### DESIGN ADVANTAGES
- Heavy duty 16 gauge cabinet and structural steel base provides greater strength.
- All electrical components are UL listed or recognized.
- All units meet CSD-1 requirements.
- Close temperature control because sensor is located in the outlet pipe.
- Optional features and trim available to meet any custom design criteria.
- Large control cabinets with ample room for addition of options or field mounted interfaces. All wiring is color-coded and all electrical components are readily accessible for ease of field service.
- Individual immersion heating elements are 2 1/2” square flanged for ease of replacement. The elements are made of a highly corrosion-resistant Incoloy sheath, with a nickel-chromium resistance wire packed in magnesium oxide powder, and configured in a U-tube design. Elements are available in both 1-phase and 3-phase ratings, and are limited to 75 watts per square inch power density to assure long life.

### STRINGENT STANDARDS
- ASME Section IV “H” Code
- UL Subject 834
- NEC/NFPA Article 424-G
- ASME Safety Code CSD-1

### STANDARD FEATURES AND ACCESSORIES
- Magnetic Contactors rated 500,000 Cycles
- Main Supply Circuit Lugs
- 120 Volt Fused Control Transformer
- On/Off Switch with Pilot Light
- Status Pilot Light for each step
- Manual Reset Probe-type Low Water Cut-Off with Pilot Light and Test Circuit (>117 kw)
- Two Adjustable High Limit Cut-offs:
  - (1) Auto Reset
  - (1) Manual Reset
- Automatic Temperature Control Via:
  - On/Off Temperature Switches (1 & 2 step units)
  - Electronic Multi-Stage Control (3 & 4 step units)
  - Proportional Solid State Step Control (units > 4 steps)
- Manual Limit Toggle Switches (one per step)
## Precision Boilers

### HW “Series II” Electric Hot Water Boilers

**Optional Equipment and Accessories**

- Non-Fused Disconnect or Non-Auto Breaker
- Fused Disconnect or Automatic Breaker
- Shunt Trip Circuit Interrupter
- Ground Fault Detection System
- Ammeter (1 or 3 phase)
- Voltmeter (1 or 3 phase)
- Watt-hour Meter
- Time Clock (24 hour or 7 day)
- Alarm Buzzer with Silencing Switch
- Safety Door Interlock
- Low Temperature Switch/Alarm
- Remote Reset of Setpoint (to Accomodate BAS Analog Reset Signal)
- PLC and Other Interface Provisions (Consult Factory)

- Local/Remote Switch (to Accommodate BAS Analog Control Signal)
- Flow Switch (Installed)
- Auto Air Vent (Installed)
- High/Low Pressure Switches/Alarms
- Auxiliary Low Water Cut-off (Float or Probe type) (Manual or Auto Reset)
- Temperature Gauge (3” / Installed)
- Oversize Inlet/Outlet Connections
- Linear Sequence Step Control
- Design Pressures Above 150 PSI
- Stainless Steel Construction (210°F) for Deionized Water
- Outdoor Reset Control

Contact Factory for Many Other Options to Meet Your Specific Requirements

### Drawings and Dimensions

#### Physical Data

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Max. Input KW</th>
<th>MBTU Per Hour</th>
<th>Max # of Elements</th>
<th>Connection Sizes (NPT)</th>
<th>Max Flow (GPM)</th>
<th>Tank Data</th>
<th>Dimensions (2) (Inches)</th>
<th>Weights (Pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td>W</td>
</tr>
<tr>
<td>HW16S</td>
<td>200</td>
<td>682</td>
<td>10</td>
<td>3”</td>
<td>170</td>
<td>16x44</td>
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<td>HW16D</td>
<td>280</td>
<td>955</td>
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<td>3”</td>
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<td>4”FLG</td>
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<td>46</td>
<td>4”FLG 1-1/2”</td>
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<td>5323</td>
<td>78</td>
<td>6”FLG 1-1/2”</td>
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<td>HW36D</td>
<td>2000</td>
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<td>HW48D</td>
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<td>48x52</td>
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<td>82</td>
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</table>

