Horizon®

Technical Specifications Manual

MAN-11124 Revision 001

HOLOGIC®

QDR™

Bone Densitometry Systems

Technical Specifications Manual

Part Number: MAN-11124
Revision 001

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1 Regulations for X-Ray Equipment

1.1 United States Federal and State Regulations

QDR™ Series Horizon® Bone Densitometry Systems conform to the United States Code of Federal Regulations, 21 CFR 1020.30 "Diagnostic X-Ray Systems and their major components." However, additional state regulations may apply for X-ray products. This may require notifying your state regulatory agency about your installation and/or operator training and certification.

It is the responsibility of the user to contact the applicable state radiation control agency to verify that your installation is in compliance with regulations in your state governing installation and use of X-ray equipment.

1.2 IEC Regulations

QDR Systems comply with the requirements of IEC 60601-1. The classification of the QDR Systems under this specification is Class 1, Type B.

The QDR Series complies with IEC 60601-3 except as follows:

Clause 6.2.1 which specifies "Each loading shall be initiated and maintained by means of control requiring continuous actuation by the operator." A QDR system scan may last up to several minutes and if interrupted must be restarted from the beginning. If a continuous actuation control were used and the operator accidentally released the control during a scan, the scan would have to be repeated from the beginning, thus resulting in unnecessary exposure to the patient. This type of control would detract from, rather than enhance, the radiation safety of the QDR system.

The QDR Series complies (as applicable) with the following IEC standards:

Table 1 IEC Standards

2nd Edition	3rd Edition
IEC 60601-1 1995	IEC 60601-1 2014
IEC 60601-1-1 2000	IEC 60601-1-2 2007
IEC 60601-1-2 2001	IEC 60601-1-3 2013
IEC 60601-1-3 1994	IEC 60601-2-28 2010
IEC 60601-1-4 2000	IEC 60825-1 2014
IEC 60601-2-7 1998	
IEC 60601-2-28 1993	
IEC 60601-2-32 1994	
IEC 60825-1 2007	

Software used in the QDR Series was developed using IEC 62304 as a guide.

1.3 Canadian Regulations

The QDR Series comply with CSA 22.2 No. 601.1

1.4 Class 1 Laser Product

The laser used on Discovery models complies with FDA performance standards for laser products except for deviations pursuant to Laser Notice number 50 dated June 24, 2007.

2 Warnings and Cautions

2.1 EMI

This instrument is designed to be compatible with the electromagnetic environments specified in IEC 60601-1-2 and will operate satisfactorily when placed in an environment that includes other equipment complying with that standard.

If equipment that is not electromagnetically compatible is placed into the environment where the QDR Systems series bone densitometer is used, the QDR series or the non-Compliant equipment may malfunction or exhibit other anomalous behavior. Consult the appropriate field service engineer.

2.2 Accessories

This instrument is supplied to the user together with those hardware and software accessories that are needed for its safe and reliable operation. Additional accessories may be provided to perform optional procedures. Do not use any accessories in conjunction with this instrument other than those supplied by Hologic for use with the instrument.

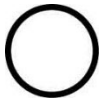
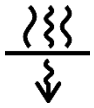
2.3 Caution

The computer and accessories provided with the QDR Systems are supplied with special power cords that are intended to be plugged into the outlet strip at the rear of the console. To protect the integrity of the system and the safety of the patient and operator, do not power these components from another source. Also, do not power any accessories or appliances other than those provided with the system from the outlet strip at the rear of the console.

2.4 Symbols

Table 2 details symbols found on the equipment.

Table **2** **Symbols**

Symbol	Description	Symbol	Description
	OFF		Serial number
	ON		Catalog number
	Follow instructions for use		Date of manufacture
	Protective earth (ground)		Manufacturer
	Warning: Electricity		Caution
	Type B applied part		X-ray source assembly, emitting
	X-ray source assembly		Dangerous voltage
	Radiation Filter		Discard electrical and electronic equipment separately from standard waste. Send decommissioned material to Hologic or contact your service representative.
	Temperature limit		Humidity limitation

3 Horizon® System Specifications

3.1 Horizon Product Specifications

Table **3** **Horizon Scanning Parameters**

Specification	Model	Definition
Scanning Method	All	Multi-detector array, Indexing table, and motorized C-Arm
X-ray System	All	Switched Pulse Dual-Energy x-ray tube, operating at 100 kV and 140 kV, 2.5 mA average at 25% duty cycle, 5.0 mA average at 50% duty cycle (30s maximum), Tungsten target
Detector System	A	216 multi-channel detector (2 mm) consisting of GOS scintillators coupled to Silicon diodes.
	W and C	128 multi-channel detector (2 mm) consisting of GOS scintillators coupled to Silicon diodes
	Wi and Ci	64 multi-channel detector (4 mm) consisting of GOS scintillators coupled to Silicon diodes.
Scanning Sites	A	Lumbar Spine (in AP and lateral projections), Proximal Femur (Hip), Femur, Forearm, and Whole Body.
	W	AP Lumbar Spine, Proximal Femur (Hip), Femur, Forearm, Decubitus Lateral Spine, and Whole Body.
	Wi	AP Lumbar Spine, Proximal Femur (Hip), Forearm, Decubitus Lateral Spine, and Whole Body.
	C	AP Lumbar Spine, Proximal Femur (Hip), Femur, Forearm, Decubitus Lateral Spine.
	Ci	AP Lumbar Spine, Proximal Femur (Hip), Forearm, Decubitus Lateral Spine.
Scan Region (at pad surface)	A	1.95 m (76.8 in.) x 0.65m (25.6 in.) maximum
	W and Wi	1.97 m (77.5 in.) x 0.65m (25.7 in.) maximum
	C and Ci	0.96 m (38 in.) x 0.51 m (20 in.) maximum
Scatter Dose Rate	A, W, and C	For scans, less than 0.01 mGy/h at 2 m from the center of the X-Ray beam; for images, less than 0.01 mGy/h at 3.5 m from the center of the X-Ray beam.
	Wi and Ci	Less than 0.01 mGy/h at 2 m from the examination table.
Leakage Radiation	All	The Horizon System meets the requirements of 21 CFR 1020.30(k) for leakage from the X-ray source.
External Shielding Requirement	All	None required unless required by local ordinance.
Measurement Accuracy	All	Measurements of Bone Mineral Content (BMC) and projected Area are calibrated to Hologic anthropomorphic spine phantom of known mineral content to within ±1.0%.

