

**ROTANODE  
E7239X  
E7239FX  
E7239GX**

## Rotating Anode X-Ray Tube Housing Assembly

- ◆ Rotating anode X-ray tube housing assembly for the purpose of general diagnostic X-ray procedures.
- ◆ Specially processed Rhenium-tungsten faced molybdenum target of 74 mm diameter.
- ◆ These tubes have foci 2.0 mm and 1.0 mm, and are available for a maximum tube voltage 125 kV with Three-phase generator.
- ◆ Accommodated with IEC 60526 type high-voltage cable receptacles.



## General Data

**IEC Classification** ..... **Class I Type B**

### Electrical:

Circuit (Center-grounded) .....	Three-phase full-wave rectified
Operating Tube Voltage:	
Radiographic .....	40 ~ 125 kV Max.
Focal Spot:	
Large Focus .....	2.0 mm
Small Focus .....	1.0 mm
Input Energy (at 0.1s):	
	60 Hz
Large Focus .....	47 kW
Small Focus .....	22.5 kW

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Motor Ratings:

Duty		Starting		Running
Power source	(Hz)	50/60		50/60
Input power	(W)	1050	270	43
Voltage <sup>1)</sup>	(V)	200	100	40
Current	(A)	6.0	3.0	1.2
Min. Speed up <sup>2)</sup>	(s)	0.8	1.5	-
Capacitor	( $\mu$ F)	24	24	24

Note: 1) The every applied voltage must be never exceeded 110% of the above specification.

2) The speed-up time is allowed up to 110% of the above specification.

Anode Speed:

50 Hz ..... 2700 min<sup>-1</sup> Min.

60 Hz ..... 3200 min<sup>-1</sup> Min.

Resistance between Housing and Low Voltage Terminals ..... 2 M $\Omega$  Min.

Normal operating range of the housing temperature ..... 16 ~ 75 °C

**Mechanical:**

Dimensions: ..... See dimensional outline

Overall Length ..... 479 mm

Maximum Diameter ..... 152.4 mm

Target::

Angle ..... 16 degrees

Construction ..... Rhenium-Tungsten-faced molybdenum

Permanent Filtration ..... 0.9 mm Al / 75 kV IEC 60522 / 2003

Radiation Protection (To meet the requirements of IEC 60601-1-3):

Leakage Technique Factor ..... 125 kV 4 mA

X-ray Coverage ..... 354 × 354 mm at SID 750 mm

Weight (Approx.) ..... 16 kg

High Tension Terminals ..... To meet the requirements of IEC 60526

Cooling Method ..... Natural or forced air

## Absolute Maximum and Minimum Ratings

(At any time, these values must not be exceeded.)

### Maximum Tube Voltage:

Radiographic ..... 125 kV

Maximum Voltage to Ground ..... 65 kV

Minimum Tube Voltage ..... 40 kV

### Maximum Tube Current:

Large Focus ..... 570 mA

Small Focus ..... 340 mA

### Maximum Filament Current:

Large Focus ..... 5.1 A

Small Focus ..... 5.1 A

### Filament Voltage:

Large Focus (At max. filament current 5.2 A) ..... 7.7 ~ 10.4 V

Small Focus (At max. filament current 5.2 A) ..... 5.8 ~ 7.8 V

Filament Frequency Limits ..... 0 ~ 25 kHz

Average Input Power ..... 60 W (85 HU/s)

(Fluoroscopic, repeated radiographic or mixed exposure)

### Thermal Characteristics:

Anode Heat Storage Capacity ..... 100 kJ (140 kHU)

Maximum Anode Heat Dissipation Rate ..... 475 W (667 HU/s)

Housing Heat Storage Capacity ..... 900 kJ (1250 kHU)

### Maximum Housing Heat Dissipation Rate:

Without Air-circulator ..... 180 W (15 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

## Warning

### Warning to Interface with X-ray Generator

#### 1. Housing Rupture

Never input over-rated power to x-ray tube assembly.

If the input power is extremely higher than specification, it may cause the over temperature of anode, insert tube glass shatter and ultimately the following serious problems due to generating over-pressure by oil vaporization inside housing assembly.

In such a critical condition, the safety thermal switch can not protect x-ray tube even if it works.

- \* Housing sealing parts (cathode side) rupture
- \* Human injury including burns due to hot oil escape
- \* Fire accident due to flaming anode target

We strongly request that the x-ray generator should have a protective function which manages input power to x-ray tube assembly.

