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## Revision History

<table>
<thead>
<tr>
<th>Version</th>
<th>Release Date</th>
<th>Description of Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>28/11/2013</td>
<td>Initial</td>
</tr>
<tr>
<td>1.1</td>
<td>22/01/2013</td>
<td>Temperature transmitter T (T1, T2, T3) - Design Modification</td>
</tr>
</tbody>
</table>
| 2.0     | 17/03/2016   | Tee and Adapter - Design Modification  
page 5: update of the calorimeter assembly graphic according to new design.  
page 6: update of the cabinet exterior graphic according to new design.  
page 7: update of the cabinet interior graphic according to new design.  
page 9: update of the calorimeter assembly and cabinet exterior graphics.  
correction: dimension conversion lenght 3m => 118’  
page 10: update of the typical installation for vertical or side of horizontal steam line graphic. Add comment on the cable connecting Harting Plus to sensors.  
page 11: update of the typical installation for top of horizontal steam line graphic.  
page 12: Text modifications for point 5, 8 and 9  
Add 'Drain Hose Specifications' chart.  
page 18: Add drain menu procedure.  
page 25: adding List of component and parts.  
page 26: update of the ETL Electrical Safety Listings logo.  
page 29, Appendix Three: update data logger (MODBUS) connection (master and slave modes).  
All document:  
SteamLog eWon data logger not available anymore, all references deleted from document.  
Yokogawa information deleted from document. |
## Safety

### Icon Legend

- **Indicates Power On**
- **Indicates Power Off**
- **Indicates important information concerning potential for personal injury or damage to equipment**
- **Indicates electrical hazard**
- **Indicates hot surface**

**Burn hazard!** Uninsulated components upstream of cabinet may be hot.
- Do not touch when unit is working.
- Allow to cool before moving or servicing unit.

Live steam will cause burns; condensate water may cause them. Skin exposure to 140 °F (60 °C) water for only five seconds may cause a second degree burn.

Keep unit away from heat-sensitive equipment and installations.

**Shock hazard!** High voltages present inside equipment.
- Electrical installation must be performed by qualified personnel.
- Disconnect power before performing any electrical service.

Read this manual. It contains important information.

This device must be installed in accordance with appropriate local, national, and international standards, codes, and practices.

Installation should always be accompanied by competent technical assistance. Improper installation, start-up, operation, maintenance, or service may void warranty.

You are encouraged to contact Armstrong International or its local sales representative for additional information.

Service must be performed by a qualified person.

