



Atomscope HFX90V

PORTABLE VETERINARY X-RAY EQUIPMENT

INSTRUCTION MANUAL

Version 1.0

Thank you for purchasing our **HFX90V** portable veterinary x-ray unit. We are confident that you will be pleased with the radiographs you make with this model. This excellent unit will give you many years of reliable service. Please read this manual completely before using our **HFX90V**. We always welcome your comments and suggestions.

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MEMO

This manual provides installation, operation and maintenance instructions for the **HF90V** portable veterinary x-ray unit. Copy and transfer without notice is prohibited. Operate the equipment correctly according to this instruction manual.


<u>CONTENTS</u>	<u>PAGE NO.</u>
1.0 NOTICE FOR SAFE OPERATION -----	3
2.0 INTRODUCTION -----	5
3.0 COMPONENTS -----	6
4.0 MAIN PARTS -----	7
5.0 CONTROL PANEL -----	8
6.0 PRECAUTION IN USE -----	9
7.0 OPERATING PROCEDURES -----	11
8.0 ERROR INDICATION -----	13
9.0 TROUBLESHOOTING -----	14
10.0 SPECIFICATIONS -----	15

1.0 NOTICE FOR SAFE OPERATION

1. The following safety symbols will be used in this manual.

	WARNING:	This symbol is warning about the possibility of injury of patient or operator.
	CAUTION:	This symbol is caution for the possibility of product failure.
	NOTE:	This symbol is note for operating this product correctly.
	WARNING: RADIATION HAZARD:	This symbol warns of a possible radiation hazard.

2. The **HFX90V** is not certified for human use.
3. During operation, the operator should be fully protected from exposure to radiation and use a dosimeter badge.
4. The **HFX90V** has been developed specially for diagnostic veterinary x-ray applications. It should not be used for other applications.
5. X-ray equipment should be operated only by individuals who have appropriate training and licenses.

	WARNING: This x-ray unit may be dangerous to patient and operator unless safe exposure factors, operating instructions and maintenance schedules are observed.
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6. Please take the following precautions during installation:
- Keep equipment dry.
 - Do not subject equipment to excessive atmospheric pressure, temperature, humidity, direct sunlight, dust, or air containing salt and sulphur.
 - Do not subject equipment to excessive vibration and/or shock during transportation, etc.
 - Do not store equipment under any adverse gaseous conditions.
 - Insure that the input electrical voltage, amperage and hertz are correct and the unit is properly grounded.
7. During operation, consult and/or develop a technique chart for appropriate anatomy, distance, and screen/film or digital imaging system speed.

8. After using the equipment:

- A) Remove cords carefully, if necessary.
- B) Keep equipment clean and dry.
- C) Store inside carrying case in cool, dry environment.

9. Maintenance

For proper maintenance, this schedule must be followed:

- A) Every 6 months
 - 1) Check the alignment of the collimator light field with the x-ray beam.
 - 2) Check the audible and visible exposure functions.
 - 3) Check to see that all bolts, screws and lock nuts are tight.
 - 4) Re-adjust the position of laser beams to be aligned with the central ray of the x-ray unit at the Source-to Image Distance (SID) you typically use.
- B) Every 2 years
 - 1) Replace the collimator bulb.



WARNING: TO INSTALLERS, SERVICE PERSONNEL, AND USERS OF X-RAY SYSTEMS RE EQUIPMENT MOUNTING SECURITY. When performing periodic maintenance, calibration, or changing of the components of an x-ray system, the person in charge should confirm whether all components and screws are properly connected and securely tightened. Continued use of loose components is dangerous and could cause further loosening, damage of screws and bolts, or mount failure which could result in HEAVY COMPONENTS FALLING DURING USE. The operator should report all loose system components to x-ray service personnel for immediate repair.

It is especially advised to check the security of the collimator mounting screws. This can be accomplished easily by grasping the collimator and attempting to move it in relation to the x-ray unit. The system should also be inspected for loose joints, not only between the collimator and tubehead/control, but other mounting areas as well.

