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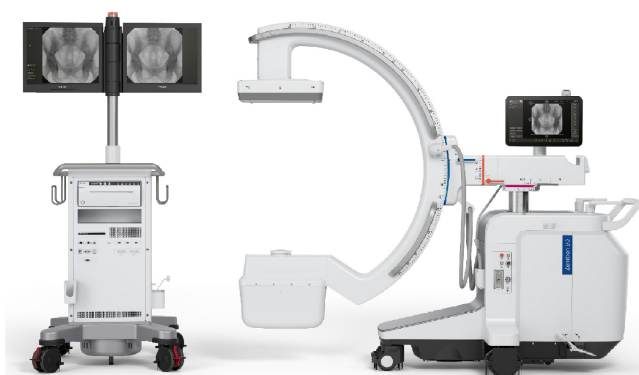
**Instructions for
Use**

English

3000 092 62552



Zenition 90 - Motorized System



Zenition 90 - Non-Motorized System

Philips Zenition 90

Release 1.1



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1 Introduction

This section introduces the equipment and the manual, plus related topics such as intended use, contraindications, compatibility, compliance, training and other manuals.

1.1 About the System

Zenition 90 is a mobile, diagnostic X-ray imaging and viewing system.

It is designed for medical use in healthcare facilities where X-ray imaging is needed.

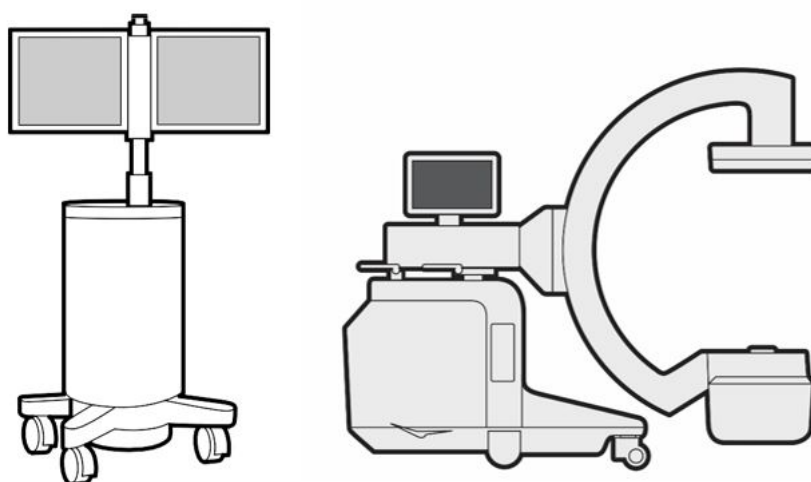


Figure 1 System overview: mobile view station (left) and C-arm stand

The system is intended for multiple patients for multiple use.

1.2 About Instructions for Use

This manual is intended to assist responsible users, operators, and organizations in the safe and effective operation of the equipment described.

These Instructions for Use may describe some products, features, or configurations that are not available in all countries. Please contact your local sales representative for the availability of products and features in your region.

The “users” and “operators” are those persons who actually handle the equipment, and the “responsible organization” is considered to be the entity accountable for the use and maintenance of the equipment.

Before attempting to operate the equipment, you must read, note, and strictly observe all **DANGER** notices and **SAFETY** markings on the system.

Before attempting to operate the equipment, you must read this manual thoroughly, paying particular attention to all **WARNINGS**, **CAUTIONS**, and **NOTES** incorporated in it. You must pay special attention to all the information given and procedures described in [Safety \(page 16\)](#).



WARNING

A warning alerts you to a potential serious outcome, adverse event or safety hazard. Failure to observe a warning may result in death or serious injury to the user or patient.

**CAUTION**

A caution alerts you to where special care is necessary for the safe and effective use of the product. Failure to observe a caution may result in minor or moderate personal injury or damage to the product or other property, and possibly in a remote risk of more serious injury, and/or cause environmental pollution.

NOTE ***A note highlights unusual points as an aid to a user.***

These Instructions for Use describe the most extensive configuration of the system, with the maximum number of options. Not every function described may be available on your system.

NOTE ***Not all configuration are available in all geographies. Please reach out to your Philips representative for configuration and services in your area.***

NOTE ***The images present in "Instructions for Use" are only for indicative purposes.***

The English language version of the Instructions for Use was originally drafted, approved and supplied by Philips Medical Systems under the product part code (document number) 3000 092 6255X, which is indicated on the rear of the title page of the English language version.

NOTE ***Last digit of part code (12NC) mentioned as "X" in document can have values between 1 to 9.***

1.3 Intended Use

The Zenition 90 with flat detector is a mobile X-ray imaging and viewing system. It is designed for medical use in healthcare facilities where X-ray imaging is needed.

The system comprises two main components: the C-arm stand and a mobile view station.

Indications for Use / Medical Purpose

The system is used for radiological guidance and visualization during diagnostic, interventional and surgical procedures on all patients. The device is to be used in health care facilities both inside and outside the operating room, sterile as well as non-sterile environment in a variety of procedures.

Applications:

- Orthopedic
- Neuro
- Abdominal
- Vascular
- Thoracic
- Cardiac

Intended Operator Profile

The Zenition 90 system is intended to be used and operated by adequately trained, qualified and authorized health care professionals who have full understanding of the safety information and emergency procedures as well as the capabilities and functions of the system.

Patient Population

Patients can be any human of whom any part of the body (from head to toe) can be subject of examination.

Clinical Environment

The system is to be used in health care facilities both inside and outside the operating room, sterile as well as non-sterile environment.

This system is intended to use with multiple patients and multiple uses. For more information see [Maintenance \(page 228\)](#).

General Safety and Effectiveness

To facilitate safe and efficacious operation of the system by a trained healthcare professional, instructions for use are provided as part of the device labeling, as well as training at system handover.

Operating Principle

The system uses X-ray generation, detection and image processing for medical imaging; and in addition displays images from other sources (e.g. ultrasound). The control mechanisms are input devices (e.g. touch panels, joysticks) and controls e.g. Touch Screen Monitor (Tableside UI Monitor), C-arc movements. The systems provides feedback by audible and visual means.



CAUTION

In the United States, Federal law restricts this device to sale, distribution, and use by, or on the order of, a physician.

1.4 Contraindications

Avoid using the system with the patients who are pregnant or who may possibly be pregnant. However, the risk may be outweighed by the benefit of diagnosis or treating a serious condition. It is the responsibility of the personnel operating the system to make the decision. Avoid using the system in case of existing radiation injury (operator or patient).

1.5 Compatibility

Equipment described in this manual should not be used in combination with other equipment or components unless such other equipment or components are expressly recognized as compatible by Philips Medical Systems.

A list of such equipment and components is available on request from the contact address given under the following heading Compliance.

Changes and/or additions to the equipment should only be carried out by Philips Medical Systems or by third parties expressly authorized by Philips Medical Systems to do so. Such changes and/or additions must comply with all applicable laws and regulations that have the force of law within the jurisdiction(s) concerned, and with best engineering practice.

Changes and/or additions to the equipment that are carried out by persons without the appropriate training and/or using unapproved spare parts may lead to the Philips Medical Systems warranty being voided. As with all complex technical equipment, maintenance by persons not appropriately qualified and/or using unapproved spare parts carries serious risks of damage to the equipment and of personal injury.

1.6 Compliance

The system complies with relevant international and national standards and laws.

Information on compliance will be supplied on request by your local Philips Medical Systems representative. Alternatively, contact the manufacturer.

For more information, see [Contacting the Manufacturer \(page 15\)](#).

NOTE *The system does not contain any patient applied parts.*

1.7 Training

Users and operators of the system must have received adequate training on its safe and effective use before attempting to operate the equipment described in this manual.

Training requirements for this type of device will vary from country to country. It is for responsible organizations to make sure that users and operators receive adequate training in accordance with local laws or regulations which have the force of law.

If you require further information about training in the use of this equipment, please contact your local Philips Medical Systems representative. Alternatively, contact the manufacturer. For more information, see [Contacting the Manufacturer \(page 15\)](#).

1.8 Other Manuals

This manual describes the Zenition 90 system.

Other pieces of equipment may be used with the system. These units are supplied with their own manuals.

1.9 Contacting the Manufacturer

You can contact the manufacturer by post, or using the Philips website.

Manufacturer's Address	
Postal address	Philips Medical Systems Nederland B.V. Veenpluis 6 5684 PC Best The Netherlands
Website address	www.philips.com/healthcare

2 Safety

This section provides important safety-related information about the system.

2.1 Important Safety Directions

Philips Medical Systems products are all designed to meet stringent safety standards.

However, all medical electrical equipment requires proper operation and maintenance, particularly with regard to human safety.

It is vital that you read, note, and where applicable strictly observe all **DANGER** notices and safety markings on the system.

It is vital that you strictly follow all safety directions under the heading **SAFETY** and all **WARNINGS** and **CAUTIONS** throughout this manual, to help ensure the safety of both patients and operators.

In particular, you must read, understand and know the Emergency procedures described in this **SAFETY** section before attempting to use the equipment for any patient examination.

You should also note the following information given in the Introduction section of this manual:

- [Intended Use](#) (page 13)
- [Contraindications](#) (page 14)
- [Compatibility](#) (page 14)
- [Training](#) (page 15)

NOTE *In case of serious incident, please contact the manufacturer. For more information, please refer to [Contacting the Manufacturer](#) (page 15)*

Maintenance and Faults



WARNING

Do not use the system for any application until you are sure that the user routine checks program has been satisfactorily completed, and that the planned maintenance program is up-to-date.



WARNING

If any part of the equipment or system is known (or suspected) to be defective or wrongly-adjusted, DO NOT USE the system until a repair has been made. Operation of the equipment or system with defective or wrongly-adjusted components could expose the operator or the patient to radiation or other safety hazards. This could lead to fatal or other serious personal injury, or to clinical misdiagnosis/mistreatment.

You can find information about the user routine checks program and the planned maintenance program in [Maintenance](#) (page 228).

Safety Awareness



WARNING

Do not use the system for any application until you have read and understood and know all the safety information, safety procedures and emergency procedures contained in these Instructions for Use. Operation of the system without proper awareness of how to use it safely could lead to fatal or other serious personal injury. It could also lead to clinical misdiagnosis/mistreatment.



CAUTION

During a procedure, ensure that patient drapes do not get stuck inside the C-arm.

**WARNING**

Do not allow the sterile covers to touch the floor or non-sterile part.

Adequate Training**WARNING**

Do not use the system for any application until you have received adequate and proper training in its safe and effective operation. If you are unsure of your ability to operate this equipment safely and effectively DO NOT USE IT. Operation of this equipment without proper and adequate training could lead to fatal or other serious personal injury. It could also lead to clinical misdiagnosis/mistreatment.

For information about training, please refer to [Training \(page 15\)](#).

Intended Use and Compatibility**WARNING**

Do not use the system for any purpose other than those for which it is intended. See [Intended Use \(page 13\)](#)

Do not use the system with any products other than those which Philips Medical System recognizes or compatible. for more information, see [Compatibility \(page 14\)](#)

**WARNING**

Operation of the system for unintended purposes, or with incompatible equipment, could lead to fatal or other serious injury. It could also lead to clinical misdiagnosis/mistreatment.

2.2 Emergency Procedures

This section provides important information about emergency procedures when operating the system.

2.2.1 Emergency Stop

Emergency procedure for direct switch Off of radiation and motorized movements.

In case of emergency, switch the system Off.



- 1 Press **Emergency Stop** button at the C-arm stand or on the TSO. X-ray generation and motorized movements are no longer available.



- 2 Press **X-ray Enable/Disable** button for 2 seconds on stand to use X-ray without motorization.

NOTE *X-ray Enable/Disable LED does not glow in white color to use a X-ray in emergency mode.*



- 3 To switch Off the system, press **System Off** button on the mobile view station.

- 4 Remove the mobile view station mains power plug from the socket outlet.

**WARNING**

When the Emergency off button is pressed, mains power is still applied to some circuits in the system until the mobile view station mains power plug is removed from the socket outlet.

2.2.2 Recovery from Emergency Procedure

Use this procedure to recover the system in emergency mode.



- 1 Turn the **Stand Key** from position 1 to 0.

- 2 Turn the **Stand Key** from 0 to 1.

System switch Off procedure:



- a At the mobile view station, press the **System Off** button to switch Off the system.
- b Please wait until the system shuts down.
- c Remove the mobile view station mains plug from the socket outlet.

Restart procedure:



- a At the mobile view station, press the **System Off** button for 3 seconds to switch Off.
- b Wait for 5 seconds.



- c To switch on, press the **System On** button on the mobile view station.
- d The system starts with default settings and a new patient.
- e At the C-arm stand, select the previously used examination type.
- f The system is ready to be used.

2.3 Electrical Safety

System covers or cables should only be removed by the qualified and authorized service personnel.

In this context, qualified means ‘those legally permitted to work on this type of medical electrical equipment in the jurisdiction(s) where the equipment is being used’, and authorized means ‘those authorized by the responsible organization’.



WARNING

Do not remove system covers or cables from this equipment, unless expressly instructed to do so in this manual. High electrical voltages are present within this equipment. Removing system covers or cables could lead to serious or fatal personal injury.



WARNING

Do not touch the pins of the mobile view station C-arm cable or the central pin of the video/USB connectors when touching the patient. Connector contact pins may carry low voltages that are safe to touch, but that may be harmful to the patient



WARNING

Do not touch the pins of the mobile view station C-arm cable plug directly after the system is powered off, some residual voltage may remain.



WARNING

In case of changing the X-ray on indicator light on the mobile view station, do not touch the electrical contacts and the patient simultaneously. Connector contacts pins may carry low voltages that are safe to touch, but that may be harmful to the patient.

**WARNING**

Only use this equipment in rooms or areas that comply with all applicable laws (or regulations having the force of law) concerning electrical safety for this type of equipment.

**WARNING**

Always electrically isolate this equipment from the mains electrical supply before cleaning, disinfecting or sterilizing it.

2.3.1 Equipotential Ground Connection

An equipotential ground (earth) connection point and a connection cable are provided for the safety of the patient.

**WARNING**

This equipment may only be used in areas meeting local standards for electrical safety in rooms used for medical purposes, for example the US National Electrical Code. IEC 60601 also gives guidance about an equipotential ground (earth) connection point.

**WARNING**

Use equipotential earthing lead between patient table and C-arm system.



The system is provided with a yellow-green cable for equipotential earth connection between the C-arm stand and the patient support table. The connection point is indicated by the equipotential earth symbol.

Alternatively, both the C-arm stand and the patient support table may be connected to an earth (ground) bus bar provided for this purpose by the hospital.

2.4 Transportation Safety

When moving mobile or transportable devices, make sure you do not collide with/or run over objects and/or persons.

The user must be familiar with the brake system and all controls for steering before moving the equipment.

Before moving the system, ensure that the system is in the transport position. For more information, see [Putting the C-arm in Transport Position \(page 78\)](#). Cross ramps, thresholds and obstacles as slowly as possible. Take extra care on steep slopes. Wheel brakes must always be applied when the device is stationary and on flat surface (no slopes).

2.5 Mechanical Safety

System covers should only be removed by qualified and authorized service personnel.

In this context, qualified means 'those legally permitted to work on this type of medical electrical equipment in the jurisdiction(s) in which the equipment is being used', and authorized means 'those authorized by the organization responsible for the equipment'. Ordinary users and operators should NEVER remove the system covers themselves.

**WARNING**

Make sure that, when the system is parked and connected to the mains for recharging, the system lock is in the O (disabled) position and the system lock key is removed to prevent accidental radiation emission and motorized movements.

**WARNING**

During manual and motorized movements of the stand or the table, the operator is responsible for the safety of the patient, staff, and equipment. Avoid collisions to prevent serious injury to the patient and staff, or damage to the equipment.

2.6 Explosion Safety

This equipment must not be used in the presence of explosive gases or vapors, such as certain anaesthetic gases.

Use of electrical equipment in an environment for which it was not designed can lead to fire or explosion.

**WARNING**

Do not use flammable or potentially explosive disinfecting sprays. Such sprays create vapors which can ignite, causing fatal or other serious personal injury, and/or damage to the equipment.

2.7 Fire Safety

Use of electrical equipment in an environment for which it was not designed can lead to fire or explosion.

Fire regulations for the type of medical area being used should be fully applied, observed and enforced. Fire extinguishers should be provided for both electrical and non-electrical fires. All operators of this medical electrical equipment should be fully aware of, and trained in, the use of fire extinguishers and other fire-fighting equipment, and in local fire procedures.

**WARNING**

Only use extinguishers on electrical or chemical fires which are specifically labeled for those purposes. Using water or other liquids on an electrical fire can lead to fatal or other serious personal injury.

If it is safe to do so, attempt to isolate the equipment from electrical and other supplies before attempting to fight a fire. This will reduce the risk of electric shocks.

2.8 Mobile Telephones and Similar Products

The system complies with the requirements of applicable electromagnetic compatibility (EMC) standards.

Other electronic equipment exceeding the limits defined in such EMC standards, such as certain mobile telephones, could, under unusual circumstances, affect the operation of the system.

**WARNING**

You should not allow any portable radio transmitting devices (such as mobile telephones) into the examination room - whether the device is switched on or off. Such devices could exceed EMC radiation standards and, under unusual conditions, interfere with the proper functioning of the system. This could, in extreme cases, lead to fatal or other serious personal injury or to clinical mistreatment.

2.9 Electromagnetic Compatibility

The system is classified as Class A equipment, suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.

The system complies with relevant international and national laws and standards on EMC for this type of product when used as intended. Such laws and standards define both the permissible electromagnetic emission levels from the product and its required immunity to electromagnetic interference from external sources.

The system needs special precautions regarding EMC, and needs to be installed and put into service according to EMC information provided in [Electromagnetic Compatibility \(page 245\)](#).

All staff that could touch connectors identified with the ESD warning symbol should receive training in ESD precautionary procedures. This training should at least include an introduction to ESD physics, the voltage levels that can occur in normal practice and the damage that can be done to electronic components. Further methods of preventing the build-up of electrostatic charge and methods for safe discharge, should be included.

**WARNING**

Medical Electrical Equipment need special precautions regarding EMC and need to be installed and put into service according to the EMC information provided in the accompanying documents.

**WARNING**

Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally. Additional measures may be necessary, such as re-orienting or relocating the system.

**WARNING**

Use of accessories and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation. See also the tables of electromagnetic emissions and immunity in [Electromagnetic Compatibility \(page 21\)](#)

**WARNING**

Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the system, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.

**WARNING**

This equipment is intended for use in a hospital environment. Operation in other than hospital environments may compromise electromagnetic compatibility.

**WARNING**

The EMISSIONS characteristics of this equipment make it suitable for use in industrial areas and hospitals (CISPR 11 class A). If it is used in a residential environment (for which CISPR 11 class B is normally required) this equipment might not offer adequate protection to radio-frequency communication services. The user might need to take mitigation measures, such as relocating or re-orienting the equipment.

NOTE *In the event of systems essential performance is lost, please perform steps as listed in section [Recovery from Emergency Procedure \(page 17\)](#) of this manual.*

2.10 Radiation Safety

Only qualified and authorized personnel may operate this equipment.

In this context, qualified means ‘those legally permitted to operate this type of medical electrical equipment in the jurisdiction(s) in which the equipment is being used’, and authorized means ‘those authorized by the organization responsible for the equipment’.

Personnel operating the equipment and personnel within the examination room must observe all laws and regulations which have the force of law within the jurisdiction(s) concerned. If there is any doubt about these laws and regulations, do not use it.

In addition, the responsible organization is strongly urged to become acquainted with the current recommendations of the International Commission on Radiological Protection, and in the United States, with those of the US National Council for Radiological Protection.

- ICRP, Pergamon Press, Oxford, New York, Beijing, Frankfurt, São Paulo, Sydney, Tokyo, Toronto
- NCRP, Suite 800, 7910 Woodmont Avenue, Bethesda, Maryland 20814, USA.

Full use must be made of all radiation protection features on the equipment, and of all radiation protection devices, accessories, systems and procedures available to you as the operator.



WARNING

Make sure that, when the system is parked and connected to the mains for recharging, the system lock is in 0 (disabled) position and the system lock key is removed to prevent accidental motorized movements or radiation emission.



Figure 2 System lock (system disabled)

Use only the prescribed dose necessary to perform a particular examination or treatment.

You should restrict access to the system in accordance with local regulations for radiation protection.



WARNING

When the system is powered up for use with system lock key in position 1, the system is in X-ray enabled state. It is recommended to keep the system in X-ray disabled state at all times, except when a procedure is in progress; to prevent the possibility of RADIATION being emitted through the accidental actuation of a foot switch/hand switch.

X-ray can be enabled by long press of the **X-ray Enable/Disable** button for at least 2 second.



Figure 3 X-ray Enable/Disable button

**WARNING**

Interventional Procedures: *this equipment is intended for procedures in which skin dose levels can be high enough in normal use to cause a risk of deterministic effects. It is vital that you strictly follow all safety directions for this type of procedure.*

NOTE *For radioscopy events which are more than 0.5 seconds, radioscopy may continue for less than 0.1 second from the time the operator releases the control (Foot switch/Hand switch). While for radioscopy events of 0.5 seconds or less, the radioscopy may continue for less than 0.5 seconds from the time the operator releases the control (Foot switch/Hand switch).*

2.10.1 Skin Dose Management

During prolonged interventional procedures skin dose levels can be high enough in normal use to cause a risk of deterministic effects.

Risk management should be used to determine the risks and benefits for any given procedure.

This system has several different selectable acquisition modes, each producing different image quality by using different dose rates. The best acquisition mode for the procedure should be used.

2.10.2 Radiation Guidelines

When performing radiation, the following rules should be followed:

- Do not radiate when not necessary.
- Radiate for as short a time as possible. [Esant galimybei naudokite automatinį dozės reguliavimą](#)
- 2.7.3. • **Use automatic dose rate control whenever possible.**
- Stay as far away as possible from the radiated object/X-ray source.
- Wear aprons and other protective clothing as appropriate.
- Use badges to monitor the radiation levels received in accordance with local regulations.
- Use the laser aiming devices to determine the region of interest instead of using fluoroscopy.
- Use fluoroscopy (or roadmap) with low dose or normal dose as much as possible instead of higher dose levels and instead of other acquisition modes to reduce dose.
- Collimate as much as possible using the pre-indicators (on the LIH image). For more information, see [Collimator and Shutter Adjustments in Last Image Hold \(page 148\)](#).
- Focal spot to skin (object) distance should be kept as large as possible to reduce the absorbed dose.
- Remove all supplementary obscuring objects from the primary beam, including your hands.
- In principle, the X-ray source should be placed under the table to reduce exposure to scattered radiation.
- Take into account any unfavorable effects that may arise due to materials located in the X-ray beam, for example, the operating table.
- The mobile view station should be positioned so that the X-ray on indicator light on the mobile view station is visible to all persons at all positions in the room.

2.10.3 Pediatric Radiation Guidelines

Special care should be taken when imaging the patients outside the typical adult size range, especially smaller pediatric patients whose size does not overlap the adult size range (For example, patients less than 52 kg (~115 lb) in weight; which approximately corresponds to an average 12 year old. Exposure to ionizing radiation is of particular concern in pediatric patients:

- 1 For certain organs and tumor types, younger patients are more radiosensitive than adults (i.e. the cancer risk per unit dose of ionizing radiation is higher for younger patients).
- 2 Use of equipment and exposure settings designed for adults of average size can result in excessive and unnecessary radiation exposure of smaller patients.
- 3 Younger patients have a longer expected lifetime over which the effects of radiation exposure may manifest as cancer. To help reduce the risk of excessive radiation exposure, you should follow the ALARA (As Low As Reasonably Achievable) principle and seek to reduce radiation dose to only the amount necessary to obtain images that are adequate clinically.

For more information, refer to FDA guidelines. <https://www.fda.gov/regulatory-information/search-fda-guidance-documents/pediatric-information-x-ray-imaging-device-premarket-notifications>

Pediatric Mode - Dose optimization techniques

Zenition 90 system is equipped with dedicated pediatric mode. This includes the dedicated examination datasets, IQ tastes, corresponding user profiles and reports. When a patient is classified as a pediatric patient and selected for examination, it is recommended to the user to remove the anti-scatter grid; and by default low dose mode is enabled. This mode is recommended for patients upto 12 years of age or ≤ 52 kg weight. For the patients above 12 years of age or weight > 52 kg, pediatric normal mode can be selected based on users preference for dose versus diagnostic image quality.

This anti-scatter grid removal helps with reducing the overall dose given to the pediatric patient.

Adjust C-arm settings to reduce dose rate while maintaining the diagnostic image quality, as younger patients are more sensitive to radiation. Following are recommendations for pediatric patients:

- All rules mentioned in [Radiation Safety \(page 22\)](#).
- Do not radiate when it is not necessary. Use non-X-ray equipment when possible (e.g. ultrasound).
- Remove any objects in the path of x-ray beam that are either not necessary to execute the procedure (e.g. mattresses, pillows, tubes, etc.) or that are not radiolucent.
- Remove the detachable grid (see [The C-arm Stand \(page 52\)](#)).
- Select the correct anatomy and detailed procedure for the examination. (e.g. Skeleton - Arm).
- Choose the lowest dose (fluoroscopy with low dose) and lowest pulse rate possible.
- Place the detector as close as possible to the patient.
- Use collimation as much as possible to protect areas outside the region of interest. Exclude eyes, thyroid, breast, and gonads when possible. When possible, perform collimation on the LIH. Combine independent shutters together with the iris to expose the smallest area possible on the body part.
- Use automatic dose rate control whenever possible (Auto kV). When selecting manual kV, it is possible to override the automatic dose rate control and lock the kV at the current value.
- Use the laser aiming device to determine your region of interest instead of using fluoroscopy.
- Instead of the right button, use the left (grey) button on the hand switch (see [Hand Switch \(page 332\)](#)) or left pedal on the foot switch (see [Foot Switch \(page 332\)](#)). When storage is needed, this can be enabled via the user interface.
- Radiate for the shortest time possible, use the LIH to review the anatomy rather than live fluoroscopy.
- Install skin spacer to keep the minimum distance between the patient and X-ray focal spot.
- Use the dose limiting parameter to set dose threshold limits to help limit the system loading parameter (kV/mA) thereby ensuring maximum dose delivered to pediatric patient to a predetermined threshold. This will help to prevent accidental high dose given to young patients. This parameter can be changed with the help of IST (Integrated Security Tool) key.

Design Features Important to Pediatric Imaging	Reference
Procedure selection	Changing the Default Examination Type (page 49)
Dose level selection	Making Fluoroscopy Images (page 135)
Pulse rate selection	Making Fluoroscopy Images (page 135)

Design Features Important to Pediatric Imaging	Reference
Removable grid message	<i>The C-arm Stand</i> (page 52)
Automatic dose control and BodySmart function	<i>Automatic kV/mA control</i> (page 149)
Laser aiming devices (optional)	<i>Laser Aiming Devices</i> (page 65)
Last image hold with storage function	<i>Storage Rate</i> (page 152)
Spacer	<i>Spacers</i> (page 64)
Auto park function	<i>Auto park</i> (page 170)

Testing Information	Reference
Estimated patient dosimetry	<ul style="list-style-type: none"> • <i>Patient Dose Information - Dose Rate With Grid</i> (page 266) • <i>Patient Dose Information - Dose Rate Without Grid</i> (page 277)
Quality control instructions	<i>Maintenance</i> (page 228)

Philips recommends reviewing generally available resources on pediatric imaging before using the equipment for pediatric cases, such as the following:

- The U.S. Food and Drug Administration, Pediatric X-ray Imaging:
www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/ucm298899.htm
- The Alliance for Radiation Safety in Pediatric Imaging, Image Gently:
www.imagegently.org
- The Society for Pediatric Radiology:
www.pedrad.org

NOTE *Use of low dose mode for thicker anatomy could affect diagnostic image quality. User judgement is recommended for determining the optimum dose versus diagnostic image quality.*



CAUTION

Use special care when imaging patients outside the typical adult size range.

2.11 Laser Light Radiation Safety

The laser light in the laser aiming devices should only be used under supervision of a medically trained person with knowledge of the hazards implied by the use of laser light.

It is the responsible organization's responsibility to fulfill the local safety regulations regarding laser light radiation.



WARNING

The lasers must not be switched on without purpose, and unnecessary exposure must be avoided.



WARNING

Use of controls, adjustments, or procedures other than those specified in this Instruction for Use may result in hazardous radiation exposure.

The lasers comply with FDA performance standards for laser products except for the deviations pursuant to Laser Notice No. 50 and Laser Notice No. 56.

Detector Laser Aiming Device

The detector laser aiming device consists of two, Class 1 lasers which are integrated in the detector unit.



WARNING
Laser radiation. Do not view directly with optical instruments. Class 1 laser product. Viewing laser output with certain optical instruments (for example eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.

Tube Laser Aiming Device



WARNING
Laser radiation. Do not view directly with optical instruments. Class 1M laser product. Viewing laser output with certain optical instruments (for example eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.

Complies with IEC60825-1 and with FDA performance standards for laser products except for the deviations pursuant to Laser Notice No. 50 and Laser Notice No. 56.

2.12 Labels and Symbols

This section describes the labels and symbols used on the equipment.

2.12.1 Labels

The system has the following labels located as shown below.

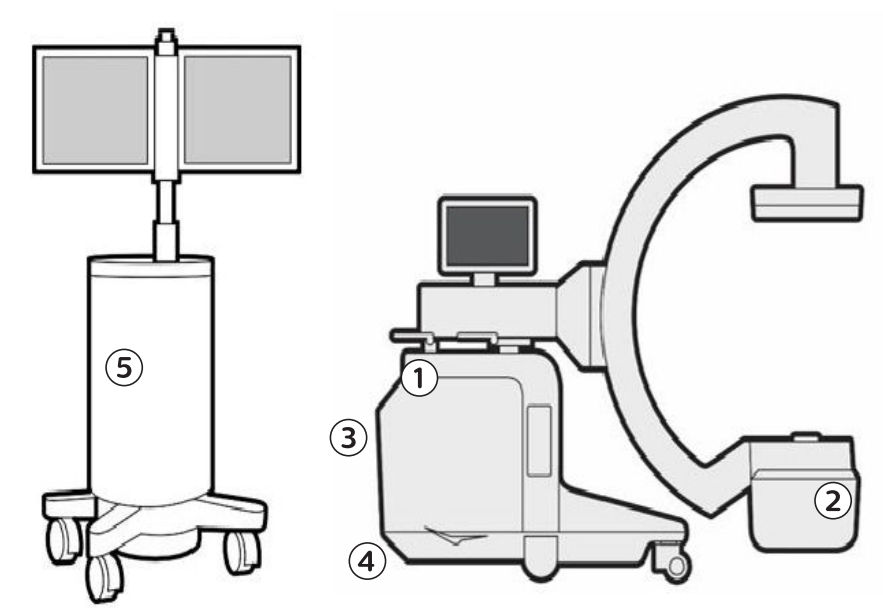


Figure 4 System Overview

Legend	
1	C-arm stand console
2	X-ray tank
3	C-arm stand back cover
4	Central labeling station
5	Front side of the mobile view station

Warning on the C-arm stand (1)

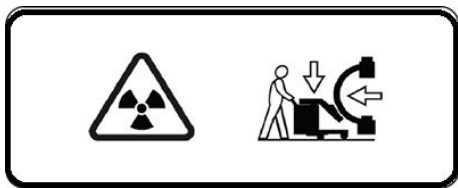


Figure 5 Transport position label

Label text

Transport position

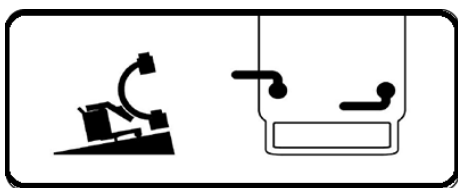


Figure 6 Ramp parked position label

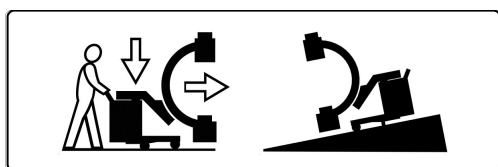
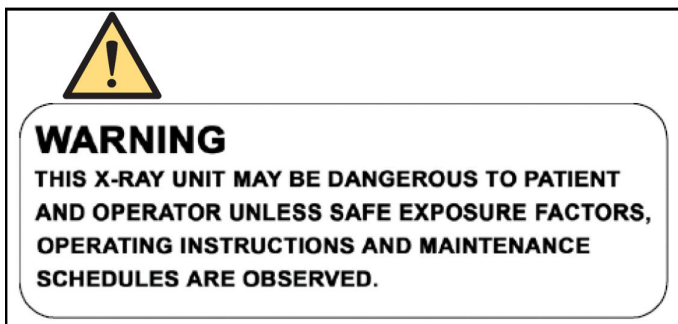


Figure 7 Transport position - Down the ramp label

Warnings on the C-arm Stand Console (1)

The following warning is displayed on the C-arm stand console. It is only applicable to the USA, China, Japan, and Canada.



Label Text

This X-ray unit may be dangerous to patient and operator unless safe exposure factors, operating instructions and maintenance schedules are observed.

Warnings on the X-ray Tank (2)

The following warning is displayed on the X-ray tank and is only applicable to USA, Canada, and Taiwan.

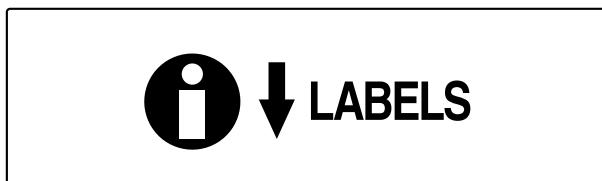


– WARNING –

**This spacer must be installed.
Unless the specific procedure prohibits this.**

Label on the Front Cover of the C-arm Stand (3)

The following label is displayed on the front cover of the C-arm stand and shows the position of the central labelling station.



Central Labeling Station (4)

The central labeling station contains the FDA certification labels of the following components:

- X-ray control
- Tank housing assembly / X-ray tube
- Image detection subsystem
- X-ray generator
- Beam limiting device
- Laser product



Figure 8 Certification label

The central labeling station also contains the complete system configuration.

NOTE *The appropriate labels on this panel must be updated when replacing certified components.*

Warnings and Labels on the Rear Side of the Mobile View Station (5)

The following labels are displayed on the rear side of the mobile view station.

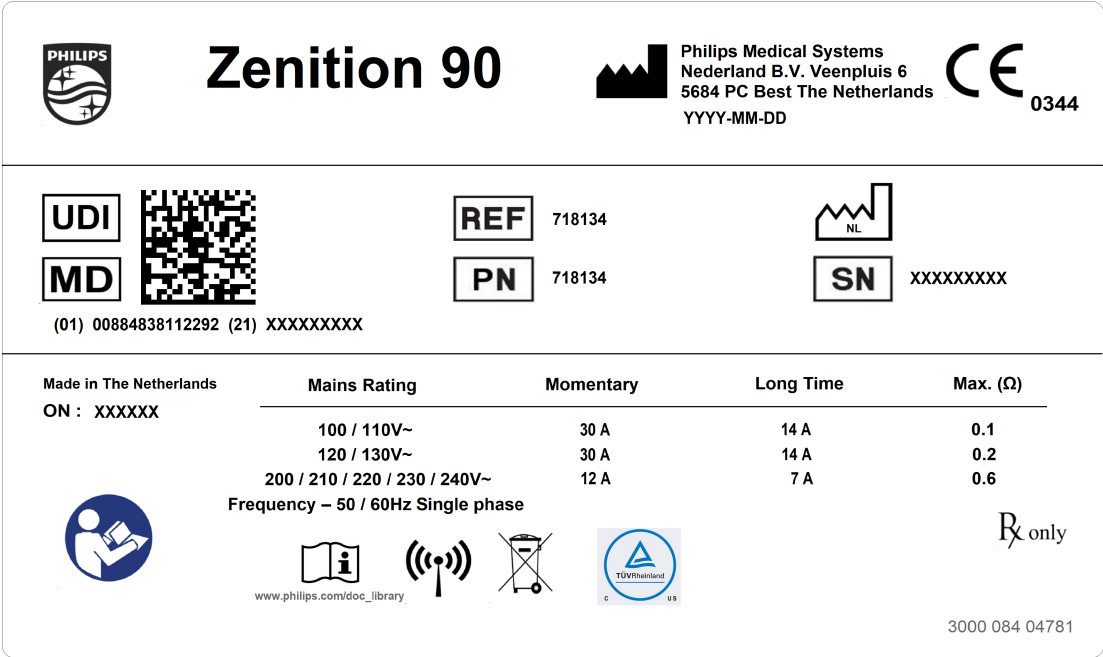


Figure 9 System label for Best location

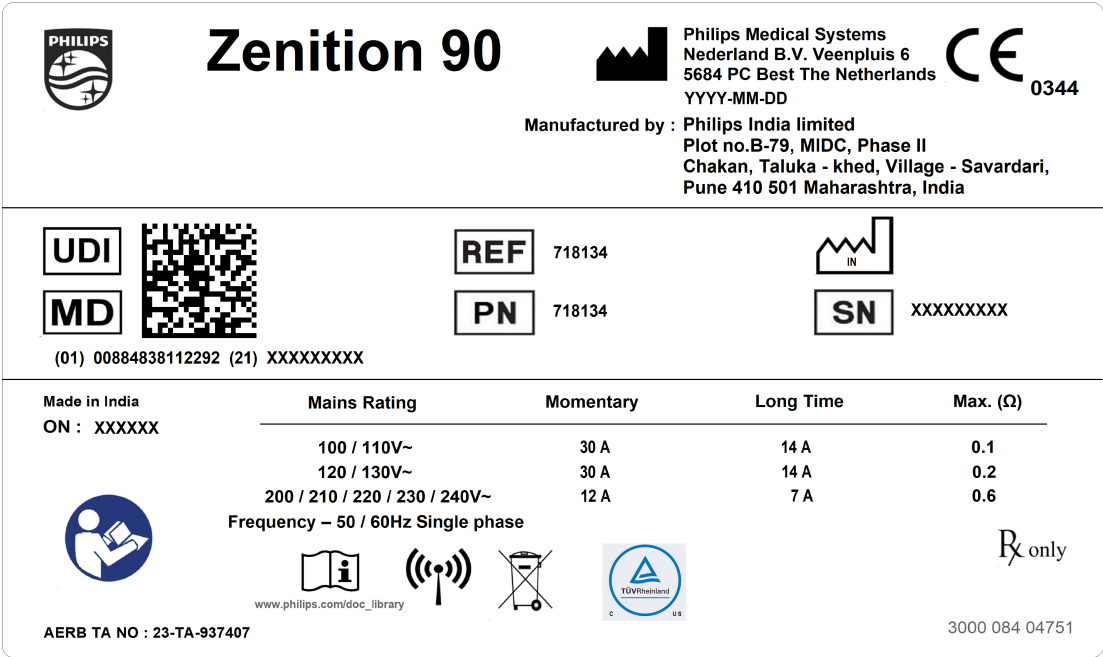


Figure 10 System label for Pune location

Label Text			
Philips Philips Medical Systems NL B.V. Veenpluis 6, 5684 PC Best The Netherlands		This box displays the manufacturing address of your system	
Mains Rating	Momentary	Long Time	Max. (Ω)
100 / 110 V~	30 A	14 A	0.1
120 / 130 V~	30 A	14 A	0.2
200 / 210 / 220 / 230 / 240 V~	12 A	7 A	0.6
Frequency – 50 / 60 Hz Single phase			

The following warning is only applicable to the USA, Canada, and China.

Warning
Grounding reliability can only be achieved when the equipment is connected to a sufficiently grounded power socket

4522 165 1308 1



Label Text
Grounding reliability can only be achieved when the equipment is connected to a sufficiently grounded power socket.

Touch Screen Monitor Label

BIGTIDE
Made In China
Mod.No. HL1236VT-HR
V : 50-57V A_{MAX} : 0.8A IP23
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

10422XXXXXXXXXX



SBM 4598 015 79591



FRU 4590 016 50961



Manufacturer :
Shenyang Torch-Bigtide
Digital Technology Co., Ltd

No.18-6B, Yaoyang Road,
Hulshan Economic Development
Area, Shenbei New District,
Shenyang, China.
Tel: 86-24-88087621

Table Side Operator Label

Table Side Operator Module
Model:RCP01



Module 000054
1.75 kg Wt.

REF 4598 017 02831

SN XXXXXX  YYYY-MM-DD

Input: 36V --- 0.18A MAX IPX4

Manufactured for:
Philips Medical Systems Nederland B.V.
Shenyang Torch-Bigtide Digital Technology Co., Ltd
Add.: No.18-6B, Yaoyang Road, Huishan Economic
Development Area, Shenbei New District, Shenyang, China
Tel: 86-24-88087621










Zenition 90 Release 1.1 Instructions for Use

30

Philips 3000 092 62552

Wired Foot Switch Label

Model no. MKF 2 1PW/1PW-MED GP26 PHILIPS	Manufactured for Philips Medical Systems Nederland B.V., by Steute Schaltgeräte GmbH & Co KG Brückenstraße 91 32584 Löhne / Germany
Wired Footswitch REF XXXX XXX XXXXX SN XXXXXXXX YYY-MM	Max Voltage 25VAC/59 VDC IPX8
 MC180133 C US	  
	

Wireless Foot Switch Label

NOTE The following images are indicative of the actual labels used on the equipment.






PHILIPS	Manufactured for: Philips Medical Systems Nederland B.V. Best, The Netherlands, by steute Technologies GmbH & Co. KG Brückenstraße 91 32584 Löhne / Germany
Model: Wireless footswitch 3P REF XXXX XXX XXXXX SN XXXXXXXX YYY-MM	12VDC / 0.5A FCC ID: XK5-SW24LE IC: 5158A-SW24LE CNC ID: C - 24885
 MC180133 C US	  
IPX8	

Figure 11 Product Label



Model: Wireless Footswitch 3P XXXX XXX XXXXX
 Tested To Comply With FCC Standards
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Figure 12 FCC Standard Label

Wireless Foot Switch Base Station

Base Station MED SW Philips

XXXX XXX XXXXX




Tested To Comply With

FCC Standards

FOR HOME OR OFFICE USE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Remote Control Label




RAFI GmbH & Co. KG

Ravensburger Str.

128 - 134

D-88276 Berg

Germany



2015 - 04

Type 459800678182




REF

3.97.000.181/0000

SN




15000123

Viewpad Vascular



2xLR06 (AA)

IP X2



1

2


3

4

5

Legend			
1	Manufacturer	4	Serial number and viewpad type
2	Date of manufacture	5	Battery requirements
3	Part number		

Information label



Avoid Disconnecting / Connecting

cables during system start-up

3000 129 74471

Your system may have additional labels as a result of local requirements.

Laser Safety Label



Figure 13 Laser Safety Label



Figure 14 Laser Safety

NOTE *The laser safety labels available on Central Labeling Station.*

2.12.2 Symbols

The system has the following symbols.

For more information, refer to the following Philips website:

www.symbols.philips.com

Danger Voltage



Dangerous voltages are present within the cabinet marked with this symbol. Only trained personnel may remove the system cover, or otherwise obtain access to system components. There are no user serviceable parts and never attempt to repair this unit.

Refer to the Instruction Manual



This symbol indicates that the accompanying documents must be consulted.

Presence of Radio Frequency Transmitters



This symbol indicates the presence of radio frequency transmitters.

Information



This symbol indicates information.

Crushing Hazard: Hand



This symbol indicates a warning that a hand crushing hazard exists.

**CE**

This symbol indicates that the equipment complies with the European Communities regulation, the number of the notified body is printed.

The CE mark on the product denotes compliance with all applicable EU Regulation. The notified body number does not apply to the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive.

**Alternating Current**

This symbol indicates alternating current.

**Equipotential Earth**

This symbol indicates the equipotential earth connector. This connector allows a connection between the C-arm stand and the patient support table or the earth (ground) bus bar provided by the hospital.

**Protective Earth (Ground)**

This symbol indicates the potential earth terminal, which is connected to conductive parts of Class 1 equipment for safety purposes. This terminal should be connected to an external earthing system by a protective earth connector.

**On**

This symbol indicates an on switch for part of the equipment.

**Off**

This symbol indicates an Off switch for part of the equipment.

**Emergency Off**

This symbol indicates an emergency off switch for the C-arm stand.

**X-ray Enable/Disable**

When Emergency button is active, you can still perform fluoroscopy by enabling **X-ray Enable/Disable** button given on the C-arm stand.

**TUV Rheinland certification mark**

This test mark is proof of compliance with Canadian National standards and US National standards.

Certified according to CAN/CSA-C22.2 No. 60601-1:14 and ANSI/AAMI ES60601-1.

**Small Focal Spot**

The value next to the symbol indicates the size of the small focal spot.

Large Focal Spot

The value next to the symbol indicates the size of the large focal spot.

Direction of Grid

This symbol indicates the direction of the grid lamella.

Laser

This symbol indicates the presence of laser equipment.

Radiation

This symbol indicates the presence of radiation (X-ray) equipment.

Transport

This symbol indicates that the C-arm stand must be put in the transport position before transporting it. For more information, see [Transportation \(page 77\)](#).

Do Not Push

This symbol indicates that you must not attempt to push the equipment at the point where the label is situated, or at any point above.

Product Disposal

This symbol indicates that the equipment contains material(s) that are harmful to the environment if disposed of incorrectly.

IP X X**Ingress Protection**

The IP code (International Protection code) indicates the degree of protection provided by an enclosure.

- IPX0: Protection against ingress of solid foreign objects is not specified, and no protection against ingress of water with harmful effects.
- IPX1: Protection against ingress of solid foreign objects is not specified, and protection against ingress of water with harmful effects from drips from above.
- IPX2: Protection against ingress of solid foreign objects is not specified, and protection against vertically falling water drops when enclosure tilted up to 15 degrees.
- IPX3: Protection against ingress of solid foreign objects is not specified, and protection against ingress of water with harmful effects from spraying.
- IPX4: Protection against ingress of solid foreign objects is not specified and protection against ingress of water splashed against the enclosure from any direction shall have no harmful effects.
- IPX8: Protection against ingress of solid foreign objects is not specified, and protection against ingress of water with harmful effects from immersion.

**Manufacturer**

This symbol identifies the medical device manufacturer. The date of manufacture, as well as the name and address of the manufacturer, can be combined in one symbol.

**Date of Manufacture**

This symbol indicates the date when the medical device was manufactured.

**Catalogue Number**

This symbol indicates the manufacturer's catalogue number so that the medical device can be identified. This symbol may be shown without the enclosure.

**Serial Number**

This symbol indicates the manufacturer's serial number so that a specific medical device can be identified. This symbol may be shown without the enclosure.

**Consult the Instructions for Use**

This symbol instructs the user to consult the Instructions for Use.

**Caution**

This symbol indicates that you should use caution and consult the accompanying documents.

**Battery**

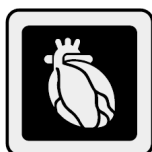
This symbol indicates the number and type of batteries used for the device.

**FCC Declaration of Conformity**

This symbol indicates that the product conforms to Federal Communications Commission limits on electromagnetic interference.

**KCC Declaration of Conformity**

This symbol indicates that the product conforms to the requirements of the Korea Certification Standard.

**Cardiac Extension**

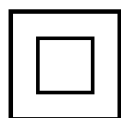
This symbol indicates that the cardiac extension is installed on your system.

**Vascular Extension**

This symbol indicates that the vascular extension is installed on your system.

**Regulatory Compliance Mark for Australia and New Zealand**

This symbol indicates that the equipment complies with regulations in Australia and New Zealand.

**Class II Equipment**

This symbol indicates that the equipment meets the safety requirements specified for Class II equipment (without the use of protective earth connection).

Rx only**Prescription Device**

In the United States, Federal law restricts this device to sale, distribution, and use by, or on the order of, a physician.

**Country of Manufacture**

This symbol indicates the country of manufacture of products.

**Medical Device**

This symbol indicates item is a medical device.

**Unique Device Identifier**

This symbol indicates the unique device identifier.

ON**Order Number**

This symbol indicates the order number.

2.13 Information Regarding Substances in the System

REACH Declaration

REACH requires that Philips Medical Systems provides chemical content information for Substances of Very High Concern (SVHC) if they are present in amounts above 0.1% of the product weight.

Components with electric or electronic equipment may contain phthalates above the threshold (for example, bis(2-ethyl(hexyl)phthalate), CAS nr.: 117-81-7). Philips Medical Systems is still in the process of investigating its supply chain to further establish which components contain phthalates. The SVHC list is updated on a regular basis. For the latest list of products that contain SVHC above the threshold, go to the following website:

www.philips.com/about/sustainability/reach

Perchlorate

Perchlorate material is present in lithium coin cells or batteries that are used in the system. Special handling may apply. For information, go to the following website:

www.dtsc.ca.gov/hazardouswaste/perchlorate

Product Recycling Passport

The WEEE Recycling passport of this product can be requested through the following website:

www.healthcare.philips.com/main/about/sustainability/recycling

California proposition 65 requires Philips Medical Systems (PH) to provide reasonable safety warning Information when substance released is above safer harbor level. For information, go to the following website:



WARNING

California's Proposition 65 requires Philips Medical Systems to provide reasonable safety warning Information when a released substance is above safe harbor levels. The internal components of this product may contain substances that, when exposed, are known to the State of California to cause cancer or reproductive harm. Based on the risk assessment performed by Philips, there is no risk or low risk to patient or hospital staff. Service personnel may be exposed to internal components while servicing the equipment. For information about risks to service personnel, refer to the service documentation.

For more information on California's Proposition 65, see the following websites

www.philips.com/about/sustainability

www.P65Warnings.ca.gov

2.14 Reporting a Serious Incident

If a serious incident occurs in relation to the device, it should be reported to the manufacturer and the competent authority of the country where you are located.

For contact details, see [Contacting the Manufacturer \(page 15\)](#)

A serious incident means any incident that directly or indirectly led to, might have led to, or in case of recurrence, could lead to, any of the following:

- The serious deterioration of the state of health (temporary or permanent) of a patient, user or other person.
- A serious public health threat.

3 Installation

This section describes how to interact with the system's user interface, and how to configure system parameters.

3.1 User Interface

The following provides a basic introduction to the user interface on the mobile view station and the C-arm stand.

More advanced controls are described in detail later in this manual.

Tooltips provide help and information about buttons and other items in the user interface. When enabled, tooltips appear after positioning the pointer over an item in the user interface.

3.1.1 Mobile View Station

This section describes navigation and the common user interface elements of the mobile view station.

Navigation

Use the touch pad and left button on the mobile view station console to control the pointer on the screen of the examination monitor and the reference monitor (see [About the System \(page 12\)](#)).

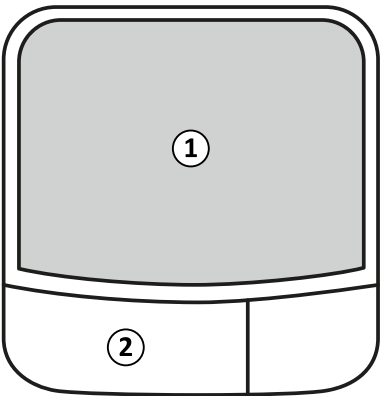


Figure 15 Touch pad

Legend	
1	Touch pad
2	Left button

Use the pointer to click buttons or select items on the screen:

- Move the pointer over a control or item.
- Press the left button on the mobile view station console to activate the control or select the item.

To assist you, the appearance of a button changes to indicate it is being clicked, and a selected item is highlighted (if appropriate).

Dragging

Items on the screen, like sliders or controls, can be dragged when appropriate. To drag an item on the screen, position the pointer over the item and drag it by moving it with the pointer while keeping the left button pressed.

Touch Screen Functionality

The examination monitor has touch screen functionality allowing you to perform actions normally requiring the touch pad (clicking buttons, selecting items, dragging items) by touching the screen directly.

Using the touch screen functionality, items on the screen can be dragged by touching them and dragging. The item is released when the screen is no longer touched.



CAUTION

Using excessive force and/or sharp objects to operate a touch screen is likely to result in damage to the screen.

Touch screen functionality is not available for the reference monitor.

Entering Text

When a text field is selected, text can be entered using the keyboard on the mobile view station console. To make a correction when entering text use the Backspace or Delete key on the keyboard.

When several text fields are available, press the Tab key on the mobile view station console after completing a field to automatically select the next field in the dialog box.

Accept



Pressing the **Accept** button on the mobile view station console is the same as clicking the highlighted (active) button on the examination monitor. Highlighted (active) buttons are displayed with a yellow outline. It is useful as a shortcut to perform the associated action.

Undo



Some actions can be undone using the **Undo** button on the mobile view station console. Pressing the **Undo** button undoes the previous action, removes a selected graphical element (such as an annotation), or resets the text of a field to the original value before editing.

Only one previous action is undone when the **Undo** button is pressed. A series of several actions can be undone by pressing the **Undo** button repeatedly.

Common User Interface Elements

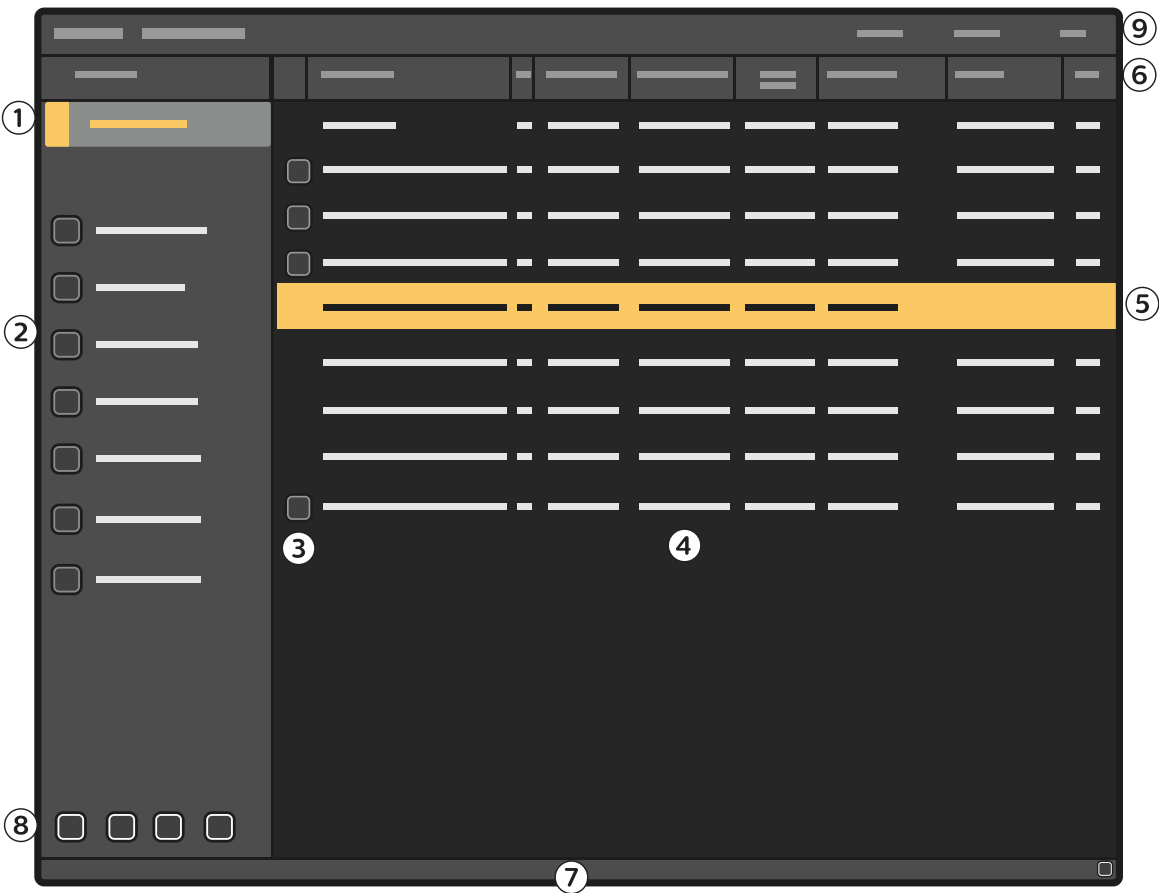


Figure 16 Mobile view station interface (administration screen) on the examination monitor

Legend			
1	List selection panel	6	Column headings
2	Control panel	7	Notification area
3	Status indicator	8	Global tools (Review task only)
4	Patient list	9	Top bar menu
5	Selected patient		

List Selection Panel

The task navigation panel allows you to move between the two available lists:

- To see the scheduled patient list, click **Schedule**.
- To see the patient list for review, click **Review**.

Control Panel

The task control panel allows you to select a function to perform within each task.

Patient List

Each line in the patient list represents a patient examination. When selected, an examination is highlighted.

The patient list includes all patients available for type of examination: **Schedule** or **Review**.

The **Schedule** and **Review** lists have independent patient lists.

Status Indicator

The status indicator displays status information about a patient examination. For more information, see [Managing Patients and Examinations \(page 114\)](#).

Column Headings








Clicking on a column heading sorts the patient list on that field. Click on the field again to reverse the sort order. The order in which columns are sorted is indicated by an arrow in the sorted column header.

Notification Area

The notification area displays warning and messages.

Global Tools

In the **Review** task, additional tools are available. These tools are available whenever images are displayed, except when live images are displayed.

Tool	Description
 Export	Use this tool to export data to another location. For example, exporting data to a PACS. For more information, see Exporting Images to a Network Location (page 187) .
 Save	Use this tool to save data to USB, DVD or CD. For more information, see Saving Images to Local Media (page 188) .
 Print	Use this tool to print data on a DICOM network printer. For more information, see Printing Images (Option) (page 190) .
	
 Job Viewer	The job viewer contains a list of queued transfer jobs. Use this tool to open the job viewer, where you can see the status of export, save, or print jobs. The icon displayed in the global tools changes to indicate the status of transfer jobs. For more information, see Viewing Transfer Jobs in the Job Viewer (page 191) .
	
	

Top Bar Menu

The top bar menu displays Profile, Help and System menu. System menu provides access to additional functions like job viewer, Wi-Fi network, remote assistance, save log file for service, start field service and system setup.

3.1.2 C-arm Stand

This section describes the user interface elements of the C-arm stand.

C-arm Stand Controls

You can switch the C-arm stand On and Off using buttons on the C-arm stand console.

You can also adjust the height of the C-arm using the height movement buttons on the C-arm stand. For more information, see [System On/Off \(page 101\)](#) and [Height Movement \(Non-Motorized\) \(page 100\)](#).

For an overview of all the buttons available on the C-arm stand, see [C-arm Stand Console \(page 329\)](#) and [C-arm Stand Height Movement \(page 331\)](#).

C-arm Stand Touch Screen

The C-arm stand is controlled using a touch screen.

The C-arm stand touch screen allows you to tap buttons, and select and drag items by touching the screen directly. For more information, see [Operation \(page 77\)](#).

For an overview of all the functions available on the C-arm stand touch screen, see [C-arm Stand Touch Screen \(page 330\)](#).



CAUTION

Using excessive force and/or sharp objects to operate a touch screen is likely to result in damage to the screen.

Functions on the C-arm stand touch screen activate when your finger is released from the touch screen. The amount of force used to tap controls on the C-arm stand touch screen is irrelevant.

3.2 System Setup

You can change some system parameters using the **System Setup** dialog box on mobile view station.

The **System Setup** dialog box allows you to change several system parameters.

These functions are described in the following pages. All changes made using the **System Setup** dialog box take effect immediately.



The **System Setup** dialog box is opened from the administration screen. You can open the administration screen by pressing the **Administration** button.



To open the **System Setup** dialog box from the administration screen, click **System** in the top bar menu and select **System Setup**.

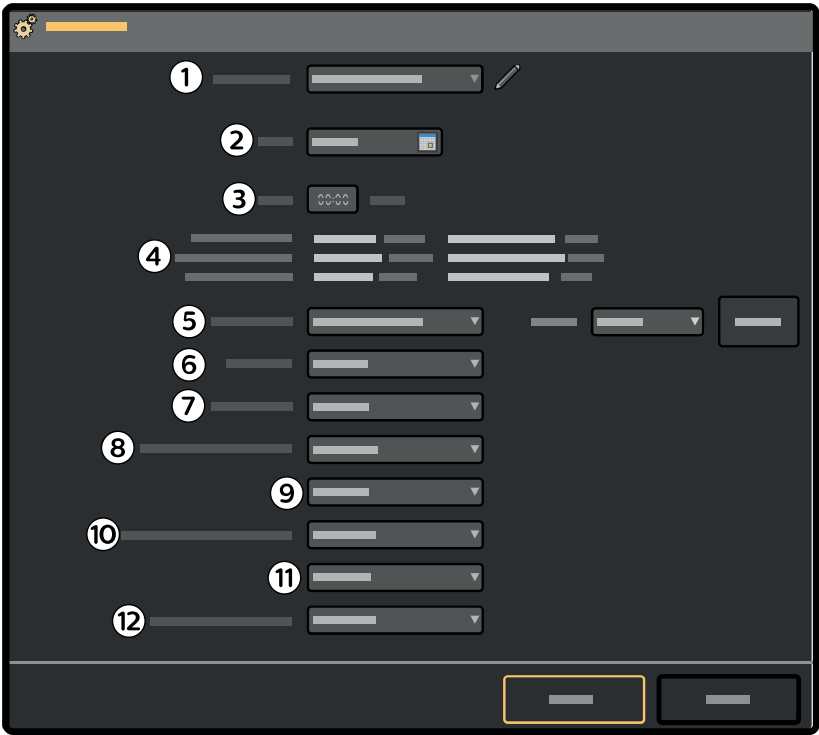


Figure 17 System Setup dialog box

Legend			
1	Physician list	7	Instructions for Use language
2	Current date	8	Default examination type (Adult)
3	Current time	9	Default anatomy/detailed procedure for Adult
4	IP addresses	10	Default examination type (Pediatric)
5	IQ test image	11	Default anatomy/detailed procedure for Pediatric
6	Language	12	External video input

Physician List

The physician list allows you to view a list of all physicians listed in the system. You can add or delete physicians from the list. For more information, see [Modifying the Physician List \(page 45\)](#).

Current Date

The current date is recorded with all acquired images. You can change the current date. For more information, see [Modifying the Date and Time \(page 46\)](#).

Current Time

The current time is recorded with the current date for all acquired images. The current time is set either manually or by a time server. For more information, see [Modifying the Date and Time \(page 46\)](#).

IP Addresses

These are the IP addresses assigned to the system.

NOTE *The IP addresses are set during system installation and cannot be modified using the System Setup dialog box.*

IQ Test Image

This allows you to choose the IQ test image to display. For more information, see [Displaying the IQ Test Image](#) (page 47).

Language

This is the language used for the system user interface. For more information, see [Changing the User Interface Language](#) (page 48).

Instructions for Use Language

This is the language used when displaying the electronic Instructions for Use. For more information, see [Electronic Instructions for Use](#) (page 113) and [Changing the Instructions for Use Language](#) (page 48).

Default Examination Type (Adult)

This is the default examination for adults, used in conjunction with the default anatomy/detailed procedure for adults. For more information, see [Changing the Default Examination Type](#) (page 49).

Default Anatomy/Detailed Procedure

This is the default anatomy/detailed procedure for adults, used in conjunction with the default procedure/examination type for adult. For more information, see [Changing the Default Examination Type](#) (page 49).

Default Examination Type (Pediatric)

This is the default examination for pediatric, used in conjunction with the default anatomy/detailed procedure for pediatrics. For more information, see [Changing the Default Examination Type](#) (page 49).

Default Anatomy/Detailed Procedure

This is the default anatomy/detailed procedure for pediatrics, used in conjunction with the default procedure/examination type for pediatrics. For more information, see [Changing the Default Examination Type](#) (page 49).

External Video Input

This is the selected type of external video input signal. External video viewing is an optional function. For more information, see [External Video](#) (page 73)

3.2.1 Modifying the Physician List

You can modify the physician list to edit, add, or delete physician names.

You can store up to 100 physician names in the list. A warning message is displayed when this limit is reached.

When the list is full, you cannot add new physicians, but you can delete physicians from the list to create space.



- 1 In the administration screen, click **System** and select **System Setup**.

The **System Setup** dialog box is displayed, including the physician list.

- 2 To add a new physician, do the following:

- a Click **Edit**.





The **Physician** dialog box is displayed.

- b** Enter the new physician's name in the **Physician** field.
- c** To close the **Physician** dialog box without adding the new physician, click **Cancel**.
- d** To save the new physician in the list, click **Add physician**.

The new physician's name is added to the list and the **Physician** dialog box is closed.

- 3** To edit an existing physician's name, do the following:



- a** Select the physician in the physician list.

- b** Click **Edit**.

The **Physician** dialog box is displayed.

- c** Edit the physician's name in the **Physician** field.

- d** To close the **Physician** dialog box without saving your changes, click **Cancel**.



- e** To save the change, click **Edit**.

The selected physician's name is changed in the physician list and the **Physician** dialog box is closed.

- 4** To delete a physician, do the following:



- a** Select the physician in the physician list.

- b** Click **Edit**.

The **Physician** dialog box is displayed.

- c** To close the **Physician** dialog box without deleting the selected physician, click **Cancel**.



- d** To delete the selected physician, click **Delete**.

The selected physician is deleted from the list and the **Physician** dialog box is closed.

3.2.2 Modifying the Date and Time

You can change the date and time in the system if they are incorrect for any reason.

The dates and times stored with existing examinations and images are not affected when you change the date and time in the system.



- 1** In the administration screen, click **System** and select **System Setup**.

The **System Setup** dialog box is displayed.



- 2** Click the calendar icon beside the **Date** field, and select the desired date.

- 3** In the **Time** box, enter the correct time using the 24-hour format (hh:mm).

If the time server is enabled at system installation, the date and time are automatically synchronized after startup when a connection with the time server is established.

The time and date is synchronized hourly when the system is connected to the time server. Any manually entered date and time is overwritten when the date and time are automatically synchronized.

- 4** To close the **System Setup** dialog box without changing the date and time, click **Cancel**.

- 5** To save your changes, click **Apply**.

The date and time are changed and the **System Setup** dialog box is closed.

3.2.3 Displaying the IQ Test Image

You can use the IQ test image to check the monitor settings and to set up the printer.

If you are using external video on the reference monitor, the IQ test image is not displayed on this monitor.



- 1 In the administration screen, click **System** and select **System Setup**.

The **System Setup** dialog box is displayed.

- 2 In the **System Setup** dialog box, select the desired **IQ Tastes / Preferences** to use.
- 3 Select the desired **Position** for the IQ test image on the screens.

Three positions are available.

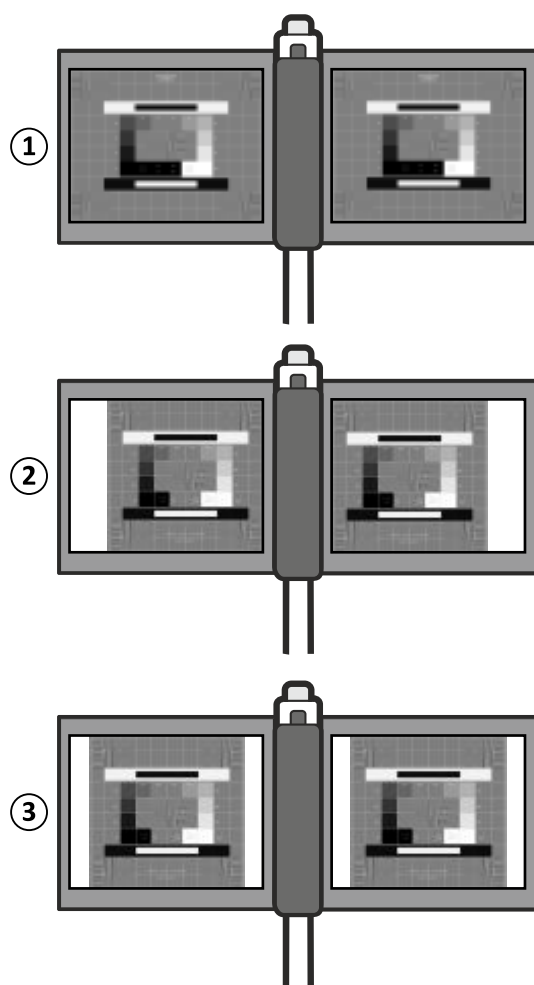


Figure 18 IQ test image positions

Legend

- | | |
|---|---|
| 1 | Full Screen (1280 x 1024 pixels) |
| 2 | Clinical (1024 x 1024 pixels) |
| 3 | Centered (1024 x 1024 pixels) |

- 4 To display the IQ test image, click **Show**.

The selected IQ test image is displayed on both the examination and reference monitors.

- 5 To display other available IQ test images, press **Previous** or **Next** on the mobile view station.



The previous or next image in the **IQ Tastes / Preferences** list is displayed.



- 6 To stop displaying the IQ test image, press **Undo** on the mobile view station.

- 7 To close the **System Setup** dialog box, do one of the following:
- To close the dialog box without saving any changes made to other settings, click **Cancel**.
 - To close the dialog box and save changes made to other settings, click **Apply**.

If an image was parked on the reference monitor, the parked image is displayed again when the IQ test image is removed.

3.2.4 Changing the User Interface Language

You can change the language used on the system.



- 1 In the administration screen, click **System** and select **System Setup**.

The **System Setup** dialog box is displayed.

- 2 In the **Language** list in the **System Setup** dialog box, select the desired language.

The **Language** list displays all available languages. The language that you select is used on the mobile view station and C-arm stand for the rest of the session.

NOTE *When the system is restarted, the user interface is displayed in the default language, which is configured during installation. To change the default language, contact Service or your hospital administrator.*

After changing the language, the following items are not translated:

- Information received from the HIS/RIS.
- Text entered by the operator.

3.2.5 Changing the Instructions for Use Language

You can change the language used to display the Instructions for Use on the system.



- 1 In the administration screen, click **System** and select **System Setup**.

The **System Setup** dialog box is displayed.

- 2 Select the desired **IFU Language**.

- 3 To close the **System Setup** dialog box without changing the Instructions for Use language, click **Cancel**.

- 4 To change the Instructions for Use language, click **Apply**.

The electronic Instructions for Use will be displayed in the selected language when opened.

The new language setting is not saved.

NOTE *When the system is restarted, the user interface is displayed in the default language, which is configured by the Service engineer during installation. To change the default language, contact Service.*

3.2.6 Changing the Default Examination Type

You can change the default examination type by selecting the default procedure and default anatomy/detailed procedure.



- 1 In the administration screen, click **System** and select **System Setup**.

The **System Setup** dialog box is displayed.

- 2 Select the desired procedure in the **Default exam type** list.

The list displays all available procedures. The selected procedure becomes the default setting for new examinations, and it remains the default setting after the system is restarted.

- 3 Select the desired anatomy/detailed procedure in the default anatomy list.

The list displays all available anatomies/detailed procedures. The selected anatomy/detailed procedure becomes the default setting for new examinations, and it remains the default setting after the system is restarted.

3.3 Customizing

Some system parameters can be changed during installation to optimize performance during special applications or to meet personal preferences. To change these parameters ask the local Service Organization.

General system parameters	Settings
Hospital name	Maximum 30 characters
Language	Allows you to select the language of the user interface
IFU Language	Allows you to select the language of the electronic Instructions for Use
Date format	yyyy-Mmm-dd, dd-Mmm-yyyy, or Mmm-dd-yyyy
Units of Measure	mm or inch
Units of Weight	kg or lb
Units of Height	cm / feet and inches
Displayed identification	Patient ID (default) or Accession number
Accession number	Read-only (default) or Editable
Contrast step 1	110%, range 50% - 150%
Contrast step 2	120%, range 50% - 150%
Contrast step 3	130%, range 50% - 150%
Brightness step 1	105%, range 50% - 150%
Brightness step 2	110%, range 50% - 150%
Brightness step 3	115%, range 50% - 150%
Default Patient Type	Adult, Pediatric
Enable Automatic Parking	No, Yes
Display Ideographic Name	No, Yes

System

General system parameters	Settings
Image rotation angle (°)	0, 90, 180, 270
Default Shutters position angle (°)	0, 90
Couple Shutters button	Visible, Hidden
Auto Shutter Positioning	Enable, Disable

General system parameters	Settings
CO2 (trace white) selection	Enable, Disable
Auto Electronic Blanking	On, Off
Audible signal normal dose	Off, Low level beep, One beep at start
Audible signal Single Shot	At begin, At end
Dose warning threshold (mGy)	1000 mGy, range 1 - 9999 mGy
Auto dose level high reset	Yes , No
Mode key on remote control	Acquisition Mode, Dose Selection
Collimator lines visible	Yes , No
Close examination	Visible, Hidden
Export to Media	Enable, Disable
Max Run Time High Level Acquisition	No, 15 seconds, 20 seconds
Status of X-Ray Enable Disable Switch when System is Powered On	Enable, Disable
Default IQ Taste (Adult)	Standard, High Contrast, Super Contrast
Default IQ Taste (Pediatric)	Pediatric Standard, Pediatric High Contrast, Super Contrast* *Available in 25 kW configuration.

DICOM

- DICOM Export Targets
- DICOM Printer Targets
- Worklist Query Definition
- DICOM Worklist Management
- DICOM MPPS Server
- DICOM Structured Dose Report
- DICOM Multimodality Viewer

Anatomy / Detailed procedure Names

Anatomy and detailed procedure names can be changed, but parameters stay the same.

Procedure Name	Settings
Skeleton	Skull, Thorax, Spine, Pelvis/Lumbar Spine, Arm and Hip/Leg
Vascular	Cerebral, Aortic Arch, Abdominal, Arm, Leg and Bolus Chase
Cardio	Coronaries, Ventricle/TAVI, Pacemaker, Electrophysiology
Pain	Head, Neck, Spine, Pelvis/Lumbar Spine, Arm and Hip/Leg
Endoscopy	ERCP, Esophagus and Bronchus
Urology	Kidney, Lithotripsy, Bladder and Ureterography

Examination Activation

This function allows you to make changes in the examination settings permanent or restores the previously used examination settings. Select the required action in the setting area and click OK to continue or click Cancel to go back to main menu

System parameters	Settings
Make examination settings permanent	Yes, No
Restore previously used examination settings	Yes, No

Electro Magnetic Brakes Setting

This setting allows you to customize the time, the brakes remain applied, when brakes are applied from the stand. The settings are applied to angulation, rotation and longitudinal brakes on the C-arm.

NOTE *The settings are not applicable in case the brake is released from the surgeon side control.*

Reference	Settings
Re-Engage Time in minutes	Re-Engage Brakes after 1 to 5 minutes of release

4 System Overview

This section provides an overview of the system, its main components, configurations and options.

4.1 About the Zenition 90 System

The system comprises two main components: the C-arm stand and mobile view station.

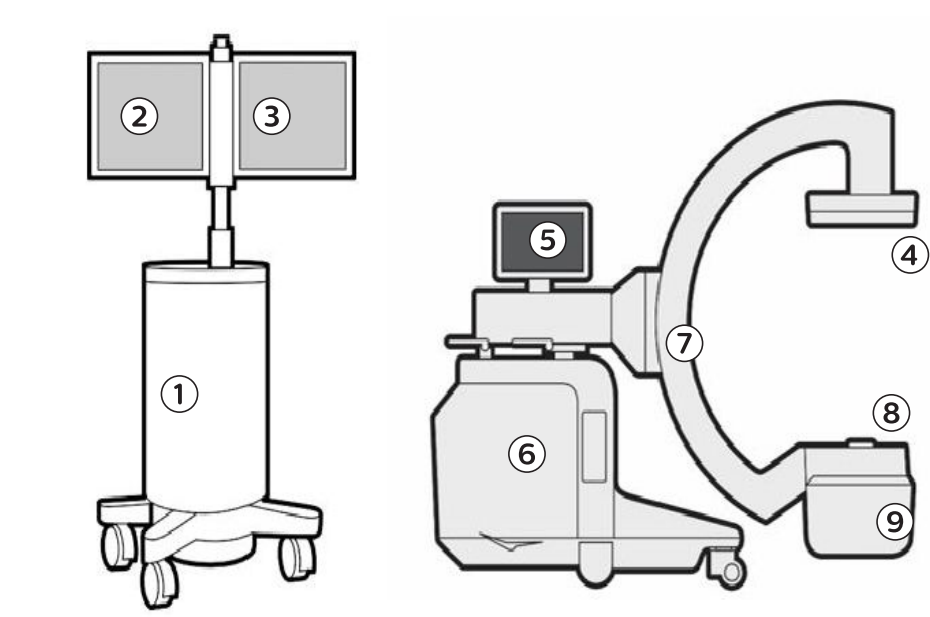


Figure 19 System Components (Motorized model)

Legend			
1	Mobile view station	6	C-arm stand
2	Examination monitor	7	C-arm
3	Reference monitor	8	Collimator
4	Detector	9	X-ray tank
5	C-arm stand touch screen		

4.2 Composition

This section covers composition of the C-arm stand and mobile view station.

4.2.1 The C-arm Stand

X-ray Tank

The X-ray tank houses the X-ray tube, which has a rotating anode for increased X-ray penetration and longer X-ray times. A built-in, additional, beam filter (0.1 mm Cu and 1 mm Al) reduces patient skin dose. Active oil cooling is used in the X-ray tank, for longer X-ray times.

For Germany only:

The X-ray tank houses the X-ray tube, which has a rotating anode for increased X-ray penetration and longer X-ray times. A built-in, additional, beam filter (0.1 mm Cu and 2 mm Al) reduces patient skin dose. Active oil cooling is used in the X-ray tank, for longer X-ray times.

Collimator

The collimator limits the X-ray beam to the actual field of view of the detector. Lead shutters can be independently moved and rotated to avoid direct radiation on the detector and reduce scattered radiation.

Detector

The detector provides detector zoom modes, and has a detachable X-ray grid. The grid removes part of the scattered radiation, improving the contrast in the image. Removing the grid may negatively affect the image quality. In some cases, such as small or thin objects where there is less scatter radiation, the influence of the grid is limited. Removing the grid in this situation reduces the radiation dose for the patient and may provide a small degree of contrast improvement.

In case of pediatric patient, it is recommended to remove the grid.

NOTE *The grid is attached with screws which can be tightened by hand. To prevent the grid from being detached, you can replace these screws with the standard screws that are supplied with the system.*

The presence or absence of the grid is clearly visible to the operator.



WARNING

Do not use the system if there is no specific reason that the X-ray grid is not mounted (for example, if an operator removed the grid during a previous procedure, but forgot to replace it after the procedure).

Ensure the detector grid is mounted for the next procedure.

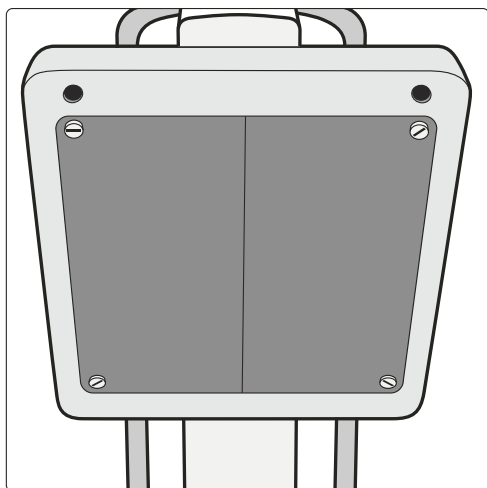


Figure 20 X-ray grid

Hand Switch

The hand switch, which can be stored on either side of the C-arm stand, is used to activate a range of X-ray and acquisition modes, such as fluoroscopy, roadmap, subtract, trace, run, and single shot.

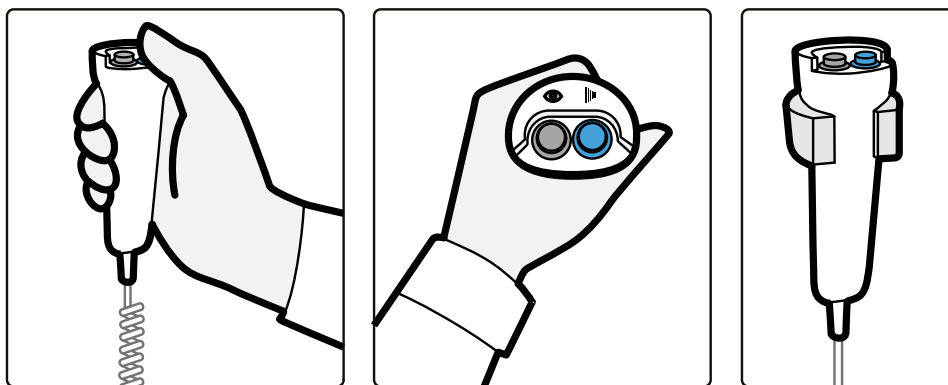


Figure 21 Hand switch

You can also use the system with foot switches. For more information, see [Wireless Foot Switch \(page 207\)](#) and [Wired Foot Switch \(page 66\)](#).

Movements and Brakes

The C-arm is counterbalanced. You can lock or unlock movement of the C-arm via electronic switches (applicable for motorized model) except the swivel movement which can be manually controlled. You can engage or disengage movement of the C-arm via electronic switches. The electronic switches are present on the stand top panel.

For Non-motorized system you can lock and unlock movements of the C-arm via manual brake handles, except for the height movement.

Non-motorized model - The height movement is motor-driven which can be controlled by switches provided on stand top panel.

Motorized model - In motorized model, C-arm, Angular, Rotational, Longitudinal and Height movements are motor driven.

The steering handles are coupled and control the rear wheels. The front wheels swivel freely. All wheels are provided with cable deflectors. The C-arm stand is equipped with a brake. See [Transportation \(page 77\)](#) for more information about steering and braking with the C-arm stand.

The C-arm movement brakes are color-coded for identification. See [C-arm Brakes and Movements \(page 84\)](#) for details.

An overview of C-arm movements is provided in the following figures.

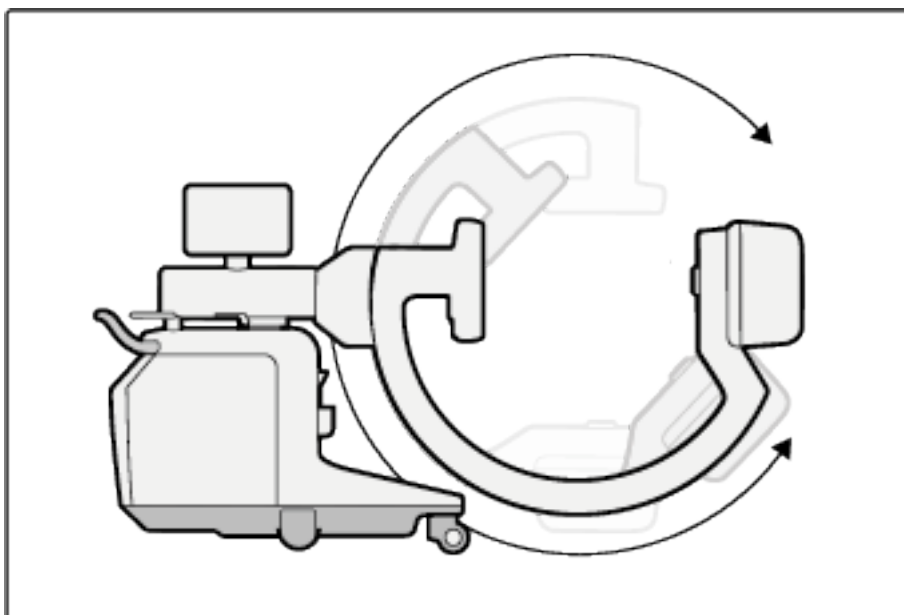


Figure 22 C-arm angulation movement

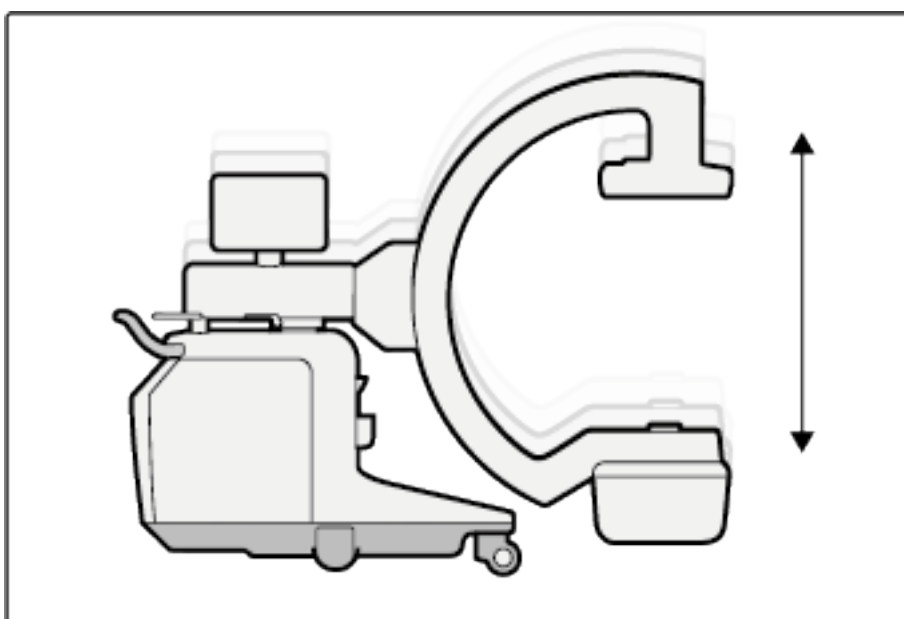


Figure 23 C-arm height movement

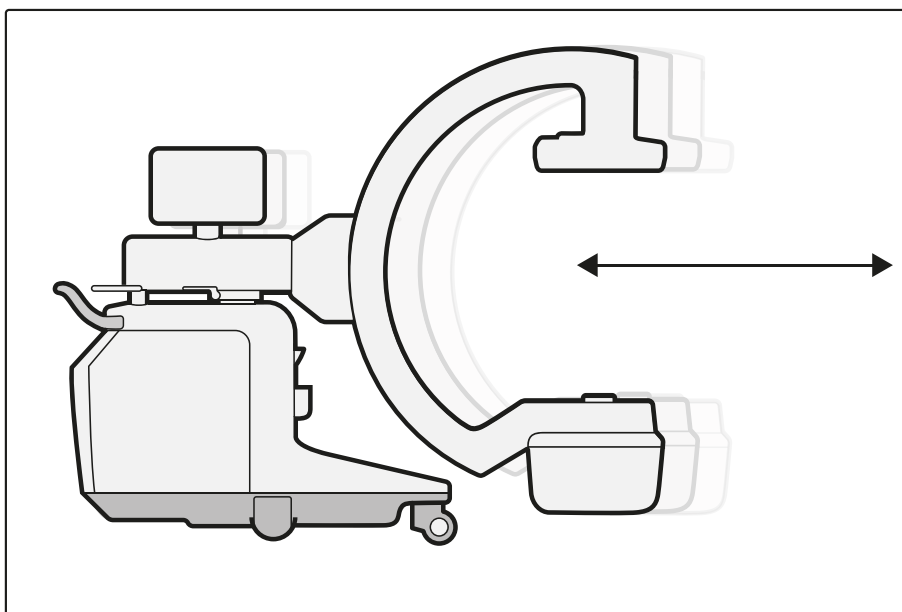


Figure 24 C-arm longitudinal movement

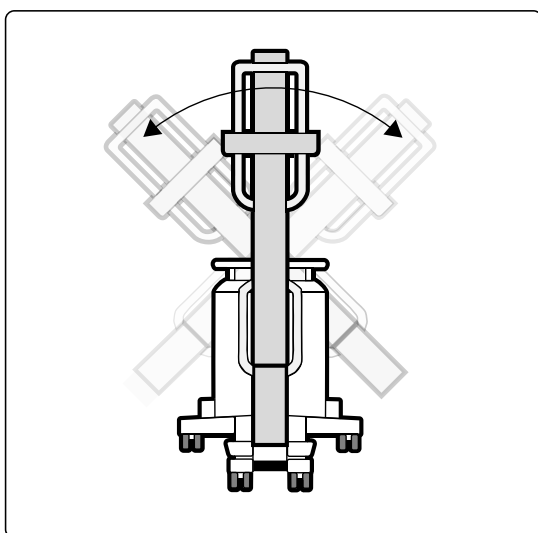


Figure 25 C-arm rotation movement

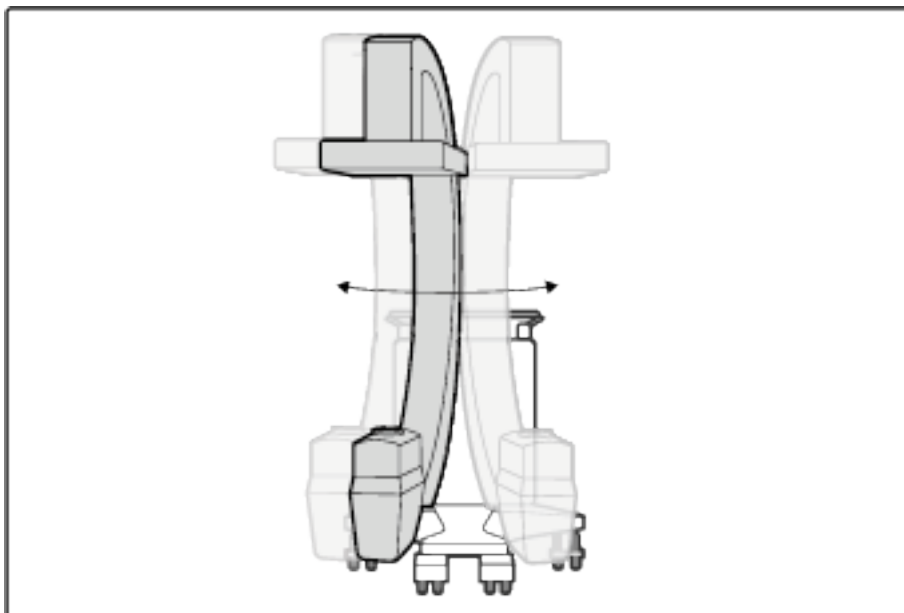


Figure 26 C-arm Swivel Movement

The C-arm Stand Console

The C-arm stand console contains the **C-arm stand off**, **C-arm stand on / System on** and **Emergency off** buttons.

Non-motorized configuration - The motorized height movement is controlled using buttons on either side of the C-arm stand. For more information, see [C-arm Stand Height Movement \(page 331\)](#).

Motorized configuration - Height movement is controlled using buttons on either side of the C-arm stand and also via Table Side Operator (TSO). Angular, Rotational and Longitudinal movements are controlled using Table Side Operator (TSO).

For an overview of the C-arm stand console buttons, see [C-arm Stand Console \(page 329\)](#)

The C-arm Stand Touch Screen

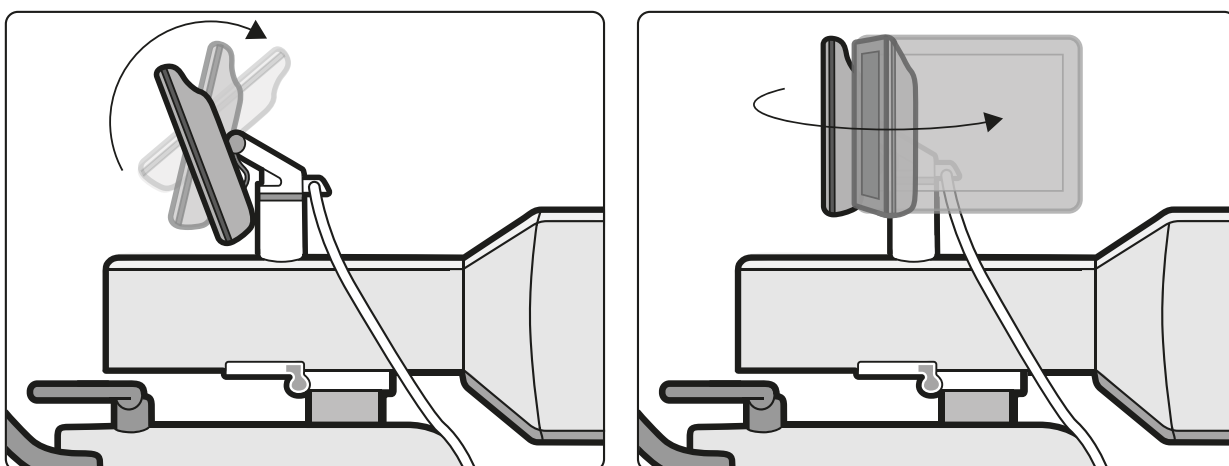


Figure 27 C-arm stand touch screen Movement

The C-arm stand touch screen controls all functions related to performing fluoroscopy and exposure.

For more information on the functions available on the C-arm stand touch screen see [Operation \(page 77\)](#). For an overview of the C-arm stand touch screen controls see [C-arm Stand Touch Screen \(page 330\)](#).