Equipment must be disposed of according to applicable environmental requirements.
<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>∆P</td>
<td>Differential Pressure</td>
<td>∆P1: Difference between water column in NCG vessel and atmosphere. ∆P2: Difference between water column in condensate vessel and atmosphere.</td>
</tr>
<tr>
<td>Al</td>
<td>Alarm</td>
<td>Indicates an out-of-limit situation, but has no impact on operation. Al1: Dryness below user-defined set point longer than two seconds. Al2: Four consecutive calculations of NCGs are over the user-defined limit. This calculated value is displayed on the main screen and updated every 30 seconds. Al3: T1 above 257 °F (125 °C) longer than two seconds.</td>
</tr>
<tr>
<td>C</td>
<td>Celsius</td>
<td></td>
</tr>
<tr>
<td>cm</td>
<td>Centimeter</td>
<td></td>
</tr>
<tr>
<td>Df</td>
<td>Default</td>
<td>Indicates failure. Turns off power to heating element and opens EV/zero to drain. Df4: T3 above 185 °F (85 °C) longer than two seconds. Df5: No condensate from condenser in last ten minutes. Df6: T2 above 356 °F (180 °C) longer than two seconds.</td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsches Institut für Normung eV</td>
<td></td>
</tr>
<tr>
<td>dP</td>
<td>Differential Pressure</td>
<td></td>
</tr>
<tr>
<td>EC</td>
<td>European Community</td>
<td></td>
</tr>
<tr>
<td>EEC</td>
<td>European Electrotechnical Commission</td>
<td></td>
</tr>
<tr>
<td>EN</td>
<td>European Norm</td>
<td></td>
</tr>
<tr>
<td>EV</td>
<td>Electronic Valve</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Fahrenheit</td>
<td></td>
</tr>
<tr>
<td>gal</td>
<td>Gallon</td>
<td></td>
</tr>
<tr>
<td>h</td>
<td>Hour</td>
<td></td>
</tr>
<tr>
<td>imp</td>
<td>Imperial [measure]</td>
<td></td>
</tr>
<tr>
<td>in.</td>
<td>Inch</td>
<td></td>
</tr>
<tr>
<td>kg</td>
<td>Kilogram</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>Liter</td>
<td></td>
</tr>
<tr>
<td>lb(s)</td>
<td>Pound(s)</td>
<td></td>
</tr>
<tr>
<td>max</td>
<td>Maximum</td>
<td></td>
</tr>
<tr>
<td>min</td>
<td>Minimum</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td>Millimeter</td>
<td></td>
</tr>
<tr>
<td>NCG</td>
<td>Non-Condensable Gases</td>
<td>NCGmax is the limit of the NCG rate. Alarm 2 indicates the limit has been exceeded. Range is 0–15%. Default is 3.5%.</td>
</tr>
<tr>
<td>P</td>
<td>Pressure</td>
<td>P is steam pressure upstream of calibrated orifice. Modbus sends data as bar even with imperial measure selected.</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per Million</td>
<td></td>
</tr>
<tr>
<td>psi(g)</td>
<td>Pounds per Square Inch (gauge)</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Steam Flow</td>
<td></td>
</tr>
<tr>
<td>QM</td>
<td>Quality Monitoring</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>Resistance</td>
<td>Shown as watts.</td>
</tr>
<tr>
<td>R/O</td>
<td>Reverse Osmosis</td>
<td></td>
</tr>
<tr>
<td>sec(s)</td>
<td>Second(s)</td>
<td></td>
</tr>
<tr>
<td>SI</td>
<td>International System of Units</td>
<td></td>
</tr>
<tr>
<td>Ss</td>
<td>Superheat</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Dryness Fraction (sometimes called steam quality or moisture content)</td>
<td>Xmin is the lower dryness limit. Alarm 1 indicates the limit has been exceeded. Range is 0.85–0.95. Default is 0.95.</td>
</tr>
</tbody>
</table>
General Description

Steam QM-3 is intended to replace manual testing of pure steam and provide real-time data proving that steam quality meets applicable requirements.

Advantages over manual testing are:
- Improved safety
- Ease of use
- Reduced time per test
- Reduced cost per test
- More accurate and objective results
- Ability to trend data over time

Steam QM-3 is set up and calibrated to test for parameters defined in EN285 standard. It performs three tests:
- Calculating dryness
- Calculating superheat
- Quantifying non-condensable gases (NCG)
  (NCG measurement is performed first. If it is within range, dryness and superheat measurements will be performed.)

Armstrong strongly recommends that the Steam QM-3 unit be installed in one location and not used for checking multiple steam outlets. It is possible to use one unit for multiple locations and it could be installed for portability at customer’s preference. Note however that:
- Calorimeter assemblies and cabinets are matched sets and are not interchangeable.
- Moving both calorimeter and cabinet to alternate locations as a unit is preferred.
- If one cabinet is connected to a different calorimeter, it must be recalibrated prior to use.

Data from Steam QM-3 can be recorded using a data historian with Modbus output (see appendix three on p. 29 for connection information.)

Materials of construction comply with all standards known at the time of manufacture.

Armstrong reserves the right to make design or specification changes without notification.
**Calorimeter Assembly**

**Note:** The assembly shown below is configured for connection to a vertical steam line. Calorimeter assembly weighs approximately 11 lbs (5 kg).

Diagram of calorimeter assembly with labels:

- **1.** Inlet tee
- **2.** Sanitary clamp
- **3.** P pressure transmitter
- **4.** Calibrated orifice (inside connection)
- **5.** Calorimeter
- **6.** Sanitary clamp
- **7.** Steam line from calorimeter to superheating chamber (not visible)
- **8.** Superheating chamber
- **9.** Drain (6 mm)
- **10.** Tee
- **11.** T1 temperature transmitter
- **12.** T2 temperature transmitter
- **13.** Heating Element

Alternate steam line connection (if chamber must be rotated)

- Steam to cabinet (flexible hose not shown)
Cabinet Exterior

Cabinet weighs approximately 42 lbs (19 kg).

