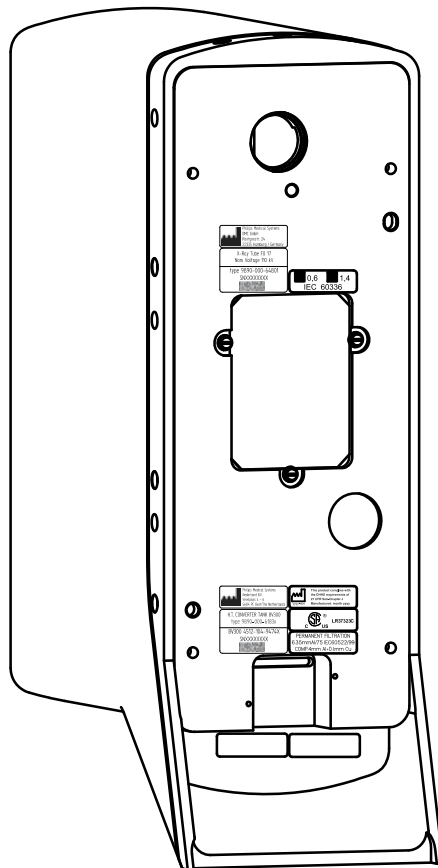


Service Manual 4512-988-03162 REV AB



ACCESSORIES

High tension converter tank BV 300

9890-000-6183x

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SERVICE INFORMATION

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MANUAL HISTORY

Date	Revision	Reason of changes
06/2012	AA	<ul style="list-style-type: none"> – Manual history included – Revision concerning IEC 60601-1 3rd edition
07/2014	AB	<ul style="list-style-type: none"> – Revision concerning IEC 82079-1 – Revision of transport data – Revision of Labeling TD-10 – General revision

This service manual was prepared by the BU GTC, Service Innovation Department, Hamburg, Germany.
For any additions, corrections or suggestions please contact your local service organization.

ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definitions
C-arm	Ceiling-arm
CU	Cooling Unit
DMC	Development and Manufacturing Centre
ESD	Electrostatic Discharge
FSE	Field Service Engineer
HT	High Tension
IEC	International Electrotechnical Commission
NTC	Negative Temperature Coefficient
REV	Revision
UPS	Uninterruptible Power Supply
WEEE	Waste Electrical and Electronic Equipment

1 INTRODUCTION

The high tension converter tank accommodates the HT transformer and the X-ray tube and is intended for use in the BV family C-arm stand.

2 SAFETY INFORMATION



2.1 Intended use

This spare part is part of an X-ray system that emits ionizing radiation. Use the spare part for diagnostic and interventional X-ray applications, only. Use the spare part within medical X-ray systems for human beings, only.

Only qualified personnel must operate the X-ray system.

Only technically qualified, appropriately trained and instructed Field Service Engineers (FSE) must do the service procedures of this spare part. The FSE must be authorized to work with radiography equipment in medical applications and to put this spare part into operation.

The conditions for safe operation, and environmental conditions are part of the accompanying documents of the X-ray system.

2.2 Accompanying documents

The user of this manual must read and carefully review the instructions about service procedures. Certain procedures can have changed since you previously did the service procedures of a similar product. The changes can significantly affect the present service procedure.

The instructions in this manual are considered as a supplementary guideline to do the service procedures of this spare part correctly. They are kept brief.

2.3 General safety precautions

- Obey the safety information of the respective X-ray device and the respective X-ray system!
- Do all service procedures in strict compliance with the provided safety instructions!
- Do all service procedures in strict compliance with the local regulations concerning safety, health, accident prevention, environment protection, and medical X-ray devices!
- Dispose of any material in accordance with the requirements of national legislation!
- Make sure that the electrical installations of medically used rooms are in compliance with the requirements of each country!
- Sensitive components! Protect them against mechanical deformation!
- Protect yourself and others from leakage radiation or scattered radiation! Do not expose yourself or others directly to the X-ray beam!

- The spare part must not be operated along with combustible anesthesia substances!
- The oxygen content of the ambient air during operation must be less than 25 %!

- Take precautions against infections because of body fluids:
 - Wear rubber gloves where body fluids can be present!
 - Do not eat, drink, or smoke with contaminated hands or gloves!
 - When you finished work, dispose of the gloves according to environmental regulations!
 - When you finished work, make sure to wash and to disinfect your hands!

- Take precautions against electrical hazards:
 - Set the power to OFF when you do the service procedures of the X-ray system. Make sure that no other person can set the X-ray system to ON accidentally! Only set the power to ON, when it is necessary for the service procedure!
 - If an uninterruptible power supply (UPS) is installed, make sure to set the UPS to OFF!
 - Connect this spare part to a supply with a protective earth conductor to prevent a possible electrical shock!
 - Make sure that all accessible internal and external protective earth conductors are connected properly after service work!
 - Use the protection service kit for electrostatic discharge (ESD) when you touch sensitive electrostatic devices!
 - Remove all jewelry, such as bracelets, watches, or rings to prevent short circuits!
 - Keep away water or other liquids from the inside of the cooling unit to prevent short-circuits or corrosion!

- Be careful with falling masses as they can cause bruises, lacerations, etc.!
- Use appropriate lifting devices when you have to lift heavy loads or ask another person for help!
- Use the carrying handles or auxiliary lifting devices on the cooling unit if available!
- If necessary, wear appropriate protective clothing, such as safety boots, safety goggles, and gloves!
- When you use cleaning agents such as detergents and disinfectants, make sure that they do not contain explosive substances as they can create explosive gas mixtures!
- Do not use aggressive cleaning agents to clean the spare part!
- Obey the manufacturer's data of the cleaning agent and disinfectant!
- Before you do service procedures, make sure that the temperature of the cooling unit surfaces decreases to a comfortable value!
- Be careful with sharp edges that some components can have!
- Make sure that you always have sufficient light!
- Do all relevant safety checks before you hand the X-ray system over to the customer!
- Never let problems unsolved that can affect the safety of the X-ray system!

2.4 Safety signs

- Do not remove or change safety signs!
- Replace illegible safety signs by genuine spare parts!
- Clean soiled safety signs!

2.5 Load limit values

The high tension converter tank has sensors which check certain parameters in operation. The sensors prevent a possible overload or damage of the high tension converter tank.

- Do not change any safety devices!
- Obey the product-specific load limit values mentioned in this manual!
- Obey the environmental data mentioned in this manual!

2.6 Tools

- Use tools and measurement devices, which are suitable for the respective service procedure!
- Use test and adjustment devices which are calibrated at regular intervals!
- Do not use auxiliary materials past their expiration date!

