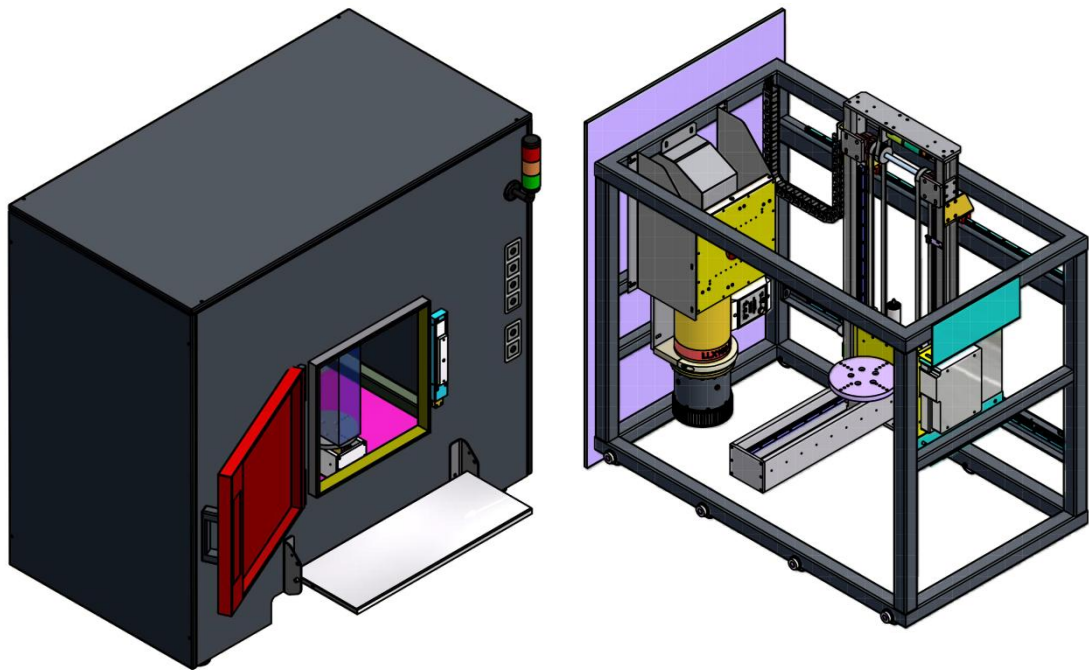


AIS 958



OPERATING MANUAL

1 Introduction

1.1 Message to Customer

We are proud that you have selected and bought one of our products for your Industrial application. This product has been built according to our highest quality standard and material quality. We have designed it in a way that is the most friendly and intuitive to the user as we always care about your safety and comfort.

Feel free in commenting our job and in bringing back your input to help us building the next generation of products, improving existing ones or their conformance to your industrial needs.

In this Operating Manual, we have compiled all data available about the product, its service and main uses. We have also added images, schematics and graphs to ease the reading and facilitate the learning.

Please read the following pages to fully understand all aspects of the driving software, operations and cares to your unit as this will assure you having an extended service life. On the safety side, a careful read is absolutely necessary because of the importance of operating the unit safely for yourself but also for neighbouring activities.

Copy requests, modifications or additional Commercial data about this manual may be directed to the Marketing Department (marketing@balteau-ndt.com).



1.2 Manufacturing program

Located and manufacturing equipment and accessories in Belgium since 1906, Balteau NDT is a world class leading company providing X-Ray solutions to various fields of the Industry. From 1kV to 450kV, our range of product is made of Portable, Mobile and Stationary units, Crawlers, Systems and Digital Solutions which are providing the broader offer to industry from a single source manufacturer.

Balteau NDT is indeed active across many different sectors:

- Oil & gas
- Energy
- Transports (automotive, rail, shipping)
- Aeronautic, Aerospace
- Military
- Bio-medical
- Misc. non NDT (Research, Art, ...)

Our range of product is also completed by tailor made solutions to meet your individual requirements addressed to our highly qualified staff of engineers including real time systems, image processing and automatic defects analysis systems.

BALTEAU is known all over the world with specific trade names and original applications solutions,

- **BALTOSPOT series** (Portable units): CERAM, LLX, GF
The portable units by excellence for fields like oil & gas, aeronautic/aerospace and mobile inspection work in general metallic or non metallic...
- **BALTOGRAPH series** (Mobile, High Power and versatile units): XSD, XMD, CLD
Dedicated to fabrication workshop, mobile units can be moved to the site when the application cannot be moved to the equipment while some equipment are specially dedicated to fixed installations and systems...
- **BALTOMATIC series** (Systems and related real time solutions)
Developed as Solutions providers, Systems can serve different industries, from Pipe manufacture to casting including Aerospace and research applications...

Our website www.balteau.com will provide you with more information and will certainly make you discovering how our company can answer your existing or/and future needs.

Our complete range is however too wide to be shown entirely on web pages, therefore, shouldn't you find the brochure or document you look for, or when you have specific requirements, please contact our Sales staff (sales@balteau.com) or Marketing Department (marketing@balteau.com).

1.3 Warranty & after sales

Your equipment is generally covered by a limited 1 year guarantee which exact terms are part of the Sales conditions of your purchase. Terms and conditions specified in our specific Sales contract are supplementing this general rule.

To get benefice of your guarantee, conditions are applying and a specific procedure has to be followed when communicating with Balteau or your After Sales service Centre if such a Service has been officially appointed in your region.

Any works operated through unauthorized service centres, local repairs attempts without precise and written indications from BNDT will void the guarantee conditions.

Service operations and warranty applications may be delayed by failing to send required information of material when requested or in diligent time. IN no cases warranty will be extended because of such problems encountered (see General Sales and Warranty conditions)

1.4 Damages during transit

We packed your equipment with adequate material and care to ensure proper protection for the designed transport.

When receiving your package, carefully inspect the external aspect and shape of the box. Should this box be damaged, if despite our cares, your unit would be damaged or warped. If this is not the case, do not open it before having taken some pictures of the box: if necessary exert all reserves to the carrier, if possible in writings with a copy to Balteau regarding the reception of the goods.

When opening the box, check that all elements are correctly packed and that seals if any are intact.

If the equipment is found defective or broken, advise both the carrier and Balteau and wait for instructions. If your material was covered by an insurance, inform the latter that some reserves have to be taken.

In all cases, pictures of the problem should be taken and a copy sent to Balteau ideally by Email (shipping@balteau-ndt.com).

1.5 Sending an equipment to Balteau NDT

When calling BNDT for warranty issues, service or calibration requests you will be asked to provide information. Among these are:

- Serial numbers of equipment and connected accessories
- Date of Purchase and contract reference (AAccXXXX)
- Description of failure
- Name of Company and person in charge for future contacts on the subject
- Phone and Email for future contacts

This list is indicative and not limitative.

A document summarizing all these information is available and can be asked to the Service department (file is 'SAV_informationminimum_GB').

You'll then be given a reference number which will become your unique identification number throughout the service process for efficient and performing tracking of operations performed on your equipment.

Unless otherwise indicated, shipment is always at your expenses. In order to reduce all costs related to transport and transfer to our company, we strongly recommend you to follow our "ShippingAir" procedure that will be sent to you on request if you contact our Shipping Department by phone, fax or mail (shipping@balteau-ndt.com)

1.6 Calibration

During the manufacturing process your equipment has been calibrated to correspond to the manufacturing standards and/or other applicable standards.

These operations have been performed with adequate personnel and calibrated material.

We recommend a calibration of X-ray devices every two years at least or 1 year if your quality requirements are stating so.

Calibration consists in checking several important functions of your equipment like:

- Focal spot check
- HV value check and adjustments
- Dose output check and adjustment

Balteau is offering Calibration services through it's Network (only through Calibration authorized Service centers) or directly from the factory.

Feel free in consulting us for rates, delays and additional information (service@balteau-ndt.com).

1.7 Equipment disposal

Balteau is providing a Disposal Service at reasonable costs as part of its global Sales program. Destructions can only be operated at Balteau's facility.

Any X-ray emitting device sold by Balteau can be destroyed on demand if, after information, approval and payment of corresponding fees, it is sent free of charges to our main manufacturing place in Belgium.

Under these conditions, after destruction operations, we will provide the user in return with a Certificate of destruction mentioning the Serial number of the Unit, the Type and Date of Destruction or Service removal. This Certificate may be used for further reference to the National or International Atomic agencies in the Country where the equipment was imported from.

The necessary documents and information for equipment identification and shipment may be asked at Balteau (xray.disposal@balteau-ndt.com).

2 Preliminary Information

2.1 Hazardous Material

Industrial equipments may contain hazardous substances and materials that may require adequate procedure for disposal.