Handle

Display

Navigation Pad

Power On indicator light

RS485 connection (M12)

Auxiliary (unused) connections

Harting connector

Electrical connection and power switch (not visible)

Cooling water inlet

Cooling water outlet

Steam from calorimeter

Condensate drain

Wheel (back)/Foot (front)
Cabinet Interior

1. NCG pressure differential sensor
2. EV1 solenoid valve
3. NCG burette
4. Condensate pressure differential sensor
5. T3 temperature sensor
6. Condensate burette
7. EV3 solenoid valve
8. EV2 solenoid valve
9. EV0 solenoid valve
10. Condenser
11. Relay board with solenoid LED
12. Main screen (consult page 6)
13. Cabinet steam inlet
14. Cabinet condensate outlet

Steam from calorimeter
Condensate drain
## Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calorimeter operating temperature range (T1)</td>
<td>0 – 150 °C (32 – 302 °F)</td>
</tr>
<tr>
<td>Maximum allowable calorimeter temperature (T1)</td>
<td>180 °C (356 °F)</td>
</tr>
<tr>
<td>Calorimeter operating saturated steam pressure range (P)</td>
<td>0.5 – 4 barg (7 – 60 psig)</td>
</tr>
<tr>
<td>Superheated steam operating temperature range (T2)</td>
<td>0 – 180 °C (32 – 356 °F)</td>
</tr>
<tr>
<td>Dryness fraction</td>
<td>0.85 – 1</td>
</tr>
<tr>
<td>Dryness fraction accuracy</td>
<td>± 0.01 of display</td>
</tr>
<tr>
<td>Non-condensable gases content</td>
<td>≤ 15%</td>
</tr>
<tr>
<td>Condensate temperature range (T3)</td>
<td>0 – 80 °C (32 – 176 °F)</td>
</tr>
<tr>
<td>Operating condensate temperature (T3)</td>
<td>65 °C (149 °F)</td>
</tr>
<tr>
<td>Estimated steam consumption</td>
<td>1.5 kg/h (3.3 lbs/h) @ 3 barg (45 psig)</td>
</tr>
<tr>
<td>Estimated water consumption</td>
<td>15 L/h (4 gal/h) @ 10 °C (50 °F)</td>
</tr>
<tr>
<td>Electrical</td>
<td>115/230 VAC</td>
</tr>
<tr>
<td></td>
<td>50/60 Hz</td>
</tr>
<tr>
<td></td>
<td>100 W</td>
</tr>
</tbody>
</table>
General Considerations (Site Selection)

Ambient temperature must be 5–60 °C (41–140 °F)
Relative humidity must be 30–80%
Altitude must not exceed 2000 m (6562 ft)

Attachment to vertical steam line is optimal.

Attachment to horizontal steam line must be at center line or above.

Superheating chamber must be installed within 45° of vertical to front or back.

- Use one or both sections of flex hose provided depending on installation
- Length must not exceed 3 m (118 in.)
- Hose must run down from calorimeter assembly to cabinet with no low spots where pools of condensate could form

Note: Where necessary outlet on heating chamber can be rotated 180° to accommodate left or right cabinet position. See instructions below (p. 11).

Mounting both calorimeter and cabinet is required. Cabinet must be mounted on a wall. Mounting hardware is supplied.

Unit must be installed with the following utilities nearby:
- Cooling water supply
- Drain
- Grounded power source with required voltage (alternative grounding of unit is permissible, but grounding is required)
Typical Installation

Note:
- Unit is shipped assembled for vertical steam line as shown below. Connecting to top of a horizontal line will require changing some components as shown on following page.
- Installation is highly variable based on site requirements.
- Connections shown below are typical.
- Contact Armstrong for variations as required.

- The cable connecting Harting Plug to the sensors can not be looped.
- Avoid electro-magnetic influence.

