

Cios Select

Operator Manual

SIEMENS Healthineers

Legend

	Indicates a hint Is used to provide information on how to avoid operating errors or information emphasizing important details
	Indicates the solution of a problem Is used to provide troubleshooting information or answers to frequently asked questions
■	Indicates a list item
✓	Indicates a prerequisite Is used for a condition that has to be fulfilled before starting a particular operation
◆	Indicates a one-step operation
1 2 3	Indicates steps within operating sequences
Italic	Is used for references and for table or figure titles
➔	Is used to identify a link to related information as well as previous or next steps
Bold	Is used to identify window titles, menu items, function names, buttons, and keys, for example, the Save button Is used for on-screen output of the system including code-related elements or commands
Orange	Is used to emphasize **particularly** important sections of the text
`Courier`	Is used to identify inputs you need to provide
Menu > Menu Item	Is used for the navigation to a certain submenu entry
<variable>	Is used to identify variables or parameters, for example, within a string

⚠ CAUTION

CAUTION

Used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or material damage.

CAUTION consists of the following elements:

- Information about the nature of a hazardous situation
- Consequences of not avoiding a hazardous situation
- Methods of avoiding a hazardous situation

⚠ WARNING

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

WARNING consists of the following elements:

- Information about the nature of a hazardous situation
- Consequences of not avoiding a hazardous situation
- Methods of avoiding a hazardous situation

1 Introduction 6
1.1 Use of the product 7
1.2 Information about this Operator Manual 11

2 Safety 14
2.1 General safety information 16
2.2 Personal safety 30
2.3 Equipment safety 38

3 System Description 45
3.1 Device Description 47
3.2 System Operation 59
3.3 Emergency situations 85

4 Examination 89
4.1 Safety information 91
4.2 Preparing the system 93
4.3 Patient registration 98
4.4 Defining the examination settings 110
4.5 Acquiring images 120
4.6 Ending the examination 133
4.7 Performing special examinations 135

5 Postprocessing 142
5.1 Patient data 144
5.2 2D image processing 155
5.3 Subtraction processing 173

6 Documentation 179
6.1 Filming/Printing 180
6.2 Exporting 184
6.3 Checking the data transfer 194
6.4 Reports 197

7 Configuration 200
7.1 User Settings 202
7.2 Examination settings (PEX Editor) 215

8 Maintenance 230
8.1 Functional and safety checks 231
8.2 Service via network connection 236
8.3 Software Update 241
8.4 Protection classes/Protection measures 244
8.5 Cleaning and Disinfection 245

9 Technical information 251
9.1 Curves and diagrams 253
9.2 Precautions for EMC – 2nd Edition 261
9.3 Precautions for EMC – 4th Edition 265
9.4 Original equipment manufacturer 270
9.5 System data 271
9.6 List of standards to be maintained covering electrical and mechanical safety 277
9.7 Labels 278

10 Options 292
10.1 Advanced Security Package to protect imaging system and patient data (HIPAA) 293
10.2 Wireless network connection (WLAN) 297
10.3 Spacer 298
10.4 Grounding cable 299
10.5 Wireless multifunctional footswitch 299
10.6 Extended wired footswitch 303
10.7 Sterile cover on the detector, single tank and C-arm 304
10.8 Laser light localizer 306
10.9 DVI video splitter 306
10.10 Printer 306
10.11 Lithotripsy 307

Index 312

1 Introduction

1.1 Use of the product 7
1.1.1 Intended purpose 7
1.1.2 Indications for use 7
1.1.3 Intended use 7
1.1.4 Indications 7
1.1.5 Contra-Indications 7
1.1.6 Patient target group(s) 7
1.1.7 User profile 8
1.1.8 Intended users 8
1.1.9 Clinical benefit 8
1.1.10 Undesireable side effects 9
1.1.11 Residual risk 9
1.1.12 Physical functionality 10
1.1.13 Conditions of use 10
Minimum requirements concerning hardware 10
Maintenance, cleaning and disinfection, service 10
1.1.14 Essential performance characteristics 10
1.1.15 Frequently used operating functions 11
1.1.16 Operating functions regarding safety 11
1.2 Information about this Operator Manual 11
1.2.1 Names and parameters 11
1.2.2 Trademarks 11
1.2.3 Values 11
1.2.4 Layout conventions 11
1.2.5 Gender inclusivity 12
1.2.6 Operator manuals on the Internet 12
Accessing the operator manuals on the Internet 12
PEPconnect 12

1.1 Use of the product

We welcome you as a user of the powerful Cios Select, the multifunctional C-arm system from Siemens Healthineers.

1.1.1 Intended purpose

Intended Purpose Statement under the European Medical Device Regulation 2017/745: Mobile X-ray system intended for angiography- and fluoroscopic-based procedures.

1.1.2 Indications for use

The Cios Select is a mobile X-ray system intended for use in Operating room, Traumatology, Endoscopy, Intensive Care Station, Pediatrics, Ambulatory patient care and in Veterinary Medicine.

The Cios Select can operate in three different modes, Digital Radiography, Fluoroscopy, and Pulsed Fluoroscopy which are necessary in performing wide variety of clinical procedures, such as intraoperative bile duct display, fluoroscopic display of a intra-medullary nail implants in various positions, low dose fluoroscopy in pediatrics, fluoroscopic techniques utilized in pain therapy and positioning of catheters and probes.

1.1.3 Intended use

Cios Select is a mobile X-ray system designed to provide X-ray imaging of the anatomical structures of patient during following clinical applications: interventional fluoroscopic, gastro-intestinal, endoscopic, urologic, pain management, orthopedic, neurologic, vascular, cardiac, critical care and emergency room procedures.

1.1.4 Indications

In general, all clinical indications of angiography- and fluoroscopic-based procedures within the intended use are applicable for this device.

1.1.5 Contra-Indications

For this product there are currently no known contra-indications. However, contra indications for angiography- and fluoroscopy- based procedures apply. The final decision for use of the medical device in a certain application is made by the physician based on his/her medical knowledge and the risks of the cases involved.

1.1.6 Patient target group(s)

The system can be used on all patients, from pediatric to geriatric.

1.1.7 User profile

Caution: Federal law restricts this device to sale by or on order of a physician

The system can be used properly only by suitably qualified medical personnel. This requires operating personnel to be familiar with the Operator Manual. This manual must be studied in detail prior to starting up the system. Special attention must be given to the following sections:

- General Safety Information
- Personal safety
- Equipment safety
- Maintenance

It is the responsibility of the system operator to ensure that operating personnel are professionally and properly instructed.

As the manufacturer of the system, SIEMENS is not responsible for any impact on its safety, reliability and performance if it is not used in accordance with the Operator Manual.

Please also read the supplements and addenda to the Operator Manual necessitated by technical developments.

1.1.8 Intended users

Operator profile: The usage of the system described in the Operator Manual requires specific technical and medical knowledge and skills regarding, at a minimum, radiation protection, safety procedures and patient safety.

People using, moving, working with the system must have acquired such knowledge and skills during their curriculum.

Equipment training: Application training is delivered with the equipment according to the handover contract. It is mandatory to follow such application training delivered by Siemens Healthineers representative before any use of the system.

The follow-up training, which is necessary due to change of personnel, is in the responsibility of the operator of the system. Any additional training can be requested from Siemens Healthineers.

1.1.9 Clinical benefit

The device is a general-purpose device for interventional imaging supporting diagnostic or therapeutic decisions by medical professionals. The device enables medical professionals to perform angiography- and fluoroscopy- based procedures within the intended use. Generic clinical benefits of angiography- and fluoroscopy- based procedures within the intended use are applicable for this device.

1.1.10 Undesireable side effects

Deterministic and stochastic effects of exposure to ionizing radiation (X-rays) are part of the physician's medical education. The necessity of an X-ray examination in relation to these risks must be considered by the physician when prescribing or performing such a type of examination.

For radiation emitting products, known deterministic effects of exposure to X-rays are erythema, cataracts, permanent epilation and delayed skin necrosis.

For radiation emitting products, known stochastic effects of exposure to X-rays are increased risks of developing cancer and hereditary diseases.

These stochastic dose effects have an increased probability of occurrence with increased dose. The related risk can be minimized by means of keeping the X-ray exposure to the necessary minimum and by means of careful and systematic application of protection measures for the operator and the clinical staff.

Examinations performed on patients especially sensitive to ionizing radiation (e.g. infants, pregnant women, individuals with certain genetic predispositions and/or diseases characterized by enhanced radiation sensitivity) or to contrast medium (e.g. chronic kidney diseases) need to be planned and performed with special care to minimize the exposure.

1.1.11 Residual risk

The Cios Select is a complex medical device, its functionality requires the seamless and synchronized operation of a high number of hardware and software components, as well as appropriate operating conditions.

A safe and effective operation of the Cios Select requires that it is operated by persons with the necessary specialist knowledge and appropriate knowledge about the system, its intended use, its functions, the conditions and limitations for its usage, periodic maintenance and routine checks which need to be performed, the potential error situations, as well as the corresponding recovery possibilities.

System functions may be disturbed or completely lost at any time due to component errors, damages like ingress of liquids or collisions, or due to inappropriate operating conditions e.g. with regards to mains power supply, excessive use of the system at maximum load for a prolonged period of time or inappropriate maintenance or service. User or operator behavior like using the system without appropriate care, using the system in combination with devices, accessories, other equipment or pieces of software in a way which is not approved by the manufacturer or cleaning or disinfecting the system not according to the provisions given in the instructions for use may also lead to damages or functional disturbances. Certain materials in the X-ray beam like patient tables may impair the image quality and may lead to a higher radiation exposure.

The Cios Select is designed to comply with regulatory requirements regarding electromagnetic compatibility. It is protected against the electromagnetic influence of external devices and does not disturb the operation of these. However, individual external devices with emissions beyond the allowed levels or even the combined emission of multiple, individually compliant devices may lead to the influence levels considered in designing and testing the Cios Select being exceeded, and eventually, to functional disturbances. External devices, which are not sufficiently stable against electromagnetic influence may be disturbed by the emissions of the Cios Select as well.

When releasing system movements, the operator's care is required in order to prevent crushing, collisions with other equipment or collisions with and thus movement of body-penetrating objects like catheters or needles.

The Cios Select manages radiation exposure in order to minimize the radiation dose for the patient, user and staff, while providing the necessary level of imaging performance. The applied dose is measured, tracked and displayed. Warnings are given under defined conditions.

In combination with the appropriate care in the clinical workflow and informed decisions considering also the clinical benefit of radiation, the above mechanisms should prevent deterministic dose effects to the patient (erythema, cataracts, permanent epilation and delayed skin necrosis). Nevertheless, such injuries cannot be completely excluded. In rare cases, the dose management mechanisms may be not be operating correctly. These issues are detectable for the user especially within a Quality Assurance framework. Some clinical applications using the Cios Select involve injecting contrast medium into the patient's cardiovascular system or other body orifices. Functional disturbances in the Cios Select may affect the imaging workflow resulting in the additional administration of contrast medium. This may lead to risks and side-effects in accordance with the information provided by the manufacturer.

1.1.12 Physical functionality

The Cios Select X-ray system is a compact, powerful mobile X-ray system with flat detector and digital image processing.

The system is equipped with a footswitch and a hand switch for triggering exposure.

The following modes of operation are available in Cios Select for the broad scope of applications: Single image radiography (Single Image), fluoroscopy (Fluoro), substraction (Sub) and roadmap (Road).

1.1.13 Conditions of use

The digital Cios Select X-ray systems are mobile systems designed for use in the ER, OR, and in radiology and endoscopy departments of hospitals, clinics, and outpatient practices. The applicable country-specific requirements must be observed when using the system.

Minimum requirements concerning hardware

The image system of Cios Select is being delivered, installed, and connected to the IT environment as a complete and functioning system by our service organization.

Maintenance, cleaning and disinfection, service

(➔ Page 230 *Maintenance*).

1.1.14 Essential performance characteristics

(➔ Page 251 *Technical information*).

1.1.15 Frequently used operating functions

- System On/Off
- Patient registration
- Selecting the operating mode
- Acquiring X-ray images
- Processing X-ray images (Postprocessing/Adding comments)
- Saving/archiving studies locally or to a PACS

1.1.16 Operating functions regarding safety

- Emergency stop function (Emergency stop switch)
- Radiation protection (Collimator function)
- Moving the C-arm

1.2 Information about this Operator Manual

1.2.1 Names and parameters

All names and data on patients and equipment that are used as examples in this Operator Manual are entirely fictional.

Any resemblance to names of real persons and institutions is entirely coincidental.

All parameters and images shown in this Operator Manual are examples. Only the parameters displayed by your system are definite.

1.2.2 Trademarks

Transliner® is a registered trademark of Siemens AG.

Microsoft and Adobe Acrobat are registered trademarks, and Windows is a trademark of Microsoft Corporation.

Oracle and Java are trademarks or registered trademarks of Oracle America, Inc.

All other product or company names mentioned in this document are trademarks or registered trademarks of their respective owners and are used only for purposes of identification or description.

1.2.3 Values

All numbers specified are typical values unless specific tolerances are indicated.

1.2.4 Layout conventions

The Operator Manual has several registers. A detailed table of contents listing all chapters contained in the manual is provided at the beginning.

Certain sections of text are marked with symbols to help you quickly identify the information content of the text.

See .

1.2.5 Gender inclusivity

At Siemens Healthineers, we want to address all genders equally in our Instructions for Use. It is not our intention to exclude anyone. We continue to update our documentation with this in mind.

1.2.6 Operator manuals on the Internet

All operator manuals for your system are available online as PDF files in the **Document Library**:



- doclib.siemens-healthineers.com

For detailed information, see: (➔ Page 12 *Accessing the operator manuals on the Internet*)

Accessing the operator manuals on the Internet



The operator manuals for your system are available electronically on the Internet.

✓ You have the correct name and version of your system (medical device) at hand.

1 In a browser window, enter the following URL:

   doclib.siemens-healthineers.com

   If you are visiting this site for the first time, you will need to register and apply for an account.

2 Follow the instructions given on the website. After logging on, you will find further support in the **Medical Imaging & Healthcare IT** document category.

3 Search and filter for the required document.

PEPconnect

PEPconnect is part of the Personalized Education Plan (PEP) Solution. It is a platform for healthcare professionals to access and share education and performance experiences, anytime, anywhere, on any device. The broad portfolio of medical imaging and therapy, laboratory diagnostics, and other healthcare-related topics is available via e-learning, competency-based training, webinars, job aids, and more.

You can find more detailed information on the webpage.

(➔ Page 12 *PEPconnect*)

Using the PEPconnect platform



1 In a browser window, enter the following URL:

pep.siemens-info.com

If you are visiting this site for the first time, you will need to register and apply for an account in the upper right area.

2 Follow the instructions given on the website.

After logging in, you will find the material of interest by using the **Search** bar or the **Explore** function following the path: **Explore > Medical Imaging and Therapy**

2 Safety

2.1 General safety information 16
2.1.1 Laws and regulations 16
2.1.2 Range of application 16
2.1.3 Using the system 16
2.1.4 Serious incident 17
2.1.5 Software 17
2.1.6 IT security measures 18
Operating system 18
Handling of sensitive data 18
User account information 18
Patching strategy 18
Data recovery 19
Boundary defense 19
Malware protection 19
Controlled access based on the need to know 19
Authentication/authorization controls 19
Continuous vulnerability assessment and remediation 19
Hardening 19
Network controls 20
Physical protection 20
Data protection controls 20
Auditing/logging 20
Remote connectivity 21
Incident response and management 21
2.1.7 Enhanced security 21
2.1.8 Potential equalization 21
2.1.9 Electromagnetic compatibility 21
2.1.10 Use in connection with high frequency surgical equipment 22
2.1.11 Maintenance and inspection 22
Wear and tear 22
Image quality 22
Calibration 23
Performing maintenance 23
Acceptance and performance testing, acceptance criteria 23
2.1.12 Malfunctions 23
Error messages at the C-arm system 23
System messages on the monitor 24
Handling error messages 24
2.1.13 Malfunction of electrical systems 25
System failure 26
Switching to emergency power supply 26
Disconnecting the power plug 26
2.1.14 EMERGENCY STOP 27
Press the EMERGENCY STOP button 27
Unlocking the EMERGENCY STOP button 28
2.1.15 Fire protection 28
2.1.16 Explosion protection 29
2.1.17 Overload protection 29
2.2 Personal safety 30
2.2.1 Open heart and skull examinations 30
2.2.2 Crushing hazards on the C-arm system 30

2.2.3 Mechanical damage 31
2.2.4 Radiation protection 31
For the patient 32
For the operating personnel 32
For patients and operating personnel 32
Deterministic radiation effect 33
Location and size of the relevant operating areas 34
Radiation interruption for all operating modes 38
2.3 Equipment safety 38
2.3.1 Mechanical safety 38
2.3.2 Positioning the C-arm 39
Brakes 39
Transport 39
2.3.3 Installation, repair 39
2.3.4 Original accessories 40
2.3.5 Combination with other systems 40
2.3.6 Attachment of dedicated options 41
General safety requirements 41
Attenuation equivalent 41
Weight counterbalance 41
Image quality 42
Electrical safety 42
Electromagnetic compatibility 42
Additional safety information 42
2.3.7 Disposal 44
2.3.8 Product service life 44

2.1 General safety information

2.1.1 Laws and regulations

If legally binding regulations govern the installation and/or operation of the system, it is the responsibility of the installer and/or the operator to observe these regulations.

Regulations required by law and the radiation protection regulations must be observed in all countries. Deviating from this Operator Manual, values may be set according to country-specific regulations.

This device bears a CE mark in accordance with the provisions of EU Regulation 2017/745 of April 5, 2017 concerning medical devices and the Council Directive 2011/65/EU of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic devices.

Data related to individual persons are subject to data protection. Please comply with the applicable legal regulations.

Legally required tests must be performed at the specified intervals.

These tests include, for example,

- Constancy test according to the X-ray ordinance (§16 RöV) in the Federal Republic of Germany.
- Tests based on DHHS guidelines (Department of Health and Human Services) where applicable.

Siemens Healthineers hereby certifies that the Cios Select is compliant with the recognized consensus standards covering electrical and mechanical safety, which are listed in the declaration of conformity in its current valid version.

2.1.2 Range of application

This Operator Manual is valid for the following product:

- Cios Select

This Operator Manual is valid for the following system software versions:

- Software Full Version: VA21D and onwards, for example VA21E
- Software Release Version: VA21

2.1.3 Using the system

CAUTION

Improper use of the system beyond its intended use.

Risk to the patient and user!

◆ The system may only be used as defined by its intended use for clinical applications.

CAUTION

System operation by untrained users.

Risk of improper operation due to misinterpretation of image information.

- Only persons with the required knowledge and expertise who have undergone the appropriate user training may work with the system.

CAUTION

Occurrence of audible signals.

Hazards possible, for example due to crushing risks, extended radiation release, and high dose rate.

- Please note that continued system operation may lead to one of these hazards.
- Use the system with extreme caution to avoid these hazards.

2.1.4 Serious incident

According to EU regulation 2017/745 (MDR), any serious incident that has occurred in relation to the device should be reported to the manufacturer and the competent authority of the EU member state in which the user and/or patient is established.

2.1.5 Software

The system and user software used in this product is protected by copyright. The current software version is displayed on screen during system start-up.

WARNING

Use of unreleased or altered software or hardware components.

Risk of malfunction that could endanger the patient or product.

- Only use Siemens Healthineers-authorized software and hardware components.
- Only perform repairs, or have them performed by an authorized third party, after having received our express written approval.

CAUTION

Unauthorized or incorrect alterations/changes of the software or connection of the system to a network.

Risk of unauthorized access.

- Make sure that all necessary precautions are taken with regard to the applicable security level if a functionality is added or the configuration of the condition on delivery is changed.

CAUTION

Unauthorized changes or interventions in the imaging system.

No or improper function of the imaging system.

- Do not perform any changes or interventions of any type on the imaging system without the written consent of Siemens Healthineers (supplier). This includes replacing hardware or installing and running additional software.

The pre-installed security package provides protection against cyberattacks, viruses, malware and other damaging software. It ensures that only trusted applications are run on the systems. It blocks unauthorized access, provides protection from network threats and infected USB sticks and thus offers control over when and who may make changes.

In order to receive software updates, the system must be switched on and connected to the network on a regular basis. If the system is equipped with WLAN, the WLAN option must be activated.

We recommend switching on the Cios Select at least once per week and connecting it to the LAN (or WLAN if available) network for 3 hours.

2.1.6 IT security measures

Operating system

Cios Select is based on Windows 10 Enterprise.

Handling of sensitive data

The Cios Select components maintaining sensitive data (other than removable media) are physically secure, i.e. cannot be removed without tools.

Additionally, secured equipment disassembly at the end of the product lifecycle ensures secured and definite destruction of all sensitive data.

User account information

The system supports HIPAA (Health Insurance Portability and Accountability Act) regulation with role based privilege assignment and access control. The security option must be procured to enable user management on application level.

Patching strategy

Siemens performs vulnerability monitoring of the included third party components (including the operating system). Vulnerabilities are assessed regarding their criticality and safety relevance. In case of critical vulnerabilities the associated hotfixes are distributed within a system service pack.

Service packs can be either installed remotely or on site by the trained Siemens service technician - depending on the availability of the remote service infrastructure at the customer's site and on the impact of the service pack.

Cybersecurity advisories and bulletins for Siemens Healthineers equipment are issued by the Siemens Product CERT (Computer Emergency Response Team).

Data recovery

It is assumed that Personal Health Information (PHI) is archived to a PACS after patient scan was completed or images/reports are ready after post processing.

The system supports backup and restore of system configuration to an external drive.

Boundary defense

Built in firewall is used to minimize the network attack surface. For optimized protection of sensitive data and operation of the system it must be deployed in a secure network environment, utilizing e.g. network segmentation, client access control and protection against access from public networks.

Boundary defenses in the hospital should be multilayered relying on firewalls, proxies, DMZ and network based IDS and IPS.

Malware protection

Microsoft Device Guard (Windows 10)

Controlled access based on the need to know

the system supports HIPAA standard with role based privilege assignment and access control. The security option must be procured to support this.

Authentication/authorization controls

The system security option provides the following controls:

- Role-based access control implemented via Windows Local Policy setting

Continuous vulnerability assessment and remediation

See (➔ Page 18 *Patching strategy*)

Hardening

- Microsoft Device Guard protects against malware
- Microsoft Device Guard is also used to ensure installed software/update is manufacturer-authorized software or update
- Microsoft Firewall minimizes attack surface
- All accounts not required for the intended use of the Cios Select are disabled or deleted, for both users and applications
- All shared resources (e.g. file shares) not required for the intended use of the Cios Select are disabled

- All communication ports not required for the intended use of the Cios Select are closed/disabled (see Section Network Information)
- All services not required for the intended use for the Cios Select are deleted/disabled (see Section Network Information)
- All 3rd party software as well as OS-included applications not required for the intended use of the Cios Select are deleted/disabled (see Section Software Bill of Materials)
- the system prohibits boot from removable media via password protected BIOS settings

Network controls

- Microsoft Firewall: Firewall rules are configured so that inbound connections from devices are restricted to minimize the attack surface
- Siemens recommends operating the system in a secured network environment, e.g. a separate network segmented or a VPN. Connection to the Internet is discouraged and may limit the liability of Siemens in case of incidents.
- In case of a denial of service (DoS) or malware attack, the system can be taken off the clinical network and operated offline. Exchange of clinical result would then require an active offline media (DICOM CDR or DVDR) function.

Physical protection

The Cios Select components maintaining sensitive data (other than removable media) are physically secure, i.e. cannot be removed without tools.

Data protection controls

- the system ensures integrity of stored data
- the system restricts health data transmission to configured DICOM nodes only
- PHI data is protected by role based access control. The security option must be procured to support this

Auditing/logging

The system security option provides the auditing for the following events: login/logout

- Unsuccessful login attempt
- Creation/modification/deletion of patient and image data (including data received from the RIS)
- Start/end of image acquisition with timestamp
- Storage of images in a study
- Start/close of examination
- Sending of images (including destination, amount, mode, etc.)

With Siemens Remote Service

- Remote service activity

Remote connectivity

The following technical and organizational measures help minimize the risk of unauthorized access through remote services (SRS):

- Network separation, secured connection, and access control to protect customer network
- Multi-factor authentication procedure
- Country-specific authorization
- User on medical device controls access mode
- Optional: access log available to customers
- Optional: immediate email when access starts/stops

Incident response and management

See (➔ Page 18 *Patching strategy*)

2.1.7 Enhanced security

The system offers several functions to increase the security of the system itself and to ensure the protection of patient data.

For maximum security, ensure that the following functions are permanently enabled and configured.

- User and user group management
- Password policy
- Screensaver
- Emergency access configuration
- Hardened operating system
- Hard disk encryption
- Network encryption
- Audit Trail with centralized Audit Trail configuration
- Blocking the use of USB storage devices

2.1.8 Potential equalization

Your system offers the possibility of a potential equalization so that all components have the same potential.

2.1.9 Electromagnetic compatibility

This medical device complies with the requirements of the applicable standard on electromagnetic compatibility (EMC).

See (➔ Page 261 *Precautions for EMC – 2nd Edition*)

Please be advised that other mobile electronic devices, e.g. cellular telephones, exceeding the established emissions limits in the EMC standard may disrupt the functions of your medical device.

WARNING

Interference

Effect on electronic life-supporting device on patient

- When observing uncommon system behavior (performance characteristics) additional measures (adjustment, relocation) could be necessary.

2.1.10 Use in connection with high frequency surgical equipment

The following regulations for use must be observed:

- IEC/TR 61289 Ed. 2.0:2019-05

  High frequency surgical equipment and high frequency surgical accessories - Operation and maintenance

2.1.11 Maintenance and inspection

Before using the equipment for examination, the user must ascertain that all safety-relevant devices function properly and that the system is ready for operation.

Wear and tear

The system is subject to mechanical and electrical wear and tear. In the interest of the safety of patients, operating personnel and third persons, maintenance and safety checks must be carried out every 24 months to maintain the operational safety and reliability of the product.

CAUTION

Wear and tear.

Risk of injury to the patient, operating personnel, and other persons. Permanent damage to the system.

- Follow the maintenance guidelines to maintain the safety and functionality of the system.

Please observe the relevant information in (➔ Page 231 *Functional and safety checks*).

Image quality

Maintenance should include checking the image quality. Maintenance at regular intervals is recommended to always ensure best image quality.

To ensure optimal image quality, have the following functions checked in particular as part of regular maintenance:

Pixel shift, image rotation, noise reduction, edge enhancement, subtraction, roadmapping, noise filter.

Calibration

Maintenance should include checking the flat detector calibration.

Please contact Siemens Healthineers Customer Service for flat detector calibration.

CAUTION

Geometric calibration adjusted incorrectly.

Risk of incorrect evaluation.

- Perform calibrations on a regular basis.

Performing maintenance

Maintenance work should be performed by trained technical personnel only. If you do not have a maintenance contract, please contact Siemens Healthineers Customer Service.

If national laws or regulations specify more frequent checking and/or maintenance, this must be observed.

Acceptance and performance testing, acceptance criteria

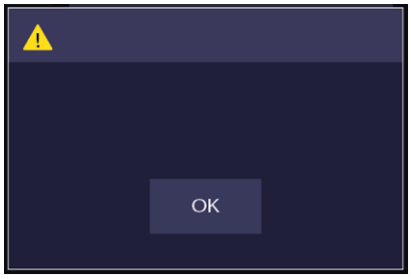
During system installation and after major modifications an acceptance test is carried out by qualified and authorized engineers. The corresponding acceptance criteria and test results are documented in a protocol on site.

2.1.12 Malfunctions

In the event of malfunctions of the Cios Select system, please call Siemens Healthineers Customer Service.

Error messages at the C-arm system

When a malfunction is detected, the Cios Select system is disabled. The problem is shown as an error on all control units.

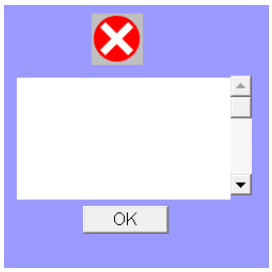


A message window with additional explanations is also displayed on the left monitor (➔ Page 24 *System messages on the monitor*).

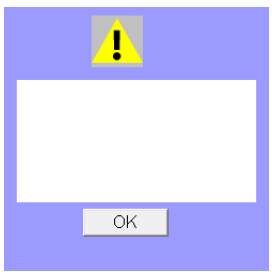
System messages on the monitor

On the left monitor (upper left), three different types of system messages can appear. The type of message is identified by a corresponding symbol (top).

Error message:



Warning:



Information:



Handling error messages

✓ An error message window is displayed.

Acknowledging error messages

1 Please read the error messages carefully. Use the scroll bars to display error messages outside the area currently displayed.

2 Acknowledge the error message by clicking **OK** or pressing the footswitch or hand switch.

If you cannot continue with the normal examination mode, contact Siemens Healthineers Customer Service.

Repeatedly occurring errors

If errors occur repeatedly, switch off the Cios Select and notify Customer Service. Save the log file with the logged system activities beforehand:

1 Right-click this icon on the lower left of the left monitor.

2 In the dialog box, select the storage destination (USB and/or local storage for analysis via remote diagnostics) and confirm with **OK**.

3 Additionally, write down the following information:

- Error number and time when error occurred.
- Operating mode selected.
- Was radiation activated when the error occurred?
- Is the error related to an operating process?

4 In the case of a malfunction or failure of the radiation indicator, please notify Siemens Healthineers Customer Service.

2.1.13 Malfunction of electrical systems

In case of risks for patients and operators (e.g. if there is no live image on the monitor and the radiation indicator is on despite this) or in case of risks for the device, you must disconnect the power plug immediately. Cios Select is completely shut down and disconnected from line power. This

- switches off radiation.
- aborts the current system program.
- aborts and cancels current operating sequences.
- deletes all image information not saved to a hard disk.

CAUTION

Technical error.

Unintentional radiation release.

◆ If the unintentional radiation release cannot be ended with the EMERGENCY STOP button, press the off switch to shut down the entire system.

Only after the cause of the hazard has been clearly identified and remedied may the system be reconnected to the power supply. In all other cases, e.g. system malfunction, contact Siemens Healthineers Customer Service immediately.

CAUTION

Failure of LED indicators.

Treatment not possible.

- Perform the daily function check of the LED indicators before beginning treatment.
- If an LED indicator fails, contact Siemens Healthineers Customer Service.

System failure

The user must have a replacement unit available if a system failure could predictably cause a critical situation resulting in patient injury during a medical examination.

WARNING

System component failure during cardiac/vascular procedure.

Risk of injury to the patient!

- Prepare a reserve system during cardiac/vascular applications.

CAUTION

Due to the complexity of the system or if the line voltage is outside of the designated specification, the loss of X-ray imaging or other system functions during an examination cannot be entirely excluded.

Imaging is delayed or not possible at all, resulting in suboptimal treatment.

- For this reason, establishing emergency procedures for such cases should be considered.

Switching to emergency power supply

In the event of a power interruption of longer than 10 ms, the Cios Select switches off. In this case the Cios Select must be switched on again after the system has switched over to the emergency power supply.

In case of a power failure, a signal sounds (up to 10 min.) when the system switches to the uninterruptible power supply (UPS).

Disconnecting the power plug

After the power plug is disconnected, the uninterruptible power supply (UPS) supplies voltage to the imaging system and the left-hand monitor until the Cios Select switches off completely.

When the power plug is pulled out, switching to the uninterruptible power supply causes an acoustic signal to sound. The UPS switches off after maximum 10 min.

CAUTION

Unsuitable devices connected to the UPS.

Risk of electrical shock or damage to the system.

- Do not attach additional devices to the UPS sockets.

CAUTION

Charge capacity exhausted.

Diagnosis delayed or not possible.

- Please remember that the UPS battery life is limited.

2.1.14 EMERGENCY STOP

Press the EMERGENCY STOP button

Immediately press the red EMERGENCY STOP button (arrow) on the C-arm system control unit at the first sign of a dangerous situation resulting from motorized movement.

- Motorized vertical movement is then immediately blocked.
- Active radiation is terminated.
- All other system functions remain unaffected by this.

CAUTION

Manual or motorized movements.

Risk of crushing and collision for persons and objects in the vicinity of moving parts.

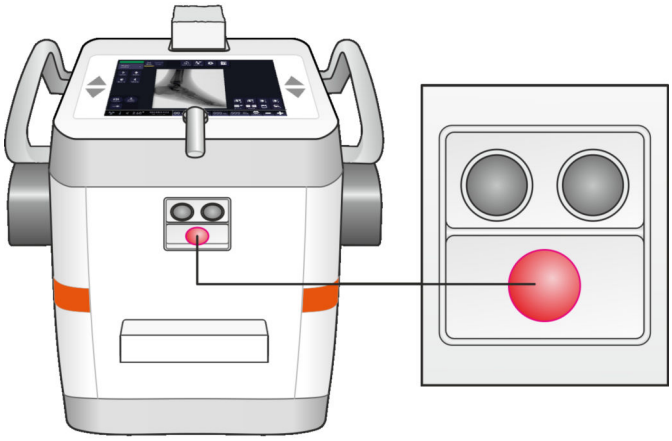
- Check the functionality of the EMERGENCY STOP button on a daily basis.

CAUTION

Position of EMERGENCY STOP buttons unknown.

Emergency STOP button will not be applied on time in case of an emergency!

- Familiarize yourself with the position of EMERGENCY STOP buttons.
- You will find EMERGENCY STOP buttons in the following locations (see the figure).

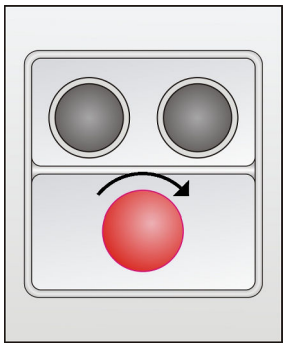


Emergency Stop button

If during an examination an error occurs and radiation cannot be interrupted by releasing the trigger switch, press the EMERGENCY STOP button on the chassis of the C-arm system.

Unlocking the EMERGENCY STOP button

Unlock the button only after the danger has clearly been eliminated.



- To unlock the button, gently turn it clockwise so that it pops back out.

2.1.15 Fire protection

CAUTION

Fire in or near the system.

Injury to patient and personnel, and damage to device. Risk of gas poisoning due to burning plastic.

- In case of fire switch off the system.
- Be aware of and inform patients of escape routes.
- Be aware of where fire extinguishers are located and know how to use them.

Please inform our Customer Service prior to starting up the Cios Select again if repair work has to be performed due to the fire.

2.1.16 Explosion protection

CAUTION

The system is not designed for operation in areas where there is an explosion hazard. The system does not meet the requirements for AP/APG classification.

Explosion hazard!

- The system may not be used in locations where explosive atmospheres may occur.

2.1.17 Overload protection

Prolonged continuous radiation at maximum tube load is permissible in fluoroscopy mode. However, this can cause the X-ray tube assembly and C-arm to heat up. For this reason, the X-ray tube assembly and C-arm have a thermal monitor. If the X-ray tube assembly is too warm, there may be a reduction in pulse rate if necessary in all operating modes beginning with the next scene. A corresponding message will be displayed.

CAUTION

Increased temperature due to extended use.

Risk of burns!

- Permitted short-term contact temperature is passed, when the switch of temperature of the monobloc activated.

CAUTION

Under extreme operating conditions (continuous operation), the X-ray tube can become very hot.

Risk of burns!

- Avoid touching the X-ray tube housing.

A constant X-ray tube load can lead to temperature-related cutoff of the radiation. Please make sure that the system has cooled down before performing critical interventional applications. It is also recommended to keep a second unit ready in case of continuous irradiation lasting longer than 30 min.

In the rare event image display is delayed due to high system utilization, radiation is automatically turned off. To continue treatment, radiation release has to be actuated again.

If the Radiography mode is misused on purpose by the operator for real-time imaging, the image display delay may be longer than in Radioscopy.

2.2 Personal safety

2.2.1 Open heart and skull examinations

If an approved system is used alone or with other equipment for open heart or open skull examinations, a conductive connection must be made between the system and an external potential equalization terminal, e.g. the tabletop.

(➔ Page 61 *Establishing the connection for potential equalization*)

Only then can the patient be connected to the system.

2.2.2 Crushing hazards on the C-arm system

Correct handling of the C-arm system requires that operating personnel and patients use only the grips provided for this purpose. Where this is not possible, monitor the points of potential crush injury between movable system parts and their guide openings.

CAUTION

The distance between the patient or other persons and the system is too small.

Risk of crushing!

- Use the system only if the patient and other persons can be observed during movements.

WARNING

The points marked on the figure indicate hazardous locations around the system.

Risk of injury to the patient and personnel due to crushing or collision.

- Be careful around the hazardous locations indicated.

CAUTION

The distance between the handles and other components is too small.

Risk of crushing!

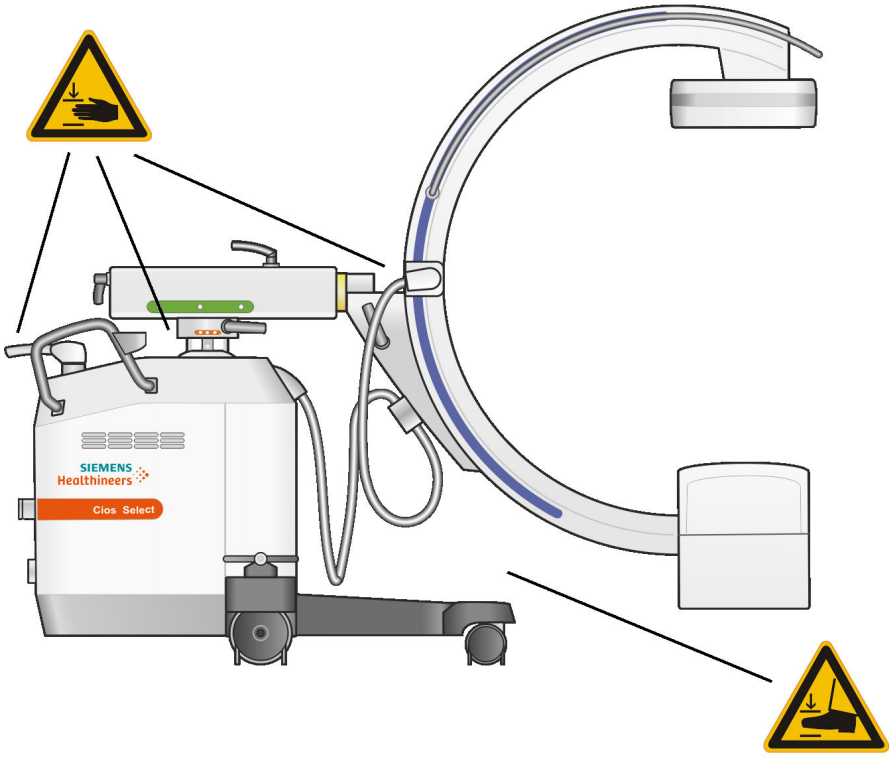
- Be careful around the hazardous locations indicated.

CAUTION

Movements of the C-arm during patient positioning.

Crushing hazard for the patient!

- Be careful around the hazardous locations indicated.



Hazardous locations during C-arm movements

2.2.3 Mechanical damage

To avoid injury to the patient, operating personnel or third parties, mechanical damage to the system must be repaired by authorized service personnel.

2.2.4 Radiation protection

The unit is intended for procedures that may involve high skin doses when it is used as intended (mainly due to the long examination times), which presents a risk of radiation injury.

The unit is emitting X-ray with the effect of ionization radiation, and the intensity and distribution can refer to (➔ Page 256 *Dosimetric information*).

Therefore observe the following important notes in order to keep the dose absorbed by the patient as low as possible.

For the patient

- Keep the radiation field as small as possible without reducing the active measuring field.
- If possible, ensure the best possible protection of the patient during fluoroscopy and acquisitions in the vicinity of his or her reproductive organs (use gonadal shields, ovarian shields and lead rubber covers).
- Remove all radiopaque parts from the fluoroscopy field or field of view, if possible.
- Set the voltage of the X-ray tube as high as necessary (note the image quality, however).

For the operating personnel

- Wear protective clothing in the control area during an examination: Depending on the application involved, the use of lead vests, lead jackets, X-ray protection goggles, sternum protection and protective gloves is recommended.

For patients and operating personnel

- Keep the fluoroscopic time as short as possible.
- Set the tube-skin distance as high as can be justified for the respective examination.

CAUTION

Because of a technical error the acquisition is not stopped or there is an unintended release of radiation.

Risk of unnecessary radiation exposure!

◆ In the event of unwanted radiation, press the nearest EMERGENCY STOP button.

CAUTION

Failure of radiation indicator.

Risk of unintended radiation!

◆ If a radiation indicator fails contact Siemens Healthineers Customer Service.

CAUTION

Additional objects in the beam path.

Risk of injury!

◆ Note that additional objects in the beam path increase scatter radiation.

CAUTION

X-ray release may be possible from remote location.

Unnecessary dose!

- Do not release X-ray mistakenly if not in viewing distance to the patient.

Please be aware that certain materials in the X-ray beam (e.g. parts of an operating table) may impair the X-ray image due to imaging of contours and inclusions in these materials. In certain rare cases, this may lead to incorrect diagnosis. This material may also result in higher radiation exposure.

Cios Select contains no patient positioning aids. Therefore, undertable radiation protection options are not included in the scope of supply. For example, overhanging lead rubber mats can be used to protect against scattered radiation underneath the patient table.

Deterministic radiation effect

As per IEC 60601-1-3, 5.2.4.5 (A.2), deterministic radiation injury is possible if a radiation dose delivered to an organ or tissue exceeds a value of 1 to 3 grays.

With typical applications and proper use of the C-arm, there is no reason to expect such radiation injuries. It is assumed that the maximum fluoroscopic time will not exceed 20 minutes, depending on the application, and that the skin entrance point will be 30 cm (50 cm maximum) away from the detector input.

Example: An accumulated fluoroscopic time of 20 minutes and a skin entrance dose of 20 mGy/min yields a dose of 400 mGy.

Certain applications in the medical disciplines of vascular and cardiac surgery in particular require a significantly longer radiation exposure time of up to 60 minutes.

Example: The dose administered during individual treatments can exceed 1 Gy, while the average radiation dose in these procedures is normally below 500 mGy.

For procedures with a longer than expected radiation time, we recommend varying the beam direction (oblique beam through orbital and/or angular rotation) during the course of the procedure. In addition, the system reports the beam duration that has already been applied (regardless of applied dose).

The skin penetration dose for various operating modes and under standard operating conditions can be estimated using the "Dosimetric information" table (➔ Page 256 *Dosimetric information*).

When changing the distance from the skin penetration point to the focus, please note that the skin dose decreases with the inverse square of the distance to the focus. This means that when the distance to the focus is halved, the skin penetration dose rate quadruples.

CAUTION

Remaining in hazardous area.

Risk of inadvertent radiation!

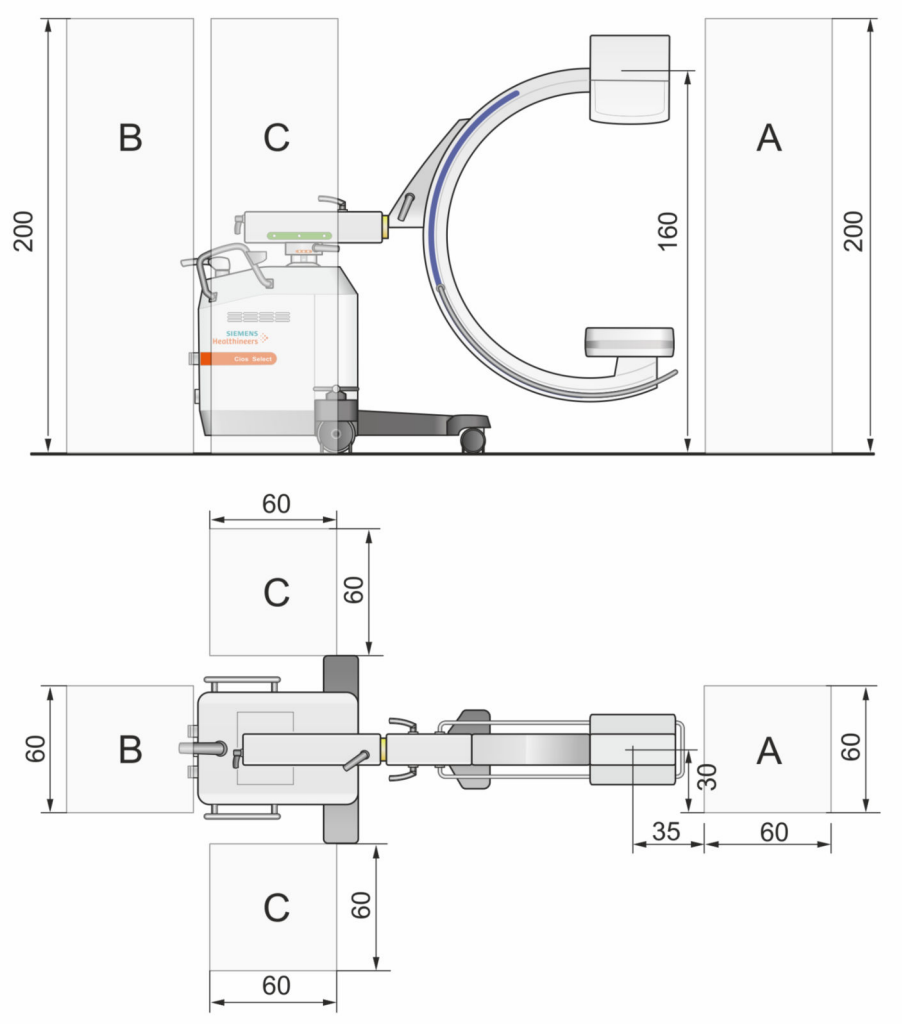
- During radiation release, make sure you are in a location subject to as little radiation as possible.

Location and size of the relevant operating areas

All examination types may be performed in the illustrated operating area of the X-ray system.

