

# AT300 X-ray Calibration System



AT300

X-ray calibration system is designed to calibrate and test standards and measurement instruments in units of air kerma and air kerma rate, ambient dose equivalent and ambient dose equivalent rate, individual dose equivalent and individual dose equivalent rate, directional dose equivalent and directed dose equivalent rate of X-ray radiation.

## Operating principle

The system is based on industrial X-ray units with metal-ceramic tubes.

The system implements irradiation configuration with fixed irradiator and calibration bench with 3-way travelling platform.

The set of generated radiation qualities is determined by X-ray unit parameters and filter settings. The size of irradiation field can be changed by varying the "focus-detector" distance and/or diameter of diaphragm. Automatic functions of field shaper and bench are remotely controlled from operator's room.

## Modifications:

**AT300, AT300/1, AT300/2**

## Application

Metrology ensuring for X-ray dosimetry:

- Checking tests and calibration in metrology service facilities
- Calibration procedures in Secondary Standard Dosimeter Laboratories (SSDL)
- Calibration of measurement instruments in the process of development, manufacturing and production
- Applied metrology

## Features

- Capability to work with one or two X-ray sources in one system
- Fields of X-ray radiation are generated according to requirements of ISO 4037, IEC 61267, CCRI and etc.
- Remote controlled shutter and filters carousel
- Replaceable disks with 11 slots for filters in each
- Three exit diaphragms are easy replaceable without disassembling
- Program 3-way control of working table positioning in automatic or manual modes with an option to restore the memorised position
- System controlled by means of personal computer and operator panel with automated calibration functions
- Laser alignment system and calibrated gouge bars provide detector alignment in easy way
- Reading instrument display during calibration with video system
- Alarm and interlocks system for safety control
- Radiation environment control in working chamber and adjacent premises
- Video surveillance of working chamber room
- Safe braking and travel limiting functions for traveling platform
- Uninterruptible power supply
- Layout design and calculation of radiation protection parameters applicable to client's premises



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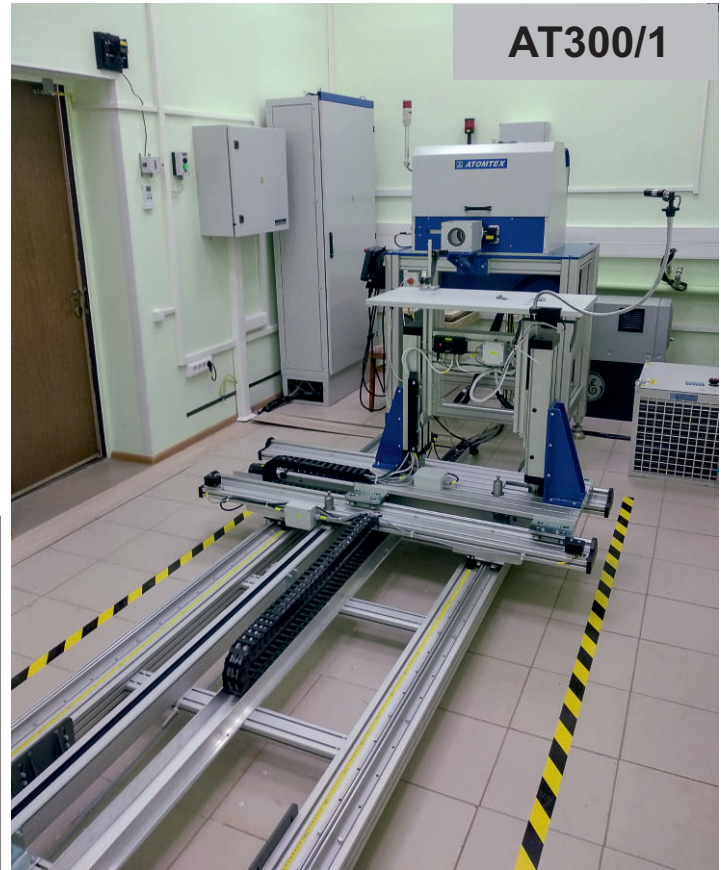
Ionizing radiations  
detectors and  
instruments

# AT300 X-ray Calibration System

The source of X-ray radiation is a highly stabilized industrial X-Ray generator ISOVOLT TITAN E with metal-ceramic X-Ray tubes

