XFM

Mobile digital radiographic device

Product Data

Cod. PDE-XFM Rev. 12

XFM is a mobile digital radiographic device intended to be used for diagnostic investigations on adult and paediatric patients, within hospitals, emergency rooms, intensive care, sports medicine. The device allows the acquisition and processing of radiographic images of the skeleton (skull, spine, extremities), thorax, abdomen and other parts of the body even on bedridden patients in hospital wards. XFM is not intended for mammography applications.

Images are acquired with a portable digital flat panel detector featuring amorphous Silicon (a-Si) technology; this detector employs **wireless** image data transmission, thus freeing the room from cumbersome and risky cables.

This battery-powered and extremely lightweight detector offers large operating autonomy and versatility of use.

With this innovative unit, ITALRAY matches the **portability** and **ease of use** of its mobile systems with the innovation of **digital technology** for the **optimization of both image quality and patient dose**, and for the immediate availability of diagnostic images through the hospital network (Full DICOM).

XFM is strongly characterized by its **extremely light weight** (less than 300 kg!), easy manoeuvrability, compact design and limited overall dimensions. This grants for easy moving around every hospital with perfect visibility.

The control panel is a large area **19" LCD high-contrast touch-screen** console that can be used also wearing protective gloves. The XFM GUI provides easy access to any available feature through its intuitive and large buttons and manage acquisition of digital radiographic images by means of a portable digital flat panel detector. This portable detector is battery powered and extremely lightweight and it employs wireless image data transmission, thus freeing the room from cumbersome and risky cables.

XFM is supplied with a **40-kW** high-frequency microprocessor-controlled generator, for shorter exposure times, with a rotating anode with double focus. The generator maximum operating voltage is 125 kV with a maximum current of 500 mA, and very short exposure times. These are necessary and essential for the execution of the x-ray exams required to this type of device.

More than 1000 anatomical programs (APR) for adult and paediatric applications are available with possibility to perform examinations with two- and three-point technique. Pre-programmed Anatomical Programs facilitate exam execution and increase system productivity.

A **light weight lithium (Li-ion) battery package** makes XFM completely "exposure independent" from wall power for very long time (up to 8 hours), allowing extensive operation and more portability since no cable will encumber system positioning.

The **motorization system**, together with the extreme light weight, increases XFM manoeuvrability and grants the user **a "one-handed" driving experience**. A highly reliable active **anti-collision system** assures safe transport within every hospital environment.

CONFIGURATIONS:

Depending on:

1. on the power supply voltage, and
2. the type of detectors with which it interfaces, that adopt different communication protocols,

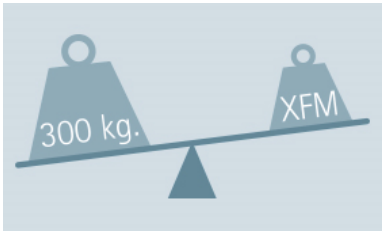
XFM is available in the following configurations:

- Mobile digital radiographic device, power supply ~ 230V interface with Multitrigger detectors
- Mobile digital radiographic device, power supply ~ 230V interface with Autosensing detectors
- Mobile digital radiographic device, power supply ~ 127V interface with Multitrigger detectors
- Mobile digital radiographic device, power supply ~ 127V interface with Autosensing detectors
- Mobile digital radiographic device, power supply ~ 115V interface with Multitrigger detectors
- Mobile digital radiographic device, power supply ~ 115V interface with Autosensing detectors.

MAIN CARACHTERISTICS

EXTREMELY LIGHT WEIGHT

XFM is strongly characterized by its extremely light weight, easy manoeuvrability, compact design and limited overall dimensions.



DOCKING STATION ON BOARD FOR FLAT PANEL DETECTOR

XFM has a dedicated bin to keep safe the flat panel detector during transportation and not use.

A dedicated bin (*) for 24x30 cm detector is available as option.

XFM GRAPHICAL USE INTERFACE

XFM GUI provides an easy and intuitive access to any available feature through its large icons, on the lateral toolbar

(*) Optional

MAIN CARACHTERISTICS

TRANSPORT BAR WITH SPEED CONTROL JOYSTICK

The motorization system, together with the extreme light weight, increases system manoeuvrability and grants the user a "one-handed" driving experience.

