X-Ray tube assembly RAY-14 family

Manual – Technical Description

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CE Mark

Caution: The sale and placing on the market of the equipment described herein is subject to approval according to national and international regulations.

This device bears a CE mark in accordance with the provisions of EU Regulation 2017/745 of April 5, 2017 concerning medical devices and the Council Directive 2011/65/EU of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The CE marking applies only to Medical Devices which have been put on the market according to the above-mentioned EU Regulation and EU Directive.

Unauthorized changes to this product are not covered by the CE mark and the related Declaration of Conformity.

Document Version

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1 General data

1.1 Validity of this document

This operator manual applies only to X-Ray tube assembly of the product RAY-14 family from Siemens Healthcare and was prepared on the basis of the applicable German and international standards, see section "Laws, standards and regulations" on page 3.

1.2 Safekeeping of operator manuals

Always keep the operator manual in an easily accessible place near the medical system.

1.3 Names and parameters

In the following, the X-ray tube assembly RAY-14 family from Siemens Healthcare is generally referred to as a medical device (ME device) or X-ray tube assembly.

Type	Model No.
RAY-14_3	7035483
RAY-14_1	7037133
RAY-14S_3	7037000
RAY-14S_3F	7037208
RAY-14S_1	7037141

Protection Class

Standard	Protection class
X-ray tube assembly according to IEC 60601-2-28: 2017	Class I

2 Address

Legal Manufacturer / Serious incident contact information	Siemens X-Ray Vacuum Technology Ltd., Wuxi No.112, Meiyu Road 214028 Wuxi, Jiangsu P. R. China Tel: +86-(0)510-66662888 Fax: +86-(0)510-85345822 * Any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the Member State in which the user and/or patient is established.
Expected service life	50,000 exposures * The lifetime of every single XTA is highly relevant to its actual use; it is probable to be longer or shorter than claimed. If there is no performance defect with XTA, it could continue to use after reaching the claimed lifetime.
Address for further inquiries	Siemens Healthcare GmbH Power and Vacuum Technology Allee am Röthelheimpark 2 91052 Erlangen Germany Phone: +49 9131 84-6911 siemens-healthineers.com
Importer (only for EEA – European Economic Area)	Siemens Healthcare GmbH Henkestr.127 91052 Erlangen Germany
Original language	English

3 Laws, standards and regulations

This product has been manufactured and developed in agreement with the following laws, directives and design regulations.

- EU Regulation 2017/745 of April 5, 2017 on medical devices (CE marking)
- Council Directive 2011/65/ EU of June 08, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment, following the requirement of standard IEC 63000:2016.
- ISO 13485:2016 Medical devices – Quality management systems – Requirements for regulatory purposes
- ISO 14971:2007 Medical devices – Application of risk management to medical devices
- 21 CFR Part 1020.30, Performance standard for ionizing radiation emitting products, (USA)
- 21 CFR Part 820 Quality System Regulation, (USA)
- International Electrotechnical Commission (IEC), the following standards are considered especially:

IEC	Title
IEC 60336:2005 + C1:2006 eq EU: EN 60336:2005	Medical electrical equipment -X-ray tube assemblies for medical diagnosis – Characteristics of focal spots
IEC 60522:2003 eq EU: EN 60522:1999	Determination of the permanent filtration of X-ray tube assemblies
IEC 60526:1978 + C1:2010 eq EU: EN 60526:2004	High-voltage cable plug and socket connections for medical X-ray equipment
IEC 60601-1:2012 +C1:2012 eq EU: EN 60601-1:2006 + AC:2010 + A1:2013	Medical electrical equipment - Part 1: General requirements for basic safety and essential performance
IEC 60601-1-3:2008 + A1:2013 eq EU: EN 60601-1-3:2008 + AC:2010 + A1:2013	Medical electrical equipment - Part 1-3: General requirements for basic safety and essential performance - Collateral standard: Radiation protection in diagnostic X-ray equipment
IEC 60601-2-28:2017 eq EU:EN IEC 60601-2-28:2019	Medical electrical equipment - part 2-28: Particular requirements for basic safety and essential performance of X-ray tube assemblies for medical diagnosis
IEC 60613:2010 eq EU: EN 60613:2010	Electrical and loading characteristics of X-ray tube assemblies for medical diagnosis
IEC 60613:1989 eq EU: EN 60613:1990	Electrical, thermal and loading characteristics of rotating anode X-ray tubes for medical diagnosis
IEC 63000:2016 eq EU: EN 63000:2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

4 Description

Intended Purpose Statement under the European Medical Device Regulation 2017/745:
X-ray tube assembly intended to be integrated into X-ray imaging systems for medical purposes

4.1 Intended purpose

This X-ray tube housing assemblies consists of a metallic (e.g. steel, aluminumalloy) case that houses an X-ray tube to provide appropriate limits for X-ray leakage and adequate insulation to avoid electric risks during a diagnostic X-ray procedure. It includes sheet lead surrounds at appropriate locations to shield unwanted X-ray radiation and collimators near the aperture; it is usually filled with oil to prevent electrical arcs from the high-voltage components of the X-ray tube. The housing also includes attachment points, cooling means, high-voltage cables, and supports for the tube and cable receptacles.

This X-ray tube housing assembly is intended to be used in diagnostic X-ray systems for radiographic and fluoroscopic applications.

Indications

Indication for use of the X-ray tube housing assembly is every clinical indication which requires a diagnostic X-ray procedure using a diagnostic X-ray system. The specific indications, parts of the body and the duration of the exposure for which the X-ray tube housing assembly can be used (once or repeated) are defined by the diagnostic X-ray system in which the X-ray tube housing assembly is integrated.

Contra-indications

For the X-ray tube housing assembly no other contra-indications besides the ones for general radiologic procedures are currently known. Specific contra-indications might need to be defined by the system integrator of the diagnostic X-ray system in which the X-ray tube housing assembly is integrated.

Intended patient population

The X-ray tube housing assembly may be used for each patient who is admitted for an X-ray examination, from newborn to geriatric. The patient population might need to be restricted on system level as result of the integration of the X-ray tube housing assembly into a diagnostic X-ray system by the system integrator.

Intended users

X-ray tube housing assemblies are intended to be integrated into diagnostic X-ray systems by a system integrator, for whom it is required to have specific technical and medical knowledge and skills, including but not limited to radiation protection, electrical and mechanical safety and clinical procedures for which the finalized system is released. Integrated into the diagnostic X-ray system, X-ray tube housing assembly/ single tank tube assembly are intended to be operated by adequately trained clinical users. Instructions for use of these devices address exclusively the system integrator and are not intended being handed over to the clinical operators. All information and advices for the clinical operator are to be included in the instruction for use and accompanying documents of the finished diagnostic X-ray system in which the X-ray tube housing assembly is integrated.

Undesirable side-effects

Since an X-ray tube housing assembly which is not integrated in a system has no clinical effect, it consequently has no ide-effects either. Clinical effects and also side-effects are depending on the design and intended use of the diagnostic X-ray system in which the X-ray tube housing assembly is integrated and need to be determined on the system level.

4.2 Functional Characteristic

4.2.1 Design

- X-ray tube assembly main parts: X-ray tube, housing, stator, insulation oil, X-ray radiation exit window and collimator flange (“-F” type)
- X-ray tube main parts: cathode, anode(including target), driving system(including bearing system), glass enclosure

4.2.2 Characteristic

- Long-term high dose yield
- Single-angle compound anode, black coated
- Focal spots are superimposed
- Compact tube assembly housing

4.3 Explanation of designation

Designation of X-ray tube assembly	**RAY-14_3** **RAY-14S_3** **RAY-14S_3F** **RAY-14_1** **RAY-14S_1**
Mounted X-ray tube	**SV 150/33/78R-S**

X-ray tube assembly key word:

RAY-xx_y	RAY tube assembly family
14	X-ray Tube assembly for the OEM market with X-ray tube SV150/33/78R-S Housing 90° reverse model (see dimension drawings)
14S	X-ray tube assembly for the OEM market with X-ray tube SV150/33/78R-S housing 90° version (See dimension drawings)
_3	3-phase drive
_1	1-phase drive
F	Flange for collimator mounted

X-ray tube key word:

SV	SV X-ray tube families for OEM customers
150	Nominal voltage 150 kV
33	Rated power of small focus F1: 33 kW

78	Rated power of large focus F2: 78 kW
R	(Rapid) rotary frequency 150/180 Hz
S	Siemens adapter

5 Notes

5.1 General notes

In the interest of complying with respected legal requirements concerning the environmental compatibility of our products (protection of natural resources, avoidance of waste) we endeavor to reuse components and to return them to the production cycle. We guarantee their reliability and functionality, quality and life of these components by taking extensive quality assurance measures including all test procedures, just as for brand new components. Reused parts are “qualified as good as new”.

Siemens Healthcare has performed a conformity assessment in accordance with the MDR for this component.

The tube assembly is not a sterile product. The housing surfaces are designed for easy cleaning/disinfection.

Applications with contacts to animal or human tissue or in body cavities are not intended.

Use the original packaging for returning the tube assembly to the manufacturer.

A higher output of the tube assembly can be achieved by optional fan cooling.

Unless otherwise indicated, all load data specified apply to six-pulse, twelve-pulse, multi-pulse or DC voltage generators.

5.2 Safety information

These safety instructions must be strictly observed!

WARNING

X-ray tube assembly works out of specification.

Risk of injuries due to damaging of the X-ray tube assembly!

- The X-ray tube assembly is to use only with specified ratings.

The X-ray tube assembly must be operated only in agreement with the safety information of this operator manual. The operator is responsible for compliance with the regulations that apply for the installation and operation of an X-ray system.

The X-ray tube assembly shall be used only in compliance with its intended use; the instructions of the operating instructions of the system manufacturer for operation, servicing and care as well as maintenance of an X-ray system apply. In particular, the tube assembly is not approved for operation in environments with combustible gas mixtures.

WARNING

Symbols not legible or damaged may cause wrong installation.

Risk of serious injuries or death due to wrong installation!

- Use of the X-ray tube assembly is forbidden if signs of mechanical, electrical or radiation-related are not legible or damaged.

Use of the X-ray tube assembly is forbidden if related signs are not legible or damaged.

The overloading of X-ray tube may cause damage to internal components and take an excess of X-ray, so user must ensure that X-ray tube assembly is not overloading.

For monitoring certain operating parameters, the X-ray tube assembly is equipped with means for preventing a possible overload of or damage to the X-ray tube assembly.

Any manipulation to these safety devices is prohibited. The load limit values listed in this manual shall not be exceeded.Depending on the operating mode, the tube assembly may reach high temperatures. Please exercise caution when touching the housing surface.

WARNING

Too high temperature may damage this equipment.

Unexpected contact may cause physical injury.

Risk of burns due to high temperature!

- In accordance with the safety concept of the user and this equipment, the 90°C temperature sensor must be connected.

For the purpose of achieving high continuous output, the tube assembly is designed for operation up to 90°C. To avoid thermal overload, the tube assembly is equipped with two temperature switches. The status of the temperature switches must be queried through the system hardware or software, which generates an error message in the event of an error. The 70°C temperature switch provides information on the energetic state of the tube assembly and provides a warning to reduce output and terminate the current examination. Depending on the system configuration, such information can also be provided by a load computer. The 90°C temperature switch provides the signal to cut off the power supply to the tube assembly. Any treatment for these safety parts is prohibited.
The maximum electric load capacity of both temperature switches intended by the tube assembly manufacturer is 230V/0.5A. The connection cables must be designed for a continuous thermal load capacity of 100°C.

WARNING

Wrong installation may cause death or serious physical injury.

Risk of electric shock!

- To avoid the risk of electric shock, this equipment must only be connected to a supply with protective earth.

Prior to an examination as the user's responsibility to ensure that all safety features are functional and that the product is ready for operation.

Operation of X-ray tube assembly must be terminated instantly when defect detected and notice customer service personnel immediately.

Handle with care!

High vacuum pressure parts inside X-ray tube assembly, implosion may be caused by careless treatment such items as impact, striking, dropping, etc.

Dismounting this equipment without authorization is not permitted.

5.3 Radiation protection

This product fulfills the requirements of IEC 60601-1-3. This X-ray tube assembly emits X-ray radiation in operation.

WARNING

Untrained person may cause person injury or system damage!

Risk of injury due to wrong operation by untrained person!

- The X-ray tube assembly should be operated only in agreement with the safety instructions of this operator manual.

CAUTION

Relevant physiologic effects may cause harm to patient.

System manufacture should take proper protection to avoid ionization radiation.

Risk of X-Ray radiation

- Only correspondingly qualified and trained personnel are allowed to operate the X-ray tube assembly.