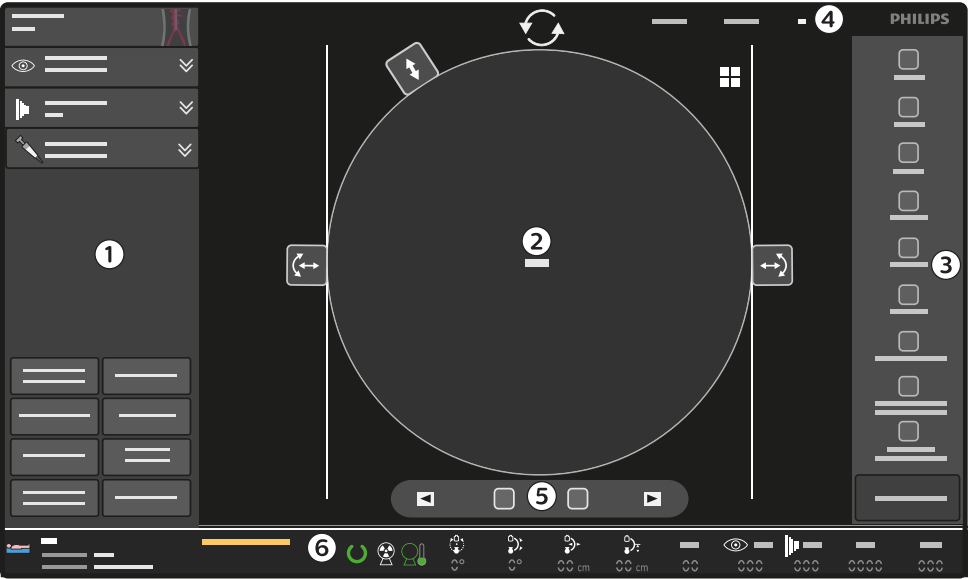


Figure 28 C-arm stand touch screen layout

Legend			
1	Function area	4	Header area
2	Image area	5	Image review toolbar
3	Image toolbar area	6	Status area

Function Area

System settings, displayed in the Function area can be changed using the expanders or by tapping buttons to toggle functions On or Off.

This area contains buttons and drop-down lists to control settings for:

- Examination type
- Fluoroscopy
 - Mode
 - Dose
 - Pulses
 - Store
 - Reduce blur
 - Reduce noise
- Exposure
 - Mode
 - Pulses
 - Store
- Injector Coupled
 - Coupling
 - X-ray Delay
- Timer On/Off
- Outline
- Detector Zoom
- ClearGuide
- Detector laser

- Tube laser (if installed)
- C-arm position memory (if installed)
kV manual/auto

Image Area

The image area displays a monochrome copy of the live image displayed on the examination monitor, scaled to fit in the available space on the C-arm stand touch screen including appropriate text, indicators, positioning and rotation controls, and shutter and collimator positions.

Image Toolbar Area

The image toolbar area displays image manipulation tool buttons appropriate to the task being carried out.

Header Area

The header area provides access to system tasks, system help and tooltips.

Status Area

This part of the display shows information about:

- The acquisition patient
- Warnings and system messages
- The radiation status
- Heat indication
- C-arm positioning (option)
- kV value
- Average mA value
 - Value for both the left and right button/pedal on the hand switch and foot switch is displayed.
- Dose display:
 - Total Cumulative Dose is displayed before and after X-ray and during Single Shot. Units: mGy.
 - The current average dose rate is displayed during X-ray on. Units: mGy/min.
 - The values represent the dose at 30 cm from the detector entrance surface.
- Cumulative time display. The format for the cumulative time depends on the selected display mode:
 - If IEC display mode is selected then minutes and seconds are displayed using the minutes/seconds format/range: 0:00–999:59.
 - If HHS display mode is selected then minutes are displayed using the minutes/decimal minutes format/range: 0.0–999.9.

System Messages

Warnings and system messages are displayed in the status area on the C-arm stand touch screen.

For more information about Warnings and system messages, see [System and Error Messages \(page 226\)](#).

The C-arm Stand Connector Panel

The C-arm stand connector panel is located on the front left-hand side of the C-arm stand.

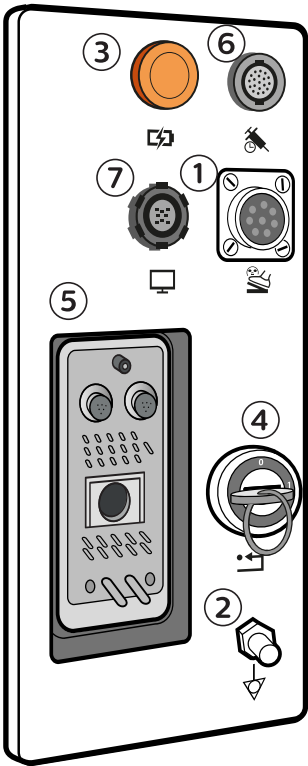


Figure 29 C-arm stand connector panel (Non-Motorized model)

Legend		
1	Wired Foot switch connector	4
2	Equipotential earth connection	5
3	Energy storage unit indicator	6
		7
		TSM connector

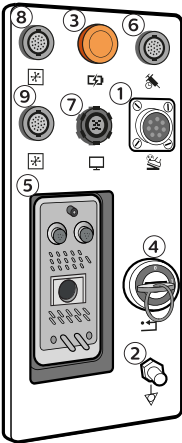


Figure 30 C-arm stand connector panel (Motorized model)

Legend		
1	Wired Foot switch connector	4
2	Equipotential earth connection	5
3	Energy storage unit indicator	6
		7
		TSM connector
		8
		TSO 1 connector
		9
		TSO 2 connector

For more information, see the following sections:

- [Connecting the Wired Foot Switch \(page 67\)](#)
- [Equipotential Ground Connection \(page 19\)](#)
- [Connecting the System \(page 101\)](#)

Energy Storage Unit

The system has an energy storage unit located in the C-arm stand to provide the additional power required during X-ray pulses. The system requires mains power to operate and cannot operate using the energy storage unit alone.

When the C-arm stand is switched off, the charge indicator light on the C-arm stand connector panel indicates the charge level of the energy storage unit; the light flashes slowly when the charge is low, and flashes faster as the energy storage unit is charged. When the energy storage unit is fully charged, the indicator light is continuously lit.

When the system is switched on, the charge indicator light is continuously lit.

System Lock

The system lock prevents operation of the C-arm stand by unauthorized personnel and during transportation. The lock is controlled by a key. The key can be removed when in the **0** position. Additionally, system key can be used to recover the system from emergency mode.

When locked using the key, the system will:

- Stop and disable X-ray
- Stop and disable motorized height movement
- Switch off the laser aiming devices
- Disable the C-arm stand touch screen
- Remove patient information from the status area on the C-arm stand touch screen
- Display a warning on the C-arm stand touch screen.

4.2.2 The Mobile View Station

Monitors

Depending on the configuration of your system, the mobile view station is equipped with either two standard monitors or two high-brightness monitors.

Examination monitor:

- Live imaging
- Roadmaps
- Outlining (optional)
- Dose display
- Last image hold (LIH) images
- Scheduling examinations
- Reviewing examinations
- Worklist
- Dose report
- System setup screen
- IQ test image
- Touch-screen functionality
- User profiling
- Timer display
- Injector interface status display
- EM brakes status display

**CAUTION**

Using excessive force and/or sharp objects to operate a touch screen is likely to result in damage to the screen.

Reference monitor:

- Reference images
- External video source
- Image Viewer application
- IQ test image
- Field service application

The monitors can be swivelled by 180 degrees for ease of viewing, either for the operator at the mobile view station console, or for the physician at the tableside, and to allow the mobile view station to be positioned with the rear (open side) pointing away from the patient. You can also adjust the height of the monitors. For more information, see [Monitors \(page 110\)](#).

Password Protection

Patient data on the mobile view station can be protected from unauthorized access with a password. Patient data cannot be viewed or accessed until the user name and correct password is entered.

NOTE *It is always possible to create an emergency examination and make acquisitions for a new patient without entering the user name and password.*

User names and passwords are set by the hospital administrator during installation with support from Service. After installation, Service or a hospital administrator, can change the user name and password or disable password protection altogether (it can be enabled again at a later date). For more information about system security, see [Security and Privacy Provisions \(page 321\)](#).

Using the Mobile View Station as a Stand-alone Unit

The mobile view station can be used as a stand-alone unit, i.e. without the C-arm stand connected, for viewing, archiving and post-processing purposes.

You can also prepare for the next intervention by selecting the examination type for the acquisition patient while the mobile view station is disconnected from the C-arm stand.

Steering

The mobile view station brake has release/apply positions and a wheel swivel locked position for easy transportation. All wheels are provided with cable deflectors.

Controls, Displays and Indicators

The mobile view station controls all functions for managing patients, examinations and images. The console consists of a keyboard and button controls.

The functions of the controls are described in [Operation \(page 77\)](#). For an overview of the console, see [Mobile View Station Console \(page 328\)](#).

X-ray On Indicator Light

The X-ray on indicator light is on when the system is emitting X-rays. It is located above the monitors at the top of the monitor support column.

Infrared Receiver Indicator

The infrared receiver is located just above the monitors. A green indicator light flashes when a command is received from the remote control.

Storage Compartment

The mobile view station includes an open storage compartment on the rear side. The maximum permitted load for the storage compartment is 5 kg.

4.2.3 Mobile View Station Connector Panel

The mobile view station connector panel is located on the rear of the mobile view station.

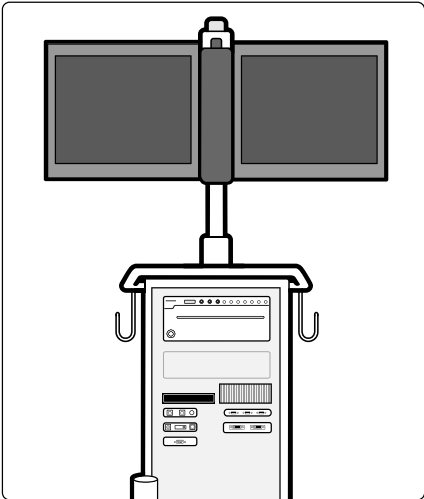


Figure 31 Mobile view station connector panel

Available Connectors

The mobile view station connector panel provides the following connectors:

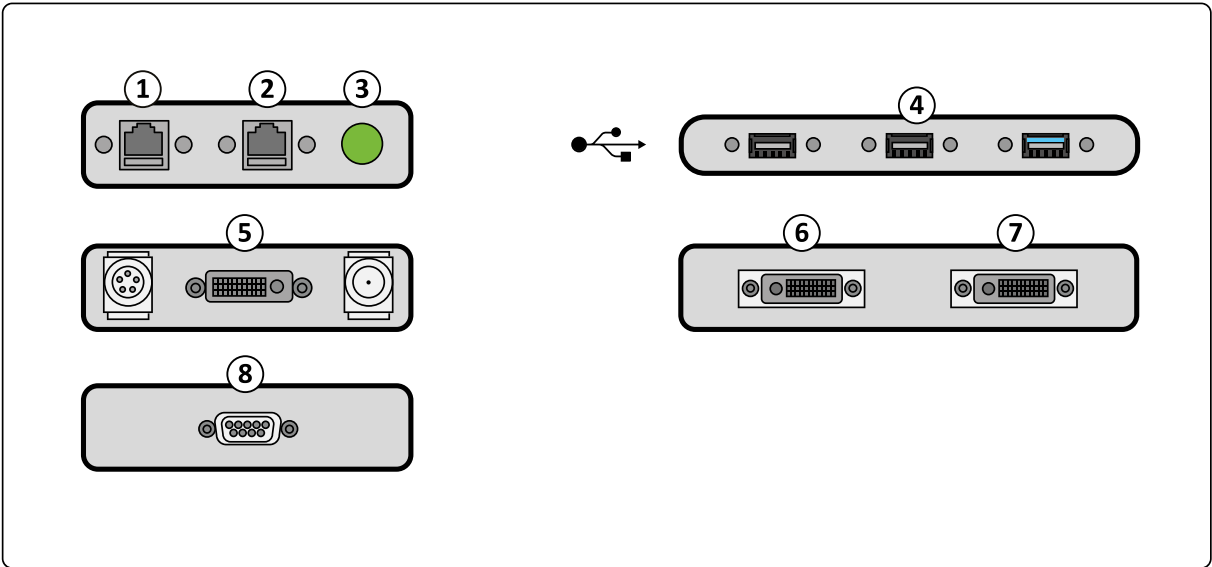


Figure 32 Mobile view station connector panel - available connectors

Legend			
1	Hospital network port	5	Video inputs (optional)
2	Service/Digital navigation link	6	DVI out left (examination monitor)
3	Mains connection indicator	7	DVI out right (reference monitor)
4	USB connectors	8	Warning light connection

The warning light connector allows the system to be connected to indicators inside or outside the examination room. These external indicators are not part of the Zenition 90 system.

**WARNING**

Do not touch the pins of the mobile view station C-arm cable or the central pin of the video/USB connectors when touching the patient. Connector contact pins may carry low voltages that are safe to touch, but that may be harmful to the patient.

**WARNING**

All connections made to external equipment that has a connection to the mains network shall be made in compliance with IEC60601-1 edition 3.1.

**CAUTION**

Do not connect the system to network outputs that provide Power over Ethernet (PoE).

Connecting External Equipment

You can connect additional monitors (not supplied) to the mobile view station using the DVI outputs on the connector panel. Additional monitors should be connected according to IEC 60601-1 table I.1.

When placing additional monitors inside the operating theater:

- It is preferable to use monitors of the same type as those that are used in the system, and that comply to IEC 60601-1. When such monitors are used in the same room as the system, a normal DVI cable can be used.
- If another type of monitor is used, which does not comply with IEC 60601-1 but does comply with IEC 60950/IEC 62366, then a galvanic separation device is mandatory.
- When the additionally placed monitors are used for diagnostic purposes, their performance should be validated for that use.

When placing additional monitors outside the operating theater, a galvanic separation device is mandatory.

When connecting equipment to the USB or Video in connection, a galvanic separation device is mandatory if the external equipment is connected to the supply mains network.

The DVI interface can be connected to the DVI interface of devices that comply with IEC 60601-1.

4.2.4 Spacers

The minimum source-skin distance is 20 cm. The spacer safeguards a minimum source-skin distance.

In some countries a 30 cm spacer is required. For those countries where it is applicable, the appropriate spacer is delivered with the system.

**WARNING**

There must always be a spacer installed to safeguard the minimum statutory source-skin distance.

The 30 cm spacer must be re-installed when the surgical application has been completed.

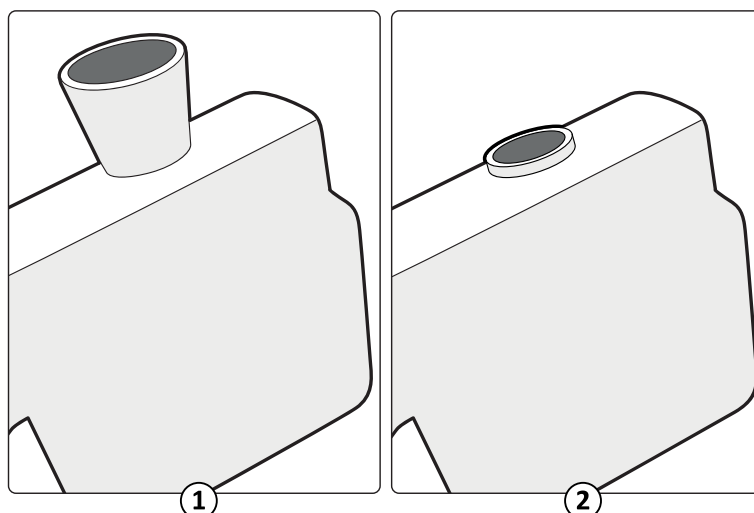


Figure 33 Spacers for minimum source-skin distance

Legend	
1	30 cm spacer
2	20 cm spacer

4.2.5 Wireless LAN

The Wireless LAN option provides the ability to maintain a network connection with your facility's RIS/HIS without requiring a physical connection (network cable).

This increases the flexibility and mobility of the system when transferring patient data between the system and networked archives such as a PACS.

4.2.6 Laser Aiming Devices

Your system can have up to two laser aiming devices:

- Detector laser aiming device
- Tube laser aiming device (option)

Using laser light, the laser aiming device projects a cross on the patient. The center of the projected cross corresponds with the center of the X-ray beam. It is used to:

- Position the C-arm, minimizing the amount of radiation for the patient and staff.
- Quickly and precisely align objects with the center of the X-ray beam.

The minimum working distance is about 20 cm from the detector. For more information about the tube laser aiming device, see [Tube Laser Aiming Device \(page 69\)](#).

Detector Laser Aiming Device

The detector laser aiming device consists of two lasers, which are integrated in the detector and produce a cross on the X-ray tank. The lasers are switched on and off using the **Detector Laser** toggle button on the C-arm stand touch screen.

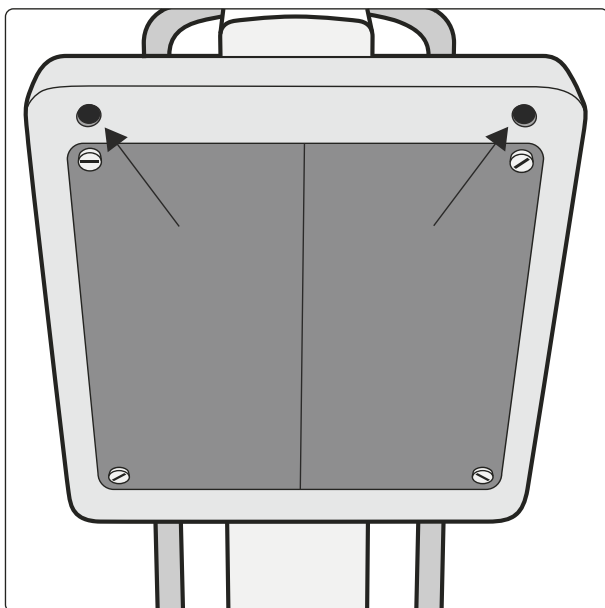


Figure 34 Detector laser aiming device



WARNING

Laser radiation. Do not view directly with optical instruments. Class 1M laser product. Viewing laser output with certain optical instruments (for example eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.

NOTE The detector laser aiming device must not be used for positioning if the patient is positioned closer than 20 cm to the detector. It will not produce a cross if it is too close.

4.2.7 Wired Foot Switch

The wired foot switch (detachable) is used to activate a range of X-ray and acquisition modes, such as fluoroscopy, roadmap, subtract, trace, run, and single shot.

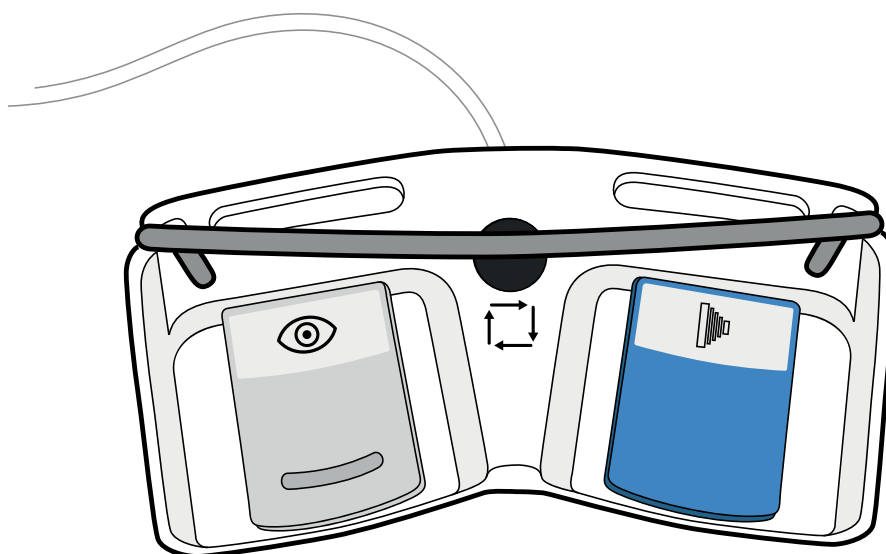


Figure 35 Wired foot switch

A wireless foot switch option is also available. For more information, see [Wireless Foot Switch](#) (page 207).

Connecting the Wired Foot Switch

You can connect a wired foot switch to the system at the C-arm stand connector panel.

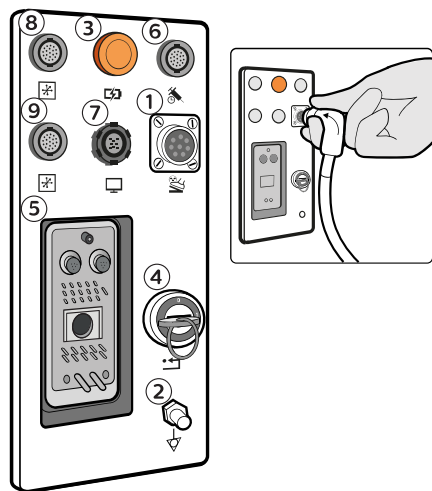


Figure 36 Connecting the wired foot switch to the C-arm stand

NOTE The legends #8 and #9 are not applicable for Non-Motorized model.

Legend	
1	Wired Foot switch connector

Storage

When not in use or when moving the system, store the wired foot switch on the storage cradle provided on the C-arm stand.

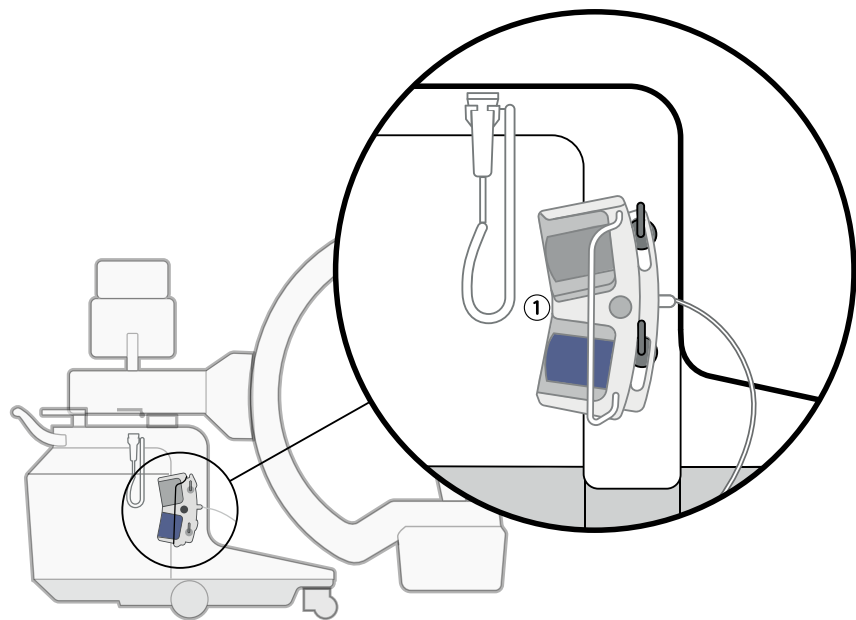


Figure 37 Wired foot switch on the C-arm stand

Legend	
1	Wired foot switch

4.3 Options

This section provides information about optional aspects of the system. Not every function described here may be installed on your system.



WARNING

Only the options and equipment delivered by Philips Medical Systems may be used in conjunction with the Philips . The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety in the resulting system.

Consideration relating to the choice shall include the following:

- **Use of the accessory in the patient vicinity.**
- **Evidence that the safety certification of the accessory has been performed in accordance with the IEC 60601-1 Ed.3.1.**

4.3.1 Paper Printer

You can print video images by using printer for printing on paper.

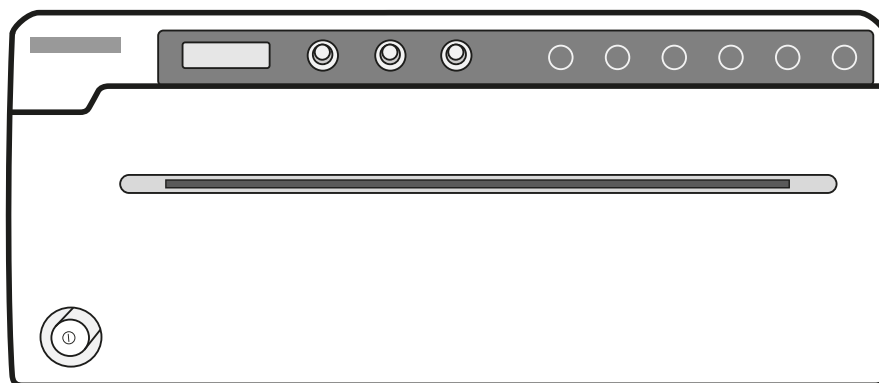


Figure 38 Printer

4.3.2 Position tracking

If the position tracking option is installed, the C-arm position is shown in the status area of the C-arm stand touch screen. The system shows the current C-arm rotation, angulation, height and longitudinal positions. For more information see [Position Tracking \(page 199\)](#).

NOTE *This is optional for Non-Motorized system.*

4.3.3 Encrypted PC

This option helps to secure the patient data.

4.3.4 Spring Bow

A spring bow is used to hold the sterile cover of the C-arm in position, while allowing free movement of the C-arm.

Some sterile covers do not require you to use the spring bow. You should check which sterile covers are in use in your hospital and whether you need to use the spring bow.

For more information, see [Spring Bow \(page 215\)](#) and [Fitting the Spring Bow \(page 216\)](#).

4.3.5 Touch Screen Module (TSM)

Touch Screen Module (TSM) can be used to control the C-arm stand functions.

The TSM allows you to tap buttons; and select and drag items by touching the screen directly. TSM reduces dependency of the operator for medical procedures

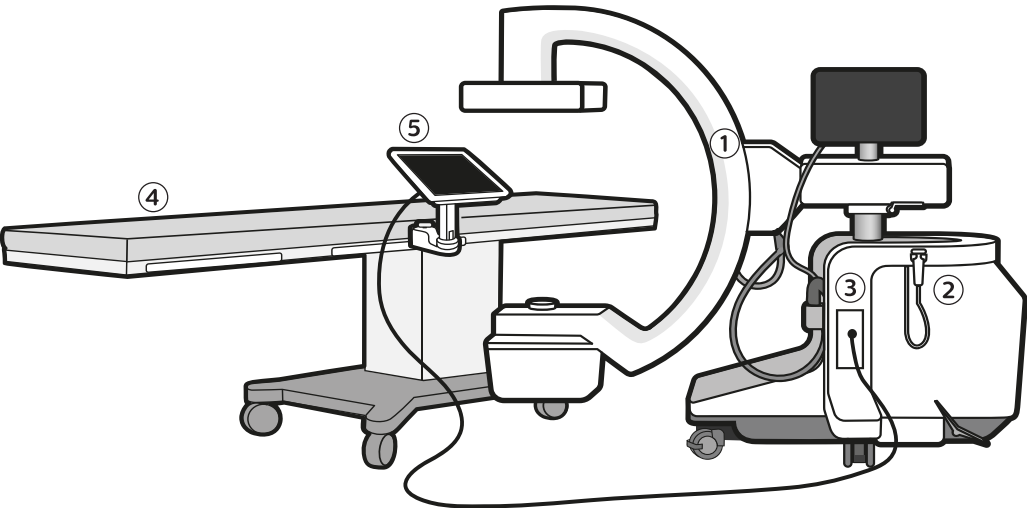


Figure 39 Touch Screen Module

NOTE Images are only for reference (or similar to this).

Legend			
1	C-arm	4	Operation Table
2	C-arm stand	5	Touch Screen Module (TSM)
3	Touch Screen Monitor Connector		

To view list of functions that the TSM supports, (see [C-arm Stand Touch Screen \(page 330\)](#))

For more information, see following sections:

[Touch Screen Module \(TSM\) \(page 216\)](#)

[Touch Screen Gestures \(page 335\)](#)

4.3.6 Tube Laser Aiming Device

The laser aiming device is built into the X-ray tank. It projects a cross hair on to the detector entrance screen. It is switched On and Off with the **Tube Laser** toggle button on the C-arm stand touch screen.

For more information, see [Laser Aiming Devices \(page 199\)](#).

4.3.7 Remote Control

The remote control is a device using infrared light. It allows some image handling functions to be controlled from the operating position.

The IR transmitter is located on the front end of the remote control and, if obstructed, no signals are transmitted. The IR receiver is located on top of the mobile view station, between the examination monitor and the reference monitor. A light on the receiver indicates that the selected command has been received. For a description of the buttons, see [Remote Control \(page 334\)](#).

The operation of the remote control is not affected, when placed in a transparent sterile cover. It is battery-powered and the batteries must be replaced regularly. For more information, see [Replacing and Charging Batteries \(page 240\)](#).

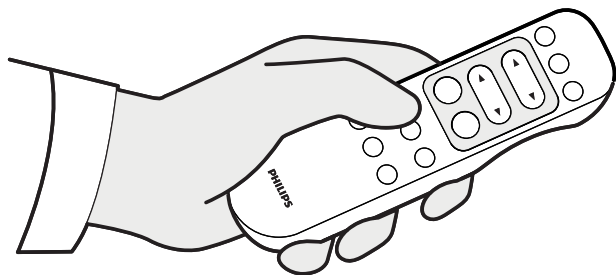


Figure 40 Remote control



WARNING

Infrared signals from the remote control may interfere with other infrared-controlled equipment in the same room, causing uncontrolled behavior. Before using the remote control in a procedure, check that no interference can be caused to other equipment.



WARNING

Identical remote controls are interchangeable. Therefore, do not use the remote control when more than one system is in use in the same room. If several systems are in the same room, remote control commands for one system may initiate actions on another system, causing uncontrolled behavior.



CAUTION

It is recommended to remove the batteries if the remote control will not be used for some time..

4.3.8 Warning light connection

The interface for X-ray On/Off, System On/Off allows the system to be connected to the indicators inside or outside the examination room. If connected, this option enables an indicator to light up every time the system is switched on and/or when X-ray is used.

4.3.9 Video converter

The video converter option is used to convert external video in signal (SDI, DVI-D or S-video) to DVI-D signal. Also, it converts PAL or NTSC to DVI-D. For more information, see [Video Converter in Options \(page 306\)](#)

4.3.10 DICOM/IHE Interface

There is an interface between the mobile view station and the hospital/departmental network. It complies with the DICOM 3.0 standard.

The DICOM interface allows images of a completed examination to be exported to a network storage device or sent to a network printer for output. Available formats are:

- DICOM SC (Secondary capture, with and without text)
- DICOM XA (X-ray Angiographic, Unprocessed, processed without Mask and Processed with Mask)

Images can be selected for export or print while the system is not connected to the network. These images will be held in a queue and sent when the system is reconnected to the network.

NOTE *The examination dose report can also be exported or printed (see [Exporting, Saving, and Printing \(page 185\)](#)). For more details, refer to the DICOM conformance statement.*

The DICOM package also provides the following functionality for the DICOM interface:

- Worklist management (WLM): allows the mobile view station to receive scheduled patient data from a WLM server on the hospital/departmental network.
- Modality Performed Procedure Step (MPPS): provides examination progress, dose report and status information that can be used for reporting purposes.
- Storage commit: provides confirmation that images have been safely archived after exporting to a network storage device.
- IHE profiles: compliant with IHE-SWF (Scheduled Workflow profile).

4.3.11 Vascular Extension

If the vascular extension is installed, the vascular extension label is present on the C-arm stand console.



Figure 41 Vascular extension label on the C-arm stand console

The vascular extension offers the optimal support for vascular cases, by providing an extensive range of vascular imaging tools:

- Subtraction mode displays digitally subtracted images, for clear visualization of contrast media.
- Live Trace-mode (peak opacification) shows the maximum opacification of the vessels.
- View Trace (peak opacification) shows the maximum opacification of the vessels in a trace image in post processing.
- Roadmap functionality supports catheter guidance.
- Remask to reselect the best image in a run as a mask image for contrast runs.
- Smart Mask reduces the X-ray dose and contrast medium usage by reusing previously acquired mask images for roadmapping.
- Landmarking provides a non-subtracted background image for anatomical reference. The visibility of the background can be adjusted to meet user preferences.
- Pixel shift compensates for movement artifacts.
- Subtraction on/off simplifies the orientation for subtracted images during roadmap procedures (controlled by remote control or the user interface on the mobile view station).
- CO₂ subtraction mode.
- CO₂ trace mode (live trace white).
- CO₂ roadmap with Smart Mask (reuse of previously acquired image).

4.3.12 Pain Extension

The pain examination consists of fluoroscopy, single shot, and digital subtract functionality to enable clear visualization of contrast injections.

The subtract functionality also makes it possible to image the exact vasculature in delicate regions of the spine to potentially reduce accidental injection in the vessels.

4.3.13 Cardiac Extension

If the cardiac extension is installed, the cardiac extension label is present on the C-arm stand console.

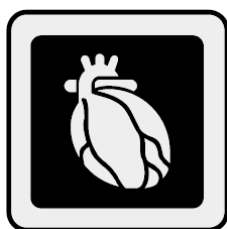


Figure 42 Cardiac extension label on the C-arm stand console

This extension provides the optimal support to perform cardiac procedures. This extension includes dedicated parameters for electrophysiology procedures, advanced pacemaker placements, and cardiac procedures such as heart valve replacements. The optimized high pulse rate of maximal 30 frames per second with a maximum of 125 mA enables sharp imaging of fast moving anatomy in the field of interest.

Subtract mode helps to perform renal artery subtract run post coronary angiogram.

4.3.14 Multi-Modality Viewer

You can import previously acquired images and pre-operative images from a DICOM source, connected portable media or a DICOM network device using the **Multi-Modality Viewer**.

These images, originate from different modalities and supports formats like XA, SC, CT, Ultrasound and MR images

You can select imported images for viewing with following viewing functionality:

- Single image view (All types of images)
- MIP (CT/MR images)
- MPR (CT/MR images)
- Run loop (XA images)

This **Multi-Modality Viewer** is available on the reference monitor. User can delete imported data manually. For more information, see [Importing External Data \(page 119\)](#).

4.3.15 Cardiovascular Extension

If the cardiovascular extension is installed, the cardiac and vascular extension labels is present on the C-arm stand console.

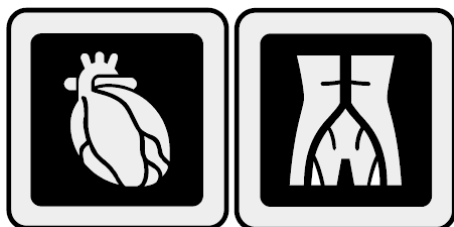


Figure 43 Cardiac and Vascular extension labels on the C-arm stand console

The cardiovascular extension offers all the features needed to optimally support cardiovascular cases. It provides an extensive range of vascular imaging tools, high pulse speeds and dedicated cardiac programs.

Vascular processing includes the following:

- Subtraction mode displays digitally subtracted images, for clear visualization of contrast media.
- Trace-mode shows the maximum opacification of the vessels (peak opacification).
- Roadmap functionality supports catheter guidance.
- Remask to reselect the best image in a run as a mask image for contrast runs.
- Smart Mask reduces the X-ray dose and contrast medium usage by reusing previously acquired mask images for roadmapping.
- Landmarking provides a non-subtracted background image for anatomical reference. The visibility of the background can be set stepwise.
- Pixel shift compensates for movement artefacts.
- Subtraction On/Off simplifies the orientation for subtracted images during roadmap procedures (controlled by remote control or user interface on the mobile view station).
- View Trace creates a trace image in post processing.
- CO₂ subtraction mode.
- CO₂ trace mode (live trace white).
- CO₂ roadmap with Smart Mask (reuse of previously acquired image).

This extension also includes dedicated parameters for electrophysiology procedures, advanced pacemaker placements, and cardiac procedures such as heart valve replacements. The optimized high pulse rate of maximal 30 frames per second with a maximum of 60 mA enables sharp imaging of fast moving anatomy in the field of interest.

4.3.16 Image Viewer

You can import previously acquired images and pre-operative images to the system from a PACS, USB flash memory drive, or DVD, using the optional **Image Viewer**.



To open or close **Image Viewer**, press the **Image Viewer** button on the mobile view station console.

For a complete reference for effective and safe use of the **Image Viewer** product, refer to the **Image Viewer** Instructions for Use.

For more information on importing images, see [Importing External Data \(page 119\)](#).

4.3.17 Wireless Foot Switch

A wireless foot switch option if available and can be installed by Service.

The wireless foot switch provides the same functions as the wired foot switch.

4.3.18 External Video

You can view external video on the reference monitor using the optional external video viewing function.

If your system has the optional external video viewing function, additional connectors are available on the mobile view station connector panel, and an additional selection are available in the system setup dialog box.

For more information, see the following sections:

- [System Setup \(page 43\)](#)
- [Mobile View Station Connector Panel \(page 63\)](#)
- [Viewing External Video \(page 214\)](#)

4.3.19 High power X-Ray

Performs variety of procedures with steep angles and lateral projections, with 25 kW or 15 kW power. (25 kW High Power X-Ray is optional).

4.3.20 Utilization Information

Enables the system utilization data export when required by user.

4.3.21 Digital Navigation Link

Navigation devices are supported for frame rate greater than 15pps, continuous fluoro or single shot. Digital navigation link option will transfer the LIH image to the connected navigation devices.

4.3.22 Trolley for TSO/TSM Mounting

You can mount TSO/TSM on a trolley during movement of a system from one operation theater to another within the hospital. However, this trolley comes as an optional component.

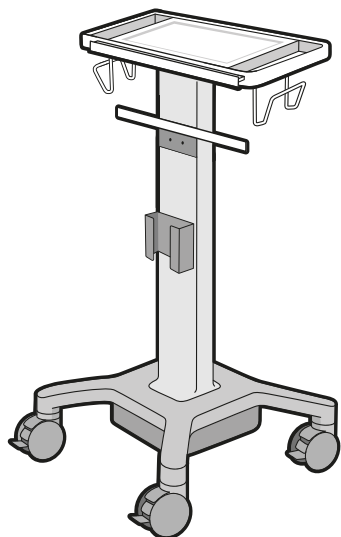


Figure 44 Trolley without TSO/TSM mounting

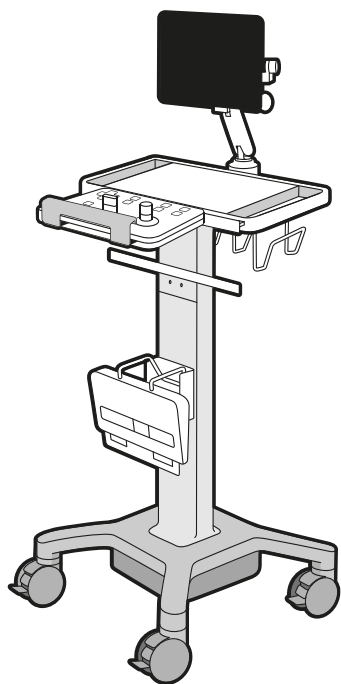


Figure 45 Trolley with TSO/TSM mounting

4.3.23 Table Side Operator (TSO)

TSO is used to operate the motorized controlled movements of the C-arm. It is mounted on table side rails or on pedestal trolley.

To perform motorization functionality, you can connect up to two TSOs simultaneously. However, you can only use one at a time to perform the same movements.

NOTE *One TSO is the default with motorized system Zenition 90 configuration and another TSO is an optional to use with the motorized system.*

For more information, see [Motorized Model \(page 84\)](#)

4.3.24 Injector Interface

The injector can be connected to the X-ray system for controlling the start and stop of the contrast injections for the X-ray system.

You can also connect a third party injector on the C-arm connector panel. You can automate the selected procedure (For example, Vascular) for contrast injection from C-arm stand touch screen (For example, Coupling ON/OFF). See [External Connected Equipment \(page 220\)](#)

4.3.25 Automatic Vascular Outline (AVO)

Automatic Vascular Outline (AVO) is used to automatically perform 2D detection and outlining of the vessel tree structures on the image. See [Automatic Vascular Outline \(AVO\) \(page 205\)](#)

4.3.26 Manual Outline Tool

The optional outline tool can be used to draw markings on an image where it may be useful during a procedure, for example, during vascular surgery to mark vessel branches and stent positioning on live fluoroscopy images. For more information about outline tool, see [Manual Outline Tool \(page 202\)](#).

4.3.27 Hardware DAP Mechanical Assembly

External hardware DAP is applicable for some countries.

5 Operation

This section describes the procedures required to operate the system.

5.1 Safety

It is mandatory for the operator to be familiar with the safety procedures as described in [Safety \(page 16\)](#).

**WARNING**

Do not use the system for any application until you have read and understood and know all the safety information, safety procedures and emergency procedures contained in these Instructions for Use. Operation of the system without proper awareness of how to use it safely could lead to fatal or other serious personal injury. It could also lead to clinical misdiagnosis/mistreatment.

**WARNING**

Do not use the system for any application until you are sure that the user routine checks program has been satisfactorily completed, and that the planned maintenance program is up-to-date.

**WARNING**

If any part of the equipment or system is known (or suspected) to be defective or wrongly-adjusted, DO NOT USE the system until a repair has been made. Operation of the equipment or system with defective or wrongly-adjusted components could expose the operator or the patient to radiation or other safety hazards. This could lead to fatal or other serious personal injury, or to clinical misdiagnosis/mistreatment.

**WARNING**

Do not modify the equipment without authorization of the manufacturer. Only authorized Philips representative can modify the equipment if required by conducting appropriate inspection and testing to ensure continued safe use of the equipment.

For information about the user routine checks program and the planned maintenance program see [Maintenance \(page 228\)](#).

**WARNING**

Do not operate the system with patients unless you have a good understanding of its capabilities and functions. Using this equipment without such an understanding may compromise its effectiveness and/or reduce the safety of the patient, user and others.

It is important to read this manual before using the system.

5.2 Transportation

**WARNING**

Limit the direction of transport across ramps (do not cross a ramp sideways).

**WARNING**

Do not park on ramps with an angle greater than 5 degrees.

**WARNING**

The effectiveness of the brakes strongly depends on the surface characteristics of the floor or ramp.

5.2.1 Putting the C-arm in Transport Position

You can place the C-arm stand in the following positions for transportation for motorized as well as non-motorized systems.

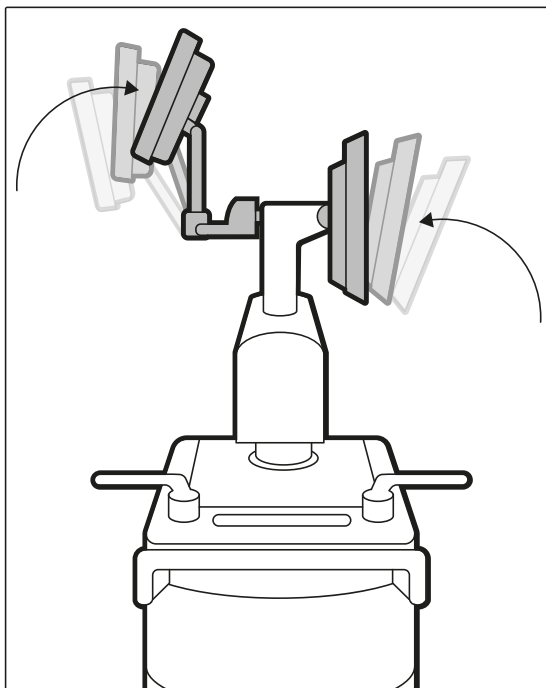


Figure 46 Position of the screens on the C-arm Stand during transportation

- Putting C-arm in the Transport position for regular and Up the ramp movements: Set Longitudinal travel to 0 cm for moving the stand.
- Putting C-arm in the Transport position for down the ramp movement: Set Longitudinal travel to 20 cm for moving the stand down the ramp.
- Longitudinal travel 0 cm position
- Swivel movement at 0 degree position
- Height movement at 8 cm position
- Rotation at 0 degree position
- Angulation in 0 degree position

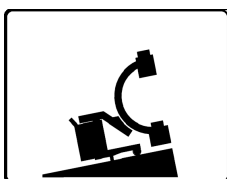


Figure 47 Transport position - up ramp

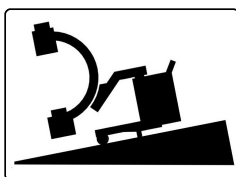


Figure 48 Transport position - down ramp

For further details, see [C-arm Brakes and Movements \(page 84\)](#)

NOTE Lock all C-arm movements, whilst the system is in transport position.

5.2.2 Moving the C-arm Stand

- 1 Release the brake.

The C-arm stand has two brake pedals: one on each side.

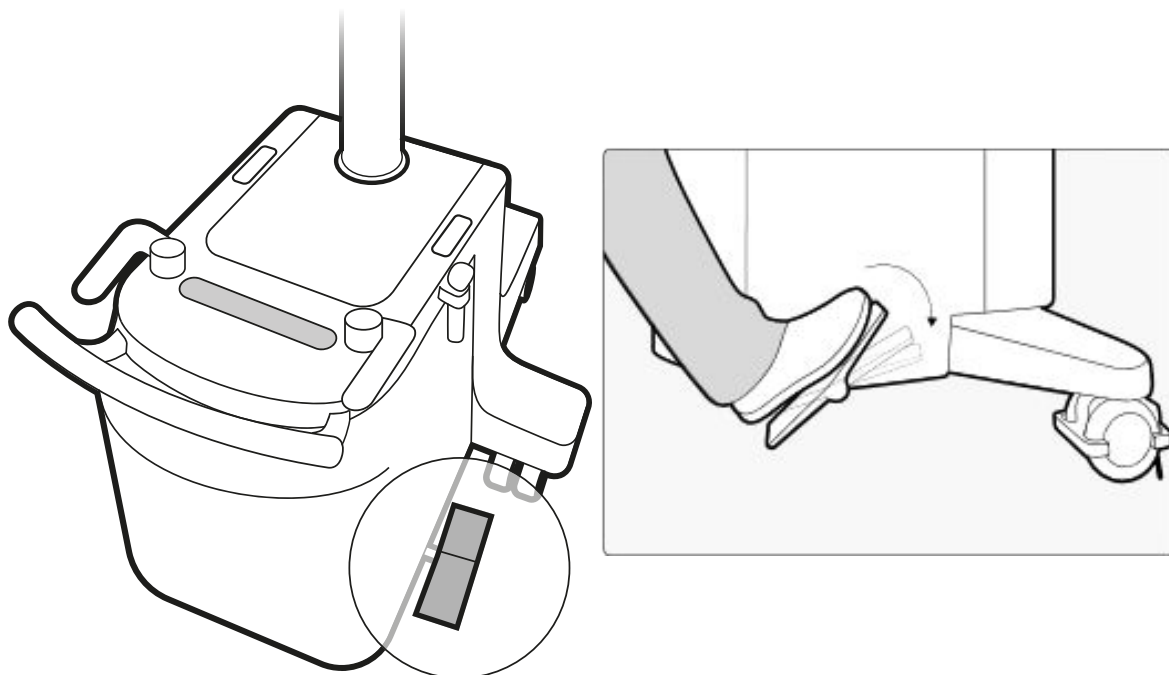


Figure 49 Releasing the C-arm Stand brake

When releasing the brake, place your whole foot on the pedal and gently tilt the pedal towards the release position.

- 2 Control movement of the stand using the push bar and steering handles.

With the steering handles in either the left or right position, the C-arm stand can be moved sideways.

NOTE *Steering handles are only intended for positioning the C-arm at the acquisition location. Steering handles should not be used during transportation except where difficult or tight corners are encountered.*

Both steering handles are coupled and control the rear wheels. They have three pre-defined ('click') positions, straight-ahead, left and right. In addition, all wheeled positions in between the pre-defined positions can be used to move the stand in the corresponding direction. The front wheels are free swiveling.

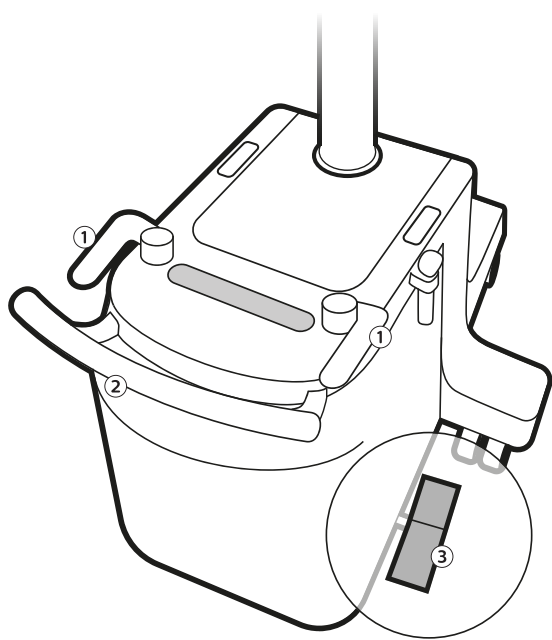


Figure 50 Moving the C-arm Stand (Motorized model)

Legend	
1	Steering handle
2	Push bar
3	Brake pedal



- 3 When the stand is in the required location, position it exactly using the steering handles.
- 4 Apply the brake by pressing the pedal towards the locked position indicated by the symbol.

5.2.3 Moving the Mobile View Station

The mobile view station can be moved using the push bar. A brake can be applied or two wheels can be locked for transport over long distances.

The mobile view station has dual pedals at each rear wheel.

Using the Dual Pedals

The mobile view station has dual pedals (red and gray) that can be used to lock and brake the rear wheels.

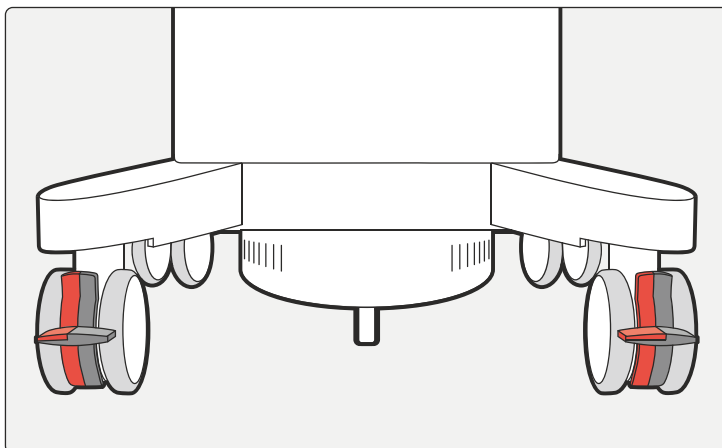


Figure 51 Dual pedals for locking and braking the mobile view station.

- 1 Lock the wheels in parallel for transport by pressing both gray pedals only.

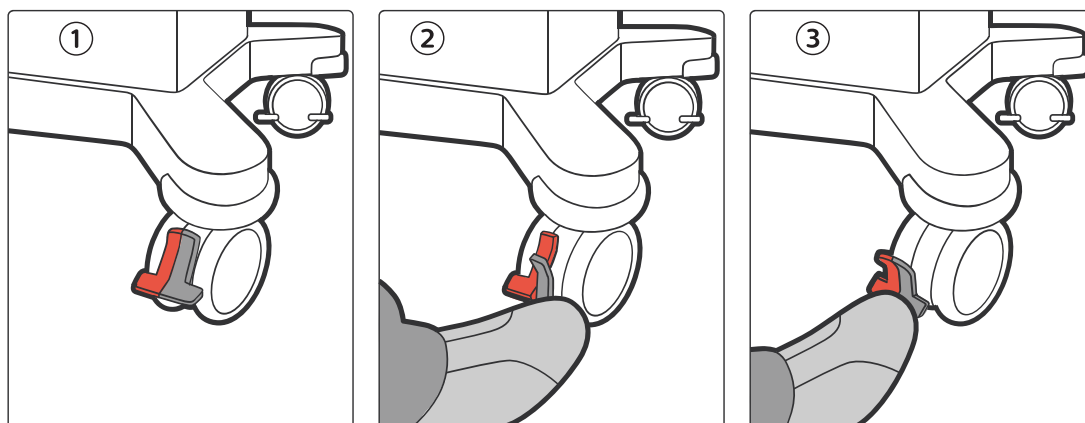


Figure 52 Wheels unlocked, locked for transportation with brakes not applied, and braked.

- 2 Apply the brake by pressing the red pedals of both wheels down.
- 3 Release the brake without releasing the wheel lock by pressing the upper part of the red pedal only on both wheels.
- 4 Release the wheels after transport by pushing the upper part of the gray pedals.

5.2.4 Putting the Monitors in the Transport Position



WARNING

Ensure that the monitors are placed in the transport position before transporting the mobile view station.

During transportation of the mobile view station, the monitors should be closed and locked, using the two locking bolts at the back of the monitors.

- 1 Lower the monitors to the lowest position.
- 2 Fold the monitors together.
- 3 Stow the cables using the cable brackets at the side of the mobile view station.

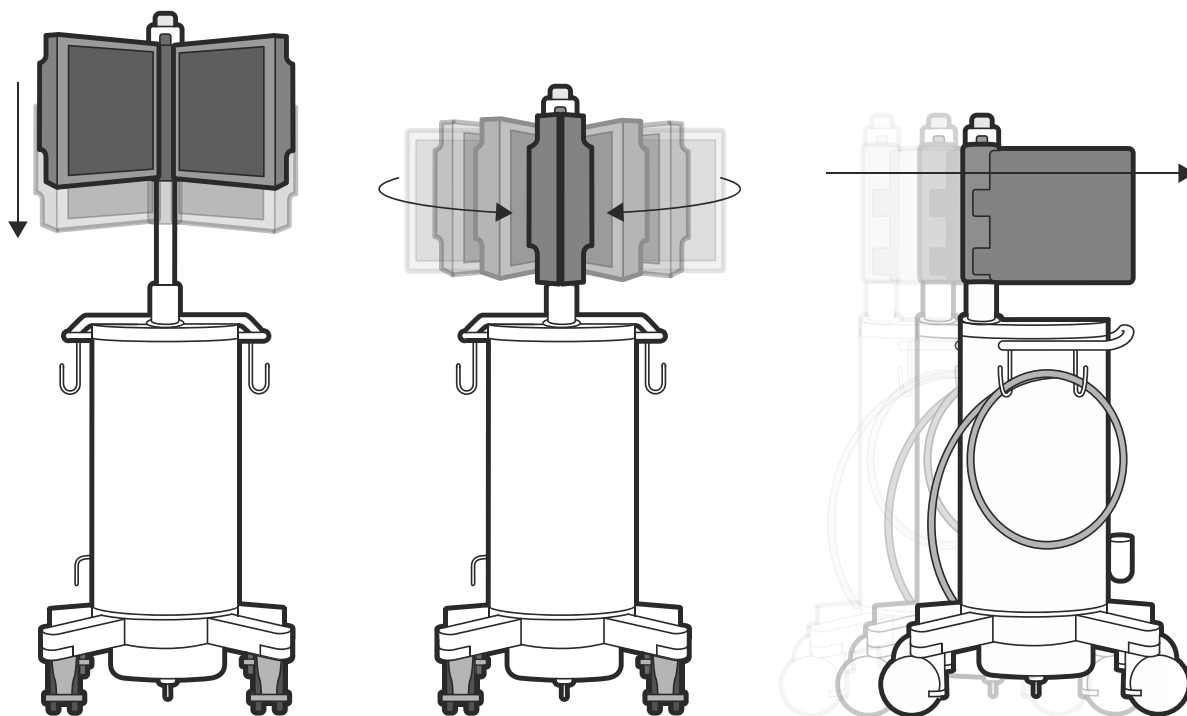


Figure 53 Putting the monitors in the transport position

- 4 To lock the monitors, pull the locking bolt out, turn it 90 degrees, and then let it slide back into the locked position.

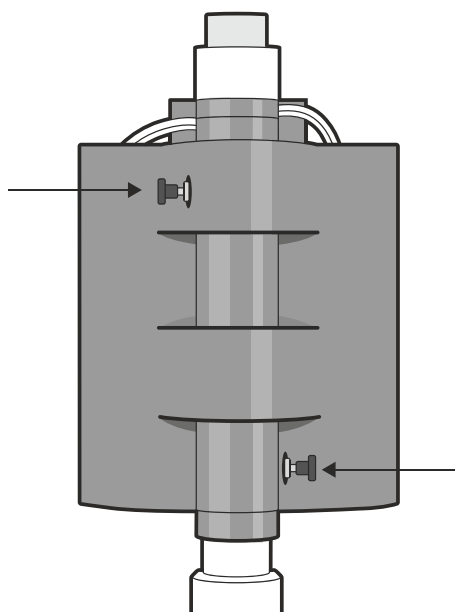


Figure 54 Monitors: locking bolts for transport

- 5 To unlock the monitors, pull the locking bolt out, turn it 90 degrees, and then let it slide back into the unlocked position.

5.3 Positioning

NOTE Do not position the system such that it makes it difficult in a case of emergency to remove the mains power plug from the socket outlet.

**CAUTION**

It is recommended to follow local practices or hospital guideline for placement/positioning system cables during usage.

C-arm

It is recommended to fit sterile covers before using the system with a patient. For details, see [Fitting the Spring Bow \(page 216\)](#).

Mobile View Station**WARNING**

Do not position the mobile view station with the rear (open) side next to the patient. The rear of the mobile view station has a fan which could adversely affect the sterile air flow.

The mobile view station should always be positioned so that the front (closed) side is closest to the patient (see the figure below).

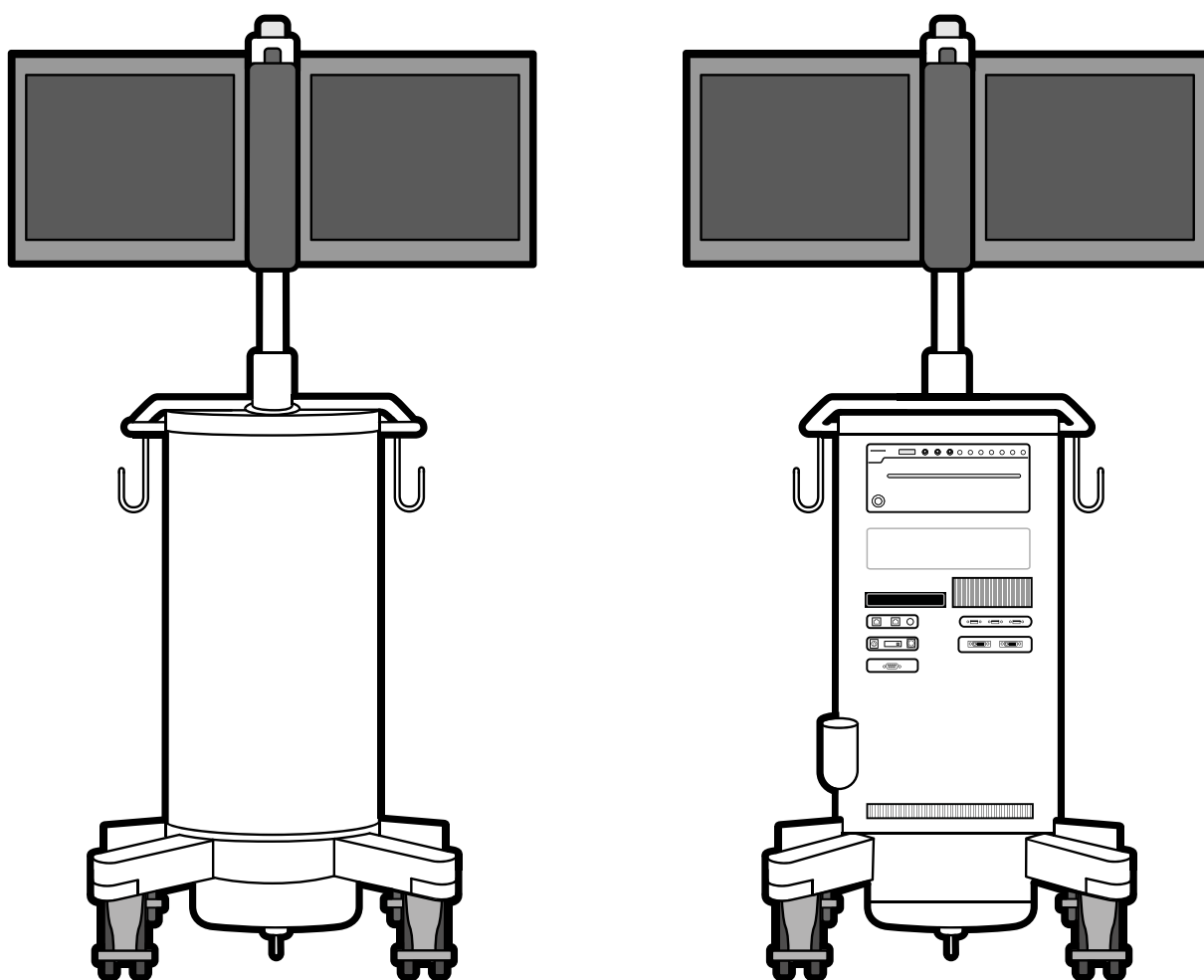


Figure 55 Mobile view station: Front side (left) and rear side (right)

5.3.1 C-arm Repositioning

During examinations, the surgeon may request that the C-arm is repositioned. The ClearGuide function supports communication between the surgeon and the operator in such cases.

For more information about ClearGuide and about using ClearGuide, see [ClearGuide \(page 152\)](#).

After seeing an X-ray image, the surgeon may ask the operator to reposition the C-arm. For example, the surgeon may ask the operator to reposition the C-arm so that the **6** marker on the detector is closer to the middle of the patient.

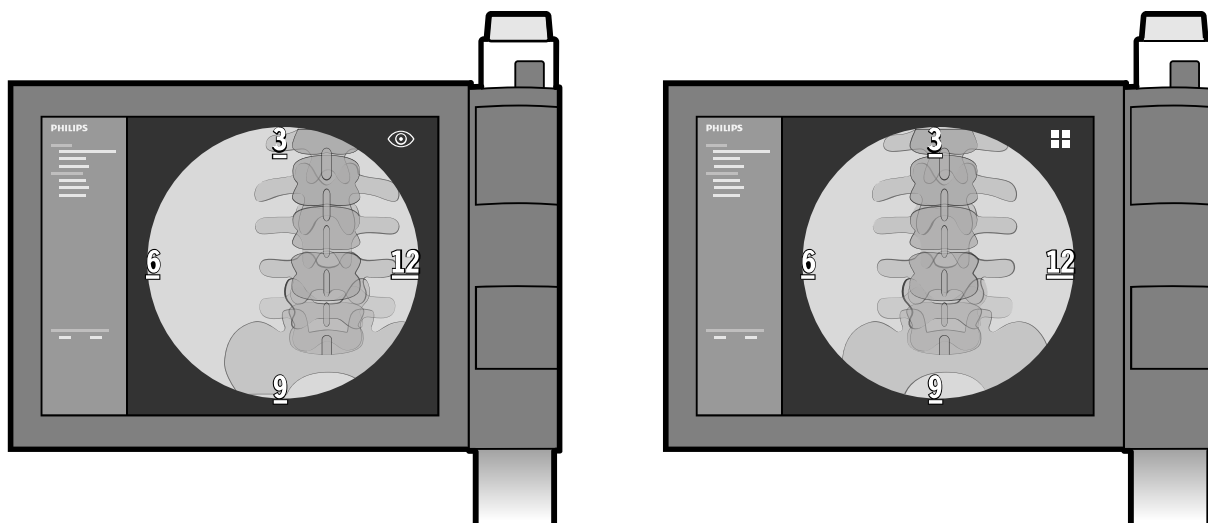


Figure 56 ClearGuide - C-arm in initial position (left) and repositioned (right)

The operator would reposition the C-arm to move the detector to the new position.

Storage Position for TSM on C-arm Stand

If you have TSM, store it as shown in the image below during movement of a system from one place to another within the hospital.

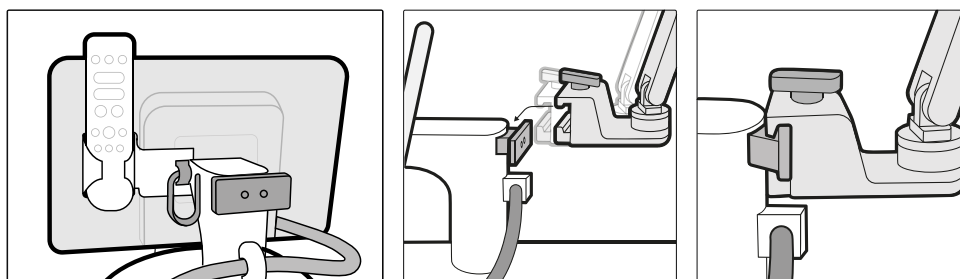


Figure 57 Storage Position for TSM on C-arm Stand

NOTE Do not use this storage position of the TSM to connect TSM and use during procedure. This may lead to -

- Interference with C-arm stand touch screen monitor movement.
- C-arm stand touch screen monitor cable and C-arm cable entanglement during procedure.

5.4 C-arm Brakes and Movements

NOTE While using the system operator must observe for the obstacle if any in the c-arm and system movement.

5.4.1 Motorized Model

The features related to motorized model are described.

Electronic Brake Switches

You can use Electronic Brake switches to engage or disengage movement of the C-arm with ease. The C-arm movement can be performed along three axis namely Angulation, Rotation and Longitudinal.

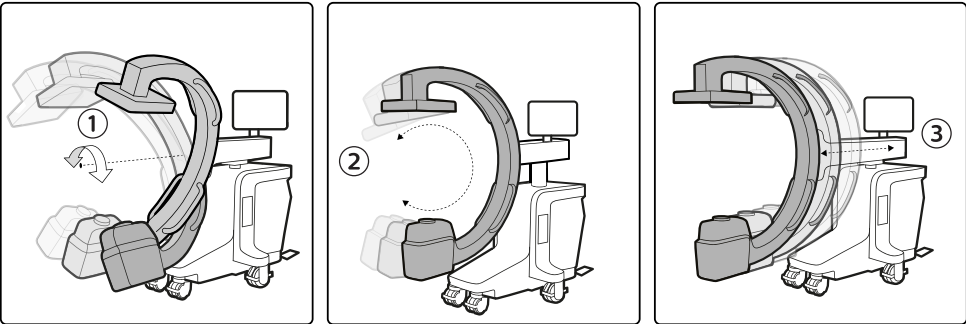


Figure 58 C-arm 3-Axis movement

Brake	
1	Rotation
2	Angulation
3	Longitudinal

By default, the brakes are in locked state. You can unlock the brakes by pressing the switches on C-arm Stand. The unlocking period for brakes is configurable by Philips Service Engineer.

- NOTE** Based on the system configuration, the Electronic Brake switches could be set to be unlocked in a duration of between 1 min to 5 min.
- NOTE** Maximum limit to release/lock brakes of 25 cycles per minute is allowed. Once this limit is reached, the brakes will be in locked state for next 1 minute/30 seconds of time.

Stand comprises of three switches for individual axis control that is Rotation, Angulation and Longitudinal.

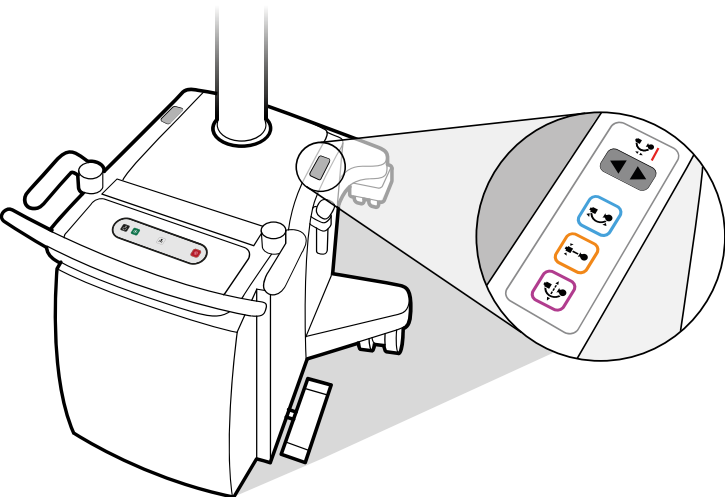



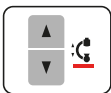


Figure 59 C-arm Electronic Brake buttons on C-arm Stand

The switches are present on the either side of the stand. Press the switch to unlock the brake and perform the desired movement. Press the switch again to apply the brake and keep the C arm in the desired position.

C-arm movements lock and height control can be managed by using the electronic brake switches provided on both sides of the C-arm stand.

The electronic brake switches are explained below:

Symbols	Color	Description
	Blue	Angulation movement lock
	Orange	Rotation movement lock
	Pink	Longitudinal movement lock
	-	Height Up/Down movement button

The backlit status of the electronic brake switches indicate that they are unlocked.

NOTE *The electronic brake switches for C-arm movement can be configured to automatically lock itself when left idle for a set amount of inactivity.*

Electronic Brake Switches Status indicator

You can view Electronic Brake switches status indication on MVS when you perform any C-arm movement. The Electronic Brake switches status icons are visible only when you connect the stand to the MVS and MVS is powered on. Each color represents activation/deactivation of the C-arm movement.

- Rotational movement - Orange color
- Angulation movement - Blue color
- Longitudinal movement - Pink color




Indication	Description
	Grey outline: Electronic Brake switches status is disabled. There is no Electronic Brake switches communication from the stand interface, while the MVS is connected to the stand and powered on.
	Colored outline: The respective movement color outline is enabled on the MVS once there is Electronic Brake switches communication from the stand interface; that is Electronic Brake switches are in locked state.
	Filled color: The respective movement Electronic Brake switches will be filled and remain active that is they are in released state.

Table Side Operator (TSO)

TSO is used to operate the motorized controlled movements of the C-arm. It is mounted on table side rails or on pedestal trolley.

To perform motorization functionality, you can connect up to two TSOs. However, you can use any one at a time to perform the same movements.

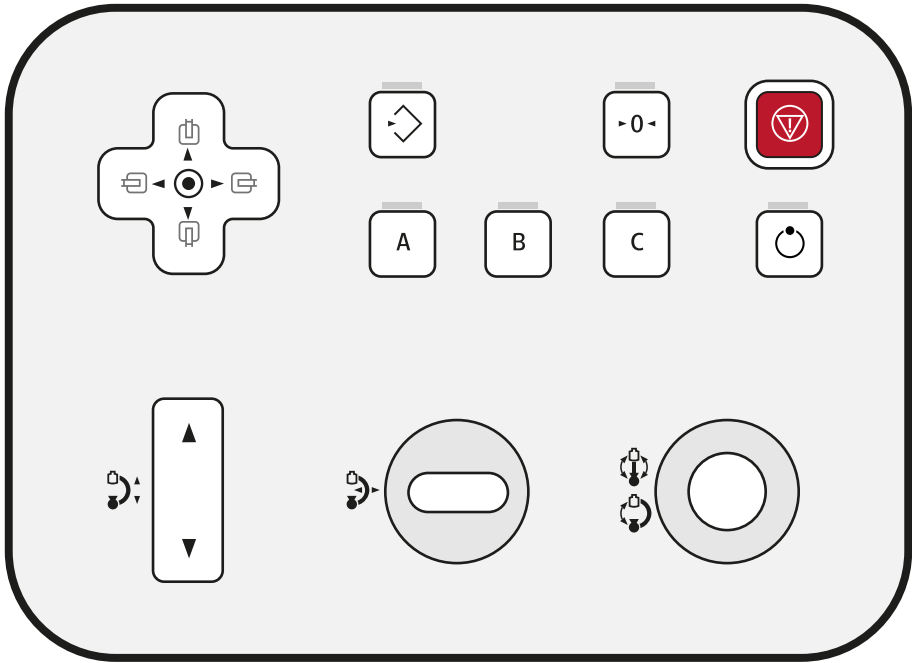


Figure 60 Table Side Operator

The C-arm movements are controlled by using the following TSO buttons:

Symbols	Legends	Description
	Orientation	The lit blue LED indicates the position of the de-tector with respect to the TSO.
	Store Position	To save the current C-arm position.
	Reset	To reset the C-arm to Home position.
	Emergency	To stop all ongoing motorized movements and X-ray.
	TSO On/Off	To enable the TSO.
	Stored C-arm Positions	To save and recall the positions.
	Rotation/Angulation	For C-arm Angulation and Rotation motorized movement.
	Forward/Backward C-arm Movement	For C-arm Longitudinal motorized movement
	Up/Down	Motorized C-arm Height up/down movement.

Switching the TSO On

- NOTE**
- *It is recommended to connect / disconnect TSO when system is in Off condition.*
 - *Connecting/disconnecting TSO during system power On may require system restart to enable the motorized movement.*



CAUTION
Do not connect/disconnect TSO during Powering On when system boot is in Progress to avoid TSO false activation.

Connect the TSO-connector cable to the C-arm stand connector panel.

Available Connectors

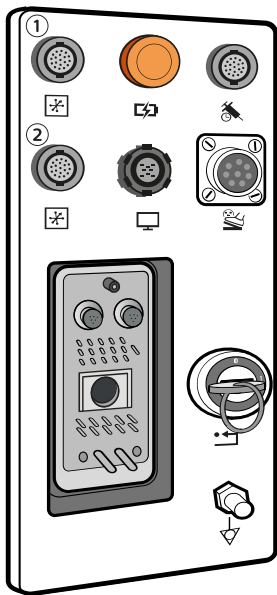


Figure 61 Motorized Model TSO Connector panel

Legend	
1	TSO 1 Connector
2	TSO 2 Connector

After attaching the TSO connector cable, a message is displayed on the C-arm stand touch screen.



Press **TSO On/Off** button on the TSO. Backlit of the button indicates that the TSO is connected and ready to use for C-arm motorized movements.

Using the Table Side Operator (TSO)

You can perform a range of C-arm movements using the Table Side Operator (TSO). The C-arm can be moved in all four axes (Angulation, Rotation, Longitudinal, and Height) using the TSO. Angulation and Rotation movements can be performed with variable speed. Longitudinal and Height movements have fixed speed.

Select the position of the detector before performing any C-arm movement.

When you select orientation, the blue color indicator light glows for the selected position.

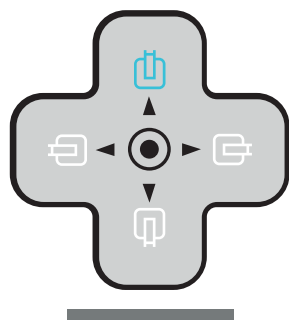
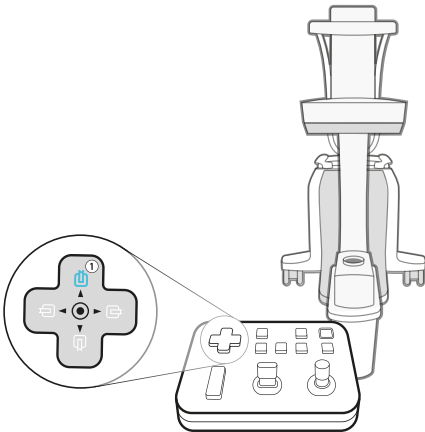
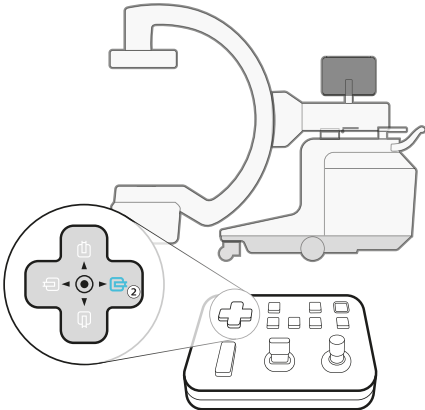


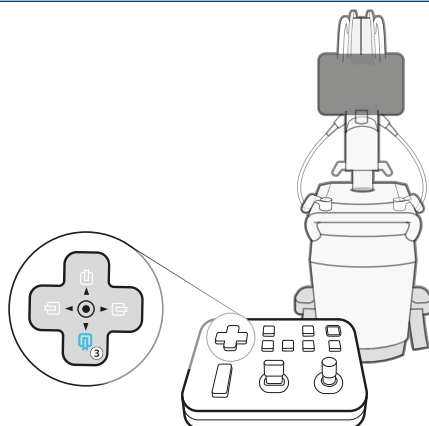
Figure 62 Orientation button

The orientation of the C-arm can be chosen with respect to the operator position around the system. Orientation selection has been explained through the following table:

Sr. No	Operator Position
1	<div></div> <div><p>If the operator position is in the front of the C-arm (Orientation Selection (1)_12 'O'clock):</p><p>Rotation movement:</p><ul style="list-style-type: none">• If the operator moves the round shaped joystick to the right, then C-arm will rotate to the right-hand side of the operator.• If the operator moves the round shaped joystick to the left, then C-arm will rotate to the left-hand side of the operator.<p>Angulation movement:</p><ul style="list-style-type: none">• If the operator moves the round shaped joystick up, then C-arm will perform angulation downward movement.• If the operator moves the round shaped joystick down, then C-arm will perform angulation upward movement.<p>Longitudinal movement:</p><ul style="list-style-type: none">• If the operator moves the rectangular-shaped joystick down, then C-arm will move forward.• If the operator moves the rectangular-shaped joystick up, then C-arm will move backward.</div>
2	<div></div>

Sr. No	Operator Position
If the operator position is on the left side of the C-arm (Orientation Selection (2)_3 'O' Clock):	
Rotation movement:	
<ul style="list-style-type: none"> If the operator moves the round shaped joystick up, then C-arm will rotate away from the operator. If the operator moves the round shaped joystick down, then C-arm will rotate towards the operator. 	
Angulation movement:	
<ul style="list-style-type: none"> If the operator moves the round shaped joystick to the right, then C-arm will perform angulation downward movement. If the operator moves the round shaped joystick to the left, then C-arm will perform angulation upward movement. 	
Longitudinal movement:	
<ul style="list-style-type: none"> If the operator moves the rectangular-shaped joystick up, then C-arm will move forward. If the operator moves the rectangular-shaped joystick down, then C-arm will move backward. 	

3



If the operator position is on the rear end of the C-arm (Orientation Selection (3)_6 'O' clock):

Rotation movement:

- If the operator moves the round shaped joystick to the right, then C-arm will rotate to the right-hand side of the operator.
- If the operator moves the round shaped joystick to the left, then C-arm will rotate to the left-hand side of the operator.

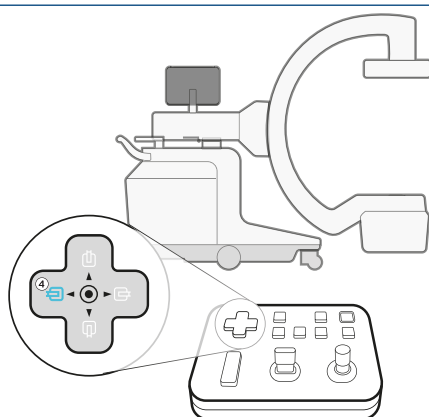
Angulation movement:

- If the operator moves the round shaped joystick up, then C-arm will perform angulation upward movement.
- If the operator moves the round shaped joystick down, then C-arm will perform angulation downward movement.

Longitudinal movement:

- If the operator moves the rectangular-shaped joystick up, then C-arm will move forward.
- If the operator moves the rectangular-shaped joystick down, then C-arm will move backward.

4



If the operator position is on the right side of the C-arm (Orientation Selection(4)_9 'O' Clock):

Rotation movement:

- If the operator moves the round shaped joystick up, then C-arm will rotate away from the operator.
- If the operator moves the round shaped joystick down, then C-arm will rotate towards the operator.

Angulation movement:

- If the operator moves the round shaped joystick to the right, then C-arm will perform angulation upward movement.
- If the operator moves the round shaped joystick to the left, then C-arm will perform angulation downward movement.

Longitudinal movement:

- If the operator moves the rectangular-shaped joystick up, then C-arm will move forward.
- If the operator moves the rectangular-shaped joystick down, then C-arm will move backward.

If orientation is selected correctly then you can perform the following four movements using the TSO:

Rotation Movement (Motorized)

- Move the round shaped joystick to the right, to rotate the C-arm right-hand side of the operator.
- Move the round shaped joystick to the left, to rotate the C-arm left-hand side of the operator.



Figure 63 Rotation Movement (Motorized)

The speed of the movement is controlled via the joystick. The maximum movement speed for Rotation is 15 degrees/second.

The C-arm stand has rotational travel range of -200° to $+200^{\circ}$.

Angulation Movement (Motorized)

- Move the round shaped joystick up, to move the C-arm downward movement.
- Move the round shaped joystick down, to move the C-arm upward movement.

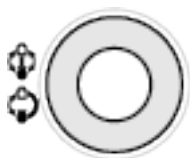


Figure 64 Angulation Movement (Motorized)

The speed of the movement is controlled via the joystick. The maximum movement speed for Angulation is 15 degrees/second.

The C-arm stand has angulation travel range of -50° to $+90^{\circ}$.

Longitudinal Movement (Motorized)

- Move the rectangular-shaped joystick up, to move the C-arm backward.
- Move the rectangular-shaped joystick down, to move the C-arm forward.



Figure 65 Longitudinal Movement (Motorized)

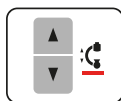
The speed of the movement is controlled via the joystick. The maximum movement speed for longitudinal movement is 60 [mm/s].

The C-arm stand has longitudinal movement range of 0 to 20cm.

NOTE *Ensure to select right orientation to move the system in desired direction.*

Height Movement (Motorized)

Height movement button is given on both the TSO and C-arm stand. To perform C-arm motorized height movement, follow any one of the options given below:



- 1 On C-arm stand press **Up** button to move the C-arm upwards. Press **Down** button to lower the C-arm position.



- 2 On TSO press **Up** button to move the C-arm upwards. Press **Down** button to lower the C-arm position.

The C-arm stand has height movement range of 0 to 49 cm.

The maximum Height movement speed is greater than 1.0 cm/s. However, it is limited to less than 2.5 cm/s.

At the transport position, the movement stops and the indicator light beside the buttons is ON.

To continue the downwards movement into the extended range, press the **Down** button again. An audible signal is given at the beginning of this movement and the indicator light remains lit



WARNING

If any irregularities occur in either direction of the height movement or of any other motorized movement in any direction during use, switch Off the system as described in [Emergency Stop \(page 17\)](#).



CAUTION

When using the system in the extended range, extra care must be taken to avoid collisions with the floor or other objects.



CAUTION

When the indicator flashes, the central circuit has detected a failure and the height movement is disabled.

Setting Position Memory

You can save C-arm positions and recall them to use later.

To save a C-arm position, first press **Store** button and then either **A**, **B** or **C** button. The current C-arm position gets saved in respective **A**, **B** or **C** storage location.



Figure 66 Store button



Figure 67 Stored Positions

The backlit LED above the respective button indicates that the position is saved.

NOTE *You can save up to three C-arm positions. It is not necessary to save it in a sequence. You can save C-arm position in any sequence A, B or C.*

To recall the C-arm position, press and hold either **A**, **B** or **C** position button. The C-arm will return to the position saved in respective **A**, **B** or **C** storage locations.

To reset and bring the C-arm to Home position, press, and hold **Reset** button. There will be a beep sound and the C-arm will return to its Home position.



Figure 68 Reset button

NOTE *If you release the A,B,C or Reset button in-between the movements, then the C-arm movement will stop at that position. Press and hold the button again to bring the C-arm movement to the position saved in the selected position button.*

In the Home position, Rotation, Angulation, and Longitudinal movements will be at 0 cm, whereas Height movement will be at 8.0 cm.

Lock/Unlock Handle for Swivel (Wig-Wag) Movement

- 1 To release the Swivel brake (black handle) from lock position, rotate the handle upwards to the unlocked position. (There is one swivel handle each on left and right side)
- 2 To re-apply the brake, return the swivel brake handle to the locked position (longitudinal position).

The degree of rotation is indicated on the scale.

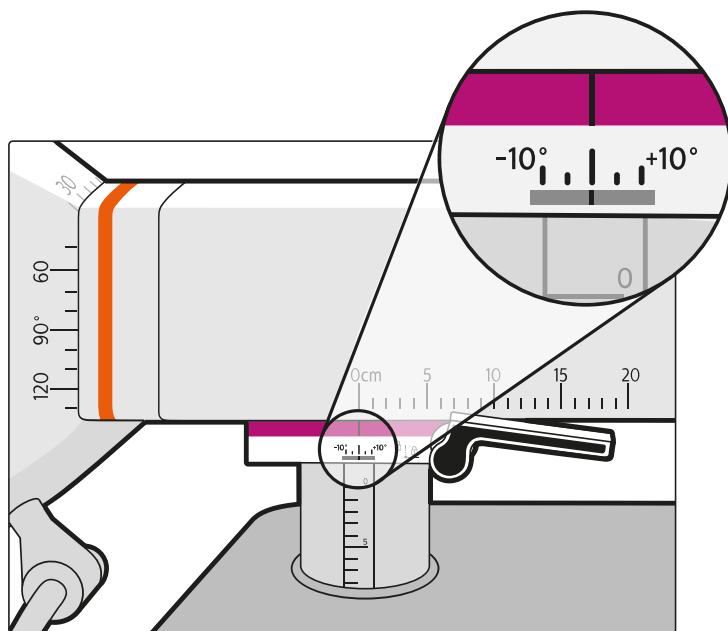


Figure 69 Wig-Wag Scale

When the handle is released, the handle points to the 'unlocked' symbol.

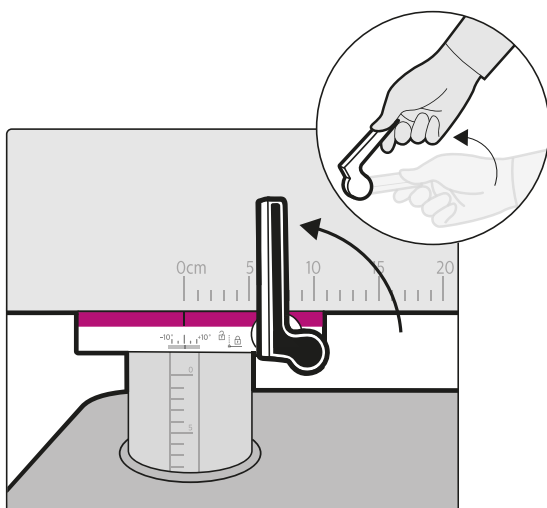


Figure 70 Unlocked

When the handle is brought to lock position, it points to the 'locked' symbol.

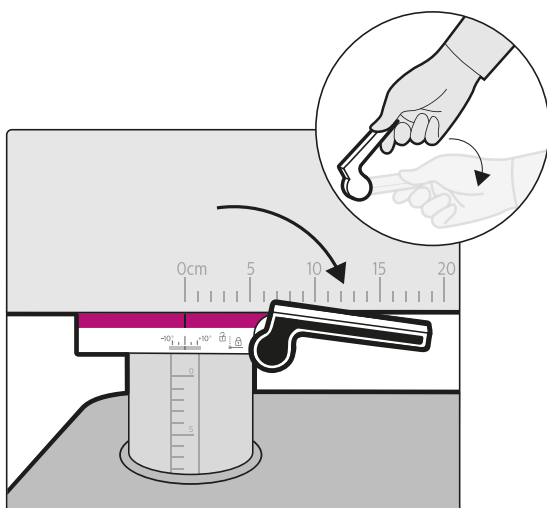


Figure 71 Locked

Collision Prevention (BodyGuard)

The collision (**BodyGuard**) mechanism protects the patient by stopping the C-arm movement when an object is sensed / detected within the periphery of detector.



WARNING

In motorized system, do not keep any obstacle surrounding detector during system Power On.



WARNING

During connecting Detector grid on detector, Collision may detect, to use system in Normal condition system Stand should be restarted (Power Off then Power ON).

If a collision occurs that causes any equipment cover to break or become detached, do the following:

- Check if there are any obstacles nearby Detector/X-ray tube, if yes then take cautious decision to remove the obstacle.
- You may continue the procedure by using manual movement if required.

- Switch off the power
- Contact technical support

BodyGuard is designed to prevent collisions with the patient during normal use of the system, when the patient is lying on the table.

BodyGuard function cannot fully safeguard the patient during the C-arm motorized movements.

BodyGuard cannot prevent all collisions, but if a collision occurs, movements will stop immediately & the collision force will be lower.

BodyGuard sensors are fitted inside of detector cover (marked in orange color).

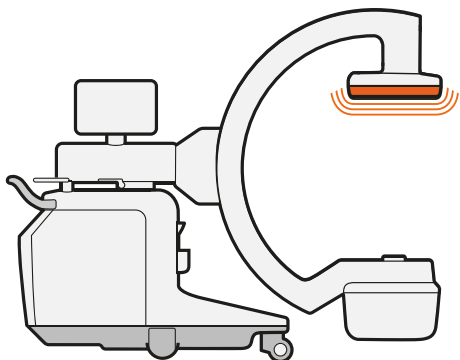


Figure 72 BodyGuard Sensor

Collision protection mechanism is taken care of by the system through establishing force limits of motors/drives fitted in C-arm assembly.

NOTE *Make sure you follow the below information concerning the BodyGuard function:*

- If there is any object placed on the patient, be careful while moving the system. **BodyGuard** may not detect other objects other than the patient.
- The **BodyGuard** sensor has a blind spot in its center. Small objects, such as the patient's nose or a very small child may not be detected when approached directly from above.
- **BodyGuard** sensors must be kept dry, otherwise the **BodyGuard** system operates with reduced efficiency and reduced speed.
- If the **BodyGuard** sensor becomes defective, stand movements are only possible at reduced speed.

If during motorized movements a potential collision is detected at the detector side or X-ray tube side, further C-arm movements are stopped, and a warning message is displayed on the live monitor. Movement opposite to the C-arm motion that caused the potential collision is allowed in order to move the C-arm out of collision range.

When collision is detected:

- The red LED indicators on TSO light up.
- System will give audible alert, (When operator move the any TSO movements.)

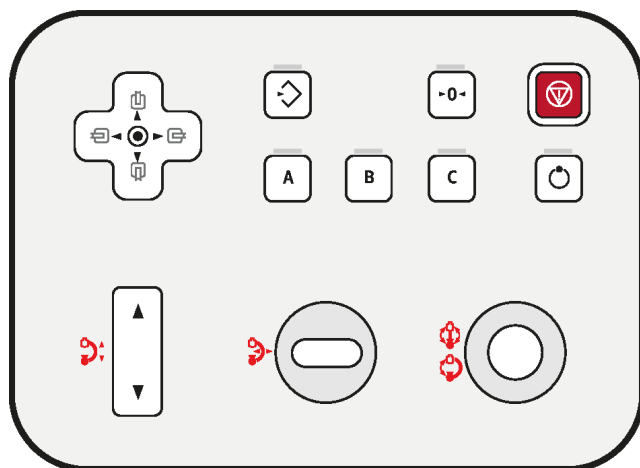


Figure 73 TSO showing collision detection Red LED indicators

Collision Prevention Override

You can override collision prevention function in the following situations:

You can override the **BodyGuard** function if it is blocking motorized stand movements, may be caused by equipment used around the patient and table. For example, ECG Cables.

It is operator's responsibility to ensure that collisions with the patient or equipment do not occur while the override function is active.

When you activate the override, the following message will be displayed in the screen:

Message: *Collision detected at detector side. Move system out of collision state.*

Message: *Collision Override. C-arc movements speed is reduced.*

The maximum movement speed during override is reduced compared to normal movements. The override function is deactivated and normal movements are available again if the requested movement is no longer being limited by the **BodyGuard** sensor.

Override Procedure

To override the system after collision detection, follow either the motorized or manual options given below:



Move either of the joysticks.

NOTE *If you are already using the joystick before collision detection, release it, double click and move twice.*

Press any of the electronic brake switches on the C-arm stand. The backlit LED button indicates that you can move the C-arm manually. Press the selected switch again to lock the C-arm in the desired position.

5.4.2 Non-Motorized Model

The features related to the non-motorized model are as described.

C-arm Brakes

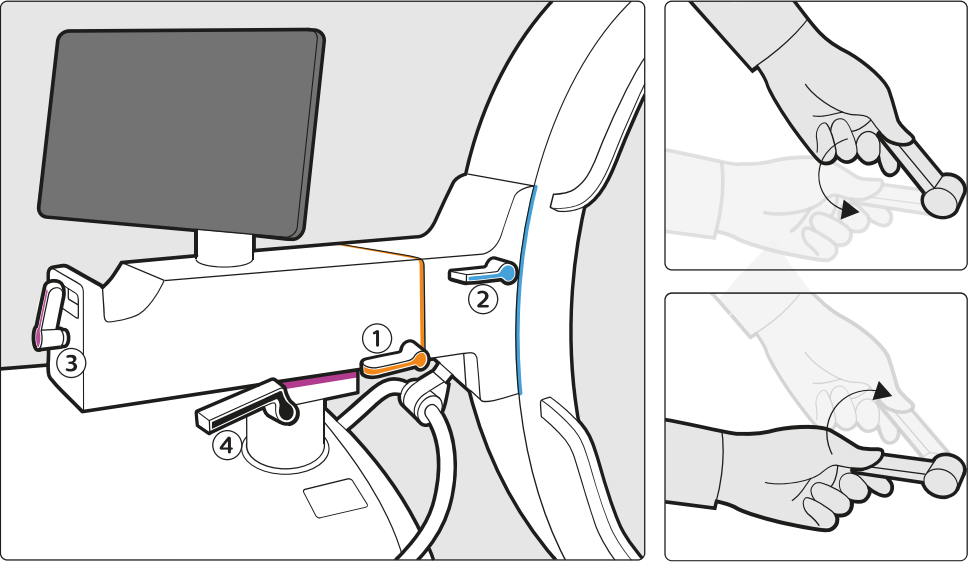


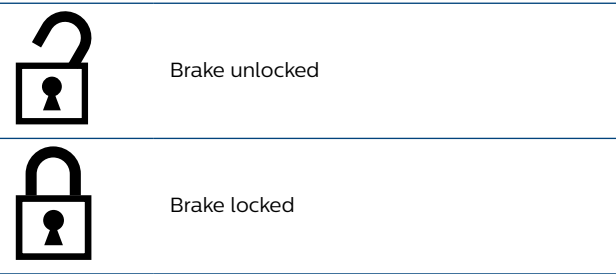
Figure 74 C-arm brake movements - Non Motorized

Brake/Movement		Color code
1	Rotation movement	Orange
2	Angulation movement	Blue
3	Longitudinal movement	Pink
4	Swivel (wig-wag) brake/movement	Black

The brake/movement for each C-arm movement is color-coded for identification at the brake handle and at the movement axis.