#### 2. Over Load Protection

X-ray tube housing assembly has a thermal protection device to notice the generator to terminate the input power. However it only works for gradual temperature increase when the tube is operated within the specified X-ray condition (but too long repetitive use). And the protection is not effective in such a case that rapid increase of target temperature destroys insert tube under overrated input. In this sense, over load protection is definitely required on X-ray generator.

From the point of effective and reliable operation, the followings are recommended:

- \* Software control: CPU calculates the total input power and controls the target temperature. This protection is effective to human error.
- \* Independent protection circuit: Independent shut down circuit separated from X-ray control unit is effective and reliable.

#### 3. Pressure release adjuster

Never touch the pressure release adjuster located on anode side wall.

And when rotor cable is attached, be careful that the rotor cable should not be located on or over the pressure release adjuster for the following mechanical reason.

The pressure release adjuster is the device which protects X-ray tube housing assembly from harmful destruction by its mechanical collapse.

When extreme over rated power is input to X-ray tube assembly, the pressure release adjuster activates and hot oil escapes through the collapsed adjuster for safety purpose.

For the reliable mechanical process, nothing should be located on or over the pressure release adjuster.

## **Cautions**

### Caution to Interface with X-ray Generator

1. Over Rating

X-ray tube assembly can be broken with applying just one over rated shot.  
Please read the technical data sheets carefully and follow the instructions.

2. Inherent Filtration

The total filtration and the distance between x-ray focal spot and human body are regulated legally.  
They should be complied with the regulation.

3. Safety Thermal Switch

X-ray tube assembly has safety thermal switch to prohibit further input power when the tube housing reaches to the temperature of switch-open.

The switch should be hooked up with the x-ray generator which control output power to x-ray tube assembly.

Even if the switch works, never turn the system power off and the cooling unit should be activated.

4. Unexpected Malfunction

X-ray tube assembly may have the risk to be unexpectedly malfunctioning due to life termination or failure. If the serious problems caused by the above risk is expected, we recommend to have a contingency plan to avoid such a case.

5. New Application

If you use the product with new application not to be mentioned in this specification or with different type of x-ray generator, please contact to us for confirming its availability.

### Caution for Installation, Adjustment and Maintenance

#### 1. Qualified Persons

Only qualified persons who have technical training and professional knowledge can handle x-ray tube assembly.

#### 2. Fragile Glass

X-ray tube is assembled with glass, therefore, it can be broken with the mechanical vibration or pulsed shock over  $19.6\text{m/s}^2$  (2G).

Careful handling is required to treat or transport.

#### 3. Ground Terminal

X-ray tube assembly has ground terminal. Ground cable should be connected.

#### 4. High Voltage

All x-ray tubes operate at voltages high enough to kill through electrical shock. Never touch the high voltage delivered plugs or terminals.

When direct access to such parts is required, the primary circuit should be disabled and high voltage capacitors/cables discharged.

#### 5. High Voltage Plug

High voltage plug should be cleaned up and free from any physical damages. Silicon compound application is required for high voltage stability.

#### 6. Operation Atmosphere

X-ray tube assembly is not allowed to use in the atmosphere of flammable or corrosive gas.

#### 7. Protective Cover

X-ray tube assembly is not allowed to use without the protective cover attached.

#### 8. Handling

Appropriate jig or tools are required for tube installation to avoid physical damages.

#### 9. Returning Tube

X-ray tube assembly should be repackaged with the original material when it is returned back for quality examination in our factory.

Be careful to put the tube upside cathode. If the packaging is not proper, the tube may not be correctly examined.

Caution in Operation

1. X-Ray Radiation

X-ray tube assembly should have the beam limiting equipment mounted on the x-ray port to protect unnecessary radiation.

2. Dielectric Oil

X-ray tube assembly has dielectric oil contained for high voltage stability. As it is poisonous for human health, if it is exposed to the non-restricted area, it should be disposed as following to the local regulation.

3. Operation Atmosphere

X-ray tube assembly is not allowed to use in the atmosphere of flammable or corrosive gas.

4. Lead Disposition

X-ray tube housing is lined with lead to protect unnecessary radiation. As the lead powder or vapor is harmful for human health, it should be disposed as following to the local regulation or returned back to us with your cost of transportation. We dispose it in our facility with free of charge.

5. X-ray tube housing temperature

Do not touch on X-ray tube housing surface just after operation due to high temperature.  
Stay X-ray tube to be cooled.