Table 3 Horizon Scanning Parameters (Continued)

Specification	Model	Definition
Calibration	All	Self Calibrating using HOLOGIC Automatic Internal Reference System. Operator calibration NOT required.
Patient Positioning	All	Manual movement (two independent axes) using push-button controls. Laser Indicator (Red, < 1mW) with crosshairs used for alignment.

Table **4** **Horizon System Weights**

Horizon Model	Machine Only kg (lbs)	Packed kg (lbs)
A	379 (835)	562 (1238)
C/Ci	264 (583)	451 (995)
W/Wi	318 (700)	486 (1072)

Table **5** **Horizon Operating Temperatures**

Specification	Model	Operation	Storage
Temperature	All	15 °C to 32 °C (59 °F to 90 °F)	-30 °C to 50 °C (-22 °F to 122 °F)
Humidity	All	20 to 80% relative humidity, non Condensing	10 to 90% relative humidity, non Condensing

Table **6** **Horizon Maximum Subject Weight**

Subject Weight:	All	The maximum subject weight is 226 kg (500 lb).

Table 7 Horizon Footprint and Geometry

	Model	Length		Width		Height	
Footprint		**m**	**in.**	**m**	**in.**	**m**	**in.**
Maximum	A	3.02	119	1.48	58.3	1.55	61.2
	W/Wi	3.02	119	1.64	64.6	1.42	56
	C, Ci	NA	NA	1.34	52.8	1.42	56
Stationary	A	2.02	79.5	1.15	45.3	1.42	56
	W/Wi	2.02	79.5	1.37	53.8	1.42	56
	C, Ci	1.97	76.0	1.14	44.8	1.42	56
Heat Load	A	1500 W (5120 BTU/h) (maximum)					
	W, Wi, C and Ci	1000 W (3400 BTU/h) (maximum)					

Table 7 Horizon Footprint (Continued)and Geometry (Continued)

	Model	Length	Width	Height
Patient Table Height: (± 25 mm (1 in.))	A	Scanning in AP Mode Adjustable to 71 cm (28 in.) from floor Maximum Elevation during Patient Positioning 88.9 cm (35 in.) Patient ON/OFF 67.3 cm (26.5 in.)		
	W, Wi, C and Ci	71 cm ± 25 mm (28 in. ± 1 inch)		
Positioning Laser	All	Laser Diode (< 1mW) cross hair, with emergency mechanical shutter		
Leakage Current:	All	Normal < 75 μA	Single Fault < 400 μA	
Resolution (approximate)	A, W, and C	1.2 line pair/mm at table top in scanning direction, single energy IVA HD mode		
	Wi and Ci	0.5 line pair/mm		
X-ray System Geometry			**mm**	**in.**
	All	Source to Detector Distance	1072 (± 12 mm)	42.2 (± 0.470 in.)
	All	Source to Patient Distance	423 (± 8 mm)	16.7 (± 0.315 in.)

3.2 Horizon Duty Cycle

Table 8 Horizon Duty Cycle

Model	Scan	Cycle
A	Whole Body	100%
	IVA, IVA HD and SE Femur	12%
	All other scan modes	50%
W and C	IVA, IVA HD and SE Femur	12%
	All other scan modes	50%
Wi and Ci	All scan modes	50%

3.3 Horizon Leakage Technique Factors

The leakage technique factors for all models of Horizon are the same. It is the maximum continuous current at the maximum peak potential. This is X-ray mode #3:

Peak potential 140/100 kVp (dual energy), current 10 mA peak 25% duty cycle or 2.5 mA average.

3.3.1 Horizon Beam Filtration

Table 9 Horizon Beam Filtration

Condition	Aluminum Equivalent Filtration
Minimum filtration permanently in the X-ray beam	6.1 mm[1]
Additional filtration, dual-energy mode at 140 kV	53 mm[2]
Additional filtration, **A** models, single-energy mode, lateral position	0.8 mm[3]

1. Of the total minimum Al Equivalent Filtration, 5.9 mm is attributable to the X-ray source and 0.2 mm is attributable to the filter drum/aperture assembly.
2. From 1.6 mm Brass.
3. From 25.4 μm copper

3.3.2 Horizon Beam Quality

Table 10 Horizon Beam Quality

Mode	Half-Value Layer (mm Al)
100 kV, no additional filtration	4.4
140 kV, no additional filtration	6.0
140 kV, with additional filtration	13.5

3.3.3 Laser Performance Specifications

Table 11 Laser Performance Specifications

Parameter	Condition	Value
Maximum Output	Device on	0.20 mW
Pulse Duration	Device on	CW (Continuous Wave)

3.3.4 Horizon Exam Mode Performance

Table 12 Horizon Exam Mode Performance

Exam Type	Model	Default scan Length (in.)	X-ray On Time(s) @ Default Length		Scan Site	In Vivo Precision (%)
			60 Hz	50 Hz		
AP Spine High Def.	A, W, C	8.0	163	196	Lumbar Spine	1.0
AP Spine Array	All	8.0	82	98	Lumbar Spine	1.0
AP Spine Fast Array	All	8.0	41	49	Lumbar Spine	1.0
AP Spine Express	A, W, C	8.1	15	18	Lumbar Spine	1.0
AP Spine Turbo	Wi and Ci	8.1	21	25	Lumbar Spine	1.0

Table 12 Horizon Exam Mode Performance (Continued)

Exam Type	Model	Default scan Length (in.)	X-ray On Time(s) @ Default Length		Scan Site	In Vivo Precision (%)
			60 Hz	50 Hz		
Decubitus Lateral Spine Fast	W, Wi, C and Ci	8.0	163	196	Lumbar Spine	2.6
Lat Spine High Def.	A	6.0	244	293	Lumbar Spine	1.0
Lat Spine Array	A	6.0	244	293	Lumbar Spine	1.0
Lat Spine Fast Array	A	6.0	123	148	Lumbar Spine	1.0
Hip High Def.	A, W, C	6.0	123	148	Proximal Femur	1.0
Hip Array.	All	6.0	62	74	Proximal Femur	1.0
Hip Fast Array	All	6.0	31	37	Proximal Femur	1.0
Hip Express	A, W, C	6.1	11	13	Proximal Femur	1.0
Hip Turbo	Wi and Ci	6.0	16	19	Proximal Femur	1.0
Dual Hip	All	Selected Scan Mode	2X Scan Mode	2X Scan Mode	Left & Right Proximal Femur	Selected Scan Mode
Whole Body	A	77.0	143	171	Whole Body	1.0
Whole Body[1]	W and Wi	77.0	360	423	Whole Body	1.0
Forearm	A, W, C	6.0	31	37	Forearm	1.0
Forearm	Wi and Ci	6.0	31	37	Forearm	1.0
IVA SE AP Imaging	A, W, C	15.7	10	12	Thoracic and Lumbar Spine	NA
IVA SE R/L Lateral	A, W, C	15.7	10	12	Thoracic and Lumbar Spine	NA
IVA DE R/L Lateral	A	14.4	539	647	Thoracic and Lumbar Spine	NA