2.7 Spare parts

- Replace faulty components which affect the safety of the X-ray equipment by genuine spare parts, only!
- Refer to the local service provider of Philips Medical Systems to order spare parts!

2.8 Safety messages and other messages used in this manual

2.8.1 Safety messages

The following safety-relevant messages occur in the manual:



WARNING shows a hazardous situation for people. If you do not prevent this situation, there is a risk of death or serious injury.

Safety messages within single steps of a service procedure occur without a preceding signal panel. The single signal word precedes these steps.

2.8.2 Other messages

The following notes occur in the manual:



IMPORTANT refers to guidelines, parameters, conditions, or restrictions to obey.



DISPOSAL indicates to dispose of any material and X-ray equipment in accordance with the requirements of national legislation!

There is material in the X-ray equipment that you must separately collect and recycle in accordance with the requirements of the European Waste Electrical Equipment (WEEE) Directive! You must not dispose of the X-ray equipment together with domestic waste!

Other messages within single steps of a service procedure occur without a preceding message panel or message symbol. The single message word precedes these steps.

3 COMPATIBILITY

3.1 Mobile X-ray systems

- BV 300 FA
- BV Endura
- BV Libra

4 TECHNICAL INFORMATION

4.1 Identification

Product name: High tension converter tank BV 300

Type number: 9890-000-6183x

4.2 Technical data

For technical data of the High tension converter tank BV 300 refer to the tables in TD-1.

5 INSTALLATION

⚠ WARNING**Hazard of electrical shock because of present voltage.**

- Set the CV system to OFF.
- If any uninterruptible power supply (UPS) is installed, make sure to set the UPS to OFF as well.
- Make sure that the system and the UPS cannot be set to ON again accidentally.

If you do not obey this instruction, there is a risk of death or serious injury.

For the installation of the tank, see the instructions in the system manual of the BV 300 FA, BV Endura / BV Libra C-arm stand.

When a tank is replaced, fit the supplied identification label and the date of manufacture label of the new tank on the central labeling plate, marked "I" of the BV 300 FA, BV Endura / BV Libra C-arm stand.

6 SETTING-TO-WORK

6.1 Conditioning procedure

The conditioning procedure is required under the following circumstances.

1. When the X-ray tank is replaced
2. If the system has not been used for a period of 3 months or more
3. If the X-ray tube arcs too much (3 times / day)

Refer to the section "Setting-to-work" of the system manual.

6.2 Conditioning cycle

The X-ray tube current as selected by typical fluoroscopy kV / mA coupling curve.

Voltage (kV)	40	50	60	70	Pause	80	Pause	90	Pause	100	Pause	110	Pause
Time (s)	30	30	30	30	60	30	120	30	120	30	120	90	120

Table 1: X-ray tube current over time

6.3 Warm-up procedure

For the warm-up procedure of the X-ray tube, see the system manual of the BV 300 FA, BV Endura / BV Libra C-arm stand.

6.4 Removing and replacing filters

⚠ WARNING

Hazard of excessive radiation exposure caused by additionally taken X-ray photographs

- Remove the filter pack for testing purposes only.
- Never use the monoblock without the filters.

If you do not obey this instruction, there is a risk of death or serious injury.

To remove the added filtration:

- Remove the 3 aluminium filter fixing screws.
- Remove the aluminium filter.
- Remove the near focus lead ring.
- Remove the copper filter.
- The filters can be removed using a little suction pad or a piece of adhesive tape.

The near focus lead ring must always be replaced for all tests.

To replace the added filtration:

- First replace the copper filter.
- Then replace the near focus lead ring.
- Finally replace the aluminium filter.

The aluminium filter must be fixed using the 3 screws.

7 CORRECTIVE MAINTENANCE



IMPORTANT

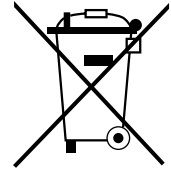
Due to legal directives, it is not permitted to exchange the X-ray tube in the tank. If any part of the tank is defective, the whole tank must be replaced.

8 END OF LIFE - DECOMMISSION

IMPORTANT



- Do not discard the spare part, the cable connectors, and the cables together with the consumer waste.
- Discard the spare part, the attached parts, the cable connectors, and the cables in a way that refers to local environmental laws and regulation!



Mechanical data**Dimensions and weight**

Reference axis for target angle See TD-6

Dimensions of tank See TD-6

Weight 16.5 kg

The red dot on the side of the X-ray tank indicates the nominal focus position. The actual focus is within a sphere of 10 mm diameter centered at this spot.

Electrical interface

Interface on connector	Mnemonic	Description
GAX 1 : 1	FILSM1	Filament transformer small focus 1
2	FILSM2	Filament transformer small focus 2
3	NTC1	NTC temperature measuring circuit
4	MAMEAS1	mA measuring circuit 1
7	ACHVT1	AC voltage for high voltage transformer 1
8	FILCOM	Filament transformer common
11	PWRGND	Power ground
12	NLEA	Protective earth
14	FILLA1	Filament transformer large focus 1
15	FILLA2	Filament transformer large focus 2
16	NTC2	NTC temperature measuring circuit 2
17	MAMEAS2	mA measuring circuit 2
20	ACHVT2	AC voltage for high voltage transformer 2

Technical data of HT converter tank

Environmental data

Conditions for operation	
Temperature limits for performance	Minimum + 10 °C
	Maximum + 35 °C
Temperature limits for safety	Minimum + 10 °C
	Maximum + 40 °C
Relative humidity for performance	Minimum + 20 %
	Maximum + 80 %
Relative humidity for safety	Minimum + 20 %
	Maximum + 93 %
Height above sea level during operation:	Minimum - 760 m
	Maximum + 3000 m
	Corresponding to + 110 ... + 70 kPa
Pollution degree classification	2

Technical data of HT converter tank

Conditions for storage and transport	
Temperature limits for storage and transportation	
Minimum	- 25 °C
Maximum	+ 70 °C
Humidity during storage and transportation	
Minimum	+ 5 %
Maximum	+ 95 %
	Condensation possible
Pressure during storage and transport	+ 110 ... + 70 kPa
Max. shock on the product during storage and transportation	
Maximum g value	10 g
Max. shock on the package during storage and transportation	
Maximum g value	25 g

Equipment classification

Classification	
Type of protection against electric shock	Class 1 equipment
Degree of protection against electric shock	Type B equipment
Degree of protection against ingress of water	Ordinary medical equipment (enclosed equipment without protection against ingress of liquids)
Method of sterilization or disinfection	Disinfectable equipment
Degree of safety for anaesthetics	None
Mode of operation	Continuous connection to the supply mains in the stand-by state and for specified loadings as given in the section "Performance data" of this manual.
Temperature of tank housing (except mounting plane) without sterile cover	
	Maximum 60 °C
<i>Measured at 25 °C ambient temperature</i>	
Sensor for oil temperature	NTC resistor
Oil temperature limit for emergency	
	85 °C ± 5 °C
<i>Measured with a thermal switch</i>	

Technical data of HT converter tank

Performance data**IMPORTANT**

The following specifications give the maximum values of performance of the tank. Depending on the type and version of the system the tank is applied with, it may not always be possible to operate the tank at its maximum performance.