Elements hereafter described are concerning general X-ray equipment and may not all be applicable to your equipment. Please read the operating manual in chapter "General Description" or the "Technical datasheet" to know what is applicable to your equipment. In case of doubts, the manufacturer is offering you a disposal service where you can obtain updated and more precise data about how to proceed to dispose of your old equipment.

2.1.1 Insulation material

This material is placed inside the generator to prevent the electrical arc to be emitted between component under high voltage and the ground. This allows sizes to be kept minimum and is a normal part of the manufacture of a X-ray equipment.

2.1.1.1 Oil insulated equipment

Oil used for electrical insulation differs from motor or conventional oil by its fluidity, composition and purpose. This oil often called "dielectric oil" is generally placed in a separate category regarding disposal. This oil can be removed from the equipment, canned and disposed according to your local regulation: reprocessing of oil with adequate media is possible and highly recommended. It is not allowed to burn used oil which may emit toxic fumes.

2.1.1.2 Gas Insulated equipment (SF6)

Isolation gas may be Hexafluoride sulphur (SF6) or Nitrogen (N): this is indicated in the technical datasheet in this operating manual. Both gases are heavier than air and asphyxiating. Gas must be released through the special nozzle and canned in a specific container for eventual reprocessing.

2.1.1.3 Solid insulation

Solid insulation is non toxic as such: insulating material can be modified epoxy, silicon or PU. Insulated blocs may contain Copper, Steel, Silver and or Lead. It is not allowed to burn insulated blocs to remove metallic materials inside as fumes can be toxic. All insulated blocs must be disposed according to local regulation.

2.1.2 X-ray tube

The insert is a bulb which contains a filament and a target built in a vacuum chamber. The target and filament are generally in Tungsten (W). The anode is made of Copper. Walls of the insert may either be Ceramic, Glass or Metal ceramic. When new, the insert is under vacuum (>10⁻⁹ mBar). A heat exchanger is placed on the Anode: the heat exchanger can be a combination of Aluminium and Copper. Pieces of Lead for shielding purposed may be inserted into the heat exchanger.


2.1.2.1 Explosion risks


When used in pressurized can (gas insulated units) the tube may become pressurized (Called Gaseous tube) if punctured by an electric arc during X-ray operations and therefore must be processed with extreme cares if removed from the pressurized can. It is not allowed to remove an insert from its can but if made by an Authorized and duly qualified Service centre.

All glass or ceramic inserts must be destroyed inside a specific container to avoid explosion and projection of glass or ceramic particles. Please ask your closest authorized dealer to proceed to this operation for you.

2.1.2.2 Beryllium Window

Some X-ray tubes are equipped with a Beryllium (Be) window which is toxic by ingestion. It is not allowed to touch the Be windows bare hands: always wear gloves. Be Insert must be disposed according to local regulations and considered as toxic material. See chapter "Disposal" for further instructions and help.

 **Ingestion of beryllium can be fatal. In case of human skin contact, thoroughly wash the concerned area in running water and soap.**

 **If in contact with eyes, wash them with sterile or clean running water and seek medical attention immediately**

2.1.3 Canister, housings and electronic components

Can and housing elements may be either Aluminium, Steel or Stainless steel. Cans may be internally layered by Lead for shielding purposes more specially in Portable units and Housings of Inserts

Electronic components are of Industrial type and will be disposed according to local regulations. Although the majority of components are ROHS compliant, the presence of Lead articles due to Radiation Shielding purpose is possible and may not give a guarantee about ROHS full compliance in all sections of the unit.

2.2 Safety & Health

An X-ray device is dedicated to emit radiations when in operations. It is therefore classified as "classified" under the "ionizing radiation's regulations".

These equipments can only be operated by Qualified and Authorized personnel duly affected to these operations by their Employer, Certification body or any Local regulating authorities in the country where they operate the unit. As information, please find attached the minimum information brought to your attention.

2.2.1 Radiation emitting material

Radiations are harmful to health after a certain dose level. The basic Safety principles on Radio protection (ALARA – As low as reasonably achievable) must always be followed when performing an exposure not only in the parameter selection, but also in the exposure settings.

2.2.2 Usage of equipment

This Equipment has been designed for Industrial applications only: it is not intended to be used in the Human medical applications like Radiography due to the relatively long minimum exposure time that is possible to set. Any use outside of the primary sector of applications is to the sole responsibility of the User.

Only equipment in good conditions, properly Maintained and Serviced only by Authorized Service centers appointed by BALTEAU shall be used. Maintenance and calibration is recommended on a regular basis and at least every 2 year. This will assure you fulfilling your obligations a described here above.

2.3 Personal qualification

ICNDT (International Committee of NDT) has issued recommended training programs for personal used in Radiographic works (RT).

The document ICNDT WH/85, section 17-85 Radiographic Testing is offering you a good guideline for implementing your own training program or for checking that your personnel has the appropriate skills and training to perform X-ray operations. It is the same for the International Atomic Energy Agency (IAEA) which has issued IAEA TECDOC 628 and more precisely the IAEA training course series 3 dedicated to X-ray.

At least one section of the training course must include Radio protection and local environment aspects (Dose to public, local regulations,...). Although highly recommended, Personnel Certification is not absolutely essential if skills and training have been demonstrated and well documented.

However, for Certification of NDT personnel, ISO9712 is providing a good basis for "Certification of NDT personnel". Alternative documents like, ASNT-TC1A, EN473 or Specific National Standards may also be used. According to the standard here above, the recommended qualification level (or training requirements) should be Level 1 at least.

2.4 Overview of a minimum training course for operating an X-ray tube

The following table of topics is indicative and may not be used as the only reference. It is intended to give the minimum basis for the implementation of a training course if nothing exists or is available to the user.

Nature of penetrating radiation

- Electromagnetic and corpuscular radiation
- X-rays and Gamma-rays
- Intensity/ inverse square law

X-ray sources

- Generators and tubes as an integrated system
- X-ray tubes
- target materials and characteristics/ configuration/ focal spot/ heat dissipation

Imaging (X-rays / Gamma rays)

- Film/ principles/ properties emulsions/ classes/ characteristic curve/ radiographic sensitivity + lead screens and fluorescent screens

Production of the Radiograph

- measurement of image density
- factors controlling image density
- geometric principles
- sensitivity
- contrast and definition
- generation and control of scattered radiation
- use of screens, blocking and filtering techniques
- use of exposure curves (exposure calculation/ exposure factors) for X-rays
- exposure calculations
- film to object correlation and specification

Hazards of excessive exposure to X-rays / Gamma-rays

Maximum permissible dose levels

Public and professional

Methods of controlling radiation dose by time/distance/shielding

X-ray tubes

- survey
- recording and reporting
- exposure shields/rooms
- operation/alarms and emergency procedures

Ionization measurement and units

- radiation detection by ionization
- exposure/ radiation absorbed dose/ dose equivalent/ dose rate

Dose measurement,

- limits and adequate uses of different measuring devices

3 Revision

Modification notes			
Issue	Reference	Date	Comments
0		September 2012	Original version
1		Janvier 2013	AIS958 Control Software update

4 General Description

4.1 Equipment Presentation

The AIS 958 consists of:

- an X-ray shielded cabinet
- 5 axes manipulator
- an X-ray generator LLX 160
- a control panel DC1
- a flat panel FP Digit 13-127
- a motorized diaphragm
- an image processing system type IPS012

See the specific operating manual to know how to use the LLX 160 generator, the DC1 and the FP Digit.

The AIS958 is a very compact and useful equipment that provides you with numerous advantages:

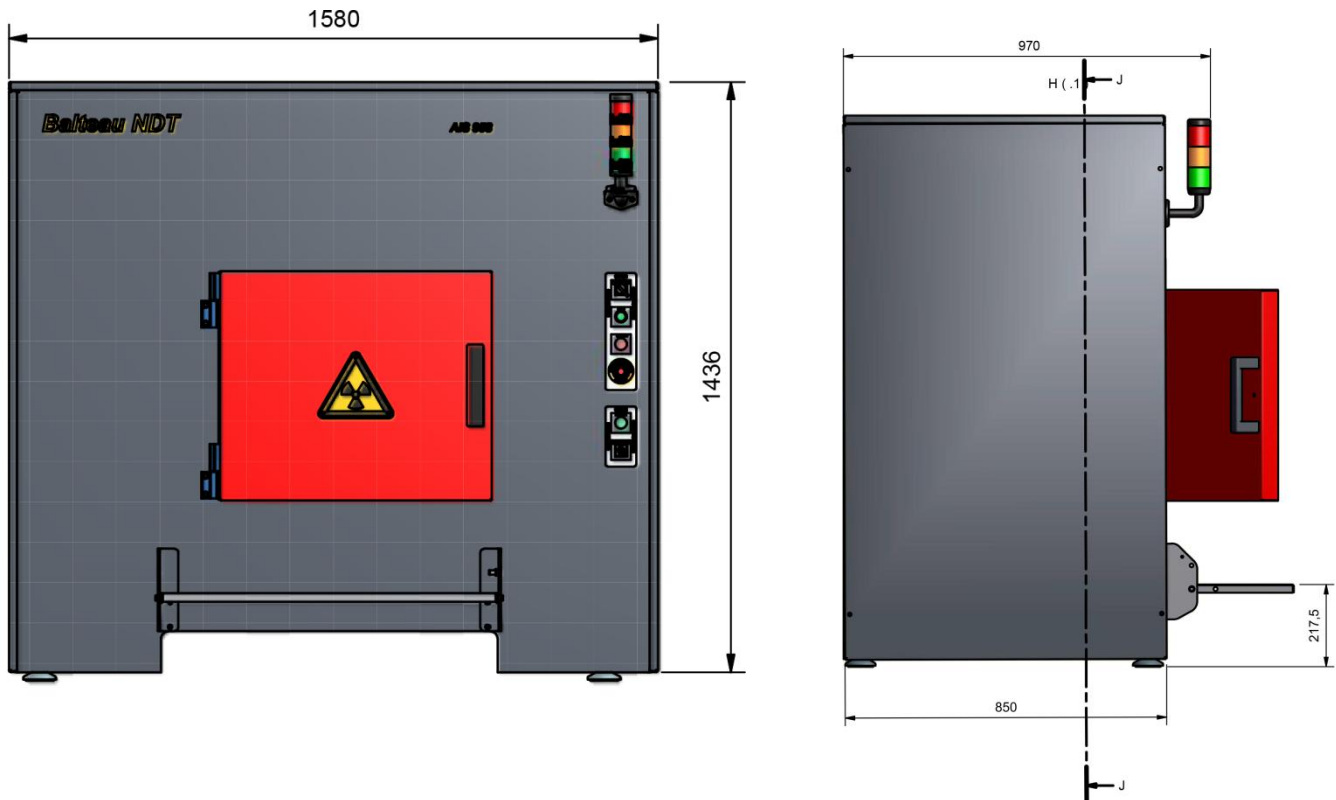
- An emergent dose rate lower than 0.25 $\mu\text{Sv/h}$, fitting the most severe international regulations on radiation hazards. Non professional people can stay indefinitely close to the equipment without any danger.
- A redundant safety on the manual swivel door, consisting of a double magnetic sensor supervised by two level 4 safety relays and of an electro magnet that secures the door with a locking strength of 3000 N.
- A 360° panoramic tower light that indicates the equipment status (red flashing, amber and green lights)
- A main switch with a removable key that avoids unauthorized people to operate the equipment without trained operator.
- Two emergency stop buttons (one on the shielded cabinet and one on the control unit)
- A nice and fully integrated design as the electrical components, all controls and all radiation proof labyrinths for air flow and cables are integrated inside the shielded cabinet. There is no more excrescences

4.2 Data Sheet

4.2.1 Main characteristics



Walls of the shielded cabinet are protecting the operators against radiation hazards; DO NOT DRILL HOLES IN WALLS!



Electrical		
Mains (single phase)	V	230
Frequency	Hz	50
Current consumption	A	9

X-ray characteristics	
See Baltospot LLX160/0 operating manual	

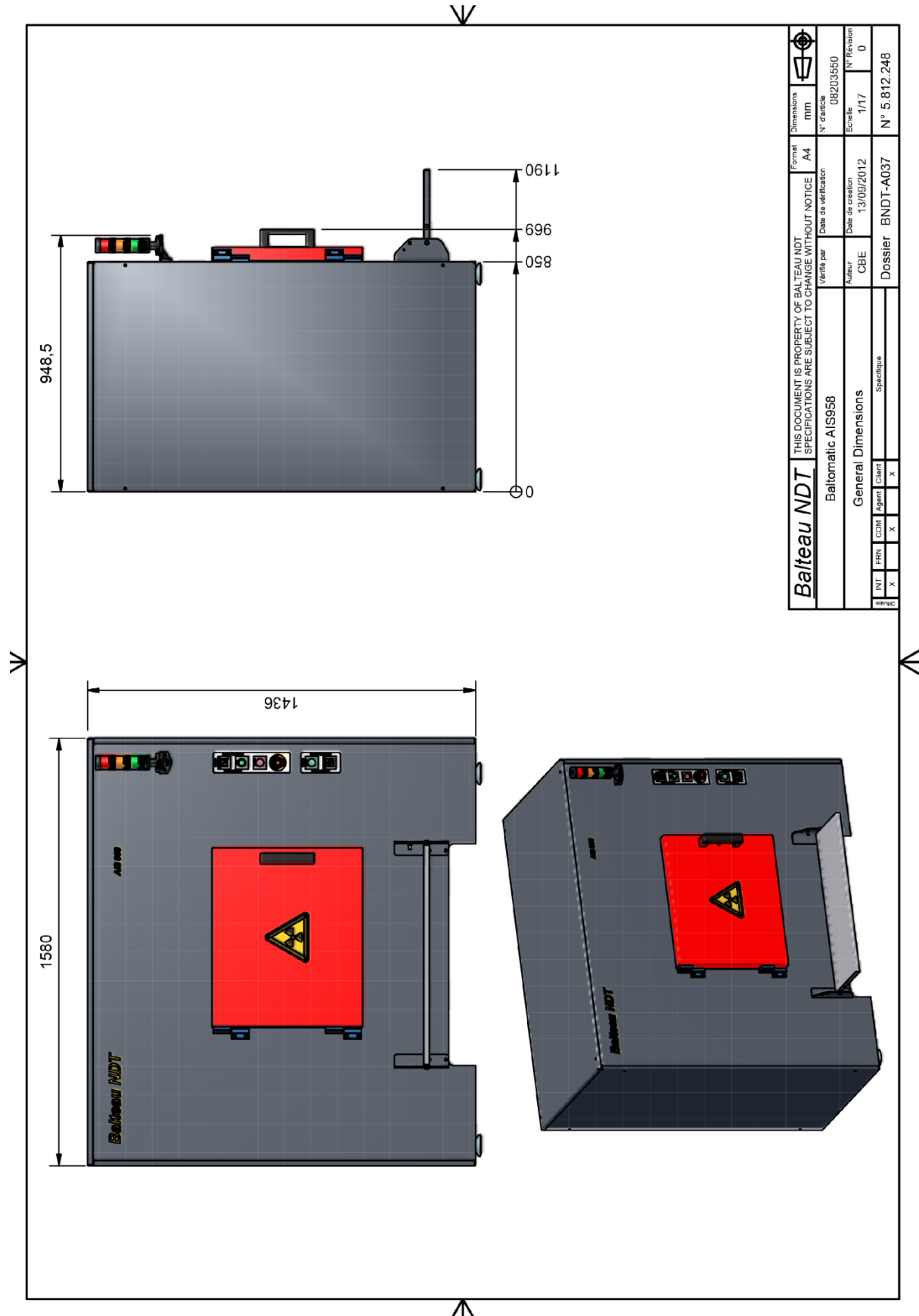
Environment	
Operating temperature	°C From 10°C to 35°C

Safety	
X-ray leak @ 10cm of the wall	< 0,25 µSv/h (fully protected cabinet)

Equipments

1. Lead-lined steel enclosure to prevent X-ray generator operation and radiation hazards
2. Manual swivel door with electromagnetic locking system and dual electric interlock security.
3. Removable panel to access the X-ray generator for maintenance. (protected with 1 interlock securities)
4. Warning light tower (Red, Amber, Green)
5. Removable side panel to access the electrical wiring
6. Electromagnetic door "OPEN/LOCK" switch
7. Interlock Reset
8. Interlock security light (lights up when a security failure (door contacts & switches) is identified)
9. Emergency Stop
10. Mains ON Lamp
11. Power ON/OFF key switch
12. Table (to put parts when equipment is used and to secure the door when equipment is switched off)
13. Installed within the cabinet:
 - LLX160/0 X-Ray generator
 - FP Digit 11-127
 - Motorized diaphragm
 - 5 axis manipulator
 - AVARA/C (radiation detector)





4.2.2 Buttons & Warnings

Power OFF/ON key switch - S1



When turned on the ON position, this connects both cabinet and DC1 to the mains. If you then turn ON the general key switch of the DC1, the control unit will start (refer then to the specific operating manual).

The internal light of the shielded cabinet (H2 – LED light) will be switched ON.

Power ON light - H1



Once the S1 key is on the ON position, H1 – Power ON will light, confirming that the mains is connected.

Emergency STOP - S3



When pushed, this button will open the power connexion of the H.V. generator. No X-ray can then be generated.

