# Thermo Scientific
# Orion 1803 Steam Sample Conditioner

**User Guide**

Thermo
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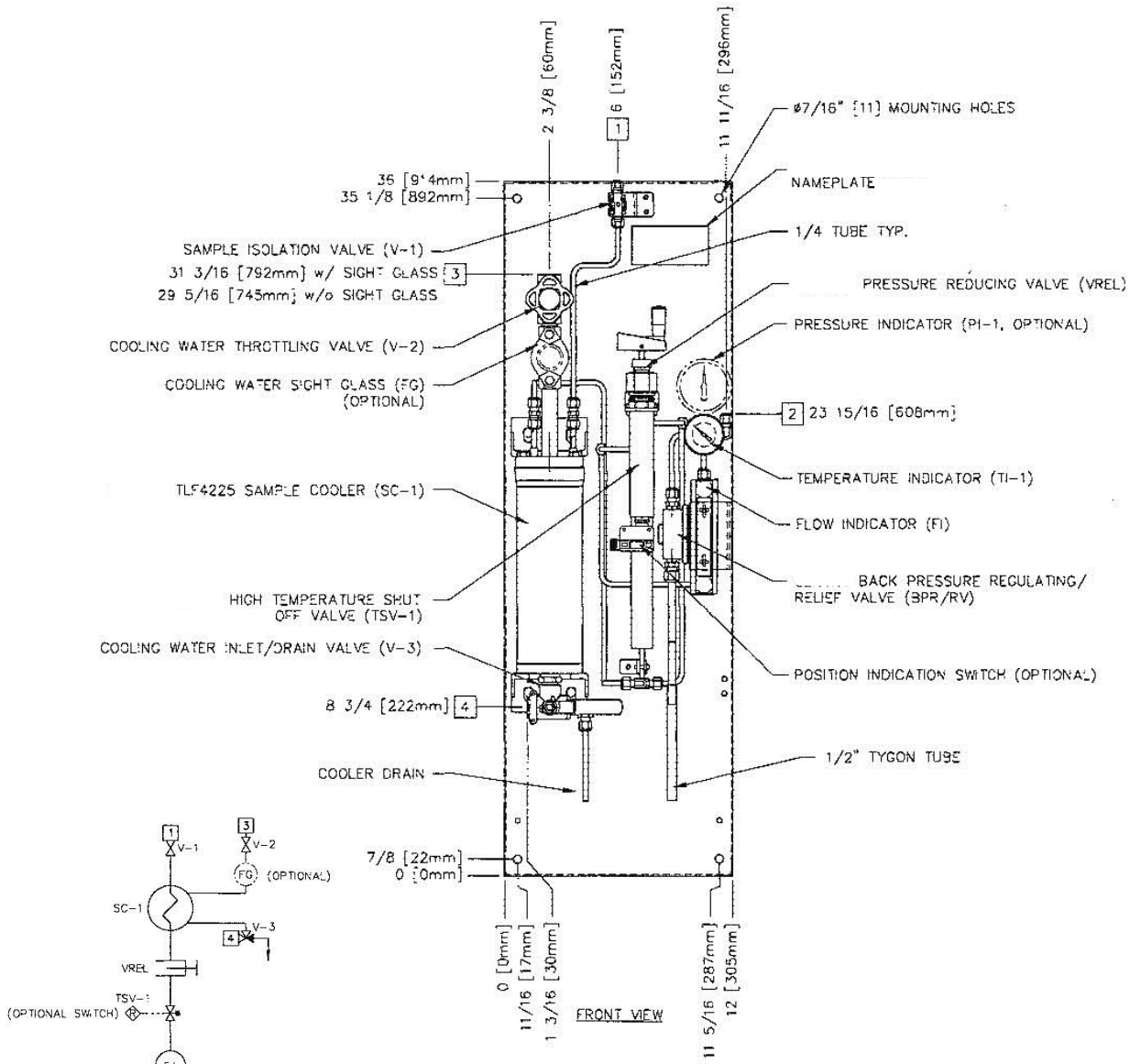


CUSTOMER CONNECTIONS

1. SAMPLE INLET, 1/4" COMP. (SS)
2. ANALYZER CONNECTION, 1/4" COMP. (SS)
3. COOLING WATER OUTLET, 1/2" FNPT (BRZ)
4. COOLING WATER INLET, 1/2" FNPT (BRZ)

METRIC DIMENSIONS, IN MM, ARE IN [ ]

# General Description

The Thermo Scientific Orion 1803 steam sample conditioning panel is a pre-piped assembly that includes all the elements necessary to prepare steam and water samples for accurate and safe online analysis.