5.4 Operating conditions

- Conditioning the X-ray tube assembly

The following program must be performed by the customer service during initial startup of the X-ray tube assembly, or following extended system down time during a service call, as well as when there are operating malfunctions of the system with a suspicion that there is electrical instability of the X-ray tube. When the X-ray tube assembly is delivered as a pre-installed system, perform the procedure once again prior to acceptance of the system by the customer.

- After extended idle time of the X-ray tube (more than 2 weeks), it is recommended that the operator perform an abbreviated warm-up procedure as described under item 1 and 3.

  Importance: Ensure that adequate radiation safety precautions are taken an protect any existing image intensifier against radiation (e.g. lead apron in the beam path).

1. Conditioning program
   (To be carried out when a new X-ray tube assembly is installed and

after prolonged downtime (more than 2 weeks) for the start-up with a cold anode)
Switch on fluoroscopy at 40 kV.
Power up to 110 kV/2 mA within 5 minutes and hold for 10 minutes.
5 minutes cooling pause! Continue with exposure mode!

2. Conditioning program (recommended for start-up with a cold anode)
Switch on fluoroscopy at 40 kV.
Power up to 110 kV/2 mA within 1 minutes and hold for 10 minutes.
5 minutes cooling pause! Continue with exposure mode!

To be carried out after prolonged downtime (more than 2 weeks).

3. Select exposure mode with F2. Note constant load curve!
70 kV / 100 mAs - 2 exposures
Pause after each exposure ≥ 23 s
90 kV / 300 mAs - 2 exposures
Pause after each exposure ≥ 90 s
109 kV / 300 mAs - 2 exposures
Pause after each exposure ≥ 109 s

4. Perform only for installation of a new X-ray tube assembly
Select exposure mode with F2. Note constant load curve!
125 kV / 50 mAs - 2 exposures
Pause after each exposure ≥ 21 s
150 kV / 50 mAs - 2 exposures
Pause after each exposure ≥ 25 s

- If the tube tends to repeatedly and strongly "arc", abort the procedure
(risk to sensitive parts of the system electronics). The customer service must be notified.
- If the downtime of X-ray tube assembly is too long, it's better to do tube-adjust process according to the tips of 1 & 3.

5.5 Electromagnetic Compatibility (EMC)

Radio signals of radio-frequency communication devices such as mobile telephones or other mobile radio devices can influence the correct functioning of a medical-electrical device.

This X-ray component is subject to special precautionary measures with regard to EMC and may be installed and put into operation only according to the installation instructions.

This medical electrical component cannot be operated on its own, but only in combination with a generator or a radiological diagnostic system. According to Chinese and IEC standards, the proof of compliance with the requirements of IEC 60601-1-2 with regard to electromagnetic compatibility should be provided by system manufacturer.

5.6 Maintenance

The X-ray tube assembly is maintenance free. There are no hazards whatsoever for persons and environment in the case of proper use.

5.7 Checks

The following checks must be performed at regular intervals.

If any announced damage was found don't start any operation with the system. Contact service personnel immediately.

5.7.1 Visual check with the generator turned off

- Check the X-ray tube assembly for external damage.
- Check all exposed cables to the X-ray tube assembly to ensure that the outer insulation is undamaged – do not touch during operation!
- Check the X-ray tube assembly for oil leakages daily.

5.7.2 Mechanical check with the generator turned off

- Check the fastening of the freely accessible X-ray tube assembly. The X-ray tube assembly must be firmly seated in the holder - ensure that it is not loose!
- Check the fastening of the freely accessible collimator, the collimator must be firmly seated on the flange – ensure that it is not loose!
- Check all exposed high-voltage plugs to ensure that they are firmly seated, tighten the mounting nuts.

5.7.3 Electrical check

- In accordance with IEC 60601-2-28 the shielding of exposed high-voltage cables between the metal housing of the X-ray generator and the X-ray tube assembly is limited to a maximum of 1 Ω /m. Conformance must be checked by a measurement. If you have concluded a maintenance contract, this measurement will be performed by the service.

5.8 Disposal

The X-ray tube assembly as well as the tube contains materials such as oil and heavy metals for which environmentally friendly and proper disposal in accordance with the valid national legal regulations must be assured. Disposal as domestic or industrial refuse is forbidden.

This equipment manufacturer possesses the required technical knowledge and will takes the tube assembly back for disposal. Please contact your X-ray tube assembly manufacturer for this purpose.

⚠ CAUTION

Improper disposal due to lack of knowledge.

Risk of environmental pollution!

- The manufacturer possesses the required technical knowledge and will take back the X-ray tube assembly for disposal.

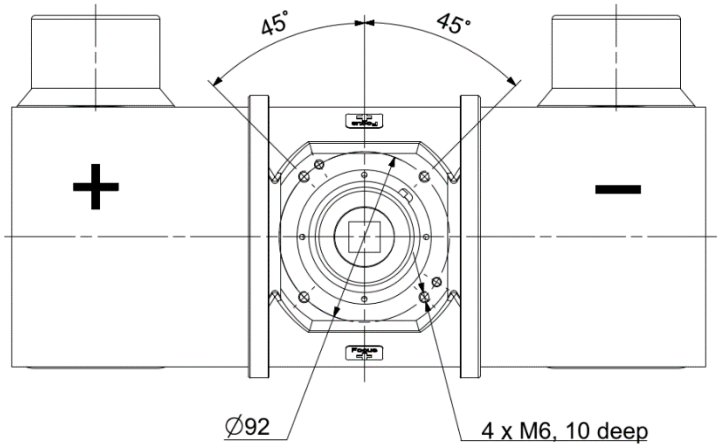
5.9 Installation notes for personnel

Only qualified staff is permitted to unpack, install and operate the X-ray tube assembly.

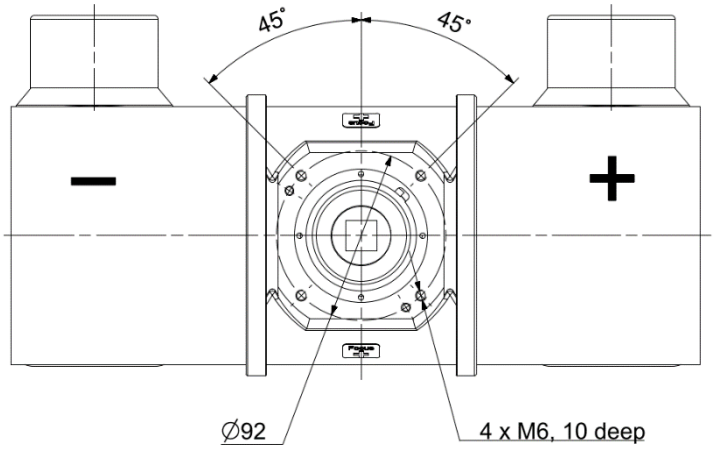
Follow instructions for installing, handling, tune-up etc. and/or reference to the operating instruction of the X-ray system.

5.9.1 Radiation outlet block

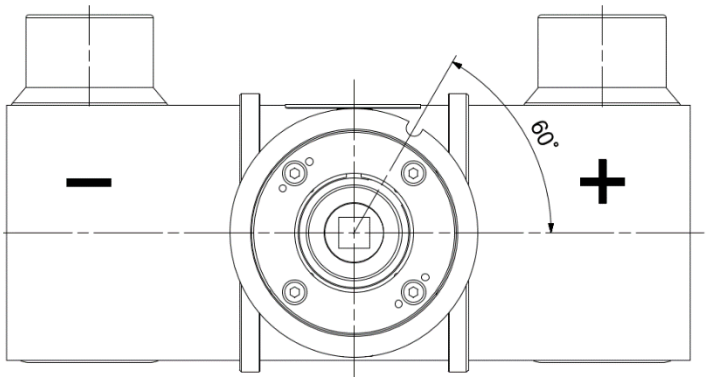
RAY-14_3 RAY-14_1



RAY-14S_3 RAY-14S_1



RAY-14S_3F



The permissible weight for all components that are mounted on the radiation outlet block may together not exceed 300 N.

Flange relevant information referred to Section 9.

Dimension in mm

— High-voltage connector on the cathode side

\+ High-voltage connector on the anode side

WARNING

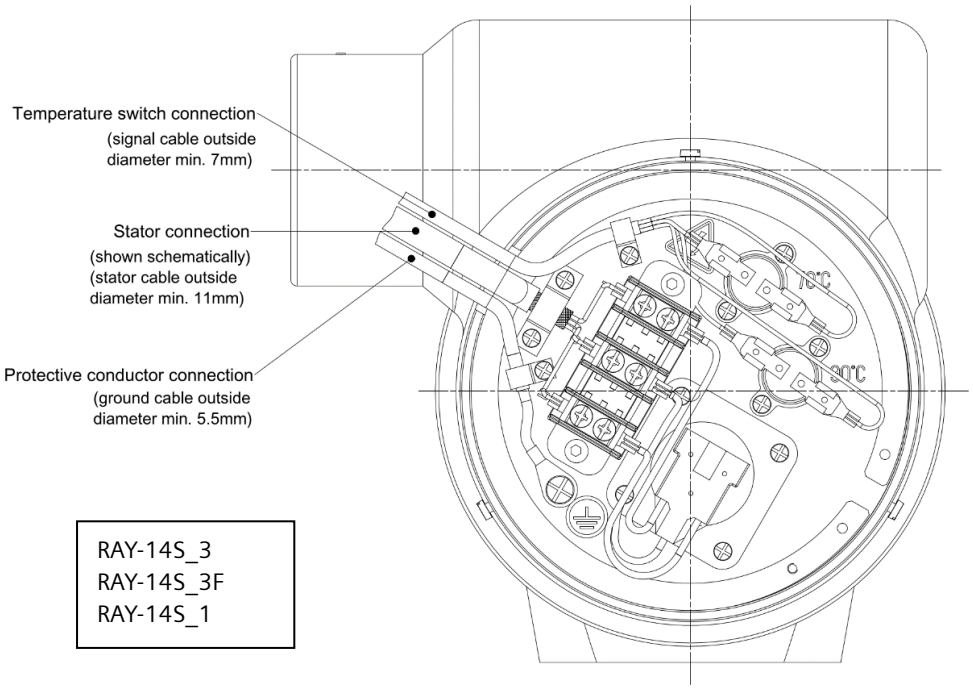
Breakage of the radiation outlet block may caused by mechanical load too high.

Risk of Physical Injury due to falling components!

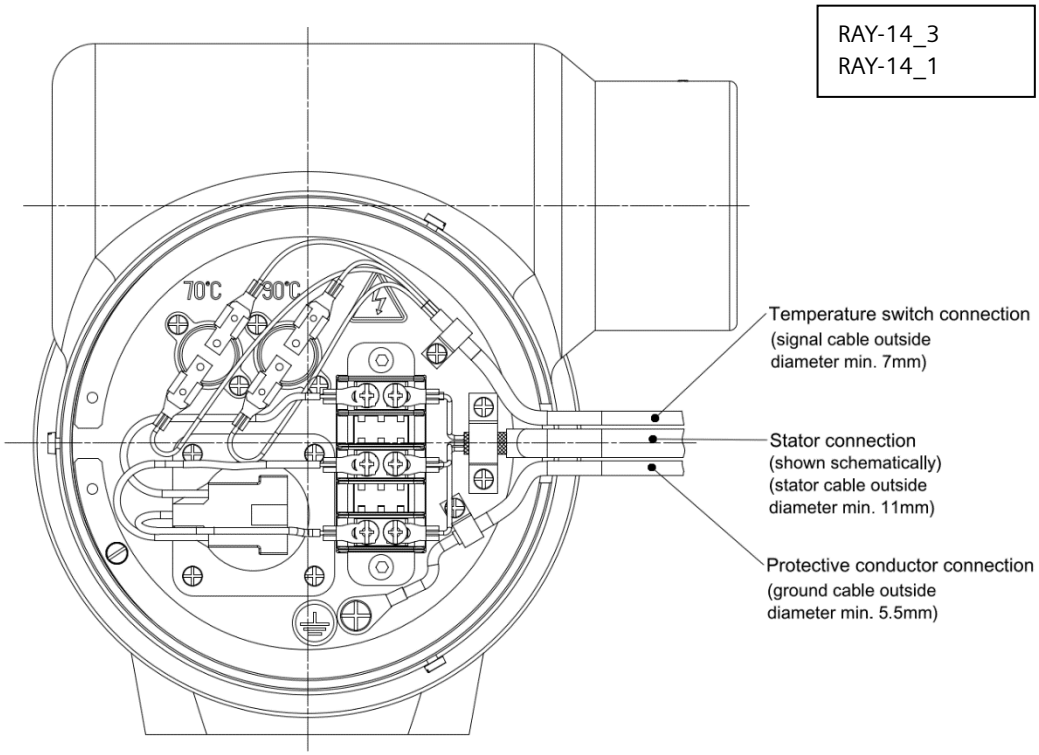
- The permissible weight for all components that are mounted on the radiation outlet block can not exceed 300 N.