Interlocks light - H6



This warning will light if one of the safety switches is activated:

- right side panel opened,
- left side panel opened,
- swivel door opened,
- Cabinet emergency stop pressed.

No X-ray can then be generated.

To start X-ray again, the error must be corrected first and then the S2 – RESET button must be pushed to reset the system.

Reset button- S2



This resets the safety relays if they have been activated by a safety switch. The error must be corrected first, otherwise the warning will remain ON and the safety relays will not allow X-rays.

Electromagnetic Door Open/Lock Switch - S6



This button must be switched to activate the electromagnet that locks the door before starting the X-rays.
If this button is not turned to the LOCK position, the X-rays can not start, even if the door is manually closed so that the door safety switch is on a safe position.

Warning Light Tower



Red flashing light - H3

This warning is flashing during X-Ray irradiation (refer to the LLX160 operating manual)

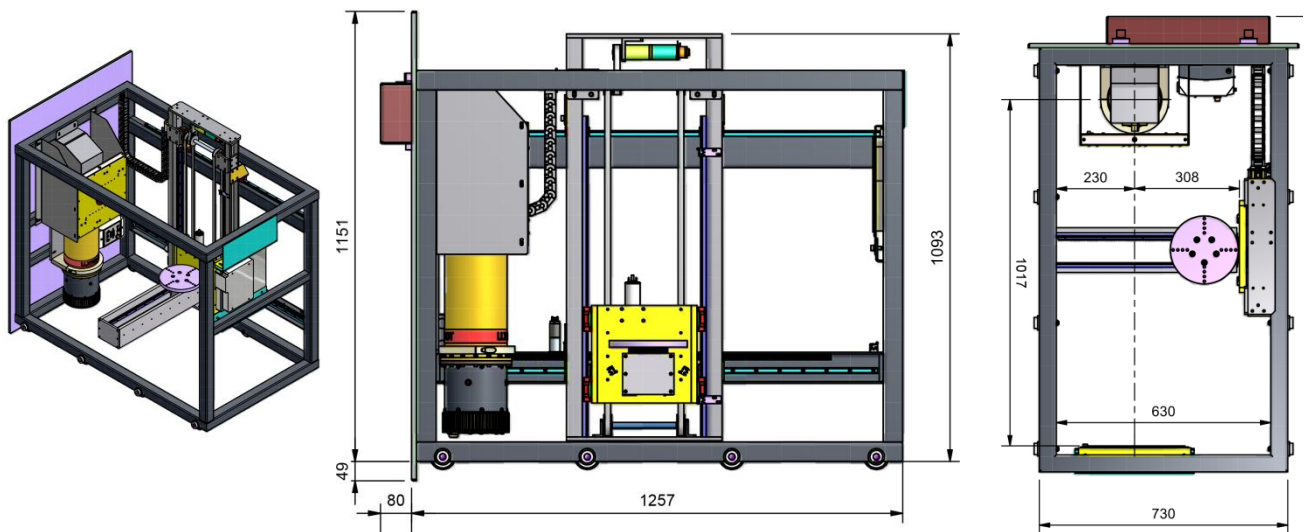
Amber light - H4

This warning lights during the pre-warning time (refer to the LLX160 operating manual)

Green light - H5

This warning lights when the DC1 is switched ON (refer to the LLX160 operating manual)

4.2.3 5 axis manipulator



4.2.3.1 The manipulator allows the operator to put the part on a rotating plate and move it along 5 axes:

- X: Change focal spot to detector distance
- Y: Left and right motion
- Z: Vertical motion
- ROT: Rotation of the plate
- TILT: Tilt of the part (elliptic projection of circular welds)

4.2.3.2 Main characteristics

	Stroke (mm)	Speed
X	400	Fixed
Y	400	Fixed
Z	400	Fixed
ROT	360°	Fixed
TILT	30° / -30°	Fixed

- Maximum loads :
 - Rotating plate : 30kg (including tools to hold the part)
 - Table: 30kg
- Rotating plate diameter: 200mm



It is the responsibility of the operator to avoid impacts between the part and the other items inside the cabinet (wall, diaphragm and detector). Axes have limit switches but it cannot control the size of the parts installed on the rotating plate. Any impact on an internal item will avoid the warranty.

4.2.3.3 Control of the manipulator motions

The 5 axes of the manipulator are controlled from the computer. Please refer to appropriate chapter in this operating manual for the description of these controls interfaces.

4.2.3.4 Axes description

Description of each axis provides an understanding of the manipulation and movement of axes. Find below diagrams representing each axis and resultant movements

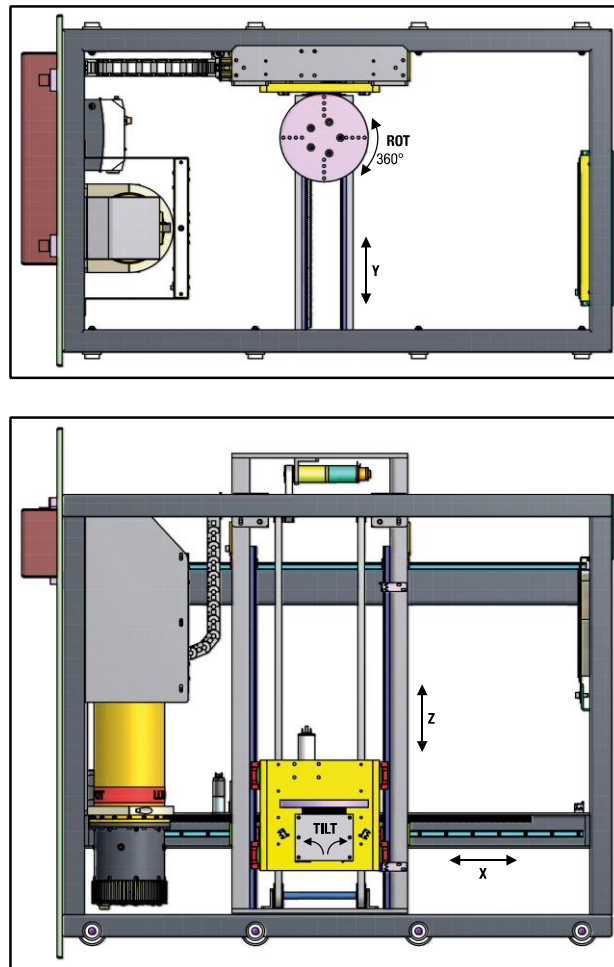


Figure1: Axes Description

- **X:** This will change the distance between the part, the x-ray source and the FP Digit (detector), allowing different enlargements (300mm)
- **Y:** This allows the scanning of the width of the part inspected with a forward and backward movement on the TILT axis.
- **Z:** is the vertical motion, allowing the user to move the part to inspect up and down.
- **ROT:** Is the rotation of the platter where the part will be disposed, moving clockwise and counter clockwise.
- **TILT:** Left and right tilt for elliptic projection of circular welds.

4.2.4 Safety Controls

Various controls have been installed in order to maximize the safety for the operators and people around.


safety component				
reference	description	controlled by	safe position	when switches are in safe position
S3	emergency stop	SEC1 safety relay, category 4	close	HV generator is powered
S4	microswitch on cover	SEC1 safety relay, category 4	close	
S5	microswitch on cover	SEC1 safety relay, category 4	close	
S8	microswitch on right panel	SEC1 safety relay, category 4	close	
S9	microswitch on left panel	SEC1 safety relay, category 4	close	
S7	door sensor	SEC2 safety relay, category 4	close	DC1 control unit allows the start of the X-ray
S6	electro-magnet switch	SEC2 safety relay, category 4	close	


The equipment can not generate X-ray if:

- The left panel is removed
- The right panel is removed
- The door is opened
- The electromagnetic door switch is turned on "OPEN" position
- The emergency stop is pushed

The equipment will generate X-ray only if:

- All the elements above are in the right position
- The green light of the Tower is ON. This will be the case only if the DC1 is on position X (Ready to start X-ray) and the electromagnetic door switch is turned on "LOCK" position.

 **Please be advised that, in order to increase the safety level, the X-ray will not start if the electromagnetic door switch is turned on OPEN, even if the door is manually closed and the door sensor activated. It has to be turned on "LOCK" position**

 **It is strictly forbidden to modify the cabinet, drill a hole in any of the faces, and modify the safety switches or the warning flashing light.**

4.3 Software Presentation

The system has been design to be used with 2 software programs:

- **AIS958 Control:** Software specifically developed and designed by Balteau NDT to control the x-ray generator, the FP Digit, the diaphragm and the 5 different axes of the manipulator.



- **IPS012:** Standard image processing software developed and designed by Balteau NDT for linear detectors, flat panels, image intensifiers and scanners (*See manual IPS012 for more information*).



