PHILIPS

Instructions for Use

English

4598 013 56696

Philips Zenition 70

Release 1.1

Contents

1 Introduction

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

1.1 About the System

Zenition 70 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.

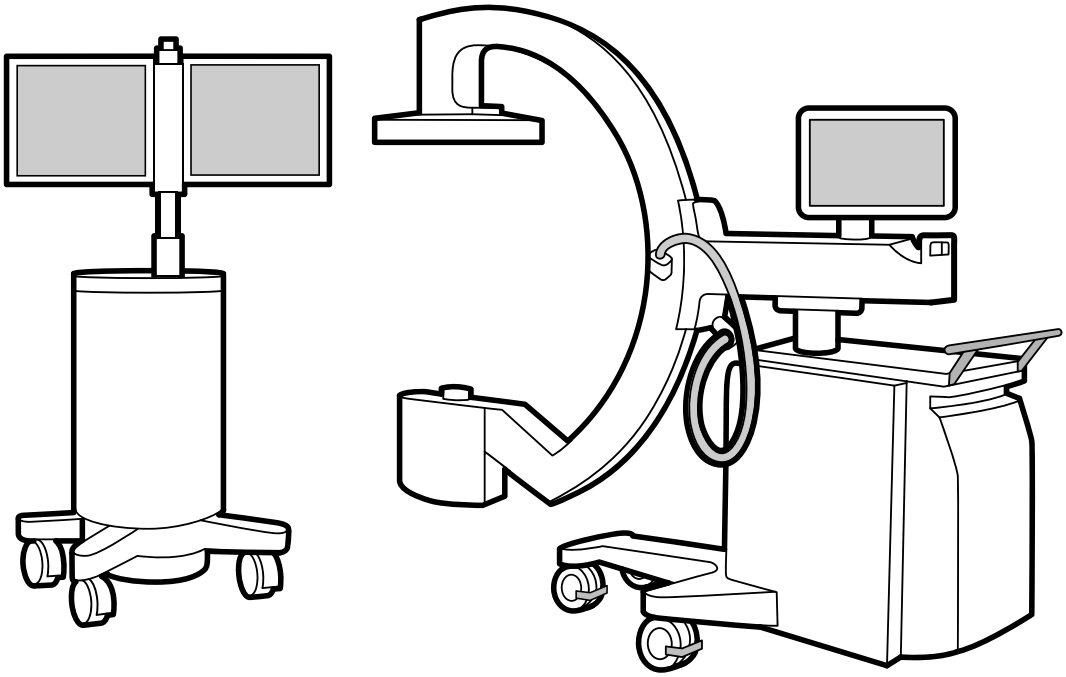


Figure 1 System overview: mobile view station (left) and C-arm stand (right)

1.2 About These 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 or features 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 and accessories. Not every function described may be available on your system.

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) 4598 013 5669X, 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.***

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

1.3 Intended Use

The Zenition 70 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 Zenition 70 device 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 device.

The device is used for radiological guidance and visualization during diagnostic, interventional and surgical procedures on all patients, except neonates (birth to one month), within the limits of the device. 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 70 device 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 device.

Patient Population
Patients can be any human, except neonates (birth to one month), of whom any part of the body (from head to toe) can be subject of examination.

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

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 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 Contra-indications

The system should not be used if any of the following contra-indications exist or are thought to exist:
- Acute skin burns (patients)
- Acute hair loss (patients)
- Chronic radiation injury (staff).

Special consideration must be given in the following situations:
- Protection of the embryo or fetus during radiological examination or treatment of women known to be pregnant
- Sensitive body organs (for example: lens of eye, gonads) must be shielded whenever they are likely to be exposed to the working beam.

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 70 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 by email.

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

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)
- *Contra-indications* (page 14)
- *Compatibility* (page 14)
- *Training* (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 194).

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.

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).

WARNING
Do not use the system with any products other than those which Philips Medical Systems recognizes as 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 Power Off

In case of emergency, switch the system off.

1 To switch off only the C-arm stand in an emergency, press the **Emergency off** button on the C-arm stand console.

X-ray generation and height 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.

2.2.2 Recovery Procedure

Use this procedure if the system does not respond.

1 Press the **System off** button on the mobile view station.

The system switches off (the shutdown time is less than 100 seconds).

NOTE ***For time critical situations, you can switch the system off faster by pressing the System off button for at least 3 seconds (shutdown time in this case is 3 seconds). This may cause data to be lost and may increase the system startup time (up to 5 minutes) for the next start.***

2 Wait 5 seconds.

3 Press the **System on** button on the mobile view station.

The startup time for radioscopy imaging is less than 80 seconds. If a password protection is enabled, see *Switching the System On* (page 79).

The system starts with default settings and a new patient.

NOTE ***The startup time may increase (up to maximum 10 seconds) if the disk is under maximum utilization.***

4 To continue the procedure, select the previously used examination type and acquisition mode.

When the procedure is finished, you can modify the patient name and other administration items for the current acquisition patient. You cannot continue the previous examination.

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.

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.

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.

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 the Transport Position* (page 67). 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.

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 disabled position and the system lock key is removed to prevent accidental motorized movements or radiation emission.

Figure 2 System lock (system disabled)

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 207).

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 207).

WARNING
Class A equipment is intended for use in all establishments other than domestic; therefore there may be potential difficulties in ensuring electromagnetic compatibility in domestic environments, due to conducted as well as radiated disturbances.

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.

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 3 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.

To switch the system to X-ray disabled state and back to X-ray enable state, perform following steps

1 On the C-arm stand touch screen/Touch Screen Monitor, tap on **System** menu. A pop-up screen is displayed with following toggle button options - Disable X-ray, Test Buzzer, Auto Run Cycle and Close.

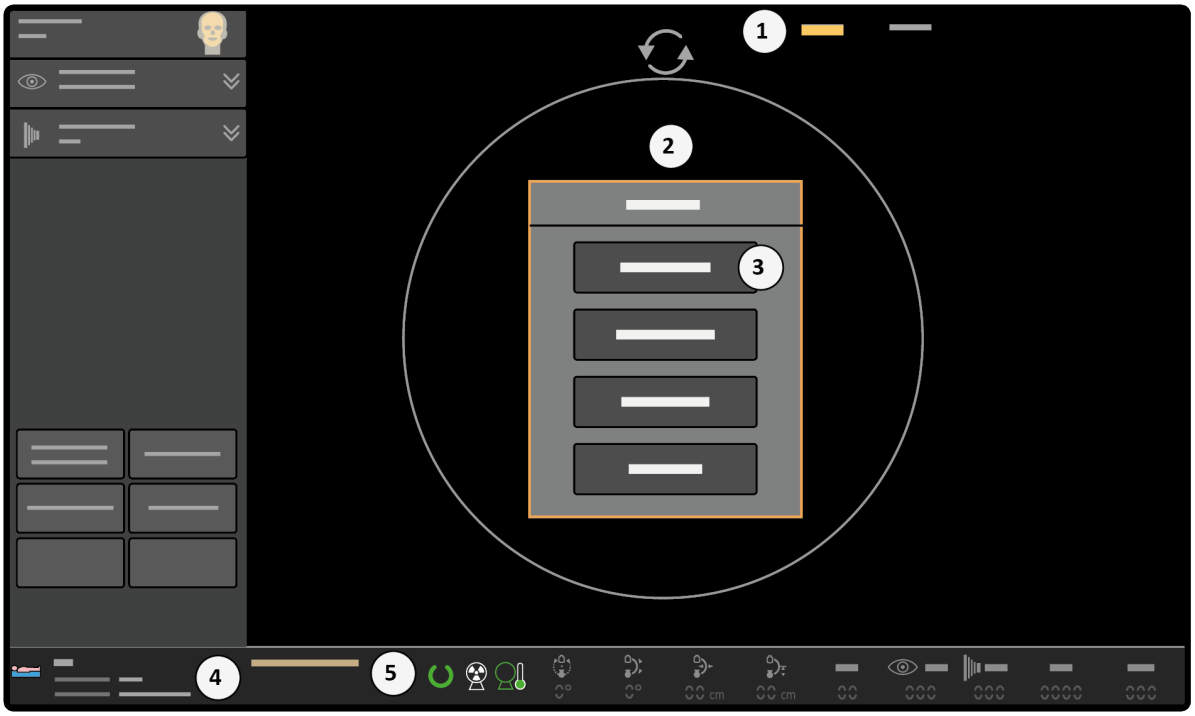


Figure 4 System menu pop-up

Legend			
1	System menu	4	System status OK message
2	A pop-up with toggle buttons	5	System ready icon status
3	Disable x-ray toggle button inactive		

Figure 5 MVS - system ready icon

2 Tap **Disable X-ray** toggle button to disable the x-ray.

3 **X-ray is disabled, Go to the system menu to enable** warning message will be displayed. Click **OK** to confirm x-ray is disabled.

4 Now again Tap **System** menu on C-arm stand touch screen/Touch Screen Monitor. Disable X-ray button is active and checked on the C-arm stand touch screen/Touch Screen Monitor. In addition, on the MVS, system not ready icon is displayed.

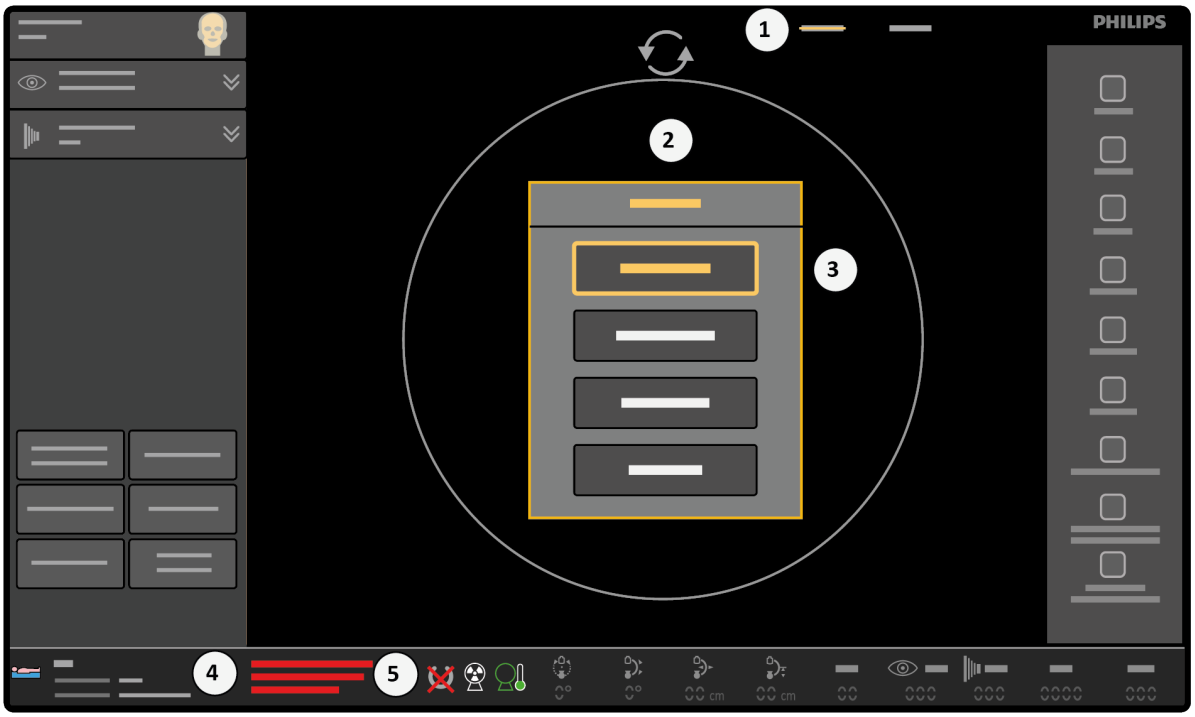


Figure 6 Active Disable X-ray toggle button

Legend			
1	System menu	4	X-ray disabled message
2	A pop-up with toggle buttons	5	System and irradiation icons are displayed
3	Disable x-ray toggle button active		

Figure 7 MVS - system not ready icon

5 To enable X-ray state, go to the **System** menu and tap on active **Disable X-ray** toggle button.

6 Click **Close** to close the pop-up screen.

NOTE ***X-ray disabled toggle button is not accessible, if the system lock key is in 0 position.***

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.

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.
- 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 117).
- 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 adverse 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

Use special care when imaging patients outside the typical adult size range. When performing pediatric radiation, the following rules should be followed:

- All rules mentioned in *Radiation Safety* (page 21).
- Do not radiate when it is not necessary. Use non-X-ray equipment when possible (e.g. ultrasound).
- Remove any objects in the beam that are either not necessary to execute the procedure (e.g. mattresses, pillows, tubes, etc.) or that are not radiolucent.
- For small or thin objects, remove the detachable grid (see *The C-arm Stand* (page 48)).
- Select the correct procedure and anatomy or detailed procedure for the anatomy (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 or left pedal on the foot switch. 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.

Design Features Important to Pediatric Imaging	Reference
Procedure selection	*Changing the Default Examination Type* (page 45)
Dose level selection	*Making Fluoroscopy Images* (page 105)
Pulse rate selection	*Making Fluoroscopy Images* (page 105)
Removable grid	*The C-arm Stand* (page 48)
Automatic dose control	*Automatic Shutter Positioning* (page 116)
Laser aiming devices	*Laser Aiming Devices* (page 59)

Testing Information	Reference
Estimated patient dosimetry	• *Patient Dose Information - Dose Rate With Grid* (page 229) • *Patient Dose Information - Dose Rate Without Grid* (page 238)
Quality control instructions	*Maintenance* (page 194)

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

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 50, dated June 24, 2007.

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 50, dated June 24, 2007.

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.

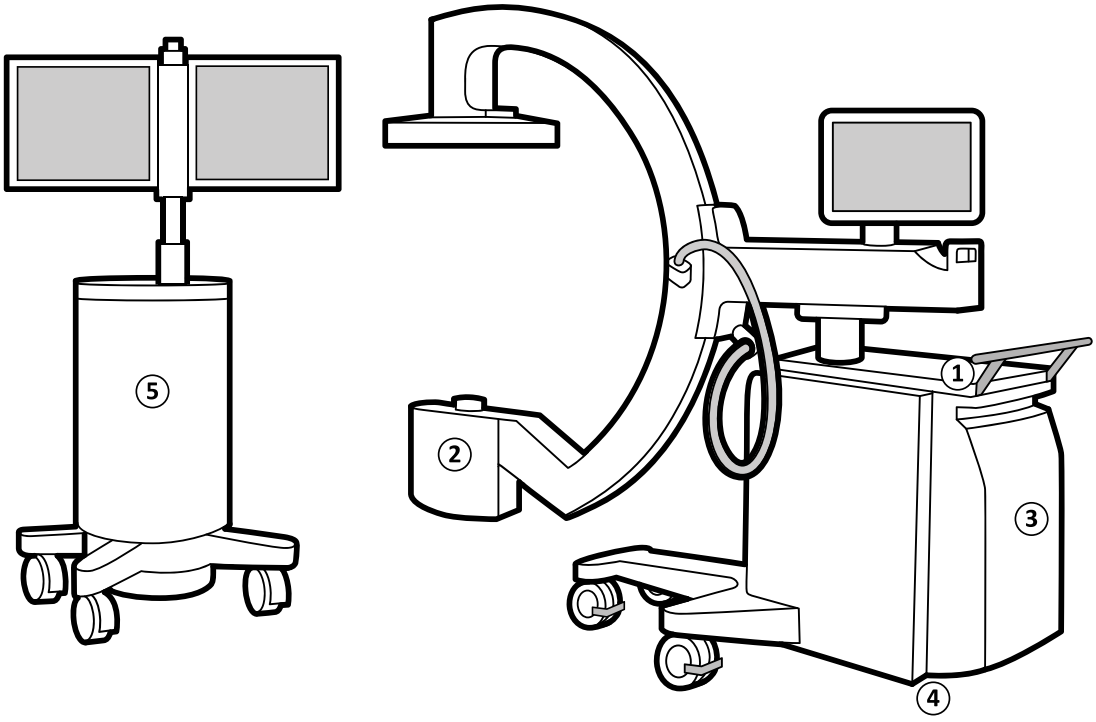


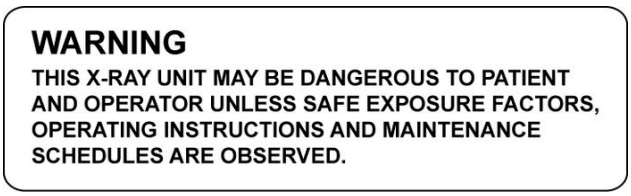
Figure 8 System overview

Legend	
1	C-arm stand console
2	X-ray tank
3	C-arm stand back cover

Legend	
4	Central labeling station
5	Front side of the mobile view station

Warnings on the C-arm Stand Console (1)

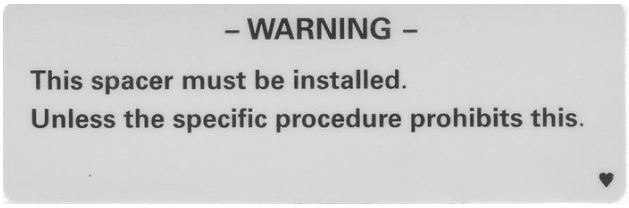
The following warning is displayed on the C-arm stand console. It is only applicable to the USA, China, Japan, and Canada.



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

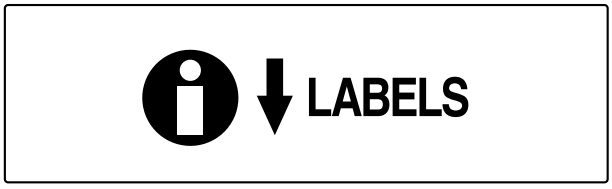
Warnings on the X-ray Tank (2)

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



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

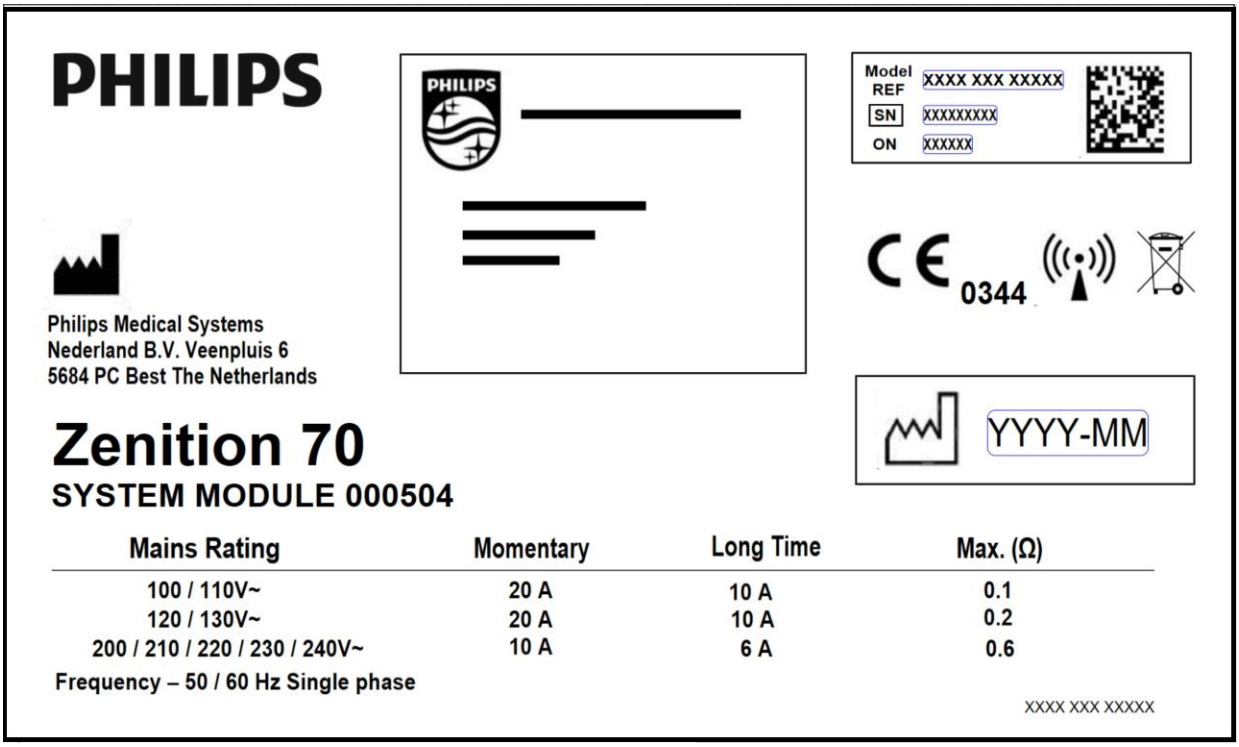
Figure 9 Certification label

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)

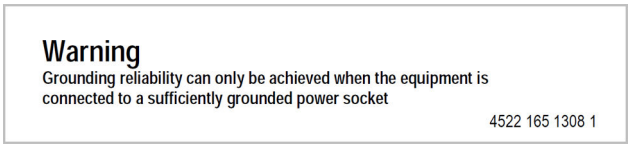
The following labels are displayed on the rear side of the mobile view station.



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~	20 A	10 A	0.1
120 / 130 V~	20 A	10 A	0.2
200 / 210 / 220 / 230 / 240 V~	10 A	6 A	0.6
Frequency - 50 / 60 Hz Single phase			

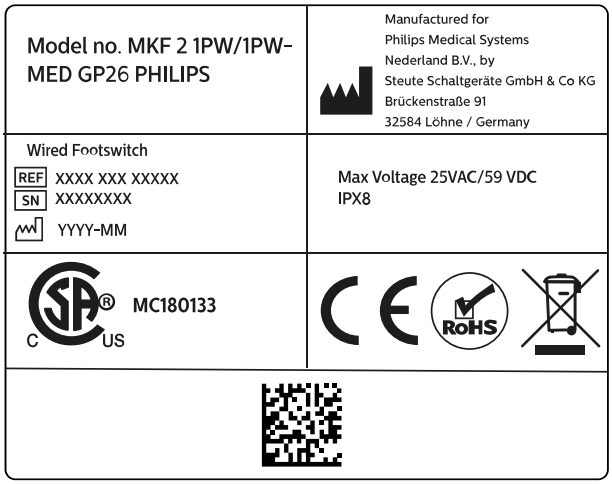
Label Text
Medical Electrical Equipment Certified according to CAN/CSA-C22.2 No. 60601-1-08 and ANSI/AAMI ES60601-1:2005

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



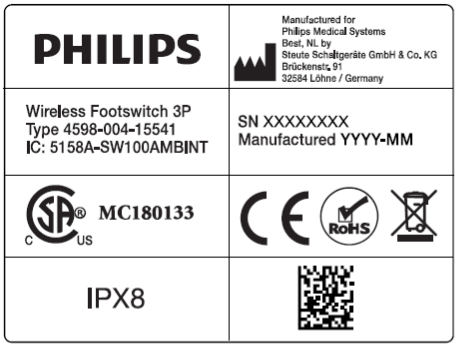
Label Text
Grounding reliability can only be achieved when the equipment is connected to a sufficiently grounded power socket.

Foot Switch Label

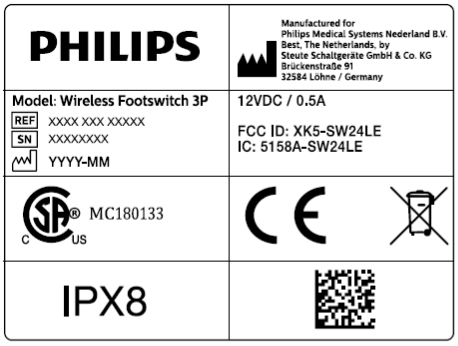


Wireless Foot Switch Label

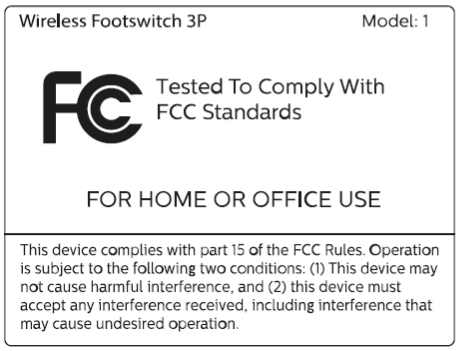
Type 1 Product Label



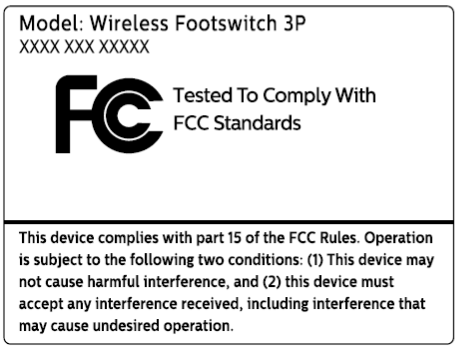
Type 2 Product Label



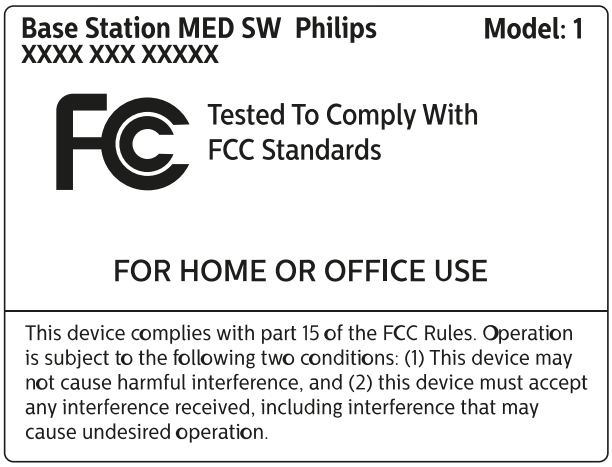
Type 1 FCC Standards Label



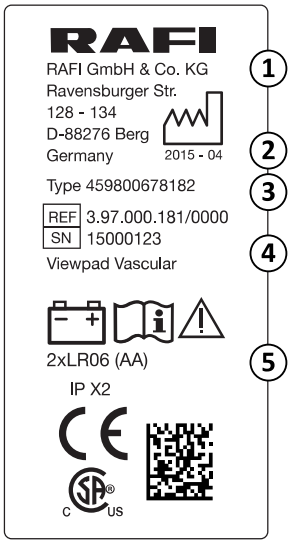
Type 2 FCC Standards Label



Wireless Foot Switch Base Station



Remote Control Label



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

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

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 Directives. 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.

Canadian Standards Association
This symbol indicates that the system has been tested and certified by the Canadian Standards Association to comply with the applicable U.S. and Canadian Standards.

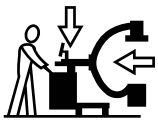
Small Focal Spot
The value next to the symbol indicates the size of the small focal spot.

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 67).

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.

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
- IPX3: Protection against ingress of solid foreign objects is not specified, and protection against ingress of water with harmful effects from spraying
- IP27: Protection against ingress of solid foreign objects greater than 12.5 mm in diameter, and protection against ingress of water with harmful effects from temporary immersion
- 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, as defined in EU Directive 93/42/EEC. 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.

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

Detailed information on product recycling is available in the Product Recycling Passport:

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:

www.philips.com/about/sustainability

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 Zenition 70 System* (page 48)).

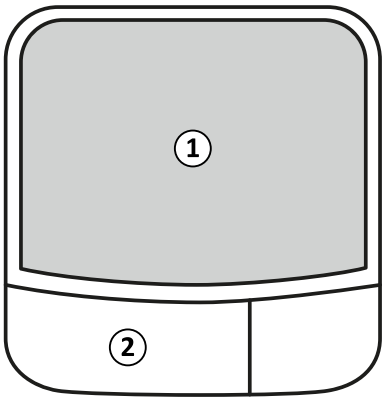


Figure 10 Touch pad

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

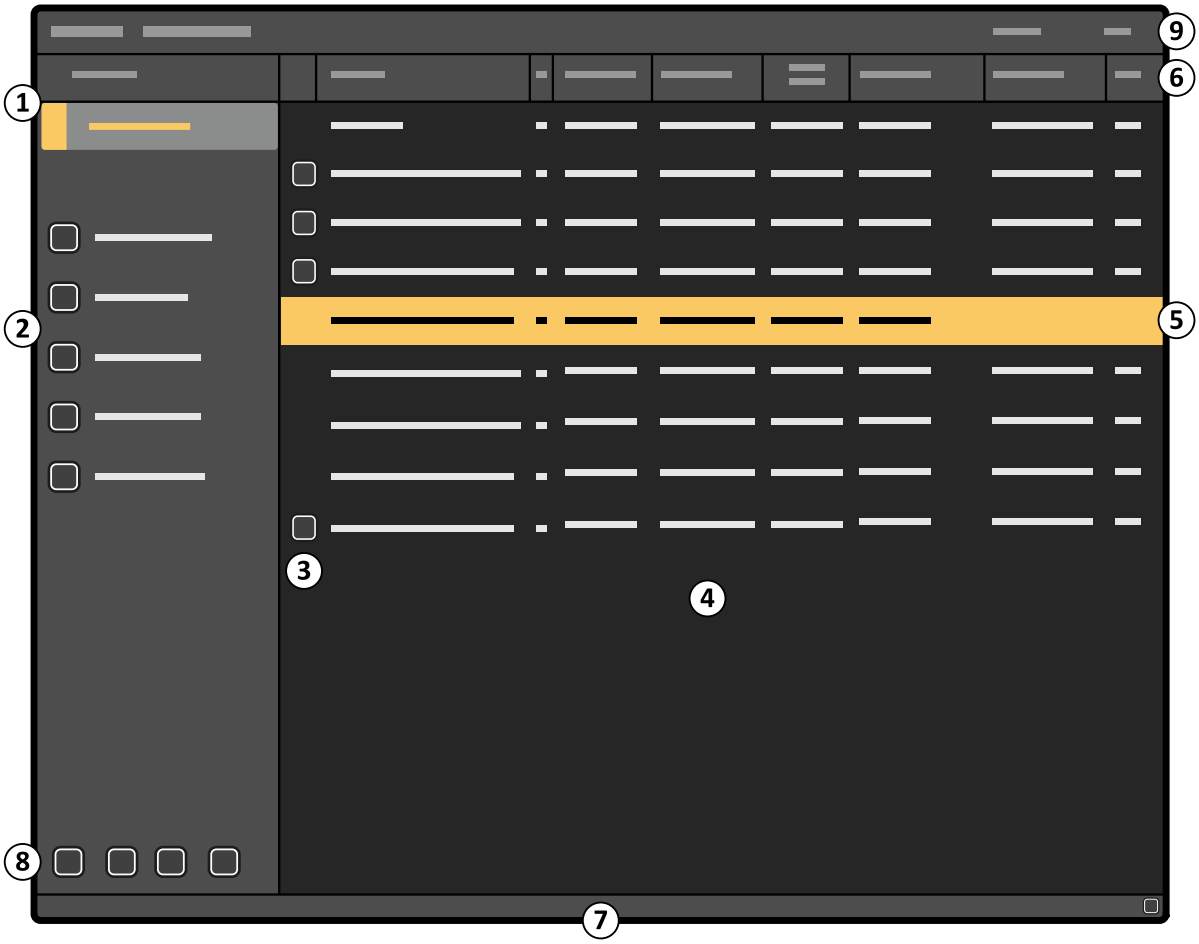


Figure 11 Mobile view station interface (administration screen) on the examination monitor

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 90)

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 154).
	**Save**	Use this tool to save data to USB, DVD or CD. For more information, see *Saving Images to Local Media* (page 155).
	**Print**	Use this tool to print data on a DICOM network printer. For more information, see *Printing Images (Option)* (page 157).
   	**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 158).

Top Bar Menu

The top bar menu provides access to additional functions like the job viewer, wireless network information, password management, system setup, remote assistance, and help information.

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 77) and *Height Movement* (page 76).

For an overview of all the buttons available on the C-arm stand, see *C-arm Stand Console* (page 280) and *C-arm Stand Height Movement* (page 282).

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 67).

For an overview of all the functions available on the C-arm stand touch screen, see *C-arm Stand Touch Screen* (page 281).

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.

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 12 System Setup dialog box

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

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 42).

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 43).

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 43).

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 43).

Language

This is the language used for the system user interface. For more information, see *Changing the User Interface Language* (page 45).

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 89) and *Changing the Instructions for Use Language* (page 45).

Default Procedure/Examination Type

This is the default procedure, used in conjunction with the default anatomy/detailed procedure. For more information, see *Changing the Default Examination Type* (page 45).

Default Anatomy/Detailed Procedure

This is the default anatomy/detailed procedure, used in conjunction with the default procedure/examination type. For more information, see *Changing the Default Examination Type* (page 45).

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 64)

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 Test Image** to use.

3 Select the desired **Position** for the IQ test image on the screens.

Three positions are available.

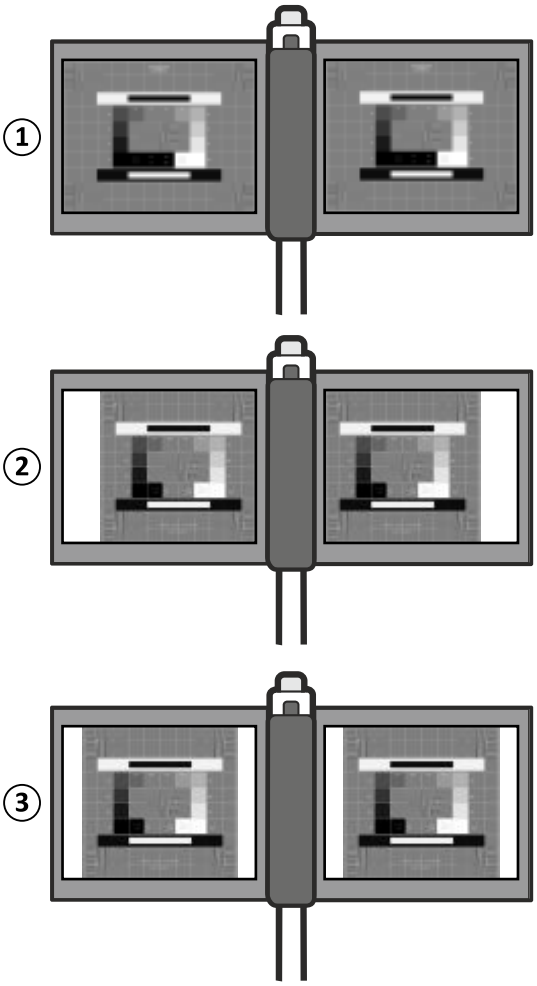


Figure 13 IQ test image positions

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 **Share**.

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 Test Image** 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 measurement	0.1 mm or 0.01 inch
Units of weight	kg or lb
Displayed identification	Patient ID (default) or Accession number
Accession number	Read-only (default) or Editable
Contrast step 1	120%, range 50% - 150%
Contrast step 2	135%, range 50% - 150%
Contrast step 3	150%, range 50% - 150%
Brightness step 1	106%, range 50% - 150%
Brightness step 2	113%, range 50% - 150%
Brightness step 3	120%, range 50% - 150%
Image rotation angle	0, 90, 180, 270 degrees only
Default Shutters positioning angle	0, 90 degrees
Couple Shutters button	Hidden, Visible
Auto Shutter Positioning	Enable, Disable
CO2 (trace white) selection	Disable, Enable
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	1000 mGy, range 1 - 9999 mGy
Auto high level reset	No, Yes
Dose selection RC Mode Key	Disable, Enable
Collimator lines visible	No, Yes
Close examination	Hidden, Visible
Export to Media	Disable, Enable

Examination types	Settings
Anatomy / detailed procedure name	Anatomy and detailed procedure names can be changed, but parameters stay the same.

Procedure/anatomy parameters	Settings
Automatic contrast brightness	On, Off
View trace on the C-arm stand	Visible, Hidden
Start kV	40 to 120 kV

Examination parameters	Settings
Image measuring field	Auto, 1, 2, 3,4, 5, 6, 7
Middle foot switch	Off, Toggle
Acquisition mode on UI	Visible, Hidden
Default pulse rates	30, 15, 8, 4, 2, 1 (max. 3 pulse rates)
Default Dose	Low, Normal, Medium, High
Storage [1]	All, off
Store LIH	True, False
Trace Black/White	Black, White
Subtraction gain	0 to 8
Landmarking gain	0 to 3
Contrast	-49 to +49
Brightness	-49 to +49
Harmonization	0 to 1 (step size 0.01)
Edge enhancement	Off, 1 to 15

[1] The default setting can be configured for the left button on the hand switch (the foot switch pedal uses the same settings).

Printer settings (option)	Settings
Brightness selection (gamma curve) for paper/transparency	Variable, see printer manual
Auto cut paper/transparency	On or off

4 System Overview

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

4.1 About the Zenition 70 System

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

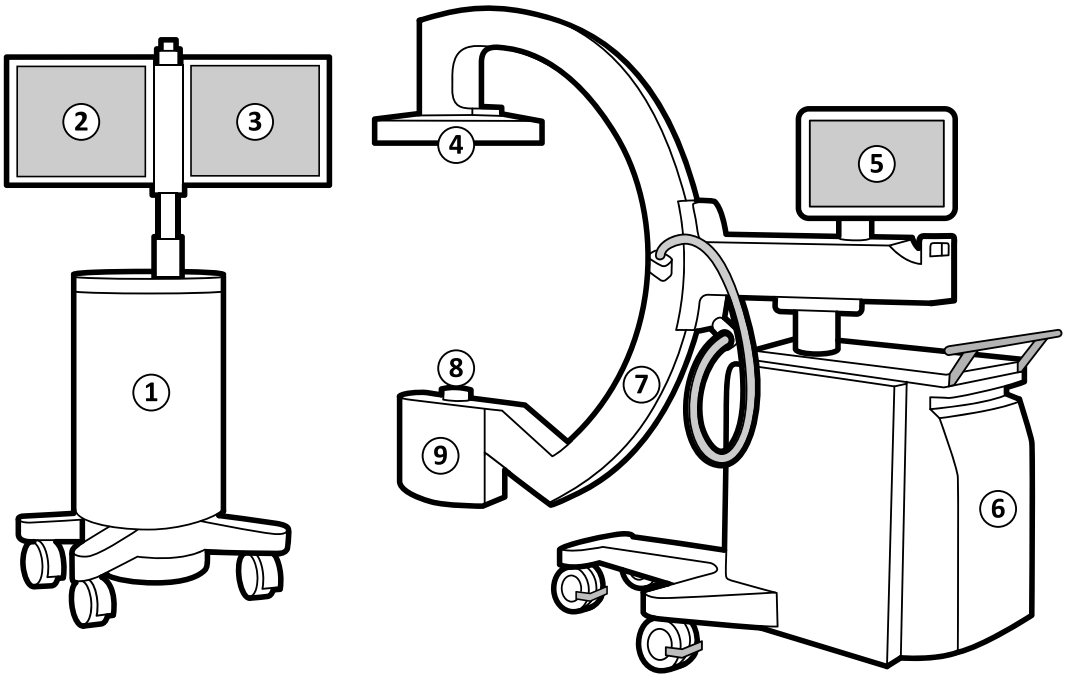


Figure 14 System components

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 Configuration

This section covers configuration 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.

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).

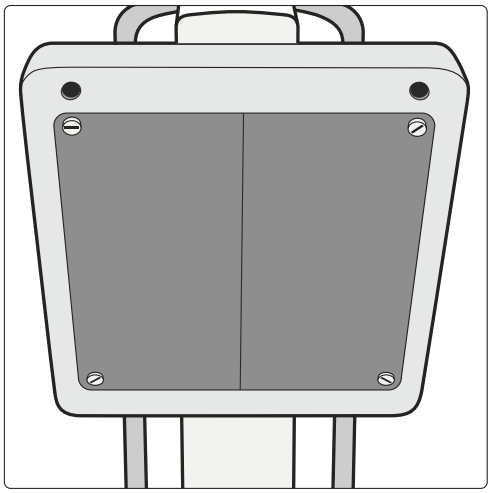


Figure 15 X-ray grid

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.

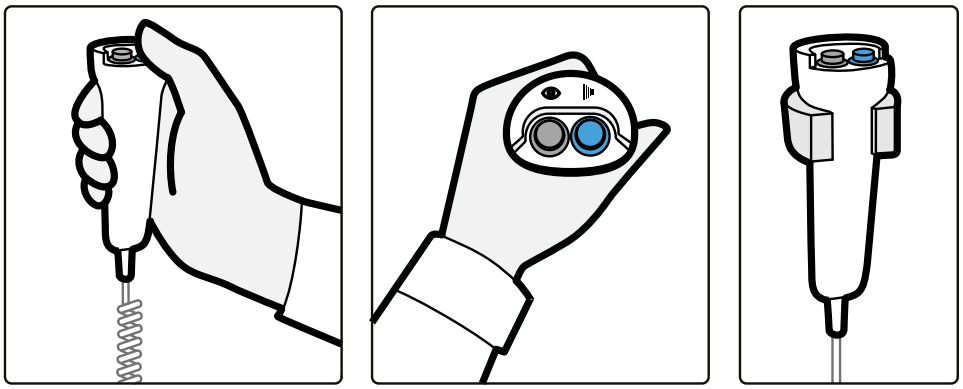


Figure 16 Hand switch

You can also use the system with foot switches. For more information, see *Wireless Foot Switch* (page 64) and *Wired Foot Switch* (page 66).

Movements and Brakes

The C-arm is fully counterbalanced and the brakes are manually controlled. The height movement is 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 67) 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 73) for details.

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

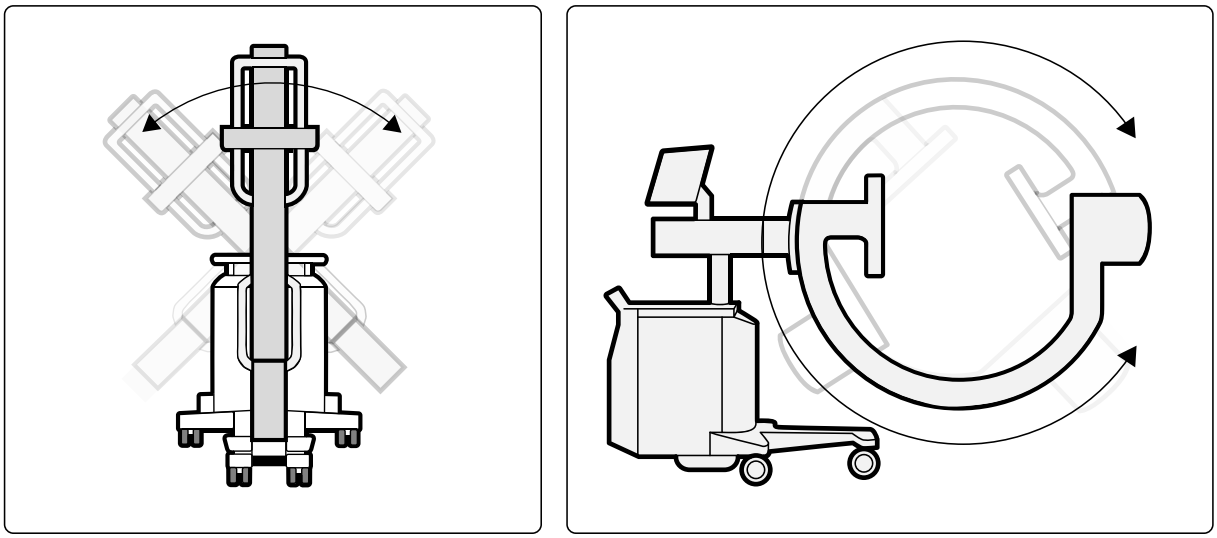


Figure 17 C-arm rotation (left) and angulation (right)

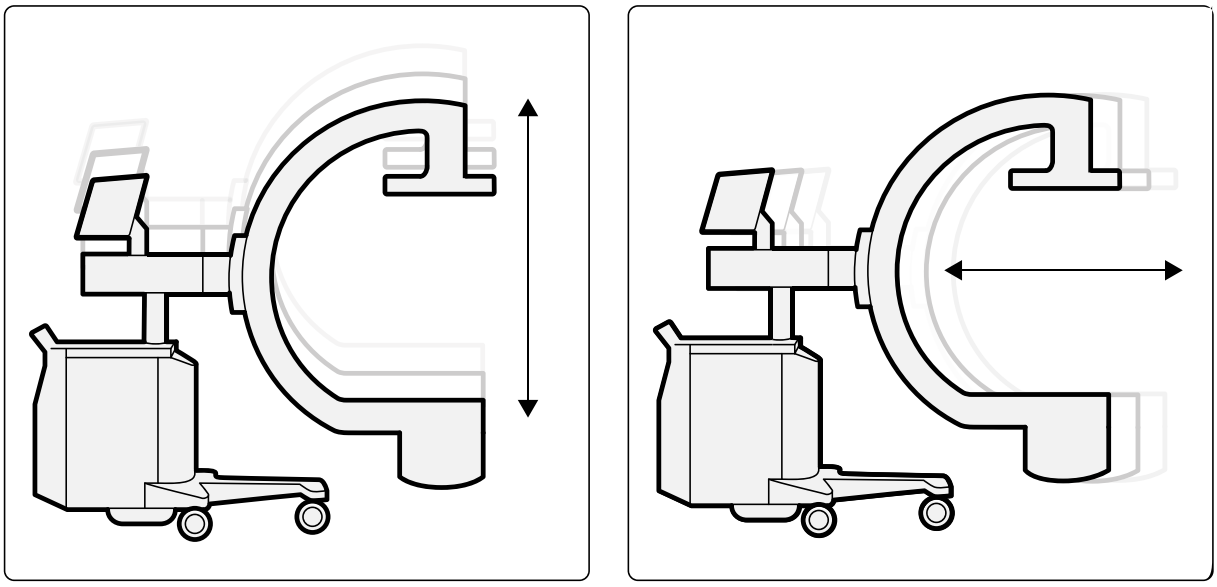


Figure 18 C-arm height (left) and longitudinal (right) movement

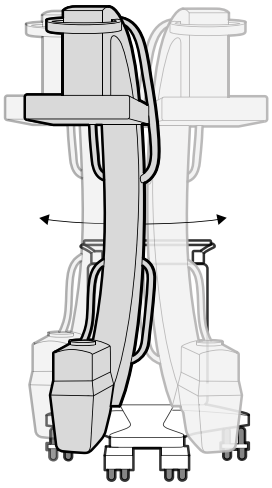


Figure 19 C-arm swivel

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.

The motorized height movement is controlled using buttons on either side of the C-arm console. For more information, see *C-arm Stand Height Movement* (page 282).

For an overview of the C-arm stand console buttons see, *C-arm Stand Console* (page 280).

The C-arm Stand Touch Screen

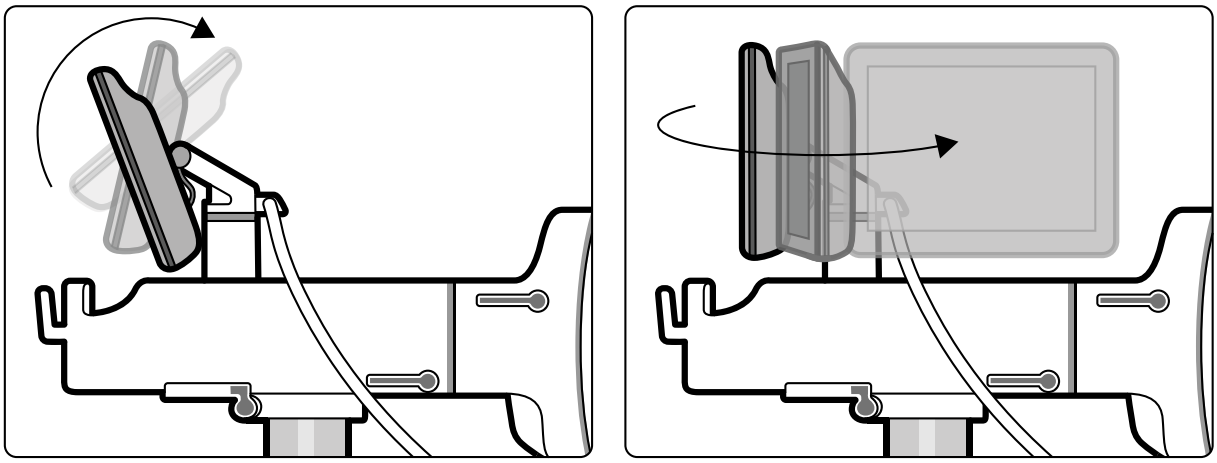


Figure 20 C-arm stand touch screen

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 67). For an overview of the C-arm stand touch screen controls see *C-arm Stand Touch Screen* (page 281).