6. Any Malfunction

Please contact to your system service person immediately, if any malfunction is noticed.

## Caution Label

- (a) This label is a caution label to notify the user of the following point.  
"Housing end cap is used to protect the electric shock and x-ray leakage."

Attachment position: X-ray tube assembly housing end cap



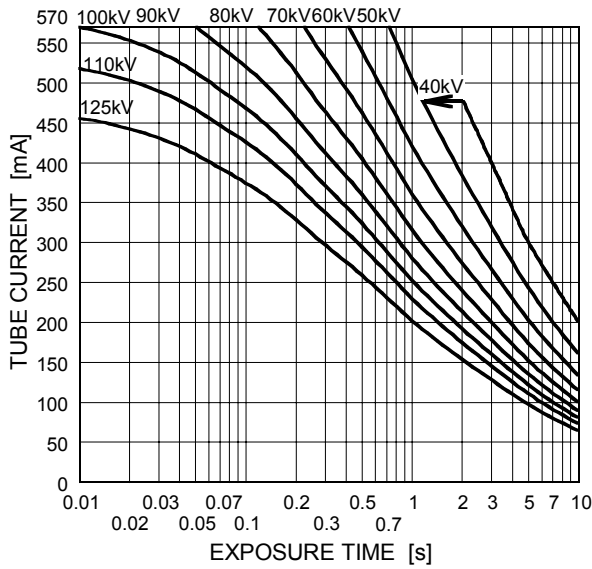
## Maximum Rating Charts

(Absolute Maximum Rating Charts)