(1) For complete model number, suffix given number by KW, element designation letter (B=15KW; C=18KW; D=20KW), voltage and pressure (eg, HW24D-840D-480-150)
(2) Element removal clearance (R”) is equal to 2 times the element KW. NOTE: Required both ends on “D” models, left end only on “S” models.
† Width includes 2 power panels (front & rear). Actual dimensions depend on options (eg. Number of Steps, Disconnects, etc.).
### 480 VOLT RATINGS*

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Rating</th>
<th>Elements</th>
<th>Number of:</th>
<th>Amps</th>
</tr>
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<tbody>
<tr>
<td>HW16S-90B</td>
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<td>160</td>
<td>208</td>
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<tr>
<td>HW16S-75B</td>
<td>480V</td>
<td>20</td>
<td>150</td>
<td>180</td>
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<td>HW16S-60B</td>
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<td>18</td>
<td>140</td>
<td>150</td>
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<tr>
<td>HW16S-45B</td>
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<td>120</td>
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<td>HW16S-30B</td>
<td>480V</td>
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<td>100</td>
<td>100</td>
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<td>HW16S-18B</td>
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<td>75</td>
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<td>480V</td>
<td>4</td>
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For lower KW ratings, please refer to the Precision "COMPAC" Boiler. Models above 1600KW are also available in 40KW increments.

### 380 & 415 VOLT RATINGS*

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Rating</th>
<th>Elements</th>
<th>Number of:</th>
<th>Amps</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW16S-90B</td>
<td>380V</td>
<td>22</td>
<td>160</td>
<td>208</td>
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<td>HW16S-75B</td>
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<td>HW16S-60B</td>
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<td>100</td>
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<tr>
<td>HW16S-18B</td>
<td>380V</td>
<td>6</td>
<td>75</td>
<td>75</td>
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<tr>
<td>HW16S-12B</td>
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<td>4</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

For lower KW ratings, please refer to the Precision "COMPAC" Boiler. Models above 1600KW are also available in 40KW increments.
**CONVERSIONS/EQUATIONS**

\[
\text{KW} = \frac{\text{GPH} \times \Delta T (^\circ F)}{410} = \frac{\text{LPH} \times \Delta T (^\circ C)}{862}
\]

\[
\text{KW} = \frac{\text{GPM} \times \Delta T (^\circ F) \times .146}{10^{\frac{\text{KW}}{2}}}
\]

\[
\text{KW} = \frac{\text{BTU}/\text{H}}{\frac{\text{ΔT} (^\circ F)}{500} \times \text{GPM}}
\]

\[
1 \text{ gal water at } 62^\circ F = 8.34 \text{ Lbs}
\]

\[
1 \text{ cu ft water at } 62^\circ F = 62.4 \text{ Lbs}
\]

\[
1 \text{ ft water} = 0.435 \text{ psi}
\]

\[
\text{Enthalpy of water} = \text{Temp} (^\circ F) - 32 \text{ BTU/LB}
\]

\[
0 \text{ psig} = 0 \text{ KPa} = 212^\circ F
\]

\[
150 \text{ psig} = 1034 \text{ KPa} = 366^\circ F
\]

\[
8 \text{ psig} = 55 \text{ KPa} = 235^\circ F
\]

\[
175 \text{ psig} = 1207 \text{ KPa} = 377^\circ F
\]

\[
15 \text{ psig} = 103 \text{ KPa} = 250^\circ F
\]

\[
200 \text{ psig} = 1379 \text{ KPa} = 388^\circ F
\]

\[
30 \text{ psig} = 207 \text{ KPa} = 274^\circ F
\]

\[
225 \text{ psig} = 1551 \text{ KPa} = 397^\circ F
\]

\[
50 \text{ psig} = 345 \text{ KPa} = 298^\circ F
\]

\[
250 \text{ psig} = 1724 \text{ KPa} = 406^\circ F
\]

\[
80 \text{ psig} = 552 \text{ KPa} = 324^\circ F
\]

\[
300 \text{ psig} = 2068 \text{ KPa} = 422^\circ F
\]

\[
100 \text{ psig} = 690 \text{ KPa} = 338^\circ F
\]

\[
350 \text{ psig} = 2413 \text{ KPa} = 436^\circ F
\]

\[
125 \text{ psig} = 862 \text{ KPa} = 353^\circ F
\]

\[
400 \text{ psig} = 2758 \text{ KPa} = 448^\circ F
\]