X-ray tube assembly at the top (dimensions in cm)

Vertical beam path: Focus 160 cm above ground



Maximum scatter radiation in operating area

Scatter radiation in the main operating area according to EN 60601-1-3

Height above the floor [cm]	Measurement A [mGy/h]	Measurement B [mGy/h]	Measurement C [mGy/h]
10	1.675	0.0988	0.6040
20	1.778	0.0805	0.6318
30	2.522	0.0587	0.6832
40	3.752	0.07	0.6757
50	5.102	0.0703	0.7612
60	6.633	0.0405	0.8137
70	8.44	0.0554	0.8447
80	9.839	0.1288	0.8337
90	9.875	0.1692	0.9508
100	9.801	0.2028	1.0120
110	12.78	0.2163	1.0320
120	13.40	0.2622	1.1520
130	11.03	0.2987	1.0790
140	8.952	0.3301	1.1060
150	8.313	0.3482	1.063
160	7.381	0.3682	0.9626
170	5.321	0.3776	0.9024
180	3.841	0.4321	0.8247
190	2.892	0.4351	0.8956
200	2.100	0.4493	0.9074

Tolerance of air kerma measurements ± 5%

- Measurement A: Operating area A

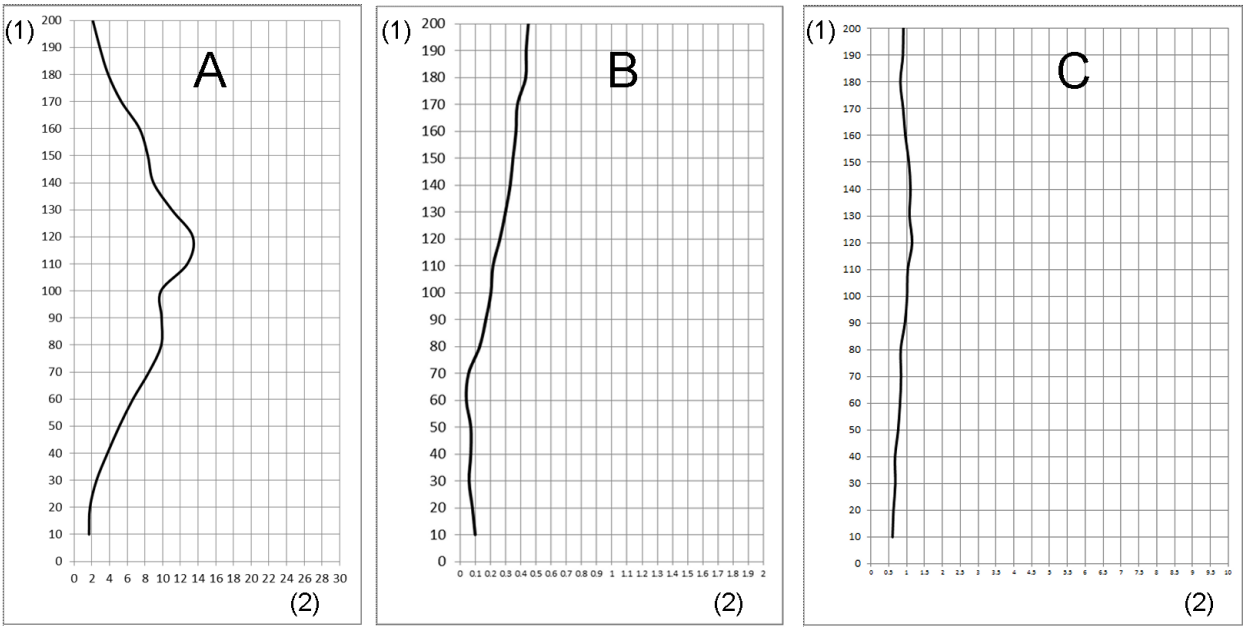
  Continuous fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm; C-arm vertical, X-ray tube assembly at the top, with scattered radiation grid

- Measurement B: Operating area B

  Continuous fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm; C-arm vertical, X-ray tube assembly at the top, with scattered radiation grid

- Measurement C: Operating area C

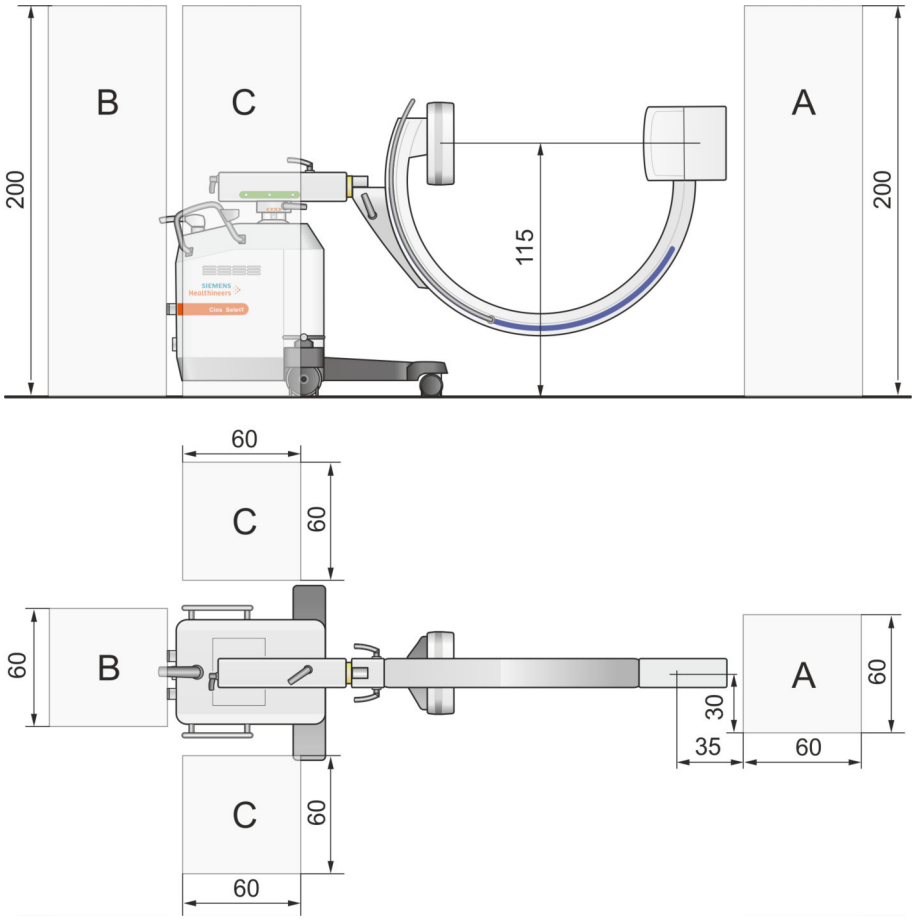
  Continuous fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm; C-arm vertical, X-ray tube assembly at the top, with scattered radiation grid



Measurement A (left), measurement B (center), measurement C (right): Fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm

(1) Height above the floor [cm]
(2) Air kerma strength [mGy/h]

X-ray tube assembly horizontal (dimensions in cm)



Maximum scatter radiation in operating area

Scatter radiation in the main operating area according to EN 60601-1-3

Height above the floor [cm]	Measurement A [mGy/h]	Measurement B [mGy/h]	Measurement C [mGy/h]
10	1.318	0.0130	0.7348
20	1.489	0.0145	0.8268
30	1.644	0.0158	0.9034
40	1.756	0.0211	0.9436
50	1.944	0.0224	0.9959
60	2.522	0.0246	1.016
70	2.782	0.0340	1.163
80	2.654	0.0350	1.195
90	2.439	0.0407	1.264
100	2.847	0.0432	1.234
110	3.248	0.0533	1.231
120	3.176	0.0619	1.137
130	2.560	0.1397	1.208
140	2.714	0.1876	1.148
150	2.598	0.3425	1.160
160	2.466	0.4108	1.092
170	2.163	0.4472	1.018
180	1.906	0.4627	0.9829
190	1.756	0.4876	0.8482
200	1.488	0.4662	0.7715

Tolerance of air kerma measurements ± 5%

- Measurement A: Operating area A

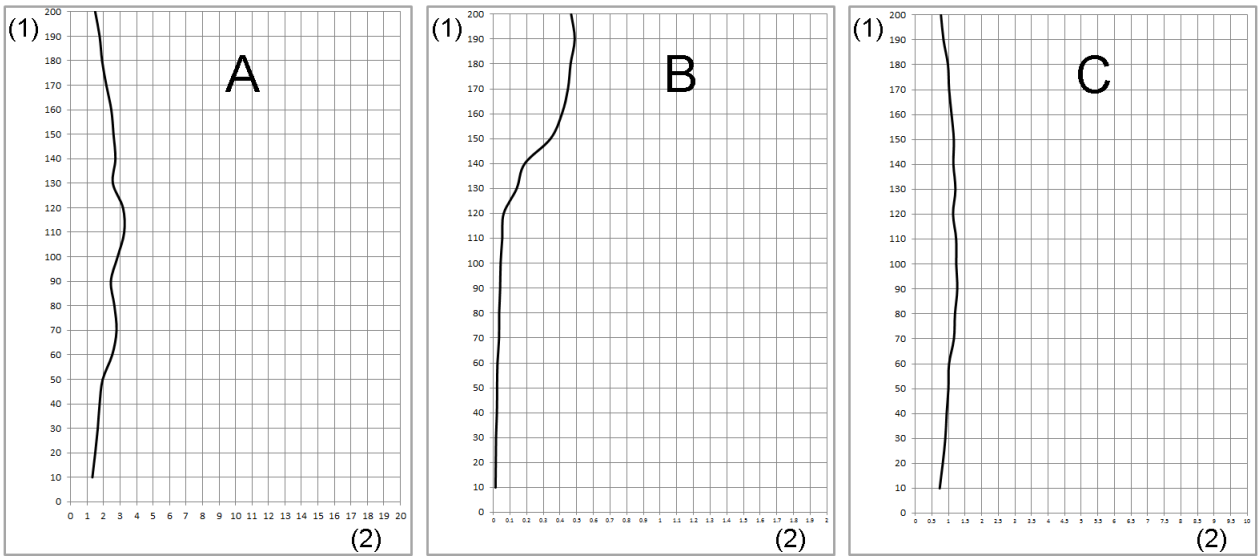
  Continuous fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm; C-arm horizontal, detector at lateral 90° position, with scattered radiation grid

- Measurement B: Operating area B

  Continuous fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm; C-arm horizontal, detector at lateral 90° position, with scattered radiation grid

- Measurement C: Operating area C

  Continuous fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm; C-arm horizontal, detector at lateral 90° position, with scattered radiation grid



Measurement A (left), measurement B (center), measurement C (right): Fluoroscopy 110 kV, 5.3 mA, Continuous, 20.5 cm x 20.5 cm

(1) Height above the floor [cm]
(2) Air kerma strength [mGy/h]

Radiation interruption for all operating modes

The hand and footswitches are designed as pushbutton switches. Radiation is interrupted in fluoroscopy when releasing the corresponding operating element or, in other operating modes, after acquiring the stored image.

2.3 Equipment safety

2.3.1 Mechanical safety

CAUTION

System component error.

An error on one system component can reduce the safety of the entire system.

- Terminate system operation.
- Contact Siemens Healthineers Customer Service.

CAUTION

Detector cover damaged.

Toxic contamination!

- If the detector is damaged, do not continue using it.
- Contact Siemens Healthineers Customer Service.

WARNING

Spindle nut broken or worn.

Risk of crushing!

- Vertical lift is blocked if the mechanical safeguard was triggered. Contact Siemens Healthineers Customer Service to replace the mechanical safeguard.

CAUTION

Flat detector hardware is exposed to high-energy isotopes at close distance, for example, by cobalt-60 radiation sources in brachytherapy

Flat detector hardware damaged, leading to low image quality or image artifacts

- Keep the detector system and electronics at a safe distance (> 3 m) from high-energy isotopes (> 1 MeV), for example, during insertion or removal process of the radiation probe in brachytherapy.

2.3.2 Positioning the C-arm

In case of improper handling of the Cios Select, the mobility of the C-arm may lead to collisions of the image receptor and the single tank with the patient and the patient table.

Brakes

Make sure the brakes are applied after adjusting the C-arm position.

Transport

When moving or transporting the C-arm system please take special care that the system parts do not collide with an obstacle. This could also result in accidental radiation release or an impairment of image quality under certain circumstances.

CAUTION

Transport damage.

Risk of injury!

- If repairs are not done by a professional, injuries to the user, patient or third parties and consequential product damage cannot be ruled out.

2.3.3 Installation, repair

Modifications of or additions to the product must be made in accordance with the legal regulations and generally accepted engineering standards.

As the manufacturer, Siemens Healthineers cannot accept responsibility for the safety features and for the reliability and performance of the equipment if:

- The product is used in a manner other than that specified in the Operator Manual
- Installation, upgrades, readjustments, modifications or repairs are performed by personnel not contracted and authorized by Siemens Healthineers
- Components affecting safe operation of the product are not replaced by original spare parts in the event of a malfunction
- The electrical wiring in the room containing the system does not meet the specifications of DIN VDE 0107 or the corresponding local regulations

If desired, we will provide the technical documentation for the product. However, this does not imply authorization to undertake repairs.

We cannot be held responsible for repairs made without our express written approval.

When any work is performed on the product, we recommend that you obtain a certificate indicating the nature and scope of the work performed. The certificate should include any changes in rated parameters or operating ranges as well as the date, the name of the company and a signature.

2.3.4 Original accessories

For safety reasons, only approved original accessories or non-Siemens Healthineers accessories approved by Siemens Healthineers may be used for this product.

The operator is liable for any risks associated with the use of accessories not approved by Siemens Healthineers.

⚠ CAUTION

Inappropriate accessories.

The use of accessories that do not comply with the safety requirements of this equipment can reduce the safety of the entire system.

- ◆ Use only original Siemens Healthineers accessories or accessories approved by Siemens Healthineers.

2.3.5 Combination with other systems

To ensure the required safety, only products/components expressly approved by Siemens Healthineers may be used in combination with this system.

Please note that changes to the system may be carried out only with the express authorization of Siemens Healthineers.

Additional components placed into the beam path (e.g. positioning aids) will attenuate radiation and can degrade image quality.

2.3.6 Attachment of dedicated options

The attachment of certain (dedicated) options is permitted only if the following conditions are met:

General safety requirements

The use of accessories that do not comply with the relevant safety requirements of this system can result in a reduced safety level of the combined system.

When choosing accessories, the following aspects must be considered in particular:

- Use of accessories close to the patient.
- Proof that the accessories have been safety tested according to the applicable IEC 60601-1 guideline and/or the IEC 60601-1-1 harmonized national standard.

WARNING

Changing the overall center of gravity.

Risk of crushing!

◆ Only products/components approved by Siemens Healthineers may be installed.

Attenuation equivalent

According to IEC 60601-1-3, inadequate attenuation of the X-ray beam by materials between the patient and image receptor must be avoided.

Documented proof by the manufacturer is recommended.

Remove any auxiliary devices located in the beam path for calibration or adjustment of the dedicated options before operating the Cios Select.

Image quality can be impaired by placing materials directly in front of the flat detector, or the applied dose is increased by the automatic adjustment. Additional objects in the beam path may result in increased scattered radiation.

Weight counterbalance

CAUTION

Changing the weight distribution

Risk of crushing!

◆ Adding weight to the image receptor or single tank side means a loss in counterweight and can result in unintended movement of the C-arm.

Users must be alerted to the loss of counterbalance by a warning label. The responsibility for affixing the corresponding warning label lies with the company that attaches the dedicated option to the C-arm.

Image quality

The attachment of a dedicated option must not affect image quality (impairment of the follow-up).

After maintenance or service work, the correct function of the non-Siemens Healthineers system on the image receptor must be tested.

Electrical safety

IEC 60601-1 must be complied with.

WARNING

Connecting the LAN socket on the trolley in operation room

Risk of electric shock!

- Only IT equipments/products approved by IEC 60950-1 or IEC 60601-1 can be used in connection with this system.

Electromagnetic compatibility

IEC 60601-1-2 must be observed in order to comply with the limit values for electromagnetic compatibility.

CAUTION

Interference

Effect on persons with implants.

- Maintain a minimum distance in accordance with IEC 60601-1-2. If this is not possible, the WLAN-client is to be turned off.

WARNING

Interference

Effect on electronic life-supporting device on patient

- When observing uncommon system behavior (performance characteristics) additional measures (adjustment, relocation) could be necessary.

Additional safety information

- To avoid thermal overloading of components and short circuits, IEC 60601-1 and, if appropriate, ANSI/AAMI ES 60601-1 must be complied with.
- Connecting external loads to the power supply of the C-arm system is not permitted.

- We recommend that users in the EU have the relevant manufacturer of the accessory operated by you confirm the CE Declaration of Conformity according to Appendix II, MDR (EU Regulation 2017/745 of April 5, 2017) concerning medical devices and the Council Directive 2011/65/EU of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic devices, and the Declaration of Compatibility according to Article 22, MDR. In countries outside the EU the relevant national regulations must be observed.
- When putting the C-arm system into operation together with other devices, ensure that the following requirements from IEC 60601-1, section 16 are met: 16.6.1 TOUCH CURRENT, 16.6.3 PATIENT LEAKAGE CURRENT, 16.9.2.2 PROTECTIVE EARTH CONNECTIONS.
- Joint connection to the power supply of the C-arm system together with other devices using a multiple socket is not permitted.
- Conductors connecting the C-arm system with other devices must be protected against mechanical damage.
- Only devices approved for this purpose by Siemens Healthineers may be connected to the NaviLink Ethernet interface.
- The connection to the NaviLink Ethernet interface may only be made using a shielded (S/FTP) Ethernet cable that complies with the relevant standards.
- The length of the Ethernet cable must not exceed 10 m.

The product liability and warranty are restricted or expire if the above listed conditions and limit values are not complied with when attaching accessories.

For non-Siemens Healthineers options we generally accept no liability.

Languages

Your system can be configured by the Siemens Healthineers Customer Service in one of the following languages:

Imaging system user interface:

- English
- German
- French
- Spanish
- Russian
- Chinese
- Japanese

Control panel:

- English
- German
- French

- Spanish
- Chinese
- Japanese

CAUTION

Incorrect image processing due to wrong configured system language.

Incorrect basis for diagnosis.

◆ Configure the system only in one of these languages.

2.3.7 Disposal

- If you want to remove the product from service, take into consideration that public legal directives may contain special regulations regarding disposal of this equipment. In order to ensure that these legal regulations are complied with and to avoid potential environmental hazards which may be caused by the disposal of your system, please consult Siemens Healthineers Customer Service.
- Batteries and packaging material must be disposed of in an environmentally safe manner according to national regulations.
- The sterile single-use covers (image receptor, C-arm) must be disposed of in accordance with national regulations or the rules of the hospital.
- For further information about the disposal of the product, please refer to our service documents.

2.3.8 Product service life

Cios Select is designed for operation under average conditions in accordance with the Operator Manual for a useful life of 10 (ten) years. If the products are operated for longer than this time, additional checks and possibly repairs beyond the usual maintenance procedures may be necessary in order to ensure the functional integrity and operating safety of these products. Please talk to us about these measures early enough!

3 System Description

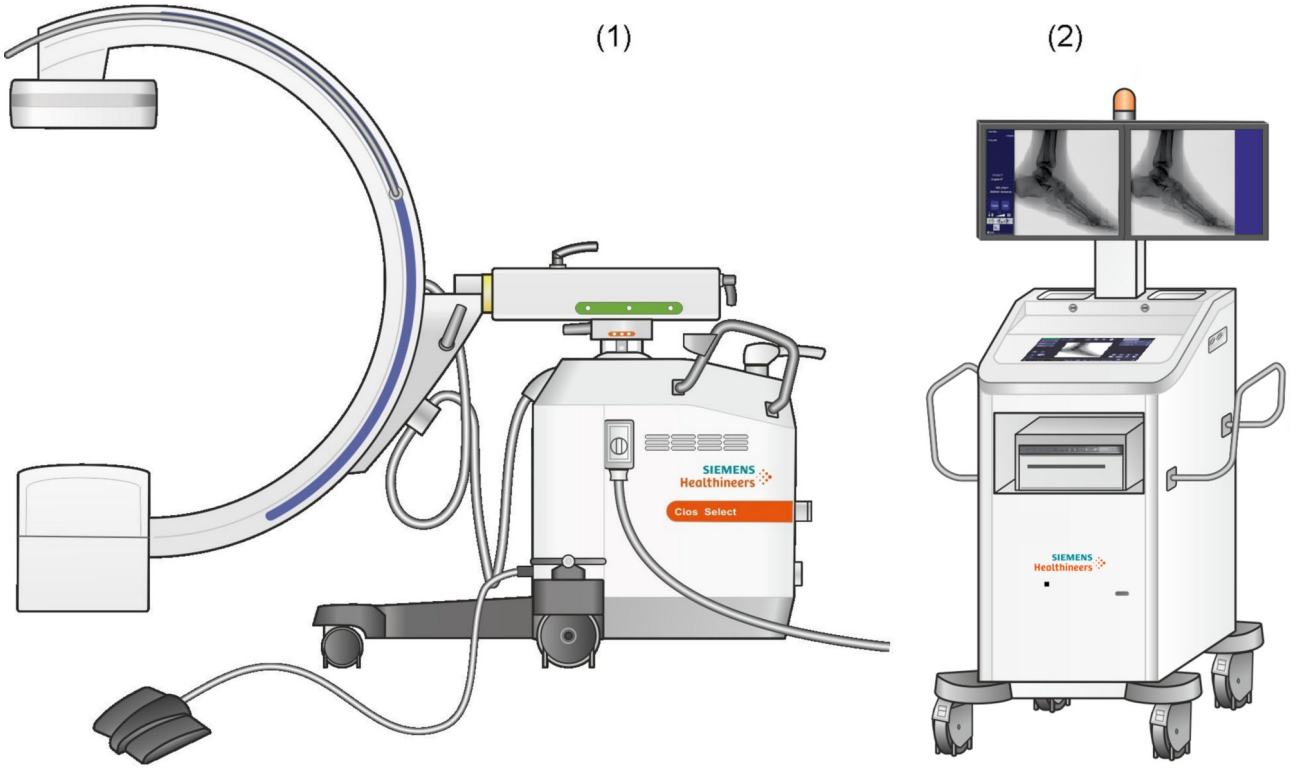
3.1 Device Description 47
3.1.1 System overview 47
Standard equipment 47
Options 48
3.1.2 C-arm system 49
Overview of components 49
Flat detector with anti-scatter grid 50
Single tank 50
Dose measuring chamber (DAP meter) 50
3.1.3 Monitor trolley 52
Overview of components 52
UPS display field 53
3.1.4 Control elements 54
Overview of control elements 54
Control unit on the C-arm system 55
Control panel on the monitor trolley 55
Hand switch 56
Footswitch 56
3.1.5 Operating modes 56
Fluoroscopy 57
Single image 57
Subtraction/Roadmap (optional) 57
3.1.6 Description of image processing 58
3.1.7 Image display 58
3.2 System Operation 59
3.2.1 Start-up 59
Connecting the C-arm system with the monitor trolley 59
Connecting the footswitch 60
Establishing the connection for potential equalization 61
Establish the power line connection 61
Switching on 62
Functions during system start-up 62
3.2.2 Move C-arm 63
Operating the brakes 64
Lifting and lowering the C-arm 65
Moving the C-arm horizontally 67
Swivelling the C-arm 68
Angulating the C-arm 68
Orbital movement of the C-arm 69
3.2.3 Control panel 70
Radiation stand-by indicator 72
Task cards 72
Control elements 73
Keyboard mode 74
3.2.4 Operating the hand switch 75
Radiation release 75
Image storage 75
Storage 76
3.2.5 Operating the footswitch 76
Radiation release 76
Image storage 77

3.2.6 Switching off 77
Switching off the system completely 78
Disconnecting Cios Select from line power 78
Reactivating the system 79
3.2.7 Transporting the C-arm system 79
Preparing the C-arm 80
Drive operation and steering of the C-arm system 80
Braking the C-arm system 81
Cable deflectors 82
3.2.8 Transporting the monitor trolley 82
Preparing the monitor trolley 82
Moving the monitor trolley 83
Locking the monitor trolley 83
Monitor trolley park position 84
3.3 Emergency situations 85
3.3.1 Function of the Emergency Stop switch 85
Overriding the brakes 85
3.3.2 Behavior in case of power failure 86
Restarting 86
3.3.3 Restarting the Cios Select 86
3.3.4 Restart via reset 87
Resetting 87
3.3.5 Procedure for cardiopulmonary resuscitation (CPR) 88

3.1 Device Description

3.1.1 System overview

The Cios Select consists of a C-arm system and a monitor trolley.



(1) C-arm system with flat detector and dual-focus stationary anode tube with generator
(2) Monitor trolley with touch screen, mouse, USB port, two TFT displays and memory for 300,000 images

Standard equipment

The following equipment is included in the basic configuration of the Cios Select:

Monitor trolley

- 2 TFT standard brightness displays
- Uninterruptible power supply (UPS)

C-arm

- 21x21 flat panel detector
- Single tank with 2.3 kW
- Dose measurement chamber for dose area product/air kerma (valid for IEC 60601-1:2005 only)

Control elements

- Control panel on the monitor trolley and C arm
- Control unit on the C-arm system

- Standard footswitch
- Hand switch

Options

The following options are available for the Cios Select:

Monitor trolley

- 2 TFT high-brightness color displays (alternative to standard TFT color displays)
- Wireless network connection (WLAN)
- SONY thermal printer

  Economical, light-weight, compact printer for singlecolor printing on thermal paper

C-arm

- Detector laser light localizer (Green)
- Single-tank laser light localizer (Green)
- Dose measurement chamber for dose area product meter (DAP meter)

Control elements

- Wireless multifunctional footswitch

Applications

- Additional operating modes SUB/Road (Basic)
- Radiation lock code
- 2D measuring function (for measuring angles and distances)
- Cios OpenApps*

  * The Cios OpenApps is not commercially available in all countries. Their future availability cannot be guaranteed.
- Target Pointer
- Litho crosshair
- DICOM Worklist
- DICOM Send
- DICOM Print
- DICOM Query/Retrieve
- HIPAA (Health Insurance Portability and Accountability Act)
- Lithotripsy
- LithoReport

Interfaces

- DVI video splitter (Monitors A and B)

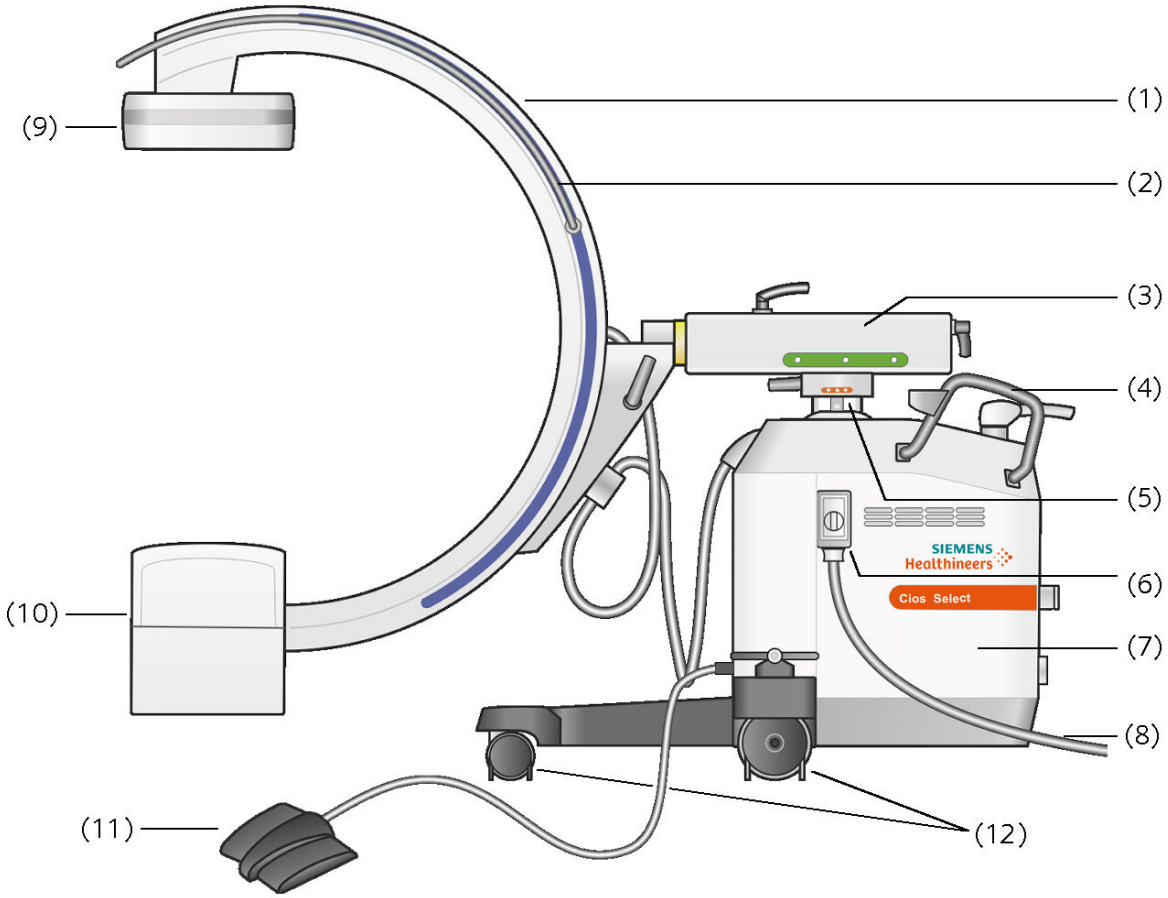
Accessories

- Grounding cable for potential equalization
- DHHS spacer

- Sterile cover for the detector and single tank
- Sterile cover with plastic brackets for the C-arm

3.1.2 C-arm system

Overview of components

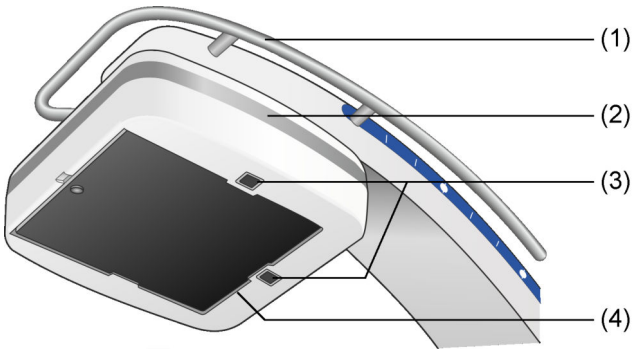


(1) C-arm
(2) Handle for manual movement/positioning of the C-arm
(3) Horizontal support arm
(4) Handles on both sides with a hand switch holder, as well as a steering handle (center) for moving/transporting and braking the C-arm system
(5) Lifting column
(6) Central plug
(7) Cios Select Electronics unit
(8) Power cable
(9) Flat detector with anti-scatter grid
(10) Single tank with X-ray tube unit and integrated collimator
(11) Footswitch (standard)
(12) Wheels with cable deflectors

Flat detector with anti-scatter grid

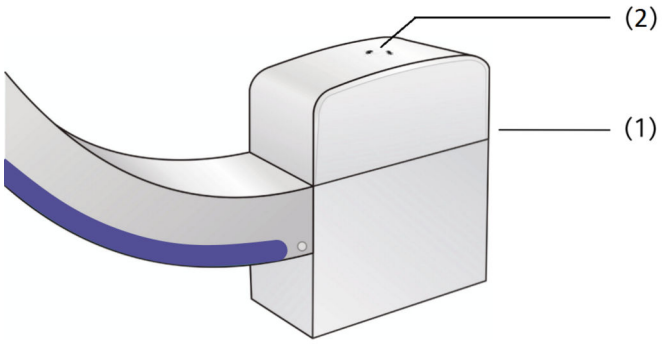
Compared with the classic image intensifier, the flat detector has a much higher dynamic range. This enables an expansion of the application range, for example, to soft tissue imaging.

The anti-scatter grid attached to the flat detector further increases image quality.



(1) Handle for manual movement/positioning of the C-arm
(2) Flat detector
(3) Exit window for optional laser light localizer
(4) Removable anti-scatter grid

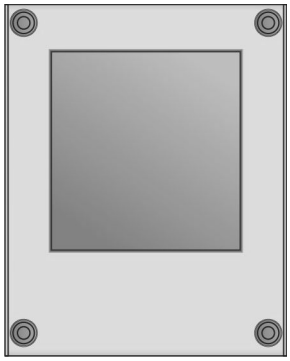
Single tank



(1) Integrated collimator system
(2) Exit window for optional laser light localizer

Dose measuring chamber (DAP meter)

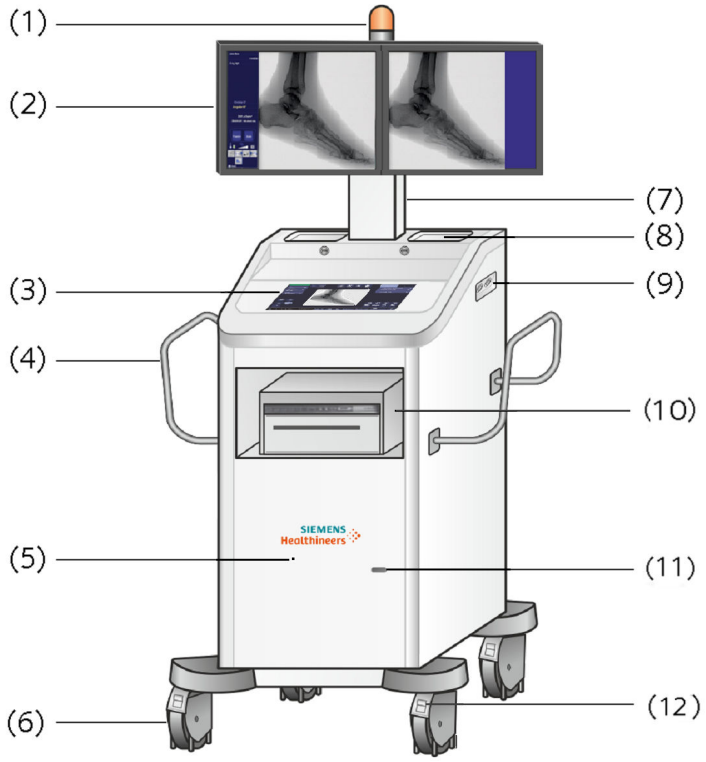
The DAP meter is integrated in the single tank of the Cios Select. The DAP meter determines the dose area product (DAP) and air kerma values (➔ Page 235 *Dose and consistency test*). The cumulative patient data are displayed on the monitor trolley during the examination (➔ Page 124 *Radiation information*)



Dose measuring chamber (DAP meter), integrated in the single tank

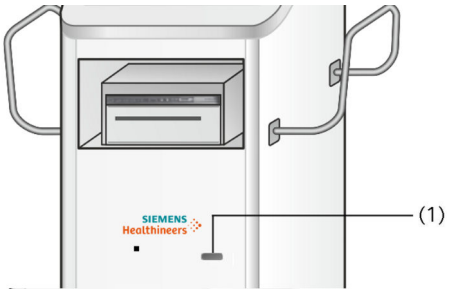
3.1.3 Monitor trolley

Overview of components



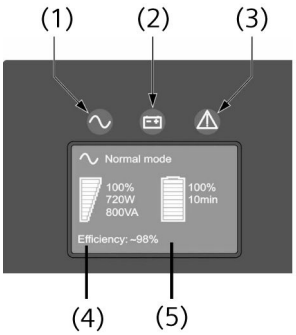
(1) Radiation Display
(2) Monitors
(3) Control panel
(4) Handles: for neat cable storage
(5) Reset key
(6) Wheels with cable deflectors
(7) Monitor column
(8) Storage for mouse; USB connections
(9) Connection for LAN, WLAN, Cios OpenApps
(10) Shelf for printer
(11) UPS window (Charge state)
(12) Locking brake

UPS display field



(1) UPS window

The UPS display field on the front of the monitor trolley shows the charge state of the batteries and the operating status.



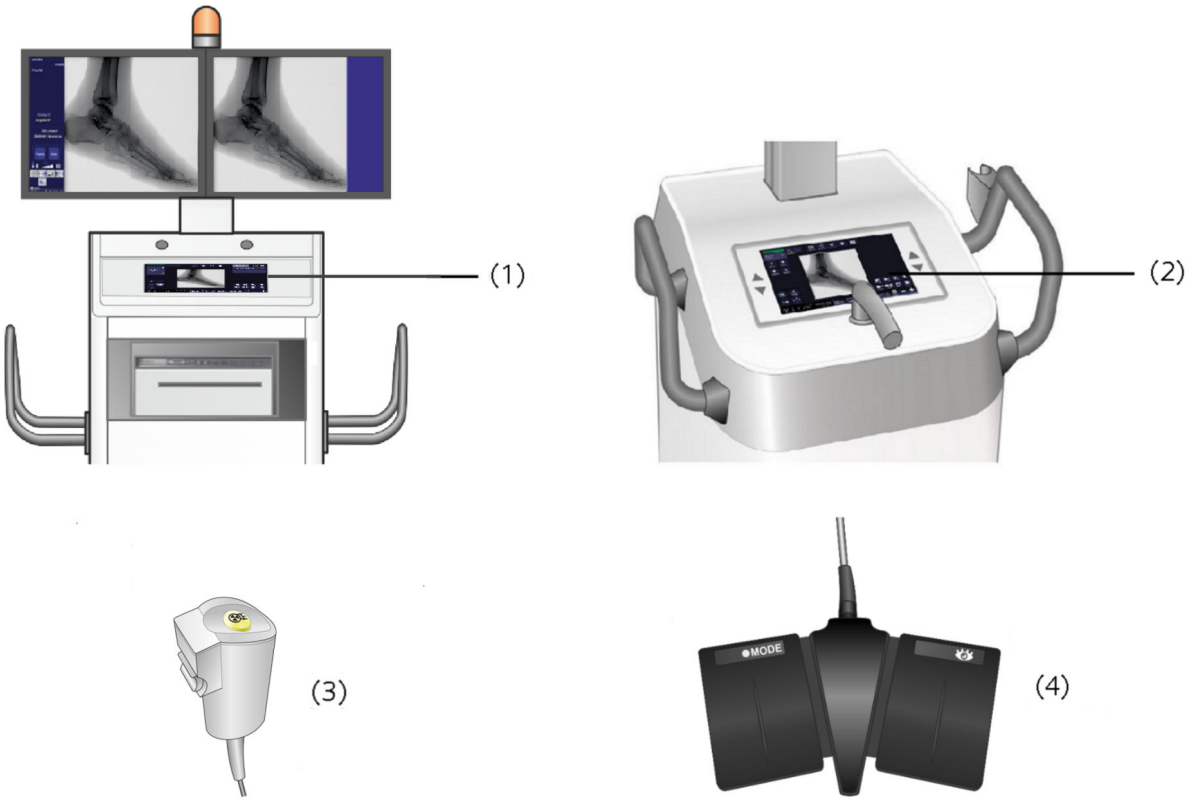
(1) LED "Green": Input voltage (line power operation)
(2) LED "Yellow": Battery operation
(3) LED "Red": Alarm, malfunction
(4) Bar display of utilization ratio
(5) Bar display of battery charge status

When the red LED is lit, the system is no longer protected against power outages by the UPS. The power plug may not be pulled until the imaging system is shut down. If this is the case, notify Siemens Healthineers Customer Service.

3.1.4 Control elements

Overview of control elements

The following graphic is an overview of the Cios Select operating elements. Some of the control elements presented here are available as options.



(1) Control panel on monitor trolley, USB ports
(2) Control panel on the C-arm
(3) Hand switch
(4) Standard footswitch
(optional: wireless multifunctional footswitch)

Use only your fingers to operate the touch screens. Do not use hard or sharp objects.

Control unit on the C-arm system

The control unit for performing your examinations is located on the C-arm system.



(1) Vertical movement of the C-arm
(2) Control panel

The control panel on the C-arm control unit offers the same functions and shows the same user interface as the control panel on the monitor trolley.

The control panel is not an imaging device as prescribed in DIN 6868-157. Any images displayed are not suitable for diagnostic purposes.

Control panel on the monitor trolley

The monitor trolley control panel is used to operate applications for preparing (e.g. entering patient data) and evaluating examinations. The control panel is integrated flush into the cover plate of the monitor trolley.

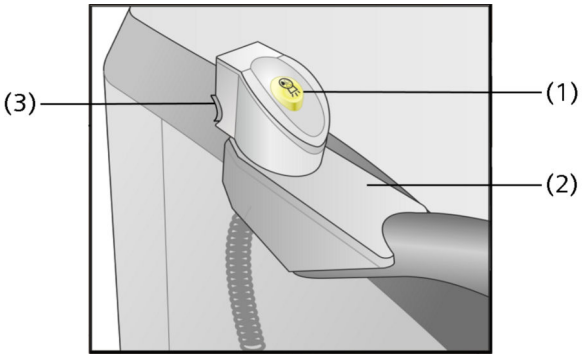


(1) USB ports
(2) Operating area for mouse
(3) Control panel on the monitor trolley

The control panel is not an imaging device as prescribed in DIN 6868-157. Any images displayed are not suitable for diagnostic purposes.

There is also a mouse, which is used as usual to execute functions on the left monitor.

Hand switch



(1) Yellow button for radiation release
(2) Holder for hand switch
(3) Key for saving images

Footswitch

The footswitch pedals assignment can be configured.



Configuration for foot pedal assignment

(1) Radiation release in preselected operating mode (standard setting)
Exception: Single image when fluoroscopy operating mode is preselected
(2) Radiation release for fluoroscopy (Standard setting)

In addition, the image saving function can be allocated to a pedal if desired. (Standard footswitch only).

3.1.5 Operating modes

The following presents the operating modes of the system, their properties, and assigned system settings.

Fluoroscopy

For **Fluoroscopy** operating mode, you can choose between several exam sets with different characteristic curve for fluoroscopy to determine the radiation parameters for fluoroscopy. Every application allows you to choose between different optimized programs.

The pulse duration is generally between 7 and 40 milliseconds. According to the level of noise reduction, many different fluoroscopic images can be integrated.

The standard setting of the system after startup is established in the configured standard application, and in general is **Fluoroscopy**.

System settings

Exposure factors and system control units including the way in which the automatic setting is controlled:

- 1 k^2 matrix
- Frame rate usually 0.5 to continuous; 0.5; 1; 2; 3; 5; 7.5; 10; 15f/s and continuous fluroscopy for configuration
- Image integration (as a function of the k factor set), i.e. a number of k exposures are integrated into one image by sliding averaging; the k factor can be set up to 32 and can be assigned to an exam set and stored.

Typical clinical procedure

Fracture reposition of the distal upper extremity (e.g. distal forearm fracture) in the plaster room of an emergency outpatient clinic where, under fluoroscopy, the fracture elements are reduced by extension, fixed temporarily in the best possible position and then fixed permanently by applying a plaster cast.

Single image

The **Single image** operating mode provides an electronic instant image of the patient on the monitor. It is recommended for final exposures. The exposure time depends on the pulse width set.

System settings

Exposure factors and system control units including the way in which the automatic setting is controlled:

- 1 k^2 matrix
- X-ray pulse with a width of 7 ms up to a maximum of approx. 160 ms.

Typical clinical procedure

Final follow-up exposure of a fracture reposition of the distal upper extremity (see above).

Subtraction/Roadmap (optional)

The Subtraction/Roadmap option allows you to perform a digital subtraction angiography and simultaneously display the unsubtracted angiogram on the second monitor. Subtraction technique allows hemodynamic display as well as display of the maximum vascular filling and Roadmap. The Roadmapping features can also be used for other procedures.

System settings

Exposure factors and system control units including the way in which the automatic setting is controlled:

- 1 k^2 matrix
- Acquisition rate is freely selectable, up to 15 frames/s;
- Image integration (as a function of the k factor set), i.e. a number of k exposures are integrated into one image; the K factor can be set up to 32 by an authorized technician.

Typical clinical procedure

- Display of an arterial vessel for localizing vascular stenoses with injection of a contrast agent to enable the contrast-enhanced display of the vascular filling (subtraction of the native image (mask) from the contrast-enhanced image).
- Alternative to native display, subsequent inversion of the displayed image allows you to display a catheter introduced into the vessel path using the Roadmap function.



For information on performing an examination with Subtraction or Roadmap, refer to (➔ Page 135 *Performing special examinations*).

3.1.6 Description of image processing

The system's overall image processing is known as the “imaging chain”. The imaging chain is divided into hardware and software modules. It includes image sources (e.g., image receptor), modules for preprocessing and postprocessing images, and image data display (e.g., monitor).

The imaging chain is also responsible for setting the correct parameters for the various components. Raw image data is transfered from the image receptor via various preprocessing steps to the imaging system PC. On the PC, the image data is then analyzed and processed in real time, and an initial adjustment of the brightness and contrast is performed. Finally, the image data is transferred to the imaging system software where it is stored.

At the same time, the image data is processed for optimum medical evaluation for the application in question (including local filtering, subtraction, brightness and contrast processing, geometric operations, peak opacification) and displayed on one or more monitors. Previewing on touch displays is carried out in the same way.

During a DICOM export the image data is not transferred as raw data but with all related processing steps (including any manual image adjustments such as windowing or annotations). From there it is sent to an archive (DICOM) along with the patient data. The original state cannot be restored. (Therefore do not use these images for the primary diagnosis!)

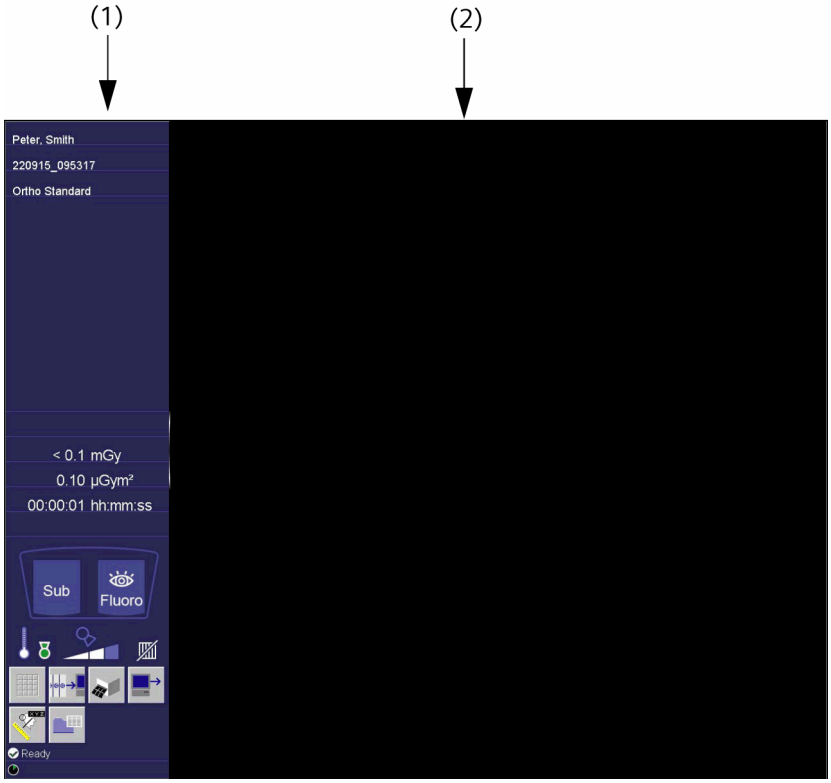
3.1.7 Image display

The imaging system uses two monitors for image display.