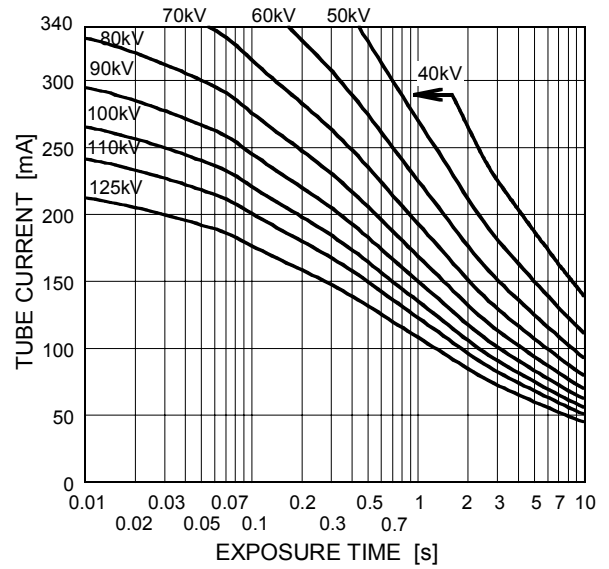
Conditions : Tube Voltage Three-Phase

Stator Power Frequency 60Hz

Focal Spot : 2.0 mm



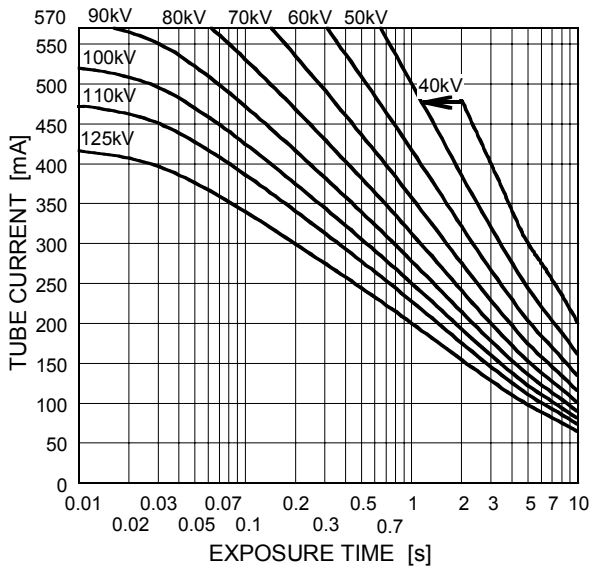
Focal Spot : 1.0 mm



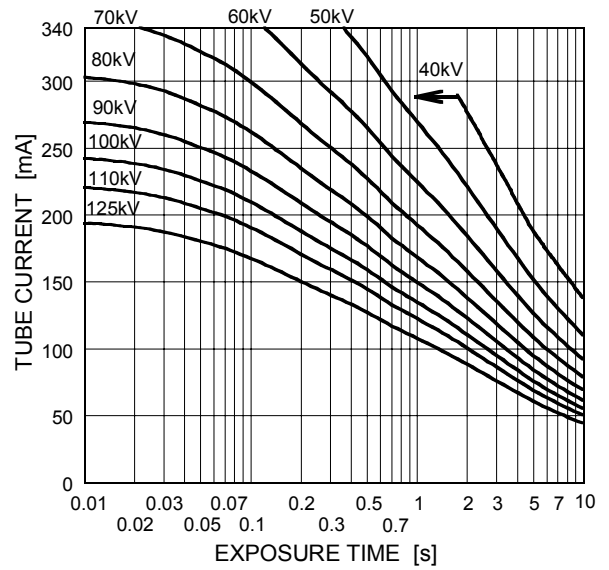
Conditions : Tube Voltage Three-Phase

Stator Power Frequency 50Hz

Focal Spot : 2.0 mm



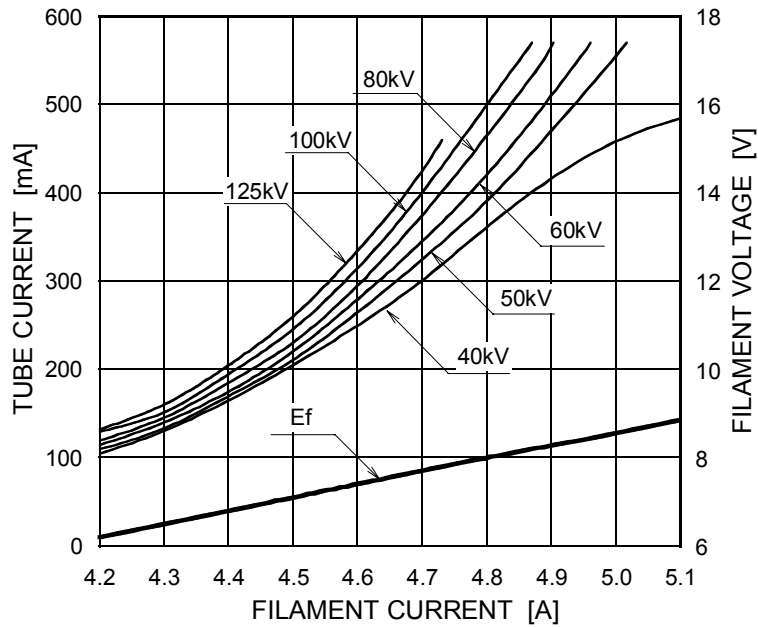