1. If steam line has no connection, install ½" valved connection.

2. If connecting to an existing steam line connection, outlet must be valved.

3. Assemble calorimeter.

   For vertical or side of horizontal steam line

   Install provided insulation.

   Pressure transmitter must not be installed down. Optimal position is up.

   Confirm that calibrated orifice is between tee and calorimeter.

   Rotate superheating chamber if necessary (see instructions next page).

   Operating unit without calibrated orifice in place may allow high pressure steam to enter unit causing personal injury. Consequent damage to equipment is not covered by warranty.
For top of horizontal steam line

1. Install provided insulation.
2. Confirm that calibrated orifice is between tee and calorimeter.
3. Tighten clamp
4. Loosen clamp between calorimeter and heating chamber.
5. Loosen linking pipe connections and remove from heating chamber.
6. Screw plug on unused connection
7. Remove plug from alternate connection point
8. Rotate superheating chamber if necessary (see instructions below).
9. Rotate superheating chamber 180°
10. Reattach linking pipe

Operating unit without calibrated orifice in place may allow high pressure steam to enter unit causing personal injury. Consequent damage to equipment is not covered by warranty.

Confirm that calibrated orifice is between tee and calorimeter.

Operating unit without calibrated orifice in place may allow high pressure steam to enter unit causing personal injury. Consequent damage to equipment is not covered by warranty.
5 Connect calorimeter to the steam line using a ½" sanitary fitting (50.3 mm - 1.98 inch) and secure using the supplied clamp and gasket.

**Note:** Distance from main steam line to calorimeter assembly inlet should not exceed 6" (152 mm). Extending distance may affect test results.

6 Position cabinet and attach flex hose between heating chamber and cabinet using gaskets provided.

**Note:** Avoid low spots where condensate could collect.

7 Connect sensor cables to cabinet.

**Note:** securing sensor cables to calorimeter assembly to relieve stress is recommended.

8 Connect cooling water supply (push in fitting to insert or remove tubing). Maximum inlet pressure is 90 psi (6 bar). Tubing diameter is 0.23" (6 mm).

**Note:** Armstrong recommends deionized, R/O, or softened water, although tap water is permissible. Armstrong provides as a standard a 394" (10 meter) hose.

9 Plumb both cooling water and condensate discharges to drain.

Condensate water may be hot (up to 212 °F [100 °C]).

Plumb with appropriate material.

---

### Drain Hose Specifications

<table>
<thead>
<tr>
<th>Connection</th>
<th>Max. Temperature</th>
<th>Max. Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double Jacket drain</td>
<td>230 °F [110 °C]</td>
<td>4 barg</td>
</tr>
<tr>
<td>Cooling water inlet</td>
<td>185 °F [85 °C]</td>
<td>6 barg</td>
</tr>
<tr>
<td>Cooling Water drain</td>
<td>185 °F [85 °C]</td>
<td>6 barg</td>
</tr>
<tr>
<td>Condensater drain</td>
<td>230 °F [110 °C]</td>
<td>4 barg</td>
</tr>
</tbody>
</table>

Cabinet condensate line must be below discharge of EV0.
Confirm voltage (shown above power switch).

**Note:** Unit is shipped set to 220/230 VAC.

To change voltage:

1. Release tab and pull out fuse cover.
2. Pull out white voltage module and rotate module 180° and reinsert.
3. Reinstall cover.

**Note:** If main power voltage was changed to 110/115 VAC, change setting on calibration menu screen to change display. See "Calibration Menu Screen" on p. 18.

If connecting to a control system or MODBUS, interface RS485 (M12) with Modbus protocol.

**Note:** Modbus settings may need to be changed; see "Advanced Setting Menu" on p. 17. (See appendix three on p. 29 for Modbus connection information.)
Start-Up Procedure

1. Confirm all connections:
   - Power
   - Cooling water inlet
   - Cooling water outlet
   - Condensate drainage from EV0 and heating chamber
   - Sensor lines

2. Open cooling water supply.

3. Turn on unit. Indicator light will come on and main screen will display.

4. Slowly open steam valve upstream of calorimeter.

   **Caution**: Uninsulated components outside cabinet will become hot once steam is applied.

   **Note**: Parameters will display in about 10 minutes (may require up to 30 minutes if condenser is empty).

5. Check for leaks and tighten connections as necessary.
Software Navigation

Standard Screens

EN285 Screen (Main Screen)

**Note:** During initialization, a progress bar is displayed until readings become available.

Arrow keys navigate in a screen or in some cases access special screens as defined later.