- The left monitor is used to display live images as well as preoperative and postoperative images.
- The right monitor is used to display the reference images.

Reference images may be:

- preoperative images, incl. images of other modalities (e.g. CT, MR)
- images of current examinations
- images from previous examinations



(1) Control area with function displays
(2) Image area

3.2 System Operation

3.2.1 Start-up

Ensure that plugs and connectors are clean and dry.

Do not use damaged cables.

Connecting the C-arm system with the monitor trolley

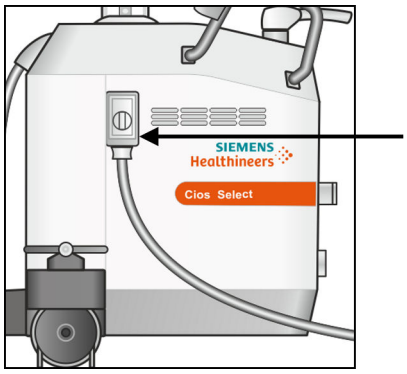
The C-arm system is connected to the monitor trolley with a cable.

CAUTION

Tripping over cable.

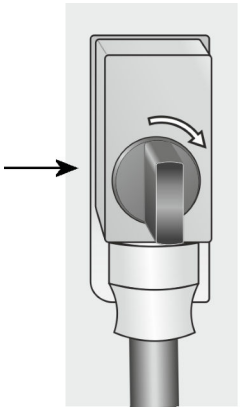
Risk of falling.

- When routing cables, make sure they run on the floor properly and without loops.



1 Plug the central plug into the socket on the left side of the C-arm system, when viewed from the C-arm. The switch must always be in the vertical position.

The monitor trolley may only be connected to the corresponding C-arm system. If the monitor trolley is connected to the wrong C-arm system, an error message is displayed indicating that the C-arm and monitor trolley are not a suitable pairing. Upon acknowledging the message, the text "Incorrect C-arm" indicating the status is displayed at the lower left of the imaging system monitor.

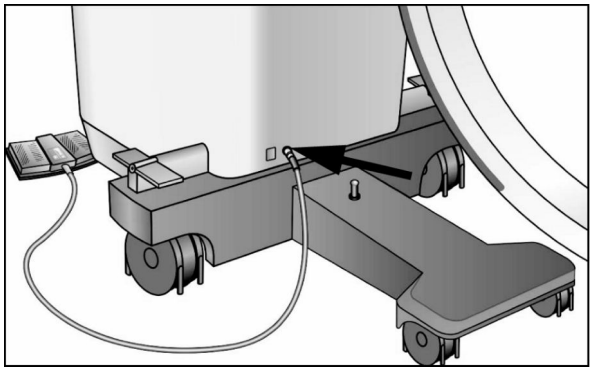


2 Turn the switch to the right until it audibly clicks into place.

The monitor trolley is connected to the C-arm system.

Connecting the footswitch

For the release of radiation with the footswitch, it must be connected to the C-arm system.



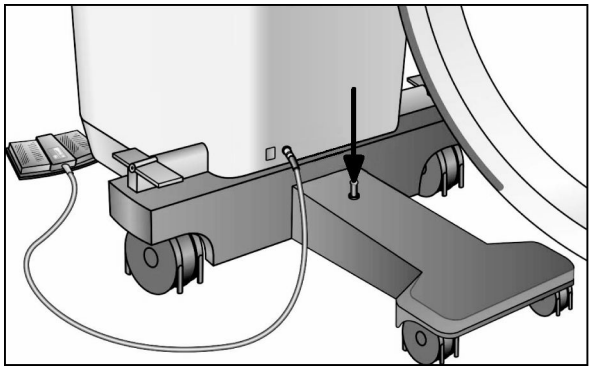


- Plug the footswitch cable into the socket labeled with the footswitch symbol on the front of the C-arm system.

Establishing the connection for potential equalization

The Cios Select can be connected to an external potential equalization terminal via the potential equalization terminal on the C-arm system. This will ensure that the Cios Select has the same electrical potential as other units connected to the same external potential equalization terminal.

Potential equalization is required when performing cardiac examinations or examinations of the open skull.





- Clamp the potential equalization cable to the terminal indicated by the symbol on the C-arm system front connection panel (arrow) and to an external potential equalization terminal in the vicinity of the patient.

  Thus, potential equalization is established.

Establish the power line connection

The Cios Select operates using a line power connection cable from the main unit to a properly grounded socket.



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

WARNING

Contact voltage while using the unit.

Electric shock to operator and patient

- Connect this device only to a power supply network that has been properly grounded.

WARNING

Cable damage.

Risk of electrical shock!

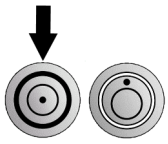
- Check the power cable. Do not use the device if the power cable is damaged.
- Take more care of the power supply cable, do not stumble it.

1 Plug the power plug into the appropriate socket.

The line power connection is established.

2 Position the unit so that it is easy to disconnect from the line power.

Switching on



- Press the ON button on the unit.

Functions during system start-up

- The Cios Select is switched on.
- The system automatically runs a self-test.
- On the control panel, all LEDs light for approx. 2 seconds as a function test and then switch off automatically.

Check whether all LEDs light correctly. If not, notify Siemens Healthineers Customer Service as there could be a malfunction.

An audible signal sounds while the system starts up.

If an audible signal does not sound, notify Siemens Healthineers Customer Service; there is a possibility that audible signals will not play back correctly.

An automatic self-test is performed for the C-arm control unit buttons.

Display of software version

During start-up, a start-up screen is displayed on the left monitor stating the current software version of your system.

Radiation stand-by



On the left monitor, radiation stand-by is indicated by a symbol in the status bar (lower left) after a patient has been registered. On the control panel, radiation stand-by is indicated by a green horizontal bar in the exposure parameters area (top left).



This icon appears on the monitor if radiation release is blocked. On the control panel, the horizontal bar is grey. You need to enter the password to unlock the radiation release (→ Page 96 *Unlocking/locking radiation release*)

Radiation cannot be released if the monitor trolley is operated separately.



Essentially, the system is not ready for radiation unless a patient is registered.

Flat detector calibration message

If a message is displayed on the monitor indicating that flat detector calibration is due:

- Contact Siemens Healthineers Customer Service.

Presettings

The following functions are set when the system is started:

- Operating mode: the preset operating mode in the application configured as **Standard**
- Image mirroring: switched off if it is not switched on in the application configured as **Standard**
- Number of images (fluoro): the default value in the application configured as **Standard**
- Automatic dose rate control (ADR): activated
- Zoom level: 0
- Collimators: Full format

3.2.2 Move C-arm

The horizontal movement, swivel movement, angulation and orbital movement of the C-arm are performed manually. Use the handles on the C-arm or the flat detector.

Additionally, the C-arm can be adjusted in height by motor control.

WARNING

Manual or motorized movements.

Risk of crushing and collision for persons and objects in the vicinity of moving parts.

- During manual and motorized movements of the device, make sure you take into account any persons or objects in the way of movement, and control the movement to avoid collisions.
- Make sure that everyone is outside the hazardous zone.

CAUTION

Activation of system movements without visual contact.

Risk of crushing!

- Use the system only if the patient and other persons can be observed during movements.

CAUTION

C-arm rotation.

Risk of crushing!

- Pay particular attention to crushing risks between moving system parts and the corresponding guide openings.

CAUTION

Movement due to unintended actuation of operating elements.

Risk of collision, risk of injury to the patient or operator, risk of damage to the device parts.

- Press the closest EMERGENCY STOP button if device movements do not stop.

Please note that the scale on the C-arm is intended for orientation only, not for measurement.

Operating the brakes

The Cios Select is equipped with mechanical brakes. The levers for releasing and locking the brakes for different directions of movement are marked with different colors. A graduated scale in the same colors for the corresponding directions of movement is located on the housing of the C-arm.

CAUTION

Brake failure.

Risk of crushing!

- Before beginning the examination, perform the daily function and safety checks.

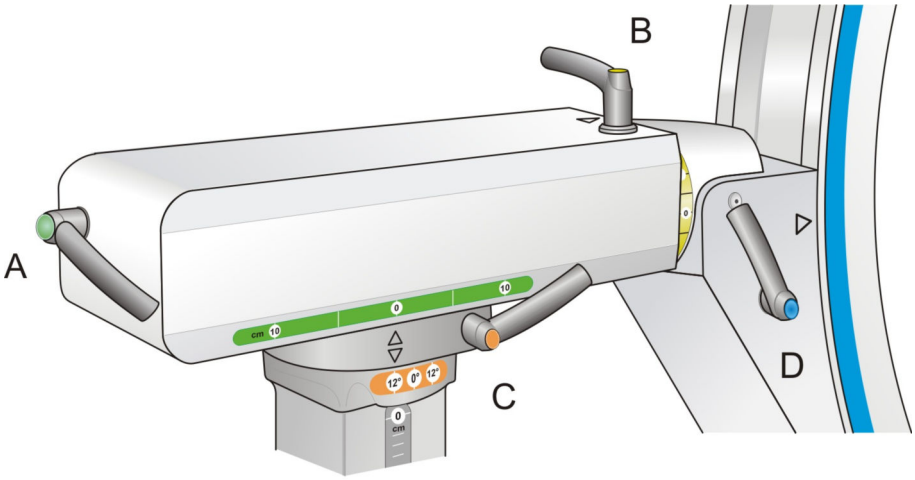
CAUTION

Braking power not sufficient.

Risk of crushing!

- While parking C-arm system on inclines activate brakes and turn castors/wheels into position which is perpendicular to down- or upward direction.

Overview of C-arm brakes



A: Horizontal brake
B: Angular brake
C: Swivel brake
D: Orbital brake

Before moving the C-arm, the brake for the relevant direction of movement must be released.

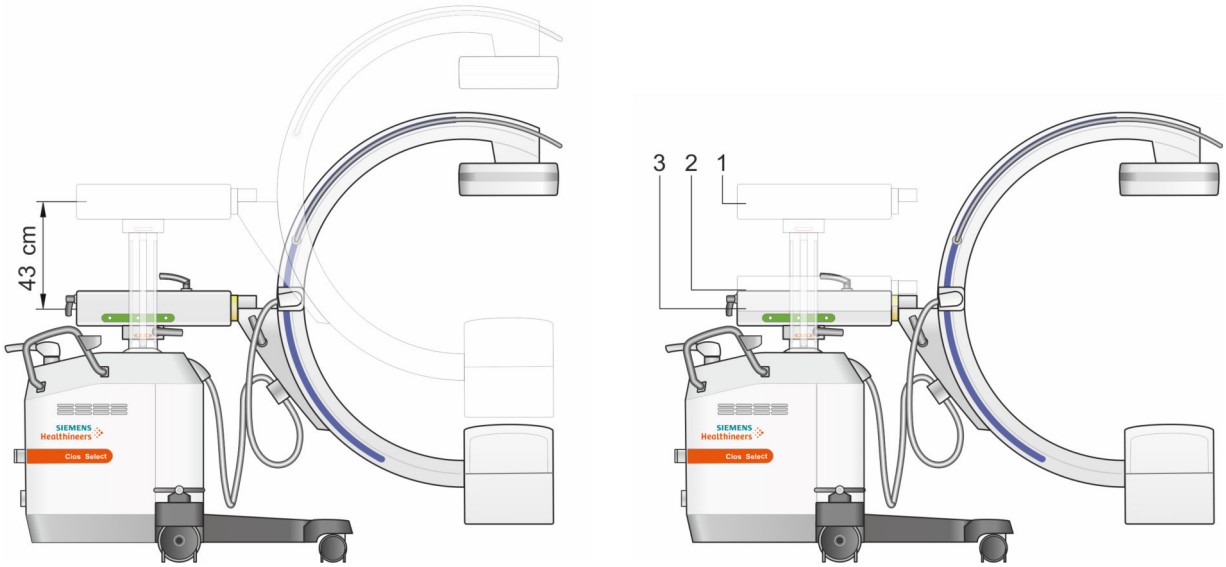
Engage the corresponding brake lever after moving the C-arm.

Lifting and lowering the C-arm

You can lift and lower the C-arm by motor control using the arrow buttons on the C-arm control unit.



The lifting column can be lowered from position 1 (highest level) to intermediate position 2, down to position 3 (lowest level).



(1) Position 1 = highest level
(2) Position 2 = intermediate position
(3) Position 3 = lowest level

Lifting the C-arm

- Press the **Up** key on the C-arm keyboard.

  The lifting column moves upwards.

Lowering the C-arm

The lifting column can be lowered to position 3.

1 Press the **Down** key on the C-arm keyboard.

  The lifting column then moves to the intermediate position (2) and automatically stops there.

2 Press the **Down** key on the C-arm keyboard again.

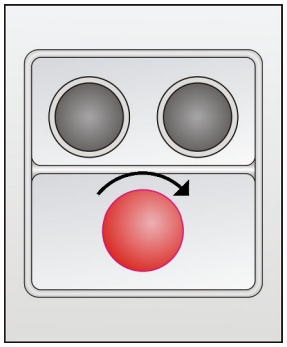
  The lifting column is lowered further.

  An audible signal sounds.

Make sure there is nothing in the hazard zone (under the C-arm or travel frame) when lowering the C-arm; crushing hazard!

Lifting movement failure

If the lifting column cannot be moved the EMERGENCY STOP button is pressed and must be unlocked.

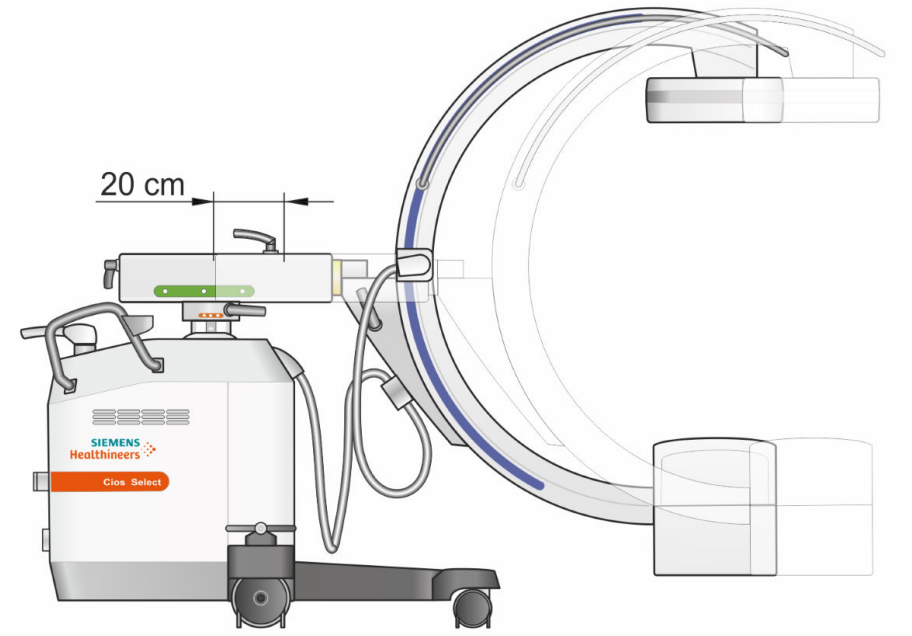


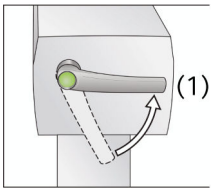
1 Turn the knob clockwise until it pops back out.

2 If the lifting column can still no longer be moved in any direction, then please contact Siemens Healthineers Customer Service.

Moving the C-arm horizontally

You can move the support arm horizontally by up to 20 cm.

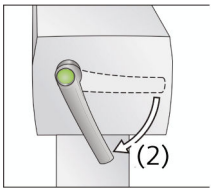




1 Open the brake lever marked in green for **horizontal movement** by turning it to position (1).

The brake is released.

2 Move the support arm to the desired position.

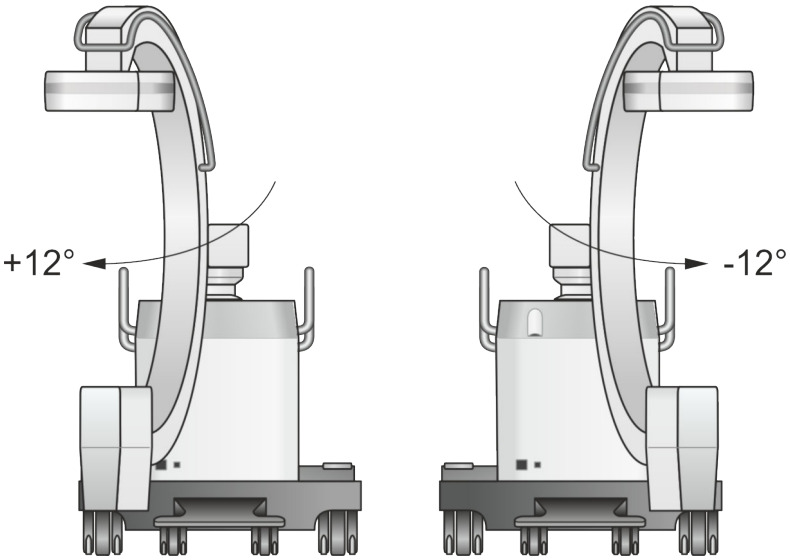


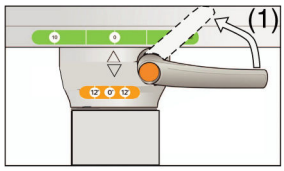
3 Lock the brake lever by turning it back to position (2).

The brake is locked.

Swivelling the C-arm

You can move the C-arm in the horizontal plane ± 12° about the lifting column.

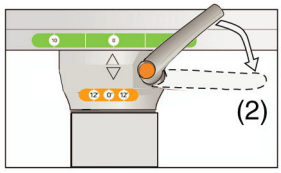




1 Open the brake lever marked in orange for **horizontal swivel** by turning it to position (1).

The brake is released.

2 Swivel the C-arm to the required position.

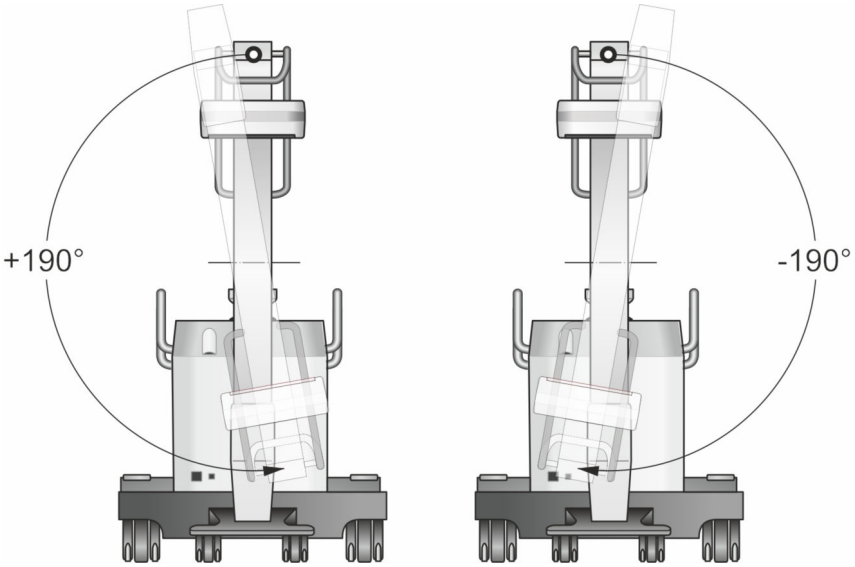


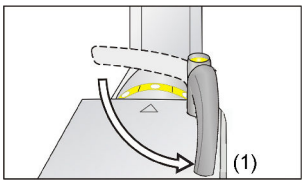
3 Lock the brake lever by turning it back to position (2).

The brake is locked.

Angulating the C-arm

You can rotate the C-arm in the vertical plane ± 190° about the horizontal support arm.

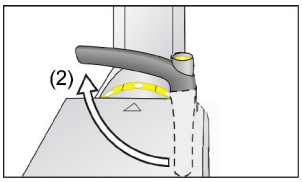




1 Open the brake lever marked in yellow for **angulation** by turning it to position (1).

The brake is released.

2 Rotate the C-arm to the required angulated position.



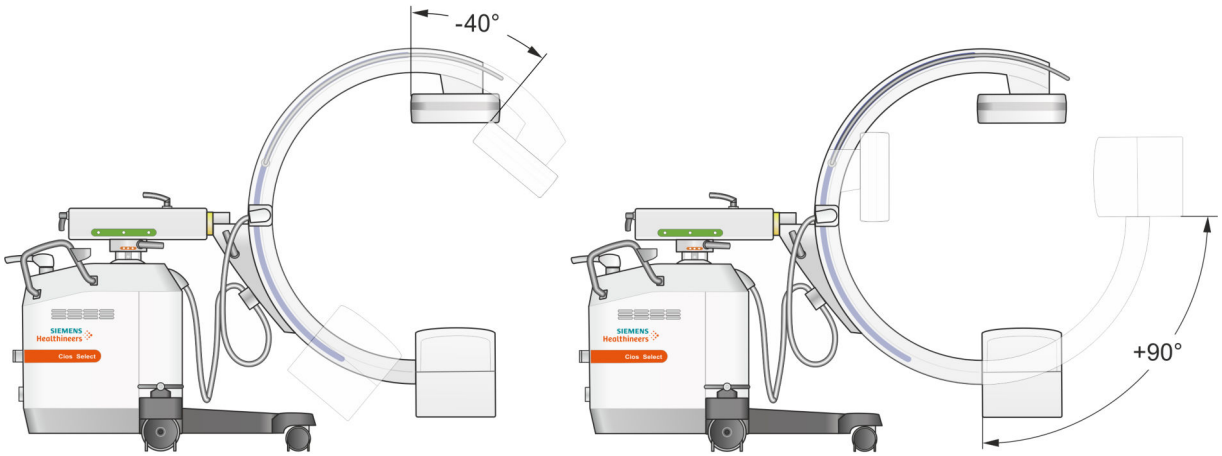
3 Lock the brake lever by turning it back to position (2).

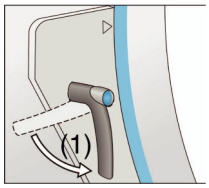
The brake is locked.

Orbital movement of the C-arm

Starting from the basic position (0°), you can swivel the C-arm by up to +90° or up to -40° (130° in total).

Do not move the C-arm if the orbital brake is activated. In case of emergency (patient recovery during power failure), the C-arm can be moved in the direction desired without releasing the brakes when enough strength is applied.

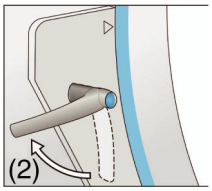




1 Open the brake lever marked in blue for **orbital movement** by turning it to position (1).

The brake is released.

2 Swivel the C-arm to the required orbital position.



3 Lock the brake lever by turning it back to position (2).

The brake is locked.

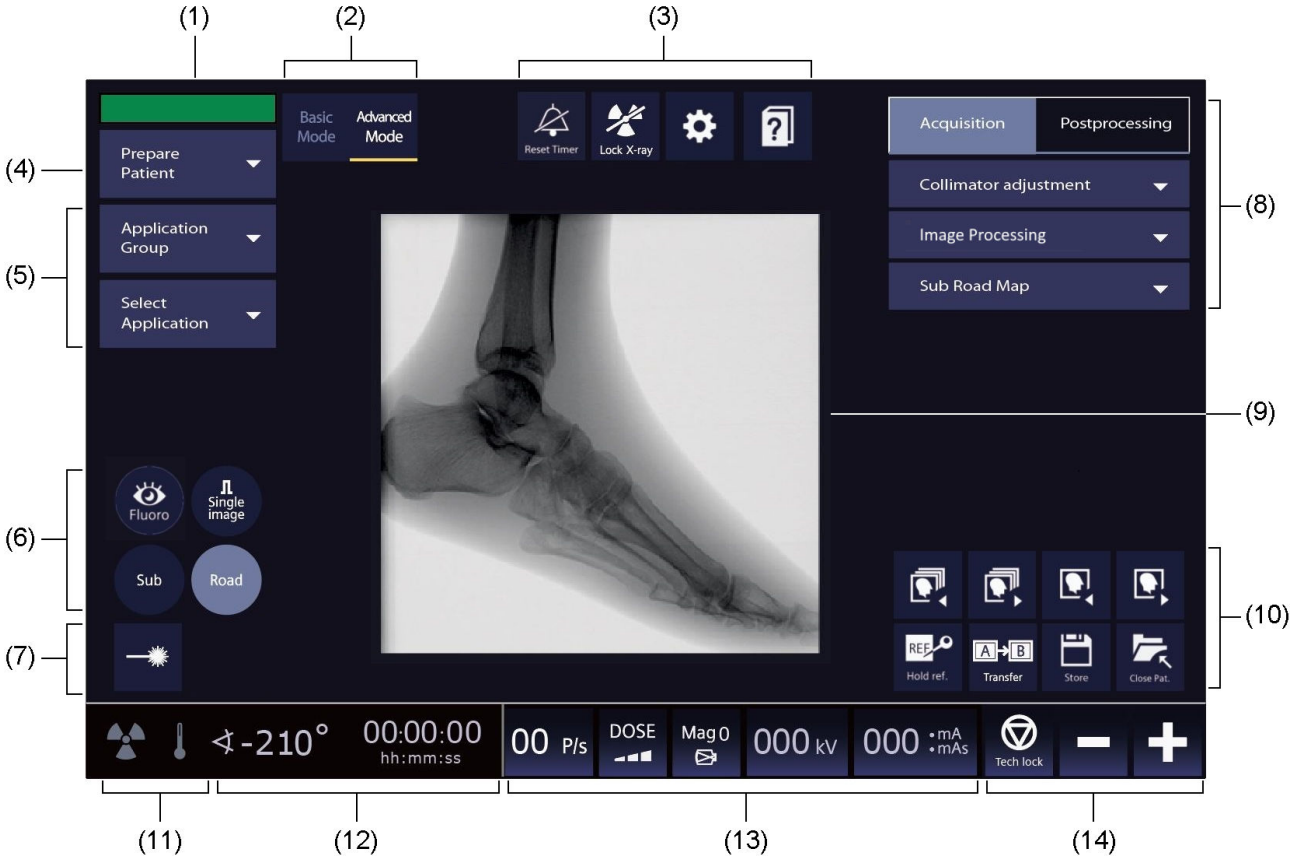
3.2.3 Control panel

The control panels on the C-arm control unit and on the monitor trolley are identical in terms of function.

There are two modes available and buttons may differ in different modes.

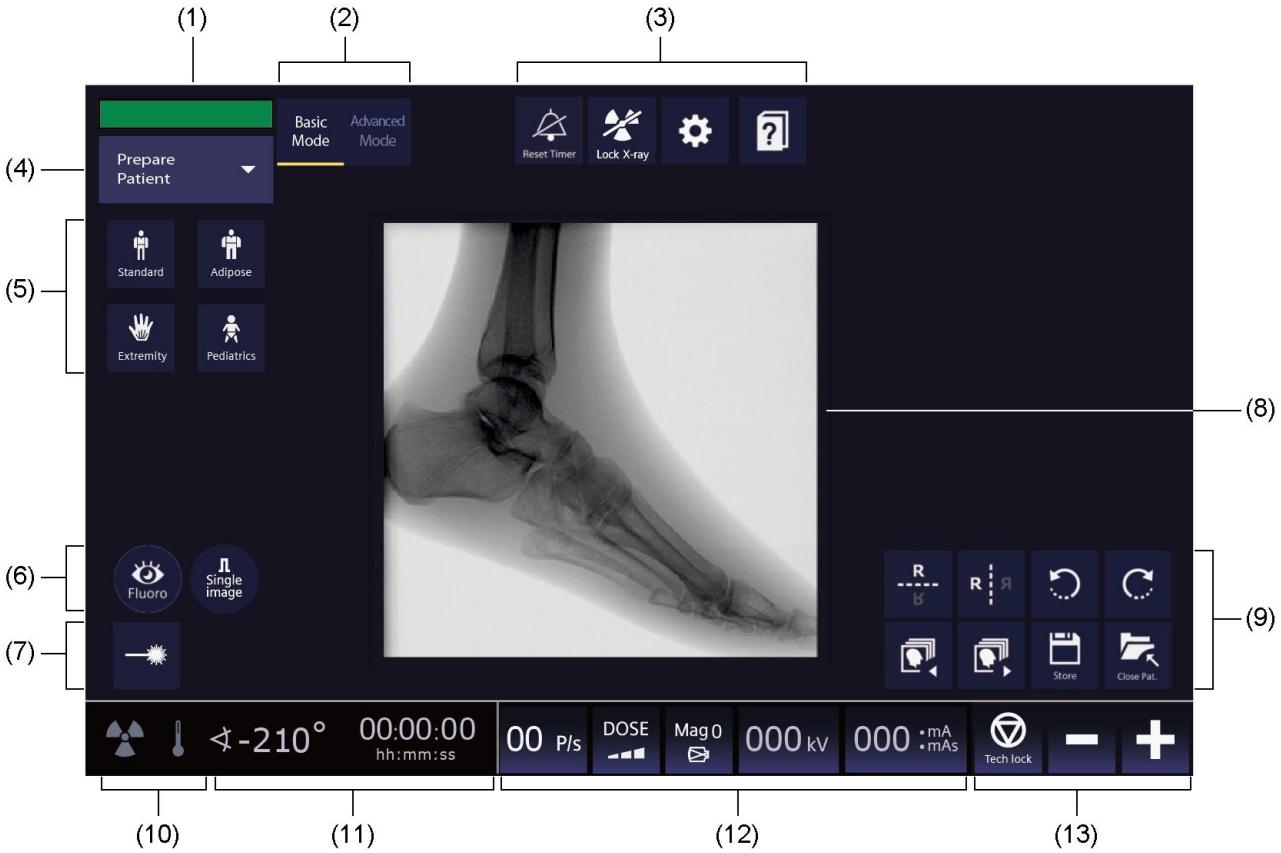
Press the corresponding button to operate the function.

Advanced Mode



(1) Radiation stand-by indicator
(2) Control panel mode selection
(3) Reset warning signal (radiation time), Radiation block, Settings and Help
(4) Prepare Patient menu
(5) Application and Application Group selection
(6) Operating mode selection
(7) Laser light localizer
(8) Acquisition and postprocessing task cards with operating elements
(9) Current image preview
(10) General functions
(11) Radiation display and tube temperature
(12) Image rotation and radiation time display
(13) Radiation parameters settings
(14) Manual parameter setting

Basic Mode



(1) Radiation stand-by indicator
(2) Control panel mode selection
(3) Reset warning signal (radiation time), Radiation block, Settings and Help
(4) Prepare Patient menu
(5) Predefined application selection
(6) Operating mode selection
(7) Laser light localizer
(8) Current image preview
(9) General functions
(10) Radiation display and tube temperature
(11) Image rotation and radiation time display
(12) Radiation parameters settings
(13) Manual parameter setting

Radiation stand-by indicator

Green: ready

White: not ready, e.g., C-arm system not connected or patient not registered

Gray: radiation release blocked (password entry required)

Task cards

In **Advanced Mode**, the task card of **Acquisition** provide you access to required operating elements for image acquisition.

In the **Postprocessing** task card, you are provided with operating elements for image postprocessing.

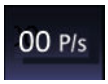
Changing task cards



- Press the tab of the required task card.

Control elements

You perform individual function and set the required parameters using the task card operating elements.



Function value display: For some functions, the current set value is displayed in the operating element (example: Pulse rate....).



Function inactive: Many functions can only be executed when specific conditions are met (for example, **Hold reference** only when the image display is on the right monitor). Functions that currently cannot be executed appear as inactive.

Performing the function



- Press the button for the required function.



For some function the button can be pressed and held to continue performing the function (such as moving the collimator).

Activating/ deactivating functions

For functions that can be switched on or off, the button with the light background indicates the active state.



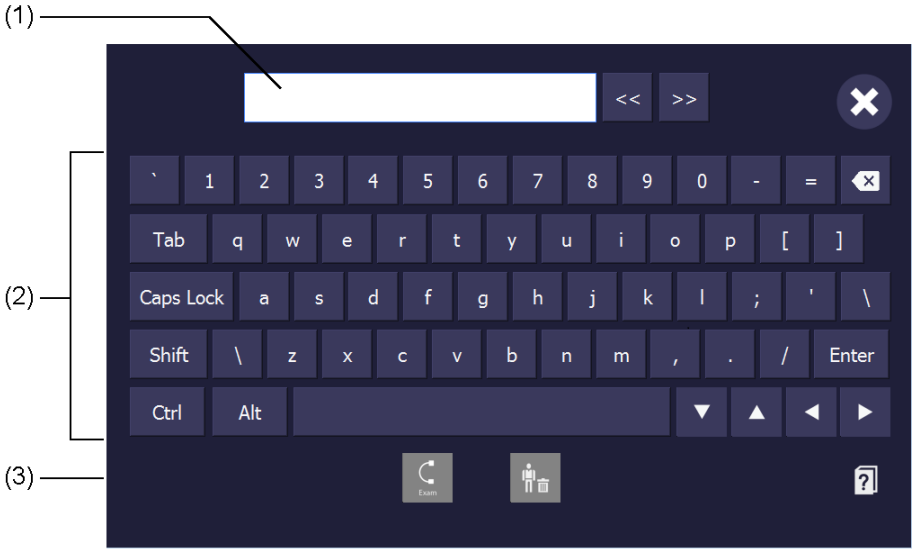
1 Press the button in deactivated state to switch on the function.



2 Press the button in activated state to switch off the function.

Keyboard mode

Keyboard mode is used to enter text and numbers.



(1) Text field
(2) Keyboard
(3) Symbol button bar for opening functions (visible only if appropriate for the current work step)

Opening keyboard mode

The system switches automatically to keyboard mode when functions requiring text input are opened (such as for patient registration). Keyboard mode can be opened manually when necessary (e.g., for service purposes).



- Press this button on the control panel (under the **Overview** menu in **Postprocessing** task card).

  A virtual keyboard appears on the control panel instead of the task cards.

Entering text

- Press the corresponding character buttons like a computer keyboard.

  The entered characters are shown in the input screen on the monitor and in the white text field of the virtual keyboard.

  For upper case letters and to enter special characters, press the Shift button and then the corresponding character.

Entering special characters

You have several options for entering special characters.

- Press one of the following key combinations:
  - The **Shift** button and the desired special characters
  - **Alt** + **Ctrl**.
  - **Alt** + **Ctrl** + **Shift**



When using a USB keyboard, ensure that the layout matches the keyboard layout of the user interface on the monitor trolley; otherwise incorrect entries can occur.

Ending keyboard mode

Keyboard mode ends automatically when the corresponding input screen on the monitor is closed. Depending on the function that is open, this can be done with the **Enter** button (such as comment text) or by opening the next work step (such as examination after patient registration).



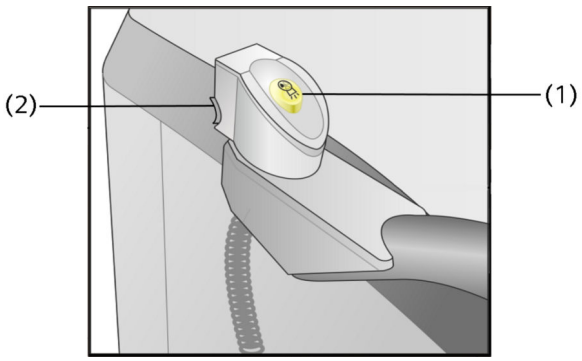
- To terminate keyboard mode manually, press the **Close** button.

  The task card previously shown is displayed again.

3.2.4 Operating the hand switch

The hand switch is used to remotely control radiation release and image storage.

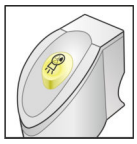
The hand switch can be inserted into the holder provided on the C-arm system.



(1) Radiation release key
(2) Image storage key

Radiation release

The hand switch is used to release radiation in the preselected operating mode.



- Press the yellow radiation release key on the hand switch and hold it down while radiation is released.

  The current radiation parameters are shown on the keyboards.

  The currently generated image is displayed on the left monitor unless the **Hold reference** function is active.

Image storage

During radiation



- Press this key on the hand switch.

  The image currently generated and displayed is saved.

After radiation



- Press this key on the hand switch.

  Holding the key for < 2 seconds: Saves the image last recorded (LIH).

Holding the key for > 2 seconds: Saves the scene last recorded (LSH).

The images are stored in the local database. They are transferred from the left monitor to the right monitor unless the **Hold reference** function is active.

Storage

When not in use, the hand switch can be kept in one of the holders on either side of the C-arm system.

3.2.5 Operating the footswitch

The footswitch is used, for example, if both hands need to be free during the exposure.

The footswitch is also suitable for applications where fluids may land on the floor.

For operation of the wireless multifunctional footswitch (optional) see (→ Page 299 *Wireless multifunctional footswitch*).

Radiation release

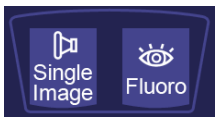
In the default setting, the pedals are allocated as follows:

- The right pedal is always used to activate **Fluoroscopy** (Fluoro).
- The left pedal is used to activate the preselected operating mode.

  Exception: If the **Fluoroscopy** (Fluoro) operating mode is preselected, the left pedal is allocated the **Single image** operating mode.

The left/right functionality of the two pedals can be reversed by Siemens Healthineers Customer Service upon request.

Pedal allocation:



The current pedal allocation is shown on the monitor trolley left screen.



If the footswitch is defective or not connected, the symbol for the hand switch is displayed instead.

Releasing radiation



- Keep the left or right foot pedal pressed during radiation release.

  The current radiation parameters are shown on the control units.

Image storage

One of the pedals can be configured with the “Save” function by Siemens Healthineers Customer Service.

In this case, in the default setting the pedals are allocated as follows:

- The right pedal is used to activate the preselected operating mode.
- The left pedal is used to activate image storage.

Saving during radiation



- Press the “Save” pedal on the footswitch.

  The image currently generated and displayed is saved in the local database.

Saving after radiation



- Press the “Save” pedal on the footswitch.

  Pressing the pedal for < 2 seconds: saves the image last recorded (LIH).

  Pressing the pedal for > 2 seconds: saves the scene last recorded (LSH).



The images are stored in the local database. They are transferred from the left monitor to the right monitor unless the **Hold reference** function is active.

3.2.6 Switching off

Before disconnecting the Cios Select from line power, you must shut it down. During the shutdown procedure the imaging system is shut down before the system is switched off.

The shutdown procedure for the imaging system is complete when the stand-by indicator in the left monitor goes out.

CAUTION

Loss of image data.

Risk of unnecessary radiation exposure!

- Do not shut down the system while radiation is being released.

If you still need the monitor trolley (for postprocessing), you can disconnect the C-arm system while switched on. In this case, only the C-arm system is shut down.

Switching off the system completely

Ending active processes

1 Close the current patient with the corresponding button on the control panel.

2 If you have just started a print job, wait until the job is completed.

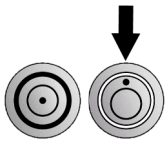
3 Make sure data were not written to CD/DVD/USB.

If necessary, wait for the write processes to be completed.

4 If there is a disk in the CD/DVD, take it out of the drive.

Open network export jobs are retained during shutdown and are continued when the system is switched back on. Storage jobs for removable devices as well as print jobs are stopped and deleted.

Switching off



◆ Press the OFF button on the unit.

The C-arm system is immediately switched off.

The imaging system switches off after the computer is shut down.

Disconnecting Cios Select from line power

Please note that after finishing an examination, the Cios Select must be shut down properly before it is disconnected from the power supply.

1 Switch off the Cios Select and wait for it to shut down.

2 Disconnect the monitor trolley power plug from the power outlet.

When the power plug is pulled, the UPS switches to battery mode (yellow LED illuminates).

Pull on the plug, not on the cable!

Releasing the connection cable

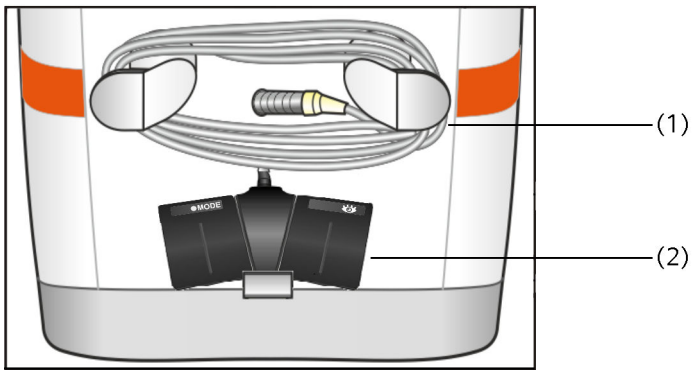
1 Turn the central plug lever on the C-arm system to the left to unlock it.

Unplug the connector.

2 If attached, disconnect the connection to the potential equalization terminal from the C-arm system.

Rolling up the footswitch cable

The footswitch is placed in the holder provided for storage and during transport.



- Roll up the footswitch cable (1) onto the cleat provided and place the footswitch into its holder (2).

When attaching the footswitch, please be careful not to kink the cable.

Reactivating the system

If the imaging system cannot be shut down properly after pressing the OFF button or if it no longer reacts to input, you must reactivate the Cios Select system as follows:



1 Use a pin or a pointed object to actuate the **RESET** button (1) on the monitor trolley:

   All running processes are terminated and the Cios Select is shut down.

2 Switch the Cios Select on again and let it boot up completely.

   Now you can either continue using the Cios Select or shut it down.

If the Cios Select is not fully operational despite the reset, please notify Siemens Healthineers Customer Service.

3.2.7 Transporting the C-arm system

The C-arm system is equipped with 4 wheels for easy steering in any direction. The C-arm system can be locked in place with the steering/brake lever.

When transporting the C-arm system and the monitor trolley in the transport position, the floor inclination must not exceed 10°.

Preparing the C-arm

Prior to transport, the C-arm system must be set to the transport position.

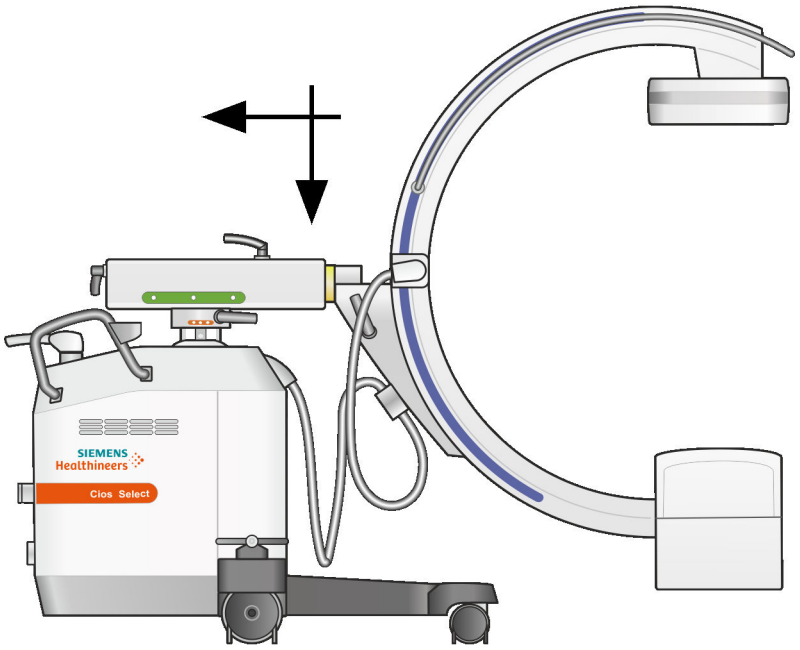
1 Release all brakes of the C-arm.

2 Set the C-arm to the transport position shown in the drawing.

- Angulation 0°
- Orbital position 0°

3 Move the lifting column to its lowest position.

4 Move the horizontal support arm all the way back.



Avoid transporting the C-arm system on inclined surfaces > 5° or it may slip or tip over.

Drive operation and steering of the C-arm system

With the steering lever, you operate the breaks of the C-arm wheels and steer the C-arm in the required direction.

The steering lever can be locked into 3 different positions. One is for movement straight ahead, the others for transverse travel to the right or left.

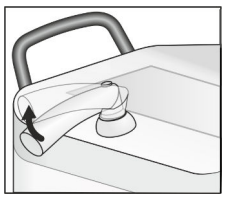
CAUTION

Weight of the device.

Risk of crushing!

- Fast braking can be impacted by the weight of the device. Pay attention to your speed as well as the floor covering, slope, and uneven areas.

1 Pull the lever up.

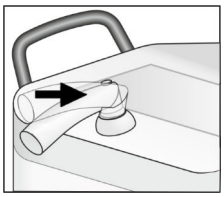


Drive operation for the C-arm system is now possible.

2 Turn the steering lever in the required direction.

3 Move the C-arm system by hand.

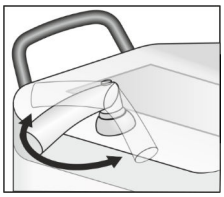
You have the following options for steering the C-arm system:



- **Motion straight ahead / pivoting in place**

  The brake is released, the steering lever is pointing straight up.

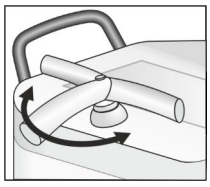
  The C-arm system can now be driven straight ahead or pivoted in place.



- **Diagonal motion**

  The brake is released, the steering lever is angled to the left or to the right.

  The C-arm system can now be driven diagonally.



- **Straight left or straight right motion**

  The brake is released, the steering lever is pointing straight to the left or the right.

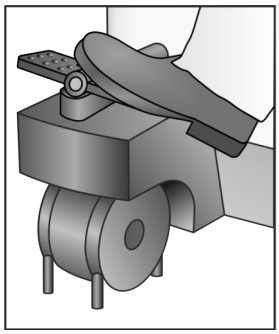
  The C-arm system can now be driven straight to the left or straight to the right.

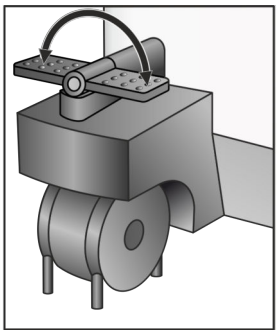
Avoid transporting the C-arm system on inclined surfaces > 5° or it may slip or tip over.