**HOW TO SELECT A MODEL NUMBER**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Rating</th>
<th>Elements</th>
<th>Number of:</th>
<th>Amps (208V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW165-135B</td>
<td>461</td>
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<td>15</td>
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<td>HW165-150B</td>
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<td>10</td>
<td>15</td>
<td>417</td>
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<td>HW160-165B</td>
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<td>15</td>
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<td>HW160-180B</td>
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<td>501</td>
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<td>HW160-195B</td>
<td>665</td>
<td>13</td>
<td>15</td>
<td>542</td>
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<tr>
<td>HW160-210B</td>
<td>717</td>
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<td>15</td>
<td>584</td>
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<td>HW205-225B</td>
<td>768</td>
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<td>626</td>
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<td>HW205-240S</td>
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<td>668</td>
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<td>HW200-255B</td>
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<td>17</td>
<td>15</td>
<td>707</td>
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<td>HW200-270B</td>
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<td>15</td>
<td>751</td>
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<td>HW200-285B</td>
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<td>15</td>
<td>793</td>
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<td>HW200-300B</td>
<td>1024</td>
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<td>15</td>
<td>834</td>
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<tr>
<td>HW200-315B</td>
<td>1075</td>
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<td>15</td>
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<td>HW200-330B</td>
<td>1126</td>
<td>22</td>
<td>15</td>
<td>918</td>
</tr>
<tr>
<td>HW200-345B</td>
<td>1177</td>
<td>23</td>
<td>15</td>
<td>959</td>
</tr>
<tr>
<td>HW200-360B</td>
<td>1228</td>
<td>24</td>
<td>15</td>
<td>1001</td>
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</tbody>
</table>

*For lower KW ratings, please refer to the Precision "COMPAC" Boiler.

---

**SATURATED STEAM: PRESSURE vs. TEMPERATURE**

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 psig</td>
<td>0 KPa</td>
</tr>
<tr>
<td>8 psig</td>
<td>55 KPa</td>
</tr>
<tr>
<td>15 psig</td>
<td>103 KPa</td>
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<tr>
<td>30 psig</td>
<td>207 KPa</td>
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<tr>
<td>50 psig</td>
<td>345 KPa</td>
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<tr>
<td>80 psig</td>
<td>552 KPa</td>
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<tr>
<td>100 psig</td>
<td>690 KPa</td>
</tr>
<tr>
<td>125 psig</td>
<td>862 KPa</td>
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</table>

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**208 & 240 VOLT RATINGS**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Rating</th>
<th>Elements</th>
<th>Number of:</th>
<th>Amps (208V)</th>
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</thead>
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<td>506,140,45,20,30</td>
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<td>HW200-435B</td>
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</table>

*For lower KW ratings, please refer to the Precision "COMPAC" Boiler.
1. **General**
   Furnish and install as shown on the plans electric hot water boilers, fabricated per these specifications, including all accessories and construction features as described herein. Boilers shall be completely factory assembled and pre-tested prior to shipment. Boilers shall be UL labeled and shall include an ASME Section IV pressure vessel which has been fabricated under inspection by an authorized inspector holding a National Board commission and subsequently stamped and National Board registered. Units greater than 117 KW shall also comply with CSD-1.

2. **Ratings**
   Boilers shall each be PRECISION “Series II” Model No. HW_____ - _____ rated_____ KW, designed and fabricated for a balanced 3-phase, 3-wire, delta load at _____ volts, 3-phase, ____ hertz. The boilers shall be designed for _____ GPM with a discharge temperature of _____°F with entering water at _____°F.

