

# High Energy Radiography Solutions

Uncover hidden defects in High-Density Objects.  
Experience unparalleled operational reliability and  
ease of use with high safety standards.

## Product Range

- ▶ 0.9MeV–15MeV X-Ray Energy Range
- ▶ 0.25–120Gy/ min Dose Range
- ▶ 30–500mm (in steel) Thickness Range

For more than a decade, we have been delivering off-the-shelf and fully customized turnkey solutions to offer safe and dependable non-destructive testing capabilities for some of the country's most prestigious projects. Our high energy X-Ray solutions can be used to inspect critical parts in Aerospace, Defence, Energy and Automotive industries

Our high energy solutions include Varex make Linear Accelerators, digital detectors and imaging software for imaging with high energy sources, shielded enclosures for digital detectors and mechanical manipulators for the Linear accelerator, Digital detector and the objects.

## 9MeV/ 15MeV Linac System for Aerospace & Heavy Engineering Industries:

The K15 dual energy linear accelerator is used for inspection of rocket motors, solid propellants, castings and heavy engineering products. Applications include,

but are not limited to, detection of cracks, porosities, in-homogenities, inclusions, foreign bodies and other defects.



### LINAC Specification

Energy Range:	9 / 15MeV
Penetration in Steel:	Up to 500mm with 15MeV, Up to 380mm with 9MeV Energy
Focal Spot:	<2mm
Dose Rate:	15MeV - 40 - 120Gy/ min-m, 9MeV - 12 - 40Gy/ min-m
X-Ray Beam Symmetry:	Within $\pm 5\%$

Large object inspection is made easy with EOT crane mounted linac head manipulator. This enables inspection of the object from various angles for flaw detection. The system can be used for inspecting steel objects up to 500mm thickness and solid propellants up to 2500mm thickness.



# Digital Radiography with Linear Accelerators

High Energy Digital Radiography solutions are widely used in High Tech industries such as Space, Heavy Engineering, Electronics, and Defence. These applications require a full spectrum of inspection procedures that must examine large volumes and complex geometries for defect analysis.

We have combined linear accelerators with multi axis manipulators for our customers' imaging requirements. These systems offer real-time NDT inspection capability and are used for defect analysis in viscoelastic materials, metals and composites.

## DFPD Specification

- ▶ Operational Energy Range: 40kV - 16MeV
- ▶ Pixel Area (Active): 42.7x42.7cm
- ▶ Pixel Pitch: 139um
- ▶ Frame Rate: 04fps (1x1) & 15fps (2x2)

## Object Details

Cylindrical shape object up to 500mm diameter, length up to 3500mm, and a maximum weight of 500kgs (Can be Customized)

## Defect Analysis

- ▶ Identify defects and voids
- ▶ Porosity details with measurement
- ▶ Foreign body objects identification

## Radiography Quality

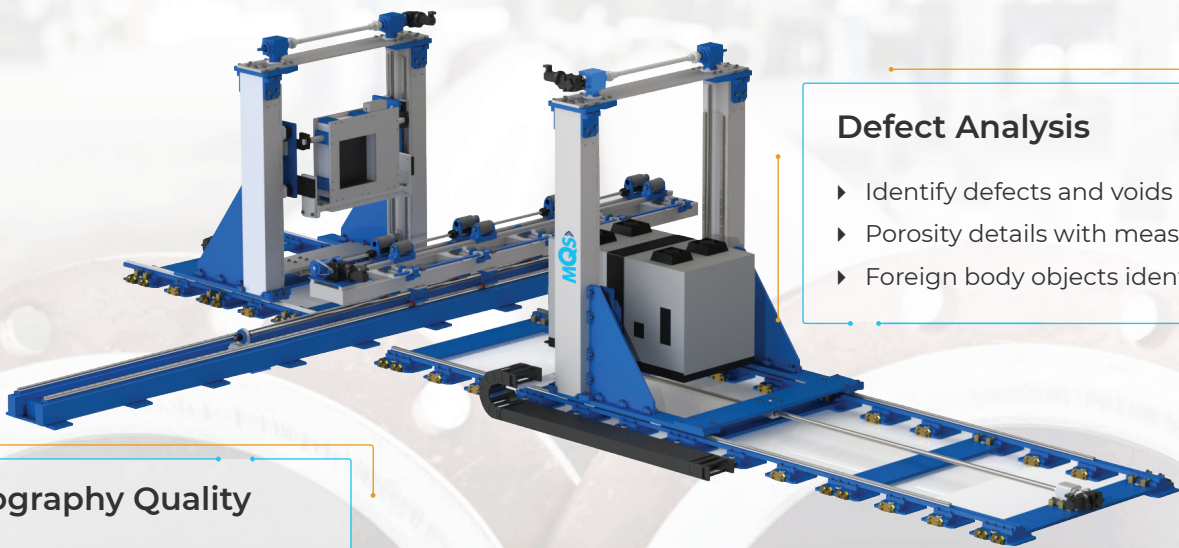
1-2T or better for 50-250mm steel  
(ASTM-E-94)