5.9.2 X-ray tube assembly connection plates

The electrical connections of stator and sensors are located under the decoration cap at anode side on connection plate (see following views). For connecting cables the decoration cap has to be removed and follow label as announced under decoration cap. Before operating XTA decoration cap has to be mounted again in an orientated way to inlet of cables.



RAY-14S_3
RAY-14S_3F
RAY-14S_1



See also Section 8 "Connection diagrams"

Note

- Connection of the signal cable to the temperature switches with a flat plug 6.3x0.8 suitable for the cable cross-section used.
- Connection of the protective conductor cable with a cable lug (closed) suitable for the cable cross-section used and for M5 screw.
- Connection of the stator cable with cable lugs (open or closed) suitable for the cable cross-section used and for M4 screw.

Stator key values

3-phase stator
RAY-14_3 RAY-14S_3 RAY-14S_3F

Test point	0 - I	0 - II	I - II
Winding resistance	≈22.8...24.8 Ω	≈22.8...24.8 Ω	≈22.8...24.8 Ω
Max. permissible operating voltage (run-up)	400V +10%		
Braking voltage	70 V DC		
Run-up time (depending on starter system)	approx. 1.0 s		

1-phase stator
RAY-14S_1 RAY-14_1

Test point	0 – I (joint work)	0 – II (joint help)
Winding resistance	≈20.4...22.6Ω	≈48.9 ... 54.1 Ω
Max. permissible operating voltage (run-up)	230V +10%	
Recommended operating voltage(run-up)	160V±10%	
Braking voltage	70 V DC	
Run-on voltage in exposure mode	80 V rms	
Run-on voltage in fluoroscopy	20 V – 40 V rms	
Run-up time (depending on starter system)	approx. 1.2 s	

In 150Hz or 180Hz operation of the tube assembly it is mandatory to brake the anode to at least 25Hz after loading. In 50 Hz or 60 Hz operation of the tube assembly, braking to 25 Hz is recommended.

Recommended phase-shift capacitor values for 1-phase stators
for 50 Hz anode rotation: 43 µF
for 60 Hz anode rotation: 30 µF
for 150 Hz anode rotation: 10 µF
for 180 Hz anode rotation: 7 µF

Different frequency converters can be used for the drive.

The stated values must be viewed only as reference values. Check the run-up time and the speed at the first start-up. Exposure release is permitted only after the nominal speed is reached.

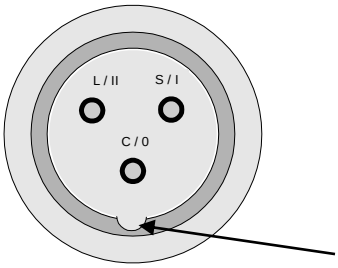
To avoid unnecessary development of heat from the stator, the electrical maximum values must be used for as short a time as possible.

The stator connection cables must be designed for a continuous thermal load capacity of 100°C.

5.9.3 High-voltage connections

The X-ray tube assembly is provided with a 3-pin high-voltage socket on the anode and the cathode sides.

This requires appropriate high-voltage cables. 30 m cable length should not be exceeded. The enclosed corona disks must be covered with silicone oil and slipped over the plug contacts.



S / I = Small focal spot

L / II = Large focal spot

C / 0 = Neutral conductor

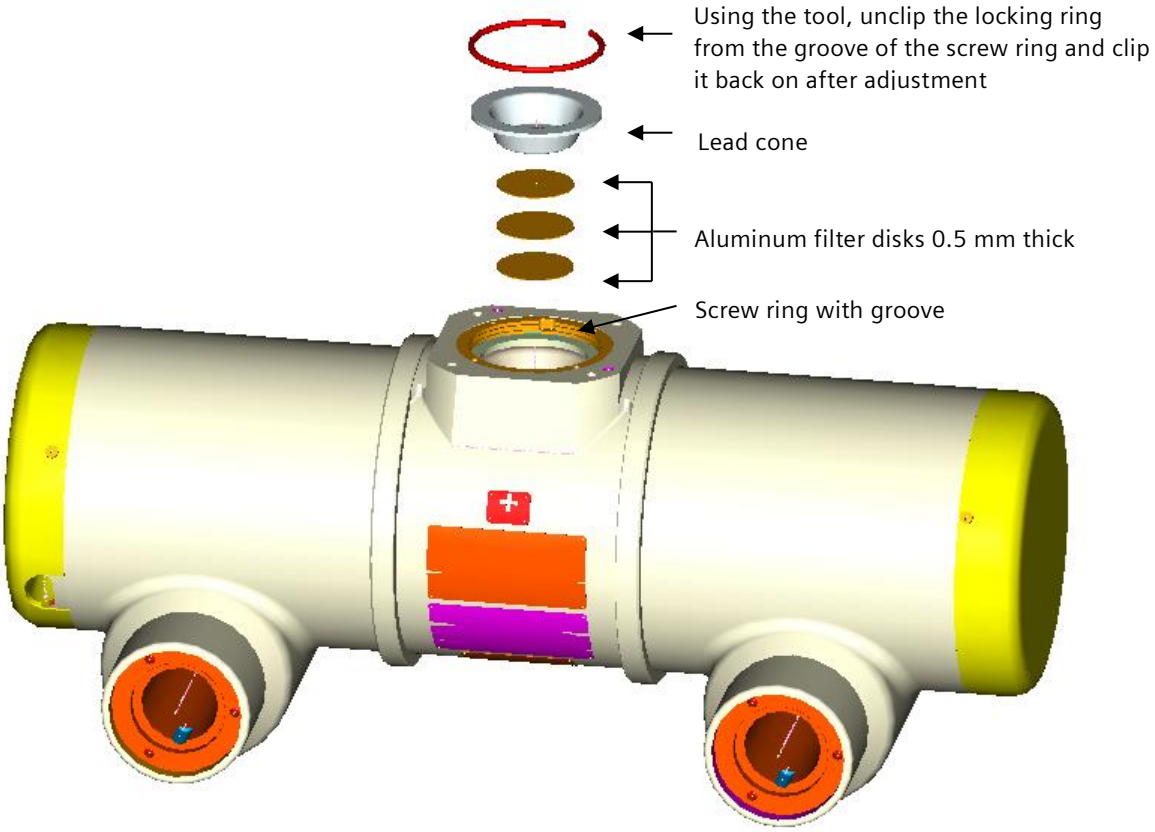
Guide groove

5.9.4 Tube assembly filtration

The total tube assembly filtration is ≥ 2.5mm Al equivalent and it is including additional filtration. The added filters consist of three filter disks (3x 0.5mm Al).

Note	Lead cone must be remounted again after removing filter disks for fitting the collimator.

The filter disks and the lead cone for image intensifier adaptation are replaced as follows:



CAUTION

A contact with unprotected lead is possible during the replacement of the filter plates. The inside of the protection cone in the radiate exit window is unpainted.

Risk of contamination in case of skin contact with lead!

- Be careful with unprotected lead.
- Do not damage the varnish protection on the outside of the lead part.

5.10 Pictograms

5.10.1 Symbol of protective earth conductor

A protective earth conductor symbol is cast on metal surface near connection point on the connecting plate at anode side of the tube assembly.

5.10.2 Warning symbol of dangerous voltage

"Warning" symbol of dangerous voltage is affixed on the connecting plate.

5.10.3 Symbols to mark cathode and anode of HV-connection horns

A pictogram as symbol to mark the HV-connecting horns concerning anode with plus sign and cathode with minus sign on the horns of the X-ray tube assembly. Symbols are located on respective horn.

HV-connection horn – anode side HV-connection horn – cathode side

5.10.4 Symbol of operating instructions

Symbol remark operator referring to operating instructions before operation is needed. Symbol locate on surface of this equipment nearby cathode socket.

CAUTION

Misunderstanding of those symbols may cause wrong installation.

Risk of person injury or system damage due to wrong installation!

- All symbols must be fully understood.

5.10.5 Symbol for compliance to UL-standard

Medical –Applied electromagnetic radiation equipment as to electric shock, fire and mechanical hazards only in accordance with ANSI/AAMI ES60601-1 (2005) + AMD 1 (2012), CAN/CSA-C22.2 No. 60601-1 (2014), IEC 60601-1-3:2008 + A1:2013, CSA CAN/CSA-C22.2 NO.60601-1-3-09 (2011) + AMD1 (2015), IEC 60601-1-6:2010 + A1:2013, CAN/CSA-C22.2 NO. 60601-1-6A:11 + AMD1 (2015), IEC 60601-2-28:2017, CAN/CSA-C22.2 NO. 60601-2-28:18; E347424

6 Technical Data

6.1 X-ray tube / tube assembly

Property	Specification			Standard
Nominal input power(s) of the anode at thermal anode reference power 300 W For anode rotary frequency 50 Hz / 60 Hz / 150 Hz / 180 Hz	Anode rotary frequency	F 1	F 2	IEC 60613:1989
		▣	■	
	50/60 Hz	22 kW	54 kW	
	150/180 Hz	33 kW	78 kW	
Nominal input power(s) of the anode at thermal anode reference power 130 W	Anode rotary frequency	F 1	F 2	IEC 60613:1989
		▣	■	
	50/60 Hz	22kW	54 kW	
	150/180 Hz	34 kW	80 kW	
Nominal input power(s) of the anode at thermal anode reference power 0 W	Anode rotary frequency	F 1	F 2	IEC 60613:1989
		▣	■	
	50/60 Hz	29kW	73kW	
	150/180 Hz	45 kW	107 kW	
Nominal radiographic anode input power	Anode rotary frequency	F 1	F 2	IEC 60613:2010
		▣	■	
	50/60 Hz	22 kW	54 kW	
	150/180 Hz	34 kW	80 kW	
Anode heat storage capacity	260 kJ(350 kHU)			IEC 60613:1989
Maximum cooling capacity of the anode	72 kJ/min 97 kHU/min			n.a.
Heating curve, cooling curve of the anode	See figure in section Heating and cooling curve of anode			IEC 60613:1989
Loading curves(single and serial load rating)	See figure in section-Loading curves			IEC 60613:1989 IEC 60613:2010

Property	Specification		Standard
Heat storage capacity of the X-ray tube assembly	1 000 kJ = 1 350 kHU		IEC 60613:1989
Heating and cooling curve of the X-ray tube assembly	See figure in section Heating and cooling curves of X-ray tube assembly		IEC 60613:1989
Max. continuous heat dissipation of the tube assembly Without fan With fan	Ambient 20-25°C 275 W 450 W	Temperature 40°C 230 W 310 W	IEC 60613:2010
Maximum (symmetrical) radiation field	See figure in section Maximum radiation field		n.a.
Anode material Top coating material	Rhenium-tungsten, molybdenum black coated Rhenium-tungsten(RT)		n.a.
Target angle (Ref: reference axis) X-ray tube and X-ray tube assembly	12 °		n.a.
Focal spot nominal value(s) Ref: Reference axis	F1 0.6 ◙	F2 1.2 ■	IEC 60336
Total filtration of the X-ray tube assembly= inherent filtration + additional filtration	≥ 2,5 mm Al / 75 kV= ≥ 1,0 mm Al/75 + (3x 0,5) mm Al		IEC 60522 IEC 60601-1-3
X-ray tube nominal voltage	150 kV		IEC 60613:2010
Generator connection or supply units	See section Notes		n.a.
Data on cathode heating Max. current Max. voltage	~ /AC, < 50 kHz F 1 ◙ 5.4 A ≈ 10.0 V	 F 2 ■ 5.5 A ≈ 15.0 V	n.a.
Emission characteristics of the cathode	See curves section Emission curves of the cathode		IEC 60613:1989 IEC 60613:2010

Property	Specification	Standard
Data on anode drive Anode rotary frequency Exposure Fluoroscopy at 110kV	150/180Hz(≈ 8500 to 10800 rpm) 20/30Hz(≈ 1200 to 1800 rpm)	n.a.
Maximum anode frequency	180 Hz	n.a.
Electrical connections and cables	See connection wiring diagram section Connection diagrams Stator connection and temperature sensors see section X-ray tube assembly connection plates	n.a.
Main dimensions and interfaces	See dimension drawings section X-ray tube assembly dimensional drawings	n.a.
X-ray tube assembly weight X-ray tube assembly weight (with flange construction)	Approx. 17.5 kg Approx. 18 kg	n.a.
Leakage radiation at 150 kV / 450 W in 1m distance	≤ 0.8 mGy/h	IEC 60601-1-3
High-voltage connection **+** **-**	3-pin 3-pin	IEC 60526:1978

