Perform-X F100–F400 / C100–C400
Radiographic System

Operating Instructions

CE
1011

Manufacturer:
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Öv street 29.
1141 Budapest
www.cxmed.com

50 pages
Document ID: 4788 / 04

CONTENTS

1 IMPORTANT SAFETY INFORMATION

CAUTION!

This equipment may be used only if the operator is familiar with its operation and safety features. The operating instructions (present document) must be carefully studied before operation.

ELECTRICAL SAFETY

Only trained service personnel are permitted to remove covers & panels from the equipment. The provisions of the local standards and electrical codes shall be observed at all times.

To avoid the risk of fire and electric shock, this equipment shall only be connected to a supply mains with protective earth.

MECHANICAL SAFETY

It is the operator's responsibility to ensure patient safety during positioning and usage.

X-RAY PROTECTION

- This equipment in itself does not have any control, which can trigger radiation. Exposure can be initiated only from a radiation-protected area, from the generator control console. Any person present in the room during radiographic examinations shall comply with applicable local radiation protection regulations. To protect the patient and the operator against unnecessary radiation exposure, additional radiation safety devices shall be installed and used, including personal wearable protection devices.
- **Set safe exposure factors, limit radiation field, keep safe distance and provide radiation protection for the patient.**

DANGER OF INJURY

- Do not reach into the operating device. It may cause injury or the moving part may catch your cloth.
- Positioning the X-ray tube may cause injury to persons in the area of danger.
- Do not reach behind the X-ray tube stand control. The X-ray tube assembly may be hot and could cause injury.

PROTECTION AGAINST EXPLOSION AND FIRE

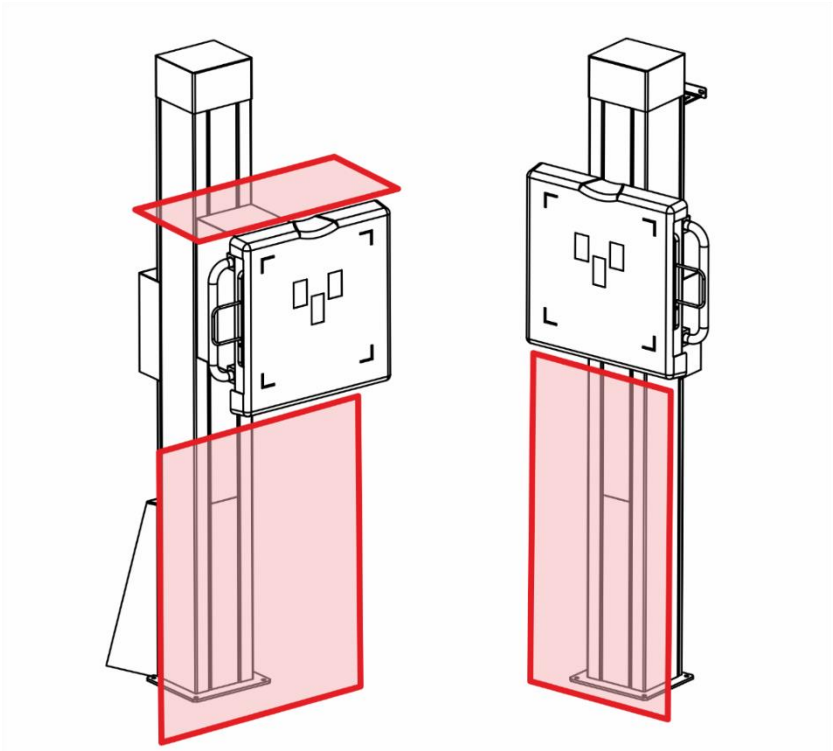
- Do not use the equipment in the presence of flammable anesthetics – explosion may occur.
- Before disinfecting or cleaning the unit, the power shall be turned off and kept off until the disinfecting or cleaning material has evaporated.

ATTENTION!

Do not use electronic devices in the x-ray room that emit **high RF energy**, such as radio transmitters and therapeutic equipment operating with electromagnetic radiation.

1.1 AREAS OF DANGER

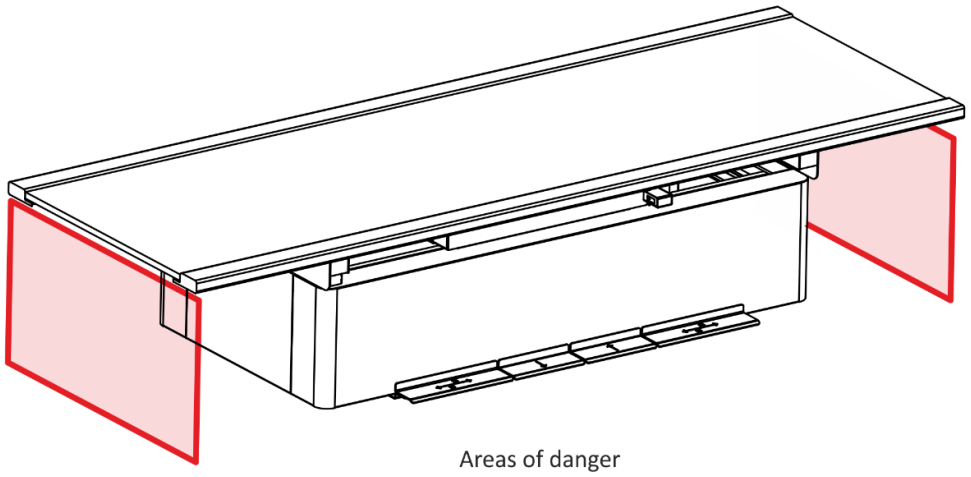
The following areas of danger are present while operating the Perform-X System:



Areas of danger in proximity of the **tilting** wall stand

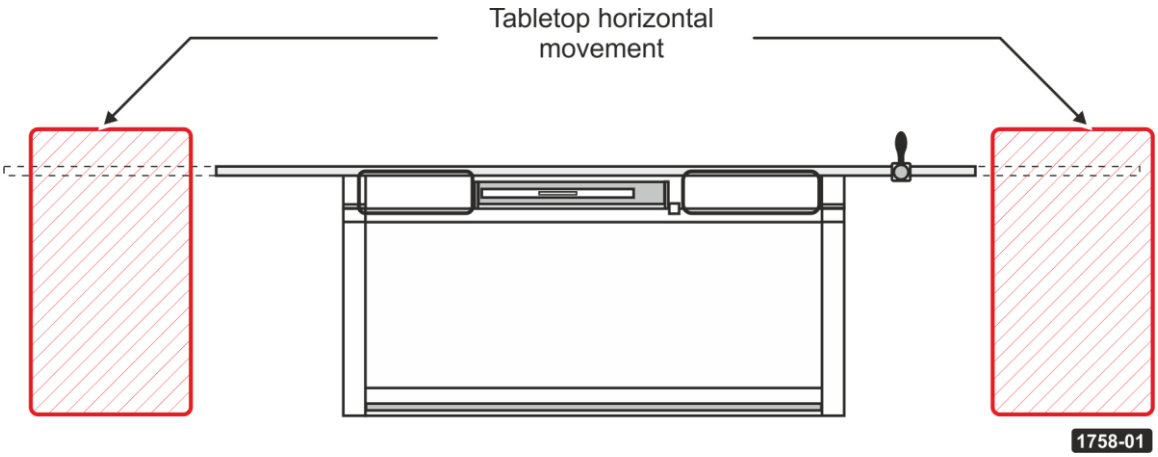
Areas of danger in proximity of the **non-tilting** wall stand

F100 F200 F300 F400 C10O C200 C300 C400



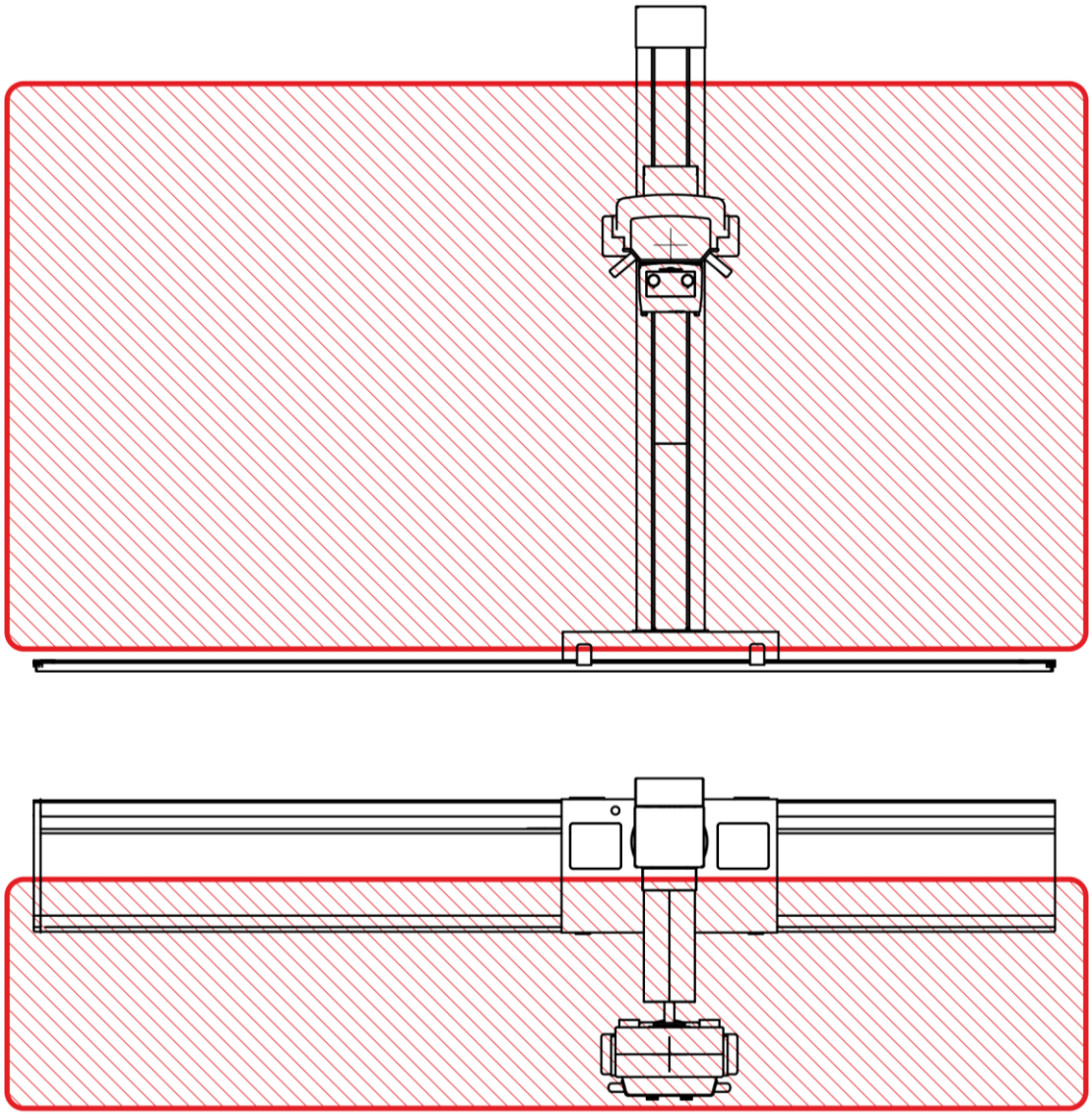
Areas of danger in proximity of the **elavating table**

F100 F200 F300 F400 C10O C200 C300 C400



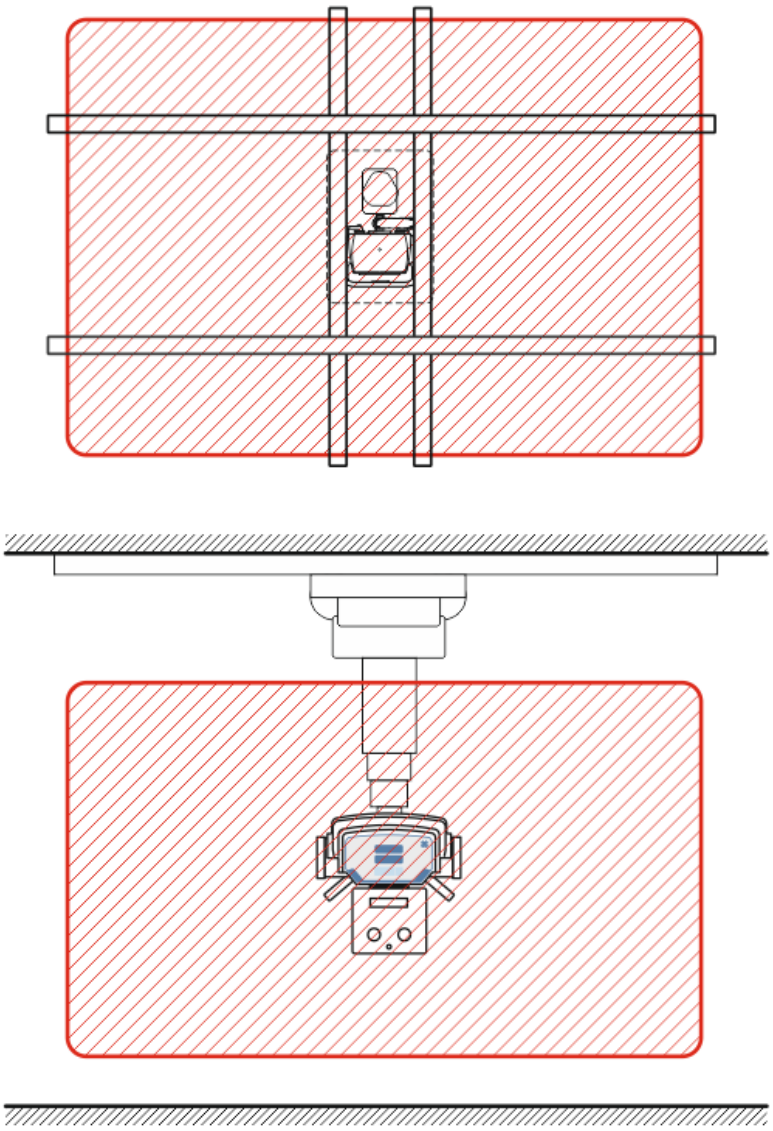
Areas of danger in proximity of the fixed height table

F100 F200 F300 F400 C10O C200 C300 C400



Areas of dander in proximity of the floor mounted tube stand TS99N

F100 F200 F300 F400 C10O C200 C300 C400



Areas of dander in proximity of the ceiling tube stand CTM-200

F100 F200 F300 F400 C10O C200 C300 C400

2 GENERAL INFORMATION

2.1 INTENDED USE, APPLICATION

This document describes the usage of the mechanical components of the **Perform-X F100-F400 and C100-C400 Radiographic System** (hereinafter *Perform-X*). The equipment forms a complete diagnostic system when equipped with other components (e.g. X-ray generator, digital acquisition workstation, flat panel detector, etc.).