2.0 INTRODUCTION

The **HF90V** is a constant potential portable x-ray device utilizing the latest high frequency inverter system. These x-ray units have the following features:

1. This x-ray unit is very easy to carry by hand because of its small size and lightweight.
2. A high frequency inverter with output greater than conventional models and constant x-ray tube voltage.
3. Output of kV and mA are corrected and stabilized by automatic feedback circuits.
4. Compared with conventional generators, the waveform can be more than 2.5 times as effective.
5. Focal spot size of x-ray tube is 0.8mm. Therefore, the quality of the resultant radiographs is better than x-ray taken by units with larger focal spots.
6. It is easy to select either exposure time or mAs on the display of the control panel.
7. The most recent kV and timer settings before the unit is turned off are stored for the next operation.
8. Five different technique setting can be stored in memory for quick recall on this x-ray unit.

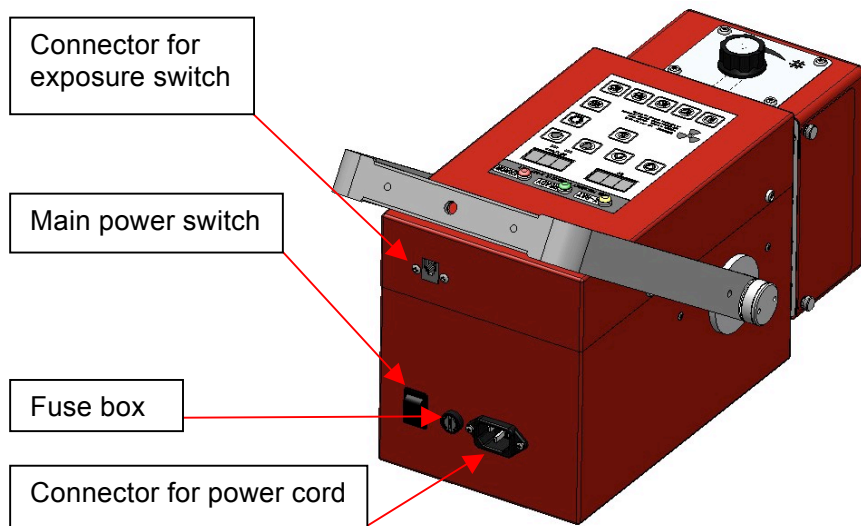
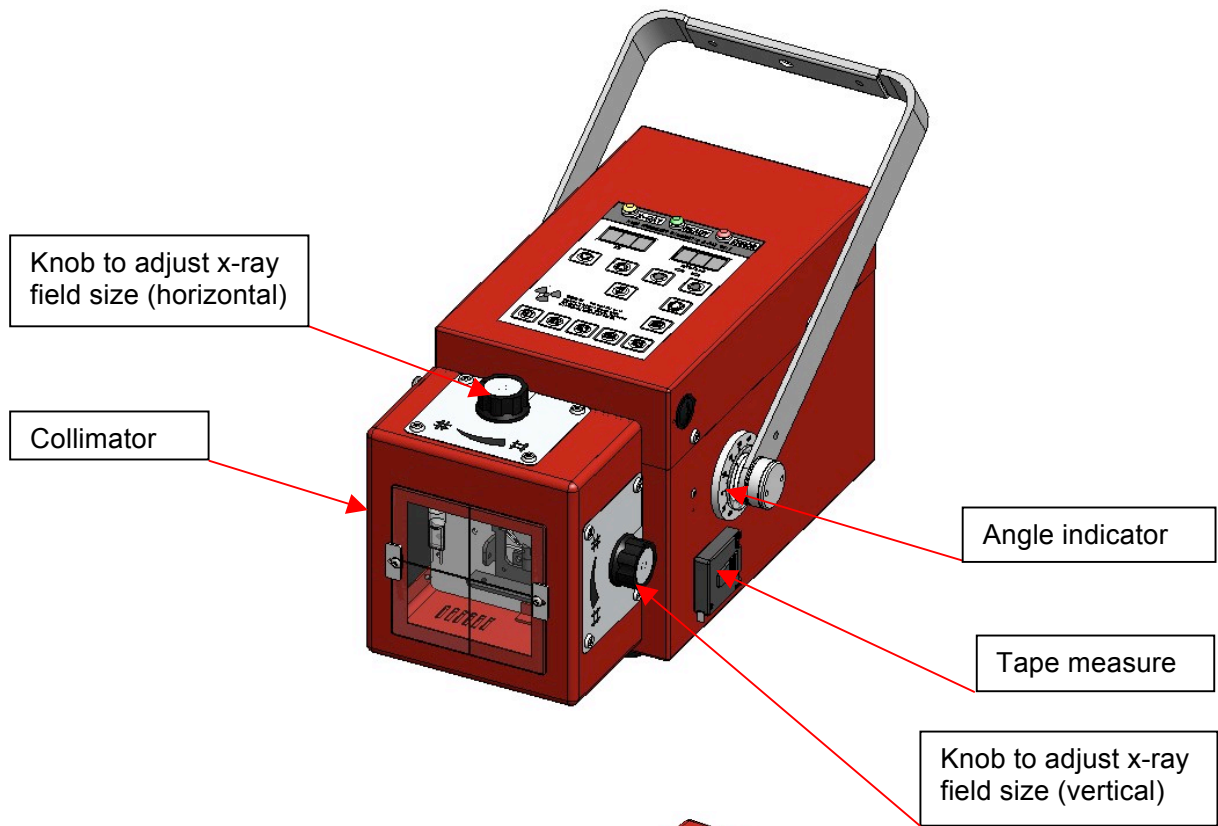