Braking the C-arm system

To securely brake the C-arm system, particularly on tilted or uneven planes and surfaces, proceed as follows:

- Keep the foot pedal pressed on both sides of the system.





The foot pedal can be pressed in both directions.

The C-arm system brakes are now locked. However, even with the brake applied, C-arm movements are still possible.

Cable deflectors

Any cables on the ground that might inhibit the maneuverability of the unit are pushed aside by cable deflectors. Unit movement is not obstructed.

When transporting the C-arm system make sure there are no obstructions on the floor.

3.2.8 Transporting the monitor trolley

Preparing the monitor trolley

Prior to transport, the connection cable for the monitor trolley should be placed on the handles of the monitor trolley.

WARNING

Increased tipping effect.

Risk of crushing!

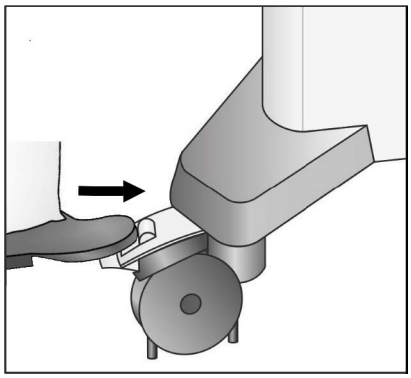
- Only products/components approved by Siemens Healthineers may be installed.



- Hang the rolled-up cables on the handles of the monitor trolley.

Avoid transporting the monitor trolley on inclined surfaces > 5° or it may slip or tip over.

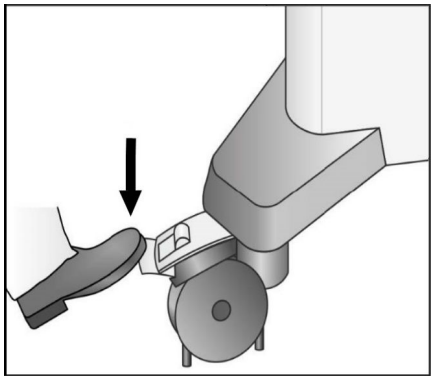
Moving the monitor trolley



- Release the brake on the wheels of the monitor trolley (see arrow) to start moving it.

When the monitor trolley is moved, care must be taken that it does not collide with, for example, catheters or anesthesia tubes.

Locking the monitor trolley



- To lock the monitor trolley, push down the brake (see arrow) on the wheels (apart from the back right wheel) with your foot until it stops/engages.

CAUTION

Brake failure.

Risk of crushing!

- Before beginning the examination, perform the daily function and safety checks.

Setting the direction of the monitor trolley

- Push down the back right wheel with your foot until it stops/engages.

  This locks the back right wheel into a fixed position when moving the monitor trolley, and thereby sets the direction of movement.

  The monitor trolley then can be pushed in the direction of the set back right wheel.

Monitor trolley park position

CAUTION

Insufficient braking force.

Risk of crushing!

- On inclines turn Trolley with footbrake downwards and activate brakes while parking.

On inclined surfaces with an angle of > 5°:

1 Make sure that the brakes are locked.



2 Make sure that the front of the monitor trolley faces forward in the direction of the incline.

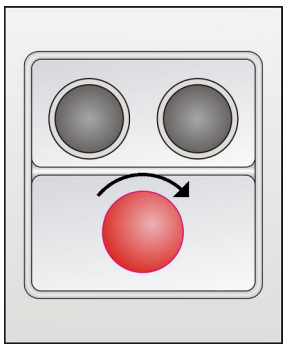
3.3 Emergency situations

Keep a replacement unit ready for critical applications in an emergency.

Refer to (➔ Page 26 *System failure*)

3.3.1 Function of the Emergency Stop switch

A red EMERGENCY STOP button is located in front of the unit.



The EMERGENCY STOP button stops the following processes immediately in a hazardous situation:

- motorized C-arm movements
- active radiation

When the EMERGENCY STOP button is activated (pressed), a red lock symbol flashes on the active emergency stop button.

If the EMERGENCY STOP button has been activated (pressed), radiation can still be released manually and the brakes can be actuated manually.

- ◆ Unlock the EMERGENCY STOP button by turning it to the right only when the hazardous situation has been eliminated.

Overriding the brakes

Do not move the C-arm if the orbital brake is activated. In case of emergency (patient recovery during power failure), the C-arm can be moved in the direction desired without releasing the brakes when enough strength is applied.

3.3.2 Behavior in case of power failure

In the case of a power failure, the unit is switched off. In order to prevent data/image loss, an uninterruptible power supply (UPS) which carries out a controlled shutdown of the imaging system is installed in the monitor trolley. The images from the last examination are saved if the auto save function is switched on (**Auto save** must be on for interventional applications).

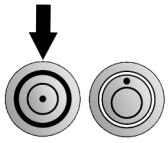
The following are not saved:

- Current, not completed examination in the event of an unexpected shutdown or power outage
- Collimator position
- Set dose values
- Image orientation
- Zoom

If there is one, a hospital emergency power supply cuts in if the mains power supply fails. However, this usually occurs with interruption and can take some time.

The system can be restarted as soon as the mains power supply is available or the emergency power unit is functioning.

Restarting



1 Press the **ON** button on the C-arm system to restart the system.

2 Wait until the unit has fully rebooted.

3 Pay attention to error messages.

When the power-up process has been completed (after approx. 2 minutes), the Cios Select is fully operational again.

4 Reselect the last patient in order to continue his or her treatment.

5 Perform the procedure, dose and collimator settings required in order to continue the application.

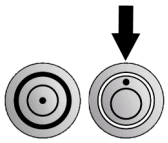
The positioning of the C-arm remains intact when the system is switched off. Nevertheless, please check the current position and correct it if necessary.

3.3.3 Restarting the Cios Select

The Cios Select must be restarted following certain error messages.

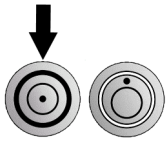
The following settings are reset to their default values by a restart:

- Collimator position
- Set dose
- Image orientation
- Zoom



1 Switch the system off by pressing the **OFF** button on the unit.

2 Wait until the computer has shut down.



3 Press the **ON** button to restart the unit.

4 Pay attention to the error messages displayed.

5 Reselect the last patient in order to continue his or her treatment.

6 Perform the procedure, dose and collimator settings required in order to continue the application.

The positioning of the C-arm remains intact when the system is switched off. Nevertheless, please check the current position and correct it if necessary.

CAUTION

Restarting the imaging system is not possible.

Treating patients no longer possible!

◆ Restart the system as presented in the following reset procedure.

3.3.4 Restart via reset

If the computer fails to shut down or no longer reacts to inputs, a system reset may be necessary.

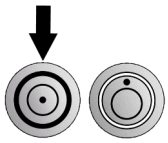
The following information will be lost following a reset:

- Collimator position
- Set dose
- Image orientation
- Zoom

Resetting

1 Use a pin or a pointed object to actuate the reset button (1) on the monitor trolley (the system will not automatically boot up afterwards).





2 After the system switches off, press the **ON** button to switch the unit on.

Wait until the system has rebooted.

3 Reselect the last patient in order to continue his or her treatment.

4 Perform the procedure, dose and collimator settings required in order to continue the application.

The positioning of the C-arm remains intact when the system is switched off. Nevertheless, please check the current position and correct it if necessary.

3.3.5 Procedure for cardiopulmonary resuscitation (CPR)

If cardiopulmonary resuscitation (CPR) becomes necessary, the Cios Select must be removed from the treatment table to ensure free access to the patient.

1 Move the C-arm to a position where it can be removed from the table without causing a collision.

2 Release the brakes and move the C-arm to the required position either via motor drive or manually. Reapply the brake to prevent unwanted movements of the C-arm.

3 Then release the brake lever and move the Cios Select out of the treatment area.

4 At the same time, watch out for the cables leading to the monitor trolley and the footswitch.

5 Release the brake of the monitor trolley, if necessary, and remove it from the treatment area.

4 Examination

4.1 Safety information 91
4.1.1 Prior to the examination 91
Examination settings 91
Audible warnings 91
Software failure 91
Storage capacity 91
Reference images from previous examinations 92
4.1.2 During the examination 92
Patient position 93
Image orientation 93
Data conformity 93
Detector temperature 93
4.2 Preparing the system 93
4.2.1 Removing/inserting the anti-scatter grid 93
Removing the anti-scatter grid 94
Inserting the anti-scatter grid 94
4.2.2 Protection against contamination and the penetration of fluids 95
4.2.3 Positioning the C-arm 95
Using the laser light localizer 95
Aligning the C-arm 96
4.2.4 System position for interventional examinations 96
4.2.5 Unlocking/locking radiation release 96
Unlocking radiation release 96
Locking radiation release 97
4.2.6 Selecting the application 98
Setting the application and application group 98
Predefined application selection 98
4.3 Patient registration 98
4.3.1 Emergency registration 100
Emergency registration on the monitor trolley 100
Emergency registration on the monitor 100
Emergency registration with the hand switch or footswitch 101
Provisional patient data 101
4.3.2 Registering a new patient 101
Opening patient registration 101
Data Entry Dialog window 102
Entering data 103
Completing registration 104
4.3.3 Registering previous patients 105
Opening the Patient list 105
Checking/correcting patient data 105
Completing registration 106
Resuming a commenced study 107
4.3.4 Registering patients from the worklist 107
Updating the worklist 107
Opening the worklist 109
Checking/correcting patient data 109
Completing registration 110
Deleting a patient entry 110

4.4 Defining the examination settings 110
4.4.1 Changing the fluoroscopy parameters 111
Selecting the operating mode 111
Setting collimators 113
Selecting the dose level 114
Switching on metal correction 115
Selecting the noise filter 116
Selecting the input format (Detector zoom/magnification) 116
Setting the pulse rate 117
Setting the X-ray parameters manually 117
4.4.2 Setting the image parameters 118
Selecting the image orientation 118
4.5 Acquiring images 120
4.5.1 Releasing radiation 120
Dose regulation indicator 121
Displaying fluoroscopy images 122
Confirming a warning signal 123
Temperature monitoring 124
Radiation information 124
Irradiation termination 125
4.5.2 Saving and displaying images 125
Storing images (during radiation) 126
Storing images (after radiation) 126
Saving and reviewing a scene 126
Changing the image display 127
4.5.3 Using reference images 128
Transferring images 128
Scrolling through images 129
Holding the reference image 129
4.5.4 Using “Cios OpenApps” (optional) 130
Selecting an application 130
Transferring images to the application 131
Terminating the application 132
4.6 Ending the examination 133
4.6.1 Closing the patient 133
4.6.2 Examining the next patient 134
Another patient registered 134
4.7 Performing special examinations 135
4.7.1 Subtraction angiography (Sub) 135
Progression 135
Performing subtraction angiography 135
4.7.2 Roadmap (Road) 136
Fill image available 136
Generating a new fill image 137
Using the fill image from subtraction angiography 137
Manually selecting the fill image 138
Positioning the catheter (Phase C) 138
4.7.3 Using the Target Pointer (optional) 138
4.7.4 Pediatric use 140

4.1 Safety information

4.1.1 Prior to the examination

Examination settings

Before starting surgery, please make sure that all the set parameters as well as examination settings in all operation modes are correct.

Audible warnings

Audible warnings over the loudspeakers indicate possible hazards, such as crushing hazards, longer radiation release or high dose rate.

⚠ CAUTION

Falling short of the safety distance.

Risk of crushing!

- Check the loudspeakers for proper functioning. An audible signal must sound while the system starts up.

Software failure

⚠ CAUTION

Software crash.

Working with the imaging system is no longer possible.

- Restart the system.

Storage capacity

When the limit of the image storage capacity is reached, the release of radiation is blocked for radiography modes (Single image, Subtraction). An acquisition in progress will continue until completion and storage of the data will be ensured by the system.

For the radioscopy acquisition modes (Fluoro operating mode, and ROAD if a valid peakOP is available) the auto-store selection will automatically be undone. A warning message will be displayed, but acquisition will be possible.

The hard disc fill level is displayed in the status bar of the left monitor. A warning signal is displayed before the final capacity of the hard disk is reached.

Icon	Short description
	Available disk space: ≤ 100%
	Available disk space: ≤ 75%

Icon	Short description
	Available disk space: ≤ 50%
	Available disk space: ≤ 25%
	Available disk space: < 12.5% This icon indicates the available disk space has reached a critical level.
	Available disk space: = 0 This icon indicates there is no available disk space.

Please make sure that there is sufficient storage capacity before you start the examination. In addition, please observe the relevant system messages.

Reference images from previous examinations

CAUTION

Risk that the network connection may not be available continuously.

Reference images not available during intervention.

- Before beginning the intervention, the user should load the required images from the network archive.

4.1.2 During the examination

CAUTION

C-arm movement during surgery.

Risk of injury!

- Due to the maneuverability of the C-arm, collisions with other surgical devices are possible if the device is not used as intended and in accordance with the instructions in this manual.

WARNING

Instruments falling into the gap between the control unit and its housing.

Risk of short circuit, electric shock, and/or fire!

- Make sure no instruments, conductive material, or fluids penetrate into the openings/joints between the control unit and its housing.

Patient position

Prior to the release of radiation, it is necessary to check whether the patient is positioned correctly.

Image orientation

Ensure correct image orientation (accurate to side) on the monitor/on the hardcopy.

Data conformity

Correct orientation of image and patient data must be checked before storage.

Before terminating an examination and beginning work on the next patient, the patient data should be verified.

The registered patient should be deselected at the end of the examination.

(➔ Page 133 *Closing the patient*)

Detector temperature

CAUTION

Detector temperature is not within recommended range.

Risk of limited image quality in the resulting X-ray images. Risk of X-ray radiation exposure without any diagnostic value!

- Regularly check the temperature icon on the display.

Exceeding the critical temperature is indicated by a system message. In this case it is recommended to shut down the system immediately to allow it to cool.

4.2 Preparing the system

CAUTION

Brake failure.

Crushing hazard from automatic movements!

- Before beginning the examination, perform the daily function and safety checks.

4.2.1 Removing/inserting the anti-scatter grid

Removing the anti-scatter grid reduces the radiation dose (as well as image quality), e.g., for a pediatric examination.

CAUTION

Changing the grid.

Crushing hazard between the detector housing parts.

- Note the hazardous zones/locations between the detector housing parts.

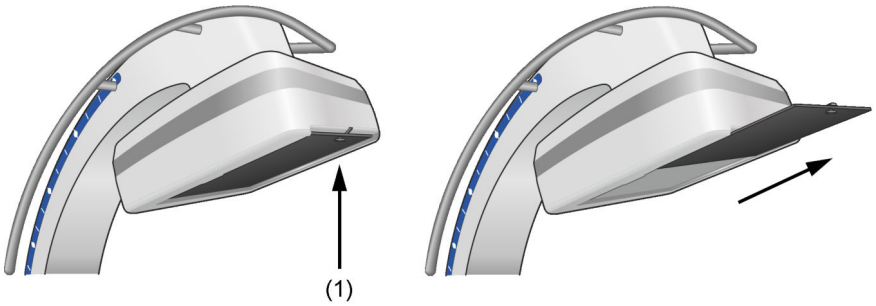
CAUTION

Incorrect grid status: inserted, removed.

Radiation unsuitable for imaging results in unnecessary radiation exposure!

- Select the application according to your clinical procedure.
- Make sure that the current grid status meets your image requirements. The imaging system indicates whether a grid has been inserted or removed.
- If necessary, insert the grid manually or remove it from the tray.

Removing the anti-scatter grid



1 Loosen the knurled screw (1) until you can pull the anti-scatter grid out.

2 Carefully pull the anti-scatter grid from its holder (2).

3 Put the anti-scatter grid in a safe place.

4 Check that the icon for “anti-scatter grid inserted” has a line through it.



This indicator appears on the left monitor and the control panels in the exposure parameter area.

Inserting the anti-scatter grid

Once the pediatric examination is completed, you must reinstall the anti-scatter grid in order to ensure optimum image quality during standard examinations.

1 Install the anti-scatter grid in the reverse order of its removal: Push in the anti-scatter grid and tighten the knurled screw.

2 Check that the icon for “anti-scatter grid inserted” does not have a line through it.



This indicator appears on the left monitor and the control panels in the exposure parameter area.

4.2.2 Protection against contamination and the penetration of fluids

If a significant amount of fluid is expected during an examination, there is a risk of fluids penetrating into the system. It is recommend to cover the relevant areas appropriately.

The C-arm can be covered completely or partially with a sterile disposable sheet to protect it against contamination.

(➔ Page 304 *Sterile cover on the detector, single tank and C-arm*)

WARNING

Fluid penetration and contamination.

Damage to the flat detector

- Make sure that the detector is always covered by a disposable cover during the examination.

4.2.3 Positioning the C-arm

Using the laser light localizer

Depending on the configuration of your Cios Select, you can use the laser light localizer as a positioning aid.

Switching on



- Press this button on the control panel.

  Depending on the system configuration, all laser light localizers on the Carm system switch on.

  The target crosshairs are displayed on the left monitor as long as the laser light localizer is switched on (depending on the configuration settings).

Switching off



- Press the activated button on the control panel.

  The activated laser light localizer is switched off automatically after 5 minutes.

Aligning the C-arm

CAUTION

Collision with other systems.

Risk of injury!

- Due to the maneuverability of the C-arm, collisions with other systems are possible if the device is not used as intended and in accordance with the instructions in this manual.

1 Align the C-arm system to the table and patient.

2 Release the relevant brake and move the C-arm to the required exposure position.

(➔ Page 63 *Move C-arm*)

3 Lock all brakes again.

4.2.4 System position for interventional examinations

For interventional examinations the system must be in vertical position.

4.2.5 Unlocking/locking radiation release

Your system has a lock-out option for radiation release to prevent unintentional release of radiation, e.g., by accidentally pressing the footswitch.

The radiation lock can be optionally secured with a password so only authorized persons can set the exposure parameters and release radiation.

We recommend activating the irradiation disabling function at all times, except when an acquisition is in progress.

You can set and change the password for locking radiation release in the configuration.

(➔ Page 214 *Password for radiation release*)

Unlocking radiation release



1 Press this button on the control panel.

Without password protection on the radiation lock, exposure parameters can be set and radiation released.

With radiation lock password protection, the password entry dialog is displayed.



2 Enter the correct password (default setting: **0000**).

Exposure parameters can now be set.

Radiation can be released with the hand switch and the footswitch.

If you mistype your password, you can delete your entry by pressing the backspace button.

Locking radiation release



1 Press this button on the control panel.

Without password protection on the radiation lock, exposure parameters setting and radiation release are locked.

With password protection, the password entry dialog is displayed.



2 Enter the correct password.

Exposure parameters setting and radiation release are locked.

4.2.6 Selecting the application

The applications contain individual sets of examination settings tailored to various medical application areas (such as General, Breast, Ortho).

The available applications are divided into application groups, for example, according to hospital-specific requirements.

CAUTION

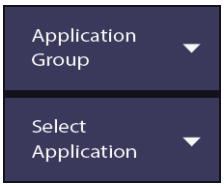
The image orientation is reset.

Risk of an incorrect decision during surgery!

- Be aware that the image orientation is reset when changing the application group or application. All previous settings are lost.

Setting the application and application group

The applications and application groups are available in the **Advanced Mode** on the control panel.



1 Press the button to open the **Application Group** or **Application** selection lists.

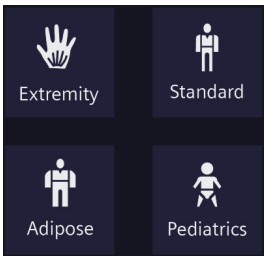
2 Use the scroll bar to scroll up and down in the selection lists.

3 Click the desired entry.

The exposure parameters including the operating mode are preset according to the selected application.

Predefined application selection

You can choose from four default standard applications in the **Basic Mode** on the control panel.



- Press the button for the required application.

The button pressed is highlighted white.

The selected application is displayed on the left monitor.

4.3 Patient registration

Before you can examine a patient with your system, you must register the patient.

Registration means that you give your system all the information about a patient that it requires for an examination.

CAUTION

Risk of mistaking patients.

The wrong patient is being treated.

- The user must ensure the correct patient is being treated before he or she is registered on the system.

CAUTION

Patient ID already exists.

Misinterpretation of data of the examined patient if the selection is based solely on the patient ID.

- Always use four-way identification [patient name, sex, date of birth, patient ID].
- Avoid mixing up patient data by using four-way identification. Selecting patient data based on the patient ID alone is insufficient. Ensure the proper display of parameters in the **Worklist** and in the **Patient list**.

Depending on how registrations are organized in your hospital and how much time you have for registration, you can choose between different patient registration procedures.

- **Emergency registration**

  If a patient is admitted who is in an extremely critical condition and must therefore be examined and treated immediately, select emergency registration. The patient is registered with provisional data as an emergency patient. This reduces the time before you can begin the examination to a minimum.

- **Registration for the examination**

  However, if you want to register a patient for an examination, you first enter the patient's data or select it from the database and then examine the patient.

- **Preregistration**

  If you want to prepare the system to examine a patient at a later point in time, then you can preregister the patient.

  For example, in the morning you can enter the data of all the patients to be examined during the day. When you want to begin an examination, simply select the relevant data and edit them, if necessary. This saves time during the examination.

- **HIS/RIS query**

  If your system is connected to a HIS/RIS system (hospital and radiology information system), the patient can be registered for the examination through one of these systems.

CAUTION

Non-harmonized configuration of HIS/RIS.

Impossibility of Communication.

- Do not use configuration "Patient ID only" within HIS/RIS as Imaging System (FLC) identifies a patient by quadruple (patient name, ID, sex, date of birth).

Patient registration is also possible on the monitor trolley when the C-arm system is disconnected.

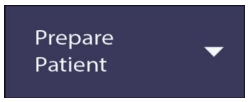
4.3.1 Emergency registration

An emergency registration is performed if a patient must be examined and treated immediately, without any time to waste entering the patient's data.

Emergency registration on the monitor trolley

Emergency registration can be performed on the control panel at any time, regardless of the processing step you find yourself in.

Start Exam menu



1 Press the **Prepare Patient** menu button.



2 Press the **Emergency** button from the drop-down button list.

You can now start with the examination.

Another patient registered

If you perform emergency registration while another patient is registered, a corresponding dialog box is displayed.

1 Select the desired options to conclude the examination.

(➔ Page 133 *Closing the patient*)

2 Click **OK** to close the currently registered patient.

Emergency registration on the monitor

When you are editing patient data the **Data Entry Dialog** window is displayed on the monitor. You can start emergency registration in that window with a click of the mouse.



- Click this button in the **Data Entry Dialog** window.

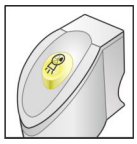
  The patient is registered as an emergency patient.

  The dialog window on the monitor closes.

Emergency registration with the hand switch or footswitch

Outside a running examination, you can perform emergency registration by activating the hand switch or footswitch.

1 Make sure that there is not a patient registered for an examination.



2 On the hand switch, press the radiation release button **once**.

– or –



On the footswitch, press the radiation release pedal **once**.

The patient is registered as an emergency patient.

Provisional patient data

During emergency registration, missing patient data are supplemented automatically. An emergency patient is registered with the following data:

Data type	Entry
Last name	**Emergency**
First name	**Emergency** if the patient ID has already been entered **sequential number** if the patient ID has not already been entered
Date of Birth	Today's date
Sex	**Unknown**
Patient ID	**E_ sequential number**

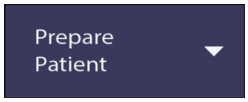
Make sure to correct the provisional patient data when the opportunity becomes available (➔ Page 147 *Correcting data*).

4.3.2 Registering a new patient

If a patient has never been examined in your hospital or practice before, no data about this patient will be stored on your system. Therefore all the required data for this patient must be entered before an examination.

Opening patient registration

Open patient registration on the control panel.



1 Press this button.



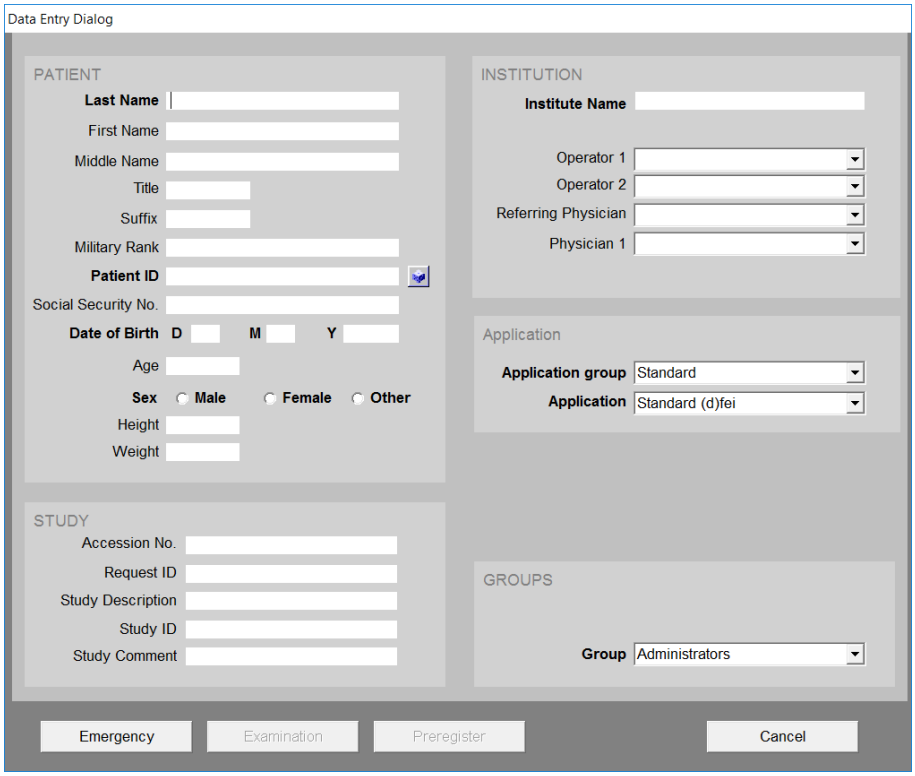
2 Press the **Registration** button from the drop-down button list.

The control panel switches to keyboard mode.

The **Data Entry Dialog** window opens on the left monitor.

Data Entry Dialog window

The mandatory fields for registration and preregistration are highlighted in bold. Which fields are displayed and which are mandatory can be configured (➔ Page 204 *Patient registration*).



PATIENT area

Name, Patient ID, Age, and Sex of the patient are always mandatory entry fields. This information uniquely identifies the patient in your databases.

Special notes:

- **Patient ID**

  You can have a unique patient ID generated as long as no internal rules have been set for the format.

- **Date of Birth**

  Four digits must be entered for the year of birth. If the date of birth is unknown, the patient's age is used to calculate a date of birth from today's date.

- **Age**

  If the date of birth has been entered, the patient's age is calculated from today's date and entered.

STUDY area In this area, data from the HIS/RIS system (option), if connected, are entered automatically. The data are used especially to uniquely identify the study created for the examination.

INSTITUTION area This area contains information regarding the examining facility and personnel. The information can be helpful if the examination images are passed on to a different organization for reporting.

Special notes:

- **Institution Name**

  The institution name entered during configuration is entered here as the default.

Application area This area shows the applications available for selection, divided into different application groups (➔ Page 98 *Selecting the application*).

GROUPS area This area is only available if HIPPA is licensed. If your user account belongs to several groups, you can select the group the patient shall belong to.

Only groups your user account belongs to are displayed.

Entering data

The cursor is in the input field for the patient's name.

Making entries

1 Enter text and numbers using the keyboard in the control panel.

The characters entered are shown on the monitor and in the text field on the control panel.





2 Use the mouse to select entries from the selection list.

You can manage the content of certain selection lists (drop-down combo boxes) in the following way:

- To add an entry to the list, mark the text entered in the text field and press **Shift** or **Ctrl** + ↑ (arrow up) on the keyboard.
- To remove an entry from the list, select it from the list (text is marked in the text field) and press **Shift** or **Ctrl** + ↓ (arrow down) on the keyboard.

Changing fields



- Use the **Tab** button or click the mouse to switch to the required field.

Generate a patient ID



- Click the icon in the **Data Entry Dialog** window.

  A new patient ID is generated based on the current date and time.

Correcting the entry



1 Press the arrow buttons to move the cursor one character at a time.



2 Press this button to delete the character ahead of the cursor.

– or –



Mark the incorrect characters with the arrow buttons while holding the Shift button, and overwrite with the keyboard.

Deleting an entry

1 Select all the characters in an entry to be deleted with the mouse.



2 Press this button.

Completing registration

Once you have at a minimum completed the mandatory fields in the **Data Entry Dialog** window, you can register the patient for the ensuing examination or preregister him or her for examination later on.

Examining the patient



- Press this button on the control panel.

  – or –



Click this button in the **Data Entry Dialog** window.

The **Data Entry Dialog** window closes.

You can start examining the patient.

Preregistering patients

During preregistration the patient and entered data are stored locally. You can then access the patient data again when you start the examination.

(➔ Page 107 *Registering patients from the worklist*)

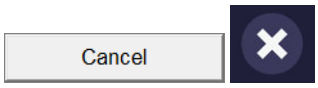


- Click this button in the **Data Entry Dialog** window.

  The patient is included in the **Worklist**.

  The **Data Entry Dialog** window closes.

You can abort the current registration and close the **Data Entry Dialog** window by clicking the **Cancel** button in the dialog window or pressing the **Close** button on the control panel.



4.3.3 Registering previous patients

A patient who has already been examined in your hospital or practice is known to your system.

For the current patient registration you apply the saved information in the **Data Entry Dialog** window.

Opening the Patient list

You open the **Patient list** on the control panel.



1 Press the **Prepare Patient** menu button.



2 Press this button from the drop-down button list.

The control panel switches to keyboard mode.

The **Patient list** opens on the left monitor.

Patient Name	Patient ID	Date of Birth	Sex	Study Description	Physician	Flag
Emergency, 61	E_61	16-01-2013 (0)	O	Standard		--------
Emergency, 66	E_66	16-01-2013 (0)	O	Standard		-----C--
Kunz, Andrea	160113_104...	01-04-1945 (67)	F	Standard		-----C--
Meier, Hans	160113_103...	23-12-1976 (36)	M	Standard		-----C--
Muster, Bernhard	160113_104...	12-05-2011 (1)	M	Standard		-----C--
Schmidt, Manuel	160113_104...	12-12-1955 (57)	M	Standard		-----C--
Zander, Stefanie	160113_104...	09-05-2000 (12)	F	Standard		-----C--

Patient not found

If the patient you want is not displayed, a database filter may be on or the patient has been deleted.

1 Set the filter criteria accordingly or switch off the filter. See (➔ Page 146 *Filtering data*)

2 If necessary, import the patient data from the archive. See (➔ Page 150 *Importing data*)

Checking/correcting patient data

Patient and exam data are corrected in the **Data Entry Dialog** window.

Opening data



1 Use the arrow buttons or mouse to select the required patient.



2 Press this button.

The data of the selected patient are transferred to the **Data Entry Dialog** window.

Editing data

1 Check that the information in the **Data Entry Dialog** window is correct and add any missing data.

(➔ Page 103 *Entering data*)



2 Press this button on the control panel.

– or –



Click this button in the **Data Entry Dialog** window.

The **Data Entry Dialog** window closes.

The **Patient list** is updated based on the changes.

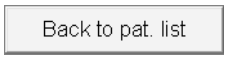
Wrong patient

If you have selected the wrong patient:



◆ Press this button on the control panel.

– or –



Click this button in the **Data Entry Dialog** window.

All changes in the **Data Entry Dialog** window are discarded.

The **Patient list** is displayed again.

Completing registration

Examining the patient



◆ Press this button on the control panel.

– or –



Click this button in the **Data Entry Dialog** window.

The **Data Entry Dialog** window closes.

You can start examining the patient.

Preregistering the patient



- Click this button in the **Data Entry Dialog** window.

  The patient is included in the **Worklist**.

  The **Data Entry Dialog** window closes.

Resuming a commenced study

If you cancelled a study with **Close**, you can continue this study later. Just select the study, load the data into the **Data Entry Dialog** window, and then start the examination. All newly generated images are saved in the existing study as a new series. Please note that this is only possible if you have already acquired images in the commenced study. An empty study cannot be used for registration.



1 Press this button.



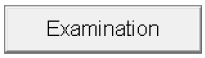
2 Open the **Patient list** by pressing this button from the drop-down button list.

3 Select the corresponding study.



4 Register the patient for examination.

You may resume your study.



4.3.4 Registering patients from the worklist

The **Worklist** contains patients that were preregistered manually in your system and automatically via the HIS/RIS connection.

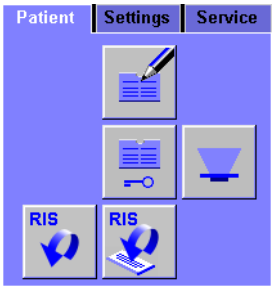
Updating the worklist

The **Worklist** is updated via the HIS/RIS system at regular intervals, and when the **Worklist** is opened. You can also initiate the update manually, for example, when you want to continue working without HIS/RIS connection.



- Press this button on the control panel.

  The **Manage Tool** opens on the left monitor.



Worklist complete



- Click this icon in the **Patient** subtask card.

  The **Manage Tool** closes.

  The **Worklist** opens on the left monitor and is updated with the examinations planned for your system.

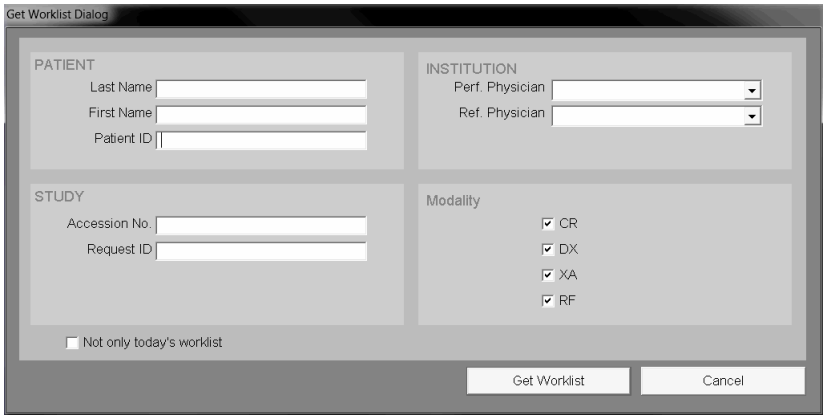
Filtering the worklist

If you are looking for a specific patient you can enter his name or you can query the HIS/RIS for specific entries only.



1 Click this icon in the **Patient** subtask card.

  The **Get Worklist Dialog** window opens.



2 Enter the data you know as search criteria.

  Possible placeholders: * stands for one or more random characters, ? stands for one random character.

  Modality: The modality planned for the patient

  Not only today's worklist: Query for all scheduled appointments.



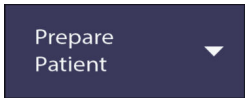
3 Click this button.

  The **Manage Tool** closes.

  The **Worklist** opens on the left monitor and updates. In addition to the patients preregistered manually, only those HIS/RIS entries that meet the search criteria are displayed.

Opening the worklist

You open the **Worklist** on the control panel, unless it is already displayed due to a manual update.



1 Press this menu button.



2 Press this button from the drop-down button list.

The control panel switches to keyboard mode.

The **Worklist** opens on the left monitor.

Patient Name	Patient ID	Date of Birth	Sex	Study Description	Procedure
Emergency, 65	E_65	16-01-2013 (0)	O		
Emergency 450	E_450	21-05-2013 (1D)	O		
Meier, Hans	160113_103359	11-11-1986 (26)	M		
Emergency, 64	E_64	16-01-2013 (0)	O		

Checking/correcting patient data

Opening data



1 Use the arrow buttons or mouse to select the required patient.



2 Press this button.

The data of the selected patient are transferred to the **Data Entry Dialog** window.

Editing data

1 Check that the information in the **Data Entry Dialog** window is correct and add any missing data.

(➔ Page 103 *Entering data*)



2 Press this button on the control panel.

– or –



Click this button in the **Data Entry Dialog** window to confirm changes.

The **Data Entry Dialog** window closes.

The **Worklist** is displayed again.



For reasons of data consistency, some information in HIS/RIS entries cannot be changed, such as the personal data of the patient.

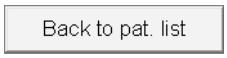
Wrong patient

If you have selected the wrong patient:



- Press this button on the control panel.

  – or –



Click this button in the **Data Entry Dialog** window.

All changes in the **Data Entry Dialog** window are discarded.

The **Worklist** is displayed again.

Completing registration



- Use the arrow buttons or mouse to select the required patient in the **Worklist**, if necessary.

Examining the patient



- Press this button to examine the patient.

  The **Worklist** closes.

You can start examining the patient.

– or –

Double-click the patient with the mouse.

Deleting a patient entry

As soon as the examination of a patient in the **Worklist** ends, the data saved in the study is moved automatically to the **Patient list**.

If an examination for a patient is cancelled, you can manually delete the entry so that the **Worklist** remains clear.



1 Use the arrow buttons or mouse to select the required patient in the **Worklist**, if necessary.

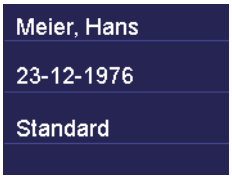


2 Press this button to remove the patient in question from the **Worklist**.

4.4 Defining the examination settings

The standard exposure parameters are already set by default for the examination, depending on the **Application** you have selected (➔ Page 98 *Selecting the application*).

If these settings are appropriate for your examination, you can start the image acquisition immediately on the Cios Select (➔ Page 120 *Acquiring images*).



The **Application** currently selected together with the patient data are displayed in the left monitor on the upper left.

Make sure that the patient's name on the monitor matches the patient to be examined.

4.4.1 Changing the fluoroscopy parameters

On the control units, you set the exposure parameters on the control panel. Settings may be changed prior to each radiation release.

CAUTION

Incorrect exposure parameters.

Risk of unnecessary radiation exposure due to incorrect exposure parameters.

- Ensure the exposure parameters are correct. Pay attention to the exposure index (EXI).

The operating modes can also be selected via the corresponding button on the multifunctional footswitch (optional), if used. You can then release radiation again right away.

(➔ Page 299 *Wireless multifunctional footswitch*)

Selecting the operating mode

The operating mode currently set is indicated by the button highlighted white. The current operating mode is deselected when switching to another mode.

The operating modes can also be selected via the corresponding button on the multifunctional footswitch (optional), if used. You can then release radiation again right away (➔ Page 299 *Wireless multifunctional footswitch*).

CAUTION

Radiography modes are misused for real-time imaging on purpose by the operator.

With radiography modes, the image display delay time may be longer than with radioscopy modes and may exceed acceptable delay limits for real-time imaging.

- For real-time imaging only select radioscopy modes such as Fluoroscopy and Roadmap. Do not select radiography modes (for example, Single image / DR, Subtraction) for real-time imaging.

Fluoroscopy

Fluoroscopy operating mode enables real-time imaging which, for example, allows viewing of moving objects.



- Press this button.

  Fluoroscopy mode is selected.

  The button is highlighted white.

Upon switching on the Cios Select, the operating mode configured as the standard application, usually **Fluoroscopy**, is selected automatically by default.

Single image

Single image operating mode enables an electronic instant image with the best image quality. Nevertheless, consider using the LIH (Last Image Hold) for a final image for documentation purposes (following the As Low As Reasonably Achievable dose principle).

On activation of single image a short radiation pulse is released.

Please note that a Fluoro exposure with > 2fps has to be made before a single exposure in order to set the exposure parameters (kV/mA) and thereby achieve good image quality.

When acquiring single images, remember to keep the radiation release button pressed (on the hand switch or footswitch) until the radiation indicator goes out.



- Press this button.

  Single image operating mode is selected.

  The button is highlighted white.

After complete image acquisition, radiation is automatically switched off, even if the radiation release button remains pressed.

Subtraction (Sub)

The subtraction technique enables an isolated display of the vascular system after injection of the contrast agent by means of background subtraction.

(➔ Page 135 *Subtraction angiography (Sub)*)



- Press this button.

  Subtraction operating mode is selected.

  The button is highlighted white.

Roadmap

The Roadmap technique enables the user to position a catheter precisely in a blood vessel under fluoroscopy.

(→ Page 136 *Roadmap (Road)*)



◆ Press this button.

The **Roadmap** mode is selected.

The button is highlighted white.

Please note that a Fluoro exposure with > 2fps has to be made before exposures using substraction or roadmap technique in order to set the exposure parameters (kV/mA) and thereby achieve good image quality.

Setting collimators

The Cios Select uses the following collimators to collimate the X-ray beam:

- Iris collimator

  The iris collimator provides radiation protection for the patient and all persons participating in the exam.

- Slot collimator

  The semi-transparent slot collimator is used primarily for collimation of the extremities.

When you open/close the iris collimator or move the slot collimator without radiation, you can see the position of the collimators on the LIH image displayed with lines superimposed.

When you release radiation, the collimators are in the position shown in the image.

Digital collimator function

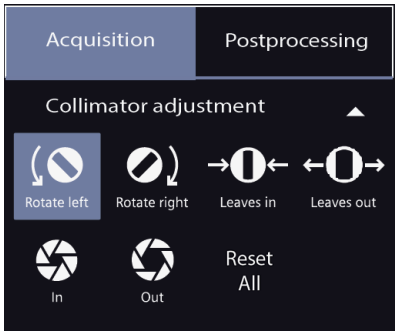
The areas outside the collimated areas are automatically blackened if so configured by Siemens Healthineers Customer Service for the selected application.

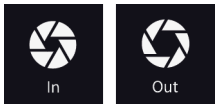
Close/open iris diaphragm

When switching on the Cios Select, the iris collimator automatically opens to full format. Smaller collimation produces less scatter radiation and therefore better image contrast.

1 Change to **Advanced Mode** if necessary

2 Open the **Collimator adjustment** menu in the **Acquisition** task card.





3 Press one of these buttons.

The iris collimator opens/closes.

CAUTION

Wrong collimator setting.

Dose not as required!

- The iris collimator needs to be set so that at least one edge of the leaves is visible in the fluoroscopy image. This must be checked daily.

Opening/closing the slot collimator

Collimation enhances image contrast and reduces scatter radiation. Direct radiation that passes the soft tissue laterally is reduced to such an extent, that differences in brightness do not disturb when images are viewed on the monitor. The position of the left and right slot collimator blades can be changed jointly (symmetric).

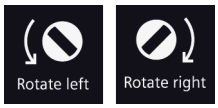


- Press one of these buttons.

  The slot collimator opens/closes symmetrically.

Rotating the slot collimator

By rotating the slot collimator, the collimated field can be quickly oriented to the direction of the anatomy under examination (e.g. the extremities).



- Press one of these buttons.

  The slot collimator rotates to the left/right.

Resetting the collimator



- Press this button.

  The collimators are reset to full format.

Selecting the dose level

You can choose between three dose levels (deviating from the current user program).

The dose level currently set is shown on the display of the control panel and on the left monitor.



Dose level display

Setting the dose level



- Press this button several times, if necessary.

  Each time you press the button, you switch between dose levels of low, medium, and high.



(1) Low dose
(2) Medium dose
(3) High dose

When selecting different dose levels, please note that additional specific parameter settings, such as k factor and pulse rate, change automatically.

If the maximum skin dose is exceeded at the highest dose level, the corresponding button is called "High level". The maximum duration of a fluoro scene is limited to 30 s. The button and the display on the monitor are marked with a warning symbol.

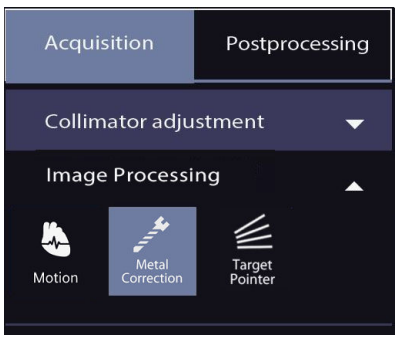


Switching on metal correction

Metal correction is designed for examinations with metal parts in the measurement range (e,g.,larger, non-standard implants). When activated, the contrast and brightness settings are adjusted accordingly and the automatic dose rate control is improved.

1 Change to **Advanced Mode** if necessary.

2 Open the **Image Processing** menu in the **Acquisition** task card.





3 Press this button.

The button is highlighted white.

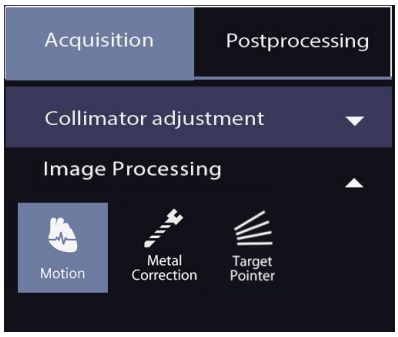
Selecting the noise filter

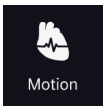
By using noise filters, you take into account the influence of movements when filtering noise. Image integration depends on the preset k factor (depending on the operating mode up to max. k = 32), which is adapted according to the selected noise filter.

k factor: The k-factor is used for image processing/image integration. For image integration a number of k exposures are integrated into one image by sliding averaging; the k factor can be selected between k = 1 and k = 16 and can be assigned to an examination set.

1 Change to **Advanced Mode** if necessary.

2 Open the **Image Processing** menu in the **Acquisition** task card.





3 Press this button.

The button is highlighted white.

Selecting the input format (Detector zoom/magnification)

Three different zoom levels are available. This sets the input format for the subsequent image acquisition. The input format is the size of the detector area that is exposed and then fills the screen when displayed on the monitor.

Zoom level	Mag 0	Mag 1	Mag 2
Input fields (active field)	20.58 cm x 20.58 cm (8.1" x 8.1")	15 cm x 15 cm (5.9" x 5.9")	10 cm x 10 cm (3.9" x 3.9")



◆ Press this button.

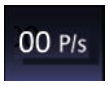
Each time you press the button, you switch between zoom levels 0 (full format), 1 and 2.



The input format display is updated accordingly.

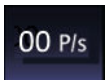
Setting the pulse rate

Depending on the configuration level you can select different pulse rates from 0.5 to 15 fps or continuous fluoroscopy. The respective set value is displayed on the control panel using the **Pulse rate** button.



- Press this button several times, if necessary.

  The pulse rate changes accordingly.