Gear symbol accesses settings menu.

Exclamation point indicates an active alarm or default condition.

Press "OK" to accept changes.

Ringing bell symbol accesses alarm settings menu.

Down arrow symbol displays subsidiary EN285 screen.

Option keys

Line 4 shows navigation for option keys.

EN285 returns to initial screen.
**Settings Menu**

Scroll settings using up/down arrows (▲ or ▼). Move arrow to value (activate selection) by pressing right arrow (►).

With arrow (►) at left of digits, change value by pressing up/down arrows (▲ or ▼). To save change press left arrow (◄) or exit screen.

Unit switches between imperial and SI units.

**Alarm Menu**

Alarm indicates an out-of-limit situation, but has no impact on operation.

Default indicates failure.

Active alarm or default indicated by number “1.”

Note: A default condition turns off power to heating element and automatically opens EV0 to drain.

To reset alarm or default:
- Navigate arrow (►) to alarm or default using arrow keys (◄ ► ▼ ▲) as appropriate.
- Press “OK.”

Note: Alarms and defaults cannot be reset over Modbus connection.
Special Screens

Code Menu

Access menu by pressing ◀ and ▶ at same time.

Navigate between digits by pressing ◀ or ▶.

Change value for digit by pressing ▲ or ▼.

Press "OK."

Advanced Setting Menu

Access code is 007.

Scroll using up/down arrows (▲ or ▼).

Activate selection by pressing right arrow (▶).

With arrow (←) at left of digits, change value by pressing up/down arrows (▲ or ▼). Press left arrow (◄) to save change.

Arrow (←) indicates active parameter.

"logger Add" specifies Modbus address of MODBUS (default is "1").

This can be Master or Slave. For more details see Appendix 3 Modbus communication.

Calibration Menu Screen

Note: This screen is shown only for voltage change. See p. 13.

Access code for this screen is 152.

Navigation is same as screen above.

Scroll using up/down arrows (▲ or ▼). With arrow (←) at left of digits you want press ok.

<table>
<thead>
<tr>
<th>Calibration</th>
<th>PSensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>0barg</td>
</tr>
<tr>
<td>EV1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>115 V</td>
</tr>
<tr>
<td></td>
<td>230</td>
</tr>
</tbody>
</table>
Drain Menu

The unit can be damaged if steam and water supplies are not disconnected before accessing this menu.

Access this menu only after disconnecting steam and water supply to the cabinet.

After a shut-down of the unit, condensate accumulates inside the cabinet. In case of long term storage the unit has to be fully drained to avoid contamination risks.

Access code is 143.

This menu will open all the QM-3’s valves. They will be closed when you get out of the menu.

Sensor Information Screen

Access screen by pressing ▲ and ▼ at same time.

Scroll using up/down arrows (▲ or▼). Activate selection by pressing right arrow (►).

With arrow (►) at left of digits, change value by pressing up/down arrows (▲ or▼). Press left arrow (◄) to save change.

Note:

• Information displayed is real time values, which may be irrelevant if unit is not connected to steam.
• This screen is for information only, and is intended for use during commissioning, debugging, etc. Values cannot be changed on this screen.

<table>
<thead>
<tr>
<th>P1</th>
<th>3.0</th>
<th>T1</th>
<th>101.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>△P1</td>
<td>208</td>
<td>T2</td>
<td>118.3</td>
</tr>
<tr>
<td>△P2</td>
<td>225</td>
<td>T3</td>
<td>64.3</td>
</tr>
<tr>
<td>P_r</td>
<td>21</td>
<td></td>
<td>974</td>
</tr>
</tbody>
</table>

X value. Displays:

• 2000 during initialization
• 10 if T1 < 212 °F (100 °C) (no steam)
• > 1000 if superheated steam
• 850–1000 (dryness fraction x 1000) during normal operation
Components and water may be hot.