As part of a complete diagnostic radiographic room, the Perform-X is intended to hold and position the radiation source, the beam limiting device, the X-ray receptor and associated devices and the patient during general radiographic procedures such as

- Chest and spine examinations
- General gastrointestinal radiograms
- Extremities procedures
- Lateral and oblique projections
- Ambulatory / emergency radiograms.

The Perform-X system **cannot be used for fluoroscopic applications**.

There is no need for particular limitation of patients in regards to age, gender or physical condition. General guidelines used in radiography apply:

- Pregnant patients or patients where pregnancy cannot be ruled out must be informed of the potential adverse effects of the ionizing radiation;
- The system can be used for infants and children utilizing proper exposure parameters (but it is not specifically designed for pediatric applications);
- The Phoenix elevating table (optional) may be helpful when examining disabled and/or elderly patients ;
- Optional overhead stretch grips may be used to make patient positioning easier and safer.

ATTENTION!

The Perform-X system may contain a **sensitive flat panel detector** (indirect radiography). To avoid property damage and maintain image quality / performance, observe at all times the handling and maintenance instructions set forth in the flat panel detector's user manual.

ATTENTION!

International standards require the use of an operational **AEC system in indirect radiography systems**. Make sure the generator's acceptance test related to AEC is completed before working with the Perform-X system.

ATTENTION!

If the Perform-X system is used for **pediatric diagnostic procedures**, at least 0.1 mm Cu or 3.5 mm Al **additional filter** is mandatory.

If the system is equipped with a DAP (Dose Area Product) meter, the collimator exit dose is measured and can be recorded in one of two ways:

- automatically if the DAP is compatible with the image acquisition system,

- manually if using a DAP with built-in or remote display.

Refer to the image acquisition user manual for further details.

2.2 COUNTERINDICATIONS

2.2.1 Adverse Effect of X-ray Radiation

There are no short term adverse effects. Generally speaking, the benefit of the X-ray procedure is far more important than the small associated risks. At the dose levels that are utilized in diagnostic radiography there is little or no evidence of health effects.

For standard radiograms made with the Perform-X radiographic system, the radiation dose is no more than the ionizing radiation from normal environmental background over a period of one year.

However, the minimal risk of exposure to any type of medical ionizing radiation needs to be weighed against the potential gain from the diagnostic information provided by the X-ray radiogram.

For further details, please refer to document *D-3633 - Information on the Effects of X-ray Radiation*.

2.2.2 Absolute Counterindications

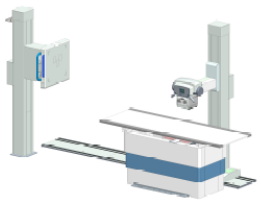
NONE

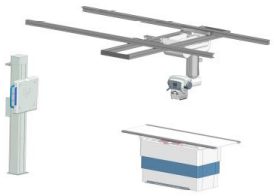
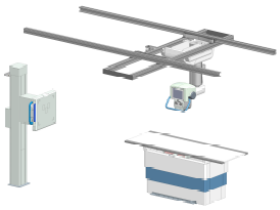
2.2.3 Relative Counterindications

- **Pregnant patients** or patients where pregnancy cannot be ruled out **must be informed** of the potential adverse effects of the ionizing radiation. The potential **risks of health effects and benefits** of the diagnostic procedure **must be weighed** individually.
- Patients weighing more than the radiographic table weight rating may not be examined on the patient table. The potential risks of equipment damage and benefits of the diagnostic procedure must be weighed individually.

2.3 SYSTEM CONFIGURATIONS

The Perform-X is available in several different configurations.

Config	Example	Tube Stand mount	Manual movements	Auto-tracking	Auto-stitching	Auto-positioning
F100		Floor	YES	NO	NO	NO
F200		Floor	YES	YES	NO	NO
F300		Floor	YES	YES	YES	NO

Config	Example	Tube Stand mount	Manual movements	Auto-tracking	Auto-stitching	Auto-positioning
F400		Floor	YES	YES	OPTION	YES
C100		Ceiling	YES	NO	NO	NO
C200		Ceiling	YES	YES	NO	NO
C300		Ceiling	YES	YES	YES	NO
C400		Ceiling	YES	YES	OPTION	YES

The Perform-X F100 system consist of the following equipment:

Component / option	Description	F100
TS99N	**Floor mounted X-ray tube stand**	**Default**
CTM-200	**Ceiling mounted X-ray tube stand**	Optional
WS99N	**Wall bucky stand**	**Default**
Stylix	**4-way float top fixed height radiographic table**	**Default**
Phoenix 1	6-way float top elevating radiographic table	Optional
Phoenix 2	6-way float top elevating radiographic table	Optional

2.4 COMPATIBILITY

The Perform-X Radiographic system is compatible with a number of certified diagnostic X-ray accessories. To verify compatibility with a particular device, please contact the service representative and/or the manufacturer. The following is an inexhaustive list of devices compatible with the Perform-X:

Device type	Manufacturer	Model	Comments
X-ray tube	Varex Imaging	RAD-XX / A and G series	Diamond, Leo, Sapphire, B-130 and B-130H housing rotating anode dual focus RAD X-ray tubes
X-ray tube	Toshiba	E72XX series	Rotating anode dual focus RAD X-ray tubes
X-ray tube	IAE	RTM782HS, RTM101HS, RTC600HS; C352 and C52S housings	Rotating anode dual focus RAD X-ray tubes
Collimator	Ralco	R-108 **	Manual collimator (compatible, but no longer offered)
Collimator	Ralco	R-225	Automatic motorized collimator
Collimator	Ralco	R-302F/A	Manual collimator with selectable filters
Collimator	UMI	M38	Manual collimator (compatible, but no longer offered)
Collimator	Varex Imaging	Optica 10 / 20	Manual collimator with optional manual filter
HV cables	Varex Imaging **	L3 / X3	L3 and X3 series HV cables rated 150 kV er pair (75kV each)
AEC detector	Varex Imaging **	ICX-1153	3-field ion AEC detector
AEC detector	Varex imaging **	SSMC-601	3-field ion AEC detector
Bucky	Innomed Medical	IBC-430	High-speed 115V/230V oscillating grid bucky
Cassette tray	Control-X Medical	CXT-17 CXT-17-DC	ISO 4090 43x43 cm cassette size tray for analogue film cassettes, CR cassettes and wireless flat panels (non-size-sensing)
Cassette tray	Poersch	QKC	ISO 4090 43x43 cm cassette size tray for analogue film cassettes, CR cassettes and wireless flat panels (non-size-sensing)
Cassette tray	Poersch	QJC	Size-sensing ISO 4090 43x43 cm cassette size tray for analogue film cassettes, CR cassettes and wireless flat panels
Flat panel detector	Canon CETD*	FDX(A)-4343R	43x43 cm CsI A-Si fixed flat panel detector

Device type	Manufacturer	Model	Comments
Flat panel detector	Canon CETD*	FDX-3543RP	35x43 cm CsI A-Si tethered portable flat panel detector
Flat panel detector	Canon CETD*	FDX(A)-3543RPW	35x43 cm CsI A-Si wifi portable flat panel detector
Flat panel detector	DRTech	EVS Series	Fixed and portable flat panel detectors (select models)
Flat panel detector	Varian	PaxScan Series	CsI A-Si fixed flat panel detectors
Flat panel detector	Thales	Pixium Series	Pixium series fixed and portable flat panel detectors (select models)
Flat panel detector	Rayence	Xmaru Series	Fixed and portable flat panel detectors (select models)
Flat panel detector	CareRay	1500 & 1800 series	Fixed and portable flat panel detectors (select models)
Flat panel detector	Vieworks	Vivix series	Fixed and portable flat panel detectors (select models)
X-ray generator	Innomed Medical	TOP-X 100LC series	100 kHz 32-50kW three or single phase, single tube RAD generator family
X-ray generator	CPI Inc.	CMP-200 series	200 kHz 32-80kW three phase, single tube RAD generator family
X-ray generator	CPI Inc.	CMP-150 series	150 kHz 32kW single phase, single tube RAD generator family
X-ray generator	CPI Inc.	Indico 100L series	100 kHz 65/80kW three phase, single/dual tube RAD generator family
Anti-scatter grid	UMI	103/178/215 lpi grids	Full size Al spacing focused grids
Anti-scatter grid	JPI	103/178/215 lpi grids	Full size Al spacing focused grids
Dose Area Product Meter	IBA Dosimetry	KermaX Plus	Display and non-display version: compatible with collimators and the DX-R image acquisition software
Image Acquisition Workstation	OR Technology	dicomPACS DX-R	DICOM 3.0 compatible open architecture image acquisition software.

* *Formerly Toshiba TETD*

** *Formerly Claymount BV*

2.5 SYMBOLS AND MARKINGS

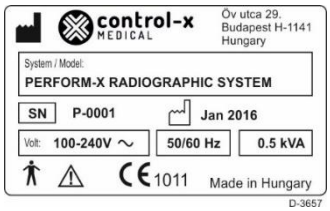
All components of the Perform-X system have a product label with the following information:

- name and address of the manufacturer;

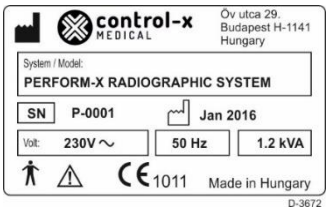
- model number, serial number and manufacturing date of the component / system;
- power supply requirements.

The location of the product labels are as specified below:

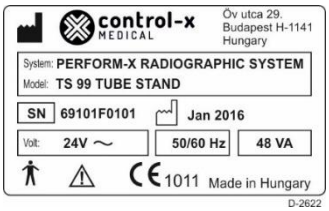
- System product label & E-Box (system control box) product label: right side of E-Box;
- TS99N tube stand label: right side of column, near the horizontal carriage;
- WS99N wall bucky stand label: right side of the column, near the floor;
- Stylix fixed height and Phoenix elevating table labels: side cover



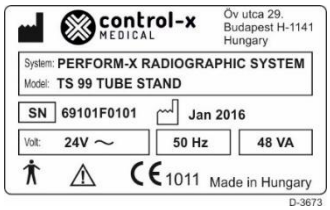
System product label sample (configurations with Stylix table)



System product label sample (configurations with Phoenix table)

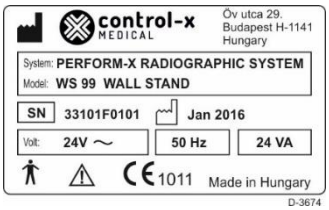


TS 99 product label sample (configurations with Stylix table)



TS 99 product label sample (configurations with Phoenix table)

WS 99 product label sample (configurations with Stylix table)



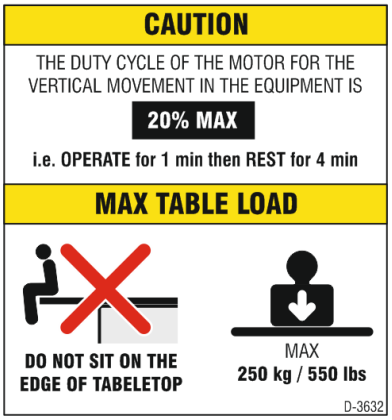
WS 99 product label sample (configurations with Phoenix table)

Stylix table product label sample

Phoenix table product label sample

Perform-X System Control Box product label sample

The following is a list of symbols used on the product and the product labels (the symbols conform to standards EN 60601-1 and EN 980):

	Date of manufacture – located on the product labels.
	Name and address of manufacturer – located on the product labels.
	Serial Number of product – located on the product labels.
	Single-phase AC main supply – located on the product labels.
	WARNING! Refer to manual for additional safety information – located on the product labels
	Instruction manual must be read – located on the product.
	Type B equipment – located on the product labels
	Protective earth ground – located inside the equipment at the main grounding terminal
	Taking care to avoid injury to hands when in the vicinity of equipment with closing mechanical parts – located on the product.
	Located on the side of the Phoenix table. (1) The Phoenix elevating table is not designed for continuous vertical movement operation. To prevent damage to the equipment and to reduce risk of fire, the table can only be moved for a **maximum of 60 seconds every 5 minutes**. (There must be a 4 minute pause after each 60 second movement, giving a 20% duty cycle.). (2) Do not sit or load at tabletop ends! The table may tip over. (3) Warning stating the maximum distributed table load.

2.6 OPERATORS

The Perform-X System is to be operated only by qualified radiology personnel authorized by local authorities to use radiographic diagnostic equipment.

Operators must have clear understanding of the hazard associated with taking X-ray radiograms and of working with patient positioning medical devices.

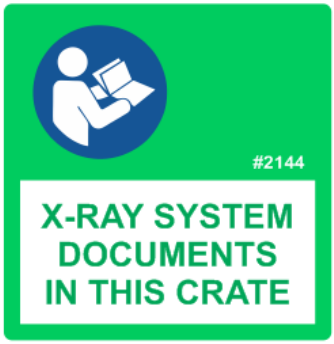
Operators' training is recommended for each operator before first using the equipment. For operator's training, please contact your local authorized distributor or the manufacturer.