The k value currently set is shown on the display of the C-arm control panel above the **Pulse rate** key. If **continuous** is set, “co” (**co**ntinuous) appears.

Setting the X-ray parameters manually

You can change the default X-ray parameters manually with the +/- buttons for kV/mA or kV/mAs (for single image operating mode).

Automatic dose rate control: Using automatic dose rate control (ADR), the kV/mA values or kV/mAs values are regulated so that the mean value of the image gray values is kept constant largely independently of the object thickness and position. This ensures optimal image quality for on-screen evaluation.

The current automatic dose rate control status can be read on the control panel using the **Tech lock** button.

The system possess an automatic metal correction which is designed for examinations with metal parts in the measurement range. The metal correction parameters are included in the **Application** settings. For example, the contrast and brightness settings are adjusted accordingly and the automatic dose rate control is improved.

If the image quality is not sufficient, please use the additional **Metal correction** or **Tech lock** functionality. **Tech lock** is provided as a quality control function which enables selection of x-ray parameters by a manual control.

Activating kV/mA stop

When metallic objects (e.g. intramedullary nails) are introduced into the beam path or when examining objects of varying density (e.g. hip prosthesis) under fluoroscopy, it is recommended that you set the kV just established with the **Tech lock** button at the start of fluoroscopy.

The automatic dose rate control (ADR) must remain activated during interventional procedures.



- Press this button.

  The button is highlighted white.

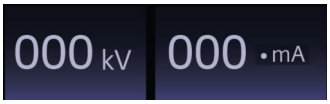
  Automatic dose control is disabled.

  The +/- buttons for kV/mA are enabled.

Do not switch between Fluoroscopy and Single Image operating modes while **Tech Lock** is active, because with **Tech Lock** the image brightness cannot be adjusted to the different dose levels in the two operating modes.

Changing the X-ray parameters manually

Activating **Tech lock** enables you to manually set kV/mA.



The set values are shown on the control panel.



- Press the +/- buttons.

  The values for kV/mA increase or decrease.

  Pressing the button for an extended period continually increases or decreases the corresponding X-ray parameter.

  Once the upper or lower limit of the setting range is reached, an audible tone is emitted. Pressing the key again has the same effect.

The mA values assigned to the kV values result from the fluoroscopy curves.

(➔ Page 253 *Curves and diagrams*)

4.4.2 Setting the image parameters

On the control units, you set the image parameters in the **Postprocessing** task card in the right area of the control panel. Changing the settings impacts the image currently displayed (if applicable) and any images acquired thereafter.

Selecting the image orientation

It may be necessary to rotate and/or flip the image so that it appears in the required orientation on the monitor.

Object display on the monitor depends upon the C-arm system position relative to the patient.

CAUTION

The image orientation may be inverted, e.g, if 2D images are displayed on external viewers.

Risk of an incorrect therapeutic decision.

- The operator must apply due diligence to correctly identify the 2D image orientation.

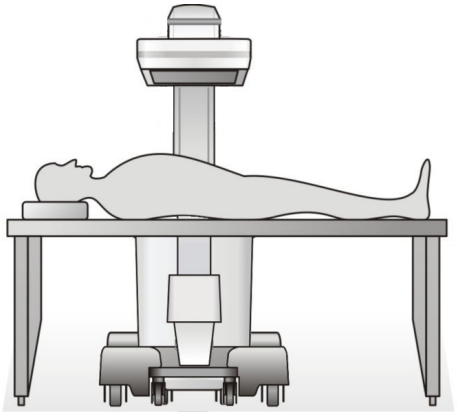
CAUTION

Inverted image orientation.

Incorrect intervention decision!

- It is recommended to mark the patient position using lead letters.

Standard image orientation





(1) Right side of patient
(2) Left side of patient

Selecting image rotation



1 Press one of these buttons.

With each short press of the button, image rotation increases 1° in the corresponding direction.

Pressing the button for an extended period continually increases or decreases the angle of rotation.

Rotation stops at 90°. If the image must be rotated further, the button must be pressed again.

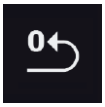


The current rotation angle is shown on the display of the control panel (display range 0° - 359°).

– or –



Use these buttons to set the angle of rotation in 90° increments.



2 Press this button to reset the angle of rotation to 0°.

Selecting image flip

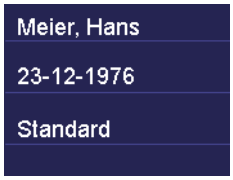


- Press one of these buttons.

  Vertical/horizontal image flip is activated.

4.5 Acquiring images

All further steps of the examination are performed at the C-arm system.
For detailed information on operating the C-arm, hand switch, and footswitch (➔ Page 45 *System Description*).



The registered patient's last name, first name and patient ID appear in the upper control area of the left monitor.

Prior to releasing radiation, make sure that the registered patient and actual patient are the same.

CAUTION

Inverted image orientation.

Risk of an incorrect decision during surgery.

- Prior to releasing radiation, ensure the correct patient position with respect to the X-ray beam.

4.5.1 Releasing radiation



- Release radiation with the hand switch or footswitch.

  The current fluoro image is displayed on the left (live) monitor.

  After radiation release switch is pressed the system will play an acoustic feedback sound until the radiation is started.

  As long as radiation is applied, a sound is played back which differs depending on the selected operating mode or dose:

  - Sound 1 for Fluoroscopy, Roadmap
  - Sound 2 for High Level Fluoroscopy, High Level Roadmap
  - Sound 3 for Single image, Subtraction

Please keep the radiation release switch pressed until radiation has been released and a usable image is displayed.

Complete image integration as a function of the set k factor (up to max. k = 32, depending on the operating mode) is ensured even for very short exposures ("toe tapping").

k factor: a number of k exposures are integrated into one image; the k factor can be set up to 32 and can be assigned to an exam set and stored (IEC 60601-2-7:1998 29.1.103 d).

CAUTION

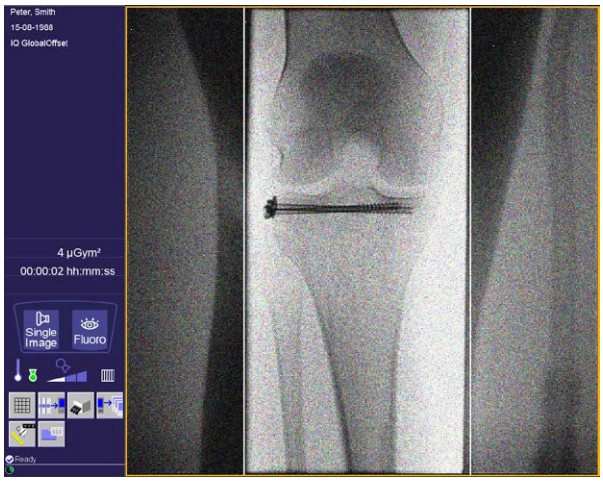
Defective imaging system hardware.

Risk of X-ray radiation exposure without a saved image!

- If no image appears, immediately stop the radiation and switch off the tube assembly.

Dose regulation indicator

At the start of radiation, the set dose value is regulated automatically to the object located in the beam path. During this phase the image impression can change gradually. The dose regulation indicator is displayed as a thin orange frame around the radiography image for as long as this process takes.



Display: "Dose regulation running"

When the control phase process is completed, the orange frame disappears.



Display: "Dose regulation successfully completed"

The dose regulation indicator provides orientation for the minimum period for which the user should release radiation to obtain a cleanly adjusted radiographic image.

The dose regulation indicator typically appears after every change of C-arm position where the automatic dose control has to adapt the dose to the new situation.

The dose regulation indicator is seen most frequently when working exclusively in single image mode and simultaneously changing the C-arm position. To avoid the poor image impression that is likely to occur in this procedure, it would be better for the user to work in fluoro mode where possible and allow the system to adjust accordingly.

Even after running the complete dose control phase, it is possible that the image impression will not meet requirements. In this case the user should implement suitable measures to adjust the image impression accordingly. (for example: change the application, modify the dose level, use **Tech lock Stop**, etc.).

The indicator also remains on continuously where necessary when the system is working at its control limit. For the available kV range, see (➔ Page 272 *X-ray generator*).

If the image impression still does not meet requirements, the user should implement the following measures where possible: for example, change the application to an "adipose" program, reduce the dose level, reduce the magnification level, avoid frame rates > 10 f/s.

Displaying fluoroscopy images

In the image area the fluoroscopic images are displayed during and after exposure. Additional information may be shown as image text, depending on the configuration.

(➔ Page 210 *Image display and print properties*)



(1) Information on kV and mA
(2) Window value and LUT information

Live images As soon as the exposure (i.e. radiation) starts, the current fluoroscopic images (live images) are displayed in the image area of the left monitor.

Last Image Hold (LIH) The left monitor displays the last fluoro image (Last Image Hold) as soon as the exposure ends.

Confirming a warning signal

After 5 minutes of fluoroscopy time, a warning signal sounds. However, this can be reset on the control panels. After 10 minutes of uninterrupted fluoroscopy time, radiation is terminated. However, it can be released again.

These settings are country-specific and can be changed by Siemens Healthineers Customer Service in accordance with the applicable regulations.



- Press the reset button (alarm icon flashes).

  The audible warning signal is deactivated.

  The fluoro timer is reset.

Temperature monitoring

If the system is used intensively over an extended period, the X-ray tube and single tank can become very hot.

Single-tank temperature



The current thermal capacity of the single tank is shown by an 11-segment bar display on the left monitor:

The length of the bar indicates the relative temperature load of the X-ray system.

X-ray tube temperature

The temperature status of the X-ray tube is shown as follows on the monitor and the control panel:



if the temperature is normal, a green tube symbol appears on the left monitor and a grey symbol appears on the control panel.



if the tube is heated, an orange tube symbol appears on the left monitor and a yellow symbol appears on the control panel.



if the tube temperature is critical, a red tube symbol with an exclamation point appears on the left monitor and a red symbol appears on the control panel.

To prevent overheating, the pulse rate for a very hot tube is limited to 10 images per second. Working with the reduced frame rate is nevertheless possible without any further restrictions.

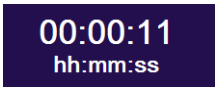
Radiation information

The DAP (dose area product) is measured by a dedicated DAP chamber which is located in the tube housing. The Air Kerma and the Air Kerma rate are calculated by the system taking into account collimator positioning and patient entrance reference point (PERP). The dose indicators (DAP, Air Kerma and Air Kerma rate) show ≤25% deviation between measured and displayed values.

The display of the accumulated dose area product (DAP) can be configured according to the national regulations:

- Gy . cm²
- dGy . cm²
- cGy . cm²
- µGy . m²
- mGy. cm²

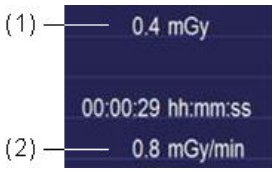
The radiation data appear on the left monitor. The fluoroscopy time is also shown on the control panel. The information is updated with every release of radiation.



Here, the entire fluoroscopic time since the start of the examination of a patient is displayed.



The cumulative dose area product for the current patient is displayed if the dose measurement chamber is installed.



As an alternative: Display of the air kerma rate (2) and cumulative air kerma value (1). These data appear on the left monitor.

The reference location for determining the air kerma strength with the optional dose measurement chamber is 30 cm in front of the flat detector input. The reason for this convention is that in typical applications the object to be examined is located approximately 30 cm in front of the flat detector.

Depending on country-specific regulations, you can have Siemens Healthineers Customer Service change the display so that it indicates the air kerma and cumulative air kerma value instead of the dose area product.

Depending on country-specific regulations, you can have Siemens Healthineers Customer Service to change the displayed unit for dose area product among several options.

Irradiation termination

For radioscopy of more than 0.5 s, the X-ray is terminated within 0.1 s after releasing the footswitch pedal or handswitch button.

For radioscopy of 0.5 s or less, X-ray is terminated within 0.5 s after releasing the footswitch pedal or handswitch button.

At low frame rates with wireless footswitch in some case the radiation may continue up to 0,150s (in order to complete last frame) after releasing the footswitch pedal.

4.5.2 Saving and displaying images

In Fluoroscopy, Subtraction and Roadmap operating modes, images can be saved manually during the examination. Images that you want to print out later have to be saved during the examination.

Images printed directly during the examination are saved automatically.

If the application used is configured such that all images are saved automatically, manual saving is not necessary and therefore not possible.

Saving images/scenes with the footswitch is also possible when the pedal allocation is configured accordingly.

Images/scenes can always be saved via the corresponding button on the wireless multifunctional footswitch (➔ Page 299 *Wireless multifunctional footswitch*).

Storing images (during radiation)



- Press this button on the control panel.

  – or –



  Press this button on the hand switch.

The current image (or the subtraction image in Sub/Roadmap mode) is stored in the local database.

The saved fluoro image is displayed on the right (reference) monitor.

Storing images (after radiation)



- Press this button on the control panel.

  – or –



  Press this button on the hand switch (press and hold < 2 seconds).

The displayed image (LIH) is stored in the local database.

The LIH is displayed on the right (reference) monitor.

Holding the key for > 2 seconds: saves the scene last recorded (LSH).

Saving and reviewing a scene

In the fluoroscopy, subtraction and Roadmap operating modes, scenes can be saved and reviewed (Last Scene Hold) during the examination.

Saving the scene



- Press this button on the control panel (hold down > 2 seconds).

  – or –



  Press this button on the hand switch (press and hold > 2 seconds).

The current scene (LSH) will be stored in the local database. In case of a restricted review range, images are saved from the starting point to the end point.

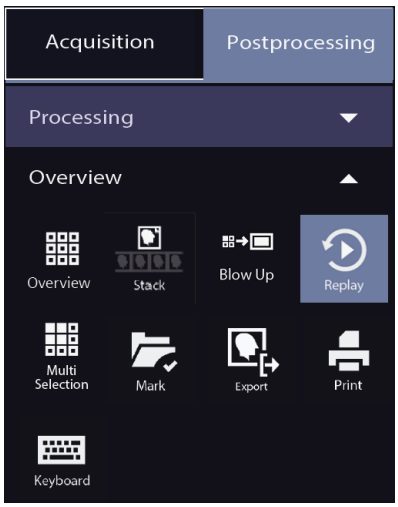
The LSH is displayed on the right (reference) monitor.

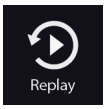
Holding the key for < 2 seconds: saves the image last recorded (LIH).

Reviewing a scene

1 Change to **Advanced Mode** if necessary

2 Open the **Overview** menu in the **Postprocessing** task card.





3 Press this button.

The scene is replayed (replay speed matches the storage rate).

The button is highlighted white.

If **Autoreplay** is configured in the application used, cine replay is started automatically at the end of the exposure.



4 Press this button again.

Scene review is paused.

The button is highlighted dark.



5 Press the button to go back/forward by a single image in the scene.



6 Press the button to play the previous/next available scene.

Changing the image display

There are tools available on the control panel for subsequent optimization of the image display.

For detailed information see (➔ Page 155 *2D image processing*).



1 Brightness



2 Contrast



3 LUT selection (3 levels)

CAUTION

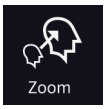
Reduced image quality due to filtering.

Risk of artifacts, e.g., metal implants can appear to be loosening phenomenon. Filters can cause loss of image quality.

- Carefully select the intensification factor, LUT and low-pass filter.



4 Edge enhancement (4 levels)



5 Zoom an image



6 Invert an image



7 Rotate an image



8 Flip an image

4.5.3 Using reference images

In addition to the live images on the left monitor, selected images, e.g. images used for comparisons, can be displayed on the right monitor.

Transferring images

Automatic

During saving, an image or scene is transferred automatically to the right monitor:



1 Save the image manually with the **Store** button (during/after radiation).

The displayed image/LIH is saved and transferred.

– or –

Save the image automatically (**Automatic save** is active).

The LIH is saved and transferred after radiation ends.



2 Save the scene manually using the **Save** button (hold down > 2 seconds).

The LSH is saved and transferred.

– or –

Save the scene automatically (**Automatic save** is active).

The LSH is saved and transferred after radiation ends.

Manual Using the **Transfer A to B** function you can transfer an image to the right monitor during or after radiation, without saving it simultaneously.

1 Change to **Advanced Mode**.



2 Press this button.

The displayed image is transferred.

Please remember that the transferred image has not been saved, and will be lost permanently if overwritten by another image.

Scrolling through images

If the **Automatic save** function is active or you have saved several times, images in addition to the displayed image are available on the right monitor.



1 Scroll to previous image/to previous scene.



2 Scroll to next image/to next scene.

Holding the reference image

The **Hold reference** function allows you to select a particular image to permanently display as the reference image on the right monitor.



1 Press this button.

The display on the right monitor is "frozen" (labeled “Hold Ref”).

The transfer of additional images and scrolling to other images is disabled on the right monitor.



2 Press the button again to cancel **Hold reference**.

Hold reference is automatically turned on for the first image transferred to the right monitor using the **Transfer A to B** button.

Hold reference is cancelled automatically when switching to image overview display.

(➔ Page 155 *Displaying the image overview*)

Hold reference is reestablished once the image overview display is closed.

4.5.4 Using “Cios OpenApps” (optional)

Cios OpenApps* allows 3rd party vendor applications to run on your system providing more integration and streamlined workflows between the imaging system and the 3rd party applications. The 3rd party applications are installed on a separate application PC which is connected to the monitor trolley.

* The Cios OpenApps is not commercially available in all countries.

The following information is referring to the Cios Select Administrator Manual.

Please check regularly the duration of your Cios OpenApps license.

After the installation of an application, wait approximately ten minutes for the background installation to complete before shutting down the system.

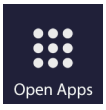
Selecting an application

Only installed and licensed Cios OpenApps applications can be selected and started. Selecting a Cios OpenApps application has to be done before starting the examination. It is not possible to change the Cios OpenApps application during an ongoing examination.

The applications installed on the system are available via a separate button which is displayed in **Advanced Mode**.

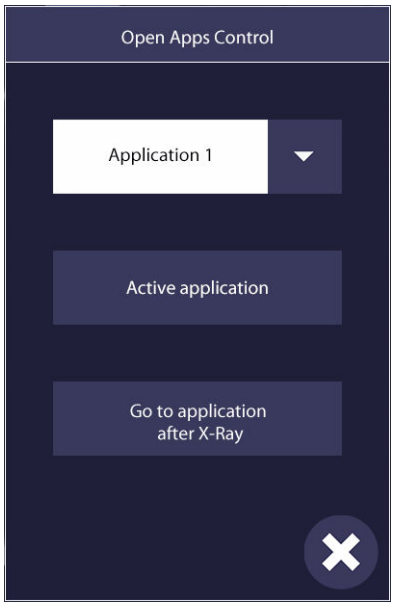
Instructions on installing Cios OpenApps applications are given in the separate operator manual “User Administration Guide”. To have a new application installed, please contact your system administrator.

Please check regularly the duration of your Cios OpenApps license.



1 Before you register a patient, change to **Advanced Mode** and press this button.

The **Open Apps Control** menu opens.



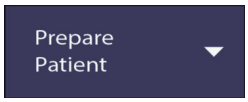


2 Select the required application.

Transferring images to the application

After activation, the user interface of the Cios OpenApps application will be displayed on the right monitor.

The system automatically closes the application when an emergency registration is performed or an acquisition is started. However, you can configure the Cios OpenApps application to resume automatically after the acquisition has ended.



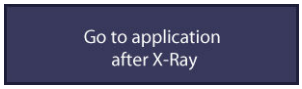
1 Open patient registration on the control panel and register the patient.

2 Define the examination settings and acquire images.

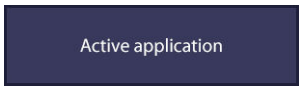
If images are acquired while the application PC is being restarted, the images are not available for transmission to the Cios OpenApps application. In this case, wait until the application PC has completely rebooted.



3 Change to the **Open Apps Control** menu.

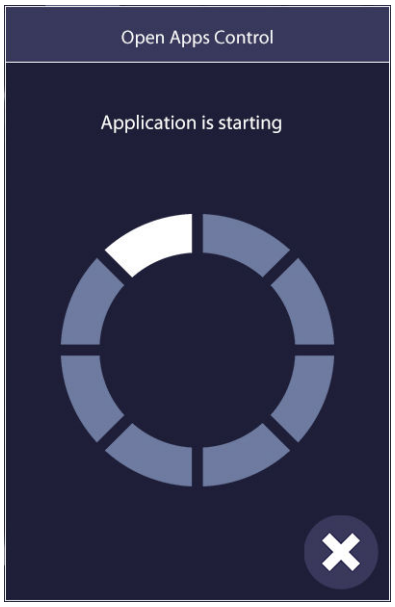


4 Press this button to activate automatic return to the Cios OpenApps application after completion of an acquisition.



5 Press this button to start the application.

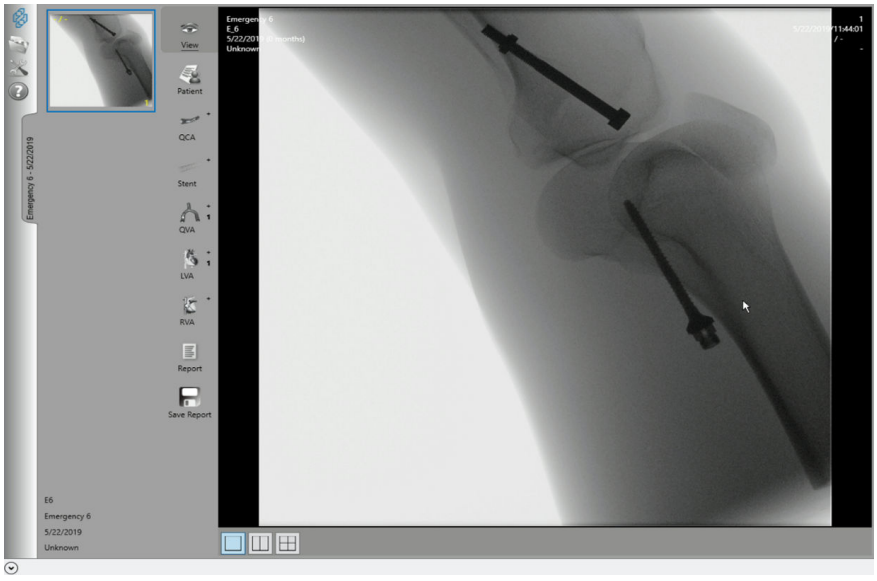
A message box is displayed on the control panels notifying that the application is being started.



The virtual keyboard appears on the control panels instead of the task cards.

Send to Open Apps

6 Press this button on the virtual keyboard to transfer the current image to the Cios OpenApps application on the right monitor.



Example of a Cios OpenApps application with an image loaded

Terminating the application

You can terminate the Cios OpenApps application in the following ways:



- Press the **Close** button on the virtual keyboard.

  – or –



  Press the radiation release key or pedal **once**.



If the radiation release key or pedal is pressed a second time, radiation will be released.

4.6 Ending the examination

After you have completed your exposures, the last acquired image is displayed on the left monitor. Now you finish the examination of the current patient.

If you want to examine the next patient immediately afterwards, you can register that patient straight away. In this case the examination of the current patient is automatically finished.

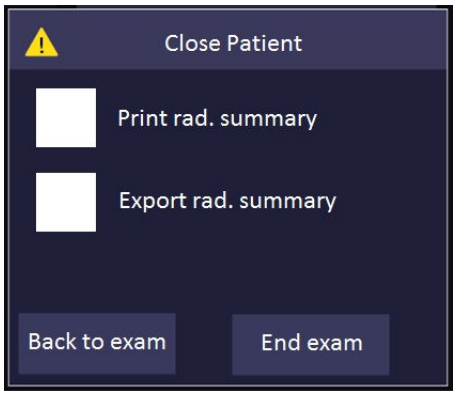
4.6.1 Closing the patient

Closing the patient ends the current examination. The patient data and images saved in a study in the local database are moved to the **Patient list**.



1 Press this button on the lower right of the control panel.

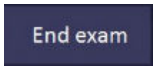
  The **Close Patient** dialog box appears on the control panel.



2 Select the desired options.

  Print rad. summary: Prints the radiation report on the default printer.

  Export rad. summary: Sends the radiation report to the default address for export.

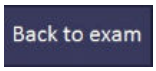


3 Press this button or press the **Close Pat.** key again on the monitor trolley keyboard.

  The MPPS documentation is automatically sent to the HIS/RIS or a network address established for this purpose.

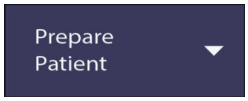
  The patient data and images are cleared from the monitors.

– or –



Press this button to continue the examination with the registered patient.

4.6.2 Examining the next patient



1 Press the **Prepare Patient** menu button.



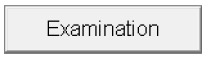
2 Press the **Registration** button from the drop-down button list.

The control panel switches to keyboard mode.

The **Data Entry Dialog** window opens on the left monitor.

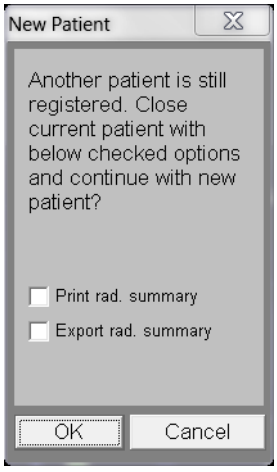


3 Register the next patient for examination.



Another patient registered

If another patient is still registered the **New patient** dialog box is displayed.



1 Select the desired options to conclude the examination (➔ Page 133 *Closing the patient*).

2 Click **OK** to close the currently registered patient.

The new patient is registered for examination.

4.7 Performing special examinations

The following optional operating modes require special procedures deviating from the standard examination:

- Subtraction angiography (Sub)
- Roadmap (Road)
- Pediatric applications

After incorrect operation, it may be necessary for the user to repeat certain procedures, e.g. administering of contrast agent.

4.7.1 Subtraction angiography (Sub)

During the examination, images without contrast agent (mask) are continuously subtracted from images with contrast agent and displayed on the monitor. Depending on the contrast agent flow, they display the relevant vascular segment without superimposition in real time.

Progression

Subtraction angiography is divided into three phases:

- Phase A

  Time until the mask is completed (2.6 seconds)

- Phase B1

  Time from the "inject" display on the monitor until the contrast agent has reached the area to be examined

- Phase B2

  Time of the actual exposure of the examination region

Performing subtraction angiography

✓ Prerequisite: The patient to be examined has been registered.

1 Make the necessary settings for the examination.

(➔ Page 110 *Defining the examination settings*)



2 Press this button on the control panel.

Subtraction operating mode is selected.

Phase A



◆ Release radiation with the hand switch or with the assigned footswitch.

During the generation of the mask the native image is displayed on both monitors.

Phase B

1 Keep the exposure release button pressed.



2 Inject the contrast agent as soon as the syringe symbol appears on the screen and control panel.

The corresponding subtraction image is displayed on the left monitor and control panel.

In the native image on the right monitor you can see the continuous filling of the blood vessel with contrast agent.

Keep the radiation release button pressed until the vessel is filled with contrast agent.

Depending on the setting of the **Landmark** function, a certain percentage of anatomical background is displayed in the subtraction images.

Fill image

◆ Let go of the radiation release button.

After radiation has been switched off the maximum fill image is calculated and displayed on the left monitor.

The vessels are highlighted in the native image on the right monitor.

The mask (phase A), subtraction series (phase B) and the fill image are saved automatically.

4.7.2 Roadmap (Road)

In the first step of the Roadmap examination, the fill image is created as a mask from a normal subtraction (phase A and phase B).

In the second step, the display of the vessel into which the catheter is to be positioned is superimposed by current fluoroscopic images (phase C).

Fill image available

You can use the existing fill image if you have already performed a subtraction angiography during the current examination (➔ Page 136 *Roadmap (Road)*).



The availability of the fill image is shown on the Road button and on the footswitch icon on the monitor. In that case, the first step of the Roadmap examination is not required.

A previously created fill image can also be used if you have switched to a different operating mode (such as single image).

Generating a new fill image

If there is no suitable fill image (e.g. from a previous subtraction angiography), you have to generate a new one.

✓ Prerequisites: The patient to be examined has been registered.

1 Make the necessary settings for the examination (➔ Page 110 *Defining the examination settings*).



2 Press this button.

The **Roadmap** mode is selected.

Phase A



◆ Release radiation with the hand switch or with the assigned footswitch.

During the generation of the mask the native image is displayed on both monitors.

Phase B

1 Keep the exposure release button pressed.



2 Inject the contrast agent as soon as the syringe symbol appears on the left monitor.

In the native image on the right monitor you can see the continuous filling of the blood vessel with contrast agent.

The corresponding subtraction image is displayed on the left monitor.

Keep the radiation release button pressed until the vessel is filled with contrast agent.

Fill image

1 Let go of the radiation release button.

Radiation is stopped.

The fill image is calculated and displayed.

2 Start positioning the catheter (➔ Page 138 *Positioning the catheter (Phase C)*).

Using the fill image from subtraction angiography

✓ Subtraction angiography (**Subtraction** operating mode) was performed at some point during the current examination.



1 Press this button.

The **Roadmap** mode is selected.

2 Start positioning the catheter (➔ Page 138 *Positioning the catheter (Phase C)*).

If you press the **Sub** button, the existing fill image is discarded. You will then have to regenerate the fill image.

Manually selecting the fill image

✓ Prerequisite: A substraction data set (substraction or Roadmap operating mode) was generated in the current examination.

Fill image with another mask

To calculate a new fill image you have to determine a suitable substraction mask that can be used.



1 Press this button.

The button is highlighted white.

The **Select Mask** menu appears.



2 Select the required image with the arrow buttons.

Pressing the arrow repeatedly takes you incrementally from image to image. The fill image is recalculated automatically.

Positioning the catheter (Phase C)

If the vessels are easily discernible, position the catheter in the fill image under fluoroscopy.



1 Release radiation with the hand switch or with the assigned footswitch.

2 Position the guidewire or the catheter under fluoroscopic control.

The right monitor shows the fluoro image (native).

The left monitor shows the subtracted Roadmap image with catheter.

You can repeat fluoroscopy as often as needed while you insert the catheter.

4.7.3 Using the Target Pointer (optional)

Target Pointer displays an overlay trajectory that helps surgeons to optimally position k-wires or other devices.

This application enables the automatic detection of K-wires and displays the trajectory as a projection to the opposite edge of the image. Displaying the trajectory is intended to help the surgeon to better predict the position of the K-wire in an early phase of the insertion.

For **Single Image** and **Fluoro** acquisition modes, an additional button is available in the **Acquisition** task card for activating the Target Pointer application.

CAUTION

Time gap between display of K-wire including overlay grafic and real moved K-wire.

Risk of wrong interventional decision.

- Duty of care for operator, that he/she shall be aware of this possible mismatch.

CAUTION

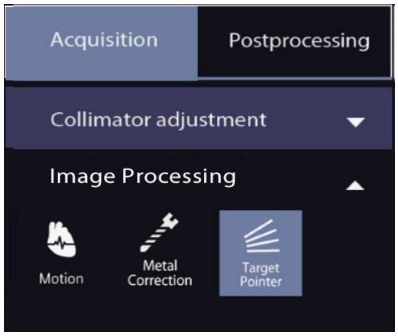
Overlay itself may hide K-wire in live X-ray image (depends on thickness of K-wire and overlay configuration).

Risk of wrong interventional decision.

- Target Pointer can be switched-off (toggle ON/OFF) to allow free view on X-ray live image.

1 Change to **Advanced Mode** if necessary.

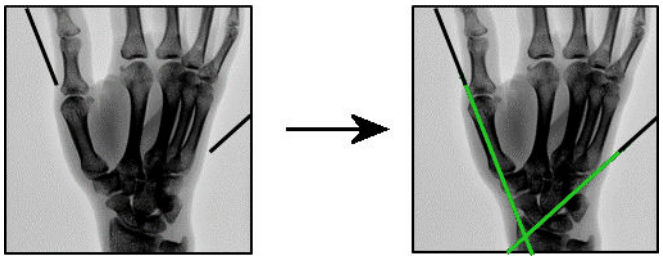
2 Open the **Image Processing** menu in the **Acquisition** task card.





3 Press this button to switch the Target Pointer on.

The trajectories of all detected K-wires will be displayed in **Single Image** or **Fluoro** acquisition mode.





4 Press the activated button to switch the Target Pointer off.

In case the initial detection of the first K-wire is insufficient (e.g. non-recognition or display of flickering, green, false-positive lines), it can be helpful to make another metallic object (e.g. a surgical clamp or another K-wire) visible in the work area.

4.7.4 Pediatric use

The Cios Select may be used for pediatric purposes. Use special care when imaging patients outside the typical adult size range.

The Cios Select provides

- a removable anti-scatter grid
- specific pediatric applications

We suggest using the available special applications for pediatric use in the application database delivered with the system. There are individual pediatric applications for each application group of the default application database. These default pediatric applications may be used for basis of the examination for all pediatric patients (in general for children up to the age of 14 years).

It is recommended to remove the anti-scatter grid for all pediatric patients up to the age of 7 years as well as all medical applications that are restricted to extremities.

For pediatric patients older than 7 years an anti-scatter grid is recommended otherwise image quality may be compromised.

If depending on patient stature the kV increases above 100 kV it is suggested to switch to the corresponding adult program (otherwise image quality may be compromised).

Depending on the medical needs for your individual examination please consider further dose savings measures, such as reducing the frames per second as low as possible and reduce the irradiation time as much as possible (also see guidelines of the Image Gently Step Lightly campaign as well as the FDA recommendations for pediatrics).*

* Reference to the Image Gently Pause and Pulse campaign materials: http://www.imagegently.org/Procedures/Fluoroscopy/Pause-and-Pulse-Resources

Additional information on pediatric use can be found on the FDA web site: https://www.fda.gov/radiation-emitting-products/medical-imaging/pediatric-x-ray-imaging

Following these suggestions will lead to a minimalized dose for the patient.

For an orientation of dose savings please see the following table with a comparison between pediatric and standard protocols:

Object: 10 cm PMMA directly located on the image receptor cover (without anti-scatter grid for pediatric programs)

	Fluoro		**Sub**	
Application (Group)	**Standard - Dose rate (mGy/min)**	**Pediatrics - Dose rate (mGy/min)**	**Standard - Dose rate (mGy/min)**	**Pediatrics - Dose rate (mGy/min)**
Card.	1.4	0.2	1.6	0.4
Gastro	1.4	0.2	1.5	0.2
General information	0.8	0.2	1.1	0.2

	Fluoro		Sub	
Application (Group)	**Standard - Dose rate (mGy/min)**	**Pediatrics - Dose rate (mGy/min)**	**Standard - Dose rate (mGy/min)**	**Pediatrics - Dose rate (mGy/min)**
Ortho	0.8	0.2	1.1	0.2
Uro	0.8	0.2	1.1	0.2
Vascular	0.8	0.2	1.0	0.2

For these existing pediatric applications we recommend to use the following settings with these groups of pediatric patients.

The age of a pediatric patient is not the only indicator which needs to be considered by choosing the best x-ray settings for a child. Other factors, such as the patient's weight, body size, and physiological and neurological development may be more appropriate indicators than chronological age.

Recommendations for pediatric patients:

Age	Example	Recommended settings
Neonate/birth - 1 month	e.g., 1-2 kg (2.2-4.4 lb) low end estimate	Please use the 2D application with the name "pediatrics" and please use only the "low dose" preset and no grid.
0-1 year	e.g., 1 year old, ~11 kg (24 lb); recumbent length 100 cm (39.4 in.)	
1-2 year		
2-6 years	e.g., 5 years old, ~21 kg (46 lb); 113 cm (44.5 in) standing height	Please use the 2D application with the name "pediatrics" and please use only the "medium dose" preset and no grid.
7-16 years	e.g., 12 years old, ~52 kg (115 lb); 156 cm (61.5 in) standing height	Please use the 2D application with the name "pediatrics" and please use only the "medium dose" preset with a grid.
16+ years and adults	~80 kg (176 lb); standing height 170 cm (67.0 in)	Please use the normal "adult" programs for all acquisition types.

5 Postprocessing

5.1 Patient data 144
5.1.1 When to use the Patient list 144
5.1.2 External data 144
5.1.3 Searching for and selecting patient data 144
Flag 145
Opening the Patient list 146
Sorting data 146
Filtering data 146
Selecting data 147
5.1.4 Correcting data 147
Opening the correction dialog 147
Data Entry Dialog window 148
Editing data 148
5.1.5 Deleting data 149
Deleting data manually 149
Protecting data from deletion 150
5.1.6 Importing data 150
Import dialog 151
Opening the import dialog 151
Data from removable devices 151
Data in the network 152
5.2 2D image processing 155
5.2.1 Loading and displaying images 155
Loading images 155
Displaying the image overview 155
Changing the display mode 157
Scrolling 157
Displaying full screen image 158
Reviewing a scene 158
5.2.2 Selecting images 159
Single selection 159
Multiselection 159
Deselecting images 160
5.2.3 Deleting individual images/series 160
5.2.4 Changing the image display 161
Selecting images for processing 161
Windowing images 161
Inverting images 163
Enhancing edges 163
Zooming and panning images 163
Rotating/flipping images 165
Resetting the image display 165
5.2.5 Evaluating images 166
Selecting images for evaluation 166
Displaying the evaluation functions 166
General work steps 167
Calibration 167
Measuring the distance 169

Measuring an angle 170
Annotating images 171
5.2.6 Saving images 173
Saving a single image 173
Saving multiple images 173
5.3 Subtraction processing 173
5.3.1 Postprocessing functions 174
5.3.2 Loading and displaying images 174
Loading images 174
Changing the monitor layout 174
Displaying images 175
5.3.3 Changing the image display 176
Including anatomical background (Landmark) 176
Making the image and mask coincide exactly (Pixel shift) 177

5.1 Patient data

All acquisitions (images, series) prepared as part of an examination are saved in a study on the hard drive of the imaging system (local database). You can access these data quickly and easily using the **Patient list**.

5.1.1 When to use the Patient list

- To examine a patient who has already been examined once before with your system and whose data are still saved in the local database

  (➔ Page 105 *Registering previous patients*)

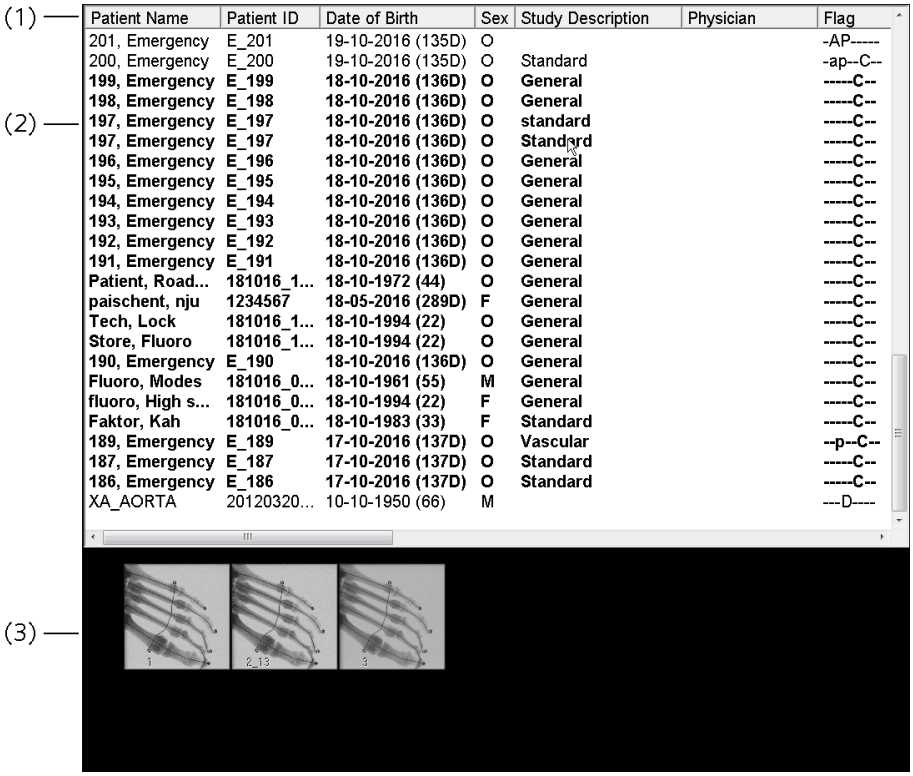
- To view the images of a patient from earlier examinations in order to compare them with current results
- To postprocess or add comments to images after an examination
- To correct incorrect information on a patient stored in your system
- To print a patient's images for documentation purposes
- To archive patient data and images or to send them to another location in your hospital via the network

5.1.2 External data

To view or process data from an external storage medium or other network node, they first have to be imported.

5.1.3 Searching for and selecting patient data

The studies of patients examined previously that are saved to the local database are displayed in the **Patient list**.



(1) Table heading
(2) Study entries (list of patients and their studies)
(3) Preview images of the selected study

Flag

An abbreviation in the **Flag** column indicates the study status:

Flag	Meaning
A/a	All/some images were sent to the archive and the receipt was confirmed (as long as the archive works with DICOM Storage Commitment)
C	Study is closed (no further acquisition possible)
D/d	All/some images were transferred to or from CD/DVD
P/p	All/some images were printed
R/r	All/some images read in via network
S/s	All/some images were sent and the receipt was confirmed(as long as the recipient works with DICOM Storage Commitment)
#	Study is protected against deletion
*	Study was received from HIS/RIS

Opening the Patient list



1 Press the **Prepare Patient** menu button.



2 Press this button from the drop-down button list.

The control panel switches to keyboard mode.

The **Patient list** opens on the left monitor.

Sorting data

You can sort list entries according to the displayed columns:



1 Click the table header for the respective column.

The list is sorted in alphanumeric ascending order based on this column.

Studies with the same entry in the sorting column are further sorted by the date and time of the examination.

2 Click the table header of the same column again.

The sorting sequence is reversed.

Filtering data

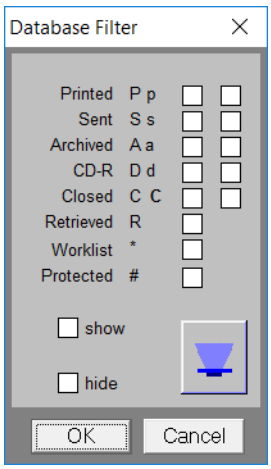
It is possible to only display studies that meet specific criteria by using database filters. The **Flags** of the individual studies are evaluated in this case.

Activating a filter



1 Press this button in the symbol button bar on the control panel.

The **Database Filter** window appears on the left monitor.



2 Activate the required check boxes.

show: only display studies with the selected flag

hide: hide all studies with the selected flag

3 Confirm with **OK** to apply the filter.

You can specifically delimit the list display by combining multiple filter criteria. Example: **Printed** together with **Archived** shows the studies that have been printed but not yet archived.

Deactivating the filter



1 Press this button in the symbol button bar on the control panel.

The **Database Filter** window appears on the left monitor.



2 Click this button in the **Database Filter** window.

All studies are displayed in the **Patient list**.

Selecting data

Searching by the first letter

1 Using the keyboard in the control panel, press the first letter of the required patient.

The first name with a suitable patient name is selected in the **Patient list**.

2 Press this same letter button again, to select the next list entry for a patient with this first letter.

Direct selection



- Use the arrow buttons on the keyboard to select the required study.

– or –

Click the list entry with the mouse.

5.1.4 Correcting data

Every now and then it is necessary to correct patient data for an examination. This is the case particularly with emergency patients that are saved to the local database with provisional data.

Patient data in studies you have already exported or sent via the network cannot be changed in the local database.

Opening the correction dialog

Patient and exam data are corrected in the **Data Entry Dialog** window.



1 Select the study entry to be corrected in the **Patient list**.

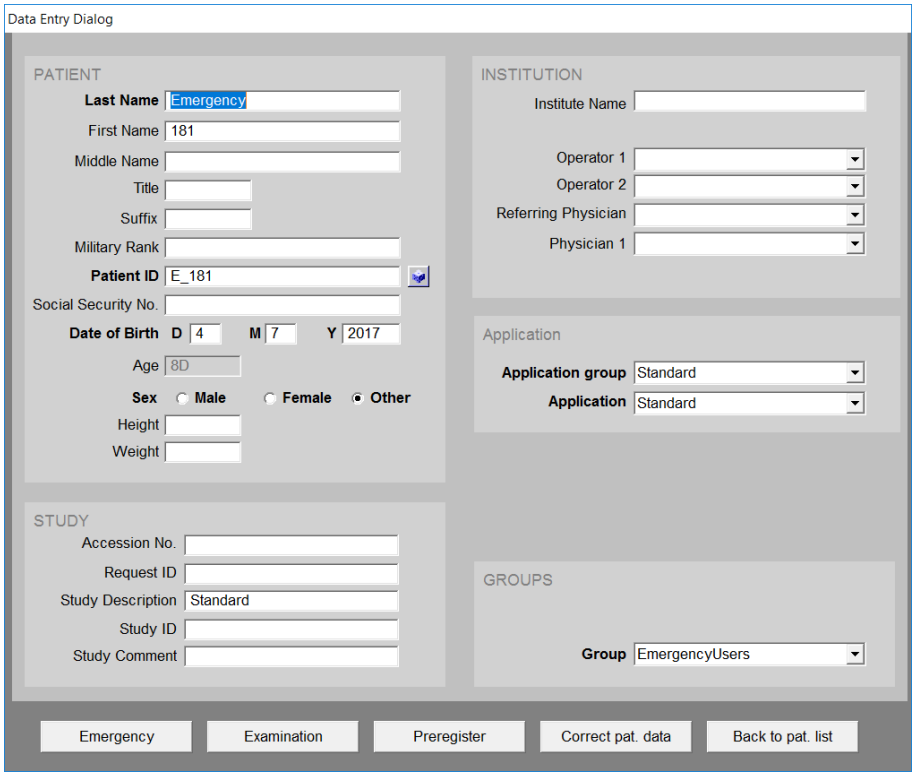


2 Press this button.

The data of the selected patient are transferred to the **Data Entry Dialog** window.

Data Entry Dialog window

Patient and exam data of the selected study saved in the local database are entered in the **Data Entry Dialog** window.



Editing data

Which fields are displayed and therefore can be corrected depends on the configuration settings.

(→ Page 204 *Patient registration*)

Changing fields



- Use the **Tab** button (hold down the **Shift** button to go backward) or click the mouse to switch to the required field.

Correcting the entry



1 On the control panel press the arrow button of the text field to move the cursor character-by-character.



2 Press this button to delete the character in front of the cursor.

– or –



Mark the incorrect characters with the arrow buttons while holding the **Shift** button, and overwrite with the keyboard.