WARNING: As the **HF90V** uses high voltage, read this manual carefully prior to operation.

3.0 COMPONENTS

1.0 X-ray Equipment (HFX90V)	1 set	
2.0 Exposure switch assembly Exposure switch (HS-M1), Cord (MXSWC-C3.0)	1pc.	
3.0 Spare Fuse (250V/20A for 120V model, 250V/15A for 230V model)	2 pcs.	
4.0 Instruction Manual	1 pc.	
5.0 Power Cord	1 pc.	
6.0 Carrying Case (Optional)	1 pc.	
7.0 Warranty Sheet	1 pc.	
8.0 Technique Chart(s)	1 set	

4.0 MAIN PARTS OF *HFX90V*

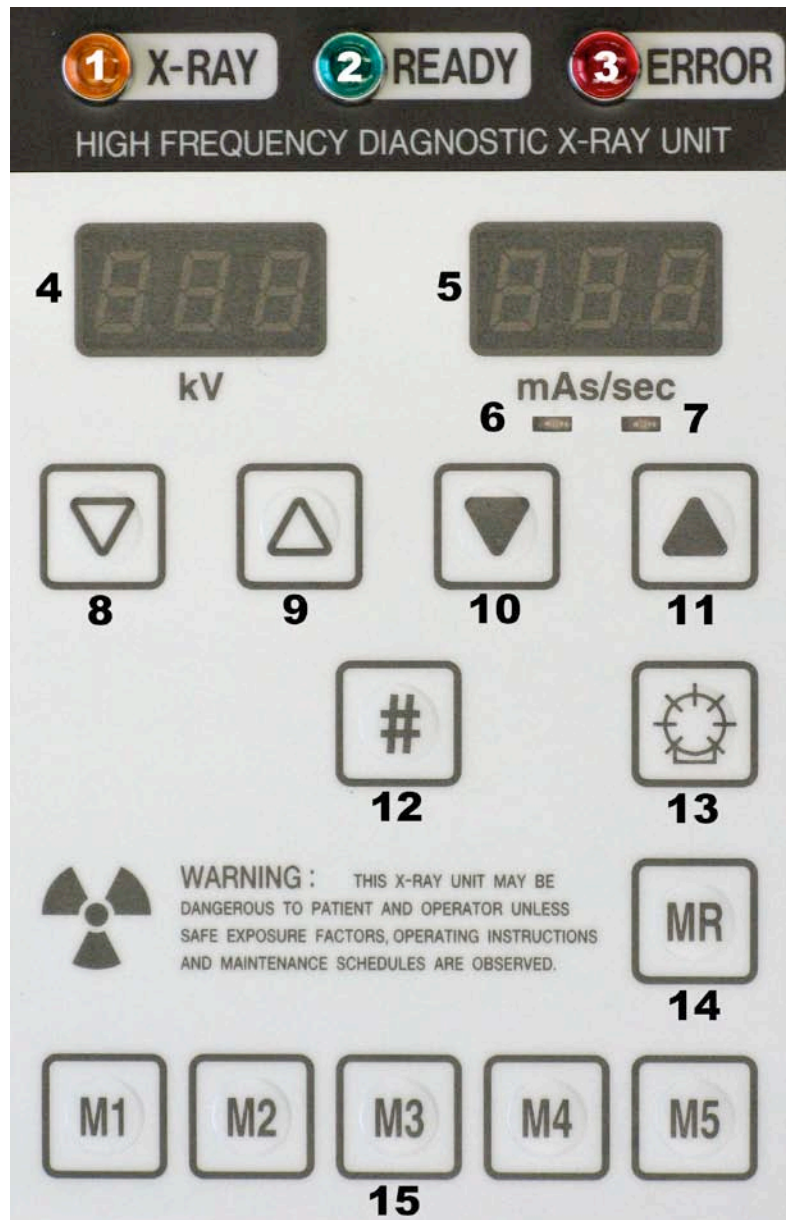


Exposure switch assembly



Power cord

5.0 CONTROL PANEL OF HFX90V



- | | |
|-----------------------------|--------------------------------------|
| 1. X-ray Indicator | 9. kV Adjustment Button (+) |
| 2. Ready Indicator | 10. mAs/sec Adjustment Button (-) |
| 3. Error Indicator | 11. mAs/sec Adjustment Button (+) |
| 4. kV Indicator | 12. Shift Button |
| 5. mAs/sec indicator | 13. Collimator light switch*) Page11 |
| 6. mAs Indicator | 14. Memory Storage Button*) Page13 |
| 7. sec Indicator | 15. Memory Recall Buttons (M1 to M5) |
| 8. kV Adjustment Button (-) | |

6.0 PRECAUTIONS IN USE

1. Power Supply

1-1. Please confirm the output voltage and amperage of the electrical circuit to which you will connect the x-ray unit. The recommended rating of the circuit is 20A (minimum) @ 120VAC, 15A (minimum) @ 230VAC.



CAUTION: Check the rating label on your unit and refer to THE SPECIFICATIONS to confirm the proper input voltage.