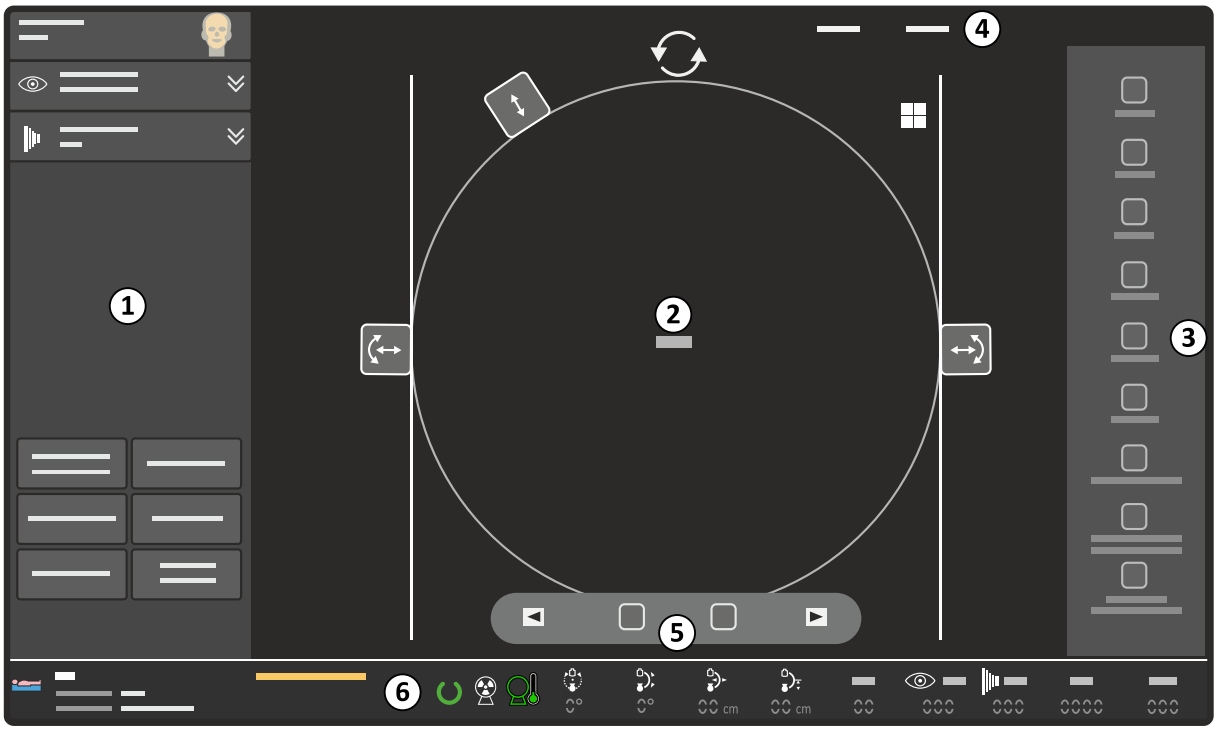


Figure 21 C-arm stand touch screen layout

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
  - Pulse rate
  - Storage
  - Reducing blur and noise
- Exposure
  - Mode
  - Pulse rate
  - Storage
- Zoom
- ClearGuide
- Detector laser
- Tube laser (if installed)
- kV manual/auto
- C-arm position memory (if installed)

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 193).

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.

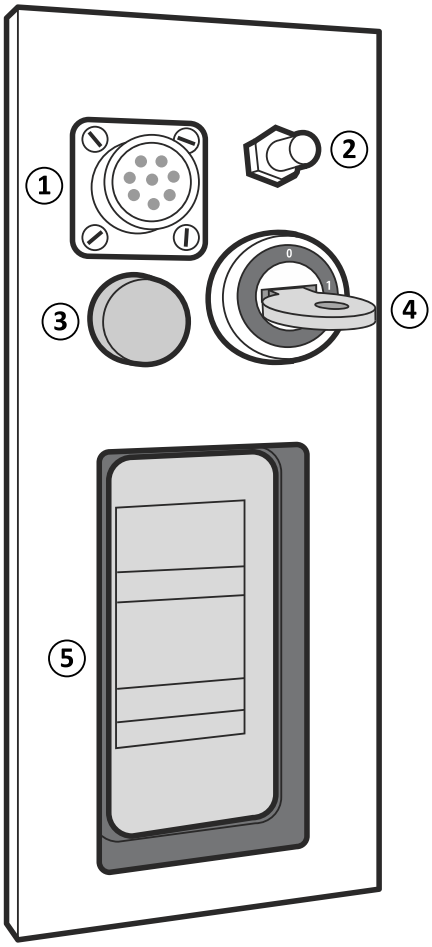


Figure 22 C-arm stand connector panel

Legend			
1	Foot switch connector	4	System lock
2	Equipotential earth connection	5	Mobile view station connector
3	Energy storage unit indicator		

For more information, see the following sections:

- *Connecting the Wired Foot Switch* (page 191)
- *Equipotential Ground Connection* (page 18)
- *Connecting the System* (page 77)

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.

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

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 86).

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 274).

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 67). For an overview of the console, see *Mobile View Station Console* (page 279).

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.

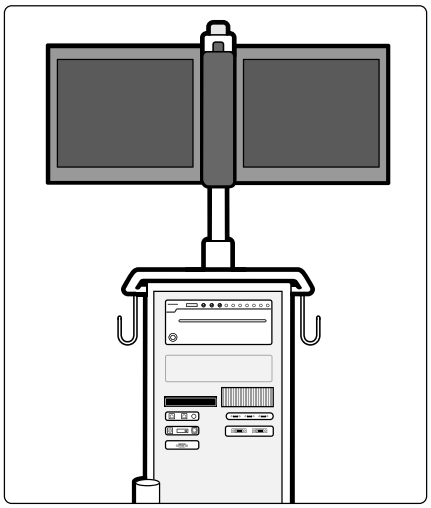


Figure 23 Mobile view station connector panel

Available Connectors

The mobile view station connector panel provides the following connectors:

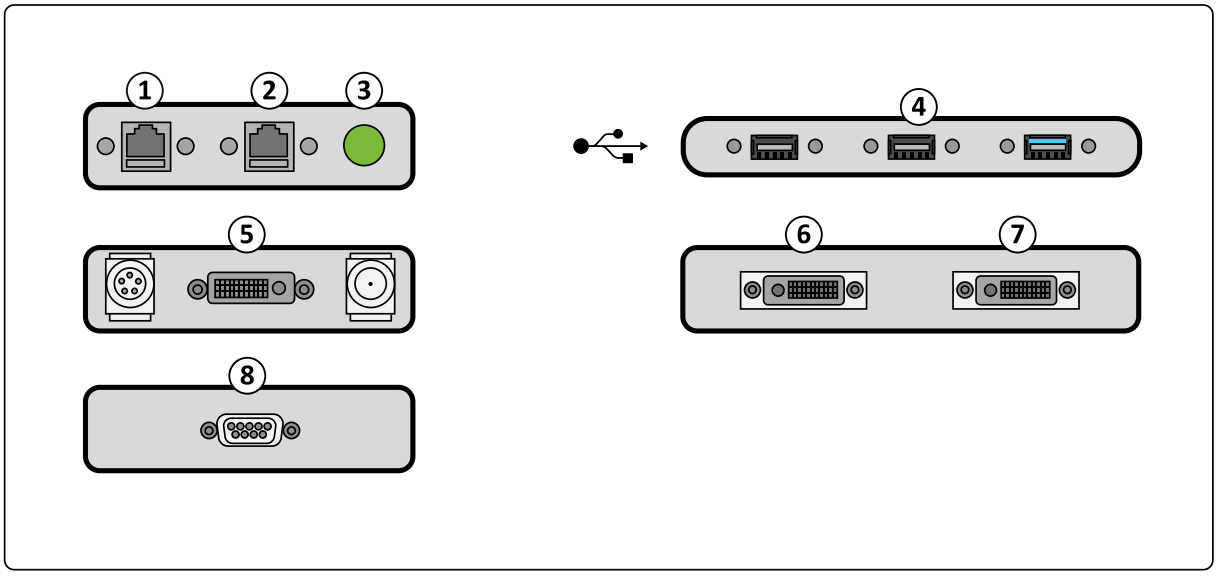


Figure 24 Mobile view station connector panel - available connectors

Legend			
1	Hospital network port	5	Video input connectors (optional)
2	Service connection port	6	DVI out (examination monitor)
3	Mains connection indicator	7	DVI out (reference monitor)
4	USB connectors	8	Warning light connector

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 70 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.

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, 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 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 285).

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 202).

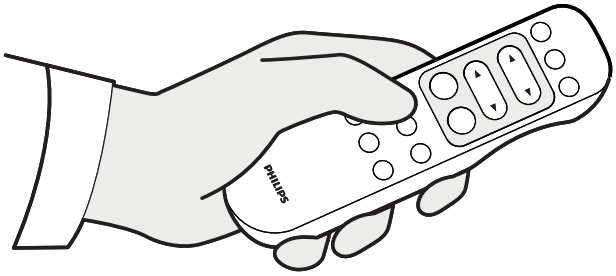


Figure 25 Remote control

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
Always remove the batteries if the remote control will not be used for some time.

4.2.5 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.
- Mark the center of the X-ray beam on the skin of the patient, for incisions and foreign body removal.

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 61).

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.

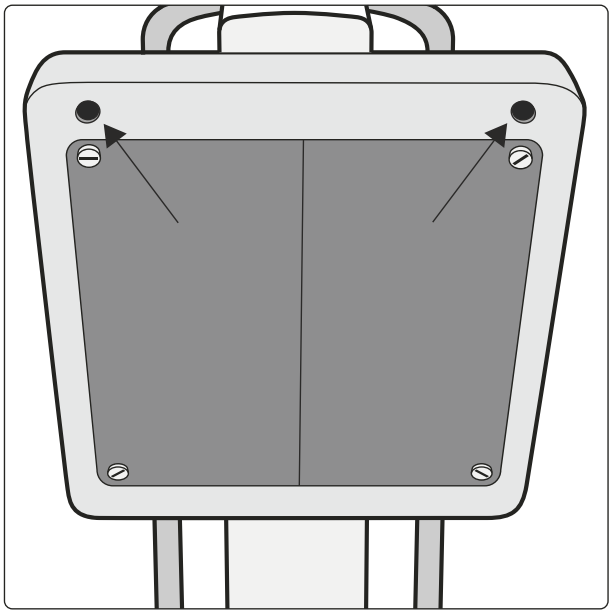


Figure 26 Detector laser aiming device

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.***

4.2.6 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.

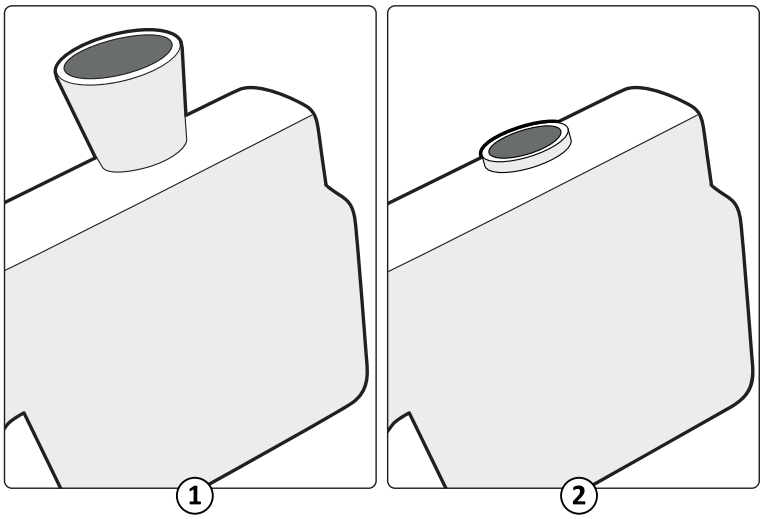


Figure 27 Spacers for minimum source-skin distance

Legend	
1	30 cm spacer
2	20 cm spacer

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 Zenition 70. 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.***

4.3.1 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 152)). 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).

4.3.2 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 163).

4.3.3 Paper/Transparency Printer

There are two possibilities for printing video images:

- Sony UP-971AD for printing on paper
- Sony UP-991AD for printing on paper or transparency film.

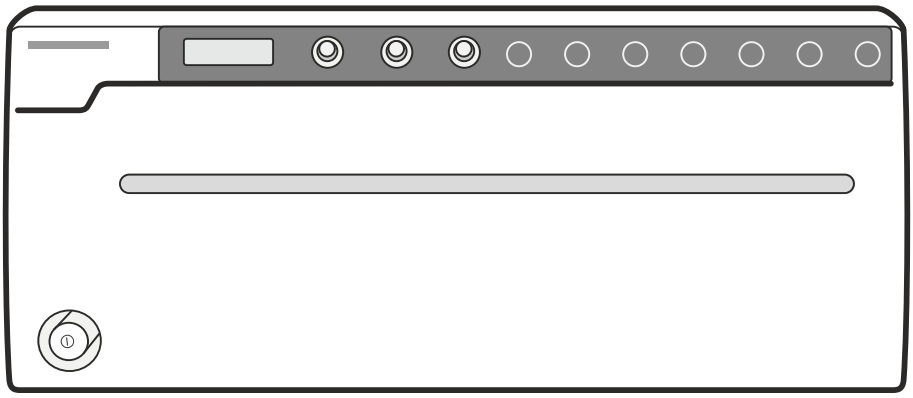


Figure 28 Printer

4.3.4 Vascular Extension

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

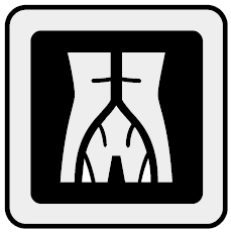


Figure 29 Vascular extension label on the C-arm stand console

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).
- CO_2 subtraction mode.
- CO_2 trace mode (live trace white).
- CO_2 roadmap with Smart Mask (reuse of previously acquired image).

4.3.5 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.

4.3.6 Cardiac Extension

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

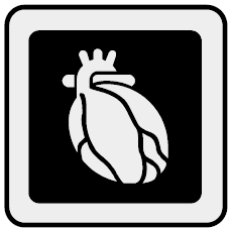


Figure 30 Cardiac extension label on the C-arm stand console

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 60 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.

4.3.7 Cardiovascular Extension

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

Figure 31 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.
- CO_2 subtraction mode.
- CO_2 trace mode (live trace white).
- CO_2 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.

4.3.8 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.

4.3.9 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 94).

4.3.10 Wireless Foot Switch

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

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

4.3.11 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 40)
- *Mobile View Station Connector Panel* (page 56)
- *Viewing External Video* (page 177)

4.3.12 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 177) and *Fitting the Spring Bow* (page 178).

4.3.13 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

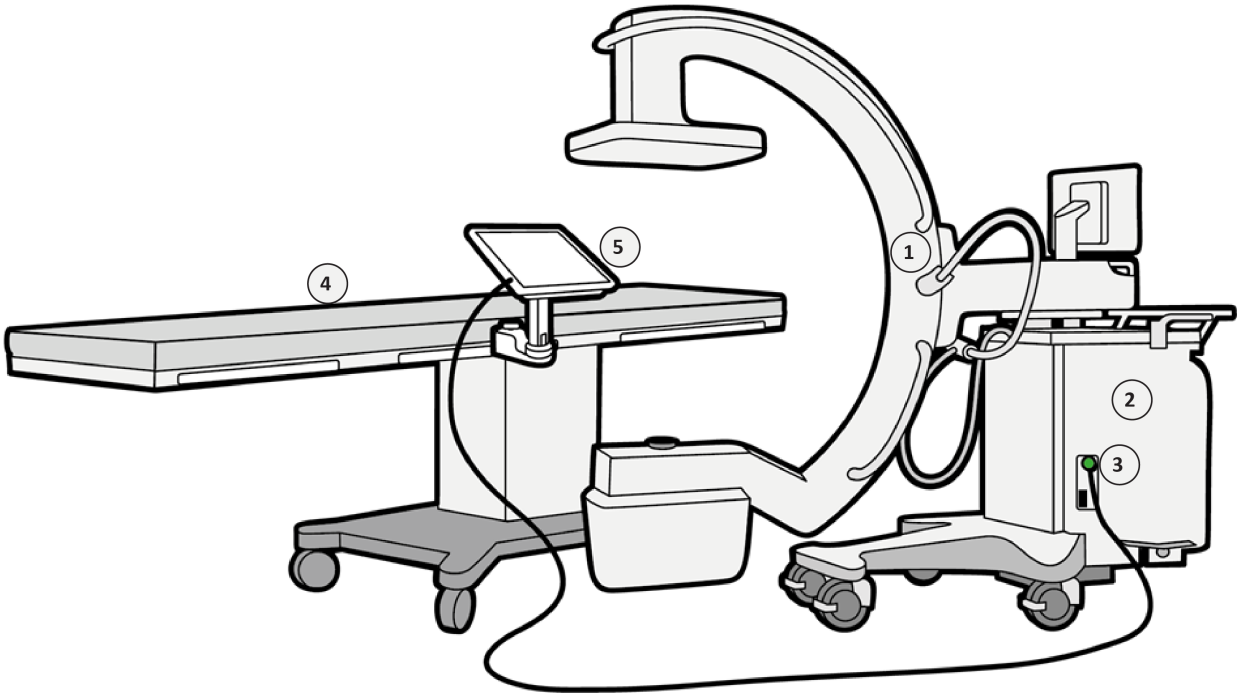


Figure 32 Touch Screen Module

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

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

To view list of functions that the TSM supports, (see *C-arm Stand Touch Screen* (page 281)C-arm Stand Touch Screen page 254)

For more information, see following sections:

Touch Screen Module (TSM) (page 178)

Touch Screen Gestures (page 286)

4.3.14 iApp software interface

iApp software interface is an optional feature that enables the system to work with third party software medical devices/iApps. For more details, refer third party software medical device / iApp Instructions For Use.

4.3.15 Collaboration Live

Collaboration Live feature can be used to communicate with Philips Zenition system user for support.

With Collaboration Live, you can perform following:

- Get real-time remote technical support from Philips.
- Share your screen with technical support from Philips.
- Activate remote takeover of the screen.

For more information, see *Collaboration Live Overwiew* (page 183)

4.4 Accessories

WARNING

Only the options and equipment delivered by Philips Medical Systems may be used in conjunction with the Philips Zenition 70. 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.***

4.4.1 Wired Foot Switch

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

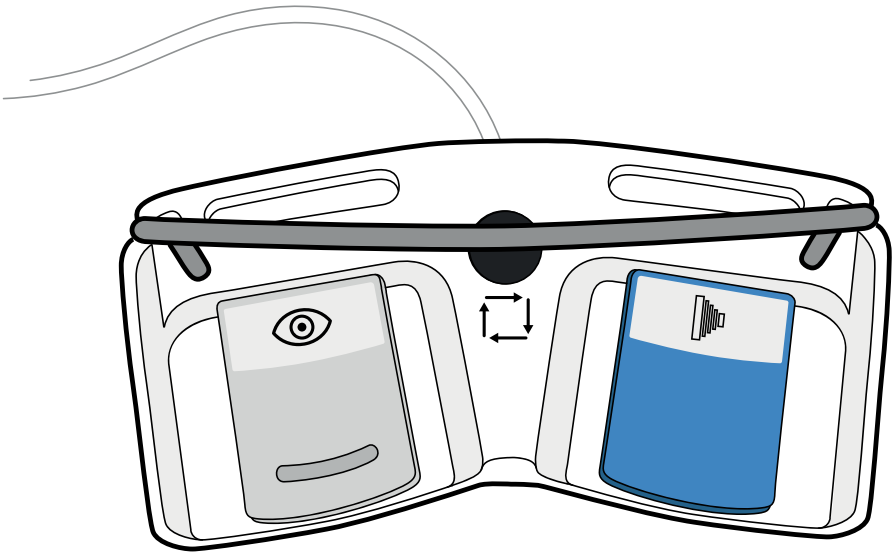


Figure 33 Wired foot switch

A wireless foot switch option is also available. For more information, see *Wireless Foot Switch* (page 64).

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.

For information about the user routine checks program and the planned maintenance program see *Maintenance* (page 194).

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 the Transport Position

You should position the C-arm stand in the following positions for transportation:
- Longitudinal travel 0 cm position
- Swivel movement 0 degrees position
- Height movement 8 cm position

- Rotation in 0 degrees position
- Angulation in 0 degrees 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.

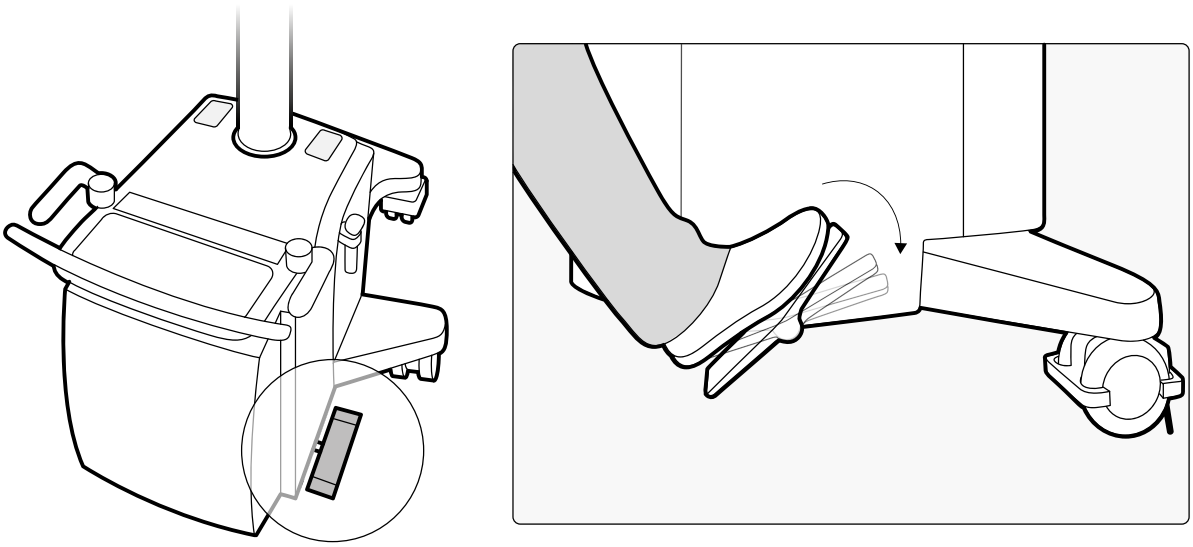


Figure 34 Releasing the C-arm stand brake

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.

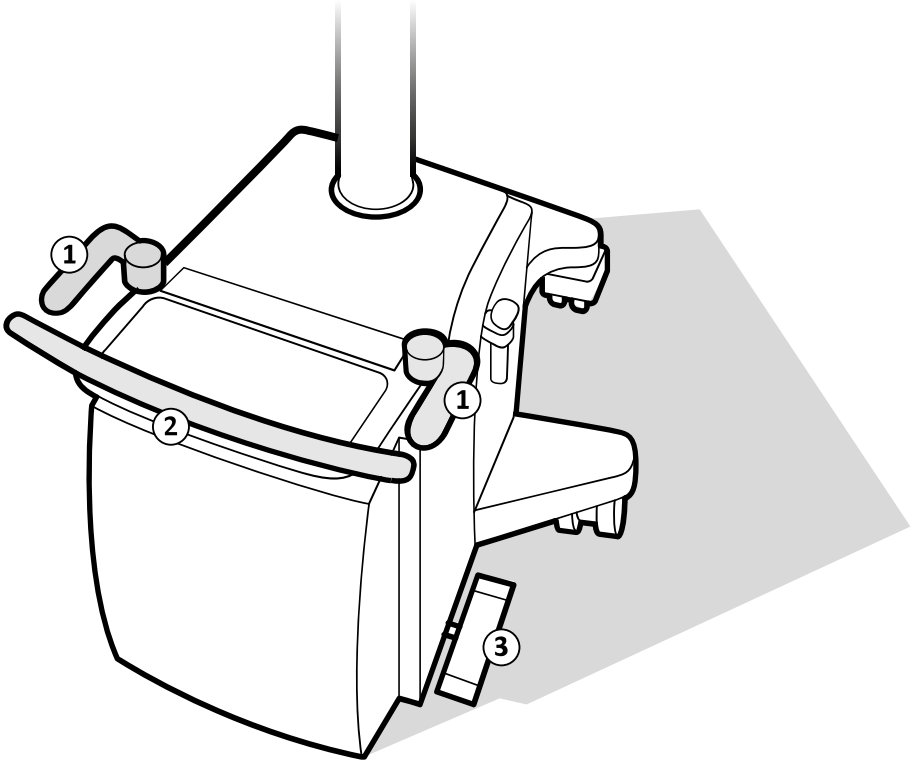


Figure 35 Moving the C-arm stand

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.

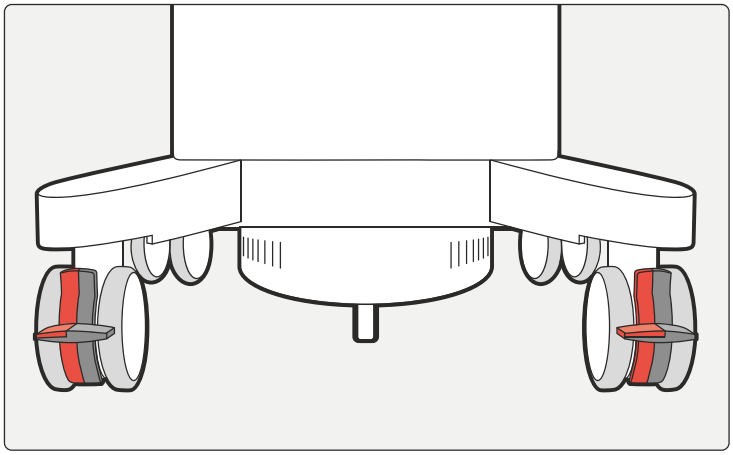


Figure 36 Dual pedals for locking and braking the mobile view station.

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

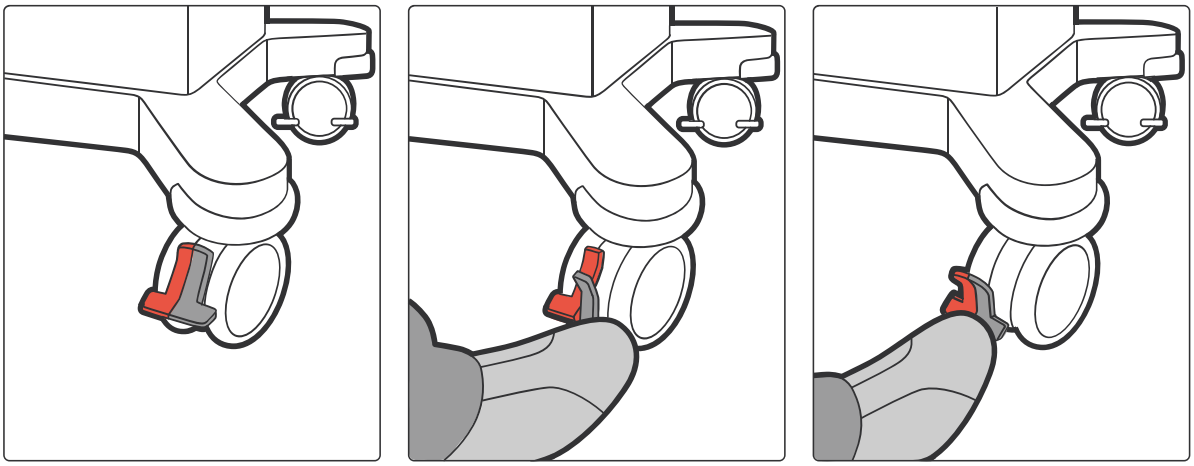


Figure 37 Wheels unlocked, locked for transportation with brakes not applied, and braked.

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 If applicable, 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.

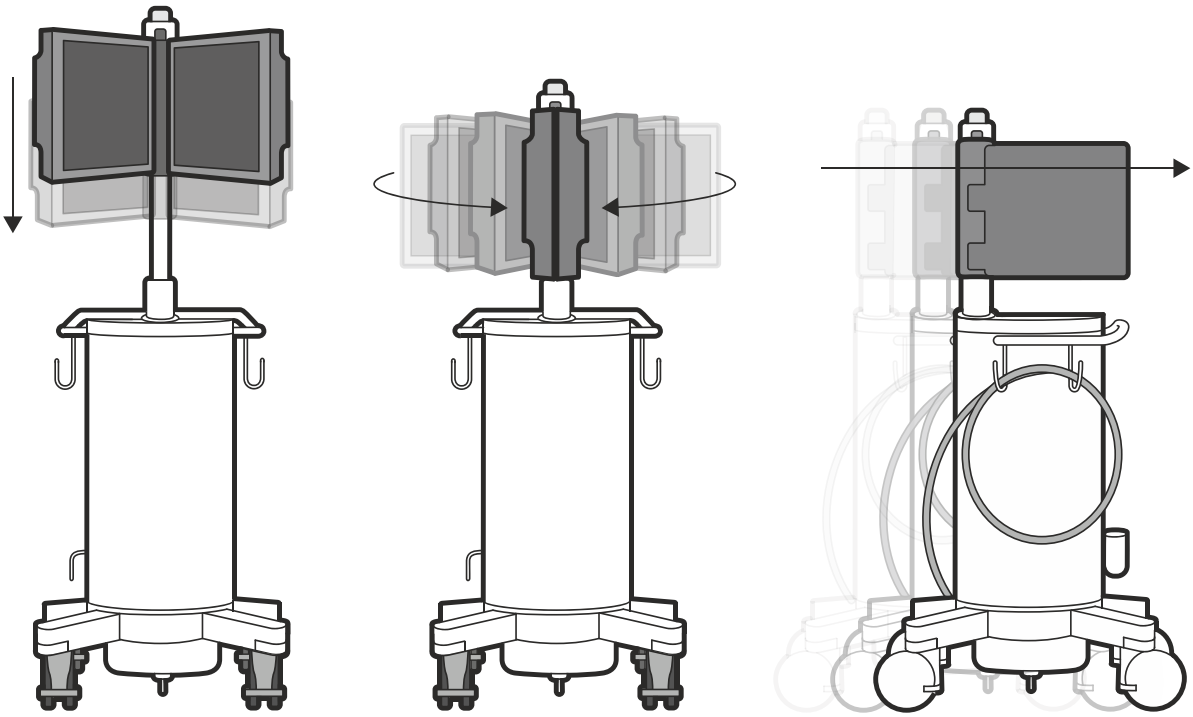


Figure 38 Putting the monitors in the transport position

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

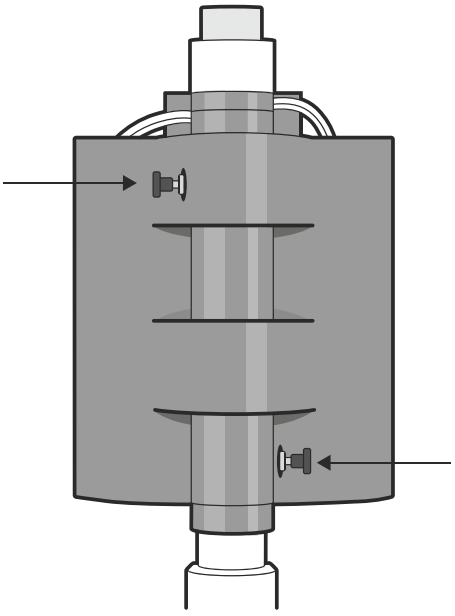


Figure 39 Monitors: locking bolts for transport

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.***

C-arm

If appropriate, fit sterile covers before using the system with a patient. For details, see *Accessories* (page 191).

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).

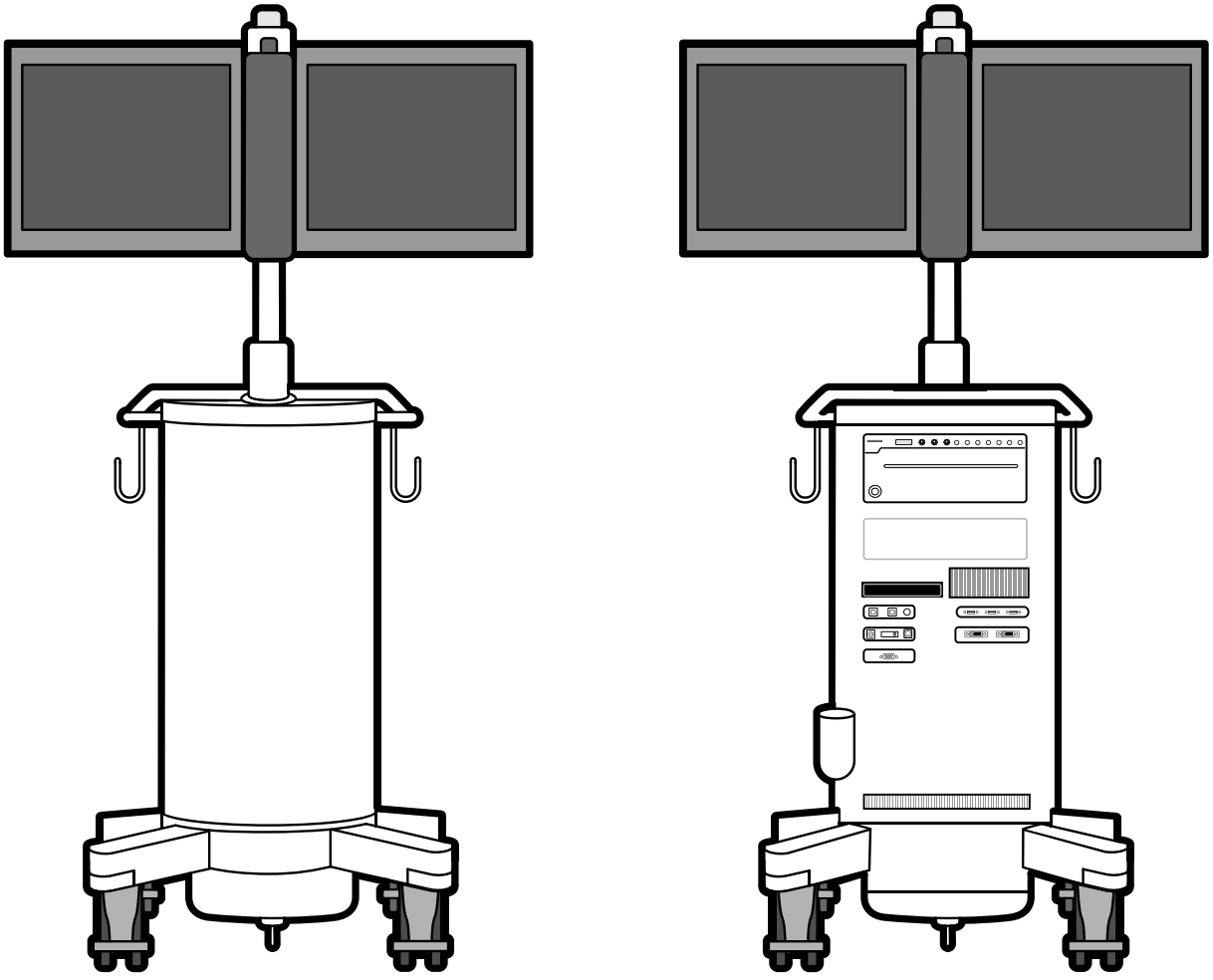


Figure 40 Mobile view station: Front side (left) and rear side (right)

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 121).

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.

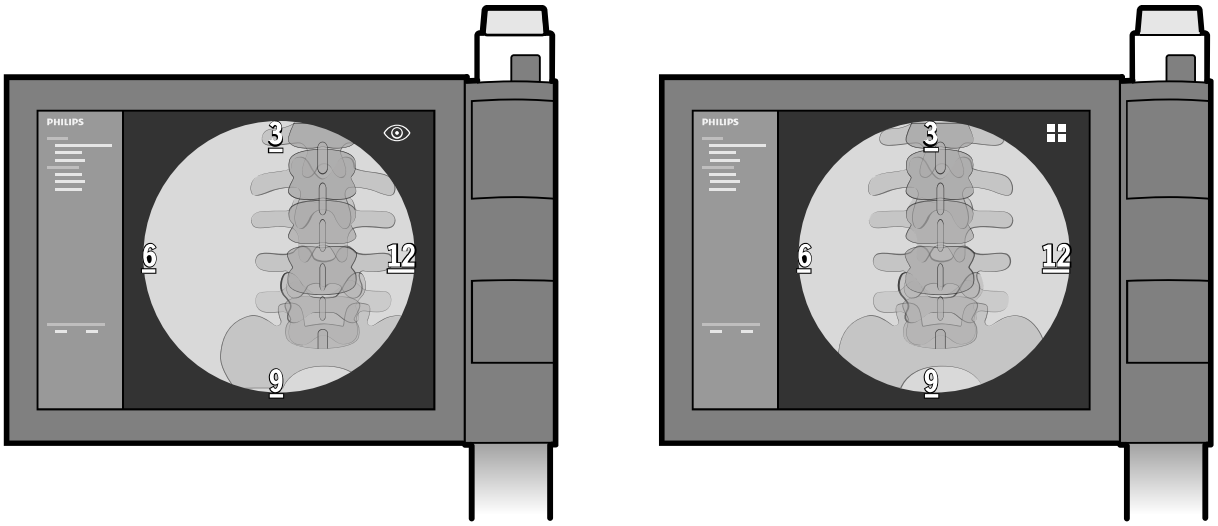


Figure 41 ClearGuide - C-arm in initial position (left) and repositioned (right)

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

5.4 C-arm Brakes and Movements

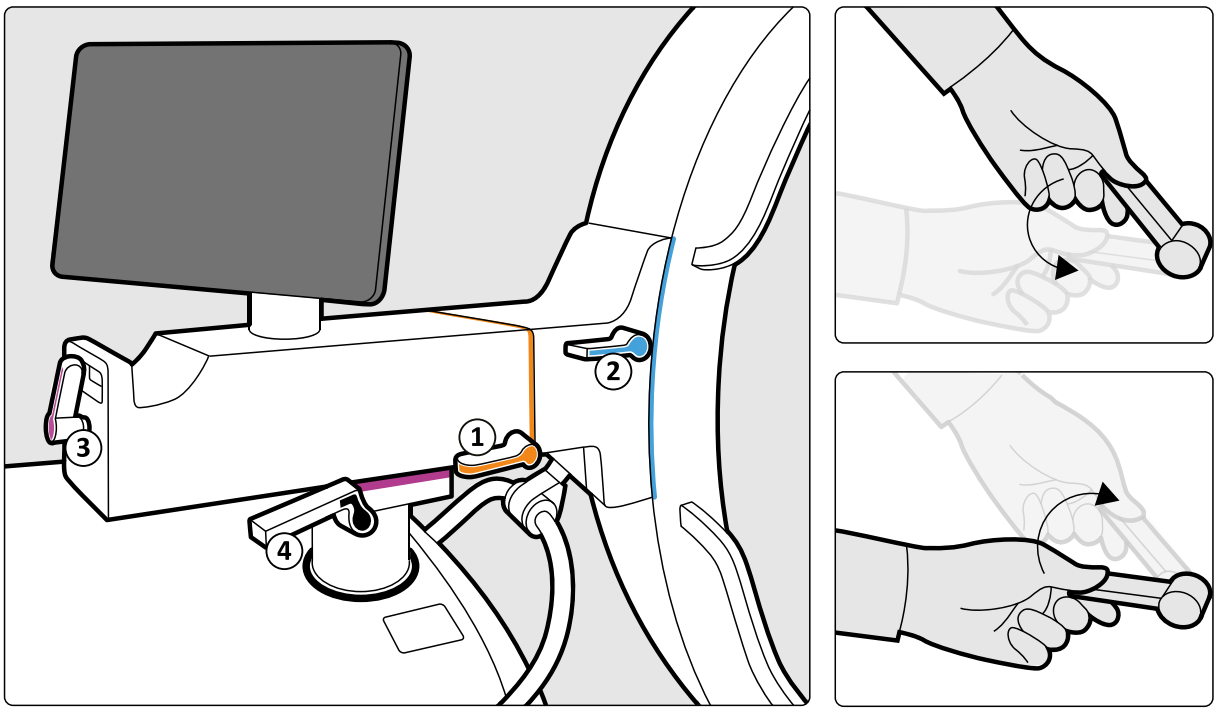


Figure 42 C-arm overview

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

The brake 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 apply the C-arm brakes when the C-arm is in position.***

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.

	Brake unlocked
	Brake locked

5.4.1 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.

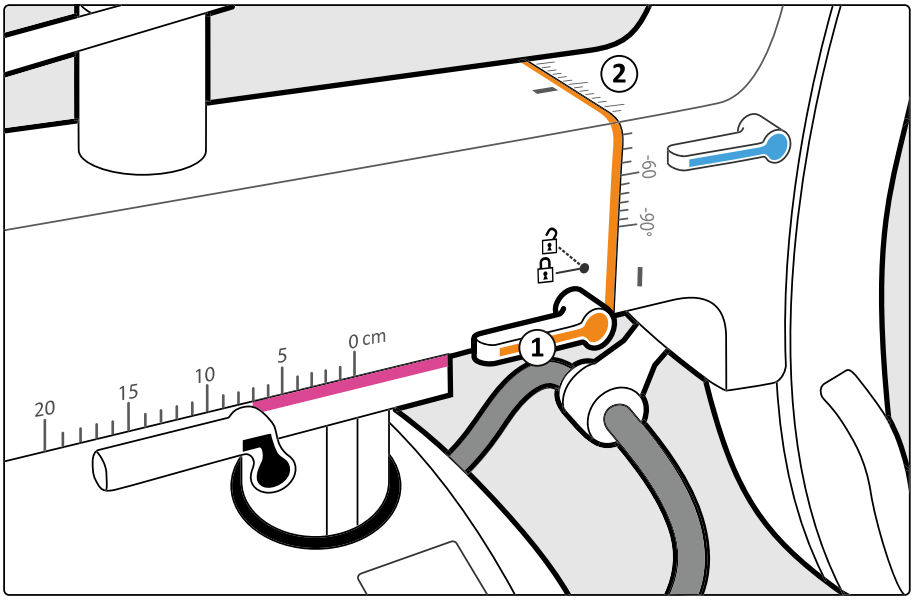


Figure 43 Rotation brake handle and degrees of rotation markers

Legend	
1	Rotation brake handle
2	Degrees of rotation markers

5.4.2 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.

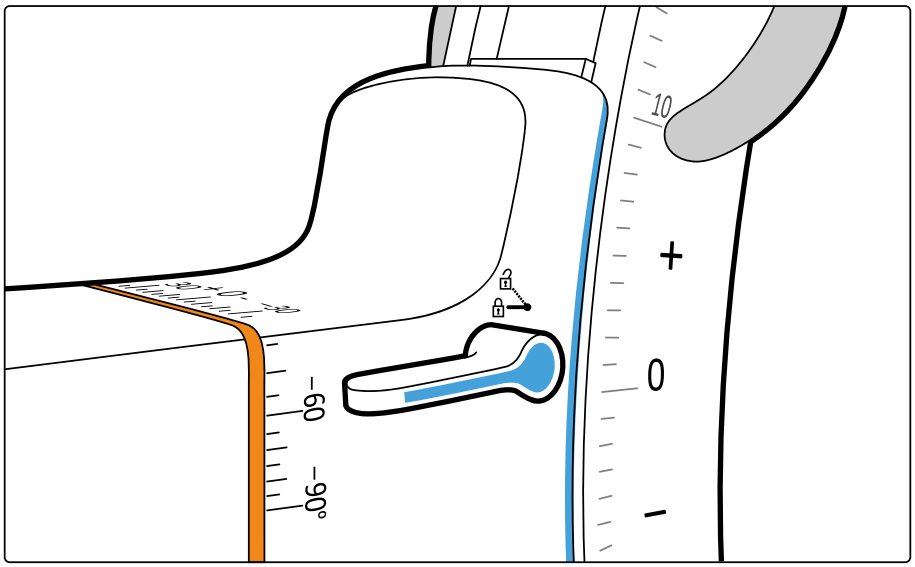


Figure 44 Angulation brake handle

5.4.3 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 20 cm.

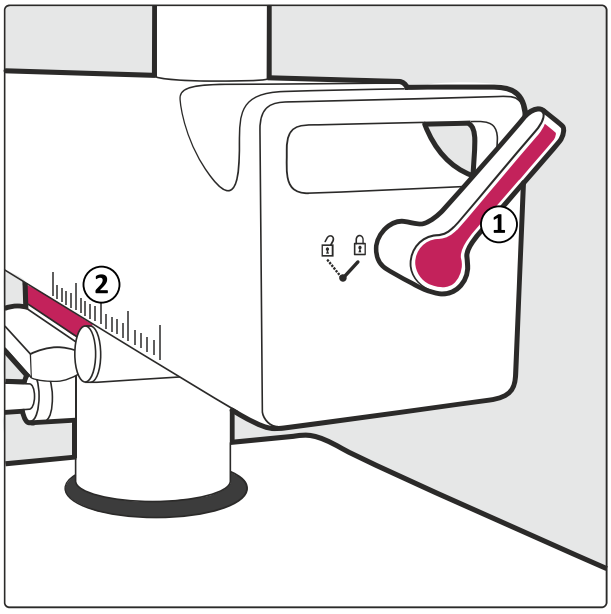


Figure 45 Longitudinal brake handle and movement measurement

Legend	
1	Longitudinal brake handle
2	Movement measurement markers

5.4.4 Swivel (Wig-Wag) Movement

To release the swivel movement brake (black handles), move the two handles upwards. To re- apply the brake, return the handles to the locked position. The swivel range is -10 degrees to +10 degrees.

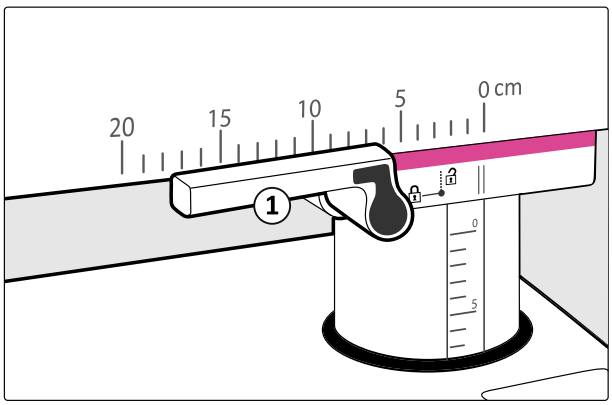


Figure 46 Swivel (wig-wag) brake handle (1), one handle on each side

5.4.5 Height Movement

The adjustment of the height is controlled by buttons next to the C-arm column on both sides of the C-arm stand.

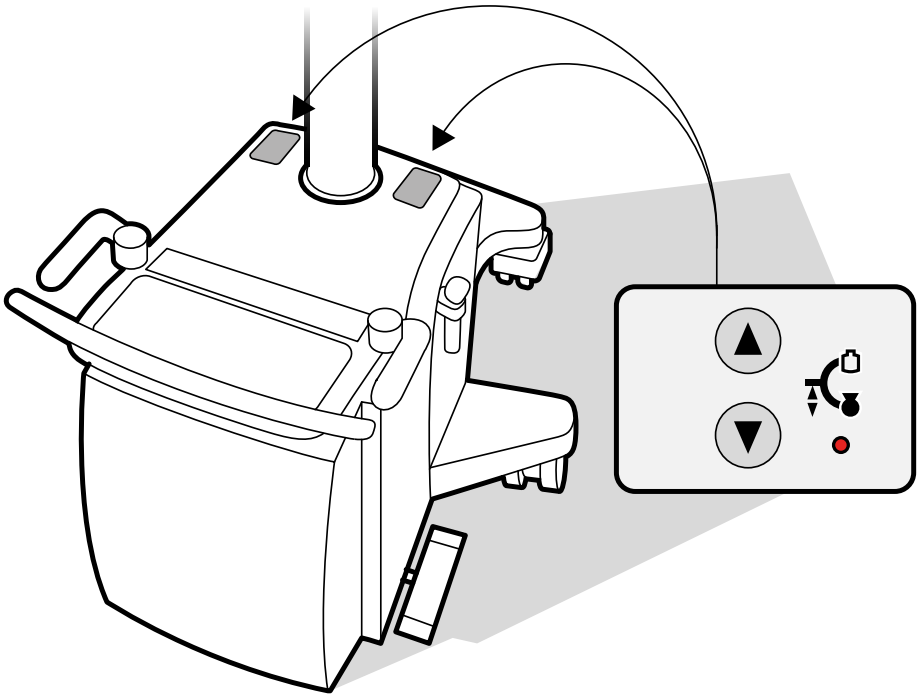


Figure 47 Height movement buttons

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.***

NOTE ***If an error "501 or 502 " related to height movement is displayed on the user interface on system startup, then restart the system to recover from the error.***

NOTE ***If an error "502" related to height movement is displayed on the user interface while using the system, then press OK on error message dialogue box, toggle the lock key ON-OFF-ON and then continue to use height movement.***

WARNING
If any irregularities occur in either direction of the height movement during use, switch off the system as described in Emergency Power Off (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.