WARNING!

Do not touch patient parts (as described in section 3.6) **and patients simultaneously.**

2.7 SERVICE PERSONNEL, INSTALLATION

The installation instructions (along with all the system documentation, including these operating instructions) are located in the packaging / crate marked with the following label:



ATTENTION!

Only qualified and trained service personnel may perform any installation and/or maintenance on this equipment.

2.8 ENVIRONMENT, FREQUENCY OF USE AND MOBILITY

The Perform-X System is designed and manufactured to be used as a fixed equipment permanently installed in a professional hospital or clinical environment. The **patient environment** is the 1.5m proximity of the patient during the upright, table or special procedures and includes the radiographic stand and tables. The E-Box (system control box) is not part of the patient environment.

2.9 DOSIMETRIC INFORMATION

The Perform-X System is equipped with certified X-ray generators. For detailed and quantitative dosimetric information, please refer to the generator operating instructions.

2.9.1 Repetition of exposures

Pay attention to (local) skin dose levels under intended use but in case of **repetitive** or **prolonged** exposure as it may cause tissue reactions!

2.9.2 Patient entrance reference point

The patient entrance reference point is located 30cm above the patient support for X-Ray equipment with the X-Ray source assembly above the patient support.

2.10 INTERCHANGEABLE OR DETACHABLE PARTS

The Perform-X system does not contain any parts that are interchangeable or detachable by the operator or the service personnel.

3 SPECIFICATIONS

3.1 MECHANICAL DATA, MOTION RANGE

TS99N TUBE STAND MECHANICAL PARAMETER F100 F200 F300 F400 C10O C200 C300 C400	**CONDITIONS**	**VALUE**
Recommended min floor-to-ceiling distance (room height)	standard (TS99N)	2400 mm
Recommended min floor-to-ceiling distance (room height) with EXTENDED stand height	extended (TS99N-EXT)	2600 mm
Minimum floor space (without generator)		8 m^2 (2.5 x 3.2 m)
X-ray tube vertical travel	standard (TS99N)	1545 mm
	extended (TS99N-EXT)	1745 mm
X-ray tube focus-to-floor distance	standard (TS99N)	335 … 1880 mm
	extended (TS99N-EXT)	335 … 2080 mm
Tube stand floor rail length	standard rail length (PFX-R247)	2470 mm
	with option PFX-R360	3600 mm
X-ray tube longitudinal movement	with standard FIXED column (P-type or M-type floor carriage)	1770 mm *(Option: 2900 mm with extended rail length)*
	with ROTATING column option (R-type or X-type floor carriage)	1610 mm *(Option: 2740 mm with extended rail length)*
X-ray tube column rotation for lateral exposures	with ROTATING column option (R-type or X-type floor carriage)	-180° … +180° with -90° / 0° / 90° detents
X-ray tube transverse travel	with TRANSVERSE arm option (T-type tube arm)	+/- 102 mm
X-ray tube rotation (around horizontal axis)		330°
CTM-200 TUBE STAND MECHANICAL PARAMETER F100 F200 F300 F400 C10O C200 C300 C400	**CONDITIONS**	**VALUE**
X-Ray tube vertical travel (CTM)		150 cm *(optionally 180 cm or 135 cm)*
X-Ray tube vertical movement speed		15 cm/sec
Min. X-Ray tube focus to floor distance	depends on vertical travel and ceiling height	30 cm
Max. X-Ray tube focus to floor distance	depends on vertical travel and ceiling height	180 cm
X-Ray tube longitudinal travel		357 / 343 cm *(Option: +140 cm with PX-2116)*

X-Ray tube longitudinal rail length		440 cm *(Option: +140 cm with PX-2116)*
X-Ray tube longitudinal movement speed		25 cm/sec
X-ray tube transversal travel		207 / 203 cm *(Option: 287 / 283 cm with PX-2117)*
X-Ray tube transversal rail length		300 cm *(Option: 380 cm with PX-2117)*
X-Ray tube transversal movement speed		13 cm/sec
X-ray tube rotation (around horizontal axis)	total rotation: 334°	120° / -214°
X-ray tube rotation (around vertical axis)	total rotation: 338°	138° / -200°
WALL STAND MECHANICAL PARAMETER **F100 F200 F300 F400 C10O C200 C300 C400**	**CONDITIONS**	**VALUE**
Mounting	standard	Floor to wall
	with option PFX-2035	Floor only
Detector STANDARD vertical travel	with bucky CXB-17 (TS99N)	1450 mm
	with grid cabinet SGC (TS99N)	1530 mm
Detector EXTENDED vertical travel	with bucky CXB-17 (TS99N-EXT)	1650 mm
	with grid cabinet SGC (TS99N-EXT)	1730 mm
STANDARD detector center-to-floor distance	with bucky CXB-17 (TS99N)	380 … 1830 mm
	with grid cabinet SGC (TS99N)	300 … 1830 mm
EXTENDED detector center-to-floor distance	with bucky CXB-17 (TS99N-EXT)	380 … 2030 mm
	with grid cabinet SGC (TS99N-EXT)	300 … 2030 mm
Detector tilt range	(T or M type tilting device)	-25 … +90°

PATIENT TABLE MECHANICAL PARAMETER F100 F200 F300 F400 C10O C200 C300 C400	CONDITIONS	VALUE
Tabletop surface		810 x 2200 mm or 810 x 2000 mm (optional)
Tabletop transverse movement		+ / - 120 mm
Tabletop longitudinal movement	left / right direction	500 mm / 600 mm
Tabletop height	Stylix fixed height table	fixed at 750 mm
	Phoenix 1 elevating table	550 … 850 mm
	Phoenix 2 elevating table	450 … 900 mm
Tabletop vertical movement	Stylix fixed height table	N/A
	Phoenix 1 elevating table	300 mm
	Phoenix 2 elevating table	450 mm
Table top vertical movement speed:	Stylix fixed height table	N/A
	Phoenix 1 & 2 table	approx. 22 mm / sec
Vertical exposure position (distance from floor)	Stylix fixed height table	750 mm, fixed
	Phoenix 1 & 2 only	750 mm (adjustable during installation)
Elevating table safety functions	Phoenix 1 / 2 table	Double-kick (optional) Crash-guard Audible warning
	Phoenix 2 table ONLY	Crash-guard with automatic upward movement upon touching an obstruction
Table detector horizontal movement	with bucky CXB-17	550 mm
	with grid cabinet SGC	610 mm
Tabletop maximum distributed load	equivalent to maximum patient weight – no additional accessories for table procedures	250 kg
Max tabletop to image receptor distance		70 mm

3.2 X-RAY PARAMETERS

Wall bucky and tabletop Al equivalency		typ. 03 mm Al max 0.8 mm Al *(99.9% purity or higher)*
Cassette size	(CR / film / portable FP)	According to ISO 4090
Bucky grid type	with CXB-17	Fixed mounted oscillating grid
Grid cabinet grid type	with SGC-100/200	Removable stationary grid
AEC detector	optional	3-field ion chamber or solid state detector with preamp
Shortest irradiation time	with AEC (recommended)	10 ms
	without AEC	1 ms
Longest possible exposure	limited by the flat panel	Typically 2.5 sec
	limited by X-ray generator	Maximum 6 sec

For detailed X-ray parameter ranges and accuracy, please refer to the X-ray generator accompanying documents.

For the following specifications please refer to the X-ray tube datasheet:

- maximum symmetrical radiation field size
- focal spot size
- target angle.

3.3 POWER SUPPLY

WS99N wall bucky stand and	24VDC, 50VA (powered from E-Box)
TS99N X-ray tube stand (including collimator light field)	24VDC, 150VA (powered from E-Box)
CTM-200 X-ray tube stand (including collimator light field)	230VAC, 560VA (powered from E-Box)
Stylix fixed height radiographic table	24VDC, 48VA
Phoenix elevating radiographic table	~230V 50 Hz, 690VA
Supply mains internal impedance	*Refer to the generator and flat panel display documentation* *(0.2 Ohms if otherwise not specified by the generator or flat panel)*

3.4 ENVIRONMENTAL DATA

Storage and transport temperature	-20°C – 55°C
Operating temperature	10°C – 40°C
Max. relative humidity (operation)	80%
Max. relative humidity (storage)	90%
Environmental protection	IP20

3.5 USAGE CONDITIONS

Exposure cycle time without positioning	Typically 10 sec (depends on the flat panel / DR component)
Exposure cycle time including positioning	Approx. 1 min. depending on positions and image of receptor
Useful expected life time	10 years (with proper maintenance and average case load of 30 positioning cycles per day)

3.6 APPLIED PARTS

The Perform-X Radiographic System contains the following applied parts that may come into contact with the patient:

1. Wall detector / cassette holder cover
2. Wall detector overhead patient grip
3. Tabletop (if applicable).

WARNING!

Do not touch the unused (unplugged) **electrical sockets / connections on the equipment**, e.g. the RJ45 (Ethernet) socket on the back of the WS99N.

WARNING!

No **additional MULTIPLE SOCKET+OUTLET or extension cord shall not be connected** to the Perform-X System.

WARNING!

Connect only the items that have been specified as part of the Perform-X System **or that have been specified as being compatible** with the Perform-X System

3.7 CLASSIFICATION

Protection against electric shock		Type B equipment
Safety classification as a medical device / radiographic system *(classification is based on MDD annex IX rule 10)*		Class II/b medical equipment

3.8 ELECTROMAGNETIC COMPATIBILITY

Guidance and manufacturer's declaration – electromagnetic emissions		
The Perform-X Radiographic System is intended for use in the electromagnetic environment specified below. The owner or operator of the Perform-X Radiographic System should assure that it is used in such an environment.		
Emissions test	**Compliance**	**Electromagnetic environment – guidance**
RF emissions CISPR 11	Group 1	The Perform-X Radiographic System uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference with? nearby electronic equipment.
RF emissions CISPR 11	Class A+20dB	The Perform-X Radiographic System is suitable for use in all establishments other than domestic. It may however be used in domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes, provided the following **warning** is heeded: • This equipment/system is intended for use by healthcare professionals only. This equipment/ system may cause radio interference or may disrupt the operation of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the Perform-X Radiographic System or shielding the location; • The Perform-X Radiographic System must be used only in a shielded location with a minimum RF shielding effectiveness and, for each cable that exits the shielded location, a minimum RF filter attenuation of 20dB for radio signals between 30MHz … 1000MHz.
Harmonic emissions IEC 61000-3-2	not applicable	
Voltage fluctuations / flicker emissions IEC 61000-3-3	not applicable	

Guidance and manufacturer's declaration – electromagnetic immunity			
The Perform-X Radiographic System is intended for use in electromagnetic environment specified below. The owner or operator of the Perform-X Radiographic System should assure that it is used in such an environment.			
Immunity test	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment – guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transients/ bursts IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/ output lines	± 2 kV for power supply lines ± 1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.

Guidance and manufacturer's declaration – electromagnetic immunity			
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycle < 5% U_T (>95% dip in U_T) for 5 sec	< 5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycle < 5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the operator of the Perform-X Radiographic System requires continued operation during power mains interruptions, it is recommended that the Perform-X Radiographic System be powered from an uninterruptible power supply.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristics of a typical location in a typical commercial or hospital environment.
Note: U_T is the AC mains voltage prior to application of the test level.			

Guidance and manufacturer's declaration – electromagnetic immunity			
The Perform-X System is suitable for use in the electromagnetic environment specified below. The owner or the operator of the Perform-X System should assure that it is used in such an electromagnetic environment.			
IMMUNITY test	**IEC 60601 TEST LEVEL**	**Compliance level**	**Electromagnetic environment – guidance**
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz outside ISM bands[a] 10 Vrms 150 kHz to 80 MHz in ISM bands[a]		The Perform-X System must be used only in a shielded location with a minimum RF shielding effectiveness and, for each cable that enters the shielded location, a minimum RF filter attenuation of 20 dB. See *D-3541 - Perform-X Radiographic System Installation Instructions (ID 3541), Section 4.2*. Field strengths outside the shielded location from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than 3 V/m. [b] Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	10 V/m 80 MHz to 2,5 GHz		
Note 1: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people. Note 2: It is essential that the actual shielding effectiveness and filter attenuation of the shielded location be verified to assure that they meet the minimum specification.			

[a] The ISM (industrial, scientific and medical) bands between 150 kHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40,66 MHz to 40,70 MHz.
[b] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength outside the shielded location in which the Perform-X System is used exceeds 3 V/m, observe the Perform-X System to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as relocating the Perform-X System or using a shielded location with a higher RF shielding effectiveness and filter attenuation.

Guidance and manufacturer's declaration – electromagnetic immunity

The Perform-X System is suitable for use in the electromagnetic environment specified below. The customer or the user of the Perform-X System should assure that it is used in such an electromagnetic environment.

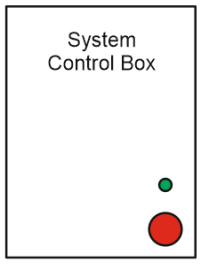
IMMUNITY test	IEC 60601 TEST LEVEL	Compliance level	Electromagnetic environment – guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz		The Perform-X System must be used only in a shielded location with a minimum RF shielding effectiveness and, for each cable that enters the shielded location, a minimum RF filter attenuation of 20 dB. See *D-3541 - Perform-X Radiographic System Installation Instructions (ID 3541), Section 4.2*. Field strengths outside the shielded location from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than 3 V/m. [a] Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2,5 GHz		

Note 1: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
Note 2: It is essential that the actual shielding effectiveness and filter attenuation of the shielded location be verified to assure that they meet the minimum specification.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength outside the shielded location in which the Perform-X System is used exceeds 3 V/m, the Perform-X System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as relocating the Perform-X System or using a shielded location with a higher RF shielding effectiveness and filter attenuation.

