5551-A
IGNITRON
WATER-COOLED, STEEL-JACKETED, MERCURY-POOL-CATHODE
TYPE HAVING MOUNTING PLATE FOR THERMOSTATIC CONTROL

For resistance-welding control

**GENERAL DATA**

**Electrical:**
- Cathode Excitation: Cyclic
- Cathode-Spot Starting: By Ignitor
- Minimum Requirements for Cathode Excitation:
  - Peak ignitor voltage required to fire: 200 volts
  - Peak ignitor current required to fire: 30 amp
  - Starting time at required voltage or current: 100 μsec
- Tube Voltage Drop:
  - At peak anode current of 3400 amperes: 26 volts
  - At peak anode current of 176 amperes: 13 volts

**Mechanical:**
- Operating Position: Vertical, flexible lead up
- Maximum Overall Length (Including flexible lead): 23-1/4"
- Maximum Radius (Including water connections): 2-7/8"
- Weight: 3.6 lbs
- Terminal Connections (See Dimensional Outline):

P - Anode
  - Terminal
  - (Flexible lead)
K - Cathode
  - Terminal
    - (Bar opposite anode terminal)

I - Ignitor
  - Terminal
    - (Within jacket skirt at cathode end)

**Cooling:**
- Type: Water
- Minimum inlet water temperature: 10 °C
- Maximum outlet water temperature: 40 °C
- Minimum water flow: 1 gpm
- Maximum water-temperature rise: 4 °C
- Maximum pressure drop: 2.5 psi

**INTERMITTENT RECTIFIER SERVICE and FREQUENCY-CHANGER WELDER SERVICE**

**Maximum Ratings, Absolute-Maximum Values:**
For zero phase-control angle and frequencies from 50 to 60 cps

**RATING I**

**PEAK ANODE VOLTAGE:**
- Forward: 500 max. volts
- Inverse: 500 max. volts

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TENTATIVE DATA 1
ANODE CURRENT:
Peak .................. 700 max. amp
Average (Averaged over any interval of 6 seconds maximum) .... 40 max. amp
Fault, for duration of 0.15 second maximum .................. 8750 max. amp

RATING II
PEAK ANODE VOLTAGE:
Forward ............... 1200 max. 1200 max. volts
Inverse ............... 1200 max. 1200 max. volts
ANODE CURRENT:
Peak .................. 135 max. 600 max. amp
Average (Averaged over any interval of 10 seconds maximum) .... 22.5 max. 5 max. amp
Average (Averaged over any interval of 0.2 second maximum) .... 22.5 max. 100 max. amp
Fault, for duration of 0.15 second maximum .................. 7500 max. 7500 max. amp

RATING III
PEAK ANODE VOLTAGE:
Forward ............... 1500 max. 1500 max. volts
Inverse ............... 1500 max. 1500 max. volts
ANODE CURRENT:
Peak .................. 108 max. 480 max. amp
Average (Averaged over any interval of 10 seconds maximum) .... 18 max. 4 max. amp
Average (Averaged over any interval of 0.2 second maximum) .... 18 max. 80 max. amp
Fault, for duration of 0.15 second maximum .................. 6000 max. 6000 max. amp

RESISTANCE-WELDING-CONTROL SERVICE®
Two Tubes in Inverse-Parallel Circuit

Maximum Ratings, Absolute-Maximum Values:
  For frequencies from 25 to 60 cps
  Ratings I-A and I-B Apply to Operation Either (1) Without Water-Saving Thermostat, or (2) With Water-Saving Thermostat Shunted by Auxiliary Contactor

RATING I-A
SUPPLY VOLTAGE (RMS) .... 250 max. 250 max. volts
DEMAND POWER (During conduction) .... 200 max. 600 max. kva

*: See next page.
**IGNITRON**

<table>
<thead>
<tr>
<th>Duty</th>
<th>Peak</th>
<th>Demand (RMS, during conduction)</th>
<th>Average (Averaged over any interval of 18 seconds maximum)</th>
<th>Fault, for duration of 0.15 second maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 max.</td>
<td>1130 max.</td>
<td>800 max.</td>
<td>56 max.</td>
<td>6720 max.</td>
</tr>
<tr>
<td>2.8 max.</td>
<td>3400 max.</td>
<td>2400 max.</td>
<td>30.2 max.</td>
<td>6720 max.</td>
</tr>
</tbody>
</table>

**RATING I-B**

<table>
<thead>
<tr>
<th>Supply Voltage (RMS)</th>
<th>600 max.</th>
<th>600 max.</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Power (During conduction)</td>
<td>200 max.</td>
<td>600 max.</td>
<td>Kva</td>
</tr>
<tr>
<td>Duty</td>
<td>37 max.</td>
<td>6.7 max.</td>
<td></td>
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</tbody>
</table>

**RATING II-A**

<table>
<thead>
<tr>
<th>Supply Voltage (RMS)</th>
<th>250 max.</th>
<th>250 max.</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Power (During conduction)</td>
<td>200 max.</td>
<td>600 max.</td>
<td>Kva</td>
</tr>
<tr>
<td>Duty</td>
<td>9.7 max.</td>
<td>1.9 max.</td>
<td></td>
</tr>
</tbody>
</table>

**RATING II-B**

<table>
<thead>
<tr>
<th>Supply Voltage (RMS)</th>
<th>600 max.</th>
<th>600 max.</th>
<th>Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand Power (During conduction)</td>
<td>200 max.</td>
<td>600 max.</td>
<td>Kva</td>
</tr>
<tr>
<td>Duty</td>
<td>23 max.</td>
<td>4.7 max.</td>
<td></td>
</tr>
</tbody>
</table>

