfaces and will contain hot fluid at a temperature approaching 100°C. Do not install in locations or in such a manner where unauthorised personnel or members of the public can come into contact with the equipment.
- Do not work on the installation whilst it is operating under pressure and / or at high temperature. Always ensure the installation and its fluid contents have cooled to a safe temperature and the equipment has been isolated from all incoming or return fluid flow and pressure sources.
- Pump(s) must not be operated without water inside the collection vessel and until the pump has been fully filled with condensate or water and purged of entrapped air. Do not run a pump with a closed suction valve or with an open end discharge pipe, or against a closed discharge valve for more than a few seconds. Never run a pump without water inside the casing and without fully flooding the pump shaft seal.
- The equipment should be drained down to a safe location only and only when the fluid has cooled to the maximum allowable temperature for the drainage or sewerage system.



2. Types & Equipment Function

2.1 Simplex and Duplex Sets

Ormandy condensate recovery and pump sets are supplied as either a single pump (Simplex) sets, or as two pump (Duplex) sets, arranged to provide a 'duty' and 'stand-by' pumping facility.

Both types of sets are designed for fully automatic operation. Standard control features incorporate; condensate level pump control, controls enclosure, incoming electrical supply door-interlocked isolator switch, 'Power On' indicator lamp, 'Pump Running' and 'Pump Tripped' indicator lamps for each pump.

Duplex sets only require a pump selector switch with automatic changeover facility and a 'High Condensate' alarm lamp.

Volt-free alarm terminals are provided for each 'Pump Tripped' and, with Duplex sets only, for 'High Condensate' alarm also.

Condensate level pump control of Ormandy condensate recovery and pump sets is by means of vibrating fork type level switches.

Ormandy Simplex condensate recovery and pump sets are controlled simply by high level and low condensate level pump control switches, with the pump switching on at 'high' level and off at 'low' level.

Ormandy Duplex condensate recovery and pump sets are also controlled by high and low condensate level pump control switches, but additionally have the special 'cascade' level control feature to provide for automatic operation of both the 'duty pump' plus the 'stand-by pump' if that operational requirement arises. Duplex pump control is affected by means of two (2 no.) separate high condensate level switches, plus one (1 no.) low level common switch. The second 'high' switch is configured to enable the 'stand-by' pump to operate at a higher level than that for the 'duty' pump. This effectively provides automatic 'duty' and 'stand-by' pump switching.

If a condition occurs which enables operation of the 'stand-by' pump, the corresponding 'Pump Running' lamp and the 'High Condensate' alarm lamp will indicate that status, both clearing automatically when the condensate level falls and the pump(s) stops at 'Low' condensate level.

All our Duplex sets also incorporate duty cycle automatic changeover, the 'duty' and 'stand-by' pump operation, alternating at the end of each condensate collection vessel emptying cycle. Additionally, a 3-position pump selector switch is incorporated to allow for selection of automatic pump changeover or single pump operation of either pump, 'Automatic' being the usual mode selected for normal operating conditions.

With the 3-position selector switch of a Duplex set in the 'Automatic' position, the labelling of the pumps as 'Pump No. 1' and 'Pump No. 2' does not signify 'duty' or 'stand-by'. The actual 'duty' and 'stand-by' modes of the pumps alternate each time they change over.

When specified, both Simplex and Duplex sets can be applied with optional special alarm facilities to provide separate indication of high and/or low condensate levels and alarms.

These operate independently of the normal pump level control. The independent 'High Condensate' alarm facility is enabled at a condensate level above that for the standard high condensate, {pump(s) on} switching levels with the alarm condition and signal being cleared automatically when the condensate level falls to the normal operating high level.

The 'Low Condensate' alarm facility is enabled at a condensate level below that of the standard low condensate, {pump(s) off} switching level, with the alarm condition and signal clearing when the condensate level rises to the normal high condensate level.

All alarm facilities are provided with both visual (indicator lamp) and volt-free terminals signaling.

When independent 'High Condensate' and 'Low Condensate' alarm facilities are incorporated, sets will generally have conductive probe type level detectors with electronic level control relays inside the controls enclosure.

Alternatively electronic vibrating fork 'High Condensate' and 'Low Condensate' alarm switches may be fitted.

3. Installation & Start Up

3.1 Installation

Ormandy standard condensate collection vessels are designed for open vented operation only and must be installed with an unrestricted open vent of vessel connection full size.