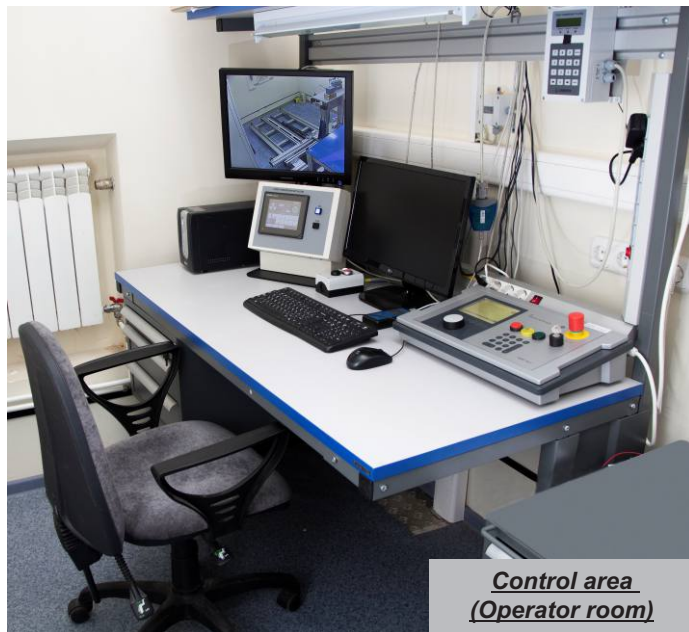
## Key features of ISOVOLT Titan series:

- High stability
- High accuracy of preset parameters
- Minimal pulsations
- Smart training of X-ray tube
- Large LCD display
- Friendly text messages in sixteen languages
- Strong and rugged construction
- Time-proved reliability
- Systems integration over RS232C interface. Options: Rs422 or RS 485 / Profibus (EN 50170) / Ethernet
- Remote control up to 100 m



	AT300	AT300/1	AT300/2
Type of X-ray unit*	ISOVOLT Titan E 320	ISOVOLT Titan E 225	ISOVOLT Titan E 160
X-ray tube type	ISOVOLT 320 M2/4.5-13	ISOVOLT 225 M2/0.4-3.0	ISOVOLT 160 M2/0.4-3.0
Anode voltage range	5 – 320 kV	5 – 225 kV	5 – 160 kV
Filtration of X-ray tube	< 4 mm Be	< 1 mm Be	< 1 mm Be

\*It is allowed to use another type of X-ray machine with the same or better technical characteristics and metrological performance



Radiation quality name	Radiation quality feature*		
	AT300	AT300/1	AT300/2
Radiation quality according to ISO 4037-1			
L-series	L-35 – L-240	L-30 – L-210	L-30 – L-125
N-series	N-40 – N-300	N-15 – N-200	N-15 – N-150
H-series	H-80 – H-300	H-30 – H-200	H-30 – H-150
Radiation quality according to ISO 61267			
RQR	RQR2 – RQR10	RQR2 – RQR10	RQR2 – RQR10
RQA	RQA2 – RQA10	RQA2 – RQA10	RQA2 – RQA10
RQT	RQT8 – RQT10	RQT8 – RQT10	RQT8 – RQT10
Radiation quality for mammography			
WMV		WMV 20 – WMV 50	WMV 20 – WMV 50
WAV		WAV 20 – WAV 50	WAV 20 – WAV 50

\* The user has the feasibility to generate other necessary beam qualities and use it hem in the facility after the calibration.

Specifications	Rated range limits*		
	AT300	AT300/1	AT300/2
Air kerma rate	$2 \cdot 10^{-8} - 2 \cdot 10^{-2}$ Gy/s	$2 \cdot 10^{-8} - 1.5 \cdot 10^{-2}$ Gy/s	$2 \cdot 10^{-8} - 1.5 \cdot 10^{-2}$ Gy/s
Air kerma	$2.8 \cdot 10^{-7} - 20$ Gy	$2.5 \cdot 10^{-7} - 15$ Gy	$3.5 \cdot 10^{-7} - 15$ Gy
Ambient, individual and directional dose equivalent rate	$2.7 \cdot 10^{-8} - 3.2 \cdot 10^{-3}$ Sv/s	$2.7 \cdot 10^{-8} - 3.2 \cdot 10^{-3}$ Sv/s	$5.3 \cdot 10^{-8} - 3.2 \cdot 10^{-3}$ Sv/s
Ambient, individual and directional dose equivalent	$3.3 \cdot 10^{-7} - 3.2$ Sv	$3.3 \cdot 10^{-7} - 3.2$ Sv	$5.2 \cdot 10^{-7} - 3.2$ Sv
Intrinsic relative error for certification as a working standard of 1-st category	±3% (for air kerma and air kerma rate) ±5% (for ambient, individual and directional dose equivalent and their rates)		