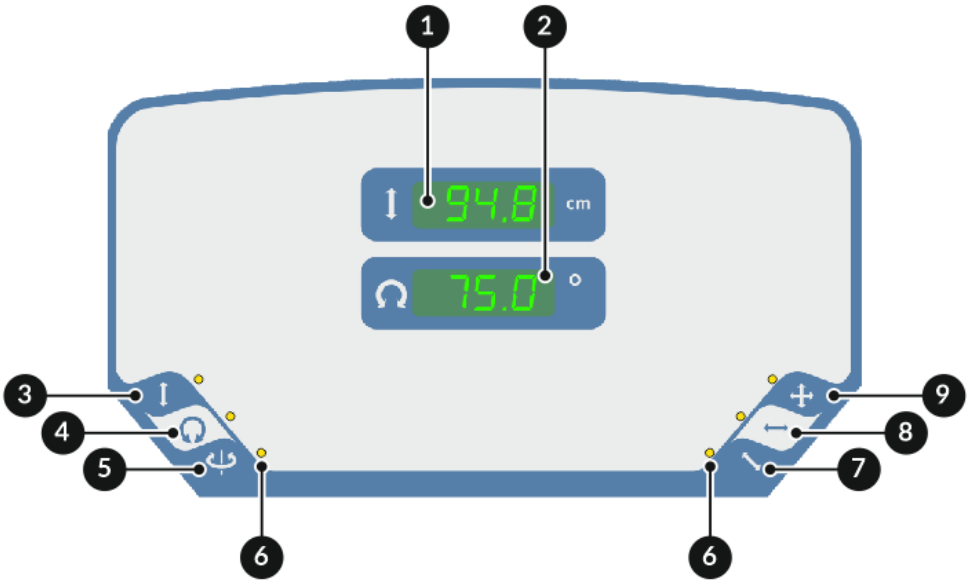
4 OPERATOR CONTROLS

4.1 SYSTEM CONTROL BOX

Symbol / Control		Operation
		SYSTEM POWER indicator. When lit green, the system is powered up.
		EMERGENCY STOP Switch Push it to fully power off the system. Turn the knob to the right to switch the system back on again.

4.2 TUBE STAND MANUAL MEMBRANE CONSOLE

F100 F200 F300 F400 C10O C200 C300 C400

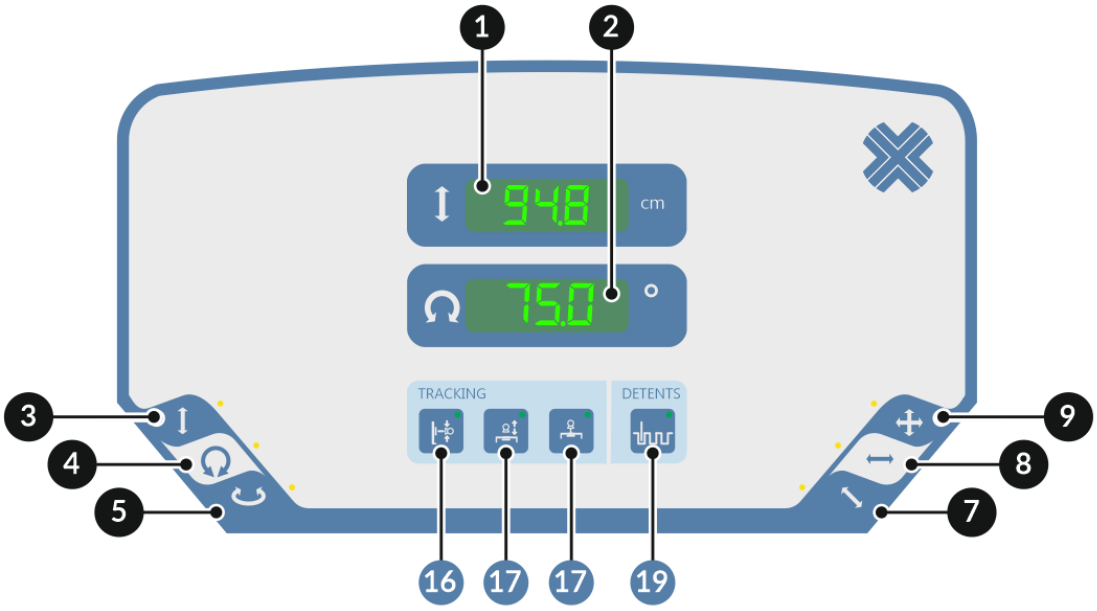


TS 99 / CTM-200 membrane console

1 SID (source image distance) display
2 X-ray TUBE INCLINE display
3 Brake release for VERTICAL movement
4 Brake release for X-ray TUBE ROTATION (incline)
5 Brake release for COLUMN or TELESCOPE ROTATION (pivot)
6 BRAKE ON indicator lights (lit when brake is engaged)
7 Brake release for transversal manual movement
8 Brake release for LONGITUDINAL movement
9 Brake release for VERTICAL and LONGITUDINAL movement

4.3 TUBE STAND BASIC MEMBRANE CONSOLE

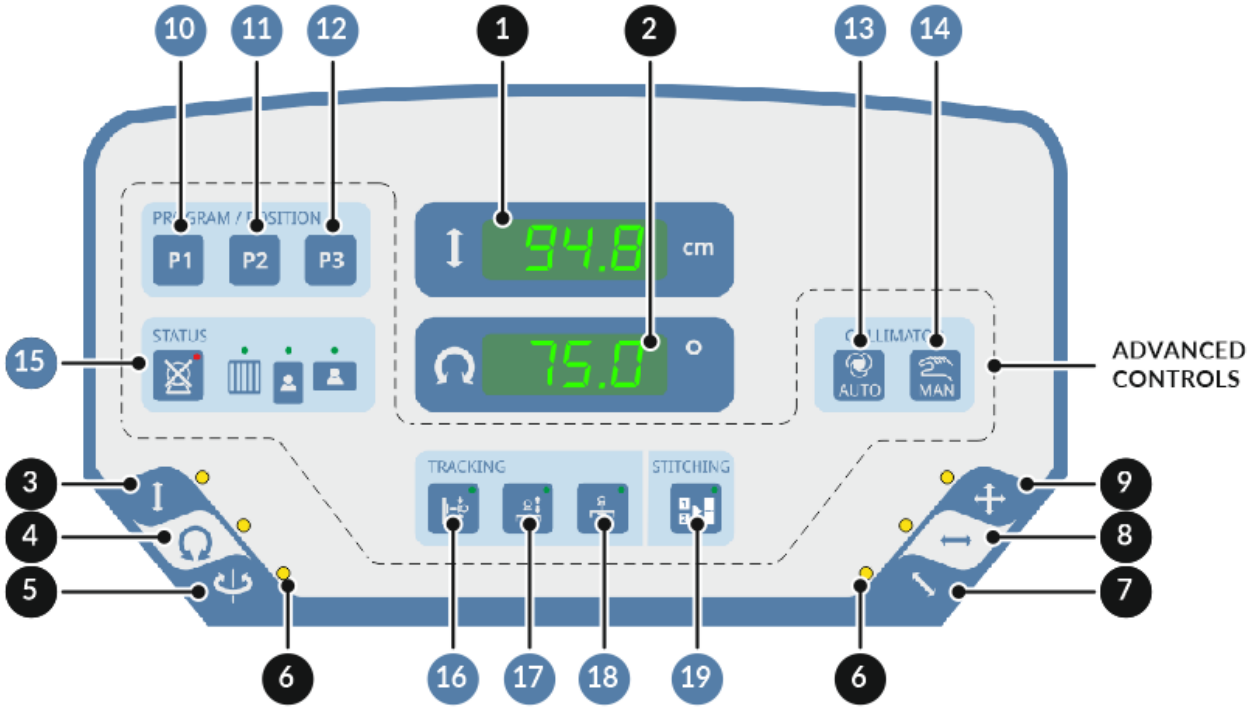
F100 **F200** F300 F400 C100 **C200** C300 C400



1 SID (source image distance) display
2 X-ray TUBE INCLINE display
3 Brake release for VERTICAL movement
4 Brake release for X-ray TUBE ROTATION (incline)
5 Brake release for COLUMN or TELESCOPE ROTATION (pivot)
6 BRAKE ON indicator lights (lit when brake is engaged)
7 Brake release for transversal manual movement
8 Brake release for LONGITUDINAL movement
9 Brake release for VERTICAL and LONGITUDINAL movement
16 Wall receptor vertical tracking ON / OFF
17 Table receptor vertical tracking (constant SID) ON / OFF
18 Table receptor auto-centering ON / OFF
19 Stitching mode ON / OFF

4.4 TUBE STAND ADVANCED MEMBRANE CONSOLE

F100 F200 F300 F400 C100 C200 C300 C400



1	SID (source image distance) display
2	X-ray TUBE INCLINE display
3	Brake release for VERTICAL movement
4	Brake release for X-ray TUBE ROTATION (incline)
5	Brake release for COLUMN or TELESCOPE ROTATION (pivot)
6	BRAKE ON indicator lights (lit when brake is engaged)
7	Brake release for transversal manual movement
8	Brake release for LONGITUDINAL movement
9	Brake release for VERTICAL and LONGITUDINAL movement
10-12	Move to preprogrammed positions P1-P3. In Stitching Mode, they select stitching Frame 1-3.
13	Turns collimator AUTOMATIC mode ON (light field is set/maintained when changing SID)
14	Turns collimator MANUAL mode ON (light field is set manually with the face knobs)
15	Status controls (interlock, grid IN, landscape / portrait receptor orientation)
16	Wall receptor vertical tracking ON / OFF
17	Table receptor vertical tracking (constant SID) ON / OFF
18	Table receptor auto-centering ON / OFF
19	Stitching mode ON / OFF

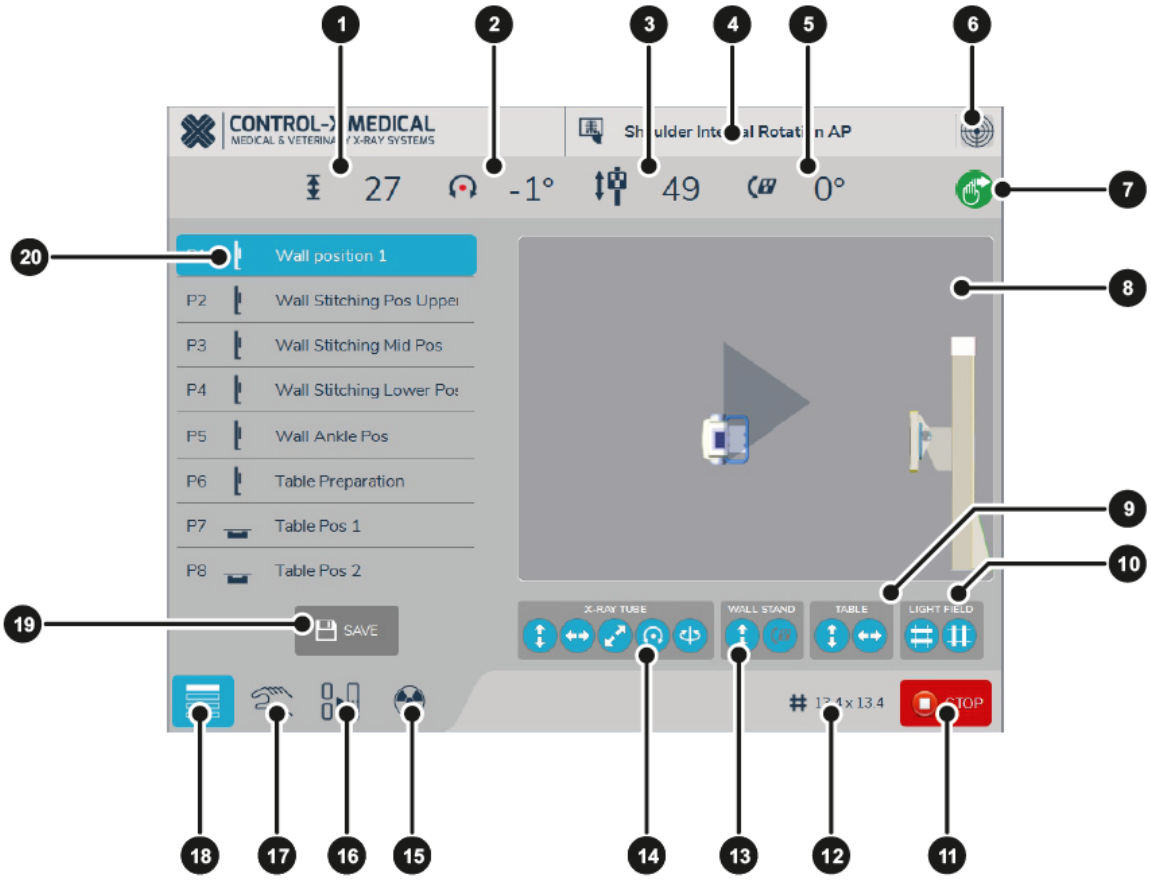
4.5 TUBE STAND LCD TOUCHSCREEN CONSOLE

F100 F200 F300 F400 C100 C200 C300 C400

ATTENTION!

In order to ensure proper functioning of the touchscreen and avoid false input or unintended parameter changes, always make sure that your **hands are dry** and there are **no waterdrops, dirt or other residue** on the surface of the screen.