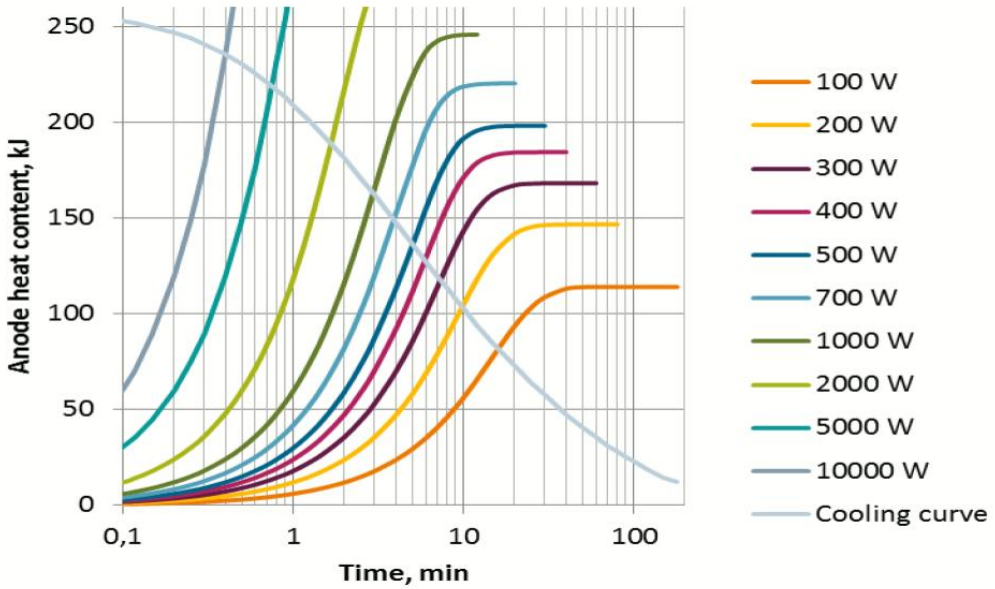
6.2 Conditions for operation, storage and transport

	Operation	Transport and storage
Ambient temperature	From 10°C to 40°C	From - 20°C to + 70°C
Relative humidity	From 30% to 75%	From 10 % to 95%
Atmospheric pressure	From 700 hPa to 1060 hPa	From 500 hPa to 1060 hPa

7 Curves

7.1 Heating and cooling curve of anode

IEC 60613:1989



7.2 Heating and Cooling Curves of X-ray tube assembly

7.2.1 Tube assembly without fan

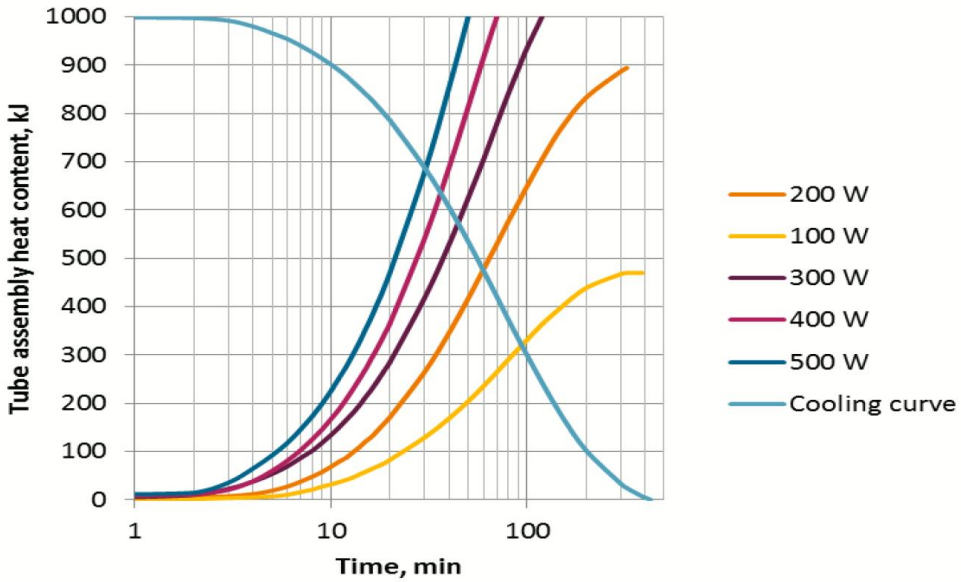
A 

X-ray tube assembly in horizontal position
Position changed during operation

B 

X-ray tube assembly only in vertical position

IEC 60613:1989

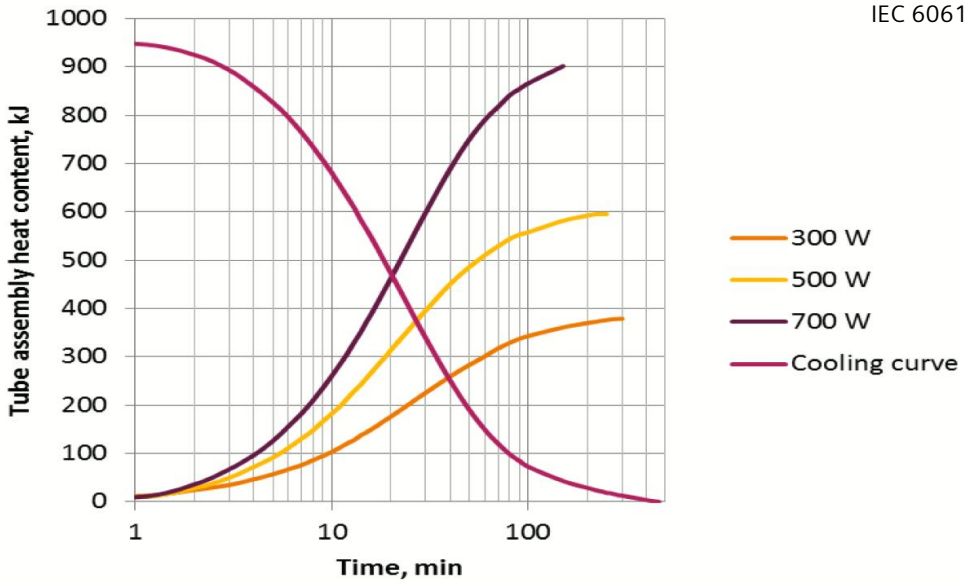


The heating curves include the power loss of the cathode and the stator, e.g. 150/180 Hz anode drive ≈5000J/start-up and deceleration, 25 Hz anode drive for fluoroscopy ≈ 75 J/s.

7.2.2 Tube assembly with fan

Tube assembly with fan horizontal or tube assembly vertical with fan on top

IEC 60613:1989

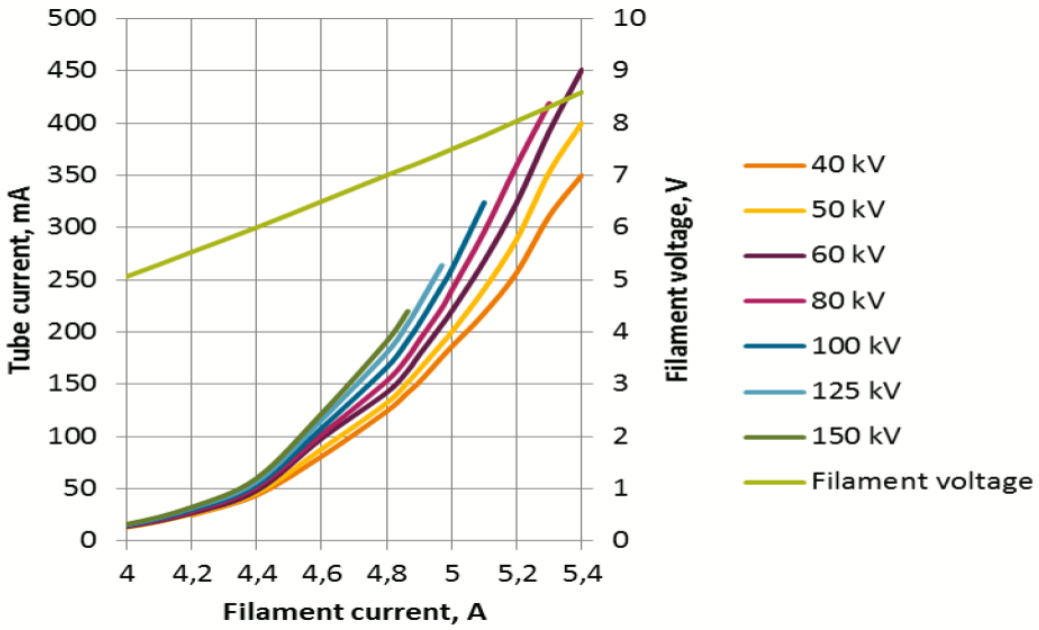


The heating curves include the power loss of the cathode and the stator, e.g. 150/180 Hz anode drive ≈5000 J/start-up and deceleration, 25 Hz anode drive for fluoroscopy ≈ 75 J/s.