Saving changes



◆ Press this button on the control panel.

– or –



Click this button in the **Data Entry Dialog** window.

The **Data Entry Dialog** window closes.

The **Patient list** is updated based on the changes.

5.1.5 Deleting data

You should delete archived images you no longer need from the local database on a regular basis. This ensures sufficient storage capacity on your system.

You can delete data as follows:

- Automatic deletion

  Depending on the configuration settings, images are deleted once they reach a specific status.

- Manual deletion

  You can individually select studies and delete regardless of data status

Deleting data manually



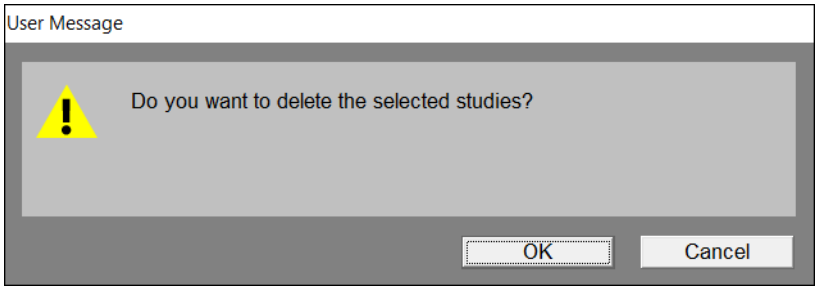
1 Select the entry to be deleted in the **Patient list**.

2 Make sure that the selected study has been archived correctly.



3 Press this button on the control panel.

Below messages pop up on the monitor.



4 Click **OK**.

The selected study and all its images are deleted.

During image postprocessing, you can delete individual images or series of a study using the image overview (➔ Page 160 *Deleting individual images/series*).

Protecting data from deletion

You can protect images on the local database against unintentional manual deletion and automatic deletion.

Setting deletion protection



1 In the **Patient list** select the entry you want to protect against deletion.



2 Press this button on the control panel.

The button is highlighted white.

Removing deletion protection



1 Select the deletion-protected entry in the **Patient list**.

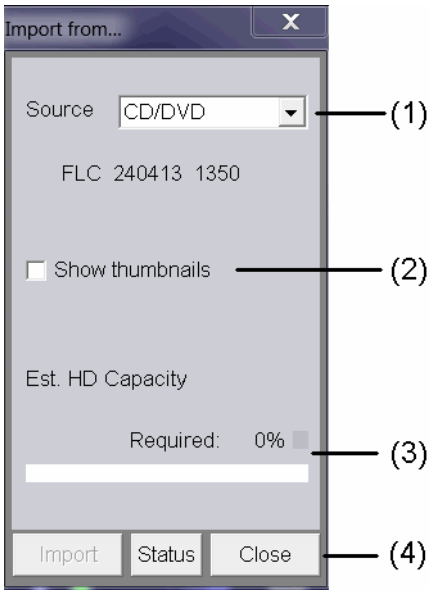


2 Press this button in the symbol button bar on the control panel.

5.1.6 Importing data

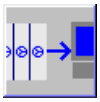
If the required patient data and images are on removable devices or other network nodes, import them to the local database. The data are then available in the **Patient list**.

Import dialog



(1) Data source selection
(2) Display thumbnails
(CD/DVD and USB storage media only)
(3) Disk space required on the hard drive
(CD/DVD and USB storage media only)
(4) Button bar
Import: Starts data import
Status: Displays the data transfer status
Close: Closes the dialog window

Opening the import dialog



- Click this button on the left monitor (lower left).

  The **Import from...** dialog window is displayed.

Data from removable devices

Image data on a data medium in DICOM format can be read in as long as an appropriate drive is installed and configured.

Displaying saved data

1 Have the required data medium on hand.

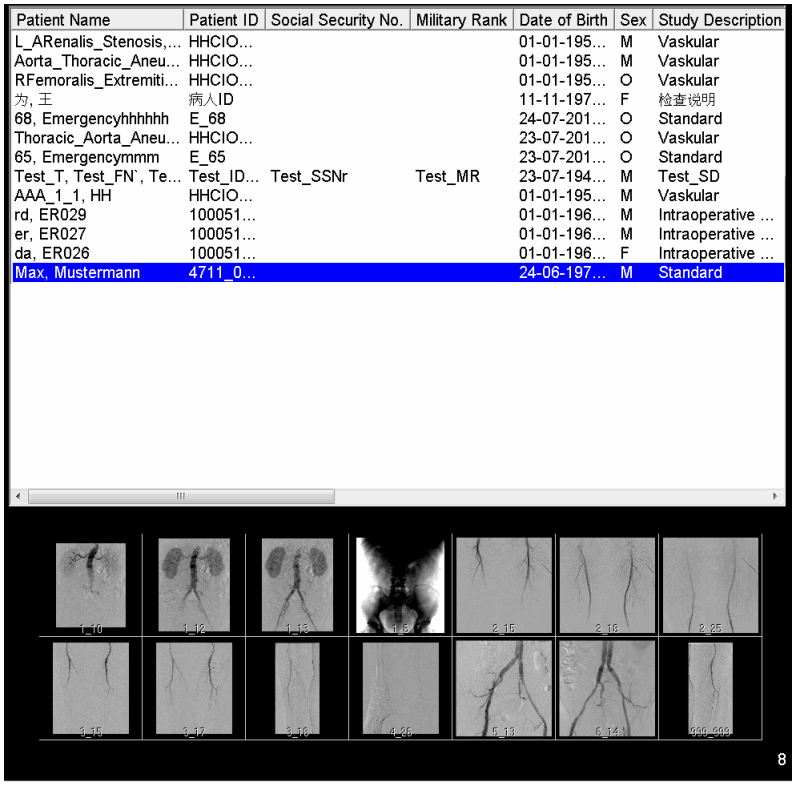
Insert the CD/DVD into the drive.

Connect the USB memory to the USB socket.

2 Select the applicable data medium as the data source in the **Import from...** dialog window.

The studies saved on the data medium are listed.

If activated, thumbnails are displayed for the currently selected study.



Example: Displaying the content of USB

Importing data

1 Click the required study with the mouse.

Press the **Ctrl** or **Shift** button on the keyboard to select multiple entries.



2 Click this button in the **Import from...** dialog window.

The data are read in.

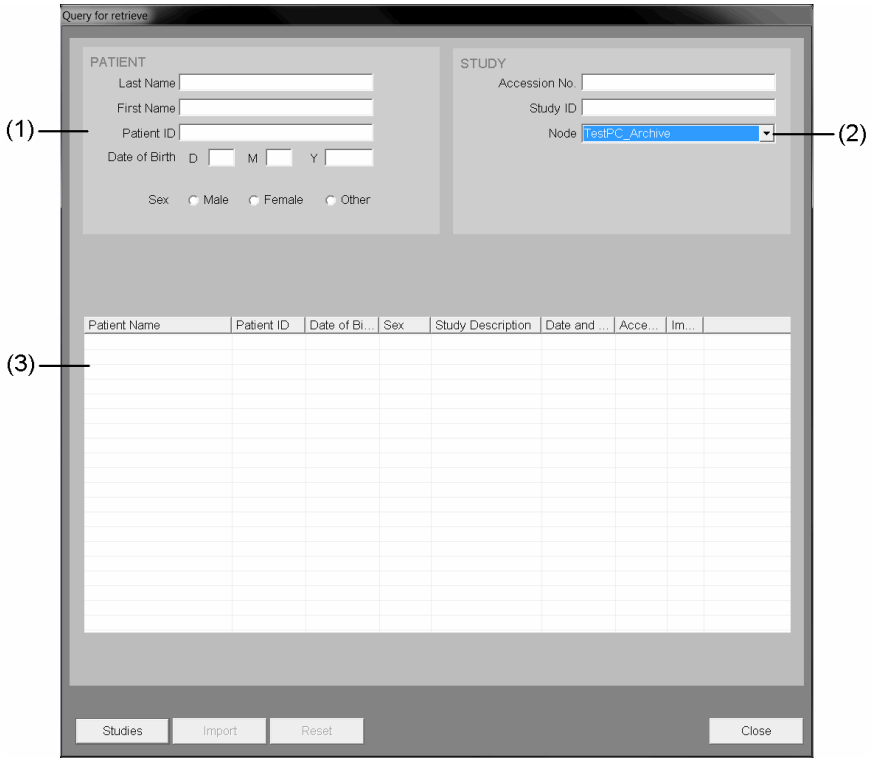
Data in the network

You can access image data on other workstations or a long-term archive using "Query & Retrieve".

Opening "Query & Retrieve"

- In the **Import from...** dialog window select the **DICOM node** entry as the data source.

  The **Query for retrieve** dialog window is displayed.



(1) Input fields for search criteria (search screen)
(2) Network node selection (data source)
(3) List of search results

Starting a search

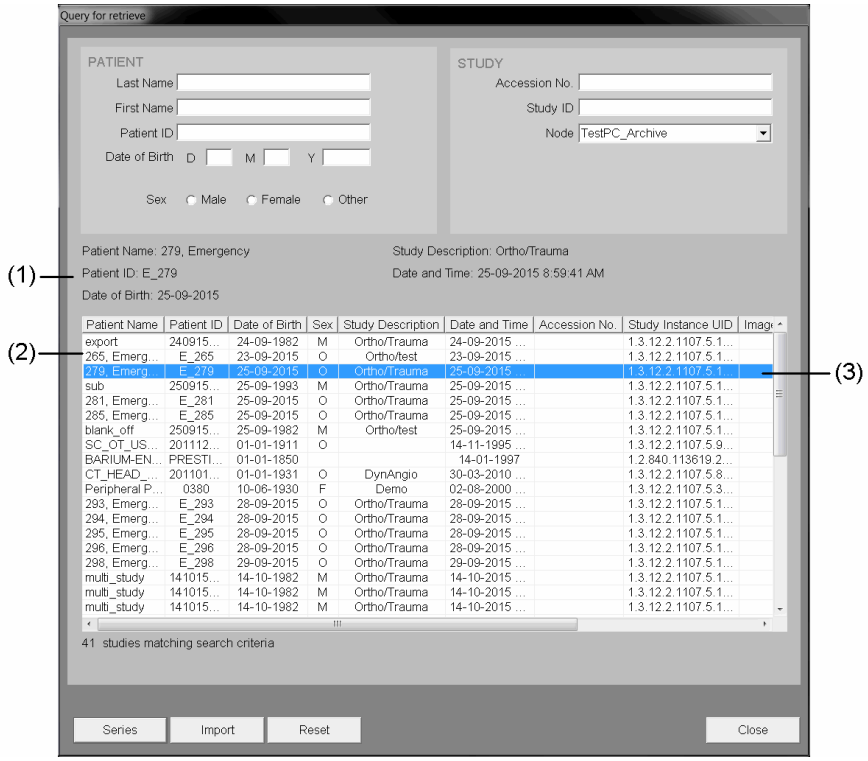
1 As search criteria enter the known patient data and further search details, if necessary.

2 Select the network node where you want to search for the data.



3 Click this button.

The patients and studies found are listed in the result area.



(1) Details on the study currently selected in the results list
(2) List of found patients and studies
(3) Currently selected study

Displaying series

If you only require a selection of images from a specific study, then display the series contained in the study.

1 Select the corresponding study in the results list.

Series

2 Click this button.

All series of the selected study are listed in the results area.

Use this button to display the list of found patients and studies again.

Studies

Importing data

1 Select the required data (studies or series) in the results list with the mouse.

Press the **Ctrl** or **Shift** button on the keyboard to select multiple entries.

Import

2 Click this button.

The data are read in.

5.2 2D image processing

As part of postprocessing, you view the results of an examination and evaluate them using 2D processing functions. You can also compare the image material from various examinations of a patient (such as the current examination and a previous examination).

5.2.1 Loading and displaying images

During an examination in progress you can only edit images of the registered patient. Outside of an examination, you can load the images of any patient for processing.

Loading images

In the **Patient list** you have access to the images of prior examinations stored on the local database. Select one or more studies of the required patient here.

With an examination in progress, all saved images are already loaded. If needed, you can load additional images from prior examinations of the registered patient.

If the required images are no longer in the local database, then first import the data from the external source.



1 Press the **Prepare Patient** menu button.



2 Press this button.

3 Search for the patient, sorting and filtering the list as necessary.

4 Double-click the patient with the mouse.

The selected images are loaded and displayed on the monitors.

Displaying the image overview

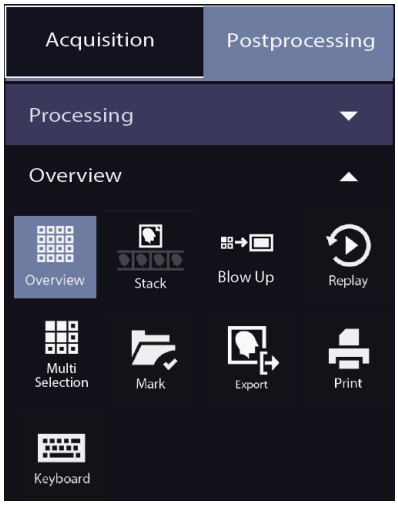
In the image overview display, the monitor layout changes specifically for 2D-postprocessing. You have direct access to all loaded images and you can select them for processing either individually or in any combination.

Activating the overview

If a patient is not registered the images are displayed in the image overview after loading. With an examination in progress, you may need to switch from the live image display to the image overview display.

1 Change to **Advanced Mode** if necessary.

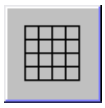
2 Open the **Overview** menu in the **Postprocessing** task card.





3 Press this button on the control panel.

– or –



On the left monitor click the 4x4 Layout button (lower left).

Monitor layout

The following views are set on the monitors by default:

- Left monitor
  - 4x4 layout with all loaded images, sorted by exposure time
  - Stack display
  - 1st series selected (1st image segment is highlighted)
- Right monitor
  - 1x1 display of the (selected) 1st series

Switching off the overview

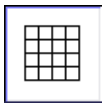
The image overview can only be switched off during an examination in progress.



◆ Press this button again.

The live image display is activated.

– or –



On the left monitor click the activated 4x4 Layout button (lower left).



The system switches to live image display automatically during radiation release.

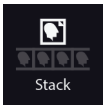
Changing the display mode

You can select from among the following displays of loaded images on the left monitor:

- Stack display: One series per image segment
- Image stripe display: One image from the selected series per image segment

Selecting stack display

Stack display is suitable as an overview of loaded studies and for direct comparison of images from several series.



◆ Press this button in the **Overview** menu.

Selecting image stripe display

Image stripe display is suitable for viewing a selected series in detail (image by image).



◆ Press this button in the **Overview** menu.

In stack display, image segments that contain a scene are identified by an icon at the bottom right. Double-clicking the scene switches to image stripe display.

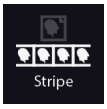


Scrolling

In the **Overview** menu you establish which image should be displayed on the right monitor.

Changing image/series





1 Select the suitable display mode:
   - Image stripe display if you want to show a different image in the current series.
   - Stack display if you want to display a different series.
2 Use the mouse to scroll until the desired image or series appears in the image overview on the left monitor.
3 Click the relevant image segment.

   The selected image is displayed on the right monitor.

Next/Previous series

If you want to show images of another series in image stripe display, you can scroll through the series without switching to stack display.



◆ Press one of the buttons repeatedly if necessary.

Displaying full screen image

Basically, the image selected in the overview is displayed as a full image on the right monitor. However, if the **Hold reference** function is active the monitor display remains unchanged. In this case use the **Blow Up** function to display the required image in full size on the left monitor.

Activating full image



- Press this button in the **Overview** menu.

Using the Next/Previous series buttons you can switch to other series in full image view.

Switching off full image



- Press this button again.

  The image overview on the left monitor switches into the most recent display mode (stripe or stack).

Outside of an ongoing examination (no patient registered), you can turn full image view on and off using the activated 4x4 layout button (lower left of screen).



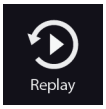
Reviewing a scene

After an examination, you can start movie mode to check the quality of the scenes you acquired.

A scene is usually reviewed on the right monitor. If **Hold reference** is active, the review takes place on the left monitor. The system switches automatically to 1x1 layout.

Starting the review

1 Show the required scene.



2 Press this button in the **Overview** menu.

  The scene is replayed (replay speed matches the storage rate).

Scrolling image by image



1 Press this button to stop the review process.



2 Press one of these buttons to go backward/forward by a single image.

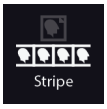
Different scene



- Press one of these buttons to go to the previous/next scene.

5.2.2 Selecting images

You have to select images before you edit them. Single and multiple selections are possible.





- Select the suitable display mode::
  - Image stripe display if you want to select multiple images in the current series.
  - Stack display if you want to select one or more series.

Single selection

- Click the required image or series with the mouse.



If the left monitor has been changed to full image mode, the image displayed there is selected.

Multiselection

Multiselection enables you to select images from one or more series individually. Images of a multiselection are marked on both monitors by a white dot.

Individual images/series



- Click the desired image or series with the mouse and press this button in the **Overview** menu.

  Repeat the above steps until all the required images or series have been selected.

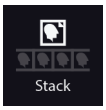
Sequential images/series



- Press this button in the **Overview** menu.

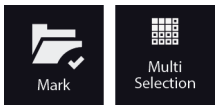
  Click the desired images/series with the mouse until all the desired images or series have been selected.

Supplementing the selection





1 Switch the display mode if necessary.



2 Select additional images/series using the two buttons.

The newly selected images/series are added to the multiselection previously defined.

Deselecting images



- Click the selected image or series with the mouse and press this button.

  The withe dot mark on the image or series disappears.

  – or –



  Press this button and click the selected images/series with the mouse.

  The withe dot mark on the image or series disappears.

5.2.3 Deleting individual images/series

While the **Patient list** is used to delete complete studies (➔ Page 149 *Deleting data*), you can use the image overview to select individual images or series for deletion.



1 In this case switch into stack display.



2 Switch into keyboard mode and press the **Alt** + **d** buttons.

A message box is displayed on the left monitor.





3 Click the images/series to be deleted in the image overview.

The selected images are marked with an **X**.

4 Click **OK** to delete the selected images.

5.2.4 Changing the image display

In the loaded images you can adapt the window values (contrast and brightness), display enlarged sections, and center regions of interest in the middle of the image. You can also rotate, flip or invert images for certain diagnostic problems.

Image manipulation capabilities are limited for images imported from other modalities.

CAUTION

Incorrect or extreme image processing parameters.

Risk of limited image quality in the resulting X-ray images. Risk of incorrect decision during intervention or artifacts.

- Apply image processing parameters carefully, such as edge enhancement and windowing, and always check them carefully.
- Always check the image quality before reaching an interventional decision.

Selecting images for processing

Changes in image display affect all images of an individual series. The image functions cannot be applied to multiple series at the same time.

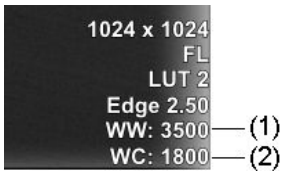
- Display an image of the required series (single selection).

Windowing images

Using the windowing settings, you establish a grayscale range in which the image is displayed. This enables you to highlight the region of interest and the relevant tissue type.

During windowing you optimize image brightness (shifting the windowing center along the grayscale) and image contrast (change of window width).

The set window values are shown at the bottom right in the image.



(1) **WW**: Window width – Contrast
(2) **WC**: Window center – Brightness

Changing window values

1 Change to **Advanced Mode** if necessary.

2 Open the **Processing** menu in the **Postprocessing** task card.





3 Press one of these buttons to reduce/increase the brightness.

Holding the button down will continuously reduce/increase the brightness.



4 Press one of these buttons to reduce/increase the contrast.

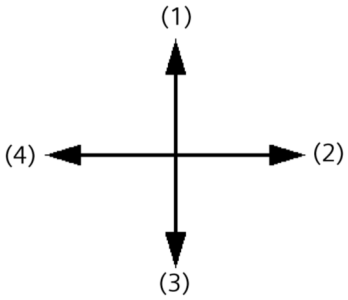
Holding the button down will continuously reduce/increase the contrast.

The controllers set numerical brightness values. Whether the image impression turns out brighter or darker depends on which display is selected (bone black or white).

Windowing using the mouse

1 Place the mouse pointer in the required image on the left monitor.

2 Move the mouse with the center mouse button pressed:



(1) Brightness - (Center +)
(2) Contrast – (Width +)
(3) Brightness + (Center -)
(4) Contrast + (Width –)

Fixed window value settings (LUTs)

Using window value settings, you can select three predefined settings for the window values using LUTs (look up tables). The values can be configured specifically for an application.



- Press this button, multiple times if necessary, to switch between the LUTs.

Inverting images

When an image is inverted, bright areas in grayscale images are displayed dark and dark areas are displayed bright. You use this function to toggle the bone display between white and black, for example.



- Press this button.

  Image inversion is switched on.

Enhancing edges

Edge enhancement is an adaptive filter that highlights all existing structures (edges) in the image. For very noisy images, setting edge enhancement to its lowest level or switching it off entirely is recommended.



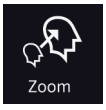
- Press this button several times, if necessary.

  Every time the button is pressed, the filter setting changes to low, medium, high, or off.

Zooming and panning images

You can zoom in on sections of images that you are particularly interested in (zooming). The zoomed image can be panned so that the relevant section is in the center of the image (panning).

Zooming the image



- Press this button several times, if necessary.

  Each time the key is pressed, the zoom level changes, i.e. from 1 (full image) to 1.5, to 2.

Panning the image

After zooming, if the relevant image area is outside the image segment, pan it accordingly.

- Press the arrow button for the direction in which the image content to be displayed is located.





Pan image up/down



Pan image left/right

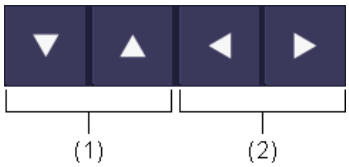
Image panning is possible only with a zoom factor > 1x.

– or –



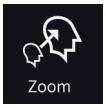
Open the keyboard by pressing the button under the **Overview** menu in the **Postprocessing** task card.

Press the arrow button for the direction in which the image content to be displayed is located.



(1) Pan image up/down
(2) Pan image right/left

Resetting Zoom/Pan



- Press this button.

  The original image display is restored.

Rotating/flipping images

The rotation and flip functions allow you to easily compare images of series that were acquired in a different orientation.

Selecting the image rotation



- Press one of these buttons.

  With each short press of the button, image rotation increases 1° in the corresponding direction.

  Pressing the button for an extended period continually increases or decreases the angle of rotation.

  – or –



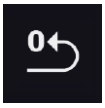
  Press this button.

  The image rotates clockwise among 0°, 90°, 180° and 270°.

Rotate using the mouse

1. Place the mouse pointer on the edge of the required image on the left monitor.
2. Drag the mouse pointer in the required direction of rotation.

No image rotation



- Press this button.

  The angle of rotation is reset to 0°.

Flipping an image



- Press one of these buttons.

  The image is flipped vertically/horizontally.

Resetting the image display

If adjusting the image parameters did not produce the desired results, you can reset the processing steps of the current session. All images are then returned to their original state.

- During an examination in progress: Status after image acquisition or after saving
- Outside an examination: Status after loading or after saving



After resetting, all changes in the image display are irrevocably lost.



1 Press this button.

A confirmation dialog box is displayed on the control panel.





2 Press **Yes** to reset the images.

– or –



Press **No** to close the dialog box without changes.

5.2.5 Evaluating images

Using graphical evaluation functions you can measure distances, lengths, and angles of relevant structures, as well as add annotations. The left monitor switches automatically to 1x1 layout. When the evaluation is finished the original monitor layout is restored.

Measurements are not possible for images imported from other modalities.

Selecting images for evaluation

Graphical evaluations can only be performed on a single image at a time.

- Display the required image (single selection).

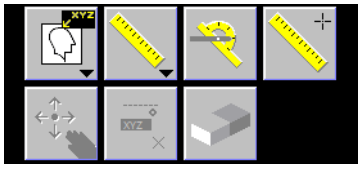
Displaying the evaluation functions

When you evaluate images on the monitor trolley you can perform all evaluation functions directly on the left screen with the mouse. You use the keyboard only to enter text.



1 Click this button on the left monitor (lower left).

The buttons for evaluation with the mouse are displayed (upper left).



2 Click the button for the required function.

The control panel switches to keyboard mode.

General work steps

During graphical evaluation you use graphic objects (such as lines and text fields) that you draw in the image on the left monitor. The graphic objects are saved in the image automatically.

The following presents the basic steps you will use with graphic objects regardless of the evaluation function.

Selecting

You must select an existing graphic object to process it.



1 Click this button.

The "Selection" function is activated.

2 Click the graphic object.

Highlighting of the reference points (vertices, center point) indicates that the graphic object is selected.

Panning

1 Select the graphic object.

2 Press the mouse button and drag & drop the center point to the required position.

Changing dimensions

1 Select the graphic object.

2 Press the mouse button and drag & drop the vertices in the required direction.

Deleting (individual)

1 Select the graphic object.



2 Click this button.

The selected graphic object is deleted.

Deleting (all)



- Click this button.

All graphic objects in the image are deleted.

Calibration

If you perform evaluations with distance measurements, you must calibrate the image.

CAUTION

Misinterpretation of results.

Incorrect interventional decision!

- During length calibration or when measuring or interpreting distances in images, note that the acquired images represent two-dimensional projections of real objects.

CAUTION

Operating error

Unnecessary radiation

- Follow instruction of calibration procedure.

Calibration object: For increased accuracy it is recommended to use a calibration object which is as large as possible, but still can be displayed completely. The edges of the calibration object must be clearly recognizable and its dimensions must be known.

CAUTION

Wrong calibration value is entered, or length or angle information are not interpreted correctly.

Insufficient or incorrect basis for diagnostic or therapeutic decisions!

- Note that the measuring results of the functions “Distance” and “Angle” depend on various factors, e. g., the position of the calibration object. Note that the acquired images represent two-dimensional projections of real objects. Verify the results before diagnostic or therapeutic decisions are taken.

Please note that the calibrating accuracy decreases if the calibration object is not located in the same plane as the measured object.

Performing calibration



1 Click this button and draw a distance line along the calibration object and select it (➔ Page 169 *Measuring the distance*)

Be careful to mark the starting and end points with as close to pixel accuracy as possible in order to achieve optimal measuring accuracy (the line to be calibrated has to be selected/marked).



2 Click this button.

The **Calibrate** dialog box is displayed.



3 Enter the distance (in mm).

4 Click **OK**.

A length scale is displayed in the image and is applied to the remaining images of the series.

Distances already drawn in are updated.

Measuring the distance

Using a distance line, you can measure the distance between two points in an image. Proceed carefully when setting the starting and end points in order to obtain as high an accuracy as possible.

Ideal conditions for distance measurement are as follows:

- Object lying directly on the image receptor
- The reference points have the maximum possible distance in the image, i.e. an accordingly large reference object was used
- The measures of the reference object are known with a high accuracy (less than 0.1 mm)
- Reference points and measurement points are exactly in the reference plane
- User defines reference line and measurement line with an accuracy of one image element (pixel)

In reality, these conditions are usually not fulfilled.

The measurement results depend (among others) on following factors of influence:

- Reference calibration and distance measurement need to be performed in the same plane (as close as possible) and this plane needs to be parallel to the detector's plane.
- The measurement accuracy amounts to 5% under the following conditions: The reference object is at least 50 mm large, and its size is known at ±1 mm accuracy. The actual inclination between the measurement and the detector plane must not exceed 5°. The plane of the object to be measured must be located within max. 1cm from that of the reference object, and it should not have a distance from the isocenter greater than 10 cm towards the tube.
- Furthermore, there are influences emerging from the recongizability of the objects themselves and from the user's accuracy of recording the objects on the screen. Large and exactly bordered reference objects featuring high contrasts are recommended. The user is responsible for keeping these impacts as small as possible.



1 Click this button.

2 Click the starting point of the line.

3 Click the desired end point.

The distance line is set.

The length (in mm) and the sequential number of the graphic object are displayed at the end point of the line.

The distance measured and shown on the display does not match the real geometric dimensions of the object as no calibration has taken place.

Measuring an angle

CAUTION

Wrong calibration value is entered, or length or angle information are not interpreted correctly.

Insufficient or incorrect basis for diagnostic or therapeutic decisions!

◆ Note that the measuring results of the functions "Distance" and "Angle" depend on various factors, e. g., the position of the calibration object. Note that the acquired images represent two-dimensional projections of real objects. Verify the results before diagnostic or therapeutic decisions are taken.

You can define an angle by two lines, the legs of the angle that you draw on the image. Proceed carefully when setting the starting and end points in order to obtain as high an accuracy as possible.

Ideal conditions for angle measurement are as follows:

- Object lying directly on the image receptor
- The points defining the angles have the maximum possible distance in the image
- User defines reference line and measurement line with an accuracy of one image element (pixel)
- Reference points and measurement points are exactly in the reference plane

In reality, these conditions are usually not fulfilled.

The results of the angular measurements depend (among others) on the following influencing factors:

- The angular measurement is performed in a projection plane parallel to the detector's plane only. The measurement accuracy in this projection plane amounts to ±1°, if the length of the drawn angle legs is at least ¼ of the image width.
- Furthermore, there are influences emerging from the user's accuracy of recording the objects on the screen. It is recommended to draw angles with legs which are as long as possible. The user is responsible for keeping these impacts as small as possible



1 Click this button.

2 Draw the first line in the image by setting the starting point and end point.

The first leg of the angle is set.

3 Draw the next line in the image by setting the starting point and end point.

The angle is set.

The drawn angle (in °) and the sequential number of the graphic object are displayed at the end points of the legs.

Either an inner or outer angle is indicated depending on the starting point and end point of the second leg.

The accuracy of angle measurement depends on user interactions and cannot be specified here absolutely. See also the info box in section (➔ Page 170 *Measuring an angle*).

The accuracy can be improved by increasing the distances between the starting and end points of the legs drawn in.

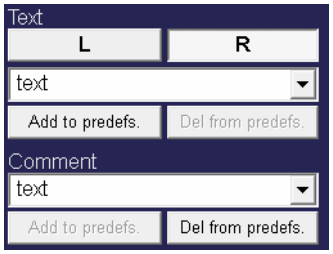
Annotating images

In addition to side identification and annotating interesting or anomalous areas in an image, you can add image comments. Comments always appear centered at the bottom edge of the image and are transferred automatically to all images of the series.



◆ Click this button.

The input dialog box for text and comments is displayed.



Setting the side identification

By identifying the side of the patient you avoid a mistake in image orientation. The side identification is applied automatically to the remaining images of the series.

1 Select the appropriate patient side in the text and comments dialog box.

2 Using the mouse, click the appropriate location in the image (e.g. at the edge of the image).

The selected identification **L** or **R** is inserted at the position of the mouse pointer.

To set the side identification in an LIH image without saving the entire scene, save the LIH after exposure and open it from the **Image Gallery**. Then you can use the **Annotate** menu to set the side labels in the LIH only. Otherwise, the scene will be automatically stored as soon as the **Annotate** menu is opened.

Inserting annotations

1 Select the annotation from the **Text** selection list.

– or –

Click the text field of the **Text** selection list and overwrite the displayed text with the keyboard.

2 Click the required position in the image.

Adding a comment

1 Select the text from the **Comment** selection list.

– or –

Click the text field of the **Comment** selection list and overwrite the displayed text with the keyboard.



2 To delete a comment from the images, use this button to delete it from the text field of the **Comment** selection list.

Creating predefined texts

You can save frequently used texts and comments as templates and select them from the list as needed.

1 Enter the text in the text field of the corresponding selection list.



2 Click this button.

The text is added to the list as a new entry.

Up to 20 entries each can be created in the **Text** and **Comment** selection lists.

Deleting predefined texts

1 Select the entry you no longer require from the corresponding selection list.



2 Click this button.

The text is deleted from the list.

5.2.6 Saving images

After completing postprocessing of a prior examination, all changes in the image are saved when you close the patient. If you want to save intermediate states, manually save the images in the required processing phase. The images are saved as copies of the original in the corresponding study.

To save images while an examination is in progress see (➔ Page 125 *Saving and displaying images*).

Saving a single image

✓ Prerequisite: Multiple images are not selected (➔ Page 159 *Multiselection*).

1 Display the required image (individual selection).



2 Press this button.

Saving multiple images

With the appropriate image selection you can save a portion or all images of one or more series, as well as segments of series.

Images/series

1 Select the required images/series in multiselection (➔ Page 159 *Multiselection*).



2 Press this button.

Partial scene

1 Show the scene.

2 Select the desired sequential images (➔ Page 159 *Multiselection*).



3 Press this button.

The images are saved as a new scene.

5.3 Subtraction processing

When subtraction is performed, two X-ray exposures are acquired of the region of interest, one without contrast agent and one with contrast agent. Afterwards both exposures are subtracted.

In the subtraction image, areas with the same attenuation and areas with a (slightly) different attenuation, e.g. vessels with contrast agent, can be discerned clearly.

5.3.1 Postprocessing functions

The following functions are available to postprocess subtraction images during or after an examination:

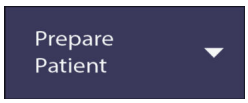
- Anatomical background
- Change mask
- Pixel shift

5.3.2 Loading and displaying images

Native images from examinations acquired in Subtraction or Roadmap operating mode (option) are stored in the local database together with the subtraction images. Both image types can be displayed simultaneously on both monitors.

Loading images

With an examination in progress, the images required for subtraction processing are already loaded and saved. For subsequent processing, load the subtraction data from the local database.



1 Press the **Prepare Patient** menu button.



2 Press this button from the drop-down button list.

The control panel switches to keyboard mode.

The **Patient list** opens on the left monitor.

3 Double-click the subtraction study of the desired patient.

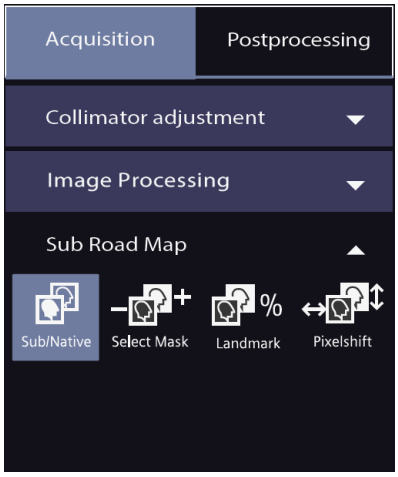
The selected images are loaded and displayed on the monitors.

Changing the monitor layout

After loading the images, 2-channel display is activated with both monitors in 1x1 layout. The left screen shows the subtraction images, the right screen the corresponding native images. This setting can be switched if necessary.

1 Change to **Advanced Mode** if necessary.

2 Open the **Sub Road Map** menu in the **Acquisition** task card.

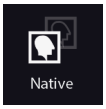




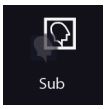
3 Press this button to switch between the monitor layouts.



2-channel display (only for full image display on the left monitor): Simultaneous display of the subtraction image (left monitor) and corresponding native image (right monitor).



1-channel display – native images: Only native images are shown on both monitors. Applies particularly when the image overview is activated on the left monitor.



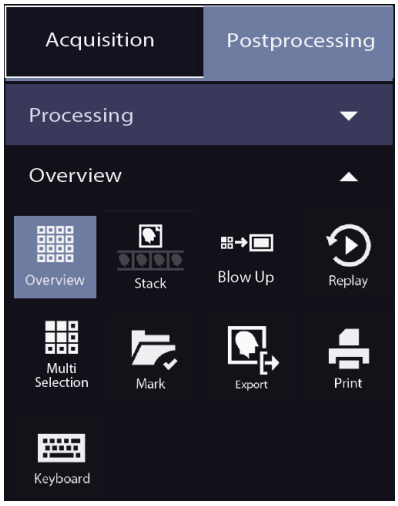
1-channel display – subtraction images: Only subtraction images are shown on both monitors. Applies particularly when the image overview is activated on the left monitor.

Displaying images

After switching the monitor to 1-channel display, use the image overview display to show the required images.

1 Change to **Advanced Mode** if necessary.

2 Open the **Overview** menu in the **Postprocessing** task card.





3 Switch on image overview if necessary.

4 Use the functions for image display in the same manner as for standard examinations (without subtraction).

- Changing the display mode (➔ Page 157 *Changing the display mode*)
- Scrolling (➔ Page 157 *Scrolling*)

  In stack display the Peak OP image (OP image with the highest value) of the respective series is displayed.
- Reviewing a scene (➔ Page 158 *Reviewing a scene*)

  In 2-channel display, the subtraction scene plays on the left monitor, the corresponding native scene on the right monitor.

5.3.3 Changing the image display

As with standard examinations (without subtraction) you can window, zoom/pan, rotate, and flip subtraction and native images.

(➔ Page 161 *Changing the image display*)

The following presents special functions for use exclusively with subtraction data set.

Including anatomical background (Landmark)

Normally the anatomical surrounding of vessels of interest are not visible in images that are displayed subtracted. By adding the masking image, the surrounding tissue can be highlighted more or less.



1 Press this button.

The **Landmark** menu appears.



2 Set the degree of inclusion with the arrow.

0%: Fully subtracted (without anatomical background)

100%: Native display

Making the image and mask coincide exactly (Pixel shift)

During acquisition of the subtraction series, the patient or the C-arm system may have moved. The images that are to be subtracted may not be congruent. The anatomical background, especially in the area of image contrasts, is therefore not canceled out.

Through a suitable shift of the mask by a few pixels, you eliminate the displacement of fill image and mask. Applying a pixel shift will also have an effect on the representation of the fill image.

The image shift with pixel shift is used in forward direction for subtraction scenes; that is, for subsequent images, not backward for previous images.

You can use manual and auto pixel shift multiple times one after the other or in combination as soon as the previously changed pixel shift is accepted.

Pixel shift Landmark menu

1 Display the required subtraction series (single selection).



2 Press this button.

The **Pixel shift Landmark** menu appears.

The subtraction series is shown in image stripe display on the left monitor.

The currently selected image of the subtraction series is shown on the right monitor.

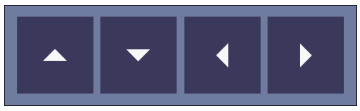
Selecting the image

◆ Use the arrows to display the first image with poor coverage on the right monitor.

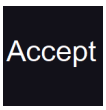


Manual pixel shift

Shift the mask manually until the best impression of the subtraction image is achieved.



1 Move the mask with the arrow buttons until you get optimum coverage.



2 Press this button to apply the pixel shift to the current and subsequent images.

Undoing pixel shift

Accept pixel shift applies the changed pixel shift to the affected images and saves it. In the event of an error, you can cancel the last step or all steps.



- Press this button to restore the state prior to opening the **Pixel shift Landmark** menu.

6 Documentation

6.1 Filming/Printing 180
6.1.1 Selecting images 180
Single image 181
Multiselection 181
6.1.2 Printing using default settings 181
Starting printing 181
6.1.3 Printing with changed settings 182
Changing print settings 182
Displaying a print preview 183
Starting printing 184
6.2 Exporting 184
6.2.1 Export procedures 184
Manual export 184
Automatic export 184
6.2.2 Export destinations 185
Removable device 185
Other workstation 185
Archive 185
6.2.3 Overview of transfer capabilities 186
6.2.4 Selecting images 187
Images from an examination in progress or postprocessing 187
Complete studies 188
6.2.5 Preparing the removable devices 188
Working with data media 188
Drives 189
Inserting a CD/DVD 189
Connecting the USB storage medium 189
6.2.6 Exporting using default settings 189
Starting export 189
6.2.7 Exporting with changed settings 190
“Export to” dialog box 190
Changing the export settings 191
Starting export 193
Establishing default settings 194
6.3 Checking the data transfer 194
6.3.1 Indicators in the status bar 194
6.3.2 Viewing and processing jobs 195
Job status list 195
Influencing job performance 196
6.4 Reports 197
6.4.1 Selecting a study 197
6.4.2 Radiation summary report 198
Opening the report 198
Exporting the report 199
Printing a report 199

6.1 Filming/Printing

You can expose the images of a study on film or print them on paper for documentation and reporting.

Make sure the printer is switched on before you send images to print.

Filming and printing are the same process except that they use different output devices. If the term "filming" or "printing" is used alone in the following, the description applies equally for the other process.

Standard printing

You can print the displayed image or a selection of multiple images simply by pressing a button. The print job is processed with standard settings (simplified print procedure).

Changing print settings

If you want to check or change settings prior to printing, use the "enhanced print procedure". You can display a print preview and adapt the print layout, for example. In a second step, you forward the print job to the required printer.

6.1.1 Selecting images

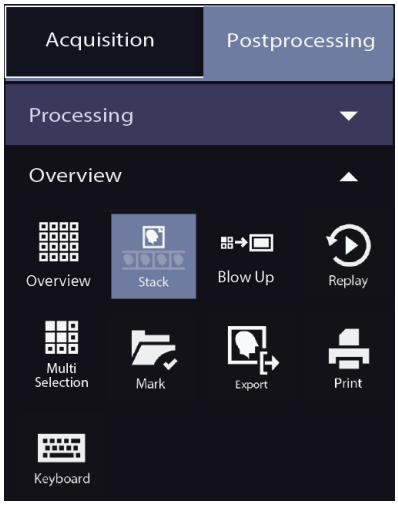
Before you start a print job, you have to select the images.

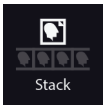
You have access to the currently loaded images through the **Postprocessing** task card on the control panel. Single and multiple image selections are possible

(➔ Page 159 *Selecting images*)

1 Change to **Advanced Mode** if necessary.

2 Open the **Overview** menu in the **Postprocessing** task card.







3 Select the suitable display mode (➔ Page 157 *Changing the display mode*):

- Image stripe display if you want to select multiple images in the current series.
- Stack display if you want to select one or more series.

Single image

◆ Click the relevant image segment in the image overview.

If the left monitor has been changed to full image mode, the image displayed there is selected.

Multiselection



◆ Press this button in each case to add the image or series selected in the image overview to the multiple selection.

– or –



Switch on multiselection by pressing this button.

Select the images or series.

Images of a multiselection are marked by a white dot.

The **Multiple Selection** menu has to be open/active during printing; otherwise, only the currently marked image/scene is printed.

6.1.2 Printing using default settings

The following default settings are used with the simplified print procedure:

- Page size and layout (page partitioning) according to the configuration settings for the Calibration object **Default Printer**.

  (➔ Page 209 *DICOM Properties - Printing*)

- Handling of subtraction images and image text display as in the last print job. These settings can be changed in the enhanced print procedure.

  (➔ Page 182 *Changing print settings*)

Starting printing



◆ Press this button on the control panel.

The print job is started.

In the **Patient list** the selected images are marked as "printing" ("**p**" flag).

When the print job is complete the images are marked as "printed" ("**P**" flag).

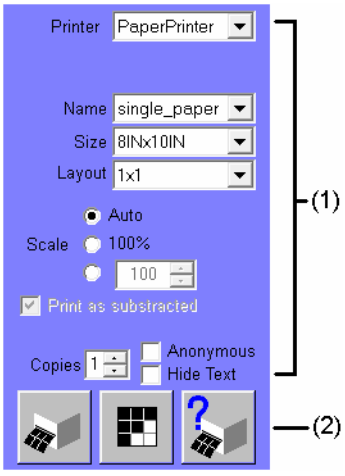
After printing, the images are released for automatic deletion if necessary. Depending on the hard disc fill level, the images are deleted on the specified date.

The "printed" flag is set as soon as the images are successfully transferred to the printer driver. Not all printers (e.g., paper printers) can solve printing problems themselves. The image printout may be lost! Verify that the printouts are available before you delete images.

6.1.3 Printing with changed settings

In the enhanced print procedure you can change the following settings:

- Printer selection
- Layout settings
- Image text display
- Handling subtraction images
- Number of copies



Input dialog box for print settings

(1) Print settings
(2) Buttons for print, print preview, and print status



◆ Click this button on the left monitor (lower left).

The input dialog box for print settings is displayed on the monitor.

Changing print settings

The input dialog box for print settings initially contains the settings used for the last print session.

Changes to the settings for subtraction images and image text display are used as new default settings for standard printing.

Printer

The **Printer** selection list contains the paper and DICOM printers configured in the system.

- Select the required printer.

Layout settings

Individual print layouts under an individual name are created in the configuration for each printer (➔ Page 211 *Print Layout card*).

- Select the layout settings in the selection list.

  Name: Stored print layouts for the selected printer

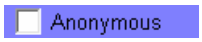
  Size: Available page sizes for the selected printer

  Layout: Available page partitions for the selected printer

Image text display

The scope of image text information is defined in the configuration for each print layout.

(➔ Page 211 *Image text settings*)



1 Select the **Anonymous** option is you want to avoid assigning printed images to a patient.

  "Anonymous" appears in the hardcopy instead of the patient name. The remaining demographic data are hidden.



2 Select the **Hide Text** option if all image text is to be hidden in the hardcopy.

Subtraction images

Subtraction images are usually printed in native display.



- If needed, select the subtracted display for printing.

Number of copies



- Define the number of copies.

  Up to 9 copies per print job are possible.

Displaying a print preview

In the print preview you can see how the images will look later on the exposed film or paper hardcopy. You can also change the position of individual images where necessary.



1 Click this button in the input dialog box for print settings.

  The images appear on the left monitor in the selected print layout.

2 Use the mouse wheel to display the individual pages of the print job.

3 Use the mouse's drag and drop function to arrange the images in the selected page layout.

Starting printing



- Click this button in the input dialog box for print settings.

  The print job is started.

  In the **Patient list** the selected images are marked as "printing" ("**p**" flag).

  When the print job is complete the images are marked as "printed" ("**P**" flag).

After printing, the images are released for automatic deletion if necessary. Depending on the hard disc fill level, the images are deleted on the specified date.

The "printed" flag is set as soon as the images are successfully transferred to the printer driver. Not all printers (e.g., paper printers) can solve printing problems themselves. The image printout may be lost! Verify that the printouts are available before you delete images.

Print status You can track and influence job processing for print jobs on DICOM printers.



- Click this button in the input dialog box for print settings.

  The **Job status list** opens.

  (➔ Page 195 *Job status list*)

6.2 Exporting

After an examination or postprocessing, the saved images are stored on the hard drive (local database).

This section explains how to save images and patient data from the local database, send them within the network, and save them to data media.

6.2.1 Export procedures

Manual export

During an examination or postprocessing, you can export the displayed image or a selection of multiple images. You can define the export destination and data format in the dialog box on the left monitor.

Automatic export

Depending on the configuration setting, at the end of the examination acquired images are sent automatically to a default address (➔ Page 208 *DICOM Properties - Sending*).