CAUTION: Please connect the **HFX90V** to a dedicated electrical circuit if possible. If other devices share the same circuit, the circuit breaker may trip during x-ray exposure.

1-2. Connect POWER CORD PLUG to a grounded electrical outlet.



WARNING: Do not operate if using an electrical outlet without proper ground. Otherwise, the operator may receive an electric shock.

2. Environmental Conditions for Use

Temperature:	+10°C to +40°C / 50°F to 104°F
Humidity:	30 – 75%, excluding condensation
Atmospheric Pressure:	700hPa to 1060hPa
Other:	Avoid using where explosive or corrosive gases are present.

3. Condition of this x-ray unit

Please check that there are no loose parts on the attachment of the collimator, the handle, and other parts of this x-ray unit.



WARNING: When parts are loose, components may fall and injure patient or operator. Please refer to NOTICE FOR SAFE OPERATION.

4. Care in using X-ray tube

In case the x-ray unit is not used for a while, seasoning is needed for the x-ray tube. After long storage, gas from the components of the x-ray tube may release into the tube, which may lead to abnormal discharges. To reduce exposure problems and prolong x-ray tube life span, perform these warm up procedures:



RADIATION HAZARD: Make sure the collimator is fully closed and no unnecessary people stand close to the x-ray unit.

4-1. If the **HFX90V** is idle more than one (1) week, perform the following procedures.

4-1-1. Set to minimum kV at 0.2 sec. Take 5 exposures at 12sec. each interval.