\* Actual values of range limits are determined by calibration.

# AT300 X-ray Calibration System

## X-ray beam shaper

This is a stand-alone equipment with a possibility of system integration.

The construction provides centering of X-ray shaper parts to ensure beam straightness and minimize the penumbra effect.

The filter assembly includes remote controlled carousel with interchangeable disks, each of which contains up to 11 filters

A bay for additional filters with maximum thickness up to 50 mm. is located after the filters assembly on the X-ray axis

There is a protected from leakage radiation slot to mount a monitor chamber in radiation beam.

The shutter closes the X-ray beam and attenuates it in more than 1000 times. The shutter closes/opens in less than 0.1 s.

The diameter of X-ray field at the distance of 2500 mm is not less than 400 mm (300 mm when the non-uniformity is  $\leq \pm 3\%$ ).

The set of lasers is used for the beam axis indication.

## Position control system

The calibration bench provides the following functionality:

- Operation of one or two X-ray irradiators mounted on the bench table.
- Automatic positioning of the working table in X, Y and Z axis and storing the position data into the memory.
- Arrangement of standard and calibrated measurement instruments on the working table and control their position in X-ray beams.

Travel reproducibility of the working table for:

- Longitudinal (along X axis)  $\leq 0.02$  mm
- Transverse (along Y axis)  $\leq 0.05$  mm
- Vertical (along Z axis)  $\leq 0.05$  mm.

Minimum travel step resolution of the working table for:

- Longitudinal (along X axis) Not above 0.005 mm
- Transverse (along Y axis) Not above 0.01 mm
- Vertical (along Z axis) Not above 0.01 mm.

The height of radiation beam axis above floor level is (1250 + 120) mm.

Travel range of working table:

- Along radiation beam axis (X axis) from **0 to 2300 mm**
- Across radiation beam axis:
  - In horizontal direction (Y axis) from **0 to 1120 mm** (to 670 mm in the version of position control system with a single irradiator)
  - In vertical direction (Z axis) from **0 to 200 mm**
- Around vertical axis 360° with 15° increments (Using a turntable)

## Complete set

- The ISOVOLT industrial X-ray machine \*, including high-voltage generator, X-ray metal-ceramic radiating tube, cooling system, installation kit, spare parts set and high-voltage bleeder (if anode voltage calibration is required)
- Position control system:
  - Positioning assembly
  - Control unit
  - Operator panel
  - Push-button station
  - Alarm unit
  - Uninterrupted power supply unit
  - Cable kit
  - Installation kit
  - Spare parts kit
- X-ray beam shaper
  - Irradiator with the base, tube mount, shutter, replaceable discs drive, replaceable diaphragms assembly unit, protective enclosure and signal column
  - Control unit
  - Remote control
  - Accessories kit
  - Cable kit
  - Spare parts kit
- Video surveillance system for measurements
- Video surveillance system
- Junction box
- Laser aiming system
- AT2327 Alarm dosimeter
- Monitor-chamber with AT5350/1 Standard dosimeter
- Two-channel temperature probe
- Filters set
- Accessories set
- Tools set
- Personal computer
- Cable set
- Installation kit
- Spare part kit

The facility complies with: GOST 8.087-2000, Safety requirements of IEC 61010-1:2010, EMC requirements of EN 55011:2009, IEC 61000-4-2:2008, IEC 61000-4-3:2008, IEC 61000-4-4:2004, IEC 61000-4-5:2005, IEC 61000-4-6:2008, IEC 61000-4-11:2004

\* Purchased by customer

Design and specifications are subject to change without notice



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