Loading data	
Maximum X-ray tube assembly heat contents	840 kJ (= 1188 kWh)
X-ray tube assembly heating curve	See TD-4
X-ray tube assembly cooling curve	See TD-4
Maximum continuous heat dissipation for X-ray tube	140 W (at 25 °C ambient temperature) <i>140 W = 112 W continuous anode input power + 28 W filament power dissipation</i>
Nominal electric power (0.1 s and 100 kV)	3000 W (100 kV at 30 mA)
Nominal X-ray tube voltage	110 kV

Filtration	
<i>Filtration related to half the rated voltage \pm 75 kV</i>	
Inherent filtration	3.0 mm Al equivalent
Additional filtration	1 mm Al and 0.1 mm Cu
Permanent filtration	6.35 mm Al / 75 kV
First half value layer	4.41 mm Al / 75 kV

Leakage	
Leakage technique factors	110 kV, 200 W
Maximum symmetrical radiation field	416 mm at 100 cm

Technical data of HT converter tank

X-ray tube	
<i>Double superimposed focus and stationary anode</i>	
Indication of origin	Philips Medical Systems DMC GmbH
Model number	FO 17, 9890 000 6480x
Nominal anode input power	Small focus, 0.81 kW Large focus, 2.4 kW
Maximum anode heat contents	35.5 kJ (= 50 kHU)
Anode heating curve	See TD-4
Anode cooling curve	See TD-4
Single load rating	See TD-2
Cathode emission characteristics	See TD-3.1
Filament characteristics	See TD-3.1
Target angle	12 degrees
Nominal focal spot values	0.6 and 1.4
Nominal X-ray tube voltage	110 kV
Target material	Tungsten

Mode of operation

Fluoroscopy	
Focus	0.6
X-ray tube voltage	40 kV ... 110 kV
X-ray tube current	0.1 mA ... 3.1 mA
Electric power	341 W (110 kVp at 3.1 mA)
Maximum loading time	105 s at 110 kV
Duty cycle at max ratings (110 kV - 3.1 mA)	30 s on, 21 s off (mean load 200 W) 60 s on, 76 s off (mean load 150 W)
Radiation output	> 1.75 R/min (measured at 60 cm from focus at 100 kV 3 mA)

Technical data of HT converter tank

High Definition Fluoroscopy

Focus	0.6
X-ray tube voltage	40 kV ... 110 kV
X-ray tube current	0.24 mA ... 7.4 mA
Electric power	814 W (110 kVp at 7.4 mA)
Maximum loading time	20 s
Duty cycle at max ratings (20 s)	110 kV, 7.3 mA; 140 s cooling (mean load 100 W) 80 kV, 6.7 mA; 88 s cooling (mean load 100 W)

Radiography A

Focus	1.4
X-ray tube voltage	40 kV ... 105 kV
X-ray tube current	20 mA fixed
Electric power	2100 W (105 kVp at 20 mA)
Maximum loading time	4 s
Duty cycle at max ratings (105 kV, 20 mA & 4 s)	single exposure: cooling time 52 s (mean load 150 W) 2 exposures: cooling time between 30 s waiting time for next 2 exposures 62 s
Radiation output	> 1.75 mR/s (measured at 60 cm from focus at 100 kV 20 mA)

Radiography B

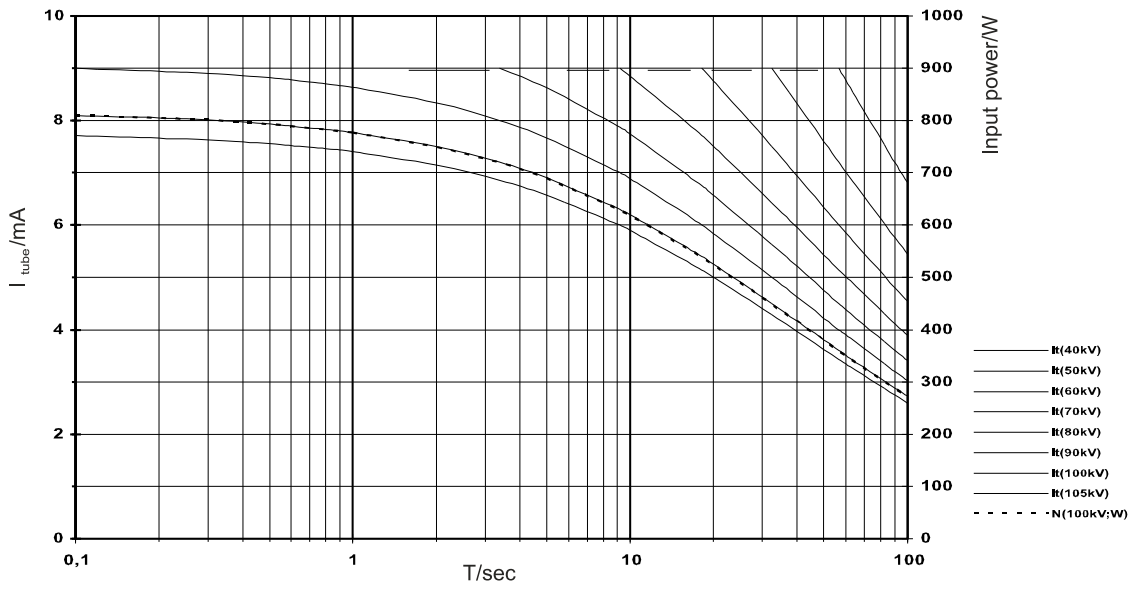
Focus	1.4
X-ray tube voltage	100 kV ... 105 kV
X-ray tube current	30 mA fixed
Electric power	max. 3150 W (105 kVp at 30 mA)
Maximum loading time	333 ms
Cooling time	20 s