4.5.1 Preprogrammed position screen



1 Source-image distance

2 X-ray tube incline

3 Wall detector center height

4 Name of selected APR

5 Wall detector tilt

6 The system has reached the target position (after an automatic positioning)

7 Movement indicator (appears in case of any equipment movement)

: Motorized movement (e.g. system positions itself to a preprogrammed position)

: Manual movement (e.g. one of the manual brakes is released)

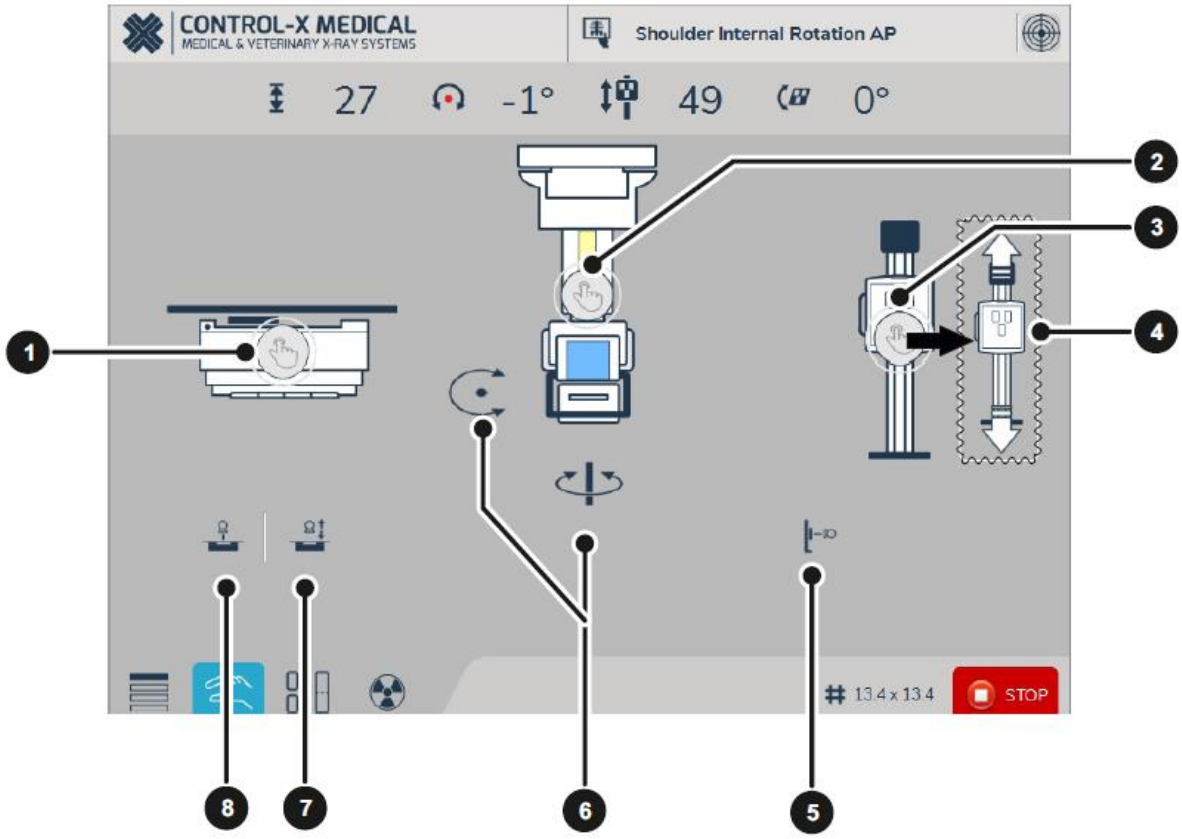
8 Equipment location displayed for the selected position, with “Go to position” button in the middle

9 Enabled motorized table (bucky) movements (vertical/horizontal)

10 Enabled motorized collimator shutter movements (cross/longitudinal)

11 Stop equipment movement

4.5.2 Manual positioning screen



1 Table detector motorized movement button

2 X-ray tube motorized movement button

3 Wall detector motorized vertical movement button

4 Movement arrows for manual positioning (appear after movement button is pressed and held)

5 Wall detector vertical tracking enabled/disabled

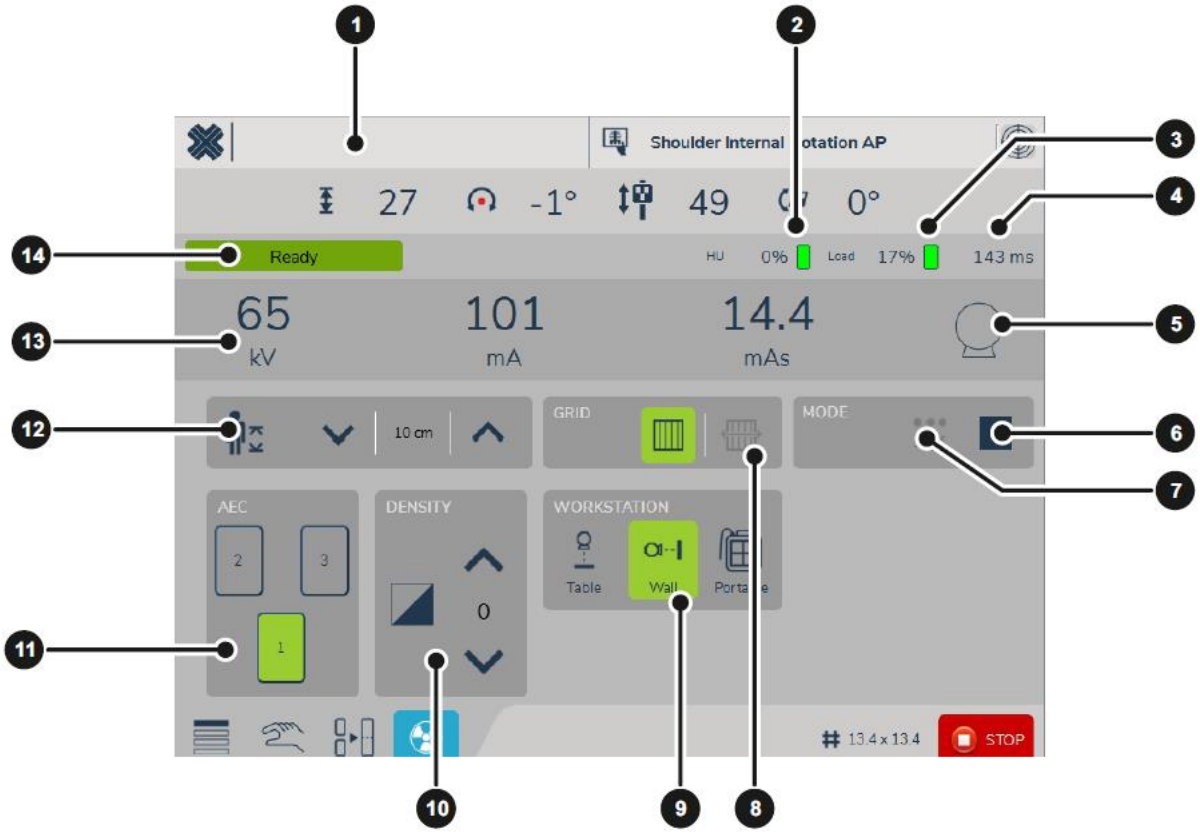
6 X-ray tube motorized rotation / pivot buttons

7 Constant vertical SID over the table enabled/disabled

8 Table detector auto centering enabled/disabled

4.5.3 Stitching Mode Screen

4.5.4 Generator Control screen



1	Patient name (if patient ID transfer feature is enabled)
2	Anode Heat Unit percentage
3	Generator load percentage
4	In mAs mode: calculated exposure time (in 3 point mode: calculated mAs value is indicated)
5	Exposure indicator - ☢ symbol appears during exposure
6	Small/ large focus selected
7	3 point mode enabled/disabled
8	Grid inserted / grid oscillation enabled/disabled
9	Configured workstations
10	AEC density settings
11	AEC filed selection
12	Tissue thickness
13	Exposure parameters
14	Generator status

When the X-ray tube is rotated (e.g. while preparing for exposure using wall stand detector) the **screen rotates automatically**. In this case the icons on the screens may be arranged differently, but all icons keep their functions.

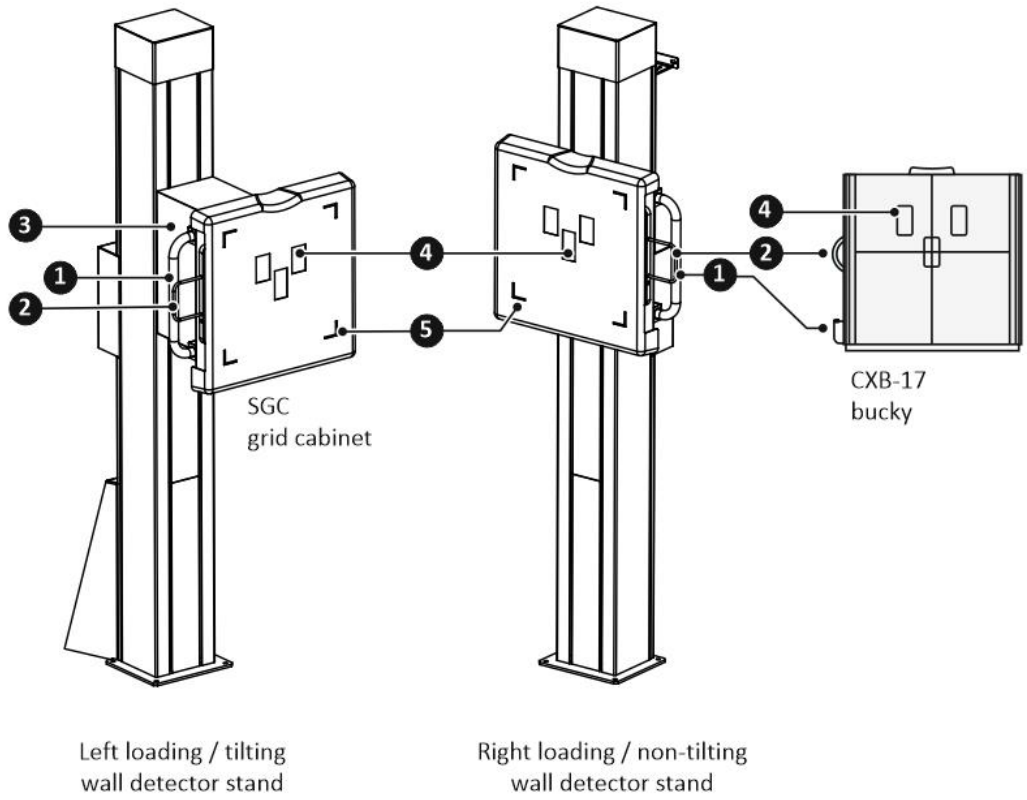
ATTENTION!

4.6 WS99N WALL BUCKY STAND

F100 F200 F300 F400 C10O C200 C300 C400

The wall bucky stand operator controls:

- vertical brake release pushbutton
- bucky tilt mechanical fastener (with option T-type and M-type tilting device)
- the handle of the cassette tray (film-based, CR or cassette size portable flat panel only)



1 VERTICAL brake release pushbutton

2 Detector CASSETTE HANDLE – *ONLY for film-based, CR or DR portable detectors*

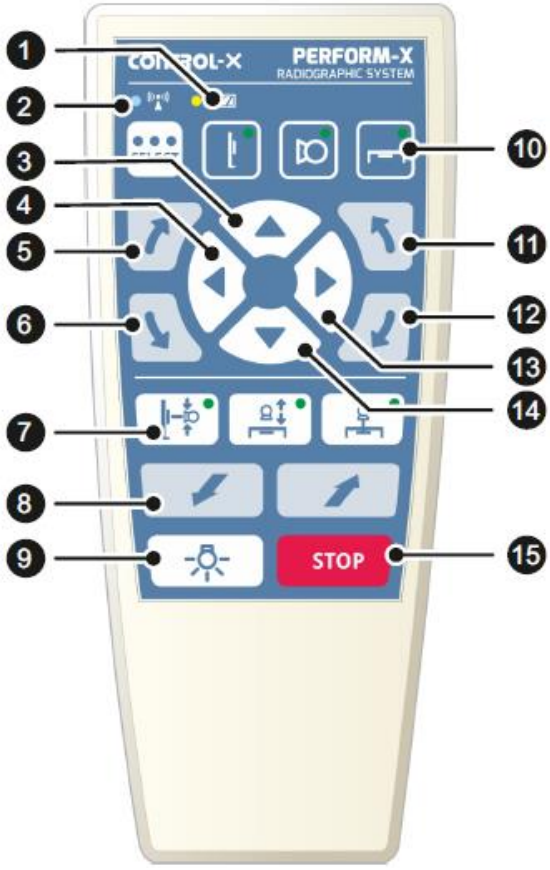
3 Detector TILT release – *ONLY* with option T-type tilting device (manual)

4 AEC field markers

5 IMAGE edge indicators

4.7 REMOTE CONTROLLER

F100 F200 F300 F400 C100 C200 C300 C400



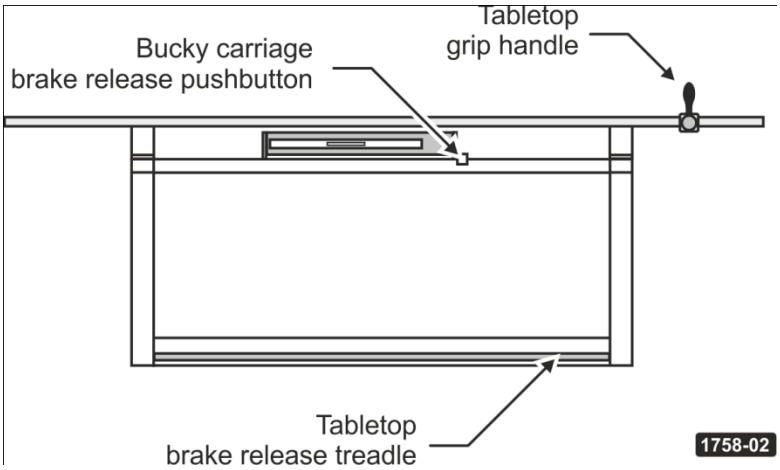
1 Battery low indicator / charging *(Bluetooth wireless type only)*
2 Connection status *(Bluetooth wireless type only)*
3 Vertical movement control (UP) for tabletop / X-ray tube / wall receptor
4 X-ray tube or table receptor longitudinal movement control (LEFT)
5 X-ray tube rotation around the horizontal axis (CLOCKWISE)
6 X-ray tube rotation around the horizontal axis (COUNTERCLOCKWISE)
7 Automatic movement functions enabled/disabled
- Wall stand auto-tracking
- Constant SID over the table receptor
- Table receptor auto-centering

