

BRT-90 PLUS DFP

Product Data Remote Controlled R&F Table $\pm 90^\circ$ Tilting

EQUIPMENT DESCRIPTION

BMI Biomedical International distributes high technology remote control diagnostic systems, able to satisfy every need of X-ray operators.

BRT-90 Plus DFP is equipped with Hi-Tech control electronics, modular and expandable, interfaced through LAN and CAN to the generator, collimator, images acquisition devices and remote tele-diagnosis server.

BRT-90 Plus DFP analogue features $+90-90$ tilting, elevating tabletop and a very easy access to the patient, even from a stretcher or a wheel chair. SID (Source-Imager Distance) is variable from 105cm up to 180 cm thus allowing thorax exams without the use of an additional Bucky stand.

It offers a complete control of the system, of the exam parameters and of the lowest patient dose so that fast execution time and ensures an impressive image quality for any examination.

The flat panel technology of **BRT-90 Plus DFP** delivers sharp and accurate images to support the diagnosis and is not affected by geometric distortion.





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STANDARD CHARACTERISTICS

Kind of equipment and class According to IEC60601-1	Protection against electric shock: Class I EM apparatus (IEC 60601-1:2005 §6.2)
Protection degree according to IEC 60529	Continuous working
Covers	ABS PUR Metallic
Colors	Standard: - White RAL9001 - Green NCS S 0575G40Y
Main power supply requirement	
Standard power supply	400 Vac ($\pm 10\%$) 3 Phase + N + Earth
Frequency	50-60 Hz
Net isolation	Transformer 2 kVA
Protection	8A with thermo magnetic switch
Line impedance	$< 1 \Omega$ 400 Vac
Loaded voltage fall	$< 2\%$



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REMOTE CONTROLLED TILTING TABLE

Technical specifications

Table height in vertical position	2580 mm
Vertical mount height	1960 mm
Width	2545 mm
Maximum height with table in horizontal position and focus to film at 180 cm	2370 mm
Minimum and maximum height from ground with table in horizontal position	470 mm – 1450 mm
Depth (distance between mounting base and tabletop inside)	2040 mm
Access from forth side (back)	300 mm
Column displacement	2240 mm
DFR holder displacement	2250 mm
Rx covering area	430 x 2090 mm
Distance from tabletop to receptor	70 mm
Distance from tabletop to flat panel detector. Magnification and reduction factor.	<ul style="list-style-type: none"> • Tabletop – Detector: 70 mm • Magnification factor at 105 cm = x 1,106 • Magnification factor at 180 cm = x 1,030 • Area reduction factor at 105 cm = x 0,930 • Area reduction factor at 180 cm = x 0,960
Weight distribution plate (to be anchored on the floor)	<ul style="list-style-type: none"> • 1520 x 1520 x 20 mm – \approx 360 Kg. • Alternatively: 1520 x 1520 x 15 mm – \approx 262 Kg



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PATIENT TABLETOP

Technical specifications

Dimensions

- 2495 × 715 mm
- Width 27 mm
- Useful area: 2320 × 505 mm

Tabletop

- Standard tabletop (white): carbon fiber covered
- Filtration 0,7 mm Al @ 100 kV
- Max patient weight 270 Kg (without limitation)
- Optional tabletop (black): carbon fiber
- Filtration 0,4 mm Al @ 100 kV
- Max patient weight 270 Kg (without limitation)
- Tabletop side profiles of 6 mm, ready to attach some accessories

Tabletop lateral movement

± 15 cm

Longitudinal excursion

- Tube column longitudinal excursion: 1880 mm
- Spot film device (center) excursion: 1685 mm
- The movement of both column and flat panel allows for patient total scanning: 210 cm at adjustable speed up to 15 cm/sec, controlled through joystick
- Important: the movement of the longitudinal tabletop is not necessary as the complete exposure of the patient is guaranteed by the field of movement of the column and the Digital Flat panel