Technical data of HT converter tank

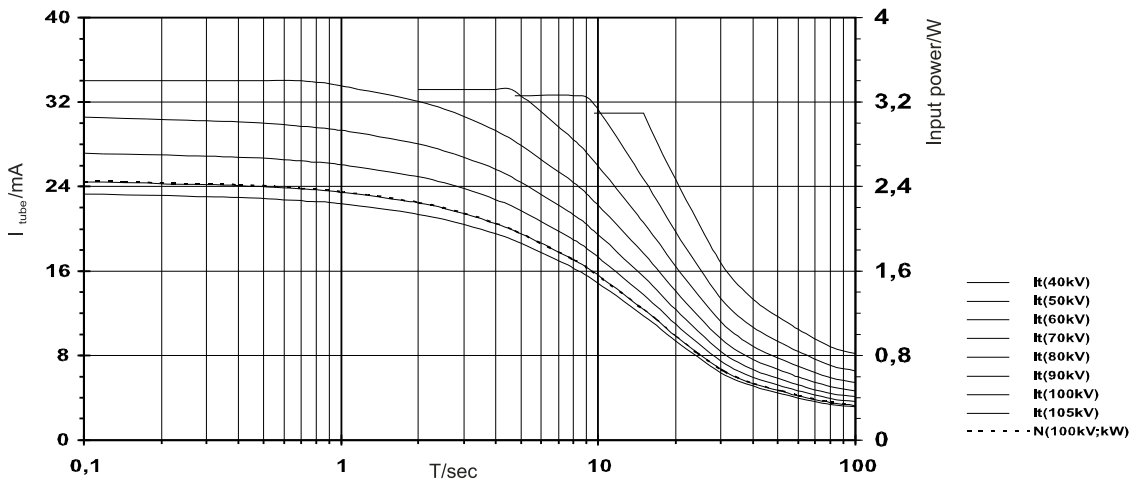
Input voltage filament*Maximum 18 V, 1200 Hz square wave*

Cathode emission characteristics	See TD-3.2
Filament characteristics	See TD-3.2

Technical data of HT converter tank



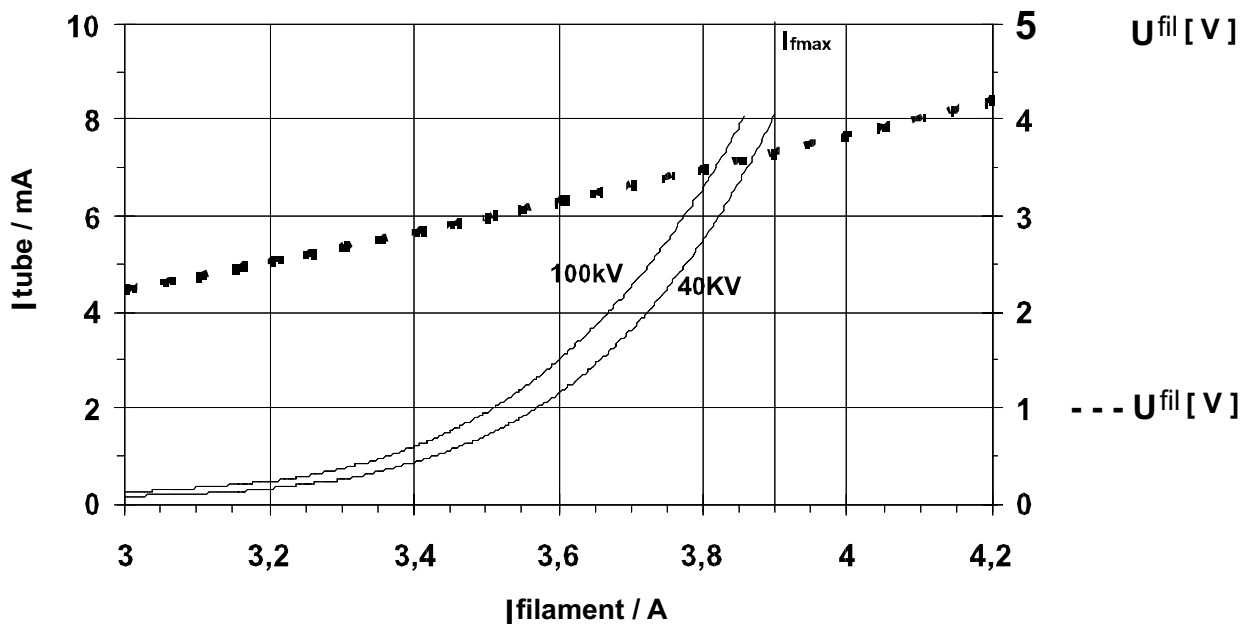
BV Endura - Single load chart, small focus; 150 W eq. anode input power



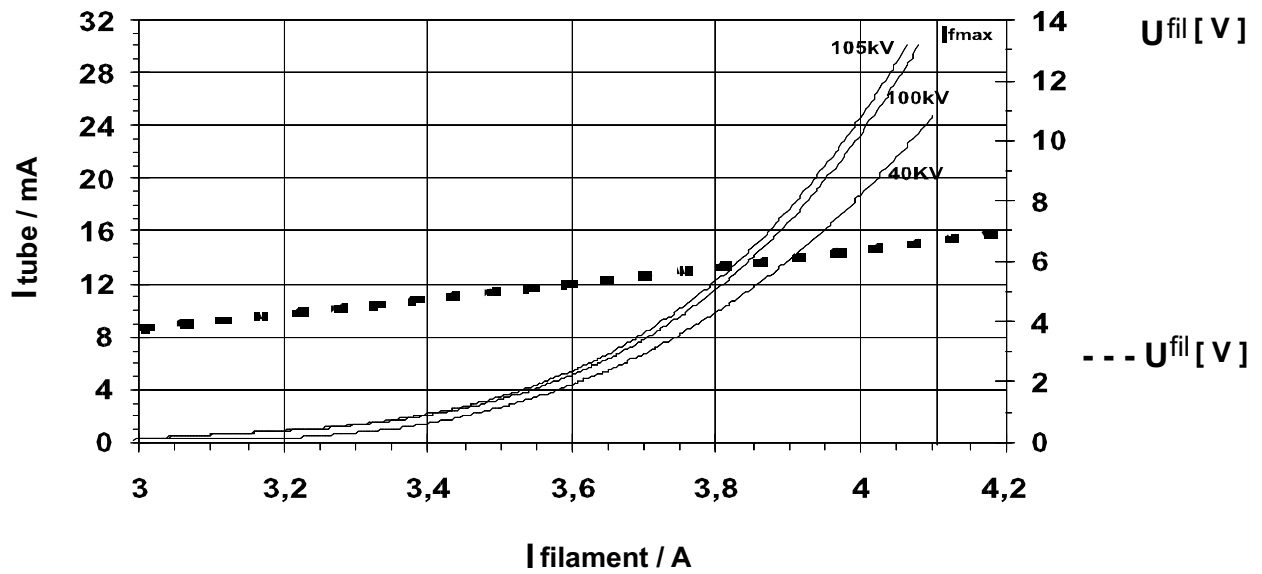
BV Endura - Single load chart, large focus; 150 W eq. anode input power