8 Transversal movement controls (FORWARD / BACK) for the X-ray tube
9 Collimator light field on / off
10 Equipment selection button with indicators (wall receptor / X-ray tube / table receptor)
11 X-ray tube pivot around the vertical axis (COUNTERCLOCKWISE)
12 X-ray tube pivot around the vertical axis (CLOCKWISE)
13 X-ray tube or table receptor longitudinal movement control (RIGHT)
14 Vertical movement control (DOWN) for tabletop / X-ray tube / wall receptor
15 STOP (cancels all motorized movement)

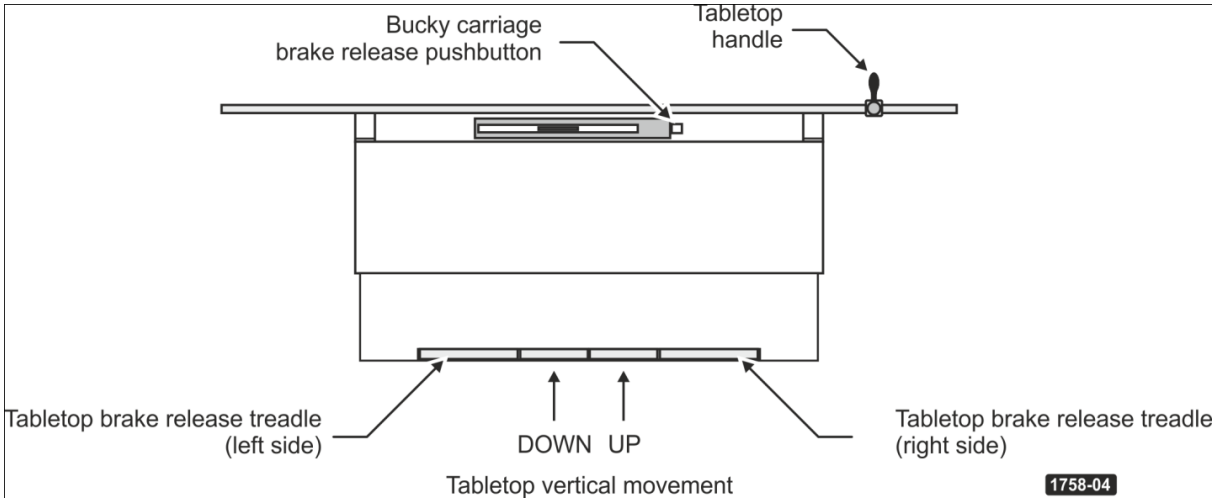
4.8 RADIOGRAPHIC TABLE

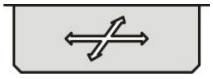
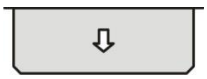
4.8.1 Stylix fixed height radiographic table:

F100 F200 F300 F400 C10O C200 C300 C400



4.8.2 Phoenix elevating radiographic table:

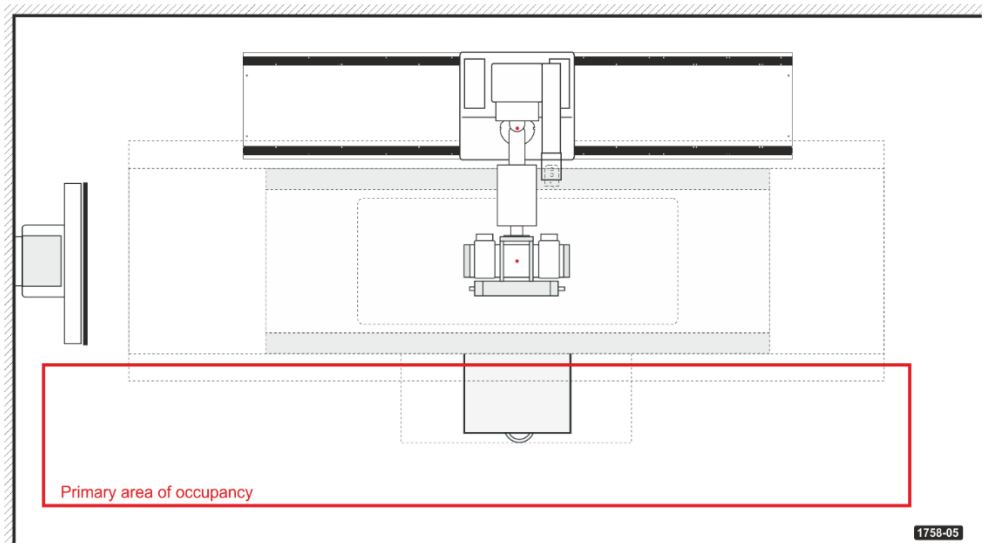


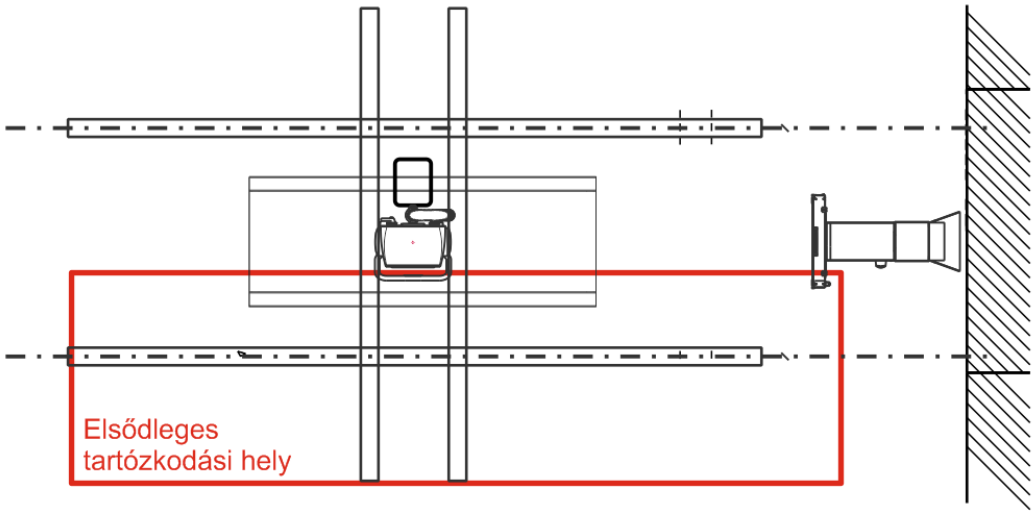
Symbol	Operation
	Foot pedal for tabletop LONGITUDINAL and TRANSVERSAL movement
	Foot pedal for UPWARD table motion
	Foot pedal for DOWNWARD table motion

	EMERGENCY STOP Switch Push it to fully switch off the table. Turn the knob to the right to switch the table back again.

4.9 SIGNIFICANT ZONE OF OCCUPANCY

During operation, the significant zones of occupancy for the floor and ceiling mounted systems are as follows:





The following operations are performed in the significant zone of occupancy:

- Patient positioning;
- Radiation source and receptor positioning;
- Beam limiting;
- Removing / inserting grid and / or cassette as needed.

Exposure initiation is to be performed from a protected area at the X-ray generator console (this area is not shown – refer to the X-ray generator user manual for further information).

5 USING THE PERFORM-X SYSTEM

5.1 TURNING ON/OFF

The system must be powered up from a main wall disconnect box (not supplied). Please contact your service representative for details.

CAUTION!

With the power turned OFF the tabletop is not fixed by the electromagnetic brakes and **may move without operating the movement controls**, including as a result of unintentional movements (e.g. when the equipment is leaned on).

The powered ON state is indicated on the:

1. E-box (system control box);
2. generator console;
3. tube stand console;
4. tube console SID / inclination displays and brake ON LEDs.

The Perform-X System does not need to be powered OFF between exposures. Following the general practice in radiology, the system is to be powered ON at the start of day and is powered OFF at the end of the day.

The system is usable immediately after power-up, there is no need to wait for warm-up or special initialization / calibration procedure.

WARNING!

Reconnect (power ON) **the mains** only **after safe usage conditions are ensured**.

Most moving / movable parts, like the detector holders and X-ray tube (with the exception of the tabletop) are secured with permanent electromagnetic brakes. These brakes will hold the moving parts securely in place when the Perform-X system is powered OFF.

5.2 USING THE WALL STAND

5.2.1 Vertical Receptor Movement

The wall bucky is equipped with an electromagnetic brake to fix the receptor in the desired position. For vertical position adjustment, press the brake release pushbutton located on the side of the bucky or in the bucky handle. Release the pushbutton once the bucky is in the desired position.

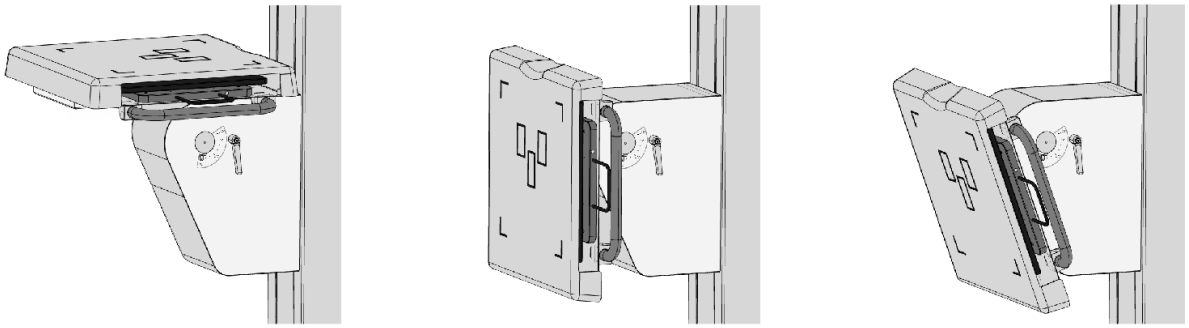
CAUTION!

Use caution when releasing the brake as **counter-balancing** of the wall detector holder **may be off** and the detector holder or the X-ray tube may suddenly start moving up or down. Counter-balancing will also be different with the **portable receptor and / removable grid in and out** of the holder.

5.2.2 Wall Bucky Tilting *(with option T-type and M-type tilting device)*

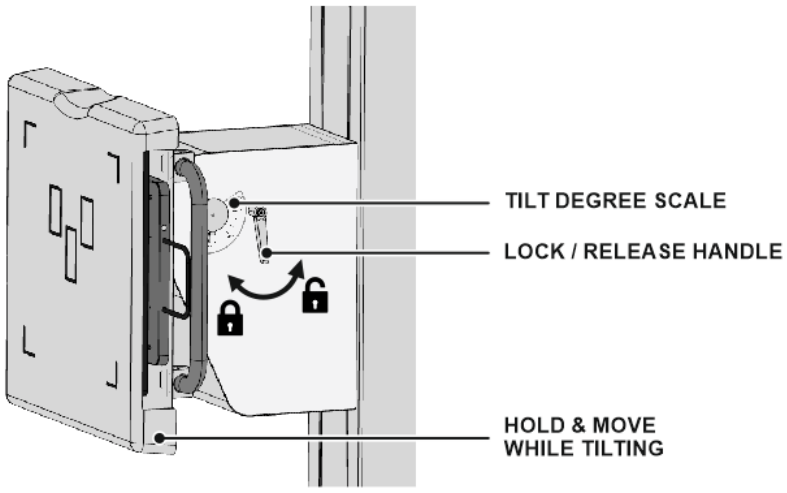
The tilt of the detector can be adjusted between +90 and -25 degrees.

- +90°: receptor is horizontal;
- 0°: receptor is vertical;
- -20°: receptor lower edge closer to column (oblique position).



Wall stand receptor tilt positions: +90° / 0° / -20° (manual version shown)

Manual tilting mechanism operation (with option T-type)



Manual tilt mechanism

1. Release the handle by turning it counter-clockwise while holding the receptor holder at the bottom. The receptor holder is counterbalanced in the entire tilt range, but the presence or lack of the grid and cassette may result in slight imbalance.
2. Tilt the receptor holder. The degree of tilt can be read on the tilt scale next to the handle. The +90°, 0° and -20° positions of the receptor holder are marked with mechanical detents.
3. Fasten the handle by turning it clockwise once the desired tilt is adjusted.

5.3 USING THE RADIOGRAPHIC TABLE

5.3.1 Tabletop Positioning

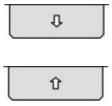
The radiographic table is equipped with electromagnetic locks, which hold the tabletop in the required position. To release the locks for repositioning a patient, activate the foot pedal marked with the four-way arrow (Phoenix elevating table) or on the single foot treadle (Stylix fixed height table).

While moving, the tabletop automatically stops in its transversal center position. After about three seconds you can move the tabletop further if you desire. For easier positioning, use the handgrip inserted in the tabletop accessory rail. The location of the handgrip can be adjusted by releasing the grip with the knob and sliding to position in the rail.

ATTENTION!

To prevent accidental movement, the Phoenix table can be configured to release the brakes **only after stepping on the foot pedals twice** (double-kick feature). Please contact your service representative to activate / deactivate this feature.

5.3.2 Vertical Tabletop Positioning *(Phoenix elevating table only)*



To control the vertical movement, press one of the vertical foot control pedals to move the table up or down. The table moves in the desired direction until it reaches the radiographic position where it stops automatically for approximately 3 seconds. If you do not desire to move the table further, simply remove your foot from the foot pedal. Otherwise the table will resume moving after the three seconds elapse.

The radiographic position is an optimal height where radiographic exposures can be conveniently taken.

WARNING!