## Manipulator Mechanism

Seven axis manipulator designed for real-time inspection of solid propellants. Also, included is a rotary table fixture for inspection of small cylindrical objects.

## System Configuration

Complete system consists of a high energy linear accelerator, flat panel detector, manipulator and a control unit that can be operated remotely from outside the inspection room.

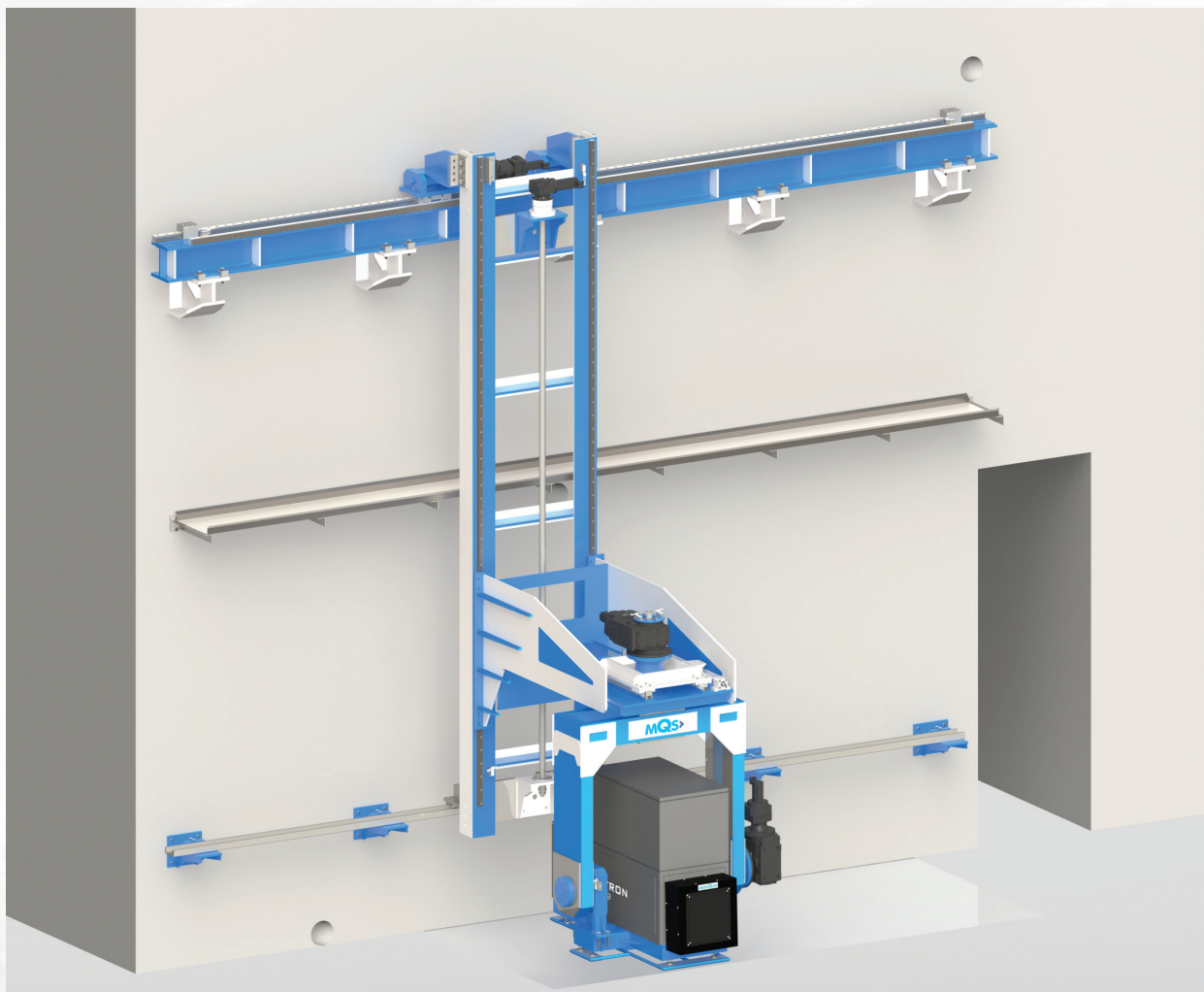


# Heavy Engineering Radiography Solutions

Wall mount manipulators are a perfect solution for applications wherein space is a constraint. These wall mounted units can be designed for holding up to a 15MeV X-ray head and is an optimum choice for space saving inspection solutions.