Focal Spot : 1.0 mm



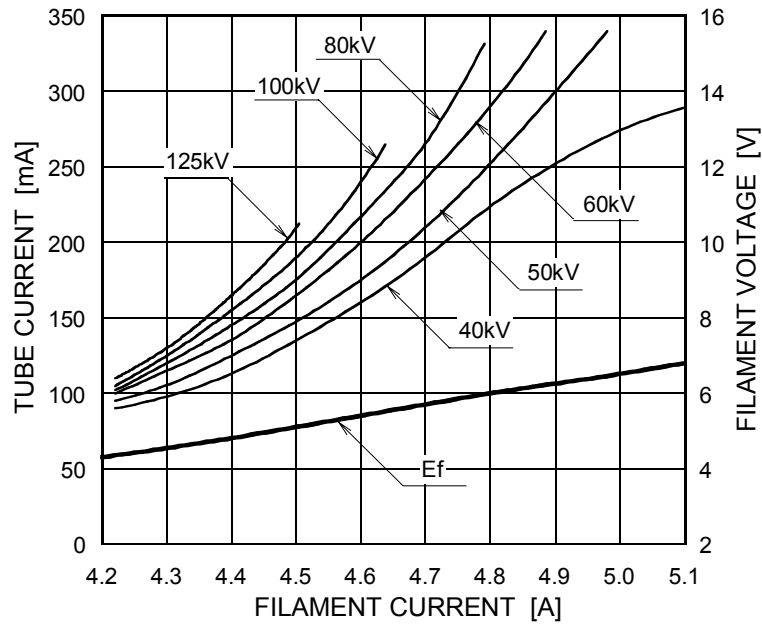
## Emission & Filament Characteristics

Three-Phase

Focal Spot : 2.0 mm

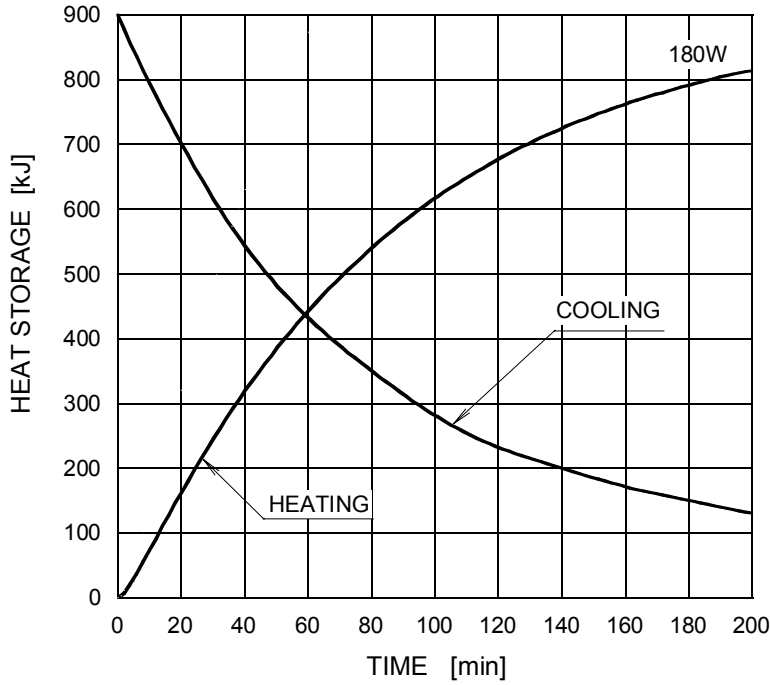


Focal Spot : 1.0 mm



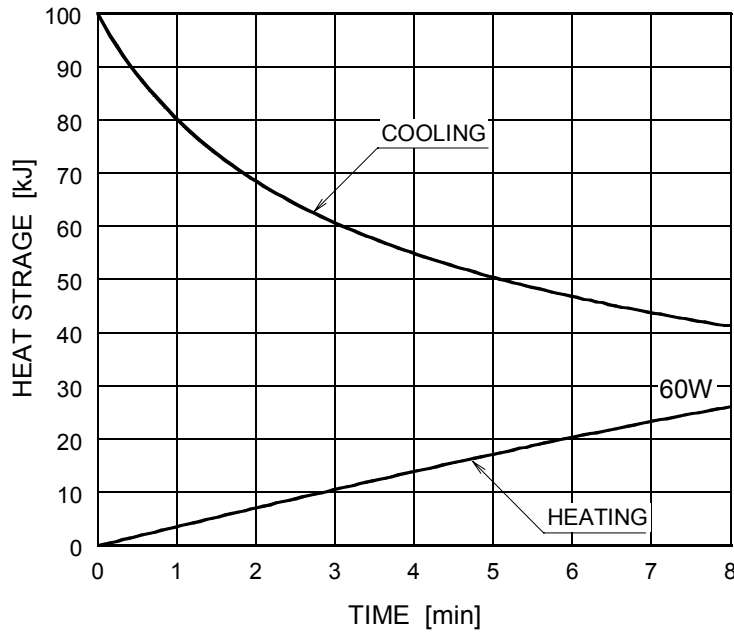
## Thermal Characteristics

### Housing Thermal Characteristics



Cooling Without Air Circulator.