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.

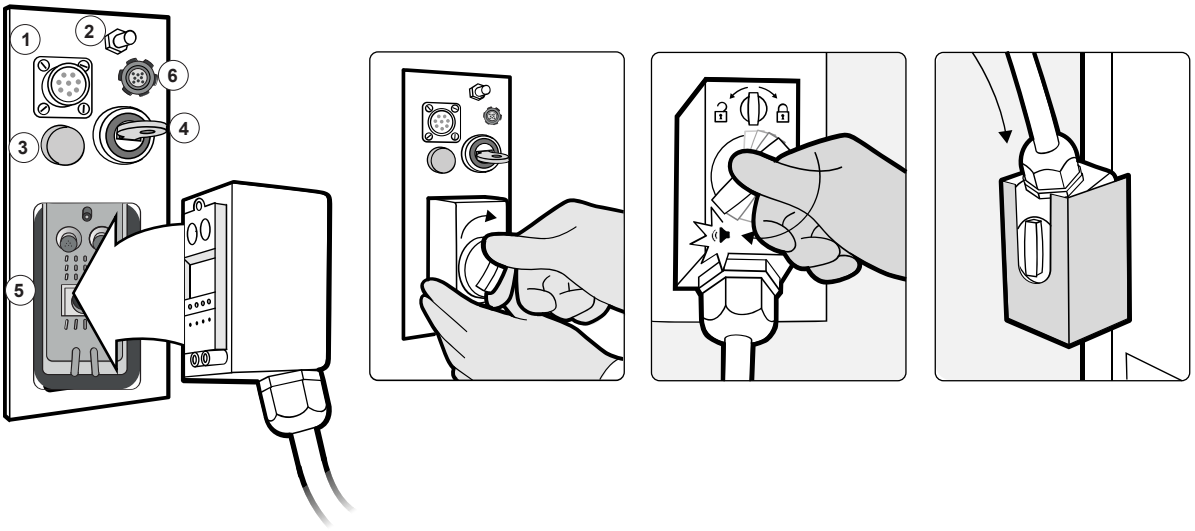


Figure 48 C-arm stand connector panel with cable connections

Legend			
1	Foot switch connector	2	Equipotential earth connection
3	Energy storage unit indicator	4	System lock
5	Mobile view station connector	6	Touch Screen Module (TSM) port (Optional)

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-am stand connector panel.

System Lock

When the system lock is set to **0**, all X-ray functions are disabled and a message appears on the C-arm display. The height movement is also blocked.

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 positioning the height movement.

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.

5.5.2 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 starts.

If password protection is enabled, the log on screen is displayed. The password protection function protects patient data from unauthorized access.

2 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

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

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.***

CAUTION
To prevent malfunction, do not touch any controls during the startup process (except the height movement buttons).

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 98).

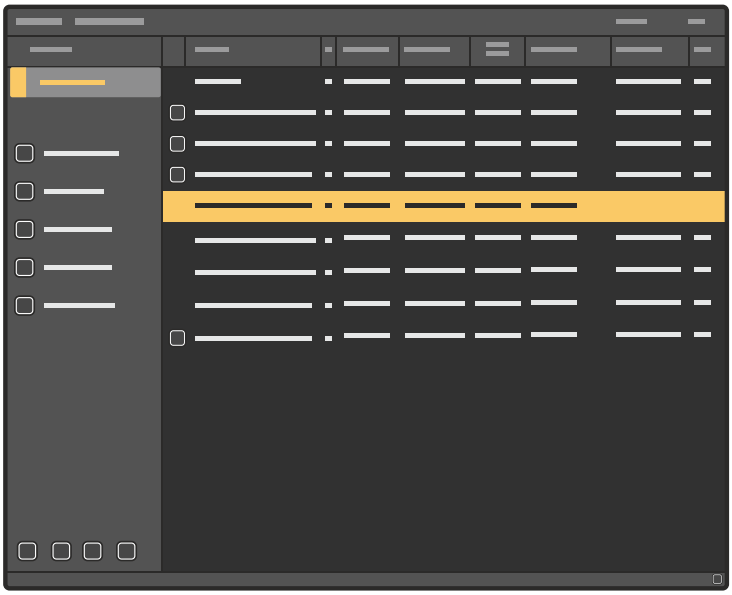


Figure 49 Mobile view station administration screen

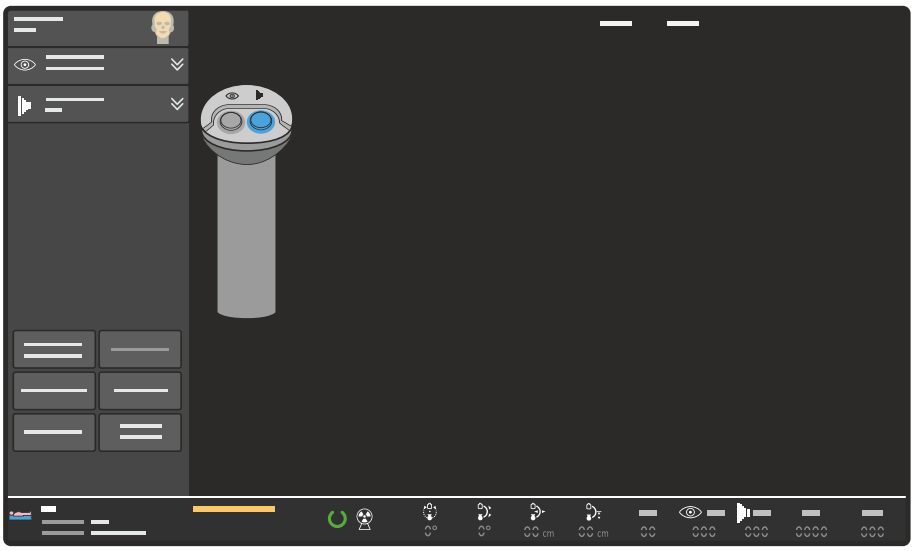


Figure 50 C-arm stand touch screen after start-up

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.

4 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 switch the system to X-ray disabled state and back to X-ray enable state, perform following steps

a On the C-arm stand touch screen/Touch Screen Monitor, tap on **System** menu. A pop-up screen is displayed with following toggle button options - Disable X-ray, Test Buzzer, Auto Run Cycle and Close.

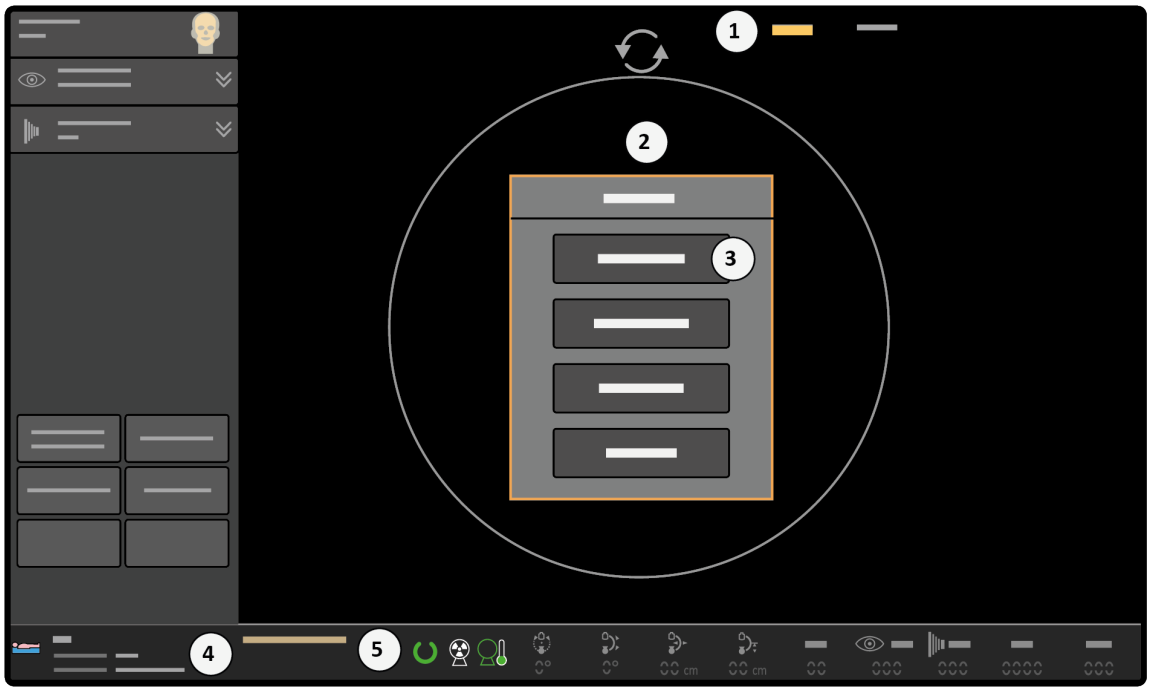


Figure 51 System menu pop-up

Legend			
1	System menu	4	System status OK message
2	A pop-up with toggle buttons	5	System ready icon status
3	Disable x-ray toggle button inactive		

Figure 52 MVS - system ready icon

b Tap **Disable X-ray** toggle button to disable the x-ray.

c **X-ray is disabled. Go to system menu to enable**, warning message is displayed. Click **OK** to confirm x-ray is disabled.

d Now again Tap **System** menu on C-arm stand touch screen/Touch Screen Monitor. Disable X-ray button is active and checked on the C-arm stand touch screen/Touch Screen Monitor. In addition, on the MVS, system not ready icon is displayed.

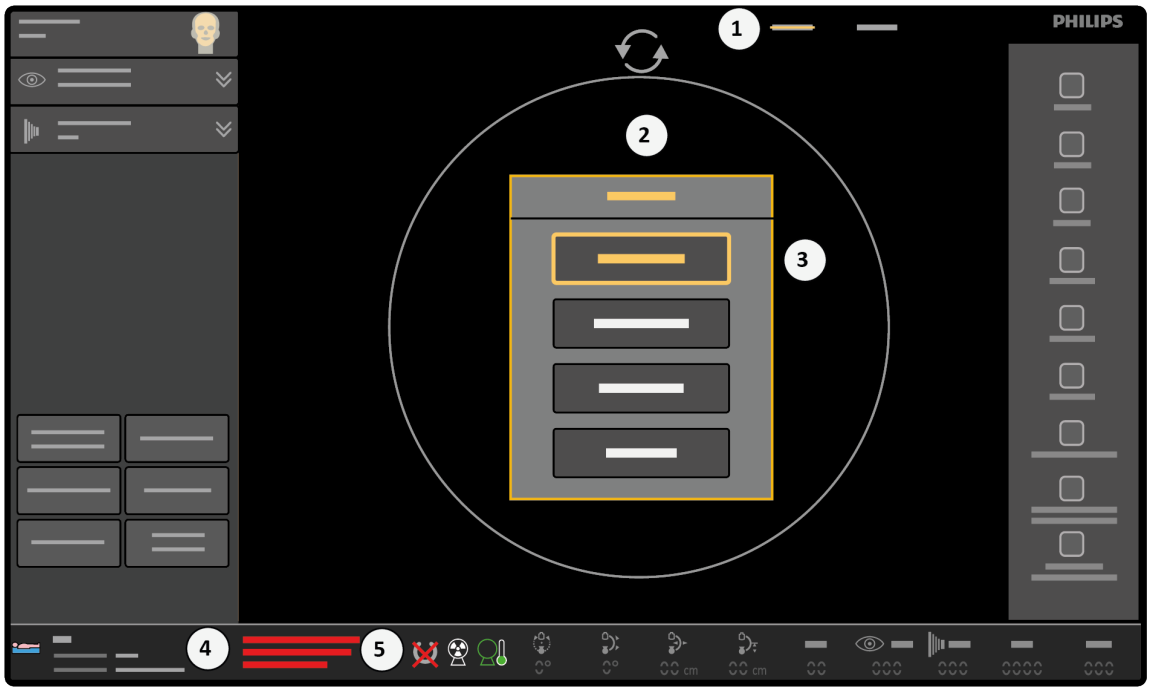


Figure 53 Active Disable X-ray toggle button

Legend			
1	System menu	4	X-ray disabled message
2	A pop-up with toggle buttons	5	System and irradiation icons are displayed
3	Disable x-ray toggle button active		

Figure 54 MVS - system not ready icon

e To enable X-ray state, go to the **System** menu and tap on active **Disable X-ray** toggle button.

f Click **Close** to close the pop-up screen.

NOTE ***X-ray disabled toggle button is not accessible, if the system lock key is in 0 position.***

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 and use the height movement the system lock must be enabled (with the key in the **I** position).

Tips	
Height movement	Height movement can be used a few seconds after pressing one of the **System on** buttons if the system lock key is in the **I** position.

5.5.3 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.

5.5.4 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**.

5.5.5 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 height 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.***

5.5.6 Emergency Power Off

In case of emergency, switch the system off.

1 To switch off only the C-arm stand in an emergency, press the **Emergency off** button on the C-arm stand console.

X-ray generation and height 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.

5.5.7 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 158).

5.5.8 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.

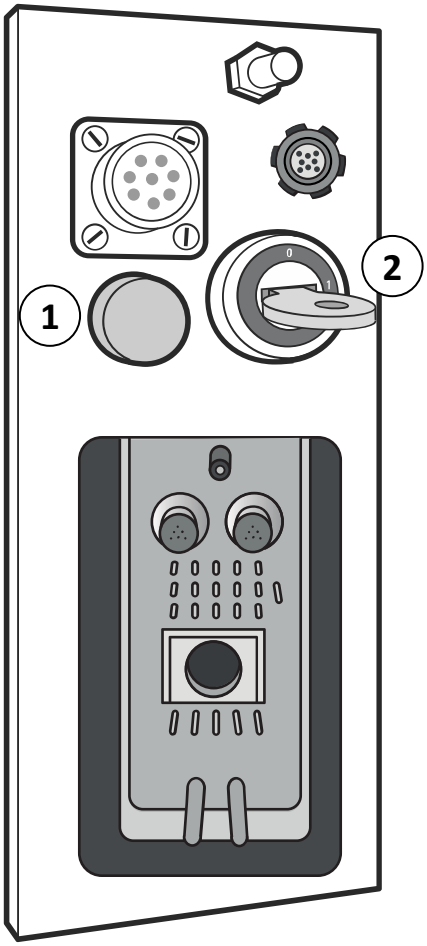


Figure 55 Energy storage unit charge indication light and system lock

Legend	
1	Charge indication light
2	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 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.***

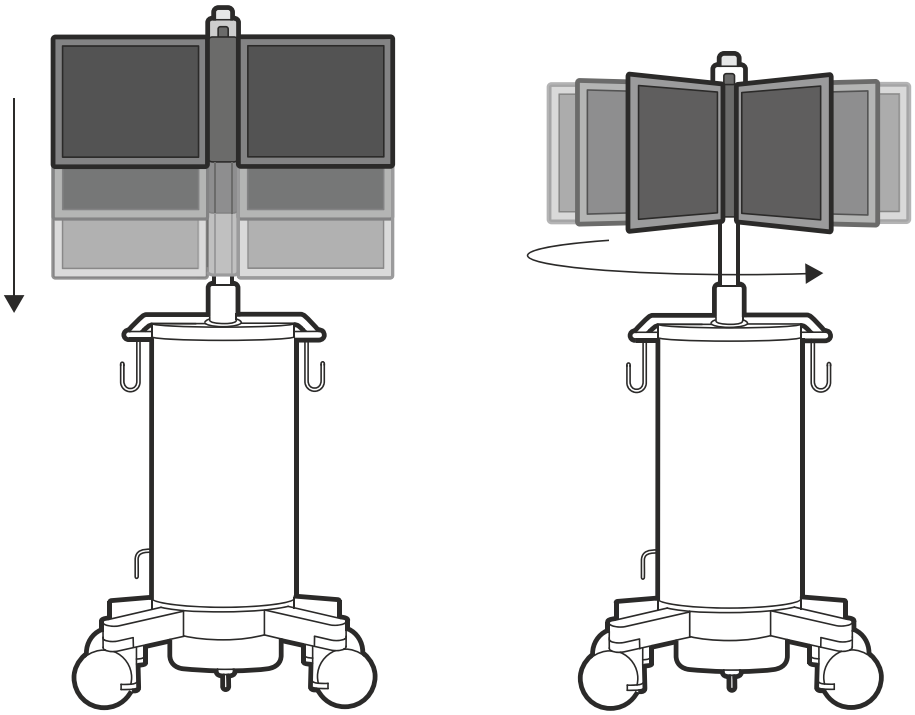


Figure 56 Monitors: height (left) and swing (right) movements

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).

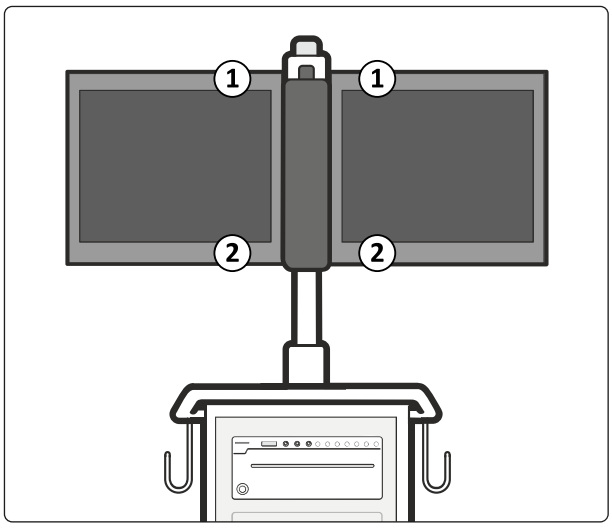


Figure 57 Hand positions for raising and lowering the monitors

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 *User Interface* (page 36).

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 193).

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.

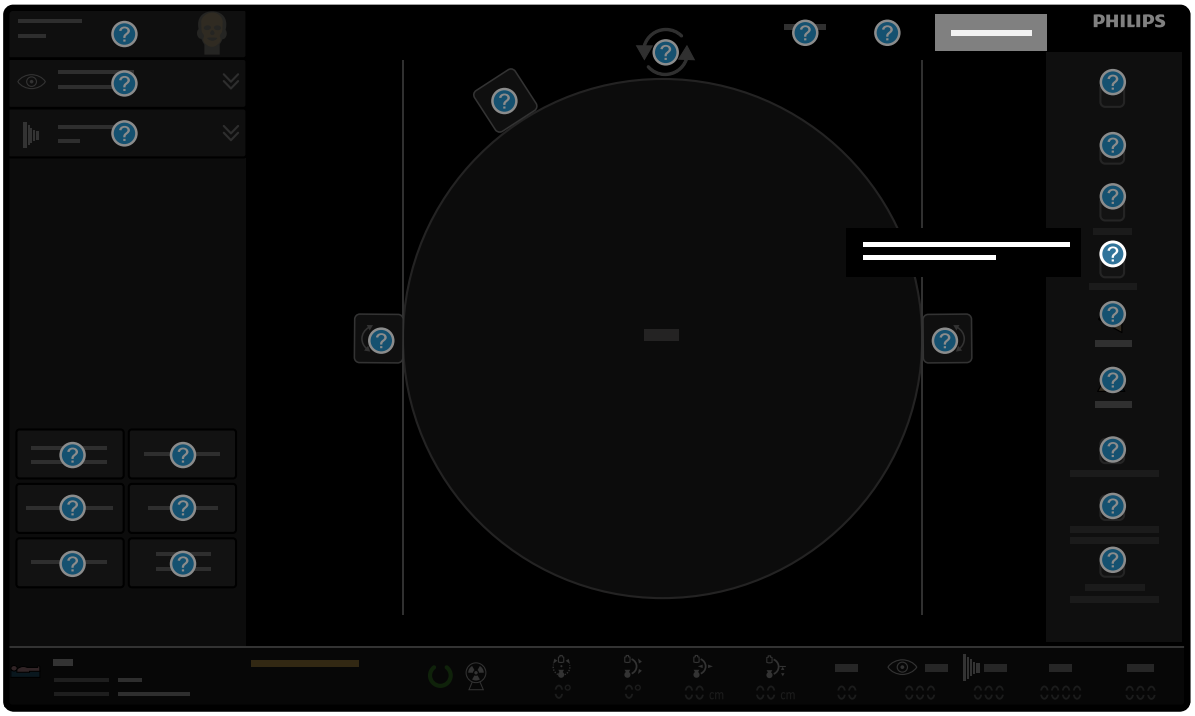


Figure 58 Tooltips

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 89).

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 45).

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.

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.

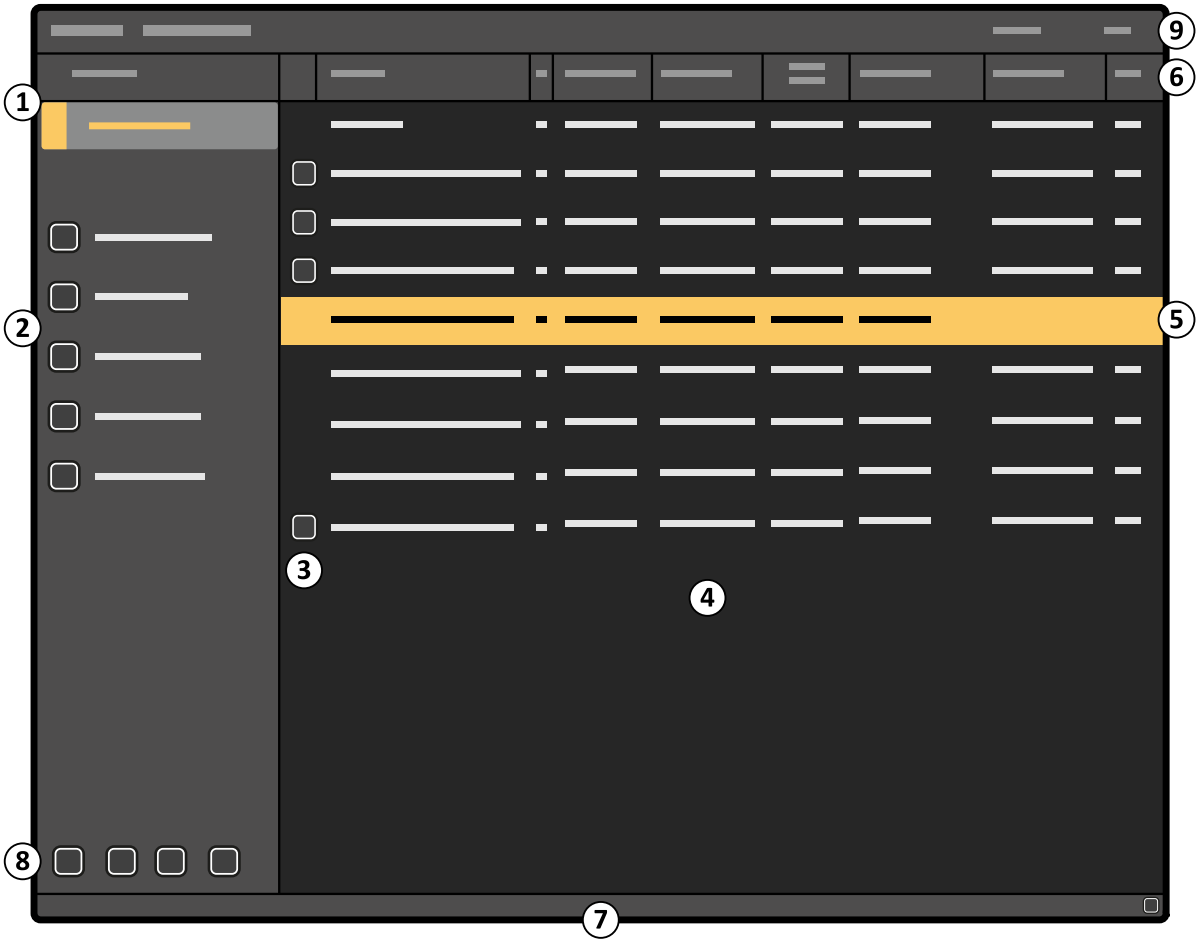


Figure 59 Administration screen on the examination monitor

Legend			
1	Task navigation panel	6	Column headings
2	Task control panel	7	Notification area
3	Status indicator	8	Global tools (**Review** task only)

Legend			
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 249 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 97)
- *Backing Up Patient Data* (page 276)
- *Archiving Patient Data* (page 276)

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

Icon	Description
	Examination has been imported from the RIS/HIS using the worklist manager (WLM)

5.8.1 The Schedule List

The **Schedule** list 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** list 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, *System Setup* (page 40).
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 40).

5.8.2 The Review List

The **Review** list 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 list. Use the scroll bar, or the Page up or Page down buttons to view more pages.***

Each line in the **Review** list 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.

Field	Comment
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 40).
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**.

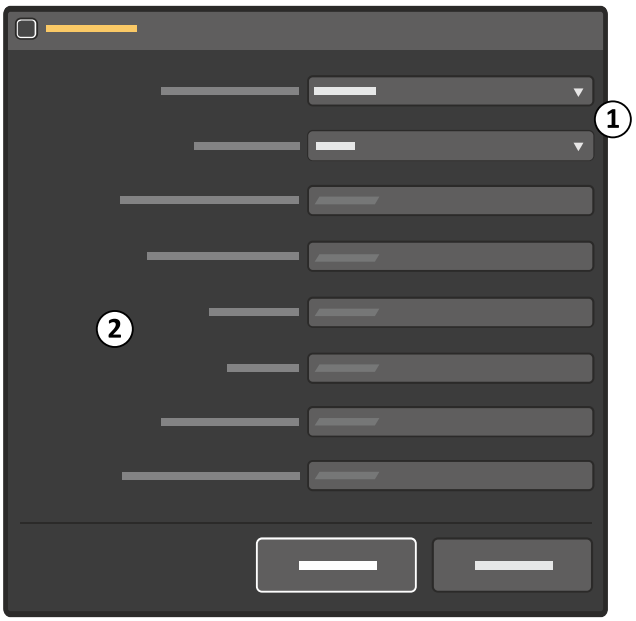


Figure 60 Get Worklist dialog box

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.

5 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 64).

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 93).

Pre-operative	
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 99).
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 154).
Print acquired images	See *Printing Images (Option)* (page 157).
Personal archive or transfer	See *Saving Images to Local Media* (page 155).

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 93).

NOTE ***You can store a maximum of 249 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 276) and Archiving Patient Data (page 276).***

1 From the administration screen, click **Schedule**.

2 Click **Add** to display the **Add Patient** dialog box.

Figure 61 **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.

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 **Webcam Sharing Disabled** 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 **Webcam Sharing Disabled** box.

6 Select **Male**, **Female** or **Unknown** for the patient's **Gender**.

7 Enter the patient's ID in the **Patient identification** box.

8 Select the desired **Examination type** from the drop down lists.

9 In the **Physician** list, select the physician's name.

10 Enter the **Accession number**.

NOTE ***The Accession number is configured as editable or read only during installation.***

11 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.

Tip	
Navigate	Instead of pressing the Tab key, 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.
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 271). 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
- Procedure and anatomy/detailed procedure
- Physician

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 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	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. 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. 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.
Acquire	It is possible to acquire images without using the **Start examination** button. If acquisition is started while another patient has been selected for acquisition, new images are stored for that patient. If acquisition is started without selecting an examination of a patient, all acquired images are stored under the “No name” examination.
Reviewing examinations	For details about selecting an examination for review, see *Image review* (page 124). For more information about processing images after acquisition, see *Image processing* (page 139).

5.8.9 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 158)*****.**

5.8.10 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 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 55).)
- The system may be too hot (see *Heat Indications* (page 101).)
- 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 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	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	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

Examination Type Procedure	Anatomy / Detailed Procedure	Use
Urology	Kidney	Kidney procedures, intravenous pyelogram (IVP), urologic procedures in the abdomen with high contrast and minimal movement
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 70 Examination Settings addendum to these Instructions for Use for more information.***

5.11 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 patient and the X-Ray tank.

WARNING
The surface temperature of the Flat detector can increase up to 43 degrees (Celsius) during prolonged usage.

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 99). 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 120).

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.

Indication	Description
	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.

5.12 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.

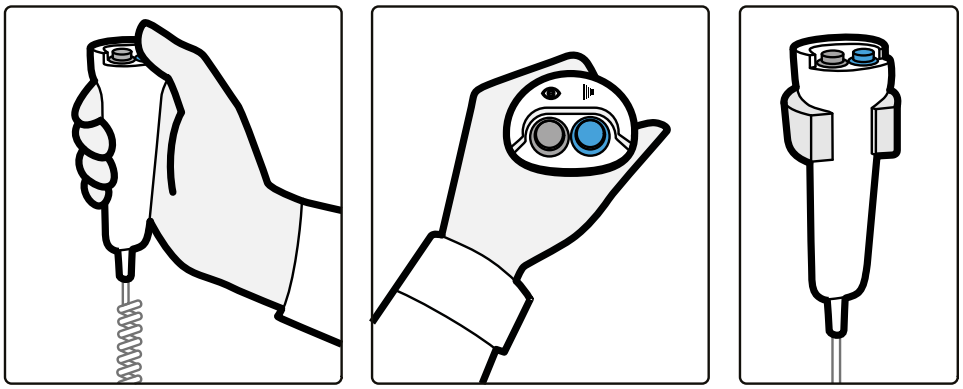


Figure 62 Hand switch

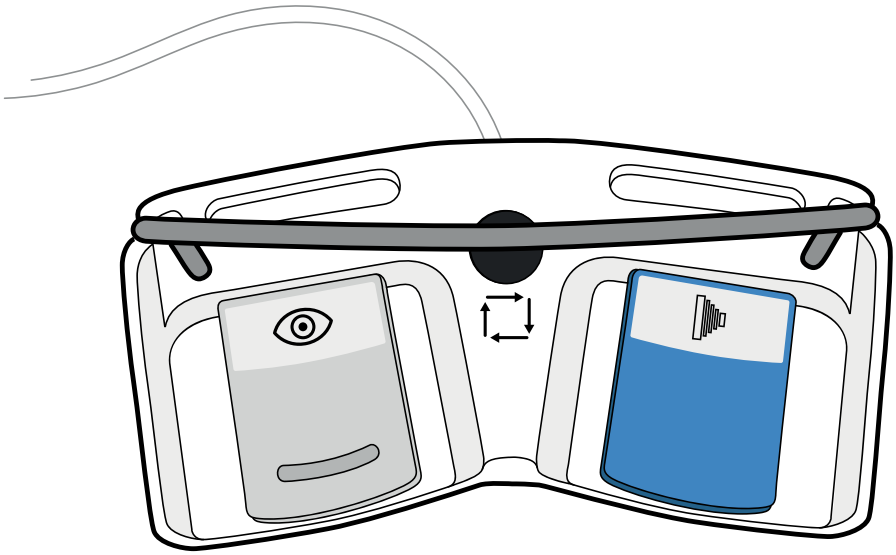


Figure 63 Foot switch

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.

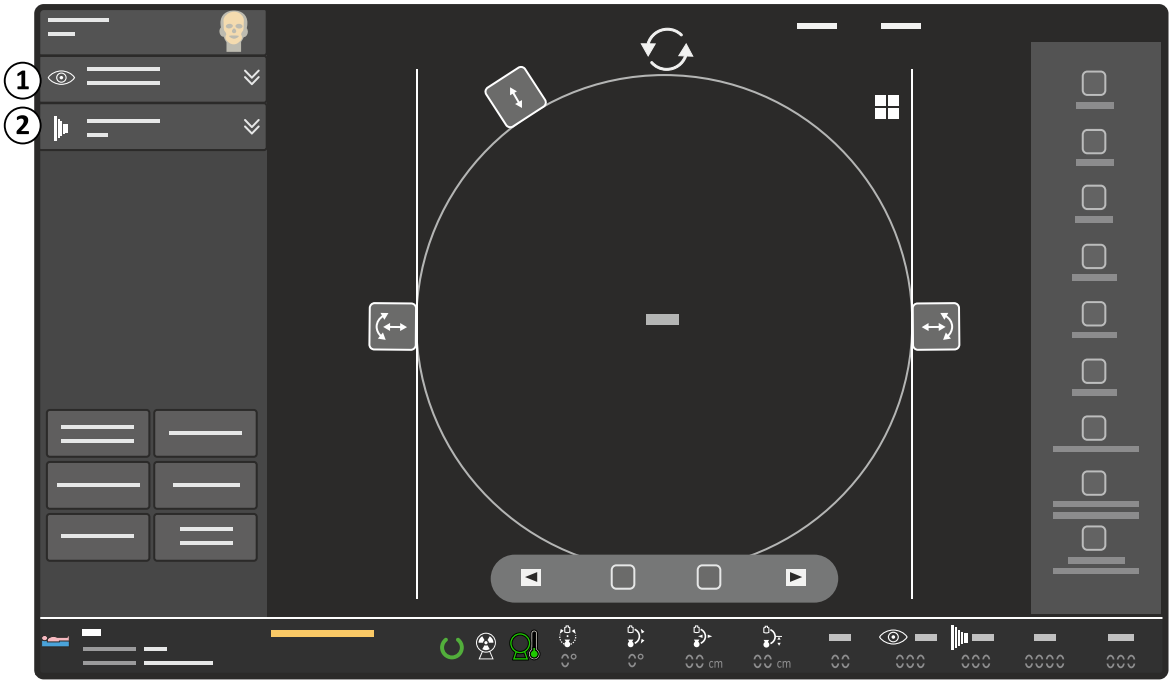


Figure 64 **Fluoroscopy** and **Exposure** expanders on the C-arm touch screen

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.***

5.13 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 button or the left 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 left button of the hand switch or the foot switch is released, X-ray is stopped and the last image hold (LIH) image is displayed.

2 To stop performing fluoroscopy, release the left hand switch button or the left 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.

Tips	
X-ray alarm timer	When fluoroscopy is performed for more than five minutes a buzzer starts. 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. If the signal is not reset within 5 more minutes of fluoroscopy or exposure, X-ray is disabled.
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. If configured to do so at installation, you can also use the **Mode** button on the remote control to change the dose level.
Storage	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.
Noise and blur	To reduce the noise level, tap the **Fluoroscopy** expander on the C-arm stand touch screen and tap the **Reduce Noise** button. To reduce blur, tap the **Fluoroscopy** expander on the C-arm stand touch screen and tap the **Reduce Blur** button. 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. These are toggle buttons. If one of the buttons becomes active, the other becomes or remains, inactive.

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 70 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.

NOTE ***High level mode is enabled by selecting the dose mode "High" on the C-arm stand touch screen.***

NOTE ***High level mode is indicated by a + symbol on the C-arm stand touch screen.***

NOTE ***Due to specific regulations in some countries, selecting dose mode "High" will not enable a High level mode, and will therefore not be indicated with a + symbol, nor be accompanied by a High Level beep signal during x-ray.***

5.13.1 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.***

5.14 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.
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 70 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 136).

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.***

5.15 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.

5.16 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 103).

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.

5.16.1 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 the contrast medium when the **Inject** message appears on the monitor. Images of the contrast bolus will appear on the monitor.

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 113) and *Pixel-shift* (page 148).
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.
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 149).
Auto run cycle	For information on enabling disabling automatic run cycle, see *Enabling and Disabling Automatic Run Cycle* (page 134).

5.16.2 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 125) and *Overview Screen* (page 131).

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.
- 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.
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 114).

5.16.3 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 114).

2 Press either the right button on the hand switch or the right pedal of the foot switch.

3 Start injecting 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 125) and Overview Screen (page 131).***

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 134).

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.

5.16.4 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 103).

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.***

5.16.5 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 125) and *Overview Screen* (page 131).

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.

5.16.6 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 67)) 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.

5.17 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.

5.17.1 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 (FD15,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.

5.17.2 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 65 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 140).

5.17.3 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 (FD15,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 (FD15,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 (FD15,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 (FD15,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).***

5.17.4 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.***

5.17.5 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 117)).

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.***

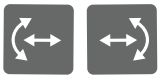
ASP When Shutters are Fully Open

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 117)).



3 Acquire images as desired. The new shutter positions are used for subsequent images.

5.17.6 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.

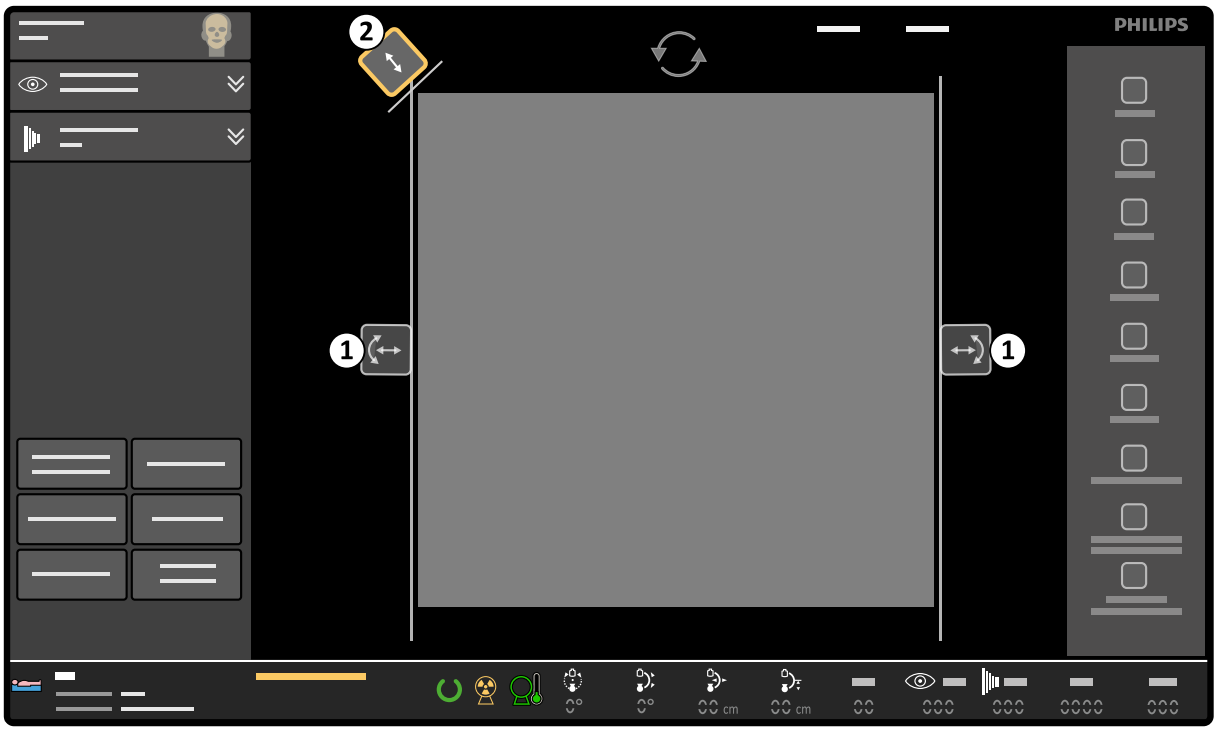


Figure 66 Collimator and shutter controls on the C-arm stand touch screen

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.

5.17.7 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.

5.17.8 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.

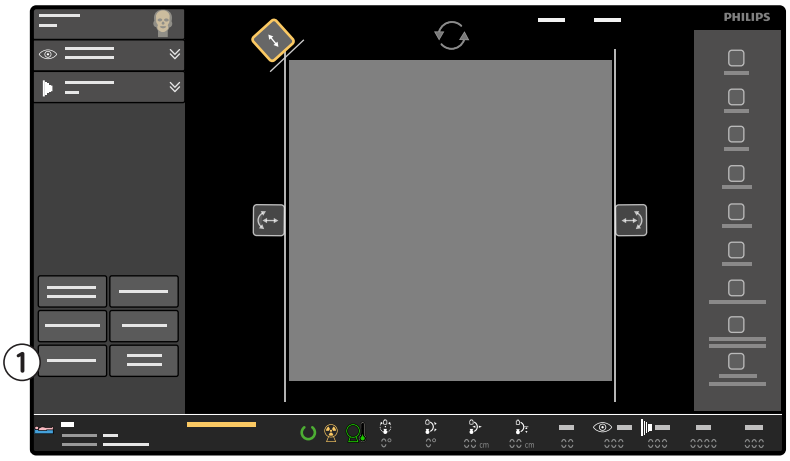


Figure 67 **kV Manual** button (1) on the C-arm stand touch screen

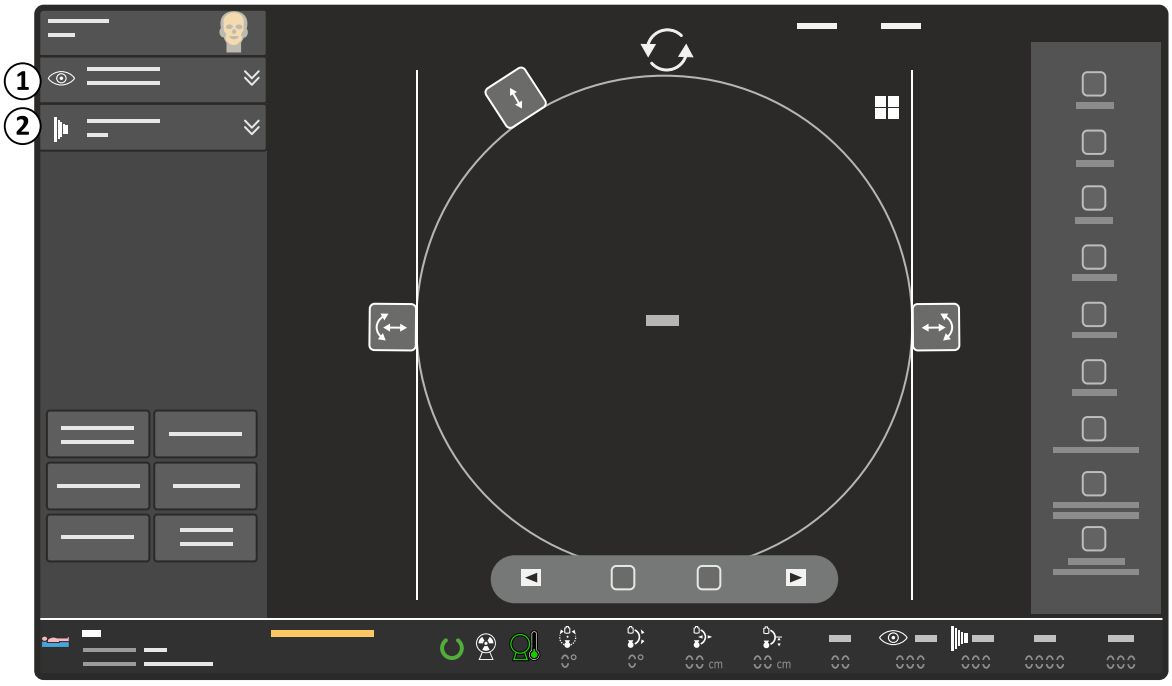
2 Tap the arrows to increase or decrease the kV value.

The mA value is coupled to the kV value.

3 To switch back to automatic control, tap **kV Manual** again.

5.17.9 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.



Legend	
1	**Fluoroscopy** expander
2	**Exposure** expander

You can select between full, ½, and ¼ 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, ½ pulse rate is 7.5 pulses/second and ¼ pulse rate is 3.75 pulses/second (displayed as 4).

5.17.10 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.

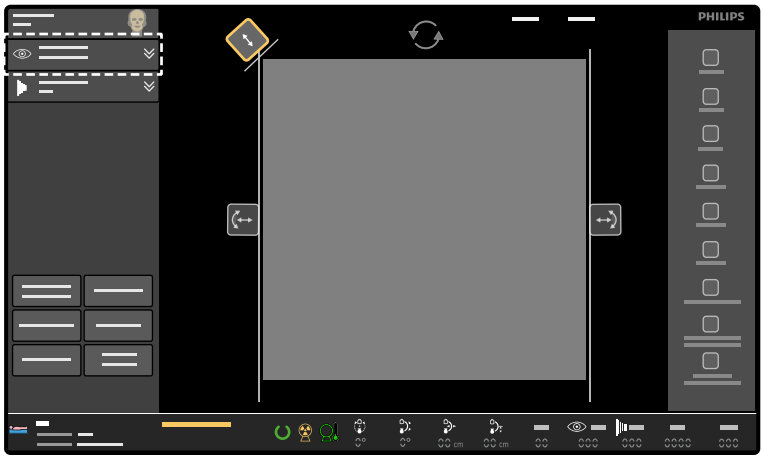


Figure 68 **Fluoroscopy** expander on the C-arm stand touch screen

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.

5.17.11 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.

5.17.12 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.

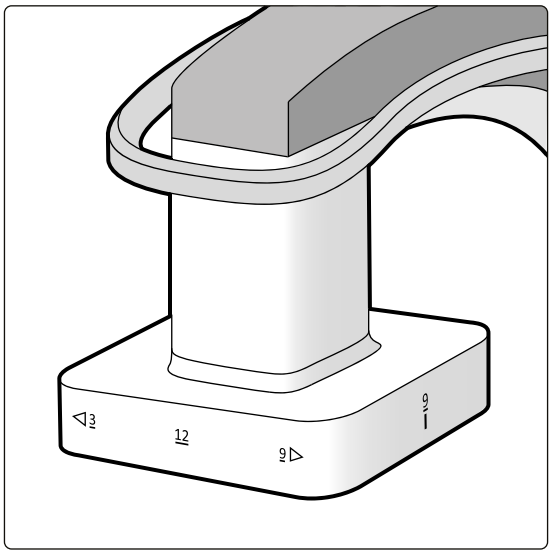


Figure 69 ClearGuide direction indicators on the detector

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.

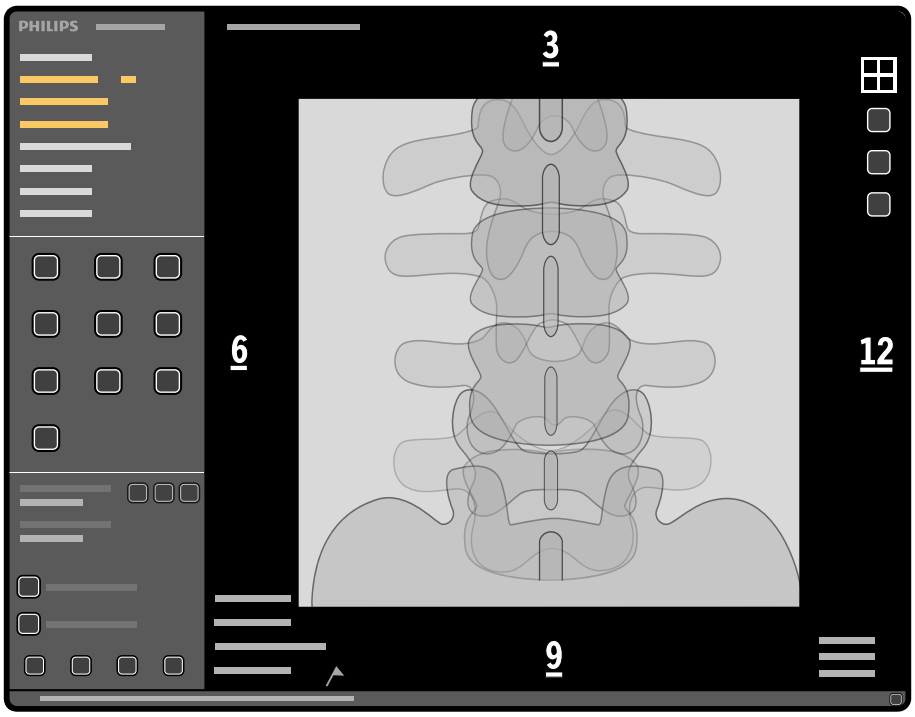


Figure 70 Direction indicators on the examination monitor

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.