A dedicated joystick positioned on the handle bar controls speed and fwd/rwd direction.

OVER BOOST

Over boost allows to momentarily increase the motor power which can be necessary in particular situations (overcoming of obstacles, high slopes of more than 12°, rapid movements in confined spaces, ...).

EXTEND OPERATION AND PORTABILITY WITH LI-ION BATTERY PACK

Li-ion battery package completes its charge in **less than 2,5 hours** and, once fully charged, it provides the system a capacity of **more than 350 exposures**.
In case of low battery charge, system can equally be connected to wall power supply in order to proceed with examination.

Li-ion battery technology grants very good power stability even when battery is below 5% of its charge. This means that, exposures can be taken even when battery charge is almost down.
Li-ion batteries assures high typical state of charge values and high cycle life, and strong steady battery capacity for temperature variations and high discharge rates.

HIGH FREQUENCY GENERATOR

XFM is equipped with a 40-kW microprocessor controlled and high-frequency inverter type generator

Maximum operating voltage reaches 125 kV and maximum current 500 mA

Short exposure times, are strongly needed for the radiological examinations requested to this kind of device.

(*) Optional

MAIN CARACHTERISTICS

SID MEASUREMENT AND DISPLAY (*)

Contactless electronic meter with LCD display for SID		

ROTATING (±90°) SWIVEL ARM

The rotating swivel arm gives the flexibility you have always wanted for a mobile X-ray system: its ±90° rotation provides all the necessary freedom to position the unit for bottom bed and bedside examinations.		

(*) Optional

CONTROL AND SAFETY

COLLISION PREVENTION

A unique active contact-less anti-collision system automatically stops the system whenever an obstacle is detected within ±45° (angle) along movement direction. Driver is informed of the obstacle also with visual alerts.		Anti-collision system can be easily disabled when positioning the system next to patient bedside or in narrow spaces.

DOSE MONITORING (*)

The display, documentation and storage system of the dispensed dose is achieved thanks to the DAP meter positioned at the exit of the X-ray tube and connected to an electronic unit for the detection and measurement of the product dose per area (DAP meter). The XFM software manages all the dosimetric data acquired in the patient file and generates a report of the individual exposures or of the entire examination. These data can then be exported in DICOM format to a network node.
The detected dose values (together with the values of the radiological parameters used in image acquisition) are displayed on the control console monitor and automatically stored in the DICOM file.
In this way the user can always have the RX emission data available, allowing (for Modality Perform Procedure Step service) the exportation also of the details related to the exposure of the patients in a standard format. The data thus available can therefore be sent automatically or upon request to a company analysis system (Radiation Report System) or to the RIS-PACS system.
The DICOM classes necessary to be able to send to PACS together with the acquired images also the information about dose delivered to the patient for each exam, are: **DICOM MPPS (SCU): Sending the examination status to HIS / RIS** and **DICOM RDSR (Radiation Dose Structured Report)**.

DOSE REDUCTION METHODS

1. For dose reduction to the patient: the possibility of using an Amorphous Silicon digital detector, with Cesium Iodide scintillator, guarantees an extremely high DQE with a consequent significant reduction in patient dose, high values of sensitivity, contrast and resolution. This allows obtaining excellent image quality with the minimum dose delivered to the patient. The detectors used in the XFM system are characterized by high DQE values;
2. For dose reduction to the patient: In order to reduce the dose to the paediatric patient, XFM is equipped with a particular collimator containing within it three optional filters that can be inserted manually by the operator. The collimator has a minimum inherent filtration of 2 mm Al eq. Paediatric filters can be inserted between these values:
   - 0 mm Al eq.
   - 1 mm Al eq. + 0,1 Cu
   - 1 mm Al eq. + 0,2 Cu
   - 2 mm Al eq.
3. For dose reduction to the patient: In order to prevent the delivery of undue dose to the patient, the XFM is equipped with a control system. This system communicates to the operator (on the operator console) that the detector is ready for image acquisition, thus avoiding that the operator makes x-ray exposure with the detector not ready, switched off, or with insufficient residual charge.
4. For dose reduction to the patient: XFM DR mobile can be equipped with an optional dose meter for patient dose monitoring (kermaxarea DAP meter). This consists of a rectangular transmissive ionization chamber and an electrometer with integrated display on the chamber itself; it is positioned in the filter-holder guides placed at the collimator outlet and allows the measurement of the total amount of radiation delivered during the diagnostic radiological examinations. Its particular sensitivity makes it indispensable in PEDIATRIC RADIOLOGY. Data measured for the single projection / exam is saved together with the corresponding image and made available both in the monitor display of the image itself and for its printing.
5. For dose reduction to the operator: the main rule to be observed by the operator is the need to avoid widespread or secondary ionizing radiation during x-ray exposure. This is achieved by keeping the Medical Radiology Technician protected by Pb aprons and away from the X-ray source, protected by shielded mobile bulkheads, or dedicated fixed structures. For this purpose, Italray XFM is equipped with a exposure push-button with a spiral cable that, when fully extended, reaches 4 meters. In addition, a wireless control (optional) equipped with preparation and emission buttons, ensures complete operation at longer distances and definitely safe (up to 50 m).