4-1-2. Set to maximum kV at 0.2 sec. Take 2 exposures at 12sec. each interval.

By following 4-1-1 & 4-1-2 warm up procedures, the x-ray unit can be kept in optimal operating condition.

4-2. On first time use of the x-ray unit, or if it is idle for more than one month, perform the following warm up procedures.


4-2-1. Set to minimum kV at 0.2 sec. Take 10 exposures at 12sec. each interval.

4-2-2. Set to 60kV at 0.2 sec. Take 10 exposures at 12sec. each interval.

4-2-3. Set to maximum kV at 0.2 sec. Take 5 exposures at 12sec. each interval.

By following 4-2-1~4-2-3 warm up procedures, the x-ray unit can be kept in optimal operating condition.

7.0 OPERATING PROCEDURES

	RADIATION HAZARD: During operation, insure that operator is fully protected from radiation.
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Connection


Connect POWER CORD and EXPOSURE SWITCH CORD to the x-ray unit. Connect POWER CORD PLUG to grounded electrical outlet of proper voltage, amperage, and hertz.


	CAUTION: Check <u>PRECAUTIONS IN USE</u> .
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Operation


1. Press MAIN POWER SWITCH on the rear panel to the on position. Each digital display on the control panel will illuminate. This x-ray unit is now ready to use.

	CAUTION: Do not switch the main power on and off quickly in a short time. When turning on again after turning off, wait for at least 1 minute. Otherwise the high frequency inverter cannot work properly.
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2. Select the kV output by pressing the kV Adjustment Button to choose the range of 50kV to 90kV, as desired. Increments are 2kV.
3. Set the exposure time for the view to be taken and the imaging medium used. Press the mAs/sec Adjustment Button to choose the exposure time between 0.02 and 2.00 second exposures.
4. Use the tape measure to position this x-ray unit at the proper SID for the image to be taken.
5. Turn on the collimator light by pressing the button  on the control panel. The light will remain on for approximately 30 seconds, and then automatically turn off. The shutters of the collimator can be adjusted at any time with the 2 knobs on the collimator. The size of radiation field will be projected only on the image receptor when the light is on.
6. Position the patient. Adjust the collimator position so the cross hair projected by the collimator light is aligned with the anatomical point and the center of the image receptor. Collimate the size of the light field so that it stays within the dimensions of the image receptor.
7. Radiography
 - A) Make sure that Error indicator is off.
 - B) Press and hold the first and second stage buttons together until the exposure has terminated.

	NOTE: The first stage pre-heats the filament of the x-ray tube. When this stage alone is depressed and the READY indicator will turn on after 2.0 seconds, the filament has been heated and the unit is ready to generate x-rays. The second stage initiates the x-ray exposure for the time set in the sec display. When the second stage is fully depressed, x-ray will be emitted, the X-RAY indicator will light, and an audible signal will be heard. This is a "dead man" exposure switch -- x-ray exposure will terminate
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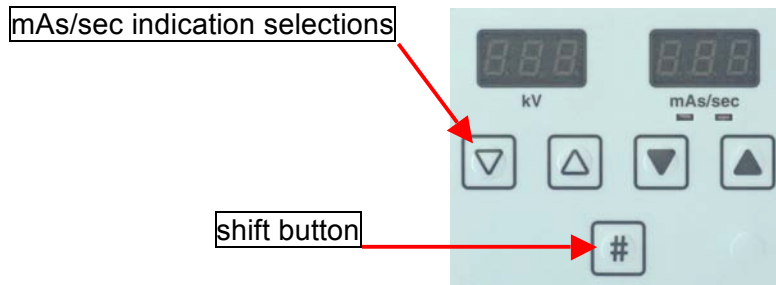
8. After each exposure, release the exposure buttons. This x-ray unit is now ready for the next exposure.