7.3 Emission curves of the cathode

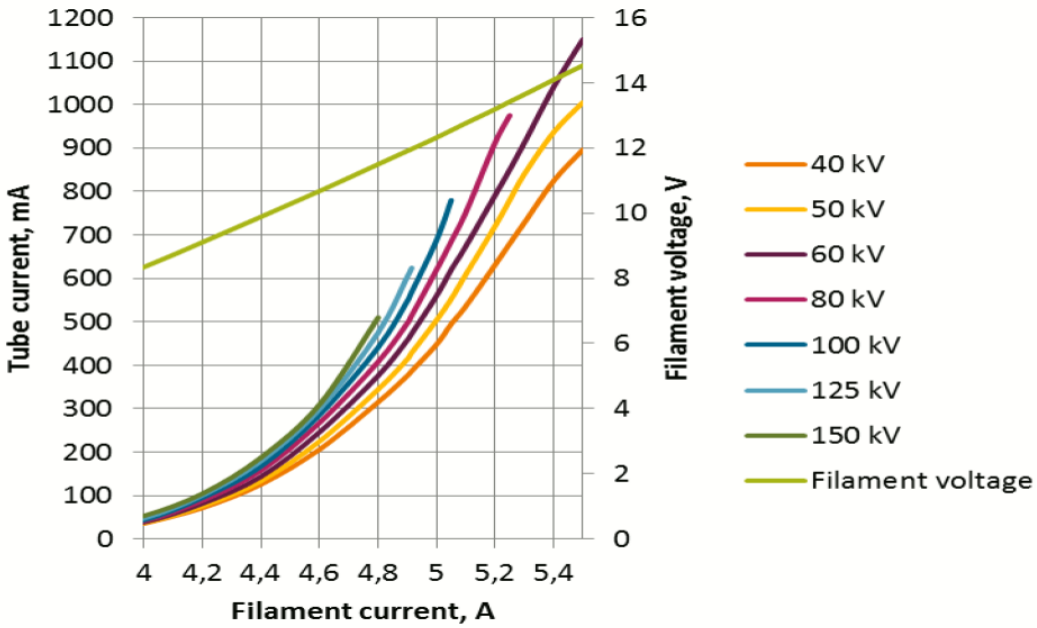
0.6

IEC 60613:2010



1.2

IEC 60613:2010



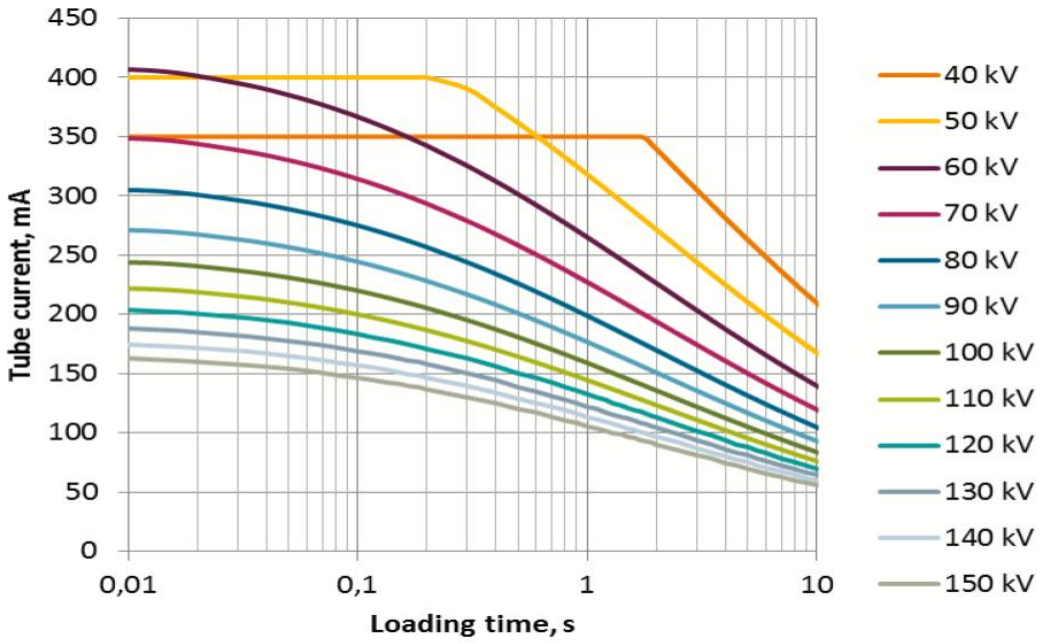
7.4 Loading curves

7.4.1 Single loading curve

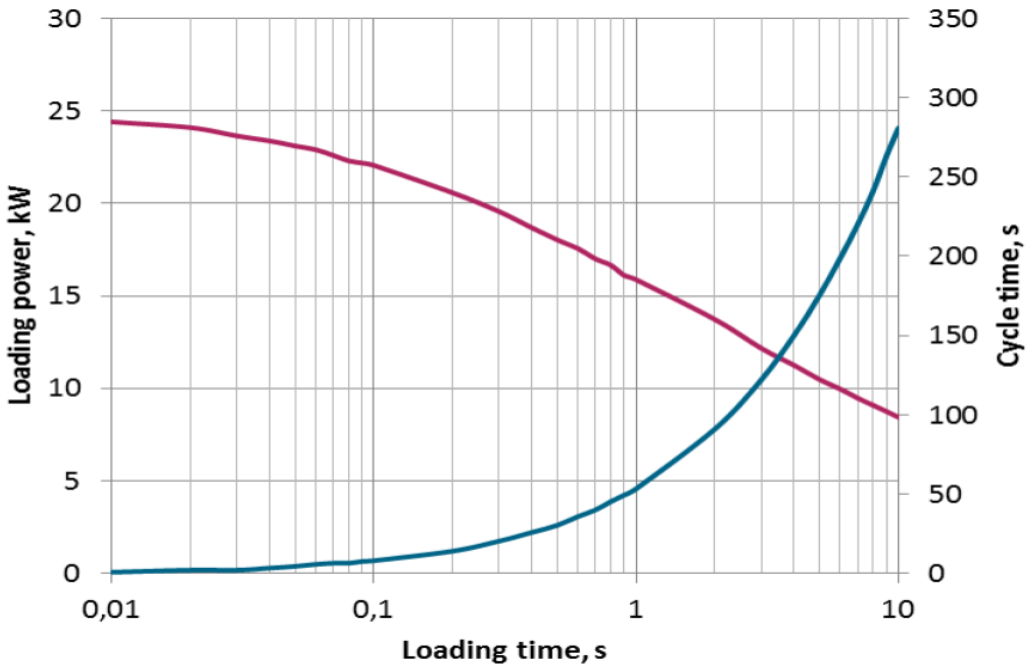
Anode drive 50/60Hz	Thermal anode reference power 300W

0.6

IEC 60613:1989



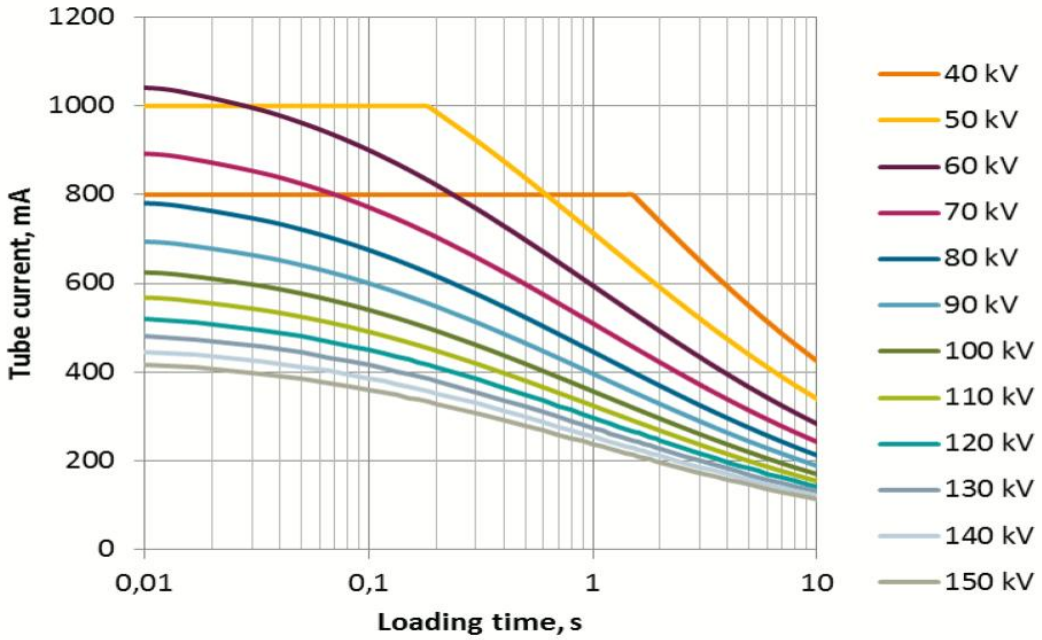
IEC 60613:2010



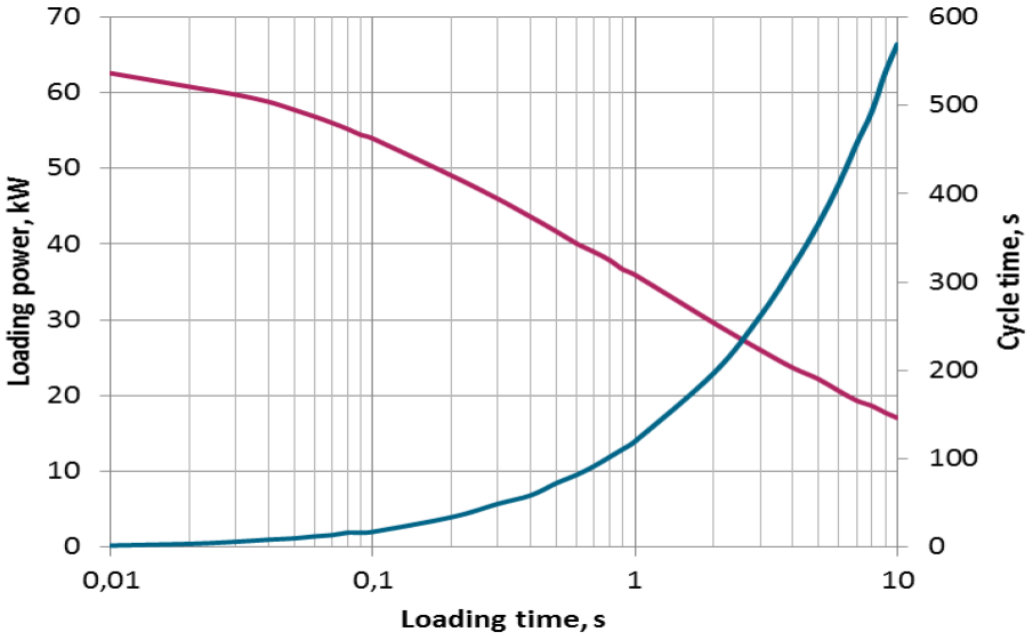
Anode drive 50/60Hz	Thermal anode reference power 300W

1.2

IEC 60613:1989



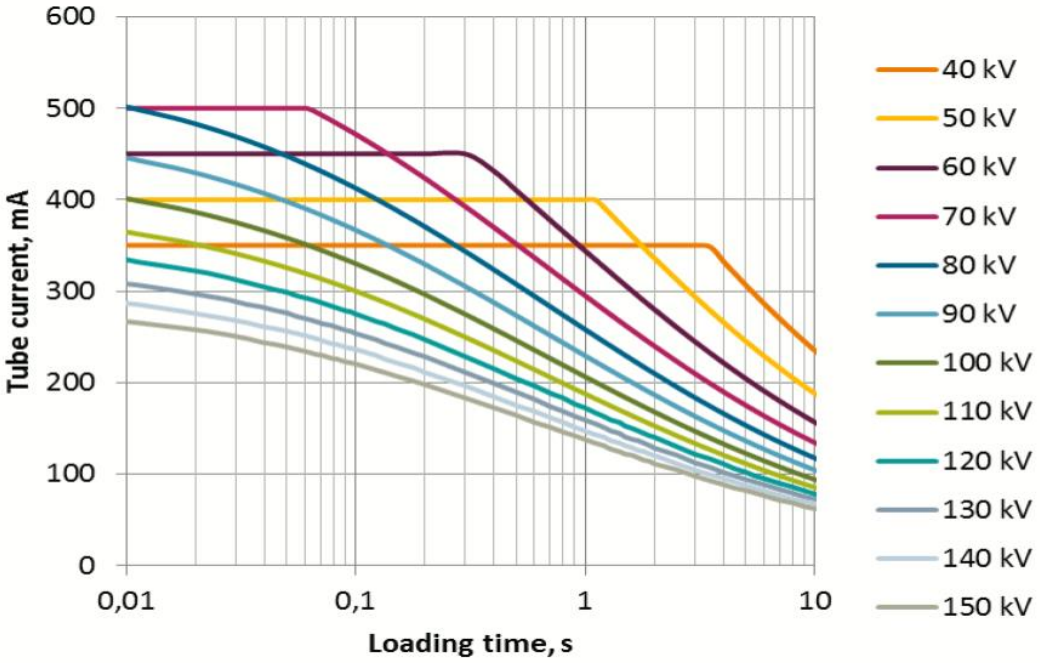
IEC 60613:2010



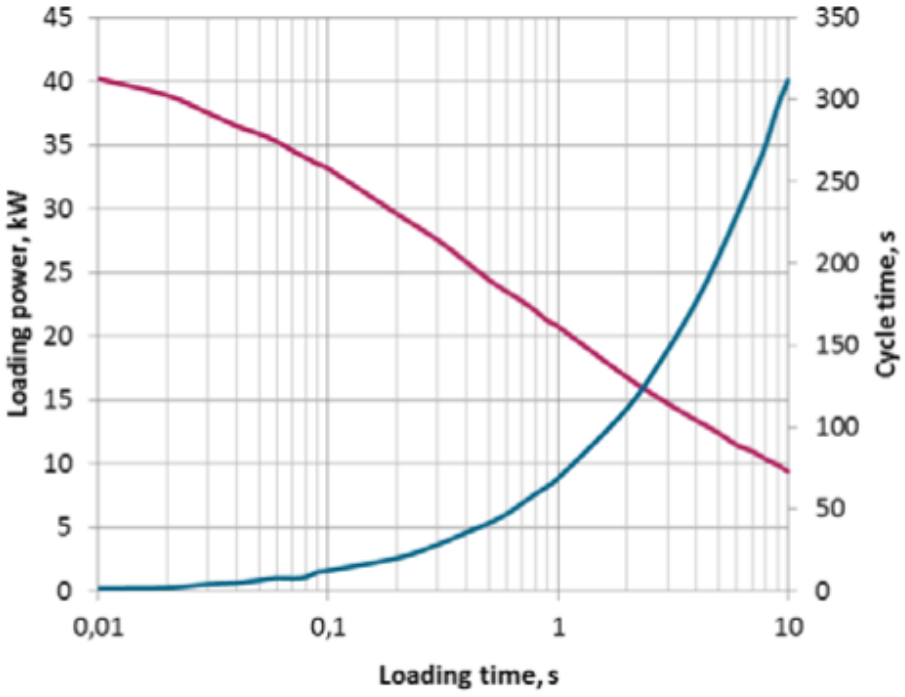
Anode drive 150/180Hz	Thermal anode reference power 300W