HTBV 004 / 005

Charts for single load rating



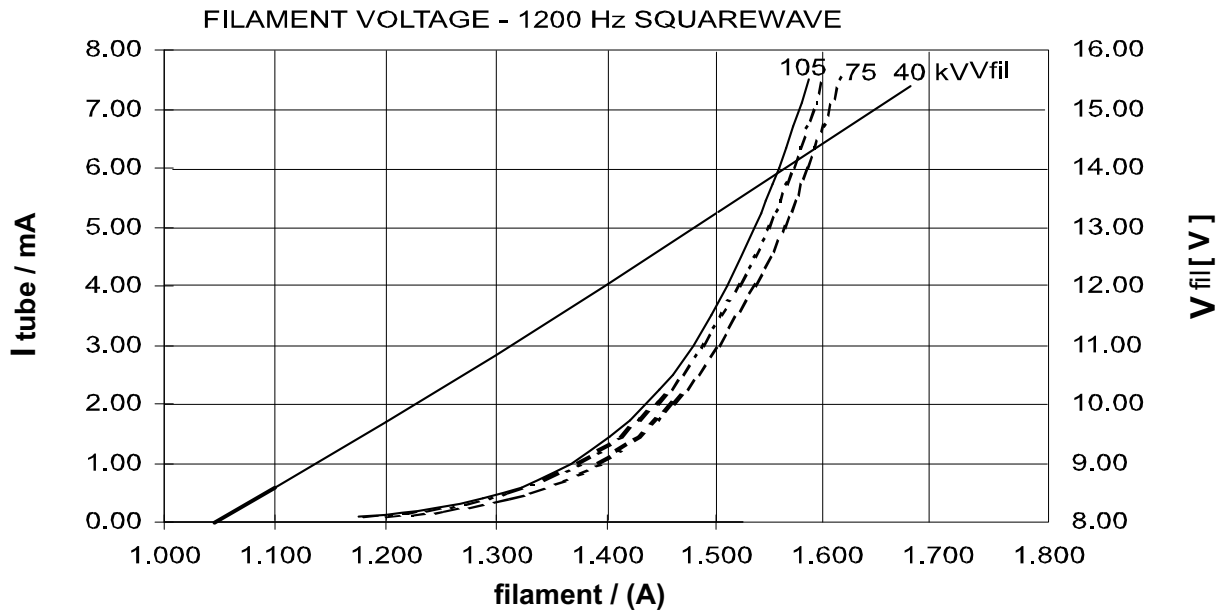
BV Endura - X-ray tube emission chart, small focus, Voltage DC



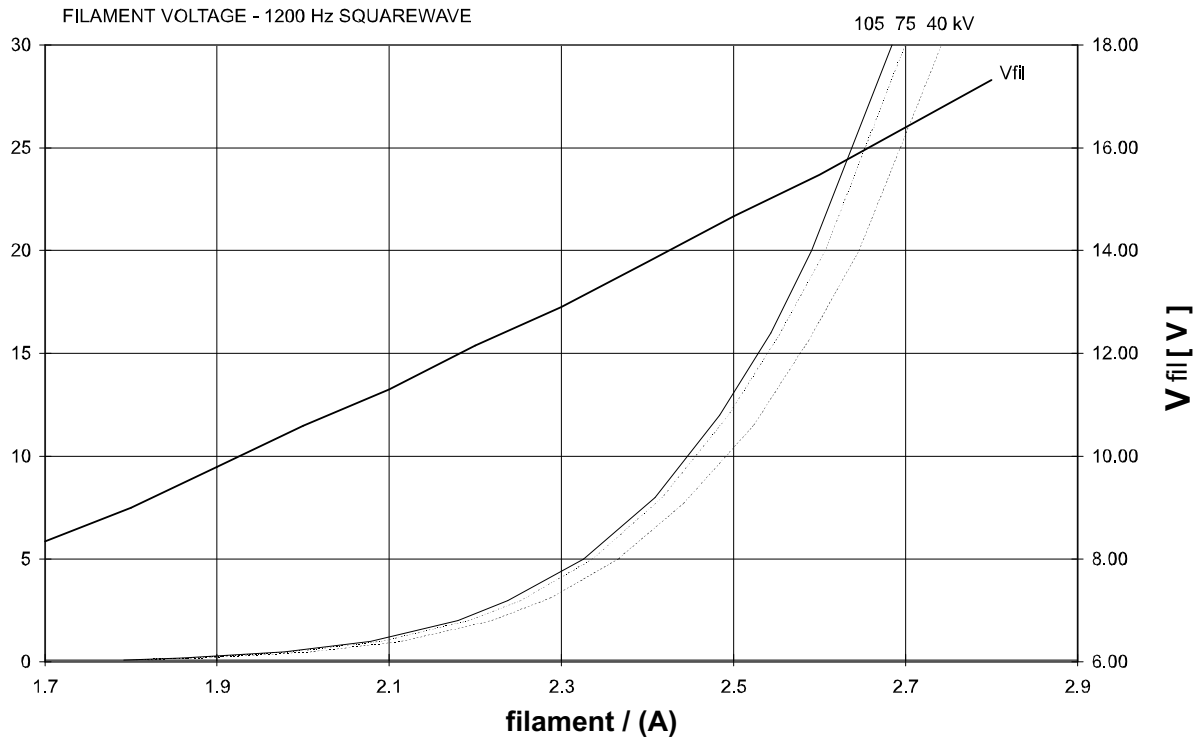
BV Endura - X-ray tube emission chart, large focus, Voltage DC