Tube angulations for oblique projections

$\pm 40^\circ$ with I.I. parallax correction

Tabletop tilting range

-90° to $+90^\circ$ continuously

X-ray tube assembly rotation range

-180° to $+180^\circ$ motorized, control from console

SID

From 1050 mm to 1800 mm, continuously or with presets

ACCESSORIES

Standard

- Removable footrest with surface 400x600 mm;
- Shoulder rest
- Pair of ergonomic handlers

Optional

- Paper roll bearer
- LDC glass bearer
- Compression band
- OB-GYN legs bearer
- Lateral cassette holder for oblique projection
- Hand safety stripes
- Additional pedal (in examination room) for RAD/Fluoro





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DYNAMIC CHARACTERISTICS

Technical specifications

Tabletop rise time from lower to max height (horizontal position)	15 s
Tabletop combined rotation from 0° to $+90^\circ$	25 s
Tabletop combined rotation from 0° to -90°	26 s
Tabletop combined rotation from -90° to $+90^\circ$	37 s
Tabletop lateral displacement	From 1 cm/s to 2,5 cm/s
Lined translation (X-ray tube + receptor) along the horizontal axis	12 s
Rotation only from 0° to $+90^\circ$	16 s
Focus to film extension from 105 to 180 cm	18 s

TOMOGRAPHY

Technical specifications

Type	Plan graph with homothetic linear movement and electronic fulcrum calculation
Stratum max height	400 mm (physical limit 450 mm)
Increase / decrease	<ul style="list-style-type: none"> Manual, 1 mm step Automatic (auto step function) with step mm program and selectable according to starting tomo angle
Speed	$10^\circ - 21^\circ/s$ adjustable
Tilting angles	<ul style="list-style-type: none"> Preset $8^\circ - 15^\circ - 20^\circ - 30^\circ - 40^\circ$ According to customer preference within max 80° with respect to the chosen anatomical area and FFD
Tomo timings	<ul style="list-style-type: none"> Up to 5 speeds can be chosen that represent a percentage of the max speed: 3525 cm/s ($21^\circ/s$) For each tilting angles the speed can be decreased in 5 steps of approx. 10% per step. A tomography at 40° and FFD 105cm at the maximum speed will take approx. 2,2 s.
Direction	Bi-directional in each position of table and FPD/column group
Sequence tomography	Sequence program with outward and inward emission up to the limits set by the operator or to the reaching of preset limit; stratum, area, etc.
Receptor movement range	Tomography can be executed in different receptor position according to the angle, to the FFD and the selected stratum.





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ABDOMINAL COMPRESSOR (Optional)

Technical specifications

Positions

- On field
- Compression

Commands

On the touch screen, through the joystick and on table control boards

Compression power

Can be set from 2 kg to 20 kg with 0,5 kg step

Min. distance compressor cone from Tabletop

80 mm

Max. distance compressor cone from tabletop

420 mm

Compressor displacement

340 mm

Protections

- Compressor limit control
- Automatically deductible compressor

Movements and parking

Motorized

Other characteristics

- Remote controlled with automatic parking. It can be separately installed
- Display of the dynamic pressure and of the set pressure

STITCHING | EXAMS OF THE COLUMN AND LOWER ARTS (Optional)

Technical specifications

Type

Linked to digital acquisition system DFP

Image size

- 43 × 60 (2 images)
- 43 × 90 (3 images)
- 43 × 120 (4 images)

Direction

Head to foot

Interface

Integrated with the H.F. Generator, collimator and Digital Images acquisition system



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COLLIMATOR

Technical specifications

Model	Manual with push buttons and knob. Automatic, microprocessor controlled and CAN-BUS interface
Functioning	Square and rectangular
Field	2 mm Al eq.
Inherent filtration	430 × 430 mm
Square field covering at 1 m FFD	> 160 lux
Light indicator accuracy	< 1% FFD
Laser pointer	Direct line projection
Optional	Additional filters as disks with automatic filter exchange. It can be done manually or automatically via CanBus. <ul style="list-style-type: none"> • 1 mm Al + 0,1mm Cu • 1 mm Al + 0,2mm Cu • 2 mm Al