Table 12 Horizon Exam Mode Performance (Continued)

Exam Type	Model	Default scan Length (in.)	X-ray On Time(s) @ Default Length		Scan Site	In Vivo Precision (%)
			60 Hz	50 Hz		
IVA DE R/L Lateral	C and W	14.4	539	647	Thoracic and Lumbar Spine	NA
SE Femur	A, W, C (Horizon only)	15.7	15	18	Femur	NA
Small Animal Spine and Femur	All	2.3	149	179	Spine and Femur	NA
Small Animal Whole Body	All	12.0	122	146	Whole Body	NA
Whole Body (Infant)	A	32.0	153	183	Whole Body	1.0
Whole Body (Infant)	W and Wi	32.0	306	402	Whole Body	

1. Whole Body time on W/Wi systems includes repositioning between scan passes, which may cause some increase in duration. Expected variation is less than 10 seconds.

3.3.5 Horizon Typical Scan Time

Table 13 Horizon Typical Scan Time

Exam Type	Model	Scan Length (in.)	X-ray On Time (s)	
			60 Hz	50 Hz
AP Spine Express	A, W, C	6.1	11	13
AP Spine Turbo	Wi and Ci	6.0	16	19
Hip Express	A, W, C	6.1	11	13
Hip Turbo	Wi and Ci	6.0	16	19
Whole Body	A	59.9	113	134
Whole Body[1]	W and Wi	59.9	290	338

1. Whole Body time on W/Wi systems includes repositioning between scan passes, which may cause some increase in duration. Expected variation is less than 10 seconds.

3.4 Horizon Exam Mode Nominal Skin Entrance Dose

Table 14 Horizon Exam Mode Nominal Skin Entrance Dose

Exam	Model	Mode	Nominal Skin Entrance Dose (mGy)
AP Spine	A, W, and C	Express	0.04
AP Spine	All	Fast	0.07
AP Spine	All	Array	0.13
Hip	A, W, and C	Express	0.04
Hip	All	Fast	0.07
Hip	All	Array	0.13
Forearm	A, W, and C	Array	0.035
VFA - AP Spine	A, W, and C	IVA	0.03
VFA - Lateral	W and C	IVA	0.03
VFA - Lateral	A	IVA	0.03
VFA - AP Spine	A, W, and C	IVA HD	0.025
VFA - Lateral	W and C	IVA HD	0.025
VFA - Lateral	A	IVA HD	0.025
Whole Body	A	Array	0.008
Whole Body	W and Wi	Array	0.012
Whole Body	A	Infant	0.01
Whole Body	W and Wi	Infant	0.012
Lateral	C, Ci, W and Wi	Array	0.35
Lateral	A	Fast	0.3
SE Femur	A, W, and C	SE Femur	0.05

3.5 Horizon Line Voltage and Maximum Line Current

Table 15 Horizon Line Voltage and Maximum Line Current

VAC (± 10%)	A (max)	Hz	Max. Apparent Resistance (± 20%)
100	16	50/60	0.32 ohm
120	14	50/60	0.32 ohm
200	8	50/60	1.28 ohm
230	8	50/60	1.28 ohm

Line Inductance

0.015 mH/volt maximum

Technique Factors for Maximum Line Current

Peak Potential 140 kVp
Tube Current 10 mA peak, 50% duty factor or 5 mA average.

Maximum Deviation

The maximum deviation from the preindication given by labeled technique factor control settings or indicators are as follows:

Table 16 Horizon Maximum Deviation

Peak Potential:	± 15%
Current:	± 40%
Time:	± 10%

Horizon Measurement Criteria for Technique Factors

The measurement criteria of the technique factors is as follows:

Table 17 Horizon Measurement Criteria for Technique Factors

Peak Potential	The voltage peak is measured with an oscilloscope. Voltage is a square pulse. Peak is defined as the peak voltage of the 4 millisecond pulse wave shape, not counting any initial overshoot.
Current	Current is measured with an oscilloscope on the last millisecond of the 4 millisecond pulse.
Time	Time of each pulse is measured with an oscilloscope and defined as the time between 50% rise and fall times of the peak potential pulse. Time of the scan is measured by counting the number of AC line pulses from the start to the end. X-ray pulses are synchronous with the AC line,

4 Horizon System Labels

4.1 Safety Labels

4.1.1 Horizon Electric Shock Warning Label

Figure 1 shows the label that is located on the cover of the X-ray Controller on all Horizon systems.

Figure 1 Horizon Electric Shock Warning Label

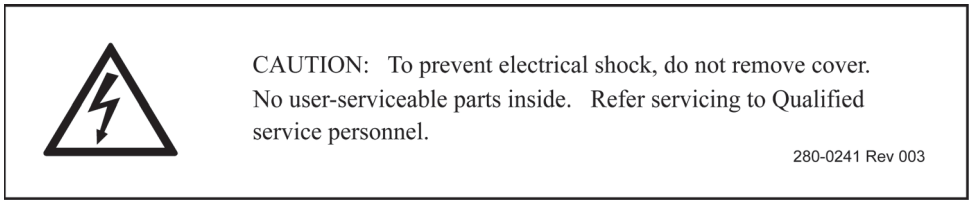


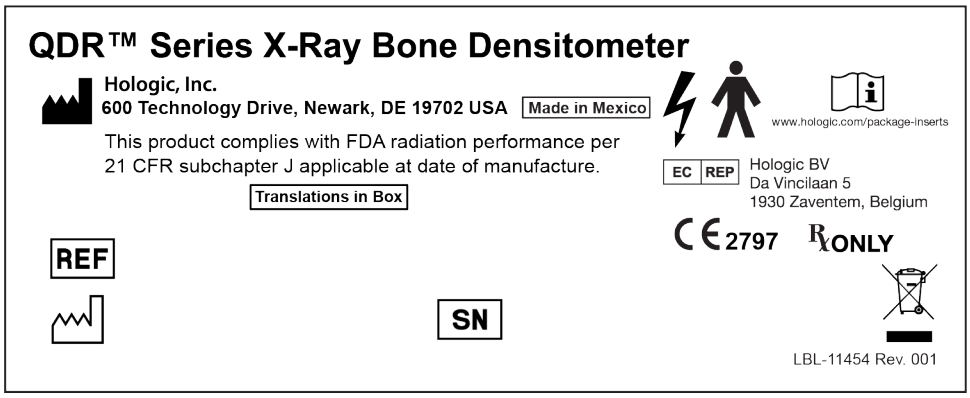
Figure 2 Electric Shock Warning Symbol

Dangerous Voltage

4.1.2 Horizon Manufacturer Serial Number Label

Figure 3 shows the label located on the right rear corner of the scanner frame.