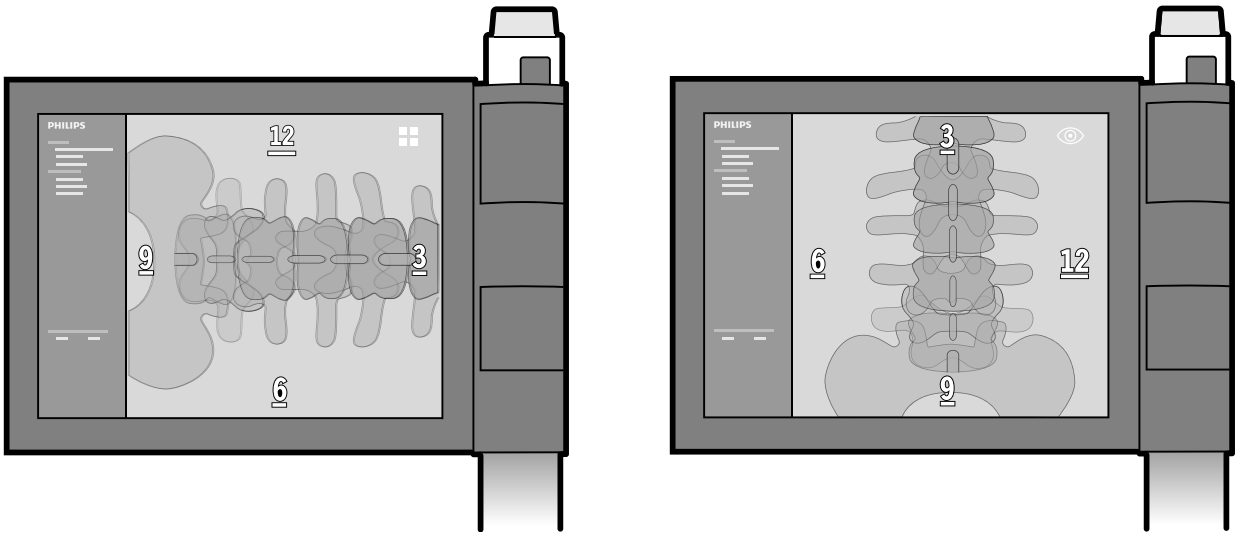


Figure 71 Original direction indicators position (left) and changed orientation example (right)

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 72).

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.

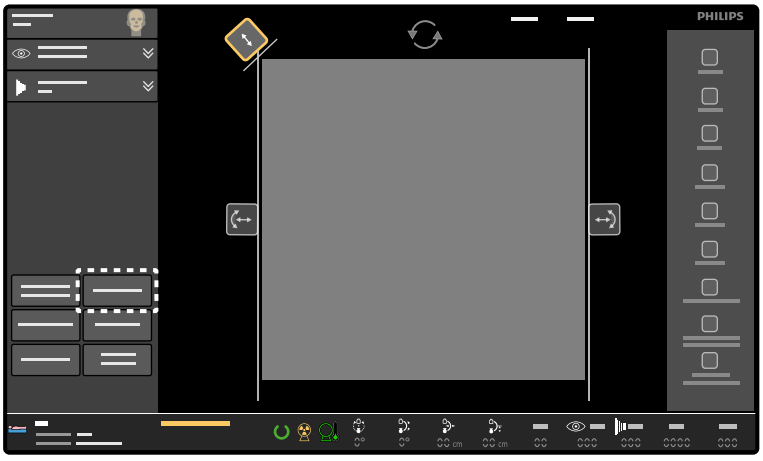


Figure 72 **ClearGuide** button on the C-arm stand touch screen

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.

5.18 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 94).

5.18.1 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 92).

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.

5.18.2 Accessing Review Functions at the C-arm Stand

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 124).

The following review functions are available at the C-arm stand:

Icon	Function
	Previous image
	Run cycle
	Overview
	Next image
	Previous run
	Pause
	Next run
	Previous overview screen
	Next overview screen
	Single image

5.18.3 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.

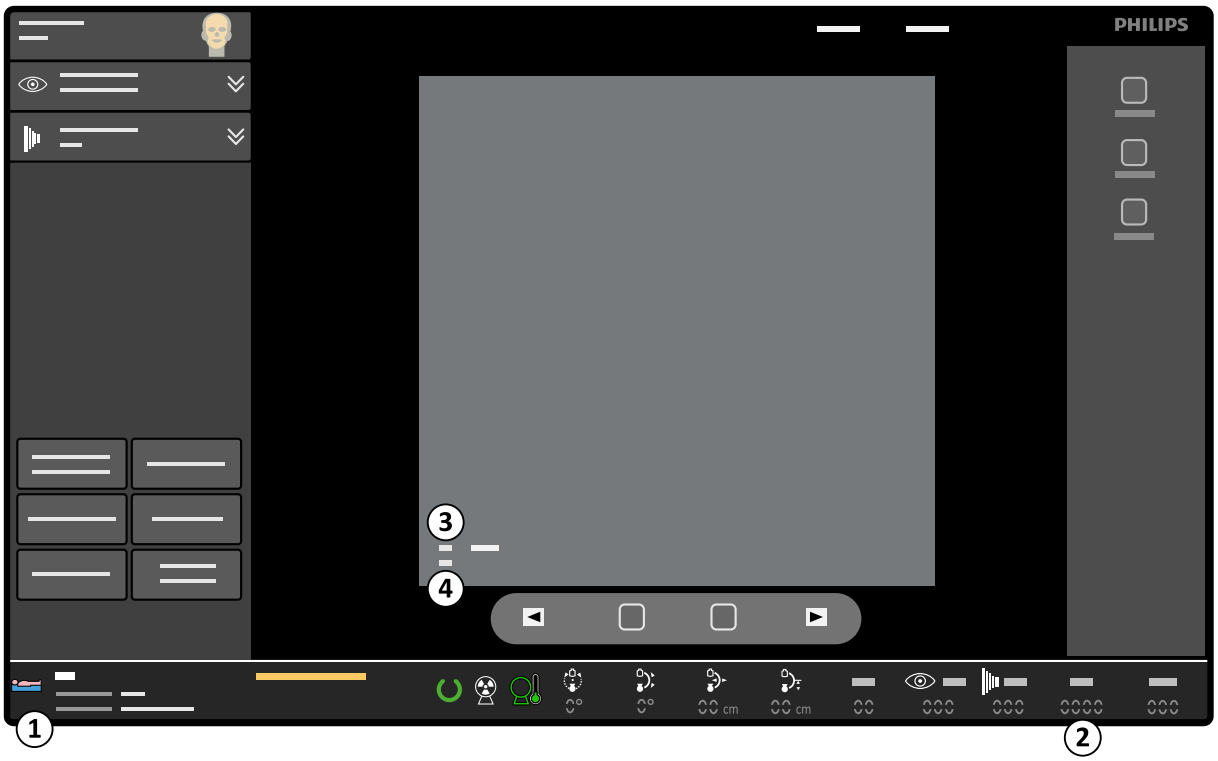


Figure 73 Single image screen (review) - C-arm stand

Legend			
1	Patient and examination details	3	Run number (run start time)
2	Examination dose	4	Image number

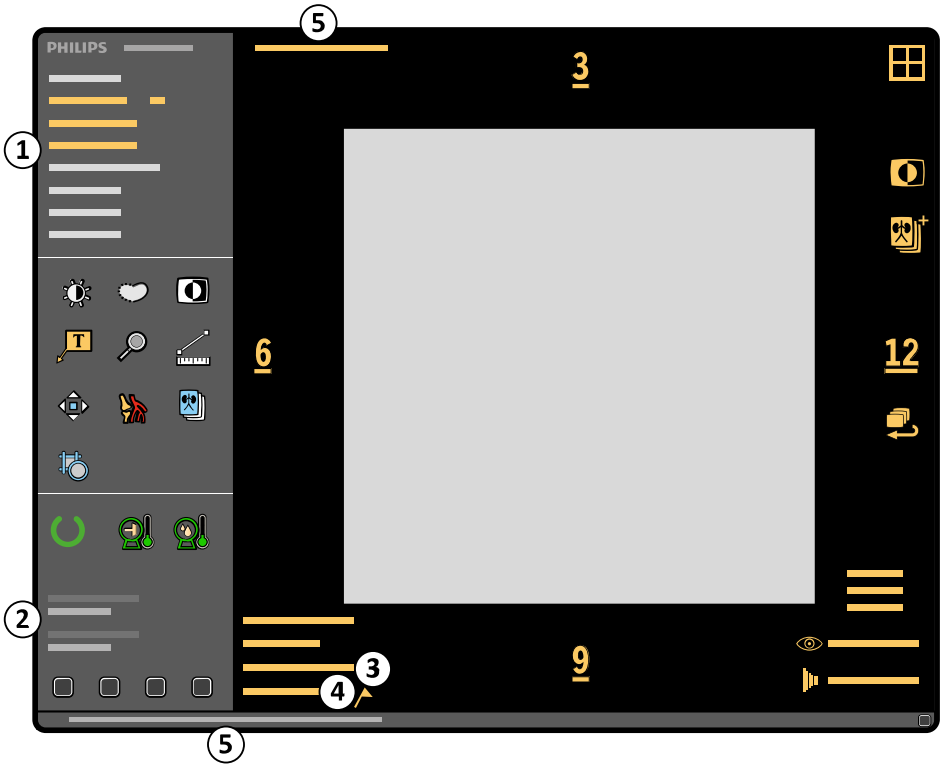


Figure 74 Single image screen (review) - mobile view station

Legend			
1	Patient and examination details	4	Image number
2	Examination dose	5	Warning and message text
3	Run number (run start time), detector format		

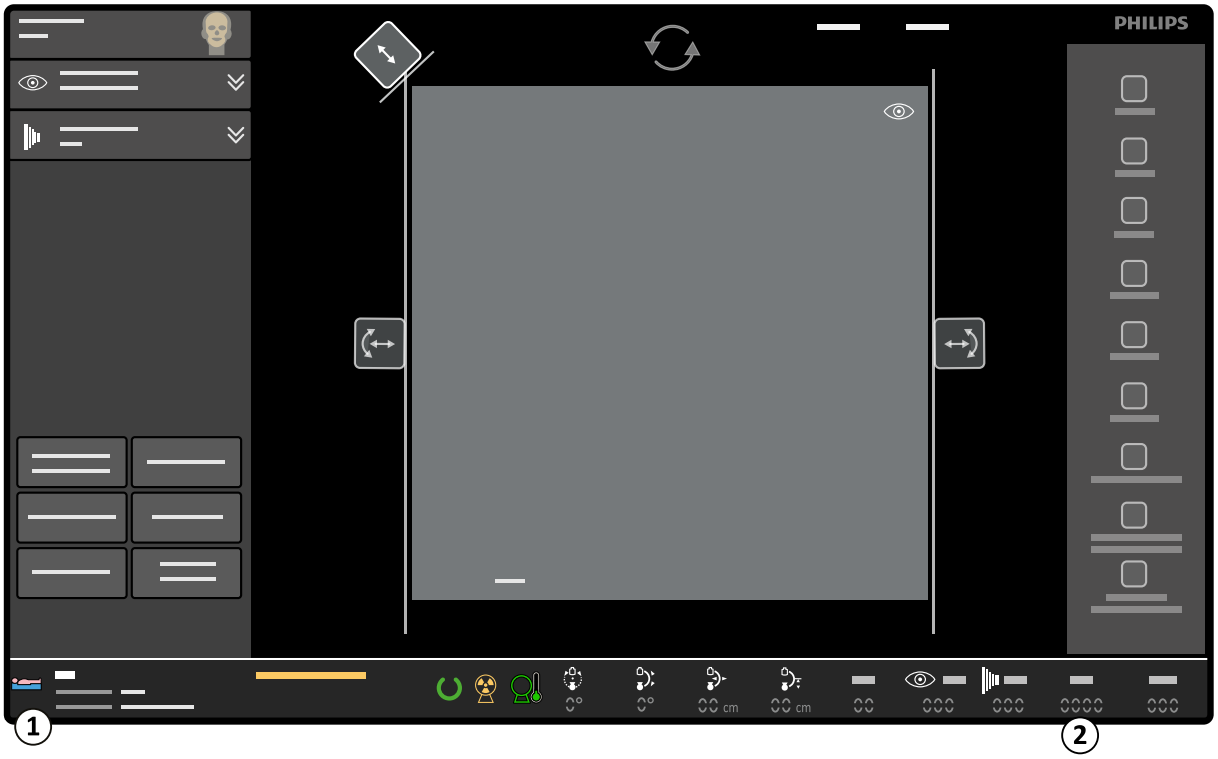


Figure 75 Single image screen - Live X-ray - C-arm stand

Legend			
1	Patient and examination details	2	Dose rate

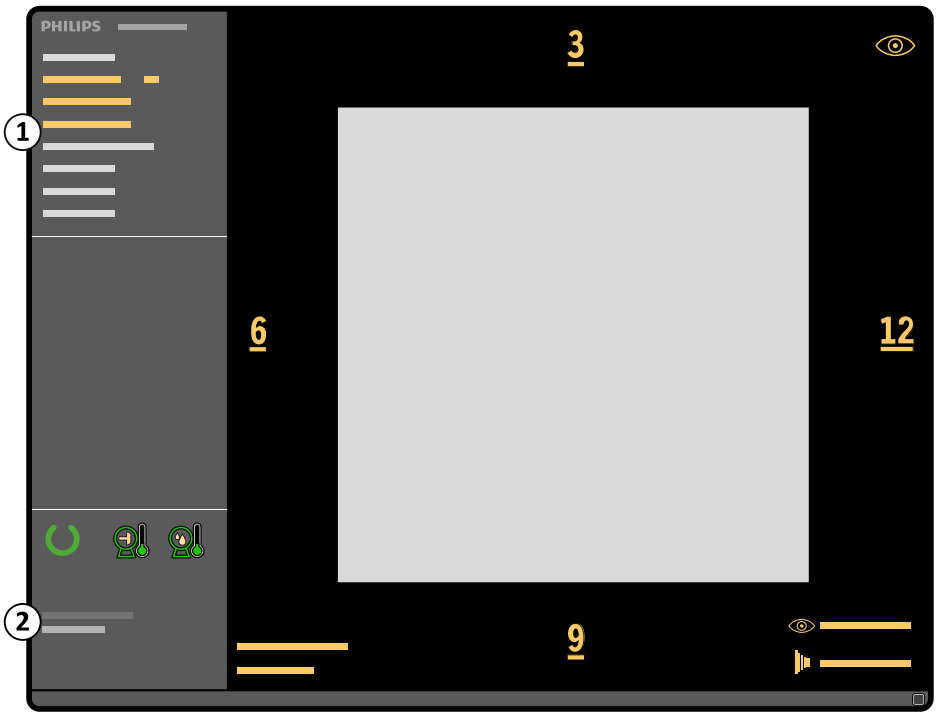


Figure 76 Single image screen - Live X-ray - mobile view station

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 $Gy.cm^2$. 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).

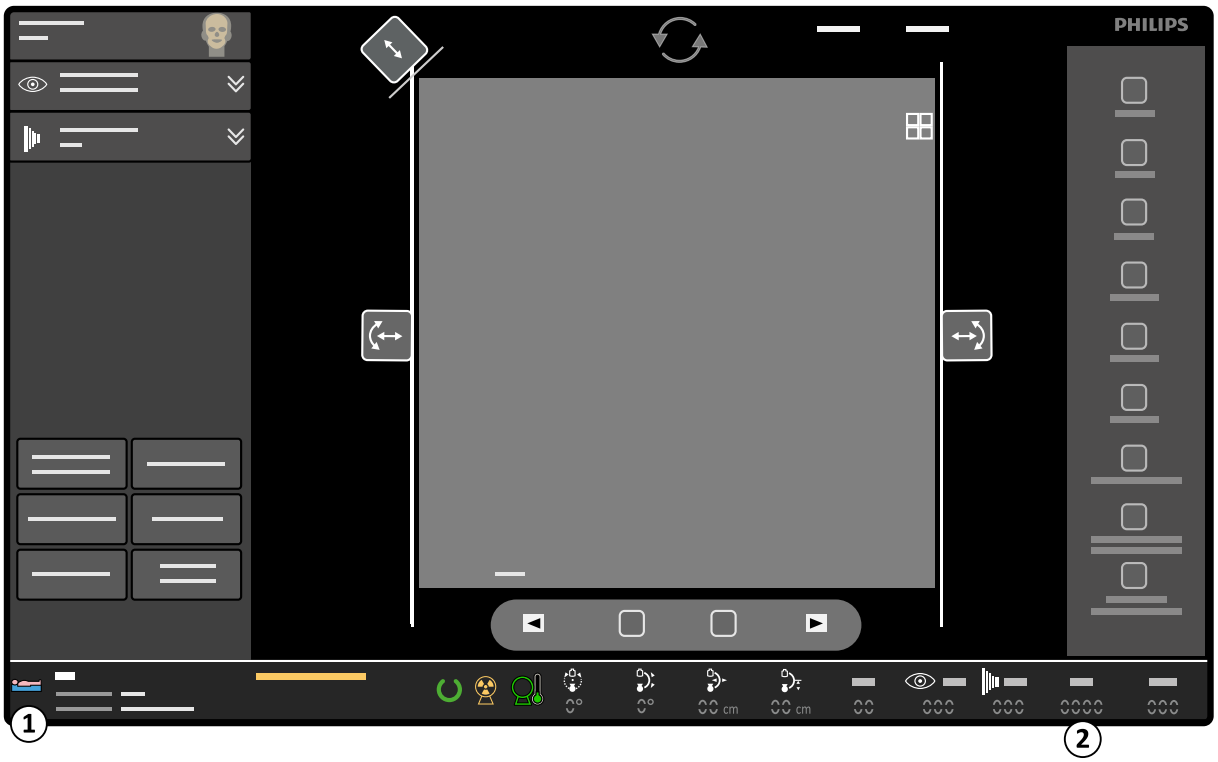


Figure 77 Single image screen - LIH - C-arm stand

Legend			
1	Patient and examination details	2	Examination dose

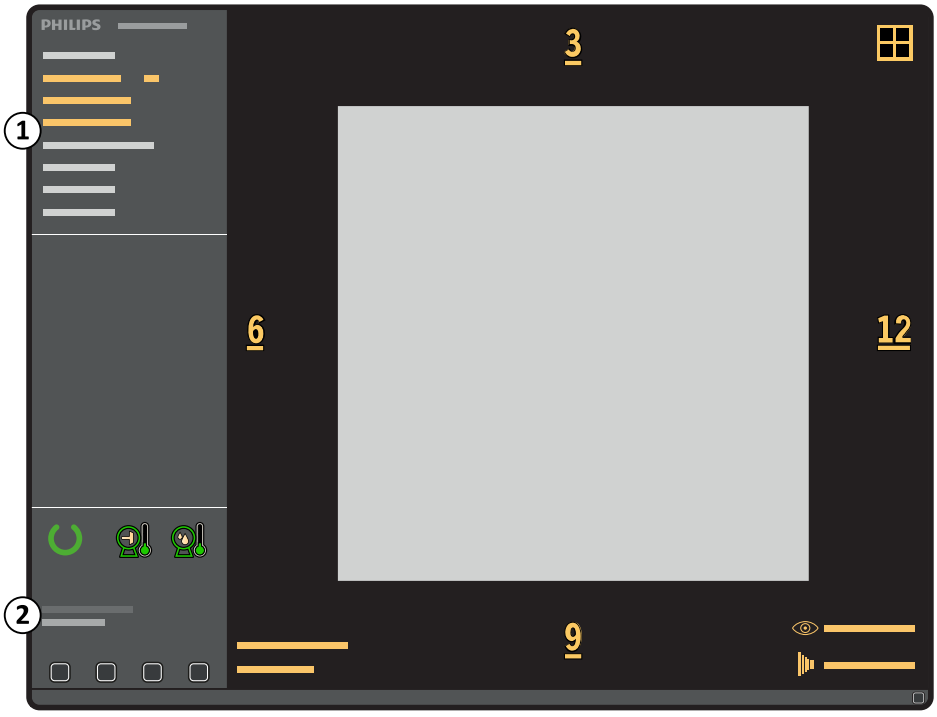


Figure 78 Single image screen - LIH - mobile view station

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.
	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 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**	**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**

5.18.4 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.

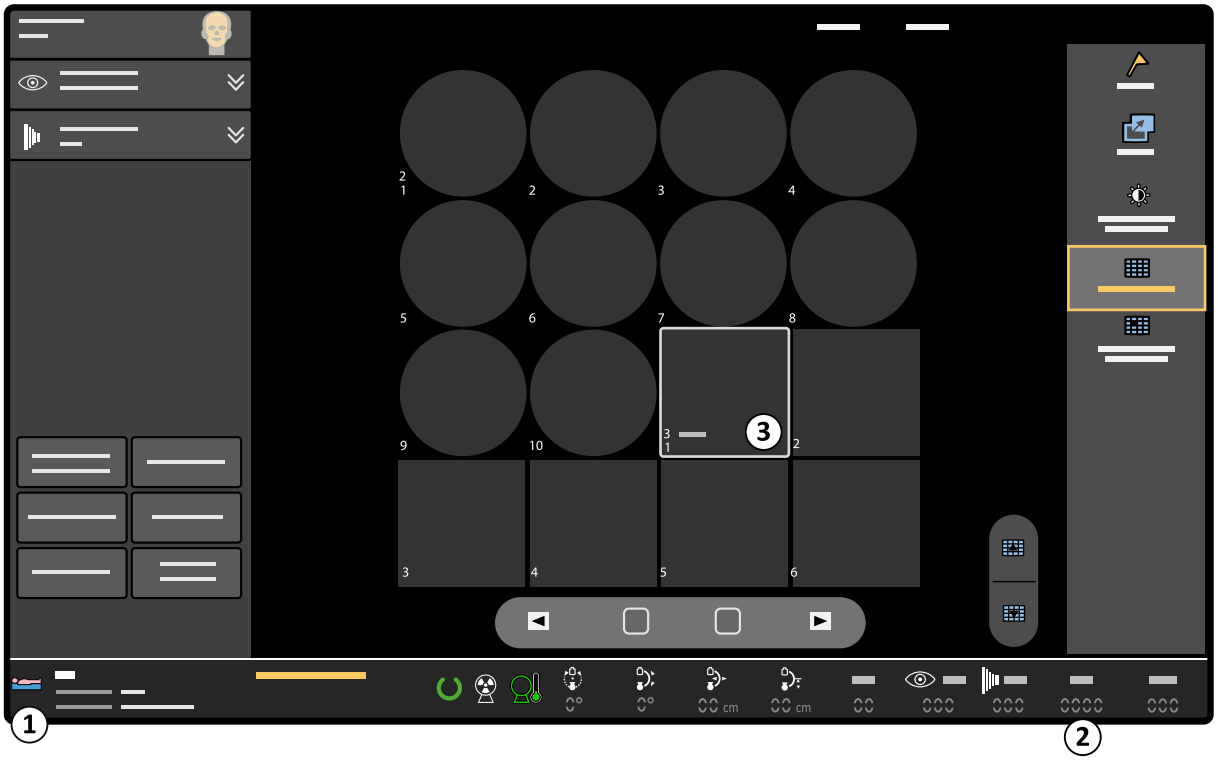


Figure 79 Overview screen on the C-arm stand

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.

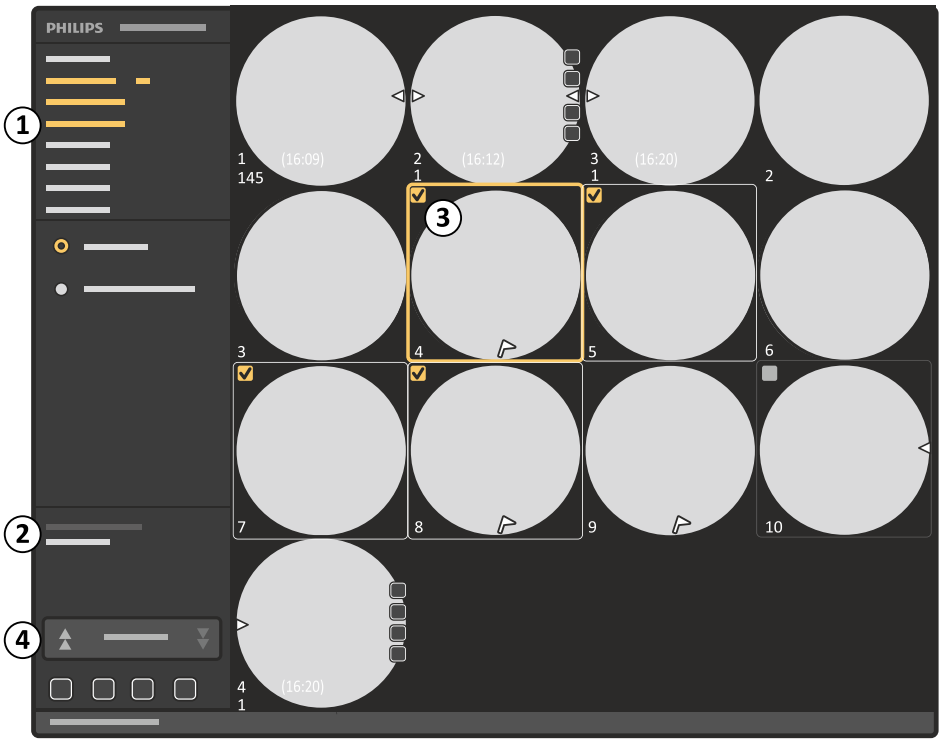


Figure 80 Overview screen on the mobile view station

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.cm^2. 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)

To	Mobile view station	C-arm stand touch screen	Remote control
View the middle image from each run in the same overview	**One image per run**	 **One image per run**	 **Overview** (Double-press)
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 overview 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.

5.18.5 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	During run cycle, you can view the previous or next run by pressing: • 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. You can also switch to the first or last run by pressing the **Page up** or **Page down** buttons.

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 111).

5.18.6 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.cm^2. 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.

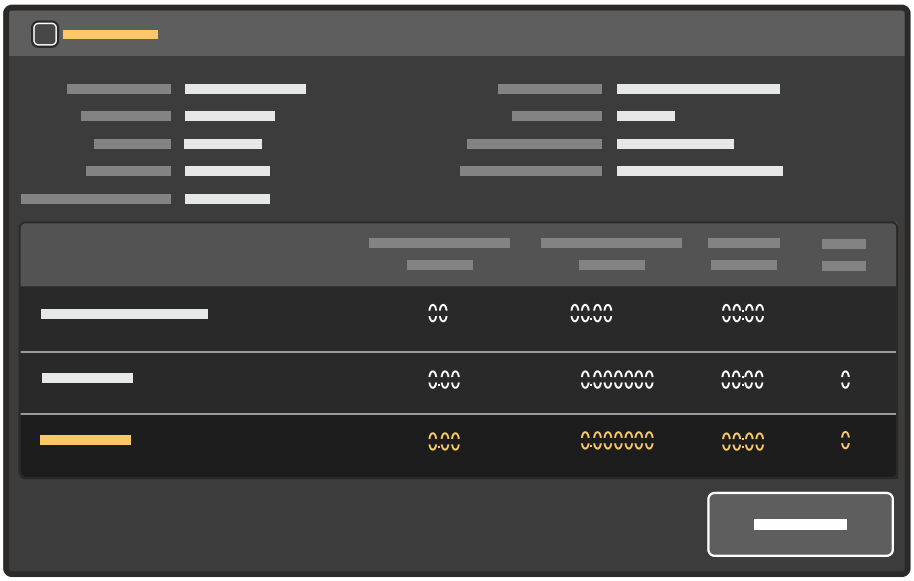


Figure 81 Dose report panel

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 *Exporting, Saving, and Printing* (page 152) for details about exporting or printing the dose report.

5.18.7 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**

5.19 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 121).

- 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**, **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.

5.19.1 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 46)), 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.

5.19.2 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 either the mobile view station or the remote control.

- 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.

5.20 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.

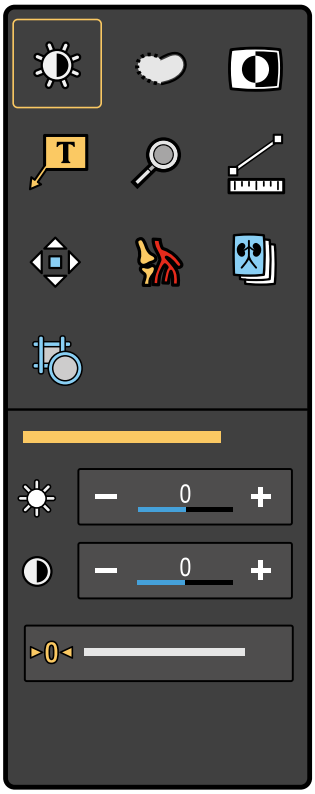


Figure 82 Image processing panel

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.***

5.20.1 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:
- Click **+** to increase the brightness of the image.
- Click **-** to decrease the brightness of the image.

3 To adjust contrast using the control panel, do the following:
- Click **+** to increase the contrast in the image.
- Click **-** to decrease the contrast in the image.

4 To adjust contrast and brightness on the touch screen, do the following:
- Drag right to increase the contrast.
- Drag left to decrease the contrast.
- Drag up to increase the brightness.
- Drag down to decrease the brightness.

5 To reset contrast and brightness to the default settings, click **Reset to Default**.

5.20.2 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:
- Click **+** to increase edge enhancement.
- Click **-** to decrease edge enhancement.

3 To adjust edge enhancement using the touchpad or touch screen, do the following:
- Drag up to increase edge enhancement.
- Drag down to decrease edge enhancement.

4 To reset edge enhancement to the default settings, click **Reset to Default**.

5.20.3 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 bottom left 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 stop inverting the image.

5.20.4 Adding Annotations and Remarks

You can add annotations to images and remarks to the current examination.

You can also select which color you want to use for annotations. Each image can contain only one annotation.

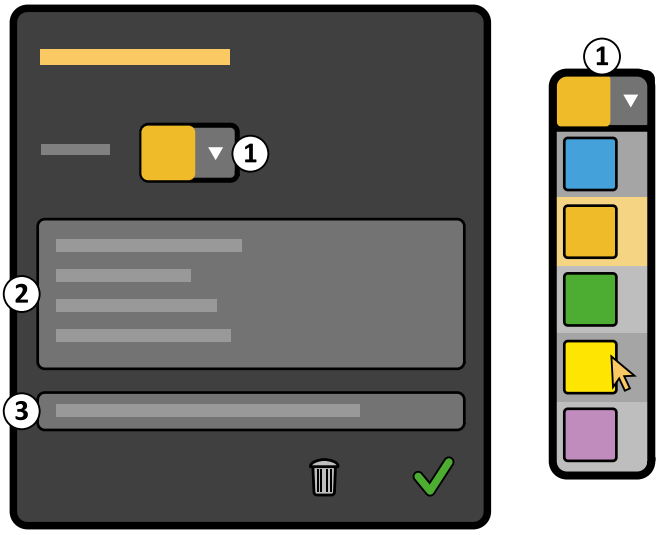


Figure 83 Annotation control panel

Legend	
1	Color list
2	Annotation text box
3	Examination remarks text box

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 **Accept**.

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.

5.20.5 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.

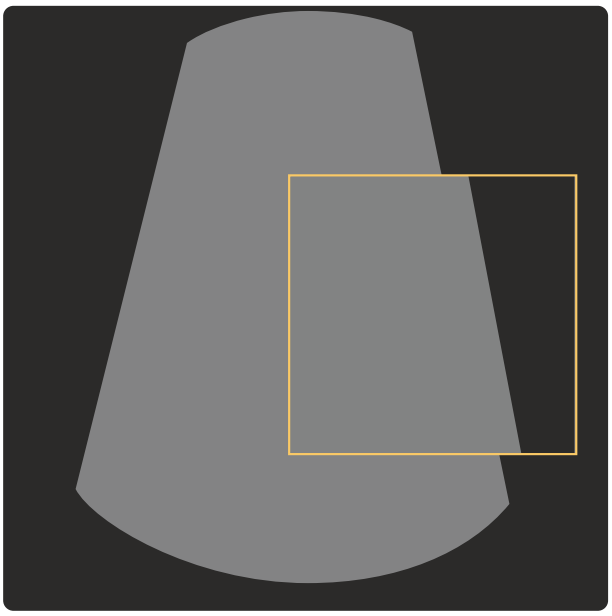


Figure 84 Zoom

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.

- 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.
Undo	The **Undo** button on the mobile view station console can be pressed to undo the last dragging action of the zoomed square. 

5.20.6 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 ±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.

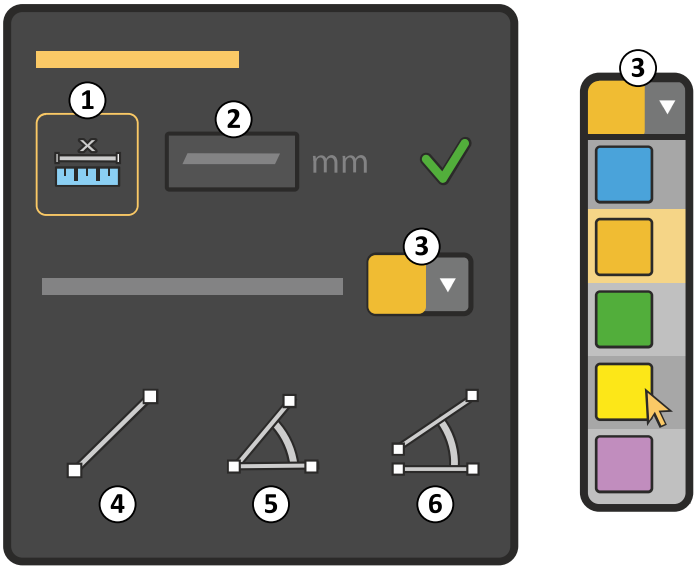


Figure 85 Measure control panel

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 142).

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 143).

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.

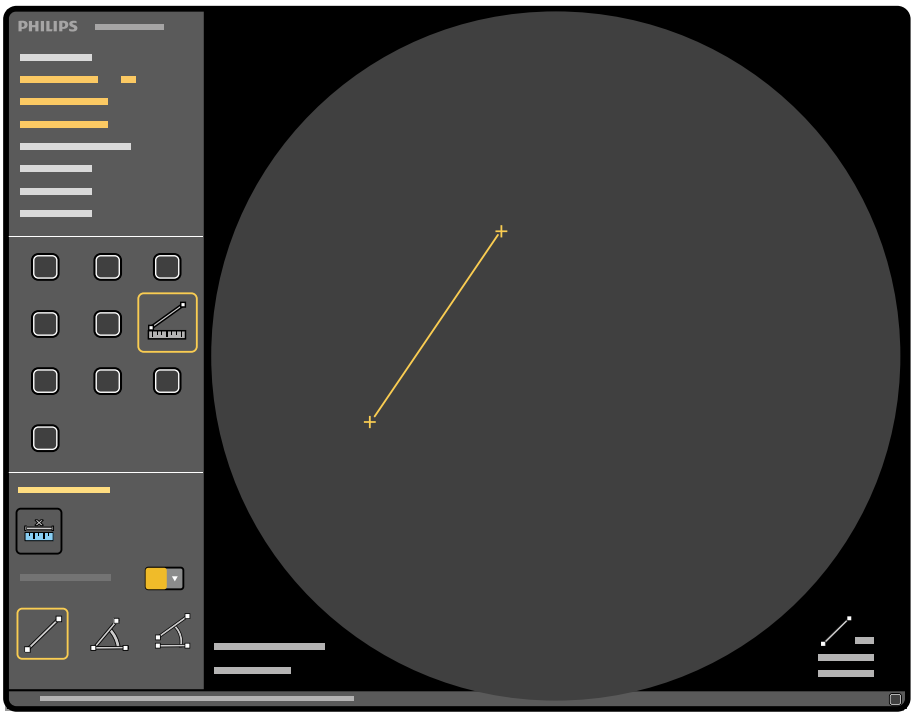


Figure 86 Measurement of two points

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 143).

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.

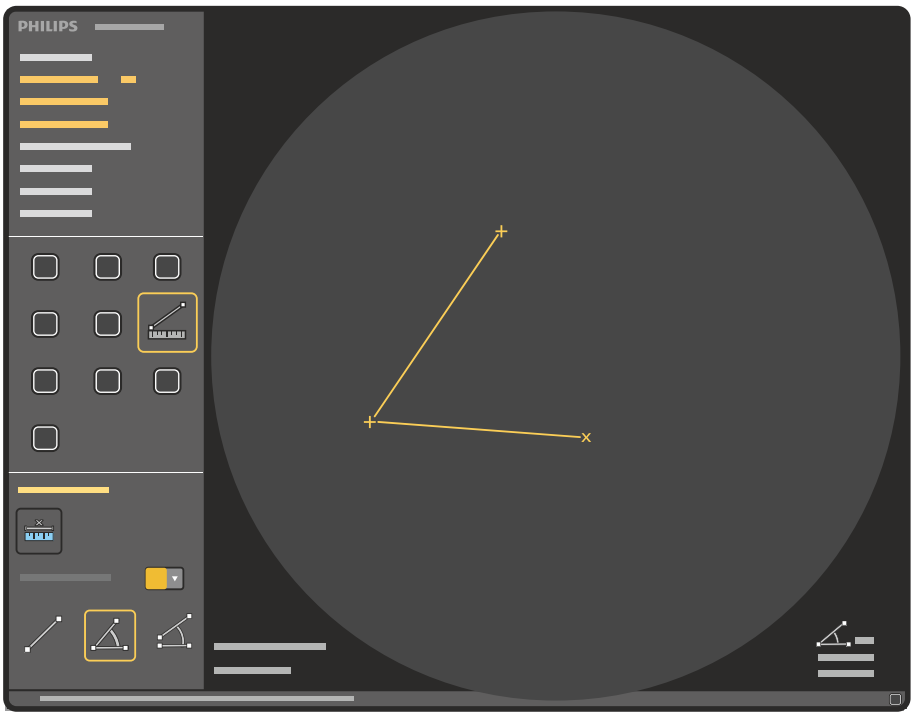


Figure 87 Measurement of two distances and angle (three points)

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.

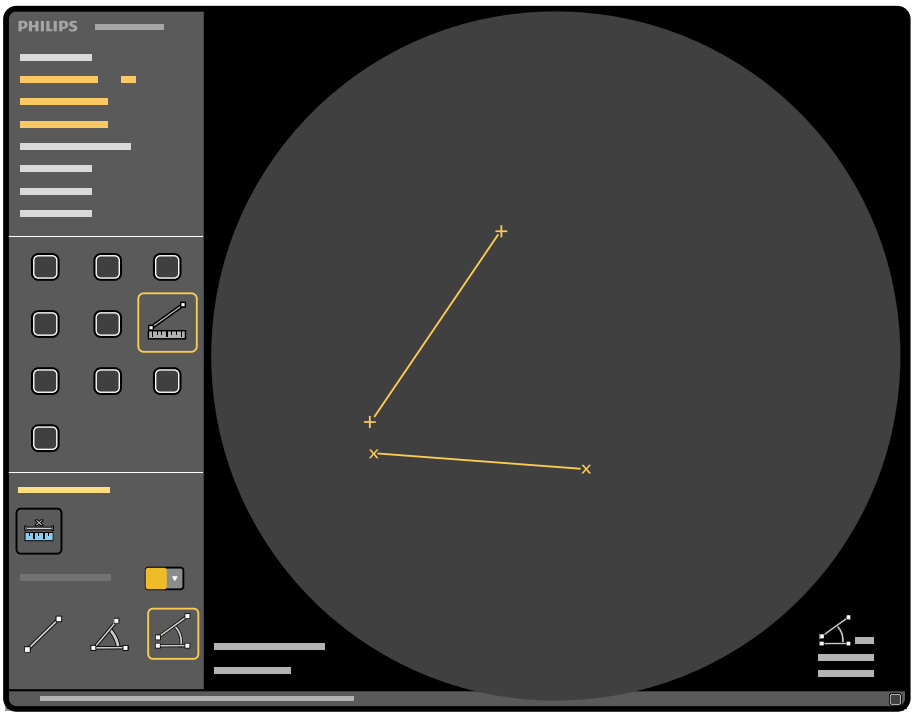


Figure 88 Measurement of two distances and angle (four points)

5.20.7 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.

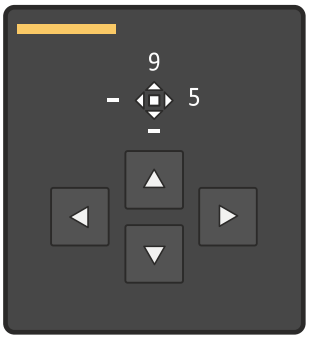


Figure 89 **Pixelshift** control panel

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 run.***

Tips	
Cancel pixelshift	Press the **Undo** button. The pixelshift values from before changing pixelshift will be restored.
	Press the **Undo** button again to reset the pixel shift values to zero.

5.20.8 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.

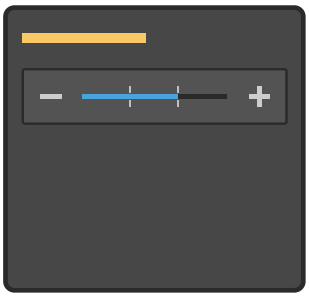


Figure 90 **Landmark** control panel

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.

5.20.9 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.***

5.20.10 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 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.***

5.20.11 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 91 **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 92 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.

5.20.12 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.***

5.21 Exporting, Saving, and Printing

You can export, save, and print patient and image data to removable media (paper, transparency, 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 be 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 158).

You can select each function in the global tools by clicking one of the following icons.

Icon	Function
	**Export**
	**Save to Media**
	**Print** (optional)

5.21.1 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 154)
- *Saving Images to Local Media* (page 155)
- *Printing Images (Option)* (page 157)

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 92).

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 125).

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 133).

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 131).

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.

5.21.2 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 131).

2 From the single image screen or from the overview screen, click **Export** in the global tools.

The **Export** dialog box is displayed.

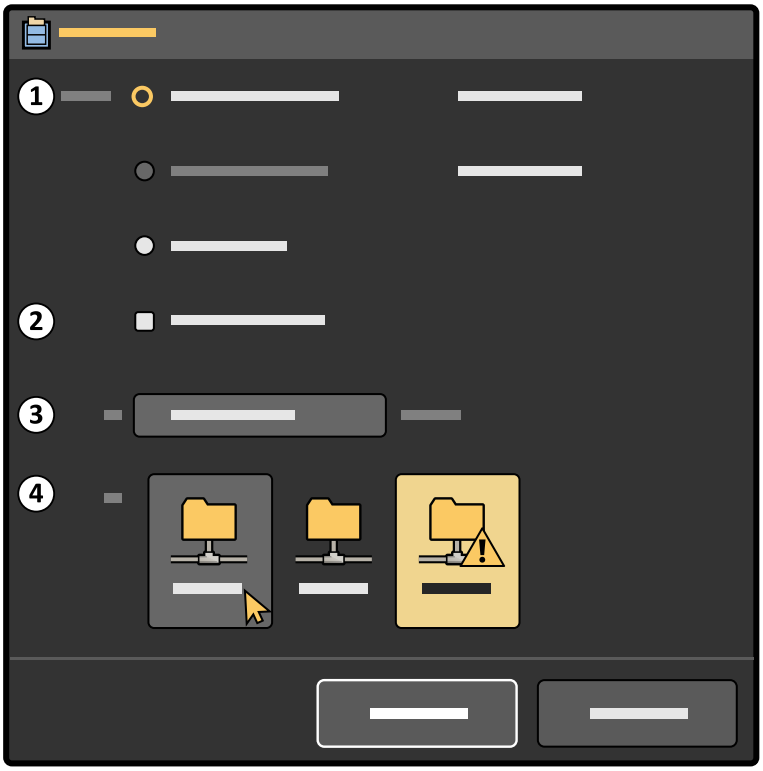


Figure 93 **Export** dialog box

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).
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)	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 158).

If you are using ClearGuide, the direction indicators are not included in the exported images.

5.21.3 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.***

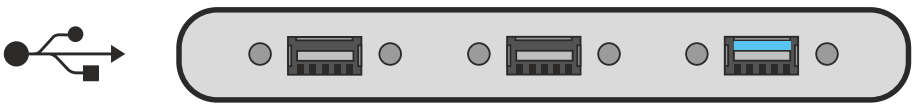


Figure 94 USB ports

1 If you are using the overview screen, select the images or series you want to save.

For more information, see *Overview Screen* (page 131).

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.

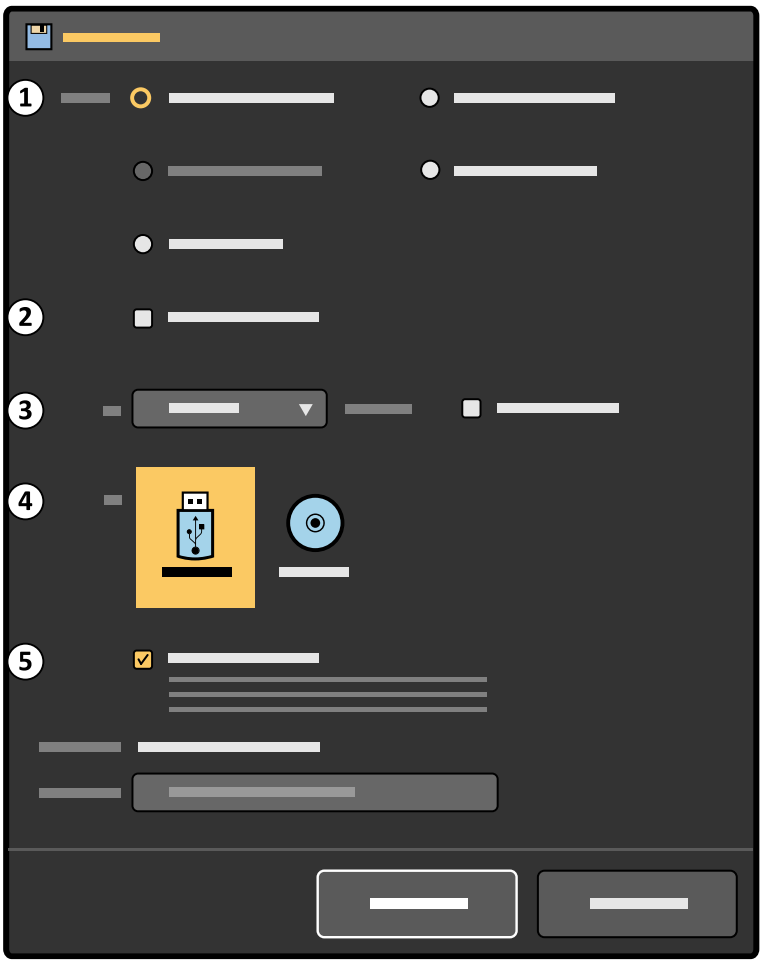


Figure 95 **Save to Media** dialog box

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 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 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 158).

If you are using ClearGuide, the direction indicators are not included in the images.

5.21.4 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 161).

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 131) and *Protection and Image Storage Management* (page 136).

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.

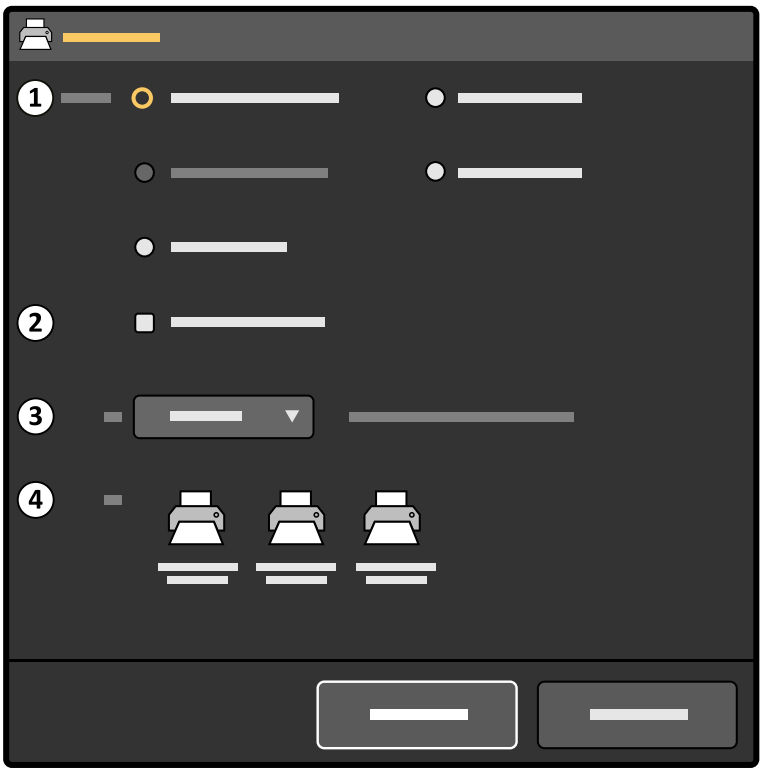


Figure 96 **Print** dialog box

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 image**

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 158).

If you are using ClearGuide, the direction indicators are not included in the printed images.