	CAUTION: To insure maximum life of x-ray tube and to avoid interruption of operation, do not exceed duty cycle of 1:60. (For example, 1 second exposure needs 60 second break.) Otherwise, heat may damage the x-ray tube.
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9. When you are finished using this x-ray unit, turn off the main power switch. All of the indicators on the control panel will turn off after several seconds.

mAs/sec indication selections

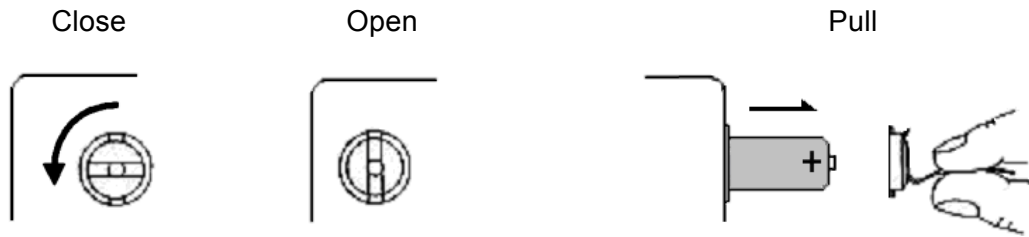
You can change the display on the control panel between mAs and sec (exposure time). Press and hold the Shift button **#** while pressing the Down Arrow **▽** below the kV indicator to alternate between mAs and sec indications. An indicator will illuminate below the window to show which technique factor is displayed.



Use of the Memory Storage features.

1. Five different technique settings can be stored in memory for quick recall on this x-ray unit. To store a technique setting, press the Memory Storage button MR then press Memory Recall button M1. This will store the technique setting displayed in memory position M1. Repeat this process for storing the different technique setting in M2-M5 as desired. Stored technique settings can be easily recalled by simply pressing M1-M5.
2. Memory Storage uses two (2) size AA alkaline batteries inside the Battery Compartment, located on the front side of the x-ray unit. Open the Battery Compartment using a coin, turning the compartment lid counterclockwise 90°. If there are no batteries in the Battery Compartment, use some adhesive tape to help you remove the compartment lid.

Insert two (2) size AA alkaline batteries in the Battery Compartment, with the + end toward the Battery Compartment lid. Reattach the Battery Compartment lid and lock it with a coin, turning it clockwise 90°.



8.0 ERROR INDICATION

ERROR Indicator

If the Error indicator is on, it means the power condition in use is bad or the unit may malfunction.

If the Error indicator is blinking after the exposure switch is released, it means exposure switch was released prematurely during an exposure before the full exposure had been completed for the time set.

If the Error indicator is on or blinking, follow the step of Troubleshooting.

9.0 TROUBLESHOOTING

This x-ray unit has self-diagnostic indications of failure or malfunction. If the following SYMPTOM is displayed, stop exposing and follow the CORRECTIVE ACTION described below. The unit may malfunction and x-ray cannot be generated.

SYMPTOM	CORRECTIVE ACTION
Error Indicator is on or blinking.	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the Red warning Indicator does not remain on, please check <u>Power Supply</u> in PRECAUTIONS IN USE (page 9) again. 3) If the Error Indicator remains on, contact your dealer for service.
Fuse is blown.	<ol style="list-style-type: none"> 1) Check <u>Power Supply</u> in PRECAUTIONS IN USE (page 9). 2) Turn off the main power switch.

	<ol style="list-style-type: none"> 3) Remove the power cord. 4) Open the fuse box in the ac inlet. 5) Remove defective fuses, and replace to new one. If it is difficult to remove defective fuses, use tools with tip sharpened. 6) If the fuse(s) is/are blown again, contact your dealer for service.
Exposure time Indicator displays "A".	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the "A" remain on, please contact your dealer for service.
Exposure time Indicator displays "C".	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the "C" remain on, please contact your dealer for service.
Exposure time Indicator displays "1".	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the "1" remain on, please contact your dealer for service.
Exposure time Indicator displays "ERR".	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the "ERR" remain on, please contact your dealer for service.
mAs indicator and sec indicator are both lit.	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the indicators remain on, please contact your dealer for service.
mAs indicator and sec indicator are lit alternately.	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the indicators remain on, please contact your dealer for service.
Control panel display does not illuminate.	<ol style="list-style-type: none"> 1) Turn off the main power switch, and turn on again after 60 or more seconds. 2) If the control panel display does not illuminate, contact your dealer for service.