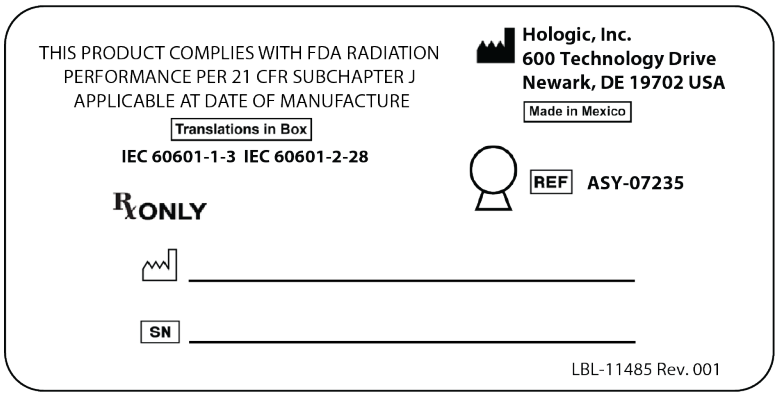
Figure 3 Horizon Manufacturer Serial Number Label



4.1.3 Horizon Radiation Compliance Label

Figure 4 shows the label that is located the cover of the X-Ray Controller assembly and rear of the C-Arm on all Horizon systems.

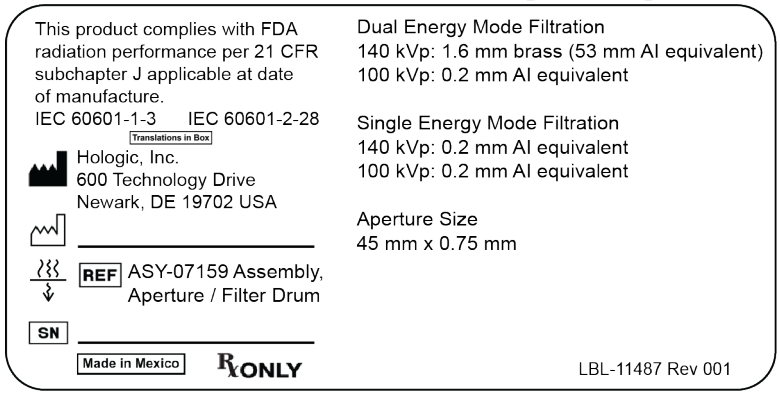
Figure 4 Horizon Radiation Compliance Label



4.1.4 Horizon Wi, Ci Radiation Compliance/Aperture Size/Filtration Label

Figure 5 shows the label that is located on the Filter Drum assembly and rear of the C-Arm on Horizon Wi and Horizon Ci models.

Figure 5 Horizon Wi, Ci Radiation Compliance/Aperture Size/Filtration Label



4.1.5 INMETRO & ULBR Product Label (Discovery)

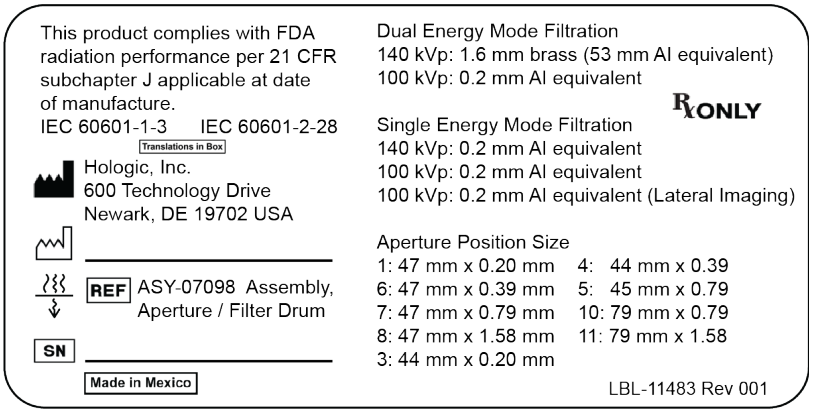
Located on back panel, INMETRO & ULBR Product Label (Figure 6) includes the INMETRO & ULBR symbols, and Segurança.

Figure 6 INMETRO & ULBR Product Label (Discovery)

Horizon A, W, C Radiation Compliance/Aperture Size/Filtration Label

Figure 7 shows the label that is located on the Filter Drum assembly on Horizon A, W and C models.

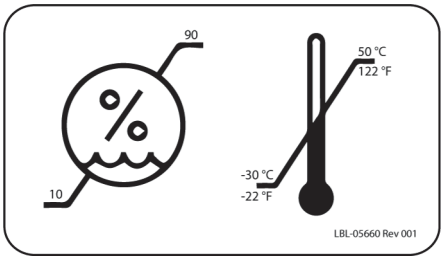
Figure 7 Horizon A, W, C Radiation Compliance/Aperture Size/Filtration Label



Storage Parameters

Figure 8 shows the label that is located on the rear of the unit, on the bottom rail, on all Horizon Systems.

Figure 8 Storage Environmental Parameters



Pinch Point Danger Label

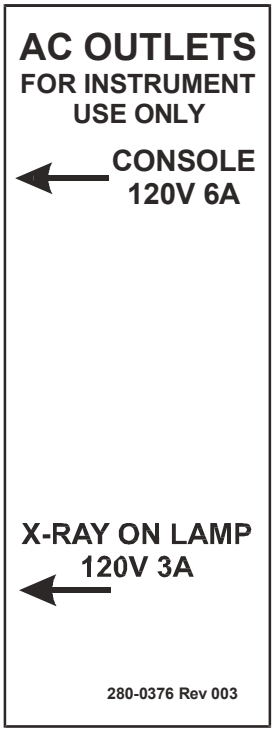
Figure 9 shows the label that is located on the rear of the unit, on the bottom rail in two places, on all Horizon systems.