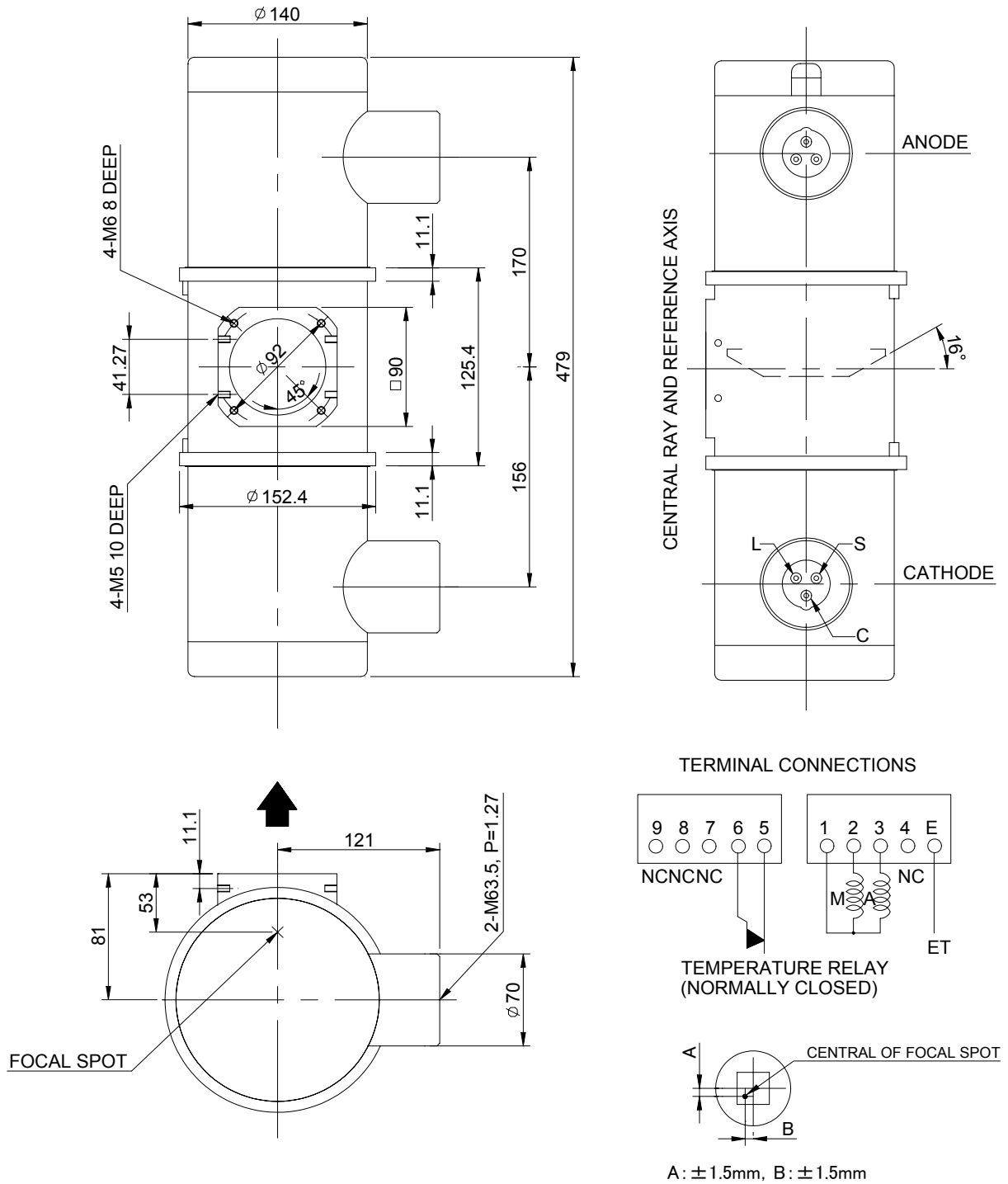
### Anode Thermal Characteristics



The heating curves are showing example of average input power to anode in operation.