0.6

IEC 60613:1989



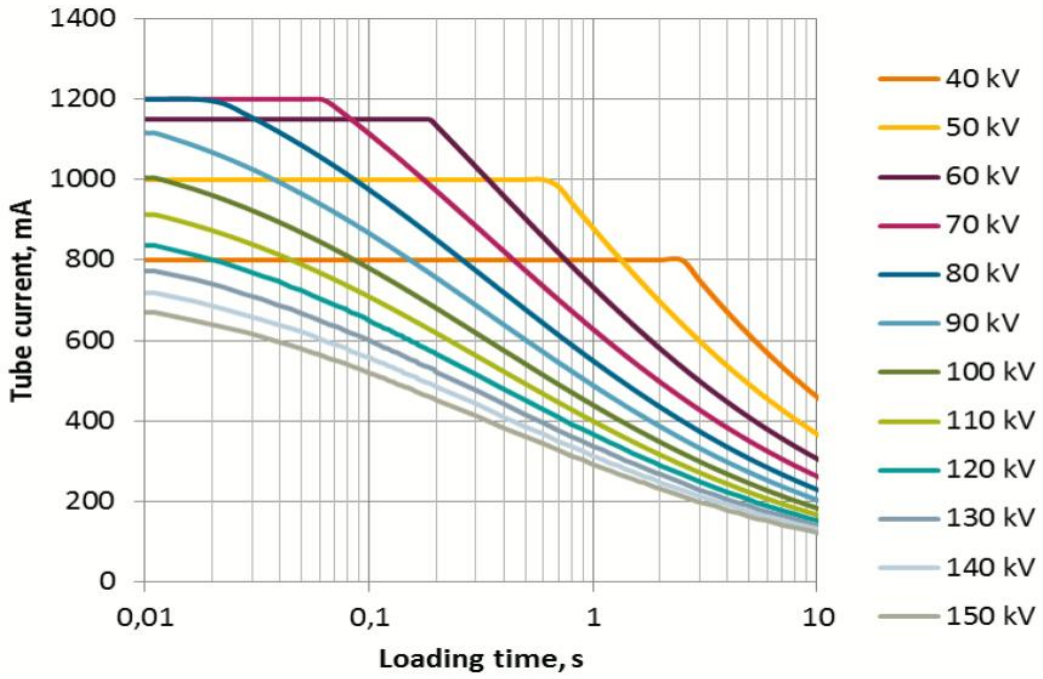
IEC 60613:2010



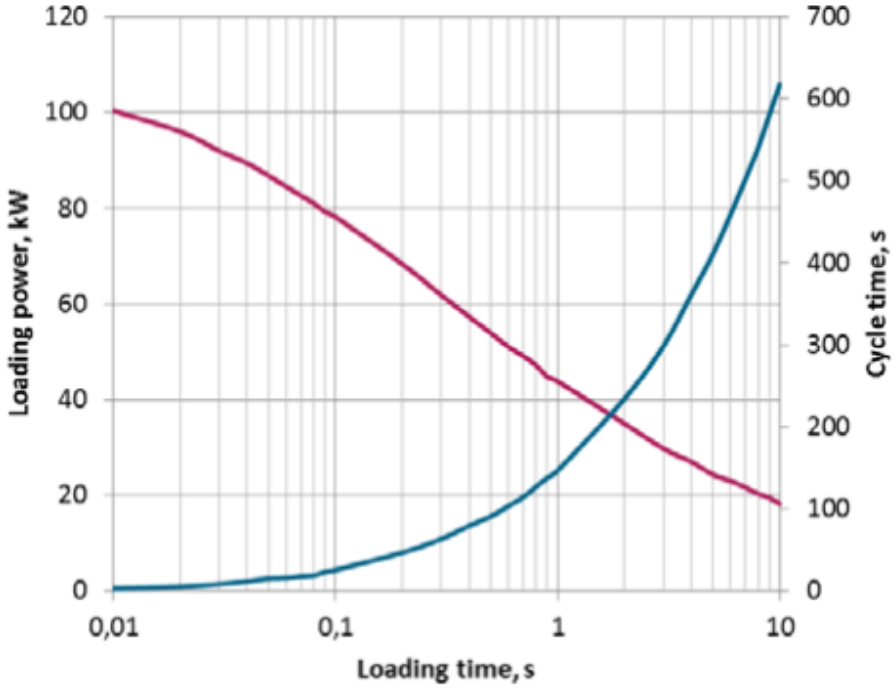
Anode drive 150/180Hz	Thermal anode reference power 300W

1.2

IEC 60613:1989



IEC 60613:2010



7.4.2 Series pulse mode

7.4.2.1 *Series pulse mode with focal spot 0.6*

Anode drive 50/60 Hz	Thermal anode reference power 300W

IEC 60613:2010

Series duration

▣ 0.6	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	3.7	7.4	14.7	22.0	36.3	57.6	88.8	139.3	204.0	266.7	328.3	388.0
100	7.3	14.6	28.8	42.8	70.3	109.9	166.7	256.0	370.0	480.0	586.7	692.0
150	10.9	21.6	42.4	62.7	102.0	157.6	235.0	356.0	507.0	652.0	795.0	936.0
200	14.4	28.4	55.5	81.6	131.3	201.6	296.7	440.0	620.0	794.7	966.7	1144.0
250	17.8	35.0	68.0	100.0	159.2	241.3	352.1	516.7	720.0	913.3	1108.3	1310.0
300	21.2	41.4	80.0	117.0	185.0	278.4	400.0	580.0	804.0	1016.0	1230.0	1452.0
350	24.5	47.6	91.9	133.0	210.0	311.7	446.3	639.3	875.0	1110.7	1341.7	1582.0
400	27.7	53.9	102.9	148.8	233.3	343.5	486.7	693.3	944.0	1184.0	1426.7	1680.0
450	30.9	59.7	114.0	163.8	255.0	372.0	525.0	744.0	999.0	1260.0	1515.0	1782.0
500	34.0	65.3	124.0	178.0	275.0	400.0	558.3	786.7	1060.0	1320.0	1583.3	1860.0
550	37.0	71.1	134.2	191.4	293.3	425.3	591.3	828.7	1111.0	1378.7	1650.0	1936.0
600	40.0	76.4	143.2	204.0	312.0	448.0	620.0	872.0	1164.0	1440.0	1720.0	1992.0
650	42.9	81.5	152.5	217.1	329.3	471.5	650.0	901.3	1209.0	1490.7	1776.7	2080.0
700	45.7	86.8	161.5	228.2	345.3	492.8	676.7	933.3	1246.0	1549.3	1843.3	2156.0
750	48.5	91.5	170.0	240.0	362.5	512.0	700.0	970.0	1290.0	1600.0	1900.0	2220.0
800	51.2	96.5	178.1	251.2	376.0	529.1	720.0	992.0	1328.0	1642.7	1946.7	2272.0
850	53.8	100.9	185.9	260.1	391.0	548.5	743.8	1020.0	1360.0	1677.3	2011.7	2312.0
900	56.4	105.6	193.2	270.0	405.0	566.4	765.0	1044.0	1386.0	1728.0	2040.0	2376.0

Pulse width(ms) x frame rate(S^{0-1})

Cycle time in [s]

IEC 60613:1989

Series duration

▣ 0.6	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	22.3	22.2	22.1	22	21.8	21.6	21.3	20.9	20.4	20	19.7	19.4
100	22	21.9	21.6	21.4	21.1	20.6	20	19.2	18.5	18	17.6	17.3
150	21.8	21.6	21.2	20.9	20.4	19.7	18.8	17.8	16.9	16.3	15.9	15.6
200	21.6	21.3	20.8	20.4	19.7	18.9	17.8	16.5	15.5	14.9	14.5	14.3
250	21.4	21	20.4	20	19.1	18.1	16.9	15.5	14.4	13.7	13.3	13.1
300	21.2	20.7	20	19.5	18.5	17.4	16	14.5	13.4	12.7	12.3	12.1
350	21	20.4	19.7	19	18	16.7	15.3	13.7	12.5	11.9	11.5	11.3
400	20.8	20.2	19.3	18.6	17.5	16.1	14.6	13	11.8	11.1	10.7	10.5
450	20.6	19.9	19	18.2	17	15.5	14	12.4	11.1	10.5	10.1	9.9
500	20.4	19.6	18.6	17.8	16.5	15	13.4	11.8	10.6	9.9	9.5	9.3
550	20.2	19.4	18.3	17.4	16	14.5	12.9	11.3	10.1	9.4	9	8.8
600	20	19.1	17.9	17	15.6	14	12.4	10.9	9.7	9	8.6	8.3
650	19.8	18.8	17.6	16.7	15.2	13.6	12	10.4	9.3	8.6	8.2	8
700	19.6	18.6	17.3	16.3	14.8	13.2	11.6	10	8.9	8.3	7.9	7.7
750	19.4	18.3	17	16	14.5	12.8	11.2	9.7	8.6	8	7.6	7.4
800	19.2	18.1	16.7	15.7	14.1	12.4	10.8	9.3	8.3	7.7	7.3	7.1
850	19	17.8	16.4	15.3	13.8	12.1	10.5	9	8	7.4	7.1	6.8
900	18.8	17.6	16.1	15	13.5	11.8	10.2	8.7	7.7	7.2	6.8	6.6

Pulse width(ms) x frame rate(S^{0-1})

Pulse power in [kW]

Anode drive 150/180 Hz	Thermal anode reference power 300W

IEC 60613:2010

Series duration

Pulse width(ms) x frame rate(S^{0-1}) ▣ 0.6	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	5.6	11.1	22.0	32.7	53.8	84.5	129.2	200.0	290.0	377.3	461.7	546.0
100	11.0	21.7	42.7	63.0	102.3	157.3	235.0	353.3	502.0	645.3	786.7	928.0
150	16.3	31.9	62.2	91.2	146.0	220.8	322.5	474.0	663.0	844.0	1025.0	1206.0
200	21.3	41.6	80.5	117.2	185.3	276.3	396.7	573.3	788.0	997.3	1206.7	1416.0
250	26.3	51.0	97.7	141.5	220.8	325.3	460.4	653.3	890.0	1120.0	1350.0	1590.0
300	31.1	60.0	114.0	163.8	253.0	369.6	517.5	724.0	972.0	1224.0	1470.0	1728.0
350	35.8	68.6	129.3	184.8	282.3	406.9	565.8	788.7	1050.0	1306.7	1563.3	1834.0
400	40.3	76.8	143.5	204.0	309.3	441.6	610.0	848.0	1120.0	1386.7	1653.3	1936.0
450	44.7	84.6	157.2	222.3	334.5	475.2	648.8	894.0	1188.0	1464.0	1740.0	2016.0
500	48.8	92.0	169.3	239.0	358.3	504.0	683.3	940.0	1240.0	1533.3	1816.7	2100.0
550	53.0	99.4	181.9	254.1	379.5	528.0	715.0	975.3	1298.0	1584.0	1888.3	2178.0
600	57.0	106.0	192.8	268.8	398.0	553.6	740.0	1016.0	1332.0	1648.0	1940.0	2256.0
650	60.9	112.7	203.7	282.1	416.0	578.9	769.2	1040.0	1378.0	1698.7	1993.3	2314.0
700	64.6	119.0	213.7	295.4	434.0	601.1	793.3	1073.3	1414.0	1736.0	2053.3	2380.0
750	68.3	125.0	223.0	307.5	450.0	620.0	812.5	1100.0	1440.0	1780.0	2100.0	2430.0
800	71.7	130.7	232.5	318.4	464.0	640.0	833.3	1120.0	1472.0	1813.3	2133.3	2496.0
850	75.1	136.6	241.4	329.8	478.8	657.3	857.1	1144.7	1496.0	1836.0	2181.7	2516.0
900	78.6	141.6	249.6	340.2	492.0	676.8	877.5	1164.0	1530.0	1872.0	2220.0	2556.0

Cycle time in **[s]**

IEC 60613:1989

Series duration

Pulse width(ms) x frame rate(S^{0-1}) ▣ 0.6	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	33.4	33.2	33	32.7	32.3	31.7	31	30	29	28.3	27.7	27.3
100	33	32.6	32	31.5	30.7	29.5	28.2	26.5	25.1	24.2	23.6	23.2
150	32.5	31.9	31.1	30.4	29.2	27.6	25.8	23.7	22.1	21.1	20.5	20.1
200	32	31.2	30.2	29.3	27.8	25.9	23.8	21.5	19.7	18.7	18.1	17.7
250	31.6	30.6	29.3	28.3	26.5	24.4	22.1	19.6	17.8	16.8	16.2	15.9
300	31.1	30	28.5	27.3	25.3	23.1	20.7	18.1	16.2	15.3	14.7	14.4
350	30.7	29.4	27.7	26.4	24.2	21.8	19.4	16.9	15	14	13.4	13.1
400	30.2	28.8	26.9	25.5	23.2	20.7	18.3	15.9	14	13	12.4	12.1
450	29.8	28.2	26.2	24.7	22.3	19.8	17.3	14.9	13.2	12.2	11.6	11.2
500	29.3	27.6	25.4	23.9	21.5	18.9	16.4	14.1	12.4	11.5	10.9	10.5
550	28.9	27.1	24.8	23.1	20.7	18	15.6	13.3	11.8	10.8	10.3	9.9
600	28.5	26.5	24.1	22.4	19.9	17.3	14.8	12.7	11.1	10.3	9.7	9.4
650	28.1	26	23.5	21.7	19.2	16.7	14.2	12	10.6	9.8	9.2	8.9
700	27.7	25.5	22.9	21.1	18.6	16.1	13.6	11.5	10.1	9.3	8.8	8.5
750	27.3	25	22.3	20.5	18	15.5	13	11	9.6	8.9	8.4	8.1
800	26.9	24.5	21.8	19.9	17.4	15	12.5	10.5	9.2	8.5	8	7.8
850	26.5	24.1	21.3	19.4	16.9	14.5	12.1	10.1	8.8	8.1	7.7	7.4
900	26.2	23.6	20.8	18.9	16.4	14.1	11.7	9.7	8.5	7.8	7.4	7.1