Figure 9 Pinch Point Danger Label

4.2 AC Outlet Label

Figure 10 shows the label that is located under the left Electronic Tray cover on all Horizon systems.

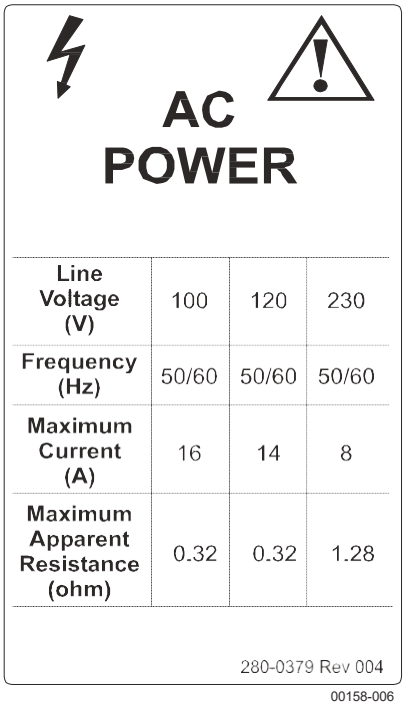
Figure 10 Horizon AC Outlet Label



4.3 AC Power Label (Horizon Series)

Figure 11 shows the label that is located under the circuit breaker on the Toroid Box on all Horizon systems

Figure 11 Horizon Series AC Power Label.



4.4 Operator Console Labels

Computer Labels

Figure 12 shows the label that is adjacent to the outlet strip on the back of the Operator console on all Horizon Series, Oasis XP, and Oasis APEX systems.

Figure 12 Horizon Operator Console Labels

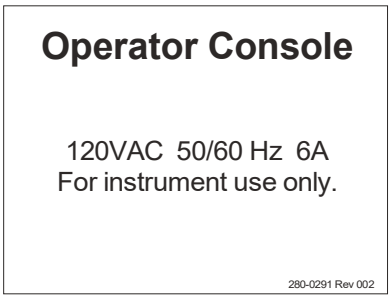
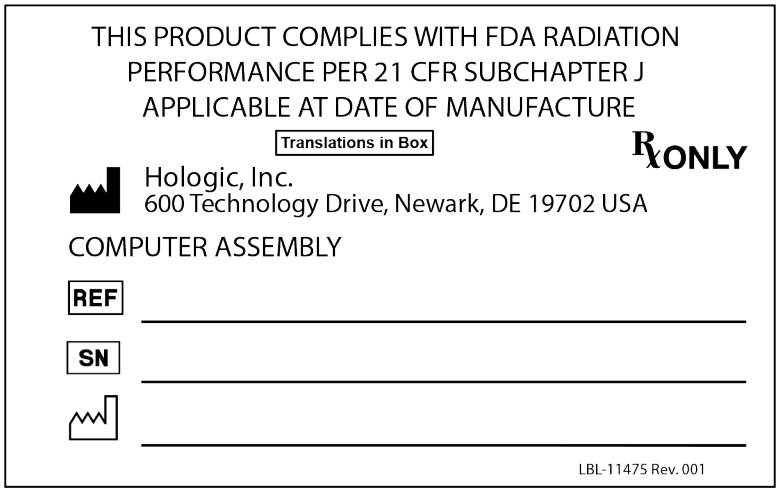


Figure 13 shows the label located on the top of the computer case on all Horizon systems.

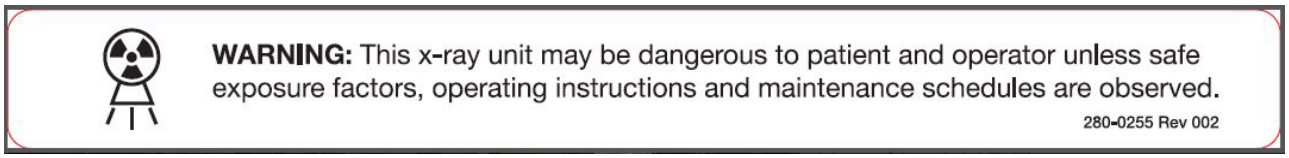
Figure 13 Horizon DHHS Compliance Label



Keyboard Label

Figure 14 shows the label located on the keyboard above the functions keys on all Horizon systems.

Figure 14 Horizon Keyboard Label

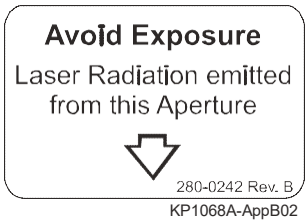


5 Discovery System Labels

5.1 Laser Locator Label

Figure 15 shows the laser locator label. These labels placed on the scanner arm show the location of the laser beam on all Discovery systems.

Figure 15 Discovery Laser Locator Label



5.2 Safety Labels

5.2.1 Electric Shock Warning Label

Figure 16 shows the label that is located on the cover of the X-ray Controller on all Discovery systems.