The vent should be taken to a safe, high level location and a vent head may be installed at the high level open vent outlet, providing no back pressure is induced at the condensate collection vessel.

The overflow connection should be provided with a 'U' trap water seal. It should always be piped away at vessel connection full size and unrestricted to a safe drain point or gully. If the drain point connects to a public sewer system the maximum permissible discharge temperature into the public sewer system should be considered.

Overflow and vent connections must never be fitted with isolation valves and/or be capped off.

Before installing and making the final piping connections to and away from an Ormandy condensate recovery and pump set, service piping must be fully purged to ensure foreign matter and installation debris has been removed.

Pump suction strainers are generally not incorporated into Ormandy condensate recovery and pump sets because, unless regularly cleaned, any resultant restriction of condensate flow into the pump suction could eventually lead to pump operational problems.

If pump suction strainers have been incorporated because of specification requirements however, it is essential to check strainer screens frequently and, ideally, within the scope of a planned maintenance programme to avoid excessive pump suction pressure losses occurring and to protect the pump against potential damage from fluid cavitation.

If a potential exists for debris carry-over into a condensate vessel, strainers can be considered for installation into the vessel inlet piping. It is essential that a strainer of type and size which offers minimal pressure loss is selected however and that the strainer screens are cleaned regularly, ideally within the scope of a planned maintenance programme.

Do not connect a power supply to a condensate set before first checking the voltage, frequency and electrical supply cable size of the site electrical supply and that it corresponds with the requirements stated in the condensate set data sheet and on the control system engraving.

Check the stated control circuit's voltage corresponds with that required on site.

Connection of this equipment to a site electrical installation should only be carried out by qualified and competent personnel and after commissioning into service, the controls enclosure must be closed and the door isolator switch security locked.

3.2 Start-Up

After completion of all checks in Section 3 and connecting all piping and electrical services, fully open all isolating valves and allow the vessel to fill with condensate.

If condensate cannot be made available and a set has to be immediately commissioned or functionally tested, the vessel can be pre-charged with clean, cold water.

After testing however, if a set is not to be left operating in normal service, the mains electrical supply to the controls enclosure should be switched off and the door interlocked isolator switch security locked to prevent inappropriate operation of the equipment.

Before turning on the electrical supply, check each pump has been fully flooded with condensate by opening the air vent on the pump casing.

Refer to the pump manufacturer's hand-book for the correct procedure.

4. Sets with Pump Discharge

4.1 Isolating Valves Only

After closing each pump discharge isolating valve, switch on the electrical supply and **briefly** run each pump against the closed valve to check the rotation of the pump.

The pumps on a duplex set will have been checked for rotation during the works test to ensure both pumps rotate in the same direction. For 3-phase sets, two of the incoming supply phases on to the door isolator switch may need to be reversed to obtain pump rotation(s) in the direction indicated on the pump casings.

Do not attempt to carry out this procedure without isolating the equipment from the main electrical supply.

After reinstatement of the electrical supply, the discharge isolating valves can now be reopened and the set is ready for normal automatic operation.

For Duplex set normal operation, select the 'Automatic' position with the 3-position selector switch to enable the automatic pump changeover to function.

4.2 Regulating Valves

When pump discharge regulating valves have been incorporated into a set, the valves must be adjusted to ensure the pumps will operate at the recommended discharge pressure.

After completing all of the above checks and with sufficient water in the condensate vessel to enable the pump(s) to run, the electrical supply should be switched on.

For a Simplex set, with the pump running and the discharge valve fully open, check the reading on the pressure gauge. Adjust the regulating valve as instructed in the valve leaflet enclosed in the documents pack until the pressure gauge indicates the pump curve duty point discharge pressure value as is indicated in the data sheet in the document pack.

Lock the valve adjustment head in that position, as instructed in the valve leaflet and remove the valve head locking 'Allen' key from site to reduce risk of interference with the setting.

For a duplex pump set, turn the 3-position selector switch to one of the single pump operation positions and carry out the above procedure for a Simplex set, checking the reading on the pressure gauge. Adjust the regulating valve as instructed in the valve leaflet enclosed in the documents pack until the pressure gauge reading corresponds with the pump curve duty point pressure value as indicated in the data sheet in the document pack.

Lock the valve adjustment head in that position, as instructed in the valve leaflet. Turn the selector switch to the second pump position and when the condensate level has risen again to 'High' level, repeat the regulating valve setting procedure for the second pump.