X-RAY TUBE (typical model)

Technical specifications

Brand and model	<ul style="list-style-type: none"> • X-ray tube: IAE model RTM 90 H(S) • Housing: IAE model C352
X-ray tube main features	<ul style="list-style-type: none"> • Focal spot size: Small focus 0,6 mm / Large focus 1,2 mm • Anode speed: <ul style="list-style-type: none"> - 3.000 r.p.m. - 10.000 r.p.m. (refer to the optional for the X-ray generator) • Nominal input power: <ul style="list-style-type: none"> - At 3.000 r.p.m.: Small focus 24 kW / Large Focus 60 kW - At 10.000 r.p.m.: Small focus 35 kW / Large Focus 85 kW (refer to the optional for the X-ray generator) • Anode material: RT-TZM • Anode angle and diameter: 12,5° / \varnothing 90 mm • Nominal X-ray tube voltage: 150 kV • Maximum anode heat content: 225 kJ (300 kHU) • Maximum continuous heat dissipation: 750 W (60.000 HU/min) • Maximum heat dissipation: 1.300 W • Inherent filtration: 0,7 mm Al equivalent

**The use of IAE X-ray tube model RTM 101 H(S) is also possible.
For technical features please refer to the specific Technical Data Sheet.**

Housing main features

Housing main features	<ul style="list-style-type: none"> • Nominal X-ray tube assembly voltage: 150 kV • Maximum X-ray tube assembly heat content: 1280 kJ (1707 kHU) • Maximum continuous heat dissipation without fan: 230 W • Minimum X-ray tube assembly inherent filtration: 1,2 mm Al @ 75 kV • Minimum total filtration: 1,5 mm Al
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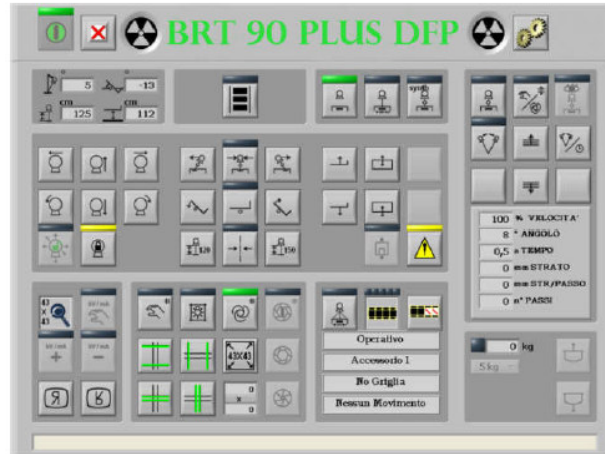




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X-RAY GENERATOR MAIN CONSOLE



Description

It is the main component which allows the total functional system's remote-control; it is provided by a Keyboard and by several alphanumeric displays for visualization of all status information and active operations as well.

19" Control console Medical Grade Panel PC Touch Screen with all commands:

- Nr. 4 keyboards duplicating the most frequent commands: tube angulations movements FFD Tabletop tilting and elevation movements
- Longitudinal and transversal displacement.

Touch screen characteristics

- Dimension: 19"
- Resolution: 1.600 \times 1.200 pixel
- Brightness: 350 cd/m²
- Number of colors: 32 bit
- View angle: 170°H - 170°V
- Aspect ratio: 4:3

Available connections

- Dedicated LAN connected to control CPU
- Standard LAN for networking
- N. 4 RS232 ports

Additional controls

N. 2 additional membrane keyboards are located on the image receptor front and x-ray tube front duplicating all table controls.