 **The equipment is supplied with a dongle (HASP) license plugged into one of the USB port of the computer, do not remove it or the software will stop running automatically.**

 **DO NOT LOOSE the dongle license, to order a new one; this will cost the price of new license!**


5 AIS958 CONTROL



5.1 Introduction

AIS958 Control is a software specifically designed to control the generator, the FP Digit detector, the diaphragm and the 5 different axes, having as a purpose the inspection of components.

 **By default X-ray will always be set up to zero kV and zero mA so the X-ray will not be running.**

 **It is your responsibility to verify that the X-ray environment is secure for your own safety.**

5.2 General Description

5.2.1 Presentation

The software is composed of 4 different zones:

- Image (1): Displays the radiography and image controls
- X-ray controls (2): X-ray Settings
- Diaphragm controls (3): Schematic front view of the diaphragm shutters + controls
- Manipulator controls (4): Icons to move the 5 axes

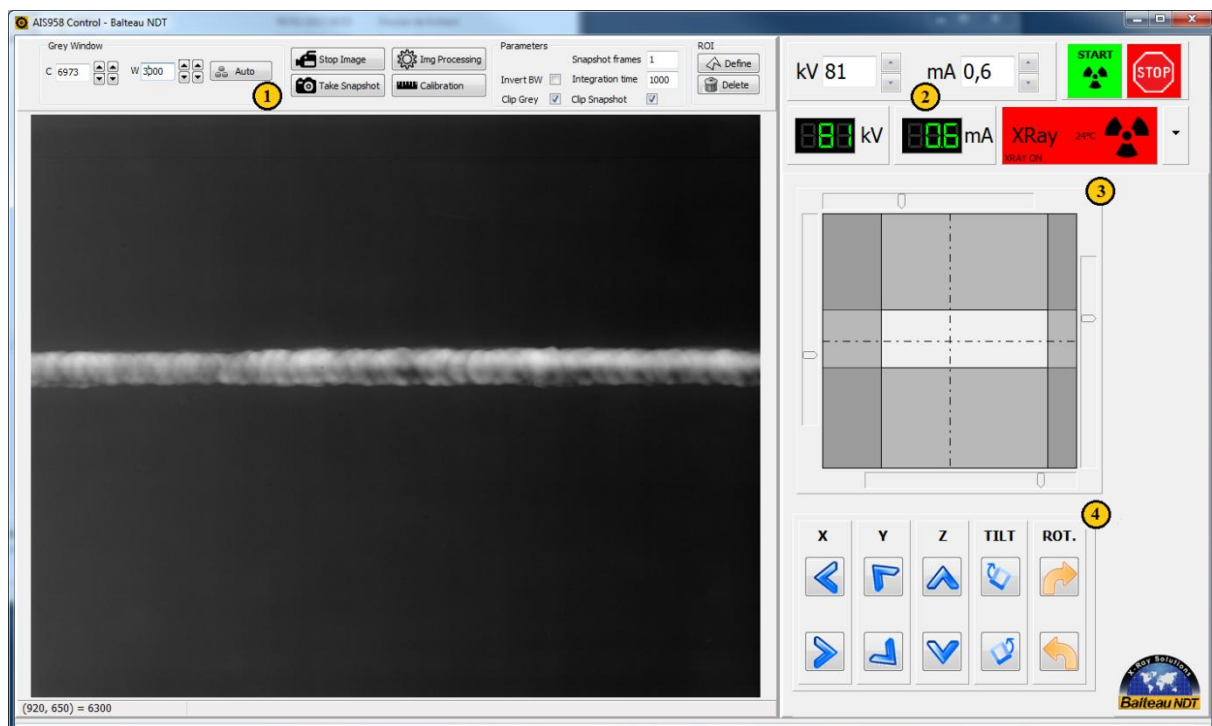


Figure 2: Acquisition User Interface

5.3 Zone Description

5.3.1 Image acquisition (1)

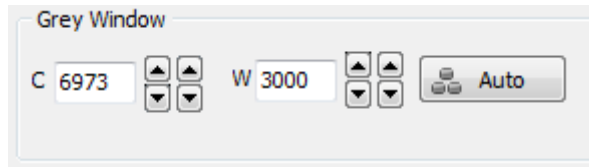


Figure3: Grey Window User Interface

The process is controlled by three controls:

- C (center): Is the center of the Grey Window.
- W (Width): is the width of the Grey Window.
- Auto: Automatic width and center computation.

The level controls the threshold value for which all pixels are displayed as black, and the window controls a similar threshold value for a white output. The simultaneous use of the two controls allows the application of a grey-level window, of variable width, which can be placed anywhere along the gray scale. Subtle grey-level changes within images can therefore be adjusted so that they are displayed with greater clarity.

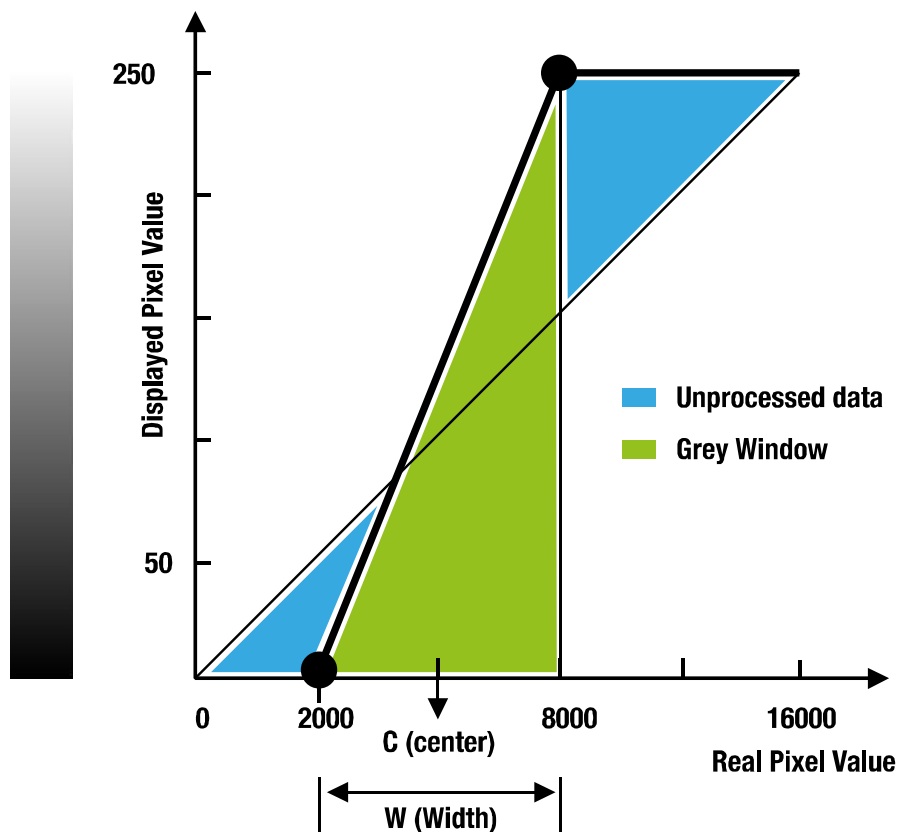


Figure4: Grey Window - Real Pixel Value vs Displayed Pixel Value

5.3.1.1 Controls

There are 4 buttons for controlling the display of the image and providing 4 possible actions:


- **Live / Stop image:** Tells the software to start or stop the detector (FP Digit)
- **Image Processing:** Tells the software to bring IPS012 up on the desktop (IPS012 must be running already)
- **Calibration:** Tells the software to calibrate the detector (FP Digit).

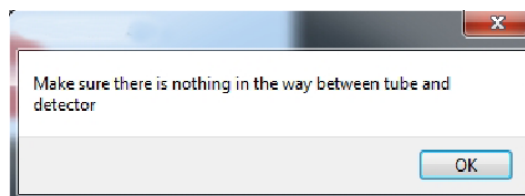
A good calibration is very important to get good quality images!


Calibration is done using the currently selected parameters (kV, mA and integration time). It is very important to calibrate the detector using parameters that gives the same dose as the one the detector receive when inspecting a part. It is better to use the same integration time as well.

Calibration can be done thru the air using low kV/mA or thru a blank item of the same material and thickness as the items to be inspected later.

Calibration should be accomplished when the detector has reached his operating temperature. If the installation is cold (Monday morning), then wait one hour so that the detector has reached his operating temperature. If you cannot wait, then do a calibration when detector is cold and the as you see image quality declines, do a calibration again.

