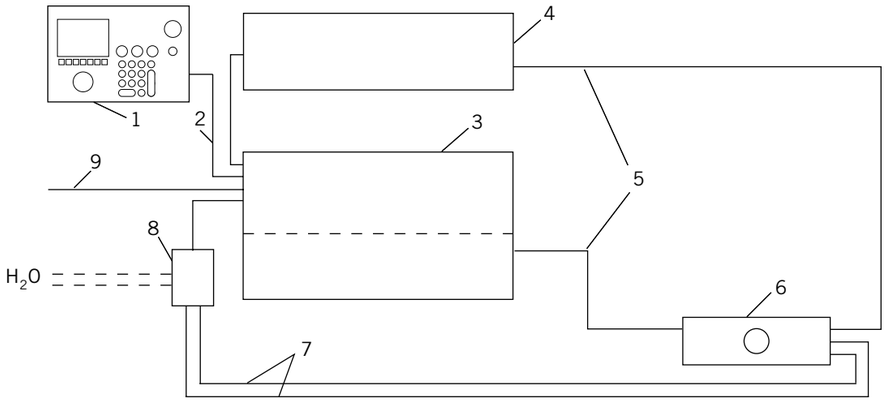
Configuration of Equipment Components



Standard Delivery Scope

(1) 1 Control module ISOVOLT TITAN in desktop housing (optional 19“ rack mount)

(2) 1 Connecting cable control/power stage, standard length 10 m (max. approx. 100 m) / 32 ft (max. approx. 320 ft)

(3) 1 High voltage generator, 225 kV cathode, with integrated power module TITAN

(4) 1 High voltage generator, 225 kV anode, incl. connecting cable

(5) 2 High voltage cables 225 kV, standard length 5 m (max. 20 m) / 16 ft (max. 64 ft)

(6) 1 Bipolar X-ray tubehousing, see separate product information

(7) 2 Cooling oil hoses, standard length 6 m (max. 20 m) / 19 ft (max. 64 ft)

(8) 1 Oilcooling pump, see separate product information

(9) 1 Mains connecting cable, standard length 10 m / 32 ft, with wire end ferrules

Input and output connections

- RS 232C interface for connection of machine controls etc., as per customer specifications, as well as modem and printer
- Interlock as per DIN 54113
- Interlock as per United States Radiation Control Act of 1968, § 1020.40
- Additional warning output that is active during pre-warning time
- External START/STOP
- External EMERGENCY-STOP
- Cooling system
- External warning flash lamp (fail-safe)
- “Mains ON” (230V / 2 A [2])
- “High Voltage ON” (230V / 2 A [2])
- Potential-free contact, for “Mains ON” (60V AC / 75V DC [1]/ 2 A)
- Potential-free contact, for “Pre-warning Time ON” (30V AC / 36V DC [1]/ 2 A)
- Potential-free contact, for “High Voltage ON” (60V AC / 75V DC [1]/ 2 A)

1) This voltage corresponds to the max. operating voltage (rating as per VDE 0110 Group B)
2) These 230 V contacts are collectively fused with 2.5 A

GEIT-30144GB (12/04)

GE Inspection Technologies X-ray

ISOVOLT TITAN 450

High Stability Industrial X-ray Equipment for Radiographic and Radioscopic Materials Inspection

Features

- Single or three phase mains available
- High Stability
- High accuracy
- Precise reproducibility
- Extremely low ripple
- High dose rate output
- Intelligent X-ray tube warm-up
- Large-size LCD display
- Clear text messages in up to 16 languages
- Rotary control (kV, mA)
- Rugged and reliable design
- Proven reliability
- Full on-site maintainability
- Local and remote diagnostics
- Systems Integration via standard RS 232C
  optional: RS 422 or RS 485 / Profibus (EN 50170)
- Remote operation up to 100 m (300 ft)
- CE compliant

Available tubehousings in accordance to application

Radiography	420 / 10	450 / 10		
Radioscopy			420 / 5	450 / 5

GE imagination at work

Control Module

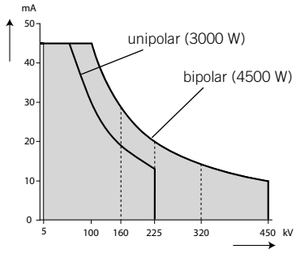
The control module is designed for ease of operation providing messages in 16 languages. Input of parameters are entered by keypad or rotary control, with set and actual values displayed on a clear text LCD readout. Upon shut-down previous operation parameters are stored and recalled automatically upon next switch-on. Alternatively the TITAN Series can be integrated into any X-ray inspection system control by remote PC interface with optional WINHS remote control program.

High Voltage Generator

The high voltage generators features:

- Rugged oil-insulated high voltage components
- SMD technology and advanced IGBT power electronics in compact design
- Complete on-site maintainability
- Stackable components minimizes the required floor space

Maximal operation data range of ISOVOLT TITAN high voltage generators is shown below:



The actual possible tube current is determined by the limits of the X-ray tube used (max. focal spot load and max. filament current).