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INSIDE | R&F DIGITAL IMAGE ACQUISITION SYSTEM

X-ray examinations

The R&F Digital Image acquisition system is a full field direct to digital imaging system combined with a Digital Flat Panel Detector. It makes for fast examination and therefore high patient workflow, as well as offering cost savings and excellent image quality at lower doses.

It covers a huge range of examinations in General Radiology studies like:

- (Angiography)
- Chest
- ERCP procedures
- Gastrointestinal
- Genitourinary
- Interventional
- Lymphography
- Long leg % spine stitching;
- Muskoloskeletal
- Myelography
- Swallowing
- Tomography

Advanced Imaging Processing

Instant ready images:

- Unlimited APR programs. More than 30 preset parameters for each anatomical study
- Anatomical presentation of the images for the best intuitive use
- Choice of the lowest X-ray dose for each selected study
- Reduce examination time
- Better comfort for the patient and the operator

A.T.H. - Anatomical Tissue Harmonization:

An advanced image processing in DR modality, an image quality enhancement as never before.

- A greater flexibility by adapting the processing to the anatomical region
- A good detail visibility in under and over penetrated areas
- Increasing of latitude without loss of detail contrast
- A.T.H. reduces the need to window and level the images presented on a workstation display in PACS system
- Images with inherent large latitudes as chest, skull and lateral spine strong enhanced without noise amplification and edge artifacts
- A great benefit thanks to a better diagnostics accuracy and radiologist productivity

Dose Saving

- Virtual collimator
- Virtual scanning

Digital Tomography

Combining the flat detector image quality with the remote-control table ergonomics, the digital Tomography becomes again very affective





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INSIDE | R&F DIGITAL IMAGE ACQUISITION SYSTEM

Image processing

- Sharp spatial filtering, kernel 3×3 to 11×11
- Automatic or manual Windowing: contrast, brightness; grey level inversion
- Automatic or manual magnification of the image: zoom on detector and on the image
- Multi image display, with "imageette" for a quick exam check
- Automatic or manual electronic collimators
- Measurement SW: distances, angles, stenosis
- Image display: H/V inversion, 90° rotation, true size image editing
- Text editing with large fixed strings selection.

Networking

- DICOM work list management – RIS connection
- DICOM storage service – Send images to a workstation & or archiving system
- DICOM storage commitment.
- DICOM print service – Print film editor program
- DICOM CDROM – Archiving on CD ROM from Mirror
- DICOM – Modality Performed Procedures Step (MPPS)
- LCD 18" or 19" Monitor for medical images display

Stitching (Optional)

Images Stitching - Integrated procedures for leg and spine images stitching.

The stitching function, (usually used for spine and legs scan) is needed for the automatic reconstruction of an X-ray image starting from a series of images acquired at fixed frequency during the scanning of the patient.

The image is reconstructed, keeping all original pixels, and can be viewed on the monitor, processed, printed or sent to the network.

As for standard acquisition, stitching is done giving the x-ray command from the generator control panel – the system automatically generates the required exposures (2,3,4) each time irradiating a different part of the patient. After the exposure, the system automatically processes the acquired images and then recomposes them creating a single image shown on the monitor after approx 30 seconds.





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INSIDE | R&F DIGITAL IMAGE ACQUISITION SYSTEM

Technical specifications

User interface

Windows XP or Win 7 / 32 bit, Win 7 /6 4 bit OS, intuitive icon, 3F mouse, keyboard. Multi language information: Italian, English, French, German, Spanish,. Other languages upon request.

✓

Archive display

Patient data archive: work-list, studies to do, studies completed, studies documented (print, store, etc).