There is a base configuration plus a variety of optional components. The drawing to the left shows a flow schematic and a general arrangement drawing of the panel.

The standard 1803 base model is 12” (width) x 36” (height) and is rated at 3030 psig at 1000 °F.

Base Model Includes:

- Sample Shutoff Valve
- Sample Cooler (TF series)
- Variable Pressure Reduction Element, VREL
- Cooling Water Valves
- Temperature Indicator
- Back Pressure and Relief Valve
- Total Flow Indicator
- Thermal Shutoff Valve, TSV

Optional Equipment:

- Pressure Gauge, Cat. No. 228714-A01
- Cooling Water Site Gauge, Cat. No. 228710-A01
- Position Switch Indicator for TSV, Cat. No. 228713-A01

# Specifications

The base configuration includes a back panel with the sample isolation valve, sample cooler, flow control valve, cooling water inlet and outlet valves, back pressure valve, temperature and flow indicators and a thermal shutoff valve.

### Sample Isolation Valve (V-1)

The sample inlet isolation valve is used to isolate flow to the sample panel only. It is not to be used for throttling, due to the damage that will occur on the seat. The valve is selected to meet the pressure and temperature operating conditions of the panel.

### Primary Sample Cooler (SC-1)

The standard cooler used is a Model TLF-4225, which has a removable shell. Other models are available upon request. If chlorinated cooling water or high chloride/bromide cooling water is used, the Model TLF-42B5 should be used.

### Flow Control Valve (VREL)

The VREL is a non-wearing rod-in-tube pressure reducing/flow control device. A unique advantage of this type device is the ease at which dirt can be passed through the system.

### Cooling Water Throttling Valve (V-2)

The cooling water is throttled on the downstream side of the cooler, not the inlet side. This valve allows adjustment of the sample temperature without wasting cooling water.

### Cooling Water Inlet Isolation/Vent Valve (V-3)

The 3-way isolation/vent valve protects the cooler shell side by eliminating the possibility of isolating the cooler while the sample may still be flowing. Either cooling water will be available to the cooler shell or the cooler shell will be vented to the atmosphere.

### Back Pressure/Relief Valve (BPR/RV)

The fixed back pressure/relief valve will hold a constant 20 psi pressure to the monitor(s) at all times. The discharge from the valve is used to take grab samples.

### Temperature Indicator (TI)

The temperature indicator is used to read the temperature of the sample before it goes on to the monitor(s).

### Flow Indicator (FI)

The flow indicator is used to read the total flow through the system. The sample throttling, VREL, must be used to set the flow rate.

### Thermal Shutoff Valve (TSV-1)

The thermal shutoff valve is a self contained, mechanical device that protects both the instrumentation as well as plant personnel from high sample temperatures. The TSV is a spring loaded, latching design with all wetted metals of 316 stainless steel.

## Optional Components

### Pressure Gauge (PI)

Gives sample pressure readout at the monitor connection. Under normal operation this gauge will read approximately 20 psig.

### Cooling Water Sight Glass (FG)

Allows panel operator to view cooling water flow at outlet of sample cooler.

### High Temperature Indicating Switch

A position indicating switch can be provided on the TSV, to enable remote indication of high sample temperature.

### Cooling Water Circuit – Shellside

The cooling water must be throttled on the outlet side of the cooler, not the inlet side. This approach gives the maximum cooling water pressure inside the cooler shell, which in turn assures the highest possible boiling point. Boiling should be eliminated since it not only encourages scaling, but also causes tube vibration and eventual fatigue failure.

**Note:** The sample isolation valve is only for shutting off the sample line. It must never be used to throttle sample flow. When the pressure is reduced across a partly closed valve and the sample is at or near saturation temperature, the sample will flash into a steam/water mixture. This can damage the valve seat so that it may no longer completely shut off sample flow when repairs or replacements are needed downstream. It can also cause water hammer in the sample cooler when the steam bubbles collapse.

### Sample Circuit

The sample first flows through an isolation valve.

The sample then flows through the primary cooler, where most of the heat is removed, then into a VREL for pressure reduction and flow control. The VREL is a pressure reducing/flow control device.

The sample then flows through a flow meter and then into a constant pressure zone. The constant pressure is maintained by a fixed back pressure/relief valve. The pressure will remain constant, independent of source pressure variations.

It is important to have constant sample flow past the sensor. Because the pressure is constant at this point, the flow through the monitor will remain constant (if adequate total flow is available). The fixed back pressure/relief valve also acts as a sample line relief valve. There is a capped fitting at the outlet of the flow meter for connecting to customer supplied monitors. The grab sample flow is the discharge from the fixed back pressure/relief valve.