NOTE *Although the movements are balanced, it is strongly recommended to always apply the C-arm brakes.*

The rotation, angulation, longitudinal, and swivel (wig-wag) brakes have symbols to indicate their movements and status. When the brake is released, the handle points to the ‘unlocked’ symbol. When the brake is applied, the handle points to the ‘locked’ symbol.



Rotation

To release the rotation brake (orange handle), move the brake handle to the unlocked position. To re-apply the brake, return the brake handle to the locked position. The degree of rotation is indicated on the scale.

The range of rotation is +200 degrees to –200 degrees.

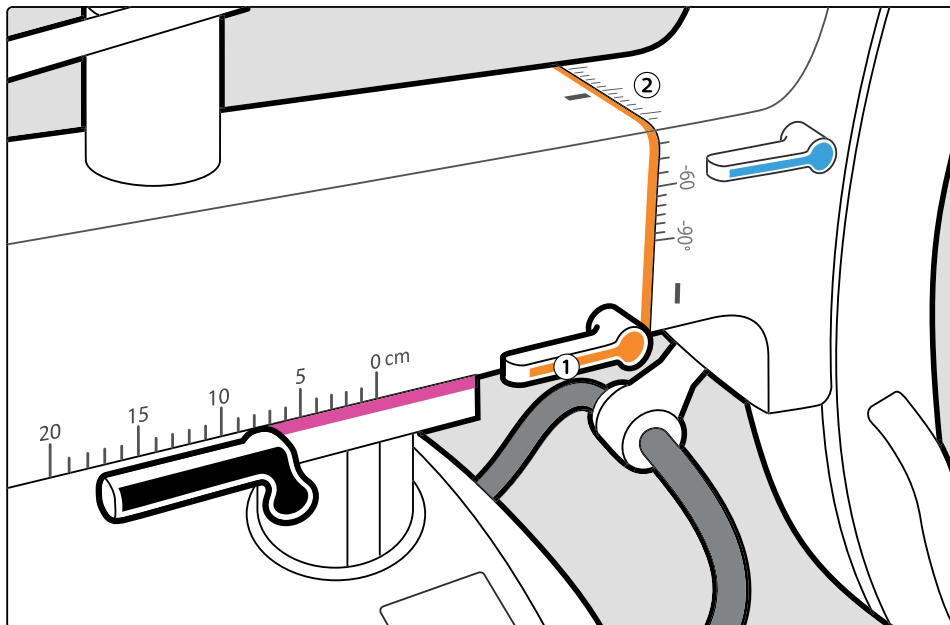


Figure 75 Rotation brake handle and degrees of rotation markers

Legend

- | | |
|---|---|
| 1 | Rotation brake handle |
| 2 | Rotation - Movement measurement markers |

Angulation

To release the angulation brake (blue handle), move the handle to the unlocked position. To re-apply the brake, return the handle to the locked position. The degree of angulation is shown on the scale.

The angulation range is +90 degrees to –50 degrees.

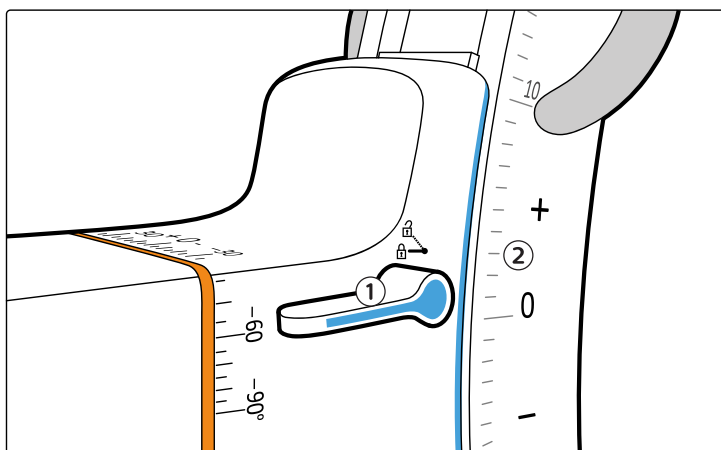


Figure 76 Angulation brake handle

Legend	
1	Angulation brake handle
2	Angulation - Movement measurement markers

Longitudinal Movement

To release the longitudinal brake (pink handle), move the handle to the unlocked position. To re-apply the brake, return the handle to the locked position. The longitudinal movement is shown on the scale. The longitudinal movement range is 0-20 cm.

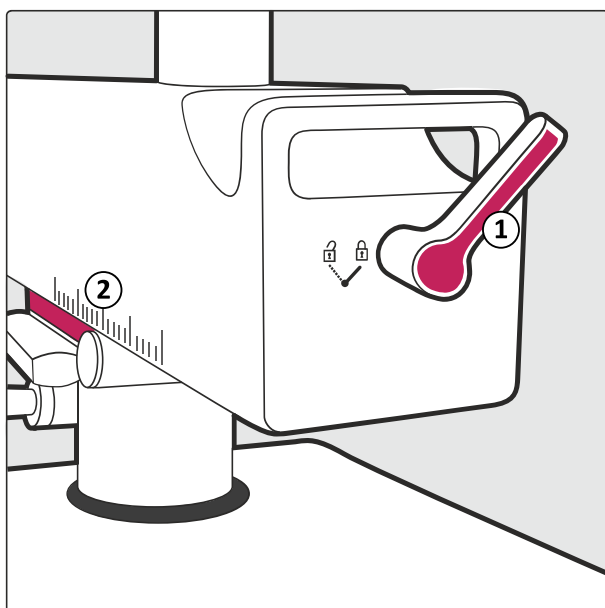


Figure 77 Longitudinal brake handle and movement measurement

Legend	
1	Longitudinal brake handle
2	Longitudinal - Movement measurement markers

Swivel (Wig-Wag) Movement

To release the swivel movement brake (black handles), move the handle upwards. To re-apply the brake, return the handles to the locked position.

The swivel range is -10 degrees to +10 degrees.

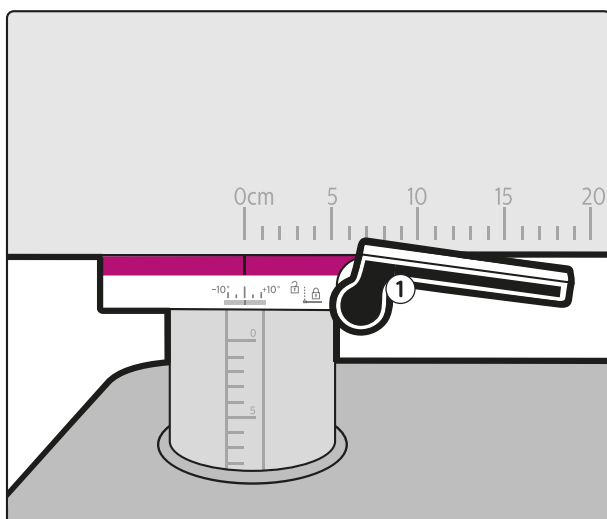


Figure 78 Swivel (wig-wag) brake handle, one handle on each side

Legend

- | | |
|---|-------------------------------|
| 1 | Swivel (wig-wag) brake handle |
|---|-------------------------------|

Height Movement (Non-Motorized)

The adjustment of the height is controlled by switches on both sides of the C-arm stand.

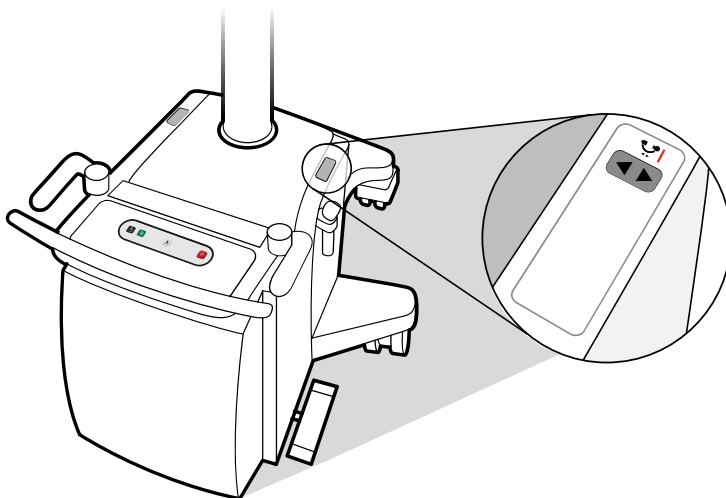


Figure 79 Height movement buttons (Non-Motorized)

- 1 Switch on the C-arm stand.
- 2 Make sure the system lock key is in the enabled (1) position.
- 3 Press the **Up** button to move the C-arm upwards. The upwards movement will continue until the button is released or when the up limit is reached.
The C-arm stand has a height movement range of 49 cm.
- 4 Press the **Down** button to move the C-arm downwards. The downwards movement will continue until the button is released or when the transport position is reached.



- 5 At the transport position, the movement stops and the indicator light beside the buttons is on.
- 6 To continue the downwards movement into the extended range, press the **Down** button again. An audible signal is given at the beginning of this movement and the indicator light remains lit.

NOTE *Toggle the lock key to enable the height movement. When using the system, if the movement gets disabled without flashing the indicator; then you can resume movement automatically by repressing up/down button.*



WARNING

If any irregularities occur in either direction of the height movement during use, switch off the system as described in [Emergency Stop \(page 17\)](#).



CAUTION

When using the system in the extended range, extra care must be taken to avoid collisions with the floor or other objects.



CAUTION

When the indicator flashes, the central circuit has detected a failure and the height movement is disabled.

5.5 System On/Off

This section describes connecting the system, using the system lock and earthing.

5.5.1 Connecting the System



WARNING

Optional equipment is only to be used if it is certified for the applicable standards and fully compatible with the system in use. The use of accessory equipment not complying with the equivalent safety requirements of the system may lead to a reduced level of safety in the resulting system. Any patient environment equipment connected to the system must comply with ANSI/AAMI ES60601-1 and IEC 60601-1 requirements. Equipment outside the patient environment may only be connected to the system if it complies with the relevant UL/ANSI/AAMI and EN/IEC standards.



WARNING

To avoid risk of electric shock, this equipment must only be connected to supply mains with protective earth.



CAUTION

Make sure that the socket outlet is provided with proper ground connection accepting grounding cord plugs. The resistance in the socket outlet must conform to the mains supply specifications as described in these Instructions for Use.

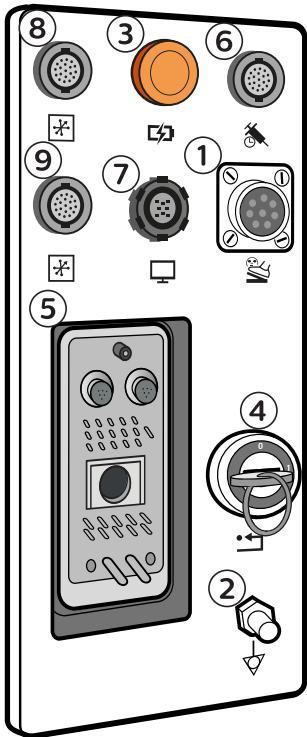


Figure 80 Stand Connector Panel (Motorized model)

NOTE The legends #8 and #9 are not applicable for Non-Motorized model.

Legend					
1	Wired Foot switch connector	4	System lock	7	TSM connector
2	Equipotential earth connection	5	Mobile view station connector	8	TSO 1 connector
3	Energy storage unit indicator	6	Injector Interface Connector	9	TSO 2 connector

When the C-arm stand and the mobile view station are in the desired position, make the following electrical connections.

- 1 Connect the mobile view station cable to the C-arm stand and turn the fastener clockwise until it clicks into place.

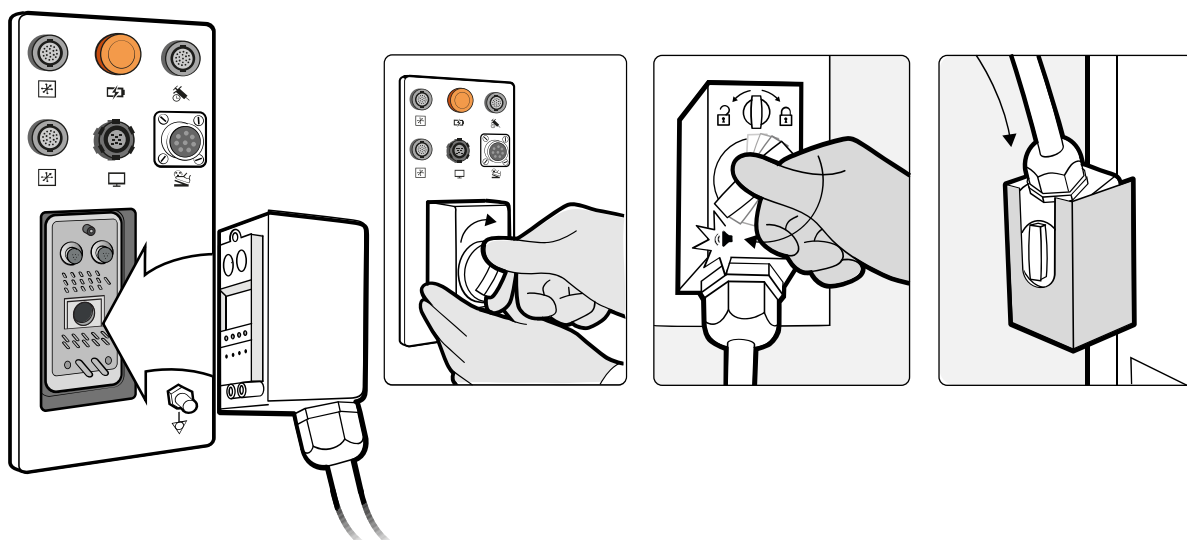


Figure 81 C-arm stand connector panel with cable connections

- 2 Connect the mains power cable of the mobile view station to a suitable mains power outlet socket.
- 3 If applicable, connect the foot switch to the C-arm stand connector panel.
- 4 If applicable, connect the TSM to the C-arm stand connector panel.
- 5 If applicable, connect the TSO 1 and TSO 2 to the C-arm stand connector panel.
- 6 If applicable, connect the injector cable to the C-arm stand connector panel.

5.5.2 System Lock

When the system lock (stand key) is set to **0**, all X-ray functions and motorized movements are disabled and a message appears on the C-arm display.

Before the system is switched on the system lock should be set to **0** to prevent unwanted X-ray emission. The system lock should only be set to **1** during radiation procedures and for using any motorized movement.

5.5.3 Equipotential Earth (Ground) Connection



WARNING

An equipotential earth (ground) connection is required for the safety of patient and user (IEC and VDE regulations).



The system is provided with a yellow-green cable for equipotential earth connection between the C-arm stand and the patient support table. The connection point is indicated by the equipotential earth symbol.

Alternatively, both the C-arm stand and the patient support table may be connected to an earth (ground) bus bar provided for this purpose by the hospital.

5.5.4 Switching the System On



- 1 Press the **System On** button on the C-arm stand or press the **System On** button on the mobile view station.

If password protection is not enabled, the system will log in without authorization.

NOTE *The system performs a system initialization and a self-test. A startup screen is displayed on the examination monitor of the mobile view station and on the C-arm stand touch screen.*

- 2 If password protection is enabled, the log on screen is displayed. To log on, enter your user name and password, and click **Log On**. The password protection function protects patient data from unauthorized access.

- 3 To start an emergency examination without logging on, click **Emergency Use**.

The system starts, but you cannot perform the following functions:

- Review existing examinations
- Start scheduled examinations
- Export, save, and print data

- 4 To log on, enter your user name and password, and click **Log On**.

After switching on the system, by default the X-ray will be displayed. You may enable it by pressing the **X-ray Enable/Disable** button for 2 second provided on the C-arm stand.

The system performs a system initialization and a self-test. A startup screen is displayed on the examination monitor of the mobile view station and on the C-arm stand touch screen.

NOTE *In rare cases, if you power ON the system and if the system starts up with an improperly scaled image on the reference monitor, then system restart will resolve the issue.*

NOTE *In motorized system, don't keep any obstacles surrounding detector during system power On.*



CAUTION

To prevent malfunction, do not touch any controls during the startup process.

The system is ready for use when:

- The examination monitor displays the administration screen
- The C-arm stand touch screen displays status and settings
- No error messages are given

For more information about starting a procedure, see [Selecting a Patient for Acquisition](#) (page 123).

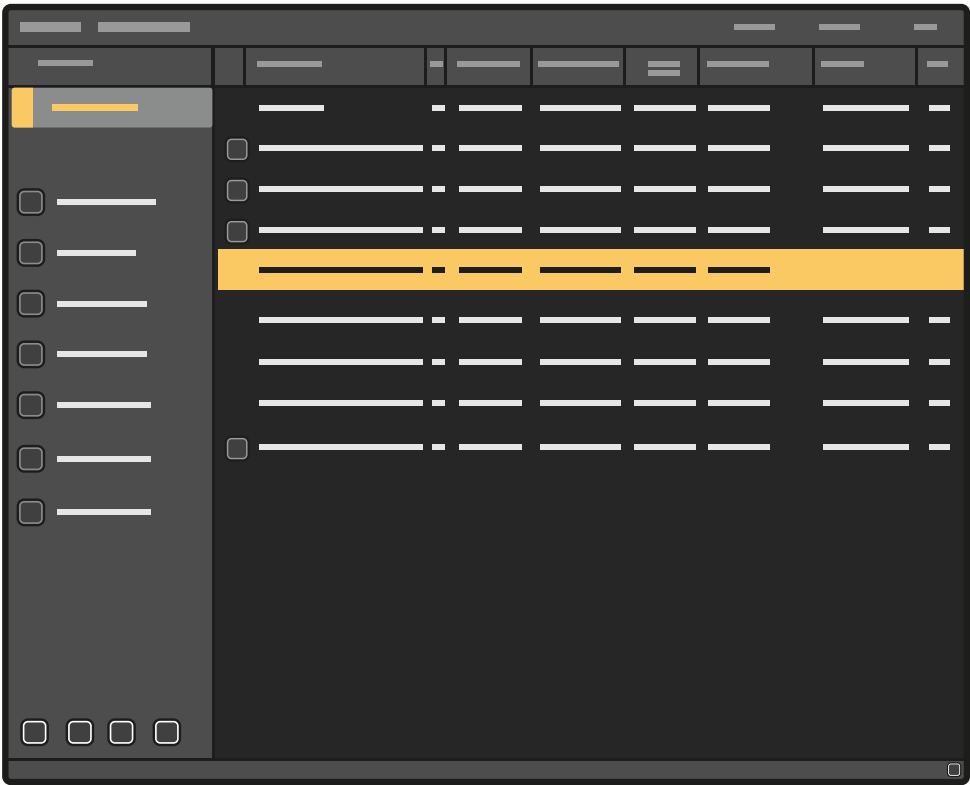


Figure 82 Mobile view station administration screen



Figure 83 C-arm stand touch screen after start-up

NOTE To avoid casual or deliberate viewing of patient data by unauthorized persons, do not leave the system unattended while it is switched on. If the system is not required, you should switch it off.

If images are queued for transfer from a previous session, a panel is displayed on the examination monitor to remind you that images are queued.

If disk space is becoming low, the reminder panel also displays an information message, reminding you to delete examinations that are no longer needed, to avoid automatic overwriting of older examinations.

- 5 Click the **OK** button to close the reminder panel.

NOTE *If the password protection function is enabled, the reminder panel is not displayed if a valid user name password is not entered.*



WARNING

When the system is powered up for use with system lock key in position 1, the system is in X-ray enabled state. It is recommended to keep the system in X-ray disabled state at all times, except when a procedure is in progress; to prevent the possibility of RADIATION being emitted through the accidental actuation of a foot switch/hand switch.



To enable X-ray radiation, press **X-ray Enable/Disable** button for 2 second on the C-arm stand.

Press **X-ray Enable/Disable** button again to disable the X-ray.

The backlit LED indicates that the X-ray has been disabled.

NOTE *By default X-ray is in disabled state at system start up.*

Tips

Stand alone mode mobile view station

The mobile view station can be used in stand alone mode (without the C-arm stand connected) for viewing and post-processing. The system is designed so that no patient mix up is possible. One of the prevention measures is that each time the mobile view station is switched on, a new Patient file is created. However there are times during an operation when the C-arm stand needs to be repositioned or temporarily removed, and then new images should be added to the same patient file. To allow for this situation the system is designed so that while the mobile view station remains switched On, the C-arm stand can be switched Off and disconnected. It can then be reconnected and switched On. In this situation the new images are added to the open Patient file.

System lock

To perform X-ray, the system lock must be enabled (with the key in the I position).

Motorized movement

Height movement can be used a few seconds after pressing one of the **System On** buttons.

5.5.5 Switching Users

You can switch users without logging the original user off.

You may want to switch users temporarily to perform specific tasks. For example, specific parts of the clinical procedure, or system tasks that require an administrator's account.

Switching users maintains the audit trail for the procedure by recording the correct responsible user.



- 1 Open the administration screen by pressing the **Administration** button.



- 2 Click **System** and select **Switch Users**.

A dialog box is displayed requesting the new user name and password.

- 3 Enter the **User name** and **Password** for the user you are switching to.

- 4 To close the dialog box without switching users, click **Cancel**.
- 5 To switch users, click **Switch**.

The system switches to the new user and continues.

5.5.6 Changing Your Password

You can change your password once you are logged in.

If your system has password complexity enabled at installation, your password must have:

- A minimum number of characters (consult with your hospital administrator)
- At least one uppercase character
- At least one number character
- At least one symbol character



- 1 Open the administration screen by pressing the **Administration** button.



- 2 Click **System** and select **Change Password**.

A dialog box is displayed requesting your existing and new passwords.

- 3 Enter your **Current password**.
- 4 Enter your **New password**.
- 5 Re-enter your new password in the **Confirm new password** box.
- 6 To close the dialog box without changing your password, click **Cancel**.
- 7 To change your password, click **Change**.

5.5.7 Switching the System Off



- 1 Switch off the complete system by pressing the **System Off** button on the mobile view station.

On the C-arm stand, the following functions are switched off immediately:

- Radiation
- Motorized movement

Remaining functions on the C-arm stand and mobile view station are switched off automatically in a controlled way to avoid data loss.

The controlled shut down process may take several seconds to complete. When the shut down process is complete, wait 5 seconds before switching the system on again.

- 2 Only unplug the system when the display indicates that the shutdown procedure is complete.



CAUTION

After switching off, the system must be connected to the mains supply to ensure recharge of the energy storage unit.

NOTE *Pressing the System Off button for more than 3 seconds immediately removes power to the entire system.*

NOTE *Pressing the C-arm stand off button on the C-arm stand switches off only the C-arm stand.*

NOTE *It is recommended to connect/disconnect TSO when system is in Off condition.*

5.5.8 Emergency Power Off

In case of emergency, switch the system off.



- 1 To switch off the C-arm stand or TSO, press the **Emergency off** button on the C-arm stand console or TSO. Motorized movements and X-rays are disabled.

When Emergency button is pressed, a message is displayed on Stand touch screen.

Message: *X-ray and Motorized movements are disabled. Press X-ray Enable key on stand to use fluoroscopy.*

X-ray generation and motorized movements are no longer available.



- 2 To switch off the system, press **System Off** on the mobile view station.

- 3 Remove the mobile view station mains power plug from the socket outlet.



WARNING

When the Emergency off button is pressed, mains power is still applied to some circuits in the system until the mobile view station mains power plug is removed from the socket outlet.



NOTE *When Emergency button is active, you can still perform fluoroscopy by enabling X-ray Enable/Disable button given on the C-arm stand.*

5.5.9 Deactivating the Emergency Mode



To deactivate the emergency mode, rotate the **System Lock Key** from position 1 to 0 and then to position 1 again.

5.5.10 Mains Failure

If mains power fails during an acquisition, all images from the current acquisition run are lost and the dose report for the lost acquisition run is not updated.

The network connection is also lost and transfer jobs are aborted. Transfer jobs aborted during the selection for transfer queuing are lost and need to be selected and queued again.

When main power is restored, you should switch the system on again. The time for the system to restart for imaging is approximately 3 minutes. The system starts with the default settings selected and a new patient.

Reference images and subtraction masks should be remade for the current patient.

Transfer jobs aborted while being transferred to the DICOM network, or when queued, are not lost and are automatically transferred again. You can resume or check aborted transfer jobs in the transfer queue by opening the job viewer. For more information, see [Viewing Transfer Jobs in the Job Viewer \(page 191\)](#).

5.5.11 Battery Management

During periods of extensive use, the battery charge level of the energy storage unit may fall. If the battery charge level falls below a certain percentage, a warning message is displayed on the C-arm stand touch screen. Both the C-arm stand and the mobile view station must remain connected, and the mobile view station must remain connected to the mains power outlet socket. This allows the energy storage unit to recharge, which is indicated by an orange light on the connector panel on the side of the C-arm stand.

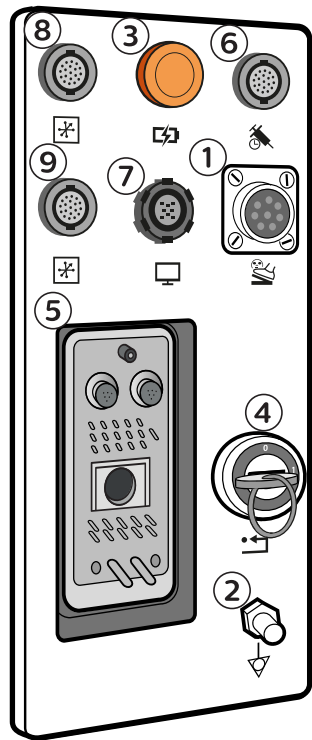


Figure 84 Energy Storage Unit Charge Indication Light and System Lock

NOTE The legends #8 and #9 are not applicable for Non-Motorized model.

Legend	
3	Charge indication light
4	System lock

It is not necessary for the C-arm stand or the mobile view station to be switched on during recharging. When the C-arm stand is switched off and the energy storage unit is recharging, the charge indication light on the C-arm stand connector panel indicates the battery charge level; as the battery charge level increases, the charge indication light flashes more frequently. The energy storage unit is fully charged when the charge indication light is lit continuously (when the C-arm stand is switched off and connected to the mains power outlet socket).

When the system is switched on, the charge indicator light is on continuously.

You should charge the battery fully before use.



CAUTION
If the system has been left connected to the mains power outlet socket for recharging, do not forget to disconnect it before transporting it to another location.

Battery Undercharge

If the battery charge level falls below 60%, a warning message is displayed on the C-arm stand touch screen.

If the battery charge level falls below 30%, X-ray may be limited by the system. Fluoroscopy with low dose is still available.

If the battery charge level falls to 0%, X-ray is disabled. The battery must be recharged to at least 15% in order to perform X-ray again. Recharging the battery to 15% takes approximately 20 minutes.

**WARNING**

When the system is switched off and parked, and it is connected to the mains power outlet socket for recharging, ensure that the system lock is in the disabled position “O” and that the system lock key is removed to prevent accidental radiation or movement.

5.6 Monitors

The mobile view station is equipped with two LCD monitors. The left monitor is the examination monitor and the right monitor is the reference monitor.

The examination monitor displays live images and last image hold (LIH). You also use the examination monitor for scheduling and reviewing examinations.

The reference monitor can be used to park reference images. It is also used to view dose parameters, errors, warnings, and information.

The factory settings of the monitors on the mobile view station are set for optimal image quality. The brightness and contrast settings of the monitors cannot be adjusted directly.

The monitors are hinged and can swing through 180 degrees for ease of viewing, either for the physician at the tableside or for the operator at the mobile view station console, and to allow the mobile view station to be positioned with the rear (open side) pointing away from the patient.

**WARNING**

Ensure that the X-ray on indicator light is visible for all persons present in and entering the operating room.

NOTE ***To avoid casual or deliberate viewing of patient data by unauthorized persons, position the system's monitors so that they face away from doorways, hallways, and other traffic areas.***

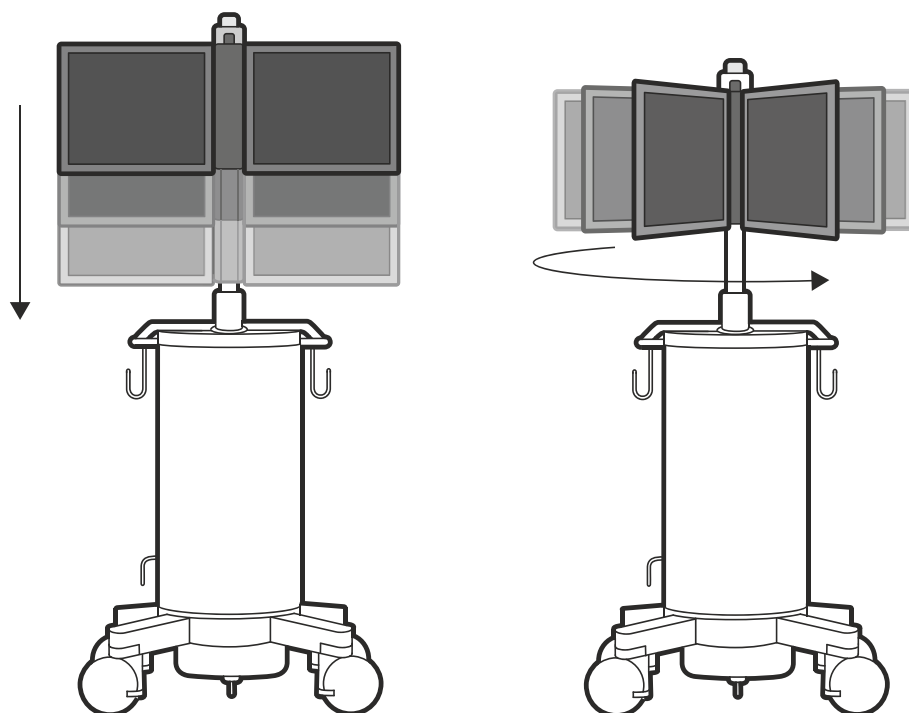


Figure 85 Monitors: height (left) and swing (right) movements

Height Movement

The monitors can be raised and lowered for increased flexibility of positioning.



CAUTION

Raise or lower the monitors with the monitors open and using both hands: hold the monitors next to the swivel axis, with two hands on top (position 1, either side) or two hands below (position 2, either side).

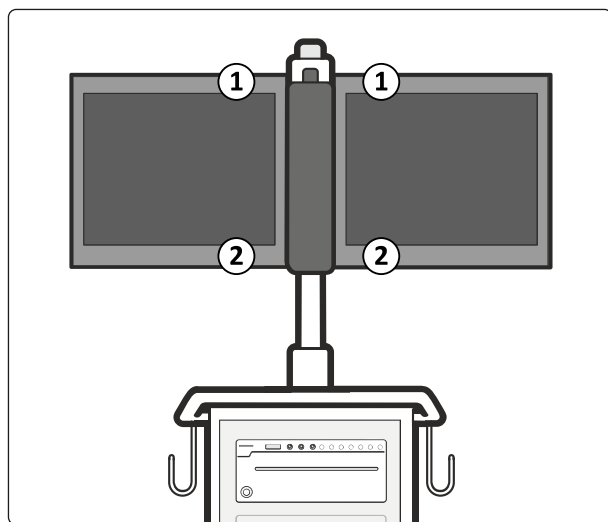


Figure 86 Hand positions for raising and lowering the monitors

Legend

- | | |
|---|--------------------------------------|
| 1 | Hand positions to lower the monitors |
| 2 | Hand positions to raise the monitors |

Touch Screen Functionality

For more information about touch screen functionality on the examination monitor and the C-arm stand touch screen, see [Touch Screen Functionality \(page 40\)](#).

5.7 Information and Help

This section covers information and help for the C-arm stand and mobile view station.

5.7.1 Information and Help on the C-arm Stand

This section covers warnings, messages and tooltips for the C-arm stand.

Warnings and Messages

If an error code or a warning is displayed in the status area on the C-arm stand touch screen, tap the text displayed in the status area to see the full warning or error message.

For more information, see [System and Error Messages \(page 226\)](#).

Tooltips

The C-arm stand touch screen features a tooltip help mode.

- 1 Tap ? in the header area.

The screen is dimmed and question mark icons appear at each button on the displayed screen.

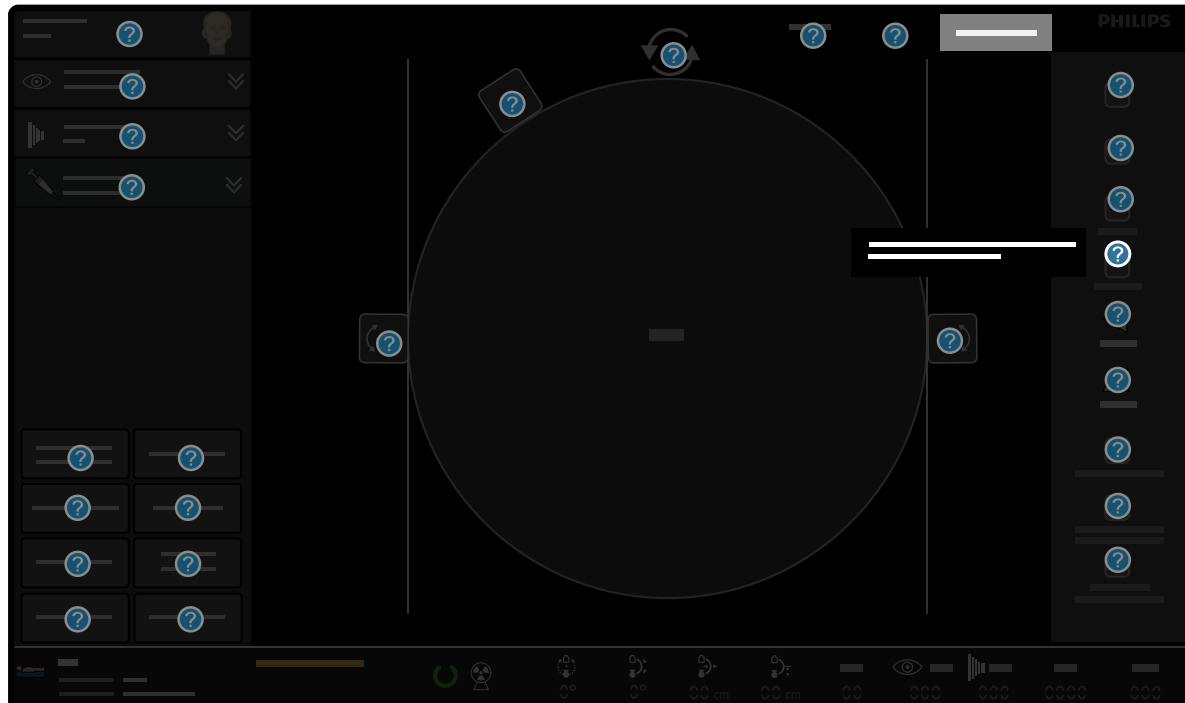


Figure 87 Tooltips

- 2 Tap a button on the C-arm stand touch screen.

A text box appears, explaining the function of the button.

Tapping another button closes the existing text box and a new text box is displayed relating to the button most recently tapped.

- 3 Tap **Close Tooltips** in the header area.

Tooltip mode is switched off. All tooltips and tooltip icons are removed from the screen.

NOTE *If the C-arm stand touch screen is not touched for 60 seconds when tooltip mode is active, tooltip mode switches off and all tooltips and tooltip icons are removed from the screen.*

Help Information

You can find additional help information using the C-arm stand touch screen.

- 1 To display the help information, tap **Help** in the header area of the C-arm stand touch screen.
A dialog box is displayed, allowing you to select a subject and view additional help.
- 2 Select a subject by tapping the subject title.
- 3 To scroll through the displayed page, swipe up or down on the screen.
- 4 To close the dialog box, click **Close** in the top right corner of the dialog box.

5.7.2 Information and Help on the Mobile View Station

You can access the electronic Instructions for Use from the mobile view station.

For more information, see [Electronic Instructions for Use \(page 113\)](#).

If your system has the Image Viewer option installed, you should refer to the Image Viewer Instructions for Use for more information about using the option.

Electronic Instructions for Use

These Instructions for Use are available to view on the screen while you are using the system.



- To open the electronic Instructions for Use, do one of the following:
 - Press the **Help** button on the mobile view station.
 - Click **Help** in the top bar menu and select **Instructions for Use**.
- To browse topic headings, use the table of contents in the left pane of the viewing window.
- To expand and collapse topic headings, click the arrow next to the heading. If a heading does not have an arrow next to it, it cannot be expanded further.
- To go directly to a topic, click the corresponding heading in the table of contents. The topic is displayed in the right pane of the viewing window.
- To move sequentially between topics, click **Back** or **Forward**.
- To close the electronic Instructions for Use, click **Close**.

The electronic Instructions for Use are available in several languages. To change the language, see [Changing the Instructions for Use Language \(page 48\)](#).

Searching the Electronic Instructions for Use

You can search the electronic Instructions for Use using keywords to help you find what you are looking for more quickly.



- 1 Click inside the search box and enter the keywords that you want to search for.
- 2 Click **Search** or press Enter to display the search results in the search window.
- 3 To view a topic, click it in the search results.

Accessing the Electronic Instructions for Use on the system



- 1 Connect the mains power cable of the mobile view station to a suitable mains power outlet socket.
- 2 Press the **System on** button on the mobile view station.



- 3 To open the electronic Instructions for Use, do one of the following:
 - Press the **Help** button on the mobile view station.
 - Click **Help** in the top bar menu and select **Instructions for Use**.

The Electronic Instructions for Use is displayed on the screen, showing the table of contents on the left side of the window, and the content itself on the right side. A search function is also provided.

Accessing the Electronic Instructions for Use for Image Viewer (Option)



- 1 To open Image Viewer, press the Image Viewer button on the mobile view station console.
- 2 Click **Help** in the top bar menu and select **Instructions for Use**.

Accessing the Electronic Instructions for Use from the Internet

- 1 Read the product name and identification of your Electronic Instructions for Use in the startup screen of the Electronic Instructions for Use.
- 2 Go to the following website: www.philips.com/doc_library
- 3 Follow the instructions on the website and select your preferred language.

The PDF file is downloaded from the website and saved to your computer.

You can open the file using a PDF reader application. If you do not have a PDF reader application installed, you can download Adobe Reader from the following website: get.adobe.com/reader

Requesting a Paper Copy of the Instructions for Use

- 1 Read the product name and identification of your Electronic Instructions for Use in the startup screen of the Electronic Instructions for Use.
- 2 Go to the following website: www.philips.com/doc_library
- 3 Follow the instructions on the website to enter your name, address, and the requested Instructions for Use.

Within the European Union, you will receive a paper copy of the requested Instructions for Use within 7 calendar days.

5.8 Managing Patients and Examinations

Patients and examinations are managed in the **Administration** screen on the mobile view station.



The **Administration** screen is displayed after the system starts up. It can be displayed at any time during an examination or processing by pressing the **Administration** button.

The patients, and the associated examination, are stored in two patients lists:

- The **Schedule** list contains patients who are scheduled for an examination. Scheduled examinations are entered on the system directly, or retrieved from the RIS/HIS.
- The **Review** list contains all acquired examinations stored on the system. Examinations on the **Review** list can be opened for viewing or postprocessing. They can also be printed or exported to targets such as PACS, or stored on different media, depending on installed options.

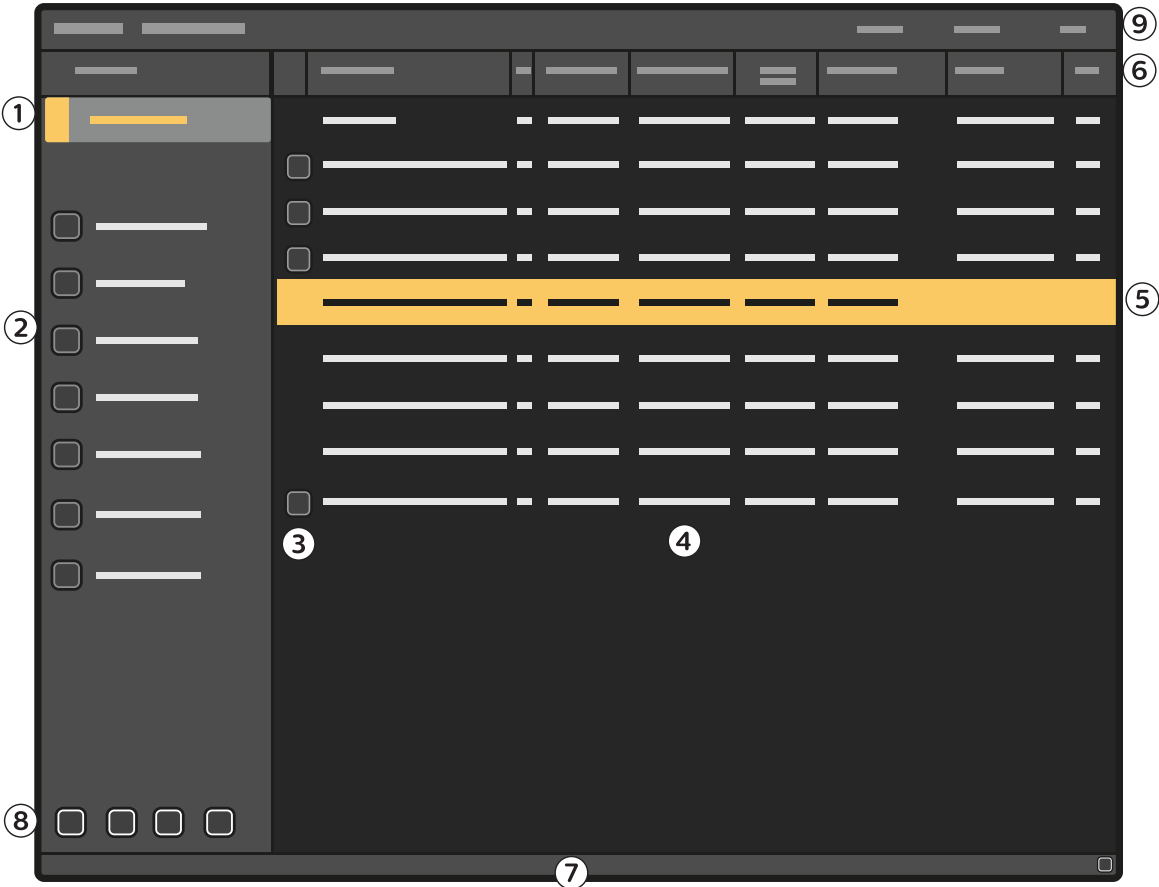


Figure 88 Administration screen on the examination monitor

Legend			
1	Task navigation panel	6	Column headings
2	Task control panel	7	Notification area
3	Status indicator	8	Global tools (Review task only)
4	Patient list	9	Top bar menu
5	Selected patient		

NOTE *If the password protection function is enabled, but no valid password is entered, access to the **Schedule** and **Review** lists is enabled, but the lists are empty. This is to allow emergency examinations to be acquired and reviewed.*

You can store a maximum of 250 examinations on the system. Once this limit is reached, the system deletes the oldest examinations to make space for new examinations. To ensure that data is not deleted inadvertently, consider deleting examinations which you no longer need to store on the system. For more information, see the following sections:

- [Deleting an Examination \(page 122\)](#)
- [Backing Up Patient Data \(page 323\)](#)
- [Archiving Patient Data \(page 323\)](#)

Tip

Examination monitor touch screen

The touch screen can be used to perform the actions described in the following sections. The operator can touch the screen directly to click buttons, and select and drag items.

**WARNING**

The system is not intended for long-term storage of patient data, and should only be used to store patient data that you are currently investigating. To ensure data security, patient data should only be stored on a secure storage device, i.e. a PACS.







NOTE *The data of an examination imported from a worklist management server (option) may be truncated for display on the mobile view station. The remaining characters are retained, and the full data will still be available if the examination is archived to a PACS, for example.*

Examination Status

The status indicator displays status information about an examination of a patient. The following list shows possible status indications.

If none of the following indications apply to an examination, no status indicator is displayed.

An examination may be valid for more than one status. In this case, the status indicator found highest in the following list is displayed.

Icon	Description
	Current acquisition examination.
	Current review examination. If the review examination is also the acquisition examination, acquisition status is shown instead.
	MPPS is performed and images of this examination have been queued for DICOM transfer. This does not necessarily mean that the images have been transferred.
	MPPS is performed and no images are queued for DICOM transfer.
	Images of this examination have been queued for DICOM transfer. This does not necessarily mean that the images have been transferred.
	Examination has been imported from the RIS/HIS using the worklist manager (WLM).

5.8.1 The Schedule List

The **Schedule** contains all scheduled examinations. By default, the list is displayed in the order in which the examinations are added, but the list can be ordered on any field by clicking on the desired field heading.

NOTE *To remove all the examinations currently in the list, refer to the Customization Manual in the Service documentation.*

Each line in the **Schedule** section represents one examination, and contains several fields to store information about the examination:

Field	Comment
Name	This field may not be fully displayed if the characters do not fit in the available space.
Gender	Male, Female or Unknown.
Date of birth	The format for this field is configured by Service during installation.
Patient ID	The display of Patient ID (or Accession number) is configured by Service or by a hospital administrator. This field may not be fully displayed if the characters do not fit in the available space.
Exam Type	Acquisition for the patient will be started using the selected examination type. To change the default examination type, see System Setup (page 43) .
Physician	This field may not be fully displayed if the characters do not fit in the available space. To edit the list of physicians, see System Setup (page 43) .

5.8.2 The Review List

The **Review** contains all completed examinations acquired on the system (including the current acquisition examination). By default, the list is displayed by examination date order, but the list can be ordered on any field by clicking on the desired field heading.

NOTE *There may be several pages of examinations in the Review section. Use the scroll bar, or the Page up or Page down buttons to view more pages.*

Each line in the **Review** represents one examination, and contains several fields to store information about the examination:

Field	Comment
Name	This field may not be fully displayed if the characters do not fit in the available space.
Gender	Male, Female or Unknown.
Date of birth	The format for this field is configured by Service during installation.
Patient ID	The display of Patient ID (or Accession number) is configured by Service or by a hospital administrator. This field may not be fully displayed if the characters do not fit in the available space.
Exam Date	The date of the first acquisition. The format for this field is configured by Service during installation.
Exam Type	The last examination type used for this examination is displayed, even if some images were previously acquired with a different examination type.
Physician	This field may not be fully displayed if the characters do not fit in the available space. To edit the list of physicians, see System Setup (page 43) .
Images	The number of images stored with the examination.

5.8.3 Querying the Worklist Management Server (Option)

If your system has the advanced DICOM software option installed, you can search for details of scheduled patients on the hospital network.

Querying the worklist management server on the hospital network allows you to receive details of scheduled patients stored on the server.

The connection settings to the worklist management server are configured at installation and can be changed by a hospital administrator.

- 1 From the administration screen, click **Schedule**.
- 2 Click **Get Worklist**.



The image shows a dark-themed UI mockup. At the top is a header bar with a small square icon on the left and a yellow horizontal bar. Below the header is a list of items. Each item consists of a horizontal bar on the left and a text area on the right. The first two items have a dropdown arrow on the right. Callout '1' points to the first dropdown. Callout '2' points to the third item. At the bottom are two buttons with horizontal bars inside.

Figure 89 Get Worklist dialog box

Number	Description
1	Read-only broad query
2	Patient-based query

The broad-query fields in the **Get Worklist** dialog box are defined during installation and are read-only. If any of the patient-based query fields are filled in, the **Scheduled Station AE-Title** and **Scheduled Station Name** fields are displayed blank.

Tip

Worklist Query	If any patient data is known use the patient-based query. If the patient is still not shown in the list, use the broad query function.
----------------	--

- 3** Enter a value in one or more of the patient-based fields, if known. Otherwise a broad query is selected.

You can enter all or the first part of a name, or use a wildcard in the Patient Name field. Use * as a wildcard for multiple characters or ? as a wildcard for a single character.

- 4** Click **Get**.



Scheduled patients are received from the worklist management server and are displayed in the **Schedule** list. The worklist management status indicator is displayed next to each received entry.

NOTE *The system must be online to receive scheduled patient data from the worklist management server.*

If an examination received from the worklist management server is already present in the **Schedule** list, the system checks and updates the information received for the examination.



- To view complete details of a scheduled patient received from the worklist management server, select the patient in the **Schedule** list and click **Exam Information**.

The **Examination Information** dialog box is displayed, showing all available information for the examination from the worklist management server. You can use this dialog box to view a patient's

special needs or allergies, or to confirm the patient's identity in cases of similarity. The **Examination Information** dialog box is only available for examinations received from the worklist management server.

You cannot change patient data from the worklist management server.

- 6 To close the **Examination Information** dialog box, click **Close**.

5.8.4 Importing External Data

You can import images and data from remote systems and sources such as a PACS or a removable storage device.

Importing data is done in conjunction with the **Image Viewer** application. You can only import images if the optional **Image Viewer** application is installed on your system.

For more information, see [Image Viewer \(page 73\)](#).

NOTE *The information presented in this section is only a quick reference. For a complete reference for effective and safe use of the Image Viewer product, refer to the Image Viewer Instructions for Use.*

Retrieving Images from a PACS

You can retrieve acquired images from the hospital network to assist with activities including:

- Pre-operative planning before acquiring runs with the system
- Intra-operative side-by-side comparison with live images as they are acquired with the system

To retrieve images from the network, refer to the **Image Viewer** product Instructions for Use.

Images that have been imported from a PACS, and that are no longer needed, should be removed to protect privacy of personal data.

NOTE *Export to the PACS is not possible since images imported are generally retrieved from a PACS, and are therefore already stored.*

Overview of Workflow

The combination of the system and the **Image Viewer** product is suited to the following workflow:

Pre-operative	
Get worklist and patient data	See Querying the Worklist Management Server (Option) (page 117) .
Get pre-operative images for surgical planning	Refer to the Image Viewer Instructions for Use.
Intra-operative	
Acquire images	Acquire images using the system. See Acquiring Images (page 129) .
Compare acquired images with pre-operative images	Use Image Viewer on the reference monitor to view acquired images and pre-operative reference images side-by-side.
Post-operative	
Send acquired images to HIS/RIS (PACS)	See Exporting Images to a Network Location (page 187) .
Print acquired images	See Printing Images (Option) (page 190) .
Personal archive or transfer	See Saving Images to Local Media (page 188) .

5.8.5 Adding a New Examination

If the patient to be examined is not already displayed in the **Schedule** list, you can add the patient. These steps describe how to add the patient manually. For more information about adding patients from the hospital worklist, see [Querying the Worklist Management Server \(Option\)](#) (page 117).

NOTE You can store a maximum of 250 examinations on the system. Once this limit is reached, the system deletes the oldest examinations to make space for new examinations. For more information, see [Backing Up Patient Data](#) (page 323) and [Archiving Patient Data](#) (page 323).

- 1

From the administration screen, click **Schedule**.
- 2

Click **Add** to display the **Add Patient** dialog box.



The screenshot shows the 'Add Patient' dialog box with the following numbered callouts:

- 1: Patient ID input field.
- 2: Patient Name input field.
- 3: Patient Address input field.
- 4: Patient City input field.
- 5: Patient State input field.
- 6: Patient Zip input field.
- 7: Patient Phone input field.
- 8: Patient Email input field.
- 9: Patient Gender dropdown menu.
- 10: Patient Race dropdown menu.
- 11: Patient Ethnicity dropdown menu.
- 12: Add button.
- 13: Cancel button.
- 14: OK button.

Figure 90 Add Patient dialog box

When you enter information in the **Add Patient** dialog box, you can use the Tab key on the keyboard to move the input focus to the next item.

Legend			
1	Patient Name	8	Accession number
2	Date of birth	9	Profile
3	Weight	10	Physician Name
4	Height	11	Examination Type
5	Gender	12	Add to list
6	Patient type	13	Start Examination
7	Patient identification	14	Cancel

3 Enter the patient's name in the **Patient Name** box.

4 Enter the patient's date of birth in the **Date of birth** boxes.

5 Enter the patient's weight in the **Weight** box.

The patient's weight should be entered in either kilograms or pounds, depending on what units have been configured in the system. The units to be used are shown beside the **Weight** box.

6 Enter the patient's height in the **Height** box.

The patient's height should be entered in either cm / feet and inches. The units to be used are shown beside the **Height** box.

7 Select **Male**, **Female** or **Unknown** for the patient's **Gender**.

8 Select **Adult** or **Pediatric** for the **Patient type**.

9 Enter the patient's ID in the **Patient identification** box.

10 Enter the **Accession number**.

NOTE *The Accession number is configured as editable or read only during installation.*

11 Select the desired **Profile** from the drop down lists.

NOTE *If you select an active profile during Add Patient, corresponding fields of Physician Name, Examination Type and Anatomy are automatically populated.*

12 In the **Physician Name** list, select the physician's name.

13 Select the **Examination Type** from the drop down list.

NOTE *Depending upon type of examination selected, respective anatomy is displayed.*

14 Do one of the following:

- To add the new examination, click **Add to list**.
- To start the examination immediately, click **Start Examination**.

The **Add Patient** dialog box closes and the new examination is added to the **Schedule** list or starts immediately.

Tip	
Enter data afterwards	It is not mandatory to enter patient data before the examination. The patient data can be modified afterwards. You cannot change patient data from the worklist management server.
Navigate	You can use the Tab key or you can select another field for input by using the touch screen or the pointer.
Select from a list	Press the Up or Down buttons to step through the items in a list.

Tip

Making corrections

To correct text in a text box, use the **Previous** and the **Next** buttons to position the insertion point next to the character that you want to remove, and then use the Backspace or Delete keys to remove the character.

The Backspace key removes the character before the insertion point, and the Delete key removes the character after the insertion point.

Use the **Undo** button to undo edits in a text box and return to the original value.

Special characters

For a list of special characters that you can use, see [Special Characters \(page 318\)](#).

To insert a special character, press and hold the **Compose** button and enter the first character, then release the **Compose** button and enter the second character.

5.8.6 Modifying an Examination

Examinations in either the **Schedule** or **Review** lists can be modified. Select the appropriate list in the **Administration** screen.

- 1 Select the desired examination in the list.



- 2 Click **Modify** in the **Administration** screen.

The **Modify** panel is displayed. This panel contains the same items as the **Add Patient** panel.

- 3 Modify the items as required.

If the examination has been received from a worklist management server, only the following items can be changed:

- Weight
- Height
- Procedure and anatomy/detailed procedure
- Physician
- Profile

- 4 Click **OK** to confirm the changes to the examination.

The **Modify** panel closes and the examination is updated.

5.8.7 Deleting an Examination

**CAUTION**

Deleting an examination cannot be undone.

You can delete examinations using the **Schedule** list or the **Review** list. Select the appropriate list in the **Administration** screen. The **Delete** function is enabled only when at least one examination is selected.

- 1 Select the examination (or examinations) in the **Schedule** list or the **Review** list.

You can select more than one examination by holding down the Shift or Ctrl keys and clicking on the desired examinations.



- 2 Click **Delete** to display the **Delete Examination** panel.

- 3 Check that the examination indicated in the **Delete Examination** panel is the examination that you want to delete.

When only one entry is selected, the **Delete Examination** panel displays the details of the entry. If two or more entries are selected, the **Delete Examination** panel indicates the number of entries selected.

- 4 Click **Delete** to delete the examination or examinations.

5.8.8 Delete Run

You can perform Delete Run function on the Mobile Viewing System (MVS).

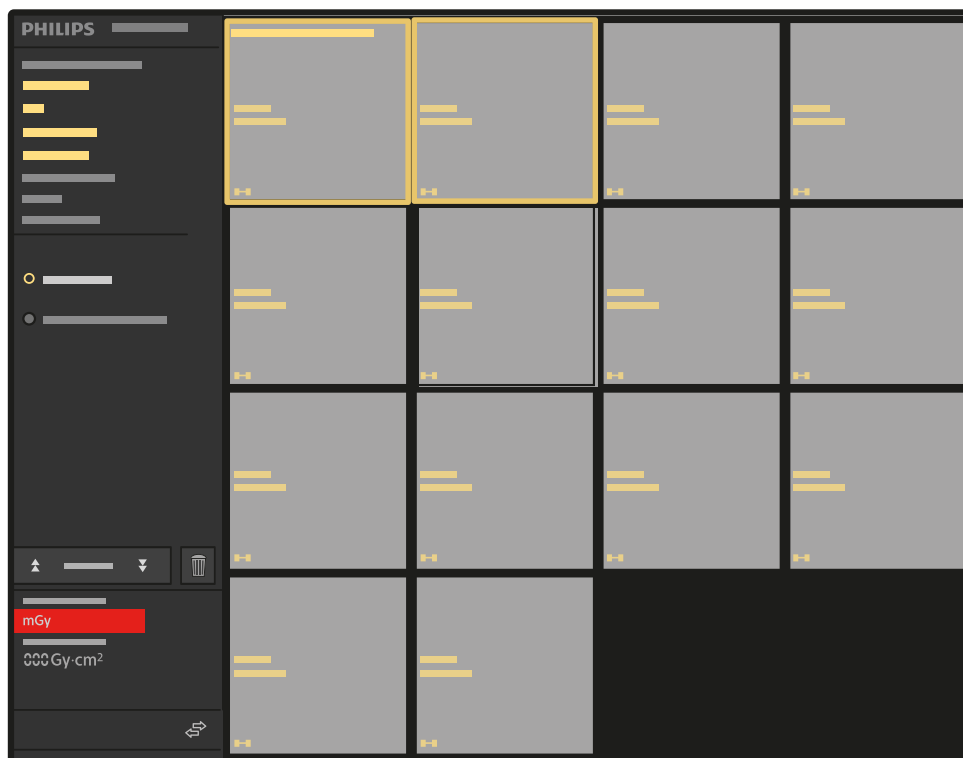


Figure 91 Delete Run

You can delete the images in the following ways:

- Select One image per run radio button. You can delete all or select images in the specific run that you want to delete.
- Deleting run

When you select to delete run, you are prompted to either to go ahead with the deletion or cancel it.



- Click **Delete** to delete the selected run.

5.8.9 Selecting a Patient for Acquisition

Use this procedure to start a new examination. If you do not use this procedure, new acquired images may be saved to the wrong patient folder.

- 1 Click **Schedule** in the **Administration** screen to display the **Schedule** list.
- 2 Select an examination of a patient for acquisition.
- 3 Click **Start examination**.



The selected examination becomes the acquisition examination.

The **Administration** screen is replaced by a blank screen on the examination monitor. The hospital, patient and physician data is displayed in the top left of the screen, ready for acquisition. The patient's name is also displayed in the center of the screen. Image data is displayed in the bottom right of the screen. All newly acquired images are added to this examination.

Tips

Status	Only examinations of patients in the Schedule list can be selected for acquisition.
Examination type	<p>When no examination type is selected, the default type is used. During the examination, the examination type can be changed on the C-arm stand.</p> <p>Tap the Examination Type selection button on the C-arm stand touch screen, select the desired procedure and anatomy/detailed procedure, and accept the selection.</p> <p>You can select the examination type for the acquisition patient on the mobile view station while the mobile view station is disconnected from the C-arm stand.</p>
Acquire	<p>It is possible to acquire images without using the Start examination button.</p> <p>If acquisition is started while another patient has been selected for acquisition, new images are stored for that patient.</p> <p>If acquisition is started without selecting an examination of a patient, all acquired images are stored under the "No name" examination.</p>
Reviewing examinations	<p>For details about selecting an examination for review, see Image Review (page 155).</p> <p>For more information about processing images after acquisition, see Image Processing (page 171).</p>

5.8.10 Closing the Current Acquisition Examination

You can close the current acquisition examination from the administration screen.

If the current acquisition examination is not selected, the **Close** button is disabled. The **Close** button is not available if the function was disabled at system installation.

An examination is automatically closed if you start an examination for a new patient.



- 1 Ensure the current acquisition examination is selected.

- 2 Click **Close**.

A confirmation dialog is displayed, requiring the operator to select whether to close the current acquisition examination.

- 3 Click **Yes** to close the current acquisition examination.

No more images can be added for this examination.

- 4 Click **No** to keep the current acquisition examination selected for acquisition.

NOTE *If DICOM Structured Dose Reporting is enabled, the job viewer is displayed and transfer of the DICOM Structured Dose Report is started automatically. For more information see [Viewing Transfer Jobs in the Job Viewer](#) (page 191).*

5.8.11 DICOM Radiation Dose Structured Report

The DICOM Radiation Dose Structured Report is a format for dose reporting that meets the DICOM conformance statement. The report and its content are not visible on the system, but the report is sent

through the DICOM network. When enabled at installation (or by the hospital administrator), the DICOM Radiation Dose Structured Report provides the following functions:

- The system automatically sends the report to the transfer queue when an examination is closed or removed from the **Review** list.
- At startup the system displays the reminder panel if there are DICOM radiation dose structured reports in the transfer queue.

NOTE A separate radiation dose structured report task is created for each configured target.

The DICOM radiation dose structured report can be enabled at installation. For more details of the DICOM Radiation Dose Structured Report, refer to the DICOM conformance statement.

5.9 Configuring a User Profile

You can configure a profile by setting your preferences for general system level parameters and IQ tastes, for the procedure/all procedures, and then you can associate the profile with the required patient. By default the system provides inbuilt profiles for Adult and Pediatric.



Figure 92 Manage Profile and System Default Profiles

Legend			
1	Profile	3	Adult Default
2	Manage Profile	4	Pediatric Default

5.9.1 Add Profile

NOTE You can add up to 100 profiles. You can add a new profile by deleting an existing unwanted profile. You can request the service person to export the user profiles to external USB drive as a backup.


Perform following steps to add a profile:

- 1 In the administration screen, click **Profile**.
- 2 In **Manage Profile** screen, Click **Add New** to display the **Add Profile** dialog box.



Figure 93 Adding a Profile

Legend			
1	General Parameters	8	Units of weight
2	Image Quality Preferences	9	Units of height
3	Profile name	10	Image rotation angle
4	Physician name	11	LIH Auto park
5	Patient type	12	Video Invert
6	Examination	13	Add to list
7	Units of measurement		

- 3 In the **General Parameters** section enter a unique profile name in the **Profile name** text box.
- 4  Select the desired **Physician Name** from the drop down list. Click **Edit** to add Physician name if it is not available in the list. For more information see [Modifying the Physician List \(page 45\)](#)
- 5 Select the **Patient type**
 - **Adult**
 - **Pediatric**
- 6 Select the desired **Examination** from the drop-down list.
Depending upon type of Examination selected, respective anatomy is displayed.
- 7 Select the desired **Anatomy** from the drop-down list.
- 8 Select **Units of measurement**
 - mm
 - inch

9 Select Units of weight

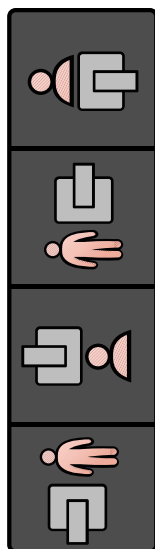
- kg
- lb(s)

10 Select Units of height

- cm
- feet and inches

11 Select desired Image rotation angle from the drop-down list.

The angle of image rotation are available based on the position of the patient and flat detector as shown below:

**12 Select the LIH Auto park check box to enable Auto park functionality. [Auto park \(page 170\)](#) .****13 Select the Video Invert check box to enable Video invert.****14 In the Image Quality Preferences section, select the appropriate tastes.**

Depending on type of patient selected, the appropriate tastes/preference are displayed:

- Select IQ Tastes **Standard** or **High Contrast** or **Super Contrast** (applicable for 25 kW configuration) if the Patient type selected is Adult.
- If Patient type selected is Pediatric, then only **Pediatric** option is displayed.

15 Click Add to list button to add the profile to the list.

In the **Manage Profile** panel you see profile name added to the list.

16 To close the dialog box without saving the changes, click Cancel.

5.9.2 Modifying a User Profile

You can modify an existing profile and add it to list with the same profile name or with a different name for scheduled patients.

1 In the administration screen, click Profile .**2 In the Manage Profile panel, select the profile that you want to modify and click Modify.****3 The Modify Profile panel is displayed.****4 Modify the items as desired.**

- You can only modify one profile at a time.
- If scheduled exams are associated with a profile, a confirmation message is displayed.

- 5 Click **Save** to confirm the changes.
- 6 To close the dialog box without saving the changes, click **Cancel**.

NOTE *You cannot modify active user profiles.*

5.9.3 Deleting a User Profile

You can delete an existing profile from the list. However, you cannot delete the active profile.

- 1 In the administration screen, click **Profile**.
- 2 In the **Manage Profile** panel, select the profile from the list that you want to delete and click **Delete**.
- 3 Click **Delete** in the confirmation message.
- 4 Click **Cancel** to exit from **Manage Profile** panel.

NOTE *You can delete more than one profile by holding down the Shift or Ctrl keys.*





CAUTION

Deleting a user profile cannot be undone.

5.10 System Readiness

The readiness of the system to perform procedures is indicated using symbols.

The system readiness is indicated on the live monitor on the mobile view station and in the status area of the C-arm touch screen using the following symbols:

Symbol	Status
	The system is ready for acquisition.
	The system is not ready for acquisition.

There can be several reasons why the system may not be ready for acquisition, for example:

- The system may be locked (see [System Lock \(page 103\)](#).)
- The system may be too hot (see [Heat Indications \(page 131\)](#).)
- The C-arm stand is not connected to the mobile view station and the mobile view station is being used in stand-alone mode.

5.10.1 Timer On/Off

The Timer On/Off feature can be accessed on the Stand UI screen.

Press the **Timer On/Off** button.

The button will glow, indicating that the **Timer On/Off** is activated.

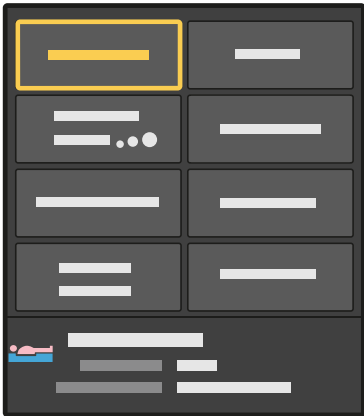


Figure 94 Timer On/Off button on Stand UI

Once the Timer is activated in Stand UI, the Count-up timer will be displayed on the MVS.

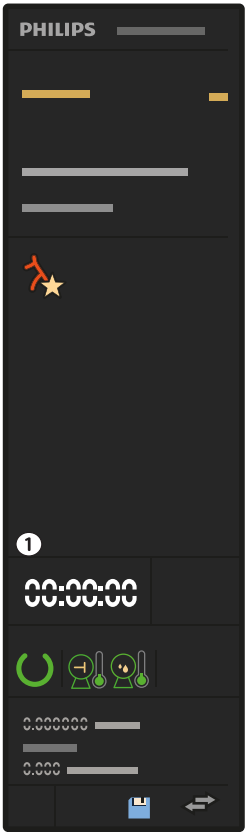


Figure 95 Count-up Timer (1)

5.11 Acquiring Images

For optimal use, perform the following steps.

- 1 Select the correct examination type by selecting the desired procedure and the desired anatomy/ detailed procedure.

The correct examination type presets the system parameters automatically and minimizes the need for manual adjustments. The table below gives an overview of the examination types and their use.

NOTE *Anatomy and detailed procedure names can be changed by a service technician, but the technical parameters remain as specified.*

Examination Type		
Procedure	Anatomy / Detailed Procedure	Use
Skeleton	Skull	Fracture repair in skull, fracture repair/fusion in cervical spine (dense shoulder, C6/C7).
Skeleton	Thorax	For inserting catheters in the thorax region.
Skeleton	Spine	Fracture repair/fusion in spine (thoracic, lumbar), Scoliose - Lordose correction.
Skeleton	Pelvis / Lumbar Spine	Fracture repair in pelvis area.
Skeleton	Arm	Fracture repair in upper extremities (hand, arm).
Skeleton	Hip/Leg	Fracture repair in lower extremities (foot, leg, hip).
Vascular	Cerebral	Control of intercranial aneurysms.
Vascular	Aortic Arch	Vascular procedures in the aortic arch.
Vascular	Abdominal	Abdominal aortic aneurysm procedures (AAA/EVAR), and all other vascular procedures in the abdomen.
Vascular	Arm	Subclavian/Axillary/Brachial/Radial/Ulnar artery, Endarterectomy, control of bypasses.
Vascular	Leg	Femoral/Popliteal/Tibial artery, Endarterectomy, control of bypasses.
Vascular	Bolus Chase	Tracking progress of contrast medium in peripheral angiography.
Vascular	Abdominal CO2	Abdominal aortic aneurysm procedures (AAA/EVAR), and all other vascular procedures in the abdomen, with CO2 as contrast medium.
Vascular	Arm CO2	Subclavian/Axillary/Brachial/Radial/Ulnar artery, Endarterectomy, control of bypasses, with CO2 as contrast medium.
Vascular	Leg CO2	Femoral/Popliteal/Tibial artery, Endarterectomy, control of bypasses, with CO2 as contrast medium.
Cardio	Coronaries	Left/right coronary arteries.
Cardio	Ventricle/TAVI	Ventriculography and heart valve replacement.
Cardio	Pacemaker	For pacemaker and resuscitation implants.
Cardio	Electrophysiology	Electrophysiology, standard imaging quality for procedures with a lot of movement and very long procedure times.
Pain	Head	Pain treatment in head, neuromodulation, laser nucleolysis.
Pain	Neck	Pain treatment in neck/cervical spine.
Pain	Spine	Pain treatment in spine (thoracic, lumbar).
Pain	Pelvis / Lumbar Spine	Pain treatment in pelvis area.
Pain	Arm	Pain treatment in upper extremities (hand, arm).
Pain	Hip/Leg	Pain treatment in lower extremities (foot, leg, hip).
Endoscopy	ERCP	Endoscopic Retrograde Cholangio Pancreatic procedure (observation of the gallbladder, pancreas and liver) and other soft tissue imaging in the abdomen, where there is a lot of movement and where high contrast is important.
Endoscopy	Esophagus	Barium swallow.
Endoscopy	Bronchus	Bronchoscopy, transbronchial biopsy.
Urology	Kidney	Kidney procedures, intravenous pyelogram (IVP), urologic procedures in the abdomen with high contrast and minimal movement.

Examination Type		
Procedure	Anatomy / Detailed Procedure	Use
Urology	Lithotripsy	Breaking of a calculus (by shock waves or by crushing with a surgical instrument) in the urinary system into pieces small enough to be voided or washed out.
Urology	Bladder	Cystoscopy.
Urology	Ureterography	Radiography of the ureter after injection of a contrast medium.

- 2 Start acquisition by pressing the left or right hand/foot switch.
 - Press the left hand/foot switch for fluoroscopy or roadmap.
 - Press the right hand/foot switch for exposure, which can be single shot, run, subtract, or trace.



WARNING

Misinterpreting still images as live images could lead to serious patient injury. When images are live, the fluoroscopy or exposure icon is displayed on the examination monitor, the X-ray on indicator light is on, and the X-ray indication icon is displayed on the C-arm stand touch screen.

NOTE The default acquisition mode for left and right hand/foot switches is set at installation but can be changed by a service technician. See the Zenition 90 Examination Settings addendum to these Instructions for Use for more information.

5.12 Heat Indications

Heat indications are displayed on the mobile view station and on the C-arm stand.



WARNING

The surface temperature of the X-ray tank can reach 60 degrees (Celsius) during prolonged X-Ray activation. Take care to avoid contact between the patient and the x-ray tank, especially when the tank is above the patient table. Placing protective covers or drapes over the X-Ray tank will further reduce the risk of direct contact between the X-Ray tank and the patient.



WARNING

The surface temperature of the Flat detector can increase up to 45 degrees (Celsius) during prolonged usage. Take care to avoid contact between the patient and Flat detector surface as far as possible. Put protective covers or drapes over the detector.

NOTE Heat indication icons are displayed in the status area of the C-arm stand and the mobile view station. An increased anode or oil temperature can result in restricted use or blockage of high dose acquisition modes. Under such restricted conditions, only emergency fluoroscopy can be used or run time may be restricted.

The system limits or disables the use of X-ray to prevent damage to the system as a result of overheating, and preventing the system becoming a danger to patients or hospital staff.

Anode heat is limited to prevent the X-ray generator from being damaged. Oil is used to cool the tube housing. This temperature is limited to prevent the tube housing becoming too hot.

The system displays warnings if the system performance is degraded as a result of overheating.

The time taken for the system to cool is dependent upon the level of operation previously undertaken and whether the anode or the X-ray tank oil needs to cool. The anode cools quickly, for example, in less than one minute, but the X-ray tank oil can take longer, for example, as much as 60 minutes.



If the system is too hot to allow the system to be used, the system readiness icon in the status area indicates that the system is not ready to perform X-ray. For more information about the system readiness icons, see [System Readiness \(page 128\)](#). A message is displayed on the C-arm stand touch screen and on the mobile view station, telling you the cause.

If the anode is too hot to allow the system to be used, a countdown is displayed above the system readiness icon showing the number of seconds you must wait before the system is ready to perform X-ray.

If the X-ray tank oil is too hot to allow the system to be used, a message is displayed in the status area indicating the approximate time until the X-ray tank oil is cool enough to allow the system to be used again. A countdown is not displayed beside the system readiness icon.

If the anode heat indication is displayed as orange for more than 20 minutes or as red for more than 15 minutes, the system is temporarily blocked and cannot be used. If the system is blocked due to a high anode temperature, a countdown timer is displayed with the heat indication icon, showing the number of seconds left until the system can be used again.

If the oil temperature continues to rise, the system is temporarily blocked and cannot be used until the oil has cooled sufficiently. A message is displayed in the status area showing an estimate of the cooling time required before the system can be used again.

Tip




Preventing the system from overheating

You can prevent the system from overheating or increase the time it takes for the system to become hot by making some changes to the way that you acquire images, for example, by increasing the amount of time allowed for the system to cool between series, reducing the pulse rate, reducing the dose, and by not using detector zoom.

Heat Indications on the Mobile View Station




On the mobile view station, separate heat indications are displayed for anode and X-ray tank (oil) temperatures.

The following heat indications are displayed in the status area for the anode temperature.

Indication	Description
	Green: The anode temperature is within the normal working range. The system can be used for all acquisition modes.
	Orange: The anode is warm, but the system can be used for all acquisition modes.
	Red: The anode is hot. The system is not available for high dose level modes.




When a high dose mode is selected, it is indicated on the **Fluoroscopy** expander on the C-arm stand touch screen by a + symbol. For more information, see [Dose Level \(page 150\)](#).

The system also monitors the X-ray tank oil temperature and provides indications in the status area. The following heat indications are displayed for the tank oil temperature.

Indication	Description
	Green: The X-ray tank oil temperature is within the normal working range. The system can be used for all acquisition modes.
	Orange: The X-ray tank oil is warm, but the system can be used for all acquisition modes.
	Red: The X-ray tank oil is hot. The system is only available for very low dose fluoroscopy procedures.

Heat Indications on the C-arm Stand

On the C-arm stand, a combined anode and oil temperature indication is displayed in the status area. Messages are displayed in the status area to indicate whether the anode or oil temperature is causing the indication.

Indication	Description
	Green: The anode and the tank oil temperatures are within the normal working range. The system can be used for all acquisition modes.
	Orange: Either the anode or the X-ray tank oil is warm, but the system can be used for all acquisition modes.
	Red: Either the anode or the X-ray tank oil is hot. A message is displayed in the status area of the C-arm stand touch screen to indicate whether this is due to anode heat or X-ray tank oil heat, and to indicate whether the system is blocked from use. You can also check the heat indication displayed on the mobile view station to determine if the anode or X-ray tank oil is hot.

5.13 Acquisition Modes

Default acquisition modes are automatically selected when you select an examination type. The acquisition modes indicate the modes programmed under the hand and foot switches.

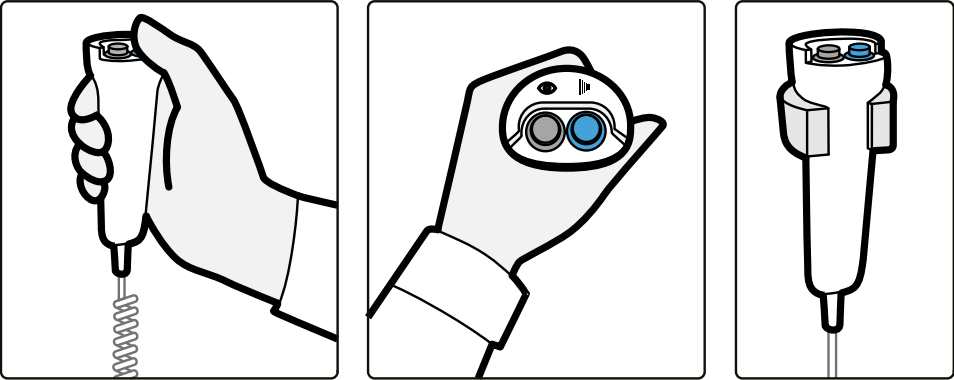


Figure 96 Hand switch

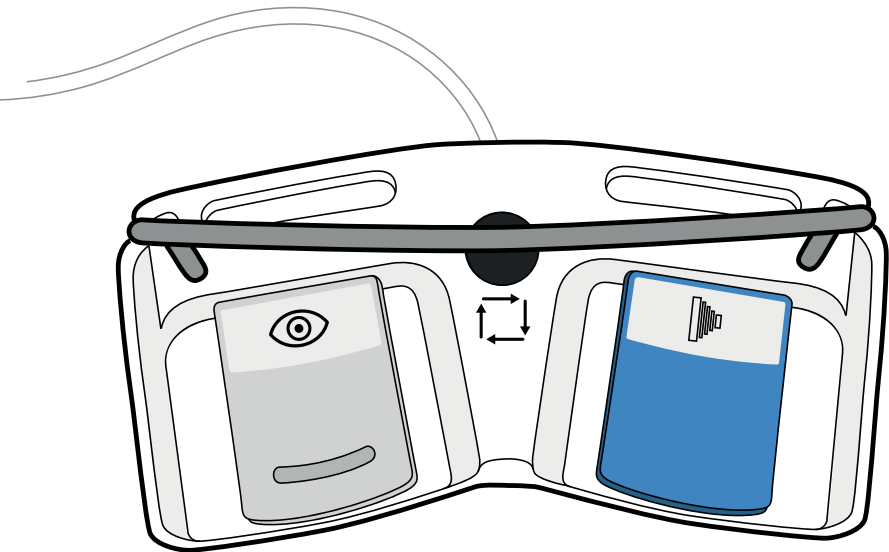


Figure 97 Foot switch

You can select an alternative acquisition mode by tapping the **Fluoroscopy** expander or the **Exposure** expander on the C-arm stand touch screen and selecting an acquisition mode from the **Mode** drop-down list in each.



If configured to do so at installation, you can also use the **Mode** button on the remote control or the middle pedal of the foot switch, to cycle through the available acquisition modes.

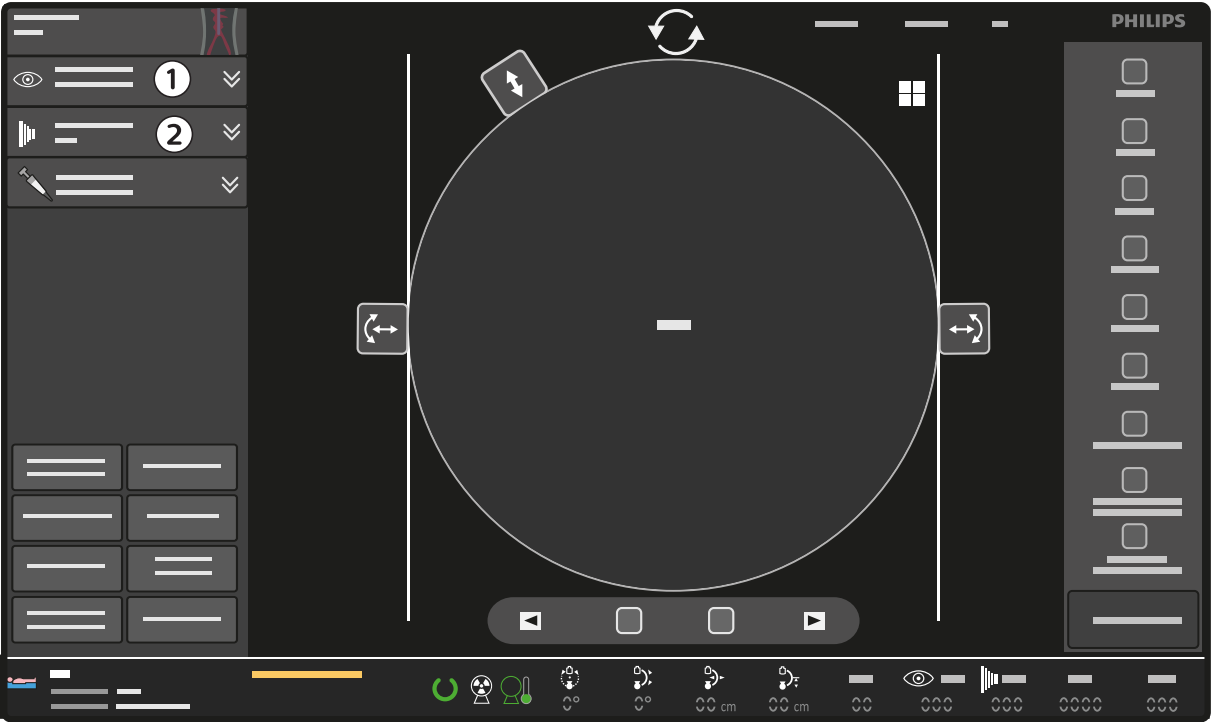


Figure 98 Fluoroscopy and Exposure expanders on the C-arm touch screen

Legend	
1	Fluoroscopy expander
2	Exposure expander

The selected acquisition mode combination determines the functions of the left and right hand/foot switches for the next live images. The following tables shows the combinations available for the left and right hand/foot switches if all acquisition modes are enabled. The combinations with Roadmap are configured when the system is installed.

Roadmap-Trace Combination

Left Hand/Foot Switch	Right Hand/Foot Switch
Fluoroscopy	Single Shot
	Run
	Subtract
	Subtract (CO2)
Roadmap	Trace
Roadmap CO2	Trace (CO2)

Roadmap-Subtract Combination

Left Hand/Foot Switch	Right Hand/Foot Switch
Fluoroscopy	Single Shot
	Run
	Subtract
	Subtract (CO2)
Roadmap	Subtract
Roadmap CO2	Subtract (CO2)

The selected acquisition mode combination is also displayed on the mobile view station.

Possible acquisition mode selections depend on the selected examination type and selection of **CO2** in the examination type menu.

If **Roadmap** is selected in the **Fluoroscopy** expander **Mode** drop-down list, **Trace (CO2)** or **Subtract (CO2)** is automatically selected for the right hand/foot switch. If **Roadmap** is changed to **Fluoroscopy** in the **Fluoroscopy** expander **Mode** drop-down list, **Single Shot** is automatically selected for the right hand/foot switch.

If **Trace** is selected in the **Exposure** expander **Mode** drop-down list, **Roadmap** is automatically selected for the left hand/foot switch. If **Trace** is changed to any other mode, **Fluoroscopy** is automatically selected for the left hand/foot switch.

If the roadmap-subtract combination was configured when the system was installed, then any other selection in the mode list in the **Exposure** expander will automatically result in **Fluoroscopy** being selected for the left hand/foot switch.

NOTE *Different options will be available depending on the examination type or installed examination data set.*

5.14 Making Fluoroscopy Images

Fluoroscopy imaging is recommended for C-arm (re)positioning and guiding purposes during surgical and interventional procedures.



- 1 To perform fluoroscopy, press either the left hand switch key [H1] or the left pedal [F1] of the foot switch.



The hour glass icon is shown when the system is preparing for acquisition.



The live icon indicates that X-ray is active and live images are being shown.



When the left key of the hand switch [H1] or the foot switch [F1] is released, X-ray is stopped and the Last Image Hold (LIH) is displayed.

Tips

X-ray alarm timer

When fluoroscopy is performed for more than five minutes a buzzer beeps. Tap the **OK** button on the C-arm stand touch screen to confirm the warning displayed and to switch off the buzzer. Fluoroscopy can continue.

X-ray is disabled till you reset the buzzer.

Tips	
Pulse rate	To change the pulse rate, tap the Fluoroscopy expander on the C-arm stand touch screen and select the desired frequency from the Pulse Rate drop-down list.
Dose level	To change the dose level, tap the Fluoroscopy expander on the C-arm stand touch screen and select the desired dose level from the Dose drop-down list.
Storage	<div>To change the storage setting, tap the Fluoroscopy expander on the C-arm stand touch screen and select the desired storage setting from the Storage drop-down list.</div> <div><ul style="list-style-type: none">No storage: no images are storedLIH: only the LIH image is storedAll: images are stored with a storage rate equal to the pulse rate.</div>
Noise and blur	<div>To reduce the noise level, tap the Fluoroscopy expander on the C-arm stand touch screen and tap the Reduce Noise button.</div> <div>To reduce blur, tap the Fluoroscopy expander on the C-arm stand touch screen and tap the Reduce Blur button.</div> <div>If the Reduce Blur toggle button is active, less noise reduction is applied to the image. If the Reduce Noise toggle button is active, more noise reduction is applied to the image.</div> <div>These are toggle buttons. If one of the buttons becomes active, the other becomes or remains, inactive.</div>



WARNING


The surface temperature of the X-ray tank can reach 60 degrees (Celsius) during prolonged X-Ray activation. Take care to avoid contact between the patient and the x-ray tank, especially when the tank is above the patient table. Placing protective covers or drapes over the X-Ray tank will further reduce the risk of direct contact between the X-Ray tank and the patient.


NOTES


- X-ray loading is disabled after 10 minutes continuous loading. To continue with X-ray, release the hand switch or foot switch and then press it again.
- The maximum continuous X-ray time depends on the selected examination type, acquisition mode, pulse speed and dose level. It may vary from 10 minutes to 60 seconds to 30 seconds. The applicable maximum continuous X-ray time is listed in the Zenition 90 Examination Settings addendum to these Instructions for Use.
- For dose awareness purposes, the system always generates high frequency repeating beeps for modes that can exceed 88 mGy/min’.
- The system can be configured at installation to provide a single beep at the start of X-ray or low frequency repeating beeps for modes that can not exceed 88 mGy/min.
- High level mode is activated by selecting dose high.
- High level mode is indicated by a + symbol on the C-arm stand touch screen.

5.14.1 Fluoroscopy Grab of a Live Image

- 1

To store and protect the currently displayed image during live fluoroscopy, do one of the following:
- 
 - Press the **Protect** button on the mobile view station.


 - Press the **Protect** button on the remote control.


 - Tap **Flag** on the C-arm stand touch screen.

The 'grabbed' image is stored in a new series.

- 2
- To store and protect the additional images during the same fluoroscopy acquisition, do one of the following:



- Press the **Protect** button again on the mobile view station.
- Press the **Protect** button again on the remote control.
- Tap **Flag** again on the C-arm stand touch screen.





- NOTE**
- All images stored during the same fluoroscopy acquisition will be saved in the same series.*
- NOTE**
- If the fluoroscopy grab function is used, the last image hold image will also be stored automatically as part of the saved series.*

5.15 Making Exposure Images

Exposure is recommended when you want to store high quality images or when you want to use high quality single shots, subtraction or trace.



- 1
- To acquire exposure images, press either the right button of the hand switch or the right pedal of the foot switch.

	The hour glass icon is shown when the system is preparing for acquisition.
	The live icon indicates that X-ray is active and live images are being shown.
	When the right button of the hand switch or the foot switch is released, X-ray is stopped and the last image hold (LIH) image is displayed.
	If auto run cycle is selected, run cycle of the last acquired run starts automatically.

- 2
- To stop acquiring exposure images, release the right button of the hand switch or the right pedal of the foot switch.



WARNING

Misinterpreting still images as live images could lead to serious patient injury. When images are live, the fluoroscopy or exposure icon is displayed on the examination monitor, the X-ray on indicator light is on, and the X-ray indication icon is displayed on the C-arm stand touch screen.



WARNING

X-ray loading is disabled after 10 minutes continuous loading. To continue with X-ray, release the hand switch or foot switch and then press it again.

Tips	
X-ray alarm timer	When X-ray is performed for more than five minutes a buzzer starts. Tap OK on the C-arm stand touch screen to confirm the warning displayed and to switch off the buzzer. X-ray can continue.
	If the signal is not reset within 5 more minutes of X-ray or exposure, X-ray is disabled.

Tips	
Pulse rate	To change the pulse rate, tap the Exposure expander on the C-arm stand touch screen and select the desired frequency from the Pulse Rate drop-down list.

The maximum continuous X-ray time depends on the selected examination type, acquisition mode, and pulse speed. It may vary from 10 minutes to 60 seconds to 30 seconds. The applicable maximum continuous X-ray time is listed in the Zenition 90 Examination Settings addendum to these Instructions for Use.

Images are stored in the (unprotected) working area of the image disk for high quality exposures. However, they can be overwritten by new runs when they are not protected. For more information, see [Protection and Image Storage Management \(page 167\)](#)


For mandatory dose awareness purposes, the system always generates high frequency repeating beeps for modes that can exceed 88 mGy/min.

The system can be configured at installation to provide a single beep at the start of X-ray or low frequency repeating beeps for modes that can not exceed 88 mGy/min.




- NOTE** *Activation of high level mode depends on the selected acquisition mode.*
- NOTE** *High level mode is indicated by a + symbol on the C-arm stand touch screen.*
- NOTE** *Due to specific regulations in some countries, some acquisition modes in some cases will not go to the high level mode, and will therefore not be indicated with a + symbol, nor be accompanied by a High Level beep signal during x-ray.*

5.16 Making Single Shot Images

Single shot exposure is used for high quality archiving. It is also suitable for moments in a procedure when exceptional image quality is required (for example, to view catheter tips).

- 
- 1 If the **Single Shot** acquisition mode has not been selected already, then tap the **Exposure** expander on the C-arm stand touch screen and select **Single Shot** from the **Mode** drop-down list.
 - 2 To ensure optimal image quality first make a scout image using fluoroscopy to set the correct kV value by pressing the left button on the hand switch or the left pedal of the foot switch.
 - 3 Then press either the right button of the hand switch or the right pedal of the foot switch to make a single shot exposure.

NOTE *Single Shot is not a real time imaging mode. The image display delay can be longer than for fluoroscopy.*

	The hour glass icon is shown when the system is preparing for acquisition.
	The live icon indicates that a newly acquired image is shown.
	The exposure is ready when the audible signal is given and the last image hold (LIH) image is displayed.

5.17 Making Vascular Images

Some examination types can be used for making vascular images. In vascular examination types, the **Mode** drop-down lists in the fluoroscopy and exposure expanders allow you to select between:

- **Fluoroscopy / Roadmap**
- **Run**
- **Subtract**
- **Trace**
- **Single Shot**

For more information on the possible combinations of acquisition modes for the left and right hand and foot switches, see [Acquisition Modes \(page 133\)](#).

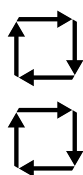


WARNING

Misinterpreting still images as live images could lead to serious patient injury. When images are live, the fluoroscopy or exposure icon is displayed on the examination monitor, the X-ray on indicator light is on, and the X-ray indication icon is displayed on the C-arm stand touch screen.

5.17.1 Performing Subtraction

1 Use one of the following to change the mode to **Subtract**:



- Tap the **Exposure** expander on the C-arm stand touch screen and select **Subtract** from the **Mode** drop-down list.
- Press the middle pedal of the foot switch to toggle to **Fluoroscopy / Subtract** mode.
- Press the **Mode** button on the remote control to toggle to **Fluoroscopy / Subtract** mode.

The mode is displayed in the lower-right corner of the examination monitor.

Tips

Motion artifacts

Do not move the system or patient during the subtraction procedure. This will result in motion artifacts.