5.21.5 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 97 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.

Icon	Status	Description
	**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**.

5.21.6 Printing the Examination Monitor Screen (Option)

If the printer option is installed, a print can be made of the examination monitor screen on paper or transparency film.

1 Make sure the printer is switched on and contains paper/transparency film.

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/transparency film 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/transparency film in hot or humid places.
- Do not leave paper/transparency film in a place subject to direct sunlight or bright room light for an extended period of time.
- Store unused or printed paper/transparency film in a cool, dark place (below 30°C / 86°F), preferably in the manufacturer's original, unopened packaging.
- Do not stack printed paper/transparency film on or under a freshly-developed diazo copy sheet.
- Do not allow any volatile organic solvent or vinyl chloride to contact the paper/ transparency film.
- Alcohol, plastic tape or film will fade the printout. Attach printed paper to other pieces of paper with double sided plastic tape or water-based solid glue.

5.21.7 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.

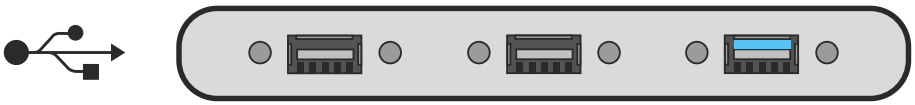


Figure 98 Mobile view station USB connectors

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.

5.21.8 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.

5.21.9 Save Log File for Service

If necessary, the system logfile 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.

5.22 Options

Some functions are optional and may not be installed on your system.

This section provides information about using optional functions.

5.22.1 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 198)******.***

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 50, dated June 24, 2007.

5.22.2 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.

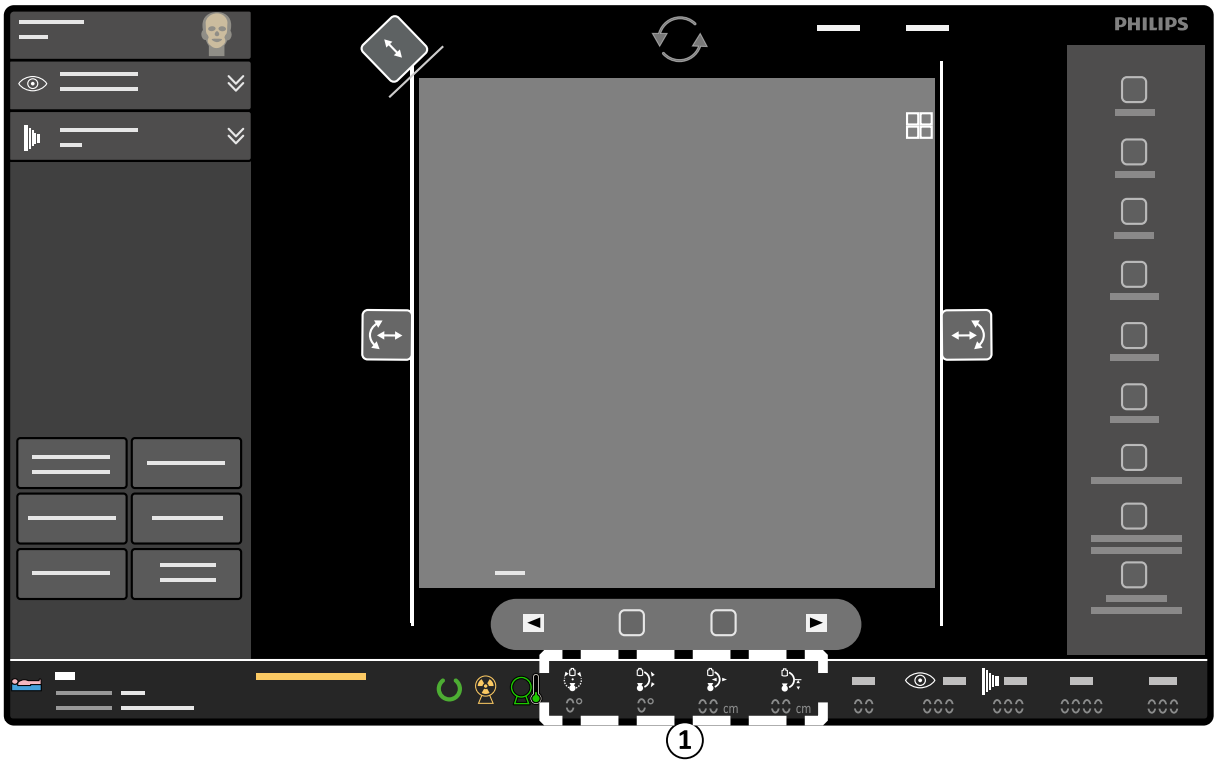


Figure 99 Position tracking in the C-arm stand touch screen status area (1)

Position tracking accuracy levels are shown in the table below.

Axis	Absolute accuracy
Angulation	± 1 degree
Rotation	± 1 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 73)).

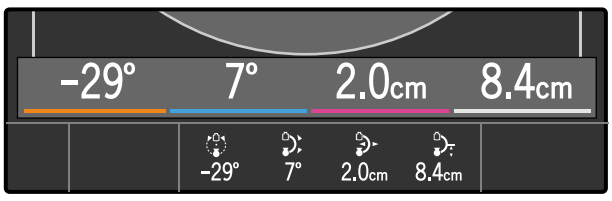


Figure 100 Magnified position tracking information when the C-arm is moved

NOTE ***If the C-arm is not moved for 5 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.

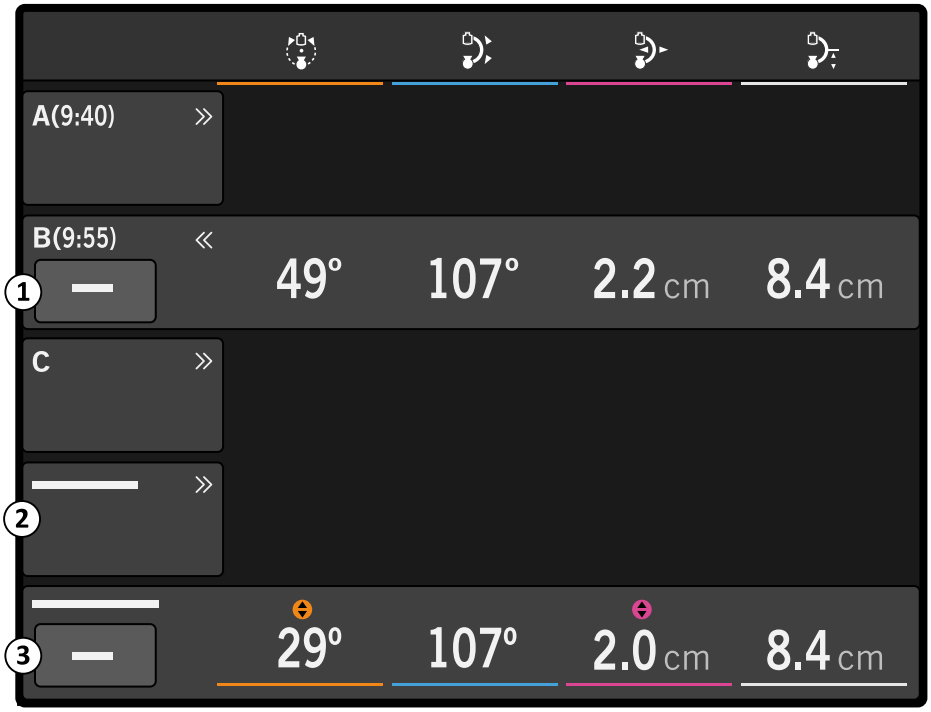


Figure 101 Position memory dialog box

Legend	
1	**Clear** button
2	**Selected Run** expander
3	**Store** button

The **Selected Run** expander contains the C-arm position at the point that X-ray ceased 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 To delete a stored position, tap the **Clear** button of the expander containing the position to be deleted.

The position values and time of storage are deleted, and the **Clear** button is disabled.

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 102 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 73). 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 131)).

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 73).

When the current position matches the position of the selected run, no indicators are shown.

5.22.3 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.

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.

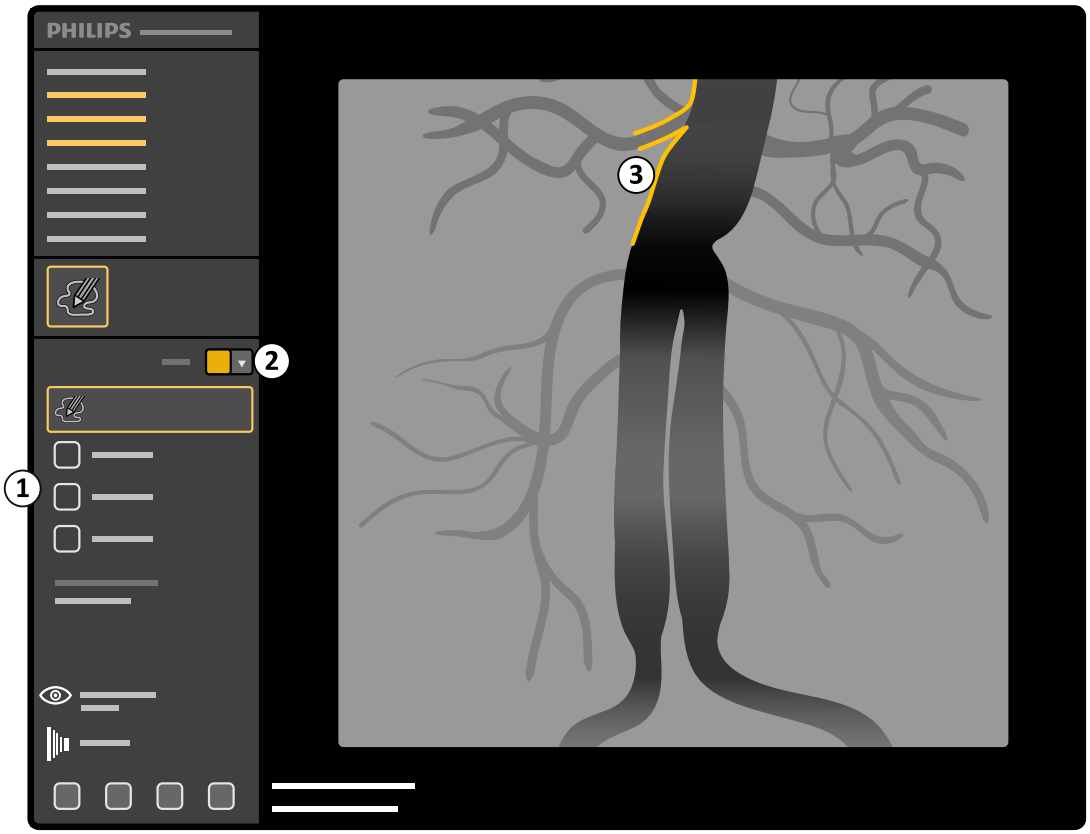


Figure 103 Outline tool on the examination monitor

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.

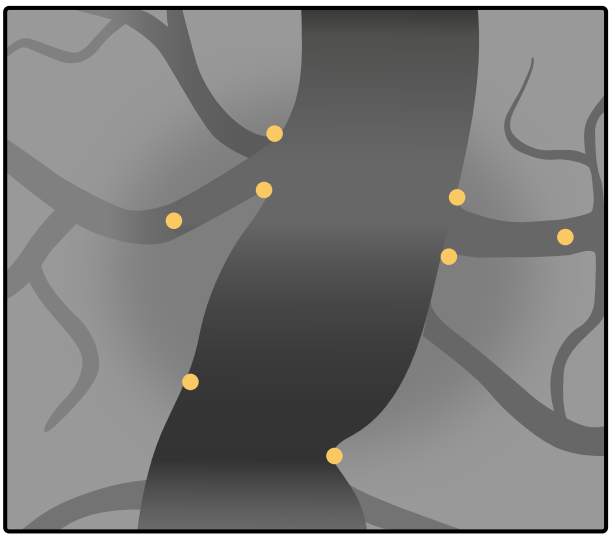


Figure 104 Example dots on an image

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 105 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.

5.22.4 Wireless Network Option

The wireless network option 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.

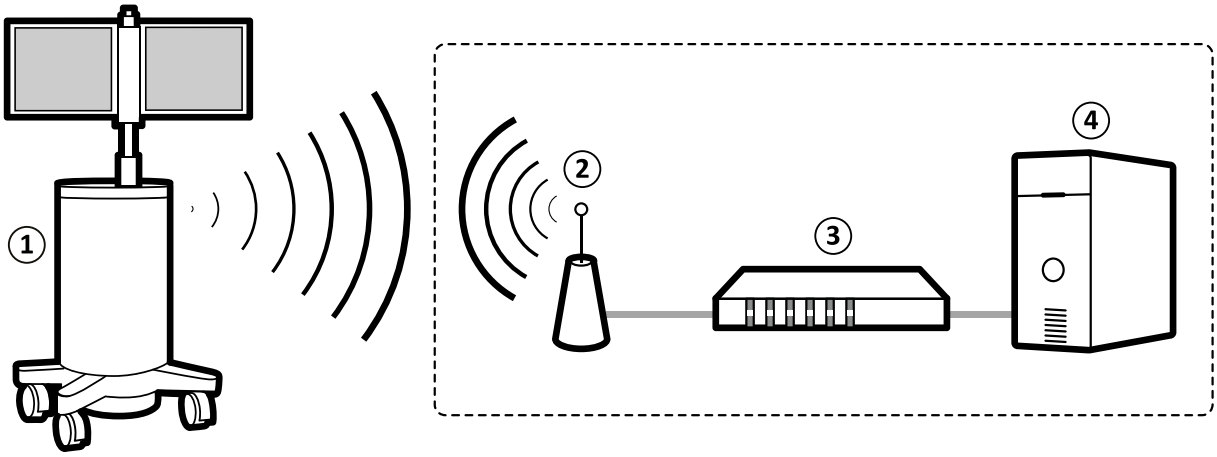


Figure 106 Wireless network infrastructure

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 option, you should follow the guidelines described here.

NOTE ***Switch the wireless networking off in areas within the facility where wireless transmission is not allowed.***

The wireless network option 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 172).

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 option should only be switched on if you understand the risks involved with wireless networking. We recommend that the wireless network option is switched off when not in use.

Network Security

The system is connected to the network whenever the wireless network option 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 276).

Wireless Signal Integrity

The wireless network option 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 option.

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.

WARNING

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.

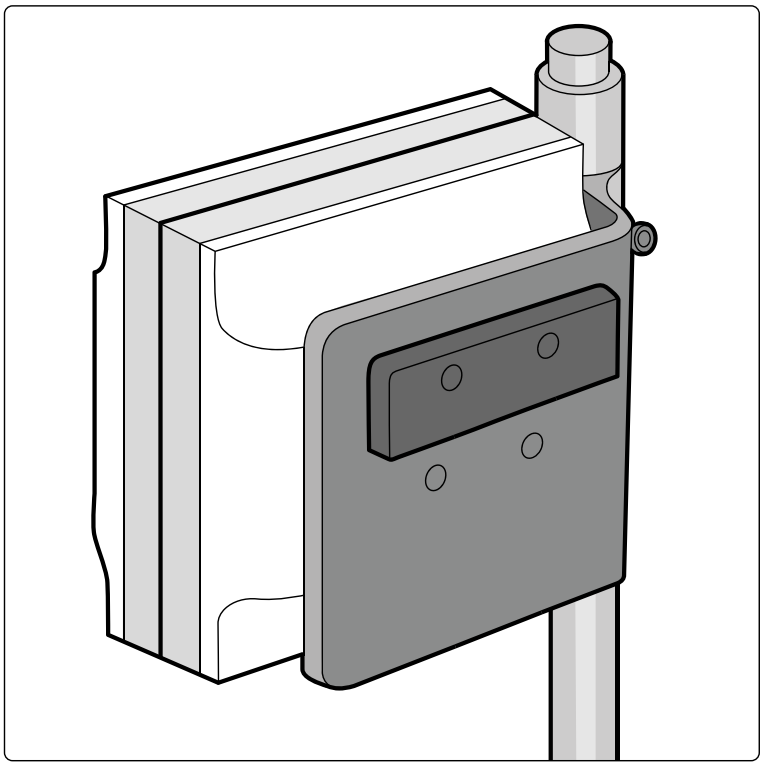


Figure 107 Wireless antennas on the mobile view station

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 option, 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 option 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 option. For more information, see *Switching the Wireless Network Connection On and Off* (page 172).
- Connect the hospital's wired connection to the hospital network port.

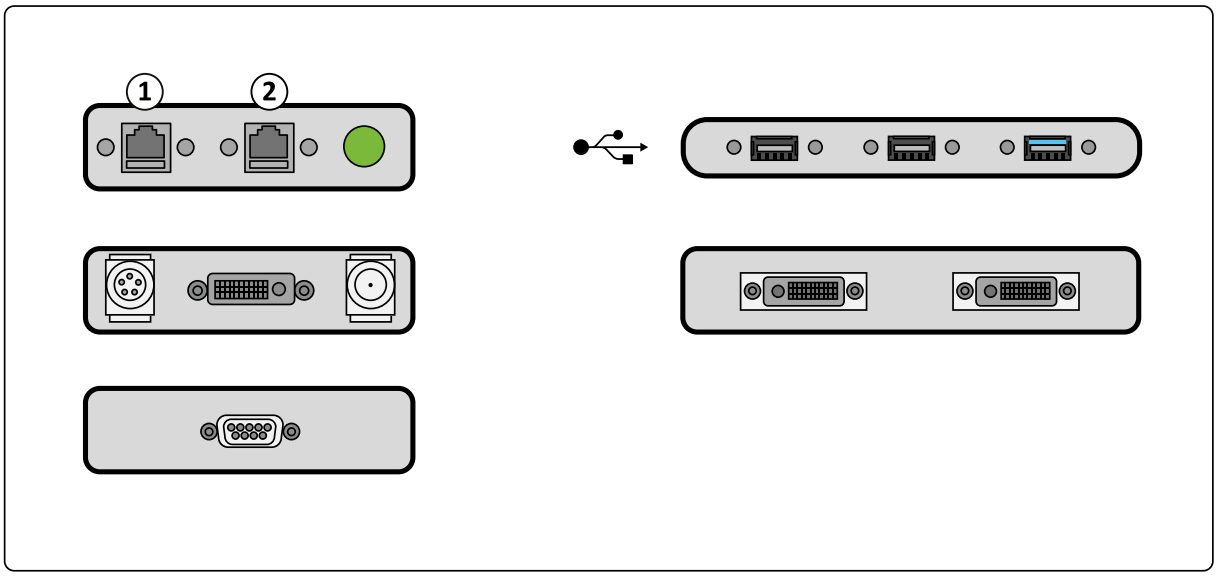


Figure 108 Mobile view station connector panel - network ports

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.***

Switching the Wireless Network Connection On and Off

You can switch the wireless network option 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 **Wireless Network**.

The **Wi-Fi Networks** dialog box is displayed.

3 To switch the wireless network option on, select **Enabled**.

4 If desired, select a network to connect to, from the **Configured networks** list.

5 To switch the wireless network option off, ensure **Enabled** is not selected.

6 To close the dialog box and save the changes you have made, click **Close**.

5.22.5 Wireless Foot Switch

The wireless foot switch is intended only for use with the system indicated in the model number. For details, refer to *Labels* (page 26) and *Symbols* (page 31).

This equipment 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.

However, there is no guarantee that 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.

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 wired foot switch.

The wireless foot switch must be positioned within 10 meters of the C-arm stand and may be put in sterile plastic coverings if so desired.

Image display delay is up to 80 ms longer when the wireless foot switch is used, compared to using the hand switch or the wired foot switch.

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 at any time.

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 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.***

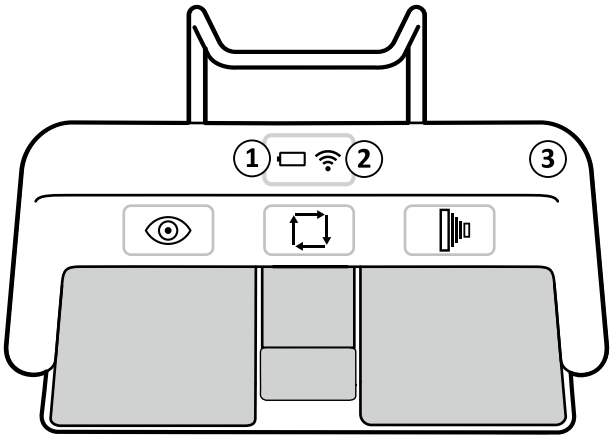


Figure 109 Wireless foot switch

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.

Indicator Light Status

The indicator lights on the wireless foot switch display the charge level of the battery and the status of the wireless connection.

Battery Indicator	Description
Green	Battery charge level should provide more than 40 hours of use.
Red	Battery charge level should provide 20 to 40 hours of use.
Red, flashing every 0.5s	Battery charge level will provide less than 20 hours of use.
Red, flashing rapidly	Battery charge level is less than 1.5%.
Green, flashing	Battery is charging.

Wireless Indicator	Description
Off	Wireless connection is operational.
Red	Wireless connection is not available. Do not use the foot switch. Wait for the wireless connection indicator to go out before using the foot switch. If the red indicator light is on for longer than 10 seconds, switch the foot switch off and then on again. If the red indicator light is on and the battery indicator is red and green, then a critical error has been detected during startup of the foot switch and the foot switch is in safe mode.
Red, flashing rapidly	Safe mode. A critical error has been detected during use.

Wireless Foot Switch Charging Unit

A charging unit is supplied to recharge the battery of the wireless foot switch.

NOTE ***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.***

To recharge the battery, remove the cap from the charging port on the back of the wireless foot switch (indicated in the following figure) and connect the charging unit to the charging port.

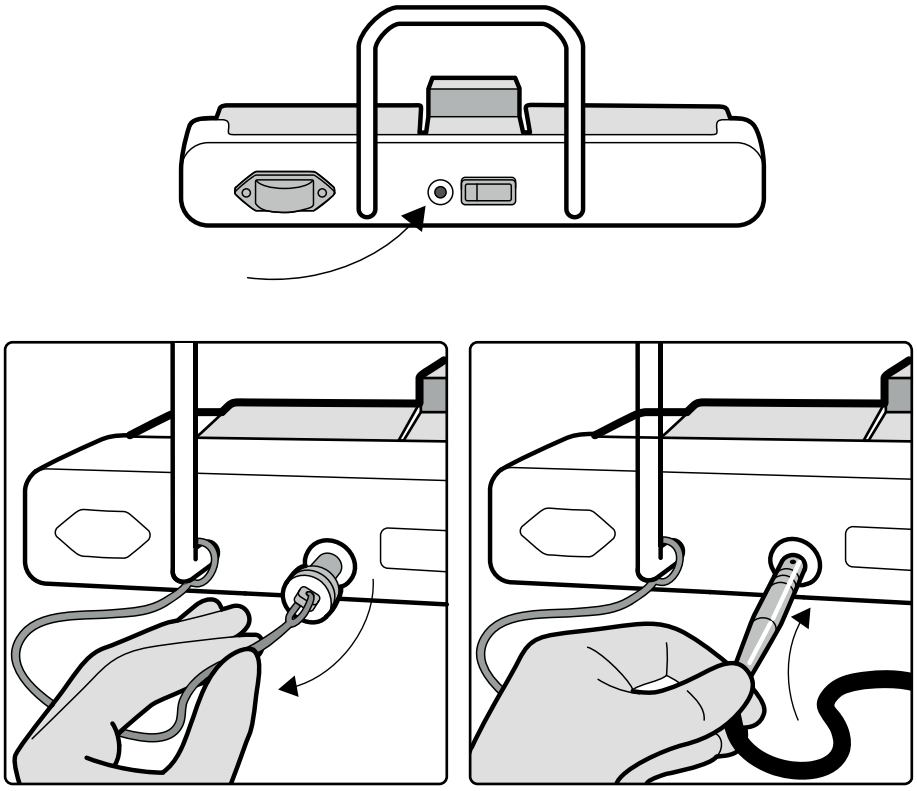


Figure 110 Charging port

NOTE ***Use only the charging unit supplied with the wireless foot switch. Using any other charging unit may cause damage to the foot switch and will void the warranty.***

The battery indicator on the wireless foot switch flashes while the foot switch is connected to the charger and is charging properly. When the foot switch is fully charged, the battery indicator is green and continuously on.

A normal, complete charge cycle takes more than 12 hours. Charging the wireless foot switch for between 6 to 8 hours charges the foot switch enough to allow up to 8 hours of continuous use. We recommend that you charge the battery every week, or when the battery status indicator turns red (indicating that the charge level is low). The battery has built-in safety devices to protect it from overcharging, over discharging, and low voltage. The foot switch switches off automatically when the battery is empty.

NOTE ***Place the cap back to the charging port after recharging of the battery is finished to prevent ingress of fluids during use.***

If the battery is depleted within 2 days after a complete charge, please contact Philips Service for a replacement battery. The battery may only be replaced by a qualified Philips service engineer.

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.

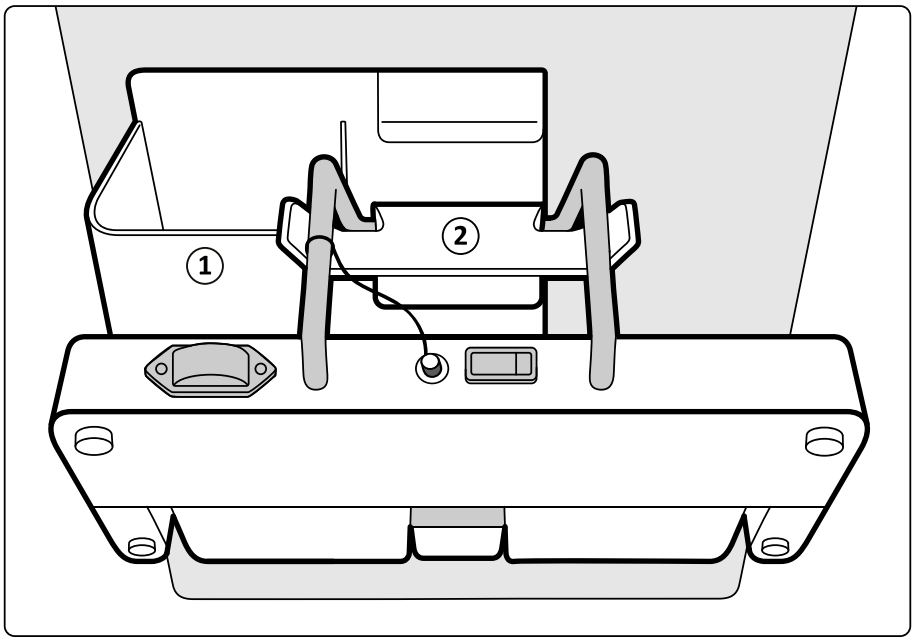


Figure 111 Wireless foot switch and charger storage on the mobile view station

Legend	
1	Charger storage location
2	Wireless foot switch storage hook

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**.

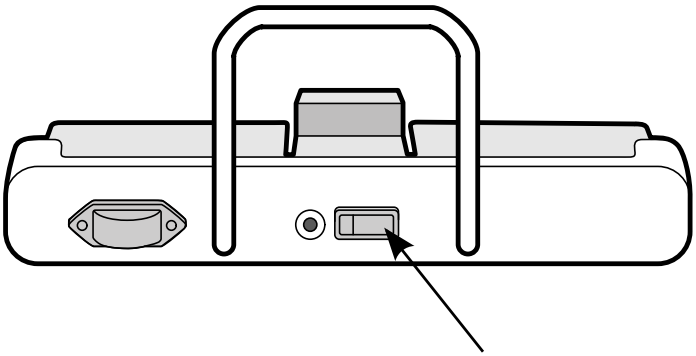


Figure 112 Wireless foot switch on/off switch

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 173).

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**.

5.22.6 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.***

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.

5.22.7 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 178).

WARNING
Two persons must install the sterile covers. One must wear sterile clothes and gloves.

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.

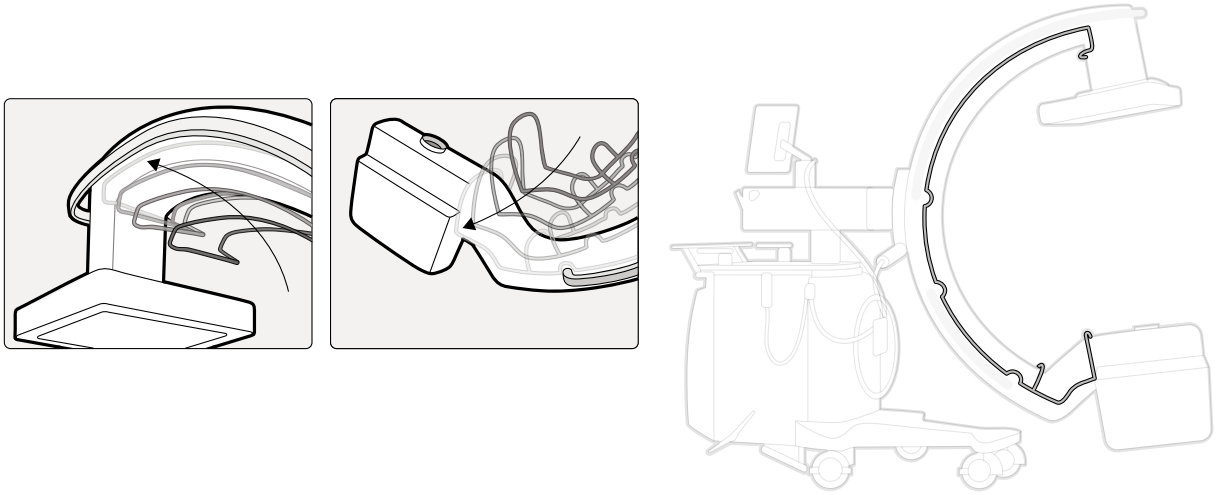


Figure 113 Fitting the spring bow

Observe local protocols and procedures when fitting covers.

5.22.8 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

- Joint 1, which connects VESA bracket to monitor
- Joint 2, which clamps the Swing Arm to accessory rails
- VESA bracket that holds the Touch Screen Monitor
- 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.

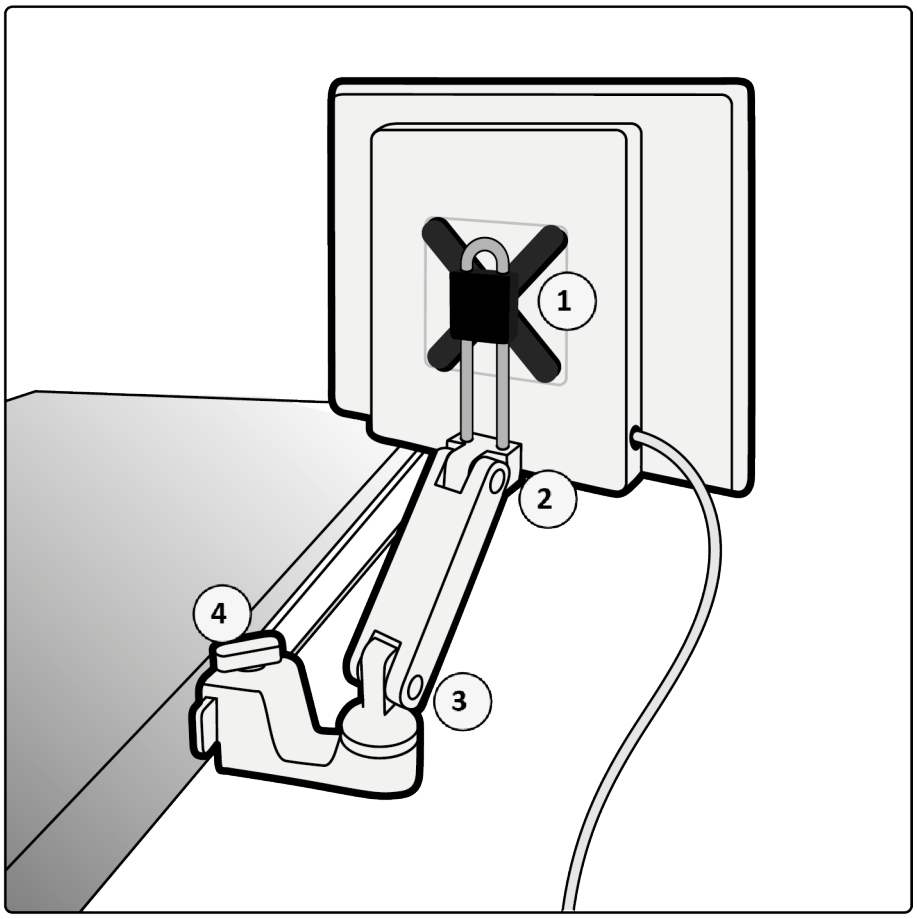


Figure 114 Swing Arm

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

Legend			
1	VESA Bracket	3	Joint 2
2	Joint 1	4	Knob

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. 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

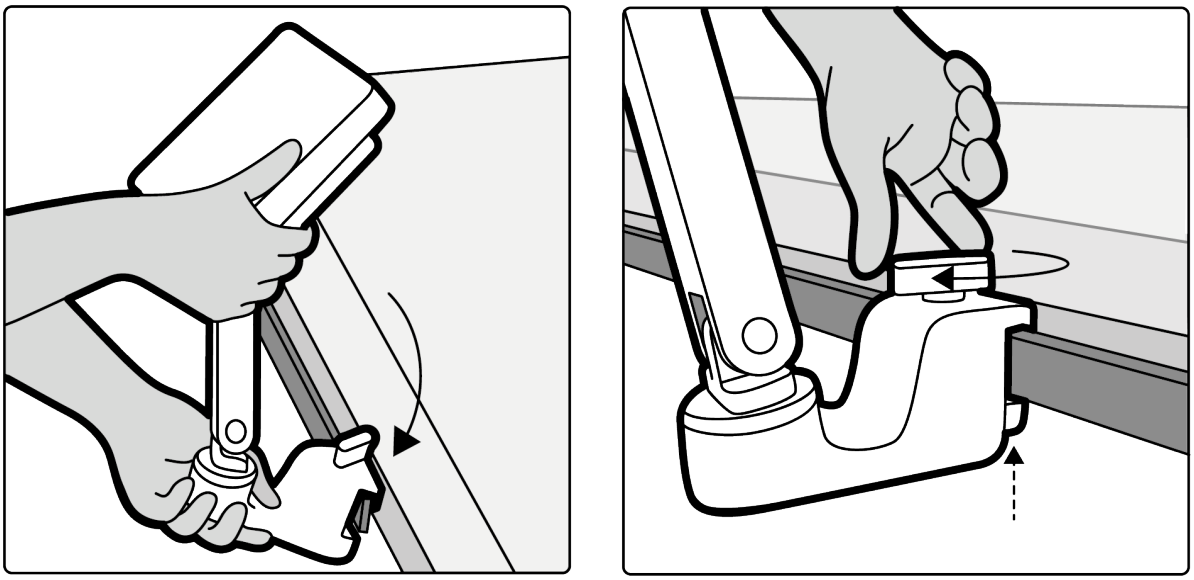


Figure 115 Attaching the Swing Arm to Accessory Rails

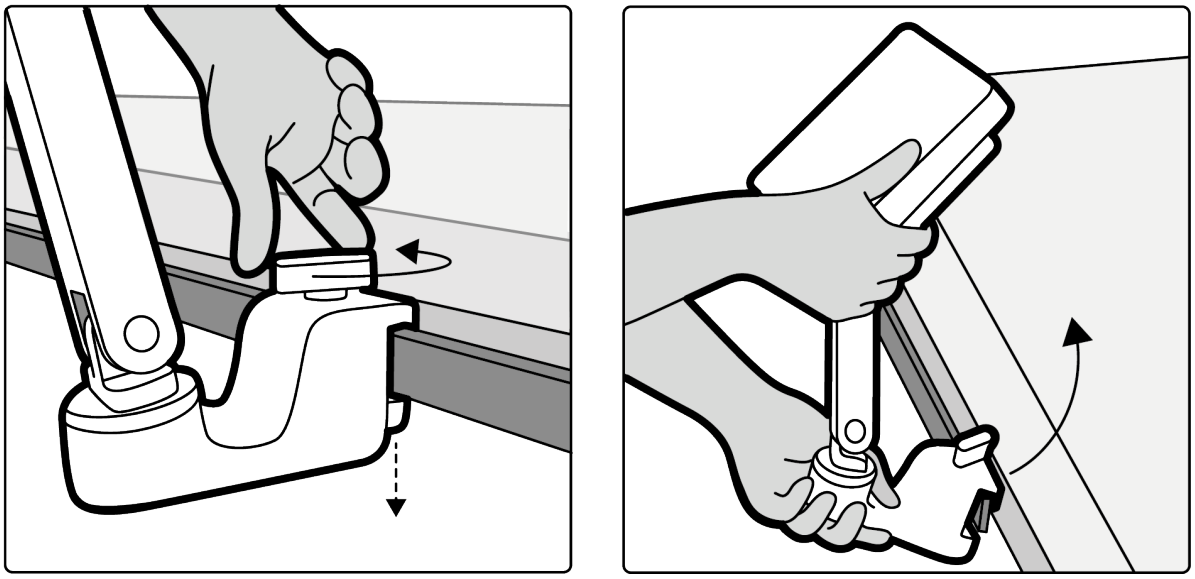


Figure 116 Detaching the Swing Arm to Accessory Rails

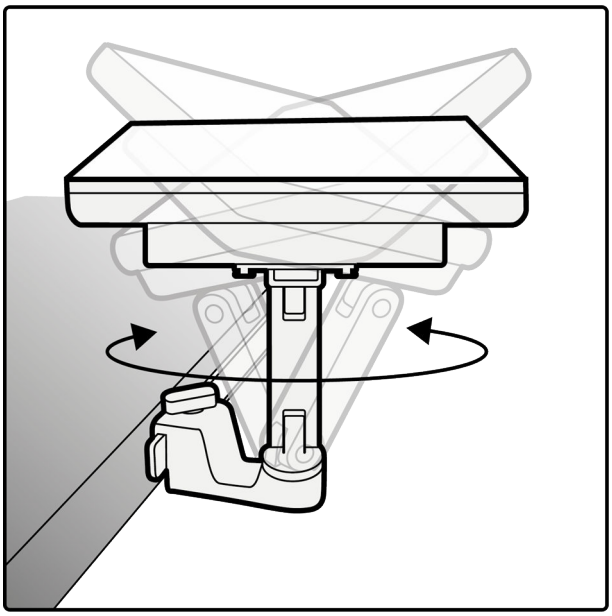


Figure 117 Swivel movement

NOTE ***To easily mount TSM on the accessory rails, ensure that the Swing Arm is in extended position and Monitor is facing the user.***

WARNING
The Swing Arm can be mounted on rails from 30 mm to 10 mm width and 23 mm to 7 mm height. 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 surgeon side to access either upright at an angle or in collapsed position.
- You can attach the Swing Arm on opposite side (nurse) of the table so that nurse or any other people in the OR can have an access.

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.

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
Ensure that when the Operator pushes TSM along the railing, the TSM should not fall on Surgeon or Operator.

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.***

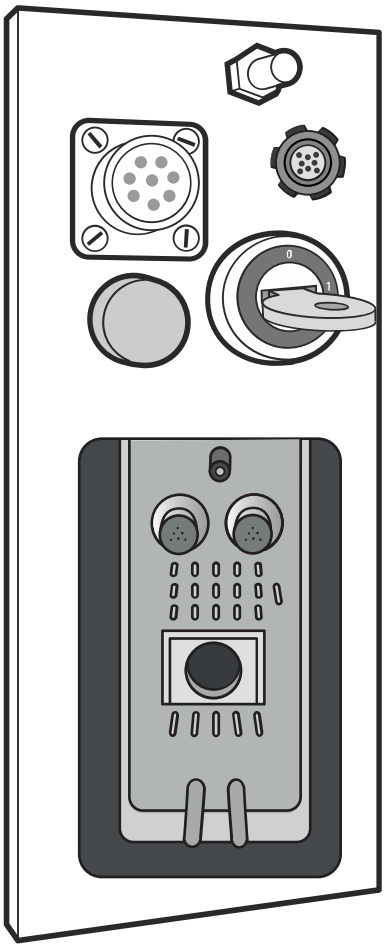


Figure 118 C-arm stand connector panel

Touch Screen Monitor

Touch Screen Monitor is mounted on a tableside 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.

5.22.9 Collaboration Live Overwiew

Collaboration Live is a non-diagnostic feature that is powered by the Reacts technology of Philips Innovative Imaging Technologies, Inc. (PIIT). This integrated collaborative solution allows you to securely communicate with authorized Philips remote user by text, voice, and video between a compatible Philips Zenition system and a remote destination.

The Collaboration Live server is a secure, web-hosted, enterprise solution that provides contact management, secure connectivity, and streaming services for Collaboration Live text, voice, and video features. The server is accessed from the Zenition system and remote-client end points over the Internet, using an industry-standard TLS encrypted method of connectivity.

Please read the instructions in the following sections before connecting the web cameras.

Mobile View Station Connector Panel (page 56)

Mobile Telephones and Similar Products (page 20)

Electromagnetic Compatibility (page 20)

Electromagnetic Compatibility (page 207)

Warnings and Cautions

Before using the system, read these warnings.

WARNING
During a Collaboration Live session, an authorized user must be present at the system, even if the remote user is properly trained and qualified.

WARNING
Use only headsets and web cameras that are compliant to all local regulations (Headsets: CE, FCC ID, IC ID KCC, RCM, NCC, TELEC, SRRC, EN 55024 immunity tested. Webcam: CE, FCC, EAC, KCC, VCCI, IECEE, EMC, C-Tick, EN 55024 immunity tested.

WARNING
Some web cameras are known to be unresponsive to MUTE/UNMUTE function from Collaboration Live application. This shall result in users voice being audible to Philips remote user even when muted.

WARNING
For any connected devices (web cameras etc.) that emit light, it is recommended to keep the devices in such a manner that light does not distract the users.

WARNING
Images remotely streamed via Collaboration Live are intended only for reference and must not be used for diagnostic purposes.

NOTE ***The performance of Collaboration Live depends on local connectivity and network performance. Interruption in connectivity or poor network performance could adversely affect aCollaboration Live session.***

CAUTION
All Collaboration Live users should follow the applicable patient privacy and data security policies required by their country and institution.

Prerequisites

Network Requirements

Before first use of **Collaboration Live** ensure that the Zenition system is connected to the site's network, which provides access to the Internet.

NOTE ***During a conversation, If you do not get a response from Philips remote user (due to network lag/connectivity issues), terminate the conversation and close the Collaboration Live application.***

For optimum performance, Philips recommends that the network connected to the Zenition system and the network used by a remote user meet the following bandwidth specifications:

- Audio: 250 K bits/s
- Screen sharing: 0.5 M bits/s
- Video streaming:-
  - Upload for webcam: 0.5 M bits/s
  - Download for video stream being received: 0.5 M bits/s

NOTE ***If the site uses a proxy server to access the Internet, and if the network administrator changes the proxy server location or password, you may need to reconfigure the Zenition system's remote access for Collaboration Live.***

Starting Collaboration Live on the Zenition System

You can launch Collaboration Live using the System menu.

1 On the **System** menu, click **Start Collaboration Live** option.

2 Collaboration Live screen is displayed with **System Account Name**.

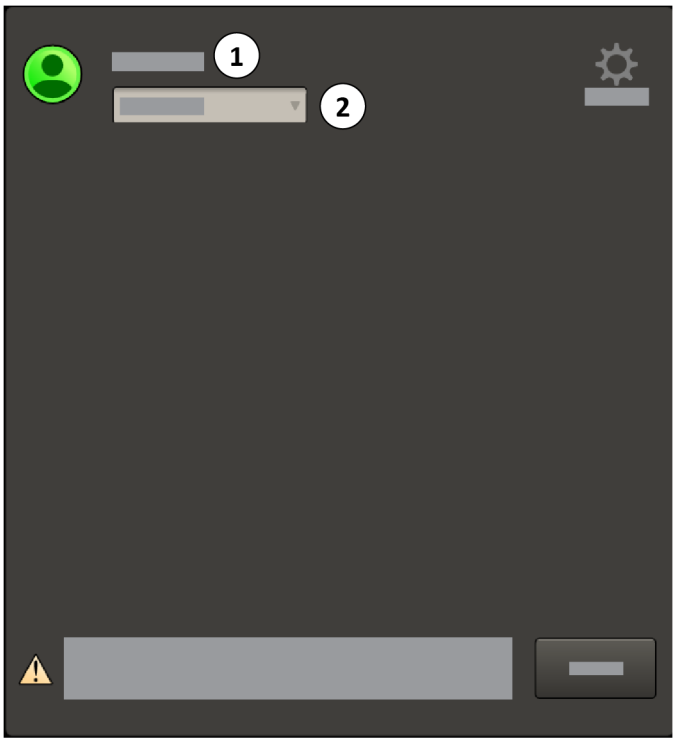


Figure 119 Collaboration Live screen

Legend	
1	System Account Name is displayed which is recognized by the Reacts server.
2	User status options are displayed: Online, Busy and Log out.

NOTE ***If status of the user is Busy, an authorized Philips remote user will not be able to call the user.***

Using Collaboration Live on the Zenition System

You can use following Collaboration Live controls and icons on the Zenition system.

Collaboration Live Controls

Control	Description
	Mutes or unmutes the microphone.
	Mutes or unmutes the speaker.
	Enables or disables webcam sharing.
	Ends the current call.

Control	Description
Give Control	Enables system control for the remote user.
Resume Call	Resumes a call.
Send	Sends a message during a chat session.
Share	Enables display sharing.
Stop Sharing	Disables display sharing.
Take Control	Disables system control for the remote user.

Collaboration Live Icons

Control	Description
	The microphone is unmuted.
	The microphone is muted.
	The speaker is unmuted.
	The speaker is muted.
	Webcam sharing is enabled.
	Webcam sharing is disabled.

CAUTION

Images remotely streamed via Collaboration Live are intended only for reference and shall not be used for diagnostic purposes. Whenever you share the screen or give control of the Zenition system to a remote user, you must acknowledge the consent message that appears before you proceed.

Viewing a New Message or Answering a Call

An authorized Philips remote user can contact user via Instant Messaging or a call. When you receive a call a notification is displayed on **Confirm Call** screen.

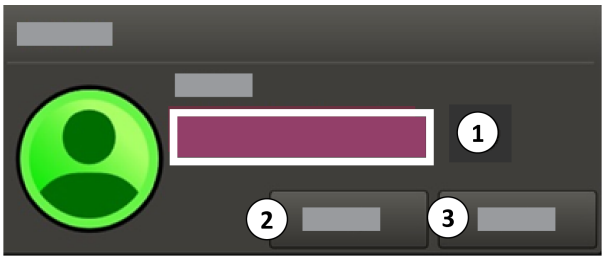


Figure 120 Confirm Call

Legend	
1	An authorized Philips user's name is displayed in **Call from** dialog box.
2	Click **Accept** to start the conversation.
3	Click **Decline** to close the conversation.

Making an Audio Call

To make an audio call, you have to connect headset to the USB port on the mobile view station (MVS).

1 Once an instant messaging session is started with Philips remote user, click **Call**.

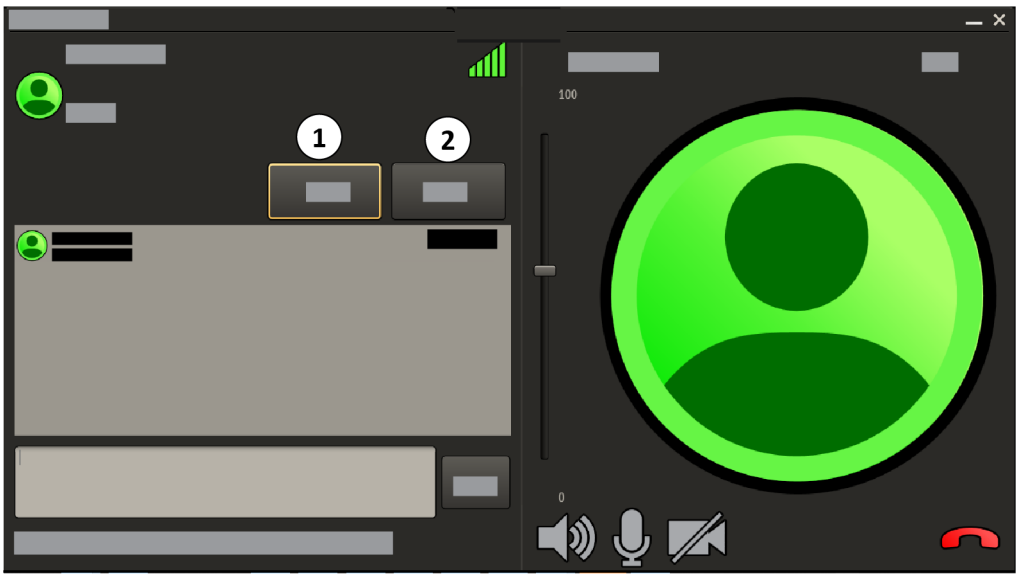


Figure 121 Conversation with screen

Legend	
1	**Chat**
2	**Share**

2 You can also **Chat** with the authorized Philips remote user while call is ongoing.

3 To share the live monitor contents, click **Share** button. For more information, see *Sharing the Zenition Live Monitor* (page 188)

CAUTION
Chat history is not saved. It is lost when the chat window is closed after the conversation is ended or the system is restarted.