10.0 SPECIFICATIONS for HFX90V

Rating

Nominal line voltage:	Single – phase, 120VAC, 50/60Hz(120V model) Single – phase, 220VAC – 250VAC, 50/60Hz(230V model)
Safe operating line voltage (on load):	Single – phase, 108VAC – 132VAC, 50/60Hz(120V model) Single – phase, 198VAC – 264VAC, 50/60Hz(230V model)
Line voltage regulation:	10.0%
Apparent resistance of supply mains:	0.2ohms @ 120VAC , 0.4ohms @ 230VAC
Maximum standby input current:	0.15A @ 120VAC 0.25A @ 230VAC
Maximum input current:	18A @ 70kVDC, 120VAC 10A @ 70kVDC, 230VAC
Line circuit breaker:	20A @ 120VAC , 15A @ 230VAC
Protection against electrical shock:	Type B Class 1
Mode of operation:	Continuous operation with intermittent loading
Duty cycle:	1:60 (one 0.2 second exposure every 12 seconds)
Degree of safety of application:	Equipment not suitable for use in the presence of a flammable

Fuse: anesthetic mixture with air or with oxygen or nitrous oxide
 20A @ 250VAC(120V model)
 15A @ 250VAC(230V model)

Beam limiting device

Model number: R-200V type: M01
 Manufacturer: Mikasa X-ray Co., Ltd.
 inherent filtration: 0.5mm Al

Dimensions And Accessories

Equipment size (X-ray Generator): W:219mm x H:191mm x L:370mm (8.62" x 7.52" x 14.57")
 Weight: 9.8kgs (21.7 lbs.)
 Exposure switch cord: HS-M1 (Two-stage, deadman with RJ11 connector)
 Size: 8 feet (2.44 meters)
 Detachable power cord: Connect to 3-wire systems, one wire grounded.
 16AWG up to 20 feet (6.1 meters)

Environmental Conditions For Use

Temperature: +10°C to +40°C (50°F to 104°F)
 Humidity: 30% to 75%, excluding condensation
 Atmospheric Pressure: 700hPa to 1060hPa
 Other: Avoid using where explosive or corrosive gases are present.

Environmental Conditions For transport and storage

Temperature: -40°C to +70°C
 Humidity: 10% to 100%
 Atmospheric Pressure: 500hPa to 1060hPa

X-ray Generator and X-ray tube

Generator

Generator system: 50kHz high frequency inverter system
 Electric power: 1.4kW @ 70kVDC, 20mA

Tube voltage: tolerance +/-10%
 range: 40kVDC – 90kVDC
 kV switch : 2kV step
 Tube current: tolerance +/-10%
 25mA @ 40kVDC – 50kVDC(0.02 to 0.1sec)
 20mA @ 52kVDC – 70kVDC(0.02 to 0.1sec)
 15mA @ 72kVDC – 90kVDC(0.02 to 0.1sec)

15mA @ 40kVDC – 50kVDC(0.11 to 2.0sec)
 12mA @ 52kVDC – 70kVDC(0.11 to 2.0sec)
 9mA @ 72kVDC – 90kVDC(0.11 to 2.0sec)

Exposure timer: tolerance +/- (10%+1msec)
 range: 0.02sec – 0.2sec : 0.01sec step
 0.2sec – 0.4sec : 0.02sec step
 0.4sec – 1.0sec : 0.05sec step
 1.0sec – 2.0sec : 0.10sec step

Leakage technique factors: 0.25mA @ 90kV
 0.25mA is maximum rated continuous current for 15mA with duty

cycle 1:60

Filtration:

inherent filtration: 2.8mmAl
total filtration: 3.3mmAl

X-ray tube

Model number:

XDT-S70

Manufacturer:

SNM Instruments Factory

Focal spot:

0.8mm

Target material:

tungsten

X-ray tube target angle:

19 degrees

X-ray tube inherent filtration:

at least 0.9mm Al

Anode heat storage capacity:

20kHU

Specifications subject to revision without notice.