2 Press either the right button of the hand switch or the right pedal of the foot switch.

After completion of the mask, the image is turned to grey and the message **Inject** appears on the monitor.

NOTE *Do not release the hand/foot switch until the subtraction run is completely finished. When the hand/foot switch is released, a new mask is made immediately after performing exposure again.*

3 Start injecting (Uncoupled injection) the contrast medium when the **Inject** message appears on the monitor. Images of the contrast bolus will appear on the monitor.


NOTE *Refer section [Injector Interface \(page 221\)](#) for subtraction functionality with interfaced injector (Coupled injection).*

4 Release the hand switch button or the foot switch pedal as soon as the contrast bolus has faded away.

5 To view the individual images of the run, tap the **Previous** and **Next** buttons on the C-arm stand touch screen, or on the remote control, or the **Previous** and **Next** buttons on the mobile view station.



- 6
- To check the acquired images dynamically, tap the **Run cycle** button on the C-arm stand touch screen, or on the remote control, or **Run cycle** button on the mobile view station.

Tips	
Making corrections	To make corrections on a subtraction run, see Remasking (page 143) and Pixel-shift (page 181) .
Subtraction on/off	It is possible to switch the subtraction on and off with the subtract on/off button on the remote control or the mobile view station, either during the procedure or during post-process. <div></div>
Landmarking	The amount of background (mask) information in a subtracted image is user selectable out of four different values. For more information, see Landmarking (page 182) .
Auto run cycle	For information on enabling disabling automatic run cycle, see Enabling and Disabling Automatic Run Cycle (page 165) .

5.17.2 Performing Roadmap after Subtraction

It is possible to use a subtracted image as a roadmap to help you navigate the catheter through the vessels.

- 1
- Select the image to be used as roadmap, from a previously acquired subtraction run.

For more information about navigating through the images, see [Single Image Screen \(page 156\)](#) and [Overview Screen \(page 162\)](#).
- 2
- Use one of the following to change the mode.
 - Tap the **Fluoroscopy** expander on the C-arm stand touch screen and select **Roadmap** from the **Mode** drop-down list.
 - Press the middle pedal of the foot switch to toggle to **Roadmap** mode.

NOTE *It works if middle pedal is configured by FSE.*

 - Press the **Mode** button on the remote control to toggle to the **Roadmap** mode.

The mode is displayed in the lower-right corner of the examination monitor.




- 3
- Press either the left button on the hand switch or the left pedal of the foot switch.

The system switches to roadmap. The mask image will be reversed so that the vessels are displayed as white. The mask image is not reversed if **Roadmap CO2** is selected.

The image can now be used for catheter guidance.

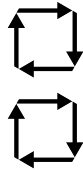
NOTE *When using an image of a previous run, make sure that neither the system nor the patient have moved since that previous run.*

Tips	
Use other images for roadmap	Unsubtracted images with contrast medium can also be used for roadmap.

Tips	
Recall	An image displayed on the reference monitor can be made current on the examination monitor and can be used as the roadmap mask. To do this, tap the Recall button on the C-arm stand touch screen or press the Recall button on the remote control. 
Zooming	For better visibility of fine guide wires when using roadmap, it is highly recommended that you use one level of detector zoom (medium). For more information on using detector zoom, see Detector Zoom (page 144) .


5.17.3 Performing Roadmap with Trace (Peak Opacification)

Peak opacification can be used to view the vasculature of the area of interest completely opacified in one image. As the contrast medium flows through the area of interest, the system traces all the exposure images (trace black for iodine and trace white for CO2 injections). In this way a subtraction image is created showing all the places the contrast medium flowed through. The traced image is then available as a roadmap for catheter guidance.

- 
- 1 Use one of the following to change the mode to **Trace**:
 - Tap the **Exposure** expander on the C-arm stand touch screen and select **Trace** from the **Mode** drop-down list.
 - Press the middle pedal of the foot switch to toggle to **Trace** mode.
 - Press the **Mode** button on the remote control to toggle to **Trace** mode.

The mode is displayed in the lower-right corner of the examination monitor.

Tips	
Optimum image quality	Stop immediately after building up the vessel image for optimum image quality.
Motion artifacts	Do not move the system or patient during the procedure. This will result in motion artifacts.
Zooming	For better visibility when using Roadmap, it is highly recommended that you use one level of detector zoom (medium). For more information on using detector zoom, see Detector Zoom (page 144) .

- 
- 2 Press either the right button on the hand switch or the right pedal of the foot switch.
 - 3 Start injecting (Uncoupled injection) the contrast medium when the **Inject** message appears on the monitor.

During trace, the vessels with contrast medium are displayed as black for iodine (optional white for CO2) on a subtraction image.

NOTE *If automatic run cycle is active, you must first select the image to be used for roadmap. For more information about image navigation, see [Single Image Screen \(page 156\)](#) and [Overview Screen \(page 162\)](#).*

Tip	
Park	Park the traced image on the reference monitor for later use with Recall .

Tip

Performing roadmap with trace

If you are performing roadmap with trace often, disable automatic run cycle to avoid the need to select the image used for roadmap. See [Enabling and Disabling Automatic Run Cycle](#) (page 165).



- 4 Press either the left button on the hand switch or the left pedal of the foot switch.

The image is inverted so that the vessels are displayed as white.

- 5 Guide the catheter (displayed as black) using **Roadmap** through the vessels.

Tips

Recall

If you change from **Roadmap** mode to **Fluoroscopy**, and obtain standard (non-roadmap) fluoroscopy images, then return to **Roadmap** mode for additional roadmap imaging in the same location, press the **Recall** button on the remote control or tap **Recall** on the C-arm stand touch screen.



The **Recall** function copies the image from the reference monitor onto the examination monitor, to be used as a roadmap mask.

5.17.4 CO2 Acquisition Modes

Additional CO2 acquisition modes can be activated when selecting a vascular procedure if CO2 has been enabled on the system.

When selecting a vascular procedure, **CO2** and **Iodine** buttons are shown on the examination type selection menu.

If aortic arch or cerebral anatomies have been selected, or if the **Bolus Chase Leg** toggle button is active, the **CO2** button is disabled and the **Iodine** button is active.

If the **CO2** button is enabled and active, additional acquisition modes can be selected in the same way as other acquisition modes using the **Mode** drop-down lists in the **Fluoroscopy** and **Exposure** expanders on the C-arm stand touch screen.

The additional acquisition modes available are:

- **Roadmap CO2**
- **Trace (CO2)**
- **Subtract (CO2)**

If **CO2** is active:

- Trace white is used if the **Trace** acquisition mode is selected.
- The **Bolus Chase Leg** toggle button is disabled if displayed.
- The **Iodine** button is not active.

If **Iodine** is active:

- Trace black is used if the **Trace** acquisition mode is selected.
- The **Bolus Chase Leg** toggle button is enabled if displayed.
- The **CO2** button is not active.

For more information on acquisition mode combinations, see [Acquisition Modes](#) (page 133).

NOTE *If the acquisition mode for the left hand/foot switch is changed from Roadmap CO2 to Fluoroscopy, the right hand/foot switch mode will change to Single Shot.*

5.17.5 Remasking

By default, the first image of a run is used as the mask. It is possible to use another image from the same run as a mask (e.g. an image closer to the start of the injection) to provide better quality images for the entire subtraction run.

- 1 Select the image to be the new mask (e.g. an image closer to the start of the injection).

For more information about navigation through the images, see [Single Image Screen \(page 156\)](#) and [Overview Screen \(page 162\)](#).



- 2 Remask by pressing the **Remask** button twice on the mobile view station.

Tips

Remote control	Subtraction can be switched on and off without remask using the remote control (no mask can or will be selected).
Remask	Care should be taken not to confuse the Remask button with the Subtract on/off button. The Remask button is only available on the mobile view station.

5.17.6 Bolus Chase

Bolus chasing is normally performed before, but sometimes after, a vascular leg examination and with **Bolus Chase** selected on the C-arm stand touch screen. The settings of the right hand/foot switch in this examination are optimized for bolus chase runs.

- 1 Tap the **Examination Type** button on the C-arm stand touch screen.

The **Examination Type Selection** menu is shown.

- 2 Tap **Vascular** as the selected procedure (step 1).
- 3 Tap **Leg** as the selected anatomy (step 2).
- 4 Tap the **Iodine** button.

The **Bolus Chase Leg** toggle button will appear.

NOTE *If the CO2 option is not available, the Iodine button will not be shown but the Bolus Chase Leg button will be shown.*

- 5 Tap the **Bolus Chase Leg** toggle button to select the bolus chase function.
- 6 Make sure the default settings meet the requirements (pulse rate) for the bolus chase. If not, tap the Exposure expander on the C-arm stand touch screen and select the desired frequency from the **Pulse Rate** drop-down list.
- 7 Press either the left button of the hand switch or the left pedal of the foot switch and move the C-arm (see [Transportation \(page 77\)](#)) or tabletop continuously during fluoroscopy to check the covering of the bolus chase route.



- 8 Release the left button of the hand switch or the left pedal of the foot switch and position the C-arm or tabletop to the start location of the bolus chase.



- 9 Press either the right button of the hand switch or the right pedal of the foot switch and follow the injected contrast medium by moving the C-arm or tabletop continuously.
- 10 Release the right button of the hand switch or the right pedal of the foot switch to stop the exposure run at the end of the bolus chase route.

5.18 Imaging Essentials

The following essential imaging functions can be applied during X-ray or when the last image hold symbol is displayed on the examination monitor. These functions are available from the C-arm stand touch screen.

A setting which has been overridden is indicated by a * shown next to the altered setting in the **Fluoroscopy** expander. When the default setting for the acquisition mode is selected, the * indicator is not shown.



WARNING

Fast switching of the Hand switch/Foot switch may not display an image. In case no image is observed on the monitor, release the Hand switch/Foot switch, and press it again after at least 1 second. There should be at least 1 second gap between two consecutive Hand switch and Foot switch press.

5.18.1 Detector Zoom

You can change the detector zoom size to fit the anatomical structure in the area of interest. The following detector zoom selections are available:

- No zoom
- Zoom 1 (medium zoom)
- Zoom 2 (maximum zoom)

You can change the detector zoom during acquisition. Changing the zoom interrupts acquisition briefly (less than one second).

Any images captured during a change of detector zoom are marked as not suitable for the measure function.

After changing the detector zoom, the collimator is automatically adjusted to the appropriate size.

Detector zoom is set to the largest zoom mode (no zoom) if another examination becomes current for acquisition.

NOTE *Square images (FD12) / squircle Image (FD17) are only displayed when no detector zoom is applied and image rotation is 0, 90, 180, or 270 degrees (± 2 degrees).*

You can change the detector zoom using the C-arm stand touch screen or using the remote control.

Changing the Detector Zoom Using the C-arm Stand Touch Screen

- 1 Tap the **Detector Zoom** toggle button on the C-arm stand touch screen.



detector zoom 1 (medium) is applied. The level of zoom being used is shown on the **Detector Zoom** toggle button.

The currently selected detector zoom mode is also displayed on the examination monitor for a few seconds.

- 2 Tap the **Detector Zoom** toggle button on the C-arm stand touch screen again to increase the level of zoom to zoom 2 (maximum).



Maximum detector zoom is applied.

- 3 Tap the **Detector Zoom** toggle button on the C-arm stand touch screen again to switch off detector zoom.



The detector is returned to no zoom.

Changing the Detector Zoom Using the Remote Control



- 1 Press the **Detector Zoom** button.

The currently selected detector zoom is displayed on the examination monitor for a few seconds.

- 2 While the detector zoom mode is displayed on the examination monitor, press the **Detector Zoom** button repeatedly to cycle through no zoom, zoom 1 (medium), and zoom 2 (maximum) until the desired detector zoom is selected.

5.18.2 Contrast and Brightness

Contrast and brightness can be changed using the C-arm stand touch screen.



- 1 Tap the **Contrast Brightness** toggle button on the right toolbar.

A slider appears beside the **Contrast Brightness** toggle button.



Figure 99 Contrast Brightness slider

- 2 Slide the pointer up on the touch screen to increase the brightness and contrast.

Or

- Drag the slider down on the touch screen to decrease the brightness and contrast.

NOTE *Changes made to contrast and brightness using the C-arm stand touch screen will also affect the examination monitor. The effect of these changes may be more pronounced on the examination monitor due to the differences in contrast and brightness between the examination monitor and the C-arm stand touch screen.*

- 3 Tap the **Auto** button to toggle the automatic brightness and contrast function, which displays optimal image quality according to the image content.

The function does not affect the contrast and brightness slider position.

The **Auto** toggle button is shown as active (yellow outline) when this function is switched on. The button is shown as inactive (no outline) when **Auto** is switched off.

The new contrast and brightness setting is applied to all images on the examination monitor. The setting is not applied to an image already parked on the Reference monitor.

NOTE *Do not use the C-arm stand touch screen as the leading display to evaluate image quality. Instead use the mobile view station examination monitor.*

You can also adjust contrast and brightness when post-processing images. For more information, see [Adjusting Contrast and Brightness \(page 172\)](#).

5.18.3 Rotating Images

Image rotation can be performed during X-ray or when the last image hold symbol is displayed on the examination monitor.

It is not possible to rotate an image if an outline drawing is present. If rotation is attempted while a drawing is present, the image will not be rotated and a warning is displayed on the examination monitor and the C-arm stand touch screen.

If the zoom, measure, annotation, or outline drawing post-processing functions have been applied to the last image hold image, the image is not rotated.



- 1 Rotate the image by dragging the image rotation control in a circular motion, clockwise or counterclockwise, on the C-arm stand touch screen.

When an image is rotated, the shutter controls, shutter markers and ClearGuide indicators are also rotated around the center of the image.

Square images (FD12) / squircle Image (FD17) are displayed when image rotation is close to 0, 90, 180, or 270 degrees (± 2 degrees) and no detector zoom is used. If a square image (FD12) / squircle Image (FD17) are displayed, the image switches to a round image when rotated. If the image is rotated close to 0, 90, 180, or 270 degrees (± 2 degrees), a square image (FD12) / squircle Image (FD17) are displayed again.

A round image displayed in last image hold will always remain round, irrespective of the rotation applied.

- 2 To reset the image to the original position, drag the image rotation icon back to its original position on the C-arm stand touch screen.

The new setting is used for subsequent images in this examination.

The last selected image rotation is applied to all stored images in a run.

NOTE *Starting a new examination resets the image rotation to the default setting.*

NOTE *Square images (FD12) / squircle Image (FD17) are only displayed when no detector zoom is applied and image rotation is close to 0, 90, 180, or 270 degrees (± 2 degrees).*

5.18.4 Mirroring and Flipping Images

The live X-ray image or the last image hold image can be mirrored horizontally (left/right), or flipped vertically (top/bottom).

It is not possible to mirror/flip an image if an outline drawing is present. If mirroring/flipping is attempted while a drawing is present, the image will not be mirrored/flipped and a warning is displayed on the examination monitor and the C-arm stand touch screen.

If the zoom, measure, annotation, or outline drawing post-processing functions have been applied to the last image hold image, the image is not mirrored/flipped.



- 1 To mirror an image left or right, tap the **Mirror** toggle button on the C-arm stand touch screen.

The button will appear active (yellow outline) when the image is mirrored.

The new setting is used for subsequent images in this examination.

- 2 To restore the mirrored image to its original orientation, tap the **Mirror** toggle button again.

The button will appear inactive (no outline) and the image returns to its original orientation.

The new setting is used for subsequent images in this examination.



- 3 To flip an image (top/bottom), tap the **Flip** toggle button on the C-arm stand touch screen.

The button will appear active (yellow outline) when the image is flipped.

The new setting is used for subsequent images in this examination.

- 4 To restore the flipped image to its original orientation, tap the **Flip** toggle button again.

The button will appear inactive (no outline) and the image returns to its original orientation.

The new setting is used for subsequent images in this examination.

NOTE *The last selected image mirroring/flipping is applied to all stored images in a run.*

NOTE *Starting a new examination resets the mirroring/flipping to the default setting.*

5.18.5 Automatic Shutter Positioning

Automatic shutter positioning (ASP) allows the operator to rapidly position shutters with a single button tap on the C-arm stand touch screen. This is effective in reducing direct radiation.

NOTE *ASP will only position the shutters correctly when the image contains areas of direct radiation.*

ASP When Shutters are not Fully Open

Use this procedure when the last image hold image is displayed and the shutters or collimator are not fully open.



- 1 Reset the shutter and collimator positions by tapping the **Reset Shutters and Collimator** button on the C-arm stand touch screen.

The shutters and collimator are reset to their fully open positions.

- 2 Perform fluoroscopy to make an last image hold image.



- 3 To activate ASP, tap the **Automatic Shutter Pos** button on the C-arm stand touch screen.

The shutters are shown in the display in the most applicable position for the LIH image.

- 4 If required, fine-tune the final shutter positions manually (see [Collimator and Shutter Adjustments in Last Image Hold \(page 148\)](#)).



- 5 Acquire images as desired. The new shutter positions are used for subsequent images.

NOTE *If an optimum position cannot be found after activating ASP, the shutters remain in the reset position and a warning message is displayed.*

ASP When Shutters are Fully Open

Use the following procedure when the last image hold image is displayed and the shutters and collimator are in the reset position (fully open).



- 1 To activate ASP, tap the **Automatic Shutter Pos.** button on the C-arm stand touch screen.

The shutters are shown in the display in the most applicable position for the last image hold image.

- 2 If required, fine-tune the final shutter positions manually (see *Collimator and Shutter Adjustments in Last Image Hold* (page 148)).



- 3 Acquire images as desired. The new shutter positions are used for subsequent images.

5.18.6 Collimator and Shutter Adjustments in Last Image Hold

The collimator and shutter positions are indicated on the image. When adjusted, the new position is used for subsequent images.

If configured at installation, when you make collimator or shutter adjustments in last image hold using the C-arm stand controls, the new positions of the collimator and shutters are displayed on the examination monitor at the mobile view station.



Figure 100 Collimator and shutter controls on the C-arm stand touch screen

Legend	
1	Shutter controls
2	Collimator control

NOTE When a new examination of a patient is selected, collimator and shutter positions are reset.

- 1 Manually adjust the shutter positions by dragging the shutter controls on the C-arm stand touch screen until the shutter is at the desired position and at the desired angle.



The shutter will automatically rotate around the center of the image area as the control is dragged.



- 2 Manually adjust the collimator position by dragging the collimator control towards, or away from, the center of the image.



- 3 Reset the shutter and collimator positions by tapping the **Reset Shutters and Collimator** button on the C-arm stand touch screen.

The shutters and collimator are reset to their fully open positions.

5.18.7 Automatic kV/mA control

By default the image brightness is controlled automatically by means of modifying the kV and mA value. The unique BodySmart function instantly adapts the shape and size of the measuring field to the patient's relevant anatomy.

5.18.8 Manual kV/mA Control

For some projections and/or image contents (e.g. a bladder filled with contrast medium) it may be necessary to override the automatic kV/mA control with the manual kV/mA control function.

- 1 Tap **kV Manual** on the C-arm stand touch screen to change to manual control.



Figure 101 kV Manual button (1) on the C-arm stand touch screen

- 2 Tap the arrows to increase or decrease the kV value.



The mA value is coupled to the kV value.

- 3 To switch back to automatic control, tap **kV Manual** again.

5.18.9 Pulse Rate

You can change the pulse rate by tapping the **Fluoroscopy** expander or the **Exposure** expander on the C-arm stand touch screen and selecting a pulse rate from the **Pulses** drop-down list.

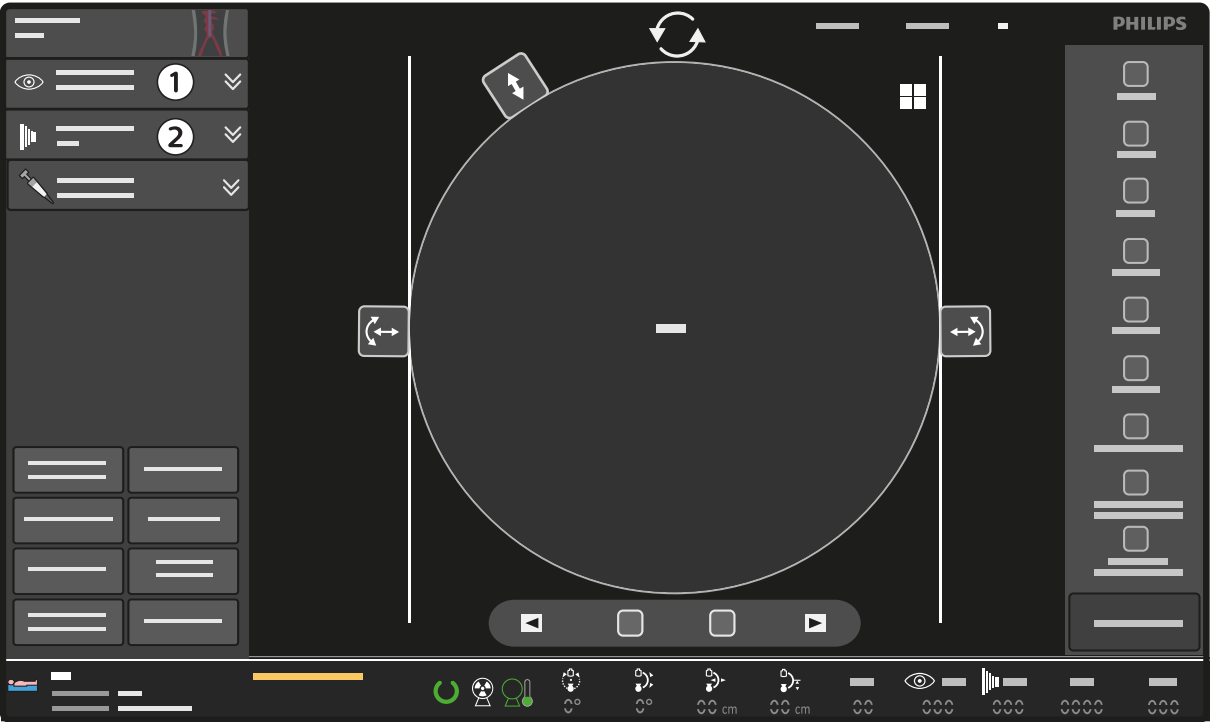


Figure 102 Pulse rate

Legend	
1	Fluoroscopy expander
2	Exposure expander

You can select between full, $\frac{1}{2}$, and $\frac{1}{4}$ pulse rates for effective dose reduction. The actual pulse rates available depend on the selected procedure or anatomy/detailed procedure. For example, if the full pulse rate is 15 pulses/second, $\frac{1}{2}$ pulse rate is 7.5 pulses/second and $\frac{1}{4}$ pulse rate is 3.75 pulses/second (displayed as 4).

5.18.10 Dose Level

You can change (override) the default dose level setting for the acquisition mode being used.

The dose level can be changed by tapping the **Fluoroscopy** expander on the C-arm stand touch screen and selecting a dose level from the **Dose** drop-down list.

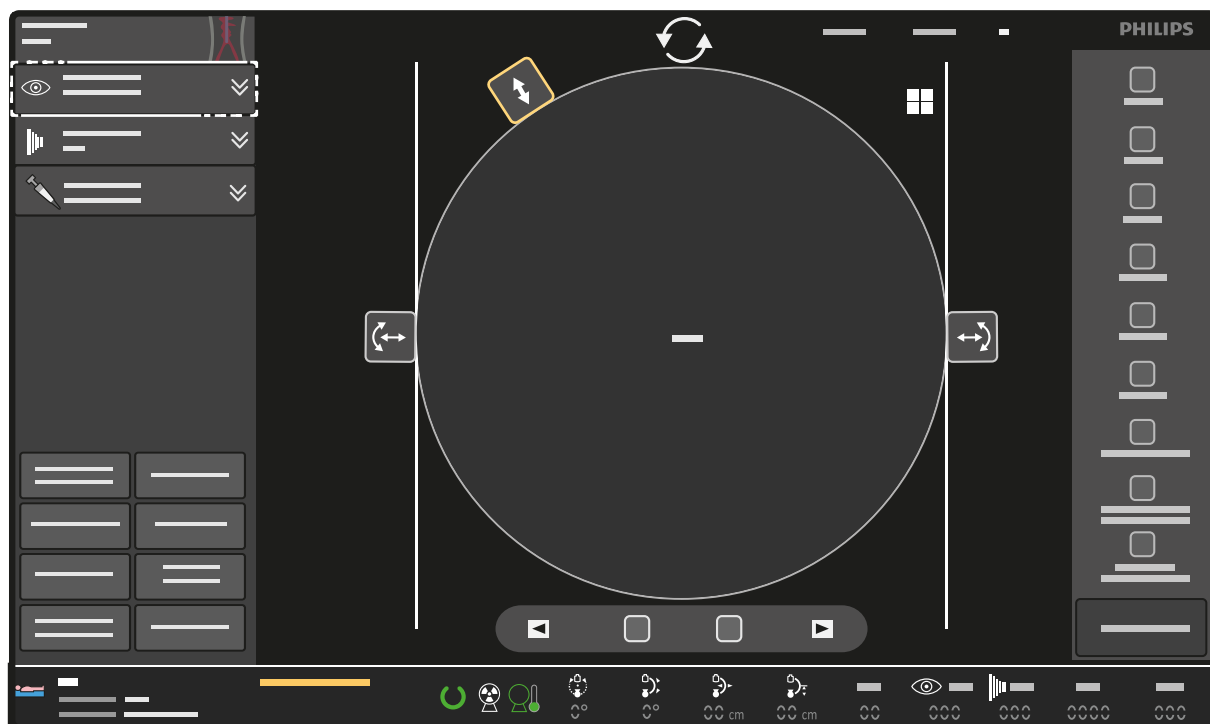


Figure 103 Fluoroscopy expander on the C-arm stand touch screen

The following dose levels can be selected:

- **Low**
- **Normal**
- **Medium**
- **High**

When high mode is selected, it is indicated on the **Fluoroscopy** expander by a + symbol.

NOTE *The available selections and the default are defined by the current acquisition mode.*

Changing the Dose Level Using the Remote Control

You can also override and select the dose level using the remote control if this has been enabled at system installation.



- 1 Press the **Mode** button on the remote control to cycle through the available dose levels.

The dose level is changed to the next available dose level.

The selected dose level is shown on the examination monitor.

Pressing the **Mode** button on the remote control changes the dose level in use in a predetermined order:

- **Low**
- **Normal**
- **Medium**
- **High**

For example, if the **Normal** dose level is in use, pressing the **Mode** button on the remote control will change the dose level to **Medium**. Pressing the **Mode** button again will change the dose level to **High**.

NOTE *Some dose levels may not be available to select depending upon the current acquisition mode, or if they have been disabled at system installation. When a dose level is not*

available, it is automatically skipped when cycling through the dose levels using the remote control.



- 2 Continue pressing the **Mode** button until the desired dose level is selected.

When the highest available dose level is reached, pressing the **Mode** button again, cycles the selection back to the beginning of the cycle, i.e the lowest available dose level.

5.18.11 Storage Rate

You can change the rate at which images are stored when performing live fluoroscopy.

To change the storage setting, tap the **Fluoroscopy** expander on the C-arm stand touch screen and select the desired storage setting from the **Store** drop-down list.

- **No storage:** No images are stored.
- **LIH:** Only the LIH image is stored.
- **All:** Images are stored with a storage rate equal to the pulse rate.

5.19 ClearGuide

The ClearGuide function provides information to the surgeon and the operator concerning image orientation in relation to the detector position.

Direction indicators are displayed on the examination monitor and C-arm stand touch screen, corresponding to markings on the detector, to support communications between the surgeon and system operator when positioning the C-arm. The direction indicators allow the surgeon to give clear instructions to the operator about which direction the C-arm should be moved in and which orientation of the image is required on the examination monitor, before and after X-ray has been used.

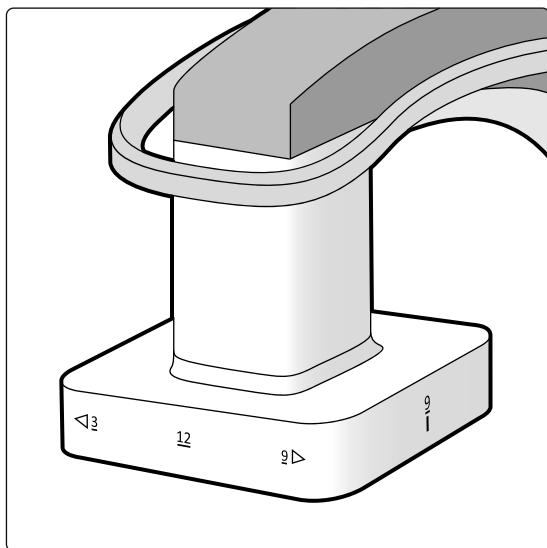


Figure 104 ClearGuide direction indicators on the detector

The direction indicators and markings (**3**, **6**, **9**, and **12**) are intended to mimic the face of a clock for ease of understanding and communication.

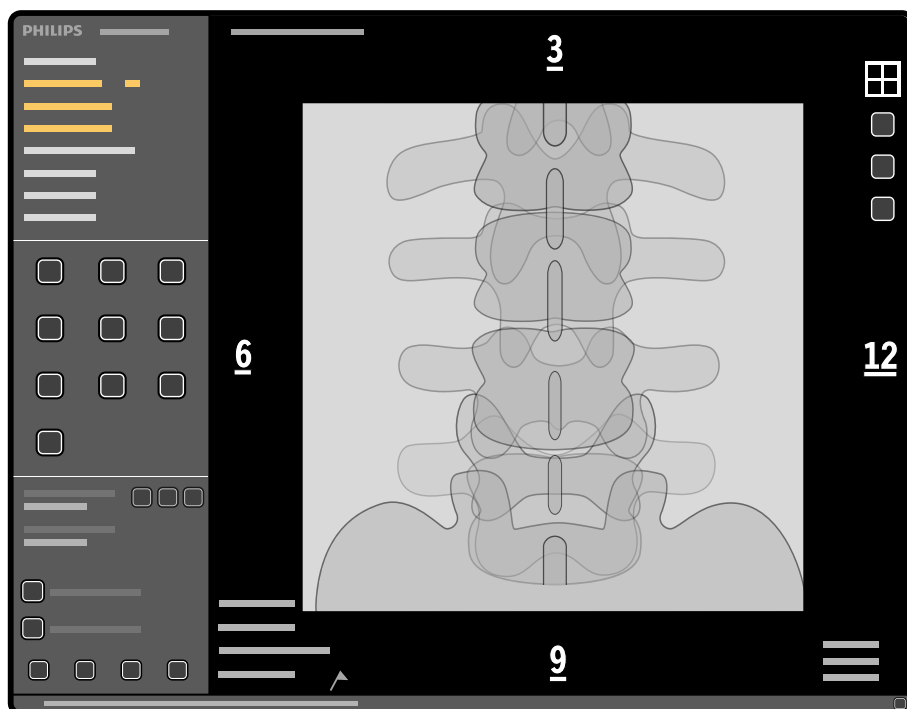


Figure 105 Direction indicators on the examination monitor

Image Orientation

During examinations, the surgeon may request that the image orientation is changed. The ClearGuide function supports communication between the surgeon and the operator in such cases.

If a scheduled patient is selected for acquisition with the patient name displayed in the middle of the screen, the direction indicators appear on the examination monitor when ClearGuide is selected.

Examples of How ClearGuide Can Be Used

The surgeon may request that the image orientation is changed on the examination monitor. For example, the surgeon may ask the operator to position the **9** at the bottom of the image with the **12** to the right side of the image.

The operator would rotate the image clockwise through 90 degrees and flip the image (top/down) using controls on the C-arm stand touch screen.

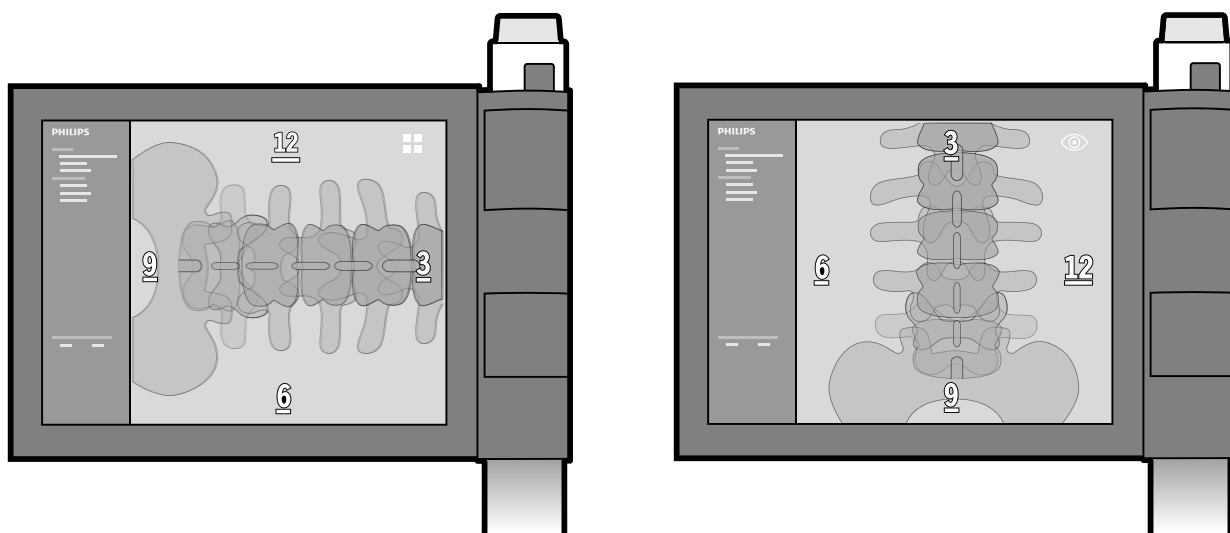


Figure 106 Original direction indicators position (left) and changed orientation example (right)

These markings also assist the operator in setting up the system when a surgeon is not present.

For more information on repositioning the C-arm, see [C-arm Repositioning](#) (page 83).

5.19.1 Using ClearGuide

ClearGuide is only available for the examination patient during a procedure and is not available for images reviewed from disk.

ClearGuide is deactivated if another acquisition examination becomes current.

- 1 Tap **ClearGuide** on the C-arm stand touch screen.

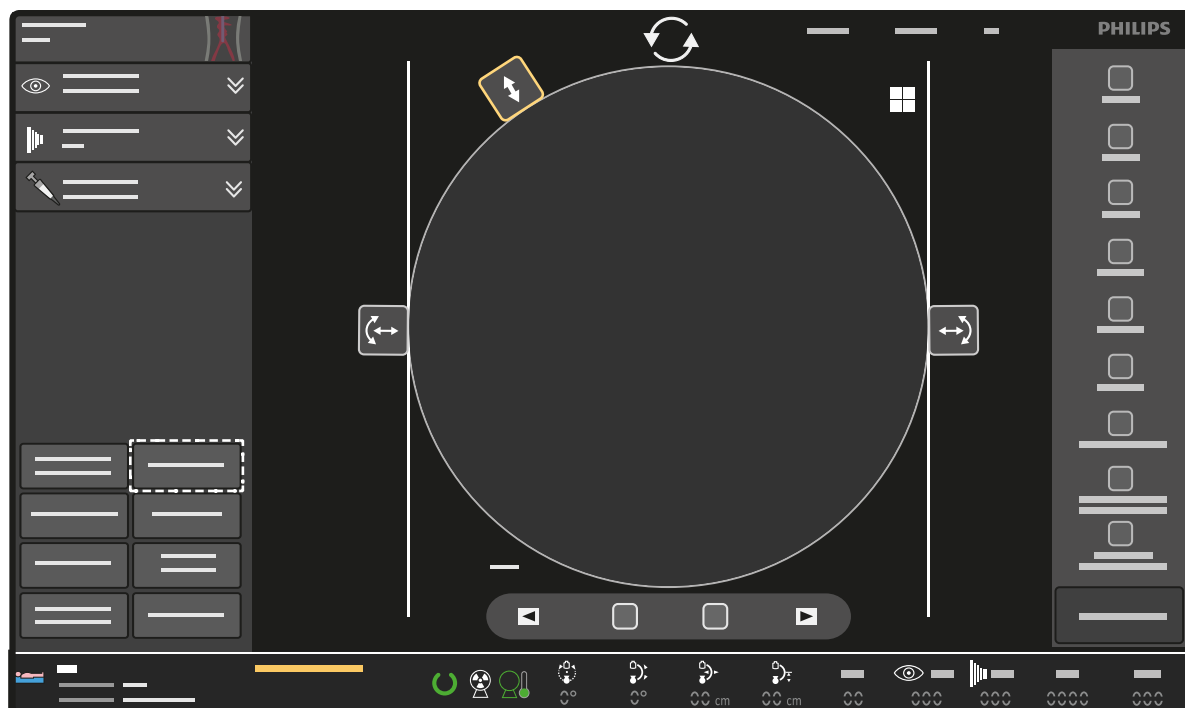


Figure 107 ClearGuide button on the C-arm stand touch screen

The ClearGuide direction indicators appear on the examination monitor and the C-arm stand touch screen.

- 2 Before first X-ray, rotate, mirror, and/or flip the image on the C-arm stand touch screen until the direction indicators on the examination monitor are in the orientation requested by the surgeon.

The system repositions the direction indicators if the image is rotated, flipped or mirrored.

The direction indicators are not included in an image that is saved to local media. The direction indicators are included in a screen snapshot that is made using the **USB** button or is printed (except for a DICOM printer).

- 3 When ClearGuide is no longer required, tap **ClearGuide** on the C-arm stand touch screen.

The ClearGuide direction indicators are removed from the examination monitor and the C-arm stand touch screen.

5.20 Image Review

You can review examinations on the mobile view station monitors. Controls for reviewing examinations are available at the mobile view station. A subset of review controls is also available on the remote control and at the C-arm stand touch screen.

For information about reviewing external data, see [Importing External Data \(page 119\)](#).

5.20.1 Selecting an Examination for Review

Examinations stored on the system can be opened for review on the mobile view station. All available examinations are stored in the **Review** list, accessible from the administration screen. For more information, see [The Review List \(page 117\)](#).



- 1 If the administration screen is not already displayed, press the **Administration** button.

The current review examination is highlighted.

- 2 If desired, select a different examination for review.

If the **Review** list contains more examinations than can be displayed on one screen, use the scroll bar, **Page up** or **Page down** buttons to view examinations further down the list.



- 3 Click **Show Examination**.

The last image of the last run of the selected examination is displayed on the examination monitor in single image mode.

When there are no stored images for the selected examination, the **Show Examination** function is disabled.









When the **Review** list is displayed, the current review examination can also be opened by pressing the **Single image** button or the **Overview** button on the mobile view station. When there is no current review examination, the current acquisition examination is displayed.

5.20.2 Image Navigation panel

You can use the C-arm stand touch screen to access principal review functions at the C-arm stand. The functions available at the C-arm stand are a subset of those available at the mobile view station, and

they can be used to review the runs in the acquisition examination. A different review examination can only be selected at the mobile view station. For more information, see [Selecting an Examination for Review](#) (page 155).

The following review functions are available at the C-arm stand touch screen:

Icon	Function
	Previous image
	Run cycle
	Overview
	Next image
	Previous run
	Pause
	Next run
	Previous overview screen
	Next overview screen
	Single image

5.20.3 Single Image Screen

The single image screen displays one image from the run. The image displayed from the run is dependent on the function used.

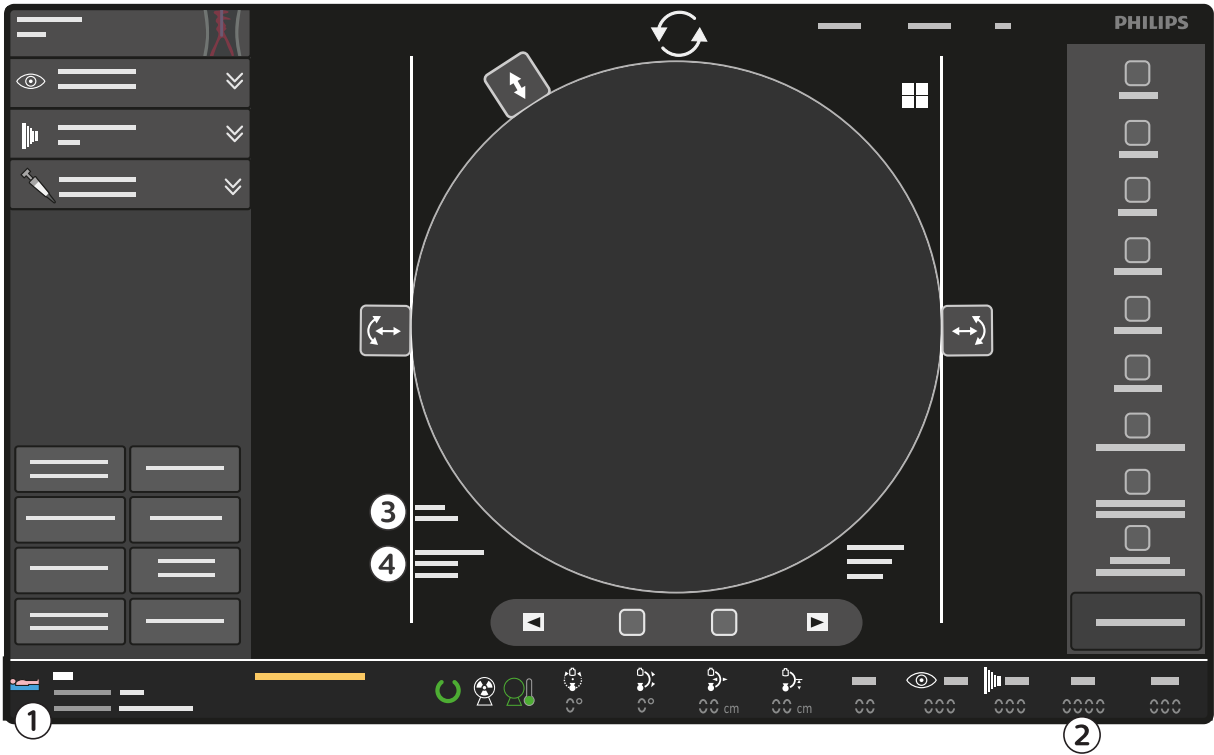


Figure 108 Single image screen (review) - C-arm stand

Legend			
1	Patient and examination details	3	Run number (run start time)
2	Examination dose	4	Image number

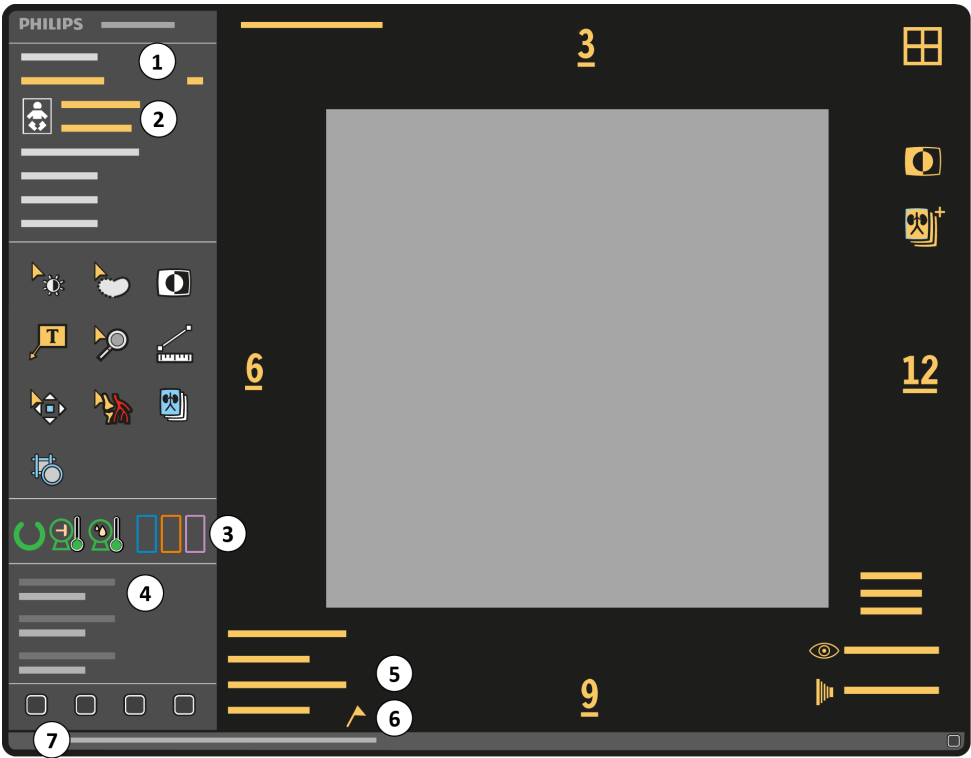


Figure 109 Single image screen (review) - mobile view station

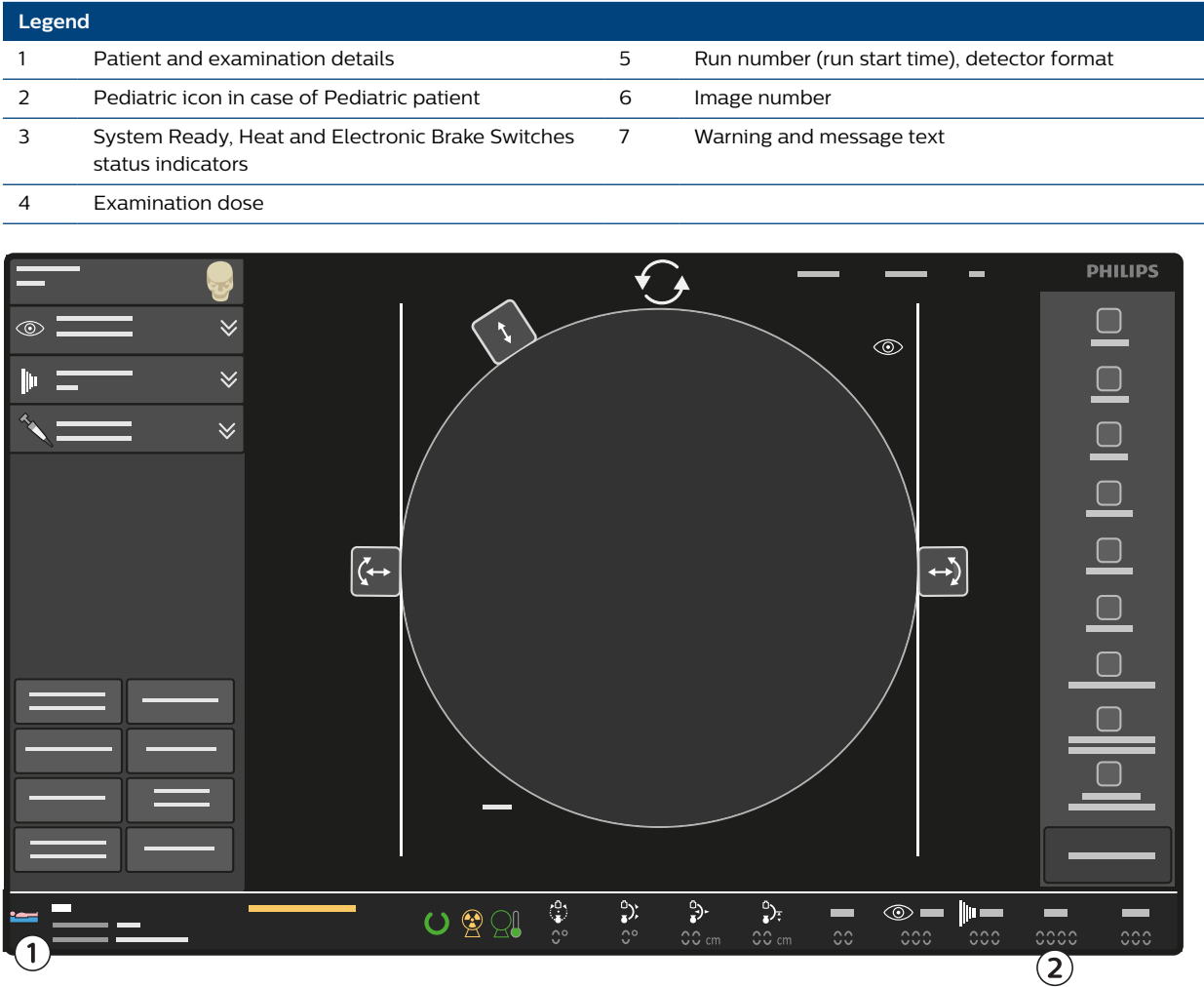


Figure 110 Single image screen - Live X-ray - C-arm stand

Legend	
1	Patient and examination details
2	Dose rate

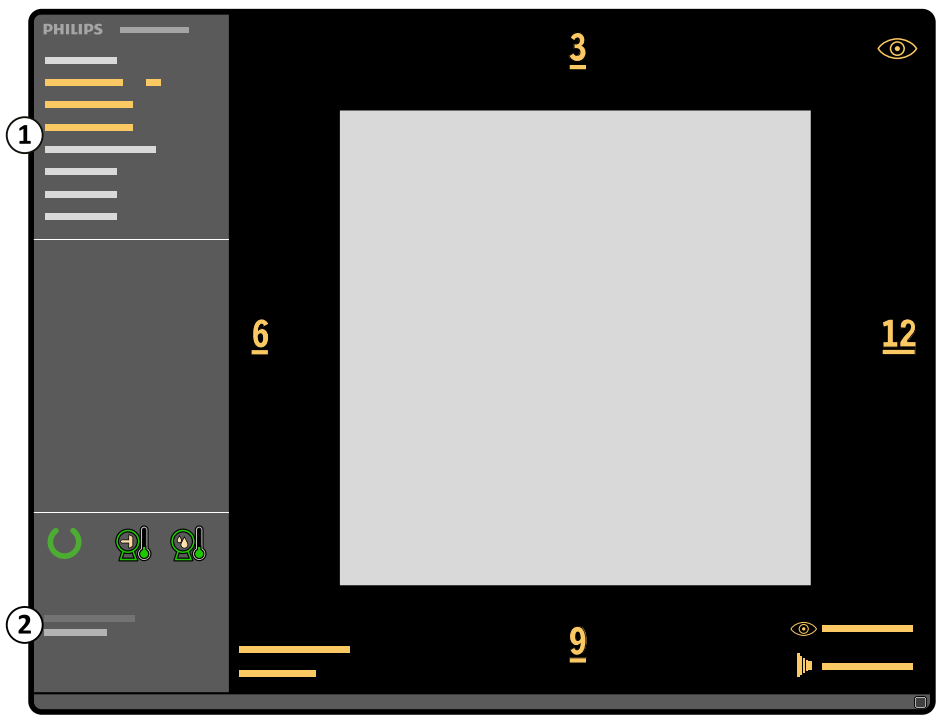


Figure 111 Single image screen – Live X-ray – mobile view station

Legend	
1	Patient and examination details
2	Examination dose

Examination dose is the cumulative patient entrance dose for the current patient in the current procedure in mGy. This dose is always visible on LIH and also on stored or protected images. A dose threshold is defined when the system is installed. If this threshold is exceeded, the cumulative dose value is displayed on a red background.

The cumulative DAP is the cumulative dose area product for the current patient in Gy.cm². The unit is configurable by the hospital administrator.

Dose rate is the amount of dose per time unit, displayed in mGy/min. It is only displayed during live X-ray (except Single shot).

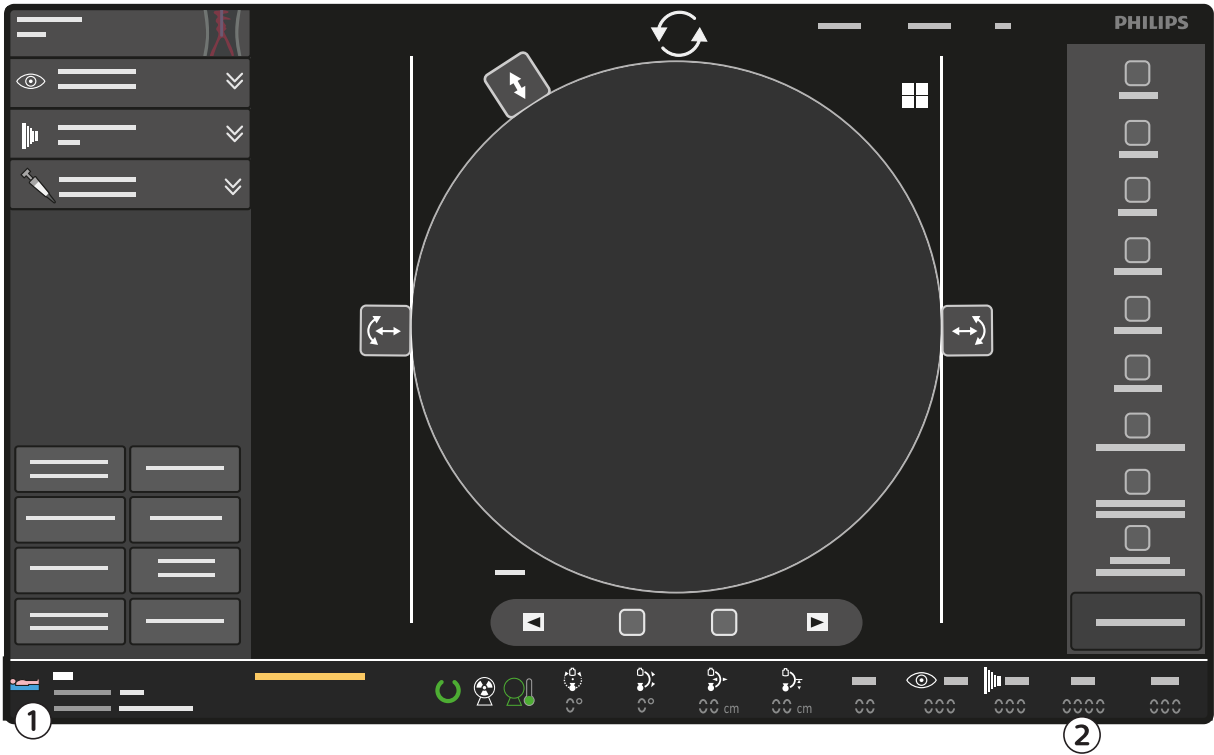


Figure 112 Single image screen - LIH - C-arm stand

Legend	
1	Patient and examination details
2	Examination dose

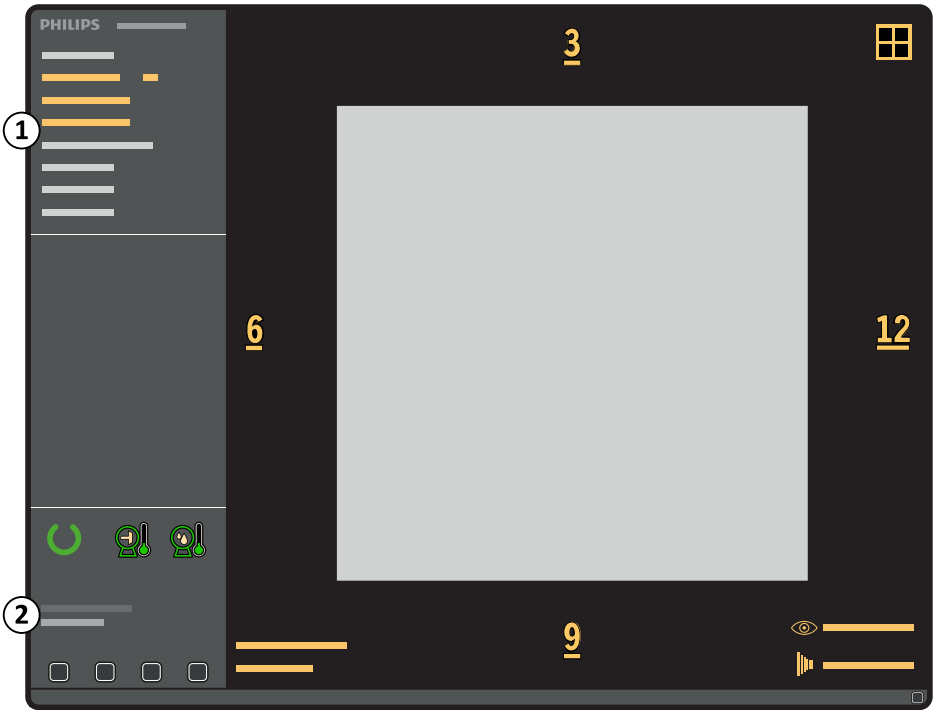






Figure 113 Single image screen - LIH - mobile view station

Legend	
1	Patient and examination details
2	Examination dose
















Examination dose is the cumulative patient entrance dose for the current examination in the current procedure in mGy. This dose is always visible in last image hold and also on stored or protected images.

The cumulative DAP is the cumulative dose area product for the current patient in Gy.cm2. The unit is configurable by the hospital administrator.

1 To display the single image screen, do one of the following:

Click the Show Examination button in the administration screen (Review list).	
	Press the Single image button on the mobile view station keypad.
	Tap the Single image button on the C-arm stand touch screen to switch to 'single image' display.
	Press the Overview button on the remote control or C-arm stand touch screen or mobile view station keypad to switch the display between the overview screen and 'single image' display.
	Press the Run cycle button on the remote control to switch the display between run cycle and 'single image' display.

2 You can display other images using the following controls:

To	Mobile view station	C-arm stand touch screen	Remote control
Navigate through the images and runs one by one	 Previous	Previous  Or Swipe from left to right on the touch screen.	 Previous
		Next  Or Swipe from right to left on the touch screen.	 Next
Display the first image in the examination (single image screen)	 Page up	—	—
Display the last image in the examination (single image screen)	 Page down	—	—
Display the last image of the previous run (single image screen)	 Up	—	—
Display the first image of the next run (single image screen)	 Down	—	—
Switch to Run cycle review	 Run cycle	 Run cycle	 Run cycle
Switch to Overview	 Overview	 Overview	 Overview

5.20.4 Overview Screen

The overview screen displays an overview of all the images (and all runs) of the selected examination in a 4 x 4 matrix.

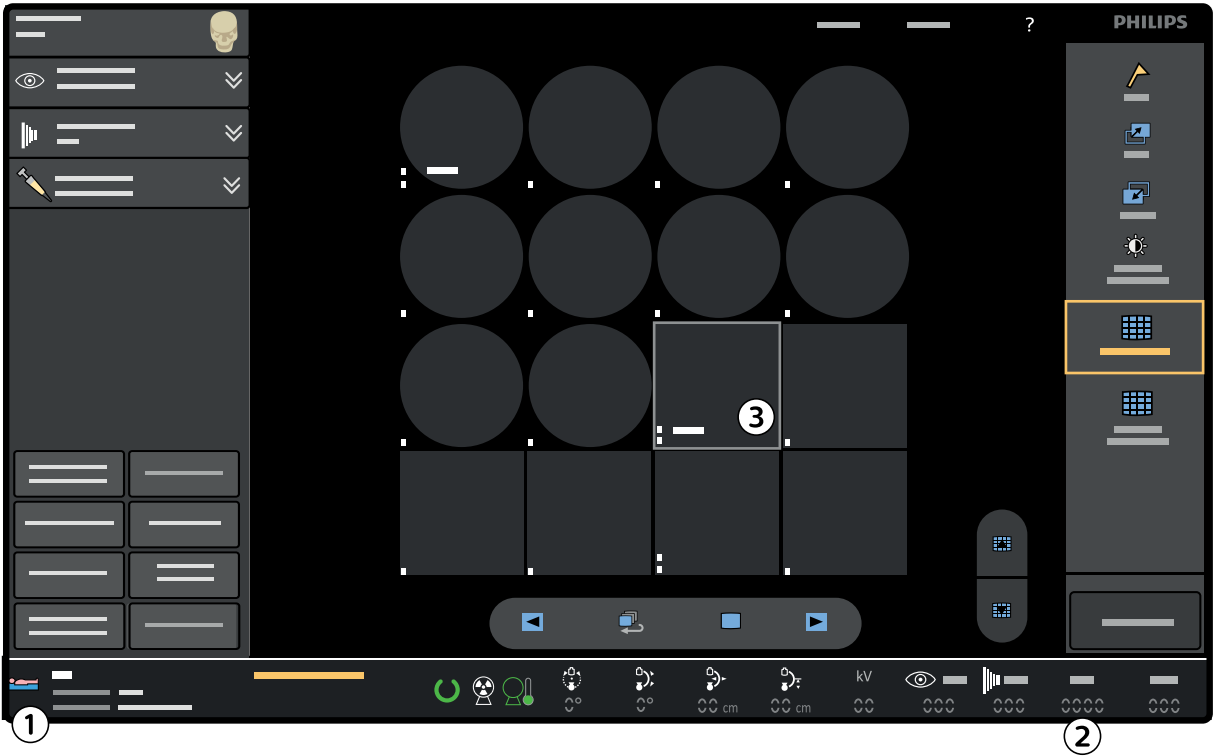


Figure 114 Overview screen on the C-arm stand

Legend		
1	Patient and examination details (selected examination)	3 Current image
2	Examination dose (selected examination)	

The examination dose is the cumulative total patient entrance dose for the current examination in the current procedure in mGy.

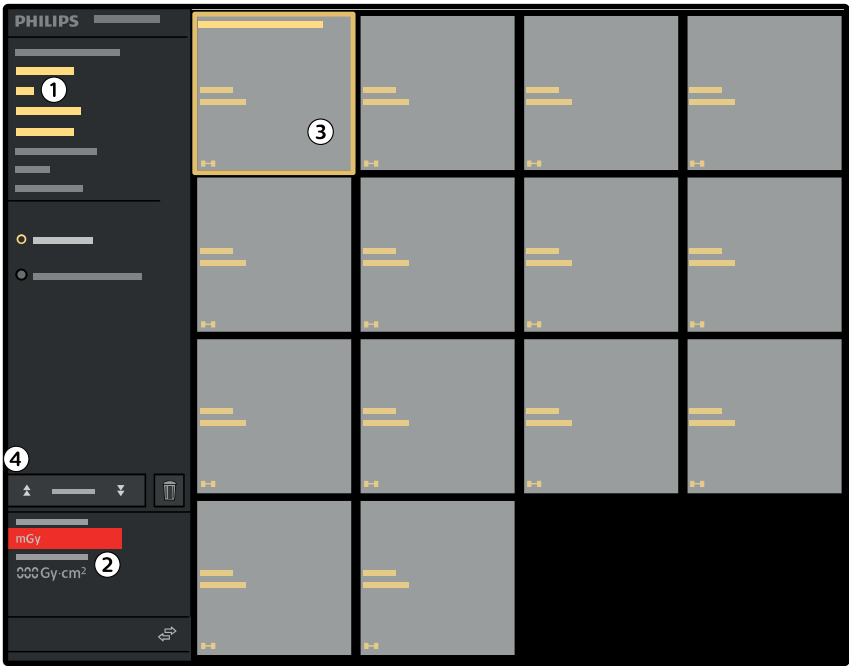


Figure 115 Overview screen on the mobile view station

Legend			
1	Patient and examination details (selected examination)	3	Current image
2	Examination dose (selected examination)	4	Page selector

Examination dose is the cumulative total patient entrance dose for the current examination in the current procedure in mGy.

The cumulative DAP is the cumulative dose area product for the current patient in Gy.cm². The unit is configurable by the hospital administrator.














- 1 To display the overview screen of the selected examination, do one of the following:

	Press the Overview button on the mobile view station.
	Tap the Overview button on the C-arm stand touch screen to switch the display to the overview screen.
	Press the Overview button on the remote control to switch the display between single image display and the overview screen.

The current image is identified by a yellow outline.

- 2 Use the following controls to navigate the overview screen:

To	Mobile view station	C-arm stand touch screen	Remote control
View all images from all runs	All images	All images	Overview (Double-press)
View the middle image from each run in the same overview	One image per run	One image per run	Overview (Double-press)

To	Mobile view station	C-arm stand touch screen	Remote control
Navigate through the images and runs one by one	 Previous	 Previous	 Previous
	 Next	 Next	 Next
	 Up	—	—
	 Down	—	—
Display the previous overview page	 Page up	 Previous over-view page Swipe the touch screen from top to bottom.	—
Display the next overview page	 Page down	 Next overview page Swipe the touch screen from bottom to top.	—
Display a single image full size	Double-click on the required image on the examination monitor.	Double-tap the required image.	 Overview

NOTE On the remote control, ‘double-press’ means to press the button twice in rapid succession.

- 3 To select or deselect images, do the following:
- a To select a different image as the current image, click or tap the desired image thumbnail.

b To select more than one image, click the top left corner of the desired images.

A check box is displayed and the image is selected. Each selected image is identified by a yellow outline. The current image has a thicker yellow outline.

You can also select multiple images by pressing Ctrl and clicking or tapping the desired images.

c To select all images in a range on screen, select the first image, then press shift and select the last image.




All images between the two images are also selected.

d To deselect an already selected image, click on the image thumbnail.

If you have selected more than one image, press Ctrl while deselecting the desired image to ensure all other images remain selected.

5.20.5 Run Cycle Review






- 1 To view the images of the run in a cycle, do one of the following:

	Press the Run cycle button on the mobile view station.
	Tap the Run cycle button on the C-arm stand touch screen.
	Press the Run cycle button on the remote control.

The run cycle symbol is displayed on the lower-right corner of the examination monitor, indicating that the run cycle is active.

- 2 To stop the cycle press **Run cycle** again.

Alternatively, you can stop the run cycle by doing the one of the following:

	Press the Single image button on the mobile view station.
	Press the Overview button on the mobile view station.
	Tap the Overview button on the C-arm stand touch screen.
	Tap the Pause button on the C-arm stand touch screen.
	(Double-)press the Overview button on the remote control.

Tips	
Viewing runs	<p>During run cycle, you can view the previous or next run by pressing:</p> <ul style="list-style-type: none">• The Previous or Next button on the mobile view station.• The Previous or Next run buttons on the C-arm stand touch screen.• Previous and Next buttons on the remote control. <p>You can also switch to the first or last run by pressing the Page up or Page down buttons.</p>

The system can be set to show automatic run cycle review instead of last image hold.

Enabling and Disabling Automatic Run Cycle

- 1 Tap **System** in the header area of the C-arm stand touch screen.
- The system menu appears.
- 2 To enable automatic run cycle, tap **Auto Run Cycle** in the system menu.
- The **Auto Run Cycle** toggle button becomes active. Images will now automatically be shown in run cycle after exposure instead of last image hold.
- Auto run cycle remains enabled if a new examination is started, even after the system has been shut down and restarted.
- 3 To disable automatic run cycle, tap **Auto Run Cycle** in the system menu.
- The **Auto Run Cycle** toggle button becomes inactive. Only single images will now be shown.
- 4 To close the system menu, tap **Close** on the system menu.

Tip

Performing roadmap with trace

Disable automatic run cycle if you are performing roadmap with trace often, to avoid the need to select the image used for roadmap. See [Performing Roadmap with Trace \(Peak Opacification\)](#) (page 141).

5.20.6 Dose Report

The dose report displays information regarding the dose received during an examination, and includes the cumulative time, cumulative dose and the number of single shot exposures.

The format for the cumulative time depends on the selected display mode:

- If IEC display mode is selected then minutes and seconds are displayed in the **Duration** column using the minutes/seconds format/range: 0:00-999:59.
- If HHS display mode is selected then minutes are displayed in the **Duration** column using the minutes/decimal minutes format/range: 0.0-999.9.

The cumulative dose is displayed in mGy, and the cumulative dose area product is displayed in Gy.cm². The unit is configurable by the hospital administrator.

The values represent the dose at 30 cm from the detector entrance surface.

NOTE *Dynamic acquisition refers to all X-ray except single shot. Details for dynamic acquisitions are only displayed if dynamic acquisition has been performed. Details of single shot acquisitions are only displayed if single shot mode has been used.*



- 1 If the **Administration** screen is not already displayed, press the **Administration** button.
The current review examination is highlighted.
- 2 If desired, select a different examination.
- 3 Click **Dose Report**.

The **Dose Report** panel is displayed on the examination monitor.

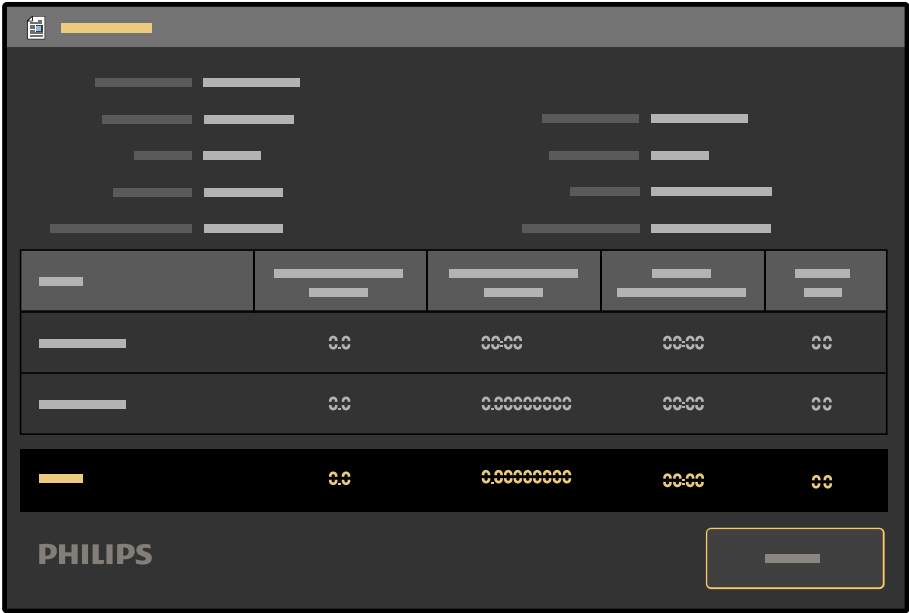


Figure 116 Dose report panel

NOTE *Some data may not be fully displayed if the characters do not fit in the available space.*

NOTE For HHS systems, an X-ray time less than 6 seconds is displayed as 0.0 minutes.

- 4 Click **Close** to close the **Dose Report** panel and return to the **Administration** screen.

Tips	
Print	If a printer is installed a copy of the report can be made by pressing the Print button on the mobile view station.
Store to USB	The report can be stored to USB by pressing the USB button on the mobile view station.
Export dose report	See <i>Exporting, Saving, and Printing</i> (page 185) for details about exporting or printing the dose report.

5.20.7 **Reviewing Other Examinations During Acquisition**

During the current acquisition, images of a previous examination can be viewed.



- 1 If the administration screen is not already displayed, press the **Administration** button.
- The current review examination is highlighted.

- 2 If desired, select a different examination for review.




A confirmation dialog box is displayed, requiring the operator to select whether to close the current acquisition examination.

NOTE Clicking the **Yes** button in the confirmation dialog box closes the current acquisition examination. No more images can be added for this examination.

- 3 Click **No** in the confirmation dialog box to keep the current acquisition examination selected for acquisition.

The selected examination can now be reviewed. When X-ray is resumed, the system will return to the current acquisition examination.

Click the **Show Examination** button. The last image of the last run of the selected examination is displayed on the examination monitor in single image mode.

Tip	
Displaying an examination	Instead of clicking Show Examination , the selected examination can also be displayed by pressing one of these buttons on the mobile view station:
	Single image
	Overview
	Run cycle

5.21 **Protection and Image Storage Management**

Images are stored in accordance with the settings you are using for acquisition.

For more information about changing the storage settings, see *Storage Rate* (page 152).

- Storage for the left hand/foot switch is off by default.
- When **Off** is selected, there is no automatic image saving; images are only saved by pressing **Flag**. Even you can store images by pressing **Flag**, **Protect** or **Park**



The default storage settings can be modified by Service.

A part of the system's storage capacity is always available for acquiring images. You can protect acquired images to control when they can be deleted.

The protect flag can be attached to an image for storage management purposes. Protected images in the current examination will not be overwritten during the examination.

5.21.1 Protecting Images



Images are stored on a disk in the system. It is possible to protect images from the current acquisition examination against overwriting. The disk contains a preconfigured amount of space that cannot be protected; this ensures a minimum working area. At the start of a new examination the working area is available for new images. The differences between the two areas of the disk are explained in the table below.

Working Area		Protected Area	
Unprotected images of older examinations can be overwritten without warning	Unprotected images of the current examination will be overwritten after the clock symbol	Protected images of older examinations can be overwritten without warning	Protected images of the current examination cannot be overwritten



CAUTION
When the disk is full with protected images, protected images of previous examinations will be overwritten without warning.

A reminder panel is displayed on startup when the disk is almost full, allowing the operator to delete examinations that are no longer required. This helps to ensure that sufficient storage space is available and to avoid the automatic overwriting of older examinations.



When the unprotected working area is full with images from the current examination, the oldest of the unprotected images from the current examination will be overwritten. Before this happens a clock symbol appears on the screen together with the imaging time (seconds) before overwriting begins.



CAUTION
The clock symbol, displayed with an amount of time in seconds, indicates that images of the current examination are going to be overwritten after this time has elapsed.



CAUTION
Unprotected images of previous examinations will be overwritten without warning.

We recommend that you delete examinations, and archive them to PACS if necessary, when they are complete to avoid overwriting images unexpectedly and to protect privacy.

After new images are overwritten, the time (seconds) before another new run is overwritten is indicated. When new images from the current examination are protected, they cannot be overwritten during the current examination.

- 1 Select the image to be protected as described in the previous chapters.
- 2 To protect the image, do one of the following:



- Press the **Protect** button on the mobile view station.
- Tap **Flag** on the C-arm stand touch screen.
- Press the **Protect** button on the remote control.

A protect indicator (a flag) is displayed on the lower-left corner of the protected image.



- 3 To protect the complete run, press the **Protect** button during the run cycle:

Tips

Protect images	During the image acquisition, protected images of the current examination are never overwritten.
Protect run	If One image per run is selected in the overview screen, the whole run is protected if the image in the overview is protected.
Print and export	Print or export images as soon as possible to ensure they are printed or exported before they can be overwritten.
Delete reviewed examinations	Delete reviewed examinations as soon as possible to avoid overwrites and the exposure of patient information.
Image and mask protection	If the protected image is a subtracted image, both mask and image are protected.
Unprotect images	If images/runs are protected, press the Protect button again to remove the 'Protect' status.
Enlarging the working area directly	If the overwrite warning clock appears the working area can be enlarged immediately by protecting runs or images. Previous examinations will be deleted.
Enlarging the working area before the examination	The working area can be enlarged by deleting older (protected) examinations. It is good practice to delete examinations when they are no longer needed.
Maximum run size	The maximum number of images in one run is 999. If this number is exceeded, the first images will be overwritten. Before this happens the warning clock will appear, together with the remaining time before the overwriting begins.
Intended concept	The preconfigured working area run buffer that cannot be protected (see Customizing (page 49)), together with the image storage management method described above, ensures that sufficient storage space is always available.

NOTE *The maximum length of one run is 999, therefore the run time (before overwriting begins) is also limited.*

No indication of the available storage capacity is given before the start of a run. The complete working area can be used to store images for each run.

Runs that require more than 999 images to be stored are considered outside the normal use of this equipment.

5.21.2 Parking an Image to the Reference Monitor



- 1 To park an image to the reference monitor, do one of the following:
 - Press the **Park** button on the mobile view station key panel.
 - Tap **Park** on the C-arm stand touch screen.
 - Press the **Park** button on the remote control.

The image on the examination monitor is copied to the reference monitor.

5.21.3 Auto park

By enabling the **Auto park** feature the image on the examination monitor gets automatically copied to the reference monitor after each acquisition.

You can enable **Auto park** feature during **Configuring a User Profile**. For more information see [Configuring a User Profile \(page 125\)](#).

If the **Auto park** feature is enabled, then the **Park** button on the C-arm stand touch screen gets replaced by **Auto park** button.

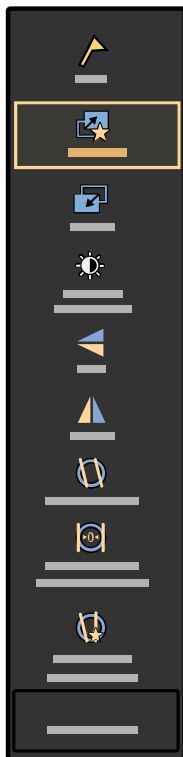



Figure 117 Auto Park button enabled on top of Park button

To enable **Auto park** feature from MVS.

- 1 Go to **Profile** and click **Manage Profile** to add a new profile (if not created).
- 2 On **Manage Profile** screen, select the profile to enable and click **Modify**.
- 3 **Modify Profile** screen is displayed. Click/Tap **LIH Auto park** check box to enable the feature.
- 4 Click **Save** button.

If the auto park feature is enabled, then the park button in stand UI gets replaced by  **Auto park** button.

Current LIH Image on the examination monitor will automatically get copied on the reference monitor in full size after each acquisition.



Figure 118 Enabling Auto park in Modify Profile

Legend			
1	Modify Profile	3	Save
2	LIH Auto park		

To disable Auto park feature:

- Perform Steps 1 and 2, and on **Modify Profile** screen uncheck the **LIH Auto park**.
- By pressing the **Auto park** button on Stand UI.

NOTE Once you disable Auto Park feature on Stand UI for a particular patient, then it will be enabled in subsequent session.

5.22 Image Processing

You can use post-processing functions on images displayed in single screen, overview and last image hold mode.



- 1 With the image(s) to be processed displayed on the examination monitor, press the **Image processing** button.

The image processing buttons are displayed in the image processing panel to left of the image. Some image processing functions have controls associated with them. These controls are displayed in the control panel below the image processing panel when the relevant function is selected.



Figure 119 Image processing panel

Each image processing function is described in detail in the following sections, along with details of the associated control panel, if appropriate.

NOTE Some image processing functions are optional, and might not be available on your system.

Tip

Touch screen

The touch screen can be used to perform the actions described in the following sections. The operator can touch the screen directly to click buttons, and select and drag items.

NOTE Do not use the C-arm stand touch screen as the leading display to evaluate image quality. Instead use the mobile view station examination monitor.

5.22.1 Adjusting Contrast and Brightness

You can adjust the contrast and brightness levels of the X-ray image to assist in viewing.

The system has default contrast and brightness settings which are used for each new acquired image run. Changes to contrast and brightness are only applied to images, including parked images, and do not affect text, annotations, or control panels.

Adjusted contrast and brightness settings are stored with the image run that you have adjusted. If you adjust the settings for subtracted images, the new settings are also stored for subtracted images.



- 1 Click **Contrast Brightness** in the image processing control panel.
Controls to adjust contrast and brightness are displayed in the control panel.

When you adjust contrast and brightness manually, **Auto CB** is switched off automatically.



2 To adjust brightness using the control panel, do the following:

- Press + to increase the brightness of the image.
- Press - to decrease the brightness of the image.



3 To adjust contrast using the control panel, do the following:

- Press + to increase the contrast in the image.
- Press - to decrease the contrast in the image.

4 To adjust contrast and brightness on the MVS, do the following:

- Press right to increase the contrast.
- Press left to decrease the contrast.
- Press up to increase the brightness.
- Press down to decrease the brightness.



5 To reset contrast and brightness to the default settings, press **Reset to Default**.

5.22.2 Enhancing Edges

You can enhance edges in the X-ray image to assist in viewing.

The system has default edge enhancement settings which are used for each new acquired image run. Changes to edge enhancement are only applied to images, including parked images, and do not affect text, annotations, or control panels.

Adjusted edge enhancement settings are stored with the image run that you have adjusted. If you adjust the settings for subtracted images, the new settings are also stored for subtracted images.



1 Click **Edge Enhancement** in the image processing control panel.



2 To adjust edge enhancement using the control panel, do the following:

- Press + to increase edge enhancement.
- Press - to decrease edge enhancement.

3 To adjust edge enhancement using the touchpad or touch screen, do the following:

- Press up to increase edge enhancement.
- Press down to decrease edge enhancement.



4 To reset edge enhancement to the default settings, press **Reset to Default**.

5.22.3 Video Invert

Video invert reverses the displayed image.



1 Click **Invert** in the image processing control panel to invert the displayed image.

2 The displayed image is inverted concurrently with the active image processing task.



An indicator is displayed at the top right of the image, indicating that the displayed image has been inverted. The setting is applied to all images in the run.

3 Click **Invert** again to disable inverting the image.

5.22.4 Adding Annotations and Remarks

You can add multiple annotations to images during post-processing.

To add annotations, do the following:



Press **Image processing** button given on the MVS keypad.

IP Panel will expand.

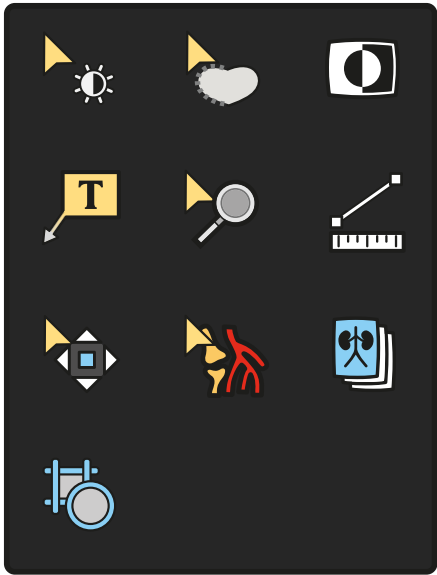


Figure 120 Image processing Panel









Press **Annotation** icon.

Annotation dialog will appear.



Figure 121 Annotation dialog

The **Annotation** buttons are explained below:

Symbols	Element	Description
	Annotation text	Annotation text box
	Examination remark	Examination remarks text box
	Text color option	Select text color
	Multiple annotation	Add more annotations
	Delete	Delete the text
	Add	Add the text to the screen

1 To add an annotation to the image, do the following:



- a Click **Annotation** in the image processing control panel.
The **Annotation** control panel is displayed.



- b Enter text in the annotation text box.
- c Click **Add**.
The annotation is added to the image.
- d Drag the annotation text box to the desired position on the image.
- e Drag the annotation arrow to the desired position on the image.

2 To modify an existing annotation, do the following:



- a Click **Annotation** in the image processing control panel.
The **Annotation** control panel is displayed. The annotation text box contains the text for the existing annotation.
- b Edit the text in the annotation text box.
- c To change the color of the annotation, select a new color in the color list.



- d Click **Accept**.
The annotation text is changed.
- e Drag the annotation text box to the desired position on the image.
- f Drag the annotation arrow to the desired position on the image.

3 To delete an annotation click on the annotation and press the **Delete** button.

The annotation and any text contained in the annotation text box are deleted. The **Annotation** control panel is closed.

4 To add a remark to the examination, do the following:



- a Click **Annotation** in the image processing control panel.

The **Annotation** control panel is displayed.



b Enter text in the examination remarks text box.

c Click **Accept**.

The remark is added to the examination. The remark appears on all images in the examination.

NOTE *You can add single or multiple annotations.*

NOTE *Maximum number of annotations per image is 25.*

5.22.5 Zooming

With the zoom function, any part of the image can be magnified by a factor of 2.



1 Click the **Zoom** button in the image processing panel.

The zoom square appears over the image (the zoom function does not have a control panel).

Zoom is applied to all images in the current run.

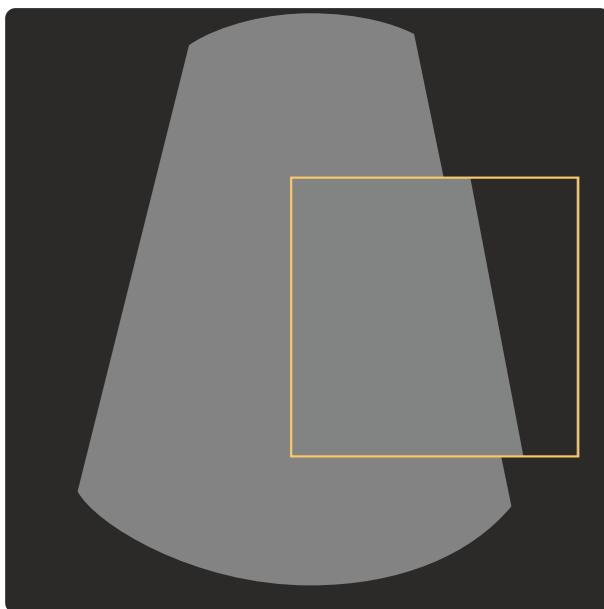


Figure 122 Zoom

2 Drag the zoom square to the position of interest.

The zoom square remains visible if another image processing function is selected from the image processing panel.

3 To remove the zoom square, do one of the following:

- Click on the zoom square to select it and press the **Delete** button given on the MVS keypad.
- Click **Zoom** again.



NOTE *A zoomed image cannot be zoomed again to provide more magnification.*

Tips

Repositioning

The zoom square can be repositioned by dragging.

The **Zoom** function does not need to be active to do this.

Tips

Undo

The **Undo** button on the mobile view station console can be pressed to undo the last dragging action of the zoomed square.



5.22.6 Measure

With the measure option, a distance in the current image can be measured. Additionally, the angle between two lines can be calculated.

Measurements can also be performed on zoomed images.

Distance measurements and angle measurements are used in vascular and orthopedic procedures. Accuracy of length measurements, when calibrated with an object of at least 8cm, is $\pm 7\%$ when no zoom is applied and the measured object is in the Interventional Reference Point (30cm from detector) and where the length of the object is at least 50 pixels on the monitor. The inaccuracy might be higher when the calibration is performed in the zoom mode and measurement is done in normal mode.

Accuracy of an angle measurement is within ± 4.0 degrees when the legs of the angle-measurement are at least 50 pixels on the monitor.

For vascular procedures, measurements can provide:

- Distance measurement of arteries and veins.
- Occasional angle measurement.

In orthopedic procedures, measurements can provide:

- Bone length measurement to define the screw length.
- Length or thickness measurement of implants.
- Angle measurement in the spine (scoliosis measurements), in the pelvis area, or in the knee.

Before making a distance measurement, and sometimes also before an angle measurement (if the length of the legs needs to be defined), calibration must be performed to set a reference value. For calibration, an object with a known length must be placed at the same height as the object that is to be measured.



- 1 In the image processing panel, click **Measure** to display the measure control panel.

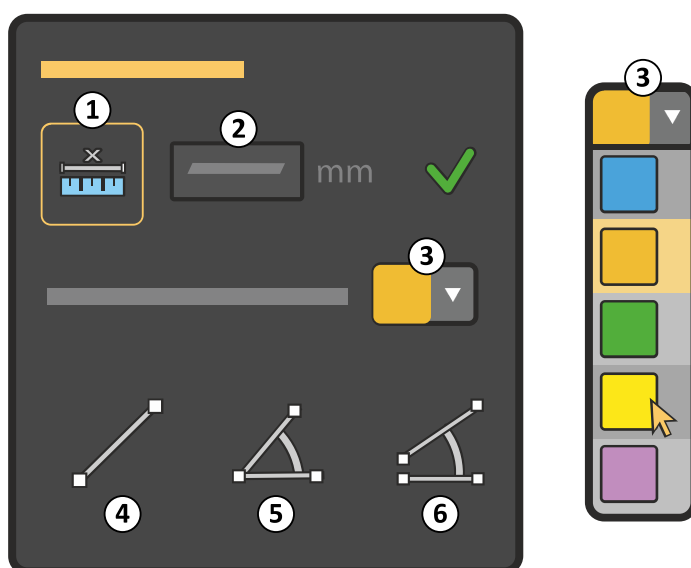


Figure 123 Measure control panel

Legend			
1	Calibrate	4	Distance measurement
2	Actual calibration measurement	5	Distance and angle measurement
3	Color list	6	Two distances and angle measurement



2 Click **Calibrate** to start calibration.

3 Draw a calibration line across a known distance in the image.

This can be done using a catheter with marks on it or with a lead ruler placed at the same height as the object that is to be measured. To gain enough accuracy, the catheter or ruler must be placed perpendicular in the X-ray beam. Calibrate a long distance to minimize the inaccuracy, for example 8-10 cm.

Place the cursor precisely on the edges of the bone or vessel. To increase the accuracy or cursor placement, use the zoom function. For more information, see [Zooming \(page 176\)](#).

NOTE *A calibration line can be drawn by dragging in the image display. Adjustments to the line can be made by dragging either end of the line.*

NOTE *The inaccuracy might be higher when the calibration is performed in the zoom mode and measurement is done in normal mode.*

You can use any of the images in a run for calibration. The calibration is valid for all images in that run and you cannot store more than one calibration per run.

4 Enter the known length as the actual calibration measurement.



5 Press the **Accept** button to store the calibration value for the run.

NOTE *Existing measurements are updated if a new calibration action is performed.*

Tips	
Delete	Measurement lines can be deleted by pressing the Delete button on the mobile view station.
Repositioning	Measurement lines can be repositioned by dragging. The measure function does not need to be active to do this.
Undo	The Undo button can be pressed to undo the last dragging action.

6 To change the color used to display measurements, select a new color in the color list.

Distance Measurement

After calibration you can measure the length of an object by placing the cursor at the beginning and at the end of the object. You can only do one measurement at a time. The measurement value is displayed in the lower right part of the screen. When the measurement line is highlighted, you can delete it, and then perform a new measurement.



WARNING
When the length of a line (or leg) needs to be measured, then calibration needs to be performed to get an accurate result. It is the responsibility of the operator to perform calibration. For details, see [Measure \(page 177\)](#)



1 In the **Measure** control panel, click **Distance**.

2 Draw a line on the image by dragging.

The length of the line is displayed. You can change the position and length of the line by dragging either end of the line.

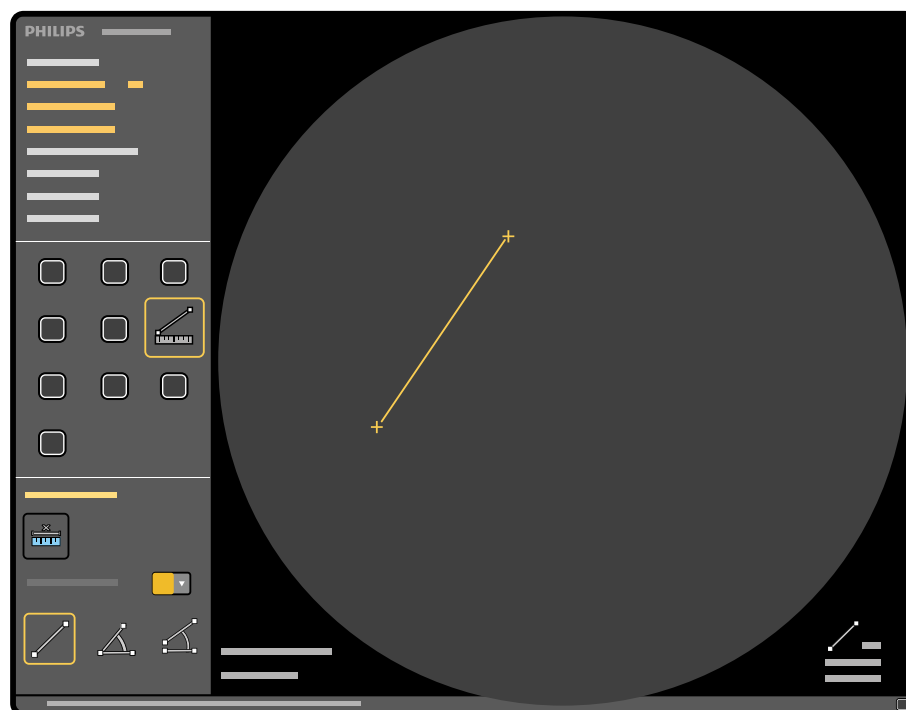


Figure 124 Measurement of two points

Angle Measurements with Length

When you start the angle measurement function, a calibration factor is requested. If you are only measuring an angle (three point angle measurement) the calibration factor is not needed and you can continue with the measurement by placing the 2 lines in the image.



WARNING

When the length of a line (or leg) needs to be measured, then calibration needs to be performed to get an accurate result. It is the responsibility of the operator to perform calibration. For details, see [Measure \(page 177\)](#).

Angle measurement can be done in two ways; a measurement with closed lines or a measurement with open lines. Normally an angle measurement with closed lines is used, but for measurements in the spine, an angle measurement with open lines is used. Four measurements can be made in one image. The angle and length measurement values are placed in the lower right part of the screen.

Three-Point and Angle Measurement



- 1 In the **Measure** control panel, click **Distance and angle**.

This function requires you to define two lines and an angle using three points in the image.

- 2 Draw a line on the image by dragging.
- 3 Create a second line and the angle by clicking in the display at the desired end point of the second line.

The lengths of both lines and their angle are displayed. You can change the position and length of the lines by dragging either end of the line.