Figure 16 Electric Shock Warning Label

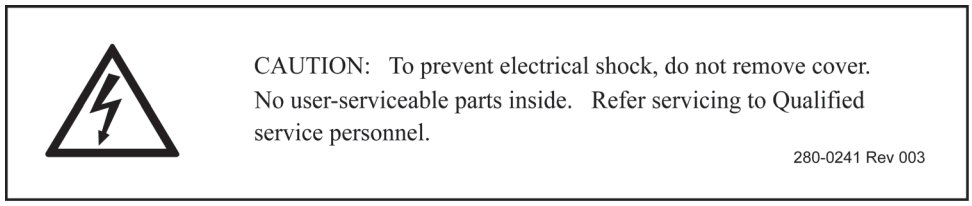


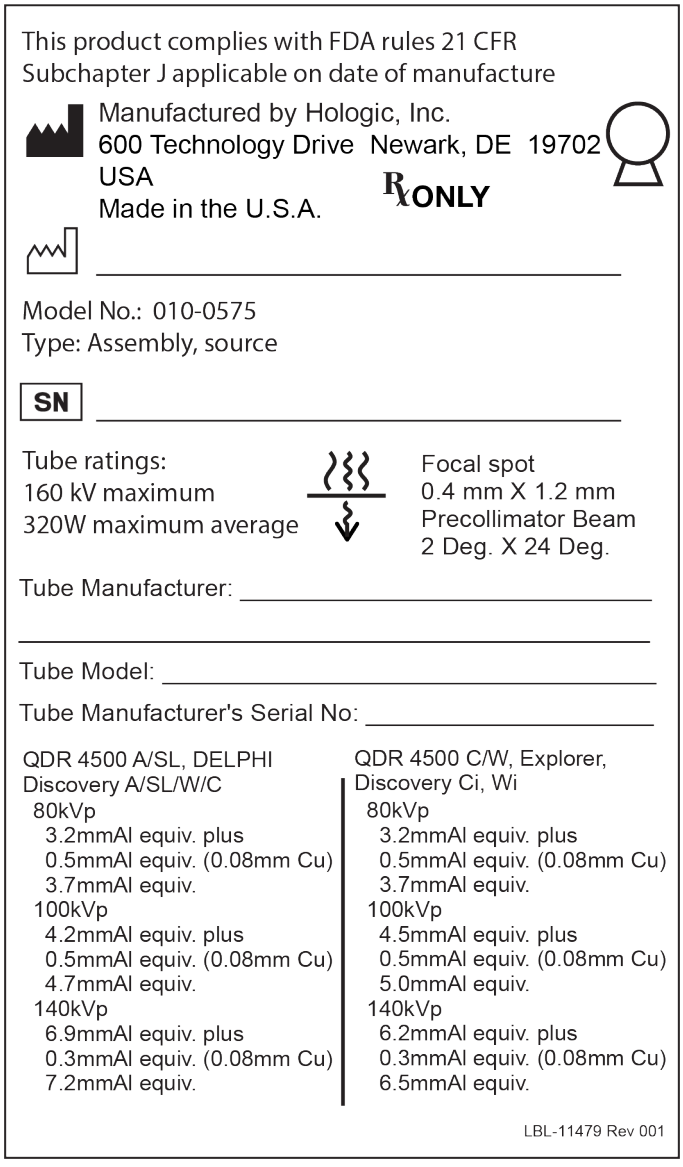
Figure 17 Shock Warning Symbol

Dangerous Voltage

5.2.2 Radiation Compliance Label

Figure 18 shows the label that is located on the cover of the X-Ray Source and rear of the C-Arm (filtration information is for the X-ray source assembly only) on all Discovery systems.

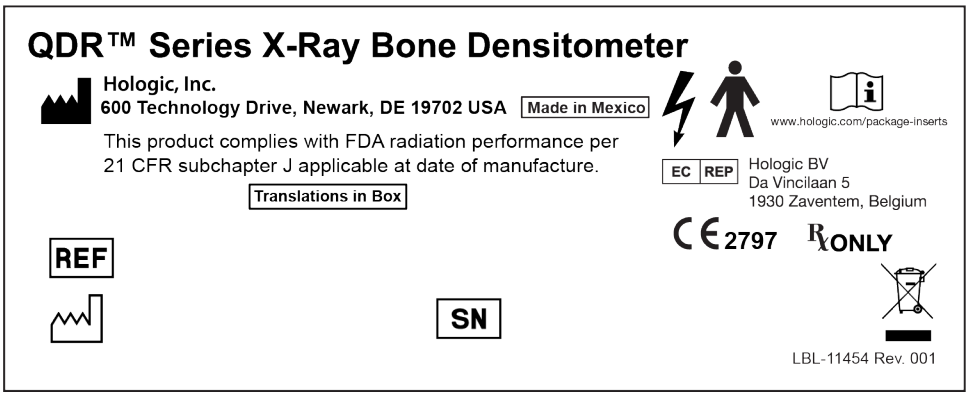
Figure 18 Radiation Compliance Label



5.2.3 Manufacturer Serial Number Label (Discovery Series)

Figure 19 shows the label located on the right rear corner of the scanner frame.

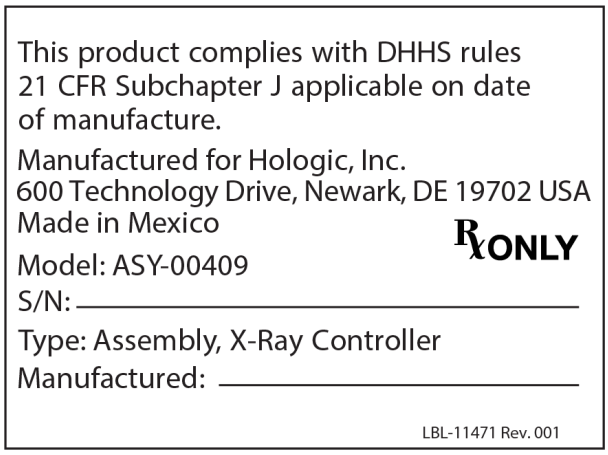
Figure 19 Discovery Series Manufacturer Serial Number Label



5.2.4 Radiation Compliance Label

Figure 20 shows the label that is located inside the cover of the X-Ray Controller assembly and rear of the C-Arm on all Discovery Series systems.

Figure 20 Radiation Compliance Label



5.2.5 INMETRO & ULBR Product Label

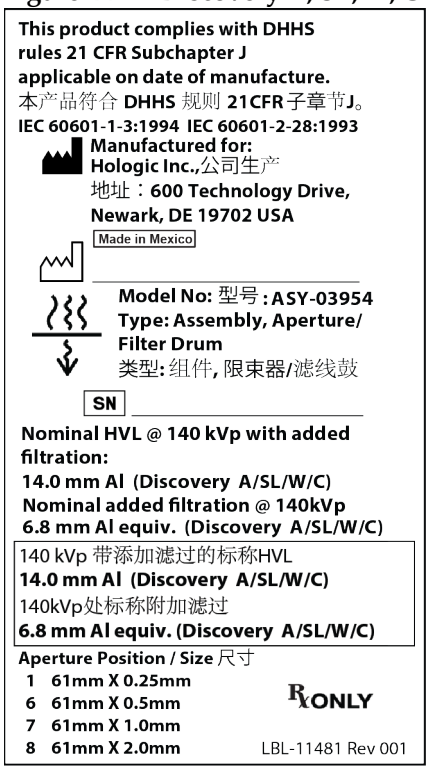
Located on back panel, INMETRO & ULBR Product Label (Figure 21) includes the INMETRO & ULBR symbols, and Segurança.

Figure 21 INMETRO & ULBR Product Label

Discovery A, SL, W, C Radiation Compliance Label

Figure 22 shows the label that is located on the Filter Drum assembly and rear of the C-Arm on Discovery A, SL, W and C models.