Disconnect power before performing electrical work.

If problem cannot be resolved, contact Armstrong.

**Power Light/Display Off**

- **Power switch on?**
  - Yes → **Power light on?**
    - Yes → Check switch on circuit board.
    - No → Check F2 fuse.
  - No → Check power cable.

- **Power switch on?**
  - Yes → **Power light on?**
    - Yes → Check switch on circuit board.
    - No → Check fuses in switch.

**NCG Burette Overflowing**

- **Exit tubing full of water?**
  - Yes → Check for plugged line.
    1. Remove tubing to burette.
    2. Remove water from tubing.
    3. Replace tubing.
  - No → Q value > 6.6 lbs/h (3 kg/h)?
    - Yes → Reduce steam pressure below 60 psi (4 barg).
    - No → Check for missing calibrated orifice.

- **Water in burette?**
  - Yes → Check EV2 (see “Solenoid Valve” on p. 23).
  - No → Condensate draining?
    - Yes → Check for missing calibrated orifice.
    - No → 1. Remove tubing to burette.
      2. Remove water from tubing.
      3. Replace tubing.
      4. If dP 2 not working, contact Armstrong.
Condensate Burette Overflowing

1. Remove tubing from burette.
2. Remove water from tubing.
3. Replace tubing.

Check EV3 (see “Solenoid Valve” on p. 23).

**Default 4**
(T3 > 185 °F [85 °C] > 2 secs)

**Note:** Access Sensor Information screen (see p. 18) to see these values.

**Check:**
1. Cooling water temperature
2. Cooling water pressure
3. Orifice
4. T1
5. Df6

Plumb cooling water.

Reset Df4.

Check tubing for blockage.

Check for plugged condenser.

**Check EV2 (see “Solenoid Valve” on p. 23).**
Default 5
(no condensate for 10 min.)

P1 > 15 psig (1 barg)?

Yes

T1 > 210 °F (99 °C)?

No

Check calibrated orifice for obstruction.

Yes

T2 > 210 °F (99 °C)?

No

Contact Armstrong.

Yes

Condensate burette full?

Yes

1. Remove tubing to burette.
2. Remove water from tubing.
3. Replace tubing.

Check EV2 function (solenoid, wiring, etc.).

Check for plugs:
- Coil
- Burette
- Tubing (remove and clean or replace as necessary)

Condensate overfilling burette?

Yes

Wait for unit to cycle. (Contact Armstrong if it does not.)

Condensate filling burette?

No

Check EV2 function (solenoid, wiring, etc.).

No

Check EV0 (see “Solenoid Valve” on p. 23).

Yes

T3 increasing?

Check EV0 (see “Solenoid Valve” on p. 23).

Condensate filling burette?

No

Check EV2 (see “Solenoid Valve” on p. 23).

Yes

Valve just upstream from calorimeter is closed or not fully open.

Inadequate steam supply.

Reset Df5 (opens EV0).

No

Check EV2 (see “Solenoid Valve” on p. 23).

1. Remove tubing to burette.
2. Remove water from tubing.
3. Replace tubing.

Check tubing from burette for plug.

Go to “NCG Burette Overflowing.”

Note: Access Sensor Information screen (see p. 18) to see these values.

Reset Df5 (opens EV0).
**Default 6**
(T2 > 356 °F [180 °C] > 2 secs)

**Note:** Access Sensor Information screen (see p. 18) to see these values.

1. **T1 < 356 °F (180 °C)?**
   - Yes → **Reset Df6.**
   - No → Steam pressure > 60 psig (4 barg)?
     - Yes → Too much superheat present.
     - No → **Check T2.**
       1. Calibration
       2. Wiring connections
       3. Wires

2. **T2 < 356 °F (180 °C)?**
   - Yes → Reduce steam pressure below 60 psig (4 barg).
   - No → Check heating element function.
**Solenoid Valve**

**Note:** See principle schematic (appendix two on p. 28) to ascertain whether applicable valve is normally open or closed.