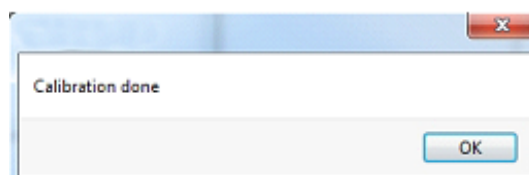
 **To do the calibration, make sure there is nothing on the way between the tube and the detector (FP Digit), manipulator included. A warning message will appear on the screen.**



 **Before starting the calibration, the user must turn the DC1 on mode "TV Aluminium" to use the right kV and mA intensity. To do so the user must push the "t" button on DC1 then select "TV Aluminium".**

 **When the user starts running a FP Digit calibration, X-RAY will be running.**

Once the calibration has been made successfully, this window appears on the screen.



- **Take Snapshot:** Tells the software to take an image, save it on disk and send it to IPS012. **To be able to take an image, IPS012 must be running; otherwise it will bring up an error**

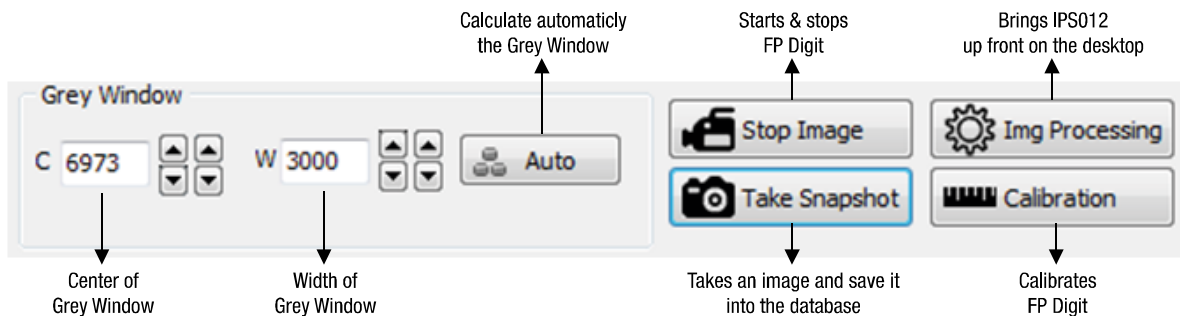
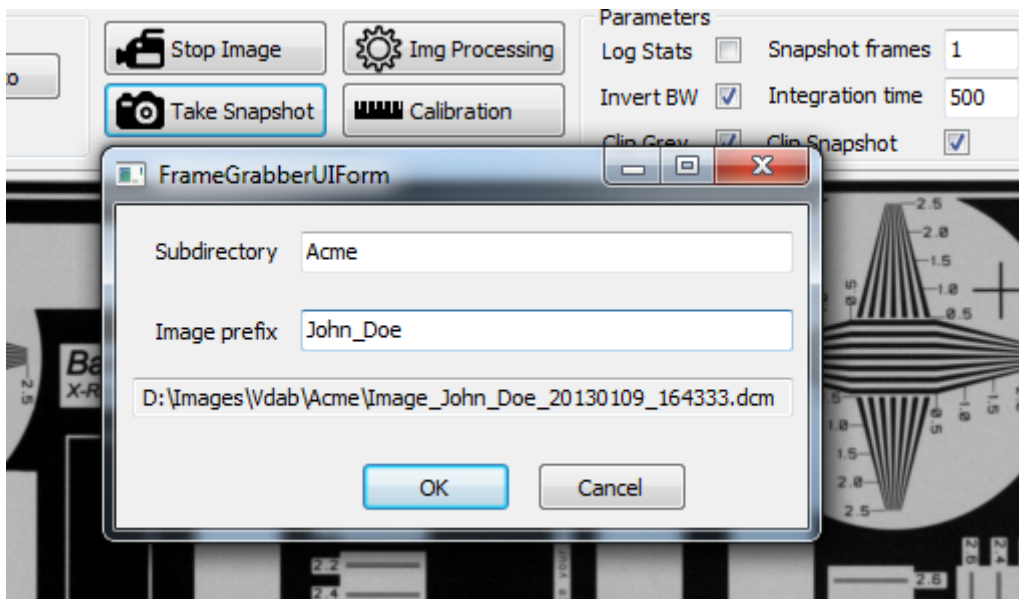


Figure 5: Inspection Interface - Image Visual Controls

When the user clicks on "Take Snapshot", the software will capture as many frames as specified by the parameter "Snapshot frames", and average the whole, producing a single image. The total time will be the number of frame multiplied by the integration time. The more frames you take, the better the result will be.

Once the frames are averaged, the result is written to a disk file in DICONDE format. Then a popup window appears:



In the "Subdirectory" field, the user could enter a company name which will be used to change the directory where the image will be stored; and could enter a person name in the "Image prefix" field which will be inserted in the image file name.

As you can see on the screen shot above, the complete path name is shown. The leading part "D:\Images\Vdab\" in the screen shot is configurable in the application INI file; the image prefix part "Image" in the screen shot is also configurable in the application INI file. The numbers at the end of the file name is the date and time so an alphabetical list shows the files in correct order.

5.3.1.2 Image Display

This part of the display shows the real time image. This is the image which will be saved on disk and sent to IPS012 when "Take Snapshot" button is clicked.

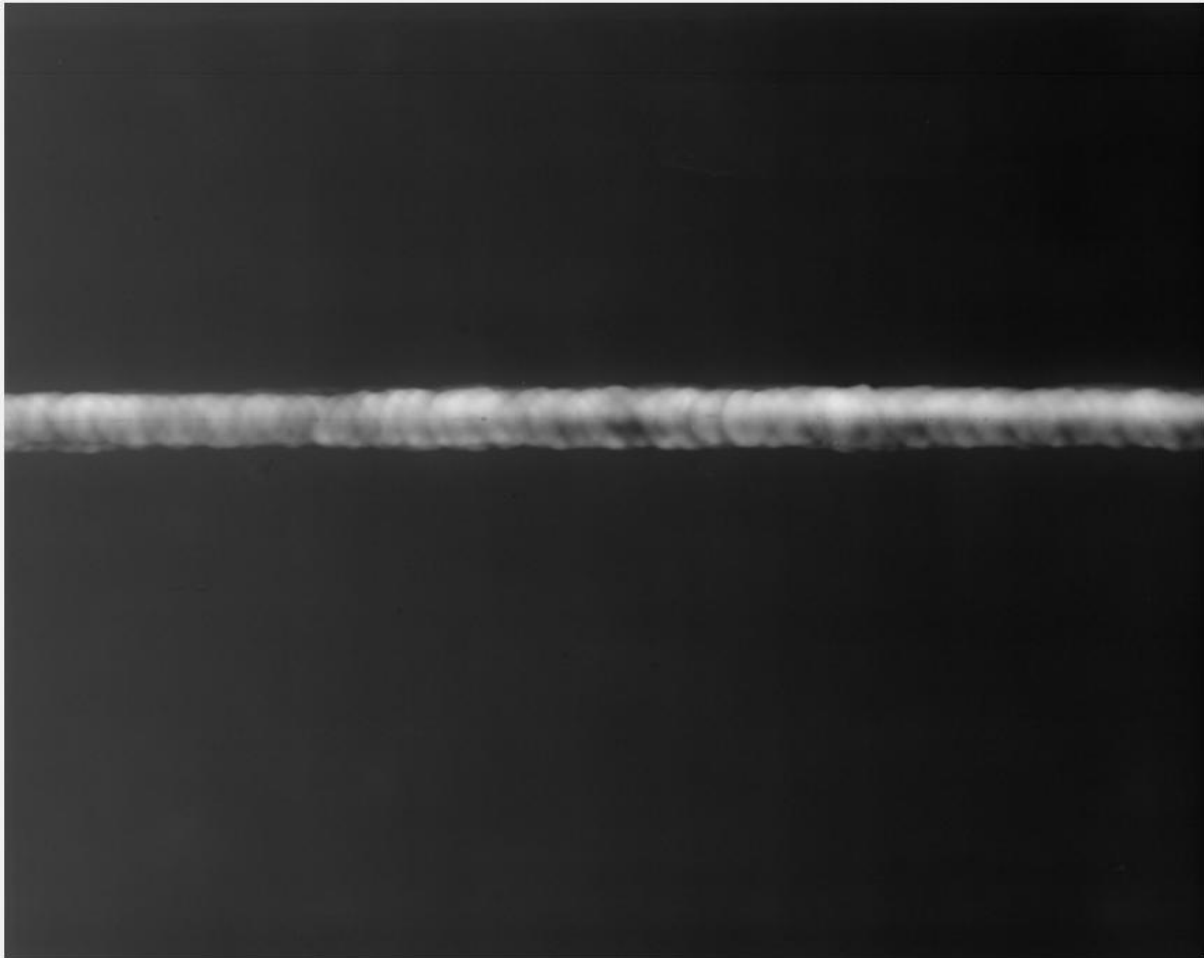
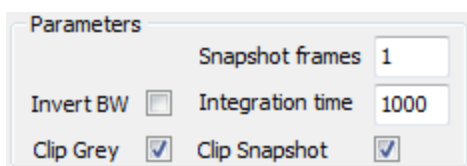


Figure 6: Acquisition User Interface - Image Display

5.3.1.3 Acquisition parameters



This group of controls will configure the way images and captured:

- **Snapshot frames:**

Define how many frames are averaged when a snapshot is taken. All frames are averaged to build the final image. The more frames are averaged, the less noisy the final image is.