(*) Optional

TECHNICAL SPECIFICATIONS	
MECHANICAL CHARACTERISTICS	
X-ray monobloc arm rotation	± 90°
X-ray monobloc arm rotation (horizontal axis)	-90° / +180°
X-ray monobloc arm rotation (vertical axis)	0° / +90°
Collimator rotation	± 90°
Width	68 cm
Length	123 cm
Height (parking position)	161 cm
Max SID from floor	205 cm
Min SID from floor	70 – 63 cm (parking position)
Max arm frontal extension	130,5 cm
Max arm lateral extension	88 cm
Braking system	Dead man braking system
Weight [kg]	298 kg
Driving rear wheels (ø)	43,5 cm
Front wheels (ø)	10 cm
BATTERY KIT	
Type	Li-ion
Batteries	24 V – 4 A
Recharging time	Max. 2,5 hours
Battery capacity	40 Ah
Stand-by autonomy	More than 6 hours
Exposure power	Up to 40 kW, also with battery charge less than 10%
Battery level indicator	On software interface.
MOTORIZATION KIT	
Max speed	Variable speed motor: up to 2,5 Km/h (5,5 km/h with **over-boost**)
Max. ramp angle	12°
Max. step height	2 cm
Motorized movement	Yes, with dedicated Li-Ion battery pack.
Anti-collision system supplied with motorization kit	Frontal contact less anti-collision sensor automatically stops the device, whenever an obstacle is detected in front of the machine during system movement.
Movement when completely out of batteries	It is possible thanks to lightweight and comfortable ergonomics

(*) Optional

TECHNICAL SPECIFICATIONS

RADIOLOGICAL CHARACTERISTICS

Switching frequency	40 kHz
Output power	40 kW
Low ripple	< 1% at max power
kV range	40 – 125 kV. Precision: 1 kV
mA range	50 - 500 mA
Range mAs	0,5 - 400 mAs (27 steps)
Time range	1 – 250 ms (battery mode) 1 – 6300 ms (from the mains)
Maximum monobloc heat content	1103 kHU
Operating mode	2-points radiological technique with selection of kV/mAs, or 3-points radiological technique with selection of kV/mA/ms
APR	More than 1000 anatomic programs. 3 points technique and 2 points technique.
Automatic Exposure Control (AEC)	3-field solid state sensors (*)
Dose Area Product (DAP)	YES, with dose information stored in image DICOM header (*)
X-ray tube type	Rotating anode
Anode speed	3.000 rpm
Anode angle	15°
Focal spots	Small focus: 0,6 x 0,6 mm - Large focus: 1,25 x 1,25 mm
Max power	14 kW (s.f.) – 40 kW (l.f.)
Anode material	RTM
Radiation field	43x43 cm @ SID=1 m
Filtration	Total: 3,7 mm Al (Inherent 0,7 mm + 1 mm additional + 2 mm collimator)
Maximum anode heat content	225 kJ (300 kHU)
Maximum continuous anode heat dissipation	750 W (60 kHU/min)
Safety devices	The radiological system is equipped with an automatic (microprocessor) controlled system that verifies the correct functioning of all its parts: - Protection and automatic control of filament current. - Protection from over current and over voltage (kV, mA). - Protection from maximum load of X-Ray tube. - Operator error or malfunctioning indication - Start-up automatic test (autotest)
X-ray emission and image acquisition when completely out of batteries	Yes, just with connection to the mains
X-ray emission and image acquisition without connection to the mains	Yes, with Li-Ion batteries (in the transition from 100% to 2% of the charge, the autonomy of the device allows to travel 11 km and make 550 exposures).
X-ray push button	- Manual with double click and 4 m extensible cable - Wireless (*)
X-ray emission indicator	On Graphical User Interface (GUI).