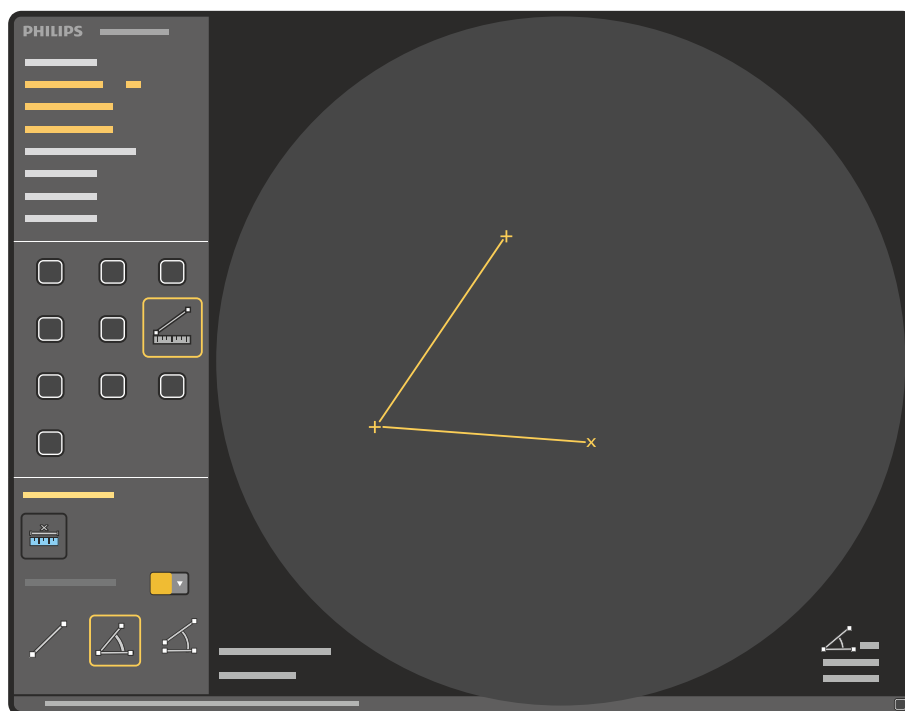


Figure 125 Measurement of two distances and angle (three points)

Measure Two Distances and Angle

This is a four-point measurement: two separate lines and an angle.



- 1 In the **Measure** control panel, click **Two distances and angle**.

This function requires you to define two unconnected lines and the angle using four points in the image.

- 2 Draw a line on the image by dragging.
- 3 Draw a second line on the image by dragging.

The lengths of both lines and their angle are displayed. You can change the position and lengths of the lines by dragging either end of the line.

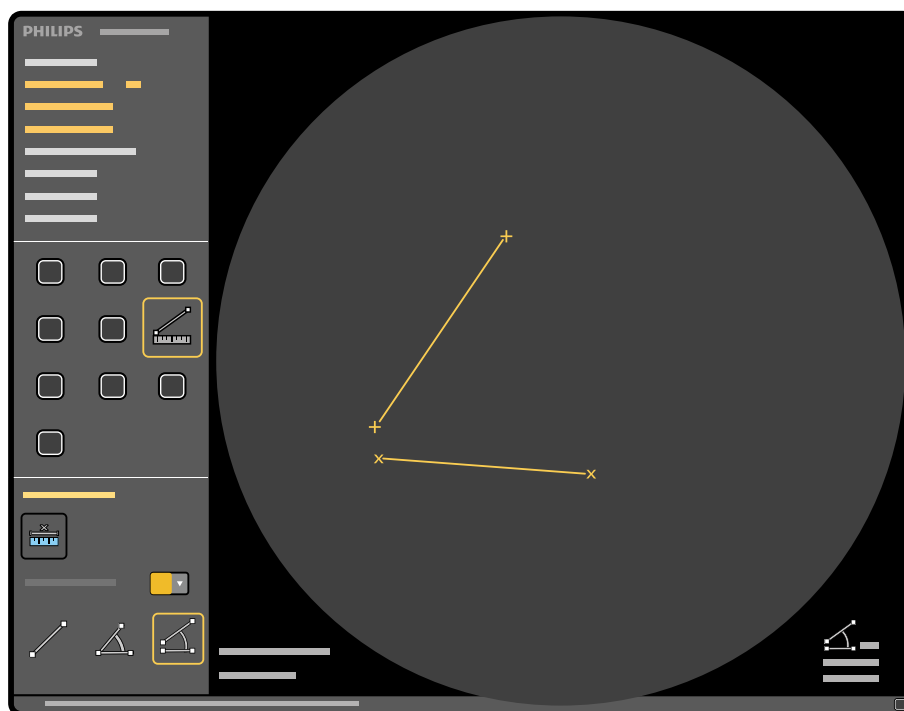


Figure 126 Measurement of two distances and angle (four points)

5.22.7 Pixelshift

The **Pixelshift** function can only be applied when the subtraction function is active. With this function the mask is shifted with respect to the image.



- 1 Click **Pixelshift** in the image processing panel.

The **Pixelshift** control panel is displayed.

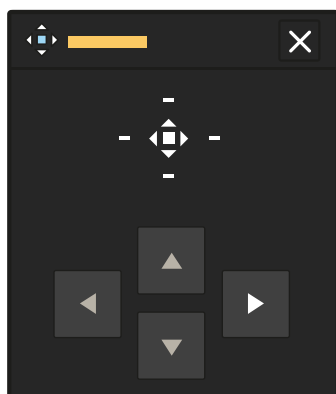


Figure 127 **Pixelshift** control panel

- 2 To adjust the mask, do one of the following:
 - Click the shift direction arrows in the **Pixelshift** control panel (the amount of shift applied is shown above the direction arrows).
 - Drag the mask in the image.

NOTE *Pixelshift is applied to all images in the current subtraction run.*

Tips

Cancel pixelshift

Press the **Undo** button. The pixelshift values from before changing pixelshift will be restored.

Tips

Press the **Undo** button again to reset the pixel shift values to zero.

5.22.8 Landmarking

The **Landmark** function displays the current subtracted run with a partial subtraction of the mask image.



- 1 Click the **Landmark** button in the image processing panel.

The **Landmark** control panel is displayed.

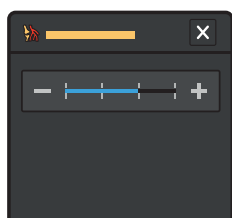


Figure 128 Landmark control panel

- 2 Select one of the four landmarking levels in the **Landmark** control panel by clicking + and -. Landmarking can also be applied by dragging in the image.

The landmarking level is applied to all images in the run.

5.22.9 View Trace Using the MVS

View Trace uses acquired images to obtain a vascular-tree background in the display.

You can control the view trace function from the mobile view station and from the C-arm stand.

NOTE *Minimum opacification is used if the run being traced is created using the iodine contrast medium selection. Maximum opacification is used for CO2 contrast medium selection.*

- 1 Select and display the first image to be traced.

Use the **Previous** and **Next** buttons to navigate the images and select the first image to start the trace.



- 2 Click **View Trace** in the image processing panel.

The system starts tracing images at the same speed as the acquisition speed.

The **View Trace** control panel is displayed.

Zoom, measurements and annotations are removed from the display.

- 3 In the **View Trace** control panel, click **Stop** to stop tracing images.

If more images are available in the run after stopping tracing, use the **Next** button to add images to the trace result.

Pressing and holding the **Next** button adds available images from the run at a rate of 2 per second.

Tracing stops automatically if the end of the run is reached before the **Stop** button is clicked.

- 4 In the **View Trace** control panel, click **Save** to save the trace image.

The trace image is stored in a new run.

The view trace indicator and the new run number are displayed.

The **View Trace** control panel is closed and the **View Trace** button on the image processing panel is disabled.

NOTE *If a subtracted run is traced, the mask image and the trace image are stored in a new run.*

5.22.10 View Trace Using the C-arm Stand

View trace uses acquired images to obtain a vascular-tree background in the display.

You can control the view trace function from the MVS and from the C-arm stand.

NOTE *Minimum opacification is used if the run being traced is created using the iodine contrast medium selection. Maximum opacification is used for CO2 contrast medium selection.*

1 If run cycle is not activated, tap **Run cycle**.

2 Select the run to be traced.

Use **Previous run** and **Next run** to navigate the runs.



3 Tap **View Trace**.

Tracing starts at the first image in the run. The system traces images at the same speed as the acquisition speed.

4 To stop tracing before the end of the run, tap **Stop Tracing**.

The trace result achieved so far is displayed. This result is not yet saved.

Tracing will stop automatically if the end of the run is reached before **Stop Tracing** is tapped.

If **View Trace** is tapped again, tracing is cancelled and no result is saved.



5 To add the next image, tap **Next image**.

NOTE *Touching and holding Next image adds available images from the run at a rate of 2 images per second.*

6 To save the trace image, tap **Save Trace Result**.

The trace image is stored in a new run as the last run in the acquisition examination. The time when you saved the trace is stored and displayed as the run start time.

The View trace indicator and the new run number are displayed.

NOTE *If a subtracted run is traced, the mask image and the trace image are stored in a new run.*

5.22.11 Manual Electronic Blanking

Using the manual electronic blanking function, the operator can cover any irrelevant or distracting parts of the image. The covering is applied to all the images in the current run.



1 Click **Manual Electronic Blanking** in the image processing panel.

The **Manual Electronic Blanking** control panel is displayed, and the shutters and diaphragm are displayed in the image.

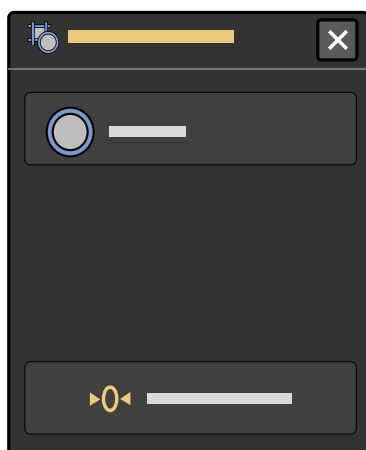


Figure 129 Manual Electronic Blanking panel

- 2 To move a shutter, click the shutter at its midway point and drag it to a new position.
- 3 To rotate a shutter, click the shutter at either end and drag until the desired rotation is achieved.
- 4 To move the diaphragm, click it and drag it inward or outward to a new position.
- 5 To apply circular blanking to a square image, click **Circular** and drag a circular segment to the desired position.

Circular segments are displayed in each corner of the image. Dragging one circular segment will move all of the segments, ensuring each segment is the same distance from the center of the image.



Figure 130 Circular blanking on a square image

- 6 To remove circular blanking, click **Circular** again.
- 7 To reset the blanking to fully open, click the **Reset** button in the **Manual Electronic Blanking** control panel.
- 8 To store the adjusted electronic blanking positions, click **Manual Electronic Blanking** in the image processing panel, or simply select another image processing function.

5.22.12 Automatic Electronic Blanking (AEB)

The areas covered by the shutters and collimator are automatically blanked (and shown as black) on the images displayed.

Automatic electronic blanking can be switched on or off by Service at installation of the system.

If the shutters and/or collimator are moved in last image hold, blanking is not changed until the next images are acquired (because the positions of the shutters and collimator in the displayed last image hold image are not changed).

If a run of images is reviewed then no automatic electronic blanking is applied if the shutters and/or collimator have been moved during acquisition of the images.

NOTE *Automatic electronic blanking is not applied if the shutters and/or collimator are moved during acquisition of the images. Automatic electronic blanking is applied again to the next images acquired.*

5.23 Exporting, Saving, and Printing

You can export, save, and print patient and image data to removable media (paper, DVD, USB device) and to a network location.



The printing function is optional and may not be installed on your system. If export target locations are not configured for your system, the export function is not displayed. The ability to save to local media is configured at installation. If your system is not configured to allow data to be saved to local media, the function is not displayed.

NOTE *Removable media that contains images and/or other medical information must be stored in a secure area that is not accessible by unauthorized individuals.*

NOTE *When handling personal data, do so in accordance with the privacy policies that apply in your healthcare environment and privacy laws that apply in your region.*

Export, save and print jobs are processed in the background, allowing you to use the system normally while the transfer jobs are processed. The status of individual transfer jobs is visible in the job viewer. The icon in the global tools indicates the overall status of transfer jobs. For more information, see [Viewing Transfer Jobs in the Job Viewer \(page 191\)](#).

You can select each function in the global tools by clicking one of the following icons.

Icon	Function
	Export
	Save to Media
	Print (optional)

5.23.1 Selecting Images to Export, Save, or Print

Before exporting, saving, or printing images and series, you can select the specific images or series that you want to use.

You can do this from either the **Review** list, the single image screen, or from the overview screen.

For more information about exporting, saving, or printing, see the following sections:

- [Exporting Images to a Network Location \(page 187\)](#)
- [Saving Images to Local Media \(page 188\)](#)
- [Printing Images \(Option\) \(page 190\)](#)

Selecting Images Using the Review List

You can select images to export, save, or print using the **Review** list.

- 1 Open the **Review** list.

For more information, see [The Review List \(page 117\)](#).

- 2 Select the desired examination.
- 3 Select the desired function in the global tools.

The relevant dialog box is displayed.

Selecting Images Using the Single Image Screen

When using the single image screen to select the image you want to export, save, or print, the single image shown is the current image.

- 1 Open the single image review screen.

For more information, see [Single Image Screen \(page 156\)](#).

- 2 To select a single image, navigate to the image you want to use.
- 3 To select a series, perform run cycle review of the series you want to use.

For more information, see [Run Cycle Review \(page 164\)](#).

- 4 Select the desired function in the global tools.

The relevant dialog box is displayed and the current image is selected.

If run cycle review was not active when you selected the desired function, then only the current image is used. The **Selected images** radio button is automatically selected, indicating that only a single image is selected.

If run cycle review was active when you selected the desired function, then **Selected series** is automatically selected, indicating the number of images in the series.

Selecting Images Using the Overview Screen

When using the overview screen, you can select multiple images and series.

- 1 Open the overview screen.

For more information, see [Overview Screen \(page 162\)](#).

- 2 To select or deselect images, do the following:

- a To select a different image as the current image, click or tap the desired image thumbnail.
- b To select more than one image, click the top left corner of the desired images.

A check box is displayed and the image is selected. Each selected image is identified by a yellow outline. The current image has a thicker yellow outline.

You can also select multiple images by pressing Ctrl and clicking or tapping the desired images.

- c To select all images in a range on screen, select the first image, then press Shift and select the last image.

All images between the two images are also selected.

- d To deselect an already selected image, click on the image thumbnail.

If you have selected more than one image, press Ctrl while deselecting the desired image to ensure all other images remain selected.

- 3 To select a series for exporting, saving, or printing, select **One image per run**.
- 4 Select the desired function in the global tools.

The relevant dialog box is displayed.

5.23.2 Exporting Images to a Network Location

You can export images to a DICOM network location.

- 1 If you are using the overview screen, select the images or series you want to export.
For more information, see [Overview Screen \(page 162\)](#).
- 2 From the single image screen or from the overview screen, click **Export** in the global tools.



The **Export** dialog box is displayed.

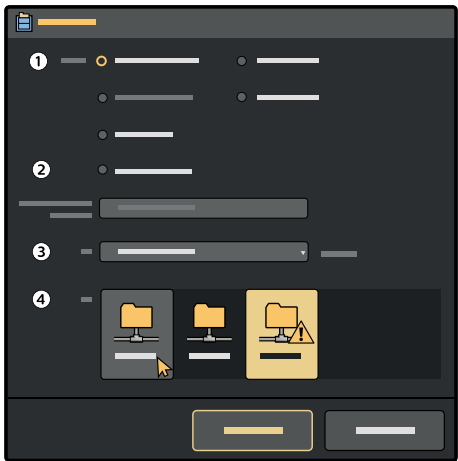


Figure 131 Export dialog box

Legend			
1	Images to be exported	3	DICOM format
2	Dose report selector	4	Destinations

- 3 Select the image or images to save.
If you are using the single image screen, the current image is the selected image.
You can change the images you want to save by selecting one of the following options:
 - **Selected images**
 - **Flagged images**
 - **Selected series**
 - **All images**
 - **No image** (select this if you want to save only a dose report image)
- 4 To include a dose report image, select **With dose report**.
- 5 Select the desired DICOM format.

You can select one of the following DICOM formats:

Format	Use
X-Ray Angiographic (XA, unprocessed)	For viewing and post-processing on workstations (raw non-processed images).

Format	Use
X-Ray Angiographic (XA, processed without mask)	For viewing images on workstations (includes all image processing including subtraction but without mask).
X-Ray Angiographic (XA, processed with mask)	For viewing images on workstations (includes all image processing including subtraction and mask image will be included as a separate image under the series).
Secondary Capture (SC) without text	For target devices which cannot handle patient data on the image.
Secondary Capture (SC) with text	For printing and archiving.

- 6 Select the destination DICOM network drive.
- 7 To close the dialog box without saving the images, click **Cancel**.
- 8 To export the images, click **Export**.

If a Modality Performed Procedure Step progress update is to be sent, the **Modality Performed Procedure Step** dialog box is displayed. Enter the required details and click **Apply**. The export job is queued and the **Job Viewer** dialog box is displayed. For more information, see [Viewing Transfer Jobs in the Job Viewer \(page 191\)](#).

If you are using ClearGuide, the direction indicators are not included in the exported images.

5.23.3 Integrated DiskCopy

The **Integrated DiskCopy** feature supports import or export of images to/from CD/DVD/USB without compromising the quality. The images do not lose the quality and can be moved seamlessly.

NOTE *The Integrated DiskCopy feature is available only for Philips service personnel with the required IST/CSIP authentication.*

5.23.4 Saving Images to Local Media

You can save images from the system to a local storage device.

NOTE *Writing data to a USB drive or DVD should be considered as temporary storage only, and should not be considered a long-term backup solution.*

The following devices are supported:

- USB flash memory drive or other USB storage device, allowing you to save the following:
 - Single images in PNG format
 - Series in PNG and MP4 format
 - Images/series in DICOM format
- DICOM DVD, allowing you to save series in a fully compliant DICOM format with images and a dose report.

You can save data to a USB drive in several sessions, but you can only save data to a DVD in a single session.

NOTE *USB drives and DVDs containing patient data must be treated as confidential and must be maintained in a secure environment. De-identification options are available when exporting personal data.*



Figure 132 USB ports

- 1 If you are using the overview screen, select the images or series you want to save.

For more information, see [Overview Screen \(page 162\)](#).



- 2 From the single image screen or from the overview screen, click **Save to Media** in the global tools. The **Save to Media** dialog box is displayed.

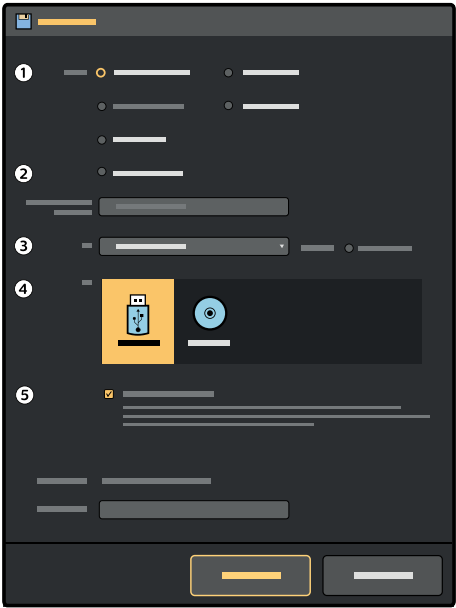


Figure 133 Save to Media dialog box

Legend			
1	Images to be saved	4	Destinations
2	Dose report selector	5	De-identify selector
3	Format selector		

- 3 Select the image or images to save.
- If you are using the single image screen, the current image is the selected image.
- You can change the images you want to save by selecting one of the following options:
- **Selected images**
 - **Flagged images**
 - **Selected series**
 - **All images**
 - **No images** (select this if you want to save only a dose report image)
- 4 To include a dose report image, select **With dose report**.
- 5 Select the desired format.
- If you save the images in a DICOM format, you can include a viewer in the local media by selecting **With viewer**. If the viewer on the local media is not compatible with your computer windows OS version, please download the latest viewer from following Philips webpage:
- <https://www.usa.philips.com/healthcare/about/support-library#!>
- On Philips web page, browse **Conformance and integration** section and click **Philips Multi-Modality DICOM Viewer**.
- 6 Select the destination drive.
- 7 To de-identify the patient, select **De-identify** and enter an appropriate **De-identified name**.

- 8 To close the dialog box without saving the images, click **Cancel**.
- 9 To save the images, click **Save**.

The save activity is queued as a job and the **Job Viewer** dialog box is displayed. For more information, see [Viewing Transfer Jobs in the Job Viewer \(page 191\)](#).

If you are using ClearGuide, the direction indicators are not included in the images.

5.23.5 Printing Images (Option)

You can choose which images to print and which DICOM printer you want to use. You can also choose to include a dose report with your print.

For more information about printing a copy of the examination monitor screen only, see [Printing the Examination Monitor Screen \(Option\) \(page 193\)](#).

- 1 In the overview screen, select the images or series you want to print by selecting or flagging the images or series.

For more information, see [Overview Screen \(page 162\)](#) and [Protection and Image Storage Management \(page 167\)](#).

If you prefer to print all the images in the current examination, you do not need to select the images.



- 2 In the global tools, click **Print**.

The **Print** dialog box is displayed.

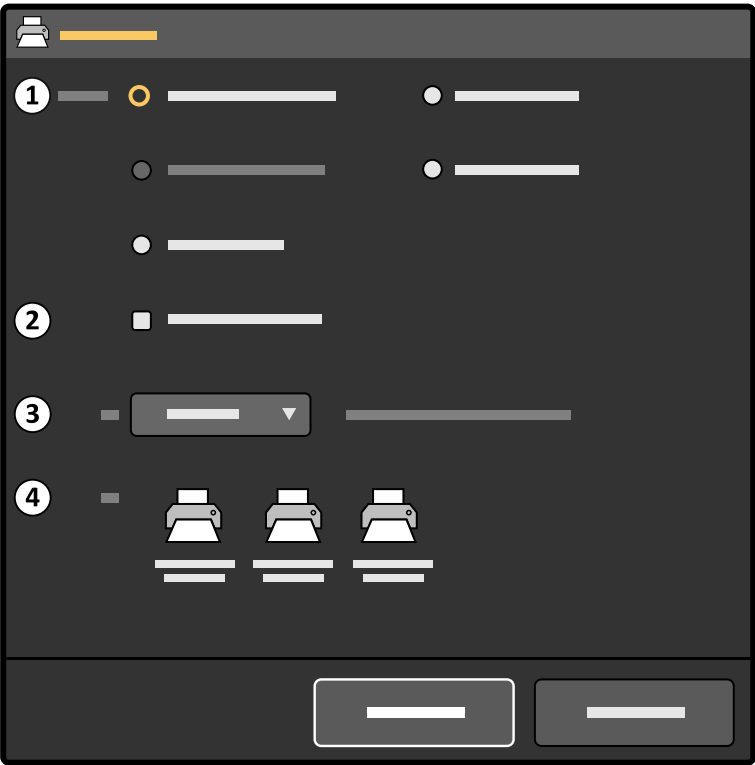


Figure 134 Print dialog box

Legend			
1	Images to be exported	3	Format
2	Dose report selector	4	Printers

- 3 Select the combination of images you want to print:

- **Selected images**
 - **Flagged images**
 - **Selected series**
 - **All images**
 - **No images**
- 4 To print a dose report with your print, select **With dose report**.
 - 5 Select the desired layout of images.
 - 6 Select the printer you want to use.
 - 7 To close the dialog box without printing, click **Cancel**.
 - 8 To print your selection, click **Print**.

The print job is queued and the **Job Viewer** dialog box is displayed. For more information, see [Viewing Transfer Jobs in the Job Viewer \(page 191\)](#).





If you are using ClearGuide, the direction indicators are not included in the printed images.

5.23.6 Viewing Transfer Jobs in the Job Viewer

The job viewer displays transfer jobs that are waiting or that resulted in errors, and allows you to see what errors were encountered.

You can see the status of current jobs in the global tools and in the **System** menu. You can also delete, abort, or repeat jobs.

The job viewer icon indicates the status using the following icons.

Icon	Status	Description
	No jobs	No jobs are being transferred, and no transfer jobs have failed.
	Busy	At least one job is being transferred, and no transfer jobs have failed.
	Error	No jobs are being transferred, and at least one transfer job has failed.
	Error and busy	At least one job is being transferred, and at least one transfer job has failed.

The job viewer opens automatically when you start an export job, a print job, or when you start to save images to local media. You can also open the job viewer at any time to view the status of transfer jobs.

To select more than one job in the list, press Ctrl and select the desired jobs. To select all jobs in a range in the list, select the first job, press Shift and select the last job. All jobs between the two jobs are selected.

- 1 To open the job viewer, do one of the following:
 - Click **System** and select **Job Viewer**.
 - Click the **Job Viewer** status icon in the global tools.

The **Job Viewer** dialog box opens.

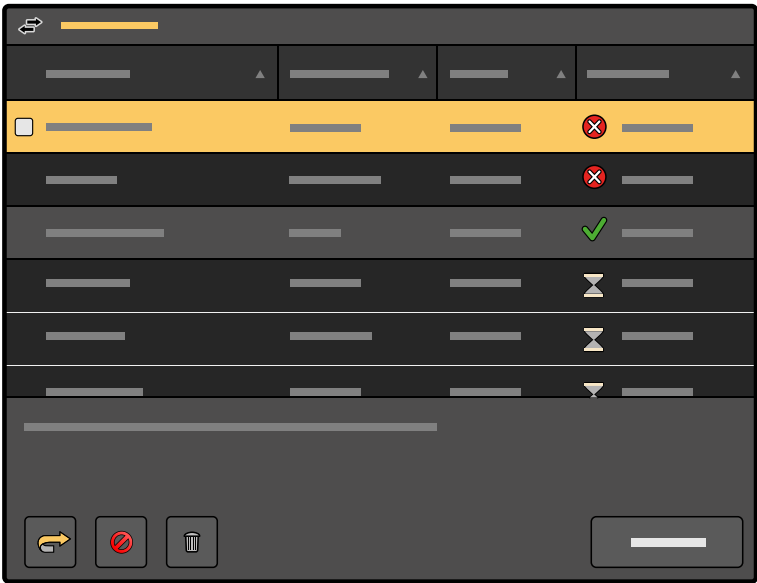





Figure 135 Job Viewer dialog box

The **Job Viewer** dialog box displays each transfer job and its status. The following statuses for transfer jobs are used:

Icon	Status	Description
	Completed	The transfer job is complete and if applicable, a successful storage commitment reply has been received from the storage target.
	Submitted	The transfer job is queued, and has not started or been attempted yet.
	Image count	The transfer job is in progress and the indicated image count shows the number of images transferred and the total to be transferred.
	Busy	MPPS status data is being transferred.
	Not committed	The transfer job has completed but a storage commitment reply has not yet been received from the storage target. The job remains in the list until the storage target commits the images to the archive. Although the job remains in the list, the images are only sent once.
	Cancelled	The transfer job was cancelled.
	Failed	A failure was detected.
	No connection	The system has detected a network connection, but a connection to the storage target is not detected.

Storage commit provides feedback on the status of images sent to the hospital network. The **Job Viewer** dialog box displays confirmation that images sent to a storage target have been archived. The time taken for the commitment of storage to be confirmed is dependent upon the storage commit server. The storage commit feature is enabled or disabled for each storage target by Service, or by a hospital administrator.

- 2
- For information about a specific transfer job, select the transfer job in the list.
More information about the selected transfer job is displayed below the list.

- 3
- To cancel transfer jobs, do the following:

a

Select the transfer jobs in the list.

b

Click **Cancel**.



All of the selected transfer jobs are cancelled immediately. The transfer jobs remain in the list and can be restarted if desired.

- 4 To restart transfer jobs, do the following:



a Select the transfer jobs in the list.

b Click **Redo**.

All of the selected transfer jobs are restarted and queued.

- 5 To delete transfer jobs, do the following:



a Select the transfer jobs in the list.

b Click **Delete**.

A dialog box is displayed requesting you to confirm that you want to delete the selected transfer jobs. Deletion cannot be undone.

c To close the dialog box without deleting the selected transfer jobs, click **Cancel**.

d To delete the selected transfer jobs, click **Delete**.

All of the selected transfer jobs are removed from the transfer queue and are no longer displayed in the list.

- 6 To close the **Job Viewer** dialog box, click **Close**.

5.23.7 Printing the Examination Monitor Screen (Option)

If the printer option is installed, a print can be made of the examination monitor screen on paper.

- 1 Make sure the printer is switched on and contains paper.

- 2 Display the desired image or dose report on the examination monitor.



- 3 Print the image by pressing the **Print** button on the mobile view station.

The use of printing paper types other than those specified in the printer's user manual may result in diminished printer performance and poor print quality.

If you are using ClearGuide, the direction indicators are included in your print.

For full instructions on using printers, refer to the printer's user manual.

NOTE *Safeguard confidentiality of printed images in accordance with applicable internal directives.*

When working with printed media, you should observe the following guidelines:

- Do not leave unused or printed paper in hot or humid places.
- Do not leave paper in a place subject to direct sunlight or bright room light for an extended period of time.
- Store unused or printed paper in a cool, dark place (below 30°C / 86°F), preferably in the manufacturer's original, unopened packaging.
- Do not stack printed paper on or under a freshly-developed diazo copy sheet.
- Do not allow any volatile organic solvent or vinyl chloride to contact the paper.
- Alcohol, plastic tape will fade the printout. Attach printed paper to other pieces of paper with double sided plastic tape or water-based solid glue.

5.23.8 Saving a Snapshot of the Examination Monitor Screen to USB

The mobile view station features a USB connection allowing the operator to store a snapshot of the examination screen on a removable USB flash memory drive.

Images saved on a USB drive should not be used for diagnostic purposes.

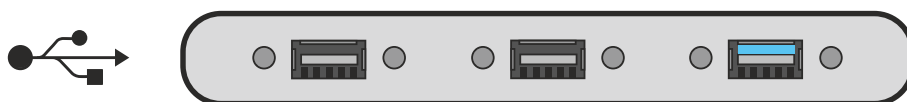


Figure 136 Mobile view station USB connectors

NOTE *You cannot save a snapshot when live images are displayed or when run cycle review is active.*

- 1 Insert a USB drive into one of the USB storage connections on the mobile view station connector panel.
- 2 Ensure the required screen is displayed on the examination monitor.
- 3 Press the **USB** button on the mobile view station.



A snapshot of the examination screen is made and stored on the USB drive in a folder named **Philips_X-ray_images**.

While the screen capture is being stored, the USB indicator light turns on and a message is displayed on the examination monitor indicating that the snapshot image is being stored and advising you to wait until this is completed before continuing.

Another snapshot cannot be made until the indicator light switches off, indicating that the store action is complete.

The snapshot is stored on the USB drive as a 24-bit color bitmap, and is named according to the patient, run number and image number. If there is insufficient space on the USB drive, an error message is displayed.

NOTE *Philips cannot guarantee that all USB drives function correctly with the system. If an error message is displayed indicating that the storage action failed, please try an alternative USB drive.*

If you are using ClearGuide, the direction indicators are included in the snapshot.

- 4 After the store action has completed, another snapshot can be captured or the USB drive can be removed.



CAUTION

Do not remove the USB drive until the USB button indicator light is off.

5.23.9 Saving Images for Service

If necessary, images can be saved to assist with system Service, for example, if you have observed problems with images or have a specific question.

You can save a maximum of 15 images for Service.

- 1 On the mobile view station, press Ctrl+S when a static full screen image is displayed on the examination monitor.

A message is displayed notifying you that health information will be disclosed to Service, and requesting your confirmation.

Patient identifying information is not stored with the image.

- 2 Click **OK** to confirm and to give your consent for the image to be saved.


The current image displayed is saved.

A message is displayed while the image is being captured, followed by a second message confirming the image has been captured, with a reference number for the image. You should note this reference number as it is required to allow Service to retrieve the correct image.

Images saved in this way can only be retrieved by Service.

5.23.10 Save Log File for Service

If necessary, the system log file can be saved to assist with system Service, for example, if you have observed problems with the system behavior or have a specific question.

- 1  On the mobile view station select the **Save Log File for Service** from the **System** menu. A popup will appear where you can Save or Cancel the creation of the log file.
- 2 Click **Save** to create the log file. This can take several minutes.
- The log file can be retrieved by Service as part of Remote Proactive Support.

5.24 Wireless Network

The wireless network provides the ability to maintain a network connection with your facility’s archiving system and a hospital network without requiring a physical connection (network cable). This increases the flexibility and mobility to transfer patient data between the system and networked archives such as a PACS.

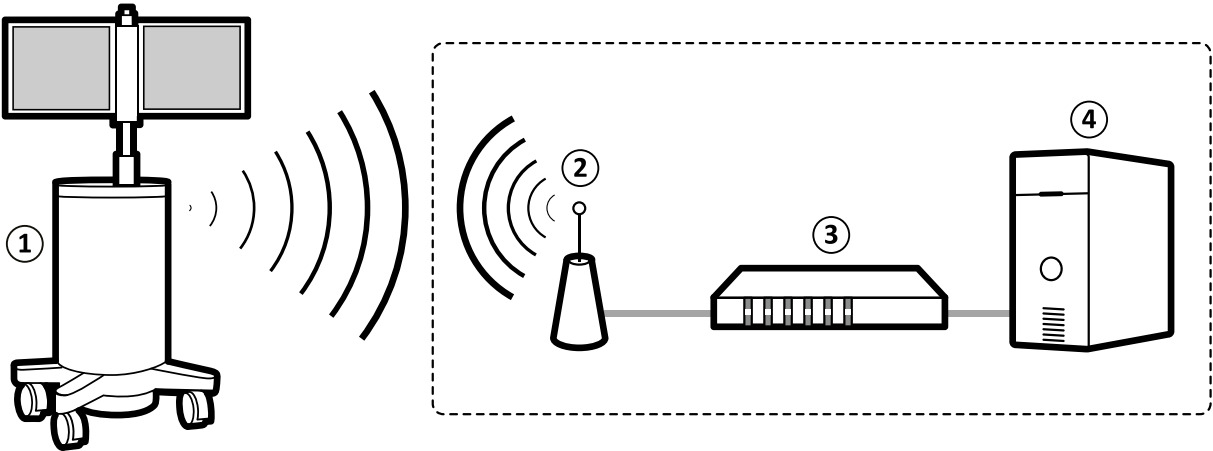


Figure 137 Wireless network infrastructure

Legend			
1	Mobile view station	3	Access point
2	Wireless link	4	PACS/RIS/HIS

Maintenance of the wireless network infrastructure, including an appropriate security configuration, is the responsibility of the healthcare facility.

The effectiveness of wireless networking is greatly dependent on environmental conditions in the hospital. To obtain secure and efficient performance from the wireless network, you should follow the guidelines described here.







Wireless Network Adapter configuration (IPv4/IPv6) will take around three minutes with High signal strength.

NOTE *Switch the wireless networking off in areas within the facility where wireless transmission is not allowed.*

The wireless network is implemented on the mobile view station. Antennas are mounted on the back on the mobile view station monitors. This wireless network can be switched on or off. For more information, see [Switching the Wireless Network Connection On and Off \(page 198\)](#).

Wireless connection strength is indicated by icons in the bottom right corner of the examination monitor and in the **System** menu.

The following icons indicate the wireless network connection status and strength.

Icon	Status
	High signal strength
	Medium signal strength
	Low signal strength
	Poor signal strength
	Unusable signal strength
	Error

The wireless network should only be switched on if you understand the risks involved with wireless networking. We recommend that the wireless network is switched off when not in use.

Network Security

The system is connected to the network whenever the wireless network is operational and the system is in range of an access point, whether the system is in use or not. This means that the system is more exposed to security threats than when using a wired connection. For more information, see [Network Security \(page 323\)](#).

Wireless Signal Integrity

The wireless network uses a radio signal that may vary in strength depending on the proximity and positioning of the wireless network devices and other objects. Interference from other devices that also use radio signals may affect the signal strength of the wireless network.

To avoid reduced connectivity through signal disturbance, it is advisable to use a wireless channel that is not in use by other wireless networks in the area.



CAUTION

Keep users or mobile devices at least 20 cm from the wireless antennas in the mobile view station (FCC regulation). Philips Medical Systems positions the wireless antennas to comply with this regulation, but it is your responsibility to maintain this regulation when the system is in use.

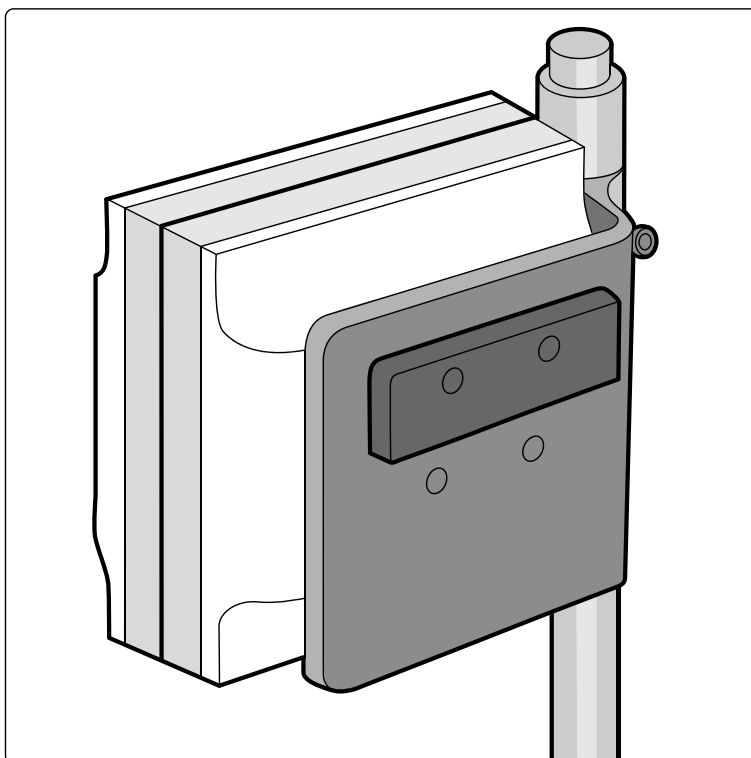


Figure 138 Wireless antennas on the mobile view station



WARNING

All wireless equipment in use in the hospital should operate in the 2.4 GHz radio frequency. Philips Medical Systems complies with this requirement, and to avoid interference with the Wireless LAN, it is also your responsibility to comply.

Access Point Roaming

Restrictions may apply to the configuration of the facility's wireless infrastructure and the system. To avoid interruptions to wireless network functions, the following precautions are recommended.

Access point roaming should only be configured if it is supported by the hospital and the hospital's IT infrastructure. If roaming between access points is supported, consider using a single subnet across access points that are used for roaming.

If roaming is not supported, use of the wireless network is restricted to a single access point. The wireless connection can only be used within the range of the designated access point. To maintain a strong signal, keep the mobile view station as close to the access point as possible.

Alternative Network Connection

Even if your wireless network is configured as recommended here, it may become inoperable due to problems beyond your control, such as:

- Radio interference
- Signal obstruction
- Wireless bandwidth congestion
- Insufficient access point coverage
- Inoperational access points as a result of maintenance or tampering
- High-frequency surgical knives

We recommend that a wired connection is available as an alternative in case of failure of the wireless network. To change the network connection to a wired connection, do the following:

- Switch off the wireless network. For more information, see [Switching the Wireless Network Connection On and Off](#) (page 198).
- Connect the hospital's wired connection to the hospital network port.

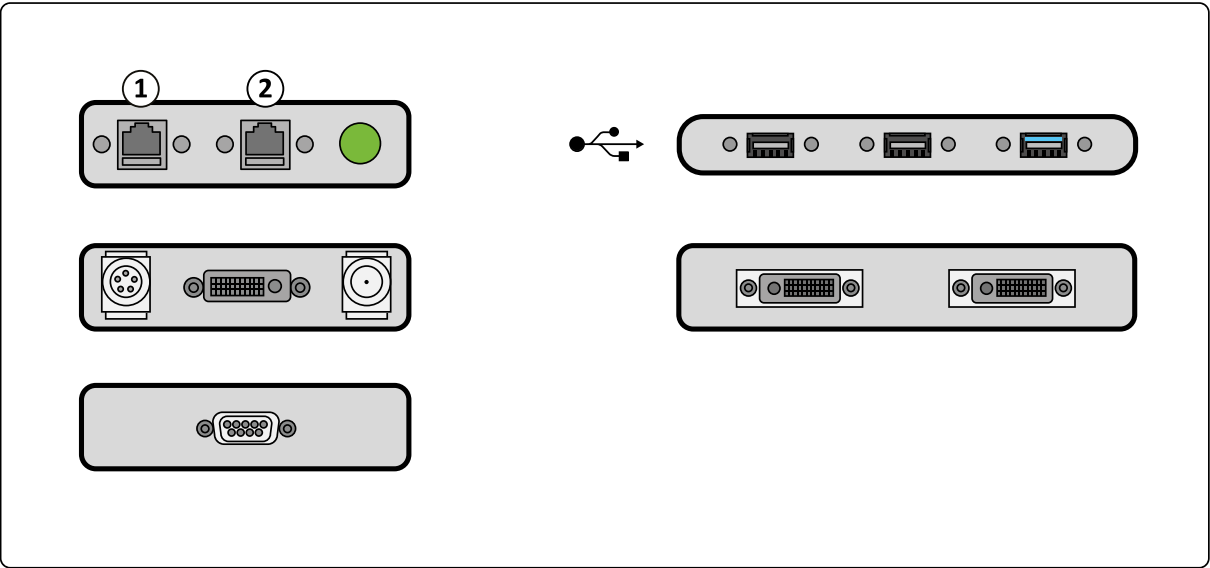


Figure 139 Mobile view station connector panel – network ports

Legend	
1	Hospital network port
2	Service connection port

Training and Support

It is the hospital's responsibility to train its staff.

- Hospital IT staff must be trained to configure network hardware to meet the network security requirements described here.
 - Clinical staff must be trained to understand the risks described here and how to avoid them.
- To assist a hospital with meeting this responsibility, additional documentation (manuals) is provided and IT support is available from Philips Medical Systems. Contact your local Philips representative for details.

NOTE *It is the hospital IT staff's responsibility to maintain wireless LAN settings.*

5.24.1 Switching the Wireless Network Connection On and Off

You can switch the wireless network on and off, to suit the environment you are working in.



- 1 Open the administration screen by pressing the **Administration** button.



- 2 Click **System** and select **Wi-Fi Networks** .

The **Wi-Fi Networks** dialog box is displayed.

- 3 To switch the wireless network on, select **Enabled**.
- 4 If desired, select a network to connect to, from the **Configured networks** list.
- 5 To switch the wireless network off, ensure **Enabled** is not selected.
- 6 To close the dialog box and save the changes you have made, click **Close**.

5.25 Options

Some functions are optional and may not be installed on your system.

This section provides information about using optional functions.

5.25.1 Laser Aiming Devices



WARNING

The lasers must not be switched on without purpose, and unnecessary exposure must be avoided.



WARNING

Use of controls, adjustments, or procedures other than those specified in this Instruction for Use may result in hazardous radiation exposure.

The optional tube laser aiming device is switched on and off by tapping the **Tube Laser** button on the C-arm stand touch screen. If the tube laser aiming device option is not present, the **Tube Laser** button is not visible.

There are no adjustments needed prior to the examination.

NOTE *For maximum accuracy of the laser aiming devices, check their alignment as described in [User Routine Checks Program \(page 232\)](#).*

Tube Laser Aiming Device (optional)



WARNING

Laser radiation. Do not view directly with optical instruments. Class 1M laser product. Viewing laser output with certain optical instruments (for example eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.



WARNING

The laser should not be used for target alignment when the light-cross center does not coincide with the image center indicator on the detector. If this occurs do not use the system until the problem is corrected by a Service technician.

NOTE *When the C-arm is positioned other than in a vertical (tank-down) position, the laser alignment accuracy decreases.*

Complies with IEC60825-1 and with FDA performance standards for laser products except for the deviations pursuant to Laser Notice No. 50 and Laser Notice No. 56.

5.25.2 Position Tracking

If the position tracking option is installed, the C-arm position is shown in the status area of the C-arm stand touch screen. The system shows the current C-arm rotation, angulation, height and longitudinal positions.

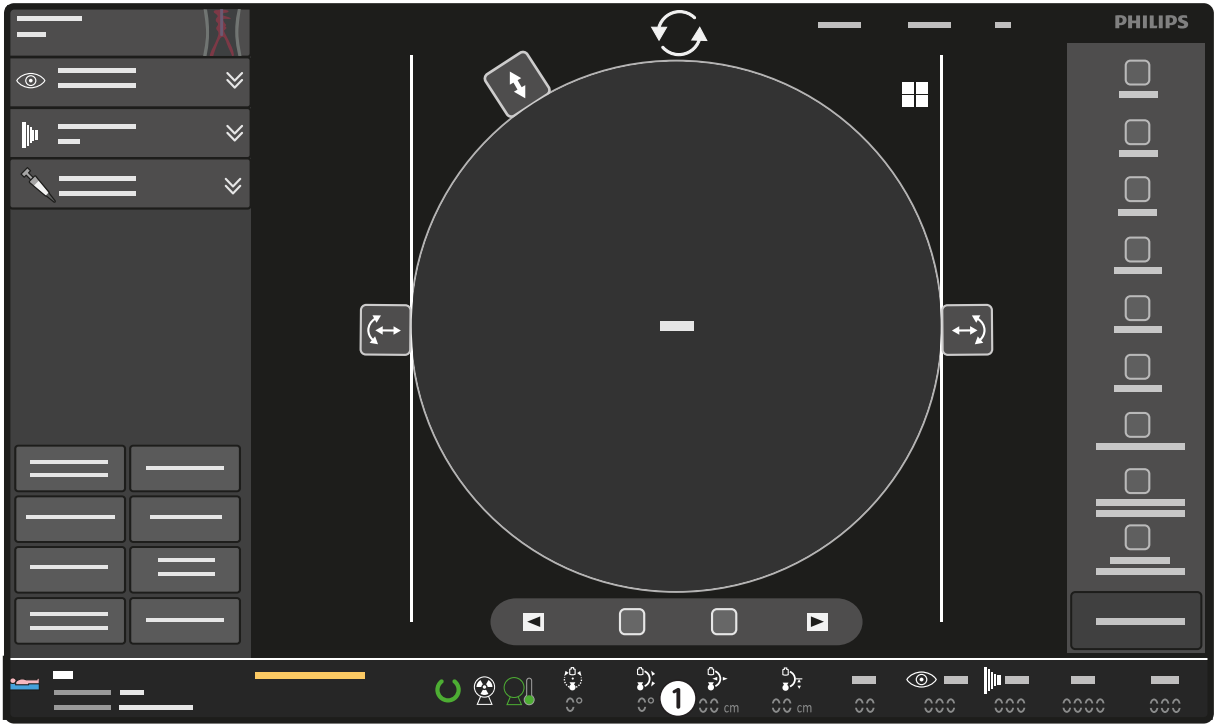


Figure 140 Position tracking in the C-arm stand touch screen status area (1)

Position tracking accuracy levels are shown in the table below.

Non-Motorized Model

Axis	Absolute accuracy
Angulation	± 1 degree
Rotation	± 1 degree
Longitudinal	± 2 mm
Height	± 2 mm

Motorized Model

Axis	Absolute accuracy
Angulation	± 2 degree
Rotation	± 2 degree
Longitudinal	± 2 mm
Height	± 2 mm

If the C-arm is moved, position information is magnified and shown in the center of the C-arm stand touch screen to assist the operator. Each figure is identified with a color corresponding to the colors used on the brake handles (see [C-arm Brakes and Movements \(page 84\)](#)).

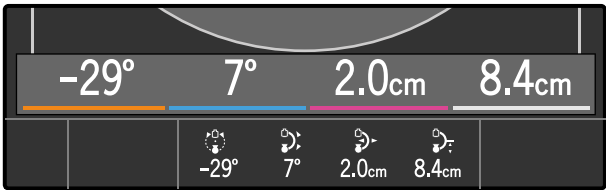


Figure 141 Magnified position tracking information when the C-arm is moved

NOTE If the C-arm is not moved for 2 seconds, the magnified figures fade from the screen.

Using the Position Memory

Up to three positions can be stored using the position memory function.

The position memory dialog box contains three expanding storage positions (**A**, **B** and **C**) that can be used to store C-arm position values.

- 1 Tap the **Position Memory** toggle button on the C-arm stand touch screen.

The position memory dialog box is displayed.

The image rotation control, shutter controls and diaphragm collimator control are not available when the position memory dialog box is displayed. To display these controls again, tap the **Position Memory** toggle button to close the position memory dialog box.

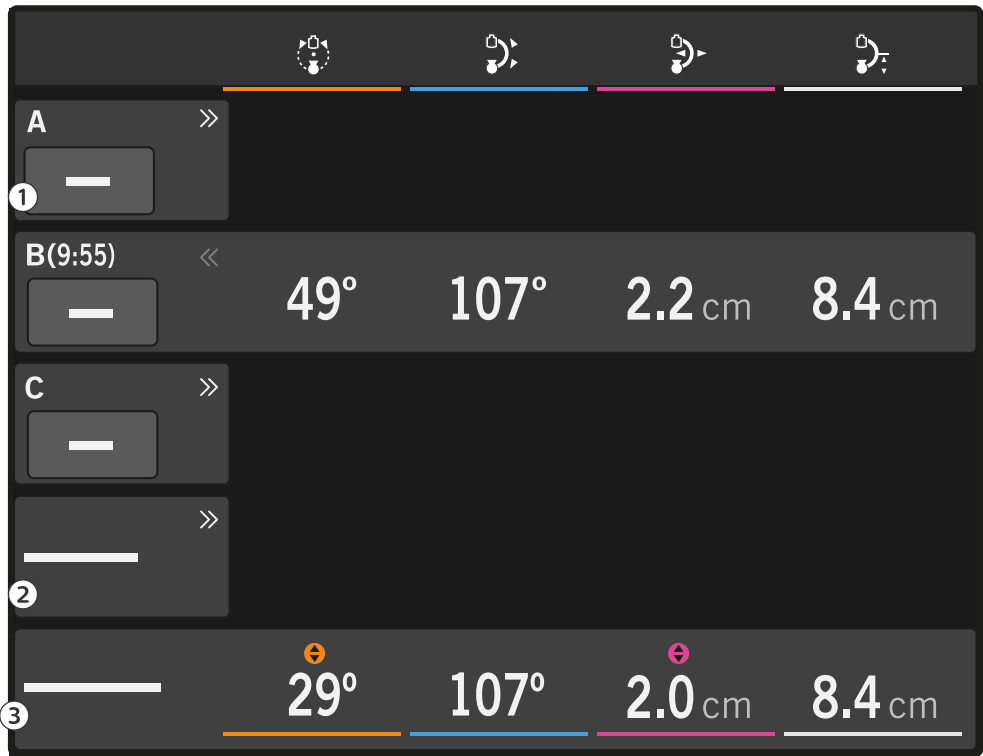


Figure 142 Position memory dialog box

Legend	
1	Store button
2	Selected Run expander
3	Current Position button

The **Selected Run** expander contains the C-arm position at the point that X-ray acquired in the selected/displayed run. The current position of the C-arm is also shown.

The **Selected Run** expander is not expanded and is disabled in Live mode, and if no image is displayed.

- 2 To store a position, make sure the C-arm is in the desired position and tap the **Store** button on the position memory dialog box.

The current C-arm position is stored in the first empty storage expander (**A**, **B** or **C**) and the storage expander opens to confirm the C-arm position has been stored. The time is also stored for reference.

The **Store** button is disabled if there are no empty expanders available.

- 3 Tap on the store button of an expander to overwrite the previously stored position.
- 4 To recall a stored position, tap the desired position (**A**, **B** or **C**) to open the expander.

The stored values are displayed.

If only one expander is open and the C-arm is not in the same position as the stored values, indicators are shown above the values of the **Current Position** that are different to those stored.



Figure 143 Position memory indicators

The C-arm can now be manually repositioned to match the stored position. For more information, see [C-arm Brakes and Movements \(page 84\)](#). When the current position matches the stored position, no indicators are shown.

- 5 To close the position memory dialog box, tap the **Position Memory** toggle button on the C-arm stand touch screen.

NOTE *The stored positions, times and the positions of the runs are lost if another acquisition examination becomes current.*

Recalling the Position of a Previous Run

- 1 To recall the position of a previous run, select the run from the overview screen (one image per run) (see [Overview Screen \(page 162\)](#)).
- 2 Tap the **Position Memory** toggle button on the C-arm stand touch screen.

The position memory dialog box is displayed.

- 3 Tap the **Selected Run** expander on the position memory dialog box.

The position details of the selected run are displayed in the **Selected Run** expander.



If only the **Selected Run** expander is open then indicators are shown above the values in the **Current Position** that are different to those stored.

- 4 Manually reposition the C-arm to match the stored position.

For more information, see [C-arm Brakes and Movements \(page 84\)](#).

When the current position matches the position of the selected run, no indicators are shown.

5.25.3 Outline Tool

Manual Outline Tool

The optional **Manual Outline Tool** can be used to draw markings on an image where it may be useful during a procedure, for example, during vascular surgery to mark vessel branches and stent positioning on live fluoroscopy images.

The outline tool is activated and used at the mobile view station.

Drawings can be created or changed using the mobile view station console touch pad or the examination monitor touch screen.



The outline tool button is only visible if the outline tool option is installed.

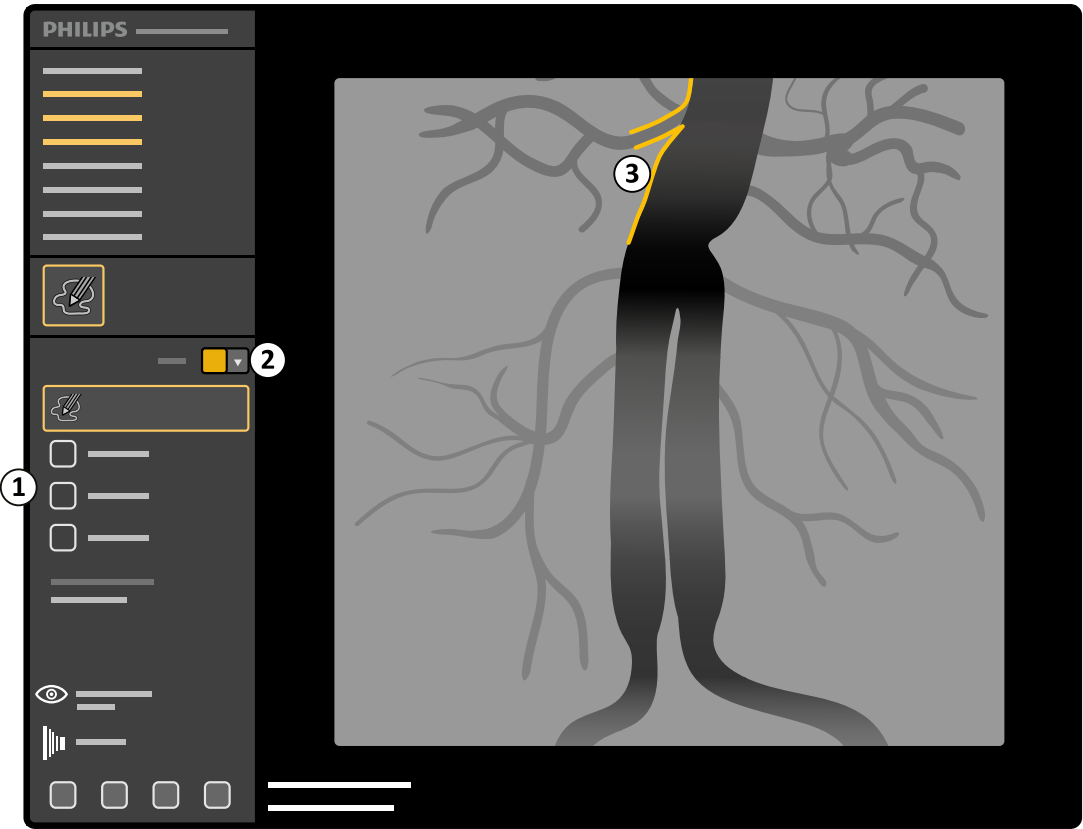


Figure 144 Outline tool on the examination monitor

Legend	
1	Outline drawing tools
2	Color selector
3	Outline drawing

Only one drawing is kept by the system. If another examination becomes current or if another drawing is made, the original drawing is lost.

It is not possible to rotate, flip or mirror an image if an outline drawing is present. If rotation, flipping or mirroring is attempted while a drawing is present, the image will not be rotated, flipped or mirrored and a warning is displayed on the examination monitor and the C-arm stand touch screen.

If an image is stored to USB, printed or copied to the reference monitor, the drawing is included. If an image is exported (DICOM), the drawing is not included.

Drawing with the Outline Tool



- 1 Click on the outline tool button on the examination monitor on the mobile view station.

NOTE *The outline tool button is disabled if the image is zoomed.*

The outline drawing tools are displayed and the **Draw** function is selected by default.

- 2 To draw a dot on the image, click on the image where the dot is required.

A dot is drawn on the image.

**CAUTION**

To avoid damaging and scratching the examination monitor, use finger on touchscreen/touchpad or use external mouse.

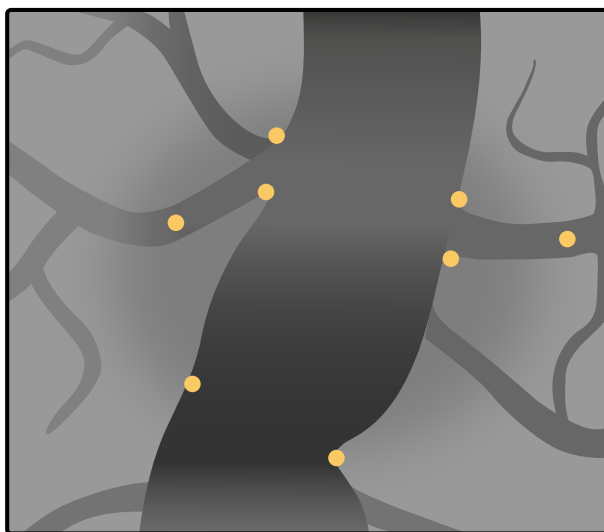


Figure 145 Example dots on an image

- 3 To draw a line on the image, use mouse or finger on the touch screen for best results.

NOTE *The Draw button is disabled and a notification is displayed if a drawing contains the maximum number of lines and dots. The maximum that can be stored by the system is 25 lines and 25 dots.*



Figure 146 Example lines on an image

- 4 To change the color of a drawing, select a new color using the color selector.

All new lines or dots that you add to this drawing will be displayed in the new color. If you delete the drawing and start a new one, the color will change to the default color.

- 5 To hide a drawing without deleting it, do one of the following:



- Click on the outline tool button on the examination monitor on the mobile view station.



- Click **Hide**.

The drawing will be removed from view but is not deleted.

NOTE *The drawing is hidden if the image is zoomed. The drawing is displayed again when the image is no longer zoomed.*



- 6 To re-display an existing drawing, click on the outline tool button on the examination monitor on the mobile view station.

The drawing will be displayed.



- 7 To delete all lines or dots on the image, click **Delete all** on the outline dialog box.



Clicking **Undo** after clicking **Delete all** will undo the delete action.



- 8 To delete the last line or dot drawn, click **Undo** on the outline dialog box.

Clicking **Undo** can be repeated until all drawn lines or dots have been removed from the image.

Automatic Vascular Outline (AVO)

The function of **Automatic Vascular Outline (AVO)** is to automatically perform 2D detection and outlining of vessel tree structures on the image.

Initializing the AVO

AVO can be started from MVS, C-arm stand touch screen or Remote Control.














- 1 Press the **Outline** icon, it expands and displays the below AVO panel.



Figure 147 AVO panel

The AVO buttons are explained below:

Symbol	Legend	Description
	Outline	Expands the sub panel containing different buttons
	Auto Outline	Automatically detect and draw the outline around vascular area
	Region	To draw on and highlight a particular area/region in the image
	Erase	To erase unintended lines
	Draw	To manually draw outlines
	Outline Color	Helps select the color of the outline
	Outline Weight	There are five line-weights options available to select from
	Snapshot	Saves images with outlines as shown on the MVS screen
	Delete	Deletes all the outlines on the image
	Undo	Cancels the last actions in the selected operation
	Show-Hide	Hides the outline and disables rest of the UI controls in the UI sub-panel. The outline and UI controls are enabled when Show-Hide button is clicked again

NOTE

AVO auto draw can be activated in Cine mode.

You can perform **Delete**, **Show-Hide** and **Auto Outline** functions by clicking **Outline** from the C-arm stand touch screen.

You can perform automatic outline using the remote by clicking **Auto Outline** icon.



Figure 148 C-arm stand touch screen Outline button

NOTE *Automatic outlining is possible on subtracted and traced images.*

NOTE *Automatic outlining is not possible on snapshot images.*



WARNING

Depending on the anatomy and acquisition parameters, the quality of the automatic vascular outline may be insufficient for the purpose of navigation. Always ensure the adequacy of the outline for the corresponding anatomy before proceeding with your navigation/intervention.

5.25.4 Wireless Foot Switch

NOTE *Wireless Foot Switch is a optional offering, If customer didn't select Wireless Foot Switch option then this section is not applicable.*

The wireless foot switch is intended only for use with the system indicated in the model number.

The wireless foot switch generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications

There is no guarantee that radio interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on; please consult your Philips Service Engineer for help.

The wireless foot switch must be installed by a qualified service engineer with Philips installation kit. Contact Philips representative for further details.

Before using the system, check that the wireless foot switch matches with the system. If identification labels have been used, check that the labels attached to the system and to the foot switch match.

If the wireless foot switch is not available or is inoperable, use the hand switch or wired foot switch.

NOTE *The wired foot switch should always remain connected to your X-ray system and be available for clinical use when using the wireless foot switch.*

NOTE *Under normal operating conditions, the maximum amount of time that irradiation can continue after the release of a foot switch pedal is within 0.1 second (applicable for radioscopy events more than 0.5 seconds).*

NOTE *The wireless foot switch is not intended for patient contact. It is classified as insulation class II. When using the wireless foot switch, observe the following guidelines:*

- Only use the wireless foot switch on a horizontal surface
- Do not tilt or move the wireless foot switch during use as this may cause the wireless foot switch to switch off, causing the immediate cancellation of signals and loss of functionality.
- Position the wireless foot switch within recommended range (See [Wireless Foot Switch \(page 309\)](#)) in order to achieve better pairing. Avoid any obstructions within the vicinity of wireless foot switch and C-arm stand. Wireless foot switch may be put in sterile plastic coverings if so desired.
- Do not use the charging cable to move, transport, or store the wireless foot switch.
- Avoid driving over the charging cable with other devices or equipment.
- Avoid pressing any of the pedals or buttons of the wireless foot switch while the X-ray system is starting.



CAUTION
Take care not to damage the cable of the charging unit when moving equipment around the room (for example, the C-arm stand, the mobile view station, carts, or beds).



CAUTION
Do not burn, incinerate or subject to extreme heat.



CAUTION
The pick up bar on the foot switch is designed to lift up the foot switch from the floor. Do not step on it.

NOTE *If the battery of the wireless foot switch is depleted during a procedure, the foot switch will switch off. In this case, the hand switch / wired foot switch should be used to continue the procedure. You should ensure that the battery is properly charged prior to using the foot switch. Do not charge the wireless foot switch while in use.*

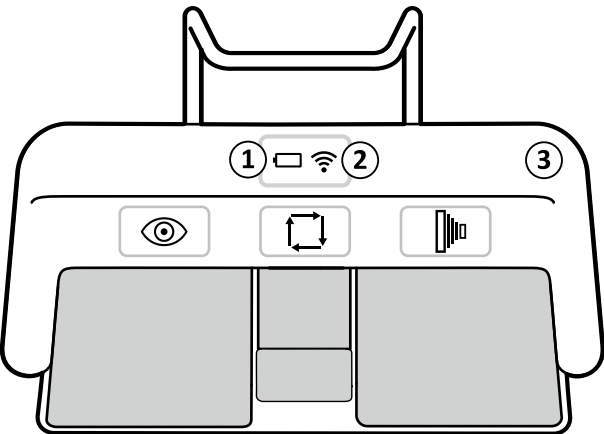


Figure 149 Wireless foot switch

Legend	
1	Battery indicator
2	Wireless connection indicator
3	Identification label recess

Identification Labels

During installation, the wireless foot switch is paired with the X-ray system, so that the foot switch only activates functions on the matching X-ray system.

A sheet of self-adhesive identification labels is supplied with the wireless foot switch, and we recommend that you use these labels to identify the foot switch and the X-ray system.







The sheet of labels provides 6 pairs of printed numbers, so that you can attach matching labels to the equipment. Additionally, 2 pairs of blank labels are provided, in case you want to use your own identification marks.


Attach one of the identification labels to the recess in the upper-right corner of the foot switch, and then attach the corresponding identification label to a clearly visible location on the X-ray system.



Wireless Foot Switch Indicators

The indicator lights on the wireless foot switch display the charge level of the battery and the status of the wireless connection. The battery indicator descriptions in the following table are based on typical usage. The status of an indicator depends on the model of your foot switch. For more information about the model types, see [Labels \(page 26\)](#)

If the wireless foot switch is not in use, it enters sleep mode and all indicators are switched off. To wake the wireless foot switch, move it or press any pedal.

Battery Indicator	Type 1	Type 2	Action
 Green	Battery charge level is between 25% and 100%.	Battery charge level should provide more than 40 hours of use.	No action required. The foot switch is ready to use.
 Red	Battery charge level is between 0% and 25%.	Battery charge level should provide 20 to 40 hours of use.	Type 1: Charge the battery. See Charging the Wireless Foot Switch Battery (page 213) . Type 2: The foot switch can be used, but it is recommended to charge the battery. See Charging the Wireless Foot Switch Battery (page 213) .
 Red, flashing every 0.5s	Not applicable	Battery charge level will provide less than 20 hours of use.	Charge the battery. See Charging the Wireless Foot Switch Battery (page 213) .
 Red, flashing rapidly	Not applicable	Battery charge level is less than 1.5%. Charge the wireless foot switch battery before use.	Charge the battery. See Charging the Wireless Foot Switch Battery (page 213) .
 Green, flashing	Battery is charging.	Battery is charging.	See Charging the Wireless Foot Switch Battery (page 213) .
 Red and green (at startup)	Not applicable	A critical error has occurred.	Disconnect the charger if it is connected. Switch the wireless foot switch off and then on again, or perform a cold restart of the X-ray system. If this does not resolve the issue, use the wired foot switch for the procedure and contact technical support.

Wireless Indicator	Status	Action
 Off	Wireless connection is operational.	No action required. The foot switch is ready to use.



Wireless Indicator	Status	Action
	Red	<p>There is an error in the wireless connection. Do not use the foot switch.</p> <p>Move the wireless foot switch closer to the receiver. The location of the receiver depends on your system configuration; it is located either inside the patient table base or in the surgery wall connection box. Wait for the wireless indicator to go out before using the wireless foot switch.</p> <p>If this does not resolve the issue, continue the procedure using the wired foot switch.</p> <p>To resolve the issue after completing the procedure, switch the wireless foot switch off and then on again or perform a cold restart of the X-ray system. If this does not resolve the issue, continue using the wired foot switch and contact technical support.</p>
	Red, flashing rapidly	<p>A critical error has occurred (not applicable for the type 1 wireless foot switch).</p> <p>Switch the wireless foot switch off and then on again or disconnect the charger if it is connected. Wait for the wireless indicator to go out before using the wireless foot switch.</p> <p>If this does not resolve the issue, continue the procedure using the wired foot switch.</p> <p>To resolve the issue after completing the procedure, perform a cold restart of the X-ray system. If this does not resolve the issue, continue using the wired foot switch and contact technical support.</p>

NOTE *If the battery indicator is red and flashing rapidly, the red wireless indicator light is also switched on. This is because there is insufficient charge in the battery to maintain the wireless connection and the wireless foot switch has stopped working. Connect the charger or use the wired foot switch.*

Wireless Foot Switch Functions

The functions that are assigned to each switch are configured when your system is installed. A label is placed next to each switch to indicate the assigned function.

The following functions are always assigned to a switch.

Mandatory Functions	
	Perform fluoroscopy
	Prepare and perform exposure

Storage

When not in use or when moving the system, store the wireless foot switch and the charger in the storage cradle provided on the mobile view station.

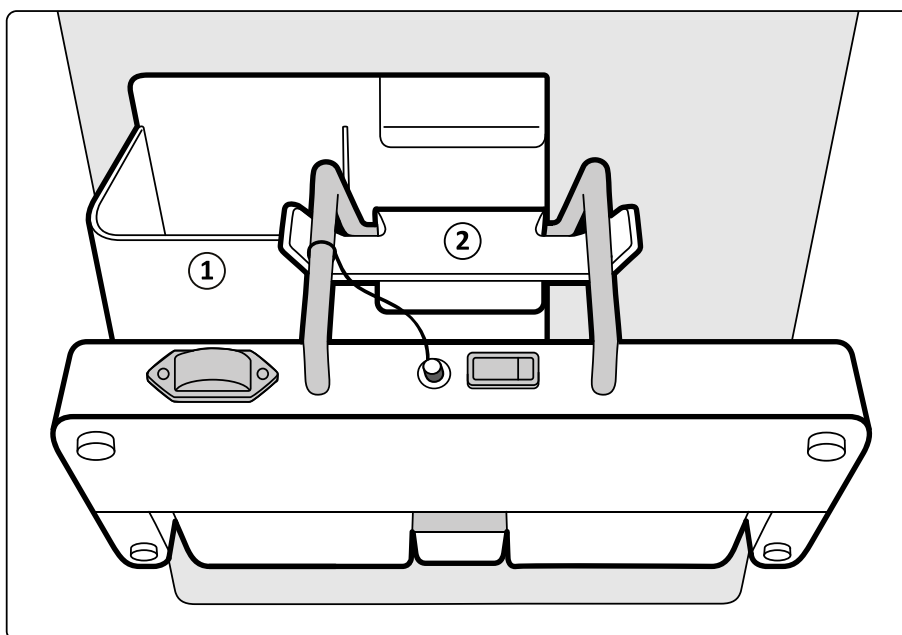


Figure 150 Wireless foot switch and charger storage on the mobile view station

Legend

- | | |
|---|-----------------------------------|
| 1 | Charger storage location |
| 2 | Wireless foot switch storage hook |

NOTE *If wireless foot switch malfunctions, this could interrupt a procedure that is in progress. In this event, you can continue with image acquisition using an alternative X-ray activation switch, such as a wired foot switch or hand switch.*

NOTE *The wired foot switch should always remain connected to your X-ray system and be available for clinical use when using the wireless foot switch.*



CAUTION

If dense or sticky fluids are spilled on the wireless foot switch (for example, blood or contrast fluid) and are allowed to build up, the wireless foot switch may not function as expected. Debris or other objects may also obstruct the function of the pedals on the wireless foot switch.

Clean the foot switch if it is soiled and at least weekly. For details of the recommended cleaning procedure, see [Cleaning the Foot Switch \(page 236\)](#)

NOTE *Use the handle of the foot switch to lift it and reposition it, but do not step or stand on the handle.*

Using a Cover on the Wireless Foot Switch

To prevent the wireless foot switch from becoming soiled and to ensure correct function, use a properly fitted impermeable, and transparent cover (bag) on the wireless foot switch. Use a cover size according to the following dimensions for wireless foot switch: 35 cm by 70 cm (13.8 in by 27.6 in). Thickness: 50 microns.

If the cover becomes soiled or shows signs of wear, use a new cover. Do not reuse a previously removed cover.

When fitting a cover on the foot switch, follow these guidelines:

- Ensure that the cover is not fitted tightly over the foot switch, so that when you press a pedal, the other pedals are not activated.
- Ensure that the cover is not left open on the top of the foot switch. An opening may allow fluids to get inside the cover and contaminate the foot switch.

Covers and sheets for the equipment can be purchased from Ecolab. For details, refer to the Ecolab website:

www.ecolab.com

NOTE *The following figure shows examples of fitting a cover on the wireless foot switch.*

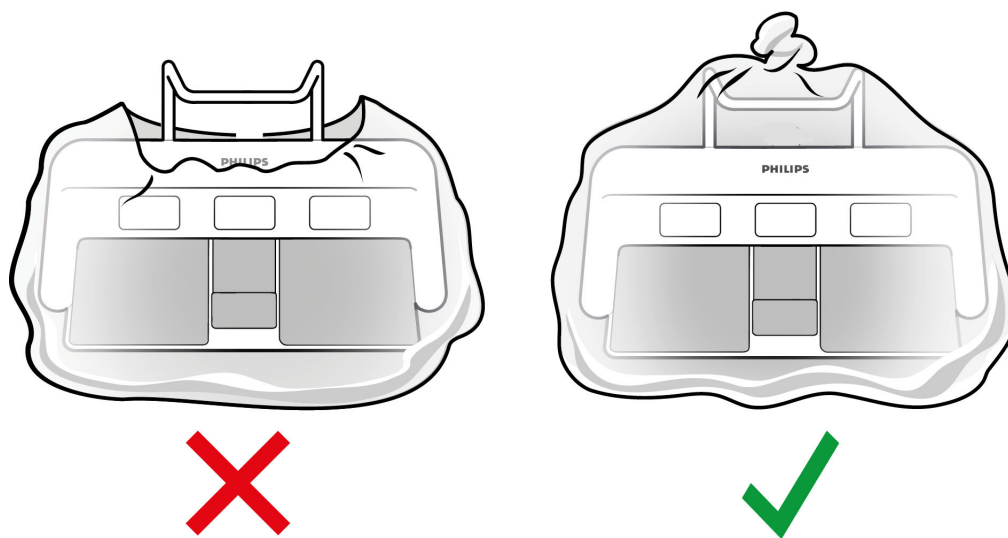


Figure 151 Transparent cover on the wireless foot switch: incorrect fitting, the cover is open (left), and correct fitting the cover is tightly wrapped (right)

Switching the Wireless Foot Switch On and Off

- 1 To turn the wireless foot switch on, switch the on/off switch on the back of the foot switch to 1.

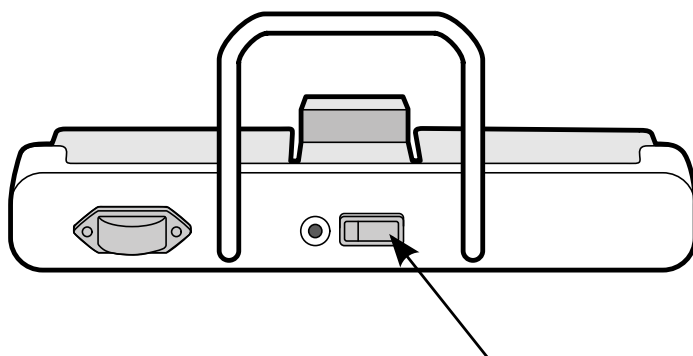


Figure 152 Wireless foot switch on/off switch

- 2 Check the status of the indicator lights on the wireless foot switch to ensure that it has sufficient charge and that the wireless connection is operational.

For details, see [Wireless Foot Switch \(page 207\)](#).

If the wireless foot switch is in sleep mode, it can be reactivated by moving it.

- 3 To turn the wireless foot switch off, switch the on/off switch to 0.

Charging the Wireless Foot Switch Battery

A charger is supplied to recharge the battery of the wireless foot switch.

NOTE *Use only the charger supplied with the wireless foot switch. Using any other charger may cause damage to the foot switch and void the warranty.*

- 1 Remove the cap from the charging port on the back of the wireless foot switch.

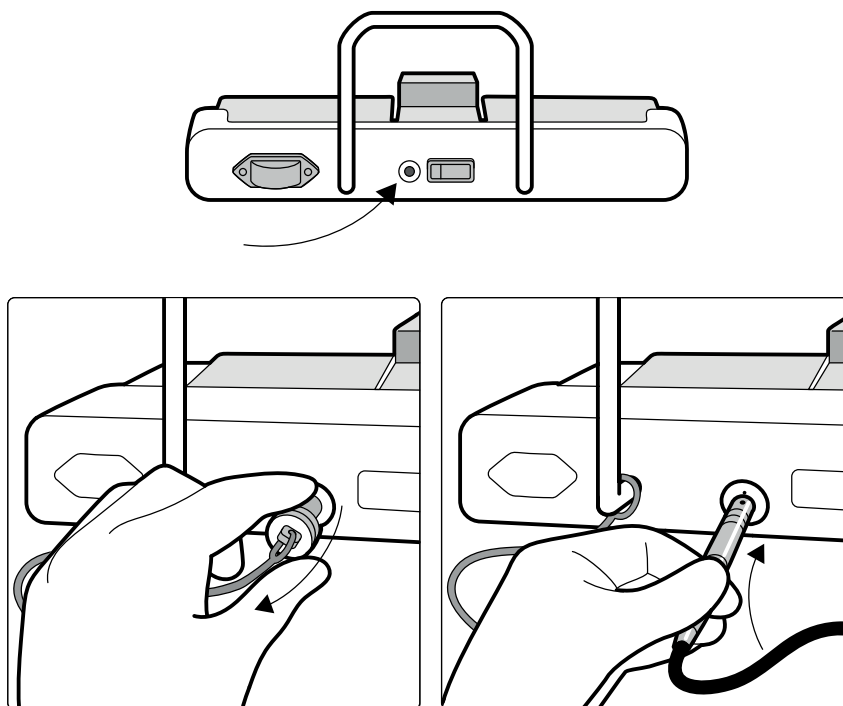


Figure 153 Wireless foot switch charging port

- 2 Connect the charger to the charging port. Ensure that you align the red dot on the charger connector with the marker on the charging port.

The battery indicator on the wireless foot switch flashes green while the foot switch is charging.

NOTE *If you use the wireless foot switch with the charger connected, ensure that the wireless foot switch is positioned to allow the charger to be easily disconnected from the foot switch if necessary. You may need to disconnect the charger to restart the wireless foot switch. If care is not taken when disconnecting the charger, damage may be caused to the charger or the wireless foot switch.*

- 3 To stop charging the wireless foot switch, disconnect the charger from the charging port by doing the following:

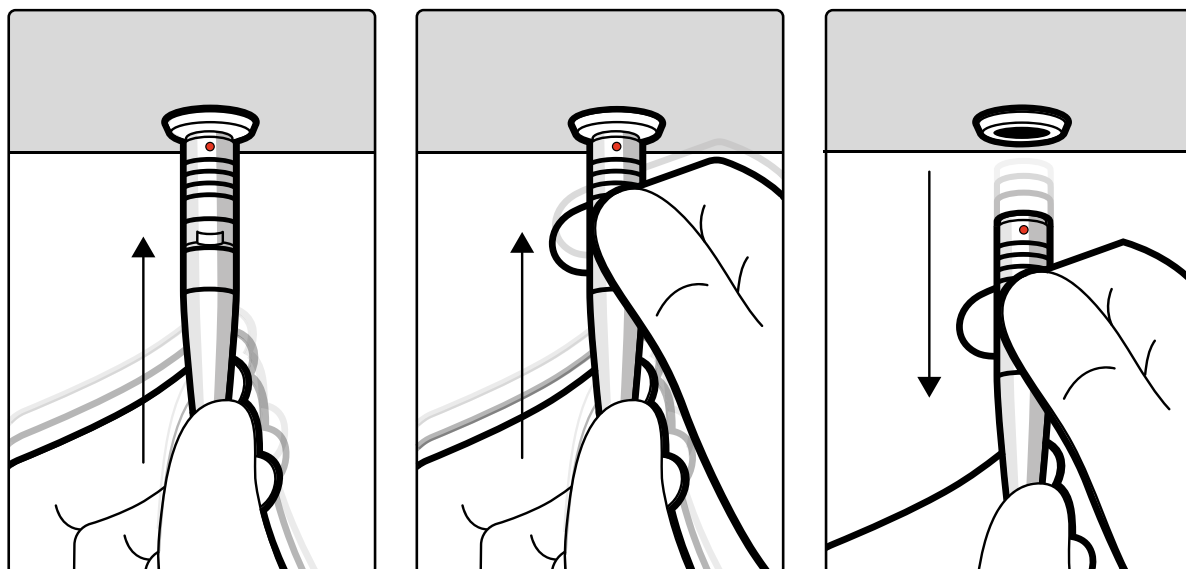


Figure 154 Disconnecting the charger cable

- a Hold the connector firmly and push it gently toward the wireless foot switch, and hold the connector in that position.
- b Using your other hand, grip the collar and pull the connector out of the charging port.
- c Put the cap back on the charging port on the back of the wireless foot switch.

NOTE *If you disconnect the charger while X-ray is being performed (while a pedal is being pressed), image acquisition stops and should be restarted, if needed, by releasing and pressing the pedal again.*

A complete charge cycle takes more than 12 hours. Ensure that the wireless foot switch battery is charged at least every week. We recommend that you charge the battery at the end of every day, or when the battery indicator turns red. The battery has built-in safety devices to protect it from overcharging.

The duration of use after charging depends on the model of your foot switch. For more information about the model types, see [Labels \(page 26\)](#).

- For the type 1 wireless foot switch, a complete charge lasts for one week of use.
- For the type 2 wireless foot switch, a charge of between 6 to 8 hours provides up to 8 hours of continuous use.

NOTE *If the battery of the wireless foot switch is depleted within 2 days after a complete charge, contact technical support for a replacement battery. The battery may only be removed and replaced by a qualified service engineer.*

Storing the wireless foot switch for longer than 12 months without recharging the battery may damage the battery.

Storing the wireless foot switch for longer than 24 months without recharging the battery will cause battery failure.

5.25.5 Viewing External Video

The optional external video function allows you to view images from an external video source connected to the mobile view station, for example, ultrasound or endoscopy images.

- 1 Connect a video source to the video-in connector on the mobile view station connector panel.

This requires video input connection using DVI (digital and analog), SDI, or S-video, using two synchronized signal and ground pairs (Y/C).

- Y = Intensity (luminance)
- C = Color (chrominance).

To connect an analog VGA input, you should use a VGA to DVI converter which is not provided with the system.

NOTE *When connecting an external video source for the first time, please connect the video source only after system is powered up and ready for use.*

NOTE *In case DVI-In source (digital and analog) is not connected to MVS connector panel and if user double presses the External Video button, then reference monitor (right) may show “No Signal input”. To overcome this, user needs to single press External Video (ON) and after some time again single press External Video button (OFF).*

- 2 To change the video source you want to display, do the following:



- a Press the **Administration** button on the mobile view station.

The **System Setup** dialog box is displayed.

- b Select the desired **External video input**.

- c Click **Apply**.



- 3 Press the **External Video** button on the mobile view station.

The external video source is displayed on the reference monitor. The external video indicator light indicates that the images on the reference monitor are from an external source.

NOTE *While switching among input video signal types, if the display does not show the external video, then the output can be reset by toggling the External Video button.*

NOTE *While viewing external video if the external video cable is accidentally disconnected, then toggle the External Video button to resume the external video display after reconnecting the cable.*



- 4 Press the **External Video** button again to stop viewing the external video source.

The external video indicator light switches off.

5.25.6 Spring Bow

You can fit sterile cloth or disposable covers to the system using the spring bow which can be fitted to the C-arm.

You should use sterile covers to prevent contamination of the system and maintain a sterile environment. It is the responsibility of the hospital to supply and fit sterile covers when needed. For information about fitting sterile covers to the C-arm, see [Fitting the Spring Bow \(page 216\)](#).



WARNING

Two persons must install the sterile covers. Sterile clothes and gloves must be worn while installing the covers.



WARNING

Do not allow the sterile covers to touch the floor or non-sterile parts.

Sterile and non-sterile covers and sheets for the equipment can be purchased from Microtek. For details, refer to the Microtek website:

www.microtekmed.com

Alternatively, you should contact your local dealer for information on where sterile covers can be purchased.

Depending on the sterile covers you use, the spring bow may not be required. Check with the manufacturer of your sterile covers for more information.

Detailed procedures for fitting sterile covers are the responsibility of the healthcare environment.

NOTE *When using a sterile cover on the C-arm stand touch screen, ensure that the cover is fitted tightly to avoid problems when using the touch screen for actions such as dragging.*

Fitting the Spring Bow

The spring bow that holds the sterile covers in place on the C-arm is not symmetrical: one end fits the detector and the other end fits the X-ray tank.

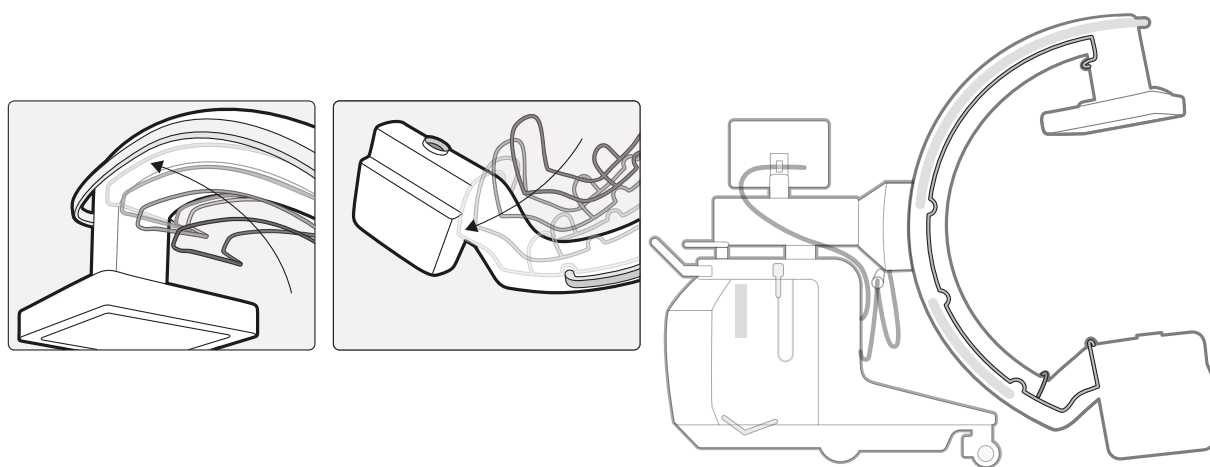


Figure 155 Fitting the Spring Bow

Observe local protocols and procedures when fitting covers.

5.25.7 Touch Screen Module (TSM)

Touch Screen Module (TSM) solution comprises of

- Swing Arm
- Touch Screen Monitor Connector
- Touch Screen Monitor

Swing Arm

The Swing Arm acts as an interface between the Touch Screen Monitor and the patient table. The Swing Arm comprises of four main components namely

- Bracket that holds the Touch Screen Monitor
- Joint 1, which connects bracket to the monitor
- Joint 2, which clamps the Swing Arm to accessory rails
- Rotating joint
- Knob that fixes the Touch Screen Monitor to the Swing arm

The Swing Arm allows user to position the Touch Screen Monitor display in upright or in collapsed position.

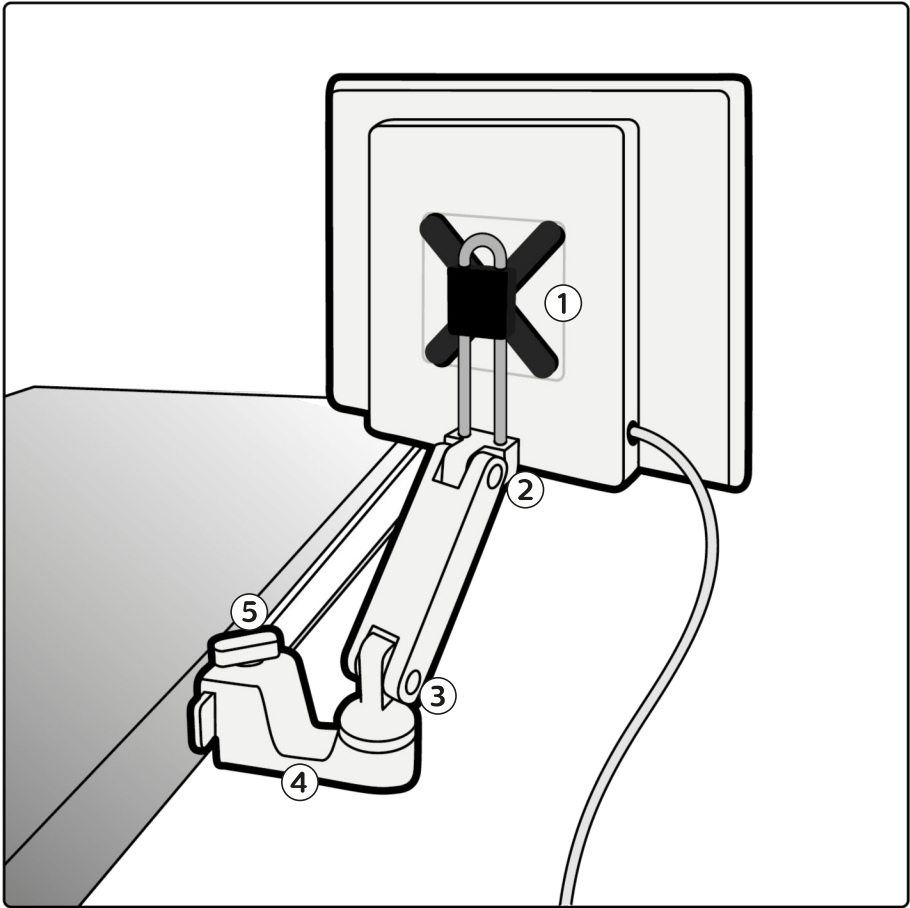


Figure 156 Swing Arm

NOTE Images added are only for reference (or similar to this)

Legends			
1	Bracket	4	Rotating joint
2	Joint 1	5	Knob
3	Joint 2		

Attaching and Detaching the Swing Arm to Accessory Rails

The Swing Arm is mounted on the accessory rails. You can attach or detach the Swing Arm to the accessory rails without removing any other equipment. The Swing Arm is compatible with side rails of different sizes. The Swing Arm can be mounted on rails from 23 mm to 30 mm height (depth) 7 mm to 10 mm width (thickness). Depending upon type of surgery table like orthopedic, vascular, user can adjust the opening of knob (loosen or tighten).

- 1
- To attach the Swing Arm to the accessory rail, do the following:
- Ensure the clamp on the Swing Arm is open by loosening the knob.
- Place the Swing Arm on the accessory rail at the desired position.
- Close the clamp by tightening the knob

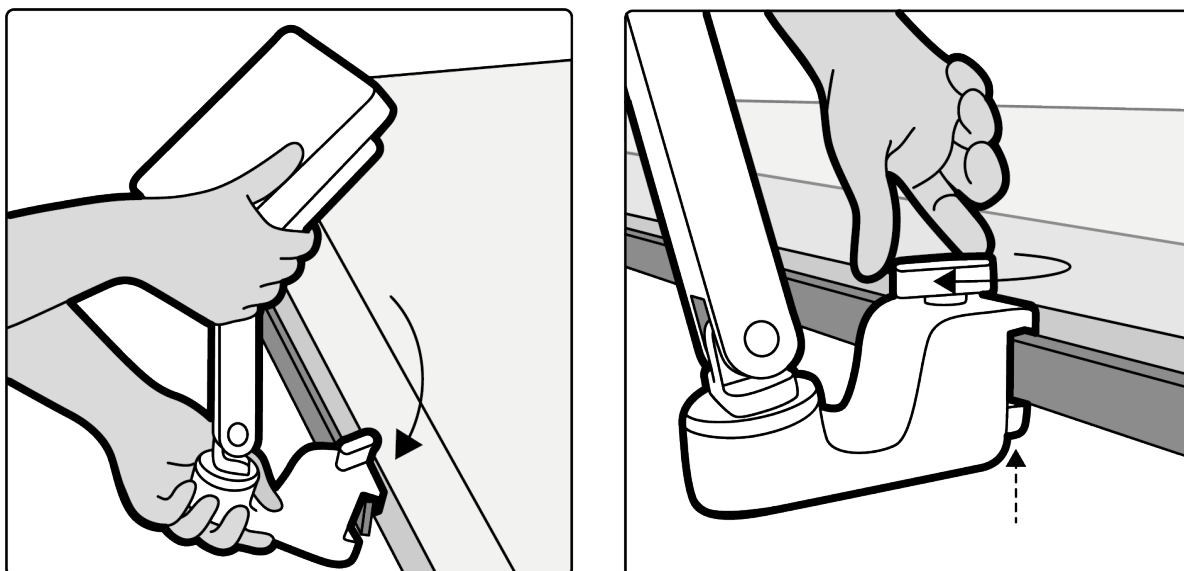


Figure 157 Attaching the Swing Arm to Accessory Rails

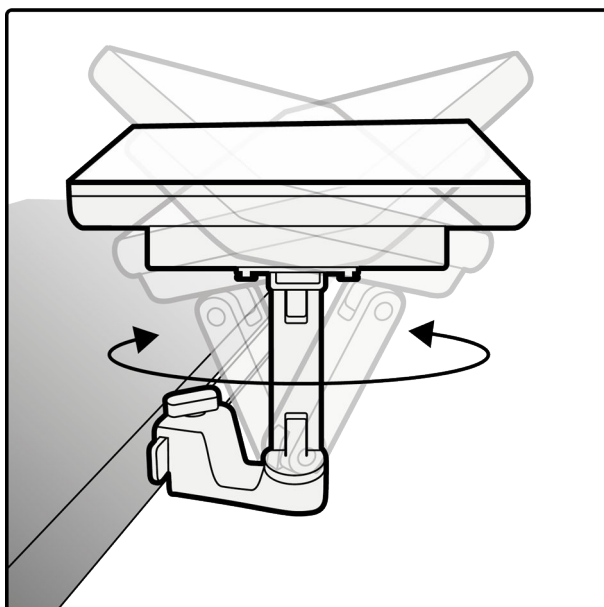


Figure 158 Swivel movement

NOTE To easily mount TSM on the accessory rails, ensure that the Swing Arm is in extended position and Monitor is facing the user.

