Rotating Anode X-ray Tube Assembly

- High speed rotating anode X-ray tube assembly for high energy radiographic operations.
- For the purpose of general diagnostic X-ray procedures.
- This tube has foci 1.2 and 0.6, and is available for a maximum tube voltage 150 kV.
- This tube assembly has specially processed rhenium-tungsten faced molybdenum target of 100 mm diameter anode disc and are accommodated with IEC60526 type high-voltage cable receptacles.

General Data

IEC Classification (IEC60601-1:2005) ........................................ Class 1 ME EQUIPMENT

Electrical:

Circuit:

- High Voltage Generator ........................................ Constant Potential High-Voltage Generator
- Grounding ................................................................................ Center-grounded

Nominal X-ray Tube Voltage (IEC60613:2010):
- Radiographic .............................................................. 150 kV

Nominal Focal Spot Value (IEC60336:2005):
- Large Focus .............................................................. 1.2
- Small Focus .............................................................. 0.6

Nominal Anode Input Power (at 0.1s) ........................................ See rating charts

<table>
<thead>
<tr>
<th></th>
<th>50 Hz</th>
<th>60 Hz</th>
<th>180 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>53 kW</td>
<td>58 kW</td>
<td>100 kW</td>
</tr>
<tr>
<td>Small</td>
<td>21 kW</td>
<td>23 kW</td>
<td>40 kW</td>
</tr>
</tbody>
</table>

Nominal Radiographic Anode Input Power (IEC60613:2010):

<table>
<thead>
<tr>
<th></th>
<th>50 Hz</th>
<th>60 Hz</th>
<th>180 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>53 kW</td>
<td>58 kW</td>
<td>97 kW</td>
</tr>
<tr>
<td>Small</td>
<td>21 kW</td>
<td>23 kW</td>
<td>38 kW</td>
</tr>
</tbody>
</table>
Motor Ratings:

Stator: XS-AG

<table>
<thead>
<tr>
<th></th>
<th>Starting</th>
<th></th>
<th>Running</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driven Frequency</td>
<td>[Hz]</td>
<td>180</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50/60</td>
<td>50/60</td>
</tr>
<tr>
<td>Input Power</td>
<td>[W]</td>
<td>3710</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>800</td>
<td>90</td>
</tr>
<tr>
<td>Voltage</td>
<td>[V]</td>
<td>420</td>
<td>80</td>
</tr>
<tr>
<td>4) 6)</td>
<td></td>
<td>190</td>
<td>48</td>
</tr>
<tr>
<td>Current</td>
<td>[A]</td>
<td>9.6</td>
<td>3.0</td>
</tr>
<tr>
<td>5)</td>
<td></td>
<td>10.2</td>
<td>2.2</td>
</tr>
<tr>
<td>Min. Speed Up</td>
<td>[s]</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>2) 8)</td>
<td></td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>Capacitor</td>
<td>[µF]</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>3) 8)</td>
<td></td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Min. Braking</td>
<td>[s]</td>
<td>2.0 (DC 100V)</td>
<td>-</td>
</tr>
</tbody>
</table>

Note 1) To be obtained with TOSHIBA starter RS-200 or equivalent.
2) The speed up time from normal speed to high speed is 2/3 times of the specified speed up time from 0 to high speed, which is described on motor rating table.
3) To be applied for high speed rotation.
4) Applied voltage between common and main terminal.
5) Common current.
6) The every applied voltage must be never exceeded 110% of the above specification.
7) No more than two high speed starts per minute are permissible.
8) The speed-up time is allowed up to 110% of the above specification.
9) The generator manufacture may choose different values. The above table is one of the recommend conditions.

Anode Speed*:

- 50 Hz ........................................................................................................... Minimum 2700 min⁻¹
- 60 Hz ........................................................................................................... Minimum 3200 min⁻¹
- 180 Hz .......................................................................................................... Minimum 9700 min⁻¹

Stator Resistance:

- Common-Main Winding ................................................................................. 9.4 Ω
- Common-Auxiliary Winding ........................................................................... 28.3 Ω

Resistance between Housing and Low Voltage Terminals ......................... Minimum 2 MΩ

Normal Operating Range of the Housing Temperature ...................................... 16 ~ 75 °C

Mode of Operation ......................................................................................... Intermittent

*Note: The revolution acceleration must not exceed 150 revolutions per square second.
After high speed rotation, dynamic braking must slow anode rotor to less than 3000 min⁻¹ within 10 seconds, but not sooner than 2 seconds.
**Mechanical:**

Dimensions ................................................................. See dimensional outline
  Overall Length ................................................................. 496 mm
  Maximum Diameter ............................................................ 195 mm