You can perform following functions:	
	To mute the microphone, click **Microphone is muted** symbol.
	To unmute the microphone, click **Microphone is unmuted** symbol.
	To mute the speaker, click **Speaker is unmuted** symbol.

	To unmute the speaker, click **Speaker is muted** symbol.
	To share video, click **Sharing Video** symbol.
	To end the call, click **End Call** symbol.

Sharing the Zenition Live Monitor

You can share the Zenition Live Monitor screen with Philips Remote service user thereby enabling remote takeover of the Zenition system (live monitor only).

To share the Zenition Live Monitor, perform following:

1 During an instant messaging session or an audio call, click **Share** button on the reference monitor. Consent message is displayed on the screen. Click **Continue** on the message screen.

2 The display border blinks to indicate that you are sharing the display on the live monitor screen.

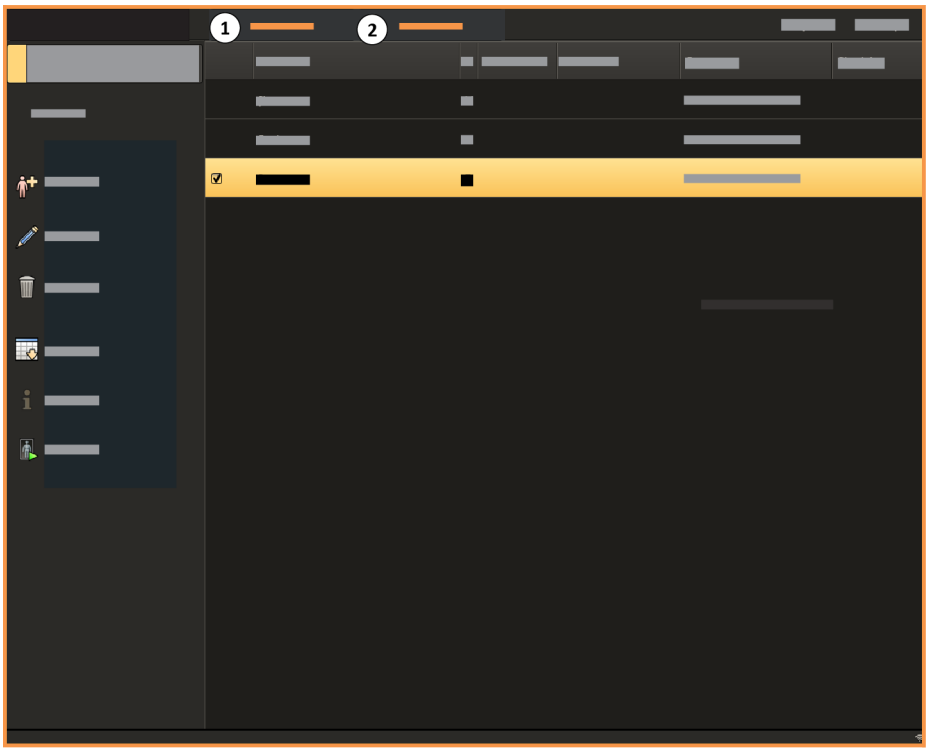


Figure 122 Sharing Zenition Live Monitor

Legend	
1	**Give Control**
2	**Stop Sharing**

3 To enable authorised Philips remote user to take control, click **Give Control** button on the live monitor. **Give Control** button toggles to **Take Control** button which allows user to take the control back.

4 To stop sharing, click **Stop Sharing** button on the live monitor.

5 To end the session, click **End Call**.

WARNING
During Collaboration Live session, an authorized user must be present at the system.

Sharing Video

You can share video with Philips Remote Service using a webcam connected to one of the USB ports on the Zenition MVS.

To share the video, perform the following:

1 During an audio call, click **Sharing Disabled** symbol on the **Conversation with** screen. Consent message is displayed on the screen. Click **Continue**.

2 Video call options are displayed on **Video Call Options** screen. You can perform following:

Figure 123 Video Call Options

Legend	
1	**My Webcam**.
2	**Remote Webcam**.
3	**Bidirectional Webcam**.
4	**Cancel**.

3 To share video from the webcam connected to the Zenition system, click **My Webcam**.

4 To view video from the remote user, click **Remote Webcam**.

5 To share both video from the webcam connected to the Zenition system and view video from the remote user, click **Bidirectional Webcam**.

6 To cancel the video call, click **Cancel**.

During video call, you can perform following:

During video call, you can perform following functions:	
	To mute the microphone, click **Microphone is muted** symbol.
	To unmute the microphone, click **Microphone is unmuted** symbol.
	To mute the speaker, click **Speaker is unmuted** symbol.
	To unmute the speaker, click **Speaker is muted** symbol.
	To continue sharing video, click **Webcam Sharing Disabled** symbol.
	To stop sharing video from the system, click **Webcam Sharing Enabled** symbol.
	To end the call, click **End Call** symbol.

Collaboration Live Settings

You can click **Settings** button to check collaboration live settings.

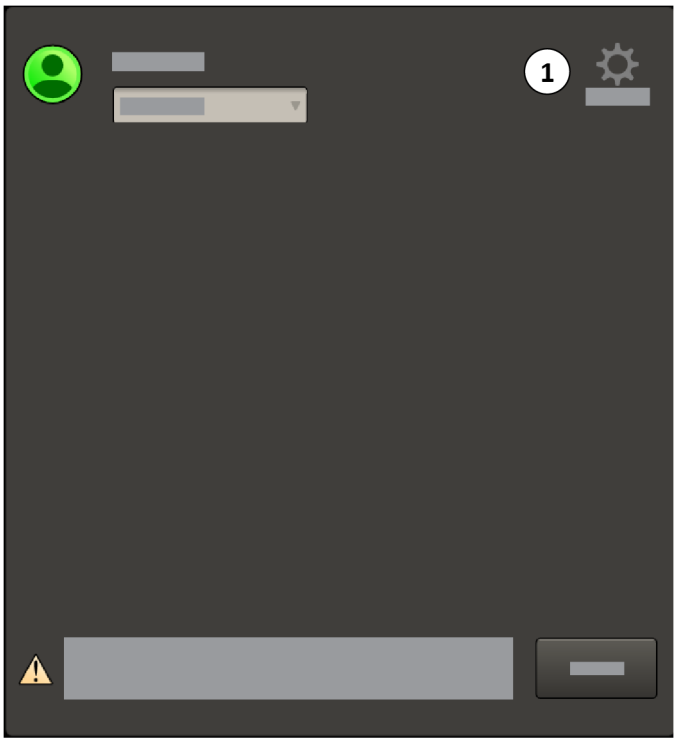


Figure 124

Legend	
1	**Settings** button.

Collaboration Live has following connectivity settings:

- **Server** provides the server URL that the system is connected to.
- **Proxy Settings** provides the proxy mode, if used.

5.23 Accessories

Before an examination is started, install the accessories as desired. Also if applicable:

- Position the remote control.
- Connect and position the foot switch.
- Check the presence of paper/transparency in the printer.

5.23.1 Connecting the Wired Foot Switch

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

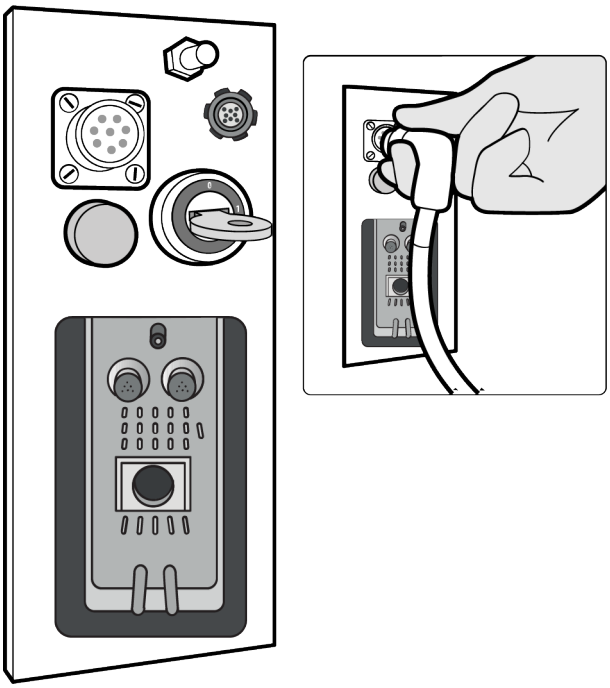


Figure 125 Connecting the wired foot switch to the C-arm stand

5.24 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.***

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.

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 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.

6.3 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.

6.4 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	Yearly
	Check mobile view station system outside	Yearly
	Check C-arm stand system outside	Yearly
	Check cables	Yearly
	Check connectors	Yearly
	Check key switch	Yearly
Check labels		Yearly

7.1.2 Mechanical Checks

What to check		Frequency
Mobile view station movement	Check wheels	Yearly
	Check grounding strip	Yearly
	Check brakes	Yearly
	Check steering function	Yearly
C-arm stand movement	Check C-arm movements	Yearly
	Check wheels	Yearly
	Check grounding strip	Yearly
	Check steering function	Yearly
	Check floor brake	Yearly
Check monitor mechanism		Yearly
Visual inspection and cleaning system inside	Mobile view station system inside	Yearly
	C-arm stand system inside	Yearly

What to check	Frequency
Options and accessories	Yearly

7.1.3 Functional Checks

What to check	Frequency
Check Ethernet connection	Yearly
Check Philips remote service connection	Yearly
Check access controls and credentials on the system	Yearly
Check log files	Yearly
Check fan	Yearly
Check controls and indicators	Yearly
Check hand switch and foot switch	Yearly
Check detector laser aiming device	Yearly
Check X-ray on indicator light on the mobile view station	Yearly
Check C-arm stand height movement	Yearly
X-ray control	Yearly

7.1.4 Radiation Safety Checks

What to check	Frequency
Dose limiting check	Yearly
X-ray tube performance check	Yearly
X-ray field check	Yearly
Dose indication check	Yearly

7.1.5 Image Quality Checks

What to check	Frequency
Detector check	Yearly
Cosmetics check	Yearly
Dose rate check	Yearly
kV stabilized check	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.

Two 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.

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 Call** 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 198).***

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 83).

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 **Server** 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
Accessories	Availability and integrity	Daily
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
Power-on	Check display and monitor for error messages [1] For more information, see *Switching the System On* (page 79).	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

Check	Description	Frequency
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 (FD15, FD12) / squircle image (FD 17), ensuring no part of the collimator is visible in the square image.

Square images (FD15, 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 115).

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 117)).

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.

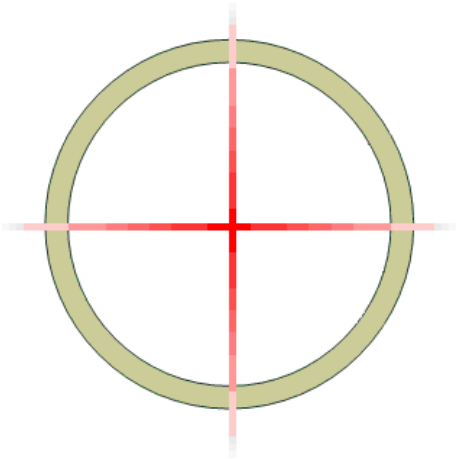


Figure 126 Laser aiming device check

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 after each procedure.

WARNING
Always electrically isolate this 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. Cleaning instructions for other equipment are described in the accompanying documents of the equipment. 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.***

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.

Disinfectant Agents

You can disinfect the system parts and accessories 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:

- Ethyl or isopropyl alcohol (95%)
- Quaternary ammonium (300 ppm)
- Glutaraldehyde (2%)
- Ortho-phthalaldehyde (0.55%)
- Hydrogen peroxide (5%)
- Chlorhexidine (0.5%) in ethanol or isopropyl alcohol (70%)
- Sodium hypochlorite (500 ppm)

The following active compounds may not be used:

- Products containing phenol-based components, such as ortho-phenylphenol, ortho-benzyl-parachlorophenol, or chloroxylenol.
- 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.

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.

7.6 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.

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.

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 173).

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 55).

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.

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 205)).

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

For advice and information, contact your Philips Medical Systems representative, or contact the manufacturer. For more information, see *Contacting the Manufacturer* (page 15).

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

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 and accessories 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 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 Electromagnetic Immunity

Guidance and Manufacturer's Declaration – Electromagnetic Immunity			
Immunity Test	**IEC 60601-1-2 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.

IEC60601-1-2 Immunity to Proximity Fields from RF Wireless Communications Equipment

According to Table 9 of IEC 60601-1-2 Ed.4.0						
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	704-787	LTE Band 13, 17	Pulse modulation 217 Hz	0.2	0.3	9
745						
780						
810	800-960	GSM 800/900 TETRA 800 iDEN 820 CDMA 850 LTE Band 5	Pulse modulation 18 Hz	2	0.3	28
870						
930						
1720	1700-1990	GSM 1800 CDMA 1900 GSM 1900 DECT LTE Band 1, 3, 4, 25 UMTS	Pulse Modulation 217 Hz	2	0.3	28
1845						
1970						
2450	2400-2570	Bluetooth WLAN 802.11 b/g/n RFID 2450 LTE Band 7	Pulse Modulation 217 Hz	2	0.3	28
5240	5100-5800	WLAN 802.11 a/n	Pulse Modulation 217 Hz	0.2	0.3	9
5500						
5785						

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 5.150-5.725 GHz 5.725-5.875 GHz	<20 dBm <23 dBm <14 dBm	The wireless network uses DSSS, OFDM, FHSS (2.4 GHz), or OFDM (5 GHz) modulation

OFDM: Orthogonal Frequency-division Mulitplexing

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)

Figure 127 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 4th edition 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 ±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	10359400
Rectification type	Full wave
Maximum general output	15 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 60336/2005)	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°

Definition	Specification
Quality equivalent filtration (IEC60522)	≥ 0.7 mm Al equivalent at 75 kV
Rotating anode supply	Single phase 50/60 Hz

Anode Heating and Cooling Curves

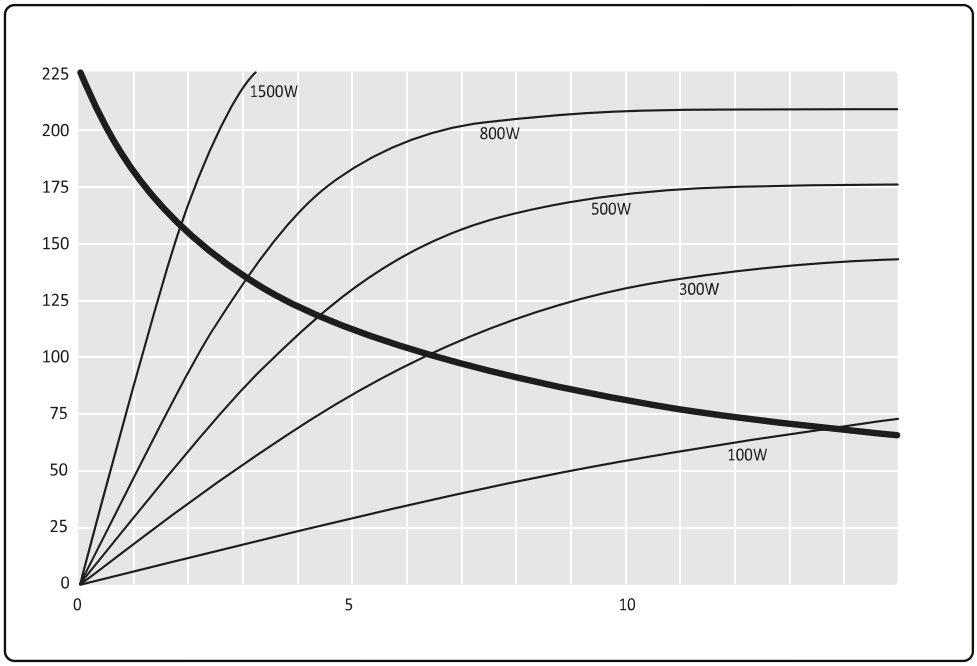


Figure 128 Anode heating and cooling curves

Legend	
X axis	Time (min)
Y axis	Stored energy (kJ)

Tube Filament Emission Characteristics

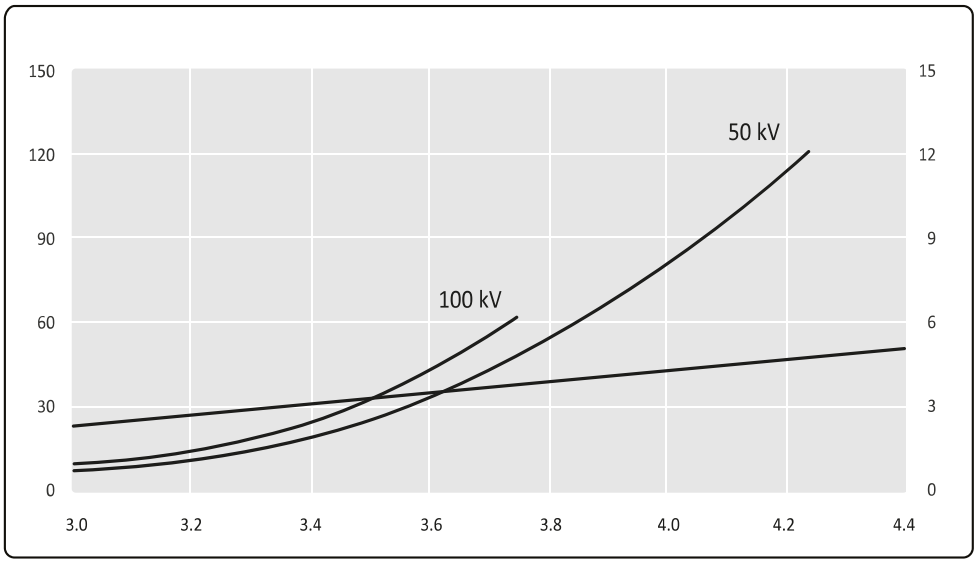


Figure 129 Emission characteristics small focus

Legend	
X axis	Filament current (A)
Y axis (left)	Tube current (mA)
Y axis (right)	Filament voltage (V)

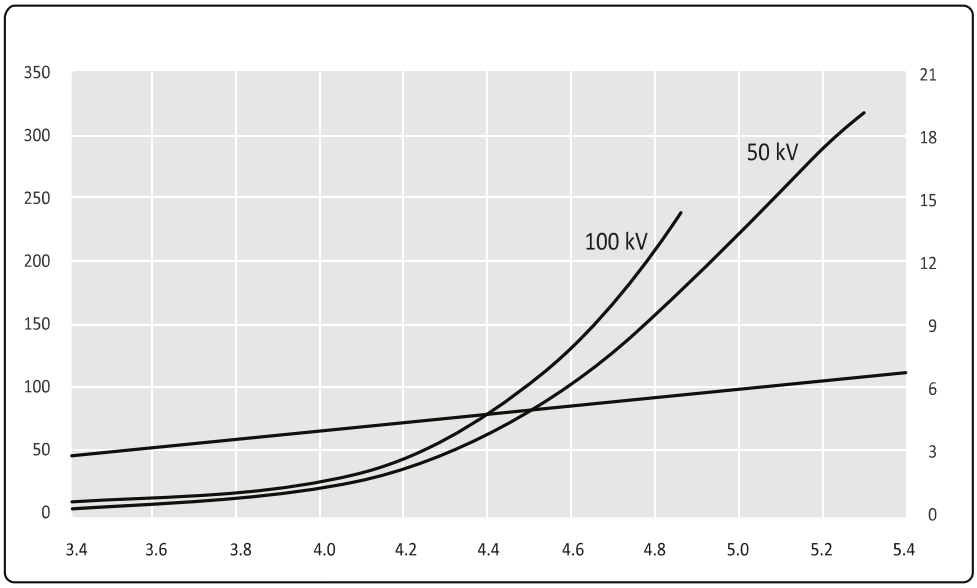


Figure 130 Emission characteristics large focus

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	Gilardoni SpA
Model name	IXion5 Monoblock
Model identification	10454900
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 60522/1999)	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 kg, ±0.5 kg

For Germany only:

Definition	Specification
Total System Filtration Eq	> 5.73 mm Al equivalent @75 kV- IEC 60522/2020
Total System Filtration	> 3 mm Al equivalent + 0.1 mm Cu equivalent

X-ray Tube Single Load Ratings

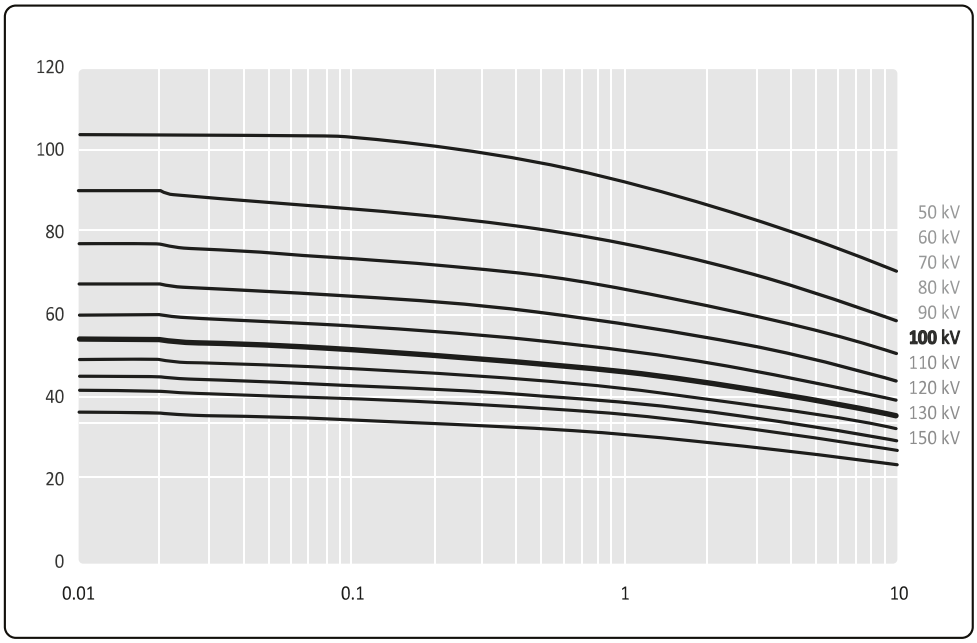


Figure 131 Single load rating small focus (40% anode heat content)

Legend	
X axis	Time (s)
Y axis	Tube current (mA)

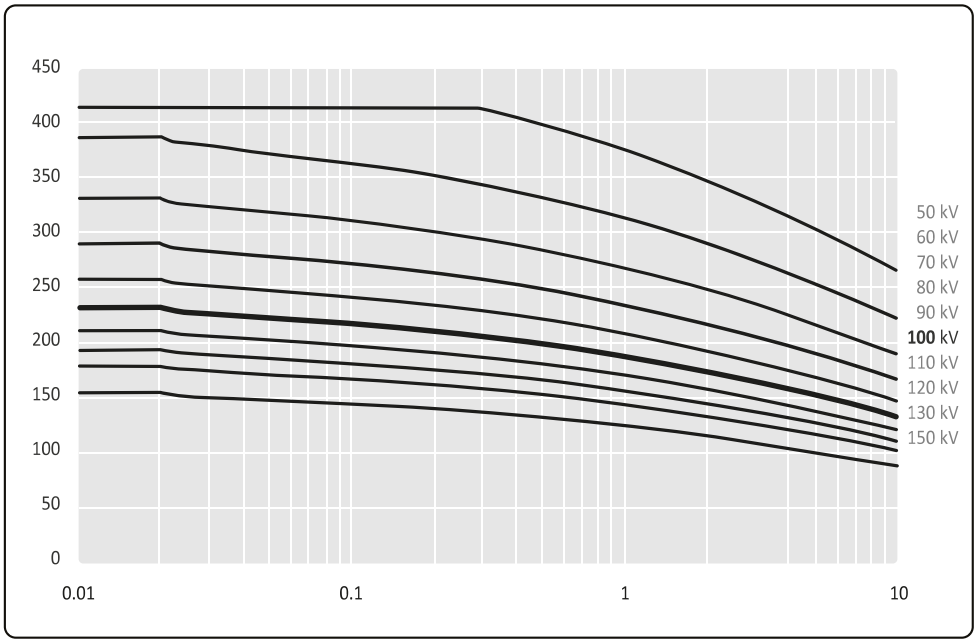


Figure 132 Single load rating large focus (40% anode heat content)

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)	11.5 kJ/min = 16.1 kHU/min = 192 W
Continuous Anode Input Power (IEC60613:2010) Average loads smaller than the maximum continuous heat dissipation can be supplied infinitely to the system	7.2 kJ/min = 10.1 kHU/min = 120 W
Maximum X-ray tube assembly heat content	1350 kJ = 1890 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 49°C
X-ray tank very warm	Approx 53°C
Hot tank! Low dose fluoroscopy still available	Approx 55°C

Tank Heating and Cooling Curves

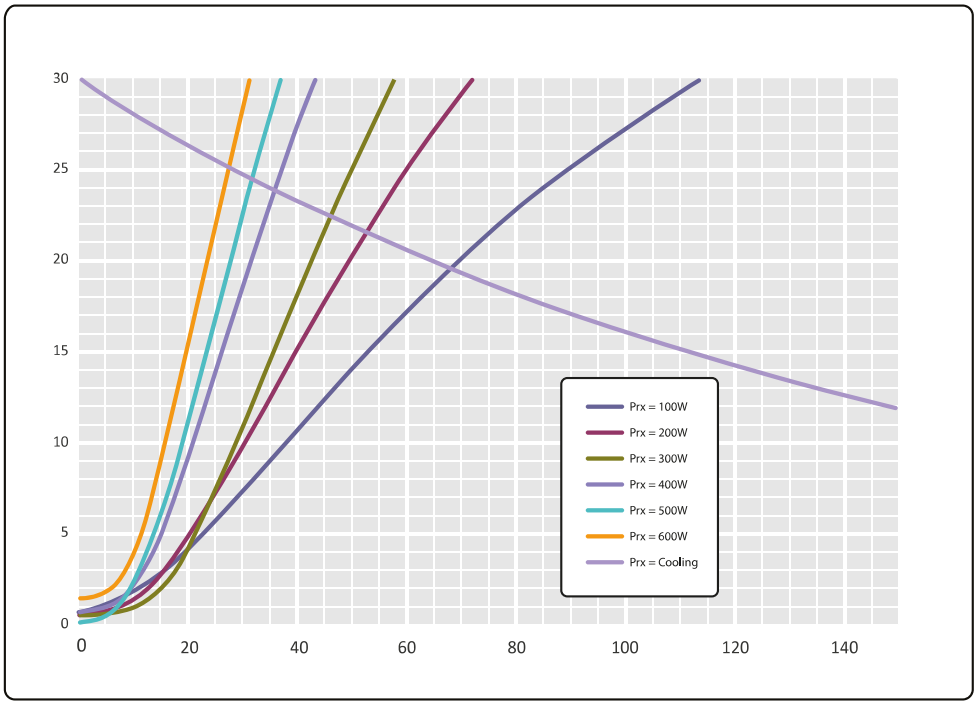


Figure 133 Tank heating and cooling curves

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 FD15

Definition	Specification
Manufacturer	Philips Medical Systems Nederland B.V.
Model identification	4598 009 2073x

Iris Collimator of BLD

Definition	Specification
Iris adjustment	Stepless
Maximum Symmetrical Radiation Field (IEC 60806)	262 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 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

9.2.7 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

9.2.8 Energy Storage Unit

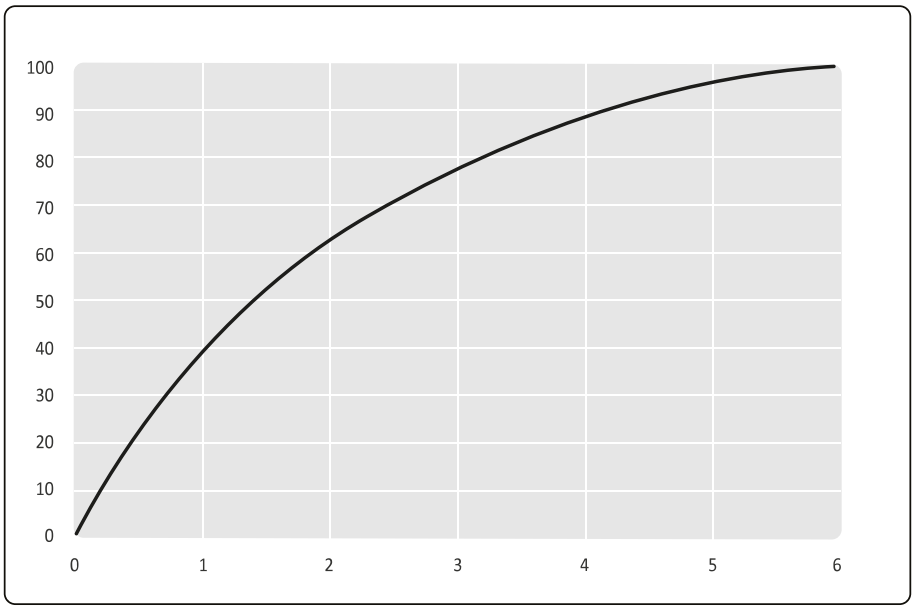


Figure 134 Energy storage unit charging time

Legend	
X axis	Time (hours)
Y axis	Charge (%)

9.2.9 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 FD15

Definition	Specification			
Model name	PIXIUM 2630Sv			
Triple mode	3 input fields with the following image formats sizes are available: • 262 mm (10.3 inch) (square or circular) • 184 mm (7.2 inch) (circular field of view) • 132.5 mm (5.2 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	1800 x 1440 (rows x columns)			
Active detector size / X-ray sensitive area	• 1560 x 1424 pixels • 287 x 262 mm			
Line noise sensor zones left and right of active area	120 pixels wide			
Pixel size	184 x 184 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: • The geometrical fill factor of the photodiode, also called optical fill factor, is 67.7%. • 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	70%	69%	67%
	0.5	60%	59%	57%
	1.0	52%	50%	46%
	1.5	46%	44%	36%
	2.0	39%	36%	25%
	2.5	26%	24%	15%
	2.7 (Nyquist)	21%	17%	10%

Definition	Specification	
Spatial resolution properties Modulation Transfer Function (MTF)[2,4]	**lp/mm**	
	0.5	80%
	1.0	59%
	1.5	41%
	2.0	29%
	2.5	19%
	2.7 (Nyquist)	17%
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, 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 50, dated June 24, 2007	

[1]: 184 µm pixel, highest gain (g4 gain).
[2]: measured in accordance with IEC 62220-1-3, including a maximum uncertainty level of 6% (abs.)/10% (rel.).
[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.

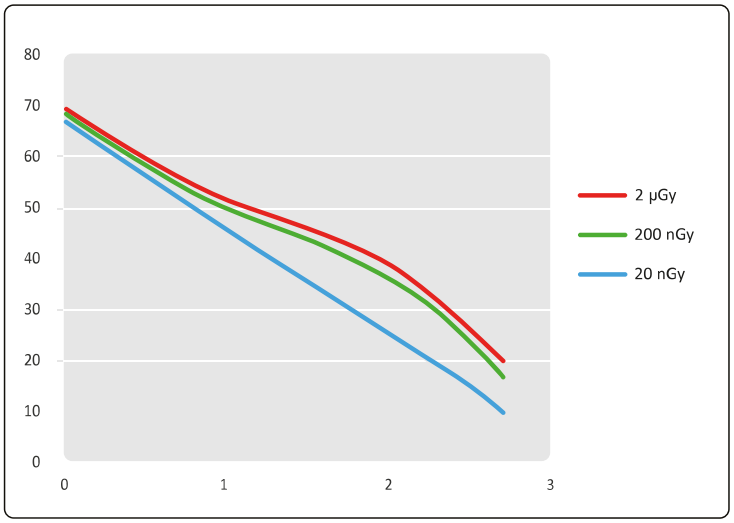


Figure 135 DQE vs. spatial frequency at 20 nGy / 200 nGy / 2 Gy in RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Frequency (lp/mm)
Y axis	DQE (%)

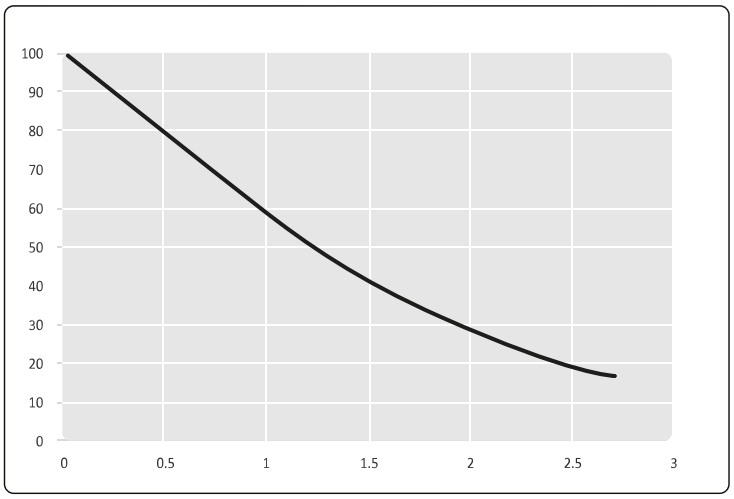


Figure 136 MTF at 2 Gy / RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Spatial frequency (lp/mm)
Y axis	MTF (%)

Grid FD15

Definition	Specification
Manufacturer	Philips Medical Systems Nederland B.V.
Model name	9896 010 6362x
Type	Rectangular
Material	Carbon fiber
Lines/cm	70
Grid focus distance	100 cm
Ratio	13:1
Attenuation ratio (B/K) (= grid exposure factor/contrast improvement ratio = 1/ transmission of primary radiation = 1/0.73)	1.37

Flat Detector FD12

Definition	Specification
Model name	PX2121CV/S
Triple mode	3 input fields with the following image formats sizes are available: • 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	• 1344 x 1344 pixels • 207 x 207 mm
Line noise sensor zones left and right of active area	12 pixels wide

Definition	Specification			
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: • 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%
Spatial resolution properties Modulation Transfer Function (MTF)[2,4]	**lp/mm**			
	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 50, dated June 24, 2007			

[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 (g5 gain) / electronic noise at highest gain (g0 gain).
[6]: The maximum temperature observed on detector surface is less than 45°C during prolonged usage.

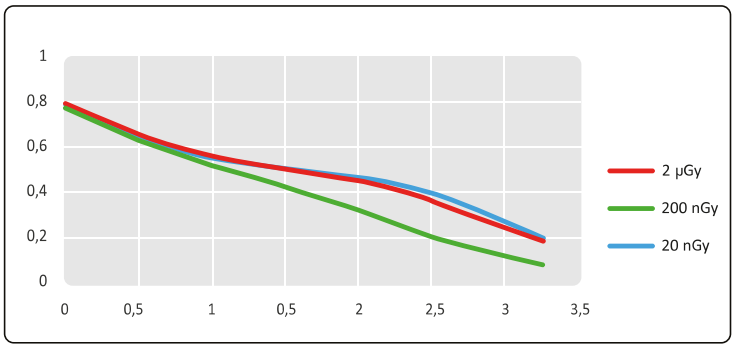


Figure 137 DQE vs. spatial frequency at 20 nGy / 200 nGy / 2 Gy in RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Spatial frequency (lp/mm)
Y axis	DQE (%)

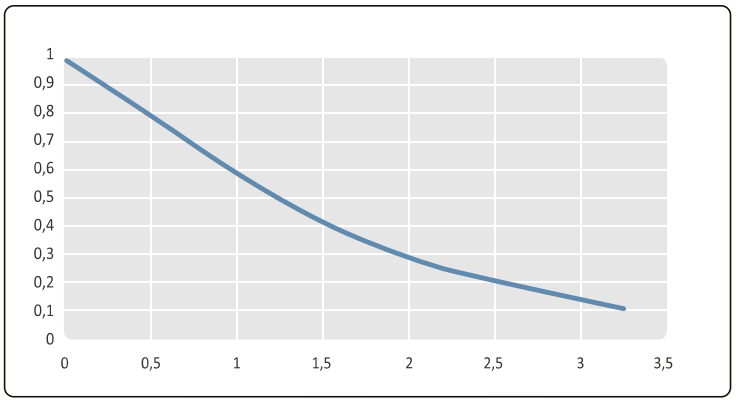


Figure 138 MTF at 2 Gy / RQA5 exposure according to IEC62220-1-3

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: • 301 mm (11.8 inch) (squircle 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	• 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			
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: • 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 Modulation Transfer Function (MTF)[1,2]	**lp/mm**			
	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			

Definition	Specification
Communication laser	Class 1 (IEC) Complies with FDA performance standards for laser products except for the deviations pursuant to laser notice 50, dated June 24, 2007

[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.

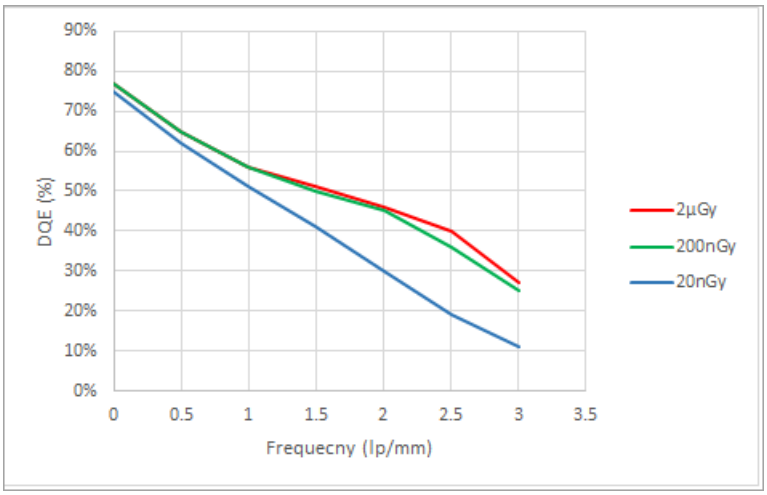


Figure 139 DQE vs. spatial frequency at 20 nGy / 200 nGy / 2 Gy in RQA5 exposure according to IEC62220-1-3

Legend	
X axis	Frequency (lp/mm)
Y axis	DQE (%)

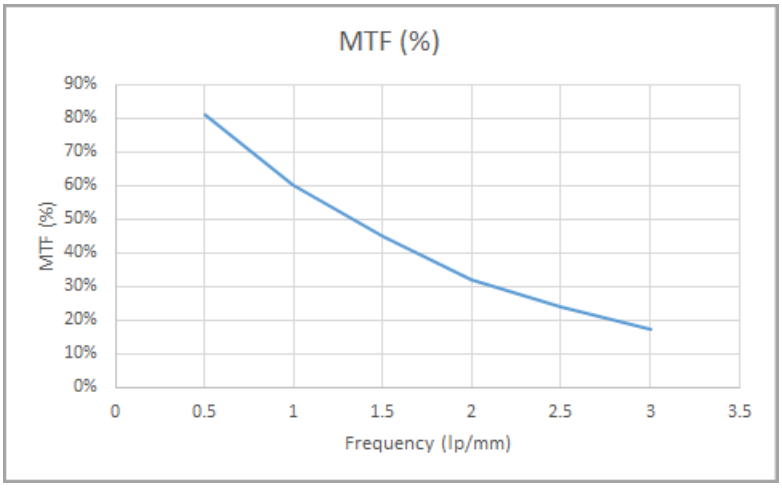


Figure 140 MTF at 2 Gy / RQA5 exposure according to IEC62220-1-3

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
Ratio	14:1
Attenuation ratio (B/K) (= grid exposure factor/contrast improvement ratio = 1/ transmission of primary radiation = 1/0.71)	1.41

9.2.10 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	• 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	• 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]	• 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 USB2 and 1 x USB3) [2]
Automatic shutter placement	Yes
Image processing version	Defined by the system release and software version
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. *For USB storage, only storage devices should be connected that are not externally powered devices.* *Note 3: The cables used shall have a typical length of 3 m.*	

9.2.11 Monitors

Mobile View Station

Definition	Standard brightness	High brightness
Type	MLCD19-SL(T)	MLCD19-HL(T)
Size	19 inch	19 inch
Display matrix	1280 x 1024	1280 x 1024
Nominal light output stabilized	N/A	500 cd/m^2
Nominal light output	330 cd/m^2	650 cd/m^2
Touch screen (optional)	Left monitor only, near touch, infrared	Left monitor only, near touch, infrared
Monitor LUT	DICOM	DICOM

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

9.2.12 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

9.3 System Data

This section contains the system data.

9.3.1 Environmental Conditions

Condition	Value
Operating temperature (without hardware options)	• 10°C to 40°C for safety • 10°C to 35°C for performance
Storage/transport temperature	• -25°C to 70°C short term storage • -25°C to 40°C long term storage
Relative humidity (operation)	• 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	10 Hz to 150 Hz, 0.35 mm peak
Shock	25 g, 6 ms to 10 ms
Classification according to IEC60529	Foot switch: IPX8 Wireless foot switch option: IPX8 Other user interfaces: IPX1 FD cover: IPX3 X-ray tank cover: IPX2
Material group classification according to IEC60601-1	IIIb
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.
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
Focus	0.6 IEC
kV range	40 kV to 120 kV
mA peak range	0.50 mA to 60.0 mA
Maximum peak power	120 kV x 60 mA = 7200 W
Maximum average power	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)
Pulse rate (pulse per second)	Full, half, and quarter pulse rates are available: • Pulse rate 4 (½ = 2, ¼ = 1) • Pulse rate 15 (½ = 7.5, ¼ = 4) • Pulse rate 30 (½ = 15, ¼ = 7.5)
Pulse width	5.333 ms to 85.333 ms

Exposure

Definition	Specification
Focus	0.6 IEC
kV range	40 kV to 120 kV
mA peak range	0.625 mA to 60.0 mA
Maximum peak power	120 kV x 60 mA = 7200 W

Definition	Specification
Maximum average power	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)
Pulse rate (pulse per second)	Full, half, and quarter pulse rates are available: • Pulse rate 4 (½ = 2, ¼ = 1) • Pulse rate 7.5 (½ = 4, ¼ = 2) • Pulse rate 15 (½ = 7.5, ¼ = 4) • Pulse rate 30 (½ = 15, ¼ = 7.5)
Pulse width	7.407 ms to 118.519 ms

Single Shot

Definition	Data
Focus	0.6 IEC
kV range	40 kV to 120 kV
mA peak range	• 2.5 mA to 60.0 mA (normal single shot) • 5.2 mA to 125 mA (high power single shot)
Maximum peak power	120 kV x 125 mA = 15000 W
Nominal peak power at 100 kV, 0.1 s (IEC60601-2-7 / IEC 60601-2-54)	100 kV x 122 mA = 12200 W
Pulse width	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)

9.3.3 Maximum Loading Factors

Fluoroscopy

Definition	Data
Nominal X-ray tube voltage	120 kV (at 60 mA)
Highest X-ray tube current (peak)	60 mA (at 120 kV)
Highest electric power (average)	60 mA x 120 kV x 14.815 ms x 15/s = 1600 W

Exposure

Definition	Data
Nominal X-ray tube voltage	120 kV (at 60 mA)
Highest X-ray tube current (peak)	60 mA (at 120 kV)
Highest electric power (average)	60 mA x 120 kV x 14.815 ms x 15/s = 1600 W

Single Shot

Definition	Data
Nominal X-ray tube voltage	120 kV (at 125 mA)
Highest X-ray tube current (peak)	125 mA (at 120 kV)
Highest electric power (average)	125 mA x 120 kV = 15000 W
Nominal electric power (average) at 100 kV, 0.1 s (IEC60601-2-7 / IEC 60601-2-54)	122 mA x 100 kV = 12200 W

Definition	Data
Lowest current time product	0.5 mAs (5 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% + 0.8 kV) According to IEC: ±10% at 40 kV
Average current deviation for X-ray	±20%
Dose (rate) accuracy	±25%
Dose area product accuracy	±35% [1]
Note 1: For X-ray field with beam diameter at detector entrance from 5 cm to maximum.	

