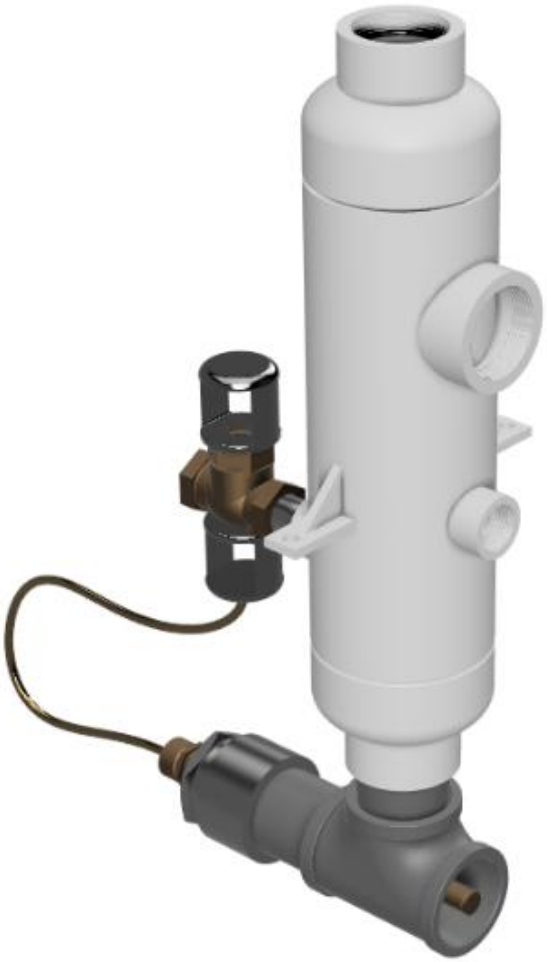
CONDENSATE COOLERS
INSTALLATION, OPERATION & MAINTENANCE GUIDE



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MADDEN ENGINEERED PRODUCTS

CONDENSATE COOLERS - GENERAL GUIDANCE MANUAL

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1. PURPOSE & SCOPE

Madden CC Series Condensate Coolers are designed to reduce the temperature of hot condensate or hot liquid drain processes by mixing process liquid with a controlled flow of cold water through a self-operating temperature regulating valve.

Typical applications include:

- Steam trap drain lines
- Steam-to-water heat exchanger drains
- Sterilizer or autoclave drain systems
- Other non-return condensate or hot liquid drain applications

This manual provides guidance for installation, startup, operation, and basic maintenance of Madden condensate coolers.

2. SAFETY INFORMATION

WARNING — HOT CONDENSATE AND STEAM SYSTEMS
Installation and service must be performed by qualified personnel familiar with steam and condensate piping systems.

Before working on equipment:

- Isolate system pressure.
- Allow equipment to cool.
- Verify piping is depressurized.
- Follow plant lockout/tagout procedures.

Failure to follow proper installation and safety practices may result in personal injury or equipment damage.

3. DESIGN INTENT & APPLICATION LIMITATIONS

3.1 Intended Use

Madden condensate coolers are designed to:

- Quench and temper hot condensate prior to drain discharge.
- Operate as atmospheric, vented drain cooling devices.
- Reduce drain temperatures to acceptable facility limits (application dependent).

3.2 Pressure Limitations

Condensate coolers are intended for **low-pressure drain applications (≤ 15 PSIG)**.

3.3 Not a Flash Tank

This equipment is **NOT designed to function as a flash tank**.

For drain processes above 15 PSIG:

- Install a separate flash vessel upstream, OR
- Use an appropriately engineered flash separation system.

3.4 Vent Requirements

The vent connection must:

- Remain unobstructed at all times.
- Be piped to a safe atmospheric location.
- Never include valves, traps, or condensing equipment.
- Never be reduced in size unless reviewed by Madden.

Improper venting may cause unsafe operating conditions and void warranty coverage.

4. EQUIPMENT DESCRIPTION

The Madden CC Series typically consists of:

- Vertical Sch 40 carbon steel vessel (SA106 standard) or 316 stainless steel (optional)
- Self-operating cold water regulating valve
- Remote sensing bulb with capillary tube
- Threaded inlet, drain, and vent connections
- Exterior industrial coating (carbon steel models)

The temperature regulator senses outlet temperature and automatically modulates cooling water flow to maintain the selected discharge temperature.