Pulse power in **[kW]**

7.4.2.2 *Series pulse mode with focal spot 1.2*

Anode drive 50/60 Hz	Thermal anode reference power 300W

IEC 60613:2010

Series duration

Pulse width(ms) x frame rate(S^{0-1})	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	9.2	18.2	35.9	53.1	86.7	134.7	202.5	308.0	441.0	568.0	695.0	820.0
100	18.0	35.3	68.7	100.6	160.3	242.7	352.5	516.0	720.0	914.7	1110.0	1308.0
150	26.5	51.5	98.8	143.1	224.0	330.4	470.0	668.0	912.0	1148.0	1385.0	1632.0
200	34.6	66.7	126.4	181.2	278.7	405.3	565.0	794.7	1060.0	1317.3	1580.0	1856.0
250	42.5	81.0	151.7	215.5	326.7	466.7	643.8	893.3	1190.0	1473.3	1750.0	2030.0
300	50.0	94.6	174.8	246.0	370.0	521.6	710.0	976.0	1296.0	1600.0	1900.0	2208.0
350	57.3	107.3	196.5	274.4	408.3	569.3	764.2	1045.3	1386.0	1708.0	2018.3	2352.0
400	64.3	119.5	216.0	300.0	442.7	614.4	813.3	1104.0	1464.0	1792.0	2133.3	2464.0
450	71.0	130.8	234.6	323.1	472.5	655.2	858.8	1158.0	1521.0	1872.0	2220.0	2574.0
500	77.5	141.7	251.3	345.0	501.7	688.0	900.0	1200.0	1580.0	1933.3	2300.0	2660.0
550	83.8	151.8	267.7	365.2	526.2	721.6	939.6	1239.3	1628.0	1994.7	2365.0	2728.0
600	89.6	161.6	282.4	382.8	550.0	748.8	975.0	1272.0	1668.0	2048.0	2420.0	2808.0
650	95.6	171.2	296.4	400.4	569.8	776.5	1012.9	1300.0	1703.0	2097.3	2470.0	2860.0
700	101.0	179.7	309.9	415.8	590.3	798.9	1038.3	1325.3	1736.0	2128.0	2520.0	2912.0
750	106.5	188.5	322.0	430.5	607.5	824.0	1068.8	1360.0	1770.0	2160.0	2550.0	2970.0
800	111.7	196.3	333.9	444.8	624.0	840.5	1093.3	1386.7	1792.0	2197.3	2586.7	3008.0
850	116.5	204.0	344.5	457.3	640.3	861.3	1112.1	1416.7	1819.0	2221.3	2635.0	3026.0
900	121.5	211.2	355.2	469.8	654.0	878.4	1132.5	1440.0	1836.0	2256.0	2670.0	3060.0

Cycle time in [s]

IEC 60613:1989

Series duration

Pulse width(ms) x frame rate(S^{0-1})	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	55.1	54.5	53.8	53.1	52	50.5	48.6	46.2	44.1	42.6	41.7	41
100	54	52.9	51.5	50.3	48.1	45.5	42.3	38.7	36	34.3	33.3	32.7
150	52.9	51.5	49.4	47.7	44.8	41.3	37.6	33.4	30.4	28.7	27.7	27.2
200	51.9	50	47.4	45.3	41.8	38	33.9	29.8	26.5	24.7	23.7	23.2
250	51	48.6	45.5	43.1	39.2	35	30.9	26.8	23.8	22.1	21	20.3
300	50	47.3	43.7	41	37	32.6	28.4	24.4	21.6	20	19	18.4
350	49.1	46	42.1	39.2	35	30.5	26.2	22.4	19.8	18.3	17.3	16.8
400	48.2	44.8	40.5	37.5	33.2	28.8	24.4	20.7	18.3	16.8	16	15.4
450	47.3	43.6	39.1	35.9	31.5	27.3	22.9	19.3	16.9	15.6	14.8	14.3
500	46.5	42.5	37.7	34.5	30.1	25.8	21.6	18	15.8	14.5	13.8	13.3
550	45.7	41.4	36.5	33.2	28.7	24.6	20.5	16.9	14.8	13.6	12.9	12.4
600	44.8	40.4	35.3	31.9	27.5	23.4	19.5	15.9	13.9	12.8	12.1	11.7
650	44.1	39.5	34.2	30.8	26.3	22.4	18.7	15	13.1	12.1	11.4	11
700	43.3	38.5	33.2	29.7	25.3	21.4	17.8	14.2	12.4	11.4	10.8	10.4
750	42.6	37.7	32.2	28.7	24.3	20.6	17.1	13.6	11.8	10.8	10.2	9.9
800	41.9	36.8	31.3	27.8	23.4	19.7	16.4	13	11.2	10.3	9.7	9.4
850	41.1	36	30.4	26.9	22.6	19	15.7	12.5	10.7	9.8	9.3	8.9
900	40.5	35.2	29.6	26.1	21.8	18.3	15.1	12	10.2	9.4	8.9	8.5

Pulse power in [kW]

Anode drive 150/180 Hz	Thermal anode reference power 300W

IEC 60613:2010

Series duration

Pulse width(ms) x frame rate(S^{0-1})	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	13.5	26.5	51.8	76.2	122.7	187.5	275.8	410.0	576.0	737.3	895.0	1054.0
100	26.0	50.5	96.7	139.8	218.3	321.6	454.2	642.7	874.0	1098.7	1326.7	1552.0
150	37.8	72.2	135.8	193.5	295.0	423.2	583.8	808.0	1065.0	1312.0	1575.0	1842.0
200	48.7	92.0	169.9	239.2	358.0	502.4	680.0	928.0	1220.0	1493.3	1766.7	2048.0
250	59.1	110.2	200.3	279.0	411.7	568.0	752.1	1020.0	1335.0	1626.7	1925.0	2230.0
300	68.9	127.0	227.6	313.8	456.0	624.0	812.5	1088.0	1422.0	1736.0	2050.0	2364.0
350	78.2	142.6	252.5	344.4	493.5	672.0	866.3	1148.0	1491.0	1820.0	2146.7	2478.0
400	86.9	157.1	274.7	370.4	526.7	712.5	913.3	1194.7	1552.0	1888.0	2226.7	2560.0
450	95.3	170.4	294.6	394.2	555.0	748.8	956.3	1230.0	1593.0	1944.0	2280.0	2628.0
500	103.2	183.0	312.0	415.0	580.0	778.7	991.7	1260.0	1640.0	1986.7	2350.0	2700.0
550	110.7	195.1	328.5	433.4	603.2	806.7	1026.7	1290.7	1672.0	2038.7	2383.3	2750.0
600	117.8	206.0	343.2	451.2	624.0	828.8	1055.0	1312.0	1704.0	2064.0	2420.0	2808.0
650	124.8	216.2	356.2	465.4	641.3	849.3	1077.9	1334.7	1729.0	2097.3	2470.0	2834.0
700	131.4	224.9	368.7	480.2	655.7	869.9	1102.5	1362.7	1750.0	2128.0	2496.7	2884.0
750	137.5	233.5	380.0	493.5	670.0	884.0	1125.0	1390.0	1770.0	2140.0	2525.0	2910.0
800	143.5	241.1	390.4	504.0	682.7	900.3	1140.0	1408.0	1792.0	2176.0	2533.3	2944.0
850	149.3	248.8	400.1	515.1	697.0	915.7	1154.6	1428.0	1802.0	2198.7	2578.3	2958.0
900	154.8	255.6	409.2	525.6	708.0	926.4	1170.0	1440.0	1818.0	2208.0	2580.0	2988.0

Cycle time in **[s]**

IEC 60613:1989

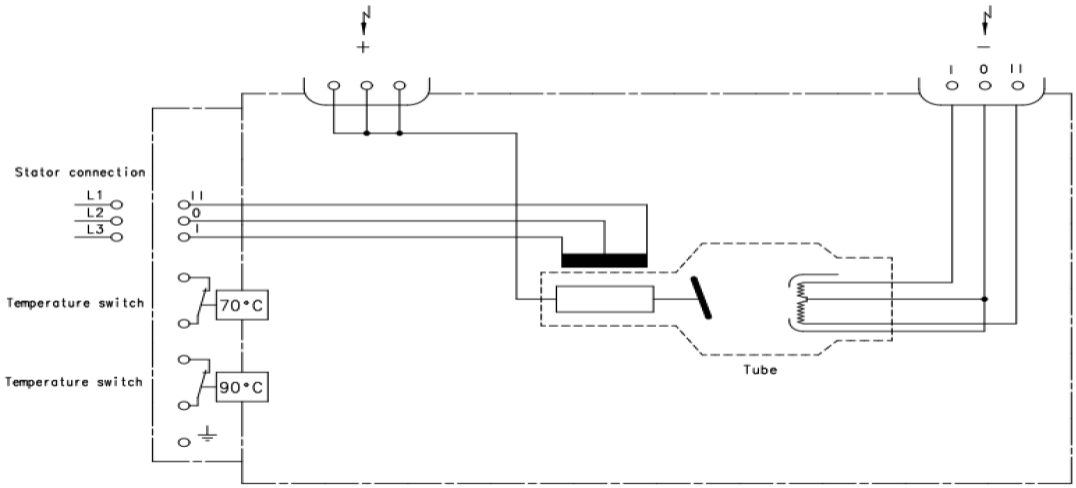
Series duration

Pulse width(ms) x frame rate(S^{0-1})	1s	2s	4s	6s	10s	16s	25s	40s	60s	80s	100s	120s
50	80.7	79.4	77.7	76.2	73.6	70.3	66.2	61.5	57.6	55.3	53.7	52.7
100	78	75.7	72.5	69.9	65.5	60.3	54.5	48.2	43.7	41.2	39.8	38.8
150	75.5	72.2	67.9	64.5	59	52.9	46.7	40.4	35.5	32.8	31.5	30.7
200	73.1	69	63.7	59.8	53.7	47.1	40.8	34.8	30.5	28	26.5	25.6
250	70.9	66.1	60.1	55.8	49.4	42.6	36.1	30.6	26.7	24.4	23.1	22.3
300	68.9	63.5	56.9	52.3	45.6	39	32.5	27.2	23.7	21.7	20.5	19.7
350	67	61.1	54.1	49.2	42.3	36	29.7	24.6	21.3	19.5	18.4	17.7
400	65.2	58.9	51.5	46.3	39.5	33.4	27.4	22.4	19.4	17.7	16.7	16
450	63.5	56.8	49.1	43.8	37	31.2	25.5	20.5	17.7	16.2	15.2	14.6
500	61.9	54.9	46.8	41.5	34.8	29.2	23.8	18.9	16.4	14.9	14.1	13.5
550	60.4	53.2	44.8	39.4	32.9	27.5	22.4	17.6	15.2	13.9	13	12.5
600	58.9	51.5	42.9	37.6	31.2	25.9	21.1	16.4	14.2	12.9	12.1	11.7
650	57.6	49.9	41.1	35.8	29.6	24.5	19.9	15.4	13.3	12.1	11.4	10.9
700	56.3	48.2	39.5	34.3	28.1	23.3	18.9	14.6	12.5	11.4	10.7	10.3
750	55	46.7	38	32.9	26.8	22.1	18	13.9	11.8	10.7	10.1	9.7
800	53.8	45.2	36.6	31.5	25.6	21.1	17.1	13.2	11.2	10.2	9.5	9.2
850	52.7	43.9	35.3	30.3	24.6	20.2	16.3	12.6	10.6	9.7	9.1	8.7
900	51.6	42.6	34.1	29.2	23.6	19.3	15.6	12	10.1	9.2	8.6	8.3