Figure 22 Discovery A, SL, W, C Radiation Compliance Label



Discovery Wi, Ci Radiation Compliance/Aperture Size Label

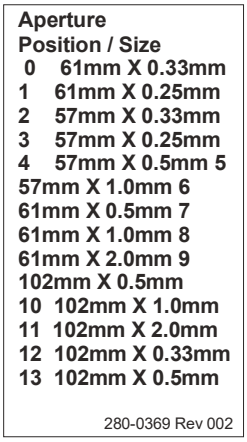
Figure 23 shows the label that is located on the Filter Drum assembly and rear of the C-Arm on Discovery Wi, Discovery Ci.

Figure 23 Discovery Wi, Ci Radiation Compliance/Aperture Size Label

Discovery A, SL, W, C Aperture Size Label

Figure 24 shows the label that is located on the Filter Drum assembly on Discovery A, SL, W and C models.

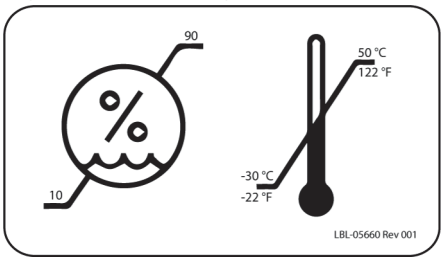
Figure 24 Discovery A, SL, W, C Aperture Size Label



Storage Environmental Parameters

Figure 25 shows the label that is located on the rear of the unit, on the bottom rail, on all Discovery Systems.

Figure 25 Storage Parameters



CSA Label

Figure 26 shows the label that is located on the rear of the unit, on the bottom rail, on all Discovery Series systems

Figure 26 CSA Label

Pinch Point Danger Label

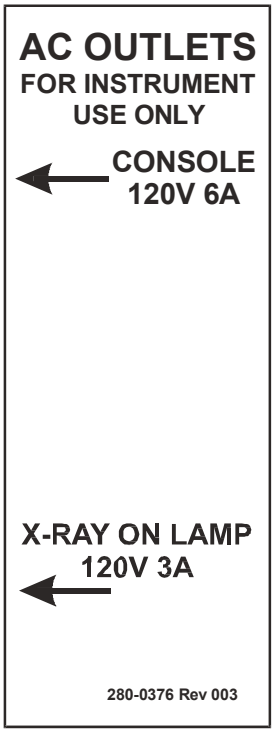
Figure 27 shows the label that is located on the rear of the unit, on the bottom rail in two places, on all Discovery Series systems

Figure 27 Pinch Point Danger Label

5.3 Discovery AC Outlet Label

Figure 28 shows the label that is located under the left Electronic Tray cover on all Discovery Series systems.

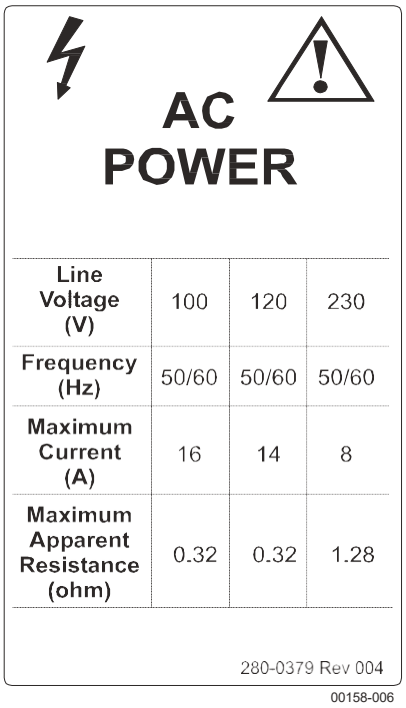
Figure 28 AC Outlet Label



5.4 Discovery AC Power Label

Figure 29 shows the label that is located under the circuit breaker on the Toroid Box on all Discovery Series systems.

Figure 29 Discovery AC Power Label



5.5 Operator Console Labels

Computer Labels

Figure 30 shows the label that is adjacent to the outlet strip on the back of the Operator console on all Discovery Series systems.

Figure 30 Discovery Operator Console Label

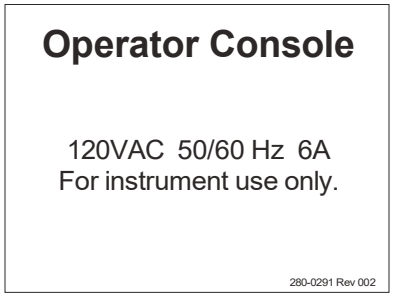
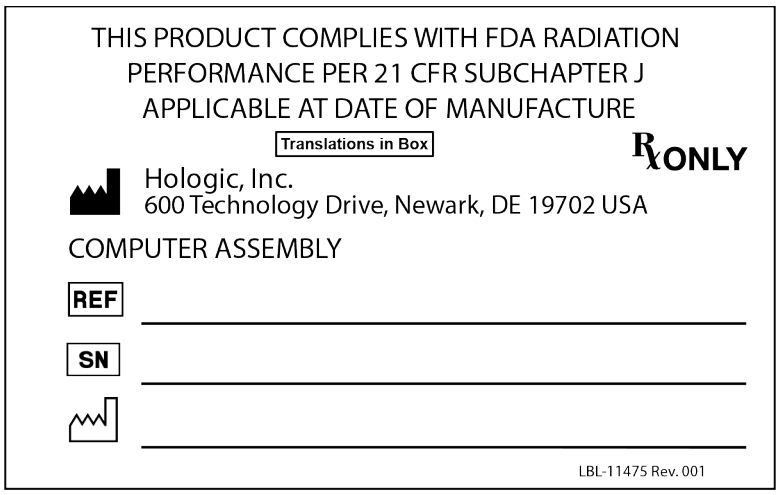


Figure 31 shows the label located on the top of the computer case on all Discovery Series systems.