Cooling System

The cooling oil temperature and flow rate are constantly monitored to ensure protection of the X-ray tube. Upon shut-down the cooler will automatically continue for a set time to prevent heat accumulation and to extend X-ray tube life.

Remark: In case of water re-cooled oil cooler, cooling water has to be provided by the customer.

Modes of Operation

- Constant Current Mode

  The X-ray tube is operated at the values preset for voltage, current and - if necessary - exposure time.

- Constant Wattage Mode

  The X-ray tube is operated at the values preset for voltage and - if necessary -exposure time. The tube current is automatically set at the maximum value which the tube output permits with a given high voltage.

- Programmed Mode

  This mode constitutes a considerable help in frequently recurrent inspection tasks. The possibility of wrong entries is reduced to a minimum. The operator calls up all X-ray parameters via a program number. For each program the parameters set for tube voltage, tube current, exposure time, focal spot size and tube type are stored by a number.

Intelligent Automatic Tube Warm-up

X-ray tubes require warm up to reach desired operating values and ensure long life. The unique built-in real time clock tracks the operating history and calculates appropriate warm-up cycle reflecting idle time and previous operational values.

Safety and Protective Devices

- Comprehensive safety devices are designed to meet international standards
- Automatic switch-off upon X-ray-On lamp failure
- Dual high voltage contactors with redundancy monitoring
- EMERGENCY-STOP lock down push button
- Two independent external safety circuits (e.g. door interlock)
- Radiation safety interlock (DIN 54113) or primary interlock (US CFR 1020.40)
- Adjustable pre-warning time
- Key switch protection inhibiting unauthorized operation

For the protection of all components including X-ray tube the following are continuously monitored and will shut down in the event of:

- Over and undervoltage (absolute and relative)
- Over and undercurrent (absolute and relative)
- Over power (wattage control)
- Over temperature and low flow rate in cooling circuit
- Over temperature in high voltage generator or power electronics

Service and Maintenance

For efficient service and maintenance, built-in diagnostics are provided locally or via remote access.

128 sets of previous operation parameters and events plus 128 warm-up cycles are stored for historical analysis.

Technical Data

High Voltage Generator

Maximum output voltage	-225 kV (cathode), +225 kV (anode)
Maximum output current	45 mA
Maximum output power	3 kW each (cathode, anode), limited by tube specification
High voltage ripple	12 V/mA (with high voltage cable 10 m), 40 kHz
Insulation	oil
Housing dimensions (anode)	350 x 870 x 620 mm (WxDxH) / 13.8 x 34.3 x 24.4 inch (WxDxH)
Housing dimensions (cathode)	350 x 870 x 850 mm (WxDxH) / 13.8 x 34.3 x 33.5 inch (WxDxH)
Weight (anode)	123 kg / 272 lbs
Weight (cathode)	189 kg / 417 lbs, including power module

Tube Voltage

Preselection and setting	from 5 to 450 kV in 0.1 kV increments
Digital display of set and actual values	simultaneous 4 digits each
Display resolution	0.1 kV
Accuracy	< ± 1%
Reproducibility	± 0.01% at constant temperature level
Temperature drift	< 65 ppm/°C

Tube Current

Preselection and setting	from 0.1 to 45 mA in 0.1 mA increments
Digital display of set and actual values	simultaneous 3 digits each
Actual value display	digital, 3 digits
Display resolution	0.1 mA
Accuracy	± 1%
Reproducibility	± 0.01% at constant temperature level
Temperature drift	< 65 ppm/°C

Exposure Time

The equipment has one programmable timer with a non-volatile memory.

Preselection and setting	from 0.1 to 99.9 minutes in 0.1 min increments or from 1 to 999 sec in 1 sec increments or continuous
Digital display of set and actual values	the remaining time is displayed, i.e. after a mains failure exposure can be continued without any time error.

Prewarning Time

Preselection and setting	digital setting from 2 to 250 seconds or de-activated
Programmed Mode	
Number of storable programs	250
Warm-up	automatic intelligent tube conditioning
X-ray tube setup	menu selectable tube parameters

Control Module

Dimensions	460 x 270 x 100 mm (WxDxH) / 18.1 x 10.6 x 3.9 inch (WxDxH), built into desk housing
Weight	4.9 kg / 10.8 lbs including desk housing

Connected Loads

Power connection	**1N PE 230 V ± 10%, 50/60 Hz**
or	**3N PE 400/230 V ± 10%, 50/60 Hz**, 3-phase, grounded neutral, TN-S or TN-C-S mains (star connected system, optional 3-phase isolation transformer)
Grounding	Separate grounding for X-ray tube and high voltage generator (minimum 6 mm²)
Mains fuses	63 A (1N PE) or 16 A (3N PE) time-delay fuses, customer-supplied