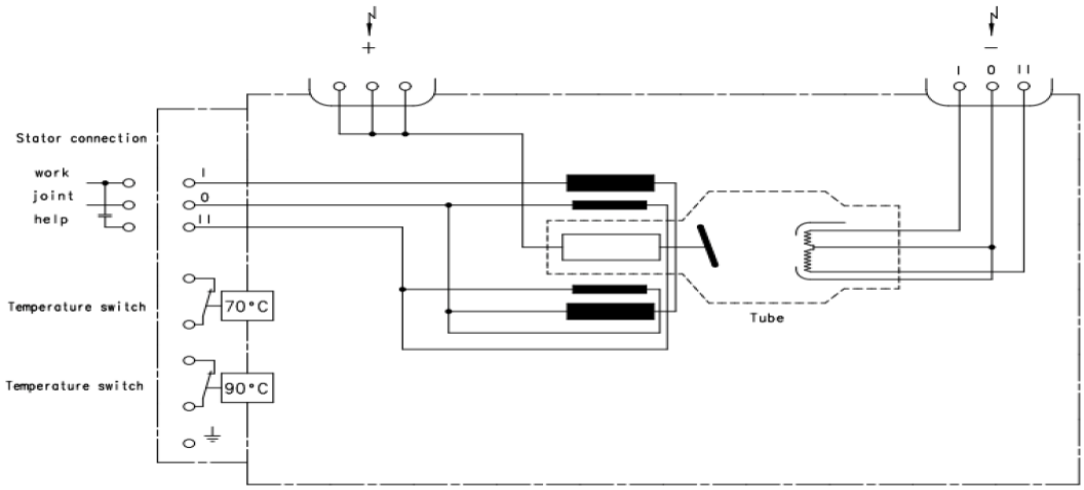
Pulse power in **[kW]**

8 Connection diagrams

RAY-14_3 RAY-14S_3 RAY-14S_3F



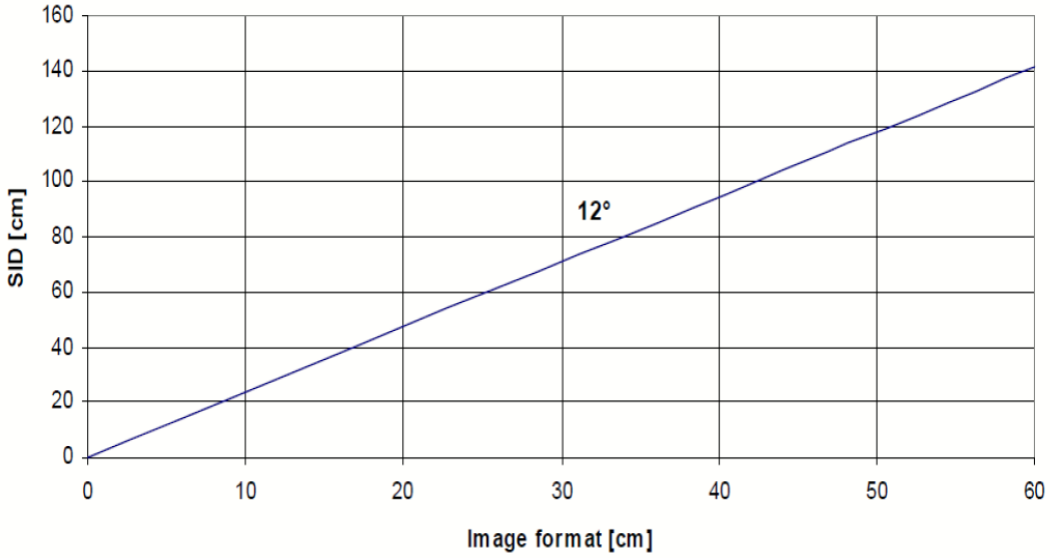
RAY-14S_1 RAY-14_1



9 Dimensional drawings

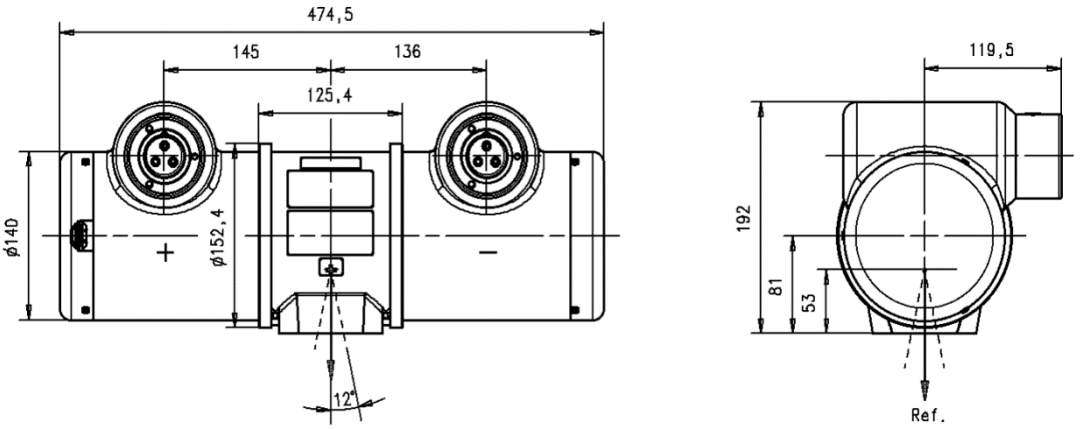
9.1 Maximum radiation field

The field coverage depends on the source-image distance (SID) and the anode angle.
For example, field coverage of 42cm x 42cm can be achieved at 1 m SID with this tube assembly (12° anode angle)

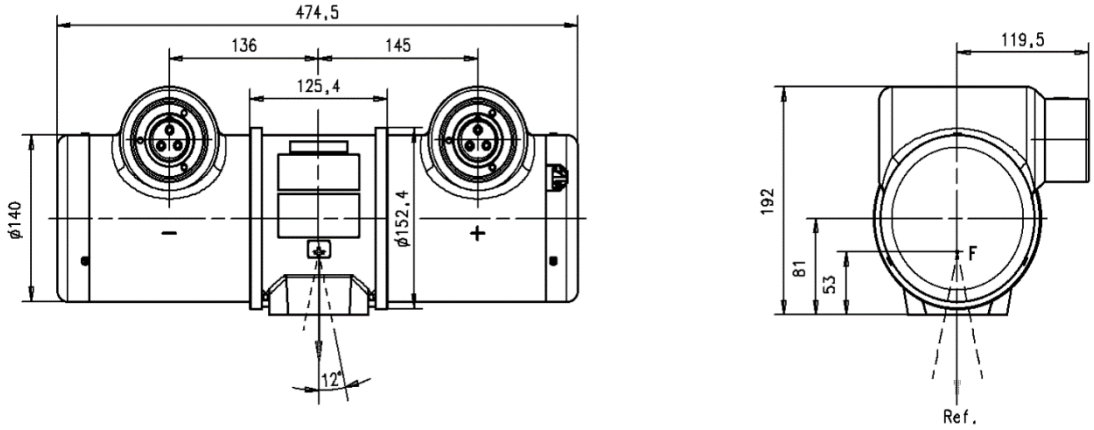


9.2 X-ray tube assembly dimensional drawings

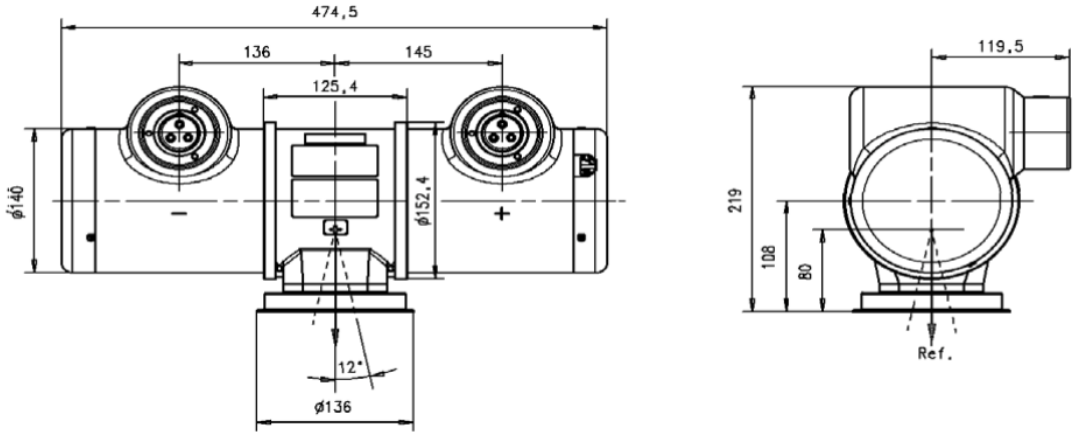
RAY-14_3 RAY-14_1



RAY-14S_3 RAY-14S_1



RAY-14S_3F



F = focus position

Ref. = reference axis

High-voltage connector on the cathode side

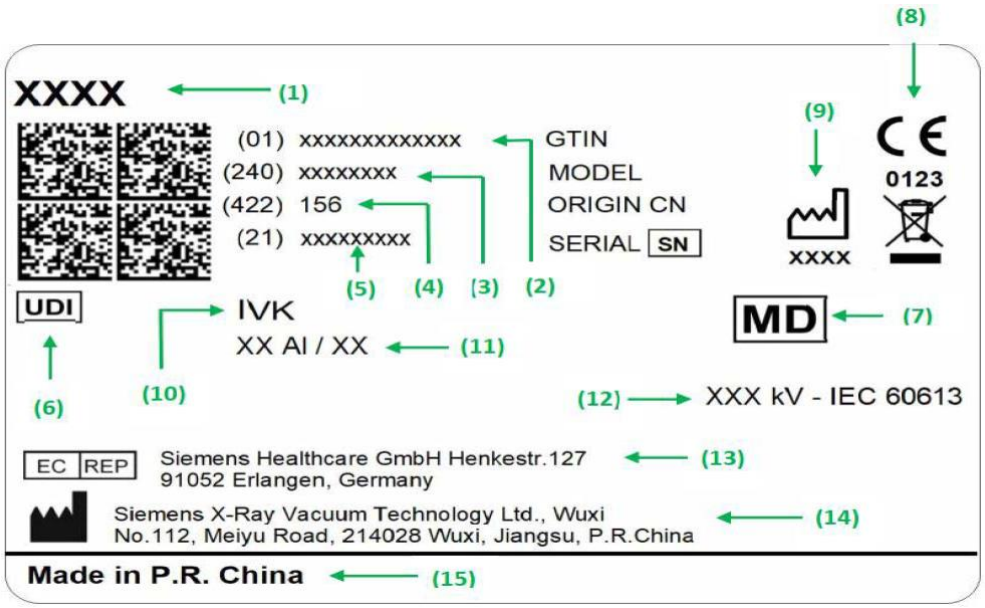
High-voltage connector on the anode side

Dimension in mm. All dimensions are estimated values.

10 Label

10.1 The type label of the X-ray tube assembly

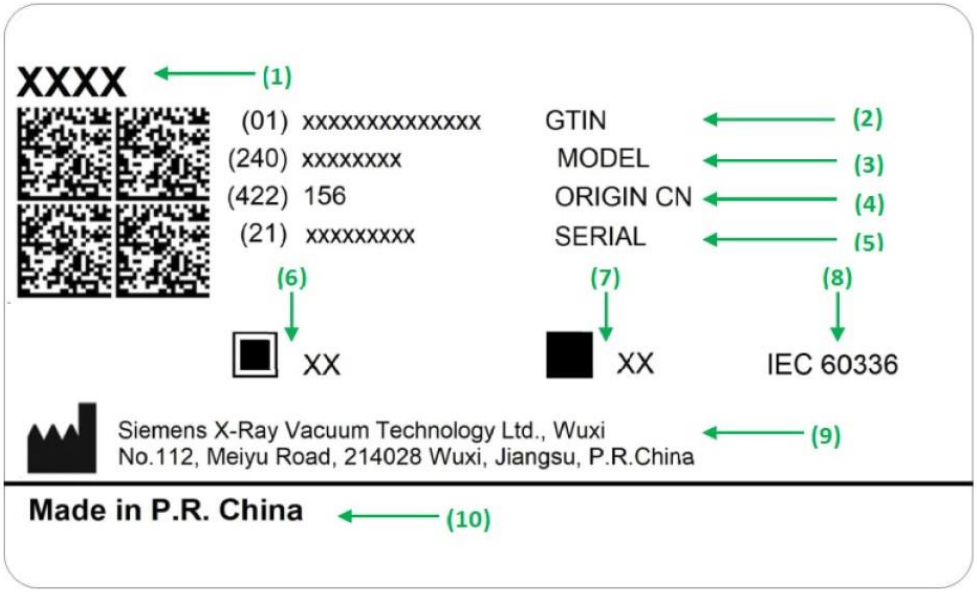
The type label of the X-ray tube assembly is described in the following figure:



1. Product name
2. Global Trade Identification Number
3. Model number
4. Country of Origin code
5. Serial number
6. UDI (Unique Device Identification)
7. MD (Medical Devices)
8. CE-conformity mark
9. Date of manufacture symbol with the date below
10. Identifier of selected system components or parts for product traceability
11. Minimum specified permanent filtration
12. Nominal input voltage
13. EC Representative
14. Legal manufacturer
15. Manufacturer’s country

10.2 The type label of the X-ray tube

The type label of the X-ray tube is described in the following figure:



1. Product name
2. Global Trade Identification Number
3. Model number
4. Country of Origin code
5. Serial number
6. Nominal focal spot size, small focus
7. Nominal focal spot size, large focus
8. Norm according to which the focal spot sizes were determined
9. Legal manufacturer
10. Manufacturer’s country

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Siemens Healthcare GmbH
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Phone: +49 9131 84-0
siemens-healthineers.com

Legal Manufacturer
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