# Installation

## Receiving and Mounting

1. Examine the unit for any shipping damage. If in doubt, take pictures of the suspect area. Examine the unit for any visible damage. Report damages to the shipper immediately. This is the responsibility of the consignee.

2. Bolt the unit to the wall using four 3/8" bolts. Mounting the unistrut to the wall then mounting the SL to the unistrut will simplify the installation.

## Connections

Step 1: Connect the cooling water inlet and outlet connections on the coolers.

Inlet (bottom), connection #4 is 1/2" FNPT

Outlet (top), connection #3 is 1/2" FNPT

Step 2: Connect the sample inlet/outlet and optional sink drain lines.

Sample lines are 1/4" compression

Optional sink drain line is 1" FPT

## Operation

1. Open the sample cooler cooling water outlet valve (V-2) to the full open position.

2. Open the sample cooler cooling water inlet valve (V-3) to the open position (handle in the 9 o'clock position).

3. Close the VREL by turning clockwise. Do not overtighten it. The VREL is not a shutoff valve.

   **Note:** When starting up a sample line always be sure that the rods are fully inserted (turn handle clockwise to insert rods) before opening the sample isolation valve. When the rods are fully inserted, the yoke bottoms in the barrel. When the rods are fully retracted, the yoke is stopped by the seal. Do not try to turn the handle at these locations by using extra force. The threads will be damaged. After opening the isolation valve, adjust the setting of the VREL until the desired flow rate is established.

4. If the thermal shutoff valve (TSV-1) is present, make sure that the valve is reset by looking at the button. If the red indicator ring is not visible, it is ready for operation. If it is visible, push the button until the valve latches and the red indicator ring is not visible.

5. Open the sample inlet isolation valve (V-1) to the full open position.

6. Adjust the VREL, by turning counterclockwise, until the desired sample flow rate is achieved. The sample will be discharging through the BPR/RV. The sample must be discharging from the BPR/RV to ensure that the sample flowing to the monitor will be at a constant pressure and therefore constant flow rate. The flow should be enough to establish turbulent flow in the sample lines between the sample source and the rack. The flow must also be in excess of that required by the monitors so that there is enough for a grab sample. Typically 1200 cc/min is recommended for 1/4" sample lines.

7. Monitor the temperature indicator (TI) to ensure that the sample temperature is not exceeding either a limit determined by the instrument requirements or personnel limitations. If the sample becomes too hot, check for cooling water flow and temperatures and reduce the sample flow rate.

8. Adjust the flow meter in each monitor line to set the proper flow for each. Check to be sure that the sample is still flowing from the back pressure valve. If not, open the VREL until a solid sample stream is established. This is the grab sample source. If it takes too long to take a grab sample, temporarily open the flow control valve further. When finished taking the grab sample, be careful not to cut back flow lower than the turbulent flow rate or the rate to maintain a solid stream.

9. If the thermal shutoff valve trip (the red indicating band is visible), the sample flow to the BPR/RV and instruments will be stopped. This tripped position indicates that the sample temperature exceeded the preset 104 °F trip point. After verifying that the cooling water is available and flowing, close the VREL and then push the button in. It may be necessary to hold the button in momentarily until all high temperature sample is flushed from the system. Re-establish flow as before, see step 6.

**Note:** The VREL is a rod-in-tube device. The pressure of the incoming sample is reduced as the liquid is forced to travel through the narrow gap between the tapered rod and the tube inside diameter. Because the work is done over the entire length of the rod, localized stresses are held to a minimum. The result is a very long service life compared with devices in which the pressure drop is taken over a very short distance (fixed orifice, pressure regulator, etc.). In those devices material erosion frequently causes loss of function.

**Note:** The VREL is not a shutoff valve. Minimum flow obtainable is about 400 cc/min or less.

**Note:** The flow through the VREL can be adjusted, while the sample is flowing, by changing the position of the rods in the tube. Turning the handle moves the rods in or out on a lead screw. If dirt in the sample blocks sample flow, the rods can be fully retracted to allow sample pressure to blow the dirt through. The sample line need never be shut off, nor the VREL disassembled to accomplish this. This is very important to the operator as he or she tries to get critical samples while boiler pressure is rising or falling during start-up or shutdown.

## Shutdown

1. Close the sample inlet isolation valve (V-1).
2. Close the VREL (clockwise).
3. Close the cooling water outlet valve (V-2).
4. Switch the cooling water inlet valve (V-3) to the vent position.