(*) Optional

TECHNICAL SPECIFICATIONS

COLLIMATOR

Blade control	Manual, 6 pairs
Light field source	Led lamp (>250 lux @ SID=1m)
Time on	Standard: 30 s (adjustable)
Collimation	Square field, up to 43 x 43 cm @ SID=1 m
Al eq contribution to total filtering	2 mm Al eq
Additional filtration	Additional filters are available for paediatric applications: 1) 0 mm Al eq 2) 1 mm Al eq + 0,1 Cu 3) 1 mm Al eq + 0,2 Cu 4) 2 mm Al eq
SID measurement and display	- Extensible meter (at collimator window) - - Optical meter with a display on the cover of monobloc (*)

(*) Optional

TECHNICAL SPECIFICATIONS

ACQUISITION WORKSTATION

HARDWARE	
HDD	64 GB MSATA (Operative system) 500 GB (image archive)
CPU	Intel
RAM	4 GB
CD/DVD recorder	Yes
Operating system	Windows Embedded
UPS	Yes
Image storage capacity	More than 25.000 images (full resolution)
LAN port	Yes
Connection to the hospital network in Wi-Fi mode	Yes (*)
SOFTWARE	
Image size	Max 15 MB (12,5 MB typ.)
Image enhancement	everest-X
Display functions	Image Flip/Mirror, R.O.I., Pan/Zoom, Window/Level, Automatic Window/Level, Annotations, Linear and angular measurements, Greyscale Inversion, Image Rotation, Electronic Collimators, Spatial Filters, Multi-Images Visualization
APR	Yes, preconfigured and editable
Exposure Index	Yes
Deviation Index	Yes
Reject analysis	Yes
Multi-language	English, Italian, Russian, French, Spanish.
Operator interface	Rear-lit High-Contrast 1280x1024 19" LCD touch screen display for all the operating parameters and messages for any possible anomalous conditions. **It can be used also wearing protective gloves**
IMAGE DISPLAY SYSTEM	
Type	LCD touch screen with capacitor technology
Size	19"
Resolution	1280 x 1024
Contrast	2000:1
Brightness	600 cd/mq led

(*) Optional

TECHNICAL SPECIFICATIONS

NETWORKING

DICOM functions	
DICOM Storage (SCU)	Yes. Send Image to PACS
DICOM Modality worklist (SCU)	Yes. Interface with HIS / RIS with auto refresh option
DICOM Print management Class	Yes. Covers the general cases of printing medical images in standardized layouts.
DICOM Media exchange (DICOM DIR)	Yes (*). Patient images export to DVD/CD
DICOM MPPS (SCU)	Yes (*). Send the status of exams to HIS / RIS
DICOM Storage commitment (SCU)	Yes (*). Send commitment status
DICOM Verification (SCU)	Yes (*)
DICOM Query / Retrieve (SCU)	Yes (*). Query and retrieve images from PACS
DICOM Structured Dose Report	Yes (*). To exchange structured data produced in the course of image acquisition or post-processing.
DICOM Storage SCP	Yes (*). Reception of dicom images.