LED illuminated?  
- Yes
- No → Check all connections and wiring upstream of LED.

Voltage to valve?  
- Yes
- No → Check F1 fuse.

Note: Use a magnetic detector or lift coil slightly. Caution: Do not completely remove an energized coil. It will burn out!

Magnetic field present at coil?  
- Yes
- No → Check:
  1. Contacts
  2. DIN connector
  3. All wiring connections

Coil burnt/melted or cold with power present?  
- Yes → Replace coil.
- No → Check all connections and wiring between LED and valve.

Replace solenoid valve or call Armstrong.

---

**Solenoid Valve LEDs**

(Located on upper right inside wall of cabinet.)

<table>
<thead>
<tr>
<th>LED</th>
<th>EV0</th>
<th>EV1</th>
<th>EV2</th>
<th>EV3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

---

**Note:**

- Use a magnetic detector or lift coil slightly. Caution: Do not completely remove an energized coil. It will burn out!
Software update

1. Turn off QM-3 and unplug from power source.
2. Open right door (where electrical components are located).
3. Find the electronic board on the back of the door.
4. Remove cautiously the memory with the adapted tool (like a PLCC extractor).

5. Replace the memory (with your thumb, push cautiously respecting the coded pin).
6. Plug and turn on the QM-3, light is ON and screen is activated.
7. Check the version software in the code menu (press simultaneously on ◀ and ▶).
## Component and Parts List

### Components

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Nr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam Quality Monitor QM-3 Package</td>
<td>D44212</td>
</tr>
</tbody>
</table>

### Parts

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Nr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation jackets (2pcs)</td>
<td>D43805</td>
</tr>
<tr>
<td>Stainless Steel Wall mount</td>
<td>D44160</td>
</tr>
<tr>
<td>Calorimeter assembly</td>
<td>D49150</td>
</tr>
<tr>
<td>Condenser with fittings</td>
<td>D79386</td>
</tr>
<tr>
<td>Main board with display</td>
<td>D44124</td>
</tr>
<tr>
<td>Relay board</td>
<td>D44125</td>
</tr>
<tr>
<td>Vessel Non Condensable Gases assembly with expansion coil</td>
<td>D44126</td>
</tr>
<tr>
<td>Vessel Condensate flow meter assembly with fittings</td>
<td>D46738</td>
</tr>
<tr>
<td>JUMO PT100 (T1 and T2)</td>
<td>D44110</td>
</tr>
<tr>
<td>JUMO Pressure transmitter</td>
<td>D44117</td>
</tr>
<tr>
<td>Heating element</td>
<td>D44118</td>
</tr>
<tr>
<td>BURKERT 3/2 solenoid valve (EV0)</td>
<td>D44119</td>
</tr>
<tr>
<td>BURKERT 2/2 solenoid valve (EV1 and EV3)</td>
<td>D44120</td>
</tr>
<tr>
<td>BURKERT 3/2 solenoid valve (EV2)</td>
<td>D44121</td>
</tr>
<tr>
<td>JUMO PT100 (T3)</td>
<td>D44122</td>
</tr>
<tr>
<td>JUMO Differential pressure sensor</td>
<td>D44123</td>
</tr>
<tr>
<td>Orifice Plate with Gasket</td>
<td>D40020</td>
</tr>
<tr>
<td>Gasket PTFE for 1/2” flexible hose (bag with 3 pieces)</td>
<td>D53335</td>
</tr>
</tbody>
</table>
Product Certifications

Directives


Conforms to the following standards:
- EN 61000-6-3: Electromagnetic compatibility generic requirements (residential, commercial and light industries)
- EN 55022: class B (conducted and radiated emission limits)
- EN 61000-6-2: Electromagnetic compatibility (EMC) – Generic standards – Immunity for industrial environments
- EN 61000-4-3: Radiated, radio frequency, electromagnetic field immunity test
- EN 61000-4-6: Immunity to conducted disturbances induced by radio frequency fields
- EN 61000-4-4: Electrical fast transient/burst immunity test
- EN 61000-4-5: Surge immunity test
- EN 61000-4-2: Electrostatic discharge immunity test
- EN 60204-1: Safety of machinery – Electrical Equipment of machines – Part 1: General requirements
- EN 292 Parts 1 & 2: Safety of machinery basic principle mechanical design

CONFORMS TO
UL STD 61010-1
CERTIFIED TO CSA
STD C22.2 NO. 61010-1

Intertek
4007613
Appendix One: Wiring Diagram
Appendix Two: Principle Schematic
MODBUS Connection

**Note:** The information on this page applies to any MODBUS data logger. A 9 ft (3 m) cord is provided with an M12 connector for Steam QM-3 cabinet connection.