NOTE Ensure the position of mounting TSM does not obstruct the surgeon or any existing connections or tubes of the patient. For example, IV drip.

- 2 Position the Touch Screen Monitor as desired
 - You can attach the Swing Arm to either side of the rails..
- 3 To detach the Swing Arm from the accessory rail, release the clamp by loosening the knob and then lifting the Swing Arm and Touch Screen Monitor off the rail.

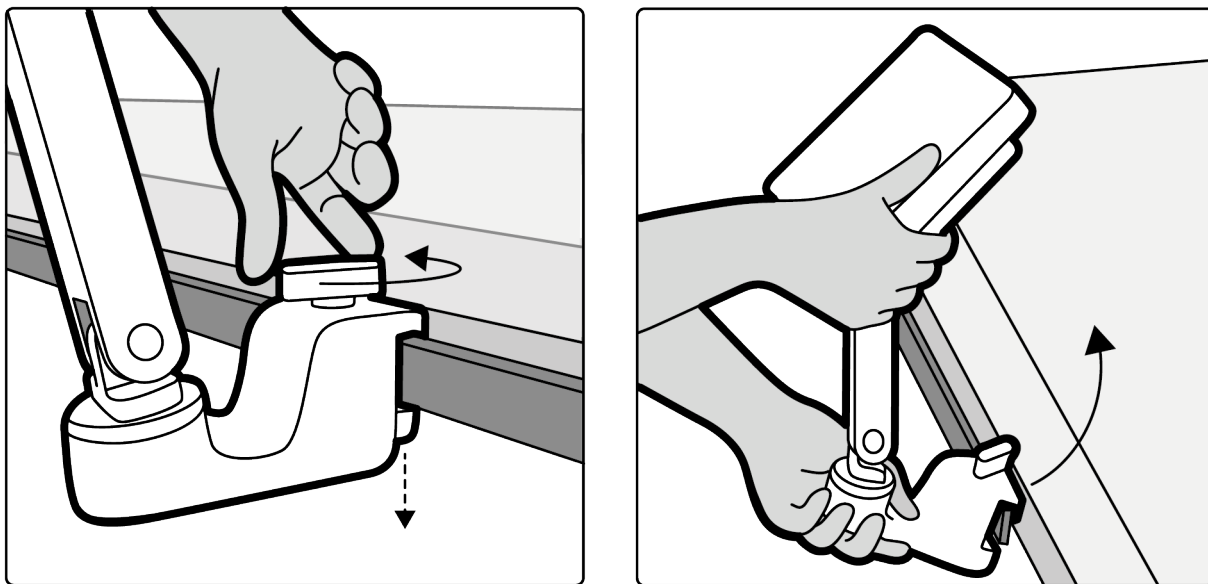


Figure 159 Detaching the Swing Arm to Accessory Rails



WARNING

Ensure that if any attachments to patients (drips, sling, etc.) entangle in the TSM; it must not detach TSM or move the TSM on the table railing.



WARNING

While adjusting the TSM along the rails, ensure that it does not fall on the user.



WARNING

Ensure TSM is mounted away from the working area of the surgeon.

Touch Screen Monitor Connector

The Touch Screen Monitor connects to the C-arm stand using the Touch Screen Monitor connector cable.

NOTE *It is possible to connect the Touch Screen Monitor connector cable to the stand Touch Screen Monitor connector panel while system is already switched on.*

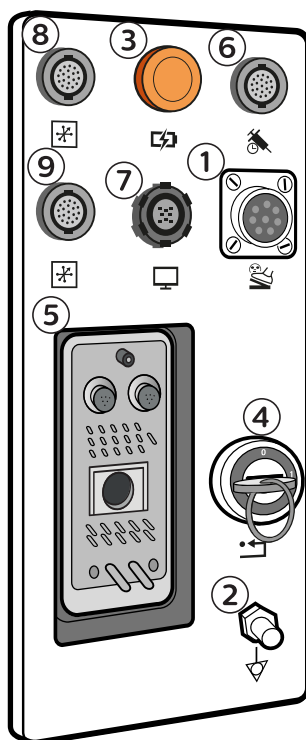


Figure 160 C-arm Stand Connector panel

NOTE *The legends #8 and #9 are not applicable for Non-Motorized model.*

Touch Screen Monitor

Touch Screen Monitor is mounted on a table side rails that provides access to touch screen either in upright or in collapsed position. Touch Screen Monitor displays optimum brightness enabling to work in both dim and bright ambient conditions in the OR. Touch Screen Monitor shows same information at any given point of time, such that If you make any change or select a menu item on C-arm stand touch screen, that will be displayed on Touch Screen Monitor instantaneously and vice versa.

NOTE *Do not use the Touch Screen Monitor screen as primary display to evaluate image quality or for diagnostic purposes. Instead, use Mobile View station Examination monitor for diagnostic purposes.*

NOTE *Apply a sterile cover to Touch Screen Monitor to minimize fluid/dust ingress for Touch Screen Monitor.*



WARNING

User must mount TSM on IEC Certified tables only to prevent possible shock.



WARNING

Use only US and Euro Standard OT Table to prevent monitor falloff from the rails.

5.26 External Connected Equipment



CAUTION

External connected equipment is only to be used if it is certified for the applicable standards and fully compatible with the system. The use of external connected equipment not complying with the equivalent safety requirements of the systems may lead to a reduced level of safety in the resulting system.



WARNING
Any patient environment equipment connected to the system must comply with ANSI/AAMI ES60601-1 and IEC 60601-1 requirements. Equipment outside the patient environment may only be connected to the system if it complies with the relevant ANSI/AAMI and EN/IEC standards.

For the video and USB connections, special precautions should be taken in accordance with the following warning.



WARNING
The use of external connected equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety in the resulting system. Consideration relating to the choice shall include the following:

- *Use of the accessory in the patient vicinity*
- *Evidence that the safety certification of the external connected equipment has been performed in accordance with IEC 60601-1 Ed 3.1.*

5.26.1 Injector Interface

This option is available for Urology, Vascular and Cardiac procedures only.

Currently, there are three third-party approved agencies which provide compatible Injectors for Philips C-arm X-ray machines. It is recommended to use the injectors that have compatibility statement for Zenition 90 C-arm systems for best working of the functionality. Third party approved agencies are given in the table below:

Injector	Company
Medrad Mark 7 Arterion	Bayer
Illumena Neo	Guerbet
Acist Cvi	Acist

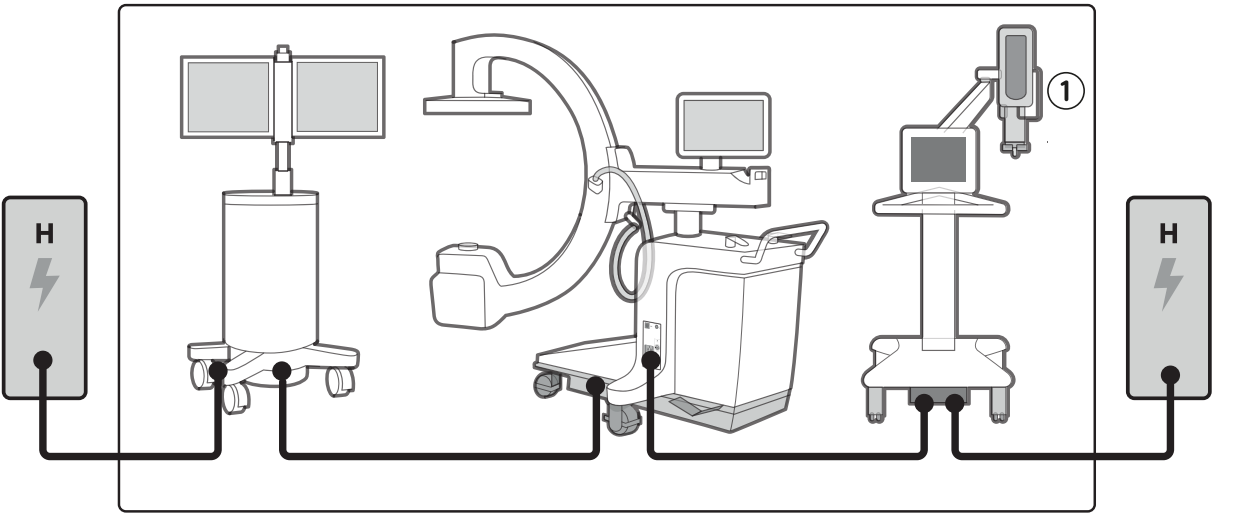


Figure 161 Contrast Injector device

Legend	
1	Contrast Injector

The injector interface option can be connected to the X-ray system for controlling the start and stop of the contrast injections for the X-ray system. The contrast fluid injected by the injector will improve the

visibility of the blood vessels in the images produced by the X-ray System for Urology, Vascular and Cardiac procedures. Contrast fluid is also used for more advanced X-ray system functions like:

- Creating roadmap for interventional guiding
- Live subtraction

You can set the system to initiate contrast injection for the selected procedure from the C-arm stand touch screen.

The amount of injection fluid (ml), the flow (ml/sec), pressure (PSI - Pounds per Square Inch) and the injector delay settings can be done on the Injector's own device interface.

You need to connect injector cable to injector interface connector on the C-arm stand connector panel as shown in figure below.

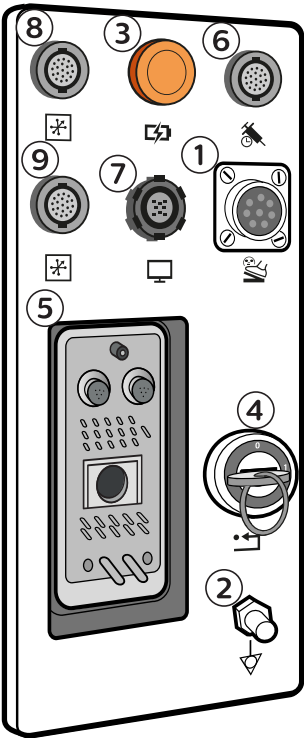


Figure 162 Injector Interface connector

NOTE The legends #8 and #9 are not applicable for Non-Motorized model.

Legend	
6	Injector Interface connector

NOTE Injector synchronization is available only for right hand switch / foot switch

MOS Injector Function

- 1 Connect injector cable to Zenition 90 C-arm stand connector panel and Power ON the system.
- 2 You can select following injector control modes:
 - Injector Uncoupled
 - Injector Coupled

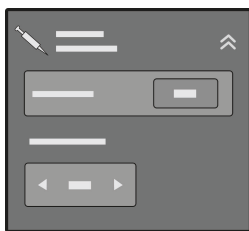


Figure 163 Injector Coupling mode

Injector Uncoupled Mode

Injector and X-ray system are not synchronized, so both can function independently.

- 1 On the C-arm stand touch screen, tap the corresponding double-arrow next to **Injector**.
- 2 By default, the **Injector** is always in **Coupling Off** mode. You can start and stop injection by pressing and releasing the **Injector** hand switch manually.
- 3 Also, you can start and stop acquisition by pressing and releasing right hand switch / foot switch connected to the C-arm stand.

NOTE *Injection and injection timing are independent of X-ray acquisition.*

Injector Coupled Mode

Injector and X-ray systems are synchronized and can work together. The timing of contrast injection and X-ray imaging can be coupled to synchronize the acquisition of images to the flow of contrast medium.

The predefined program gets activated and both X-ray and the **Injector** work seamlessly. This mode is available for **Subtract**, **Trace** and **Run Acquisition** modes.

NOTE *You must first arm the injector before proceeding to coupling function.*

- 1 On the C-arm stand touch screen, tap the corresponding double-arrow next to **Injector**.
- 2 The panel expands to display the **InjectorCoupling** mode. By default, the **Injector** is always in **Coupling Off** mode.
- 3 Tap **Coupling On** to enable the injector coupling mode. Once, it gets activated the **Coupling** button is highlighted.
- 4 On the mobile view station, the Coupling icon glows, indicating that Injector Coupling is activated.
- 5 Set the x-ray delay value to desired duration using the **X-ray Delay** control given on the panel.
- 6 Press right hand switch / foot switch connected to C-arm stand to start injection and image acquisition.
- 7 The system will start the injection and the countdown timer will start decrementing to 0.



NOTE *If delay time is set to 0, then the countdown timer pop-up window will not be displayed. You will not be able to use any function on C-arm stand touch screen, TSM and TSO during a pop-up display.*

If the hand switch / foot switch is released during countdown, injection will stop and message will be displayed. **"Message: X-ray switch released during x-ray delay timer."**

Injector will be auto decoupled on C-arm stand touch screen, when:

- a new exam is selected for acquisition
- if the procedure is changed to single shot

Further there are two modes under Coupling:

1 Non-Digital Subtracted Acquisition (NDSA) mode

2 Digital Subtracted Acquisition (DSA) mode

Non-Digital Subtracted Acquisition (NDSA) mode

- Contrast injection will start (depending on the injection delay settings) after first X-ray image is displayed on the live monitor.
- Contrast injection will stop immediately after acquisition stops.
- Contrast injection will start (depending on the set injection delay on Injector device) after pressing right hand switch / foot switch. The X-ray image capturing will start after set X-ray delay time.

Digital Subtracted Acquisition (DSA) mode

The **Digital Subtracted Acquisition** mode can be further explained by below two scenarios:

Scenario 1: No X-ray Delay (X-ray delay is set to zero)

- When right hand-switch / foot switch masking image will be captured and displayed on the MVS/ C-arm stand touch screen. The contrast Injection will start after mask phase is completed.
- Contrast injection will stop immediately after X-ray acquisition ends.

NOTE *Contrast injection will stop if scheduled volume of injection is finished.*

- The injector interface can be used during the DSA mode or Trace activation mode.
- The X-ray functionality remains unaffected by whether the injector interface is activated or deactivated during the entire acquisition procedure.

Scenario 2: X ray Delay time set for more than 0 sec

- The contrast injection starts on pressing of right hand switch / foot switch, and the X-ray delay countdown timer is displayed on the MVS/ C-arm stand touch screen for the set time.
- X-ray starts at **Nth** seconds after pressing right hand switch / foot switch.

N is calculated as follows:

$N = \text{X-ray set delay time} - \text{calculated mask time}$

- After X-ray starts, mask images are acquired until end of set delay time on C-arm stand touch screen.
- Contrast injection stops immediately after acquisition.

NOTE *Contrast injection will stop if scheduled volume of injection is finished.*

- The X-ray functionality remains unaffected by whether the Injector interface is activated or deactivated during the entire acquisition procedure.

NOTE *For Non DSA & DSA mode: Activation of contrast injection depends on the set delay time on the injector device.*

X-ray Delay

You can set a timer to give a delay between pressing the right hand switch / foot switch and the X-ray image capture. The system will count down and capture image at the end of the set timer.

Depending on the set delay time, the timer will begin counting-down the time. The X-ray gets activated before injection to capture the masked image and at 0 seconds it will capture the subtracted image.

NOTE

- The value for X-ray delay can be set with increment of 0.5 seconds.
- On the first increment (from 0 seconds) X-ray delay time will jump to masking time calculated by the system.
- Maximum delay time which can be set is 40 seconds.



Figure 164 X-ray Delay

NOTE *X-ray delay control will be in disabled mode until the Injector is coupled.*

NOTE *Operator needs to set x-ray delay time depending upon the patient's condition during procedure.*

6 System and Error Messages

This section describes the handling of system and error messages appearing on the system.

6.1 C-arm Stand

When an error occurs, a warning message is displayed on the C-arm stand touch screen.

Most messages and warnings can be confirmed by tapping the **OK** button in the message dialog box. When **OK** is tapped, the dialog box disappears and the message is shown in the status area of the C-arm stand touch screen.

Some messages or warnings cannot be confirmed and will remain displayed on the C-arm stand touch screen until the issue has been resolved.

If more than one message or warning has been displayed, the status area of the C-arm stand touch screen displays the message with the highest priority.

Following actions are required based on message class and message number.

- 1 Non recoverable errors
Messages for non-recoverable errors are not removed. The system must be switched off /on to remove this error state.
- 2 User resettable errors
Messages for User resettable errors are removed if the User confirms this error message in the warning dialog.
- 3 X-ray alarm timer messages
X-ray alarm timer messages are removed if the User confirms this message in the warning dialog.
- 4 Status/Warning messages
Status/Warning messages are automatically removed by the system if the status/warning message is not applicable anymore.

6.1.1 Viewing Messages on the C-arm Stand

Current messages or warnings can be viewed on the C-arm stand touch screen.

- 1 Tap the message displayed in the status area of the C-arm stand touch screen.

Current messages and warnings will be displayed in a dialog box. If more than one message is displayed, the dialog box will allow the operator to scroll through the messages (swipe up or down).

If instructed to call Service, note the error code and the date and time.
- 2 Tap the **OK** button to close the dialog box.

6.2 Table Side Operator (TSO)

When collision or error related to motorized movement occurs, including emergency; LEDs next to the buttons start flashing in RED on the TSO. Additionally message will be displayed on the C-arm stand touch screen. All ongoing motorized movements are immediately stopped.

- 1 The system error message will appear in the event of collision detection.

The error message will disappear if the user performs relevant actions against error messages.

- 2 The system error message will appear in case emergency key is pressed.
The error message will disappear if the operator turns the System lock key on the connector panel from position 1 to 0 and to position 1 again.

6.3 Mobile View Station

Error and system messages are displayed on the examination monitor.

The system messages appear while performing an action and are self- explanatory.

The error messages appear on a black screen. Note the message and the date and time, and call Service.

6.4 Printer (Option)

Error messages appear on the printer's display.

For a complete list of the error messages and the possible cause and remedies see the printer's Instructions for Use.

6.5 Image Viewer (Option)

For a complete list of the error messages and the possible cause and remedies refer to the **Image Viewer** Instructions for Use.

7 Maintenance

This product requires proper operation, planned maintenance, and checks the responsible organization must perform routinely, which are essential to keep the product operating safely, effectively and reliably.

7.1 Planned Maintenance Program

Planned maintenance may only be carried out by qualified and authorized service technicians and is comprehensively described in the service documentation.

In this context, qualified means those legally permitted to work on this type of medical electrical equipment in the jurisdictions in which the equipment is being used, and authorized means those authorized by the organization responsible for the equipment.

Philips provides a full planned maintenance and repair service on both a call basis and a contract basis. Full details are available from your Philips Service Organization.

Although the operator does not carry out planned maintenance, always take all practical steps to make sure that the planned maintenance program is fully up to date before using the equipment with a patient.

7.1.1 General Checks

What to check	Frequency
Visual inspection and cleaning system outside	Check mains cable
	Check and clean MVS system exterior
	Check C-arm stand system exterior
	Check cables
Check labels	Yearly

7.1.2 Mechanical Checks

What to check	Frequency
Mobile view station movement	Check wheels
	Check grounding strip
	Check brakes
	Check steering function
	Check Cables, Units and Racks
C-arm stand movement	Check C-arm movements
	Check wheels
	Check grounding strip
	Check steering function
	Check floor brake
Check monitor mechanism	Yearly
Visual inspection and cleaning system inside	Mobile view station system inside
	C-arm stand system inside

What to check	Frequency
Motorized model	Check C-arm movements Check wheels Check grounding strip Check steering function
Non-Motorized model	Check C-arm movements Check wheels Check grounding strip Check steering function
Check C-arm stand height movement	Yearly
Check ZigZag sheets	Yearly
Check C-arm Cable shape	Yearly

7.1.3 Functional Checks

What to check	Frequency
Check Log Files	Yearly
Functional check hand switch and foot switch	Yearly
Check Audible Signal	Yearly
Check C-arm stand touch screen	Yearly
Check Touch Screen Module monitor (optional)	Yearly
Check Options and Accessories	Yearly
Check Philips Remote Service Connection	Yearly
Check Injector Interface	Yearly
Check Table Side Operator Module	Yearly
X-ray tube performance test	Yearly

7.1.4 Radiation Safety Checks

What to check	Frequency
Patient Entrance Dose Rate Limitation check	Yearly
Patient Entrance Dose Rate Indication Verification	Yearly
Maximum Patient Entrance Dose Rate Verification	Yearly
X-ray field verification	Yearly

7.1.5 Image Quality Checks

What to check	Frequency
Display performance	Yearly
Contrast range: Display performance	Yearly
Detector Front-end Adjustment	Yearly
Image uniformity	Yearly
FD and grid artifacts	Yearly
Penetration KV stabilized	Yearly
Penetration Dose rate Fluoroscopy	Yearly
Sharpness: Limiting resolution	Yearly

7.1.6 Electrical Safety Checks

What to check	Frequency
Measure protecting earth resistance	Yearly
Measure equipment leakage current	Yearly

7.2 Remote Assistance

The remote assistance function allows you to gain expert support and help from a Philips representative in a remote location.

For more information about configuring your system to allow remote assistance, refer to your documentation for the Philips Support Connect application.

Three types of remote assistance are available:

- Remote viewing: the remote operator can view your system screens but is unable to control inputs to the system.
- Remote access: the remote operator can view your system screens and can control inputs to the system.
- On user request the proactive assessment of the system parameters can be enabled. This helps improving the system availability and avoid downtime.

7.2.1 Enabling and Disabling Remote Assistance

If your system is configured to allow remote assistance, you can enable and disable the function.

- 1 If you are not logged onto the system using an administrator's account, switch users.



- 2 Open the administration screen by pressing the **Administration** button.



- 3 Click **System** and select **Remote Assistance**.

A dialog box is displayed allowing you to reschedule the session for another date and time or to select the type of remote assistance to use.

- 4 To enable a remote assistance session, do one of the following:
 - Click **Enable Remote View**.
 - Click **Enable Remote Access**.

The remote session is enabled and the available function buttons change. The function buttons displayed allow you to disable the remote assistance session or to switch to the other type of session.

- 5 To switch between remote assistance types, click the appropriate button:
 - **Switch to Remote View**
 - **Switch to Remote Access**
- 6 To disable the remote assistance session, click the appropriate button:
 - **Disable Remote View**
 - **Disable Remote Access**

The remote assistance session is disabled.

- 7 To reschedule the remote assistance session, do the following:

- a Select **Schedule Session Later**.
- b Select the desired **Start Date** and **Start Time**.
- c Select an appropriate **End Date** and **End Time**.
- d To allow the scheduled remote assistance session to start automatically at the specified time, select **Automatically accept incoming connections**.

NOTE *If you do not select **Automatically accept incoming connections**, you will need to confirm that the remote assistance session can start, when the scheduled date and time is reached.*

- e Select the type of remote assistance you want to schedule by clicking one of the following:
 - **Schedule Remote Access**
 - **Schedule Remote View**

The remote assistance session is scheduled.



The status **Remote Access Scheduled** is displayed in the dialog box.

- 8 To close the dialog box, click **Close**.

7.3 Field Service

The field service function provides the capability for Philips to perform service actions on the system, or to entirely or partly perform service actions from a remote location. The field service function is provided by the Philips SupportConnect application installed on your system.

Field service is designed to reduce system down time and improve system performance through proactive maintenance.

Field service features include the following:

- Improving corrective and planned maintenance by remote access to the system status and configuration.
- Enabling proactive maintenance by means of automatic generation and uploading of log files.
- To upload On demand log files (on the request of field service engineer), perform following steps.

- 1 In the administration screen, click **System** drop-down menu and click **Save Log File for Service** button.

- 2 **Save Log File for Service** dialog box is displayed. Click **Save** button.

Manually performed remote field service operations are only possible when you explicitly put the system in service mode by starting field service.

When the system is in service mode, this is clearly indicated on the display of the system. System functions that use the reference monitor are disabled, for example, viewing external video or using **Image Viewer**.

It is not possible to remotely activate any safety-related functions, such as X-ray or mechanical movements.



WARNING

The system may not be used for clinical purposes during a remote service session.

NOTE *Always carry out the daily user routine checks after a remote service session. For more information, see [User Routine Checks Program \(page 232\)](#).*

For information about using the field service application, refer to your documentation for the Philips SupportConnect application.

7.3.1 Starting Field Service

To allow local or remote servicing of the system, you can start a field service session.

To start field service, you must be logged on using an administrator's account. The system must be switched on especially for field service actions and must not be used for normal operation. The system must be connected to the network.

- 1 If you are not logged onto the system using an administrator's account, switch users.

For more information, see [Switching Users \(page 106\)](#).



- 2 Open the administration screen by pressing the **Administration** button.



- 3 Click **System** and select **Start Field Service**.

Depending upon the logon and security configuration, a dialog box may be displayed requesting that you confirm you want to continue. If a message is displayed, read the message and take the appropriate suggested action.

A dialog box is displayed where you can log on to the field service application.

- 4 To close the dialog box without starting a field service session, click **Cancel**.

The dialog box is closed and the administration screen is displayed.

- 5 To continue with the field service session, do the following:

- a Enter your **Administrator name** and **Administrator password**.

- b Click **Log On**.

The Philips Support Connect application starts and **Service Enabled** is displayed in the upper left corner of the examination monitor.

If you enter the wrong **Administrator name** or **Administrator password** three times, field service mode is disabled and you should restart the system to enable it again.

7.4 User Routine Checks Program

The organization responsible for the system must create a user routine checks program as detailed in the table below.

Normally, the responsible organization will instruct operators to perform these checks and any corresponding actions. In any case, it is for the operator of the system to make sure that all checks and actions have been satisfactorily completed before using the system for its intended purpose.

The following checks are visual or audible checks.

Check	Description	Frequency
Cable deflectors	Check for presence and damage	Daily
Brakes, wheels, steering	Ensure correct function	Daily
Cabling	Inspect all cables for kinks and/or cracks	Daily
Beep and light test	Check for correct function ²	After start-up
Connectors	Check correct connection and damage	Daily

Check	Description	Frequency
Power-on	Check display and monitor for error messages ¹ For more information, see Switching the System On (page 103) .	Before use
X-ray	Ensure correct function X-ray control ²	Daily
	Check diaphragm settings and verify their position ²	Daily
	Check the correct function of the system lock	Daily
C-arm stand	Ensure correct function of the buttons	Daily
Energy storage unit	Check for battery charge warning message	After start-up
Hand switch	Check for damage and correct function	Daily
Foot switch	Check for damage and correct function	Daily
Wireless foot switch	Check battery charge level The battery must be replaced if it discharges from fully charged to empty within 2 days.	Daily
Height movement	Check for correct function	Daily
Mobile view station	Ensure correct function of the monitors	Daily
	Ensure correct function of the buttons and keys	Daily
	Ensure correct date and time setting	Daily
	Ensure all queued images are exported	Daily
	Remove patient data that is no longer needed on the system	Daily
Wireless connection	Check that a network connection is available	Daily
Remote control	Check for damage and correct function	Daily
Laser aiming device	Check for correct alignment ²	Daily
Printer	Check for correct function and paper/ transparency presence	Daily

¹ Contact Service for advice on error messages which appear after start-up.

² For detailed instructions see below.

7.4.1 Buzzer Test C-arm Stand

The buzzer test should be performed after start-up.

- 1 Tap **System** in the C-arm stand touch screen header area.
A system dialog is displayed.
- 2 Tap the **Test Buzzer** button.
The system will sound a three-tone buzzer.
- 3 Tap the **Close** button to close the system dialog.

7.4.2 Light Test on the Mobile View Station

- 1 Press the **Previous** and **Next** buttons simultaneously to activate the light test.



All indicator lights switch on.

NOTE *The X-ray On indicator light is tested automatically when the system starts.*

- 2 Release the buttons, or one of the buttons, to stop the light test.

7.4.3 X-ray Control Function Check

The X-ray control function check should be performed daily without any objects in the X-ray beam.

- 1 Tap the **Manual kV** button on the C-arm stand touch screen.
- 2 Set the kV value manually to 70 kV.
- 3 Tap the **Manual kV** button on the C-arm stand touch screen again to select automatic kV and perform fluoro.

If the kV value drops to 42 – 50 kV the X-ray control function is working properly.

7.4.4 Collimator Check

The collimator should be checked daily.

- 1 Perform fluoroscopy without any objects in the X-ray beam.
- 2 If a circular image is displayed, rotate the image to display a square image (FD12) / squircle image (FD 17), ensuring no part of the collimator is visible in the square image.

Square images (FD12) / squircle image (FD 17) are only displayed when the image rotation is 0, 90, 180 or 270 degrees (± 2 degrees).

For more information about rotating images, see [Rotating Images \(page 146\)](#).

- 3 Rotate the image to approximately 45 degrees.
- 4 Perform fluoroscopy without any objects in the X-ray beam and close the collimator to about half the size.
- 5 Fully open the collimator (see [Collimator and Shutter Adjustments in Last Image Hold \(page 148\)](#)).
When the circle covers the edge of the image the collimator setting is correct.
- 6 Perform this procedure again for each of the detector zoom selections.

7.4.5 X-ray Detector Laser Alignment Device Check

The detector laser alignment device check should be performed daily.

- 1 Tap the **Detector Laser** button on the C-arm stand touch screen to switch the detector laser aiming device on.

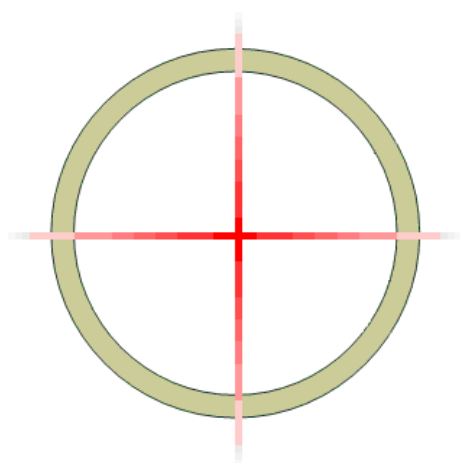


Figure 165 Laser aiming device check

- 2 Measure the crossing point of the lasers on the X-ray tank to check that the lasers intersect at the center point of the circle with an acceptable tolerance.

7.4.6 Tube Laser Alignment Device Check

The tube laser aiming device alignment check should be performed daily.

- 1 Tap the **Tube Laser** button on the C-arm stand touch screen to switch the laser aiming device on.
- 2 Check if the laser cross coincides with the mark on the detector.

7.5 Cleaning and Disinfecting

Insufficient cleaning of residues that remain on the equipment after procedures may lead to patient infection from polluted parts. Ensure that the system is thoroughly and extensively cleaned and disinfected before and after each procedure.



WARNING

Unplug the equipment from the mains electrical supply before cleaning, disinfecting or sterilizing it.

When cleaning and disinfecting the system, follow these general guidelines:

- Use sterile covers to prevent pollution or contamination of the equipment.
- Do not allow liquids to enter the system. This may cause corrosion or electrical damage.
- Do not apply cleaning liquid or spray directly onto the system. Always use a cloth dampened with the cleaning product.
- Switch the system off prior to cleaning and disinfecting to avoid electric shock or accidental activation of X-ray. Be aware that even when the system is switched off, live voltages may still be present on some interfaces.
- Do not use corrosive or abrasive agents or pads.
- Some cleaning agents or disinfection agents may cause discoloration.
- When cleaning scratched or worn painted surfaces, it is to be expected that some additional paint is removed.

NOTE ***You should always comply with local instructions, regulations, and guidelines concerning hygiene.***

These cleaning and disinfecting instructions only apply to the X-ray system and do not apply to other equipment in the room. If cleaning or disinfecting is needed at the interface of third-party equipment with the X-ray system, dismount the equipment before cleaning or disinfecting. You should also

dismount third-party equipment if you need to clean or disinfect it with agents that are not compatible with the X-ray system.

NOTE *Always follow the manufacturer's instructions for the cleaning agents or disinfectants that you use.*

7.5.1 Cleaning

Clean the system as needed with a damp cloth and a detergent solution to remove all visible residues.

Scrubbing with a soft bristle brush, such as a toothbrush, may be necessary to reach corners or to remove material that has dried onto the surface.

NOTE *When cleaning in the procedure room of the X-ray equipment, you should leave the non-sterile covers attached to x-ray equipment.*

Cleaning the Foot Switch

NOTE *The following cleaning procedure applies to the wireless foot switch.*

Before cleaning the wireless foot switch, ensure that the wireless foot switch and the X-ray system are switched off.

Clean the wireless foot switch after each clinical session to avoid impaired functionality due to bacterial contamination or soiling.

Always comply with local instructions, regulations, and guidelines concerning hygiene.

Always follow the manufacturer's instructions for the cleaning agents or disinfectants that you use.

When cleaning the wireless foot switch, always use a cloth dampened with water and a mild cleanser. Do not use cleaning agents that may damage the metal surfaces, such as detergents, abrasive cleansers, or solvent-based cleaners (such as benzine, stain remover).

You must only clean the wireless foot switch by hand.

To ensure correct function of the foot switch, clean it when it is soiled and at least every week.

The following items are needed to clean the foot switch:

- Regular cleaning agent that is available to hospital staff.
- A soft toothbrush or equivalent.
- Ready-to-use wipes.
- Dry, lint-free wipes.

If ready-to-use wipes are not available, apply cleaning agent to dry with lint-free wipes.

The contact time of the cleaning agent with the foot switch is not relevant.

Do not use cleaning agents that may damage the metal surfaces, such as abrasive cleansers or solvent-based cleaners (such as benzine, stain remover). Always follow the manufacturer's instructions for the cleaning agents that you use.

- 1 Switch off the X-ray system before cleaning the foot switch.
- 2 If a disposable cover is fitted on the foot switch, remove the cover.
- 3 Inspect the following areas of the foot switch for trapped objects and for contamination by dense or sticky fluids, for example, blood or contrast fluid:

- On top of the foot switch: along the upper edges of the pedals where the pedals meet the housing of the foot switch (area 1 in the following figure).
- On top of the foot switch: along the lower edges of the pedals, between the underside of the pedals and the base plate (area 2 in the following figure).
- On the underside of the foot switch: along the hinges of the pedals (area 3 in the following figure).

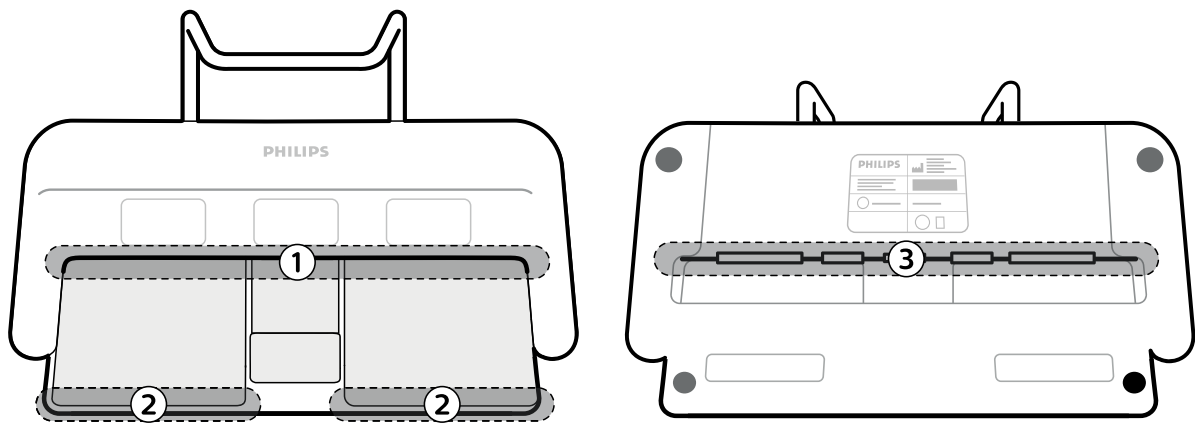


Figure 166 Foot switch inspection areas (shaded): the top of the foot switch (left) and the underside of the foot switch (right)

Inspection Areas	
1	Along the upper edges of the pedals where the pedals meet the housing of the foot switch.
2	Along the lower edges of the pedals, between the underside of the pedals and the base plate.
3	Along the hinges of the pedals

- 4 To remove residues in the inspection areas indicated in the figure above, apply the cleaning agent to the soft brush and clean using a linear motion.
When cleaning area 1, press the pedals and clean between the pedals and the housing of the foot switch.
- 5 Continue cleaning the indicated inspection areas until all visible residues are removed.
- 6 Clean the rest of the foot switch with ready-to-use wipes using a linear motion.
- 7 While cleaning, change wipes as necessary.
- 8 Continue cleaning until all visible residues are removed.
- 9 After cleaning the foot switch, remove the cleaning agent with damp, lint-free wipes using a linear motion.
Wipes should be dampened with tap water or demineralized water. The temperature of the water should be between 15°C (59°F) and 35°C (95°F).
- 10 After removing the cleaning agent, dry the foot switch with dry, lint-free wipes using a linear motion.
You should always dry the foot switch after removing the cleaning agent. Drying agent is not required.
- 11 Continue drying the foot switch until it is visibly dry.

7.5.2 Disinfecting

Disinfection may not be effective if the surfaces are not thoroughly cleaned first. Ensure that all surfaces are cleaned and residues of cleaning agents are removed with water.

To ensure the effectiveness of disinfection, always follow the instructions of the disinfection product used. After disinfecting, ensure that no residue disinfection agent remains on the equipment. It is recommended that any disinfection product is first tested on small areas of the system that are not visible to verify compatibility. Suggestion is to use disinfectant agents with corrosion protector agents.

Disinfection should be done starting from top to bottom of the medical device.

Disinfectant Agents

You can disinfect the system in the examination room using disinfecting agents consisting of the following disinfectant compounds (note the exceptions that follow this list). These compounds have been tested for compatibility with the system:

- Isopropanol 100%
- Ethanol 70%
- Chlorohexidine 0.5% in 70% Ethanol
- Haemosol 1% in 1 liter water.
- Chlorine 250 ppm in 1 liter distilled water
- Natriumchloride 0.9% (NaCl)
- Iodine 1% in 70 % Ethanol
- Hexabrix 320

The following active compounds may not be used:

- Products containing phenol-based components, such as ortho-phenylphenol, ortho-benzyl-parachlorophenol, or chloroxylonol.
- Products containing fluids such as ether, white spirit, turpentine, trichloroethylene, and perchlorethylene.

The safety data sheets of a disinfectant product provide detailed information on its composition. These data sheets can be obtained from the manufacturer of the product.

Frequency and Method

Part type		Type of contact		
A. Applied Parts		Direct patient contact required for intended use, intact skin only.		
B. Treated as applied parts		May come in contact with patient, intact skin only.		
C. Contaminated parts		Other parts that may be contaminated with bodily fluids or other fluids. No direct patient contact.		
D. Other parts		Environmental surfaces. No direct patient contact.		

Part Type	Cleaning	Frequency	Disinfection	Frequency
Type A	NA	NA	NA	NA
Type B	Yes	Daily	Yes	Daily or after every patient
Type C	Yes	Weekly	Yes	As necessary
Type D	Yes	Weekly	Yes	As necessary

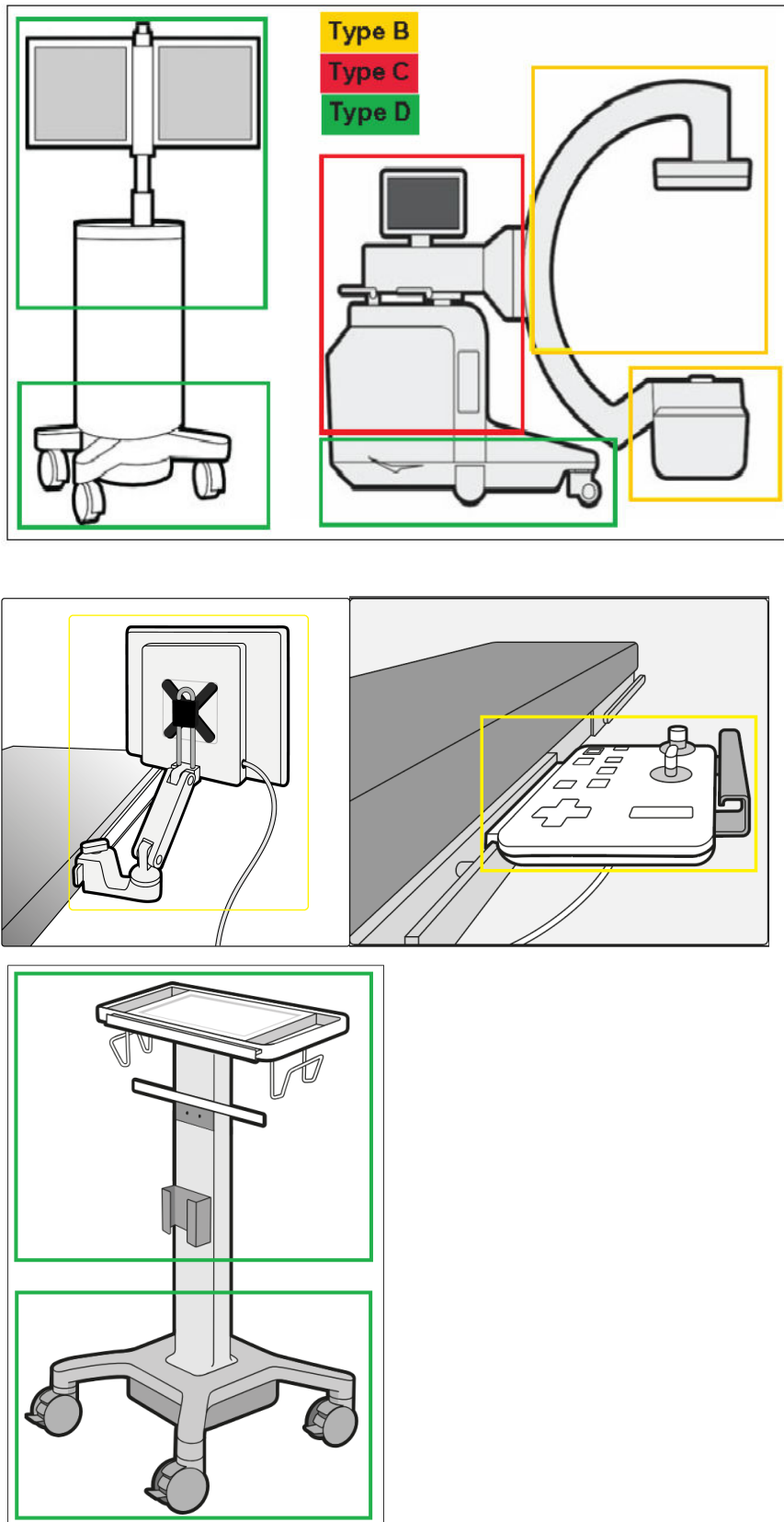


Figure 167 Part types on System

Using Disinfectant Sprays

Disinfecting a medical equipment room using disinfectant sprays is not recommended. Vapor can penetrate the equipment causing corrosion or electrical damage. However, if you do use disinfectant sprays in the vicinity of the X-ray equipment, follow this guidance:

- Do not use flammable or potentially explosive disinfectant sprays. The resulting vapor could ignite, causing injury to staff or damage to equipment.
- If you intend to use non-flammable, non-explosive disinfectant sprays, first switch off the equipment and allow it to cool down. This prevents convection currents drawing disinfectant vapor into the equipment.
- You must cover the equipment thoroughly with plastic sheeting before using disinfectant sprays.
- When all traces of disinfectant vapor have dispersed, you can remove the plastic sheet and disinfect the equipment in the recommended way.

7.5.3 Cleaning and Disinfecting for Third-Party Injector



WARNING

Always electrically isolate Injector equipment from the mains electrical supply & remove the signal cable between Injector & the system before cleaning, disinfecting or sterilizing it.

If user opted for Third-Party Injector interface with the system, to ensure the effectiveness of Cleaning & Disinfection of the Injector, always follow the instructions & recommendations specified by Injector Manufacturer in respective IFU / Manual.

7.5.4 User Verification Test

Perform the following verification test every day before using the system. If you find any damage or if any step fails, stop using wireless foot switch and use hand switch or wired foot switch.

- 1 Inspect the wireless foot switch for damage, such as tears, cuts, or abrasions.
- 2 Inspect the handle of the wireless foot switch to ensure that it is securely attached and has not become loose.
- 3 Inspect the wireless foot switch for proper pairing to the system.
- 4 Test all pedals on all connected foot switches for proper function.

7.6 Replacing and Charging Batteries

The system contains batteries which you must change or charge periodically.

Your product contains a built-in rechargeable battery covered by the European Directive 2006/66/EC, which cannot be disposed of with normal household waste. To safeguard the functionality and safety of your product, always ensure a qualified and authorized service technician removes or replaces the battery. Inform yourself about the local regulations on separate collection of batteries. Correct disposal of batteries helps prevent negative consequences for the environmental and human health.

NOTE *Batteries harm the environment; dispose of the old batteries in an environmentally sound way.*

Remote Control

For safe operation, the remote control batteries (type LR06 / AA) should be replaced at regular intervals.

When the battery power is low and the batteries need to be replaced, the color of the battery indication light on the remote control changes to orange and the indication light flashes when you release a button on the remote control.

Wireless Foot Switch

The wireless foot switch contains a rechargeable battery.

For more information about charging the wireless foot switch battery, see [Wireless Foot Switch \(page 207\)](#).

Energy Storage Unit

The energy storage unit contains rechargeable batteries. This unit is recharged during normal use of the system.

For more information, see [Energy Storage Unit \(page 255\)](#).

Mobile View Station PC

For safe operation, the mobile view station PC battery (type CR2032) should be replaced at regular intervals by a qualified and authorized service technician.

7.7 Environmental Impact of the System

You can assess the environmental impact of the system by measuring the typical energy consumption during various operational modes. To reduce the environmental impact of the system, switch it off when it is not in use. However, bear in mind any clinical limitations that might make switching the system off impractical.

For information, visit the following website and select one of the available guides:

www.cocir.org/initiatives/ecodesign-initiative/saving-energy

8 Product Disposal

Philips Medical Systems is concerned to help protect the natural environment, and to help ensure continued safe and effective use of the system through proper support, maintenance and training.



Therefore Philips equipment is designed and manufactured to comply with relevant guidelines for environmental protection. As long as the equipment is properly operated and maintained, it presents no environmental risks. However, the equipment may contain material(s) which could be harmful to the environment if disposed of incorrectly. Use of such material(s) is essential to performing the functions of the equipment, and to meeting statutory and other requirements.

This section of this manual is directed mainly at the organization responsible for the equipment or system – the body with legal authority over the equipment. Operators are not usually involved in disposal, except in the case of certain batteries (see [Disposing of Batteries \(page 243\)](#)).



CAUTION

Before passing on the system, or taking it out of service, all patient data must be deleted from the system to avoid unauthorized viewing.

For more information about recycling Philips Medical Systems products, refer to the following website: www.medical.philips.com/main/about/sustainability/recycling/index.wpd

8.1 Passing the System on to Another Responsible Organization

If the system is to be passed on to another responsible organization that intends to use it for its intended purpose, then it should be passed on in its complete state, with all site-specific (configuration) data and patient data that was stored on the system carefully removed.

In particular, the existing responsible organization should make sure that all the product support documentation – including this manual – is passed on to the new responsible organization.

Before passing on the product or taking it out of service, all patient data stored on the product must be unrecoverably deleted and any removable storage media containing archived and/or exported patient data must be removed and disposed of.

A new responsible organization should be made aware of the support services that Philips Medical Systems provides for installing, commissioning and maintaining the equipment or system, and for the comprehensive training of operators.

It must be remembered by the existing responsible organization that passing on medical electrical equipment to a new responsible organization may create serious technical, medical and legal risks (for example, breach of privacy). Such risks can arise even if the equipment is given away. The existing responsible organization is strongly advised to seek advice from their local Philips Medical Systems representative before committing themselves to passing on any equipment. Alternatively, contact the manufacturer. For more information, see [Contacting the Manufacturer \(page 15\)](#).

Once the equipment has been passed on to a new responsible organization, a previous responsible organization may still receive important safety-related information, such as bulletins and field change orders. In many jurisdictions, there is a clear duty on the previous responsible organization to communicate such safety-related information to the new responsible organization. A previous responsible organization that is not able or prepared to do this should inform Philips Medical Systems about the new responsible organization, so that Philips Medical Systems can provide the new responsible organization with safety-related information.

8.2 Final Disposal of the System

Final disposal is when the responsible organization disposes of the equipment or system in such a way that it can no longer be used for its intended purposes.



CAUTION

Do not dispose of the system (or any parts of it) with industrial or domestic waste. This system contains hazardous materials which require special disposal. Incorrect disposal of any of these materials may lead to serious environmental pollution.

NOTE *Incorrect disposal of data stored on the system may have serious privacy implications.*

As an aid to the responsible organization, Philips provides support for the following procedures:

- Recovering reusable parts
- Recycling of useful materials by competent disposal companies
- Safe and effective disposal of equipment

Hospital staff should not de-install the system prior to disposal. Contact the manufacturer to arrange for the system to be de-installed in a safe manner. For more information, see [Contacting the Manufacturer \(page 15\)](#).

NOTE *Computer disks and media from the system could contain personal data. Contact the manufacturer for information about disposing of these items.*

Product Recycling Passport

Detailed information on product recycling is available in the Product Recycling Passport:

www.healthcare.philips.com/main/about/sustainability/recycling

8.3 Disposing of Batteries

This section provides information about the responsible disposal of batteries from the system.

Your product contains a built-in rechargeable battery covered by the European Directive 2006/66/EC, which cannot be disposed of with normal household waste. To safeguard the functionality and safety of your product, always ensure a qualified and authorized service technician removes or replaces the battery. Inform yourself about the local regulations on separate collection of batteries. Correct disposal of batteries helps prevent negative consequences for the environmental and human health.

Your product contains batteries covered by the European Directive 2006/66/EC, which cannot be disposed of with normal household waste. Inform yourself about the local regulations on separate collection of batteries. Correct disposal of batteries helps prevent negative consequences for the environmental and human health.

The system's computer contains a lithium battery and must be disposed of according to local, state, and federal laws regarding the disposal of lithium batteries. If you cannot dispose of this battery in your area, return it to the manufacturer for disposal.

8.3.1 Remote Control Batteries

The remote control contains LR06 (AA) type batteries which must be disposed of responsibly and in accordance with local regulations.

8.3.2 Wireless Foot Switch Battery

NOTE *Wireless Foot Switch is a optional offering, If customer didn't select Wireless Foot Switch option then this section is not applicable.*

The wireless foot switch contains lithium ion batteries, and must be disposed of according to local, state, and federal laws regarding the disposal of lithium ion batteries. If you cannot dispose of this battery in your area, return it to the manufacturer for disposal.

8.3.3 Energy Storage Unit

The energy storage unit contains a number of chemicals harmful to the environment. Removal and disposal of this unit must always be carried out by qualified and authorized Service technicians.

8.3.4 Mobile View Station PC Battery

The mobile view station PC contains a lithium coin cell battery, and must be disposed of according to local, state, and federal laws regarding the disposal of lithium batteries.

9 Technical Data

This section provides detailed information about the system technical specification.

9.1 Standards and Regulations

The system is developed and manufactured with observance of a number of directives, regulations and standards. Information regarding the compliance status with relevant national and international standards, regulations and laws can be obtained – on request – from your Philips Medical Systems representative or by contacting the manufacturer. For more information, see [Contacting the Manufacturer \(page 15\)](#).

The system conforms to IEC 60601-1 Edition 3.1, ordinary equipment (enclosed without protection against ingress of water). The mode of operation is continuous operation with intermittent loading, as described in the sections dealing with the generators in the system.

The C-arm stand and mobile view station (including all options delivered by Philips Medical Systems) are suitable for use within the patient environment.

The system is not suitable for use in the presence of a flammable anesthetic mixture.

Philips Medical Systems will make available on request circuit diagrams, component parts list, descriptions, calibration instructions and any other information which will assist the appropriately qualified technical personnel to repair those parts of the equipment that have been designated by the manufacturer as repairable.

9.1.1 Electromagnetic Compatibility

IEC60601-1-2 edition 4.1 Electromagnetic Emissions

Guidance and manufacturer's declaration – electromagnetic emissions:

- The system is intended for use in the electromagnetic environment specified below. This ME equipment is suitable for professional healthcare facility environment. The operator of the system or the responsible organization should ensure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment – Guidance
RF emissions CISPR 11	Group 1	The system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/flicker emissions IEC 61000-3-3	Not applicable	

IEC60601-1-2 edition 4.1 Electromagnetic Immunity

Guidance and Manufacturer's Declaration – Electromagnetic Immunity			
Immunity Test	IEC 60601-1-2:2014 + AMD1:2020 Edition 4.1 Test level	Compliance Level	Electromagnetic Environment – Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±8 kV contact ±15 kV air	±8 kV contact ±15 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%.
Radiated RF IEC 61000-4-3	3 V/m 80 MHz – 2.7 GHz	10 V/m 80 MHz – 2.7 GHz	Portable and mobile RF communications equipment should be used no closer to any part of the system, including cables, than the recommended separation distance calculated from the formula $d = [6/E] \sqrt{P}$, where P is the maximum power in watt, d is the minimum separation distance in m, and E is the immunity test level in V/m.
Immunity to proximity fields from RF wireless communications equipment			
IEC 61000-4-3	Refer to the table below	Refer to the table below	Portable and mobile RF communications equipment should not be used closer to any part of the system, including cables, than 30 cm.
Electrical fast transient/burst IEC 61000-4-4	±2 kV, 100 kHz for power supply lines ±1 kV, 100 kHz for input/output lines	±2 kV, 100 kHz for power supply lines ±1 kV, 100 kHz for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV for each line to line ±2 kV for each line to earth	±1 kV for each line to line ±2 kV for each line to earth	Mains power quality should be that of a typical commercial or hospital environment.
Conducted RF IEC 61000-4-6	3 V, 0.15 MHz to 80 MHz 6 V in ISM bands between 0.15 MHz to 80 MHz	3 V, 0.15 MHz to 80 MHz 6 V in ISM bands between 0.15 MHz to 80 MHz	
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	0% UT (100% dip in UT) for 0.5 cycles 0% UT (100% dip in UT) for 1 cycle 70% UT (30% dip in UT) for 25/30 cycles 0% UT (100% dip in UT) for 250/300 cycles	0% UT (100% dip in UT) for 0.5 cycles 0% UT (100% dip in UT) for 1 cycle 70% UT (30% dip in UT) for 25/30 cycles 0% UT (100% dip in UT) for 250/300 cycles	Mains power quality should be that of a typical professional healthcare facility. If the user of the system requires continued operation during power mains interruptions, it is recommended that the system be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at IEC levels characteristic of a typical location in a typical commercial or hospital environment.

Guidance and Manufacturer's Declaration – Electromagnetic Immunity			
Immunity Test	IEC 60601-1-2:2014 + AMD1:2020 Edition 4.1 Test level	Compliance Level	Electromagnetic Environment – Guidance
Proximity magnetic fields IEC 61000-4-39	Test Frequency : 134.2 kHz Modulation: Pulse modulation 2.1 kHz, 50% duty cycle Immunity Test Level : 65 A/m	Test Frequency : 134.2 kHz Modulation: Pulse modulation 2.1 kHz, 50% duty cycle Immunity Test Level : 65 A/m	Portable and mobile RF communications equipment should not be used closer to any part of the system, including cables, than 30 cm. System is used in professional healthcare facility environment.
	Test Frequency : 13.56 MHz Modulation: Pulse modulation 50 KHz, 50% duty cycle Immunity Test Level : 7.5 A/m	Test Frequency : 13.56 MHz Modulation: Pulse modulation 50 KHz, 50% duty cycle Immunity Test Level : 7.5 A/m	

IEC60601-1-2-4th edition Immunity to Proximity Fields from RF Wireless Communications Equipment

According to Table 9 of IEC 60601-1-2 Ed.4.1						
Test Frequency (MHz)	Band (MHz)	Service	Modulation	Maximum Power (W)	Distance (m)	Immunity Test Level (V/m)
385	380 -390	TETRA 400	Pulse modulation 18 Hz	1.8	0.3	27
450	430-470	GMRS 460 FRS 460	FM, ± 5 kHz deviation 1 kHz sine	2	0.3	28
710 745 780	704-787	LTE Band 13, 17	Pulse modulation 217 Hz	0.2	0.3	9
810 870 930	800-960	GSM 800/900 TETRA 800 iDEN 820 CDMA 850 LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
1720 1845 1970	1700-1990	GSM 1800 CDMA 1900 GSM 1900 DECT LTE Band 1, 3, 4, 25 UMTS	Pulse Modulation 217 Hz	2	0.3	28
2450	2400-2570	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band 7	Pulse Modulation 217 Hz	2	0.3	28
5240 5500 5785	5100-5800	WLAN 802.11 a/n	Pulse Modulation 217 Hz	0.2	0.3	9

Equipment Frequencies and Modulations

Radio Equipment	Frequency	Power (dBm)	Modulation
Wireless foot switch and base station	2400.0-2483.5 MHz	<10 dBm	The wireless foot switch has a Bluetooth® short range radio link that uses a Gaussian Frequency Shift Keying Modulation
Wireless network (WiFi)	2.400-2.4835 GHz	<20 dBm	The wireless network uses DSSS, OFDM, FHSS (2.4 GHz), or OFDM (5 GHz) modulation
	5.150-5.725 GHz	<23 dBm	
	5.725-5.875 GHz	<14 dBm	

OFDM: Orthogonal Frequency-division Multiplexing

DSSS: Direct Sequence Spread Spectrum

FHSS: Frequency Hopping Spread Spectrum

NOTE *Actual used frequencies and power may differ due to local regulations.*

Restrictions

The frequency range 5150 – 5350 MHz is limited to indoor use only in the following countries:

- Austria (AT)
- Belgium (BE)
- Bulgaria (BG)
- Croatia (HR)
- Cyprus (CY)
- Czech Republic (CZ)
- Denmark (DK)
- Estonia (EE)
- Finland (FI)
- France (FR)
- Germany (DE)
- Greece (GR or EL)
- Hungary (HU)
- Ireland (IE)
- Italy (IT)
- Latvia (LV)
- Lithuania (LT)
- Luxembourg (LU)
- Malta (MT)
- Netherlands (NL)
- Poland (PL)
- Portugal (PT)
- Romania (RO)
- Slovakia (SK)
- Slovenia (SI)
- Spain (ES)
- Sweden (SE)
- United Kingdom (UK)

	AT	BE	BG	HR	CY	CZ	DK
	EE	FI	FR	DE	EL	HU	IE
	IT	LV	LT	LU	MT	NL	PL
	PT	RO	SK	SI	ES	SE	UK

Figure 168 Frequency range restrictions

Cables and Accessories

List of cables and accessories:

- For USB storage, only storage devices should be connected that are not externally powered devices.
- The hospital network cable, video in/out cable, or DVI out cable shall have a typical length of 3 m and shall be shielded.

Performance

Essential performance for surgical C-arms is defined as maintaining live X-ray imaging once the intervention has started. The system is compliant with the requirements of the IEC60601-1-2 Ed.4.1. and the system is in compliance with the compliance criteria as defined in the standard.

Surgical Knife Compatibility



WARNING

The use of high-frequency surgical equipment may interfere with the operation of other medical systems. The use of surgical equipment that complies with the IEC60601-2-2 standard with a maximum cut mode of 300 W, a maximum coagulation mode of 100 W, and a working frequency of 450 kHz \pm 100 kHz will not affect the essential performance or basic safety of the system. However, concurrent use of high-frequency surgical equipment in close proximity to the system during X-ray image acquisition may compromise image quality. The use of high-frequency surgical equipment in close proximity to user interfaces may temporarily compromise their functional operation.



WARNING

Using a high-frequency surgical equipment tip in close proximity to the stand user interface may cause unintended activation or deactivation of functions on the user interface, which may, in extreme cases, affect the mode of the next image acquisition. To prevent acquisition using undesired settings, check that the desired acquisition mode settings are still correct after usage of the high-frequency surgical equipment in close proximity to the stand user interface and before performing the next x-ray acquisition.



WARNING

The emissions of high-frequency surgical equipment strongly depend on the arrangement and length of the active and neutral cords, on the operating mode (sparking or not), and on many other application conditions. Consult the accompanying documentation of the high-frequency surgical equipment for guidance related to electromagnetic interference.

9.2 Main Components

This section contains technical data for the main components of the system.

9.2.1 X-ray Generator

Definition	Specification
Model identification	409085-001
Rectification type	Full wave
Maximum generator output	25 kW

9.2.2 X-ray Tube

Definition	Specification
Manufacturer	IAE SpA
Model identification	RTM 780 H (Type RO-0306)
Tube type	Rotating anode
Nominal X-ray tube voltage	120 kV
Nominal focal spot value (IEC 60336)	0.3 and 0.6 IEC
Nominal anode input power (100 kV and 0.1 s)	0.3 focus = 6.0 kW 0.6 focus = 25.0 kW
Maximum anode heat dissipation	54 kJ/min = 75.6 kHU/min = 900 W
Maximum anode heat content	225 kJ = 315 kHU
Target material	RT-TZM (Rhenium-Tungsten-Titanium-Zirconium-Molybdenum)
Anode angle	10°
Inherent filtration (IEC60522)	≥ 0.7 mm Al equivalent at 75 kV
Rotating anode supply	Single phase 50/60 Hz

Anode Heating and Cooling Curves

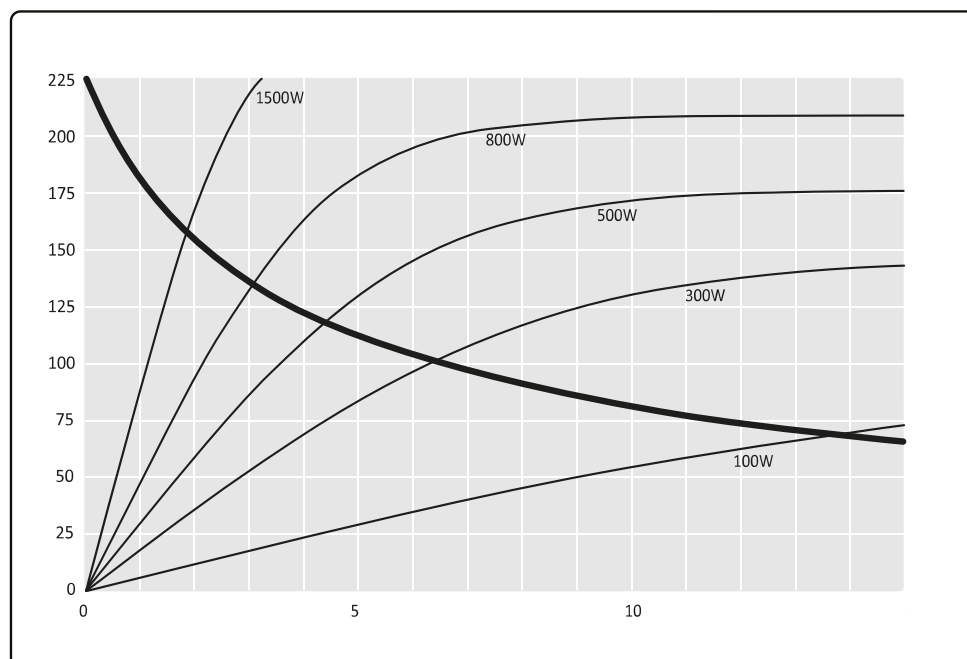


Figure 169 Anode heating and cooling curves

Legend	
X axis	Time (min)

Legend	
Y axis	Stored energy (kJ)

Tube Filament Emission Characteristics

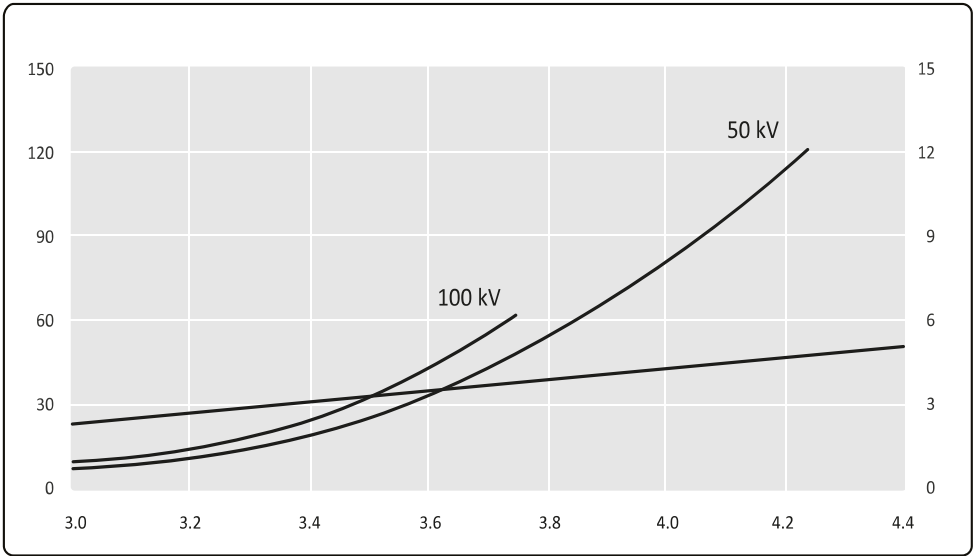


Figure 170 Emission characteristics small focus

Legend	
X axis	Filament current (A)
Y axis (left)	Tube current (mA)
Y axis (right)	Filament voltage (V)

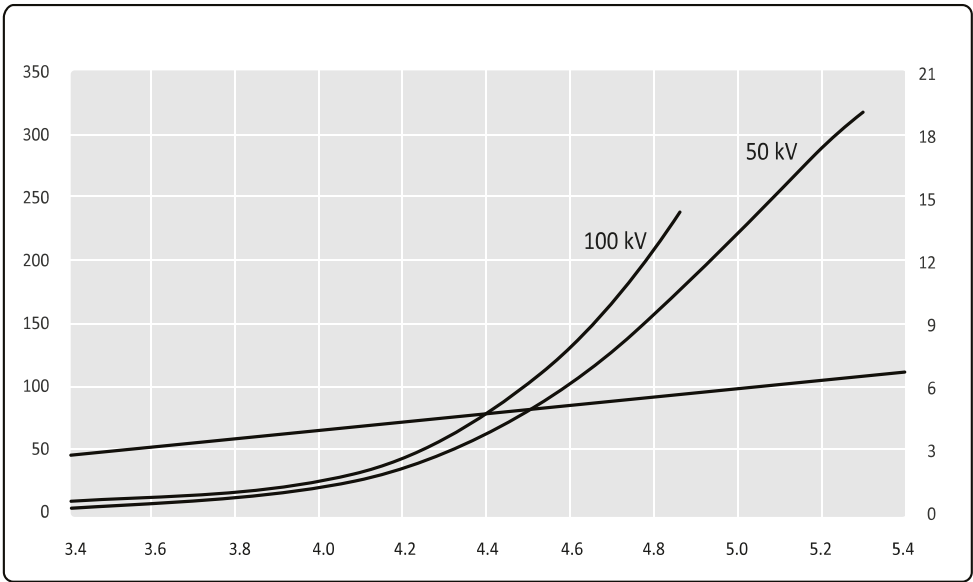


Figure 171 Emission characteristics large focus

Legend	
X axis	Filament current (A)
Y axis (left)	Tube current (mA)
Y axis (right)	Filament voltage (V)

9.2.3 X-ray Tube Assembly

X-ray tube assembly without beam limiting device, console, and cover.

Definition	Specification
Manufacturer	Spellman
Model name	MONOBLOCK MMB
Model identification	409085-002
Nominal X-ray tube housing voltage	120 kV
Inherent filtration	0.75 mm Al equivalent at 75 kV
Additional filtration	1 mm Al + 0.1 mm Cu
Permanent filtration (IEC 60522)	4.73 mm Al equivalent at 75 kV
Leakage technique factors (maximum kV and continuous heat dissipation for the tube)	120 kV and 300 W
Indication of focal spot position	Red spot on the side, front, and back of the tank
Weight	27.5 kg, ± 0.5 kg

For Germany only:

Definition	Specification
Total System Filtration Eq	> 5.73 mm Al equivalent @75 kV- IEC 60522
Total System Filtration	> 3 mm Al equivalent + 0.1 mm Cu equivalent

X-ray Tube Single Load Ratings

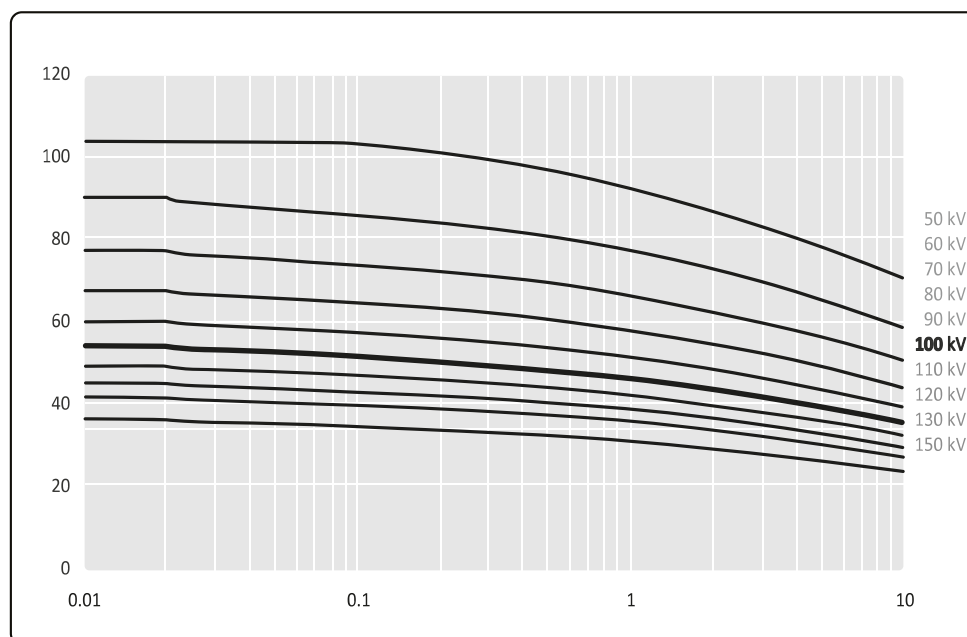


Figure 172 Single load rating small focus (40% anode heat content)

Legend	
X axis	Time (s)
Y axis	Tube current (mA)

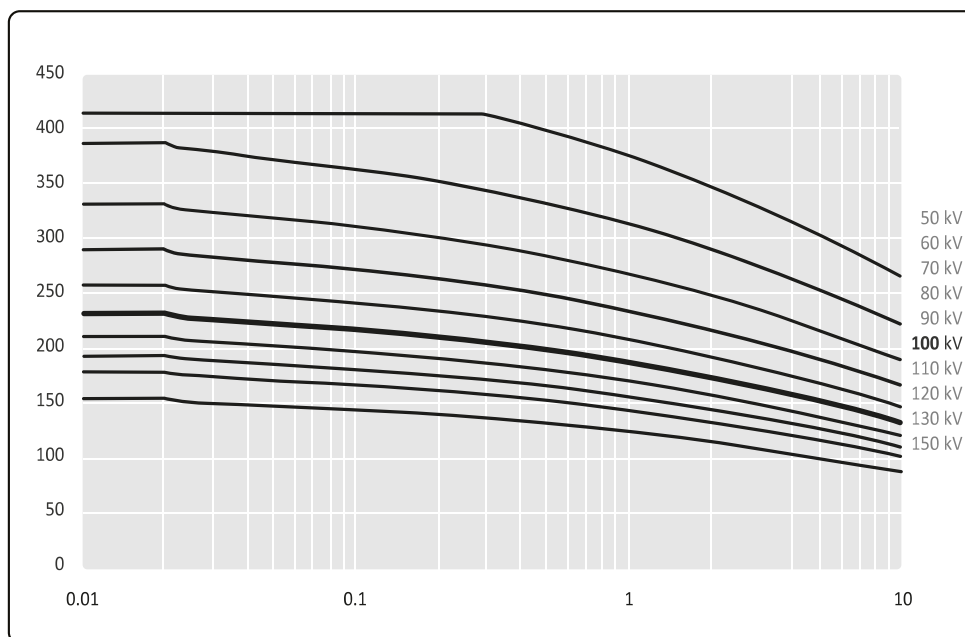


Figure 173 Single load rating large focus (40% anode heat content)

Legend	
X axis	Time (s)
Y axis	Tube current (mA)

9.2.4 X-ray Source Assembly

X-ray tube assembly with beam limiting device, console, and cover.

Definition	Specification
Nominal Continuous Input Power (IEC60613:2010) (Maximum continuous heat dissipation, IEC613:1989)	11.98 kJ/min = 16.7 kHU/min = 198.5 W
Continuous Anode Input Power (IEC60613:2010) Average loads smaller than the maximum continuous heat dissipation can be supplied infinitely to the system	7.5 kJ/min = 10.5 kHU/min = 125 W
Maximum X-ray tube assembly heat content	1483kJ = 2076 kHU
Filtration spacer cover	< 0.4 mm Al equivalent at 75 kV

X-ray Tank Surface Temperature Indication

Definition	Specification
None	Tank oil is within working range
X-ray tank warm	Approx 51°C
X-ray tank very warm	Approx 54.6°C
Hot tank! Low dose fluoroscopy still available	Approx 60°C

Tank Heating and Cooling Curves

NOTE Ambient Temperature; 23 to 25°C with pump ON.

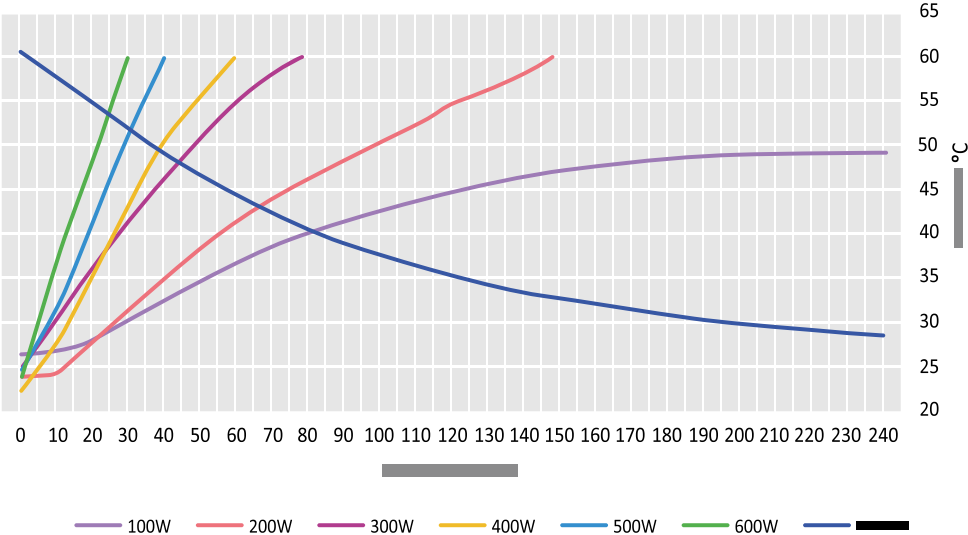


Figure 174 Tank heating and cooling curves

Legend	
X axis	Time from start, continuous exposure @ 100 kV (min)
Y axis	External surfaces average over temperature (°C)

9.2.5 Beam Limiting Device (BLD) for FD12

Definition	Specification
Manufacturer	Philips Medical Systems, Nederland B.V.
Model identification	4598 012 0023x

Iris Collimator of BLD

Definition	Specification
Iris adjustment	Stepless
Maximum Symmetrical Radiation Field (IEC 60806)	207 mm
Minimum beam diameter at detector entrance (for all formats)	< 50 mm at detector
Operation	From C-arm stand touch screen (remote controlled)

Shutters of BLD

Definition	Specification
Type	2 independent shutters
Adjustment	Stepless
Width adjustment	Down to < 50 mm slit at detector
Rotation	360 degrees
Operation	From C-arm stand touch screen (remote controlled)
Indication	On C-arm stand touch screen, also during Last Image Hold

9.2.6 Beam limiting device (BLD) for FD17

Definition	Specification
Manufacturer	Philips Medical Systems, Nederland B.V.
Model identification	4598 017 0760x

Iris Collimator of BLD

Definition	Specification
Iris adjustment	Stepless
Maximum Symmetrical Radiation Field (IEC 60806)	301 mm
Minimum beam diameter at detector entrance (for all formats)	< 50 mm at detector
Operation	From C-arm stand touch screen (remote controlled)

Shutters of BLD

Definition	Specification
Type	2 independent shutters
Adjustment	Stepless
Width adjustment	Down to < 50 mm slit at detector
Rotation	360 degrees
Operation	From C-arm stand touch screen (remote controlled)
Indication	From C-arm stand touch screen, also during Last Image Hold

9.2.7 Energy Storage Unit

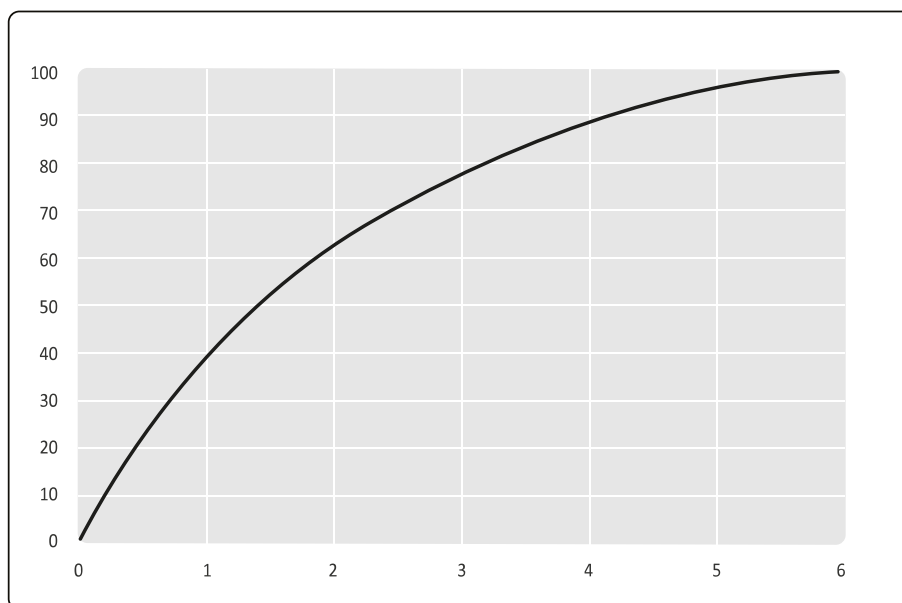


Figure 175 Energy storage unit charging time

Legend	
X axis	Time (hours)
Y axis	Charge (%)

9.2.8 Image Detection Subsystem

The image detection subsystem is responsible for the transformation of X-ray into digital video. Main parts are the flat detector, grid, and controller.

Definition	Specification
Model name	FDC-M

Flat Detector FD12

Definition	Specification			
Model name	PX2121S			
Triple mode	3 input fields with the following image formats sizes are available: <ul style="list-style-type: none">• 207 mm (8.1 inch) (square or circular)• 154 mm (6.1 inch) (circular field of view)• 110 mm (4.3 inch) (circular field of view)			
X-ray to light conversion	Scintillator, which consists of Thallium-doped Cesium Iodide			
Light to electronic charge and voltage conversion	Amorphous silicon diodes on the sensor plate convert the light into electronic charge, and TFT switches on the sensor plate release the charge towards the MAPIX (charge amplifier ASIC)			
Total number of sensor elements	1368 x 1344 (rows x columns)			
Active detector size / X-ray sensitive area	<ul style="list-style-type: none">• 1344 x 1344 pixels• 207 x 207 mm			
Line noise sensor zones left and right of active area	12 pixels wide			
Pixel size	154 x 154 μm			
Geometrical fill factor	The geometrical fill factor is the fraction of the pixel area sensitive to the incoming signal, which can be divided into two parts: <ul style="list-style-type: none">• The geometrical fill factor of the photodiode, also called optical fill factor, is 63%.• The relevant parameter for a radiographic imager is the fill factor for X-rays, that is the ratio of the X-ray sensitive pixel area to the total pixel area. It determines the fraction of absorbed X-ray quanta, which contribute to the signal. In this imager, this X-ray fill factor is 100%.			
Available non-binned or binned modes	1 x 1, 2 x 2			
Maximum surface temperature	<45°C			
Cooling	Passive cooling			
Detective Quantum Efficiency (DQE) ^{1,2,3} at 15 fps, RQA5	lp/mm	2 μGy	200 nGy	20 nGy
	0	77%	78%	76%
	0.5	65%	66%	63%
	1.0	56%	56%	52%
	1.5	51%	50%	43%
	2.0	46%	45%	33%
	2.5	40%	36%	21%
	3.0	27%	25%	12%
	3.25	20%	18%	9%

Definition	Specification														
Spatial resolution properties	lp/mm														
Modulation Transfer Function (MTF) ^{2,4}	<table> <tr><td>0.5</td><td>80%</td></tr> <tr><td>1.0</td><td>59%</td></tr> <tr><td>1.5</td><td>42%</td></tr> <tr><td>2.0</td><td>29%</td></tr> <tr><td>2.5</td><td>21%</td></tr> <tr><td>3.0</td><td>14%</td></tr> <tr><td>3.25</td><td>11%</td></tr> </table>	0.5	80%	1.0	59%	1.5	42%	2.0	29%	2.5	21%	3.0	14%	3.25	11%
0.5	80%														
1.0	59%														
1.5	42%														
2.0	29%														
2.5	21%														
3.0	14%														
3.25	11%														
Quantum limited performance	The operation range of the sensor is specified to be operated with system doses between 10 nGy and 4300 nGy, at a maximum speed of 30 frames per second. Within this range the device is operated quantum limited.														
Data output signal	DVLP														
Overall detector dynamic range, 154 µm pixel ⁵	16 bit, 96 dB														
Loading factors test for residual radiation	120 kV and 360 W														
Communication laser	Class 1 (IEC) Complies with FDA performance standards for laser products except for the deviations pursuant to Laser Notice No. 50 and Laser Notice No. 56.														

¹: 154 µm pixel, highest gain (g0 gain).

²: measured in accordance with IEC 62220-1-3

³: DQE is shown in the figure below.

⁴: MTF is shown in the figure below.

⁵: Overall detector dynamic range = $20 \times \log(\text{signal at saturation dose at lowest gain (g5 gain)} / \text{electronic noise at highest gain (g0 gain)})$.

⁶: The maximum temperature observed on detector surface is less than 45°C during prolonged usage.

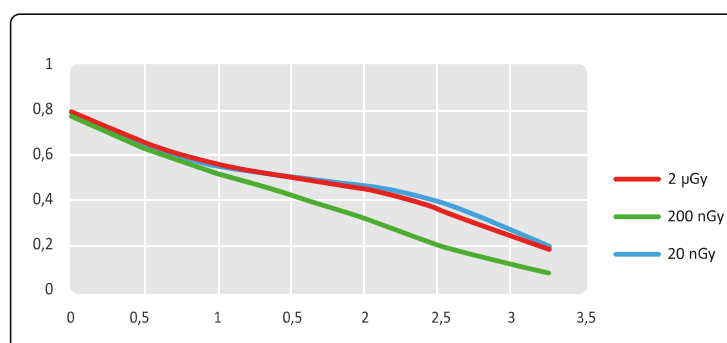


Figure 176 DQE vs. spatial frequency at 20 nGy / 200 nGy / 2 Gy in RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Spatial frequency (lp/mm)
Y axis	DQE (%)

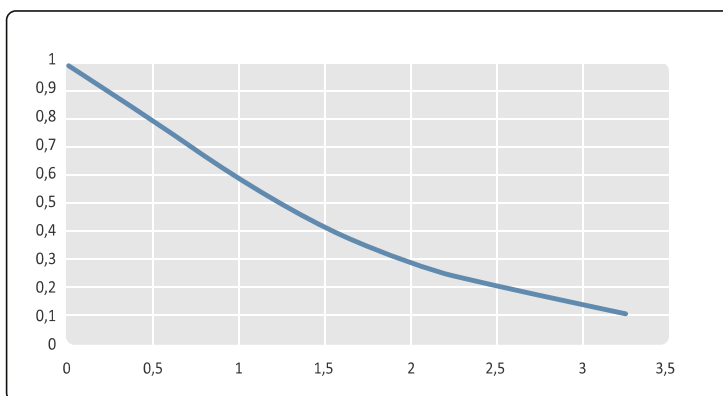


Figure 177 MTF at 2 Gy / RQA5 exposure according to IEC62220-1-3

Legend

X axis	Spatial frequency (lp/mm)
Y axis	MTF (%)

Grid FD12

Definition	Specification
Manufacturer	Philips Medical Systems, Nederland B.V.
Model name	9896 010 6313x
Type	Rectangular
Material	Carbon fiber
Lines/cm	74
Grid focus distance	100 cm
Ratio	14:1
Attenuation ratio (B/K) (= grid exposure factor/contrast improvement ratio = 1/transmission of primary radiation = 1/0.71)	1.41

Flat Detector FD17

Definition	Specification
Model name	PIXIUM 3030S
Triple mode	3 input fields with the following image formats sizes are available: <ul style="list-style-type: none"> • 301 mm (11.8 inch) (square or circular) • 222 mm (8.7 inch) (circular field of view) • 154 mm (6.1 inch) (circular field of view)
X-ray to light conversion	Scintillator, which consists of Thallium-doped Cesium Iodide
Light to electronic charge and voltage conversion	Amorphous silicon diodes on the sensor plate convert the light into electronic charge, and TFT switches on the sensor plate release the charge towards the MAPIX (charge amplifier ASIC)
Total number of sensor elements	1956 x 1956 (rows x columns)
Active detector size / X-ray sensitive area	<ul style="list-style-type: none"> • 1956 x 1956 pixels • 301 x 301 mm
Line noise sensor zones left and right of active area	12 pixels wide
Pixel size	154 x 154 µm

Definition	Specification			
Geometrical fill factor	The geometrical fill factor is the fraction of the pixel area sensitive to the incoming signal, which can be divided into two parts: <ul style="list-style-type: none">• The geometrical fill factor of the photodiode, also called optical fill factor, is 63%.• The relevant parameter for a radiographic imager is the fill factor for X-rays, that is the ratio of the X-ray sensitive pixel area to the total pixel area. It determines the fraction of absorbed X-ray quanta, which contribute to the signal. In this imager, this X-ray fill factor is 100%.			
Available non-binned or binned modes	1 x 1, 2 x 2			
Maximum surface temperature	<45°C			
Cooling	Passive cooling			
Detective Quantum Efficiency (DQE) ^{1,2,3} at 15 fps, RQA5	lp/mm	2 µGy	200 nGy	20 nGy
	0	77%	77%	75%
	0.5	65%	65%	62%
	1.0	56%	56%	51%
	1.5	51%	50%	41%
	2.0	46%	45%	30%
	2.5	40%	36%	19%
	3.0 (Nyquist)	27%	25%	11%
Spatial resolution properties	lp/mm			
Modulation Transfer Function (MTF) ^{1,2}	0.5	81%		
	1.0	60%		
	1.5	45%		
	2.0	32%		
	2.5	24%		
	3.0 (Nyquist)	17%		
Quantum limited performance	The operation range of the sensor is specified to be operated with system doses between 10 nGy and maximum working point 3125 nGy, at a maximum speed of 30 frames per second. Within this range the device is operated quantum limited.			
Data output signal	DVLP			
Overall detector dynamic range, 184 µm pixel ⁵	16 bit, 96 dB			
Loading factors test for residual radiation	120 kV and 360 W			
Communication laser	Class 1 (IEC) Complies with FDA performance standards for laser products except for the deviations pursuant to Laser Notice No. 50 and Laser Notice No. 56.			

¹: 154 µm pixel, highest gain (g0 gain).

²: Measured in accordance with IEC 62220-1-3.

³: DQE is shown in the figure below.

⁴: MTF is shown in the figure below.

⁵: Overall detector dynamic range = 20 x log (signal at saturation dose at lowest gain (g11 gain) / electronic noise at highest gain (g4 gain)).

⁶: The maximum temperature observed on detector surface is less than 45°C during prolonged usage.

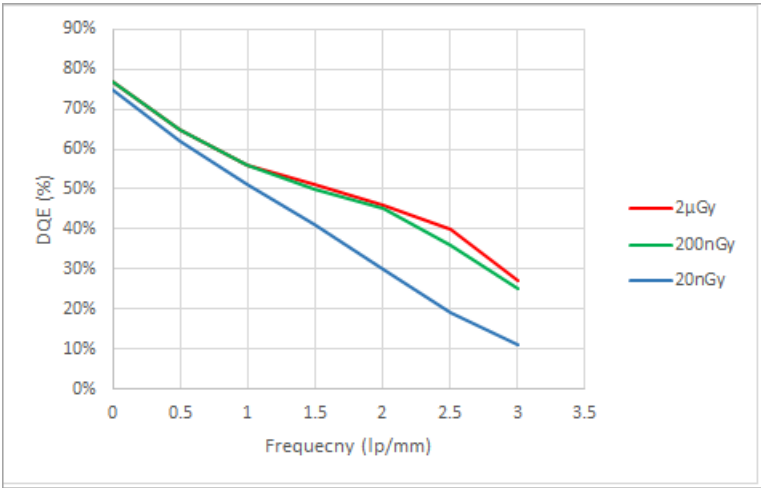


Figure 178 DQE vs. spatial frequency at 20 nGy / 200 nGy / 2 Gy in RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Frequency (lp/mm)
Y axis	DQE (%)

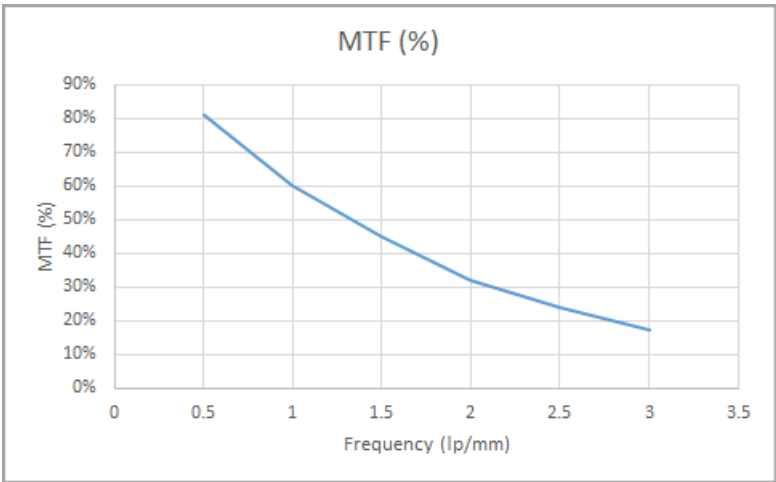


Figure 179 MTF at 2 Gy / RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Spatial frequency (lp/mm)
Y axis	MTF (%)

Grid FD17

Definition	Specification
Manufacturer:	Philips Medical Systems, Nederland B.V.
Model name	9896 010 7367x
Type	Rectangular
Material	Carbon fiber
Lines/cm	74
Grid focus distance	100 cm

Definition	Specification
Ratio	14:1
Attenuation ratio (B/K) (= grid exposure factor/contrast improvement ratio = 1/transmission of primary radiation = 1/0.71)	1.41

9.2.9 Digital Image Processor

The image processing software is used as the image processor. The main specifications of this unit are shown in the table below.