(*) Optional

TECHNICAL SPECIFICATIONS

DIGITAL IMAGING SYSTEM COMPATIBLE WITH THE DEVICE

FLAT PANEL DETECTOR	Pixium 3543 DR	Pixium 3543 EZ	Pixium 2430 EZ
Detector type	Portable wireless		
Technology	Amorphous silicon		
Scintillator	Cesium Iodide (CsI)		
Format (ISO 4090)	35 x 43 cm	35 x 43 cm	24 x 30 cm
Active detector matrix (Effective Pixel matrix)	2664 x 2156 pixels	2880 x 2400 pixels	1560x1920 pixels
Image depth	16 bits		
Pixel pitch	160 µm	148 µm	
Detector Battery Indicator and Charger	Yes, and charger for up to 3 batteries simultaneously		
Battery charging time	Max 4 hours		
Battery autonomy	Max 8 hours		
Max.load capacity	Distributed: 150 kg	Distributed: 300 kg	
Typical DQE (@ 0lp and RQA5, per IEC 62220-1)	70%	70%	
Modulation Transfer Function (MTF)	@ 1 lp/mm: 61% @ Nyquist: 13%	@ 1 lp/mm: 61% @ Nyquist: 10%	
Image display time	< 6 s (Preview: 2 s)	< 6 s (Preview: 1 s)	4 s (Preview: 1 s)
Spatial resolution	3,13 lp/mm	3,4 lp/mm	
Weight	3,1 kg	2,8 kg	1,6 kg
Communication interface	Wireless / Tethered (*)		
X-ray generator synchronization	X-ray push button – Autotriggering mode		
Internal memory	1 GB (approx. 50 images full resolution)		
Standard components	One detector One battery	One detector Two batteries 3-slot battery charger	
Optional components	3-slot battery charger (*) One battery (*)	-	

(*) Optional

TECHNICAL SPECIFICATIONS

DIGITAL IMAGING SYSTEM COMPATIBLE WITH THE DEVICE

FLAT PANEL DETECTOR	**Mars 1717X**	**Mars 1417X**
Type	Wireless static flat panel detector	
Technology	Amorphous silicon	
Scintillator	Cesium Iodide (CsI)	
Format (ISO 4090)	43x43 cm (17''x17'')	35x43 cm (14"x17")
Detector dimension	46,0 x 46,0 x 1,5 cm	38,4 x 46,0 x 1,5 cm
Active detector matrix (Effective Pixel matrix)	4267x4267 pixels	3500x4300 pixels
AD conversion	16 bits	
Pixel pitch	100 µm	
Detector Battery Indicator and Charger	Yes and charger for up to 2 batteries simultaneously	
Battery charging time	4 hours	
Battery capacity	8,5 hours	
Max.load capacity	300 kg	
Typical DQE (@ 0lp and RQA5, per IEC 62220-1)	77%	75%
Modulation Transfer Function (MTF)	@ 1 lp/mm: 69% @ 3 lp/mm: 22%	@ 1 lp/mm: 68% @ 3 lp/mm: 21%
Full image display time	<5 s	<4.5s
Spatial resolution	Min 4.3 lp/mm	4.3 lp/mm
Weight	Max 3,4 kg (including battery)	3 kg (including battery)
Communication interface	Wireless	
X-ray generator synchronization	X-ray push button – *Autotriggering* mode	
Standard components	One detector Two batteries One battery charger	

TECHNICAL SPECIFICATIONS

DIGITAL IMAGING SYSTEM COMPATIBLE WITH THE DEVICE

FLAT PANEL DETECTOR	**Mars 1717V3**
Type	Wireless static flat panel detector
Technology	Amorphous silicon
Scintillator	Cesium Iodide (CsI)
Format (ISO 4090)	43x43 cm (17''x17'')
Detector dimensions	46,0 x 46,0 x 1,5 cm
Active detector matrix (Effective Pixel matrix)	3072 x 3072 pixels
AD conversion	16 bits
Pixel pitch	139 µm
Detector Battery Indicator and Charger	Yes, and charger for up to 2 batteries simultaneously
Battery charge duration	Max 2,5 hours
Battery capacity	5 hours
Max.load capacity	100 kg
Typical DQE (@ 0lp and RQA5, per IEC 62220-1)	66%
Modulation Transfer Function (MTF)	@ 1 lp/mm: 70% @ 3 lp/mm: 41%
Full image display time	5 s
Spatial resolution	3,6 lp/mm
Weight	4,6 kg (including battery)
Communication interface	Wireless
X-ray generator synchronization	X-ray push button – *Autotriggering* mode
Standard components	One detector Two batteries One battery charger

TECHNICAL SPECIFICATIONS

INSTALLATION DATA

Power supply (*)	Single phase, 230 or 115 or 127 Vac ±10%
Frequency	50/60 Hz
Maximum Absorbed Current	16 A