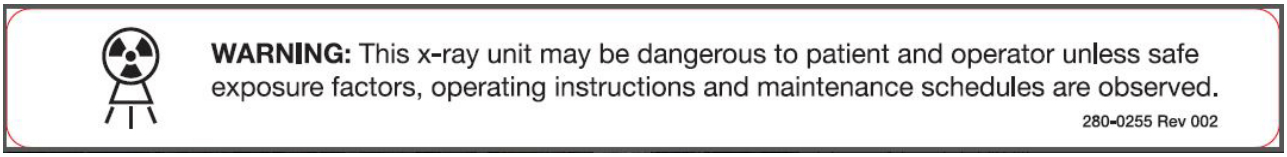
Figure 31 Computer Case Label



Keyboard Label

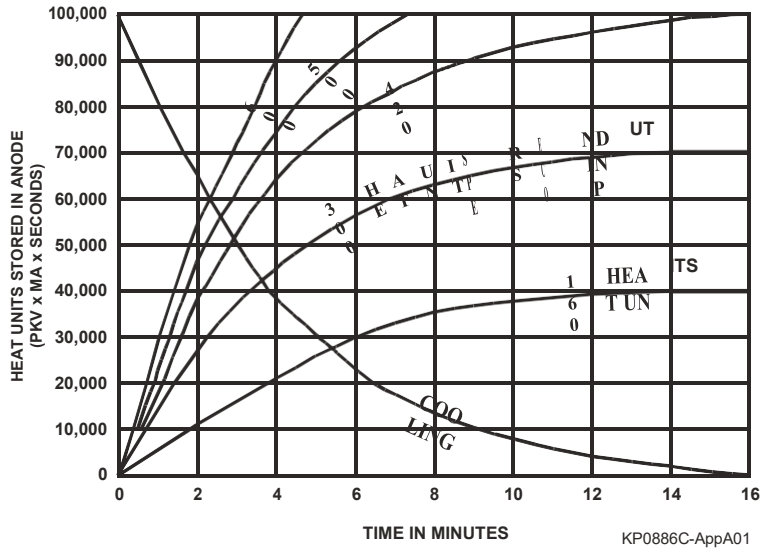
Figure 32 shows the label located on the keyboard above the functions keys on all Discovery Series systems.

Figure 32 Discovery Keyboard Label



6 QDR Series Tube Rating Chart for Hologic X-Ray Tank

Figure 33 QDR Series Tube Rating Chart for Hologic X-Ray Tank



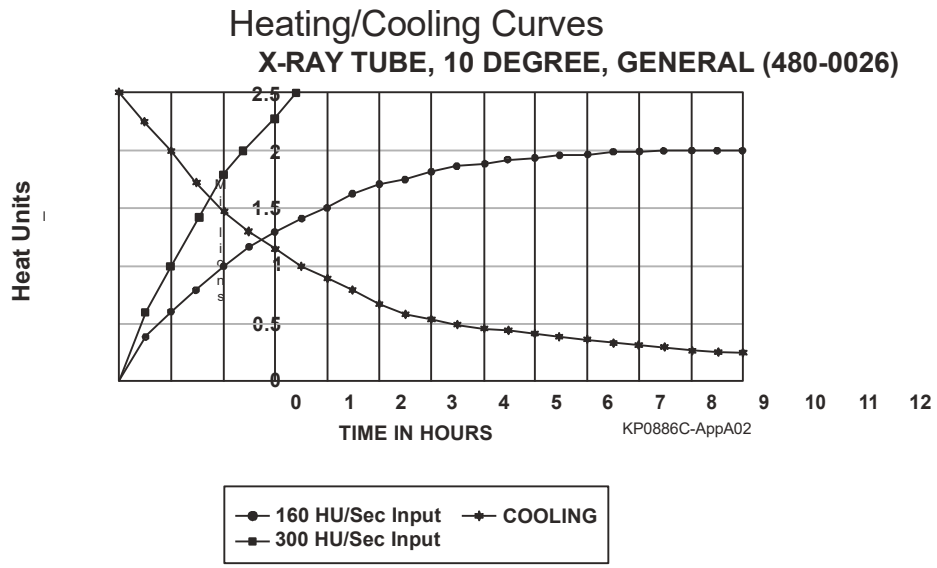
ANODE THERMAL CHARACTERISTICS

X-RAY TUBE, 10 DEGREE, GENERAL (480-0026)

Maximum Stored Heat Normal Operation 70 Kilojoules

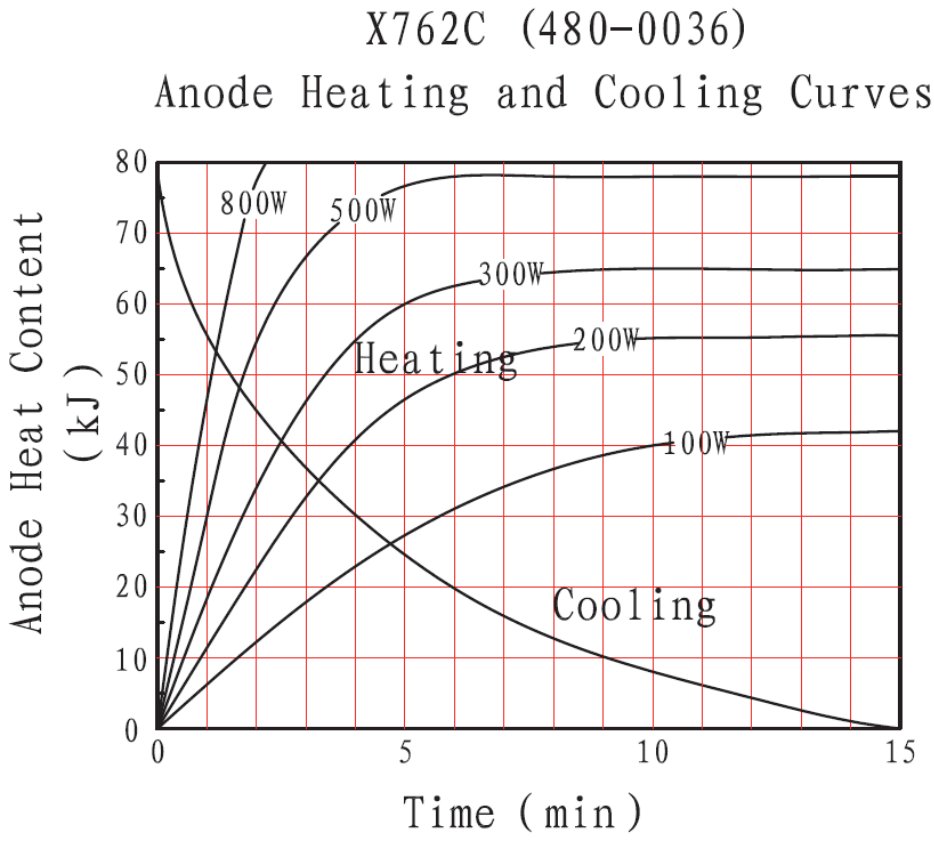
7 Tube Housing Rating Chart

Figure 34 Tube Housing Rating Chart



8 Tube and Tube Housing Rating Chart for Spellman™ High Voltage X4233 X-Ray Source

Figure 35 Tube and Tube Housing Rating Chart for Spellman High Voltage X4233 X-Ray Source



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