✓

Operative panel

- Frame area : 1280 × 1024 pixels
- Image area: 1024 × 1204 pixel, overwrite tools (patient data, image data, dose, symbols and graphics)
- Icons area: pre-acquisition data selection, post-processing functions, images destination for reporting, system status, exposure dose rate evaluation.
- Thumbnails of the main 6 images/run acquired

✓

Display

Control Desk: 19" LCD medical display, DICOM LUT, monochrome image, colours for icons and graphic (live image display)

✓

In room: one/two 19" medical LCD high brightness (1.500 cd/m²), DICOM LUT, native monochrome (live and reference images)

✓

Special operative modes

- Tomography: linear tomography with selectable angles
- Stitching: serial images acquisition and automatic reconstruction 60 cm, 90 cm, 120 cm (optional)

✓

✓

Automatic pre-acquisition parameters according to APR

- Rx dose in radiography and fluoroscopy for 4 different patient sizes
- kV-mA / mAs
- AEC on/off, measure fields choice
- Rx tube focus
- Focus to Flat panel detector distance
- Grid type: on/off, grid 1 or grid 2
- Pre-collimation, filter selection
- Positioning exam / patient
- Image processing in fluoroscopy or radiography: ROI, LUT, algorithms
- Image display modality, magnification programs
- Image windowing (contrast / level)

✓

Post Processing

- Images review: FW/RW, images search, cine-loop, mosaic (4, 9, 16, 1+5, 1+7)
- Images delete: from the mosaic mode or from the full study
- Images presentation: Image magnification from 1:1 pixel up to 3:1; H/V inversion; 90° rotation; windowing; gamma correction; grey scale inversion; spatial filters (sharp/smooth, kernel, harmonization)
- Graphic management: angles & distances measures, calibration, free texts, images cover, arrows, etc.
- Image collimation: free collimation with automatic re-centering.

✓





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INSIDE | R&F DIGITAL IMAGE ACQUISITION SYSTEM

Technical specifications

Networking

Description

Standard

Optional

Dicom 3: Send, Print, Worklist

✓

Dicom 3: Storage Commitment

✓

Dicom 3: Modality Performed Procedure Step (MPPS)

✓

Dicom 3: Query/Retrieve

✓

Dicom 3: Dose Structured Report

✓

Archiving

- Local on removable media (CD Rom/DVD, Dicom or Row Format)
- Remote archiving in mass storage device (PACS)
- Remote printing using film editor program: format true size: stand-ard, row, col, slide and super slide

✓

PC Cabinet

Main Controller:

Control PC for the complete Rx diagnostic with interface & controls of: remote table, collimator, generator, ione chamber, grid, DAM, PID, PU4343

✓

PID:

PC for images processing. PC architecture: Windows W7 Pro 64 bit, Pentium 4/3 GHz, 8 GB RAM, 250 GB HD (minimum configuration)

✓

TOMORIX | TOMOSYNTHESIS (Optional)

Technical specifications

Functionally

Description

The tomosynthesis is a digital technique that allows the reconstruction of volumetric images starting from a finite number of bidimensional projections taken at different tube angulations. This is given by the separation of the acquisition process from the visualization one. Among the advantages with respect to CT scan technique, it is well accepted by those patients affected by severe claustrophobia.

Tomosynthesis features several applications like:

- Weight bearing views
- Knee pain
- Spontaneous osteo necrosis
- Bone on bone
- Worn cartilage