The logger end of the cord must be wired by the customer.

Program the logger with the following information.

**Note:** The Modbus address and the mode of communication is defined in the Steam QM-3 Advanced Setting Menu, see p. 17.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud Rate</td>
<td>9600 bauds/sec</td>
</tr>
<tr>
<td>Data Length</td>
<td>8 bits</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
<tr>
<td>Handshaking</td>
<td>N/A</td>
</tr>
<tr>
<td>Address</td>
<td>From 1 to 80</td>
</tr>
<tr>
<td>Mode</td>
<td>Master or slave</td>
</tr>
</tbody>
</table>

**Master Mode**

Data are sent in different registers as shown in the table below using Modbus function 16 (0x10).

All values are SI units. If conversion is required, it must be done manually.

Decimal values are not used. Readings are shown as whole numbers, e.g., 19.2 will show as 192.

**Slave Mode**

In slave mode: you can send query’s with function 0x02 and 0x04, according the register maps below.

**Note:** The length of the query and response must remain less than 23 bytes (max 3 register per query).

**Function 0x02 Read Discrete Inputs**

<table>
<thead>
<tr>
<th>Register</th>
<th>Name</th>
<th>Factor</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10001</td>
<td>Alarm1</td>
<td>N/A</td>
<td>0: disable - 1: enable</td>
<td>Toggle to 1 when the alarm 1 is on</td>
</tr>
<tr>
<td>10002</td>
<td>Alarm2</td>
<td>N/A</td>
<td>0: disable - 1: enable</td>
<td>Toggle to 1 when the alarm 2 is on</td>
</tr>
<tr>
<td>10003</td>
<td>Alarm3</td>
<td>N/A</td>
<td>0: disable - 1: enable</td>
<td>Toggle to 1 when the alarm 3 is on</td>
</tr>
<tr>
<td>10004</td>
<td>Default4</td>
<td>N/A</td>
<td>0: disable - 1: enable</td>
<td>Toggle to 1 when the default 4 is on</td>
</tr>
<tr>
<td>10005</td>
<td>Default5</td>
<td>N/A</td>
<td>0: disable - 1: enable</td>
<td>Toggle to 1 when the default 5 is on</td>
</tr>
<tr>
<td>10006</td>
<td>Default6</td>
<td>N/A</td>
<td>0: disable - 1: enable</td>
<td>Toggle to 1 when the default 6 is on</td>
</tr>
</tbody>
</table>

**Function 0x04 Read Inputs Registers**

<table>
<thead>
<tr>
<th>Register</th>
<th>Name</th>
<th>Factor</th>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>T1</td>
<td>10x</td>
<td>°C</td>
<td>Integer (16 bits)</td>
</tr>
<tr>
<td>30002</td>
<td>T2</td>
<td>10x</td>
<td>°C</td>
<td>Integer (16 bits)</td>
</tr>
<tr>
<td>30004</td>
<td>Alarm3</td>
<td>10x</td>
<td>Bar [a]</td>
<td>Integer (16 bits)</td>
</tr>
<tr>
<td>30007</td>
<td>Default4</td>
<td>1000x</td>
<td>-</td>
<td>Integer (16 bits)</td>
</tr>
<tr>
<td>30008</td>
<td>Default5</td>
<td>10x</td>
<td>Kg/hr</td>
<td>Integer (16 bits)</td>
</tr>
<tr>
<td>30011</td>
<td>Default6</td>
<td>10x</td>
<td>-</td>
<td>Integer (16 bits)</td>
</tr>
</tbody>
</table>
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