Target:
  Anode Angle ................................................................. 12 degrees
  Diameter ................................................................. 100 mm
  Construction ................................................................. Rhenium-Tungsten faced Molybdenum

Filtration:
  Permanent Filtration ...................................................... 1.1 mm Al / 75 kV IEC60522:1999
  Available Additional Filter combination (0.4 - 1.5 mm) .......... Maximum 2.6 mm Al / 75 kV

Radiation Protection (In accordance with IEC60601-1-3:2008):
  Leakage Technique Factor ................................................ 150 kV, 4 mA
  X-ray Coverage ................................................................. 430 × 430 mm at SID 1000 mm
  Weight (Approx.) ............................................................... 24 kg
  High Voltage Receptacle To meet the requirements of IEC60526 Corrigendum1:2010
  Cooling Method ............................................................... Natural or forced air

Tube Model Number .......................................................... E7869
Tube Housing Model Number ............................................... XH-112V
Absolute Maximum and Minimum Ratings
(At any time, these values must not be exceeded.)

Maximum X-ray Tube Voltage (IEC60613:2010):
- Radiographic: 150 kV
- Between Anode (or Cathode) and Ground: 75 kV
- Minimum X-ray Tube Voltage: 40 kV

Maximum X-ray Tube Current (IEC60613:2010):
- Large Focus: 1000 mA
- Small Focus: 500 mA

Maximum Filament Current:
- Large Focus: 5.8 A
- Small Focus: 5.1 A

Filament Voltage:
- Large Focus (At maximum filament current 5.8 A): 12.4 ~ 16.7 V
- Small Focus (At maximum filament current 5.1 A): 9.3 ~ 12.5 V

Filament Frequency Limits: 0 ~ 25 kHz

Continuous Anode Input Power (IEC60613:2010): 300 W (420 HU/s)

Thermal Characteristics:
- Anode Heat Content: 420 kJ (600 kHU)
- Maximum Anode Heat Dissipation: 1750 W (2465 HU/s)
- X-ray Tube Assembly Heat Content: 1420 kJ (2000 kHU)
- Nominal Continuous Input Power (IEC60613:2010)
  - Without Air-circulator: 278 W (23 kHU/min)
Environmental Limits

Operating Limits:
Temperature ................................................................. 10 ~ 40°C
Humidity ................................................................. 30 ~ 85 %
(No condensation)
Atmospheric Pressure .................................................. 70 ~ 106 kPa

Shipping and Storage Limits:
Temperature ................................................................. -20 ~ 70°C
Humidity ................................................................. 20 ~ 90 %
(No condensation)
Atmospheric Pressure .................................................. 50 ~ 106 kPa
Maximum Rating Charts
(Absolute Maximum Rating Charts)

Conditions: Tube Voltage
Constant Potential High-Voltage Generator
Stator Power Frequency 50Hz

Nominal Focal Spot Value: 1.2

Refer to IEC60613:2010

Nominal Focal Spot Value: 0.6

Refer to IEC60613:2010
Maximum Rating Charts
(Absolute Maximum Rating Charts)

Conditions: Tube Voltage
Constant Potential High-Voltage Generator
Stator Power Frequency 60Hz

Nominal Focal Spot Value: 1.2

Refer to IEC60613:2010

Nominal Focal Spot Value: 0.6

Refer to IEC60613:2010
Maximum Rating Charts
(Absolute Maximum Rating Charts)

Conditions: Tube Voltage
Constant Potential High-Voltage Generator
Stator Power Frequency 180Hz

Nominal Focal Spot Value: 1.2

Refer to IEC60613:2010

Nominal Focal Spot Value: 0.6

Refer to IEC60613:2010
Emission & Filament Characteristics

Constant Potential High-Voltage Generator

Nominal Focal Spot Value: 1.2

Note 1) For Reference Only
Note 2) Refer to IEC60613:2010

Nominal Focal Spot Value: 0.6

Note 1) For Reference Only
Note 2) Refer to IEC60613:2010
Thermal Characteristics

X-ray Tube Assembly Heating / Cooling Curve

Anode Heating / Cooling Curve
**Dimensional Outline**

**Unit: mm**

**EXPLANATION OF SYMBOLS**

**CATHODE TERMINAL**
- C : COMMON
- L : LARGE FOCUS
- S : SMALL FOCUS

**TERMINAL CONNECTIONS**
- C1 : COMMON
- M : MAIN WINDING OF THE STATOR
- A : AUX. WINDING OF THE STATOR
- NC : NON-CONNECTION
- ET : EARTH TERMINAL

**CENTRAL X-RAY ANODE & CATHODE TERMINAL**
- IEC60526 TYPE

**TERMINAL CONNECTIONS**

**Note:** Do not connect terminal No. 1 and No. 5 or No. 6 in series circuit.
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