Frame rate

4/6/8 fps

Single exposure duration

4 ms

Number of exposures per exam

Up to 60

Projection angle

40°

Scanning speed

7,5 s

Stratum selection

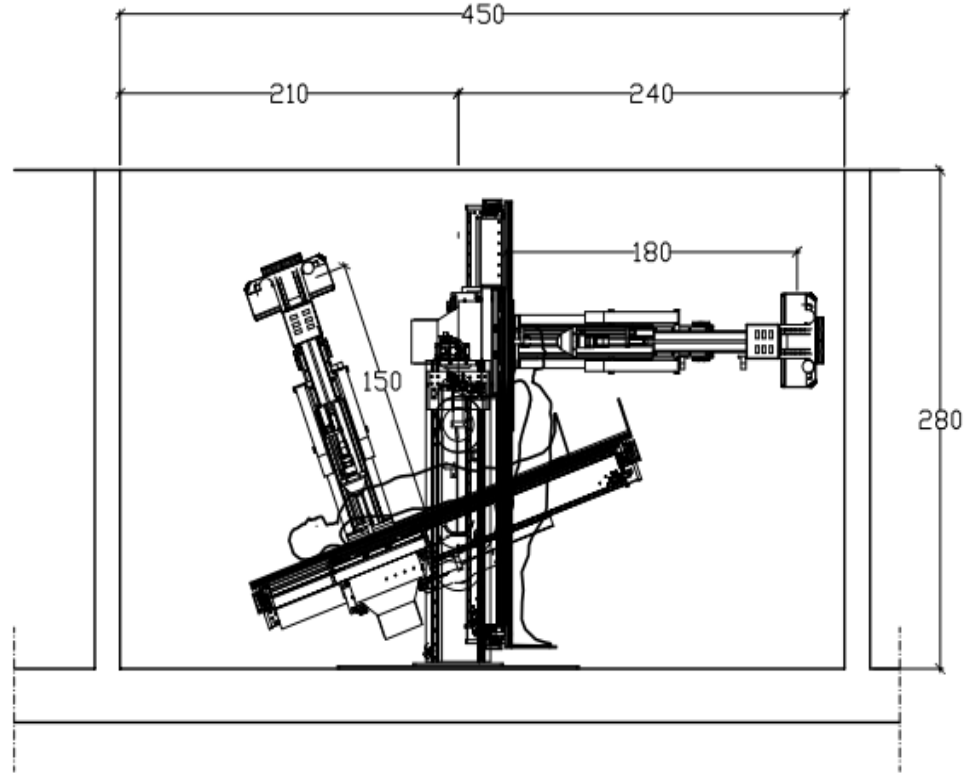
It can be select by the operator from 0 to 400 mm



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MINIMUM OVERALL DIMENSIONS OF THE EQUIPMENT DURING OPERATION

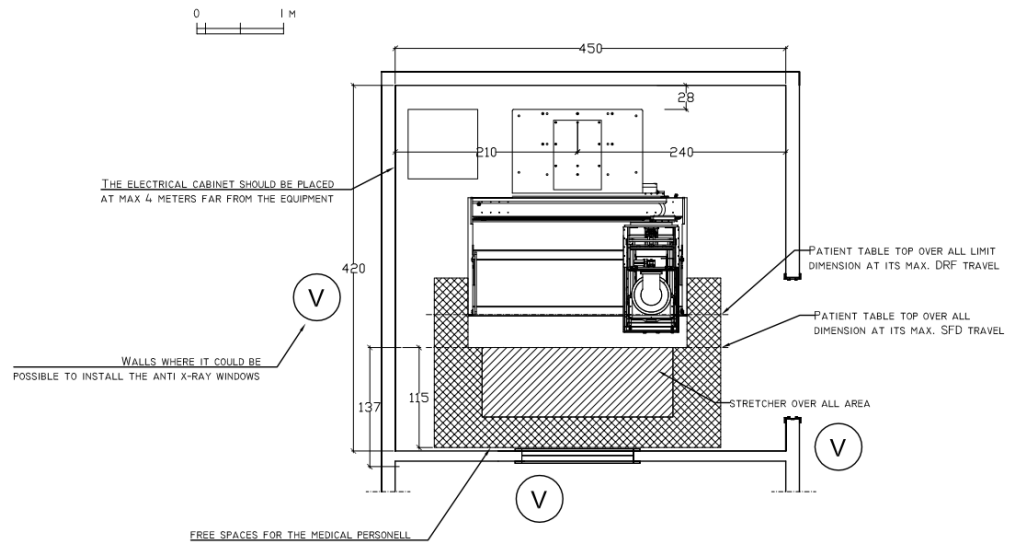




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DIAGNOSTIC ROOM LAYOUT EXAMPLE



In case of DRF the depth could be reduced from 420 cm to 380 cm