HTBV 006/ 007

Emission and filament curves
X-ray tube



BV Endura - X-ray tube emission chart, small focus

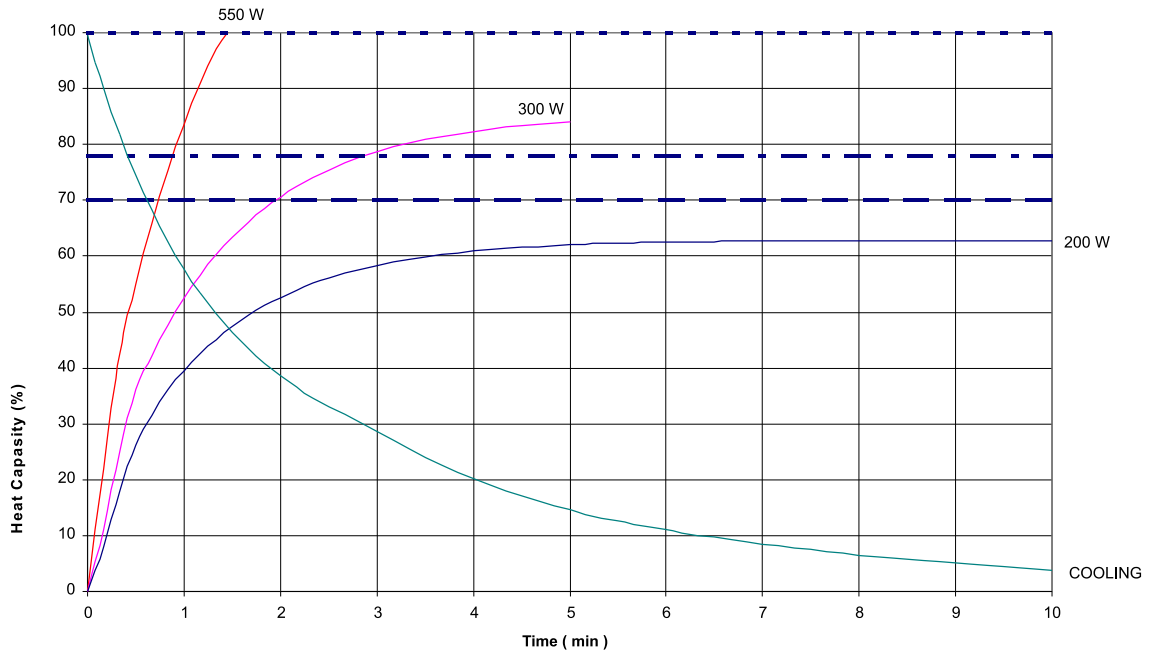


BV Endura - X-ray tube tank emission chart, large focus

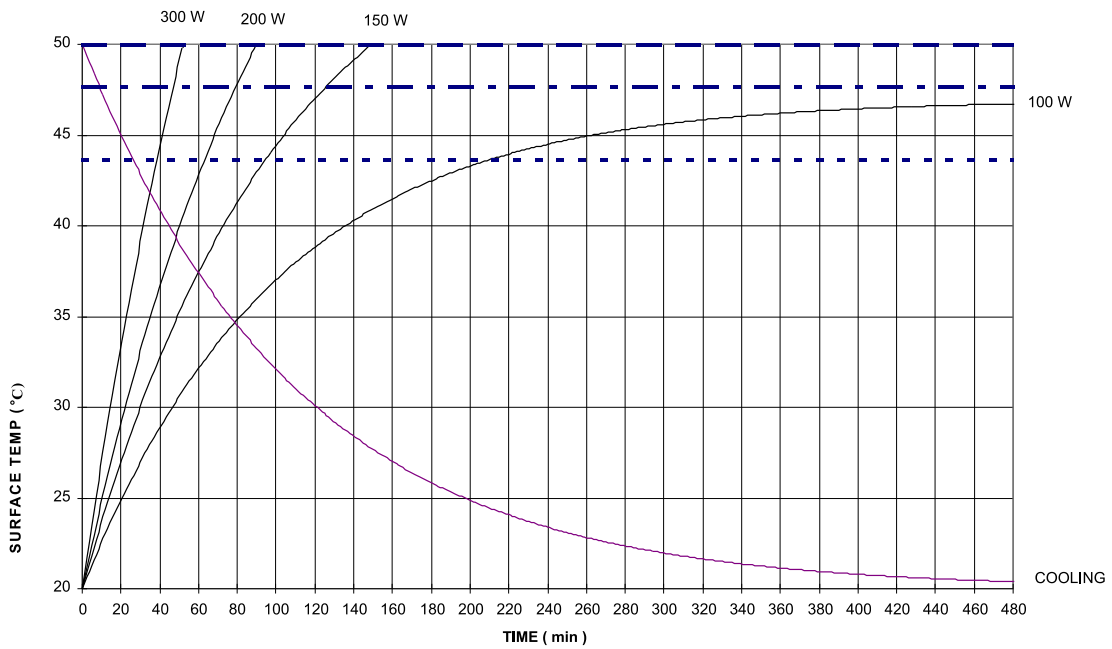
HTBV 008 / 009

Emission and filament curves
Cathode

BV Endura - Anode heating and cooling curves

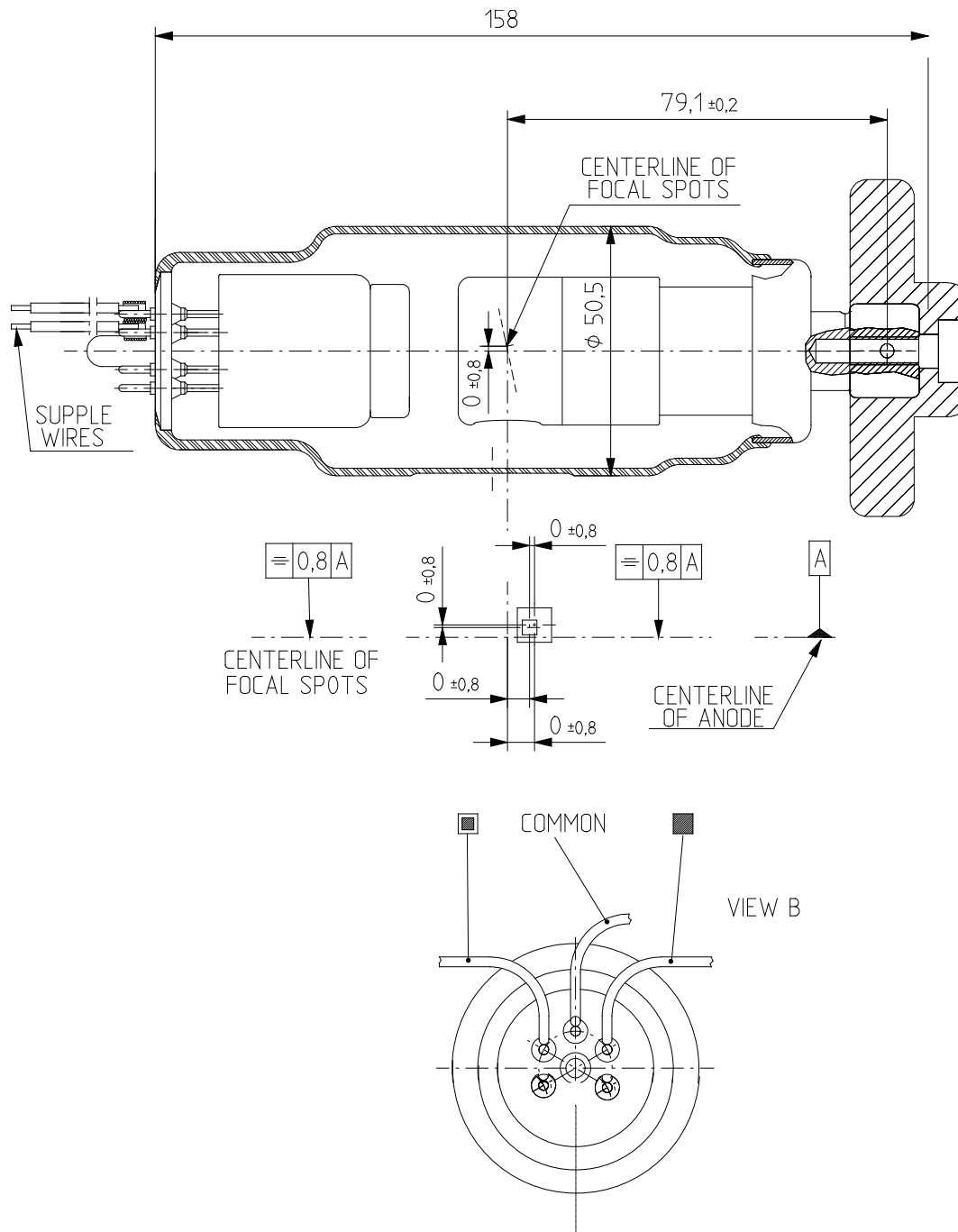


BV Endura - Heating and cooling curves



HTBV 010 / 011