You can change the default address and export settings in the dialog box used for manual export.

6.2.2 Export destinations

Depending on the job setting, you select one of the following export destinations in the enhanced export procedure.

Removable device

You write data to removable devices to save it short term or pass it on.

The following media types is supported for saving data:

- DVD-R (minus R), DVD+R
- USB storage media (external hard drives, sticks)

The accidental use of other media, e.g., DVD-RW, can result in an error message or impair functionality.

CAUTION

Risk that CD/DVD-R media used for exporting can become damaged or be unreadable on other CD/DVD drives.

Data loss or apparent data loss.

- Use removable devices as transfer media only. Only data media approved by Siemens Healthineers may be used.

In general, do not use storage media that require their own power supply. In addition, do not use USB storage media containing an autorun .inf file.

As a rule, you cannot release radiation during the CD/DVD/USB write process. In exceptional cases (emergencies), you can release radiation in fluoroscopy mode. However, radiation may be disrupted.

Moreover, the export process of subtracted images to CD/DVD/USB is interrupted during radiation release and other processing-intensive procedures (e.g., play LSH). In those cases images are stored as raw data.

You are therefore urgently advised to start write processes outside of examination hours (e.g. at the end of the office day).

Other workstation

If your system is connected to a network, you can send patient and examination data to other workstations via the network. The data can be processed or used for diagnosis there.

Archive

To archive, you send the selected patient and examination data to a DICOM network node that has been established as an archive. You can import archived data back to your local database whenever you need them.

CAUTION

Use of the imaging system hard drive as a long-term archive.

Loss of image data.

- Do not use the imaging system hard drive as a long-term archive. Follow the local regulations regarding the archiving of X-ray images, while taking into account the use of DICOM archive nodes.

CAUTION

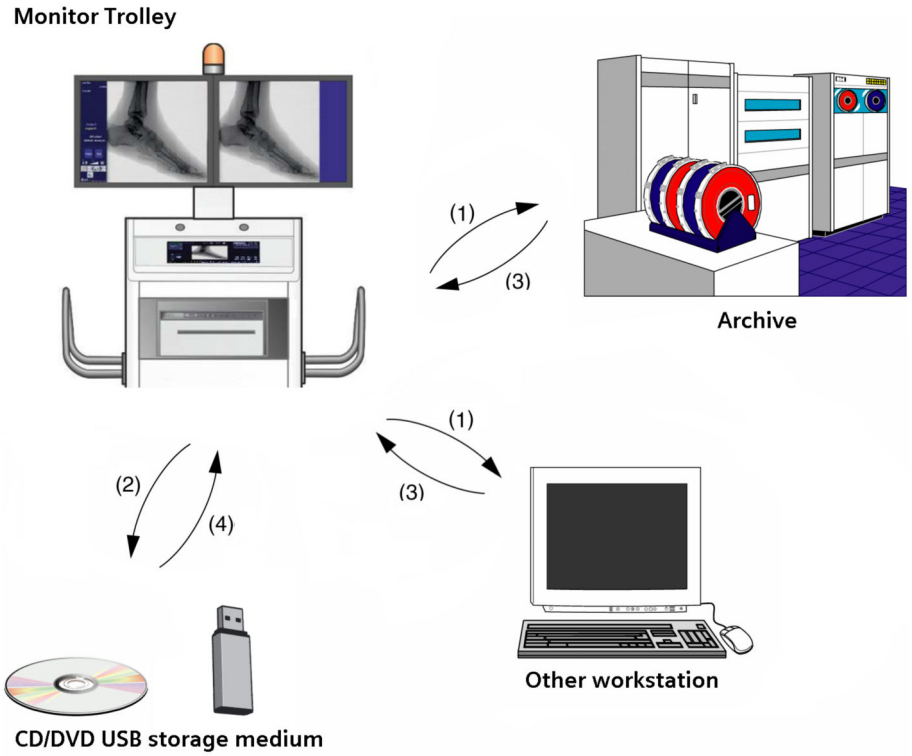
Loss of image data.

Risk of unnecessary radiation exposure!

- The hard disk of the imaging system is not suitable for long-term archiving of patient and image data. There are statutory requirements governing the archiving period, data availability, and data security (data integrity), as well as recommendations concerning fire protection or water damage for the archiving of image data. The operator of the archive is responsible for observing these regulations.
- Because of advances in technical development and statutory requirements, the storage of image data and access to it cannot be realized with a single storage and media technology alone. Therefore, the migration of data may be necessary under the responsibility of the operator of the digital archive.

6.2.3 Overview of transfer capabilities

The figure below shows the data backup and transfer options available to you.



(1) Export to DICOM network nodes (Archive or other workstation)
(2) Export to removable devices (CD/DVD, USB drive)
(3) Import from DICOM network nodes (Query & Retrieve)
(➔ Page 152 *Data in the network*)
(4) Importing from removable devices
(➔ Page 151 *Data from removable devices*)

Please remember that not all transfer options may be available on your system. The devices and network nodes available depend on the individual configuration of your system and the options installed.

6.2.4 Selecting images

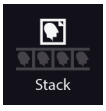
Before you start an export job, you have to select the images.

You can only export objects that are stored in the local database. If data are to be transferred from one data medium to another, they must first be imported. Exporting data from other modalities is not possible however.

Images from an examination in progress or postprocessing

You have access to the currently loaded images through the **Postprocessing** task card on the control panel. Single and multiple image selections are possible

(➔ Page 159 *Selecting images*)





- Select the suitable display mode in the **Overview** menu:
  - Image stripe display if you want to select multiple images in the current series.
  - Stack display if you want to select one or more series.

Single image

- Click the required image or series.

If the left monitor has been changed to full image mode, the image displayed there is selected.

Multiselection



- Switch on multiselection in the **Overview** menu.

  Select the images or series.

  – or –

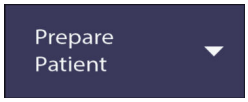


  Press this button to add the image or series selected in the image overview to the multiple selection.

The **Multiple Selection** menu has to be open/active during export; otherwise, only the currently marked image/scene is exported.

Complete studies

To save or archive complete studies, select the data sets in the **Patient list**.



1 Press the **Prepare Patient** menu button.



2 Press this button from the drop-down button list.

3 Search for the required patient by sorting and filtering the list as necessary.

4 Select the required study or studies.

6.2.5 Preparing the removable devices

Depending on the routine you use, one or several drives and connections for external data media will be established for your system.

Working with data media

Follow the instructions of the manufacturer for handling and storage of CD/DVDs.

Drives

Your system comes with two USB ports for data storage.

You can connect a portable CD/DVD drive to the system.

Inserting a CD/DVD

CDs/DVDs can be written to on one side only.

Place the CD/DVD into the drive with the label facing upwards.

Never shut down the Cios system or disconnect the monitor trolley from the C-arm system while data is being written to CD/DVD.

Connecting the USB storage medium

CAUTION

Risk of connecting/disconnecting USB devices during the exposure.

Such behavior can lead to system instability. This can also impact other processes, such as exposure jobs in progress. Loss of data, interference in exposure process.

- Do not insert or disconnect USB devices during exposure or other critical processes.

CAUTION

Risk of disconnecting USB devices during ongoing data transfer.

Loss of data and damage to the data medium possible.

- Do not disconnect the USB device during active data transfer (such as export).
- Use removable devices as transfer media only. Removable devices are not permitted for archiving purposes.

- Connect the USB plug into the USB jack.

6.2.6 Exporting using default settings

During the simplified export procedure, the settings established as defaults are used. The default settings can be changed in the enhanced export procedure.

Starting export

On the control panel there is an export button.



◆ Press this button.

The export job is started.

After successful completion of the export job to a network node, the selected images are marked as sent (“S” flag) or archived (“A” flag) in the **Patient list**.

After exporting, the images are released for automatic deletion if necessary. Depending on the hard disc fill level, the images are deleted on the specified date.

The “sent” or “archived” flag is set as soon as the images are successfully transferred to the network nodes. Even when the addressee works with Storage Commitment, the flags only identify the receipt and storage of the data on the recipient’s hard drive. A misinterpretation of the flags can result in a loss of data during the prescribed storage period. For this reason, follow the regulatory requirements regarding the archiving procedure.

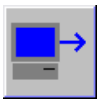
Note that the exported images are not transmitted as raw data, but including all of the applied processing steps. They cannot be restored to their original state. Do not use these images for the primary diagnosis!

6.2.7 Exporting with changed settings

In the enhanced export procedure you can change the following settings:

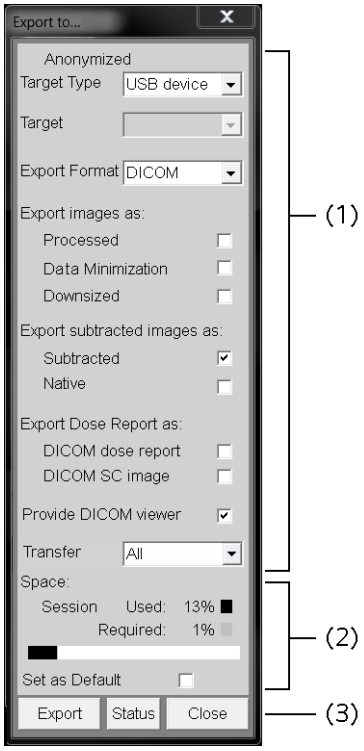
- Export destination selection
- Data format
- Image properties
- Handling subtraction images
- Saving with a DICOM Viewer

“Export to” dialog box



◆ Click this button on the left monitor (lower left).

The **Export to...** dialog box appears on the monitor.



(1) Export settings
(2) Storage capacity or removable devices
(3) Buttons for export, export status, and close

Changing the export settings

In the **Export to...** dialog box you can first enter settings that will be used as the defaults.

Export destination

- Select the required destination medium from the **Target Type** selection list.
  - **DICOM node**: Another workstation, archive, PACS
  - **CD/DVD**: Inserted CD or DVD
  - **USB device**: Connected USB data medium

Do not press or click the **Export to DVD** button during an ongoing export procedure.

When DVD recording is active, export to DVD is not possible.

Export address

When selecting "DICOM node" you have to enter a network address configured in the system as the destination.

- Select the network node from the **Target** selection list.

Data format

The systems and applications in which the exported data can be opened and processed depend on the data format.

- Select the data format in the **Format** selection list.
  - **Private**: Format that is only readable by FLC imaging systems
  - **DICOM**: Standardized file format in medical imaging
  - **TIFF**: PC graphics format
  - **AVI**: PC video format

When "DICOM node" is selected as the export destination, only the DICOM format can be used.

Image properties

Depending on the data format, prior to export images can be prepared differently in terms of graphics and text embedding as well as file size.

When **Private** is selected as the data format, the data must be exported in its original state.

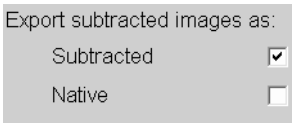


- Select the image properties in the **Export images as** area.
  - **Processed**: changes in the image display compared to the original are used (such as window values, image rotation/flip, zoom, pan, edge filter) and evaluation graphics are “burned” into the image.
  - **Data Minimization**: “Data Minimization” appears in the image instead of the patient name. The remaining demographic data are hidden.
  - **Downsized**: The files are made smaller by reducing the image resolution 50% and the bit depth to 8 bits/pixel.

To save the image brightness and contrast, select **Processed**.

Subtraction images

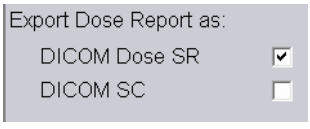
You can export images of a specific image type or multiple image types from subtraction series.



- Select the image types in the **Export subtracted images as:** area.
  - **Subtracted**: Images in subtracted display
  - **Native**: Native images without mask and without Peak OP image

Radiation Summary Report

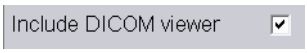
Two different file formats are possible if the radiation summary report is exported in DICOM format.



- Select the file format in the **Export Dose Report as:** area.
  - **DICOM Dose SR**: Structured Report (DICOM SR)
  - **DICOM SC**: Image with “burned in” text.

DICOM Viewer

When exporting to a removable device, a DICOM Viewer is saved to the CD/DVD or USB medium together with the image data. This allows for viewing the exported images on any computer. The DICOM Viewer starts directly from the data medium (automatically after inserting/connecting). No installation of files takes place on the computer in question.



- Deselect this option if you do not want to save the DICOM Viewer.

Scope of data



- Specify the scope of the images to be exported.
  - **Selected**: all selected images (especially individually selected images)
  - **Marked**: all marked images
  - **All**: all images in the study

Checking disk space

If a removable device is indicated as the export destination, the current storage capacity and required disk space are displayed.



1. Use the display to check where there is sufficient space available on the medium.
2. Change the data medium if necessary before starting the export.

Starting export



- Do not press or click the **Export to DVD** button during an ongoing export procedure. Click this button in the **Export** dialog box.

  The export job is started.

After successful completion of the export job to a network node, the selected images are marked as sent (“S” flag) or archived (“A” flag) in the **Patient list**.

After exporting, the images are released for automatic deletion if necessary. Depending on the hard disc fill level, the images are deleted on the specified date.

The “sent” or “archived” flag is set as soon as the images are successfully transferred to the network nodes. Even when the addressee works with Storage Commitment, the flags only identify the receipt and storage of the data on the recipient's hard drive. A misinterpretation of the flags can result in a loss of data during the prescribed storage period. For this reason, follow the regulatory requirements regarding the archiving procedure.

Export status

You can track and influence job processing for all export jobs.



- Click this button in the **Export** dialog box.

  The **Job status list** opens.

(➔ Page 195 *Job status list*)

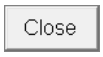
Establishing default settings

Export jobs for automatic export and for sending the radiation summary report at the end of the examination are performed using default settings.

1 Select the required export settings in the **Export** dialog box.



2 Select the **Set as Default** option.



3 Click this button.

Changed default settings are stored.

6.3 Checking the data transfer

All jobs for importing, exporting, and printing/filming data are performed in the background.

The processing of jobs can be viewed in the status bar, enabling you to react in case of error.

6.3.1 Indicators in the status bar

The corresponding icon is displayed in the status bar on the left monitor (lower left) for data transfers in progress. The icons indicate the action being performed and whether an error has occurred.

Action	Not active	Active	Error
Write to CD/DVD	No icon		No icon
Read from CD/DVD	No icon		No icon
Write to USB device	No icon		No icon
Read from USB device	No icon		No icon
Export to DICOM network node (sending)	No icon		
Import from DICOM network nodes (receiving)	No icon		No icon
Printing/filming to DICOM-printer	No icon		

6.3.2 Viewing and processing jobs

In the **Job status list** you can learn about the following jobs running in the background – sorted by transfer type:

- Printing/filming to DICOM printer (DICOM Film)
- Export to DICOM network node (DICOM Send)
- Import from DICOM network nodes (DICOM Retrieve)
- Write to CD/DVD
- Read from CD/DVD
- Write to USB storage medium
- Read from USB storage medium

Job status list

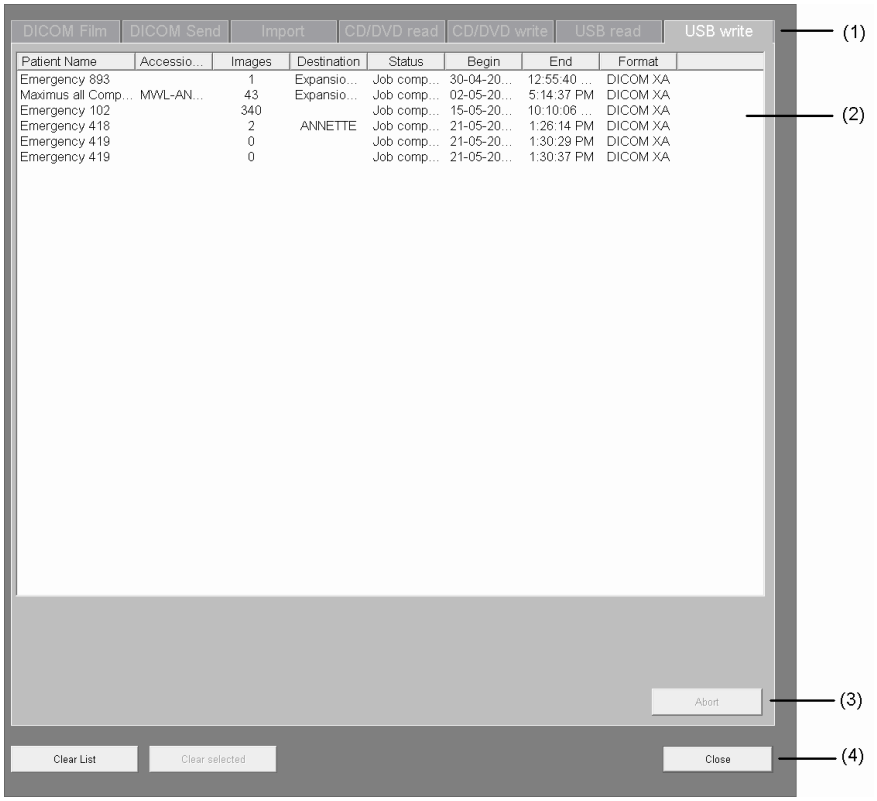
Several methods are available for opening the **Job status list**:

◆ Click the **Status** button in the **Import from**, **Export** dialog box, or print settings dialog box.

– or –

Click the icon for the applicable data transfer on the left monitor.

The **Job status list** is displayed. The task card for the applicable data transfer is displayed.



(1) Tabs for selecting the transfer type
(2) Details and status of the transfer jobs
(3) Area to show the course of job processing
(4) Buttons for deleting the list or selection and to close

Influencing job performance

The work steps available in the list depend on the transfer type and the status of a job.

Jobs from all system users are displayed in the **Job status list**. The patient name is also displayed. It is recommended that you delete this list manually.

Selecting jobs

Some actions are limited to the transfer jobs selected in the list.

- Click the required jobs in the list (press and hold **Ctrl** for multiple selection)

Restarting DICOM Send

Failed export jobs to DICOM network nodes can be repeated with the same settings or redirected to a new address.

- Click **Send**.

  The selected jobs are restarted with the original destination address.

  – or –

  Click **Redirect**.

The selected jobs are diverted to the DICOM network node currently set in the **Export** dialog box.

Aborting jobs

- Click **Abort**.

  All transfer jobs are cancelled and the start of other planned jobs in the list is prevented.

A data transfer in progress for which there are additional images (such as a print job with multiple images on a page) is not cancelled.

Clearing lists

- Click **Clear List**.

  All jobs that have ended or for which data transfer preparation has been completed are hidden.

  – or –

  Click **Clear selected**.

  Of the **selected** jobs in the list, all that have ended or for which data transfer preparation has been completed are hidden.

6.4 Reports

Certain examination data are saved in the form of structured reports.

Cios Select offers the following types of reports:

- Radiation Summary Report

Use: The reports serve to document examination and treatment data. They are mostly generated automatically. Depending on the type of report you can read, edit/supplement, print, and export them.

Prerequisite: The examination of a registered patient is the prerequisite for a report to exist.

Formats: Reports are saved in two different formats. This allows them to be opened in different applications.

- Secondary Captures (DICOM SC)

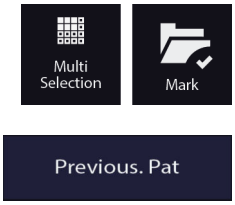
  Allows loading into a viewer, for example; PACS compatible.

- Structured Report (DICOM Dose)

  Data format that is compatible with other DICOM systems; reports must be exported to these systems in DICOM-SR format.

6.4.1 Selecting a study

One radiation summary report is created in the local database for each study.



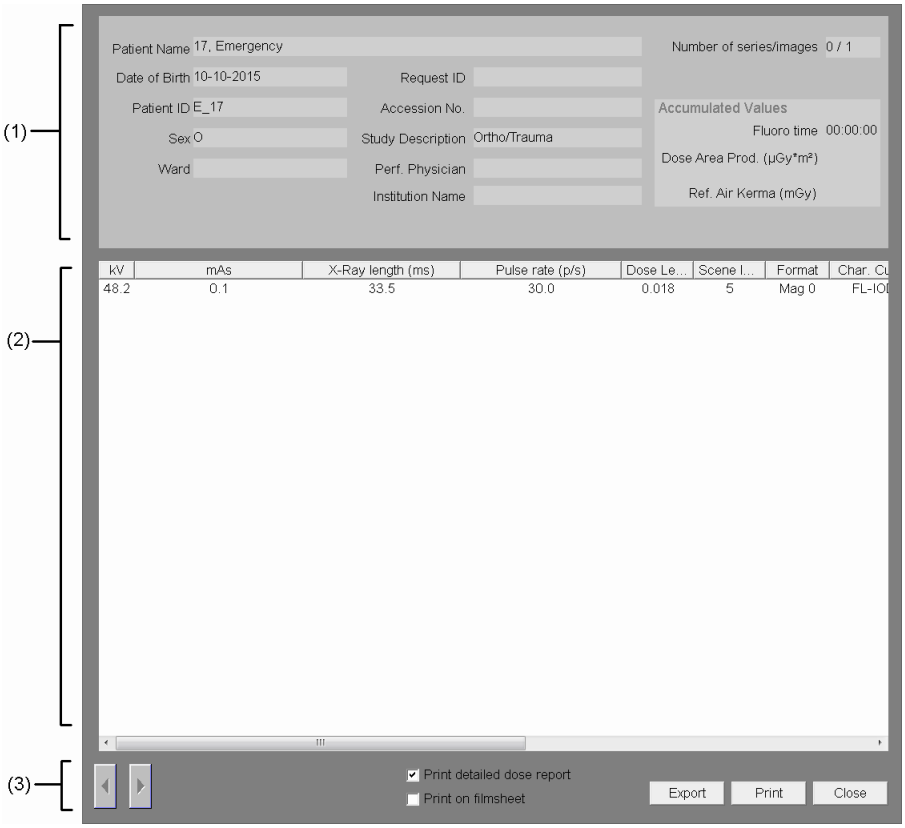
- Select an image or series of the required study in the **Postprocessing** task card on the control panel.

  – or –

  In the **Patient list** select the study if the applicable data have not been loaded.

6.4.2 Radiation summary report

The radiation summary report contains the cumulated values for the number of exposures, duration, and dose over the course of an examination. The generation of this report is a fully automated process.



(1) Patient and examination data, cumulative radiation data
(2) Detailed information on the acquired series and images
(3) Buttons for scrolling in the report, exporting, and printing the report, as well as closing the dialog box

Opening the report

✓ Prerequisite: A study or a series/image is selected.



- Click this button on the left monitor (lower left).

  The radiation summary report is displayed on the monitor.

Exporting the report

The default settings established in the **Export to...** dialog box are used when exporting the report. This is particularly true of the file format when DICOM format is set.



- Click this button.

  The report is exported to the default address.

Printing a report

When you send the report directly to the default printer, the settings established for standard printing are used. To use other printer settings or a different printer, open the print preview first.

Standard print



1 Deselect the **Print on filmsheet** option, if necessary.



2 Click this button.

  The report is printed on the default printer.

Changing print settings



1 Select the **Print on filmsheet** option.



2 Click this button.

  The report is opened in print preview. Make the necessary print settings and start the print job here (➔ Page 182 *Changing print settings*).

7 Configuration

7.1 User Settings 202
7.1.1 Opening/closing a configuration window 202
7.1.2 Site info 202
Institution Name 203
Institutional Department Name 203
Hospital Address 203
Patient Demographic Data 203
Daylight saving time 204
Application selection 204
7.1.3 Patient registration 204
Name-display format 205
7.1.4 DICOM Properties 205
DICOM Properties - General 206
DICOM Properties - Protocol codes 207
DICOM Properties - Sending 208
DICOM Properties - Printing 209
7.1.5 Examination Properties 209
Set Black 209
Nominal Power Shot 210
7.1.6 Image display and print properties 210
Display Layout card 210
Print Layout card 211
Image text settings 211
7.1.7 Deleting images automatically 213
Auto delete 214
7.1.8 Password for radiation release 214
7.2 Examination settings (PEX Editor) 215
7.2.1 Introduction 215
PEX Editor 215
PEX database 215
Online/offline 215
Data categories 215
Names 216
Storage capacity 216
Access control 216
Access modes 216
Import/Export 217
Automatic backup 217
7.2.2 Starting the PEX Editor 217
PEX Editor layout 219
General work steps in the PEX Editor 219
7.2.3 Editing application groups 220
Assigning applications to application groups 221
Removing applications from an application group 221
Establishing the default application group 221
7.2.4 Editing applications 222
Configure triplets for applications 222
Defining other parameters 223
7.2.5 Parameter for fluoroscopy and exposure 224
Parameter 224

7.2.6 Defining parameter sets 225
7.2.7 PEX service functions 226
Configuration parameters 226
Changing the PEX Editor password 226
Backing up and restoring the PEX database 227

7.1 User Settings

7.1.1 Opening/closing a configuration window



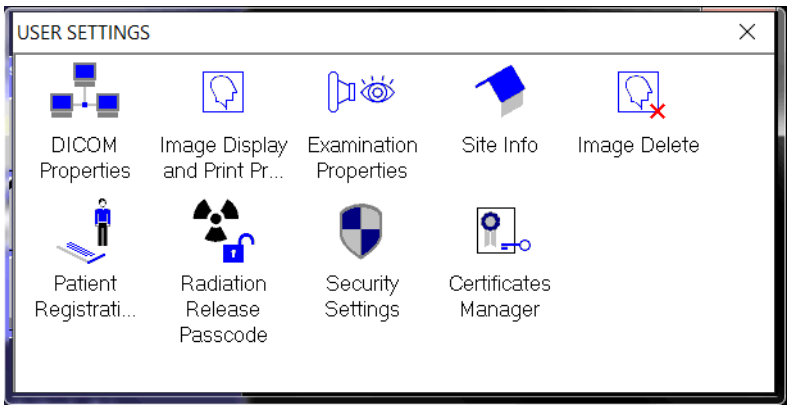
1 Press this button on the monitor trolley control panel.

Manage Tool is displayed on the monitor.



2 Click this icon on the **Settings** subtask card in the **Manage Tool**.

The menu for defining user settings is displayed.



3 Double-click the required settings icon.



See section “Network encryption (TLS)” in the Cios Select Administrator Manual if you choose **Certificates Manager**.

4 Change the settings as required.

5 Click **Apply** to accept the changes.

6 Click **OK** to confirm the changes and close the settings window.

7 Click **Cancel** to reject your changes and close the settings window.

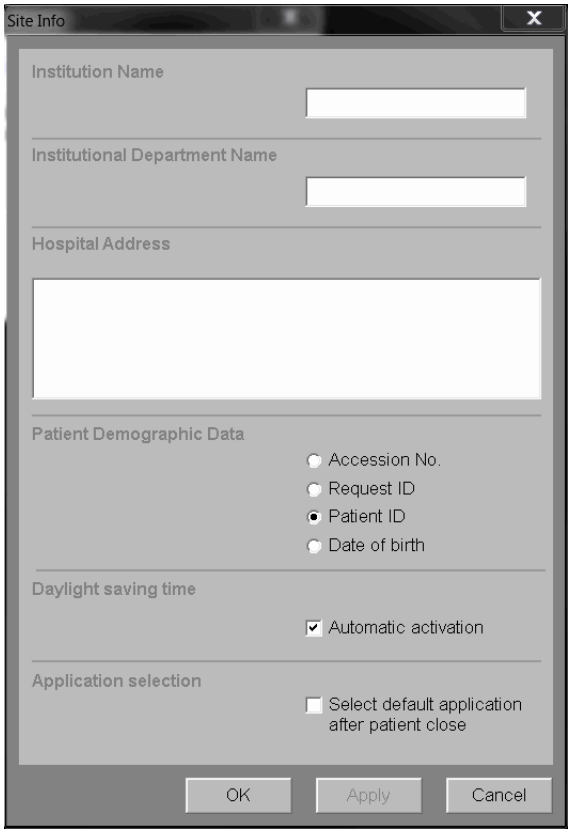


8 Press the **Close** button on the keyboard to exit the **Manage Tool**.

7.1.2 Site info



In the **Site Info** dialog box you establish site-specific settings, such as the name and address of your facility.



Institution Name

- Enter the name of your hospital or practice (64 characters maximum).

A change of the **Institution Name** will have no effect on already acquired images.

Institutional Department Name

- Enter the name of your department or ward (64 characters maximum).

Hospital Address

- Enter the address of your hospital or practice.

Patient Demographic Data

- Select the patient data to display on the monitor in addition to the patient name:

  Accession No.

  Request ID

  Patient ID

Date of birth

Daylight saving time

- Select **Automatic activation**.

  When **Automatic activation** is selected, the system automatically switches to daylight saving time.

Application selection

- Activate the **Select default application after patient close** check box.

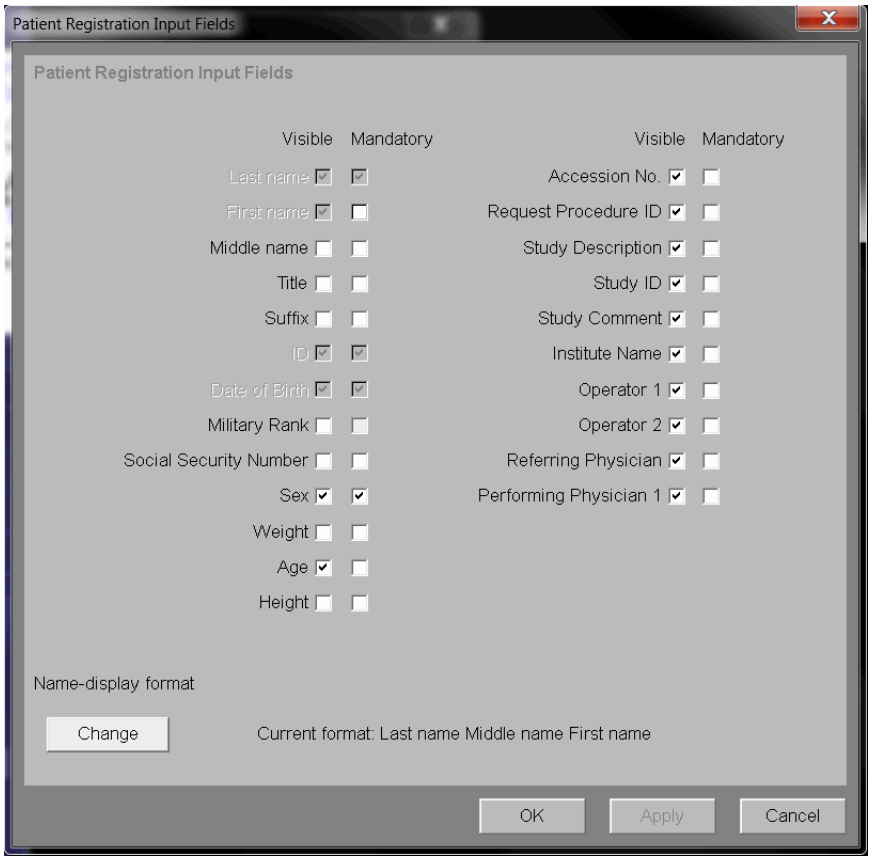
  When **Select default application after patient close** is selected, the system automatically switches to the default application after closing patient.

7.1.3 Patient registration



In the **Patient Registration Input Fields** dialog box you establish what information can be entered during patient registration.

Entries can only be made with the mouse.



- Activate or deactivate the respective entries.

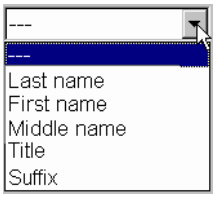
  Visible: Entry will be shown in the **Data Entry Dialog** window.

Mandatory: Entry must be completed in the **Data Entry Dialog** window. (Entry will be shown in the **Data Entry Dialog** window in **bold** letters).

Name-display format

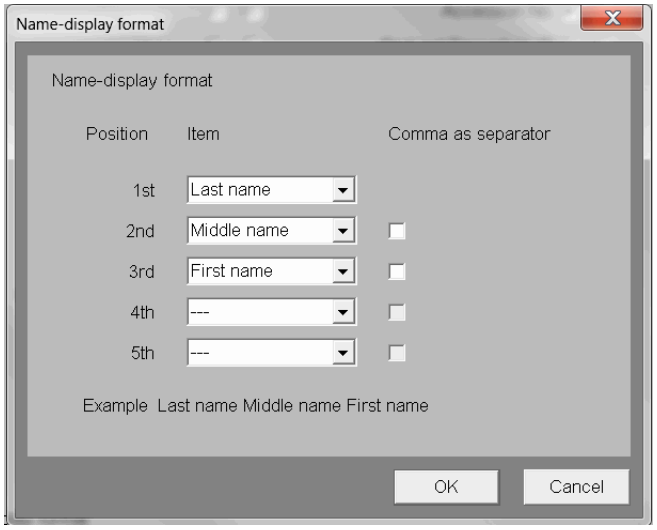
Set the parts of the patient name to be displayed:

1 Click **Change**.



2 Select the parts of the patient name that should be displayed (maximum five).

3 Click the corresponding check box if a comma should be placed between the parts of the name.



4 Click **OK**.

The patient name composition that has been established is displayed.

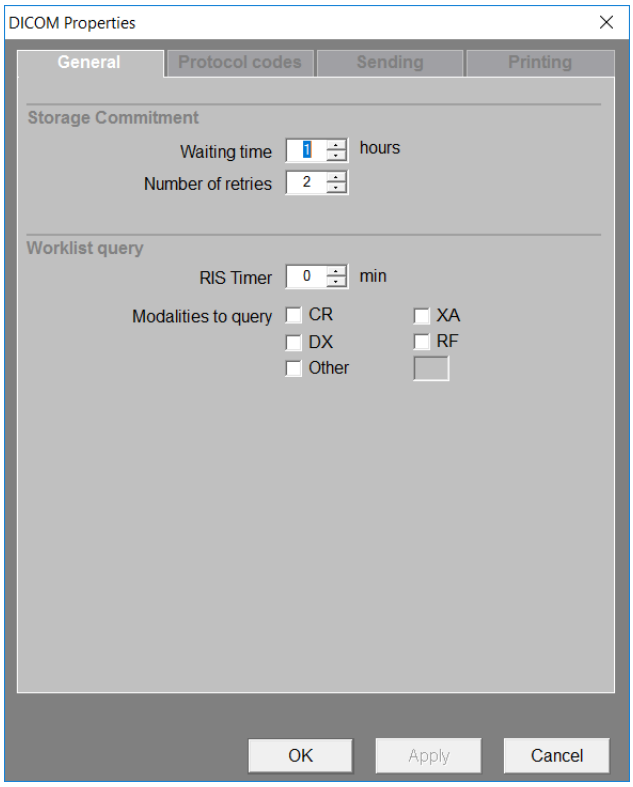
This composition will be used when displaying patient names in images and on hardcopies/filmsheets.

7.1.4 DICOM Properties



In the **DICOM Properties** dialog box you establish the settings for DICOM functions, such as saving, sending, and printing of images.

DICOM Properties - General



Storage Commitment

Waiting time: the time the imaging system waits for storage commitment after a study/images have been sent to an archive server.

Number of retries: if the archive server is not available, the imaging system performs the selected number of retries.

If a DICOM node for which storage commitment is configured does not send a confirmation within the configured waiting time/number of retries, neither the **S** (sent) or **A** (archived) flag is set.

Worklist query

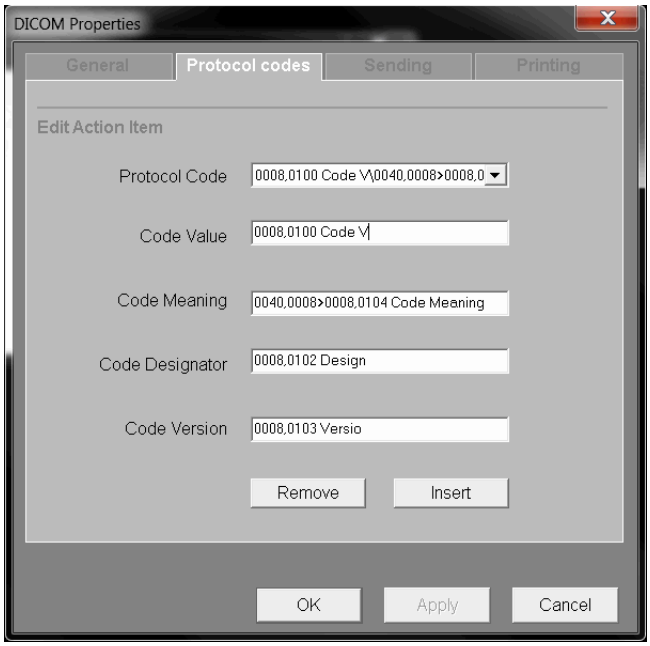
RIS Timer: You can set the update interval (in minutes) for receiving worklist data from the HIS/RIS (hospital/radiology information system).

Possible settings:Update: 0 ... 1440 minutes (24 hours), 0 = no update

Modalities to query: selection of modality/modalities to use for worklist queries.

Any modality with a two-letter name can be entered for the worklist query (**Other**).

DICOM Properties - Protocol codes



For MPPS Close, you can define protocol codes.

Adding a new protocol code

1 Enter the code: **Code Value**, **Code Meaning**, **Code Designator**, **Code Version**.

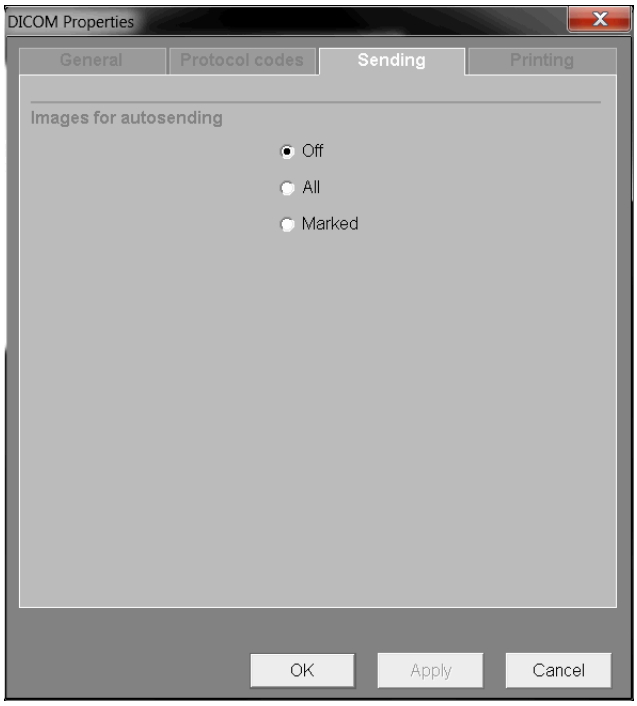
2 Then click **Insert**.

A new **Protocol Code** is created.

Deleting a protocol code

◆ Select the entry to be deleted from the **Protocol Code** list and then click **Remove**.

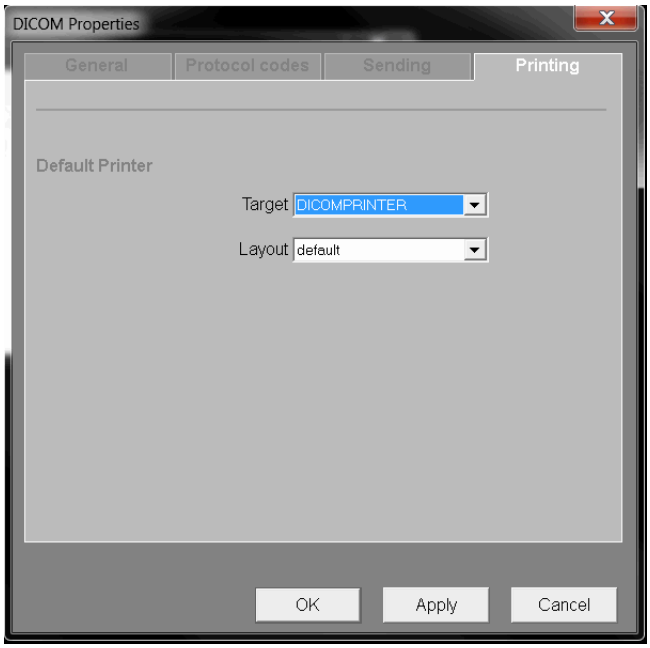
DICOM Properties - Sending



Images for autosending Select which images are to be sent automatically:

- **Off**: No images will be sent automatically.
- **All**: All acquired images will be sent automatically.
- **Marked**: Only marked images will be sent automatically.

DICOM Properties - Printing



Default Printer:

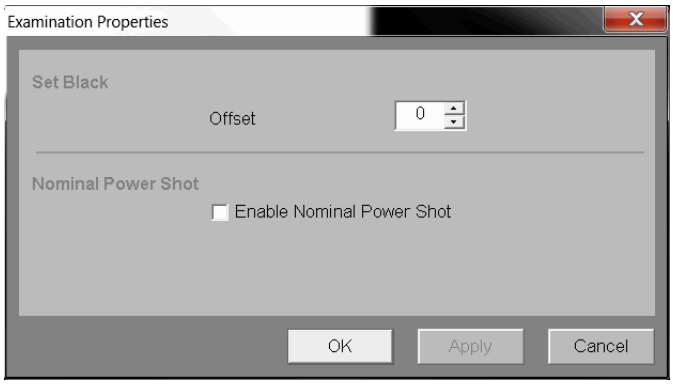
- **Target**: Select one of the configured printers
- **Layout**: Select one of the currently defined DICOM layouts

(Specification: first layout of the default printer)

7.1.5 Examination Properties



Activate special performance tests to check your X-ray system in the **Examination Properties** dialog box.



Set Black

Offset: You can set an offset which will be taken into account when applying the digital collimator function.

Nominal Power Shot

Enable Nominal Power Shot: For VA (Veteran's Health Administration) hospitals in the United States it is required to check the nominal power of an X-ray exposure at 100 kV for 100 ms in accordance with the IEC. When this function is active, the generator creates an exposure with the nominal power when triggering a single image exposure. The function is deactivated again automatically after triggering an exposure.

To activate the function, proceed as follows:

1 The check mark for **Enable Nominal Power Shot** has to be set in the user settings.

2 A patient has to be registered.

3 A new application has to be selected (regardless of which).

The Nominal Power Shot is active one time. (Single image and 100 kV are displayed at this time).

7.1.6 Image display and print properties



In the **Image Display and Print Properties** dialog box you establish the information to be displayed in the images when shown on the monitor and in the hardcopy.

Display Layout card

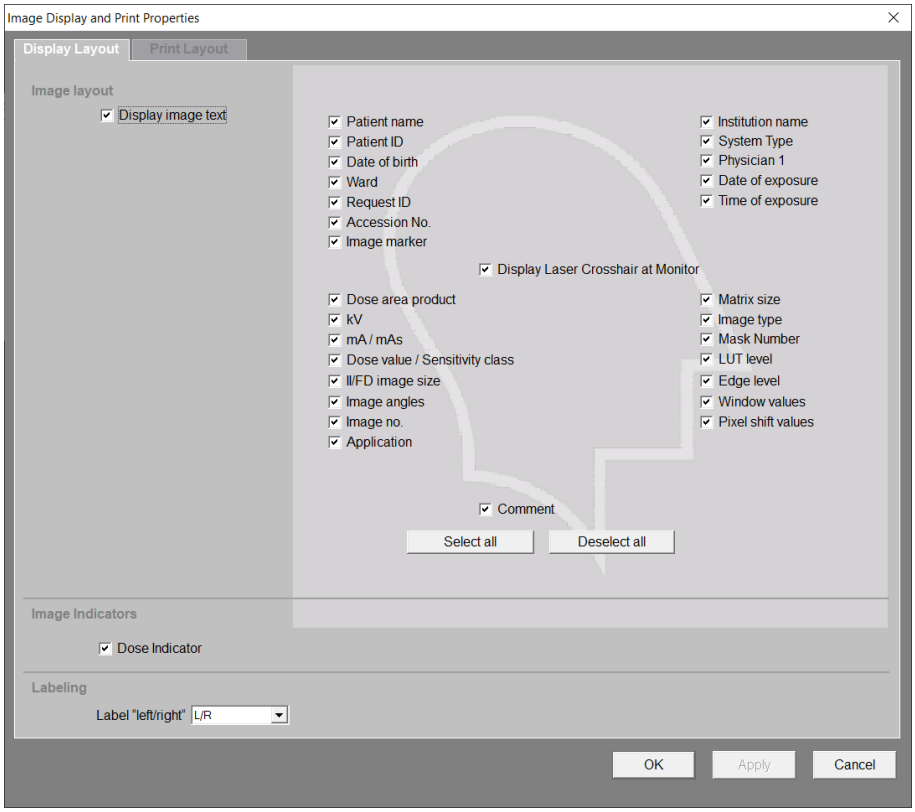


Image layout **Display image text**: Show the selected text elements in the image on the monitor.