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 FD15, 20 cm PMMA

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
13.3	160	13	71	12.2	33.0	61
9.60	115	17	71	8.78	22.0	91
8.00	98.9	20	71	7.32	19.1	105
6.66	80.1	25	71	6.10	17.3	116
5.00	59.28	34	71	4.58	9.17	218
4.80	58.4	34	71	4.39	11.2	178
4.00	47.6	42	71	3.66	9.25	216
3.60	45.22	44	71	3.29	6.45	310
3.33	40.6	49	71	3.05	7.52	266
2.88	33.9	59	71	2.64	6.54	306
2.40	29.0	69	71	2.20	5.68	352
2.00	24.1	83	71	1.83	4.66	429
1.73	20.9	96	71	1.58	3.99	501
1.44	17.3	115	71	1.32	3.30	607
1.20	14.6	137	71	1.10	2.74	729
1.00	12.4	161	71	.915	2.42	826
0.72	8.89	225	71	.659	1.73	1156
0.60	7.34	272	71	.549	1.40	1425

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD15, 10 cm PMMA

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min @ 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
13.3	160	13	56	4.03	5.997	167
9.60	115	17	56	2.90	4.017	249
8.00	98.9	20	56	2.42	3.477	288
6.66	80.1	25	56	2.02	2.775	360
5.00	59.28	34	56	1.51	1.522	657
4.80	58.4	34	56	1.45	2.004	499
4.00	47.6	42	56	1.21	1.707	586
3.60	45.22	44	56	1.09	1.051	951
3.33	40.6	49	56	1.01	1.400	714
2.88	33.9	59	56	.871	1.213	824
2.40	29.0	69	56	.726	1.033	968
2.00	24.1	83	56	.605	0.868	1153
1.73	20.9	96	56	.523	0.762	1313
1.44	17.3	115	56	.436	0.627	1595
1.20	14.6	137	56	.363	0.511	1955
1.00	12.4	161	56	.303	0.451	2217

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min @ 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
0.72	8.89	225	56	.218	0.326	3065
0.60	7.34	272	56	.182	0.264	3789

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Dynamic Modes for FD15, 5 cm PMMA

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [4]
13.3	160	13	50	1.96	2.27	440
9.60	115	17	50	1.41	1.68	594
8.00	98.9	20	50	1.17	1.45	688
6.66	80.1	25	50	.978	1.14	876
5.00	59.28	34	50	.734	0.67	1493
4.80	58.4	34	50	.704	0.87	1144
4.00	47.6	42	50	.587	0.70	1419
3.60	45.22	44	50	.528	0.45	2228
3.33	40.6	49	50	.489	0.58	1717
2.88	33.9	59	50	.423	0.52	1919
2.40	29.0	69	50	.352	0.45	2210
2.00	24.1	83	50	.294	0.36	2772
1.73	20.9	96	50	.254	0.31	3219
1.44	17.3	115	50	.211	0.27	3723
1.20	14.6	137	50	.176	0.22	4449
1.00	12.4	161	50	.147	0.18	5481
0.72	8.89	225	50	.106	0.14	7393
0.60	7.34	272	50	.088	0.11	8767

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Dynamic Modes for FD12, 20 cm PMMA

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
13.3	160	13	70	12.2	32.2	62
9.60	115	17	70	8.76	23.3	86
8.00	98.9	20	70	7.30	20.1	99
6.66	80.1	25	70	6.08	16.2	124
5.00	59.28	34	70	4.56	9.70	206
4.80	58.4	34	70	4.38	11.9	169
4.00	47.6	42	70	3.65	9.77	205
3.60	45.22	44	70	3.29	6.81	294
3.33	40.6	49	70	3.04	7.73	259

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
2.88	33.9	59	70	2.63	6.91	289
2.40	29.0	69	70	2.19	6.01	333
2.00	24.1	83	70	1.83	4.92	406
1.73	20.9	96	70	1.58	4.22	474
1.44	17.3	115	70	1.31	3.48	574
1.20	14.6	137	70	1.10	2.90	690
1.00	12.4	161	70	.913	2.56	782
0.72	8.89	225	70	.657	1.83	1094
0.60	7.34	272	70	.548	1.48	1348

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD12, 10 cm PMMA

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
13.3	160	13	58	4.77	6.95	144
9.60	115	17	58	3.43	4.95	202
8.00	98.9	20	58	2.86	4.18	239
6.66	80.1	25	58	2.38	3.44	290
5.00	59.28	34	58	1.79	2.31	434
4.80	58.4	34	58	1.72	2.47	404
4.00	47.6	42	58	1.43	2.01	498
3.60	45.22	44	58	1.29	1.70	587
3.33	40.6	49	58	1.19	1.73	578
2.88	33.9	59	58	1.03	1.43	699
2.40	29.0	69	58	.859	1.11	905
2.00	24.1	83	58	.716	1.00	1003
1.73	20.9	96	58	.618	0.85	1170
1.44	17.3	115	58	.515	0.70	1423
1.20	14.6	137	58	.429	0.59	1685
1.00	12.4	161	58	.358	0.50	1998
0.72	8.89	225	58	.258	0.35	2851
0.60	7.34	272	58	.215	0.30	3351

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Dynamic Modes for FD12, 5 cm PMMA

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [4]
13.3	160	13	51	2.22	2.27	440
9.60	115	17	51	1.60	1.68	594

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [4]
8.00	98.9	20	51	1.33	1.45	688
6.66	80.1	25	51	1.11	1.14	876
5.00	59.28	34	51	.834	0.67	1493
4.80	58.4	34	51	.800	0.87	1144
4.00	47.6	42	51	.667	0.70	1419
3.60	45.22	44	51	.600	0.45	2228
3.33	40.6	49	51	.556	0.58	1717
2.88	33.9	59	51	.480	0.52	1919
2.40	29.0	69	51	.400	0.45	2210
2.00	24.1	83	51	.334	0.36	2772
1.73	20.9	96	51	.288	0.31	3219
1.44	17.3	115	51	.240	0.27	3723
1.20	14.6	137	51	.200	0.22	4449
1.00	12.4	161	51	.167	0.18	5481
0.72	8.89	225	51	.120	0.14	7393
0.60	7.34	272	51	.100	0.11	8767

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Dynamic Modes for FD17, 20 cm PMMA

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min @70 cm	2 Gy in min [1]	kV	mA	mGy/min @70 cm	2 Gy in min [2]
13.3	147.8	14	70	12.2	37.34	54
9.60	109.5	18	70	8.77	27.78	72
8.00	90.6	22	70	7.31	22.75	88
6.66	75.5	26	70	6.09	18.68	107
5.00	56.9	35	70	4.57	14.01	143
4.80	56.2	36	70	4.38	14.16	141
4.00	46.2	43	70	3.65	11.31	177
3.60	41.4	48	70	3.29	10.47	191
3.33	38.7	52	70	3.04	9.666	207
2.88	33.5	60	70	2.63	8.403	238
2.40	28.1	71	70	2.19	6.383	313
2.00	23.5	85	70	1.83	5.571	359
1.73	16.9	118	70	1.58	4.391	455
1.44	16.9	118	70	1.32	4.097	488
1.20	14.3	140	70	1.1	3.00	621
1.00	11.9	169	70	.913	2.813	711
0.72	8.3	241	70	.658	2.074	964
0.60	6.9	289	70	.548	1.711	1169

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD17, 10 cm PMMA

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min @ 70 cm	2 Gy in min [1]	kV	mA	mGy/min @70 cm	1 Gy in min [3]
13.3	151.6	13	56	4	7.07	141
9.60	113.6	18	56	2.9	5.106	196
8.00	93.09	21	56	2.4	4.242	236
6.66	77.09	26	56	2	3.553	281
5.00	58.32	34	56	1.5	2.689	372
4.80	57.8	35	56	1.4	2.577	388
4.00	47.54	42	56	1.2	2.071	483
3.60	42.51	47	56	1.1	1.95	513
3.33	39.93	50	56	1	1.789	559
2.88	34.55	58	56	0.9	1.552	644
2.40	28.78	69	56	0.7	1.203	831
2.00	24.07	83	56	0.6	1.024	977
1.73	17.4	115	56	0.5	0.82	1220
1.44	17.36	115	56	0.4	0.746	1340
1.20	14.6	137	56	0.4	0.607	1647
1.00	12.23	164	56	0.3	0.516	1938
0.72	8.735	229	56	0.2	0.375	2667
0.60	7.338	273	56	0.2	0.311	3215

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD17, 5 cm PMMA

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min @70 cm	2 Gy in min [1]	kV	mA	mGy/min @ 70 cm	1 Gy in min [4]
13.3	149.6	13	50	1.96	2.497	400
9.60	108	19	50	1.41	1.756	569
8.00	88.55	23	50	1.17	1.464	683
6.66	73.69	27	50	0.978	1.256	796
5.00	55.52	36	50	0.733	0.958	1044
4.80	54.88	36	50	0.704	0.888	1126
4.00	43.04	46	50	0.587	0.685	1460
3.60	39.07	51	50	0.528	0.654	1529
3.33	38.02	53	50	0.489	0.618	1618
2.88	32.84	61	50	0.422	0.537	1862
2.40	27.63	72	50	0.352	0.413	2421
2.00	23.09	87	50	0.293	0.341	2933
1.73	16.5	121	50	0.253	0.269	3717

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min @70 cm	2 Gy in min [1]	kV	mA	mGy/min @ 70 cm	1 Gy in min [4]
1.44	16.48	121	50	0.211	0.245	4082
1.20	13.83	145	50	0.176	0.209	4785
1.00	11.59	173	50	0.147	0.172	5814
0.72	8.138	246	50	0.106	0.123	8130
0.60	6.872	291	50	0.088	0.101	9901

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Single Exposures for FD15, 20 cm PMMA

Exposures	Maximum output (120 kV)			Object: 20 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	2 Gy limit [2]
Normal – 100 ms	60.0	1.20	1669	71	54.9	.247	8089
Normal – 165 ms	60.0	1.98	1011	71	54.9	.408	4903
High Power – 100 ms	125.0	2.5	801	71	114.4	.515	3883

[1] Duration when deterministic effects are possible.

[2] Number of exposures to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD15, 10 cm PMMA

Exposures	Maximum output (120 kV)			Object: 10 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [3]
Normal – 100 ms	60.0	1.20	1669	56	18.2	.045	22229
Normal – 165 ms	60.0	1.98	1011	56	18.2	.074	13472
High Power – 100 ms	125.0	2.5	801	56	37.8	.094	10670

[1] Duration when deterministic effects are possible.

[3] Number of exposures to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Single Exposures for FD15, 5 cm PMMA

Exposures	Maximum output (120 kV)			Object: 5 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [4]
Normal – 100 ms	60.0	1.20	1669	50	8.81	.017	58621
Normal – 165 ms	60.0	1.98	1011	50	8.81	.028	35528
High Power – 100 ms	125.0	2.5	801	50	18.3	.036	28138

[1] Duration when deterministic effects are possible.

[4] Number of exposures to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Single Exposures for FD12, 20 cm PMMA

Exposures	Maximum output (120 kV)				Object: 20 cm PMMA		
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	2 Gy limit [2]
Normal – 100 ms	60.0	1.20	1669	70	54.8	.241	8287
Normal – 165 ms	60.0	1.98	1011	70	54.8	.398	5023
High Power – 100 ms	125.0	2.50	801	70	114.1	.503	3978

[1] Duration when deterministic effects are possible.

[2] Number of exposures to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD12, 10 cm PMMA

Exposures	Maximum output (120 kV)				Object: 10 cm PMMA		
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [3]
Normal – 100 ms	60.0	1.20	1669	58	21.5	.052	19182
Normal – 165 ms	60.0	1.98	1011	58	21.5	.086	11626
High Power – 100 ms	125.0	2.50	801	58	44.7	.109	9208

[1] Duration when deterministic effects are possible.

[3] Number of exposures to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Single Exposures for FD12, 5 cm PMMA

Exposures	Maximum output (120 kV)				Object: 5 cm PMMA		
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [4]
Normal – 100 ms	60.0	1.20	1669	51	10.0	.017	58621
Normal – 165 ms	60.0	1.98	1011	51	10.0	.028	35528
High Power – 100 ms	125.0	2.50	801	51	20.8	.036	28138

[1] Duration when deterministic effects are possible.

[4] Number of exposures to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Single Exposures for FD17, 20 cm PMMA

Exposures	Maximum output (120 kV)			Object: 20 cm PMMA			
	Avg mA @120 kV	mGy 70 cm	2 Gy in min [1]	kV	mA	mGy 70 cm	2 Gy in min [2]
Normal – 100 ms	60.0	1.20	1663	70	54.8	.305	6557
Normal – 165 ms	60.0	1.96	1019	70	54.8	.498	4016
High Power – 100 ms	125.0	2.36	848	70	114	.615	3252

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD17, 10 cm PMMA

Exposures	Maximum output (120 kV)			Object: 10 cm PMMA			
	Avg mA @120 kV	mGy 70 cm	2 Gy in min [1]	kV	mA	mGy 70 cm	1 Gy in min [3]
Normal – 100 ms	60.0	1.20	831	56	18.2	.052	19231
Normal – 165 ms	60.0	1.96	510	56	18.2	.0873	11455
High Power – 100 ms	125.0	2.36	424	56	37.9	.105	9524

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD17, 5 cm PMMA

Exposures	Maximum output (120 kV)			Object: 5 cm PMMA			
	Avg mA @120 kV	mGy 70 cm	2 Gy in min [1]	kV	mA	mGy 70 cm	1 Gy in min [4]
Normal – 100 ms	60.0	1.20	831	50	8.8	.0193	51813
Normal – 165 ms	60.0	1.96	510	50	8.8	.0314	31847
High Power – 100 ms	125.0	2.36	424	50	18.3	.0389	25707

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

NOTE ***20cm PMMA values are for large field size. For FD12 without the grid, the dose increases 50% and 100% for middle and small field sizes respectively. For FD15 with and without the grid and FD12 with the grid, the dose increases 30% and 60% for middle and small field sizes respectively. For FD17 without grid, the dose increases 47% and 110% for middle and small field sizes respectively and with grid the dose increases 21% and 45% for middle and small field sizes respectively.***

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 67.5cm (FD15) / 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).*

9.3.8 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 FD15, 20 cm PMMA

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
13.3	160	13	60	5.89	6.46	211
9.60	115	17	60	4.23	7.11	281
8.00	98.9	20	60	3.53	6.26	320
6.67	80.1	25	60	2.94	4.83	414
5.00	59.28	34	60	2.06	2.75	726
4.80	58.4	34	60	2.11	3.48	575
4.00	47.6	42	60	1.76	3.04	658
3.60	45.22	44	60	1.49	1.96	1018
3.33	40.6	49	60	1.47	2.50	801
2.88	33.9	59	60	1.27	2.19	913
2.40	29.0	69	60	1.06	1.97	1015
2.00	24.1	83	60	0.88	1.60	1253
1.73	20.9	96	60	0.76	1.39	1442
1.44	17.3	115	60	0.63	1.15	1738
1.20	14.6	137	60	0.53	0.95	2104
1.00	12.4	161	60	0.44	0.84	2379
.720	8.89	225	60	0.32	0.62	3228
.600	7.34	272	60	0.26	0.49	4063

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD15, 10 cm PMMA

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
13.3	160	13	51	2.22	2.17	460
9.60	115	17	51	1.60	1.60	625
8.00	98.9	20	51	1.33	1.45	690
6.66	80.1	25	51	1.11	1.11	897
5.00	59.28	34	51	.834	0.62	1609
4.80	58.4	34	51	.800	0.91	1096
4.00	47.6	42	51	.667	0.68	1474
3.60	45.22	44	51	.600	0.43	2333
3.33	40.6	49	51	.556	0.56	1776
2.88	33.9	59	51	.480	0.49	2056
2.40	29.0	69	51	.400	0.42	2378
2.00	24.1	83	51	.334	0.35	2851
1.73	20.9	96	51	.288	0.30	3358
1.44	17.3	115	51	.240	0.26	3908
1.20	14.6	137	51	.200	0.21	4753
1.00	12.4	161	51	.167	0.18	5592
.720	8.89	225	51	.120	0.13	7648
.600	7.34	272	51	.100	0.11	9071

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Dynamic Modes for FD15, 5 cm PMMA

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [4]
13.3	160	13	47	1.25	0.98	1018
9.60	115	17	47	.898	0.73	1367
8.00	98.9	20	47	.748	0.62	1623
6.66	80.1	25	47	.623	0.50	2009
5.00	59.28	34	47	.468	0.28	3612
4.80	58.4	34	47	.449	0.37	2718
4.00	47.6	42	47	.374	0.29	3490
3.60	45.22	44	47	.337	0.19	5153
3.33	40.6	49	47	.312	0.25	4039
2.88	33.9	59	47	.269	0.20	4922
2.40	29.0	69	47	.224	0.18	5582
2.00	24.1	83	47	.187	0.14	6901
1.73	20.9	96	47	.162	0.12	8155
1.44	17.3	115	47	.135	0.10	9552
1.20	14.6	137	47	.112	0.09	11307
1.00	12.4	161	47	.094	0.07	14234
.720	8.89	225	47	.067	0.05	18773
.600	7.34	272	47	.056	0.05	21842

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Dynamic Modes for FD12, 20 cm PMMA

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
13.3	160	13	62	5.89	11.4	176
9.60	115	17	62	4.23	8.19	244
8.00	98.9	20	62	3.53	7.37	271
6.66	80.1	25	62	2.94	5.66	353
5.00	59.28	34	62	2.46	3.32	602
4.80	58.4	34	62	2.11	4.01	499
4.00	47.6	42	62	1.97	3.24	618
3.60	45.22	44	62	1.77	2.39	838
3.33	40.6	49	62	1.47	2.93	684
2.88	33.9	59	62	1.27	2.34	854
2.40	29.0	69	62	1.06	2.19	913
2.00	24.1	83	62	0.88	1.69	1187
1.73	20.9	96	62	0.76	1.45	1379
1.44	17.3	115	62	0.63	1.19	1675
1.20	14.6	137	62	0.53	1.01	1976
1.00	12.4	161	62	0.44	0.86	2321
.720	8.89	225	62	0.32	0.62	3219
.600	7.34	272	62	0.26	0.52	3830

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD12, 10 cm PMMA

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
13.3	160	13	52	2.58	2.70	371
9.60	115	17	52	1.86	1.93	518
8.00	98.9	20	52	1.55	1.75	572
6.66	80.1	25	52	1.29	1.37	730
5.00	59.28	34	52	.968	0.82	1221
4.80	58.4	34	52	.929	1.00	1003
4.00	47.6	42	52	.774	0.84	1193
3.60	45.22	44	52	.697	0.53	1892
3.33	40.6	49	52	.645	0.70	1433
2.88	33.9	59	52	.557	0.61	1652
2.40	29.0	69	52	.464	0.52	1918
2.00	24.1	83	52	.387	0.43	2329
1.73	20.9	96	52	.334	0.37	2699

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
1.44	17.3	115	52	.279	0.31	3219
1.20	14.6	137	52	.232	0.26	3878
1.00	12.4	161	52	.194	0.22	4605
.720	8.89	225	52	.139	0.16	6218
.600	7.34	272	52	.116	0.13	7745

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Dynamic Modes for FD12, 5 cm PMMA

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [4]
13.3	160	13	48	1.42	1.20	835
9.60	115	17	48	1.02	0.86	1160
8.00	98.9	20	48	.854	0.77	1306
6.66	80.1	25	48	.711	0.61	1629
5.00	59.28	34	48	.534	0.35	2895
4.80	58.4	34	48	.512	0.45	2233
4.00	47.6	42	48	.427	0.35	2847
3.60	45.22	44	48	.384	0.23	4322
3.33	40.6	49	48	.356	0.31	3194
2.88	33.9	59	48	.307	0.26	3899
2.40	29.0	69	48	.256	0.23	4319
2.00	24.1	83	48	.214	0.18	5672
1.73	20.9	96	48	.184	0.15	6804
1.44	17.3	115	48	.154	0.13	7674
1.20	14.6	137	48	.128	0.11	9124
1.00	12.4	161	48	.107	0.08	11825
.720	8.89	225	48	.077	0.07	15348
.600	7.34	272	48	.064	0.06	18145

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Dynamic Modes for FD17, 20 cm PMMA

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
13.3	139.7	14	61	5.88	12.38	162
9.60	98.9	20	61	4.23	8.99	222
8.00	86.1	23	61	3.53	7.83	256
6.67	69.1	29	61	2.94	6.25	320
5.00	52.1	38	61	2.20	4.72	424
4.80	51.7	39	61	2.12	4.63	432
4.00	43.0	47	61	1.76	3.70	540

Max Output (120 kV)			Object: 20 cm PMMA			
Avg mA @ 120 kV	mGy/min 70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	2 Gy in min [2]
3.60	39.4	51	61	1.59	3.47	576
3.33	35.7	56	61	1.47	3.23	619
2.88	31.1	64	61	1.27	2.79	717
2.40	26.3	76	61	1.06	2.15	929
2.00	20.6	97	61	0.88	1.72	1161
1.73	15.9	126	61	0.76	1.49	1342
1.44	16.0	125	61	0.64	1.38	1450
1.20	13.5	148	61	0.53	1.10	1812
1.00	11.2	178	61	0.44	0.94	2123
0.72	8.0	250	61	0.32	0.69	2903
0.60	6.8	296	61	0.27	0.57	3509

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD17, 10 cm PMMA

Max Output (120 kV)			Object: 10 cm PMMA			
Avg mA @ 120 kV	mGy/min @70 cm	2 Gy in min [1]	kV	mA	mGy/min 70 cm	1 Gy in min [3]
13.3	139.8	14	51	2.22	2.844	352
9.60	100.9	20	51	1.60	1.961	510
8.00	83.4	24	51	1.33	1.646	608
6.67	69.4	29	51	1.11	1.411	709
5.00	52.2	38	51	0.833	1.086	921
4.80	51.4	39	51	0.80	1.005	995
4.00	42.0	48	51	0.667	0.776	1289
3.60	39.2	51	51	0.60	0.775	1290
3.33	35.3	57	51	0.556	0.703	1422
2.88	30.7	65	51	0.48	0.608	1645
2.40	25.5	78	51	0.40	0.481	2079
2.00	21.2	94	51	0.333	0.394	2538
1.73	15.3	131	51	0.288	0.312	3205
1.44	15.2	131	51	0.24	0.283	3534
1.20	12.9	155	51	0.20	0.24	4167
1.00	10.8	186	51	0.167	0.198	5051
0.72	7.8	257	51	0.12	0.14	7143
0.60	6.5	307	51	0.10	0.117	8547

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Dynamic Modes for FD17, 5 cm PMMA

Max Output (120 kV)			Object: 5 cm PMMA			
Avg mA @ 120 kV	mGy/min @70 cm	2 Gy in min [1]	kV	mA	mGy/min @ 70 cm	1 Gy in min [4]
13.3	143.6	14	47	1.28	1.31	761
9.60	103.4	19	47	0.92	0.92	1086
8.00	85.51	23	47	0.77	0.78	1280
6.66	71.21	28	47	0.64	0.68	1471
5.00	53.74	37	47	0.48	0.52	1916
4.80	52.79	38	47	0.46	0.46	2160
4.00	43.25	46	47	0.38	0.36	2793
3.60	40.23	50	47	0.35	0.36	2809
3.33	36.55	55	47	0.32	0.33	3040
2.88	31.53	63	47	0.28	0.29	3484
2.40	26.43	76	47	0.23	0.23	4310
2.00	22.06	91	47	0.19	0.19	5405
1.73	15.84	126	47	0.17	0.15	6849
1.44	15.94	125	47	0.14	0.13	7576
1.20	13.44	149	47	0.12	0.12	8621
1.00	11.22	178	47	0.10	0.09	10753
0.72	8.041	249	47	0.07	0.07	15152
0.60	6.56	305	47	0.06	0.06	17857

[1] Duration when deterministic effects are possible.

[4] Time (minutes) to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Single Exposures for FD15, 20 cm PMMA

Exposures	Maximum output (120 kV)			Object: 20 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	2 Gy limit [2]
Normal - 100 ms	60.0	1.20	1669	60	24.8	.066	30175
Normal - 165 ms	60.0	1.98	1011	60	24.8	.109	18288
High Power - 100 ms	125.0	2.50	801	60	51.6	.138	14484

[1] Duration when deterministic effects are possible.

[2] Number of exposures to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD15, 10 cm PMMA

Exposures	Maximum output (120 kV)			Object: 10 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [3]
Normal - 100 ms	60.0	1.20	1669	51	10.0	.016	61349
Normal - 165 ms	60.0	1.98	1011	51	10.0	.027	37182
High Power - 100 ms	125.0	2.50	801	51	20.8	.034	29448

[1] Duration when deterministic effects are possible.

[3] Number of exposures to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Single Exposures for FD15, 5 cm PMMA

Exposures	Maximum output (120 kV)			Object: 5 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [4]
Normal - 100 ms	60.0	1.20	1669	47	5.61	.007	135718
Normal - 165 ms	60.0	1.98	1011	47	5.61	.012	82253
High Power - 100 ms	125.0	2.50	801	47	11.7	.015	65145

[1] Duration when deterministic effects are possible.

[4] Number of exposures to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Single Exposures for FD12, 20 cm PMMA

Exposures	Maximum output (120 kV)			Object: 20 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	2 Gy limit [2]
Normal - 100 ms	60.0	1.20	1669	62	29.6	.095	21064
Normal - 165 ms	60.0	1.98	1011	62	29.6	.157	12766
High Power - 100 ms	125.0	2.50	801	62	61.6	.198	10111

[1] Duration when deterministic effects are possible.

[2] Number of exposures to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD12, 10 cm PMMA

Exposures	Maximum output (120 kV)			Object: 10 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [3]
Normal - 100 ms	60.0	1.20	1669	52	11.6	.020	49406
Normal - 165 ms	60.0	1.98	1011	52	11.6	.033	29943
High Power - 100 ms	125.0	2.50	801	52	24.2	.042	23715

[1] Duration when deterministic effects are possible.

[3] Number of exposures to reach 1 Gy. 10 cm PMMA levels are applicable to small patients/pediatrics.

Single Exposures for FD12, 5 cm PMMA

Exposures	Maximum output (120 kV)			Object: 5 cm PMMA			
	mA	mGy 70 cm	2 Gy limit [1]	kV	mA	mGy 70 cm	1 Gy limit [4]
Normal - 100 ms	60.0	1.20	1669	48	6.41	.009	111361
Normal - 165 ms	60.0	1.98	1011	48	6.41	.015	67492
High Power - 100 ms	125.0	2.50	801	48	13.3	.019	53453

[1] Duration when deterministic effects are possible.

[4] Number of exposures to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

Single Exposures for FD17, 20 cm PMMA

Exposures	Maximum output (120 kV)			Object: 20 cm PMMA			
	Avg mA @120 kV	mGy 70 cm	2 Gy in min [1]	kV	mA	mGy 70 cm	2 Gy in min [2]
Normal – 100 ms	60.0	1.20	1663	61	26.5	.10	19417
Normal – 165 ms	60.0	1.96	1019	61	26.5	.17	11834
High Power – 100 ms	125.0	2.36	848	61	55.1	.21	9434

[1] Duration when deterministic effects are possible.

[2] Time (minutes) to reach 2 Gy. 20 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD17, 10 cm PMMA

Exposures	Maximum output (120 kV)			Object: 10 cm PMMA			
	Avg mA @120 kV	mGy 70 cm	2 Gy in min [1]	kV	mA	mGy 70 cm	1 Gy in min [3]
Normal – 100 ms	60.0	1.20	831	51	10	.025	40650
Normal – 165 ms	60.0	1.96	510	51	10	.040	25063
High Power – 100 ms	125.0	2.36	424	51	20.8	.048	20661

[1] Duration when deterministic effects are possible.

[3] Time (minutes) to reach 1 Gy. 10 cm PMMA levels are applicable to normal patients, while maximum output level is applicable for obese patients.

Single Exposures for FD17, 5 cm PMMA

Exposures	Maximum output (120 kV)			Object: 5 cm PMMA			
	Avg mA @120 kV	mGy 70 cm	2 Gy in min [1]	kV	mA	mGy 70 cm	1 Gy in min [4]
Normal – 100 ms	60.0	1.20	831	47	5.6	.011	90909
Normal – 165 ms	60.0	1.96	510	47	5.6	.018	56497
High Power – 100 ms	125.0	2.36	424	47	11.7	.021	47170

[1] Duration when deterministic effects are possible.

[4] Number of exposures to reach 1 Gy. 5 cm PMMA levels are applicable to very small patients/pediatrics.

NOTE ***20cm PMMA values are for large field size. For FD12 without the grid, the dose increases 50% and 100% for middle and small field sizes respectively. For FD15 with and without the grid and FD12 with the grid, the dose increases 30% and 60% for middle and small field sizes respectively. For FD17 without grid, the dose increases 47% and 110% for middle and***

small field sizes respectively and with grid the dose increases 21% and 45% for middle and small field sizes respectively.

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 67.5cm (FD15) / 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.

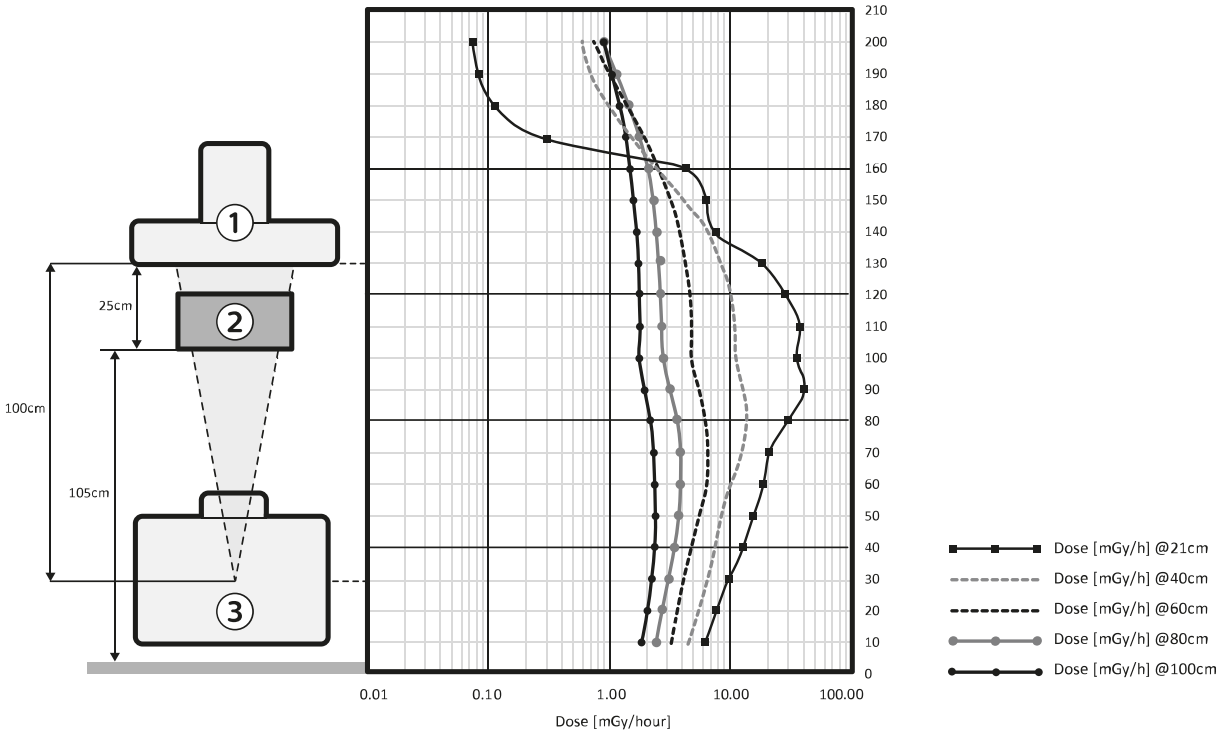


Figure 141 Designated significant zone of occupancy for FD15

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	

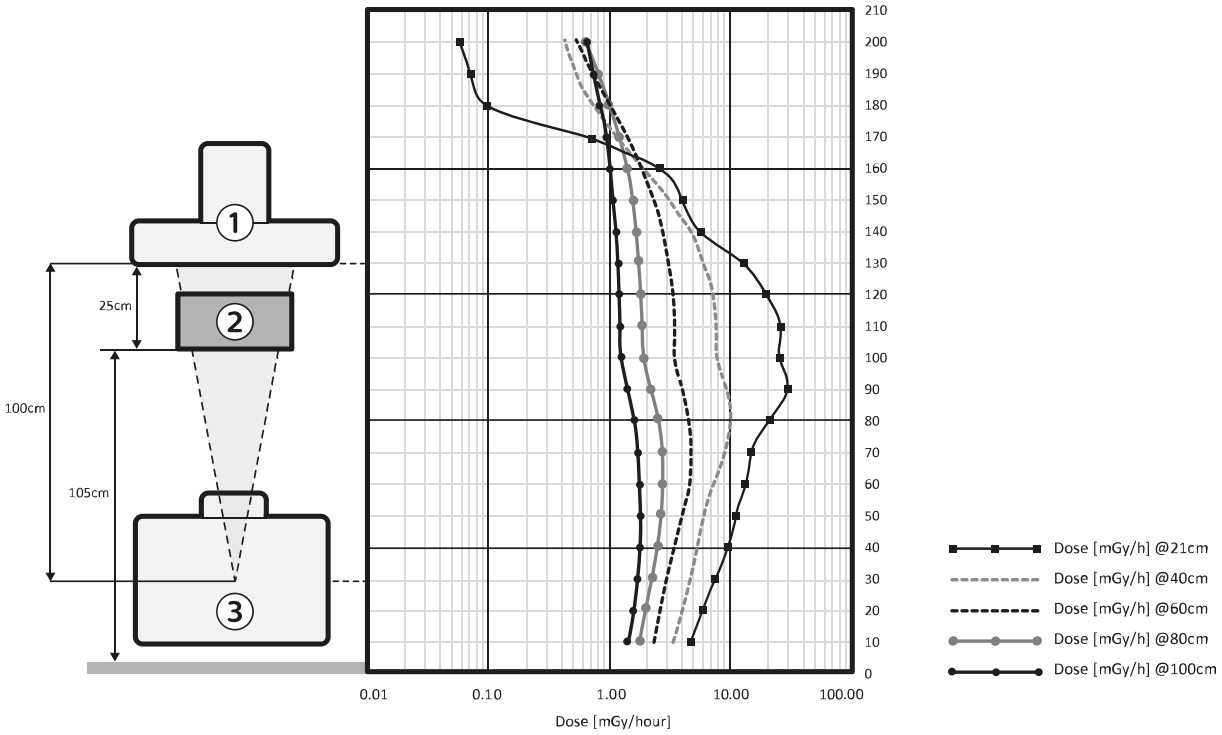


Figure 142 Designated significant zone of occupancy for FD12

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	

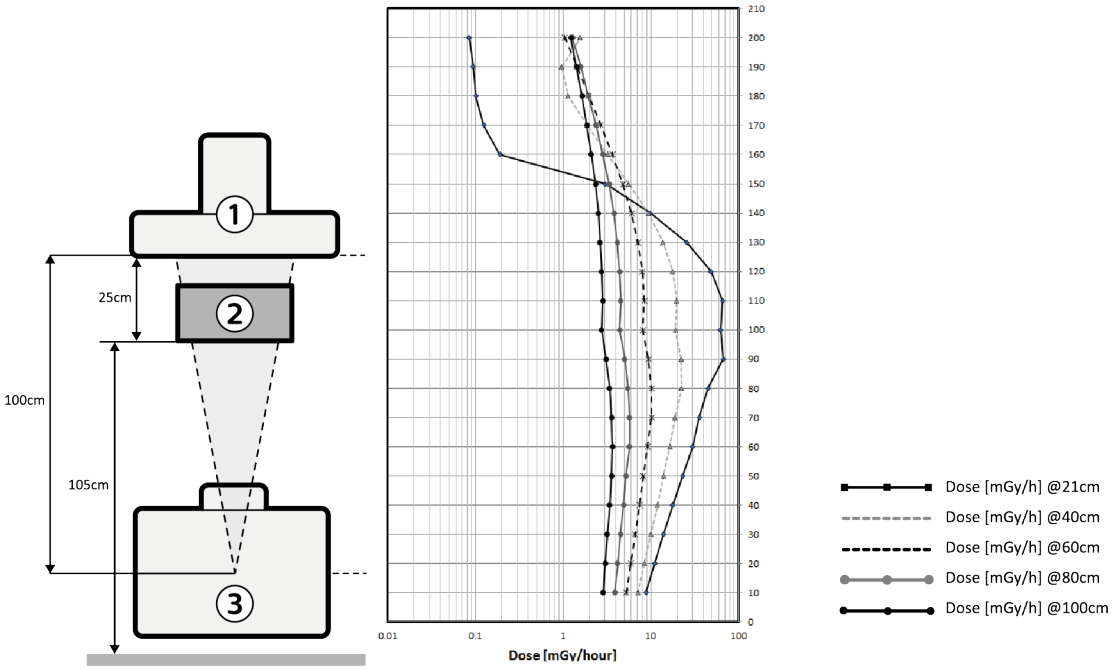


Figure 143 Designated significant zone of occupancy for FD17

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)
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 21).

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

Procedure	Typical Loading Factors			Received Dose [mGy]
	Voltage [kV]	Current [mA]	Time [min]	
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 cm^2 at the patient entrance reference point.

The results are normalized to 1 (µGy/s)/($Gycm^2$/s).

For example, the dose area rate product for fluoroscopy, 2.4 mA at 120 kV and 100 cm^2, is 0.040 $Gycm^2$/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 ±50%.

The following figures illustrate the measuring conditions for the system.

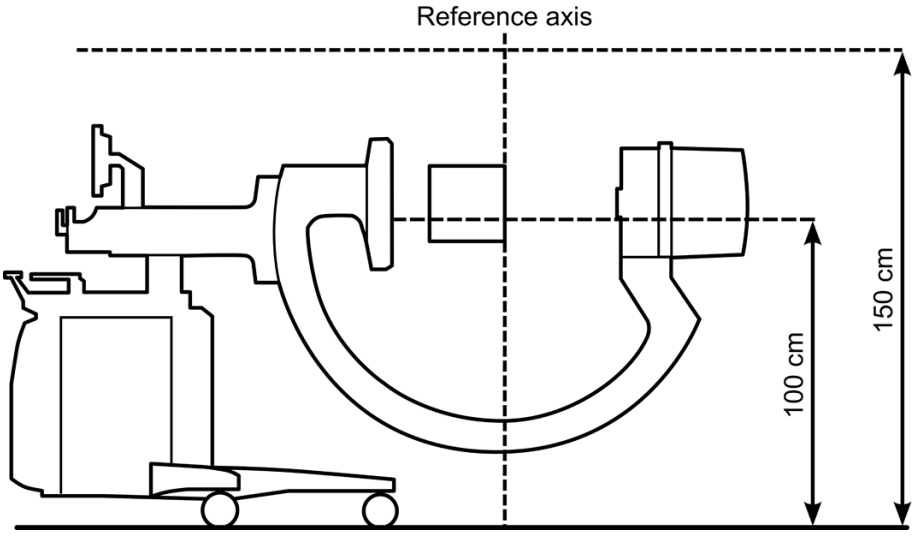


Figure 144 Isokerma map measurement configuration (horizontal)

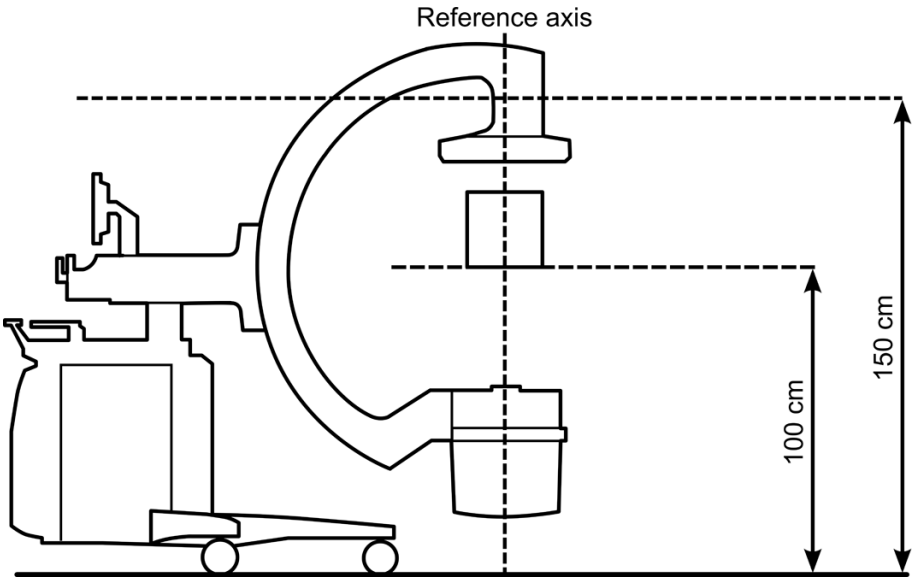


Figure 145 Isokerma map measurement configuration (lateral)

Isokerma Maps for FD15

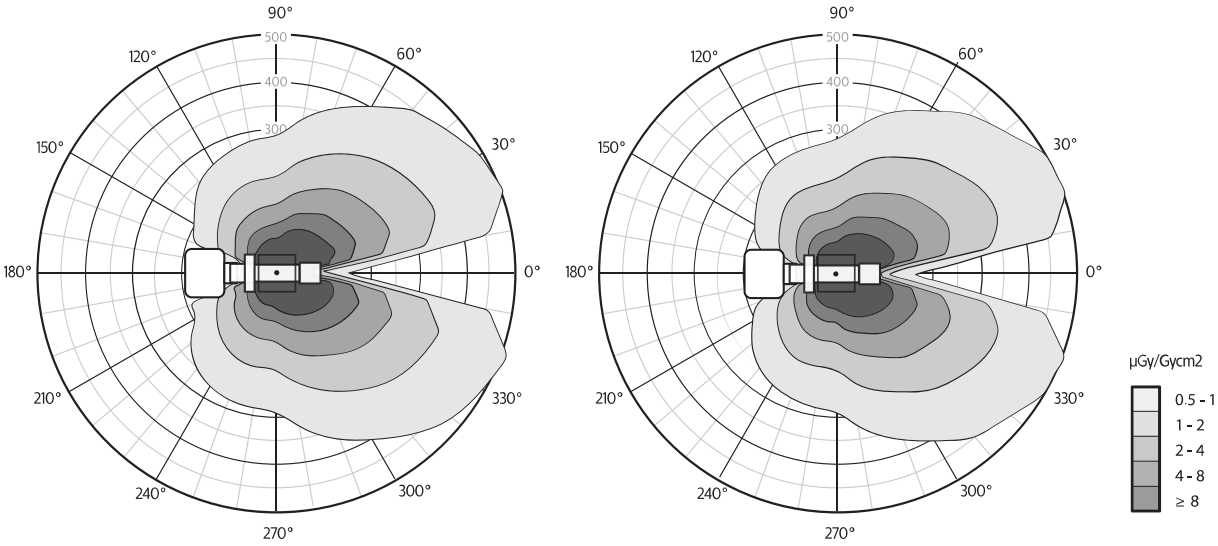


Figure 146 Isokerma map for FD15, horizontal position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

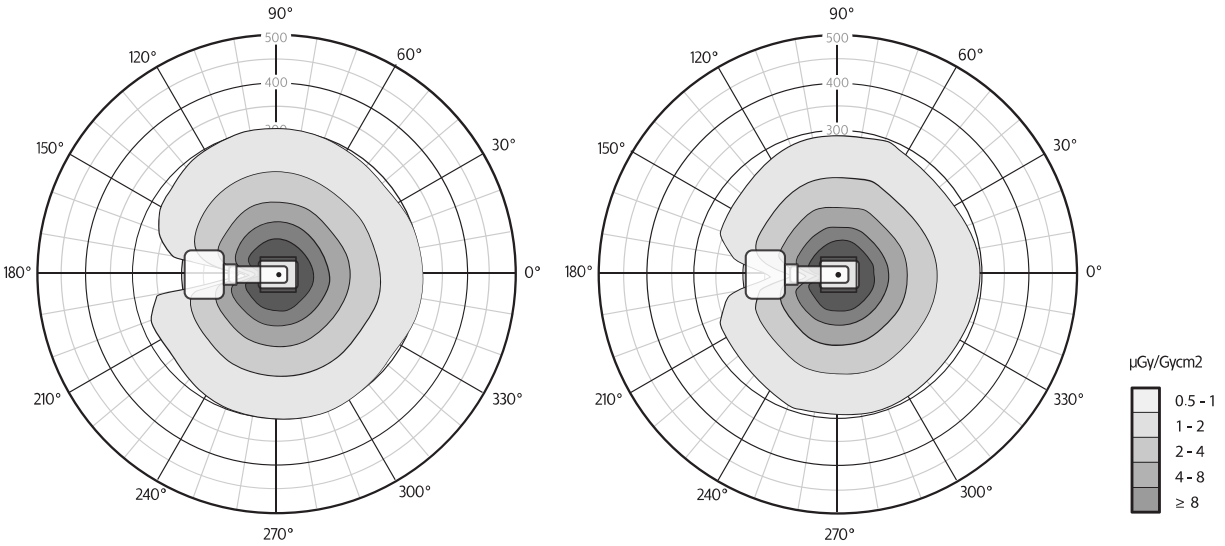


Figure 147 Isokerma map for FD15, lateral position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

NOTE ***When normalized to 1 µGym^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 FD12

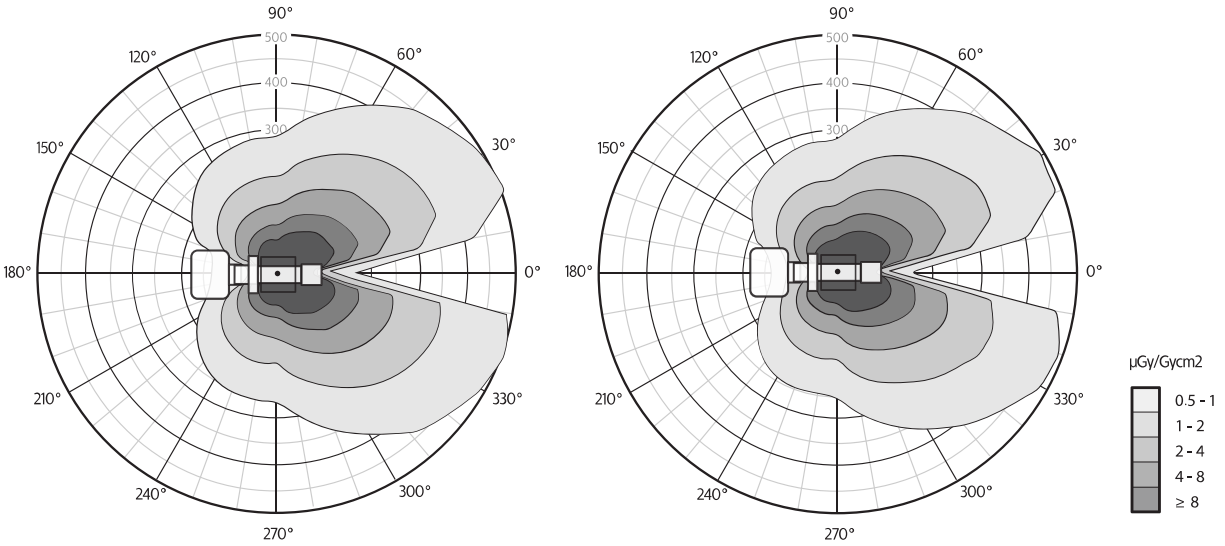


Figure 148 Isokerma map for FD12, horizontal position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

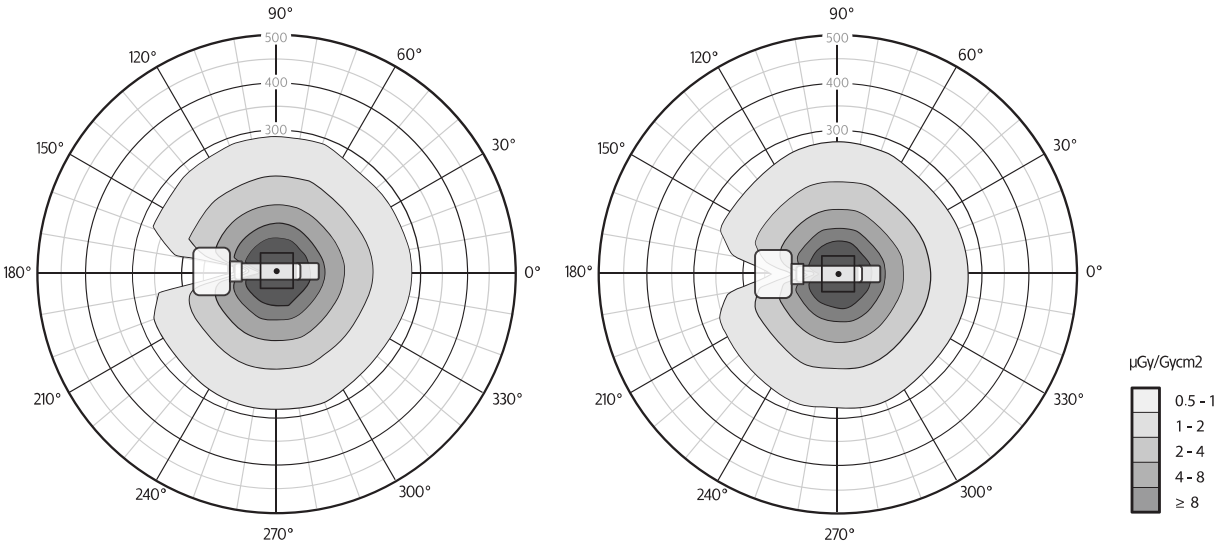


Figure 149 Isokerma map for FD12, lateral position, tube opposite stand, at 1.0 m (left) and 1.5m (right)

NOTE ***When normalized to 1 µGym^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

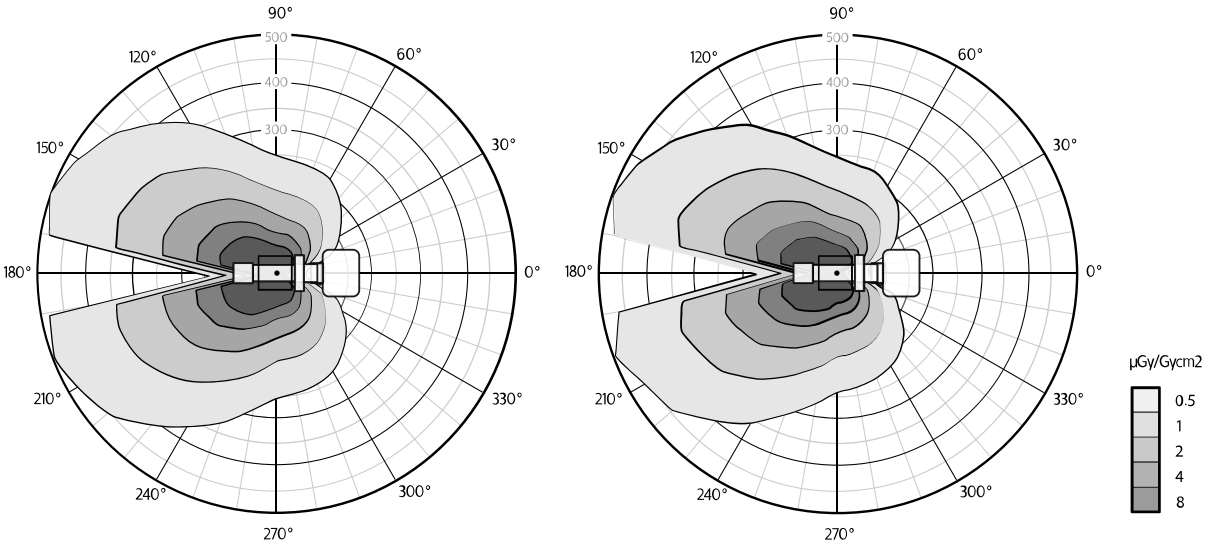


Figure 150 Isokerma map for FD17, horizontal position, tube at 180 degrees, at 1.0 m (left) and 1.5m (right)