3. **Pressure Vessel**
   The pressure vessel and all trim shall be as set forth in the ASME Code, including ASME “HV” stamped safety relief valve sized as required. The vessel shall be provided with a (threaded) (flanged) ____” inlet and outlet, plus safety valve and drain nozzle as required. The pressure vessel shall be housed in a 16-gauge steel enclosure allowing 3 inches of insulation space around the vessel and filled with 3 inches of 3/4 pound-density fiberglass insulation. The electric panel and vessel shall be mounted on a common, structural steel base with overall dimensions of the unit not to exceed ___“D x ___“W x ___“H.

4. **Internal Power Distribution**
   The power distribution shall be through cable connection to mechanical lugs. Power shall be fed through current limiting fuses to magnetic contactors, and then to the heating element circuits. Contactors shall be 3-pole magnetic contactors tested by UL for 500,000 cycles at full load. The coil voltage shall be 120-volts. Internal wiring shall be in accordance with UL & NEC.

5. **Heating Elements**
   Elements shall be individually mounted in steel flanges. The flange size shall not exceed 2 1/2 inches square, with a maximum of three single-bend U-shaped element blades per flange. Element sheath material shall be Incoloy; element watt density shall be 75 WSI.

6. **Controls**
   The control circuit shall be 120-volt single-phase, one side grounded. Control voltage shall be provided by an integral control circuit transformer, fused on both legs of the primary, with a control circuit fuse on the ungrounded leg of the secondary. The controls shall include an ON/OFF switch, solid state step control (____ steps), indicator lights for each stage of heating, a low water cutoff, and one auto reset and one manual reset high limit temperature switches.

7. **Manufacturer**
   Boilers shall be PRECISION Model HW_____ - _____ or approved equivalent. Alternate bids shall indicate any deviations from these specifications, and shall state price additions or deductions for substitution of said alternates.
LIMITED WARRANTY

PRECISION warrants all electrical components (except pilot lights and fuses), pressure vessel and heating elements, if found defective in workmanship or material while under normal use and service within the first year of operation or until 18 months after shipment from PRECISION’S factory, whichever occurs first, after authorized return by purchaser to PRECISION (at purchaser’s expense) and after examination discloses to PRECISION’S reasonable satisfaction to be defective. The repair or replacement of defective parts will be made by PRECISION without charge. PRECISION will not be held responsible for any field charges in connection with the removal or replacement of allegedly defective parts, nor for incidental or consequential damages. This guarantee does not include damage resulting from unsuitable water.

CONTACT US FOR THESE QUALITY PRODUCTS

- Electric Storage Heaters 125 to 5500 Gallons
- Electrode High Voltage Boilers
- Thermal Storage Systems Space Heating & Domestic or Process Water; Electric, Gas or Steam Fired
- Pressure Vessels Water Storage Tanks Flash Tanks Blowdown Tanks
- Tanks with Tube Bundle(s)
- Unfired Hot Water and Steam Generators
- Boiler Feedwater Systems
- Deaerators and Surge Tanks
- Steam Superheaters-Electric
- Circulation Heaters-Electric
- Gas or Oil-Fired Vertical Firetube Boilers and Water Heaters
- Gas or Oil-Fired WaterTube Boilers (Flextube Type)
- Chemical Bypass Feeders and Automatic Chemical Feed Systems
- Tanks with Tube Bundle(s)
- Unfired Hot Water and Steam Generators
- Boiler Feedwater Systems
- Deaerators and Surge Tanks
- Steam Superheaters-Electric
- Circulation Heaters-Electric
- Gas or Oil-Fired Vertical Firetube Boilers and Water Heaters
- Gas or Oil-Fired WaterTube Boilers (Flextube Type)
- Chemical Bypass Feeders and Automatic Chemical Feed Systems

NOTE: In pursuing our policy of continuous development of products, PRECISION reserves the right to vary any detail in this bulletin without notice.