- **Integration time:**

The field specifies the number of millisecond (mS) the detector must use to capture X-Rays. The more mS you select, the more sensitive the detector is. A value of 500 to 1000 mS is a good start point.

- **Invert BW:**

This checkbox will select if the display shows normal grey levels, or invert the grey levels. When inverted, the image looks like a film.

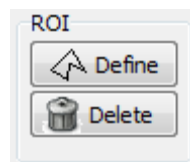
- **Clip Grey:**

This checkbox select the "Auto" button behavior. If unchecked, the auto button will use the full image to compute width and center of the grey window. If checked, the auto button will use the region of interest (ROI) currently selected. If no ROI is defined, then the full image is taken.

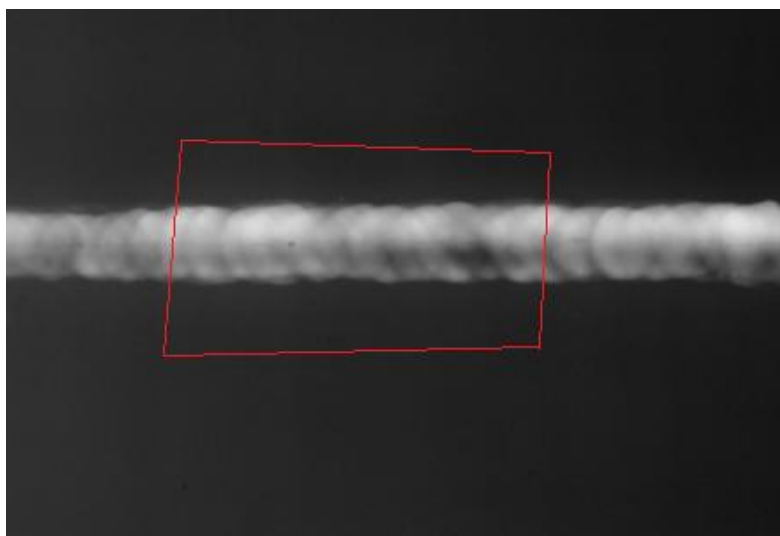
- **Clip snapshot:**

This checkbox select how "Take Snapshot" button will behave. When unchecked, the button will create a complete image. When checked, the image will be the rectangular area containing the currently defined ROI. If no ROI is defined then the full image is taken.

5.3.1.4 Region Of Interest (ROI)



A region of interest (ROI) can be defined by clicking "Define" button and then clicking on 4 different points on the image. This defines a polygonal region of interest. The ROI can be deleted by clicking on the "Delete" button. A red line shows when the ROI is.



The ROI is a 4 side polygon with arbitrary size and orientation.

The ROI is used to compute automatic grey window and to create images using the "Take Snapshot" button. See the parameters control group describe above.

5.3.2 X-ray controller (2)

The X-ray controller sets up the X-ray for inspection. The interface for the X-ray controller may be divided into different zones.

5.3.2.1 X-ray settings

This section allows the kV & mA setting values for the tube head.

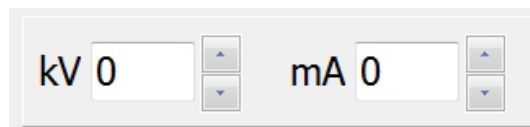


Figure 7: Inspection Interface - X-ray controls settings

5.3.2.2 Start & Stop

These buttons allow the user to start running X-ray with the Start button and to stop the X-ray with the Stop button. **Stop is also used to clear error on the DC1.**



It is your responsibility to verify that the X-ray environment is secure for your own safety.



Figure 8 : Inspection User Interface X-ray controller start & stop

5.3.2.3 Ongoing X-ray

This zone informs the user of ongoing kV & mA values.



Figure 9: Inspection User Interface – Ongoing X-ray parameters

5.3.2.4 Tube information

The tube information gives four types of information about the tube head: focus type, tube type, tube status and tube temperature.

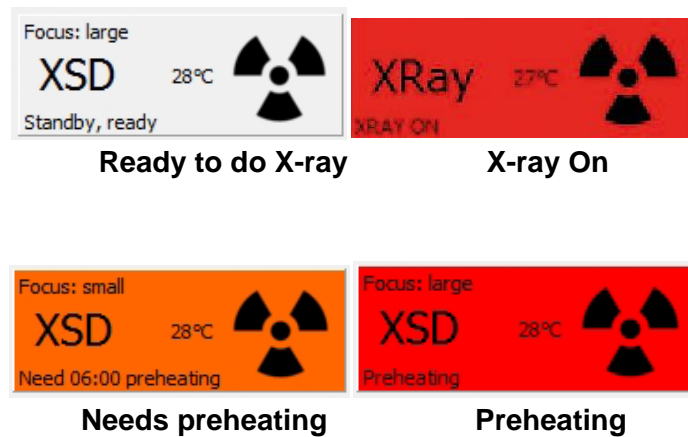


Figure 10 : Inspection User Interface – X-ray tube information

Note: Not all tubes have dual focus.

General Schematic View

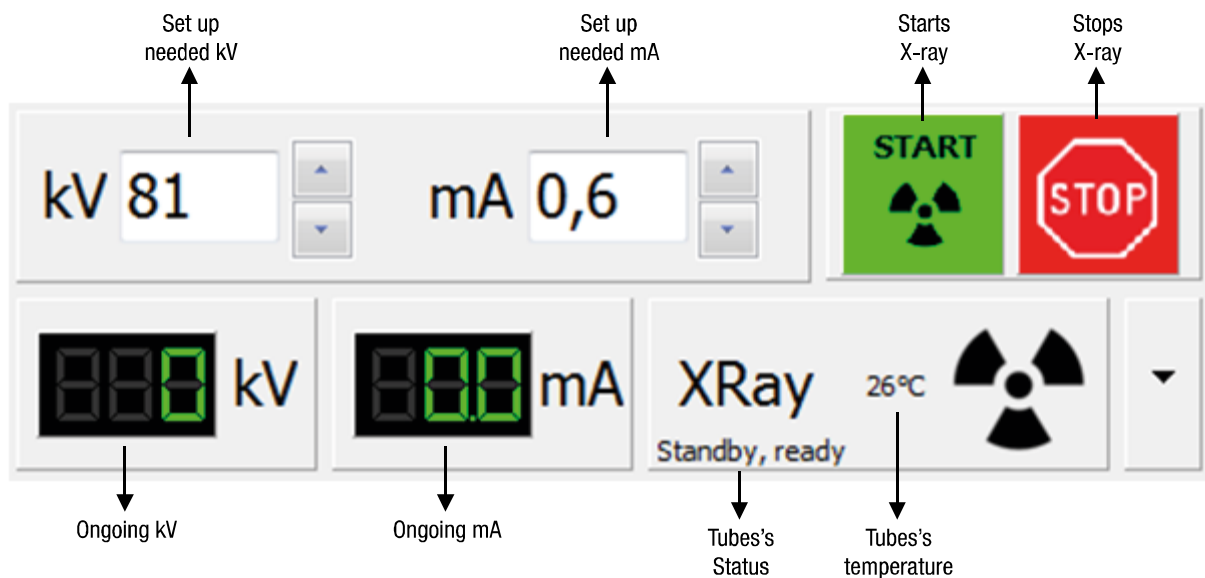
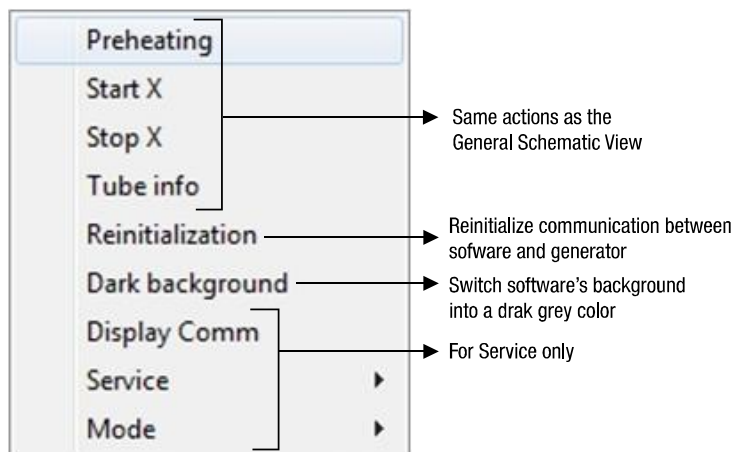


Figure 12: General Schematic View



5.3.2.5 Preheating

Preheating will start using the pop-up menu which is displayed when clicking on the arrow down button near the X-Ray generator status.