5. RECEIVING & INSPECTION

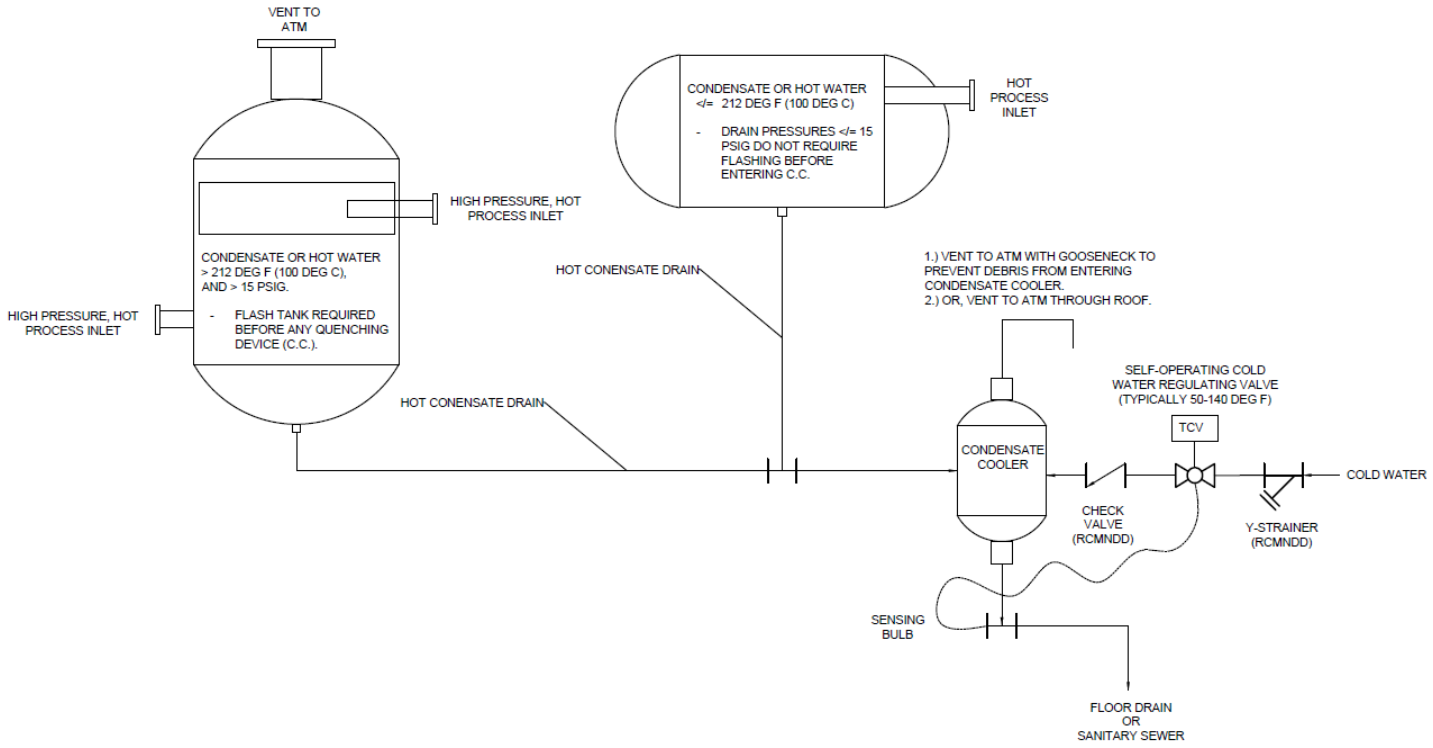
Upon receipt:

1. Inspect for shipping damage.
2. Verify model number and connection sizes.
3. Confirm sensor capillary is undamaged.
4. Ensure vent and drain connections are clear.

Do not install damaged equipment. Notify Madden immediately if shipping damage is observed.

6. INSTALLATION INSTRUCTIONS

6.0 Typical Piping and Installation Diagram



IMPORTANT HIGHLIGHTS – (1) Vent must stay open, (2) Gravity drain only, (3) Condensate Coolers are not intended to be used as an independent flash tank. More details are provided on following pages.

6.1 Orientation & Support

- Install unit vertically with vent connection at the top.
- Provide rigid piping support or mounting to prevent movement.
- Avoid imposing excessive piping loads on vessel connections.