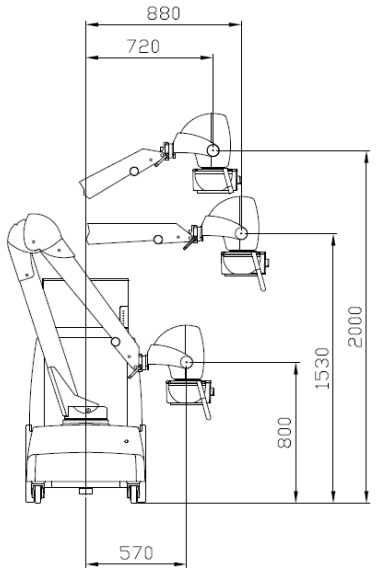
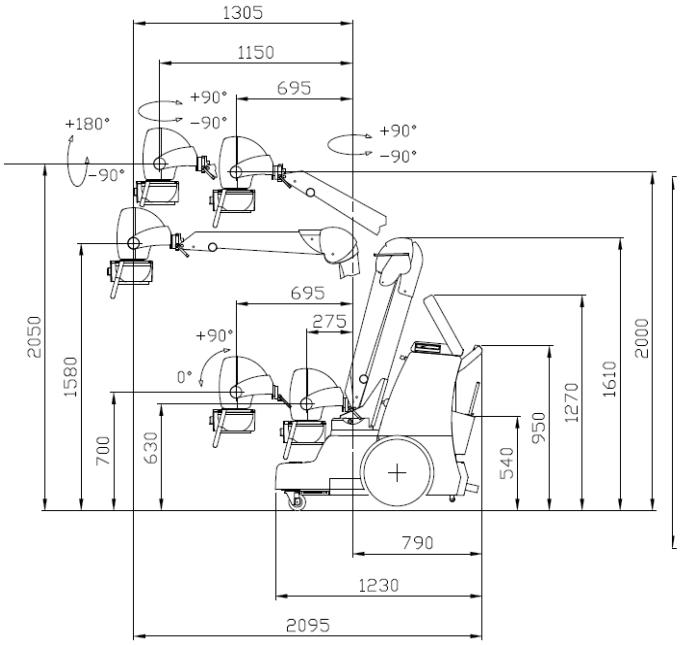
ENVIRONMENTAL CONDITIONS

OPERATING	
Temperature Humidity Atmospheric Pressure	+10°C ÷ +40°C 20% ÷ 80% 500 mbar ÷ 1100 mbar
TRANSPORT AND STORAGE	
Temperature Humidity Atmospheric Pressure	-25 ÷ +70 °C 20% ÷ 80% 500 mbar ÷ 1100 mbar

(*) Depending on the XFM configuration

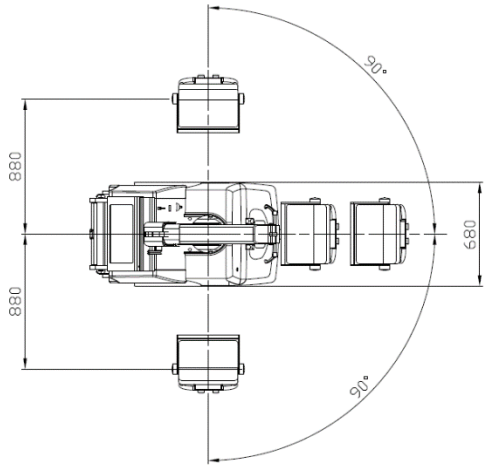
SIZE AND DIMENSIONS

XFM

FRONT VIEW		
LATERAL VIEW		

SIZE AND DIMENSIONS

XFM

TOP VIEW		

ACCESSORIES

APRON HANGER

VERSATILE STORAGE AREA FOR GLOVES, SWIPES, DISINFECTANT, ...

DOUBLE-CLICK WIRELESS CONTROL (*)

(*) Optional

INSTALLATION AND WARRANTY

INSTALLATION

Only authorized technical personnel that has been appropriately trained by ITALRAY can install XFM. Upon request, ITALRAY Installation Office can prepare system installation layouts (including eventual construction/electrical)

WARRANTY

ITALRAY guarantees its products for one year from the delivery date. ITALRAY can offer to its customers a wide range of service plans that will perfectly fit all needs and preferences

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