The manipulator's mainframe is designed for movement along long travel axis, hoist (up and down), magnification, tilt and rotation axes along with precise movements for high accuracy inspection requirements. Such systems find wide applications in the casting and foundry industries and can be used with both film and digital radiography systems.

The system is suitable for inspection of an object size of 3 x 5 m (height X diameter). A rotation and tilt angle of  $\pm 60^\circ$  with  $0.1^\circ$  stepper accuracy provides an extra provision for inspecting the object from multiple angles.



5 axis manipulator supplied to a casting industry and being used with a 9MeV linear accelerator



# MQHCT Series High Energy Computed Tomography Solutions

High energy Computed Tomography (CT), the most advanced radiography application, helps produce stunningly detailed internal imagery for large, highly intricate parts in near-micron resolutions.

Our High Energy CT solutions empower you to inspect complex parts with unmatched precision and speed.

Choose from a range of energies depending on your application, and simplify the process of inspecting heavy, dense, and delicate materials at your facilities. Customize your CT High Energy solution with our multi-axial manipulators, linear accelerators, digital flat panel detectors and imaging software.

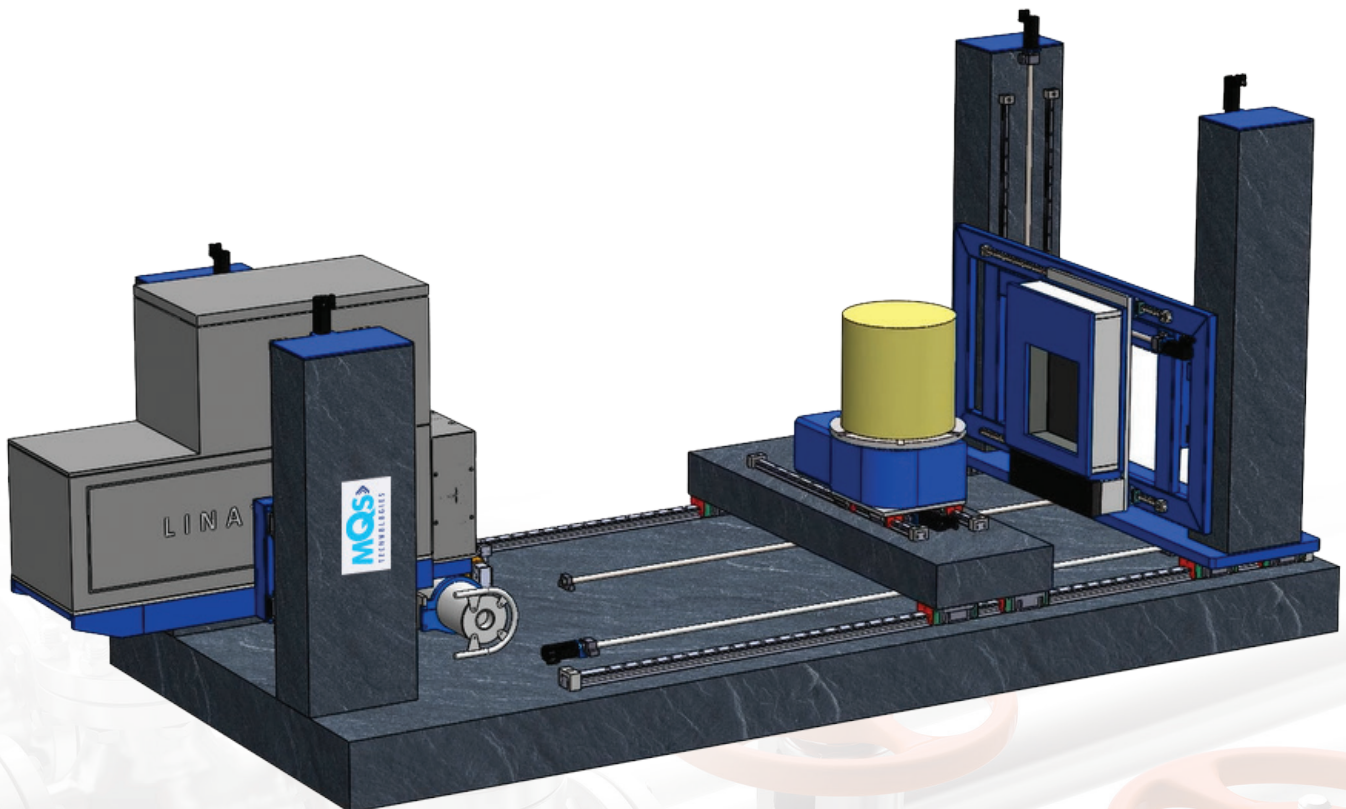
**A typical System Consists of - X-Ray Source:** Dual Energy Linatron with an additional option of a Dual Focus 450kV Industrial X-Ray system.