6.2 Piping Requirements

6.2.1 Hot Condensate Inlets

- Connect process drain lines to designated inlet connections.
- Avoid installing isolation valves that may inadvertently block condensate flow unless operationally required.

6.2.2 Cold Water Supply

- Connect cold water supply to regulating valve inlet.
- Confirm flow direction matches valve body arrow.
- Install upstream isolation valve.
- Backflow prevention devices should be installed as required by local codes.

6.2.3 Drain Connection

- Drain piping must be discharged freely by gravity. Madden recommends installing an elbow and short vertical downward discharge immediately downstream of the sensing bulb tee to promote gravity drainage and stable temperature sensing. If possible, immediately terminate to a floor drain/sewer line.
- Maintain an atmospheric air gap at the floor or service drain.
- If discharge requires a horizontal pipe run, ensure an adequate drop is provided to gravity drain. Do not create lift or backpressure in the drain line.

6.2.4 Vent Connection

- Run vent piping unimpeded to a safe atmospheric location.
- Do not restrict or cap vent piping.
- Avoid horizontal runs that may trap condensate.
- A gooseneck termination is recommended to reduce debris and weather intrusion into the condensate cooler vent line.

6.3 Sensing Bulb Installation

- Install sensing bulb in designated outlet location.
- Ensure full contact with flowing fluid.
- Protect capillary tubing from physical damage or sharp bends.

6.4 Pre-Startup Checklist

Before placing the unit into operation, confirm:

☐ Unit installed in vertical position
☐ Vent connection open and unobstructed
☐ Drain piping sloped properly by gravity
☐ Cold water supply available and valved open
☐ Sensing bulb installed and secured
☐ No visible piping strain or misalignment
☐ All threaded connections tightened and leak checked
☐ Installation reviewed by qualified technician

6.5 Startup Procedure

1. Open cooling water supply.
2. Slowly introduce hot condensate flow.
3. Observe discharge at drain.
4. Verify cooling water valve begins modulating as temperature rises.
5. Check for leaks and vibration.
6. Verify discharge temperature meets facility requirements.

Allow system to stabilize before making temperature adjustments.

7. TEMPERATURE ADJUSTMENT

The self-operating valve is field adjustable within the design range supplied with the unit.

- Turn adjusting screw clockwise -> increases set temperature.
- Turn adjusting screw counter-clockwise -> decreases set temperature.

Allow sufficient time after adjustment for system stabilization.

8. NORMAL OPERATION

During normal operation:

- Cooling water flow will vary automatically based on process temperature.
- Minor venting or flashing may occur during load changes.
- Seasonal cooling water temperature changes may affect performance.

Operator intervention is typically not required once set.

9. MAINTENANCE GUIDE

Madden condensate coolers contain no moving internal vessel components.

Recommended periodic checks:

Frequency	Inspection Item
Monthly	Check for leaks or vibration
Quarterly	Verify discharge temperature
Annually	Inspect regulating valve operation
As Needed	Flush piping for debris or fouling

Replacement or service of the thermostatic valve should follow the valve manufacturer's instructions.

10. TROUBLESHOOTING GUIDE

Symptom	Possible Cause	Recommended Action
Discharge temperature too high	Insufficient cooling water	Verify supply pressure and valve operation
Discharge temperature too high	Cooling valve set too high	Adjust setpoint lower
Excess steam from vent	Process pressure too high	Add upstream flash tank
No cooling water flow	Valve installed backwards or failed	Verify flow direction and inspect valve
Temperature swings	Sensor improperly installed	Check sensing bulb location

11. INSTALLATION RESPONSIBILITY NOTICE

Proper installation of venting, drain routing, backflow prevention, and piping support is the responsibility of the installing contractor and/or system designer.

Madden Engineered Products is not responsible for performance issues caused by:

- Improper venting
- Installation outside design pressure limits
- Drain backpressure or lifted drain lines
- Incorrect valve orientation
- Failure to follow installation guidelines

12. WARRANTY

Madden Engineered Products warrants equipment to be free from defects in material and workmanship at time of shipment.

Warranty does not cover:

- Improper installation or misapplication
- Use outside rated pressure or temperature limits
- Blocked vent lines or improper drain conditions
- Freeze damage or water quality related issues
- Unauthorized modification of equipment

See Madden's Terms and Conditions of Sale document for complete warranty details.

13. TECHNICAL SUPPORT

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