# Troubleshooting

| Symptom | Possible Problems) | Remedy |
|---|---|---|
| Elevated Sample Temperature | Loss of cooling water flow | Check cooling water supply |
| | Increase in cooling water inlet temperature | Reduce cooling water temperature or increase flow |
| | Scaled cooler | Chemically clean (see cooler maintenance) |
| | Increased sample flow | Adjust sample flow rate |
| Reduced Sample Flow | Plugged line | Blow down line and exercise flow control valve |
| | BPRV failure | See leaking BPR/RV |
| Leaking Valve Stems | Loose or worn packing | Tighten packing nut or replace packing |
| Leaking Cooler | Loose housing from thermal shock or worn gasket | Tighten bolts on rod assembly or replace gasket if cut or worn |
| Leaking BPR/RV | Diaphragm failure | Replace diaphragm |

# Maintenance

## Sample Cooler

The only service coolers normally require is occasional descaling of the shell side. This can be done chemically or mechanically after removing the shell. The frequency of this cleaning depends on the hardness level and the outlet temperature of the cooling water. When a significant increase in the approach temperature occurs, it is time to descale the cooler. If the cooler is used in continuous steam service, inhibited demineralized cooling water may be required to avoid frequent descaling.

## VREL

There is no normal maintenance required. In the event of a blockage, the VREL can normally be cleared by fully opening the valve. Care must be taken to insure that live steam is not discharged during this process.

If after normal maintenance and adjustment the VREL seals develop a leak and cannot be adjusted, a VREL replacement seal kit is available.

### Valve Packings

Occasionally during initial start-up or restart of the sample panel, the sample inlet isolation valve packing can leak. If this occurs, remove the handle and tighten the packing nut while the valve is in service, then replace handle. If the packing continues to leak, replace the packing.

**Note:** All 1803 systems produced prior to June 2008 use packing material specified by Parker. Please consult with Parker directly on the replacement ordering part numbers. Currently the 1803 systems are produced with the Swagelok packing material.

### Flow Meters

The interior surface of the flow meter can be cleaned by removing the plug at the top of the meter and wiping with a soft cloth. Be sure the inlet isolation valve is closed prior to opening the meter. No other service is possible.

### Back Pressure/Relief Valve

The only serviceable part is the diaphragm. No pressure adjustment is available. See the Ordering Information section for a parts.

### Thermal Shutoff Valve

There are no customer serviceable components in this valve. Occasional exercising of the valve may be performed by increasing the sample temperature by either increasing sample flow rate or decreasing cooling water flow rate. This may be recommended if sample water is exceptionally dirty. Verify that all monitors are isolated before performing this operation. If repair is necessary, contact Technical Support.

## Assistance

After troubleshooting all components of your measurement system, contact Technical Support. Within the United States call 1.800.225.1480 and outside the United States call 978.232.6000 or fax 978.232.6031. In Europe, the Middle East and Africa, contact your local authorized dealer. For the most current contact information, visit www.thermo.com/contactwater.

For the latest application and technical resources for Thermo Scientific Orion products, visit www.thermo.com/waterapps.

## Warranty

For the most current warranty information, visit www.thermo.com/water.

# Ordering Information

| Cat. No. | Tag | Description |
|---|---|---|
| 228709-A01 | BPR/RV | Back Pressure Regulator/Relief Valve |
| 228710-A01 | FG | Cooling Water Sight Gauge |
| 228711-A01 | FI | Flow Meter (350 to 1900 cc/min) |
| 228712-A01 | TSV | Thermal Shutoff Valve (set at 104 °F) |
| 228713-A01 | TS | Position Switch Indicator for TSV |
| 228714-A01 | PI | Pressure Gauge (0 to 60 psi) |
| 228715-A01 | SC-1 | TLF-4225 Sample Cooler |
| 228716-A01 | TI | Thermometer (0 to 250 °F) |
| 228717-A01 | VREL | VREL High Pressure Sample Flow Control Valve |
| 228718-A01 | V-1 | 1/4” High Pressure/Temp Sample Isolation Valve (Welded) |
| 228719-A01 | V-1 | 1/4” High Pressure/Temp Sample Isolation Valve (Compression) |
| 228720-A01 | V-2 | Cooling Water Throttling/Isolation Valve (outlet) |
| 228721-A01 | V-3 | Cooling Water Isolation/Vent Valve (inlet) (3-way) |

**Gaskets and Packing**

| Cat. No. | Description |
|---|---|
| 228722-A01 | TLF-4225 Sample Cooler Gaskets (1 required per cooler) |
| 228723-A01 | VREL Seal Kit |
| 228724-A01 | Back Pressure Valve Diaphragm |
| 228725-A01 | High Pressure/Temp Sample Isolation Valve Packing Kit* |

* All 1803 systems produced prior to June 2008 use packing material specified by Parker. Please consult with Parker directly on the replacement ordering part numbers. Currently the 1803 systems are produced with the Swagelok packing material.

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