*+,†,: See next page.
ANODE CURRENT (Per tube):
Peak ................................... 466 max. 1410 max. amp
Demand (RMS, during con-
duction)# ...................... 333 max. 1000 max. amp
Average (Averaged over any
interval of 10.7 sec-
onds maximum)# ....... 36 max. 21 max. amp
Fault, for duration of 0.15
second maximum ....... 925 max. 2800 max. amp

IGNITOR
Maximum Ratings, Absolute-Maximum Values:

PEAK IGNITOR VOLTAGE:
Positive ......................... Equal to anode volts
Negative ......................... 5 max. volts

IGNITOR CURRENT:
Peak .................................. 100 max. amp
Average (Averaged over any interval
of 5 seconds maximum) ........... 1 max. amp
RMS ................................. 10 max. amp

• RMS voltage, current, and demand kva are on the basis of full-cycle
  conduction (no phase delay) regardless of whether or not phase control
  is used.
• Defined as (cycles "on")/(cycles "on" + cycles "off") during the
  specified averaging time.
† For supply voltages between 250 volts and 600 volts, duty is propor-
  tional to supply voltage. For supply voltages lower than 250 volts,
  the values for 250 volts apply.
# For supply voltages between 250 volts and 600 volts, demand anode
  current and averaging time are each inversely proportional to supply
  voltage. For supply voltages lower than 250 volts, the values for 250
  volts apply.

OPERATING CONSIDERATIONS

The 5551-A is equipped for mounting a thermostatic control
with a mounting plate calibrated either for controlling the
flow of cooling water through the water jacket, or for pro-
tection of the ignitron against overheating.

When the cooling water is circulated successively through
the water jackets of two or more ignitrons, the water-saving
thermostat, if used should be mounted on the ignitron connect-
ed directly to the water supply.

The water-saving thermostat, which has normally open
contacts, is calibrated to close a circuit energizing a
solenoid valve in the water-supply line and thus permit
water flow to start when the temperature of the thermostat
mounting plate exceeds approximately 35°C. Because of the
lag between the heating of the ignitron envelope and the
functioning of the water-saving thermostat to start water
flow through the water jackets, the ignitron may overheat
before the flow of cooling water starts.
Such overheating can be prevented by the use of an auxiliary contactor shunted across the contacts of the water-saving thermostat and actuated by the welding-control switch. The contactor causes the solenoid valve in the water-supply line to open as soon as welding current flows.

If the water-saving thermostat is not shunted by an auxiliary contactor, it will be necessary to use a lower value of maximum average current than that which is specified when the auxiliary contactor is employed. The lower average current value is achieved by increasing the maximum averaging time and decreasing the maximum duty. Although the same maximum conduction time is permitted for both of these operating conditions, the use of the water-saving thermostat alone, without the auxiliary contactor requires a longer interval between successive welds than when the thermostat is shunted by the contactor.

When a protective thermostat is used, it should be mounted on an ignitron from which the cooling water discharges into the drain. The protective thermostat is calibrated to open a set of normally closed contacts at a jacket temperature of approximately 520°C. The opening of these contacts causes a protective device to function. This device may be a relay opening the ignitor firing controls, or preferably, a circuit breaker which removes power from the ignitrons.

Care must be taken to insure that the water jacket of each ignitron is completely filled before power is applied. Tube operation with a partially filled water jacket may cause abnormal heating of the tube envelope, with resultant arc-back which impairs tube life. It is also necessary to arrange the cooling system so as to prevent any draining of the water jackets when the flow of water ceases.
NOTE 1: MAY BE SLOTTED.
NOTE 2: DASHED POSITION MANUFACTURER'S OPTION.
RATING CHART
RESISTANCE-WELDING-CONTROL SERVICE

TWO TUBES CONNECTED IN INVERSE PARALLEL
NO WATER-SAVING THERMOSTAT, OR WATER-
SAVING THERMOSTAT SHUNTED BY
AUXILIARY CONTACOR,
PROTECTIVE THERMOSTAT OPTIONAL.

<table>
<thead>
<tr>
<th>CURVE</th>
<th>RMS ANODE-SUPPLY VOLTS</th>
<th>MAXIMUM AVERAGING TIME-SECONDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>250</td>
<td>18</td>
</tr>
<tr>
<td>B</td>
<td>500</td>
<td>9</td>
</tr>
<tr>
<td>C</td>
<td>600</td>
<td>7.5</td>
</tr>
</tbody>
</table>

CONDUCTION TIME = 0.5 SECOND

DEMAND AMPERES (RMS) IN LOAD
DUTY - PER CENT

ELECTRON TUBE DIVISION
RADIO CORPORATION OF AMERICA, HARRISON, NEW JERSEY
RATING CHART
RESISTANCE-WELDING-CONTROL SERVICE

TWO TUBES CONNECTED IN INVERSE PARALLEL.
WATER-SAVING THERMOSTAT WITHOUT
AUXILIARY CONTROLLER.
PROTECTIVE THERMOSTAT OPTIONAL.

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<th>RMS ANODE-SUPPLY VOLTS</th>
<th>MAXIMUM AVERAGING TIME-SECONDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>250</td>
<td>25.6</td>
</tr>
<tr>
<td>B</td>
<td>500</td>
<td>12.8</td>
</tr>
<tr>
<td>C</td>
<td>600</td>
<td>10.7</td>
</tr>
</tbody>
</table>

CONDUCTION TIME = 0.5 SECOND

DEMAND AMPERES (RMS) IN LOAD

DUTY - PER CENT