### Dimensional Outline of E7239X

Unit mm

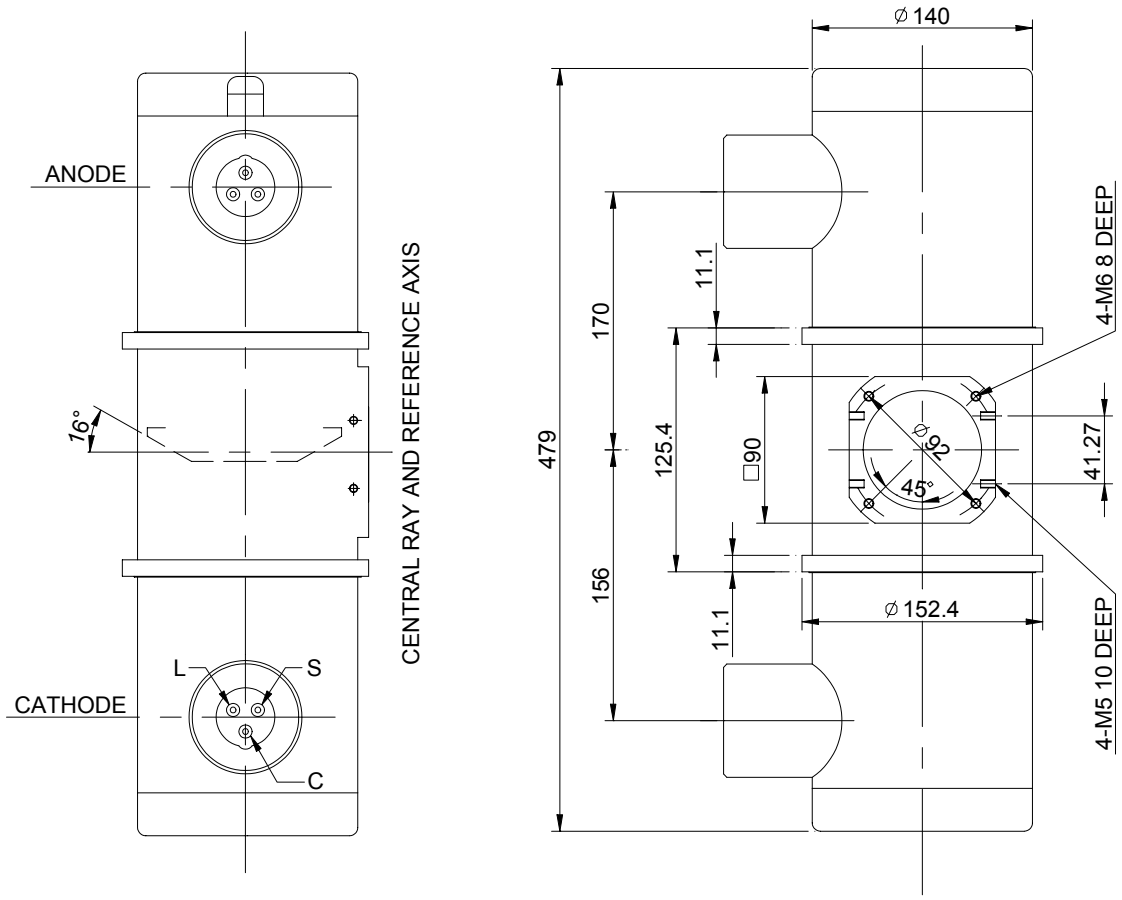


C : COMMON  
 L : LARGE FOCUS  
 S : SMALL FOCUS  
 M : MAIN WINDING OF THE STATOR  
 A : AUX. WINDING OF THE STATOR

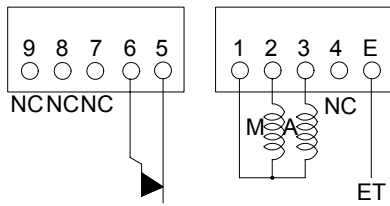
NC: NON-CONNECTION  
 ET: EARTH TERMINAL  
 ▲ : CENTRAL X-RAY  
 ANODE & CATHODE TERMINAL  
 : IEC 60526 TYPE

### Dimensional Outline of E7239FX

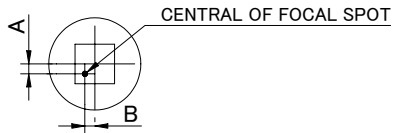
Unit mm



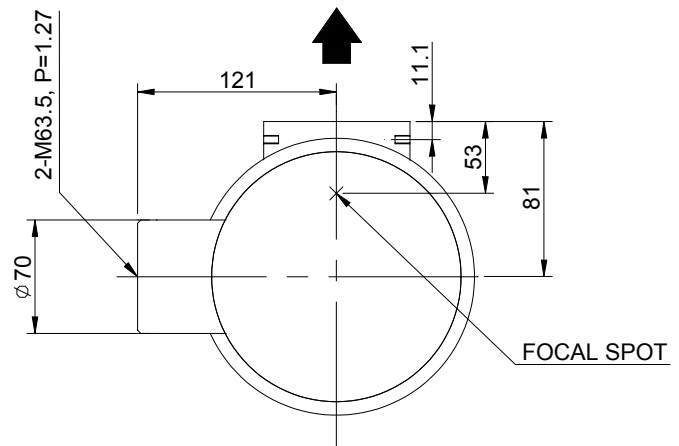
TERMINAL CONNECTIONS



TEMPERATURE RELAY (NORMALLY CLOSED)



