

MIC-series™ 1 - 9 MeV Microtron high-energy X-ray source

The MIC-series is a modular system. The Control Console, Modulator and RF Unit are common to all model configurations. Only the X-Ray Head changes to match the application. The MIC-series is designed to easily fit both mobile and fixed installations.

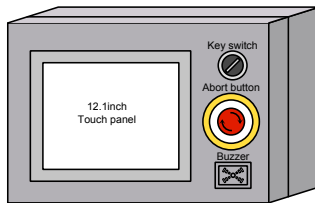
The MIC-series is offered in four basic models: MIC1, MIC2, MIC4, and MIC9.

Specifications

1.0 Standard Equipment and Services

1.1 Control Console

The standard control console is atouch screen display system. An optional desktop PC control console is available.



Touch Panel Control Console

1.2 X-Ray Head Low Leakage (0.1 %)

1.3 Compact RF Unit

1.4 Modulator/Power Distribution Cabinet

External signal interface

1.5 Temperature Control Unit (TCU)

The TCU is used to keep the system components at a nominal 30°C.

1.6 Standard Spare Parts Kit

The standard spare parts kit includes such as PC boards and individual components.

1.7 Interconnecting Cables and Hoses Included

1.8 Manuals and Data Books

Two sets of operator and maintenance manuals and data books are included.

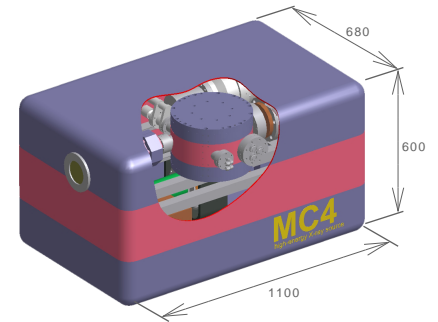
1.9 Installation Supervision and Start-up Assistance

1.10 One-year Warranty

2.0 Performance

2.1 X-ray Beam Quality

The X-ray beam quality is specified using Half Value Layer (HVL) in steel. This corresponds to the nominal X-ray energy shown in Table 1. These HVL numbers are derived from a compilation of broad beam data measurements.



MIC4 X-ray Head and RF Unit

2.2 X-ray Beam Dose Rate* (10 cm x 10 cm field)

The maximum continuous dose rate at 1 meter is listed in Table 1. (Without flattening filter.)

* Dose rate is reduced with flattening filter.

Table 1

Model	Nominal Energy (MeV)	HVL (mm)	Flatness (% @ ±7.5°)	Max. Dose Rate (Gy/min)
MIC1	.95	>17.6	>82.0	0.27
MIC2	2.0	-	>77.0	2.57
MIC4	3.5	-	>72.5	4.88
MIC6	5.5	-	>62.0	8.36
MIC9	9.0	-	>55.0	56.7

Note: Other energies are available including energy option

2.3 X-ray Field Size

A30° cone or 22.5° square defines the field. Also see section 4.1.

2.4 X-ray Beam Focal Spot Size

The focal spot size does not exceed 1.0 mm in diameter. Also see section 4.6.

2.5 X-ray Beam Symmetry

The beam asymmetry does not exceed 5% at ±7.5° off the central axis for all energies.

2.6 Radiographic Quality

The MIC-series system will demonstrate at least ASTM E 94 1-2T, or equivalent, sensitivity over the ranges given in Table 2 using film detection.

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Table 2

Model	Nominal Energy (MeV)	Range (mm)
MIC1	.95	-
MIC2	2.0	-
MIC4	3.5	35 - 200
MIC6	5.5	50 - 250
MIC9	9.0	75 - 380

2.7 Standard Leakage Radiation

The leakage radiation is specified along the horizontal axis at 1 meter from the beam centerline at angles 60° and greater, outside the primary beam. The values in Table 3 are a fraction of the primary beam central axis dose rate measured with a 10 cm x 10 cm collimator. Leakage is taken with the Primary Beam completely blocked. See section 4.2 for lower leakage options.

Table 3

Model	Leakage (fraction)
MIC1, MIC2, MIC4, MIC6, MIC9	1x10 ⁻³

Neutron shielding must be provided by the user when a microtron is operating at > 6.0 MeV energy. A 6.1 MeV electron beam may produce a worst case 1.0 x 10⁻⁵ rem of neutrons per X-ray rad in the primary beam. A 9.0 MeV electron beam may produce a worst case 1.0 x 10⁻⁴ rem of neutrons per X-ray rad in the primary beam.

3.0 Customer Facility Requirements

3.1 Electrical Requirements

3.1.1 The MIC-series operates from a single 15 kVA 50/60 Hz power source. Two voltage ranges are available.

3.1.1.1 Low Voltage Option

200 VAC, 3 phase, 3 or 4 wire plus ground, 60 Amp minimum surge per leg. ±10% voltage regulation is required.

3.1.1.2 High Voltage Option

400 VAC, 3 phase, 4 wire plus ground, 40 Amp minimum surge per leg. ±10% voltage regulation is required.

3.1.2 The TCU is connected to a common power source.

3.2 Operating Environment

3.2.1 Indoor Service

The operating environment for control console and modulator must be between 15°C and 30°C, with 70% maximum relative humidity (non-condensing).

3.2.2 Outdoor Service

Consult factory about outdoor use of the MIC-series.

3.2.3 Ventilation

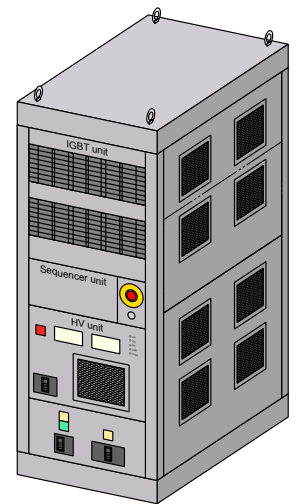
The approximate heat given to room air from each component with system operating at full power is given below:

X-Ray Head/RF Unit: 2.0 kW

Modulator cabinet: 5.0 kW

Temperature Control Unit: 5.0 kW

Touchscreen Control Console: Negligible



Modulator

4.0 Optional Equipment

4.1 Custom Beam Collimation

Nonstandard field sizes are available per customer's requirements. A motorized collimator is also available to quickly change the beam collimation.

4.2 Lower Leakage Options are listed in Table 4.

Table 4

Model	Leakage (fraction)	
	Super Low	Ultra Low
MIC1	2 x 10 ⁻⁵	2.5 x 10 ⁻⁶
MIC2	2 x 10 ⁻⁵	2.5 x 10 ⁻⁶
MIC4	2 x 10 ⁻⁵	2.5 x 10 ⁻⁶
MIC6	2 x 10 ⁻⁵	2.5 x 10 ⁻⁶
MIC9	2 x 10 ⁻⁵	2.5 x 10 ⁻⁶

4.3 Voltage Regulator

Recommended for installations where line power short-term fluctuations are greater than ±5%. A step-up or step-down transformer can also be ordered to adapt a non-standard voltage source for use with the MIC-series or TCU. The regulator is CE and UL approved.