To prevent accidental movement, the Phoenix elevating table can be configured to release the brakes **only after stepping on the foot pedals twice** (double-kick feature). Please contact your service representative to activate / deactivate this feature.

The Phoenix elevating table features a safety mechanism to stop vertical (downward) movement when the tabletop touches with an object in its path (e.g. wheelchair).

NOTE (PHOENIX 2 elevating table ONLY):
Upon touching an obstruction while moving downward, the Phoenix 2 table will automatically stop and move upwards about 2 centimeters for additional safety.

By default, exposures can be initiated at any table height. Upon request, the Phoenix table *(PHOENIX 1 table ONLY)* can be configured to provide an interlock to allow exposures only at a specific height (radiographic position), which is selectable during installation. The recommended tabletop-floor distance for the radiographic position is 750 mm.

Please note that the vertical travel is disabled if activating both up and down direction pedals at the same time.

The Phoenix elevating table is not designed for continuous vertical movement operation. To prevent damage to the equipment and to reduce risk of fire, the table can only be moved for a **maximum of 60 seconds every**

WARNING!	**5 minutes**. (There must be a 4 minute pause after each 1 minute movement, giving a 20% duty cycle.). See warning label located on the side of the Phoenix radiographic table.

WARNING!	**When driving the table down**, the front cover of the table will approach the operator's foot to 55 mm. The Phoenix table provides a **loud audible warning sound** (beeping) when the table is within 100 mm of the foot pedal while moving down.

5.3.3 Positioning the Table Receptor

The Phoenix table is shipped with a cassette tray for portable receptors or a fixed detector built in the bucky or grid cabinet. Use the release pushbutton to disengage the magnetic lock and move the receptor to the desired position. The release pushbutton is a momentary switch – to lock the receptor in the required position, release the button.

5.3.4 Removing or Replacing the Grid (optional)

In some configurations, the anti-scatter grid may be removed (e.g. for hand / wrist and similar studies). To remove the grid, slightly lift the grid frame and pull it out. To insert the grid, slowly slide in the grid frame and once it is completely inserted, push it down to lock it in place.

WARNING!	Note that **when removing the anti-scatter grid, the patient dose is increased** and the image quality may degrade due to the scattered radiation. The absence of the grid is clearly visible in the grid slot.

5.4 WORKING WITH FIXED AND PORTABLE RECEPTORS

5.4.1 Fixed Receptors

FIXED, non-removable receptors (DR detectors / flat panels) are typically used in wall stands. The active (image) area of most fixed receptors is 43 x 43 cm. Rotation of the receptor between portrait and landscape orientation is not necessary and not possible. *Please contact your service representative about manually or automatically rotating the acquired images using the image acquisition software*.

5.4.2 Cassette Trays

For portable / removable receptors, the receptor holders (bucky or grid cabinet) on the wall stand and in the table may be equipped with a versatile CASSETTE TRAY, which can hold a number of different sized films / CR cassettes from 13 to 43 cm. To insert the cassette, pull it out, open the cassette locks and place the cassette in the center of the tray. The cassette is fixed in position once the locks are released.

5.4.3 Docking Stations

For 35 x 43 cm active area portable / removable receptors (especially for wireless DR flat panel detectors), the receptor holders (bucky or grid cabinet) on the wall stand and in the table may be equipped with a DOCKING STATION. To insert the cassette, pull it out, and push the far edge of the cassette against the 2 plastic retainers with springs and insert the opposite edge to the single fixed plastic holder in the center. The docking station tray can be rotated 90 degrees to allow portrait and landscape orientation. The portrait and landscape positions are locked in place with mechanical detents.

ATTENTION!

The docking station **tray shall only be pushed when locked in the landscape or portrait position**. Forcing the tray in any other position may result in damaging the receptor.

CAUTION!

Use caution when connecting the optional **charging cable** to a portable receptor **while in the cassette tray or docking station**. Make sure the cable does not obstruct equipment movement and is away from operator / patient traffic.

5.5 USING THE TUBE STAND

CAUTION!

Use caution when releasing the brakes as **counter-balancing** of the X-ray tube **may be off** and the X-ray tube may suddenly start moving up or down.

5.5.1 Adjusting the Beam Direction

Adjustment of the X-ray tube stand is performed in three steps:

- directing the X-ray beam to the required image receptor;
- centering the X-ray beam to the image receptor;
- setting the appropriate SID (source-to image-distance).

Directing the X-ray beam into vertical, horizontal and the optional transversal positions are the most frequently performed adjustments. The beam pointing vertically to the table receptor is the basic position of the X-ray tube.

The X-ray tube position is secured by electromagnetic brakes. To perform any positioning, press the appropriate brake release pushbutton. The brake release pushbuttons are located on the two sides of the tube stand console near to the handles within reach. The LED lights next to each brake release button are lit when the corresponding brake is ON (engaged).

5.5.2 X-ray Tube Rotation

The X-ray tube can be rotated around the horizontal axis. The rotating axis is perpendicular to the axis of the X-ray tube and crosses its focus point, when the tube is rotated around this axis the focus will not be set off.

Due to the inflexibility of the high-voltage cables, the X-ray tube can only be rotated approximately ± 120° in both (right and left) directions.

The rotation of the X-ray tube can be fixed in any position by releasing the membrane switch (with an electromagnetic lock). Additionally, mechanical detents help to position the tube precisely in vertical and horizontal directions. The tube inclination is always available on the LED display of the tube stand console.

The mechanical detents of the arm rotation provide accurate main beam direction (0 and 90 degree) positioning. Contact your service representative for calibration in case the readouts are inaccurate in these positions.

5.5.3 Vertical and Horizontal Movement

The vertical and the horizontal position of the X-ray tube can be adjusted by pressing either of the three brake release buttons. The switches release, respectively, the horizontal, vertical or both brakes.

Upon reaching the desired position, release the switch to lock the tube stand and the vertical carriage.

The SID (source image distance) for both vertical and horizontal beam direction is displayed on the upper LED display of the tube stand console. The vertical / horizontal SID is automatically selected based on the tube rotation between 40…50°.

Please note that:

*For systems with option R or X type floor carriage – ROTATING COLUMN: The **SID measurement is not available for lateral exposures** (whenever the column is rotated from its default position over the table).*

*The **SID is always calculated horizontally or vertically** in perpendicular projection for oblique procedures. In such positions, the collimator tape measure used in the line of X-ray beam may yield a value different from the digital SID display.*

WARNING!

The digital SID display of the TS99N tube stand is NOT a primary measuring feature. Always make sure the proper SID is adjusted using the **built-in tape measure** of the collimator.

5.5.4 Transversal Movement *(with T-type tube arm)*

The transversal position of the X-ray source is adjustable by pressing the button marked with a diagonal arrow.

Upon reaching the desired position, release the switch and the movement will stop.

A mechanical detent helps to position properly the X-ray tube to the center of the table and wall detector. Be sure the receptor installed in the radiographic table is aligned with the center of the table. Under table exposures should be taken in the center position of the cross-arm (tube centered over the table).

5.5.5 Column Rotation *(with R and X type floor carriage)*

The column rotation of the tube stand allows taking lateral exposures on the table or even (when rotated 180°) vertical exposure on a stretcher or mobile X-ray table.

To rotate the tube stand, release the COLUMN ROTATION lock release and turn the X-ray tube stand column in the desired direction. Mechanical detents are located at 0, left 90° and right 90°. Once the column is out of the detent position and is between two detents, disengage the brake release button. Slowly turn the column towards the detent position. The column will automatically lock into position at the detent.

To direct the X-ray beam in the required position, the tube can be rotated independently of

the position of the column and the vertical and longitudinal travel can be activated at any time as well.

*Please note that after activating the column lock release, the **column stays unlocked for 3 seconds**. After 3 seconds, the locks will automatically activate for safety reasons and to protect the locking mechanism.*

5.6 TRACKING FUNCTIONS AND AUTOMATIC POSITIONING

F100 F200 F300 F400 C10O C200 C300 C400

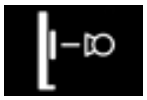
WARNING!

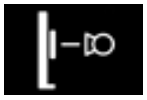
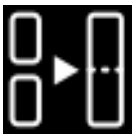
In order to avoid injuries and damage, before initiating any automatic movement on the system always make sure the movement area is clear (e.g. there is no risk of collision with patient or any object).

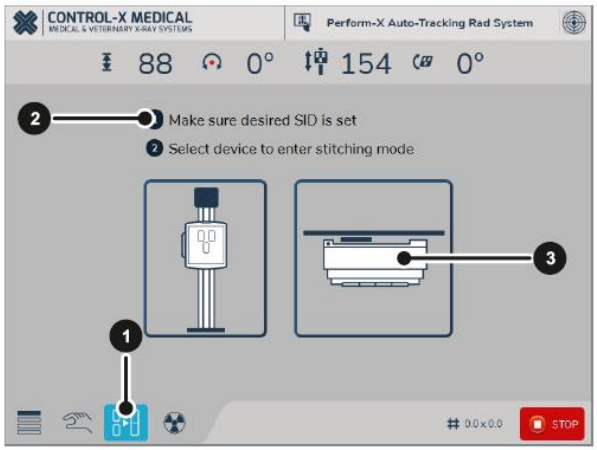
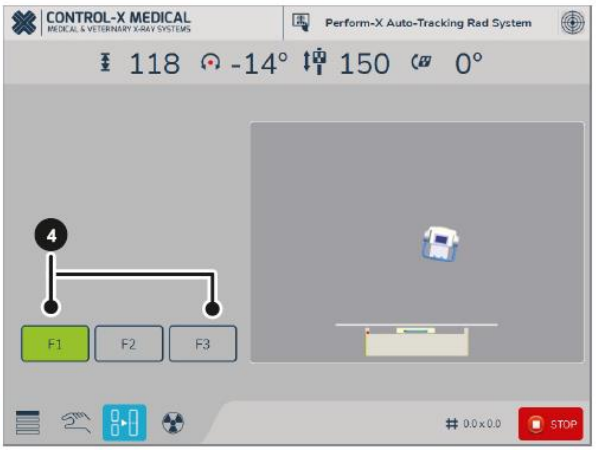
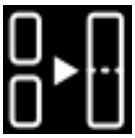
In case of emergency any system movement can be stopped by pushing the following buttons:

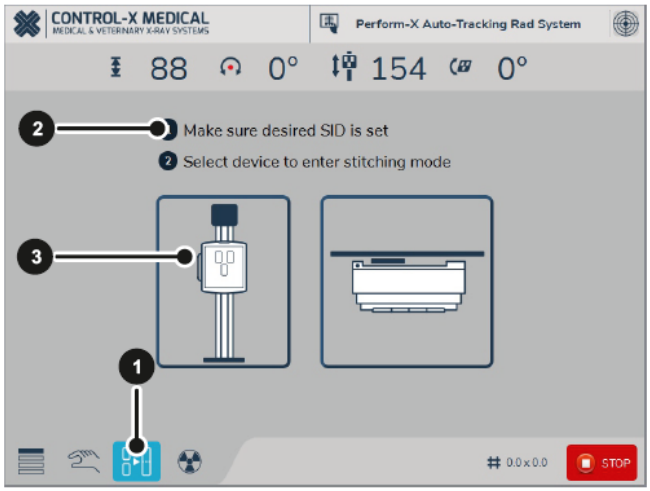
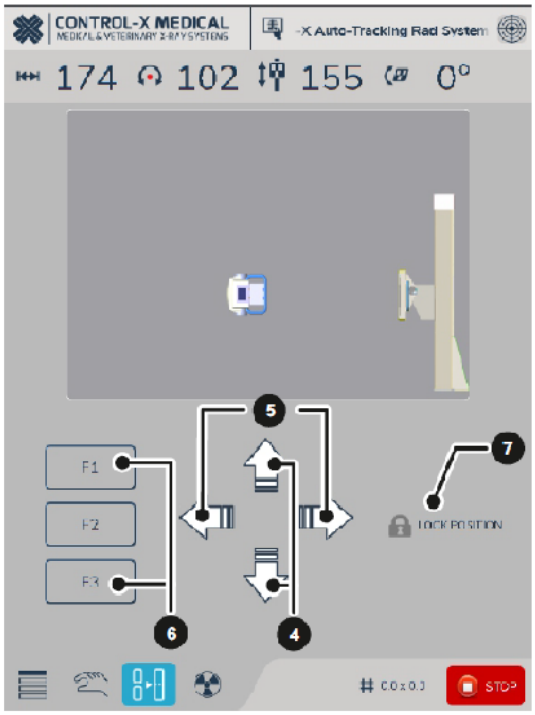
- Brake release buttons on the tube stand handle
- Stop button on the LCD display (if applicable)
- Stop button on the remote control (if applicable)

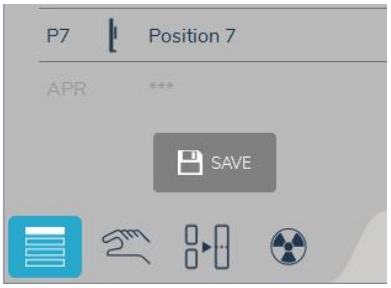
Based on configuration, the Perform-X system is equipped with a number of automatic tracking and positioning functions:

Function	Operation	System requirements
Wall detector: vertical auto-tracking 	The tube immediately follows the wall detector upon vertical movement. The X-ray beam is automatically centered with the detector center. *Works with horizontal X-ray beam only – not suitable for oblique projection centering.*	• Auto Tracking or higher
Wall detector: two-way vertical auto-tracking 	a) The tube immediately follows the wall detector upon vertical movement. The X-ray beam is automatically centered with the detector center. b) The wall detector immediately follows the tube upon vertical movement. The detector is automatically centered with the X-ray beam center. The two device are equivalent, the functions can be simultaneously used (the manually controlled device is the temporary 'Master'). *Works with horizontal X-ray beam only – not suitable for oblique projection centering.*	• Auto Tracking or higher • Motorized vertical wall detector movement