A: ±1.5mm, B: ±1.5mm

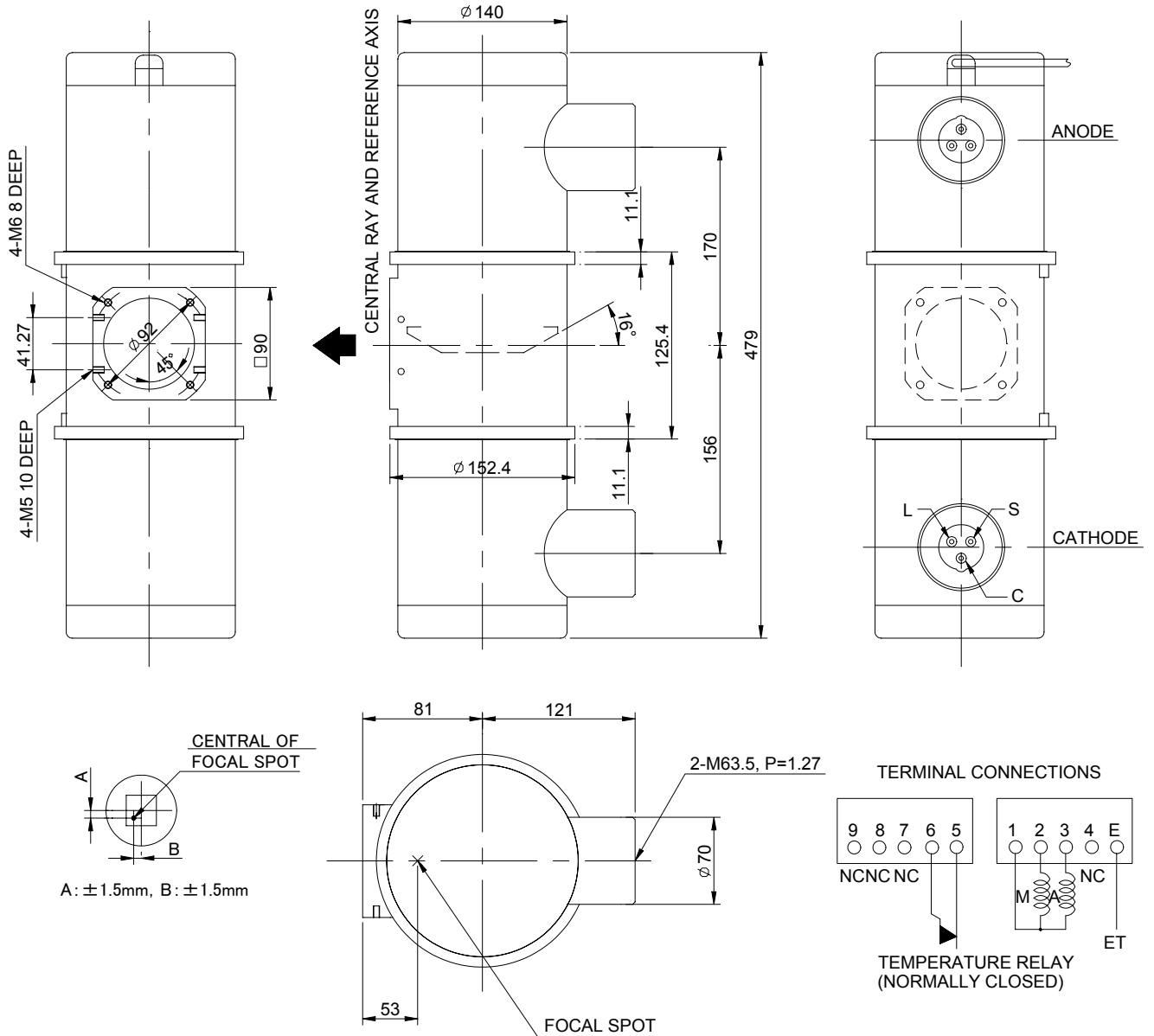


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- ▲ : CENTRAL X-RAY ANODE & CATHODE TERMINAL : IEC 60526 TYPE

### Dimensional Outline of E7239GX

Unit mm



C : COMMON  
 L : LARGE FOCUS  
 S : SMALL FOCUS  
 M : MAIN WINDING OF THE STATOR  
 A : AUX. WINDING OF THE STATOR

NC : NON-CONNECTION  
 ET : EARTH TERMINAL  
 ▲ : CENTRAL X-RAY  
 ANODE & CATHODE TERMINAL : IEC 60526 TYPE

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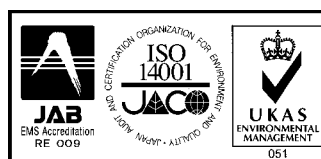
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System Standard, ISO 14001



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Management System ISO 9001, ISO 13485