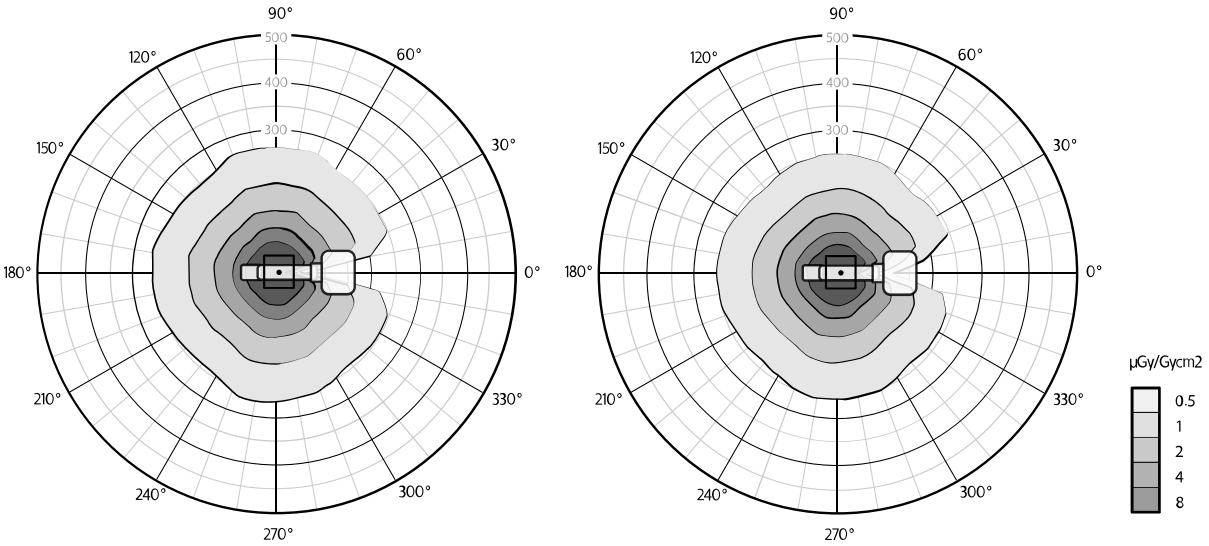


Figure 151 Isokerma map for FD17, vertical position, tube below, at 1.0 m (left) and 1.5m (right)

NOTE ***When normalized to 1 µGym^2 (IEC60601-2-43:2000) instead of 1 Gycm^2 (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
Distance from C-arm to X-ray beam	730 mm
Weight	340 kg (max)
Lowest lateral working positions (distance from floor to center of horizontal X-ray beam)	1027 mm (C-arc under table)

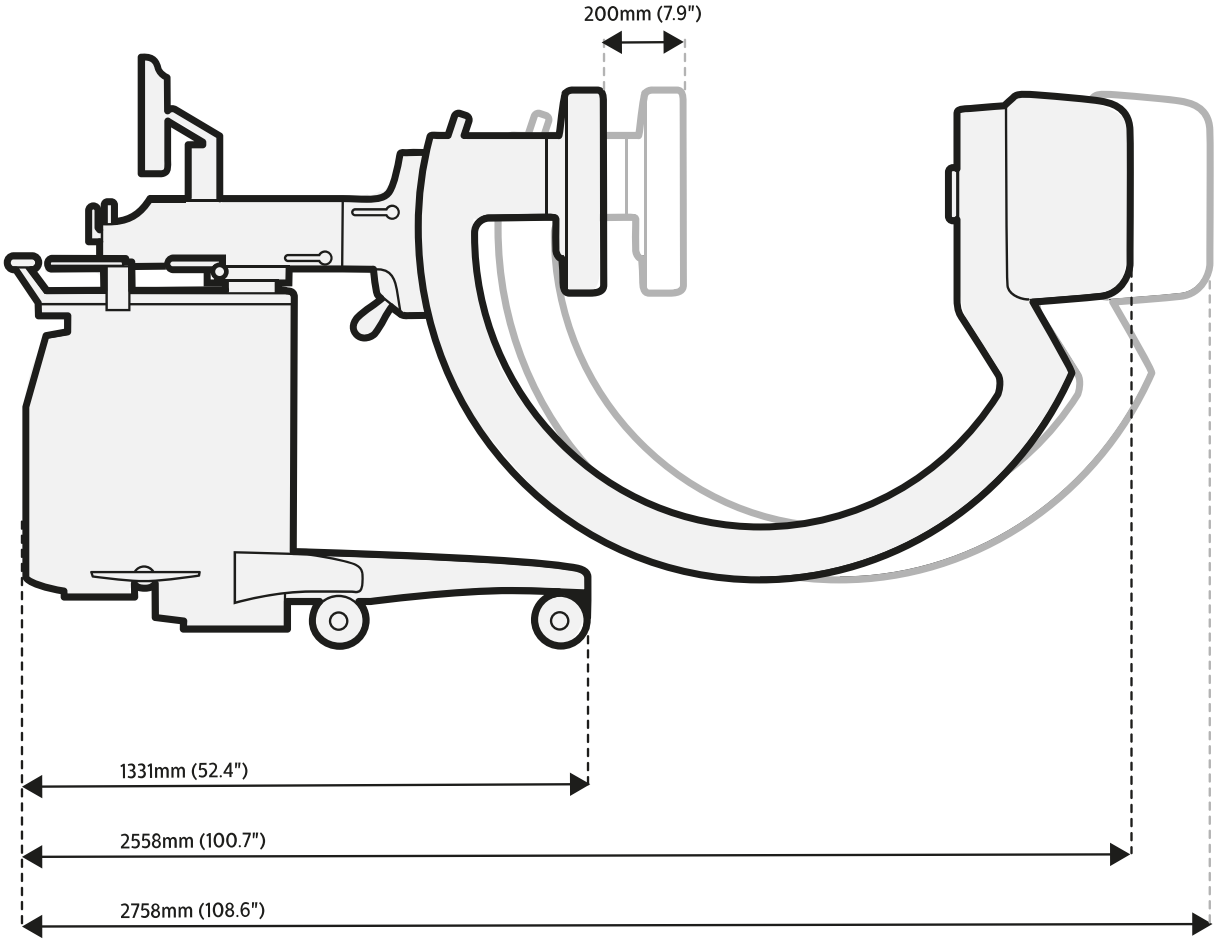


Figure 152 C-arm stand dimensions: longitudinal movement

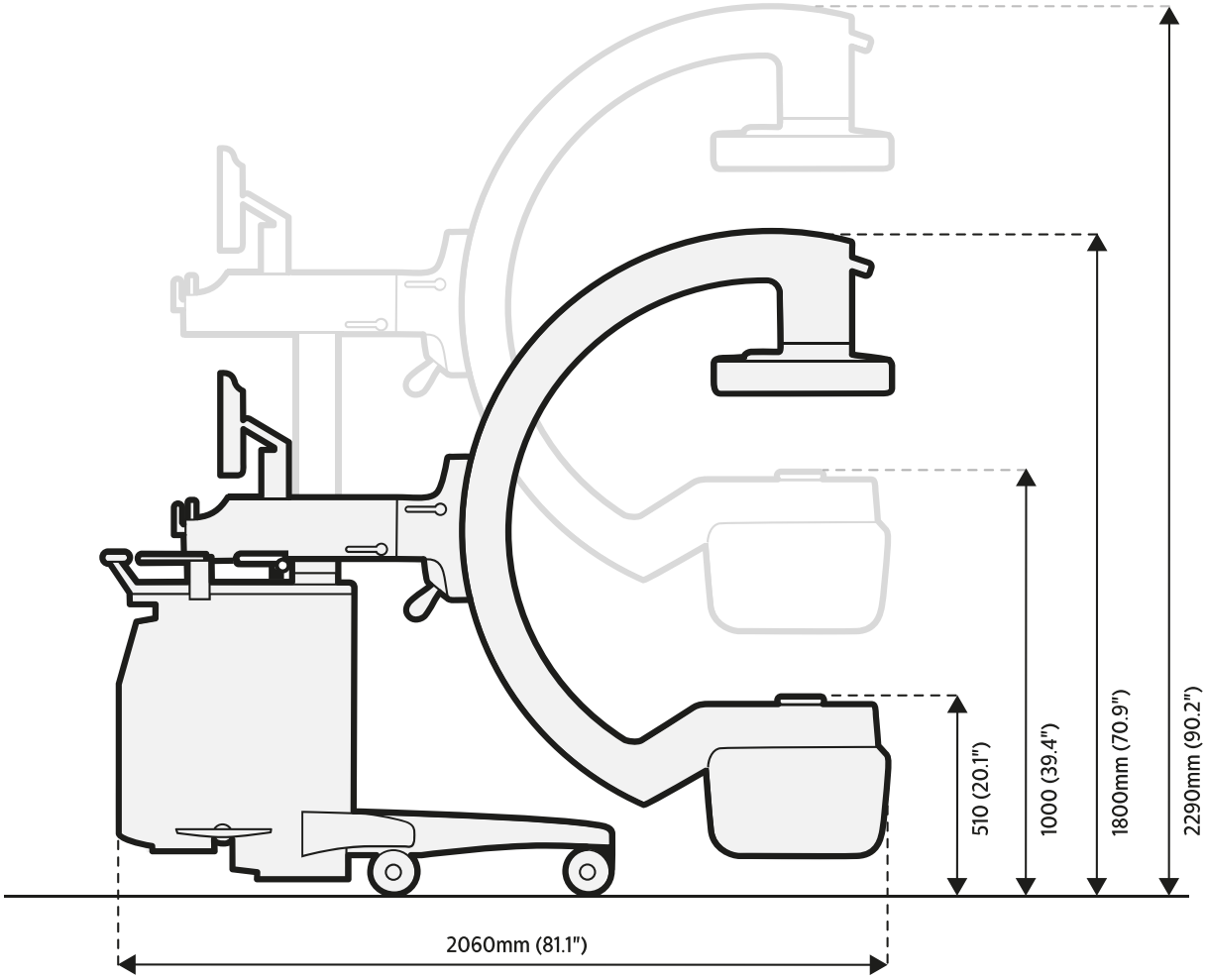


Figure 153 C-arm stand dimensions: height movement

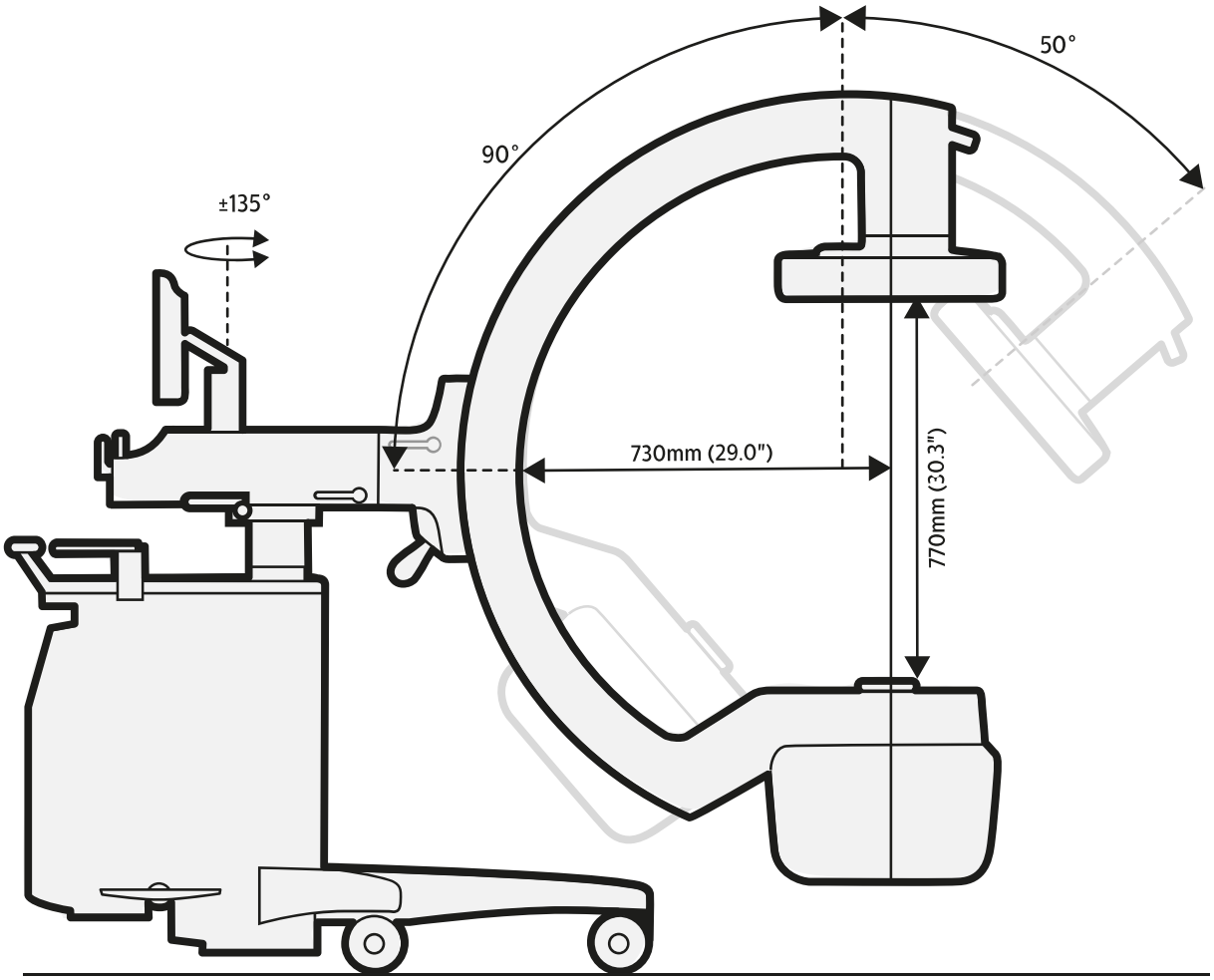


Figure 154 C-arm stand dimensions: angulation

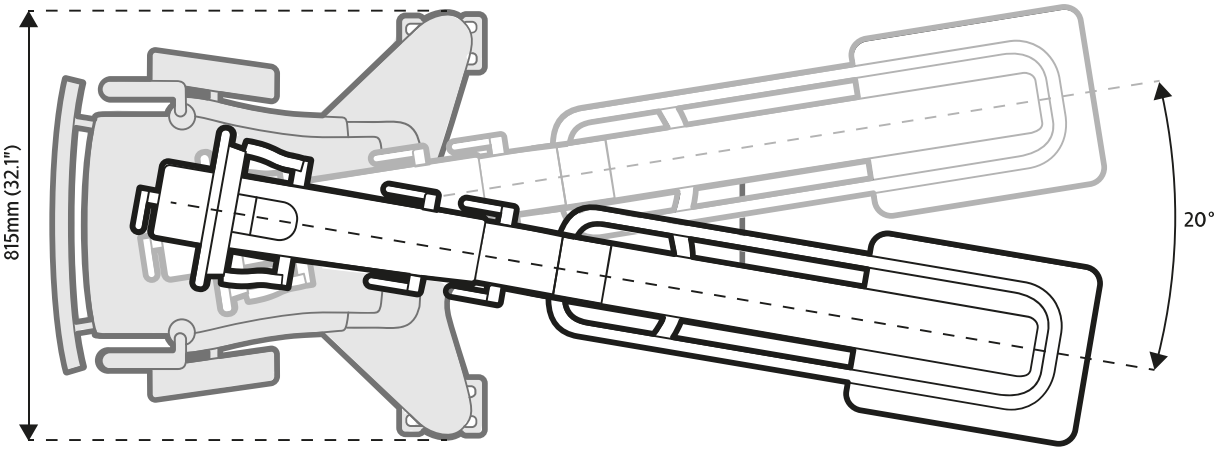


Figure 155 C-arm stand dimensions: panning movement (swivel)

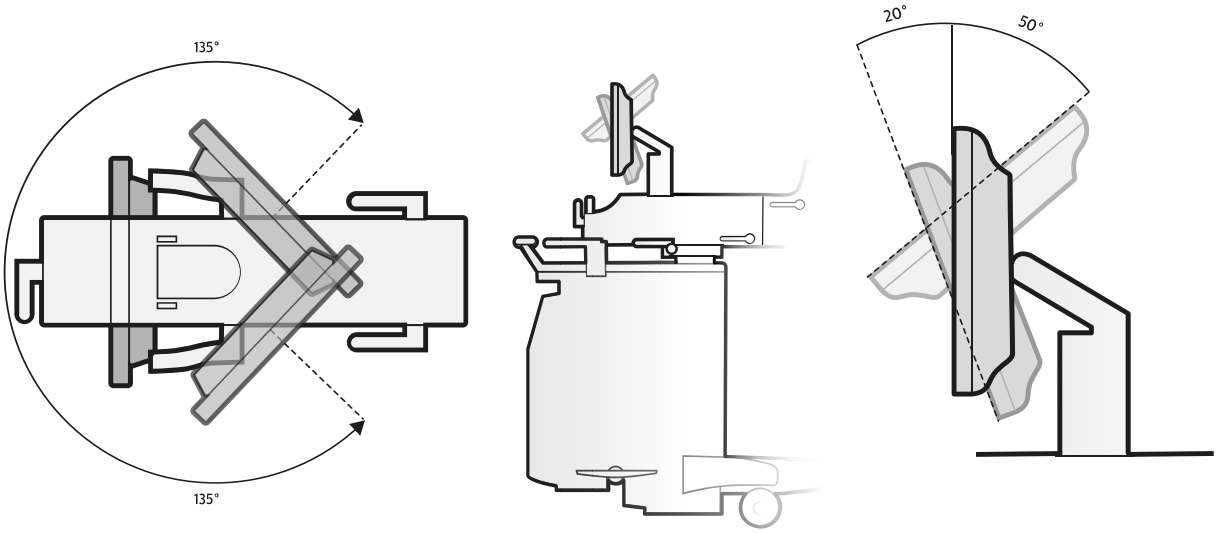


Figure 156 Stand monitor: rotation (left) and tilt (right)

9.3.12 Mobile View Station Dimensions

Definition	Value
Weight (including options)	<140 kg
Paper / transparency printer (option)	8.5 kg

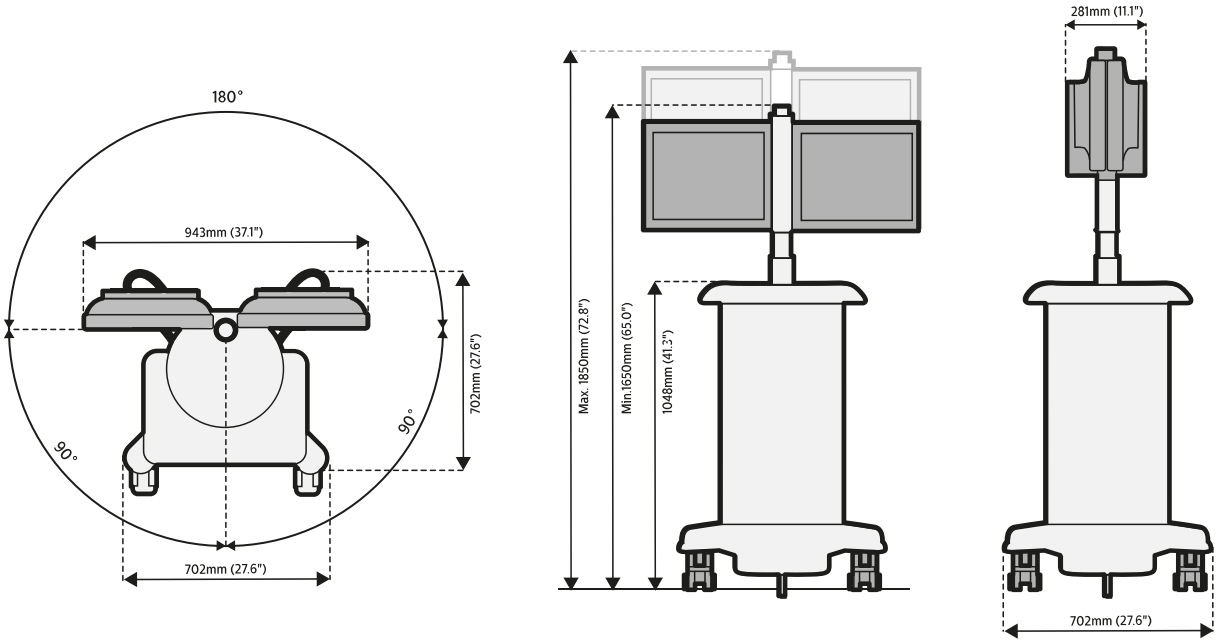


Figure 157 Mobile view station dimensions

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

INFORMATION ONLY - Please read Section X

SECTION I - Product and Manufacturer Identity

Product Identity: **Sealed Lead Battery** **Cyclon®, Genesis®, SBS, or Hawker XT™**	Revision Date: June 1998
Manufacturer's Name and Address Hawker Energy Products Inc. 617 North Ridgeview Drive Warrensburg, MO 64093-9301	Emergency Telephone Number: (660) 429-2165 Customer Service Telephone Number: 800-964-2837

SECTION II - Ingredients

Hazardous Components	CAS#	OSHA PEL-TWA	% (By weight)
Lead	7439-92-1	50µg/m³	45 - 60%
Lead Dioxide	1309-60-0	50µg/m³	15 - 20%
Sulfuric Acid Electrolyte	7664-93-9	1.0 mg/m³	15 - 20%
Non-Hazardous Materials	N/A	N/A	5 - 10%

SECTION III - Physical/Chemical Characteristics

Boiling Point - N/A	Specific Gravity (H 2 O=1) - N/A
Vapor Pressure (mm Hg.) - N/A	Melting Point - N/A
Solubility in Water - N/A	Appearance & Color - N/A

SECTION IV - Fire and Explosion Hazard Data

Flash Point (Method Used): N/A	Flammable Limits: N/A	LEL: N/A	UEL: N/A

Extinguishing Media: Multipurpose Dry chemical, CO_2 or water spray.
Special Fire Fighting Procedures: Cool Battery exterior to prevent rupture. Acid mists and vapors in a fire are toxic and corrosive.
Unusual Fire and Explosion Hazards: Hydrogen gas may be produced and may explode if ignited. Remove all sources of ignition.

SECTION V - Reactivity Data

Conditions to Avoid: Avoid shorting. Avoid over-charging. Use only approved charging methods. Do not charge in gas tight containers.

SECTION VI - Health Hazard Data

Routes of Entry: N/A	Health Hazards (Acute and Chronic): N/A
Emergency and First Aid Procedures:	Battery contains acid electrolyte which is absorbed in the separator material. If battery case is punctured, completely flush any release material from skin or eyes with water.

SECTION VII - Precautions for Safe Handling & Use

Routes of Entry: N/A	Health Hazards (Acute and Chronic): N/A
Steps to be taken in case material is released or spilled:	Avoid contact with acid materials. Use soda ash or lime to neutralize. Flush with water.

SECTION VII - Precautions for Safe Handling & Use	
Waste Disposal Method:	Dispose of in accordance with Federal, State, & Local Regulations. Do not incinerate. Batteries should be shipped to a reclamation facility for recovery of the metal and plastic components as the proper method of waste management. Contact distributor for appropriate product return procedures.

SECTION VIII - Control Measures

Not Applicable

SECTION IX - Transportation

Hawker Energy Products Inc. batteries are starved electrolyte batteries which means the electrolyte is absorbed in the separator material. The batteries are also sealed. As of September 30, 1995, Hawker Energy Products Inc. batteries were classified as “nonspillable batteries”, and as such are not subject to the full requirements of 49 CFR § 173.159. The previous exempt classification, “Dry Batteries, Not Restricted” was discontinued effective September 30, 1995. “Nonspillable” batteries are excepted from the regulation's comprehensive packaging requirements if the following conditions are satisfied: (1) The battery is protected against short circuits and is securely packaged. (2) For batteries manufactured after September 30, 1995, the battery and outer packaging must be plainly and durably marked “NONSPILLABLE” or “NONSPILLABLE BATTERY” and (3) The battery is capable of withstanding vibration and pressure differential tests specified in 49 CFR § 173.159(d). Hawker Energy Products Inc. batteries have been tested by WYLE Scientific Services & Systems Laboratories Group and determined to be in compliance with the vibration and pressure differential tests contained in 49 CFR § 173.159(d), and therefore as of September 30, 1995, excepted from the DOT requirements set forth in 49 CFR § 173.159, other than paragraph (d). Battery shipments from Hawker Energy Products Inc. Warrensburg location, will be properly labeled in accordance with applicable DOT regulations.

Packaging changes performed at other locations may require additional labeling, since in addition to the battery itself containing the required marking, the outer packaging of the battery must also contain the required marking: “NONSPILLABLE” OR “NONSPILLABLE BATTERY”.

Because the batteries are classified as “Nonspillable” and meet the three conditions above, [from § 173.159(d)] they do not have an assigned UN number nor do they require additional DOT hazard labeling. The regulation change effective September, 1995, was to clarify and distinguish to shippers and transporters, all batteries that have been tested and determined to be in compliance with the DOT Hazardous Material Regulations, the International Civil Aeronautics Organization (ICAO), and the International Air Transport Association (IATA) Packing Instruction 806 and Special Provision A67, and therefore excepted from all other requirements of the regulations and classified as a “nonspillable battery”.

SECTION X - Additional Information

The Hawker sealed lead acid battery is determined to be an “article” according to the OSHA Hazard Communication Standard and is thereby excluded from any requirements of the standard. The Material Safety Data Sheet is therefore supplied for informational purposes only. The information and recommendations contained herein have been compiled from sources believed to be reliable and represent current opinion on the subject. No warranty, guarantee, or representation is made by Hawker Energy Products Inc., as to the absolute correctness or sufficiency of any representation contained herein and Hawker Energy Products Inc. assumes no responsibility in connection therewith, nor can it be assumed that all acceptable safety measures are contained herein, or that additional measures may not be required under particular or exceptional conditions or circumstances.

N/A or Not Applicable - Not applicable for finished product used in normal conditions.

9.3.14 Certifiable Items

Component type	Model designation	Labeling
X-ray control	Zenition 70 R1.1 STND with FD	Central
Tube housing assembly	iXion Monoblock (see the unit manual)	Central
X-ray generator	iXion HF generator (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

Wireless LAN Option	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.***

Wireless Foot Switch	Type 1 Specification	Type 2 Specification
Frequency range	2.4000 GHz to 2.4835 GHz	2402 MHz to 2480 MHz
Channel spacing	500 KHz	2 MHz
Modulation	2-FSK, MSK	Gaussian Frequency Shift Keying (GFSK) Adaptive frequency-hopping on 40 channels
Range	10 m in open field	10 m in open field
Conformity	• Europe: EN 300440, EN 301489, EN 60950, EN 50371 • USA: FCC Part 15C, single modular, FCC identifier XK5-SW100AMBINT • Canada: RSS-210 Issue 7, 5158A-SW100AMBINT	• Europe: EN 301489, EN 300328 v2.1.1, EN 60950-1, FCC 15.247 • USA: FCC, Part 15B, single Modular, FCC Identifier: XK5-SW24LE • Canada: RSS-210 Issue 7, 5158A-SW24LE
Effective radiated power (ERP)	≤10 mW	≤10 mW

NOTE ***The system reaction time is up to 80 ms longer when the wireless foot switch is used, compared to using the hand switch or the wired foot switch.***

Video Converter	Specification
Video input	• S-Video • SDI • DVI

Input	Supported Format
S-Video	• PAL Interlaced 720 x 576, 50 Hz • NTSC Interlaced 720 x 480, 60 Hz
SDI	See the table below
DVI-Digital	• 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)	• 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

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	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
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	• DVD+R • DVD+R DL • DVD+RW • DVD-R • DVD-R DL • DVD-RW • DVD-RAM (Version 2) • 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

WARNING
Only the options and equipment delivered by Philips Medical Systems may be used in conjunction with the Philips Zenition 70. 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		
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

9.3.17 Accessories

Accessory	Description
Foot switch	Wired foot switch is used to activate a range of X-ray and acquisition modes.
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.

9.3.18 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] • Secondary Capture Image Storage (SC) • X-ray Angiography Image Storage (XA) Query/Retrieve • Storage Commit • Basic Worklist Management • Modality Performed Procedure Step (MPPS) Print Management • Basic Gray Scale Print • Radiation Dose Structured Report (RDSR)

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.

9.3.19 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

Definition	Specification
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	20/18 A	8/7 A
	200-240 V	4/3 A	10/8 A	5/4 A
Power (VA)	100-130 V	800 VA	2100 VA	900 VA
	200-240 V	800 VA	2100 VA	900 VA
Power (Watt)	100-130 V	700 W	2000 W	800 W
	200-240 V	700 W	2000 W	800 W
Total heat dissipation	-	700 W	-	1000 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	20 A	10 A	0.1
120/130 V	50/60 Hz	20 A	10 A	0.2
200/210/220/230/240 V	50/60 Hz	10 A	6 A	0.6

100/110/120/130 V	Specification
Frequency	50/60 Hz
Current (long term/momentary)	10/20 A
Maximum impedance	See note
Mains voltage tolerance	See note
Mains fuse	Slow

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 ±10%.

120-130 V	Specification
Current (long term/momentary)	10/20 A
Maximum impedance	See note
Mains voltage tolerance	See note
Mains fuse	Slow
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 ±10%.

200-240 V	Specification
Current (long term/momentary)	6/10 A
Maximum impedance	0.6 Ohm
Mains voltage tolerance	10%
Mains fuse	Slow

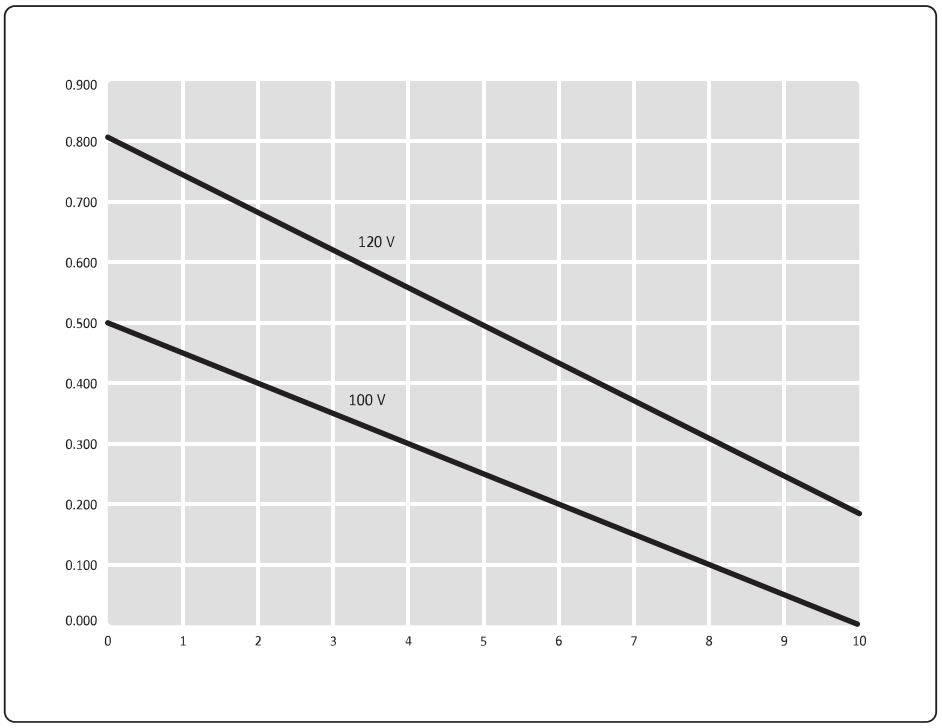


Figure 158 Maximum mains resistance versus main voltage tolerance

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
LAD	Laser Aiming Device
LCD	Liquid Crystal Display
LED	Light Emitting Diode
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

Abbreviation	Explanation
SCU	Service Class User
SSL	Secure Socket Layer
USB	Universal Serial Bus
VPN	Virtual Private Network
XA	X-ray Angiographic

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, transparency film, video, video DVD, USB memory device or examinations/images to a DICOM PACS.

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.

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	Second		First	Second		First	Second		First	Second
±	+	-	È	E	‘	Ü	U	“	ð	d	-
¢	c	/	É	E	’	Ý	Y	’	ñ	n	~
£	L	-	Ê	E	^	Þ	I	p	ò	o	‘
¤	o	x	Ë	E	“	ß	s	s	ó	o	’
¥	Y	=	Ì	I	‘	à	a	‘	ô	o	^
©	o	c	Í	I	’	á	a	’	õ	o	~
«	<	<	Î	I	^	â	a	^	ö	o	“
»	>	>	Ï	I	“	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 for the special character.

2 Press the second required 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
  - Spine
  - Thorax
  - Arm

  - Hip/Leg
  - Pelvis
- 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
  - Hip/Leg

Fluoroscopy Selections

- Acquisition mode
  - Fluoroscopy
  - Roadmap
  - Roadmap CO2
- Pulse rate
  - 15 / s
  - 8 / s
  - 4 / s
- Storage
  - No storage
  - LIH
  - All
- Dose level

  - Low
  - Normal
  - Medium
  - High
- Noise
  - Reduce blur
  - Default (both buttons inactive)
  - Reduce noise

Exposure Selections

- Acquisition mode
  - Single shot
  - Run
  - Subtract
  - Trace
  - Subtract CO2
  - Trace CO2
- Pulse rate

30 / s		15 / s		8 / s		4 / s
15 / s	or	8 / s	or	4 / s	or	2 / s
8 / 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	249
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 Physician names	100
Maximum number of Technician 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
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

Variable	Quantity
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 276)).
- Switch the system off after use (see *Switching the System Off* (page 83)).

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 249 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 276).

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 249 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 154).

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.

12 Legends

This section provides an overview of the main system controls. For more information regarding specific functions, see *Operation* (page 67).

12.1 Mobile View Station Console

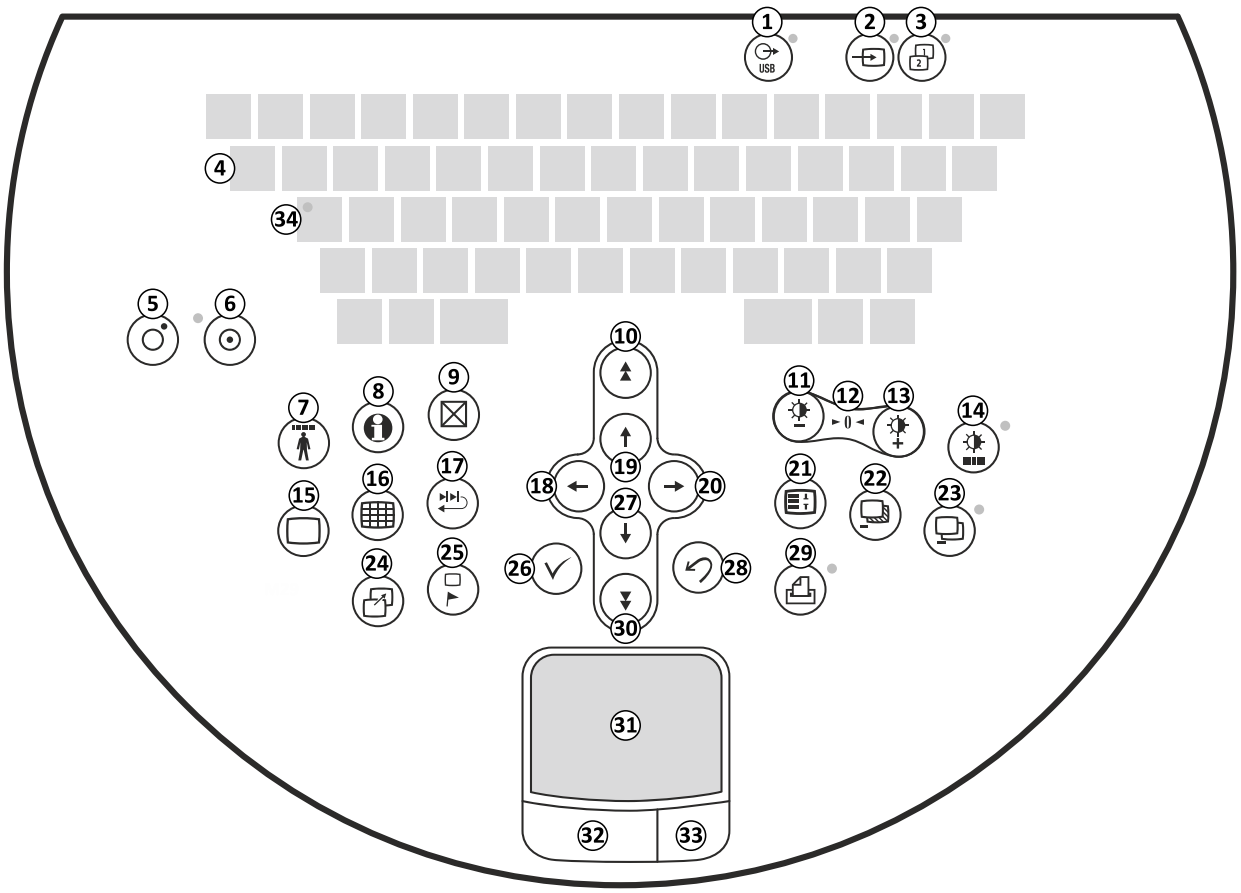


Figure 159 Mobile view station console

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

Key	Description
14	Auto contrast/brightness (with indicator light)
15	Single image screen
16	Overview screen
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 160 C-arm stand console

Key	Description
1	C-arm stand off
2	C-arm stand on / System on
3	Emergency off

12.3 C-arm Stand Touch Screen

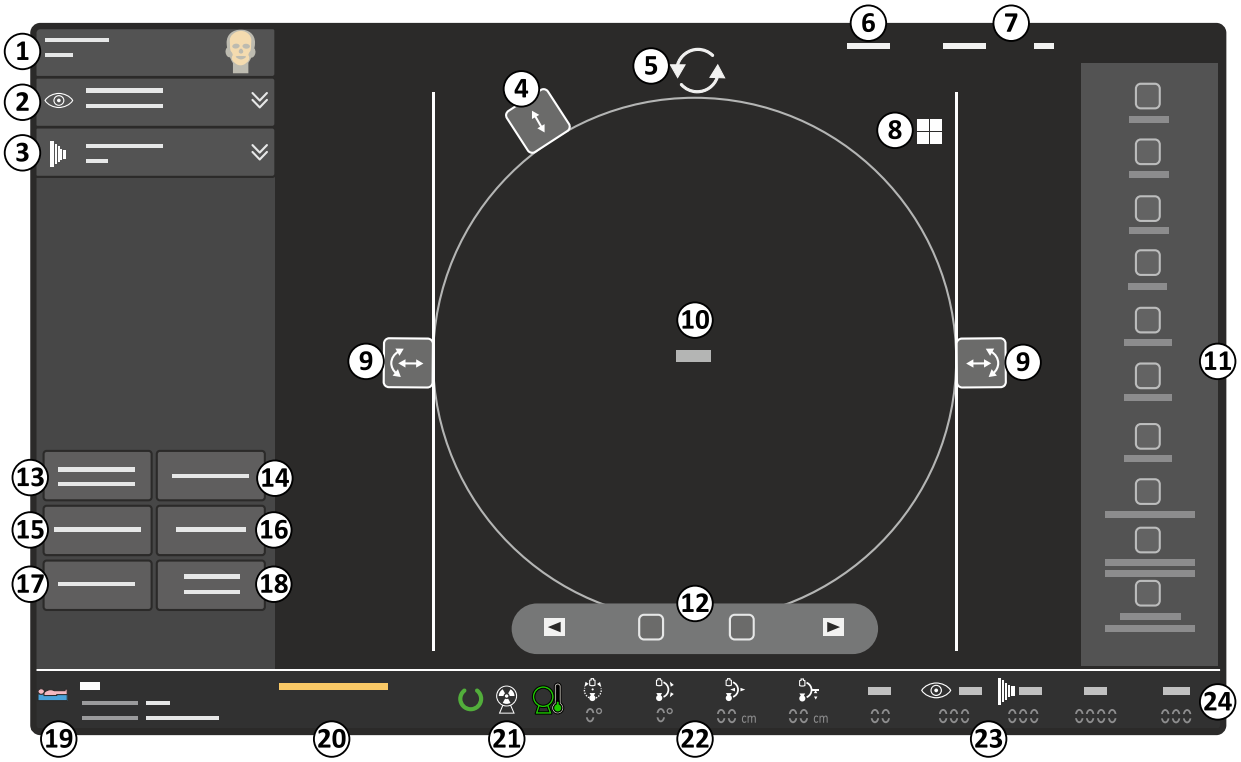


Figure 161 C-arm stand touch screen

Button	Description
1	Examination type selector
2	Fluoroscopy expander
3	Exposure expander
4	Diaphragm collimator control
5	Image rotation control
6	System menu
7	Help and tooltips
8	Last image hold indicator
9	Manual shutter positioning controls
10	Main image area
11	Image toolbar
12	Run cycle navigation controls
13	Detector zoom control
14	ClearGuide
15	Detector laser control
16	Tube laser control
17	Manual kV control
18	Position memory
19	Patient information
20	System messages
21	X-ray status and heat indication
22	C-arm position
23	Dose information

Button	Description
24	Fluoroscopy / exposure time

12.4 C-arm Stand Height Movement

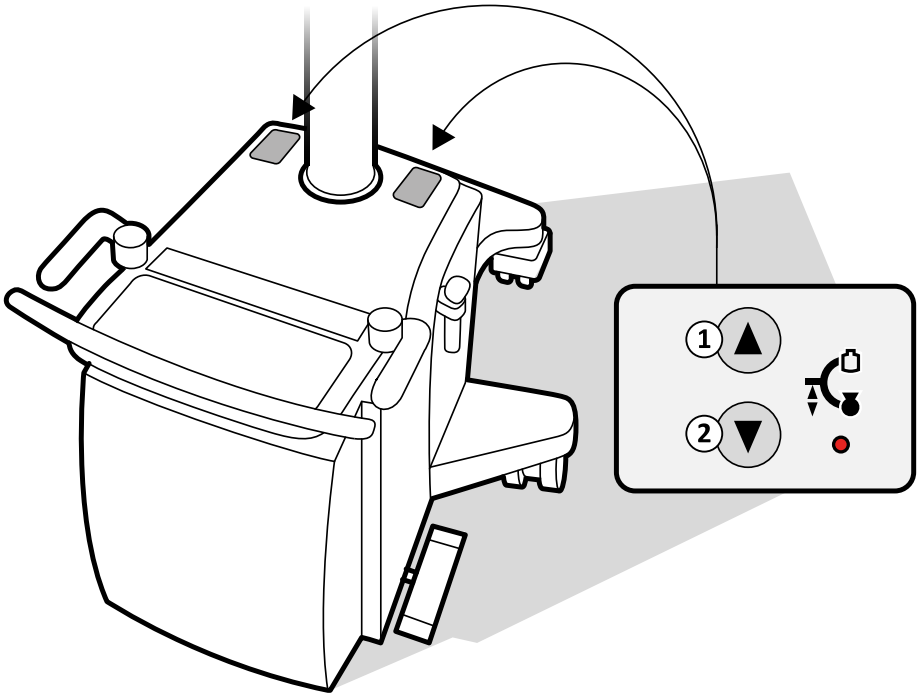


Figure 162 C-arm stand height movement controls

Key/item	Description
1	Up
2	Down
3	Indicator light

12.5 Hand Switch

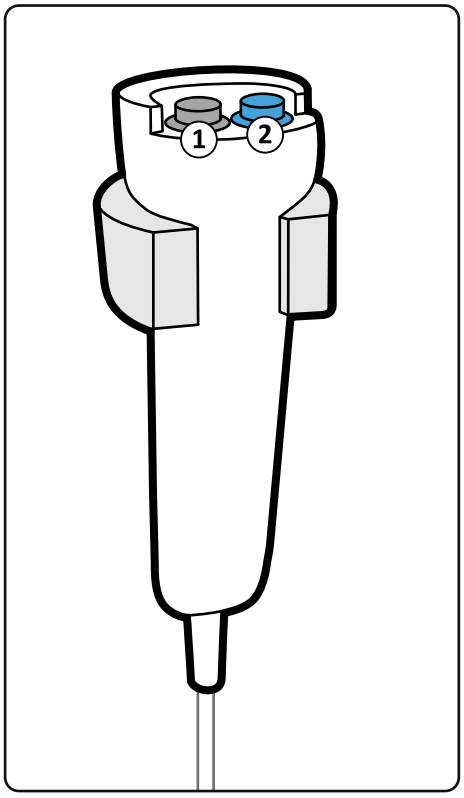


Figure 163 Hand switch

Key	Function
1	Fluoroscopy
2	Exposure / Single shot

12.6 Foot Switch

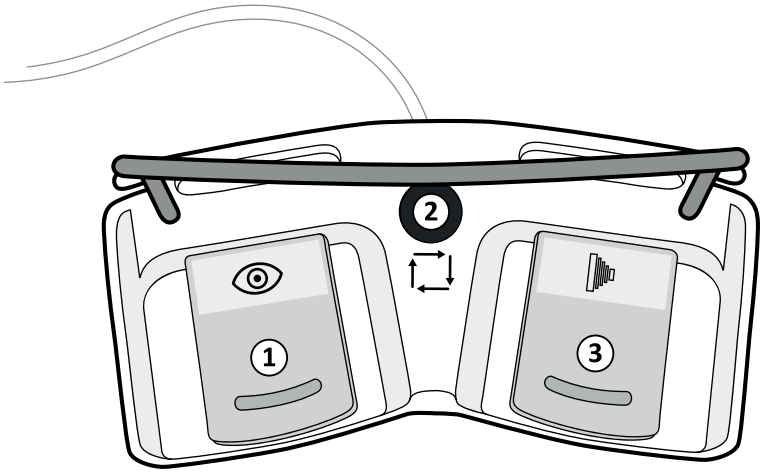


Figure 164 Foot switch

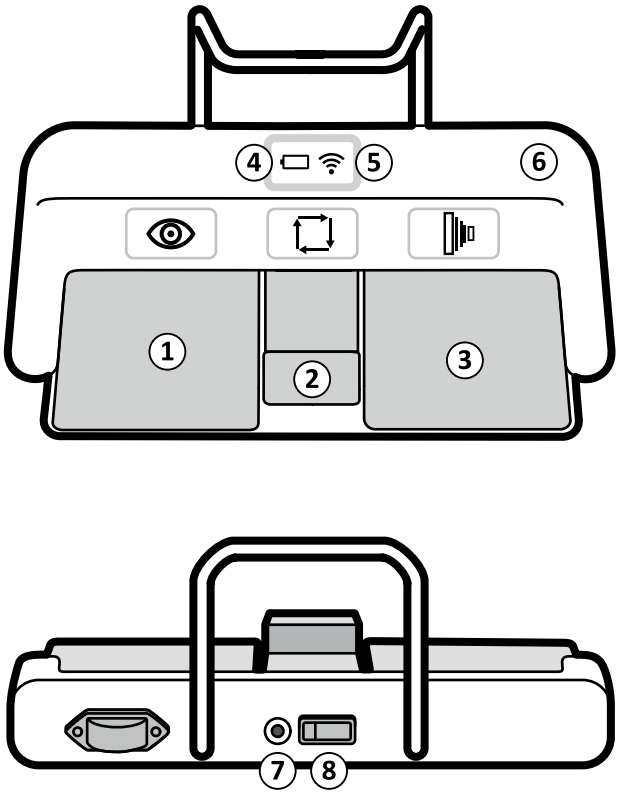


Figure 165 Wireless foot switch

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

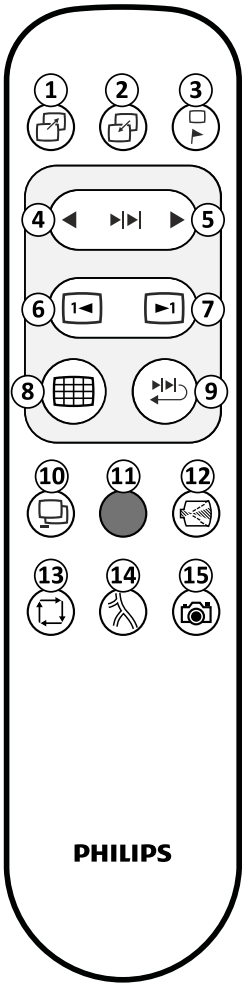


Figure 166 Remote control

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	Not used
15	Not used

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

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This Medical Device meets the provisions of the transposition of the Medical Device Directive 93/42/EEC within the country of origin of the Notified Body concerned with the device.

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