During preheating, the kV/mA display will be replaced by a progress bar to inform the user about the preheating status.

During preheating, the diaphragm will automatically be closed.

5.3.3 Diaphragm controls (3)

The user is able to control all 4 shutters individually, top, bottom, left and right.

- Top and bottom shutter positioning: to move the shutter on the needed position, the user must click on the controller then to a vertical motion to the top or the bottom until the shutter's view is on the needed position.
- Left and right shutter positioning: to move the shutter on the needed position, the user have to click on the controller then to a horizontal motion to the left or the right until the shutter's view is on the needed position.

General Schematic View

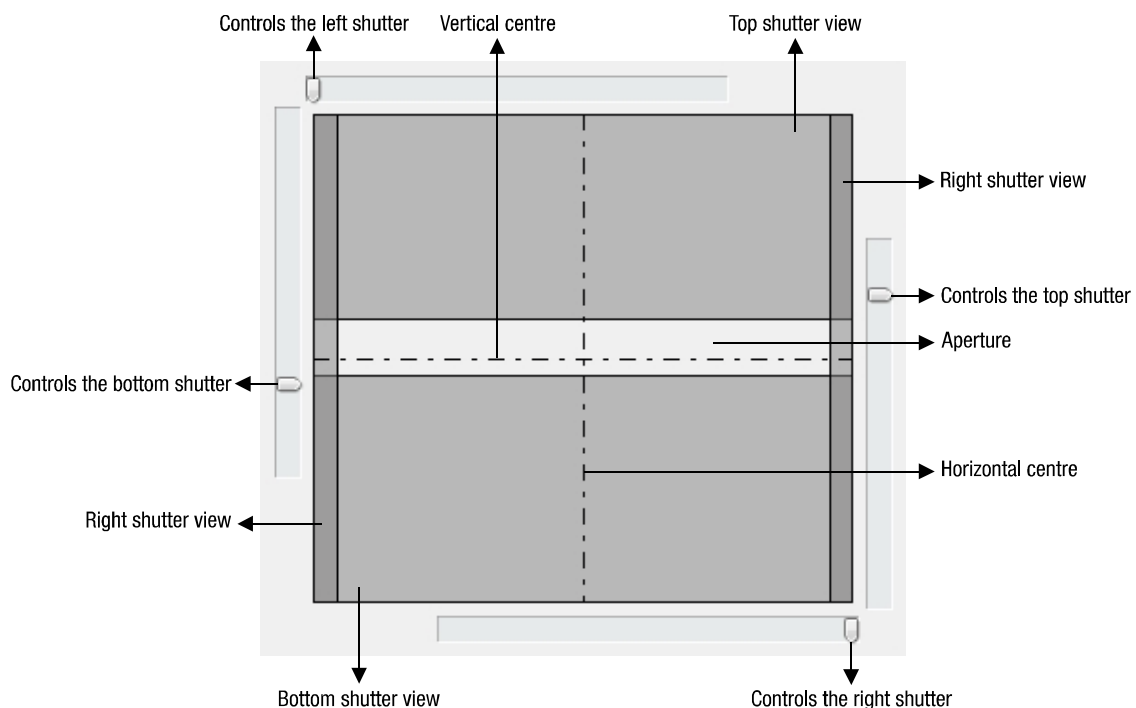


Figure 23: Diaphragm controls

5.3.4 Manipulator controls (4)

These commands will allow the user to control each axes of the manipulator in order to position the part on the right position.

 **To create an ongoing movement, keep your finger pressed on the mouse left button.**

 **To stop the ongoing movement, stop pressing on the mouse left button.**

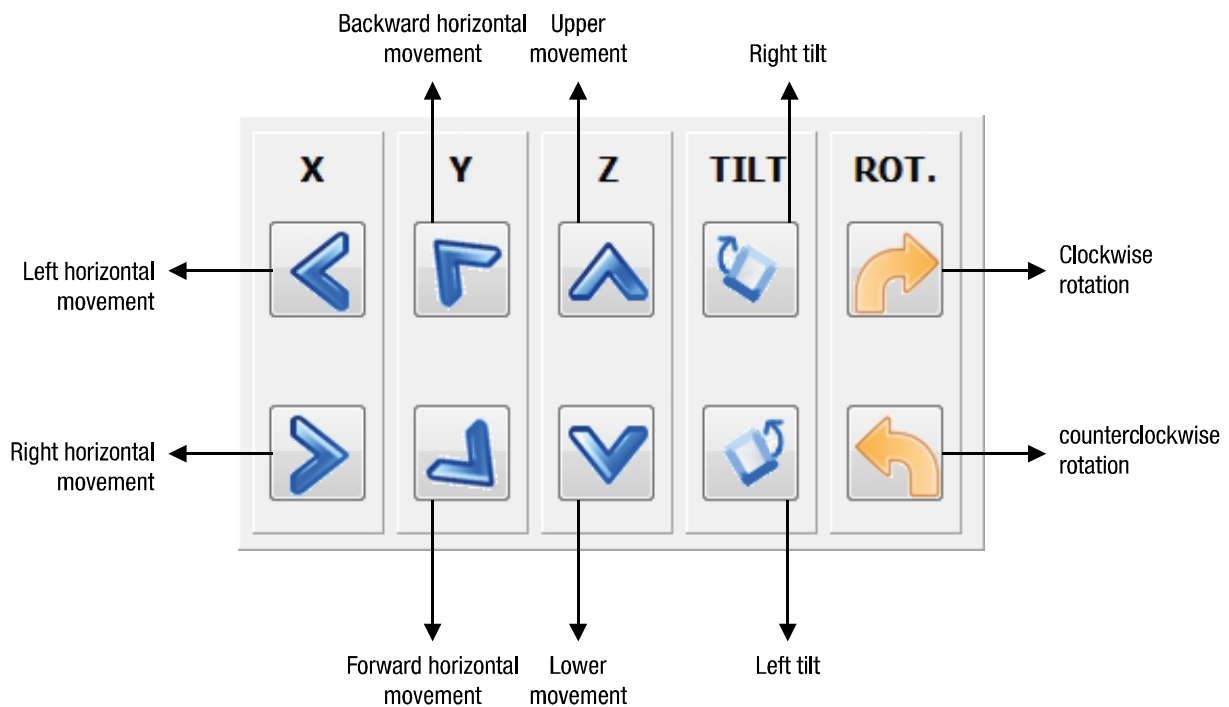


Figure 34: Manipulator controls

REMARK: The motion speeds are pre-defined, they cannot be adjusted.

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Balteau in words...

BALTEAU NDT is a company based and established in Belgium since 1906. The activity of the power transformers successfully turned into the X-ray business in 1932. Years after years BALTEAU has affirmed its leadership leading the technology and setting the foundation of modern X-ray technologies. The first company ever to reach 200, 300 and 400 kV in the past, Balteau has today brought to the industry new standards that are consciously Safety oriented to allow users to operate equipment safer and easier. Balteau is also greatly caring about environment and always uses top grade and specification materials to ensure that the efficiency of the equipment will be at the top of what is technologically achievable.

On the service and spares side, BALTEAU is providing the buyer with an exceptional and unequalled commitment of continuous service all through the life cycle of the product. Qualified engineers and an extensive Worldwide network dedicated to serve our Customers is actively participating to the success of our brand and to your possibility of always getting, from the selection of your equipment to its follow up in service, a qualified and professional support.

Balteau in numbers...

BALTEAU has a very long established network in more than 40 countries, some of our agencies are of second generation proving they rely on the quality of our products and that they are totally committed to their business in NDT.

BALTEAU has produced more than 13.000 generators spread in more than 60 countries. We have 3 ranges of products and are the only manufacturer in the world to provide from Crawlers to Systems built into the same factory.

Balteau in names...

Patented names and commercial brandings are:

- BALTOSPOT (Portable and Crawlers X-ray equipment)
- GFC (Panoramic portable equipment)
- CERAM (Pulsed frequency portable equipment)
- HAND X (Radio remote control for portable X-ray)
- BALTOGRAPH (Stationary X-ray equipment)
- XSD (HF CP X mobile and stationary X-ray equipment – High power)
- CLD (HF CP X mobile and stationary X-ray equipment – Low power)
- BALTOSCOPE (Radioscopic and Digital imaging)
- AIS & Systems (Custom made)

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