From the set position, a regulating valve can normally be used to isolate the pump discharge and when reopened again, retain the original setting. However the pressure gauge reading must be checked to ensure no pressure variation has occurred.

Adjust if necessary.

For Duplex pump sets, select 'Automatic' with the 3-position selector switch for normal pump auto-changeover operational service.

5. 'Cascade' Pump Operation

5.1 Duplex Sets Only

To check the 'cascade' switching of the 'stand-by' pump and 'High Condensate' alarm function, the 3-position selector switch will need to be in the 'Automatic' position.

Disable the 'duty' pump by closing the pump discharge isolating valve or regulating valve. The 'duty' pump will continue to run against the closed valve but will not empty the condensate collection vessel. (Alternatively, the pump can be stopped by tripping the overload.)

When the condensate level rises to 'High Condensate' alarm level the 'stand-by' pump will start and the 'High Condensate' alarm lamp will illuminate. The volt-free terminals will also be enabled to remote signal the condition if so connected.

Both pumps will run then together (if the 'duty' pump has not been tripped out) until the condensate falls to 'Low' level. At 'Low' level both pumps will stop and the 'High Condensate' alarm will clear.

To carry out the above 'cascade' checking procedure for both pumps, the condensate level must be allowed to fall to the, 'pumps off' 'Low' level to enable the latching of the automatic pump changeover relay.

To return the set to fully automatic operation with pump automatic changeover, open both pump discharge isolation and/or regulating valves and select 'Automatic' with the 3-position selector switch.

6. Storage, Shut Down & Equipmen Protection

As delivered, there may be residual water remaining in the pump piping and pump casing from the factory testing procedures. If the equipment is to be held in storage before installation, ensure it is protected from sub-zero temperature conditions to prevent mechanical damage from freezing.

Refer to the Storage Instructions leaflet included with the documents pack.

6.1 Shutting Down the Equipment

1. Turn off the electrical supply and security lock the door interlocked isolator switch.
2. Close the pump suction and outlet valves.
3. If taking out of service, protect the pump(s) from frost damage due to residual condensate in pump(s), etc.
4. Drain down pump casing(s) as necessary, to a safe drain point, referring to the pump manual.
5. Drain down the condensate collection vessel and piping to a safe drain point, using the drain nozzle provided.

7. Thermal Insulation & Cladding

7.1 Insulation

Ormandy condensate recovery and pumping sets can be thermally insulated and clad to minimise heat losses and for protection against personal injury due to contact with hot surfaces providing the condensate temperature cannot exceed that specified for the maximum pump suction fluid temperature.

8. Fault Checks

8.1 Level Controls & Alarms

The most probable fault to occur will be loss of pump(s) operating control, usually the pump(s) failing to either start at high condensate level or stop at low condensate level.

Do not carry out these procedures without isolating the equipment from the electrical supply.

8.2 Condensate Recovery & Pumping Sets Fitted with vibrating Fork Switches

These sets have electronic, vibrating fork, level switches.

Vibrating fork type switches are individual units and are inserted into the vessel at various positions, dependent upon the required switching levels.

As with the float type switching unit, there is a vibrating fork switch for each required pump switching level, viz., 2 no. for a Simplex set and 3 no. for a Duplex set.

Each vibrating fork switch head has a LED indicator which illuminates permanently when the fork is in contact with condensate, viz., 'wet' state, and flashes once per second (1Hz) when in the 'dry' state. The LED also gives 'condition' indication, with 3 flashes per second (3Hz) if an internal fault occurs and once per 4 second (0.25Hz) if $I_{max} > 500 \text{ mA}$, or if a short circuit load occurs.

There is no continuous visual level indication with vibrating fork switches and the units are not user serviceable. Refer to manufacturer's manual for full data.

Vibrating fork switches can be safely removed from the vessel by disconnecting the electrical connection at the DIN plug on the switch head but the condensate level in the vessel will need to be reduced to below the level of the switch before withdrawing the switch.

8.3 Condensate Recovery & Pumping Sets with Independent Alarms

Fully independent alarms utilise conductive probes inserted from the top of the condensate collection vessel, the probes being interfaced with special level relays inside the controls enclosure.

The probe systems work at 9v a.c. maximum, have no working parts and, being rated at 200oC, are inherently reliable. The level relays are also inherently reliable, being life rated for 100,000 operations.