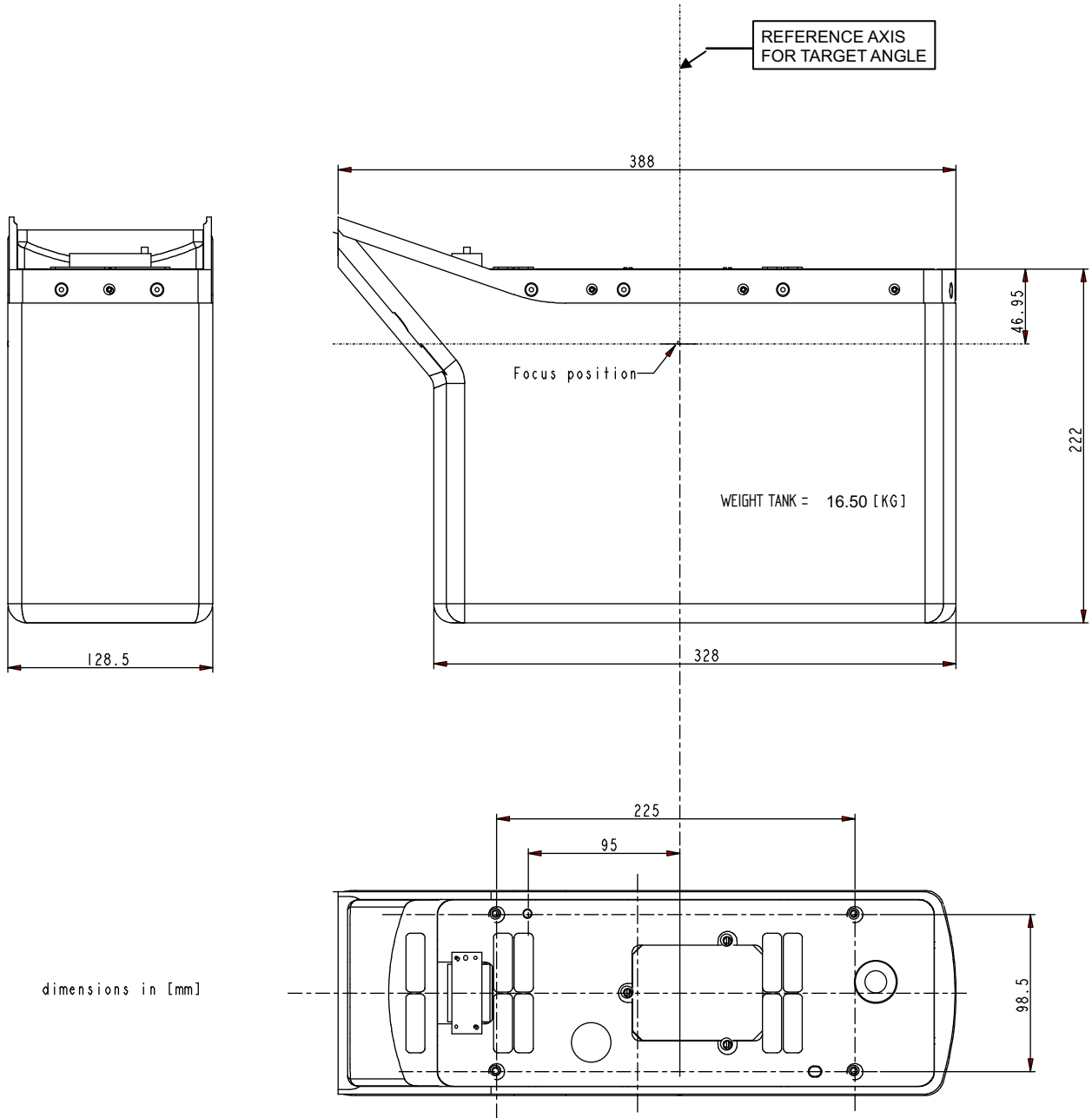
Heating and cooling curves



FO 17 X-ray tube

HTBV 012

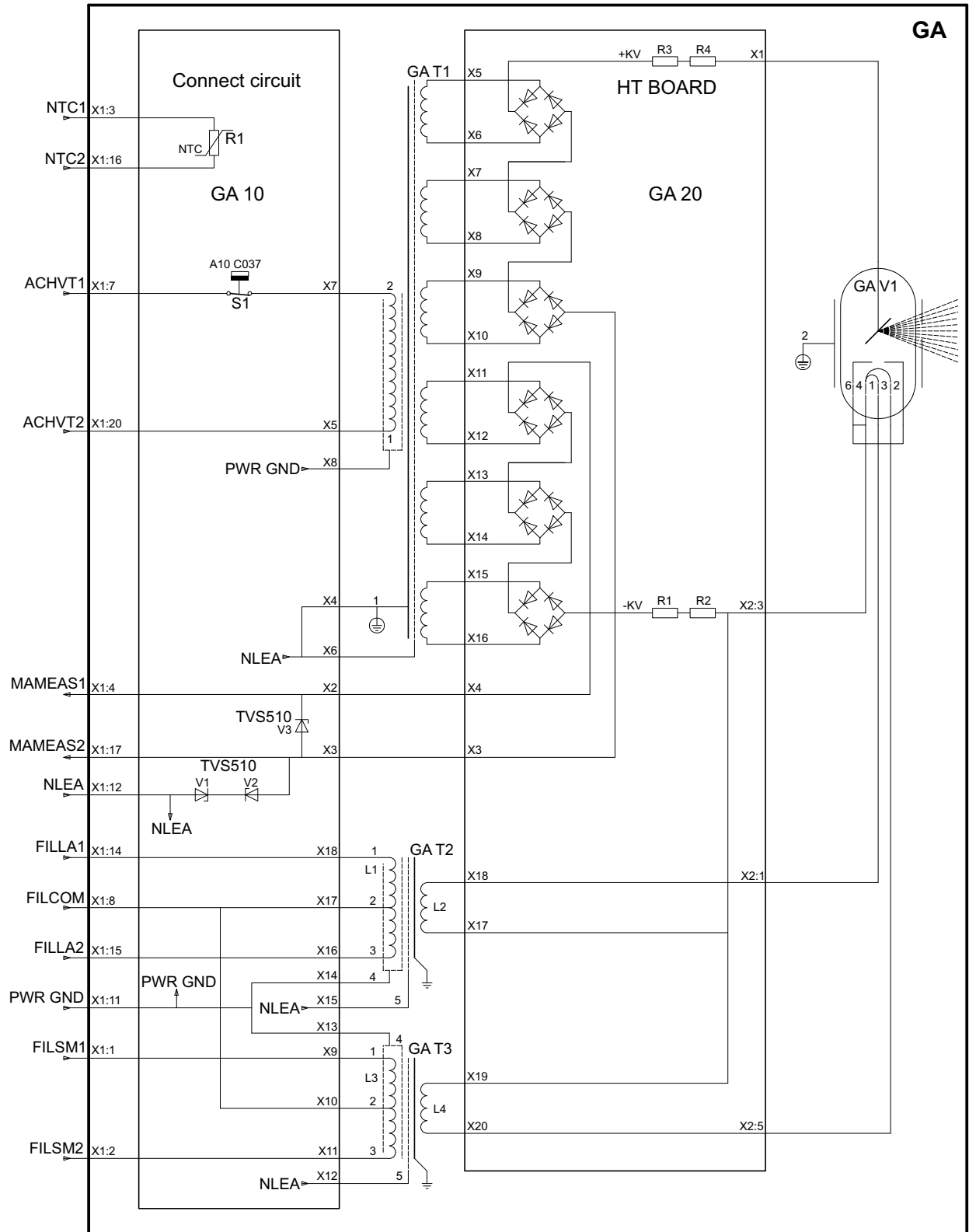
Mechanical dimensions of X-ray tube



HT CONV: TANK 9890 000 6183x

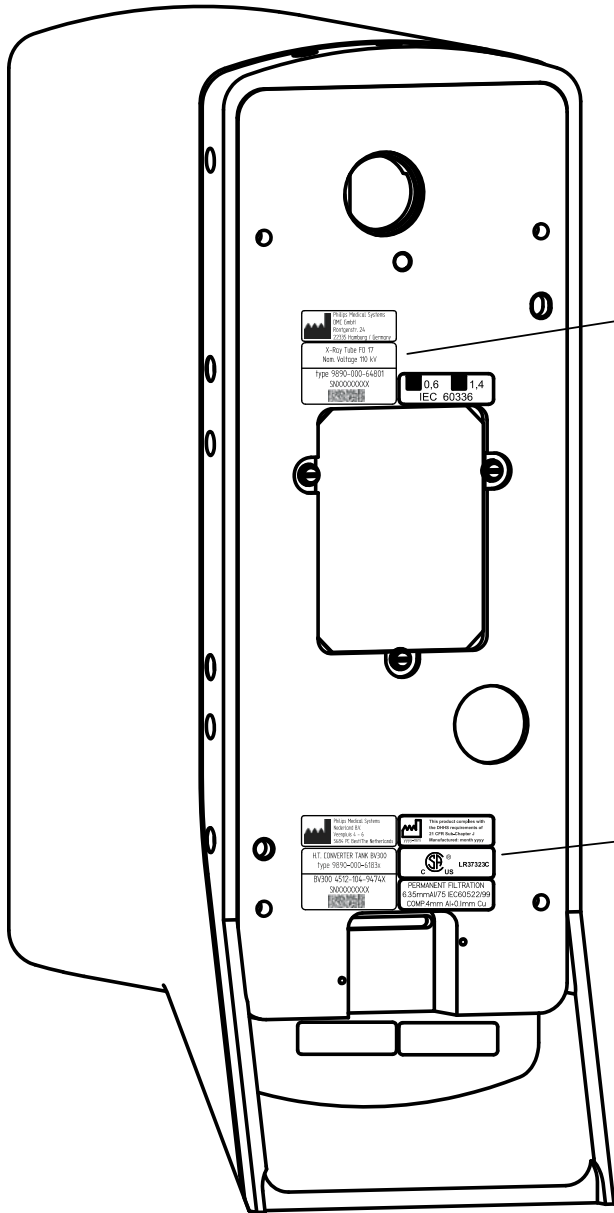
HTBV 013

Mechanical dimensions of
HT converter tank






HTBV 014

Circuit diagram



Philips Medical Systems
DMC GmbH
Röntgenstr. 24
22335 Hamburg / Germany


X-Ray Tube FO 17
Nom. Voltage 110 kV
type 9890-000-64801
SNXXXXXXXX


 0,6  1,4
IEC 60336

Philips Medical Systems
Nederland B.V.
Veenpluis 4 - 6
5684 PC Best/The Netherlands

 This product complies with
the DHHS requirements of
21 CFR Sub-Chapter J
yyyy-mm Manufactured: month yyyy

H.T. CONVERTER TANK BV300
type: 9890-000-6183x
BV300 4512-104-9474X
SNXXXXXXXX


 LR37323C
PERMANENT FILTRATION
6.35mmAl/75 IEC60522/99
COMP.4mm Al+0.1mm Cu

HBCT 003

Labeling of HT converter tank