Definition	Specification
Type	Software-based 14-bit video pipeline processor with real-time processing, storage, and overlay
Standard processing	<ul style="list-style-type: none"> • Feed-forward gain control • White compression • Adaptive temporal recursive noise reduction • Spatial noise reduction • Adaptive multiresolution brightness / contrast / edge enhancement • Blanking • Video invert • Digital image rotation • Mirroring • Flipping • Manual/auto contrast/brightness
Processing options	<ul style="list-style-type: none"> • Subtraction • Roadmapping • Trace white • Trace black • View trace • Zoom • Measure • Pixel shift • Landmarking
Disk storage	140,000 images
Maximum storage speed	Up to 30 images/s
External connections at the mobile view station ³	<ul style="list-style-type: none"> • 2 x DVI-out (1 x LMON and 1 x RMON) ¹ • Video in (1 x S-video, 1 x SDI, 1 x DVI) • Gigabit Ethernet (hospital network and service port) • 3 USB (2 x USB-2.0 and 1 x USB-3.0) ²
Automatic shutter placement	Yes
Image processing version	Defined by the system release and software version ⁴
<p><i>Note 1: Before using the external video for diagnostic purposes, the system on which this video is displayed needs to be validated using a representative sample set of videos.</i></p> <p><i>Note 2: For USB storage, only storage devices should be connected that are not externally powered devices.</i></p> <p><i>Note 3: The cables used shall have a typical length of 3 m.</i></p> <p><i>Note 4: System software version is displayed during system startup or via Information Help - About.</i></p>	

9.2.10 Monitors

Mobile View Station

Definition	Standard brightness	High brightness
Model number	MLCD19L (Touch / Non-touch)	MLCD19-HB (Touch / Non-touch)
Size	19 inch	19 inch

Definition	Standard brightness	High brightness
Display matrix	1280 x 1024	1280 x 1024
Monitor LUT	DICOM	DICOM

NOTE *Refer accompanying monitor user manual for more details.*

NOTE *Adjustment of contrast and brightness is only configurable by a service engineer.*

C-arm Stand Touch Screen

Definition	Specification
Type	HL1530
Size	15.3 inch LCD
Position	Rotate and tilt
Display matrix	1280 x 768

9.2.11 Detector Laser Aiming Device

Detector laser aiming device	Description
Manufacturer	Power Technology Inc
Model name	FD Laser Aiming Device
Model no	FP-L-635-10-34-Philips-V2-C2
Added filtration (mirror)	None
Location	Integrated in detector covers (no influence at X-ray beam)
Classifications	IEC Class 1. Complies with FDA performance standards for laser products
Maximum position inaccuracy of the indicated X-ray beam center	±5 mm
Operation	Remote controlled
Laser product specification	Wavelength: 635 nm (±5 nm) Maximum output: 10 mW (±1 mW) Beam divergence: 34 degrees

9.2.12 Wireless LAN

Wireless LAN	Specification
Frequency	IEEE 802.11 a/b/g/n/ac/ax (2.4 GHz and 5 GHz band)
Authentication	WPA and WPA2, 802.1X (EAP-TLS, PEAP)
Security	AES, TKIP, WEP, FIPS 140-2 validated
Antennas	2
Effective radiated power (ERP)	8.09 mW (9.08dBm)

NOTE *WPA and TKIP are not applicable for Windows 10.*

9.3 System Data

This section contains the system data.

9.3.1 Environmental Conditions

Condition	Value
Operating temperature (without hardware options)	<ul style="list-style-type: none"> 10°C to 40°C for safety 10°C to 35°C for performance
Storage/transport temperature	<ul style="list-style-type: none"> -25°C to 55°C short term storage -25°C to 40°C long term storage
Relative humidity (operation)	<ul style="list-style-type: none"> 20% to 93% for safety 20% to 80% for performance
Relative humidity (storage)	5% to 95% (non condensing)
Air pressure (operation and storage)	70 kPa to 110 kPa
Operating altitude	0 to 3000 meters
Vibration	<ul style="list-style-type: none"> Stand - 1 to 120 Hz, PSD with Grms of 0.97 g vertical, 0.58 g longitudinal, 0.93 g lateral MVS - 1 to 140Hz, PSD with Grms 1.4 g vertical , 0.87 g longitudinal, 0.85 g lateral
Classification according to IEC60529	Wired Foot switch: IPX8 Wireless foot switch (Option): IPX8 Other user interfaces: IPX1 FD cover: IPX3 X-ray tank cover: IPX2 Touch Screen Monitor (TSM) (Option): IP23 Table Side Operator (TSO) (Option): IPX4
Material group classification according to IEC60601-1	IIb
Pollution degree classification according to IEC60601-1	2: micro-environment where only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation is to be expected.
Electrical safety protection class according to IEC60601-1	Class I Equipment
Overvoltage category (IEC 60664-1)	For the mains part mains: II For all other circuits overvoltage category I is applicable

9.3.2 System Loading Data

Fluoroscopy

Definition	Specification 15 kW	Specification 25 kW
Focus	0.6 IEC	0.6 IEC
kV range	40 to 120 kV	40 to 120 kV
mA peak range	0.50 mA to 60.0 mA	0.50 mA to 100 mA
Maximum peak power	120 kV x 60 mA = 7200 W	120 kV x 100 mA = 12000 W
Maximum average power	120 kV x 13.3 mA = 1600 W	120 kV x 13.3 mA = 1600 W
Maximum continuous loading time	10 min (≤ 600 W average power) 60 sec (≤ 1200 W average power) 30 sec (> 1200 W average power)	10 min (≤ 600 W average power) 60 sec (≤ 1200 W average power) 30 sec (> 1200 W average power)
Pulse rate (pulse per second)	Full, half, and quarter pulse rates are available: <ul style="list-style-type: none"> Pulse rate 4 ($\frac{1}{2} = 2$, $\frac{1}{4} = 1$) Pulse rate 15 ($\frac{1}{2} = 7.5$, $\frac{1}{4} = 4$) Pulse rate 30 ($\frac{1}{2} = 15$, $\frac{1}{4} = 7.5$) 	Full, half, and quarter pulse rates are available: <ul style="list-style-type: none"> Pulse rate 4 ($\frac{1}{2} = 2$, $\frac{1}{4} = 1$) Pulse rate 15 ($\frac{1}{2} = 7.5$, $\frac{1}{4} = 4$) Pulse rate 30 ($\frac{1}{2} = 15$, $\frac{1}{4} = 7.5$)
Pulse width	5.334 ms to 85.333 ms	4.443 ms to 85.333 ms

Exposure

Definition	Specification	
	15 kW	25 kW
Focus	0.6 IEC	0.6 IEC
kV range	40 to 120 kV	40 to 120 kV
mA peak range	0.50 to 60.0 mA	0.5 to 100 mA
Maximum peak power	120 kV x 60 mA = 7200 W	120 kV x 100 mA = 12000 W
Maximum average power	120 kV x 13.3 mA = 1600W	120 kV x 13.3 mA = 1600W
Maximum continuous loading time	10 min (≤ 600 W average power) 60 sec (≤ 1200 W average power) 30 sec (> 1200 W average power)	10 min (≤ 600 W average power) 60 sec (≤ 1200 W average power) 30 sec (> 1200 W average power)
Pulse rate (pulse per second)	Full, half, and quarter pulse rates are available: <ul style="list-style-type: none"> Pulse rate 4 ($\frac{1}{2} = 2$, $\frac{1}{4} = 1$) Pulse rate 7.5 ($\frac{1}{2} = 4$, $\frac{1}{4} = 2$) Pulse rate 15 ($\frac{1}{2} = 7.5$, $\frac{1}{4} = 4$) Pulse rate 30 ($\frac{1}{2} = 15$, $\frac{1}{4} = 7.5$) 	Full, half, and quarter pulse rates are available: <ul style="list-style-type: none"> Pulse rate 4 ($\frac{1}{2} = 2$, $\frac{1}{4} = 1$) Pulse rate 7.5 ($\frac{1}{2} = 4$, $\frac{1}{4} = 2$) Pulse rate 15 ($\frac{1}{2} = 7.5$, $\frac{1}{4} = 4$) Pulse rate 30 ($\frac{1}{2} = 15$, $\frac{1}{4} = 7.5$)
Pulse width	7.407 ms to 118.519 ms	4.443 ms to 118.519 ms

Single Shot

Definition	Specification	
	15 kW	25 kW
Focus	0.6 IEC	0.6 IEC
kV range	40 to 120 kV	40 to 120 kV
mA peak range	<ul style="list-style-type: none"> 2.5 mA to 60.0 mA (normal single shot) 5.2 mA to 125 mA (high power single shot) 	<ul style="list-style-type: none"> 2.5 mA to 60.0 mA (normal single shot) 8.68 mA to 208.33 mA (high power single shot)
Maximum peak power	120 kV x 125 mA = 15000 W	120 kV x 208.33mA = 25000 W
Nominal peak power at 100 kV, 0.1 s (IEC 60601-2-54)	100 kV x 122 mA = 12200 W	100 kV x 203.8 mA = 20380 W
Pulse width	100 ms and 165 ms (normal single shot) 100 ms (high power single shot)	100 ms and 165 ms (normal single shot) 100 ms (high power single shot)
Waiting time between loads	2 sec (normal single shot) 30 sec (high power single shot)	2 sec (normal single shot) 30 sec (high power single shot)

9.3.3 Maximum Loading Factors

Fluoroscopy

Definition	Data	
	15 kW	25 kW
Nominal X-ray tube voltage	120 kV (at 60 mA)	120 kV (at 60 mA)
Highest X-ray tube current (peak)	60 mA (at 120 kV)	60 mA (at 120 kV)
Highest electric power (average)	60 mA x 120 kV x 14.815 ms x 15/s = 1600 W	60 mA x 120 kV x 14.815 ms x 15/s = 1600 W

Exposure

Definition	Data	
	15 kW	25 kW
Nominal X-ray tube voltage	120 kV (at 60 mA)	120 kV (at 100 mA)
Highest X-ray tube current (peak)	60 mA (at 120 kV)	100 mA (at 120 kV)
Highest electric power (average)	60 mA x 120 kV x 14.815 ms x 15/s = 1600 W	100 mA x 120 kV x 4.443 ms x 30/s = 1600 W

Single Shot

Definition	Data	
	15 kW	25 kW
Nominal X-ray tube voltage	120 kV (at 125 mA)	120 kV (at 208.33 mA)
Highest X-ray tube current (peak)	125 mA (at 120 kV)	208.33 mA (at 120 kV)
Highest electric power (average)	125 mA x 120 kV = 15000 W	208.33 mA x 120 kV = 25000 W
Nominal electric power (average) at 100 kV, 0.1 s (IEC 60601-2-54)	122 mA x 100 kV = 12200 W	203.8 mA x 100 kV = 20380 W
Lowest current time product	0.5 mAs (5 mA, 100 ms at 40 kV)	0.868 mAs (8.68 mA, 100 ms at 40 kV)

9.3.4 Display Accuracy

The display accuracy for all tube voltages greater than 45 kV are given in the following table. The dose indications are calculated using the acquisition parameters, a calibrated lookup table, and a model of the collimator position.

Definition	Data
Tube voltage deviation	±8%
Average current deviation for X-ray	±20%
Dose (rate) accuracy	±25%
Dose area product accuracy	±35% ¹
<i>Note 1: For X-ray field with beam diameter at detector entrance from 5 cm to maximum. For France DAP accuracy is 25%.</i>	

9.3.5 Measurement Basis for Approval Tests

Parameter	Description
Tube voltage (kV pk)	Measured using a non invasive kV pk meter placed 20 cm from the focus. Note that the meter should take filtration into account.
Tube current peak (mA pk)	Measured using an oscilloscope connected to the tube current test pins of the generator.
Tube current average (mA)	Calculated using mA pk, pulse width, and pulse frequency measurements.
Time	The exposure time measured using a time function in the dose meter.
X-ray output	Measured using a dose meter placed in the reference axis of the X-ray beam.
Leakage, residual, and scattered radiation	Use manual kV control and set to kV max. Read the displayed mA value and scale the radiation result for the test mA.

9.3.6 Acquisition Parameter Settings

Mode	Specification
Automatic mode (used for fluoroscopy and exposure)	0.1 kV steps, -mA coupled to kV value
Manual mode (used for Fluoroscopy, exposure, and Single shot)	1.0 kV steps, -mA coupled to kV value
Accuracy of automatic control system	10% of average gray level in measuring field

9.3.7 Patient Dose Information - Dose Rate With Grid

These are typical dose rates for the system with the grid. The actual dose rate displayed on the system is calibrated and is slightly different from the values in the table.

To determine the expected dose (rate), first define the "Avg mA @ 120kV" from the selected procedure - acquisition mode - pulse speed (frequency) combination in the examination setting tables.

Dynamic Modes for FD12, 5 cm PMMA With Grid - Auto Mode

Dynamic Modes for FD12, 5 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 51kV	mGy / min ¹	2Gy in min ²	kV	mA@ 52kV	mGy / min ¹	2Gy in min ²	kV	mA@ 54kV	mGy / min ¹	2Gy in min ²
0.50	51	0.083	0.09	21898	52	0.097	0.11	17647	54	0.124	0.16	12295
0.72	51	0.120	0.11	17442	52	0.139	0.14	14085	54	0.178	0.21	9709
0.83	51	0.139	0.15	12931	52	0.161	0.19	10453	54	0.206	0.27	7444
0.90	51	0.150	0.14	14052	52	0.174	0.18	11278	54	0.223	0.26	7792
1.00	51	0.167	0.18	11342	52	0.193	0.22	9160	54	0.248	0.31	6501
1.20	51	0.200	0.21	9494	52	0.232	0.26	7702	54	0.297	0.37	5401
1.44	51	0.240	0.23	8811	52	0.278	0.28	7059	54	0.356	0.41	4902
1.67	51	0.278	0.30	6749	52	0.322	0.36	5525	54	0.413	0.52	3883
1.73	51	0.288	0.28	7255	52	0.334	0.34	5854	54	0.428	0.50	4013
2.00	51	0.333	0.35	5655	52	0.387	0.43	4619	54	0.495	0.62	3222
2.40	51	0.400	0.38	5231	52	0.464	0.48	4187	54	0.594	0.69	2886
2.50	51	0.417	0.40	5042	52	0.483	0.50	4021	54	0.619	0.72	2787
2.88	51	0.480	0.51	3889	52	0.557	0.63	3168	54	0.713	0.90	2218
3.33	51	0.556	0.61	3291	52	0.644	0.76	2646	54	0.825	1.07	1871
3.60	51	0.600	0.66	3014	52	0.696	0.82	2428	54	0.891	1.15	1744
4.00	51	0.667	0.64	3122	52	0.773	0.80	2504	54	0.990	1.15	1745
4.80	51	0.800	0.88	2279	52	0.928	1.09	1836	54	1.190	1.54	1302
5.00	51	0.833	0.93	2159	52	0.967	1.15	1738	54	1.240	1.63	1229
6.67	51	1.110	1.18	1697	52	1.290	1.44	1386	54	1.650	2.04	979
8.00	51	1.330	1.45	1383	52	1.550	1.79	1118	54	1.980	2.51	795
9.60	51	1.600	1.73	1158	52	1.860	2.15	931	54	2.380	3.00	667
13.33	51	2.220	2.41	831	52	2.580	2.97	673	54	3.300	4.21	475
0.6*	51	0.100	0.10	20690	52	0.116	0.12	16807	54	0.149	0.17	11673
1.02*	51	0.170	0.16	12766	52	0.197	0.20	10118	54	0.252	0.29	6865
1.8*	51	0.300	0.29	6977	52	0.348	0.36	5576	54	0.446	0.52	3834

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 12, 5 cm PMMA With Grid for Auto Mode

Single Exposures for FD 12, 5 cm PMMA With Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	51	10	0.0304	65789
High Power-100ms (25 KW)	51	34.7	0.062	32258
Normal-100ms	51	10	0.021	97561
High Power-100ms (15 KW)	51	20.8	0.041	48426

Single Exposures for FD 12, 5 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	52	11.6	0.0367	54496
High Power-100ms (25 KW)	52	40.3	0.076	26316
Normal-100ms	52	11.6	0.025	78833
High Power-100ms (15 KW)	52	24.2	0.051	38986

Single Exposures for FD 12, 5 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	54	14.90	0.051	39216
High Power-100ms (25 KW)	54	51.60	0.105	19048
Normal-100ms	54	14.9	0.036	55556
High Power-100ms (15 KW)	54	30.9	0.0715	27972

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD12, 10 cm PMMA With Grid - Auto Mode

Dynamic Modes for FD12, 10 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 56kV	mGy / min ¹	2Gy in min ²	kV	mA@ 58kV	mGy / min ¹	2Gy in min ²	kV	mA@ 60kV	mGy / min ¹	2Gy in min ²
0.50	56	0.151	0.22	9009	58	0.179	0.30	6772	60	0.207	0.39	5141
0.72	56	0.218	0.28	7117	58	0.258	0.37	5338	60	0.298	0.49	4049
0.83	56	0.252	0.37	5410	58	0.298	0.50	4011	60	0.344	0.66	3041
0.90	56	0.273	0.35	5714	58	0.322	0.47	4252	60	0.372	0.62	3226

Dynamic Modes for FD12, 10 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 56kV	mGy / min ¹	2Gy in min ²	kV	mA@ 58kV	mGy / min ¹	2Gy in min ²	kV	mA@ 60kV	mGy / min ¹	2Gy in min ²
1.00	56	0.303	0.43	4669	58	0.358	0.57	3515	60	0.413	0.75	2673
1.20	56	0.363	0.52	3873	58	0.429	0.69	2907	60	0.496	0.91	2203
1.44	56	0.436	0.56	3552	58	0.515	0.76	2646	60	0.595	1.00	2003
1.67	56	0.505	0.71	2814	58	0.597	0.94	2122	60	0.689	1.24	1610
1.73	56	0.523	0.69	2883	58	0.618	0.92	2185	60	0.714	1.21	1657
2.00	56	0.606	0.85	2341	58	0.716	1.14	1754	60	0.827	1.51	1322
2.40	56	0.727	0.95	2098	58	0.859	1.27	1574	60	0.992	1.67	1194
2.50	56	0.757	1.01	1978	58	0.895	1.35	1481	60	1.030	1.78	1125
2.88	56	0.872	1.25	1600	58	1.030	1.66	1201	60	1.190	2.19	914
3.33	56	1.010	1.49	1346	58	1.190	2.00	1001	60	1.380	2.61	767
3.60	56	1.090	1.60	1250	58	1.290	2.14	934	60	1.490	2.81	711
4.00	56	1.210	1.62	1235	58	1.430	2.15	931	60	1.650	2.80	715
4.80	56	1.450	2.14	934	58	1.720	2.88	695	60	1.980	3.75	534
5.00	56	1.510	2.23	898	58	1.790	2.98	671	60	2.070	3.89	514
6.67	56	2.020	2.82	709	58	2.390	3.75	533	60	2.760	4.92	407
8.00	56	2.420	3.50	572	58	2.860	4.68	427	60	3.310	6.13	327
9.60	56	2.910	4.21	475	58	3.440	5.64	355	60	3.970	7.38	271
13.33	56	4.040	5.83	343	58	4.770	7.84	255	60	5.510	10.24	195
0.6*	56	0.182	0.24	8333	58	0.215	0.32	6243	60	0.248	0.42	4728
1.02*	56	0.308	0.41	4914	58	0.364	0.54	3674	60	0.421	0.72	2784
1.8*	56	0.545	0.72	2762	58	0.644	0.96	2092	60	0.744	1.26	1588

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD12, 10 cm PMMA With Grid for Auto Mode

Single Exposures for FD12, 10 cm PMMA With Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	56	18.2	0.073	27397
High Power-100ms (25 KW)	56	63.1	0.156	12821
Normal-100ms	56	18.2	0.0487	41068
High Power-100ms (15 KW)	56	37.9	0.0968	20661

Single Exposures for FD12, 10 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	58	21.5	0.098	20408

Single Exposures for FD12, 10 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
High Power-100ms (25 KW)	58	74.6	0.208	9615
Normal-100ms	58	21.5	0.06467	30926
High Power-100ms (15 KW)	58	44.7	0.127	15748

Single Exposures for FD12, 10 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	60	24.80	0.129	15504
High Power-100ms (25 KW)	60	86.10	0.277	7220
Normal-100ms	60	24.8	0.085	23529
High Power-100ms (15 KW)	60	51.7	0.17	11765

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD12, 20 cm PMMA With Grid - Auto Mode

Dynamic Modes for FD12, 20 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 70kV	mGy / min ¹	2Gy in min ²	kV	mA@ 75kV	mGy / min ¹	2Gy in min ²	kV	mA@ 81kV	mGy / min ¹	2Gy in min ²
0.50	70	0.457	1.53	1310	75	0.462	1.834	1090	81	0.469	2.273	880
0.72	70	0.658	1.97	1015	75	0.665	2.572	778	81	0.675	2.949	678
0.83	70	0.761	2.51	796	75	0.770	3.032	660	81	0.781	3.761	532
0.90	70	0.822	2.49	803	75	0.832	3.027	661	81	0.843	3.700	541
1.00	70	0.913	2.84	703	75	0.924	3.447	580	81	0.937	4.221	474
1.20	70	1.100	3.40	589	75	1.110	4.211	475	81	1.120	5.119	391
1.44	70	1.320	3.96	505	75	1.330	4.563	438	81	1.350	5.881	340
1.67	70	1.520	4.68	427	75	1.540	5.690	351	81	1.560	6.953	288
1.73	70	1.580	4.74	422	75	1.600	5.807	344	81	1.620	7.108	281
2.00	70	1.830	5.80	345	75	1.850	7.043	284	81	1.870	8.638	232
2.40	70	2.190	6.63	302	75	2.220	8.023	249	81	2.250	9.876	203
2.50	70	2.280	7.00	286	75	2.310	8.448	237	81	2.340	10.167	197
2.88	70	2.630	8.26	242	75	2.660	10.007	200	81	2.700	12.323	162
3.33	70	3.040	9.88	202	75	3.080	11.920	168	81	3.120	14.697	136
3.60	70	3.290	10.51	190	75	3.330	12.823	156	81	3.370	15.653	128
4.00	70	3.650	11.01	182	75	3.700	13.367	150	81	3.750	16.283	123
4.80	70	4.380	14.38	139	75	4.440	17.307	116	81	4.500	21.227	94
5.00	70	4.570	14.77	135	75	4.620	17.947	111	81	4.690	22.100	90
6.67	70	6.090	19.13	105	75	6.160	23.193	86	81	6.250	28.203	71
8.00	70	7.310	22.73	88	75	7.390	27.593	72	81	7.500	34.030	59
9.60	70	8.770	27.33	73	75	8.870	33.357	60	81	9.000	41.067	49

Dynamic Modes for FD12, 20 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 70kV	mGy / min ¹	2Gy in min ²	kV	mA@ 75kV	mGy / min ¹	2Gy in min ²	kV	mA@ 81kV	mGy / min ¹	2Gy in min ²
13.33	70	12.200	38.44	52	75	12.300	47.073	42	81	12.500	57.147	35
0.6*	70	0.548	1.68	1188	75	0.555	2.054	974	81	0.562	2.505	798
1.02*	70	0.930	2.86	700	75	0.941	3.493	573	81	0.954	4.332	462
1.8*	70	1.640	5.00	400	75	1.660	6.107	328	81	1.690	7.461	268

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD12, 20 cm PMMA With Grid for Auto Mode

Single Exposures for FD12, 20 cm PMMA With Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	70	54.8	0.458	4367
High Power-100ms (25 KW)	70	190	1.012	1976
Normal-100ms	70	54.8	0.279	7168
High Power-100ms (15 KW)	70	114	0.562	3559

Single Exposures for FD12, 20 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	75	55.5	0.56	3571
High Power-100ms (25 KW)	75	193	1.23	1626
Normal-100ms	75	55.5	0.338	5917
High Power-100ms (15 KW)	75	116	0.681	2937

Single Exposures for FD12, 20 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	81	56.20	0.688	2907
High Power-100ms (25 KW)	81	195.00	1.492	1340
Normal-100ms	81	56.10	0.414	4831
High Power-100ms (15 KW)	81	117	0.841	2378

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD17, 5 cm PMMA With Grid – Auto Mode

Dynamic Modes for FD17, 5 cm PMMA With Grid – Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 51kV	mGy / min ¹	2Gy in min ²	kV	mA@ 53kV	mGy / min ¹	2Gy in min ²	kV	mA@ 54kV	mGy / min ¹	2Gy in min ²
0.50	51	0.083	0.09	22140	53	0.110	0.16	12658	54	0.124	0.16	12685
0.72	51	0.120	0.114	17493	53	0.158	0.185	10803	54	0.178	0.207	9646
0.83	51	0.139	0.152	13187	53	0.183	0.262	7634	54	0.206	0.266	7519
0.90	51	0.150	0.142	14085	53	0.198	0.231	8663	54	0.223	0.258	7752
1.00	51	0.167	0.175	11450	53	0.220	0.270	7409	54	0.248	0.305	6550
1.20	51	0.200	0.210	9509	53	0.264	0.326	6129	54	0.297	0.369	5425
1.44	51	0.240	0.224	8915	53	0.317	0.371	5397	54	0.356	0.408	4898
1.67	51	0.278	0.292	6857	53	0.367	0.452	4428	54	0.413	0.509	3932
1.73	51	0.288	0.285	7018	53	0.380	0.458	4370	54	0.428	0.511	3914
2.00	51	0.333	0.354	5650	53	0.440	0.561	3565	54	0.495	0.620	3224
2.40	51	0.400	0.392	5102	53	0.528	0.631	3170	54	0.594	0.712	2810
2.50	51	0.417	0.421	4747	53	0.550	0.677	2956	54	0.619	0.752	2658
2.88	51	0.480	0.517	3871	53	0.634	0.817	2448	54	0.713	0.902	2218
3.33	51	0.556	0.598	3343	53	0.733	0.930	2151	54	0.825	1.046	1912
3.60	51	0.600	0.633	3160	53	0.792	0.982	2036	54	0.891	0.107	1807
4.00	51	0.667	0.673	2973	53	0.880	1.084	1846	54	0.990	1.208	1656
4.80	51	0.800	0.866	2310	53	1.060	1.340	1492	54	1.190	1.508	1326
5.00	51	0.833	0.879	2274	53	1.100	1.376	1453	54	1.240	1.549	1291
6.67	51	1.110	1.173	1706	53	1.470	1.833	1091	54	1.650	2.039	981
8.00	51	1.330	1.407	1421	53	1.760	2.164	924	54	1.980	2.443	819
9.60	51	1.600	1.698	1178	53	2.110	2.608	767	54	2.380	2.942	680
13.33	51	2.220	2.345	853	53	2.930	3.633	551	54	3.300	4.100	488
0.6*	51	0.100	0.102	19544	53	0.132	0.152	13132	54	0.149	0.183	109449
1.02*	51	0.170	0.166	12072	53	0.224	0.252	7939	54	0.252	0.305	6565
1.8*	51	0.300	0.301	6645	53	0.396	0.453	4417	54	0.446	0.544	3674

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD17, 5 cm PMMA With Grid for Auto Mode

Single Exposures for FD17, 5 cm PMMA With Grid for Auto Mode				
Mode	No Zoom			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	51	10	0.0317	63091
High Power-100ms (25 KW)	51	34.7	0.066	30303
Normal-100ms	51	10	0.0197	101523

Single Exposures for FD17, 5 cm PMMA With Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
High Power-100ms (15 KW)	51	20.8	0.039	51282

Single Exposures for FD17, 5 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	53	13.2	0.04712	42445
High Power-100ms (25 KW)	53	45.8	0.096	20833.
Normal-100ms	53	13.2	0.031	64516
High Power-100ms (15 KW)	53	27.5	0.06	33333

Single Exposures for FD17, 5 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	54	14.90	0.054	37175
High Power-100ms (25 KW)	54	51.60	0.113	17699
Normal-100ms	54	14.9	0.035	57143
High Power-100ms (15 KW)	54	30.9	0.0687	29112

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD17, 10 cm PMMA With Grid - Auto Mode

Dynamic Modes for FD17, 10 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 56kV	mGy / min ¹	2Gy in min ²	kV	mA@ 59kV	mGy / min ¹	2Gy in min ²	kV	mA@ 61kV	mGy / min ¹	2Gy in min ²
0.50	56	0.151	0.24	8253	59	0.193	0.37	5445	61	0.220	0.48	4155
0.72	56	0.218	0.313	6390	59	0.278	0.480	4166	61	0.317	0.652	3068
0.83	56	0.252	0.397	5038	59	0.322	0.622	3215	61	0.367	0.807	2478
0.90	56	0.273	0.390	5128	59	0.347	0.601	3331	61	0.397	0.807	2478
1.00	56	0.303	0.438	4563	59	0.386	0.698	2867	61	0.441	0.935	2139
1.20	56	0.363	0.526	3800	59	0.463	0.842	2375	61	0.529	1.129	1772
1.44	56	0.436	0.617	3240	59	0.556	0.958	2087	61	0.635	1.281	1562
1.67	56	0.505	0.731	2735	59	0.643	1.159	1726	61	0.735	1.556	1286
1.73	56	0.523	0.733	2729	59	0.667	1.170	1710	61	0.762	1.508	1326
2.00	56	0.606	0.876	2284	59	0.772	1.406	1423	61	0.882	1.807	1107
2.40	56	0.727	1.012	1976	59	0.926	1.614	1239	61	1.060	2.047	977
2.50	56	0.757	1.068	1873	59	0.965	1.707	1172	61	1.100	2.160	926
2.88	56	0.872	1.271	1573	59	1.110	2.037	982	61	1.270	2.625	762
3.33	56	1.010	1.496	1337	59	1.290	2.393	836	61	1.470	3.062	653
3.60	56	1.090	1.646	1215	59	1.390	2.581	775	61	1.590	3.450	580

Dynamic Modes for FD17, 10 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 56kV	mGy / min ¹	2Gy in min ²	kV	mA@ 59kV	mGy / min ¹	2Gy in min ²	kV	mA@ 61kV	mGy / min ¹	2Gy in min ²
4.00	56	1.210	1.704	1174	59	1.540	2.712	738	61	1.760	3.455	579
4.80	56	1.450	2.150	930	59	1.850	3.447	580	61	2.120	4.402	454
5.00	56	1.510	2.293	872	59	1.930	3.605	555	61	2.200	4.815	415
6.67	56	2.020	2.888	693	59	2.570	4.635	432	61	2.940	5.921	338
8.00	56	2.420	3.536	566	59	3.090	5.598	357	61	3.530	7.481	267
9.60	56	2.910	4.235	472	59	3.700	6.728	297	61	4.230	8.994	222
13.33	56	4.040	5.910	338	59	5.150	9.342	214	61	5.880	12.553	159
0.6*	56	0.182	0.243	8215	59	0.232	0.368	5430	61	0.265	0.479	4173
1.02*	56	0.308	0.404	4948	59	0.393	0.618	3234	61	0.449	0.809	2473
1.8*	56	0.545	0.728	2747	59	0.695	1.102	1814	61	0.794	1.437	1392

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD17, 10 cm PMMA With Grid for Auto Mode

Single Exposures for FD17, 10 cm PMMA With Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	56	18.2	0.074	27027
High Power-100ms (25 KW)	56	63.1	0.153	13072
Normal-100ms	56	18.2	0.0457	43764
High Power-100ms (15 KW)	56	37.9	0.0921	21716

Single Exposures for FD17, 10 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	59	23.2	0.115	17391
High Power-100ms (25 KW)	59	80.4	0.235	8511
Normal-100ms	59	23.2	0.07	28571
High Power-100ms (15 KW)	59	48.2	0.132	15152

Single Exposures for FD17, 10 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	61	26.50	0.151	13245
High Power-100ms (25 KW)	61	91.80	0.310	6452

Single Exposures for FD17, 10 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-100ms	61	26.5	0.092	21739
High Power-100ms (15 KW)	61	55.1	0.183	10929

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD17, 20 cm PMMA With Grid - Auto Mode

Dynamic Modes for FD17, 20 cm PMMA With Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 69kV	mGy / min ¹	2Gy in min ²	kV	mA@ 75kV	mGy / min ¹	2Gy in min ²	kV	mA@ 80kV	mGy / min ¹	2Gy in min ²
0.50	69	0.430	1.32	1515	75	0.462	1.824	1096	80	0.468	2.171	921
0.72	69	0.620	1.97	1015	75	0.665	2.572	778	80	0.673	2.856	700
0.83	69	0.717	2.48	808	75	0.770	3.032	660	80	0.779	3.497	572
0.90	69	0.775	2.47	810	75	0.832	3.215	622	80	0.842	3.700	541
1.00	69	0.861	2.47	810	75	0.924	3.649	548	80	0.935	4.183	478
1.20	69	1.030	3.38	591	75	1.110	4.403	454	80	1.120	5.029	398
1.44	69	1.240	3.89	514	75	1.330	5.140	389	80	1.350	5.881	340
1.67	69	1.440	4.10	488	75	1.540	6.034	331	80	1.560	6.903	290
1.73	69	1.490	4.67	428	75	1.600	6.081	329	80	1.620	6.975	287
2.00	69	1.720	4.86	411	75	1.850	6.661	300	80	1.870	8.290	241
2.40	69	2.070	5.63	355	75	2.220	7.747	258	80	2.240	9.244	216
2.50	69	2.150	5.78	346	75	2.310	8.689	230	80	2.340	10.008	200
2.88	69	2.480	7.14	280	75	2.660	9.813	204	80	2.690	11.813	169
3.33	69	2.870	8.24	243	75	3.080	11.337	176	80	3.120	13.677	146
3.60	69	3.100	9.34	214	75	3.330	12.823	156	80	3.370	15.653	128
4.00	69	3.440	9.20	217	75	3.700	12.693	158	80	3.740	15.803	127
4.80	69	4.130	11.95	167	75	4.440	16.423	122	80	4.490	20.757	96
5.00	69	4.300	13.15	152	75	4.620	19.180	104	80	4.680	22.100	90
6.67	69	5.740	16.02	125	75	6.160	22.050	91	80	6.230	27.327	73
8.00	69	6.890	22.34	90	75	7.390	29.443	68	80	7.480	34.030	59
9.60	69	8.260	27.01	74	75	8.870	35.527	56	80	8.980	41.067	49
13.33	69	11.500	36.56	55	75	12.300	47.463	42	80	12.500	56.220	36
0.6*	69	0.517	1.51	1325	75	0.555	2.082	961	80	0.561	2.490	803
1.02*	69	1.240	3.62	552	75	1.330	4.983	401	80	1.350	5.974	335
1.8*	69	1.550	4.47	447	75	1.660	6.177	324	80	1.680	7.390	271

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD17, 20 cm PMMA With Grid for Auto Mode

Single Exposures for FD17, 20 cm PMMA With Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	69	51.7	0.369	5420
High Power-100ms (25 KW)	69	179	0.801	2497
Normal-100ms	69	51.7	0.215	9302
High Power-100ms (15 KW)	69	108	0.453	4415

Single Exposures for FD17, 20 cm PMMA With Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	75	55.5	0.509	3929
High Power-100ms (25 KW)	75	193	1.094	1828
Normal-100ms	75	55.5	0.289	6920
High Power-100ms (15 KW)	75	116	0.613	3263

Single Exposures for FD17, 20 cm PMMA With Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	80	56.10	0.602	3322
High Power-100ms (25 KW)	80	195.00	1.304	1534
Normal-100ms	80	56.1	0.345	5797
High Power-100ms (15 KW)	80	117	0.725	2759

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Manual Mode With Grid - @120 kV

Avg mA @120 kV	With Grid - Manual Mode @120 kV											
	No Zoom				Zoom 1				Zoom 2			
	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²
0.50	120	0.500	5.81	344	120	0.500	5.74	348	120	0.500	6.13	326
0.72	120	0.720	7.78	257	120	0.720	8.01	250	120	0.720	7.99	250
0.83	120	0.833	9.87	203	120	0.833	10.21	196	120	0.833	10.16	197
0.90	120	0.900	9.73	206	120	0.900	10.30	194	120	0.900	9.97	201
1.00	120	1.000	11.10	180	120	1.000	11.48	174	120	1.000	11.42	175
1.20	120	1.200	13.25	151	120	1.200	13.81	145	120	1.200	13.72	146
1.44	120	1.440	15.53	129	120	1.440	16.00	125	120	1.440	15.92	126
1.67	120	1.667	18.31	109	120	1.667	19.22	104	120	1.667	18.89	106

Avg mA @120 kV	With Grid - Manual Mode @120 kV											
	No Zoom				Zoom 1				Zoom 2			
	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²
1.73	120	1.728	18.22	110	120	1.728	19.14	105	120	1.728	18.75	107
2.00	120	2.000	22.14	90	120	2.000	22.79	88	120	2.000	22.70	88
2.40	120	2.400	25.49	78	120	2.400	26.25	76	120	2.400	26.06	77
2.50	120	2.500	26.56	75	120	2.500	27.47	73	120	2.500	27.33	73
2.88	120	2.880	32.02	62	120	2.880	32.72	61	120	2.880	32.53	61
3.33	120	3.333	37.82	53	120	3.333	39.68	50	120	3.333	39.09	51
3.60	120	3.600	41.57	48	120	3.600	42.67	47	120	3.600	42.48	47
4.00	120	4.000	42.36	47	120	4.000	43.80	46	120	4.000	43.53	46
4.80	120	4.800	54.82	36	120	4.800	57.18	35	120	4.800	56.45	35
5.00	120	5.000	58.63	34	120	5.000	60.33	33	120	5.000	59.67	34
6.67	120	6.667	73.49	27	120	6.667	75.49	26	120	6.667	75.19	27
8.00	120	8.000	87.39	23	120	8.000	89.73	22	120	8.000	90.75	22
9.60	120	9.600	105.17	19	120	9.600	108.73	18	120	9.600	109.57	18
13.33	120	13.334	146.67	14	120	13.334	152.47	13	120	13.334	153.17	13
0.6*	120	0.600	6.76	296	120	0.600	6.75	296	120	0.600	6.73	297
1.02*	120	1.020	11.52	174	120	1.020	11.58	173	120	1.020	11.47	174
1.8*	120	1.800	20.01	100	120	1.800	19.97	100	120	1.800	19.90	101

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Note 5: At max dose 120KV there will be no difference in the dose value for FD12 and FD17 for different phantom settings, Hence data is not repeated.

Single Exposures With Grid - Manual Mode @120 kV

Single Exposures With Grid - Manual Mode @120 kV				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	120	60	1.688	1185
High Power-100ms (25KW)	120	208	3.604	555
Normal-100ms	120	60	1.076	1859
High Power-100ms (15KW)	120	125	2.23	897

Single Exposures With Grid - Manual Mode @120 kV				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	120	60	1.688	1185

Single Exposures With Grid - Manual Mode @120 kV				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
High Power-100ms (25KW)	120	208	3.582	558
Normal-100ms	120	60	1.078	1855
High Power-100ms (15KW)	120	125	2.223	900

Single Exposures With Grid - Manual Mode @120 kV				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	120	60	1.690	1183
High Power-100ms (25KW)	120	208	3.565	561
Normal-100ms	120	60	1.078	1855
High Power-100ms (15KW)	120	125	2.23	897

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: At max dose 120KV there will be no difference in the dose value for FD12 and FD17 for different phantom settings, Hence data is not repeated.

NOTE *The normal dose - full speed acquisition modes are designated as the IEC normal mode (IEC 60601-2-43). The low dose - quarter speed acquisition modes are designated as the IEC low mode.*

NOTE *The patient entrance reference point (interventional reference point) is intended to be representative of the point of intersection of the X-ray beam axis and the patient. For this type of system, normal use for interventional procedures is with the C-arm vertical or horizontal and the patient as close as possible to the detector. This reference point is defined at 30 cm from the detector entrance surface or 67.3cm (FD12) from the focal spot (IEC 60601-2-43 and IEC60601-2-54). The reference air kerma (rate) values are determined at the reference point.*

NOTE *For verification of the radiation data, place the 20 cm PMMA phantom on the detector. In auto mode, let the system stabilize the kV. Switch over to hand mode and place the dose probe in the middle of the beam at 30 cm from the detector (here the X-ray field area is half of the field area at the detector).*

NOTE *The error in estimating the total absorbed dose to the skin introduced from the defined point should average out if the procedure is composed of multiple views. Even under the worstcase conditions, errors should be less than a factor of two (only at maximum kV and 20 cm PMMA). Of course, assessing the position of the patient and calculating the appropriate correction factor can eliminate most of this error (IEC 60601-2-43 and IEC60601-2-54).*

9.3.8 Patient Dose Information - Dose Rate Without Grid

These are typical dose rates for the system without the grid. The actual dose rate displayed on the system is calibrated and is slightly different from the values in the table.

To determine the expected dose (rate), first define the "Avg mA @ 120kV" from the selected procedure - acquisition mode - pulse speed (frequency) combination in the examination setting tables.

Dynamic Modes for FD12, 5 cm PMMA Without Grid – Auto Mode

Dynamic Modes for FD12, 5 cm PMMA Without Grid – Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 49kV	mGy / min ¹	2Gy in min ²	kV	mA@ 51kV	mGy / min ¹	2Gy in min ²	kV	mA@ 52kV	mGy / min ¹	2Gy in min ²
0.50	49	0.063	0.06	31746	51	0.083	0.09	21352	52	0.097	0.11	17442
0.72	49	0.091	0.08	25974	51	0.120	0.12	16529	52	0.139	0.15	13761
0.83	49	0.106	0.10	19672	51	0.139	0.16	12848	52	0.161	0.19	10435
0.90	49	0.114	0.10	21053	51	0.150	0.15	13453	52	0.174	0.18	11070
1.00	49	0.127	0.12	17143	51	0.167	0.18	11236	52	0.193	0.22	9231
1.20	49	0.152	0.14	14252	51	0.200	0.21	9419	52	0.232	0.26	7682
1.44	49	0.182	0.15	13245	51	0.240	0.23	8596	52	0.278	0.29	6936
1.67	49	0.211	0.20	10152	51	0.278	0.30	6667	52	0.322	0.37	5469
1.73	49	0.219	0.18	11236	51	0.288	0.28	7255	52	0.334	0.35	5797
2.00	49	0.253	0.24	8276	51	0.333	0.36	5623	52	0.387	0.44	4594
2.40	49	0.304	0.25	8119	51	0.400	0.38	5217	52	0.464	0.48	4181
2.50	49	0.317	0.26	7595	51	0.417	0.41	4930	52	0.501	0.50	4021
2.88	49	0.365	0.35	5769	51	0.480	0.52	3866	52	0.557	0.63	3155
3.33	49	0.422	0.42	4804	51	0.556	0.62	3235	52	0.644	0.76	2641
3.60	49	0.456	0.45	4481	51	0.600	0.68	2924	52	0.696	0.85	2359
4.00	49	0.507	0.42	4777	51	0.667	0.65	3067	52	0.773	0.81	2480
4.80	49	0.608	0.59	3398	51	0.800	0.90	2229	52	0.928	1.09	1832
5.00	49	0.633	0.63	3185	51	0.833	0.96	2084	52	0.967	1.18	1699
6.67	49	0.844	0.78	2577	51	1.110	1.19	1688	52	1.290	1.45	1379
8.00	49	1.010	0.98	2051	51	1.330	1.47	1361	52	1.550	1.80	1109
9.60	49	1.220	1.18	1698	51	1.600	1.75	1141	52	1.860	2.16	926
13.33	49	1.690	1.63	1230	51	2.220	2.44	821	52	2.580	2.99	670
0.6*	49	0.076	0.07	30000	51	0.100	0.10	20478	52	0.116	0.12	16667
1.02*	49	0.129	0.10	19737	51	0.170	0.16	12552	52	0.197	0.20	10033
1.8*	49	0.228	0.19	10753	51	0.300	0.29	6912	52	0.348	0.36	5550

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 12, 5 cm PMMA Without Grid for Auto Mode

Single Exposures for FD 12, 5 cm PMMA Without Grid for Auto Mode				
Mode	No Zoom			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	49	7.6	0.020	100000
High Power-100ms (25KW)	49	26.4	0.042	47281
Normal-100ms	49	7.60	0.013	152672

Single Exposures for FD 12, 5 cm PMMA Without Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
High Power-100ms (15KW)	49	1.69	0.027	74074

Single Exposures for FD 12, 5 cm PMMA Without Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	51	10	0.0304	65789
High Power-100ms (25KW)	51	34.7	0.063	31746
Normal-100ms	51	10	0.0204	98039
High Power-100ms (15KW)	51	20.8	0.0404	49505

Single Exposures for FD 12, 5 cm PMMA Without Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	52	11.6	0.037	54496
High Power-100ms (25KW)	52	40.3	0.077	25974
Normal-100ms	52	11.6	0.0247	80972
High Power-100ms (15KW)	52	24.2	0.050	40000

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD12, 10 cm PMMA Without Grid - Auto Mode

Dynamic Modes for FD12, 10 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 53kV	mGy / min ¹	2Gy in min ²	kV	mA@ 56kV	mGy / min ¹	2Gy in min ²	kV	mA@ 57kV	mGy / min ¹	2Gy in min ²
0.50	53	0.110	0.14	14563	56	0.151	0.22	9302	57	0.165	0.25	7968
0.72	53	0.158	0.19	10733	56	0.218	0.29	6873	57	0.238	0.34	5970
0.83	53	0.183	0.25	7979	56	0.252	0.39	5076	57	0.275	0.45	4448
0.90	53	0.198	0.23	8646	56	0.273	0.36	5484	57	0.297	0.43	4702
1.00	53	0.220	0.29	6985	56	0.303	0.45	4478	57	0.330	0.52	3881
1.20	53	0.264	0.32	6173	56	0.363	0.50	4005	57	0.396	0.58	3444
1.44	53	0.317	0.38	5326	56	0.436	0.60	3352	57	0.476	0.69	2907
1.67	53	0.367	0.44	4563	56	0.505	0.69	2906	57	0.551	0.80	2491
1.73	53	0.380	0.42	4781	56	0.523	0.66	3035	57	0.571	0.77	2612
2.00	53	0.440	0.56	3565	56	0.606	0.83	2396	57	0.661	0.97	2068
2.40	53	0.528	0.59	3411	56	0.727	0.92	2172	57	0.793	1.06	1886
2.50	53	0.550	0.61	3268	56	0.757	0.96	2091	57	0.826	1.11	1802
2.88	53	0.634	0.77	2594	56	0.872	1.21	1657	57	0.952	1.40	1434
3.33	53	0.733	0.93	2151	56	1.010	1.44	1391	57	1.100	1.71	1173
3.60	53	0.792	1.05	1903	56	1.090	1.65	1214	57	1.190	1.81	1103

Dynamic Modes for FD12, 10 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 53kV	mGy / min ¹	2Gy in min ²	kV	mA@ 56kV	mGy / min ¹	2Gy in min ²	kV	mA@ 57kV	mGy / min ¹	2Gy in min ²
4.00	53	0.880	1.08	1846	56	1.210	1.53	1310	57	1.320	1.76	1135
4.80	53	1.060	1.34	1492	56	1.450	2.05	974	57	1.590	2.41	829
5.00	53	1.100	1.46	1370	56	1.510	2.29	872	57	1.650	2.61	766
6.67	53	1.470	1.77	1130	56	2.020	2.75	726	57	2.200	3.19	627
8.00	53	1.760	2.16	928	56	2.420	3.38	591	57	2.640	3.94	508
9.60	53	2.110	2.61	767	56	2.910	4.07	491	57	3.170	4.70	425
13.33	53	2.930	3.63	551	56	3.670	4.94	405	57	4.410	6.64	301
0.6*	53	0.132	0.15	13132	56	0.182	0.23	8646	57	0.198	0.27	7360
1.02*	53	0.224	0.25	7939	56	0.308	0.39	5093	57	0.336	0.46	4335
1.8*	53	0.396	0.45	4417	56	0.545	0.70	2845	57	0.595	0.82	2439

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 12, 10 cm PMMA Without Grid for Auto Mode

Single Exposures for FD 12, 10 cm PMMA Without Grid for Auto Mode				
Mode	No Zoom			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	53	13.2	0.046	43478
High Power-100ms (25KW)	53	45.8	0.095	21053
Normal-100ms	53	13.2	0.031	65359
High Power-100ms (15KW)	53	27.5	0.06	33113

Single Exposures for FD 12, 10 cm PMMA Without Grid for Auto Mode				
Mode	Zoom 1			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	56	18.2	0.0715	27972
High Power-100ms (25KW)	56	63.1	0.151	13245
Normal-100ms	56	18.2	0.047	42301
High Power-100ms (15KW)	56	37.9	0.0937	21345

Single Exposures for FD 12, 10 cm PMMA Without Grid for Auto Mode				
Mode	Zoom 2			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	57	19.8	0.085	23529
High Power-100ms (25KW)	57	68.8	0.177	11299

Single Exposures for FD 12, 10 cm PMMA Without Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-100ms	57	19.8	0.056	35714
High Power-100ms (15KW)	57	41.3	0.108	18519

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD12, 20 cm PMMA Without Grid - Auto Mode

Dynamic Modes for FD12, 20 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 63kV	mGy / min ¹	2Gy in min ²	kV	mA@ 67kV	mGy / min ¹	2Gy in min ²	kV	mA@ 70kV	mGy / min ¹	2Gy in min ²
0.50	63	0.273	0.613	3261	67	0.378	1.013	1974	70	0.457	1.45	1375
0.72	63	0.393	0.780	2564	67	0.544	1.300	1539	70	0.658	1.86	1073
0.83	63	0.455	1.041	1921	67	0.630	1.723	1161	70	0.761	2.46	814
0.90	63	0.491	0.974	2053	67	0.680	1.619	1236	70	0.822	2.33	858
1.00	63	0.546	1.160	1724	67	0.756	1.890	1058	70	0.913	2.69	743
1.20	63	0.655	1.420	1409	67	0.907	2.325	860	70	1.100	3.32	602
1.44	63	0.786	1.558	1284	67	1.090	2.588	773	70	1.320	3.62	553
1.67	63	0.910	1.927	1038	67	1.260	3.157	634	70	1.520	4.49	446
1.73	63	0.943	1.924	1040	67	1.310	3.187	628	70	1.580	4.59	436
2.00	63	1.090	2.412	829	67	1.510	3.931	509	70	1.830	5.60	357
2.40	63	1.310	2.692	743	67	1.810	4.437	451	70	2.190	6.57	304
2.50	63	1.370	2.839	704	67	1.890	4.639	431	70	2.280	6.66	300
2.88	63	2.620	5.958	336	67	2.180	5.630	355	70	2.630	8.02	249
3.33	63	1.820	4.097	488	67	2.520	6.700	298	70	3.040	9.52	210
3.60	63	1.970	4.311	464	67	2.720	7.077	283	70	3.290	10.03	199
4.00	63	2.180	4.482	446	67	3.020	7.433	269	70	3.650	10.65	188
4.80	63	2.620	5.956	336	67	3.630	9.807	204	70	4.380	13.99	143
5.00	63	2.730	5.986	334	67	3.780	9.856	203	70	4.570	14.11	142
6.67	63	3.640	7.991	250	67	5.040	13.103	153	70	6.090	18.65	107
8.00	63	4.370	9.372	213	67	6.050	15.387	130	70	7.310	21.68	92
9.60	63	5.240	11.320	177	67	7.260	18.597	108	70	8.770	26.31	76
13.33	63	7.280	15.820	126	67	10.100	26.067	77	70	12.200	37.09	54
0.6*	63	0.328	0.68	2935	67	0.454	1.13	1770	70	0.548	1.63	1229
1.02*	63	0.56	1.15	1737	67	0.770	1.93	1038	70	0.930	2.78	719
1.8*	63	0.983	2.04	980	67	1.360	3.39	590	70	1.640	4.88	410

Note 1: Dose measured at PERP located at 30 cm from the surface of t0.945he FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 12, 20 cm PMMA Without Grid for Auto Mode

Single Exposures for FD 12, 20 cm PMMA Without Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	63	32.8	0.197	10152
High Power-100ms (25KW)	63	114	0.426	4695
Normal-100ms	63	32.8	0.121	16529
High Power-100ms (15KW)	63	68.2	0.241	8299

Single Exposures for FD 12, 20 cm PMMA Without Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	67	45.4	0.317	6309
High Power-100ms (25KW)	67	157	0.695	2878
Normal-100ms	67	45.4	0.194	10309
High Power-100ms (15KW)	67	94.5	0.389	5141

Single Exposures for FD 12, 20 cm PMMA Without Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	70	54.8	0.442	4525
High Power-100ms (25KW)	70	190	0.982	2037
Normal-100ms	70	54.8	0.271	7380
High Power-100ms (15KW)	70	114	0.546	3663

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD17, 5 cm PMMA Without Grid - Auto Mode

Dynamic Modes for FD17, 5 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 49kV	mGy / min ¹	2Gy in min ²	kV	mA@ 50kV	mGy / min ¹	2Gy in min ²	kV	mA@ 52kV	mGy / min ¹	2Gy in min ²
0.50	49	0.063	0.07	30612	50	0.073	0.08	24691	52	0.097	0.12	16043
0.72	49	0.091	0.083	24000	50	0.106	0.104	19169	52	0.139	0.160	12474
0.83	49	0.106	0.106	18809	50	0.122	0.132	15152	52	0.161	0.200	10000
0.90	49	0.114	0.101	19737	50	0.132	0.127	15789	52	0.174	0.196	10187
1.00	49	0.127	0.120	16620	50	0.147	0.151	13245	52	0.193	0.230	8708
1.20	49	0.152	0.146	13667	50	0.176	0.182	11009	52	0.232	0.279	7168
1.44	49	0.182	0.158	12658	50	0.211	0.202	9885	52	0.278	0.318	6296
1.67	49	0.211	0.204	9804	50	0.244	0.252	7947	52	0.322	0.381	5245
1.73	49	0.219	0.202	9885	50	0.253	0.253	7916	52	0.334	0.390	5128

Dynamic Modes for FD17, 5 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 49kV	mGy / min ¹	2Gy in min ²	kV	mA@ 50kV	mGy / min ¹	2Gy in min ²	kV	mA@ 52kV	mGy / min ¹	2Gy in min ²
2.00	49	0.253	0.245	8152	50	0.293	0.302	6623	52	0.387	0.462	4332
2.40	49	0.304	0.278	7194	50	0.352	0.348	5742	52	0.464	0.540	3706
2.50	49	0.317	0.289	6912	50	0.367	0.361	5545	52	0.483	0.559	3580
2.88	49	0.365	0.355	5634	50	0.422	0.441	4535	52	0.557	0.670	2987
3.33	49	0.422	0.420	4766	50	0.489	0.521	3839	52	0.644	0.783	2553
3.60	49	0.456	0.447	4478	50	0.528	0.553	3614	52	0.696	0.838	2388
4.00	49	0.507	0.462	4329	50	0.587	0.579	3452	52	0.773	0.890	2246
4.80	49	0.608	0.605	3308	50	0.704	0.747	2679	52	0.928	1.158	1727
5.00	49	0.633	0.622	3215	50	0.733	0.773	2588	52	0.967	1.170	1710
6.67	49	0.844	0.825	2424	50	0.978	1.016	1968	52	1.290	1.536	1302
8.00	49	1.010	0.995	2011	50	1.170	1.229	1627	52	1.550	1.841	1087
9.60	49	1.220	1.194	1675	50	1.140	1.471	1359	52	1.860	2.206	907
13.33	49	1.690	1.650	1212	50	1.960	2.032	984	52	2.580	3.062	653
0.6*	49	0.076	0.069	28986	50	0.088	0.086	23166	52	0.116	0.134	14925
1.02*	49	0.129	0.113	17751	50	0.149	0.143	14019	52	0.197	0.223	8982
1.8*	49	0.228	0.204	9820	50	0.264	0.258	7742	52	0.348	0.401	4992

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 17, 5 cm PMMA Without Grid for Auto Mode

Single Exposures for FD 17, 5 cm PMMA Without Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	49	7.6	0.020	100000
High Power-100ms (25KW)	49	26.4	0.042	47281
Normal-100ms	49	7.6	0.013	153846
High Power-100ms (15KW)	49	15.8	0.027	75047

Single Exposures for FD 17, 5 cm PMMA Without Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	50	8.8	0.0255	78431
High Power-100ms (25KW)	50	30.6	0.054	37037
Normal-100ms	50	8.8	0.015	133333
High Power-100ms (15KW)	50	18.3	0.033	60606

Single Exposures for FD 17, 5 cm PMMA Without Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	52	11.6	0.039	51282
High Power-100ms (25KW)	52	40.3	0.082	24390
Normal-100ms	52	11.6	0.024	81967
High Power-100ms (15KW)	52	24.2	0.05	40209

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD17, 10 cm PMMA Without Grid - Auto Mode

Dynamic Modes for FD17, 10 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 53kV	mGy / min ¹	2Gy in min ²	kV	mA@ 55kV	mGy / min ¹	2Gy in min ²	kV	mA@ 57kV	mGy / min ¹	2Gy in min ²
0.50	53	0.110	0.16	12658	55	0.138	0.21	9569	57	0.165	0.28	7151
0.72	53	0.158	0.185	10803	55	0.198	0.252	7938	57	0.238	0.333	5999
0.83	53	0.183	0.262	7634	55	0.230	0.352	5676	57	0.275	0.477	4190
0.90	53	0.198	0.231	8663	55	0.248	0.309	6478	57	0.297	0.416	4805
1.00	53	0.220	0.270	7409	55	0.275	0.365	5474	57	0.330	0.493	4053
1.20	53	0.264	0.326	6129	55	0.330	0.443	4514	57	0.396	0.600	3336
1.44	53	0.317	0.371	5397	55	0.397	0.500	4004	57	0.476	0.666	3002
1.67	53	0.367	0.452	4428	55	0.459	0.609	3286	57	0.551	0.822	2432
1.73	53	0.380	0.458	4370	55	0.476	0.614	3259	57	0.571	0.814	2457
2.00	53	0.440	0.561	3565	55	0.551	0.758	2637	57	0.661	1.013	1974
2.40	53	0.528	0.631	3170	55	0.661	0.849	2356	57	0.793	1.129	1771
2.50	53	0.550	0.677	2956	55	0.689	0.911	2195	57	0.826	1.211	1651
2.88	53	0.634	0.817	2448	55	0.793	1.101	1816	57	0.952	1.473	1358
3.33	53	0.733	0.930	2151	55	0.918	1.267	1579	57	1.100	1.705	1173
3.60	53	0.792	0.982	2036	55	0.992	1.343	1489	57	1.190	1.806	1107
4.00	53	0.880	1.084	1846	55	1.100	1.451	1378	57	1.320	1.935	1034
4.80	53	1.060	1.340	1492	55	1.320	1.829	1094	57	1.590	2.462	812
5.00	53	1.100	1.376	1453	55	1.380	1.874	1067	57	1.650	2.520	794
6.67	53	1.470	1.833	1091	55	1.840	2.478	807	57	2.200	3.342	598
8.00	53	1.760	2.164	924	55	2.200	2.934	682	57	2.640	3.941	508
9.60	53	2.110	2.608	767	55	2.640	3.543	564	57	3.170	4.754	421
13.33	53	2.930	3.633	551	55	3.670	4.944	405	57	4.410	6.635	301
0.6*	53	0.132	0.152	13132	55	0.165	0.203	9849	57	0.198	0.272	7360
1.02*	53	0.224	0.252	7939	55	0.280	0.342	5853	57	0.336	0.461	4335
1.8*	53	0.396	0.453	4417	55	0.496	0.615	3253	57	0.595	0.820	2439

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 17, 10 cm PMMA Without Grid for Auto Mode

Single Exposures for FD 17, 10 cm PMMA Without Grid for Auto Mode				
No Zoom				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	53	13.2	0.046	43478
High Power-100ms (25KW)	53	45.8	0.096	20833
Normal-100ms	53	13.2	0.03	66667
High Power-100ms (15KW)	53	27.5	0.06	33389

Single Exposures for FD 17, 10 cm PMMA Without Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	55	16.5	0.062	32258
High Power-100ms (25KW)	55	57.4	0.130	15385
Normal-100ms	55	16.5	0.0401	49875
High Power-100ms (15KW)	55	34.4	0.0801	24969

Single Exposures for FD 17, 10 cm PMMA Without Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	57	19.8	0.085	23529
High Power-100ms (25KW)	57	68.8	0.177	11299
Normal-100ms	57	19.8	0.054	37313
High Power-100ms (15KW)	57	41.3	0.107	18692

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Dynamic Modes for FD17, 20 cm PMMA Without Grid - Auto Mode

Dynamic Modes for FD17, 20 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 62kV	mGy / min ¹	2Gy in min ²	kV	mA@ 66kV	mGy / min ¹	2Gy in min ²	kV	mA@ 68kV	mGy / min ¹	2Gy in min ²
0.50	62	0.247	0.529	3778	66	0.352	0.900	2222	68	0.404	1.14	1753
0.72	62	0.355	0.749	2669	66	0.506	1.236	1618	68	0.582	1.54	1297
0.83	62	0.411	0.902	2217	66	0.586	1.493	1339	68	0.674	1.95	1024
0.90	62	0.444	0.933	2144	66	0.633	1.548	1292	68	0.728	1.93	1035
1.00	62	0.493	1.107	1807	66	0.703	1.794	1115	68	0.808	2.20	911
1.20	62	0.592	1.329	1505	66	0.844	2.165	924	68	0.970	2.65	756

Dynamic Modes for FD17, 20 cm PMMA Without Grid - Auto Mode												
Avg mA @120 kV	No Zoom				Zoom 1				Zoom 2			
	kV	mA@ 62kV	mGy / min ¹	2Gy in min ²	kV	mA@ 66kV	mGy / min ¹	2Gy in min ²	kV	mA@ 68kV	mGy / min ¹	2Gy in min ²
1.44	62	0.710	1.487	1345	66	1.010	2.475	808	68	1.160	3.08	649
1.67	62	0.822	1.830	1093	66	1.170	2.978	672	68	1.350	3.68	544
1.73	62	0.852	1.786	1120	66	1.220	2.953	677	68	1.400	3.63	552
2.00	62	0.987	2.197	910	66	1.410	3.555	563	68	1.620	4.37	458
2.40	62	1.180	2.465	811	66	1.690	4.052	494	68	1.940	5.00	400
2.50	62	1.230	2.578	776	66	1.760	4.235	472	68	2.020	5.24	382
2.88	62	1.420	3.150	635	66	2.030	5.094	393	68	2.330	6.33	316
3.33	62	1.640	3.740	535	66	2.340	6.051	331	68	2.690	7.62	263
3.60	62	1.780	4.060	493	66	2.530	6.606	303	68	2.910	8.10	247
4.00	62	1.970	4.083	490	66	2.810	6.712	298	68	3.230	8.34	240
4.80	62	2.370	5.337	375	66	3.380	8.719	229	68	3.880	11.01	182
5.00	62	2.470	5.645	354	66	3.520	9.252	216	68	4.040	11.42	175
6.67	62	3.290	7.168	279	66	4.690	11.707	171	68	5.390	14.59	137
8.00	62	3.950	8.720	229	66	5.630	14.293	140	68	6.470	17.51	114
9.60	62	4.740	10.480	191	66	6.750	17.203	116	68	7.760	21.11	95
13.33	62	6.580	14.570	137	66	9.380	23.903	84	68	10.800	29.28	68
0.6*	62	0.296	0.611	3273	66	0.422	1.013	1975	68	0.485	1.286	1555
1.02*	62	0.502	1.136	1761	66	0.716	1.731	1155	68	0.823	2.221	900
1.8*	62	0.888	1.802	1110	66	1.270	3.023	662	68	1.460	3.848	520

Note 1: Dose measured at PERP located at 30 cm from the surface of t0.945he FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Single Exposures for FD 17, 20 cm PMMA Without Grid for Auto Mode

Single Exposures for FD 17, 20 cm PMMA Without Grid for Auto Mode				
Mode	No Zoom			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	62	29.6	0.167	11976
High Power-100ms (25KW)	62	103	0.354	5650
Normal-100ms	62	29.6	0.106	18868
High Power-100ms (15KW)	62	61.7	0.212	9434

Single Exposures for FD 17, 20 cm PMMA Without Grid for Auto Mode				
Mode	Zoom 1			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	66	42.2	0.273	7326
High Power-100ms (25KW)	66	147	0.582	3436

Single Exposures for FD 17, 20 cm PMMA Without Grid for Auto Mode				
Zoom 1				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-100ms	66	42.2	0.172	11628
High Power-100ms (15KW)	66	87.9	0.341	5865

Single Exposures for FD 17, 20 cm PMMA Without Grid for Auto Mode				
Zoom 2				
Mode	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	68	48.5	0.344	5814
High Power-100ms (25KW)	68	168	0.729	2743
Normal-100ms	68	48.5	0.216	9259
High Power-100ms (15KW)	68	101	0.433	4619

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Manual Mode Without Grid - @120 kV

Avg mA @120 kV	Without Grid - Manual Mode @120 kV											
	No Zoom				Zoom 1				Zoom 2			
	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²
0.50	120	0.500	5.81	344	120	0.500	5.74	348	120	0.500	6.13	326
0.72	120	0.720	7.78	257	120	0.720	8.01	250	120	0.720	7.99	250
0.83	120	0.833	9.87	203	120	0.833	10.21	196	120	0.833	10.16	197
0.90	120	0.900	9.73	206	120	0.900	10.30	194	120	0.900	9.97	201
1.00	120	1.000	11.10	180	120	1.000	11.48	174	120	1.000	11.42	175
1.20	120	1.200	13.25	151	120	1.200	13.81	145	120	1.200	13.72	146
1.44	120	1.440	15.53	129	120	1.440	16.00	125	120	1.440	15.92	126
1.67	120	1.667	18.31	109	120	1.667	19.22	104	120	1.667	18.89	106
1.73	120	1.728	18.22	110	120	1.728	19.14	105	120	1.728	18.75	107
2.00	120	2.000	22.14	90	120	2.000	22.79	88	120	2.000	22.70	88
2.40	120	2.400	25.49	78	120	2.400	26.25	76	120	2.400	26.06	77
2.50	120	2.500	26.56	75	120	2.500	27.47	73	120	2.500	27.33	73
2.88	120	2.880	32.02	62	120	2.880	32.72	61	120	2.880	32.53	61
3.33	120	3.333	37.82	53	120	3.333	39.68	50	120	3.333	39.09	51
3.60	120	3.600	41.57	48	120	3.600	42.67	47	120	3.600	42.48	47
4.00	120	4.000	42.36	47	120	4.000	43.80	46	120	4.000	43.53	46
4.80	120	4.800	54.82	36	120	4.800	57.18	35	120	4.800	56.45	35
5.00	120	5.000	58.63	34	120	5.000	60.33	33	120	5.000	59.67	34
6.67	120	6.667	73.49	27	120	6.667	75.49	26	120	6.667	75.19	27
8.00	120	8.000	87.39	23	120	8.000	89.73	22	120	8.000	90.75	22
9.60	120	9.600	105.17	19	120	9.600	108.73	18	120	9.600	109.57	18
13.33	120	13.334	146.67	14	120	13.334	152.47	13	120	13.334	153.17	13

Avg mA @120 kV	Without Grid - Manual Mode @120 kV											
	No Zoom				Zoom 1				Zoom 2			
	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²	kV	mA	mGy / min ¹	2Gy in min ²
0.6*	120	0.600	6.76	296	120	0.600	6.75	296	120	0.600	6.73	297
1.02*	120	1.020	11.52	174	120	1.020	11.58	173	120	1.020	11.47	174
1.8*	120	1.800	20.01	100	120	1.800	19.97	100	120	1.800	19.90	101

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: *mA combination is only possible for pediatric procedures.

Note 4: In auto mode, Let the system stabilize the Kv. Place the dose probe in the middle of the beam at 30 cm from the detector.

Note 5: At max dose 120KV there will be no difference in the dose value for FD12 and FD17 for different phantom settings, Hence data is not repeated.

Single Exposures Without Grid - Manual Mode @120 kV

Single Exposures Without Grid - Manual Mode @120 kV				
Mode	No Zoom			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	120	60	1.688	1185
High Power-100ms (25KW)	120	208	3.604	555
Normal-100ms	120	60	1.076	1859
High Power-100ms (15KW)	120	125	2.23	897

Single Exposures Without Grid - Manual Mode @120 kV				
Mode	Zoom 1			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	120	60	1.688	1185
High Power-100ms (25KW)	120	208	3.582	558
Normal-100ms	120	60	1.078	1855
High Power-100ms (15KW)	120	125	2.223	900

Single Exposures Without Grid - Manual Mode @120 kV				
Mode	Zoom 2			
	kV	mA	mGy ¹	No of exposure to reach 2Gy ²
Normal-165ms	120	60	1.690	1183
High Power-100ms (25KW)	120	208	3.565	561
Normal-100ms	120	60	1.078	1855
High Power-100ms (15KW)	120	125	2.23	897

Note 1: Dose measured at PERP located at 30 cm from the surface of the FD.

Note 2: Duration when deterministic effects are possible.

Note 3: At max dose 120KV there will be no difference in the dose value for FD12 and FD17 for different phantom settings, Hence data is not repeated.

NOTE *The normal dose - full speed acquisition modes are designated as the IEC normal mode (IEC 60601-2-43). The low dose - quarter speed acquisition modes are designated as the IEC low mode.*

NOTE *The patient entrance reference point (interventional reference point) is intended to be representative of the point of intersection of the X-ray beam axis and the patient. For this type of system, normal use for interventional procedures is with the C-arm vertical or horizontal and the patient as close as possible to the detector. This reference point is defined at 30 cm from the detector entrance surface or 67.3cm (FD12) / 67.45 cm (FD17) from the focal spot (IEC 60601-2-43 and IEC60601-2-54). The reference air kerma (rate) values are determined at the reference point.*

NOTE *For verification of the radiation data, place the 20 cm PMMA phantom on the detector. In auto mode, let the system stabilize the kV. Switch over to hand mode and place the dose probe in the middle of the beam at 30 cm from the detector (here the X-ray field area is half of the field area at the detector).*

NOTE *The error in estimating the total absorbed dose to the skin introduced from the defined point should average out if the procedure is composed of multiple views. Even under the worst-case conditions, errors should be less than a factor of two (only at maximum kV and 20 cm PMMA). Of course, assessing the position of the patient and calculating the appropriate correction factor can eliminate most of this error (IEC 60601-2-43 and IEC60601-2-54).*

9.3.9 Designated Significant Zone of Occupancy

The system is specified for radiological examinations needing the operator and/or staff to be close to the patient during normal use.

The system itself has no provisions to protect against stray radiation caused by irradiation of the patient. Therefore, it is not possible to give a specific zone of occupancy for the use of the operator and staff.

Instead of this, the scatter diagrams below give an indication of the stray levels to be expected in the vicinity of the patient.

In these diagrams, the patient is represented by a phantom of 25 × 25 × 15 cm as required by IEC 60601-1-3 and IEC60601-2-54. The X-ray tube voltage is set at maximum. The X-ray tube current corresponds to the value for the leakage technique factor of the X-ray tube assembly.

The isokerma maps as given in this chapter show that the profile of the stray radiation is the same in a circle around the reference axis.

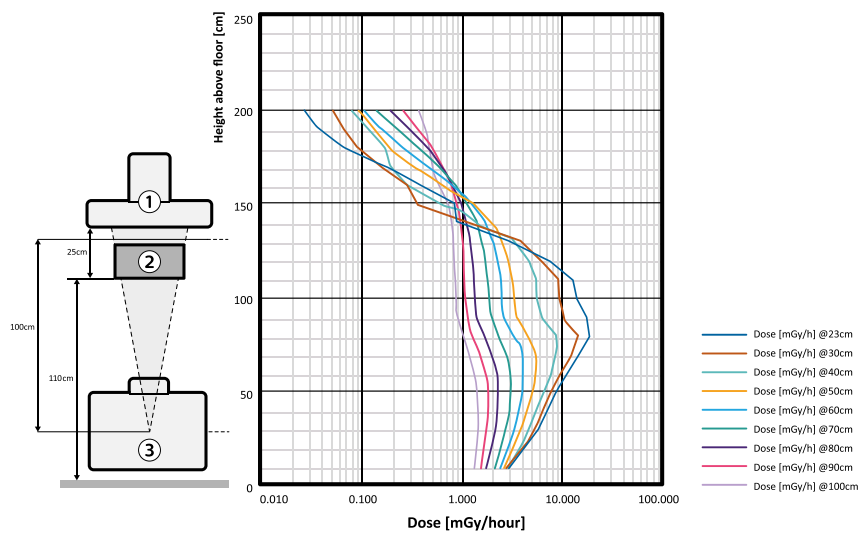


Figure 180 Designated significant zone of occupancy for FD12

Legend	
1	Detector
2	Phantom (25 cm x 25 cm x 15 cm PMMA)
3	X-ray source
X axis	Dose (mGy/hour)
Y axis	Height above floor (cm)
Technique factors:	
• Fluoroscopy, 15 pls/sec, 120 kv / 300 W, no additional filtration	
• Field entrance at the phantom is the maximum square	
• Dose is indicated for distances measured from the isocenter of the phantom	

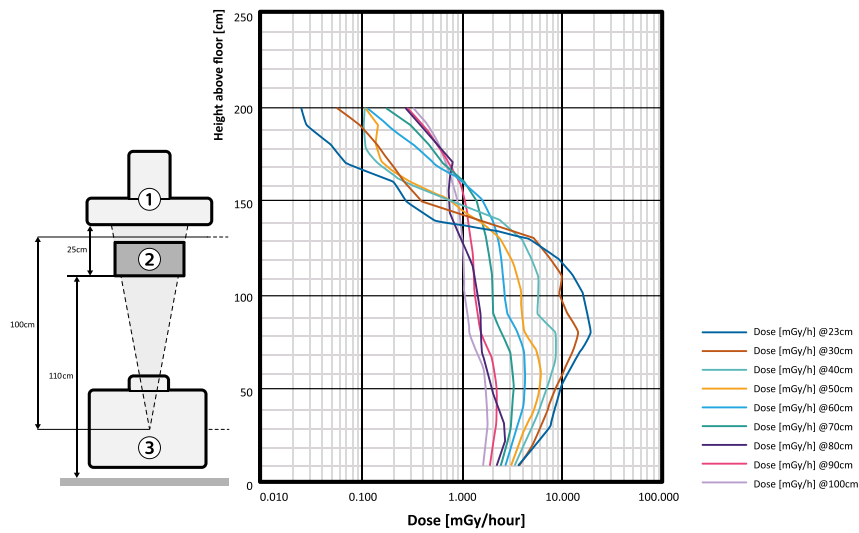


Figure 181 Designated significant zone of occupancy for FD17

Legend	
1	Detector
2	Phantom (25 cm x 25 cm x 15 cm PMMA)
3	X-ray source
X axis	Dose (mGy/hour)
Y axis	Height above floor (cm)

Legend

Technique factors:

- Fluoroscopy, 15 pls/sec, 120 kv / 300 W, no additional filtration
- Field entrance at the phantom is the maximum square
- Dose is indicated for distances measured from the isocenter of the phantom

The diagrams show high stray radiation levels around the patient.

Therefore, it is strongly recommend wearing aprons and other protective devices to reduce the dose levels for operator and staff.

If possible, place the X-ray source under the table and collimate as much as possible to reduce scattered radiation.

Furthermore, it is strongly recommended to follow the other radiation guidelines as given in [Radiation Safety \(page 22\)](#).

Risk to Operators

The following table indicates the typical received radiation dose by the operator for several procedures (collimator fully open, at a height of 1 m, and 30 cm from the reference axis).

Procedure	Typical Loading Factors			Received Dose [mGy]
	Voltage [kV]	Current [mA]	Time [min]	
Skeleton - Extremities	60	0.99	5	0.06
Skeleton - Spine	85	3.78	6	0.51
Skeleton - Hip and Pelvis	75	3.70	8	0.44
Abdominal	75	3.70	4	0.22
Endoscopy	75	3.70	8	0.44
Biopsy	75	3.70	5	0.28
Foreign Body Removal	75	3.70	5	0.28
Pain Management	85	3.78	3	0.26
2D Navigation	85	3.78	3	0.26
Vascular	75	3.70	25	1.38
Vascular - Aneurysm	80	3.74	50	3.45
Cardiac	90	4.78	30	3.48
Cardiac - Electrophysiology	90	1.38	60	2.04

9.3.10 Scattered Radiation (Isokerma Data)

Isokerma maps display measurements that describe the distribution of stray radiation around the system.

Measurement Conditions

A 25 cm cube PMMA phantom was placed 5 cm in front of the detector input surface. The entrance plane of the phantom was therefore at the patient entrance reference point 30 cm in front of the detector. The maps are determined by applying an X-ray beam of 100 cm² at the patient entrance reference point.

The results are normalized to 1 (μGy/s)/(Gycm²/s).

For example, the dose area rate product for fluoroscopy, 2.4 mA at 120 kV and 100 cm², is 0.040 Gycm²/s.

Then the actual dose rate for a normalized value of 1.0 is 40 nGy/s.

Measurements were taken in the horizontal position and in the lateral position. In horizontal position, the table height was set to 94 cm, while in lateral position the table height was set to 100 cm.

The degree of uncertainty regarding the results is less than $\pm 50\%$.

The following figures illustrate the measuring conditions for the system.

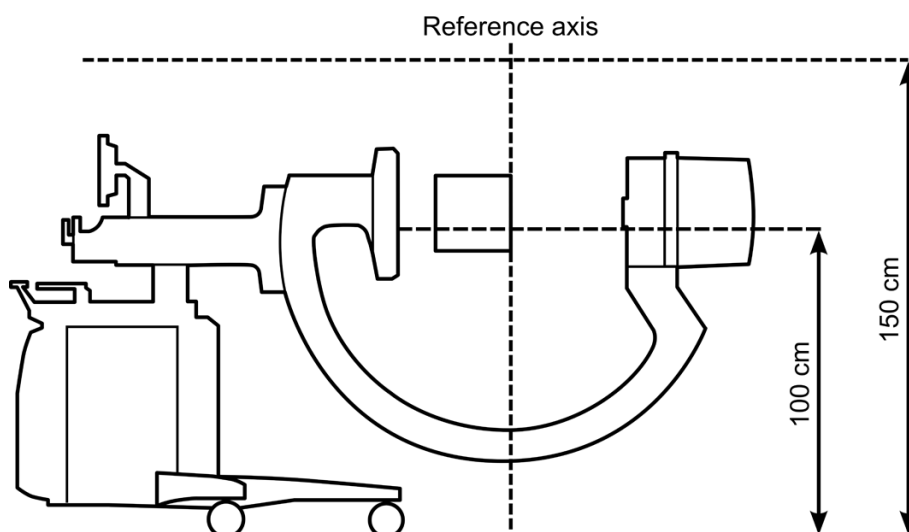


Figure 182 Isokerma map measurement configuration (Horizontal beam)

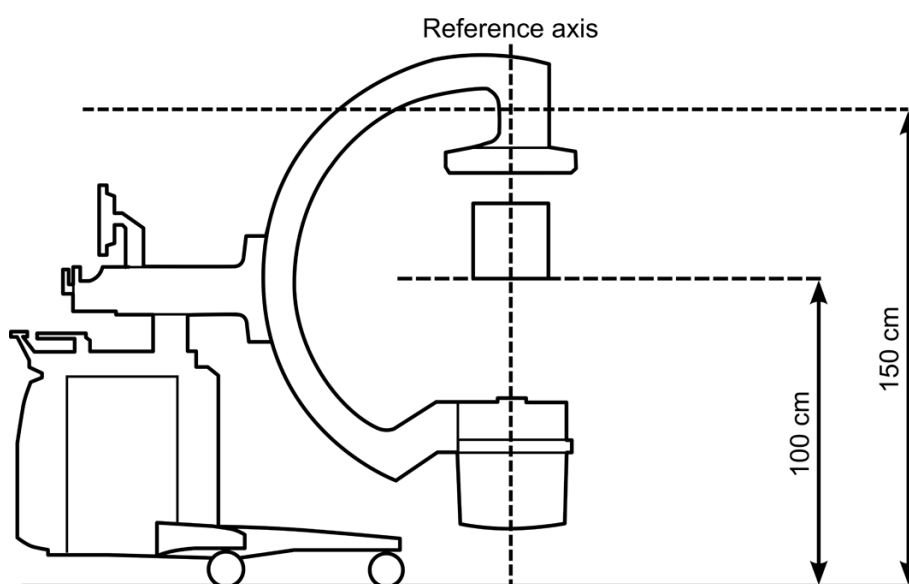


Figure 183 Isokerma map measurement configuration (Vertical beam)

Isokerma Maps for FD12

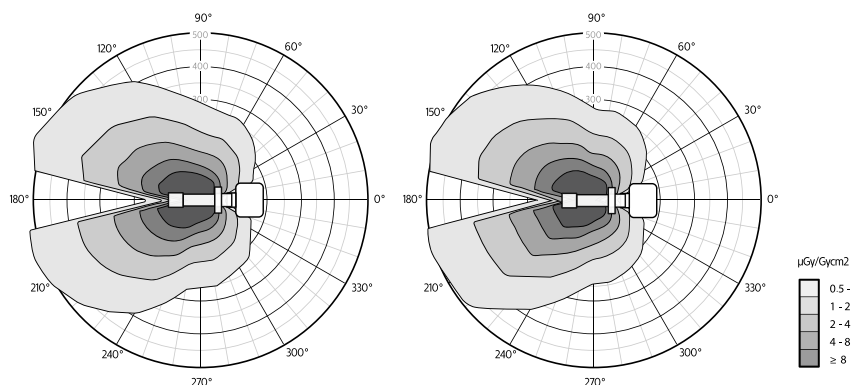


Figure 184 Isokerma map for FD12, Horizontal position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

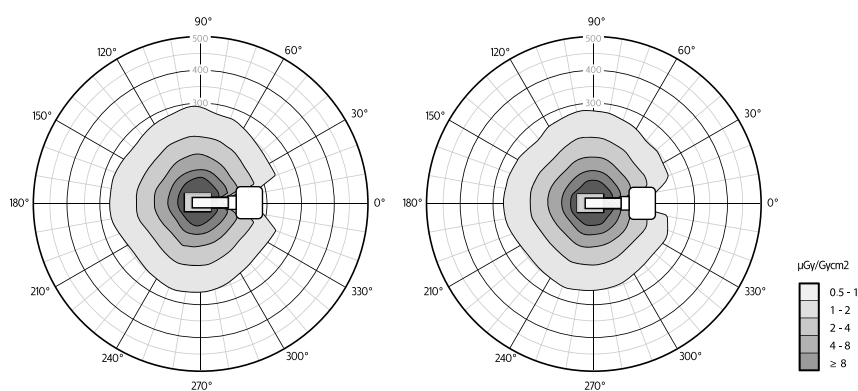


Figure 185 Isokerma map for FD12, Vertical position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

NOTE When normalized to $1 \mu\text{Gycm}^2$ (IEC60601-2-43:2000) instead of 1 Gycm^2 (IEC60601-2-43:2009), divide the figures of the table by 100.

Isokerma Maps for FD17

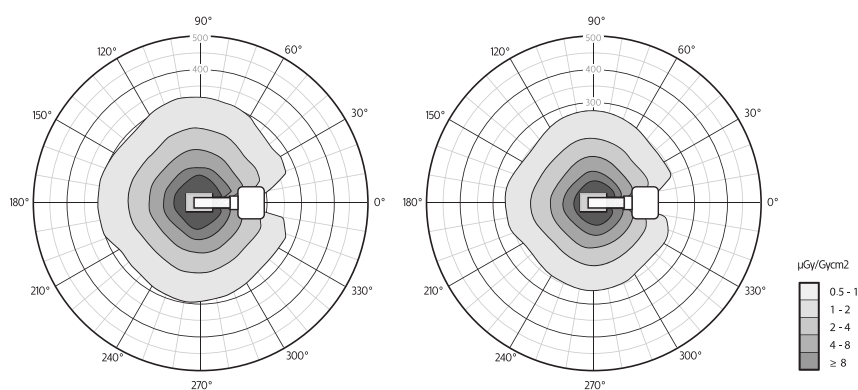


Figure 186 Isokerma map for FD17, Vertical position, at 1.0 m (left) and 1.5m (right)

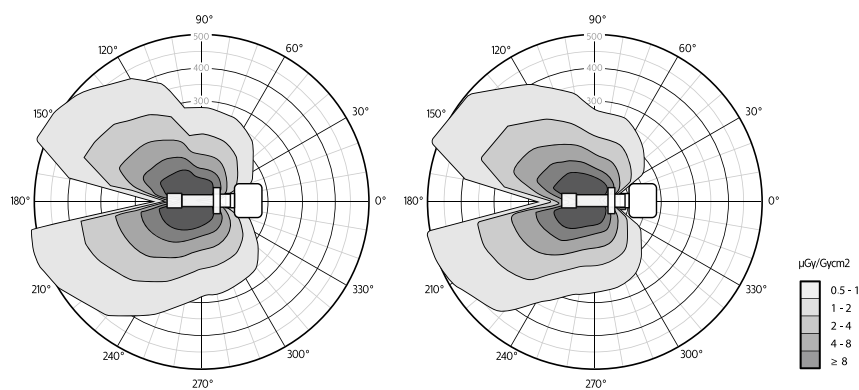


Figure 187 Isokerma map for FD17, Horizontal position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

NOTE *When normalized to 1 μGym² (IEC60601-2-43:2000) instead of 1 Gycm² (IEC60601-2-43:2009), divide the figures of the table by 100.*

9.3.11 C-arm Stand Dimensions

Definition	Specification
Motorized height movement	490 mm
Longitudinal movement	200 mm
Swivel movement	±10 degrees
Angulation	+90/-50 degrees
Rotation	±200 degrees (typical ±205 degrees max)
Source to image distance (SID)	99.3 cm
Source to skin distance (SSD)	IEC: minimal 20 cm; HHS minimal 30 cm
Distance from flat detector screen to X-ray tube output window (free space)	770 mm with IEC spacer 670 mm with HHS spacer
Distance from C-arm to X-ray beam	730 mm
Weight	Non-Motorized FD12 / FD17 (15kW) – 374 kg* Motorized FD12 / FD17 (15kW) – 394 kg* Motorized FD12 / FD17 (25 kW) – 400 kg* * Standard offering (no optional feature)
Lowest lateral working positions (distance from floor to center of horizontal X-ray beam)	1027 mm (C-arc under table)

Motorized Model

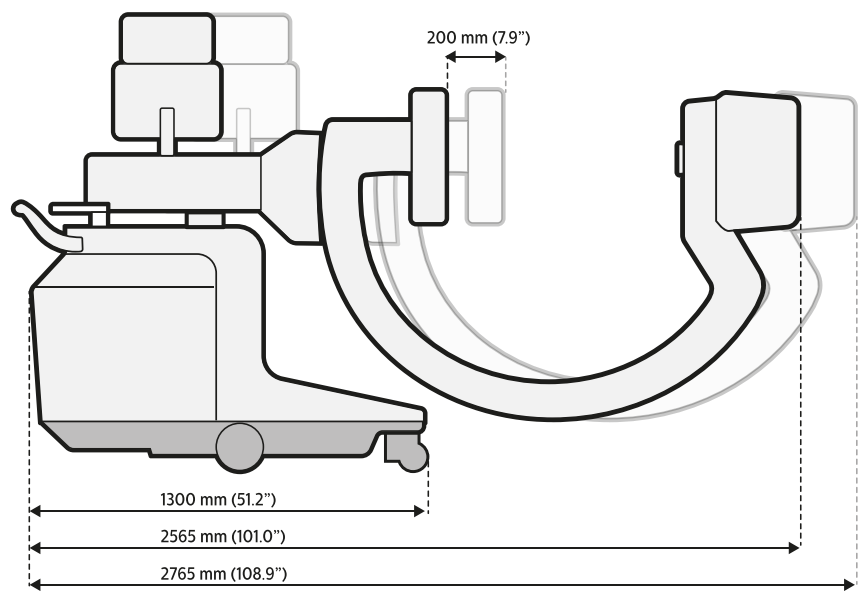


Figure 188 C-arm stand dimensions: Longitudinal movement (Motorized)

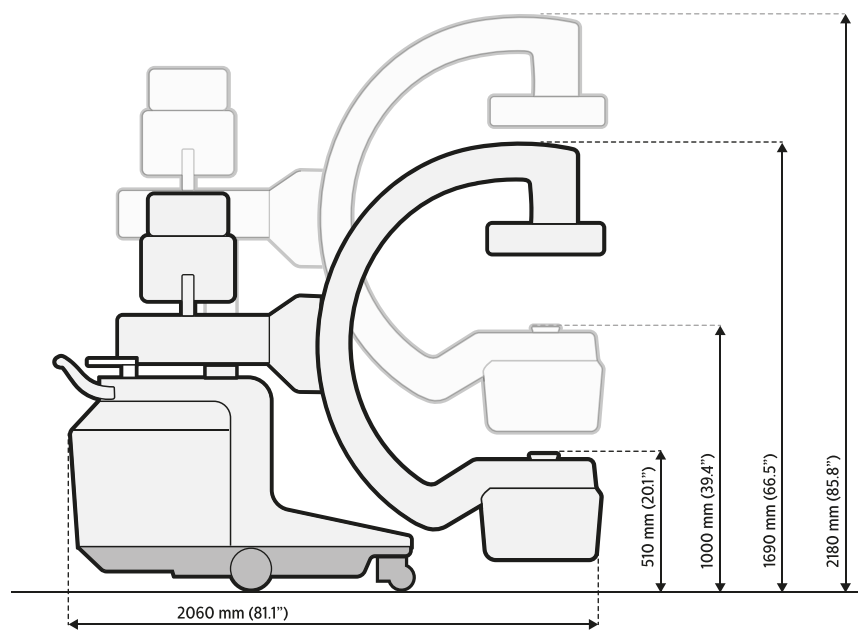


Figure 189 C-arm stand dimensions: Height movement (Motorized)

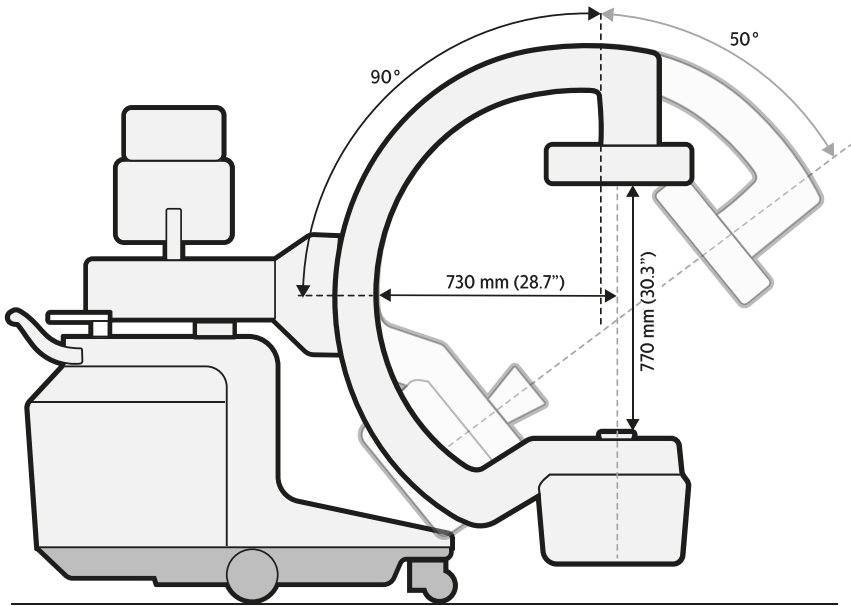


Figure 190 C-arm stand dimensions: Angulation (Motorized)

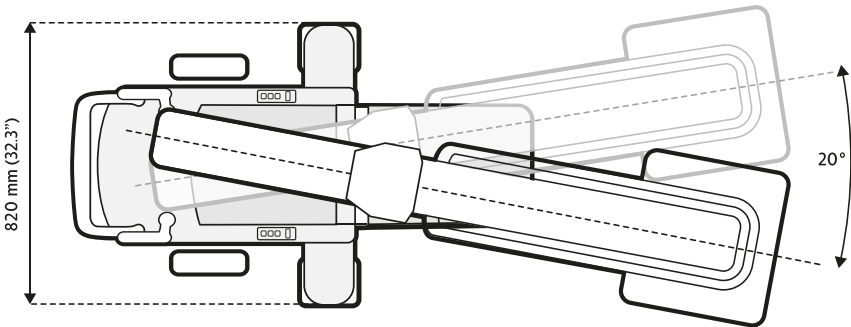


Figure 191 C-arm stand dimensions: Panning movement (Swivel) (Motorized)

Non-Motorized Model

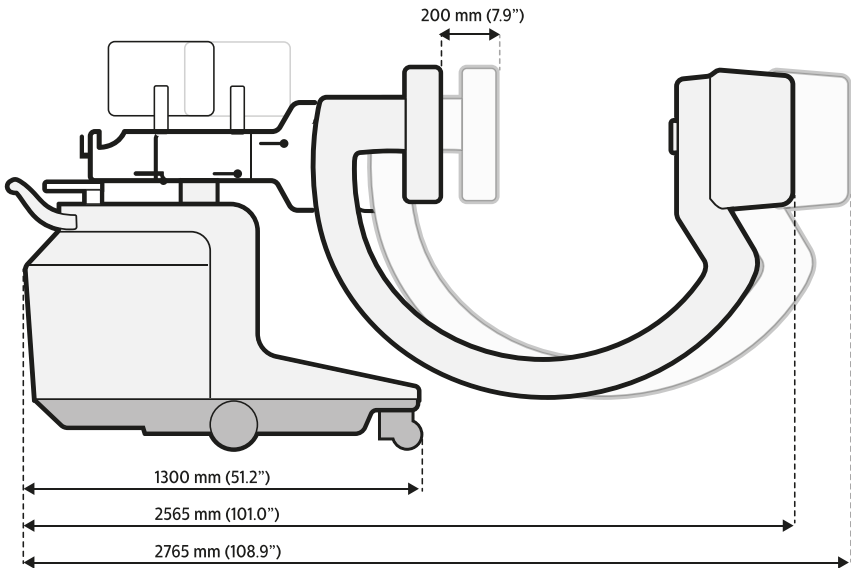


Figure 192 C-arm stand dimensions: Longitudinal movement (Non Motorized)

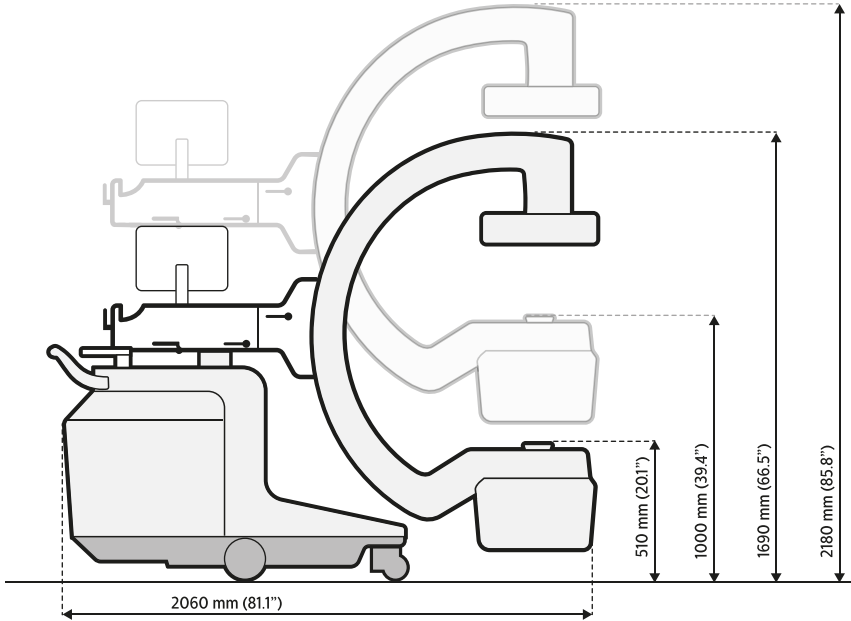


Figure 193 C-arm stand dimensions: Height movement (Non Motorized)

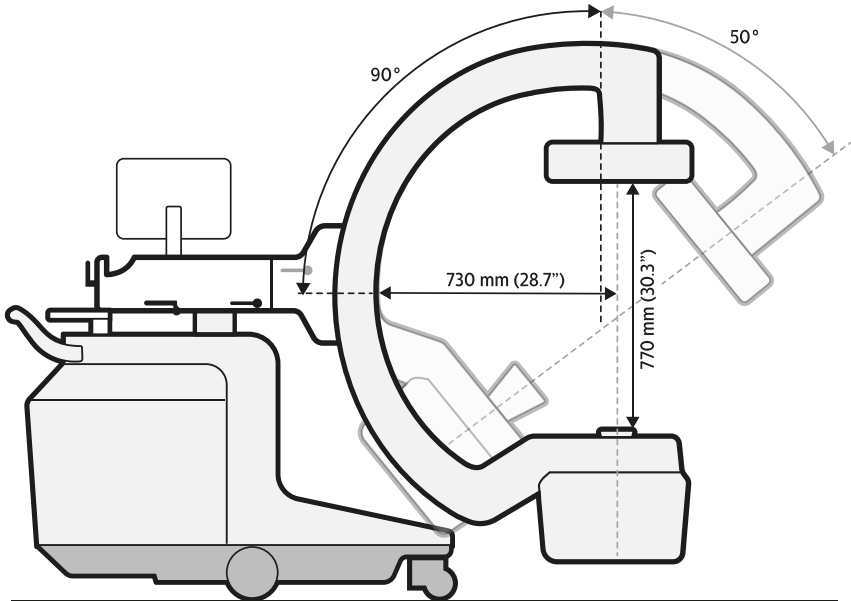


Figure 194 C-arm stand dimensions: Angulation (Non Motorized)

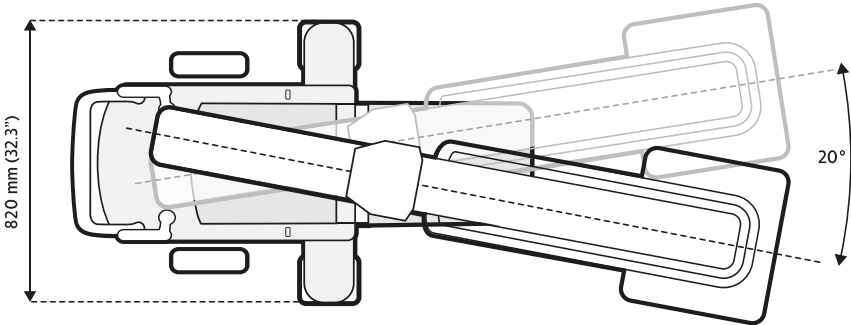


Figure 195 C-arm stand dimensions: Panning movement (Swivel) (Non Motorized)

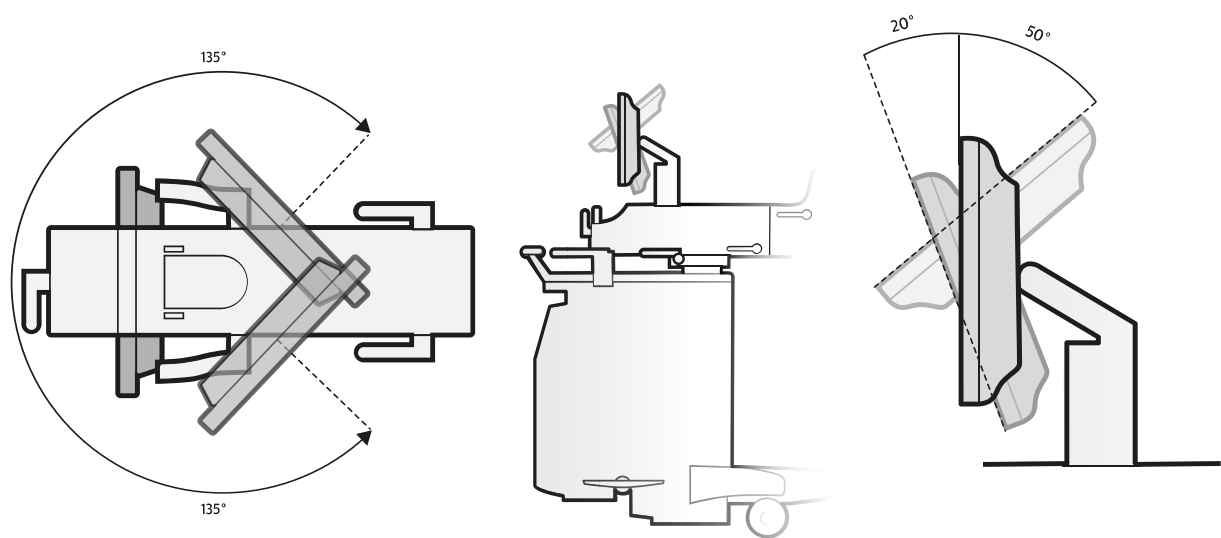


Figure 196 Stand monitor: Rotation (left) and tilt (right) (Motorized and Non-Motorized Model)

9.3.12 Mobile View Station Dimensions

Definition	Value
Weight (including options)	<140 kg
Paper / transparency printer (option)	8.5 kg

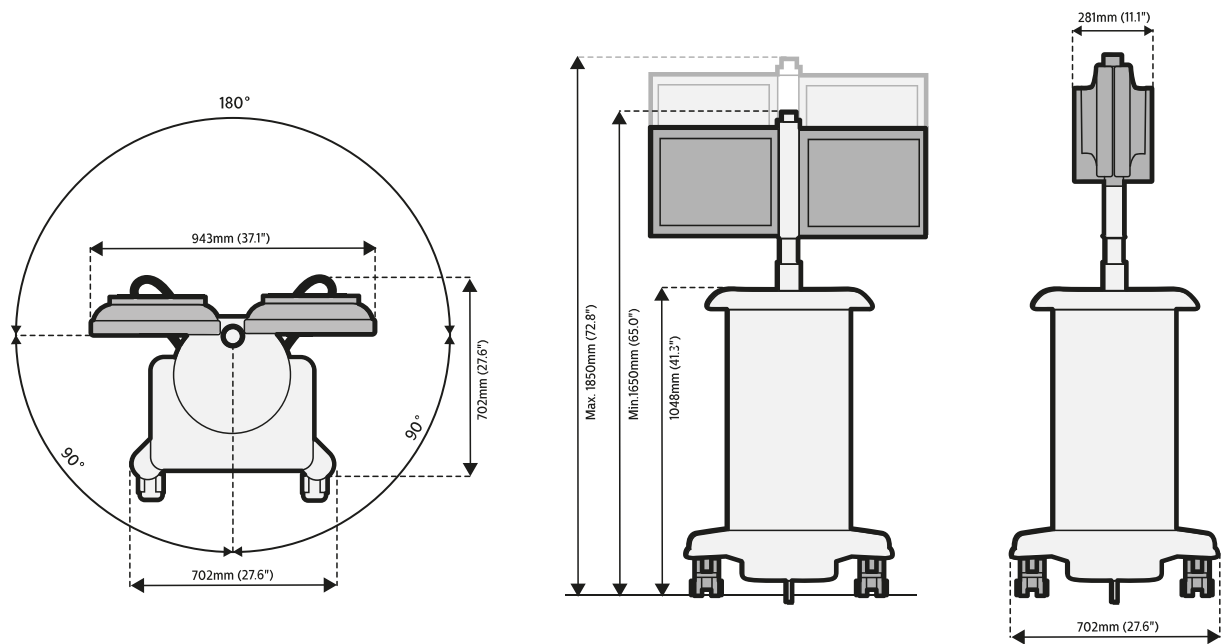


Figure 197 Mobile view station dimensions

9.3.13 Material Safety Data Sheet



CAUTION
The supplier has issued the data on the following pages. The information and recommendations are believed to be accurate. However, no guarantee or warranty, expressed or implied, is made.