If a relay needs to be changed, however, it can be readily removed from the DIN rail mounted octal base and new relay inserted without any need for re-wiring. Replacement relays must be of the high sensitivity type, suitable for low conductivity fluids and should be changed only with a like-for-like component. Refer to Ormandy if assistance required.

8.4 Condensate Recovery Pumping Sets with Vibrating Fork Type Switches

Independent alarms utilise vibrating fork type level switches, these being identical to those described with independent alarms for level control.

8.5 Pumps Mechanical Seals

Mechanical seal failure is usually indicated by fluid leakage from that area of the pump assembly.

The usual cause is dry running the pump, lubrication of the seal being dependent upon the fluid being pumped.

Multi-stage pumps have the shaft seal at the top of the casing and are especially vulnerable if the mechanical seal has not been fully flooded because of improper pump casing venting.

8. Fault Checks Cont.

8.6 Fluid Cavitation

Cavitation occurs because of, (a) insufficient pump suction pressure for the liquid (condensate) temperature at the pump suction port, or, (b) because the condensate flow rate and discharge pressure does not correspond with the selected duty point on the pump performance curve, or a combination of (a) and (b).

Simplistically, because there is insufficient suction pressure at the extant condensate temperature, the pressure in the pump casing can reduce sufficiently for the condensate to partly 'flash' into a vapour and condensate mixture, the total liquid state of the condensate not being sustainable at the reduced pressure and elevated temperature.

The result is commonly known as cavitation and most mass produced pumps are not designed to reliably handle a fluid in this combined vapour and liquid state.

Cavitation invariably results in excessive operating noise inside the pump, will ultimately lead to a serious mechanical failure of the pump and/or impeller(s) and should always be eliminated.

If cavitation occurs, the following should be reviewed.

- The duty conditions specified for the pump selection and if the correct condensate pumping set model been selected for the actual duty conditions.
- Whether the actual condensate temperature at the pump suction port is higher than that specified for the pump selected.
- Is the pump discharge pressure requirement less than that specified for the pump selected?
- If the condensate temperature is significantly higher than that specified, check the condensate returns systems for high pressure/temperature condensate discharge from any item of plant and, especially, for faulty steam traps.
- If regulating valve sets have been included in the condensate set package, check they have been adjusted as recommended above.
- If regulating valves have not been included in the condensate set package, consider installing pump discharge flow/pressure regulating valve sets to control the condensate flow and discharge pressure at the selected pump duty point.

8.7 Pump(s) Fail to Run or Motor Fault

1. Check main power supply and door interlocked isolator are switched on.
2. Check condensate is at high level - pump(s) will not run until high level switch(es) are in a 'wet' state, or the float is the 'high' position
3. Check pump selector switch position - Duplex pump sets only.
4. Check full load current stated on motor plate and overload setting - adjust if necessary.
5. Check control circuit MCB or transformer fuses if the control circuit is low voltage - re-set or replace. If repeated tripping or fuse failure occurs, the control system must be fully checked by a competent electrical engineer.
6. Check each level control function - pump(s) will only run if both high and low level switches function correctly.
7. Check for electrical wiring fault or short circuit condition.
8. Check motor windings for integrity and, for three phase motors loss of one or more phases.
9. Single phase motors - check capacitor connections and capacitor conditions.

9. Maintenance & Repairs

9.1 Duplex Sets Only

Only carry out maintenance and repairs with the electrical supply disconnected and not before a set and its fluid contents have cooled to a safe temperature (say below 25°C) and with the set fully isolated from incoming and outgoing condensate flow and pressure.

Duplex sets - if removing a pump for repair or maintenance and the set is to remain operational, the power must always be switched off at the mains supply and the cable terminations made safe before returning a set into service for single pump operation.

If a pump requires repair or servicing, refer to the pump manufacturer's manual. Contact Ormandy to order spare parts, or to return the entire pump to Ormandy Ltd.

Vibrating fork level control switches are not user serviceable. If a fault occurs to a level switch, contact Ormandy Ltd. to obtain a replacement switch, or return the entire switch to Ormandy Ltd.

Float type level control switches are user serviceable but, in certain circumstances, re-setting can be difficult. If a fault occurs, it is therefore preferable to contact Ormandy Ltd, to obtain a replacement switch, or return the entire switch to Ormandy Ltd.

To remove a level control or alarm switch, reduce the condensate level to below the level of the switch before attempting to remove a switch from the vessel. Always immediately replace the removed switch, or plug the removed switch nozzle before returning a set into operational service.





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