Function	Operation	System requirements
Wall detector : 3D vertical auto-tracking 	a) The tube immediately follows the wall detector upon vertical movement. The X-ray beam is automatically centered with the detector center. b) The wall detector immediately follows the tube upon vertical movement. The detector is automatically centered with the X-ray beam center. c) When in oblique projection, changing the horizontal SID the X-ray tube centers with the detector The two device are equivalent, the functions can be simultaneously used (the manually controlled device is the temporary 'Master'). This tracking function can be used with any arbitrary beam-detector angle.	• Auto Tracking or higher • Motorized vertical wall detector movement
Table detector: vertical auto-tracking (constant vertical SID) 	While adjusting the table height, the X-ray tube follows the table top and keeps the original vertical SID constant. Can be used with both vertical and oblique beam directions.	• Auto Tracking or higher • Elevating radiographic table
Table detector: automatic detector centering 	When moving or rotating the X-ray tube, the motorized table detector automatically follows the beam center. Can be used with both vertical and oblique beam directions.	• Auto Tracking or higher • Elevating radiographic table • Bucky Auto Centering
Automatic horizontal stitching 	The horizontal auto-stitching positioning supports stitching together 3 images taken on the table receptor. The systems automatically positions the individual frames with an overlap. To achieve ideal stitched output, the frames are taken with a constant focal point. 1. Select the stitching screen tab 2. Make sure the desired SID is set 3. Select the Table detector as device 4. Select the position of the first image to be take (F1 / F3) (the button pushed will turn green) 5. At this point it is still possible to change SID with the footswitch of the table. If the SID is changed the previously selected frame button will turn gray again, so it is needed to be pushed again. 6. Make the first exposure. Once the exposure is taken, push F2 to move the system to the next position. 7. Make the second exposure. Once the exposure is taken, push F3. Wait for the system to position itself then make the last exposure.	• Motorized table detector • Motorized tube rotation • Stitching SW option • *Recommended: automatic motorized collimator*

Function	Operation	System requirements
 		
Automatic vertical stitching 	The vertical auto-stitching positioning supports stitching together 3 images taken on the wall receptor. The systems automatically positions the individual frames with an overlap. To achieve ideal stitched output, the frames are taken with a constant focal point. 1. Select the stitching screen tab 2. Make sure the desired SID is set 3. Select the Wall stand as device 4. Set the height of WS for the first frame according to patient height 5. If needed, SID distance also can be adjusted 6. Select the position of the first image to be taken (F1 / F3) (when pushed, the button turns blue) 7. Push Lock position button. After this button is pushed, it is not possible to change height or SID (the button for the actual frame turns green). *Note: If the setting is not correct for the desired examination, click on any icon (other than stitching screen) on the bottom left corner then start again from step 1.* 8. Make the first exposure. Once the exposure is taken, push F2 to move the system to the next position. 9. Make the second exposure. Once the exposure is taken, push F3. Wait for the system to position itself then make the last exposure.	• Auto Stitching or higher • Motorized tube rotation • Wall Detector movement • Auto Stitching SW option • *Recommended: stitching stand* • *Recommended: automatic motorized collimator*

Function	Operation	System requirements
	 	
APR Auto Positioning	The X-ray tube and the detector moves into a default position according to the APR selected inside the generator control software on the workstation. When using an automatic collimator, the light field size is also programmable. In case this function is enabled, the P8 position on the preferred position screen becomes an APR position. The APR position has three states: • Until there is no new APR selection after the startup the APR row is disabled (gray coloured) • If an APR program was selected on the workstation, the APR position will get the same name as the APR program inside the APEX software. Until it is not saved, the name will be displayed in blue colour. After saving it will became red. • In case an already saved APR is selected inside APEX, the APR name will automatically displayed in red, so there is no need to save it again. In order to move the system components to the position that is determined by the APR, click on the triangle in the equipment position display	• APEX (v18.1 or later) software with CXGI interface enabled • Remote APR Option • *Recommended: automatic motorized collimator*

Function	Operation	System requirements
		

5.7 POSITIONING THE PATIENT

WARNING!

During positioning the patient, always **wear appropriate protective devices** according to procedures prescribed by your healthcare institution.

Adjust the position of the patient / body part according to the exposure and projection.

5.7.1 Wall Bucky Exposures

Recommended procedure:

1. Adjust the film-focus (source-image) distance;
2. Release the wall receptor brake using the brake release pushbutton and move the receptor vertically into the approximate exposure height;
3. (In case of tilting receptor) adjust the tilt angle of the receptor if necessary. The tilt angle is indicated on the inclination scale located on the tilting mechanism;
4. Adjust the patient into the desired position and set the final receptor height. Make sure that the region of interest is centered on the receptor;
5. When performing chest studies / screening, use the chin rest located on the top of the bucky or grid cabinet;
6. After positioning the patient, adjust the center and the size of the beam using the collimator.

5.7.2 Table Exposures

Recommended procedure for table exposures:

1. If necessary, move the X-ray tube aside so that the patient can easily and safely climb onto the table;
2. In case of Phoenix table, adjust the table height for convenient patient transfer onto the table (especially for elderly and disabled patients);
3. *(Phoenix only)* After positioning the patient, move the tabletop into the vertical exposure position (the tabletop automatically stops for convenient default exposure height);
4. Adjust the SID, the beam center and light field size. Use the tabletop longitudinal and transverse movements as necessary;
5. Make sure that the receptor is centered using the centering line of the collimator.

When working with portable digital detectors or film / CR cassettes, it is possible to take exposures directly on the tabletop (e.g. extremities studies). In this case, the SID scale located

higher on the tube stand column must be observed for SID distances (except for special procedures).

The recommended procedure for on-the-tabletop exposures:

1. If necessary, move the X-ray tube aside so that the patient can easily and safely climb onto the table;
2. In case of Phoenix table, adjust the table height for convenient patient transfer onto the table (especially for elderly and disable patients);
3. *(Phoenix only)* After position the patient, move the tabletop into the vertical exposure position (the tabletop automatically stops for convenient default exposure height);
4. Position the cassette / detector under the region of interest as desired;
5. Adjust the SID, the beam center and size. Use the tabletop longitudinal and transverse movements as necessary.

5.8 TAKING EXPOSURES

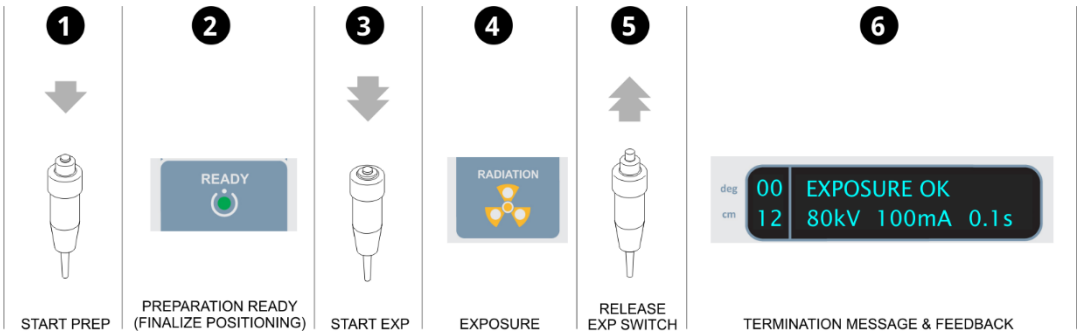
Depending on system configuration, the X-ray parameters can be monitored and adjusted:

- on the image acquisition workstation screen (in exposure mode);
- on the dedicated generator control console (e.g. Milestone or CMP-200 desktop console) or
- on the tube stand 10" LCD touch screen display *(requires LCD Console and integrated generator control sw. module).*

Please refer to the generator operating instructions for details on APR selection and adjusting X-ray parameters.

The exposure can only be initiated using the 2-step exposure hand switch or the built-in PREP / EXP buttons on the dedicated generator control console.

1. Press the 2-step exposure hand- or footswitch. The first step prepares the generator and the X-ray tube for the exposure. The preparation ready state will be indicated by a visual and/or audible READY signal. Any final positioning (instructions to patient, controlling breathing etc.) should be done at this time.
2. Press the second step of the exposure switch to take an exposure. During the exposure, the yellow exposure symbol will light up on the console(s) and an audible signal will also be heard. **Make sure you do not release the exposure switch prematurely!**
3. Alternatively, if patient position is not required right before the exposure, the 2-step exposure switch can be pushed all the way at once, without pausing between the steps.
4. After the exposure, the measured feedback values and a termination (or error) message will be displayed on the generator console. The feedback message will be on display depending on generator type and setup. In case of any errors during the exposures, the error message will appear on the generator console. Contact your service representative and be prepared to give details on the error conditions and messages.
5. On DR systems, the image appears on the image acquisition workstation in a few seconds after a successful exposure. On CR and conventional X-ray systems, follow the CR / film processing protocol to develop the image.



Exposure sequence *(Milestone generator control console indicators shown)*

WARNING!

The **exposure sequence can be interrupted immediately at any time** in case of an emergency, when patient movement is detected or if other problem occurs.

5.9 EXPOSURE INTERLOCKS

In certain situations, exposures may be disabled by an external interlock (e.g. tube overheat, door switch etc.). Refer to the X-ray generator user manual for further information.

5.10 ERROR MESSAGES AND ERROR CONDITIONS

The stands and radiographic table components of the Perform-X system do not have error message displays. For error messages and conditions related to the X-ray generator, please refer to the operating instruction shipped with the X-ray generator.

6 MAINTENACE

The Perform-X radiographic system requires regular maintenance to ensure safe operation and to increase the operating life of the equipment. The operator shall check the equipment for functional defects or any deviation from the normal operation. In case of deviation, the unit shall be turned off and your service representative must be notified. The equipment shall not be used until the defect is repaired.

6.1 DAILY ROUTINE CHECK

Check the operating elements (X-ray tube, receptor, tabletop, brakes etc.) for proper functioning. In case of unusual noises or sounds while positioning or slower elevating speed (Phoenix table), contact your service company immediately.

6.2 WEEKLY CHECK

The floor rails must be clean for proper operation and smooth horizontal travel. If necessary, clean the rails with a lint-free cloth.

6.3 PERIODIC MAINTENANCE

To ensure safe and trouble free operation the system shall be checked by your service representative, at least annually. Please refer to the *Maintenance* section of the installation manual.

ATTENTION!

Each failing component which effects the safe operation of the equipment, shall be replaced with **original spare parts**.

Parts of the equipment are treated with anti-corrosion agents. To prevent wear, the manufacturer applied lubricants and under normal circumstances there is no need for further lubrication. Contact your service representative if lubrication becomes necessary.

6.4 CALIBRATION

Some of the components require periodic calibration:

- The X-ray tube must be calibrated every 12 months to compensate for tube aging and ensure accurate operation (refer to the X-ray generator technical manual for calibration instructions);
- If the system is shipped with a DAP (dose area product) meter, the DAP meter is factory calibrated. The calibration certificate is included in the DAP packaging. Recommended frequency of recalibration is 5 years and must be carried out based on the included DAP user manual.

For detailed information, please refer to the installation manual.

6.5 CLEANING AND DISINFECTION

The Perform-X System does not require special cleaning or sterilization. However, it is recommended to clean from time to time:

- the tube stand console and its handles;
- the tabletop;
- wall bucky / grid cabinet cover and brake release handles.

For cleaning without disinfecting, you may use mild soapy water or an equivalent cleaning solution. Apply some solution with lint free cloth or paper towel and wipe down the surface. If for some reason, the handles or other surfaces require disinfection, you may use Actichlor (contains Sodium Dichloroisocyanurate, a form of chlorine) or equivalent with a 3 to 5% Hypochlorite concentration.

Method of disinfection:

1. Turn OFF the system completely (using the wall disconnect switch);
2. Use 50/50 disinfectant / water solution;
3. Apply (e.g. spray) the disinfectant on a lint free cloth. Make sure the **cloth is only damp and not wet**;
4. **Do NOT apply the disinfectant directly** on the surfaces as the substance may get into the equipment;
5. Wipe the surfaces carefully with the cloth;
6. Before turning the equipment on again, make sure that the disinfectant has evaporated.

WARNING!

To clean / treat the surfaces, only **acid-free, non-corrosive, non-abrasive** substances shall be used.

Only such disinfecting methods shall be used that correspond to the relevant regulations and rules as well as the protection from explosion.

The use of disinfecting spray is not recommended because it can get inside the equipment.

WARNING!

Make sure that **no water or other liquids** enter any component of the Perform-X system. Such liquids may cause short circuit in electrical components and / or corrosion on surfaces.

7 DISPOSAL AND DECOMMISSIONING

X-ray machines do not present a radiation hazard when they are not in operation. However, many structural components are built with materials that may be considered hazardous (e.g., lead, tungsten) for disposal purposes. These materials must be segregated and disposed of according to the regulatory agency having jurisdiction.

Dismantling and disposing the X-ray equipment may be subject to **clearance by a radiological survey.**

WARNING!

All dismantling and decommissioning activities related to the Perform-X system must be performed by **organizations authorized** to perform such tasks.

WARNING!

During decommissioning and disposal, **serious injury may occur** when dismantling:

- The **glass inside the X-ray tube** may brake and can cause injuries;
- Skin may come into contact with **hazardous substances** (lead, tungsten);
- **Weights and heavy parts** can become loose when disassembling.

WARNING!

The Perform-X is a permanently installed equipment with material that may contain **hazardous materials**. These include but are not limited to:

- Lead (in the X-ray tube and the collimator);
- Tungsten (in the X-ray tube);
- X-ray film and film processing agents (not supplied by the manufacturer).

REVISION HISTORY

Version	Date	Change	Pages
01	2020.07.03	Original version	Entire document
02	2020.09.11	Corrected typos and updated wording to ‘receptor’	Several pages
03	2020.10.28	Added information for F200-400 and C100-C400	Several pages
04	2020.05.12	Added compatibility information on IAE X-ray tubes and Varex HV cables	11