Sealed Lead Battery



SECTION I - PRODUCT IDENTIFICATION

Chemical Trade Name (as used on label):

Cyclon®, Odyssey, Genesis®, SBS, XE®, Armsafe Plus®, MILPC, Nexsys, or Large TPPL.

Revision Date: April 2019

Chemical Family/Classification:

Sealed Lead Battery

Manufacturer's Name and Address:

EnerSys Energy Products Inc.
617 N. Ridgeview Drive
Warrensburg, MO 64093-9301

Telephone:

For information and emergencies, contact EnerSys Energy Products

Environmental, Health & Safety Dept. at 660-429-2165

24-Hour Emergency Response Contact:

CHEMTREC DOMESTIC: 800-424-9300

CHEMTREC INT'L: 703-527-3877

SECTION II - GHS HAZARDS IDENTIFICATION

HEALTH		ENVIRONMENTAL	PHYSICAL
Acute Toxicity		Aquatic Chronic 1	Explosive Chemical, Division 1.3
(Oral/Dermal/Inhalation)	Category 4	Aquatic Acute 1	
Skin Corrosion/Irritation	Category 1A		
Eye Damage	Category 1		
Reproductive	Category 1A		
Carcinogenicity (lead compounds)	Category 1B		
Carcinogenicity (acid mist)	Category 1A		
Specific Target Organ Toxicity (Repeated exposure)	Category 2		

GHS LABEL:

HEALTH	ENVIRONMENTAL	PHYSICAL

Hazard Statements**DANGER!**

Causes severe skin burns and serious eye damage.
May damage fertility or the unborn child if ingested or inhaled.
May cause cancer if ingested or inhaled.
Causes damage to central nervous system, blood and kidneys through prolonged or repeated exposure.
May form explosive air/gas mixture during charging.
Extremely flammable gas (hydrogen).
Explosive, fire, blast, or projection hazard.
May cause harm to breast-fed children
Harmful if swallowed, inhaled, or contact with skin
Causes skin irritation, serious eye damage.

Precautionary Statements

Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear protective gloves/protective clothing, eye protection/face protection.
Avoid breathing dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
Contact with internal components may cause irritation or severe burns. Avoid contact with internal acid.
Irritating to eyes, respiratory system, and skin.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid contact during pregnancy/while nursing.
Keep away from heat/sparks/open flames/hot surfaces.
No smoking.

SECTION III - COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Approximate % by Weight
Inorganic Lead Compound:	.	.
Lead	7439-92-1	45 - 60
Lead Dioxide	1309-60-0	15 - 25
Tin	7440-31-5	0.1 - 0.2
Sulfuric Acid Electrolyte (Sulfuric Acid/Water)	7664-93-9	15 - 20
Case Material:	.	5 - 10
Polypropylene	9003-07-0	
Polystyrene	9003-53-6	
Styrene Acrylonitrile	9003-54-7	
Acrylonitrile Butadiene Styrene	9003-56-9	
Styrene Butadiene	9003-55-8	
Polyvinylchloride	9002-86-2	
Polycarbonate, Hard Rubber, Polyethylene	9002-88-4	
Polyphenylene Oxide	25134-01-4	
Polycarbonate/Polyester Alloy	--	
Other:	.	.
Absorbent Glass Mat	--	1 - 2

Inorganic lead and sulfuric acid electrolyte are the primary components of every battery manufactured by EnerSys Energy Products.

There are no mercury or cadmium containing products present in batteries manufactured by EnerSys Energy Products.

SECTION IV - FIRST AID MEASURES**Inhalation:**

Sulfuric Acid: Remove to fresh air immediately. If breathing is difficult, give oxygen. Consult a physician.

Lead: Remove from exposure, gargle, wash nose and lips; consult physician.

Ingestion:

Sulfuric Acid: Give large quantities of water; do not induce vomiting or aspiration into the lungs may occur and can cause permanent injury or death; consult a physician.

Lead: Consult physician immediately.

Skin:

Sulfuric Acid: Flush with large amounts of water for at least 15 minutes; remove contaminated clothing completely, including shoes.

If symptoms persist, seek medical attention. Wash contaminated clothing before reuse. Discard contaminated shoes.

Lead: Wash immediately with soap and water.

Eyes:

Sulfuric Acid and Lead: Flush immediately with large amounts of water for at least 15 minutes while lifting lids.

Seek immediate medical attention if eyes have been exposed directly to acid.

SECTION V - FIRE FIGHTING MEASURES

Flash Point: N/A

Flammable Limits:

LEL = 4.1% (Hydrogen Gas)

UEL = 74.2% (Hydrogen Gas)

Extinguishing Media: Carbon dioxide; foam; dry chemical. Avoid breathing vapors. Use appropriate media for surrounding fire.

Special Fire Fighting Procedures:

If batteries are on charge, shut off power. Use positive pressure, self-contained breathing apparatus. Water applied to electrolyte generates heat and causes it to spatter. Wear acid-resistant clothing, gloves, face and eye protection.

Note that strings of series connected batteries may still pose risk of electric shock even when charging equipment is shut down.

Unusual Fire and Explosion Hazards:

Highly flammable hydrogen gas is generated during charging and operation of batteries. To avoid risk of fire or explosion, keep sparks or other sources of ignition away from batteries. Do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries. Follow manufacturer's instructions for installation and service.

SECTION VI - ACCIDENTAL RELEASE MEASURES**Spill or Leak Procedures:**

Stop flow of material, contain/absorb small spills with dry sand, earth, and vermiculite. Do not use combustible materials. If possible, carefully neutralize spilled electrolyte with soda ash, sodium bicarbonate, lime, etc. Wear acid-resistant clothing, boots, gloves, and face shield. Do not allow discharge of unneutralized acid to sewer. Acid must be managed in accordance with local, state, and federal requirements. Consult state environmental agency and/or federal EPA.

SECTION VII - HANDLING AND STORAGE**Handling:**

Unless involved in recycling operations, do not breach the casing or empty the contents of the battery. There may be increasing risk of electric shock from strings of connected batteries. Keep containers tightly closed when not in use. If battery case is broken, avoid contact with internal components. Keep vent caps on and cover terminals to prevent short circuits. Place cardboard between layers of stacked automotive batteries to avoid damage and short circuits. Keep away from combustible materials, organic chemicals, reducing substances, metals, strong oxidizers and water. Use banding or stretch wrap to secure items for shipping.

Storage:

Store batteries in cool, dry, well-ventilated areas with impervious surfaces and adequate containment in the event of spills. Batteries should also be stored under roof for protection against adverse weather conditions. Separate from incompatible materials. Store and handle only in areas with adequate water supply and spill control. Avoid damage to containers. Keep away from fire, sparks and heat. Keep away from metallic objects which could bridge the terminals on a battery and create a dangerous short-circuit.

Charging:

There is a possible risk of electric shock from charging equipment and from strings of series connected batteries, whether or not being charged. Shut-off power to chargers whenever not in use and before detachment of any circuit connections. Batteries being charged will generate and release flammable hydrogen gas. Charging space should be ventilated. Keep battery vent caps in position. Prohibit smoking and avoid creation of flames and sparks nearby. Wear face and eye protection when near batteries being charged.

SECTION VIII - EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits (mg/m³) Note: N.E. = Not Established

INGREDIENTS (Chemical/Common Names)	OSHA PEL	ACGIH	US NIOSH	Quebec PEV	Ontario OEL	EU OEL
Lead and Lead Compounds (inorganic)	0.05	0.05	0.05	0.05	0.05	0.15 (b)
Tin	2	2	2	2	2	N.E
Sulfuric Acid Electrolyte	1	0.2	1	1	0.2	0.05 (c)
Polypropylene	N.E	N.E	N.E	N.E	N.E	N.E
Polystyrene	N.E	N.E	N.E	N.E	N.E	N.E
Styrene Acrylonitrile	N.E	N.E	N.E	N.E	N.E	N.E
Acrylonitrile Butadiene Styrene	N.E	N.E	N.E	N.E	N.E	N.E
Styrene Butadiene	N.E	N.E	N.E	N.E	N.E	N.E
Polyvinylchloride	N.E	N.E	N.E	N.E	1	N.E
Polycarbonate, Hard Rubber, Polyethylene	N.E	N.E	N.E	N.E	N.E	N.E
Polyphenylene Oxide	N.E	N.E	N.E	N.E	N.E	N.E
Polycarbonate/Polyester Alloy Rubber, Polyethylene	N.E	N.E	N.E	N.E	N.E	N.E
Absorbent Glass Mat	N.E	N.E	N.E	N.E	N.E	N.E

NOTE (b) As inhalable aerosol
(c) Thoracic fraction

Engineering Controls (Ventilation):

Store and handle in well-ventilated area. If mechanical ventilation is used, components must be acid-resistant. Handle batteries cautiously to avoid spills. Make certain vent caps are on securely. Avoid contact with internal components. Wear protective clothing, eye and face protection when filling, charging or handling batteries. Do not allow metallic materials to simultaneously contact both the positive and negative terminals of the batteries. Charge the batteries in areas with adequate ventilation. General dilution ventilation is acceptable.

SECTION VIII - EXPOSURE CONTROLS/PERSONAL PROTECTION**Respiratory Protection (NIOSH/MSHA approved):**

None required under normal conditions. When concentrations of sulfuric acid mist are known to exceed the PEL, use NIOSH or MSHA-approved respiratory protection.

Skin Protection:

If battery case is damaged, use rubber or plastic acid-resistant gloves with elbow-length gauntlet, acid-resistant apron, clothing and boots

Eye Protection:

If battery case is damaged, use chemical goggles or face shield.

Other Protection:

Under severe exposure emergency conditions, wear acid-resistant clothing and boots.

SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES

Properties Listed Below are for Electrolyte:

Boiling Point:	203 - 240° F	Specific Gravity (H₂O = 1):	1.215 to 1.350
Melting Point:	N/A	Vapor Pressure (mm Hg):	10
Solubility in Water:	100%	Vapor Density (AIR = 1):	Greater than 1
Evaporation Rate: (Butyl Acetate = 1)	Less than 1	% Volatile by Weight:	N/A
pH:	~1 to 2	Flash Point:	Below room temperature (as hydrogen gas)
LEL (Lower Explosive Limit)	4.1% (Hydrogen)	UEL (Upper Explosive Limit)	74.2% (Hydrogen)
Appearance and Odor:	Manufactured article; no apparent odor. Electrolyte is a clear liquid with a sharp, penetrating, pungent odor.		

SECTION X - STABILITY AND REACTIVITY

Stability: Stable X_ , Unstable _ _ _

This product is stable under normal conditions at ambient temperature

Conditions To Avoid: Prolonged overcharge; sources of ignition

Incompatibility: (Materials to avoid)

Sulfuric Acid: Contact with combustibles and organic materials may cause fire and explosion. Also reacts violently with strong reducing agents, metals, sulfur trioxide gas, strong oxidizers and water. Contact with metals may produce toxic sulfur dioxide fumes and may release flammable hydrogen gas.

Lead Compounds: Avoid contact with strong acids, bases, halides, halogenates, potassium nitrate, permanganate, peroxides, nascent hydrogen and reducing agents.

Hazardous Decomposition Products:

Sulfuric Acid: Sulfur trioxide, carbon monoxide, sulfuric acid mist, sulfur dioxide, and hydrogen sulfide.

Lead Compounds: High temperatures likely to produce toxic metal fume, vapor, or dust; contact with strong acid or base or presence of nascent hydrogen may generate highly toxic arsine gas.

Hazardous Polymerization:

Will not occur.

SECTION XI - TOXICOLOGICAL INFORMATION**Routes of Entry:**

Sulfuric Acid: Harmful by all routes of entry.

Lead Compounds: Hazardous exposure can occur only when product is heated, oxidized or otherwise processed or damaged to create dust, vapor or fume. The presence of nascent hydrogen may generate highly toxic arsine gas.

Inhalation:

Sulfuric Acid: Breathing of sulfuric acid vapors or mists may cause severe respiratory irritation.

Lead Compounds: Inhalation of lead dust or fumes may cause irritation of upper respiratory tract and lungs.

Ingestion:

Sulfuric Acid: May cause severe irritation of mouth, throat, esophagus and stomach.

Lead Compounds: Acute ingestion may cause abdominal pain, nausea, vomiting, diarrhea and severe cramping. This may lead rapidly to systemic toxicity and must be treated by a physician.

SECTION XI - TOXICOLOGICAL INFORMATION**Skin Contact:**

Sulfuric Acid: Severe irritation, burns and ulceration.

Lead Compounds: Not absorbed through the skin.

Eye Contact:

Sulfuric Acid: Severe irritation, burns, cornea damage, and blindness.

Lead Compounds: May cause eye irritation.

Effects of Overexposure - Acute:

Sulfuric Acid: Severe skin irritation, damage to cornea, upper respiratory irritation.

Lead Compounds: Symptoms of toxicity include headache, fatigue, abdominal pain, loss of appetite, muscle aches and weakness, sleep disturbances and irritability.

Effects of Overexposure - Chronic:

Sulfuric Acid: Possible erosion of tooth enamel, inflammation of nose, throat and bronchial tubes.

Lead Compounds: Anemia; neuropathy, particularly of the motor nerves, with wrist drop; kidney damage; reproductive changes in males and females. Repeated exposure to lead and lead compounds in the workplace may result in nervous system toxicity. Some toxicologists report abnormal conduction velocities in persons with blood lead levels of 50mcg/100 ml or higher. Heavy lead exposure may result in central nervous system damage, encephalopathy and damage to the blood-forming (hematopoietic) tissues.

Carcinogenicity:

Sulfuric Acid: The International Agency for Research on Cancer (IARC) has classified "strong inorganic acid mist containing sulfuric acid" as a Group 1 carcinogen, a substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within a battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may result in the generation of sulfuric acid mist.

Lead Compounds: Lead is listed as a Group 2A carcinogen, likely in animals at extreme doses. Per the guidance found in OSHA 29 CFR 1910.1200 Appendix F, this is approximately equivalent to GHS Category 1B. Proof of carcinogenicity in humans is lacking at present.

Medical Conditions Generally Aggravated by Exposure:

Overexposure to sulfuric acid mist may cause lung damage and aggravate pulmonary conditions. Contact of sulfuric acid with skin may aggravate diseases such as eczema and contact dermatitis. Lead and its compounds can aggravate some forms of kidney, liver and neurologic diseases.

Acute Toxicity:

Inhalation LD50:

Electrolyte: LC50 rat: 375 mg/m³; LC50: guinea pig: 510 mg/m³

Elemental Lead: Acute Toxicity Point Estimate = 4500 ppmV (based on lead bullion)

Oral LD50:

Electrolyte: rat: 2140 mg/kg

Elemental Lead: Acute Toxicity Estimate (ATE) = 500 mg/kg body weight (based on lead bullion)

Additional Health Data:

All heavy metals, including the hazardous ingredients in this product, are taken into the body primarily by inhalation and ingestion. Most inhalation problems can be avoided by adequate precautions such as ventilation and respiratory protection covered in Section 8.

Follow good personal hygiene to avoid inhalation and ingestion: wash hands, face, neck and arms thoroughly before eating, smoking or leaving the worksite. Keep contaminated clothing out of non-contaminated areas, or wear cover clothing when in such areas. Restrict the use and presence of food, tobacco and cosmetics to non-contaminated areas. Work clothes and work equipment used in contaminated areas must remain in designated areas and never taken home or laundered with personal non-contaminated clothing. This product is intended for industrial use only and should be isolated from children and their environment.

The 19th Amendment to EC Directive 67/548/EEC classified lead compounds, but not lead in metal form, as possibly toxic to reproduction.

Risk phrase 61: May cause harm to the unborn child, applies to lead compounds, especially soluble forms.

SECTION XII - ECOLOGICAL INFORMATION**Environmental Fate:**

Lead is very persistent in soil and sediments. No data on environmental degradation. Mobility of metallic lead between ecological compartments is slow.

Bioaccumulation of lead occurs in aquatic and terrestrial animals and plants but little bioaccumulation occurs through the food chain.

Most studies include lead compounds and not elemental lead.

SECTION XII - ECOLOGICAL INFORMATION

Environmental Toxicity: Aquatic Toxicity:

Sulfuric acid:

- 24-hr LC50, freshwater fish (Brachydanio rerio): 82 mg/L
- 96 hr- LOEC, freshwater fish (Cyprinus carpio): 22 mg/L

Lead: 48 hr LC50 (modeled for aquatic invertebrates): <1 mg/L, based on lead bullion

Additional Information:

- No known effects on stratospheric ozone depletion.
- Volatile organic compounds: 0% (by Volume)
- Water Endangering Class (WGK): NA

SECTION XIII - DISPOSAL CONSIDERATIONS (UNITED STATES)

Spent batteries:

Send to secondary lead smelter for recycling. Spent lead-acid batteries are not regulated as hazardous waste when the requirements of 40 CFR Section 266.80 are met. This should be managed in accordance with approved local, state and federal requirements. Consult state environmental agency and/or federal EPA.

Electrolyte:

Place neutralized slurry into sealed containers and handle as applicable with state and federal regulations. Large water-diluted spills, after neutralization and testing, should be managed in accordance with approved local, state and federal requirements. Consult state environmental agency and/or federal EPA.

Following local, State/Provincial, and Federal/National regulations applicable to end-of-life characteristics will be the responsibility of the end-user.

SECTION XIV - TRANSPORT INFORMATION

U.S. DOT:

Excepted from the hazardous materials regulations (HMR) because the batteries meet the requirements of 49 CFR 173.159(f) and 49 CFR 173.159a of the U.S. Department of Transportation's HMR. Battery and outer package must be marked "NONSPILLABLE" or "NONSPILLABLE BATTERY" Battery terminals must be protected against short circuits.

IATA Dangerous Goods Regulations DGR:

Excepted from the dangerous goods regulations because the batteries meet the requirements of Packing Instruction 872 and Special Provisions A67 of the International Air Transportation Association (IATA) Dangerous goods Regulations and International Civil Aviation Organization (ICAO) Technical Instructions. Battery Terminals must be protected against short circuits.

The words "NOT RESTRICTED", SPECIAL PROVISION A67" must be provided when the air waybill is issued.

IMDG:

Excepted from the dangerous goods regulations for transport by sea because the batteries meet the requirements of Special Provision 238 of the International Maritime Dangerous Goods (IMDG CODE). Battery terminals must be protected against short circuits.

Requirements for Safe Shipping and Handling of Cyclon Cells:

Warning – Electrical Fire Hazard – Protect against shorting. Terminals can short and cause a fire if not insulated during shipping. Cyclon product must be labeled "NONSPILLABLE" during shipping. Follow all federal shipping regulations. See section IX of this sheet and CFR 49 Parts 171 through 180, available online at www.gpoaccess.gov.

Requirements for Shipping Cyclon Product as Single Cells:

Protective caps or other durable inert material must be used to insulate each terminal of each cell unless cells are shipping in the original packaging from EnerSys, in full box quantities. Protective caps are available for all cell sizes by contacting EnerSys Customer Service at 1-800-964-2837.

Requirements for Shipping Cyclon Product Assembled Into Multicell Batteries:

Assembled batteries must have short circuit protection during shipping. Exposed terminals, connectors, or lead wires must be insulated with a durable inert material to prevent exposure during shipping.

SECTION XV - REGULATORY INFORMATION

UNITED STATES:

EPA SARA Title III:

Section 302 EPCRA Extremely Hazardous Substances (EHS):

Sulfuric acid is a listed "Extremely Hazardous Substance" under EPCRA, with a Threshold Planning Quantity (TPQ) of 1,000 lbs.

EPCRA Section 302 notification is required if 1000 lbs or more of sulfuric acid is present at one site (40 CFR 370.10). For more information consult 40 CFR Part 355. The quantity of sulfuric acid will vary by battery type. Contact your EnerSys representative for additional information

SECTION XV - REGULATORY INFORMATION**Section 304 CERCLA Hazardous Substances:**

Reportable Quantity (RQ) for spilled 100% sulfuric acid under CERCLA (Superfund) and EPCRA (Emergency Planning and Community Right to Know Act) is 1,000 lbs. State and local reportable quantities for spilled sulfuric acid may vary.

Section 311/312 Hazard Categorization:

EPCRA Section 312 Tier Two reporting is required for non-automotive batteries if sulfuric acid is present in quantities of 500 lbs or more and/or if lead is present in quantities of 10,000 lbs or more. For more information consult 40 CFR 370.10 and 40 CFR 370.40.

Section 313 EPCRA Toxic Substances:

40 CFR section 372.38 (b) states: If a toxic chemical is present in an article at a covered facility, a person is not required to consider the quantity of the toxic chemical present in such article when determining whether an applicable threshold has been met under § 372.25, § 372.27, or § 372.28 or determining the amount of release to be reported under § 372.30. This exemption applies whether the person received the article from another person or the person produced the article. However, this exemption applies only to the quantity of the toxic chemical present in the article.

Supplier Notification:

This product contains toxic chemicals, which may be reportable under EPCRA Section 313 Toxic Chemical Release Inventory (Form R) requirements.

If you are a manufacturing facility under SIC codes 20 through 39, the following information is provided to enable you to complete the required reports:

Toxic Chemical	CAS Number	Approximate % by Wt.
Lead	7439-92-1	45 - 60
Sulfuric Acid Electrolyte (Sulfuric Acid/Water)	7664-93-9	15 - 20
Tin	7440-31-5	0.1 - 0.2

See 40 CFR Part 370 for more details.

If you distribute this product to other manufacturers in SIC Codes 20 through 39, this information must be provided with the first shipment of each calendar year.

The Section 313 supplier notification requirement does not apply to batteries, which are "consumer products".

TSCA:

TSCA Section 8b – Inventory Status: All chemicals comprising this product are either exempt or listed on the TSCA Inventory.

TSCA Section 12b (40 CFR Part 707.60(b)) No notice of export will be required for articles, except PCB articles, unless the Agency so requires in the context of individual section 5, 6, or 7 actions.

TSCA Section 13 (40 CFR Part 707.20): No import certification required (EPA 305-B-99-001, June 1999, Introduction to the Chemical Import Requirements of the Toxic Substances Control Act, Section IV.A)

RCRA:

Spent Lead Acid Batteries are subject to streamlined handling requirements when managed in compliance with 40 CFR section 266.80 or 40 CFR part 273.

Waste sulfuric acid is a characteristic hazardous waste; EPA hazardous waste number D002 (corrosivity) and D008 (lead).

CAA:

EnerSys supports preventative actions concerning ozone depletion in the atmosphere due to emissions of CFC's and other ozone depleting chemicals (ODC's), defined by the USEPA as Class I substances. Pursuant to Section 611 of the Clean Air Act Amendments (CAAA) of 1990, finalized on January 19, 1993, EnerSys established a policy to eliminate the use of Class I ODC's prior to the May 15, 1993 deadline.

STATE REGULATIONS (US):**Proposition 65:**

Warning: Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Batteries also contain other chemicals known to the State of California to cause cancer. Wash hands after handling.

INTERNATIONAL REGULATIONS:

Distribution into Quebec to follow Canadian Controlled Product Regulations (CPR) 24(1) and 24(2).

Distribution into the EU to follow applicable Directives to the Use, Import/Export of the product as-sold.

Article 33 (1) of the REACH regulation (Reg. EC 1907/2006), which entered into force on 1st of June 2007 in the European Union, requires that manufacturers communicate the presence of Substances of Very High Concern (SVHC) in articles (lead batteries) in concentration greater than 0.1% by weight.

Effective the 27th of June 2018, the European Chemical Agency (ECHA) updated the Candidate List with the inclusion of Lead Metal (CAS No.: 7439-92-1). This inclusion of Lead as an SVHC applies to all of EnerSys Lead based battery products regardless of the design (Flooded, Gel, AGM, etc...).

SECTION XVI - OTHER INFORMATION**Revised: AE 01/04/19****NFPA Hazard Rating for Sulfuric Acid:**

Flammability (Red) = 0

Reactivity (Yellow) = 2

Health (Blue) = 3

Sulfuric acid is water-reactive if concentrated.

DISCLAIMER

This Safety Data Sheet is created by the manufacturer to comply with the requirements of 29 CFR 1910.1200. To the extent allowed by law, the manufacturer hereby expressly disclaims any liability to any third party, including users of this product, including, but not limited to, consequential or other damages, arising out of the use of, or reliance on, this Safety Data Sheet.

9.3.14 Certifiable Items

Component type	Model designation	Labeling
X-ray control	Zenition 90 R1.1 STND with FD	Central
Tube housing assembly	Monoblock MMB (see the unit manual)	Central
X-ray generator	Generator MMB (see the unit manual)	Central
Beam limiting device	Collimator	Central
Flat detector	Image detection subsystem	Central

9.3.15 Open Source Software

Open source software is used in this product. See the Software Installation USB stick supplied with the product for license information and source code.

9.3.16 Options

Tank Laser Aiming Device	Description
Manufacturer	Philips Medical Systems, Nederland B.V.
Model name	Tube laser aiming device
Model no	4598 008 4322x
Added filtration (mirror)	<0.4 mm Al equivalent at 75 kV
Added filtration (laser reference plate)	0.98 mm Al equivalent @ 75 kV
Alignment accuracy	<0.3% of SID in vertical beam direction
Location	Integrated in X-ray source assembly
Operation	Remote controlled
Manufacturer laser product	LaserComponents GmbH
Laser product type	FP-DOE-635-5-245-F700
Classification	Class 1M
Laser product specification	Wavelength: 635 nm Maximum output: <5 mW Beam divergence: 10 degrees
Video Converter	Specification
Video input	<ul style="list-style-type: none"> • S-Video • SDI • DVI

Input	Supported Format
S-Video	<ul style="list-style-type: none"> PAL Interlaced 720 x 576, 50 Hz NTSC Interlaced 720 x 480, 60 Hz
SDI	See the table below
DVI-Digital	<ul style="list-style-type: none"> 640 x 480 60 Hz 720 x 480 60 Hz 720 x 576 50 Hz 1024 x 768 60 Hz 1280 x 720 50 Hz 1280 x 720 60 Hz 1280 x 1024 60 Hz 1920 x 1080 50 Hz 1920 x 1080 60 Hz
DVI-Analog (VGA)	<ul style="list-style-type: none"> VGA 640 x 480 SVGA 800 x 600 XGA 1024 x 768 SXGA 1280 x 1024 UXGA 1600 x 1200

SDI Video Input - Supported Formats									
Video Format	Aspect Ratio	NTSC / PAL / HDTV	Frame Rate [Hz]	Y Sample Rate [MHz]	PbPr Sample Rate [MHz]	YCbCr Tx Rate [MHz]	YCbCr Bus Width	SDI Tx Rate	SMPTE Standard
720 x 480i	4:3	NTSC	30 / 1.001	13.5	6.75	27	10-bit	270 Mb/s	259M-C SD-SDI
960 x 480i	16:9	NTSC	30 / 1.001	18	9	36	10-bit	360 Mb/s	259M-C SD-SDI
720 x 480p	4:3	NTSC	60 / 1.001	27	13.5	54	10-bit	540 Mb/s	344M/347M
720 x 576i	4:3	PAL	25	13.5	6.75	27	10-bit	270 Mb/s	259M-C SD-SDI
960 x 576i	16:9	PAL	25	18	9	36	10-bit	360 Mb/s	259M-C SD-SDI
720 x 576p	4:3	PAL	50	27	13.5	54	10-bit	540 Mb/s	344M/347M
960 x 720p	16:9	HDTV	60	74.25	37.125	74.25	20-bit	1.485 Gb/s	292M-C SD-SDI
1280 x 720p	16:9	HDTV	60 / 1.001	74.25 / 1.001	37.125 / 1.001	74.25 / 1.001	20-bit	1.485 / 1.001 Gb/s	292M-C SD-SDI
1280 x 720p	16:9	HDTV	50	74.25	37.125	74.25	20-bit	1.485 Gb/s	292M-C SD-SDI
1920 x 1080i	16:9	HDTV	30	74.25	37.125	74.25	20-bit	1.485 Gb/s	292M-C SD-SDI
1920 x 1080i	16:9	HDTV	30 / 1.001	74.25 / 1.001	37.125 / 1.001	74.25 / 1.001	20-bit	1.485 / 1.001 Gb/s	292M-C SD-SDI
1920 x 1080i	16:9	HDTV	25	74.25	37.125	74.25	20-bit	1.485 Gb/s	292M-C SD-SDI
1920 x 1080p	16:9	HDTV	60	148.5	74.25	148.5	2 x 10-bit 1 x 20-bit	2.97 Gb/s	372M Dual Link SDI 424M / 425M 3G-SDI

SDI Video Input - Supported Formats									
Video Format	Aspect Ratio	NTSC / PAL / HDTV	Frame Rate [Hz]	Y Sample Rate [MHz]	PbPr Sample Rate [MHz]	YCbCr Tx Rate [MHz]	YCbCr Bus Width	SDI Tx Rate	SMPTE Standard
1920 x 1080p	16:9	HDTV	60 / 1.001	148.5 / 1.001	74.25 / 1.001	148.5 / 1.001	2 x 10-bit 1 x 20-bit	2.97 / 1.001 Gb/s	372M Dual Link SDI 424M / 425M 3G-SDI
1920 x 1080p	16:9	HDTV	50	148.5	74.25	148.5	2 x 10-bit 1 x 20-bit	2.97 Gb/s	372M Dual Link SDI 424M / 425M 3G-SDI

Note 1: In North America, the dominant broadcast HDTV standards are 720p60 and 1030i/30. In Europe, 720p50 and 1080i/25 have been adopted.

Note 2: Non-integer frame rates were introduced when color was incorporated into the NTSC monochrome signal in the early 1950s. This new frame rate is obtained by dividing the even frame rate by 1.001.

DICOM CD/DVD Drive	Specification
Media supported	<ul style="list-style-type: none"> • DVD+R • DVD+R DL • DVD+RW • DVD-R • DVD-R DL • DVD-RW • CD-R • CD-RW (US+/US/HS/MS)

Remote Control	Specification
Model name	Viewpad MoS
Type	4598 011 2060x

Other Options	Specification
Printer paper / transparency	Refer to the manual supplied with the equipment
Spacer HHS	Spacer HHS 30 cm
DVI-out	Connection for external monitors using DVI
Spring bow for covers	For C-arm cover

NOTE Only the options and equipment delivered by Philips Medical Systems may be used in conjunction with the Philips Zenition 90. The use of accessory equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety in the resulting system.

Consideration relating to the choice shall include the following:

- Use of the accessory in the patient vicinity.
- Evidence that the safety certification of the accessory has been performed in accordance with the IEC 60601-1.

Touch Screen Monitor	Specification
Type	HL1236VT-HR
Size	12.1 inch LCD
Position	Rotate and tilt
Display matrix	1280 x 800

Touch Screen Monitor	Specification		
Weight	2.05 kg		
Dimensions	Width	Depth	Height
	310.75 mm	53.84 mm	212.75mm
Cable Length	5 meters		
IP Level	23		

TSM Accessory Rails	Specification	
Dimensions	Maximum	Minimum
Size	30 mm X 10 mm	23 mm X 7 mm

Options	Description
Wireless Foot switch	Wireless foot switch is used to activate a range of X-ray and acquisition modes.
Spring Bow	A spring bow is used to mount sterile cover.
Touch Screen Module (TSM)	Touch Screen Module is used to control the C-arm stand functions
Remote Control	The remote control is used to control viewing and processing functions from anywhere in the examination room.

Wireless Foot Switch

The specifications that apply depend on the model of your foot switch. For more information about the model types, see [Labels \(page 26\)](#).

Item	Specification
Frequency range	2402 MHz to 2480 MHz
Channel spacing	2 MHz
Modulation	Gaussian Frequency Shift Keying (GFSK) Adaptive frequency-hopping on 40 channels
Range	10 m in open field 3 m recommended range (during use)
Conformity	Europe: EN 301 489-1, EN 301 489-17, EN 300 328, EN 62368-1, FCC 15.247 USA: FCC, Part 15C, single modular, FCC Identifier: XK5-SW24LE Canada: RSS-247 Issue 1, 5158A-SW24LE Japan: MIC 204-650001, ARIB STD-66
Effective radiated power (ERP)	≤10 mW

Radio Operation

The ideal radio transmission range is up to 10 meters. The following factors and local conditions may reduce the transmission range:

- High frequency interference
- WLAN or Bluetooth networks in the near area
- Additional wireless devices using the same frequency
- Inappropriate antenna arrangement
- Metallic devices in general
- Human beings in the near area
- Examination room wall insulation with metallic coatings

If there is more than one 2.4 GHz system in the same area using the same frequency at the same time, telegram colliding cannot be avoided, which can cause connection issues.

Radio Equipment

The wireless foot switch can optionally be integrated with the medical electrical equipment. Compliance with the immunity requirements for medical electrical equipment and compliance with emission limits from 150 kHz to 1000 MHz has been shown through inclusion of the radio equipment in the EMC system tests. Compliance with the emission limits from 1000 MHz to 6000 MHz has been shown by tests on the individual radio equipment.

Radio Equipment	Frequency	Power (EIRP)	Modulation
Wireless foot switch and base station	2400.0-2483.5 MHz	< 10 mW	Spectrum use: FHSS Protocol type: Bluetooth® <ul style="list-style-type: none"> Type of modulation: FSK Channel spacing: 1 MHz Protocol type: Bluetooth Low Energy <ul style="list-style-type: none"> Type of modulation: GFSK Channel spacing: 2 MHz



WARNING

The system may be subject to interference from other equipment using the same frequencies shown above, even if the other equipment complies with CISPR emission requirements.

For more information, refer to the Electromagnetic Compatibility subsection of the Technical Information section in the Instructions for Use provided with the X-ray system.

Declaration of Conformity for Radio Equipment

Hereby, Philips Medical Systems, Nederland B.V. declares that this wireless foot switch radio equipment is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available on request from the manufacturer.

For the United States and Canada, the radio conformity is based on radio module license grants:

Equipment	FCC License Grant Number	IC License Grant Number
Wireless foot switch (3P), wireless base station	XK5-SW100AMBINT or XK5-SW24LE	5158A-SW100AMBINT or 5158A-SW24LE

Coexistence and Parallel Operation

Simultaneous operation with WLAN or Bluetooth networks is possible. If there are repeated disturbances (radio disconnection), radio network planning should be carried out.

IP Rating

Equipment	IP Rating	Protection
Wireless foot switch	IPX8	Protected against the effects of continuous immersion in water

Mains Power

Equipment	Mains Voltage	Mains Frequency	Maximum Power Consumption
Wireless foot switch charger	100 - 240 V AC	50 / 60 Hz	26 W

Electromagnetic Emissions and Immunity

For information about electromagnetic emissions and immunity, refer to the Instructions for Use supplied with the X-ray system.

9.3.17 Connectivity

Connectivity	Description
Network protocol	TCP/IP network using DICOM v3.0 protocol
Network medium	Ethernet 1000BaseT or Wireless (optional)
Exam based export	Yes
DICOM conformance – as SCU	Image storage ¹ <ul style="list-style-type: none"> • Secondary Capture Image Storage (SC) • X-ray Angiography Image Storage (XA) • Radiation Dose Structured Report (RDSR) Query/Retrieve <ul style="list-style-type: none"> • Storage Commit • Basic Worklist Management • Modality Performed Procedure Step (MPPS) Print Management <ul style="list-style-type: none"> • Basic Gray Scale Print

Note 1: Before using the exported images for diagnostic purposes, the system on which these images are displayed needs to be validated using a representative set of exported images.

9.3.18 Power Supply

Definition	Specification
Mains type	Single phase (live/neutral, separate earth)
Input voltage range	100, 110, 120, 130, 200, 210, 220, 230, or 240 V Volt adjustable presets
Frequency	50 or 60 Hz
Maximum frequency deviation	±1 Hz

Wall outlet sockets must be provided with a proper ground connection accepting grounding cord plugs. The mains plug must be hospital-grade in the USA and Canada. In other countries, the plug must be approved for use in this application by the relevant local safety regulations.

Definition	Mains supply	Stand-by	Stator ²	Fluoroscopy ¹
Current (maximum/typical)	100-130 V	7/6 A	26/20 A	9/8 A
	200-240 V	4/3 A	12/9 A	6/3 A
Power (VA)	100-130 V	800 VA	2300 VA	900 VA
	200-240 V	800 VA	2300 VA	900 VA
Power (Watt)	100-130 V	700 W	2100 W	800 W
	200-240 V	700 W	2100 W	800 W
Total heat dissipation	-	700 W	-	1100 W

Note 1: Fluoroscopy at 120 kV 13.3 mA.

Note 2: Stator acceleration time is 0.3 or 0.9 seconds.

NOTE The measured values will not exceed the specified values by more than 10% (IEC 60601-1).

Mains rating	Frequency	Momentary	Long term	Maximum Ω
100/110 V	50/60 Hz	26 A	9 A	0.1
120/130 V	50/60 Hz	26 A	9 A	0.2

Mains rating	Frequency	Momentary	Long term	Maximum Ω
200/210/220/230/240 V	50/60 Hz	12 A	6 A	0.6

100/110/120/130 V	Specification
Frequency	50/60 Hz
Current (long term/momentary)	9/26 A
Maximum impedance	01/0.2
Mains voltage tolerance	See note
Mains fuse	10 mm x 38 mm Fuse, Fast Acting, Rating 600V AC/DC, 15A Breaking capacity 100kA

Note: The maximum mains impedance is shown in the figure below as a function of the voltage tolerances for 100 V and 120 V. For example, at 100 V and 0.1 Ohm impedance the mains voltage tolerance is +10/-8% or at 0.2 Ohm impedance the tolerance has dropped to +10/-6%. At 120 V and an impedance of 0.18 Ohm the tolerance dropped to $\pm 10\%$.

120-130 V	Specification
Current (long term/momentary)	9/26 A
Maximum impedance	0.2
Mains voltage tolerance	See note
Mains fuse	10 mm x 38 mm Fuse, Fast Acting, Rating 600V AC/DC, 15A Breaking capacity 100kA
Mains plug	(USA/Japan only) NEMA 5-15p

Note: The maximum mains impedance is shown in the figure below as a function of the voltage tolerances for 100 V and 120 V. For example, at 100 V and 0.1 Ohm impedance the mains voltage tolerance is +10/-8% or at 0.2 Ohm impedance the tolerance has dropped to +10/-6%. At 120 V and an impedance of 0.18 Ohm the tolerance dropped to $\pm 10\%$.

200-240 V	Specification
Current (long term/momentary)	6/12 A
Maximum impedance	0.6 Ohm
Mains voltage tolerance	10%
Mains fuse	10 mm x 38 mm Fuse, Fast Acting, Rating 600V AC/DC, 15A Breaking capacity 100kA For ANZ countries 10 mm x 38 mm Fuse, Fast Acting, Rating 600V AC, 10A Breaking capacity 100kA

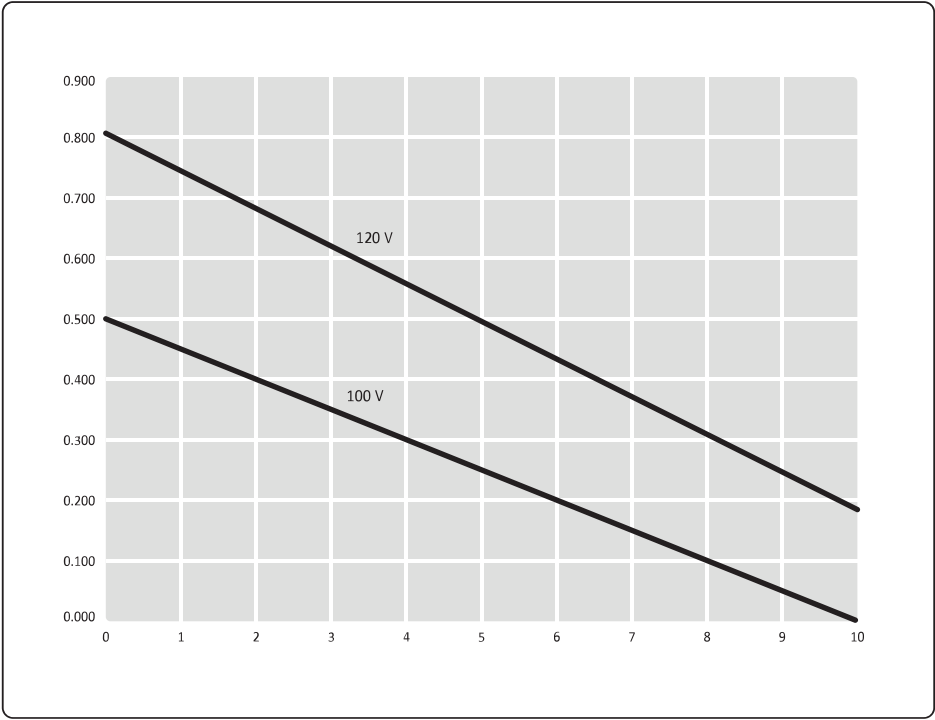


Figure 198 Maximum mains resistance versus main voltage tolerance

Legend	
X axis	Maximum negative mains voltage tolerance (%)
Y axis	Maximum mains resistance (ohm)

10 Glossary

This section provides definitions for specific terms and abbreviations used in these Instructions for Use.

10.1 Abbreviations

Abbreviation	Explanation
Avg	average
CB	Contrast/Brightness
ASP	Automatic Shutter Positioning
CBE	Contrast, Brightness and Edge enhancement
CCIR	Comité Consultatif International des Radio communications (International Radio Consultation Committee)
CD	Compact Disc
CE	European Communities (regulation)
DHHS	Department of Health and Human Services (US)
DICOM	Digital Imaging and Communication in Medicine
DVD	Digital Versatile Disc
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
FDA	Food and Drug Administration (US)
HHS	Health & Human Services (United States office for HHS)
HIPAA	Health Insurance Portability and Accountability Act (US)
HIS	Hospital Information System
IEC	International Electrotechnical Commission
IHE	Integrating the Healthcare Enterprise
IP	IP address: Internet Protocol address IP button/panel: Image Processing button/panel IPXX: International Protection code according to IEC60529
IQ	Image Quality
IR	Infrared
LCD	Liquid Crystal Display
LIH	Last Image Hold
Max	Maximum
MPPS	Modality Performed Procedure Step
MVS	Mobile View Station
OS	Operating System
PACS	Picture Archiving and Communications System
PC	Personal Computer
PMMA	Polymethyl-methacrylate
RF	Radio Frequency
RIS	Radiology Information System
ROW	Rest of World
RSN	Remote Service Network
SC	Secondary Capture
SCU	Service Class User
SSL	Secure Socket Layer

Abbreviation	Explanation
USB	Universal Serial Bus
VPN	Virtual Private Network
XA	X-ray Angiographic
TSO	Table Side Operator

10.2 Definitions and Terms

Acquisition

All X-ray techniques that acquire images.

Acquisition patient

Current patient of which images are acquired.

Acquisition status

The status of the acquisition patient. As long as the patient has this status, images can be acquired. There is only one patient with this status.

Archiving

Copying the screen contents of the examination monitor to paper, video, video DVD, USB memory device or examinations/images to a DICOM PACS.

Auto Park

Auto park feature is used to park the image on reference monitor after each acquisition.

Current image

The current image displayed on the examination monitor or the image highlighted by the square cursor in an overview display.

Dynamic viewing

Viewing with the run cycle function activated.

Examination monitor

This is the primary monitor for displaying live images, last image hold or post-processing.

Exposure

Acquisition technique using X-ray, a detector and imaging chain to produce a live image on a monitor. The images can be viewed live and are stored in a patient file for future reference.

External video

Video from an external source can be replayed on the reference monitor by connecting a compatible playback device to the mobile view station and using the external video function.

Fluoroscopy

Acquisition technique using continuous radiation and a detector and imaging chain to produce a live image on a monitor. The images can be simply viewed live and not stored, or they can be stored in a patient file for future reference.

Isokerma

A contour line on a scattered radiation diagram showing the boundary where a certain radiation level is exceeded.

Last image hold (LIH)

The image of the last X-ray is displayed on the examination monitor and is labeled with the LIH symbol in the upper right corner of the image.

Measurement

Determination of the angle and (relative) size of an object visible in the image.

Overview

Display of a 4 x 4 images matrix on the examination monitor.

Patient administration

Patients are administered on the system using the mobile view station administration screen. The administration screen contains lists of patients. You can perform patient administration activities from the administration screen. Administration activities include adding new patients and examinations, viewing examination information, and importing scheduled examinations from the hospital network.

Patient entrance reference point

The patient entrance reference point is intended to be representative of the point of intersection of the X-ray beam axis and the patient. The display of dose rate and cumulative dose is valid for this distance. The patient entrance reference point is 30 cm from the detector entrance surface or 67.4 cm from the focal spot. (Ref. IEC 60601-2-43.)

Patient file

A file where acquired images can be stored. Each stored image obtains an identification consisting of a run and image number. Up to 140,000 images can be stored.

Phantom

An object used for calibration and verification purposes.

Pixelshift

The Pixelshift function allows you to move the mask image in relation to the live image. Pixelshift is only available when you are using subtraction.

Post-processing

Performing activities to analyse and manipulate images after acquisition.

Reference monitor

This is the secondary monitor for displaying images, used as a reference.

Reviewing

Looking at and post-processing images after an examination is terminated.

Review status

The moment the images of a patient are reviewed, it will get the 'review' status. The patient will keep this status until another patient is reviewed. There is only one patient with this status.

Roadmap

Display of fluoroscopy images on a vascular background.

Roadmap CO2

Display of fluoroscopy images on a vascular background when CO2 contrast medium is used for the mask image.

Run cycle

Dynamic review of images within one run.

Scheduled status

A patient has the scheduled status prompt after input or retrieval of patient data from RIS/HIS. The patient will retain this status until acquisition is performed.

Static viewing

Viewing with the run cycle function deactivated.

Subtraction

Display of exposure images to obtain a vascular-tree background.

Trace

Display of (live) mask-subtracted exposure images with maximum opacification.

Table Side Operator

TSO is an essential control unit for motorized movements, which is mounted on table side rails or on pedestal trolley.

USB storage

The mobile view station provides connectors to attach USB memory devices, such as flash memory drives.

View trace (peak opacification)

View trace uses acquired images to obtain a vascular-tree background during post-processing.

Viewing

Looking at images during and/or just after the acquisition run.

Viewing patient

Patient of which images are viewed or post-processed.

Zoom

An optional post-processing feature to enlarge a part of the current run.

11 Appendix

This section provides additional useful information, including quantitative and security related information.

11.1 Special Characters

	First	Sec- ond		First	Sec- ond		First	Sec- ond		First	Sec- ond
±	+	-	È	E	'	Ü	U	"	ð	d	-
ç	c	/	É	E	,	Ý	Y	,	ñ	n	~
£	L	-	Ê	E	^	þ	l	p	ò	o	'
¤	o	x	Ë	E	"	ß	s	s	ó	o	,
¥	Y	=	Ì	l	'	à	a	'	ô	o	^
©	o	c	Í	l	,	á	a	,	õ	o	~
«	<	<	Î	l	^	â	a	^	ö	o	"
»	>	>	Ï	l	"	ã	a	~	÷	:	-
®	o	r	Ð	D	-	ä	a	"	ø	o	/
¼	1	4	Ñ	N	~	å	a	o	ù	u	'
½	1	2	Ò	O	'	æ	a	e	ú	u	,
¾	3	4	Ó	O	,	ç	c	,	û	u	^
À	A	'	Ô	O	^	è	e	'	ü	u	"
Á	A	,	Õ	O	~	é	e	,	ý	y	,
Â	A	^	Ö	O	"	ê	e	^	þ	l	o
Ã	A	~	×	/	\	ë	e	"	ÿ	y	"
Ä	A	"	Ø	O	/	ì	i	'			
Å	A	o	Ù	U	'	í	i	,			
Æ	A	E	Ú	U	,	î	i	^			
Ç	C	,	Û	U	^	ï	i	"			

To create one of the special characters:

Comp

- 1 Hold down the **Compose** button and press the first required character (use right Shift key for upper case or special character).
- 2 Press the second required character (use right Shift key for upper case or special character) and then release the **Compose** button to complete the special character.

11.2 Menu and Function Selection Tree

This section provides an overview of the system's modes of operation.

Examination Type Selection Tree

- Skeleton
 - Skull
 - Thorax
 - Arm
 - Spine

- Pelvis/Lumbar Spine
 - Hip/Leg
- Urology
 - Kidney
 - Lithotripsy
 - Bladder
 - Ureterography
- Endoscopy
 - ERCP
 - Esophagus
 - Bronchus
- Vascular
 - Cerebral
 - Aortic Arch
 - Abdominal
 - Iodine
 - CO2
 - Arm
 - Iodine
 - CO2
 - Leg
 - Iodine
 - CO2
 - Bolus Chase (yes/no)
- Cardio
 - Coronaries
 - Ventricle/TAVI
 - Pacemaker
 - Electrophysiology
- Pain
 - Head
 - Neck
 - Arm
 - Spine
 - Pelvis/Lumbar Spine
 - Hip/Leg

Fluoroscopy Selections

- Acquisition mode
 - Fluoroscopy
 - FluoTap
 - FluoCarto
 - Roadmap
 - Roadmap CO2
- Pulse rate

15 / s	or	4 / s
7.5 / s		2 / s
4 / s		1 / s

- Storage

- No storage
- LIH
- Store all
- Dose level
 - Low
 - Normal
 - Medium
 - High
- Noise
 - Default (both buttons inactive)
 - Reduce blur
 - Reduce noise

Exposure Selections

- Acquisition mode
 - Single shot
 - Run
 - Subtract
 - Trace
 - Subtract CO2
 - Trace CO2
 - RunCarto
- Pulse rate

30 / s		15 / s		7.5 / s		4 / s
15 / s	or	7.5 / s	or	4 / s	or	2 / s
7.5 / s		4 / s		2 / s		1 / s

11.3 Quantitative Data

The table below contains an overview of quantitative data.

Variable	Quantity
Maximum number of Exams in Exam Review list	250
Maximum number of Exams in Exam Schedule list	250
Maximum number of scheduled WLM Exams	248
Maximum number of Images per Run	999
Maximum number of Profile names	100
Maximum number of Physician names	100
Maximum number of Protocol names (MPPS)	100
Maximum number of characters for Patient name ¹	64
Maximum number of characters for Remark text field	10
Maximum number of characters for Patient ID ¹	64
Maximum number of characters for Hospital name ¹	30
Maximum number of characters for Physician name ^{1,2}	30
Maximum number of characters for Technician name (MPPS)	30
Maximum number of characters for Protocol name (MPPS)	20
Maximum number of characters for Accession number	16
Maximum number of characters for Requested procedure ID	16

Variable	Quantity
Maximum number of characters for Procedure name	30
Maximum number of characters for Anatomy/Detailed procedure name	30
Maximum number of characters for annotation (including new line characters)	30
Maximum number of characters for user name	30
Maximum number of characters for password	14
Maximum number of lines in annotation	6
Maximum number of lines for draw outline	25
Maximum number of pixels per line for draw outline	2000
Maximum number of dots for draw outline	25
Maximum number of images in Transfer queue	5000
Maximum number of irradiation events in DICOM radiation dose structured report	1000
Maximum number of images	140,000
Display matrix size (maximum area used to display information)	1280 x 1024
Display image matrix size	1000 x 1000
Export Image size XA and SC without text	1024 x 1024 x 16 bits
Export Image size SC with text	1024 x 1024 x 8 bits

Note 1: Fields may not be fully displayed if the characters do not fit in the available space.

Note 2: Longer names can be imported and exported if DICOM worklist management is used.

11.4 Security and Privacy Provisions

It is the policy of Philips Medical Systems to adhere to all required standards and regulations. To assist the hospital in fulfilling the Health Insurance Portability and Accountability Act (HIPAA) requirements, introduced by the United States Department of Health and Human Services, you should be aware of the following information and functionality when using the system.

Customer Role in the Product Security Partnership

We recognize that the security of Philips Medical Systems products is an important part of your facility's security-indepth strategy. However, these benefits can only be realized if you implement a comprehensive, multilayered strategy (including policies, processes, and technologies) to protect information and systems from external and internal threats.

Following industry-standard practice; your strategy should address physical security, operational security, procedural security, risk management, security policies, and contingency planning. The practical implementation of technical security elements varies by site and may employ a number of technologies, including firewalls, virus-scanning software, authentication technologies.

As with any computer-based system, protection must be provided such that firewalls and other security devices are in place between the medical system and any externally accessible systems.

The USA Veterans Administration has developed a widely used Medical Device Isolation Architecture for this purpose. Such perimeter and network defenses are essential elements in a comprehensive medical device security strategy.

For the latest information, including the Product Security Policy Statement and recommended customer actions, see the Philips Medical Systems product security website at:

<http://www.healthcare.philips.com/main/support/productsecurity>

11.4.1 Risks Related to Hospital Network Connectivity

Connection to the hospital network or external equipment could result in previously unidentified risks to patients, operators, or third parties. It is the customers responsibility to identify, analyze, evaluate, and control these risks. Changes to the hospitals network could introduce new risks that require additional analysis.

An assessment should be repeated whenever changes are made to the network. These changes include:

- Changes in the network configuration
- Connection of additional items to the network
- Disconnection of items from the network
- Updates or upgrades to items that are connected to the network

11.4.2 Access Control

Access control lists (unique user names for each user of the system) are supported in this release. A password protection function is available, which requires a user to enter a password before patient data can be accessed. You are recommended to use this function to implement basic access control. Use strong passwords to control access to the workstation.

- Emergency acquisition is still possible when the password protection function is used. Logging in without a password provides access to acquisition functions, but prevents access to existing patient data on the system.
- Consider using a predefined account to access patient data if you forget or lose your account details. (This is known as a "break the glass" procedure.)
- The password protection function can be disabled by Service.

Store the site configuration data (password) securely. It is the administrator's responsibility to change the password regularly.

11.4.3 Screen Blanking and Automatic Log-Off

Screen blanking and automatic log-off are not supported in this release. To avoid casual or deliberate viewing of patient data by unauthorized persons, do not leave the system unattended while it is switched on.

You are recommended to use the following methods to avoid unauthorized viewing:

- Position the system's monitors so that they face away from doorways, hallways, and other traffic areas.
- Fold the system's monitors.
- Delete examinations after they have been archived (see [Archiving Patient Data \(page 323\)](#)).
- Switch the system off after use (see [Switching the System Off \(page 107\)](#)).

11.4.4 De-identification of Patient Data

The system does not currently provide a way to de-identify patient data prior to printing or DICOM export.

If you wish to export de-identified patient data, the following options are available:

- Click the **Save** button and check the **De-identify** checkbox in the **Save to Media** panel. Enter a de-identified name in the text box.
- Rename the patient data using unrecognizable values before printing or exporting.
- If de-identification tools are available on a connected DICOM archive, use them to de-identify patient data after archiving, and then print or export the data.

NOTE *If the De-identify checkbox is checked, all DICOM attributes will be de-identified. If the dose report is included all patient data and the accession number are removed (blanked) from the dose report. The de-identify name text box can be used to enter a patient name to be used for the de-identified images. This name is also included in the dose report if the dose report is included.*

NOTE *If the De-identify checkbox is not checked then all text and the text box below the De-identify checkbox are not displayed.*

11.4.5 Backing Up Patient Data

The system is an interventional tool and not intended to provide a backup function. Writing patient data to USB storage device or to DVD should be considered as temporary storage only, and should not be considered a long-term backup solution.

NOTE *You can store a maximum of 250 examinations on the system. Once this limit is reached, the system deletes the oldest examinations to make space for new examinations.*

To ensure patient data security after acquiring images using the system, you should send them to a dedicated DICOM storage device that is intended to be used as an archive. For more information, see [Archiving Patient Data \(page 323\)](#).

11.4.6 Archiving Patient Data

The system is an interventional tool and is not intended for long-term storage of patient data. It should only be used to store patient data that you are currently investigating.

NOTE *You can store a maximum of 250 examinations on the system. Once this limit is reached, the system deletes the oldest examinations to make space for new examinations.*

To ensure data security after acquiring images using the system, you should send them to a dedicated DICOM storage device that is intended to be used as an archive. We recommend that you export images to a PACS. For more information, see [Exporting Images to a Network Location \(page 187\)](#).

After archiving images, you can delete them from the system to ensure available space for future acquisitions.

11.4.7 Disaster Recovery

To protect patient data against loss, you should include the system in your hospital's disaster plan. You are recommended to follow these guidelines when creating a procedure to safeguard patient data:

- Patient data should only be stored temporarily on the system.
- Transfer patient data to a dedicated DICOM archive as soon as possible after acquisition.
- Delete patient data from the system after they have been archived.
- Do not use removable media as long-term storage for patient data.

11.4.8 Network Security

The system has an integrated firewall to protect against harmful intrusions. Further protection can be provided by ensuring that the system is connected to a local network that uses appropriate network security, such as firewalls and antivirus scanning at points of access. Philips Medical Systems supports network security in the wireless network option by using wireless equipment with a strong and varied feature set for wireless communication in enterprise networks.

NOTE *Only a strong network security configuration can ensure that the system is protected against malicious network attacks and that patient data is protected against unauthorized access.*

NOTE *It is recommended that the hospital IT uses an up-to-date, managed wireless infrastructure that is enterprise grade and has strong security controls.*

Security patches are also applied to the embedded operating system of the system (known as OS hardening), which provide a further layer of protection against viruses, malware, and harmful intrusions. Removable media (USB and DVD) could be used to create unauthorized copies of patient data.

Removable media drives and connectors cannot be disabled in this release. Therefore, to protect against unauthorized copying, you are recommended to ensure the system is always attended by an authorized person while in use.

Unauthorized Use

The wired and wireless network option allows you to park the mobile view station in any location and maintain a network connection for performing routine tasks such as archiving examinations. To protect patient data and prevent unauthorized transmission of data, you should use available security functions to restrict access to the data by unauthorized persons and take precautions to restrict physical access to the system whenever it is left unattended.

11.4.9 Patient Data Storage

Patient data on the system is stored encrypted on the system hard drive, which is compliant with FIPS 140-2. This protects the data should the hard drive be lost, removed, or reused.

11.4.10 Patient Data Transmission

Patient data exchanged via the network with the system is not encrypted. You may implement your own policy of secure transmission to protect patient data across your network.

11.4.11 Service Data Transmission

Transfer of log files initiated by the system employs an encrypted end-to-end channel using SSL and certificates. The log files transferred across the SSL connection do not contain personal data.

The Philips RSN VPN tunnel provides a secure channel across the internet for remote access to the system when service has been enabled on the system. Contact service for details about RSN provisions.

11.4.12 Malware Protection

This equipment incorporates protection mechanisms against the intrusion of malware.

A whitelist approach to malware protection is applied. When whitelist protection software is installed, any untrusted software not mentioned on the whitelist is blocked.

Without proper cyber security maintenance, the effectiveness of these provisions may degrade over time, since malware is continuously altered to target newly discovered vulnerabilities.

Philips Medical Systems systematically analyzes sources of information related to cyber security vulnerabilities to assess the cyber security risk to its systems. To ensure the proper functioning of the system, Philips Medical Systems may recommend specific customer or service actions, or issue service recommendations to update, alter, or replace system protection mechanisms as described in this document.

The latest information, including the Product Security Policy Statement and recommended customer actions, can be found at:

www.philips.com/productsecurity

NOTE *You should regularly check the system's published cyber security status at the link above.*

Despite preventive measures already implemented, a remote possibility remains that the system may become infected with malware. When malware is detected, or when you notice that unfamiliar behavior or degraded performance occurs repeatedly, including after being switched off and on again, you should call technical support for an inspection. When the inspection confirms the infection, be sure to take measures to contain and remove the source of infection. Technical support will reinstall the system software to bring the system back into specification. Technical support can also assist in accessing the system's event log, which may provide information useful for the investigation.

11.4.13 Audit Trail

Audit trail events are logged by the system. These audit trail events contain user actions with patient data and the system.

11.5 Device Identifier

Device Name	Basic UDI-DI
Zenition 90	0884838BM917TQ

11.6 Council Directive 2013/59 EURATOM

This Instructions for Use covers most of the Council Directive 2013/59 EURATOM requirements. Additional requirements are provided below.

Device class: IIb (EU 2017/745)

The system has an automatic intensity control and an image detector & complies with IEC 60601-2-43 requirements.

Information on the residual risks, any adverse event and precaution for use: The IFU contains the warnings and precautions for use applicable to the product.

Every individual risk level per hazard and the overall residual safety risk is acceptable using the criteria defined in the Risk Management Plan and in the applicable internal procedures.

The summary of the clinical evaluation results as mentioned in article R.5211-36-1: With respect to safety of the device, there were no risks from the risk analysis that required clinical data for the purpose of evaluation or risk benefit analysis. Furthermore, reviewed clinical data did not identify any risk specific to the device that was not already assessed in the risk analysis. Therefore, this clinical evaluation concludes that the device will not compromise the clinical condition or the safety of patients, or the safety and health of users and other persons.

With respect to performance of the device, the analysis indicates that the performances as claimed in the intended use have been established.

Final conclusion:

- 1 The clinical safety and performance of the device was demonstrated with the clinical evaluation;
- 2 No (further) clinical investigations are required;
- 3 Conformity with the relevant General safety and performance requirements of the Medical Device Regulation (EU) is demonstrated;

With respect to post market clinical follow up, no specific device features or other aspects were identified that require special attention during the post market phase. Post market surveillance monitoring activities (i.e., conducting a search in the literature and clinical experience databases) related to the use of the device in the market are planned conform Philips internal processes.

For the list of the applicable Harmonized Standards, you can refer to the Declaration of Conformity.

11.7 DIN6868-157 Compliance Testing

11.7.1 Introduction

This section provides information about quality assurance of the displays mounted on the system according to DIN6868-157.

The DIN6868-157 standard indicates requirements and guidelines to assess the image quality assurance in diagnostic X-ray departments. In particular, part 157 prescribes X-ray ordinance acceptance and constancy test of Display systems in their environment.

Notice - Acceptance or constancy tests must be performed at regular intervals according to DIN6868-157 or as per applicable local regulations.

Important Information

For clinical user guidance, there is an applicability statement at the start of each sub-section in the document.

11.7.2 IQ Test Image Types

The system is equipped with different test images that are used for different DIN6868-157 tests. One pixel of the test image represents one pixel on the monitor, except zoom images. The **IQ-Test Images** drop down menu in the **System Setup** is used to select the images to be displayed. The **IQ-Test Images** have different type of images as explained below.

- Clinical reference images are used to check adequate image quality medically.
 - **Peripheral Vascular, DSA, Pelvis, Cervical Spine and Urology.**
- Overall image quality images are used to check image geometry, resolution, luminance, distortion and artifacts.
 - **TG18-OIQ, TG18-OIQ-ZoomQ1 to TG18-MP-ZoomQ4**

NOTE *TG18-OIQ-ZoomQ1 to TG18-MP-ZoomQ4 images are added to assist in the measurement tests. An integral magnification factor of two is used with respect to the original TG18-OIQ image.*

- Grayscale resolution image are used to check the monitor luminance response.
 - **TG18-MP, TG18-MP-ZoomQ1 to TG18-MP-ZoomQ4**

NOTE *TG18-MP-ZoomQ1 to TG18-MP-ZoomQ4 images are added to assist in the measurement tests. An integral magnification factor of two is used with respect to the original TG18-MP image.*

- Luminance uniformity images are used for luminance, color uniformity, pixel errors, uniformity of multiple monitors.
 - **TG18-UN80, TG18-UN10, TestImage-UN80, TestImage-UN10, TestImage-UN100, TestImageFSCSys**
- Luminance response images used to check DICOM grayscale calibration series, minimum and maximum luminance.
 - **TG18-LN8-01 to TG18-LN8-18**

11.7.3 Navigate through Test Images

If the image name and image position are selected, clicking on **Show** button displays the image at the selected area location in exam monitor and reference monitor.

Keys	Behavior when IQ-Test images are displayed
ADMI	Close IQ-Test Images on both monitors and go to ADMI screen
Previous	Displays the previous test image. By continuous clicking the key, cycles backward through the images
Next	Displays the next test image. By continuous clicking the key, cycles forward through the images
Up	Displays the current IQ-Test Images at the previous position in a cyclic way: Fullscreen, Center and Clinical Area
Down	Displays the current IQ-Test Images at the next position in a cyclic way: Fullscreen, Clinical Area and Center
Undo	Close IQ-Test Images on both monitors and go back to the Setup panel

- NOTE**
- ***For correct display/function of test images, ensure below LEDs are off. WS LED, DVD display LED and external video LED.***
 - ***When IQ-Test Images are displayed, do not use any other MVS or remote control keys other than above listed MVS keys.***

11.7.4 Preparation for Test

Before starting the DIN6868-157 test(s), follow below steps to make the system ready for DIN6868-157 measurements.

- 1 Make sure the monitor is clean. Remove any dust particles, fingerprints, or whiteboard markings on the monitor.
- 2 System must be switched ON for at least 30 minutes before starting the tests with TG18-UN80 in full screen mode.
- 3 Room-lighting appliances, windows, ILLUMINATORS, clothing, etc., must not give rise to any spurious reflections on the monitor. Be careful while wearing bright (white) clothes, as it influences the measurements.
- 4 The ambient lighting during the tests and during the intended use of the monitor must remain constant and stable.
- 5 If the ambient luminance is below 0.15 cd/m², a negative deviation from the measured value of the acceptance test may be disregarded for constancy test.
- 6 Use test equipment that compliant with the DIN6868-157 standard.

12 Legends

This section provides an overview of the main system controls. For more information regarding specific functions, see [Operation \(page 77\)](#).

12.1 Mobile View Station Console

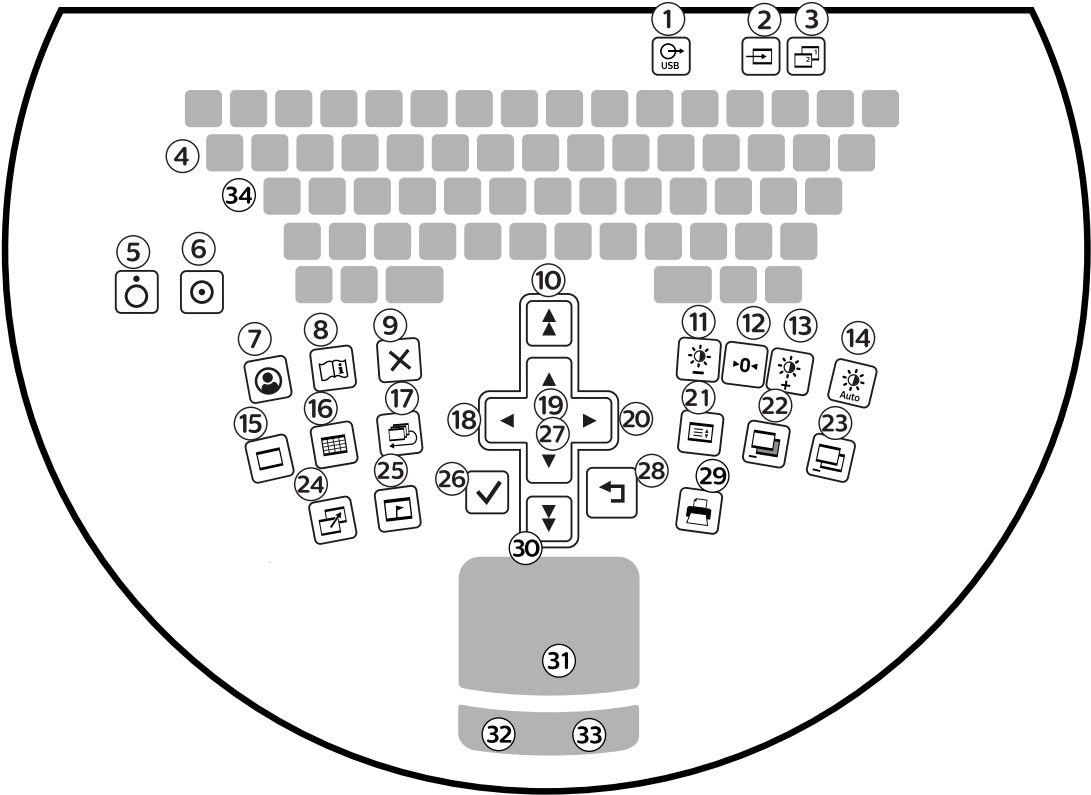


Figure 199 Mobile view station console

Key	Description
1	USB (with indicator light)
2	External video (with indicator light)
3	Image Viewer (with indicator light)
4	Compose
5	System off
6	System on
7	Administration
8	Help (eIFU)
9	Delete ¹
10	Page up
11	Contrast/brightness decrease
12	Contrast/brightness reset
13	Contrast/brightness increase
14	Auto contrast/brightness (with indicator light)
15	Single image screen
16	Overview screen

Key	Description
17	Run cycle
18	Previous
19	Up
20	Next
21	Image processing
22	Remask
23	Subtract on/off (with indicator light)
24	Park
25	Protect (flag)
26	Accept ¹
27	Down
28	Undo ¹
29	Print (with indicator light)
30	Page down
31	Touch pad
32	Left button
33	Right button
34	Caps lock (with indicator light)

¹ When using some applications on the reference monitor such as Image Viewer or a service interface, these buttons have no defined behavior. When pressed, they may input an undefined character into a text field. When using such applications on the reference monitor, you should use the main console keyboard and the mouse.

12.2 C-arm Stand Console



Figure 200 C-arm stand console

Key	Description
1	C-arm stand off
2	C-arm stand on / System on
3	X-Ray enable/disable
4	Emergency off

12.3 C-arm Stand Touch Screen

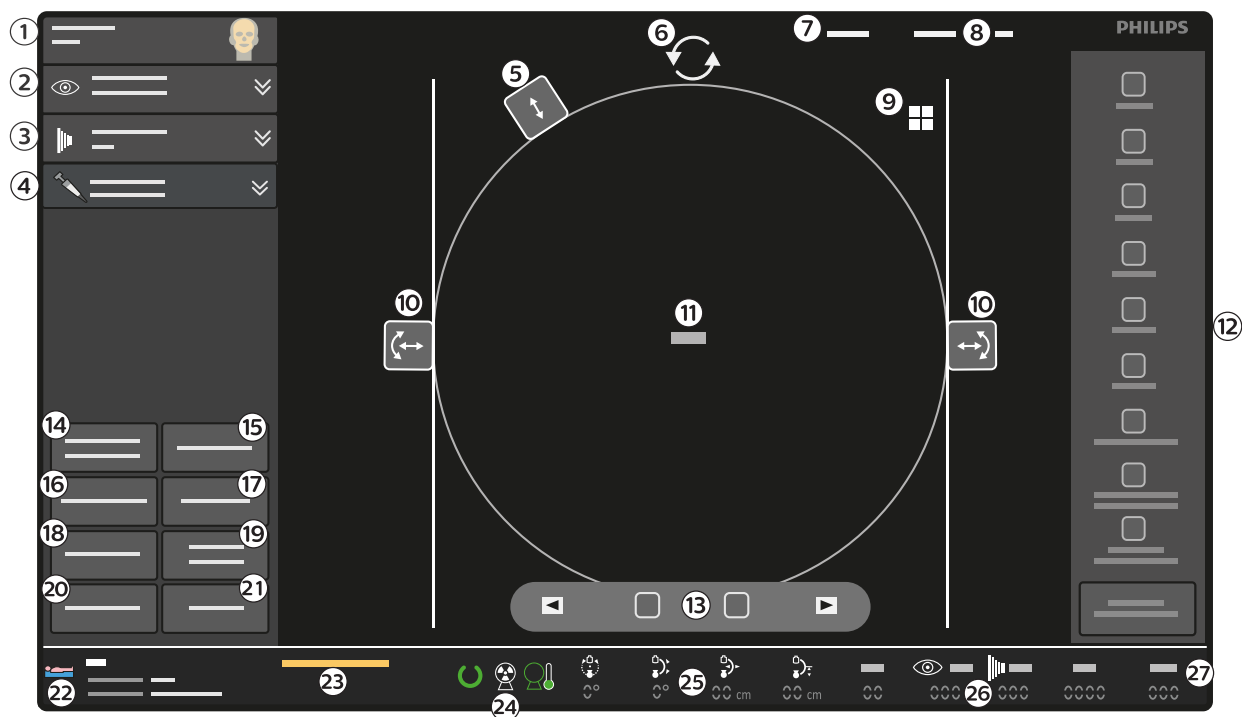


Figure 201 C-arm stand touch screen

Button	Description
1	Examination type selector
2	Fluoroscopy expander
3	Exposure expander
4	Injector
5	Diaphragm collimator control
6	Image rotation control
7	System
8	Help and tooltips
9	Last image hold indicator
10	Manual shutter positioning controls
11	Main image area
12	Image toolbar
13	Run cycle navigation controls
14	Timer On/Off
15	Outline
16	Detector zoom control
17	ClearGuide
18	Detector laser control
19	Tube laser control
20	Position memory
21	kV Manual control
22	Patient information
23	System messages
24	X-ray status and heat indication

Button	Description
25	C-arm position
26	Dose information
27	Fluoroscopy / exposure time

12.4 C-arm Stand Height Movement

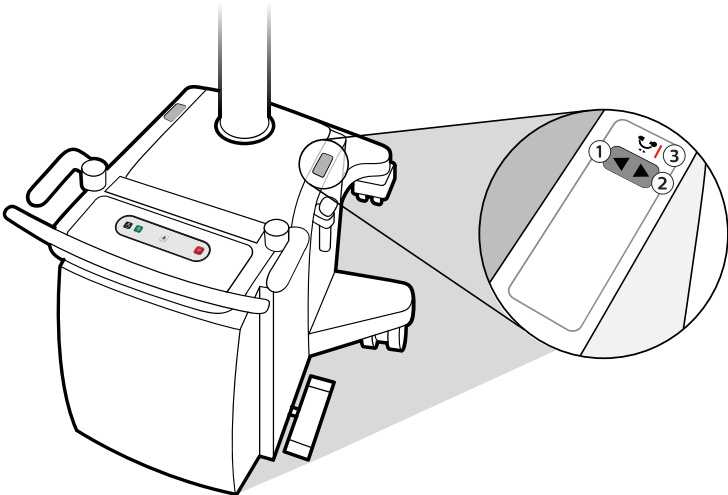


Figure 202 C-arm stand height movement controls (Non-Motorized Model)

Key/item	Description
1	Up
2	Down
3	Indicator light

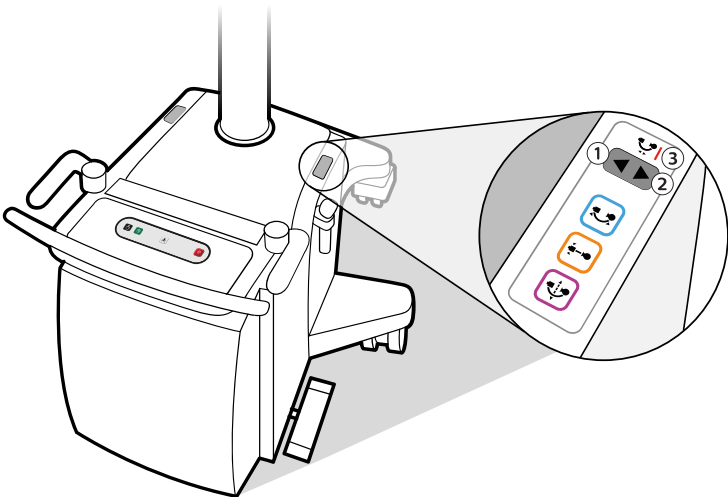


Figure 203 C-arm stand height movement controls (Motorized model)

Key/item	Description
1	Up
2	Down
3	Indicator light

12.5 Hand Switch

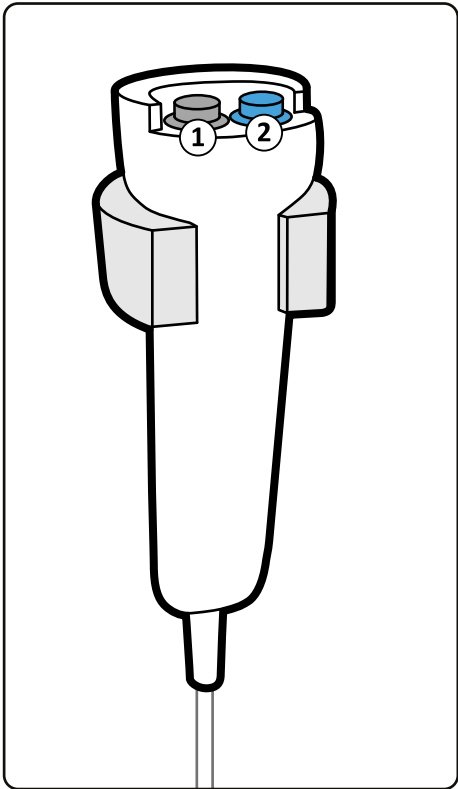


Figure 204 Hand switch

Key	Function
1	Fluoroscopy
2	Exposure / Single shot

12.6 Foot Switch

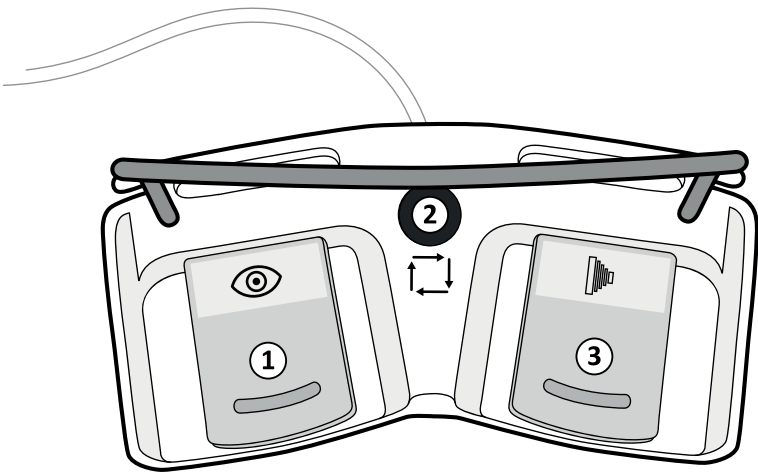


Figure 205 Foot switch

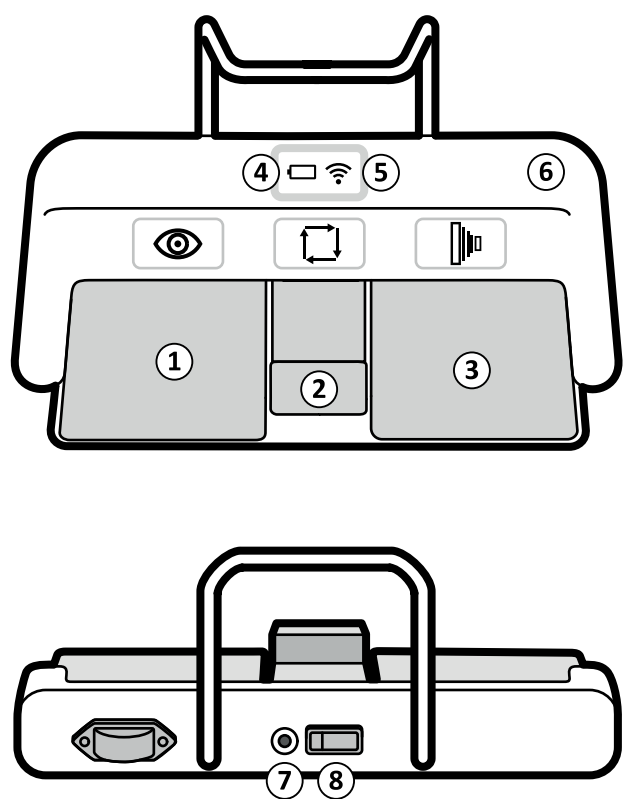


Figure 206 Wireless foot switch

Key	Function
1	Fluoroscopy
2	Mode switch
3	Exposure / Single shot
4	Battery indicator
5	Wireless connection indicator
6	Identification label recess
7	Charging port
8	On/off switch

12.7 Remote Control

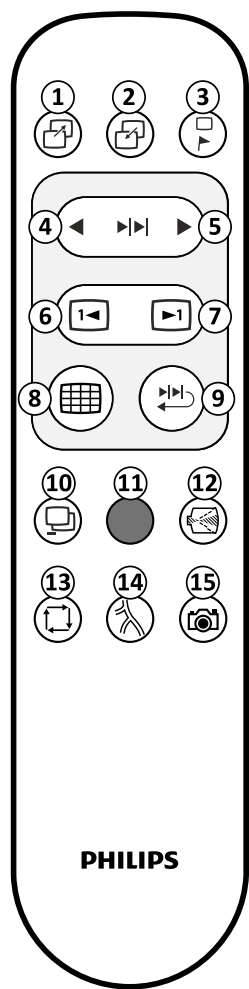





Figure 207 Remote control

Key	Description
1	Park
2	Recall mask
3	Protect image
4	Previous run
5	Next run
6	Previous image
7	Next image
8	Overview
9	Run cycle
10	Subtract on/off
11	Not used
12	Detector zoom
13	Mode
14	Automatic Vascular Outlining
15	Snapshot

12.8 Touch Screen Gestures

You can use touch gestures on the touch screen module.

Gesture	Action	Effect
Tap		Tap the screen on a function Activates the function
Drag		Touch an item or region in the window and move across the screen Drags an item on the screen, or pans the image
Slide		Touch a list item and move up or down Scrolls the list

NOTE Functions on the C-Arm Stand Touch Screen Activates when you release your finger from the touch screen. The amount of force used to tap controls on the C-arm stand touch screen is irrelevant.



WARNING
Do not use excessive force and/or sharp objects to operate the touch screen. It may result in damage to the screen

12.9 Table Side Operator for Motorized Model

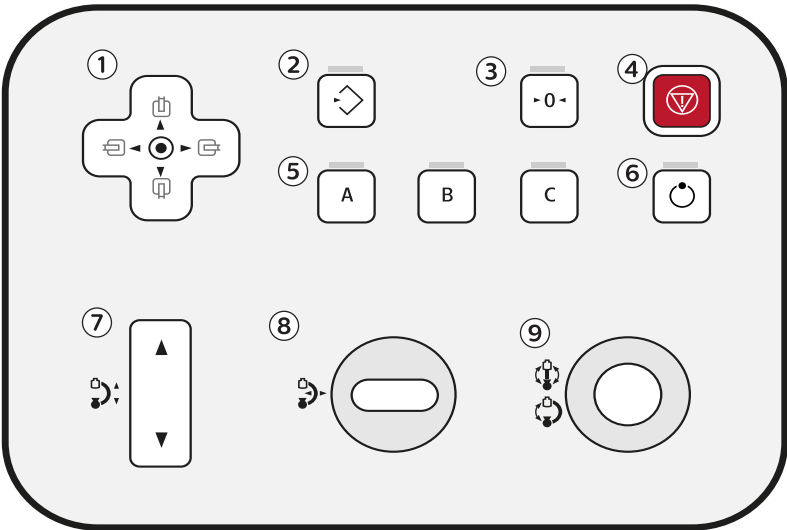


Figure 208 Table Side Operator

Key	Description
1	The lit blue LED indicates the position of the operator
2	To save the current C-arm position
3	To reset the C-arm to Home position

Key	Description
4	To stop all ongoing motorized movements
5	To save and recall the positions
6	To switch on the TSO
7	Motorized C-arm Height up/down movement
8	For C-arm Forward/Backward motorized movement at constant speed
9	For C-arm Angulation & Rotation motorized movement

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This medical device conforms with the applicable requirements set out by the European Union, as demonstrated in the Declaration of Conformity.

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