**Imaging System:** Digital flat panel detector suitable for energy ranges up to 16MeV with an additional option of a line detector.

**Handling Systems:** Custom built Multi axial manipulators for X-Ray tube, flat panel and object.

**Imaging Software:** MQS Imaging Suite for image acquisition and system control, VG Studio Max for image reconstruction, visualisation and analysis and Varex CBCT tools for image enhancement.

**Control Station:** Control unit, Operator workstation and Image Visualisation workstation.



Dual head multi energy CT system for digital radiography applications

## Available Product Range for Linear Accelerators

Model	Nominal Energy	Max Dose Rate	Thickness Range (in steel)
M1	0.95MeV	0.25Gy/ min	30 - 105mm
M3A	1MeV	0.25Gy/ min	30 - 105mm
	2MeV	2Gy/ min	35 - 160mm
	3MeV	3Gy/ min	35 - 210mm
M6A	3.5MeV	2.5Gy/ min	35 - 210mm
	5MeV	5Gy/ min	40 - 235mm
	6MeV	8Gy/ min	45 - 270mm
M9A	5MeV	6Gy/ min	40 - 235mm
	6MeV	8Gy/ min	45 - 270mm
	9MeV	30Gy/ min	70 - 380mm
K15	9MeV	36Gy/ min	70 - 380mm
	15MeV	120Gy/ min	200 - 500mm

*\*Thickness range mentioned is the nominal range*

- ▶ Focal Spot Size – measured using Full Width Half Max method and does and exceed 2.0mm
- ▶ Field Flatness – measured at 1 meter from target at  $\pm 7.5^\circ$  off the central axis
- ▶ Small Focal Spot 1.0 to 1.5mm available for the Mi-9 only. Maximum dose rate may be reduces. Less than 1.0mm available at further dose reduction
- ▶ Field Symmetry – beam asymmetry is measured at 1meter from target and does not exceed 5%
- ▶ Shielding for Low Leakage 1.0x10.3 (fraction)
- ▶ An internally mounted single spot laser is available to align the X-Ray beam to an object being radiographed. Not available with ULLP leakage option. Laser is 533nm, Class II, 0.5Mw.

All Linac models from Varex Imaging Corporation are designed and manufactured in accordance with the Electro-magnetic Compatibility Directive89/ 336/ EEC and Low Voltage Directive 73/ 23/ EEC.

# LINACs are Being used Successfully Worldwide for the Inspection of:

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## APPLICATIONS

- ▶ Castings
- ▶ Solid Propellants
- ▶ Rocket Motor Bodies
- ▶ Weldments
- ▶ Warhead Munitions
- ▶ Ammunition
- ▶ Cargo
- ▶ Ship Body
- ▶ Aircraft Body
- ▶ Valves
- ▶ Pressure Vessels
- ▶ Engine Blocks
- ▶ Composites



For designing a customised high energy X-ray for your inspection needs,  
**call or write to us**

## Our Clients



## About MQS Technologies

MQS Technologies (formerly MedeQuip Services) is a diversified firm with Design, manufacturing & maintenance capabilities that offers custom solutions for engineering & healthcare applications.

Focused on three business lines - Non-Destructive Testing, Aerospace & Defense and Healthcare, our USP lies in leveraging decades of multidisciplinary expertise in electronics, electro-mechanical, mechanical and software domains, to provide user-friendly products and services for a wide range of industries.

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