Print Layout card

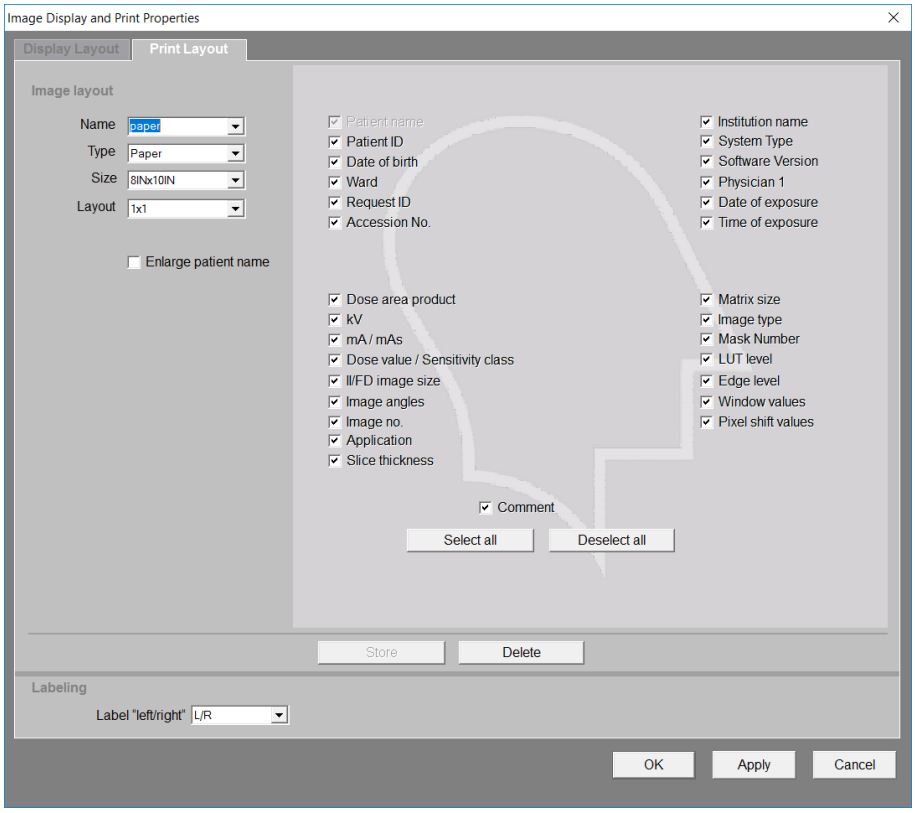


Image layout

- **Name**: Print layout name.
- **Type**: Type of print layout (Paper, DICOM)
- **Size**: Size of the paper/filmsheet in inches
- **Layout**: Page partitioning
- **Enlarge patient name**: Print the patient name larger than the other text

Image text settings

Top left Patient information:

- **Patient name**: Patient's last name, first name
- **Patient ID**: Patient's identification number
- **Date of birth**: Patient's date of birth
- **Ward**: Ward of examination
- **Request ID**
- **Accession No.**

Bottom left Exposure information:

- **Dose area product**: dose area product
- **kV**: Exposure kV
- **mA/mAs**: Exposure mA/mAs
- **Dose value/Sensitivity class**: Dose value or sensitivity
- **II/FD image size**: Input format/zoom level
- **Image angles** (not applicable to Cios Select)
- **Image no.**: Image number
- **Application**: Application program name
- **Slice thickness** (not applicable to Cios Select)

Bottom center

- **Comment**: Image comment

Top right System information:

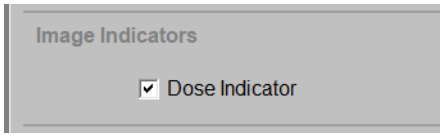
- **Institution name**: (➔ Page 202 *Site info*)
- **System Type**: Product name
- **Software Version**: Product version
- **Physician 1**: Examining physicians
- **Date of exposure**: Date acquired
- **Time of exposure**: Acquisition date and time

Bottom right Image information:

- **Matrix size**: Image matrix
- **Image type**: Image type
- **Mask Number**: Number of the mask image
- **LUT level**: Name of the look-up table (LUT)
- **Edge level**: Edge enhancement module name
- **Window values**: Window values
  - **WW**: Window Width
  - **WC**: Window Center

  Window values: for subtracted images:
  - **WC**: Window Contrast
  - **WB**: Window Brightness
- **Pixel shift values**: Pixel shift value X:.../Y:...

Image Indicators



Dose Indicator: Displays the dose indicator in the image on the monitor.

Labeling



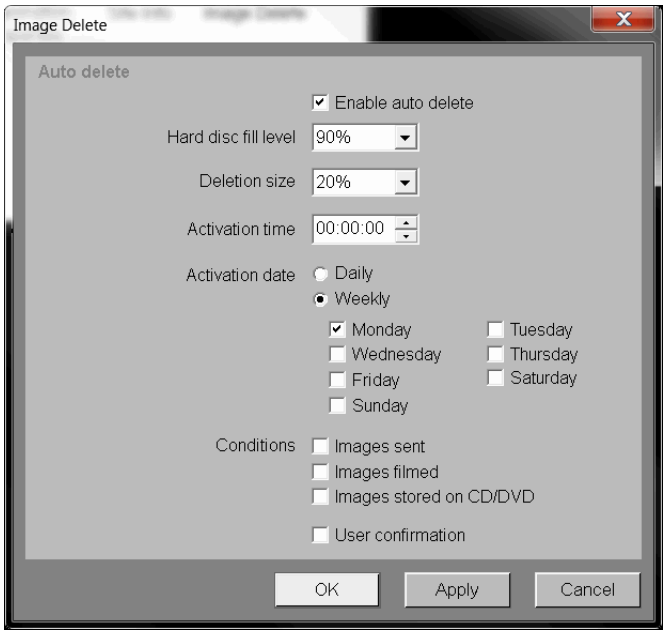
Label "left/right": select text for laterality labels, depending on regional practice.

- **L/R**:
  - Display **L** (English: **Left** or German: **Links**) for left label
  - Display **R** (English: **Right** or German: **Rechts**) for right label
- **G/D**:
  - Display **G** (French: **Gauche**) for left label
  - Display **D** (French: **Droite**) for right label
- **SIN/DX**:
  - Display **SIN** (Latin: **sinister**) for left label
  - Display **DX** (Latin: **dexter**) for right label

7.1.7 Deleting images automatically



In the **Image Delete** dialog box you establish the rules for automatic deletion of images in the local database.



Auto delete

Enable auto delete: Activate the automatic image deletion function.

If enabled, you can define the rules for automatic deletion.

- **Hard disc fill level**: Hard disc fill level (depending on the "memory extension" license key) for activation of automatic deletion (60% to 90%)
- **Deletion size**: Amount of hard disk volume to be deleted (10% to 40%)
- **Activation time**: Activation time for automatic deletion (hh:mm:ss)
- **Activation date**: Activation day for automatic deletion (**Daily**/**Weekly** with selection item for day)
- **Conditions**: Condition(s) for automatic deletion of images (any combination of the following conditions):
  - **Images sent**: Delete all images that have been sent to a DICOM node (with or without confirmation of receipt).
  - **Images filmed**: Delete all printed/filmed images.
  - **Images stored on CD/DVD**: Delete all images stored on CD/DVD.

At least one condition has to be set to activate the automatic delete function.

- **User confirmation**: Obtain user confirmation before starting automatic deletion (show confirmation dialog box).

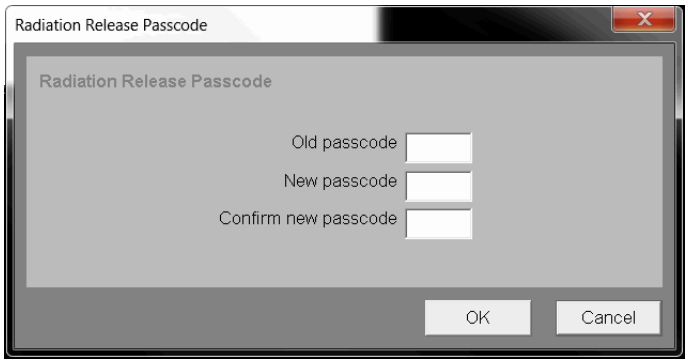
If the confirmation dialog box pops up during the shutdown procedure, the mouse does not work when the Cios OpenApps has been configured. The system cannot be shut down.

Switch the mouse to the other USB port and confirm the dialog.

7.1.8 Password for radiation release



In the **Radiation Release Passcode** dialog box you change the password required for radiation release.



1 Enter the old password.

2 Enter a new password (four-digit number).

3 Repeat entry of the new password.

4 Click **OK**.

7.2 Examination settings (PEX Editor)

7.2.1 Introduction

The Cios Select system provides a series of applications and acquisition program triplets for standard examinations.

The applications are divided into application groups and saved in a database.

The fluoroscopy and acquisition parameters are established in the applications.

All **Fluoro**, **ROAD**, **DR** (Single image), **SUB** acquisition programs are available as versions with low, medium, and high dose.

Operating mode	Fluoro	ROAD	SUB	DR
Low	x	x	x	x
Medium	x	x	x	x
High	x	x	x	x

An application comprises three acquisition program triplets each (low, medium, high) for each operating mode (fluoro, single image, subtraction, roadmap).

PEX Editor

The **Programs and Exams Editor**, **PEX Editor** for short, is a tool for viewing and editing application groups, applications, and acquisition program triplets. You can also define parameter sets that can be used with the acquisition programs.

The **PEX Editor** may be used by authorized persons only.

PEX database

The PEX Editor administers a database, the PEX database, containing the definitions of the application groups, applications, and acquisition program triplets, as well as the parameter sets.

Online/offline

The PEX Editor runs on the Cios Select.

Offline editing of the PEX database is also supported. A special version of the PEX Editor runs on a separate Windows PC without the main application.

Data categories

The PEX database supports the storage of the following data types:

- User data

  Your specific applications and application groups.

- Siemens data

  – Standard applications, application groups, parameter sets, and program triplets. These entries are marked with **(d) = default**.

  – IQAP applications, application groups, and parameter sets. These entries are marked with **(i) = IQAP**.

  – Calibration applications, application groups, and parameter sets. These entries are marked with **(c) = calibration**.

  – Service programs for maintenance. These entries are marked with **(m) = maintenance**.

Names

The names of the applications, application groups, parameter sets, and program triplets depend on the language set for the user interface:

- The names of Siemens elements depend on the language set for the user interface. In other words, every element has a different name in each configurable language, but the parameters are the same in each language.
- User specific applications and application groups do not depend on the set language. In other words, there is only one name for all configurable languages.

Storage capacity

The following number of programs can be stored in the database:

- Up to 44 activated application groups, i.e., up to 44 application groups that can be selected on the control panel
- Up to 3000 applications
- Up to 44 applications per application group
- Up to 30 application program triplets per application

Access control

To open the PEX Editor you are asked to enter a user name and password or to select the viewing mode. The customer mode password is site-specific. It can be set up and edited. In service mode, the customer mode password can be reset without knowledge of the current password.

Access modes

There are three modes for accessing the data:

- In **Customer mode**, you have access rights for user data and also for viewing the standard applications and application groups. Access to IQAP, calibration, and service data is not possible.
- In **IQ expert mode**, Siemens image quality experts have access to view and edit all data.
- In **Viewing mode**, you can see all data sets, but you cannot modify them.

Import/Export

You can import a PEX database into the PEX Editor via any local or external drive e.g. local hard drive, or a USB storage medium. Each import replaces the current database and cannot be undone.

Depending on licensing, several applications/acquisition programs may be inactive after the transfer. Inactive applications/acquisition programs cannot be selected.

Automatic backup

Backups of the PEX database are done automatically. The automatic backup runs in the background after each editing session when the PEX Editor is closed.

Up to ten backups are kept in a folder on the hard drive.

A database stored via automatic backup can be restored with the import function.

7.2.2 Starting the PEX Editor



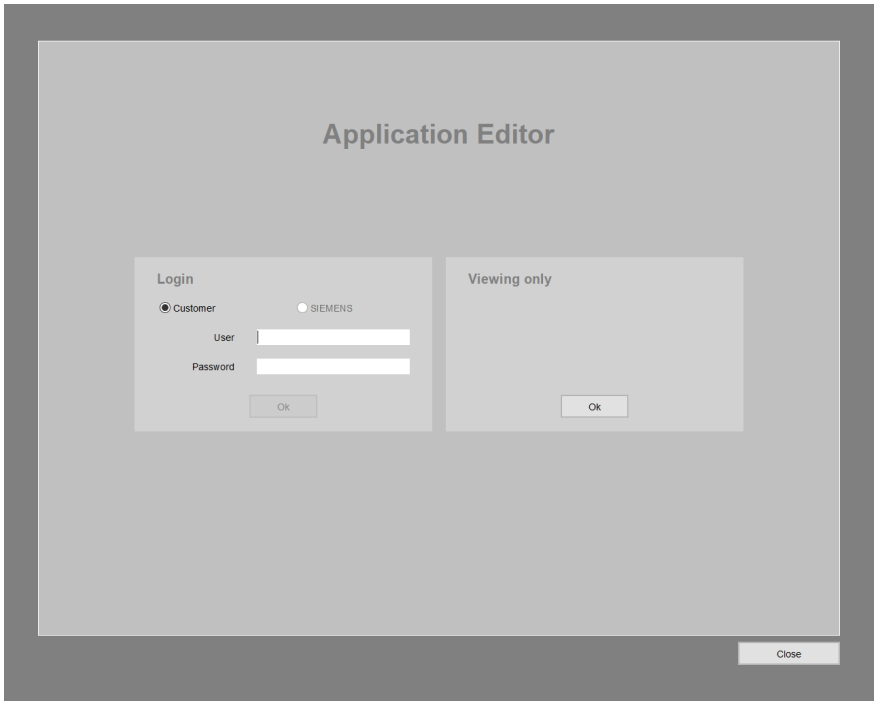
1 Press this button on the monitor trolley control panel or keyboard.

Manage Tool is displayed on the monitor.

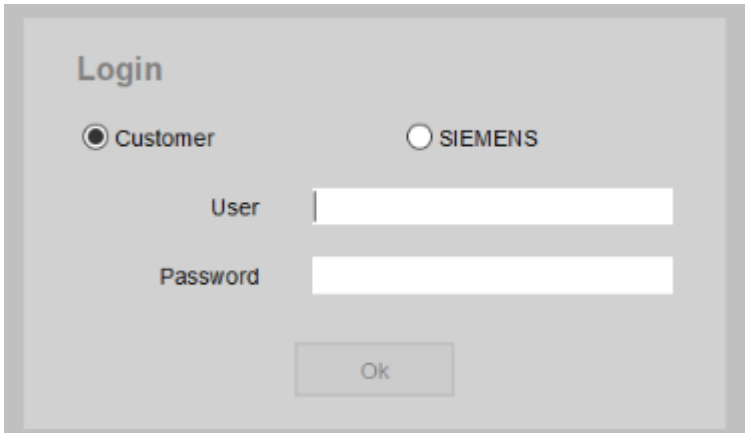


2 Click this icon on the **Settings** subtask card in the **Manage Tool**.

If HIPAA is licensed, the password dialog box for the **PEX Editor** is displayed.



If HIPAA is not activated, the login window is displayed:



Enter your login name and password, and confirm with **OK**.

3 Select **Customer** mode.

Enter the user name and correct password

The factory-set password for customer mode is: customer.

4 Click **Ok** or press **Enter**.

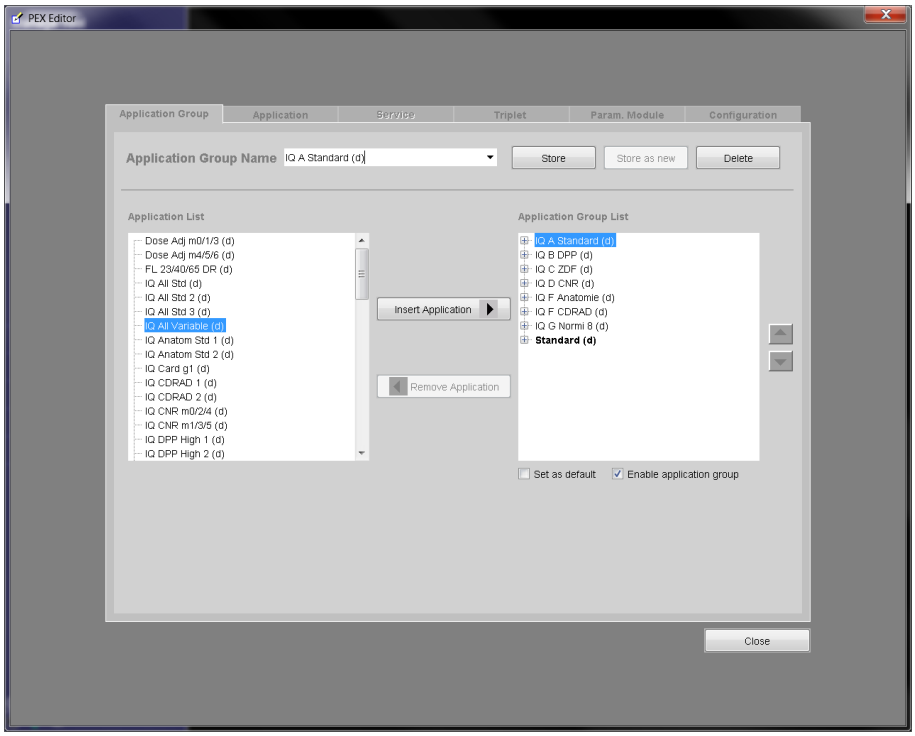
The **PEX Editor** is opened for editing.

– or –

Click **Ok** for **Viewing only**.

The **PEX Editor** is opened for viewing only.

PEX Editor layout



Example

The PEX Editor includes the following task cards:

- **Application Group**: Add or remove applications from application groups.
- **Application**: Establish acquisition program selection and properties within an application.
- **Triplets**: Establish acquisition program triplets for **Fluoro**, **SUB**/**ROAD** (SUB and ROAD are not applicable to Cios Select Plus, Pro), **DR** operating modes.
- **Param. Module**: Define and edit parameter sets referenced in the acquisition programs.
- **Configuration**: Define and edit system configuration data, e.g. backup/restore of the PEX database

General work steps in the PEX Editor

◆ Check/modify the parameters.

(➔ Page 220 *Editing application groups*)

(➔ Page 222 *Editing applications*)

(➔ Page 224 *Parameter for fluoroscopy and exposure*)

Adopting changed parameters

◆ Click **Store**.

Creating a new application group/application or a new acquisition program triplet

1 Enter a new designation for **Application Group Name** or **Application Name** or **Triplet Name**.

2 Click **Store as new**.

Deleting an application group/ application or an acquisition program triplet

1 Select the element.

2 Click **Delete**.

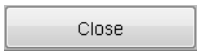
A confirmation dialog box appears.

3 Click **Yes** to delete the element.

A triplet used in an application cannot be deleted.

Siemens standard triplets can only be deleted in IQ expert mode.

Rejecting changed parameters



1 Click **Close**.

– or –

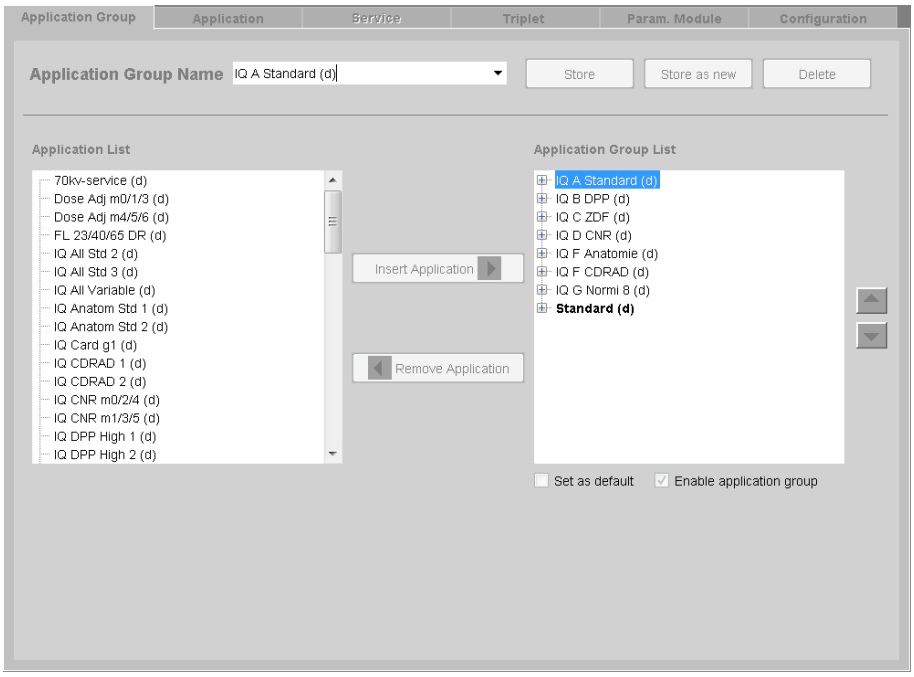


Click the Close icon.

A confirmation dialog box appears.

2 Click **Ok** to reject changes.

7.2.3 Editing application groups



Example

The **Application Group** task card displays all available applications and application groups. You define application groups and assign applications to the application groups here.

- The applications are listed in the **Application List**.
- The application groups and all assigned applications are listed in the **Application Group List**.

(➔ Page 219 *General work steps in the PEX Editor*)

The **Application Group Name** comprises a maximum 15 Unicode characters.

Assigning applications to application groups

1 Mark an application in the **Application List**.

2 Mark an application group in the **Application Group List**.

3 Click **Insert Application**.

– or –

Drag an application from the **Application List** to an application group in the **Application Group List**.

The application is assigned to the application group under the position marked in the **Application Group List**.

The same application can be assigned to multiple application groups.

Removing applications from an application group

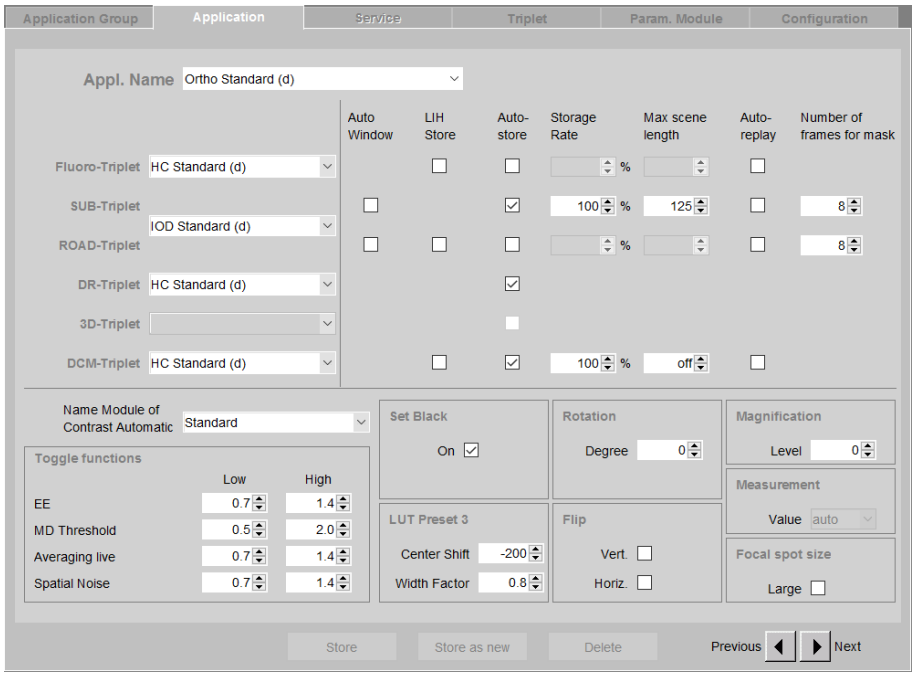
1 Mark the application in the **Application Group List**.

2 Click **Remove Application**.

Establishing the default application group

◆ Mark the application in the **Application Group List** and then click **Set as default.**

7.2.4 Editing applications



Example

The **Application** task card shows the assigned acquisition program triplets for the **Fluoro**, **SUB, ROAD** (SUB, ROAD are not applicable to Cios Select Plus, Pro), **DR** operating mode, as well as additional parameters. You can configure the applications and establish the application-specific parameters here.

(➔ Page 219 *General work steps in the PEX Editor*)

The **Application Name** comprises a maximum 15 Unicode characters.

Configure triplets for applications

1 Select a triplet for each operating mode.

2 Activate the **Auto Window** to switch to automatic window value assignment for **SUB/ROAD**.

The brightness and contrast settings of the currently available Peak OP image are used when reviewing the subtraction scene or for subsequent subtraction exposures.

3 For automatic saving activate the **Auto-store** option field and enter the **Storage Rate** and **Max scene length**.

The maximum scene length is set in seconds.

The percentage save frequency (save rate) corresponds to the proportion of images to be saved from the live scene; e.g., at a 25% save rate, every 4th image is saved.

CAUTION

Storage rate is set incorrectly or being not aware of replay/image saving behavior.

Images are lost or replay rate/image saving differs from the pulse rate during acquisition!

- Choose the storage rate with care.
- Note that for 30 frames per second with 20x20 detector in overview, image information is summarized in 15 frames for replay/storage only (no image information is lost).

4 Activate **Autoreplay** if scenes should replay automatically.

5 For **SUB/ROAD** establish the **Number of frames for mask**, i.e., the number of images used to calculate the mask (not applicable to Cios Select Plus, Pro).

Defining other parameters

1 Select an entry in the **Name Module of Contrast Automatic** list to establish the brightness and contrast.

2 Select a multiplication factor for **Toggle function EE**.

The user can toggle the edge enhancement between low, default, and high on the control panel. The default value is set in the triplet. The values for low and high are calculated by a factor.

A factor of 1 means the edge enhancement is medium.

A factor of 0 means the edge enhancement is off.

3 Select a multiplication factor for **Toggle function MD**.

The user can toggle the motion detection (k factor) between low, default, and high on the control panel. The default value is set in the triplet. The values for low and high are calculated by a factor.

A factor of 1 means the motion detection is medium.

4 Select a **Center Shift** and a **Width Factor** for **LUT Preset 3**.

The values for center shift and width factor can be set for automatic contrast regulation. Correction values for center/width and brightness/contrast of the third LUT can be set.

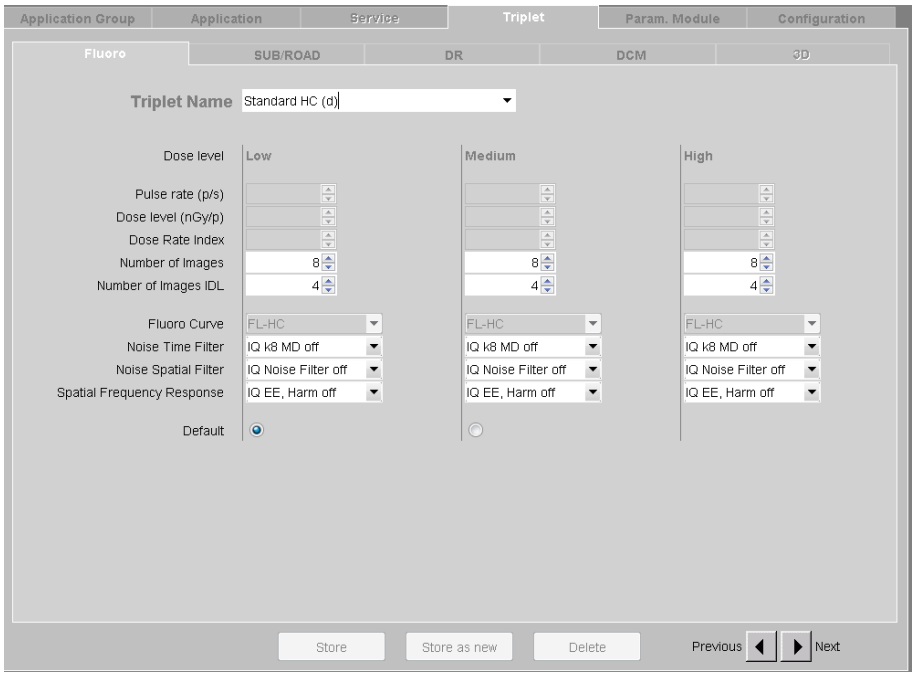
5 Activate **Set Black** if the image area outside the collimated area should be blackened (digital collimation).

6 Define the input values for **Rotation** in degrees (0 - 359), **Flip** (vertical and/or horizontal flip) and **Magnification** (Level 0, 1, 2).

7 Establish the measurement field with the **Measurement** parameter.

8 Switch between small and large focus with the **Focal spot size** parameter.

7.2.5 Parameter for fluoroscopy and exposure



Example

The **Triplets** task card enables triplets and parameters to be established for all operating modes on the corresponding cards.

- **Fluoro** card: Parameters for unsubtracted fluoroscopy
- **SUB/ROAD** card: Parameters for subtracted fluoroscopy (not applicable to Cios Select Plus, Pro)
- **DR** card: Parameters for unsubtracted single image acquisitions
- **3D** card: Parameters for 3D scanning (not applicable to Cios Select)
- **DCM** card: Parameters for digital cine mode (not applicable to Cios Select)

(➔ Page 219 *General work steps in the PEX Editor*)

Parameter

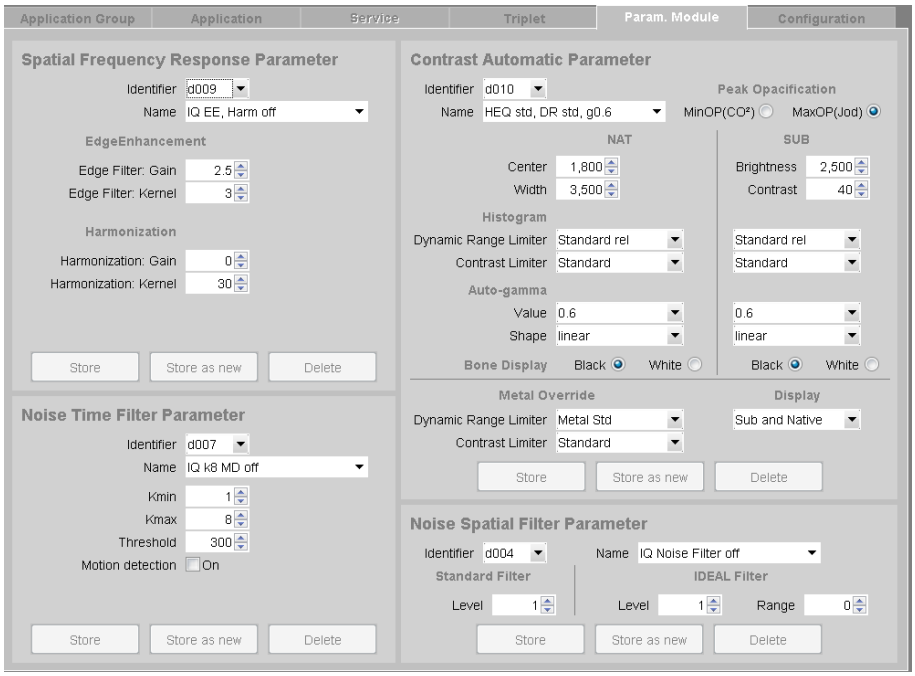
Triplet Name: Name of the fluoroscopy or acquisition program triplet (max. 63 characters).

- **Number of Images**: Number of images from which the LIH (last image hold) is calculated.
- **Number of Images IDL**: Number of pulses used to calculate the individual images in Fluoro and SUB/ROAD modes.
- **Number of Pulses**: Number of pulses to obtain a specific overall dose for a single image acquisition.

  Examples: A factor of 1 corresponds to a single acquisition. With a factor of 8, the image is calculated from 8 acquisitions. Possible values: 1, 2, 4, 8, 16, 32

- **Landmark**: Basic setting for anatomical background in subtracted images. Possible values: 0 - 100% (not applicable to Cios Select Plus, Pro)
- Parameter modules **Noise Time Filter**, **Noise Spatial Filter**, **Spatial Frequency Response**: Three parameter sets can be selected for each dose level. The parameter sets are defined by experts. (➔ Page 225 *Defining parameter sets*)
- **Default**: Establish the default parameter set: **Low** or **Medium**. **High** cannot be selected as the default.

7.2.6 Defining parameter sets



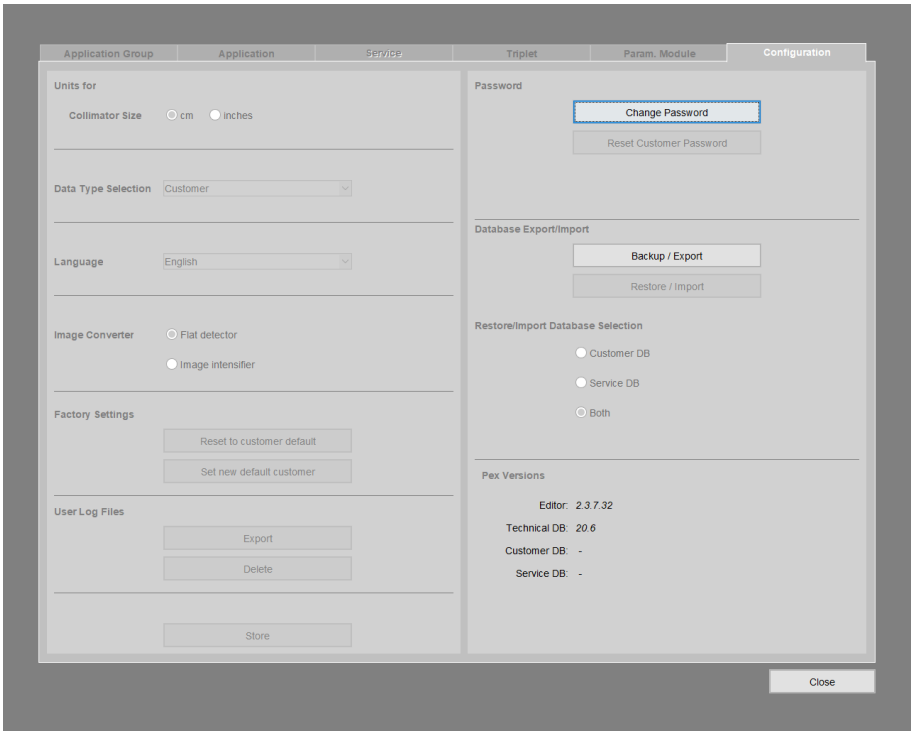
Example

Parameter sets can be defined and edited on the **Param. Module** task card. These can then be referenced in application and/or triplet definitions.

Parameter sets may be changed in expert mode only; changed parameter sets cannot be saved in customer mode.

7.2.7 PEX service functions

Configuration parameters



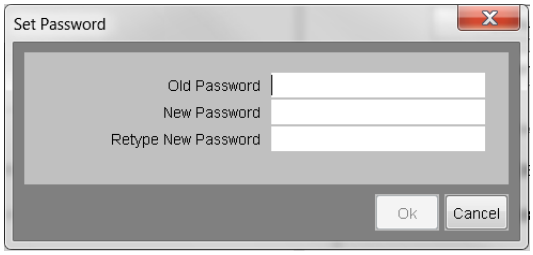
- **Units for**: Unit to be used (**cm** or **inches**) for the **Collimator Size**
- **Password**: (➔ Page 226 *Changing the PEX Editor password*)
- **Database Export/Import**: (➔ Page 227 *Backing up and restoring the PEX database*)
- **Restore/Import Database Selection**: Database selection for export/import
- **Pex Versions**: Displays the PEX Editor version

Changing the PEX Editor password

1 Click the **Configuration** card.

2 Click **Change Password**.

The password change dialog is displayed.



3 Enter your old password.

4 Enter your new password.

5 Re-enter your new password.

6 Click **Ok**.

Backing up and restoring the PEX database

It is possible to import or export the PEX database via a local or external drive (e.g. local hard drive, USB memory stick).

This process should only be perform by an expert or specialist.

- Click the **Configuration** card.

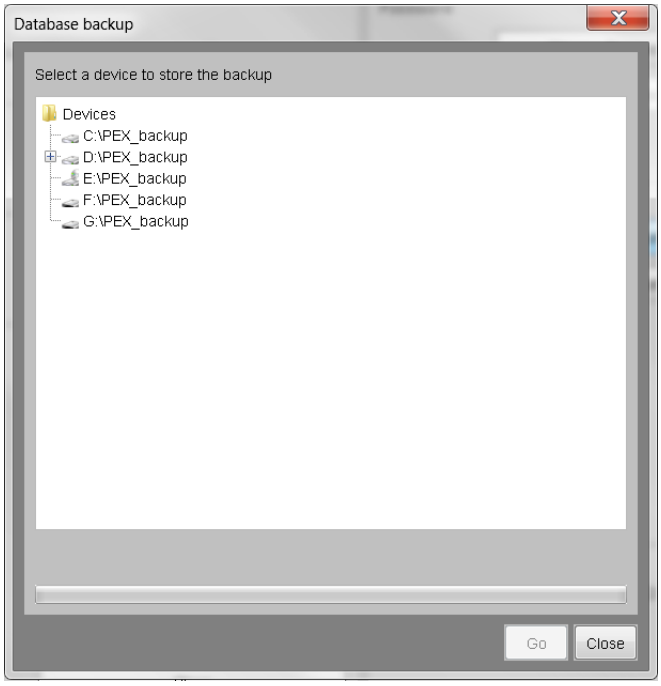
Exporting the PEX database

1 If necessary, have the required external data medium on hand.

Connect the USB memory to the USB socket.

2 Click **Backup / Export**.

A list of all writable devices connected to the PC in use (system or user PC with offline PEX Editor) that can be used for export/backup is displayed.



3 Select the destination drive.

4 Click **Go** to start export.

The PEX database is copied to the destination drive in a predefined folder (e.g. D:\PEX_backup\). The name of the database copy is the original name extended by creation date and time.

A message window indicates that the backup is complete.

5 Click **OK**.

The number of backups on the local drive (C: and D: drives) is limited to 10.

Importing a PEX database

By importing you replace the old system database. If an error occurs during transfer, the old database remains valid.

After correct import the old database is permanently deleted.

1 If necessary have the required external data medium to which the new database will be stored on hand.

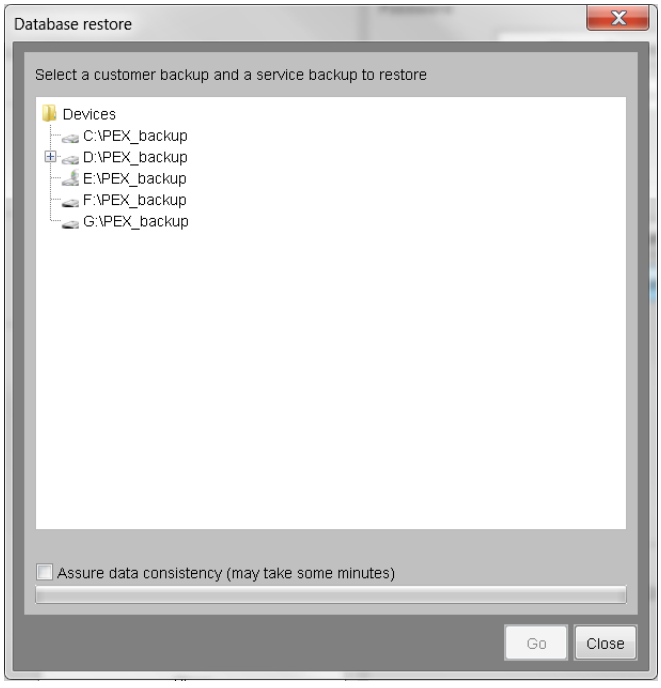
Connect the USB memory to the USB socket.

2 Select the database you want to replace.

Customer DB, **Service DB**, or **Both** for both databases.

3 Click **Restore / Import**.

A list of all readable devices connected to the PC in use (system or user PC with offline PEX Editor) that can be used for import/restore is displayed.



4 Select the source device.

A list of all restorable databases is shown.

When copying from the local hard drive you have to select one of the two backup folders (manual, automatic backup) to get the list of restorable databases.

5 Select the new database or databases.

6 Activate **Assure data consistency** if the data are to be checked for errors.

7 Click **Go** to start the import.

8 Maintenance

8.1 Functional and safety checks 231
8.1.1 Daily checks 231
Prior to the examination 231
Checking the EMERGENCY STOP function for motor-driven system movements 231
8.1.2 Monthly checks 231
Functional check of the dose rate control 231
8.1.3 Checks prior to special examinations (e.g. of the open heart and skull) 232
8.1.4 Calibration 232
Network administration and calibration 232
Detector calibration 232
Calibrating the dose measurement chamber 233
8.1.5 Maintenance plan for checking the system 233
8.1.6 Maintenance intervals 234
General information 234
Batteries 234
8.1.7 Dose and consistency test 235
Preparation 235
Dose measurement 236
Calculation 236
8.2 Service via network connection 236
8.2.1 Remote service 237
Software updates via remote access 237
Setting the access rights 237
8.2.2 Application support 238
8.2.3 Transmitting error messages 240
Transmitting to the factory 240
Saving to a USB drive 241
8.3 Software Update 241
8.3.1 Software update failed but system recovery was successful 243
8.3.2 Software update and system recovery failed 244
8.4 Protection classes/Protection measures 244
8.5 Cleaning and Disinfection 245
8.5.1 Active ingredient classes 245
Not recommended cleaning agents and products 245
8.5.2 Preparing the C-arm system 246
8.5.3 General cleaning and disinfection measures 246
Combining the cleaning and disinfection process 247
Material damage 248
Transport and park position of the C-arm system and the monitor trolley 248
8.5.4 Cleaning and disinfection areas 248
Surfaces of the C-arm system 248
Surfaces of the monitor trolley 249
8.5.5 Cleaning procedure 250
8.5.6 Disinfection procedure 250

8.1 Functional and safety checks

To ensure that the Cios Select is ready for operation and all safety features are functioning properly, you must perform regular functional and safety checks.

8.1.1 Daily checks

Prior to the examination

1. Check the power plug. If the power plug is damaged, the Cios Select must not be used.
2. Check the power cable. If the power cable is damaged, the Cios Select must not be used.
3. Check the function of the locking brakes of the C-arm system and the monitor trolley as well as the steering of the C-arm system.
4. Check the C-arm counterbalance after releasing the brakes.
5. Check the loudspeakers for proper functioning. An audible signal must sound while the system starts up.
6. Check that all radiation indicators are functioning properly.
7. Inspect the flat detector housing and the single tank for mechanical damage.
8. Make sure the anti-scatter grid is correctly fastened on the flat detector input.

Checking the EMERGENCY STOP function for motor-driven system movements

1. Switch the Cios Select on.
2. Move the lifting column and press the **EMERGENCY STOP** button at the same time.

   The lifting movement is stopped.

   A message is displayed on the monitor indicating that EMERGENCY STOP has been actuated.
3. Release the **EMERGENCY STOP** button again.
4. Press one of the buttons for moving the lifting column.

   The lifting movement is enabled again.

8.1.2 Monthly checks

Functional check of the dose rate control

You can check the function of the dose rate control without an object using the simple procedure described below. A kV value of ≤ 45 kV must stabilize:

1. Open the rectangular and slot collimators to maximum aperture.
2. Press the **Tech Lock** key.
3. Select 110 kV with the **+/-** keys.

4 Press the **Tech Lock** key again.

The stop function is canceled; automatic dose rate control is switched on again.

5 Release radiation in fluoroscopy mode.

The tube voltage is reduced to a value ≤ 45 kV.

The monitor image is not overexposed.

8.1.3 Checks prior to special examinations (e.g. of the open heart and skull)

- Make sure that there is an additional conductive connection between the C-arm system and a point of potential equalization, e.g. the patient table.

8.1.4 Calibration

Network administration and calibration

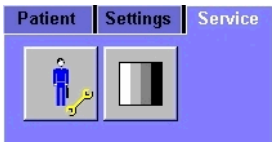


1 Press this button on the monitor trolley control panel.

Manage Tool is displayed on the monitor.

The control panel switches to keyboard mode.

2 Click the **Settings** subtask card on the monitor.

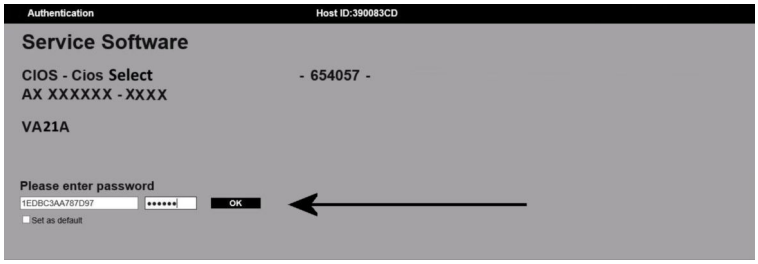


3 Click the **Service** subtask card on the monitor.



4 Click this button.

The Service login screen appears.



Detector calibration

The detector calibration shall be done in the regular intervals.

CAUTION

Incorrect calibration parameters. Reduced image quality.

Risk of unnecessary radiation exposure due to incorrect calibration parameters!

- Calibrate the system after 24 months to preserve image quality.

To ensure optimum quality, we recommend performing detector calibration at shorter intervals than specified above.

Additionally the imaging system will remind the user to recalibrate the detector in factory-defined intervals.

The detector calibration needs to be done also in case there are new defective pixels visible in the x-ray image. These defective pixels will be displayed e.g. as white dots in the image. In such a case perform the detector calibration as soon as possible.

It will be always possible to work with the system even if the detector calibration warning was confirmed without starting the detector calibration immediately.

Please contact Siemens Healthineers Customer Service for flat detector calibration.

Calibrating the dose measurement chamber

The dose measurement chamber is calibrated on a regular basis as part of the maintenance contract (every 5 years at the latest). If you do not have a maintenance contract, Siemens Healthineers Customer Service or the manufacturer can calibrate the dose measuring chamber.

8.1.5 Maintenance plan for checking the system

The tests and inspections required by national laws or regulations, such as DHHS regulations or RöV (constancy tests), are not part of the activities listed in this maintenance plan.

If national laws or regulations specify more frequent checking and/or maintenance, this must be observed.

Maintenance work should be performed by trained technical personnel only. To keep the system in an optimum condition, we recommend that you conclude a maintenance contract. If you have any questions relating to maintenance/maintenance contract please contact our Siemens Healthineers Customer Service.

Please observe the relevant information in (➔ Page 22 *Maintenance and inspection*).

8.1.6 Maintenance intervals

General information

Initial maintenance for a new system is performed after **24 months** and includes **all maintenance activities**.

Regular maintenance then takes place in 24-month intervals. It contains numerous maintenance steps that have to be performed:

Procedures to be performed	Function	Interval
External visual inspection	Damage, total system Damage to the system and network connection	24 months
Mechanical safety	Paneling, cable guards, C-arm, C-arm movements, flat detector exchangeable grid/grid holder, brakes. Wheels, lifting columns, emergency stop button, warning labels, identification labels, monitors, options (if available - e.g. laser light localizer)	24 months
Electrical safety	Cable and plug, fluoroscopy indicator, acoustic warning signal, forced switch-off for radiation, radiation release switch, radiation indicator, radiation iris, rubber voltage discharger, monitors, options (e.g. dose area product and/or air kerma measuring device), image quality total system, checks in accordance with IEC 62353	24 months
Maintenance	System ventilation, cleaning of system	24 months
Operating value inspection	Output and assess Event Log	24 months
Functional inspection	Control functions, monitor indicators of beam path opening/slot collimator positions, options	24 months
Upkeep	Housing	24 months

The stated functions are minimum requirements

Batteries

Battery replacement intervals (UPS and PC)

Procedures to be performed	Function	Interval
Operating value inspection	UPS lead gel batteries PC bios battery	First replacement after 42 months, subsequently every 48 months

The stated functions are minimum requirements

8.1.7 Dose and consistency test

The goal of the dose and consistency test is to maintain the accuracy of dosimetric indications.

Carry out dose area product testing after performing the following procedure:

Preparation

1 Open the collimator completely (full format).

2 Select the “Fluoroscopy” operating mode.

3 Center the lead ruler on the flat detector.

4 Release radiation, setting the rectangular collimator to approx. 15 cm edge length.

5 Keep the field size (shown on the lead ruler) constant.

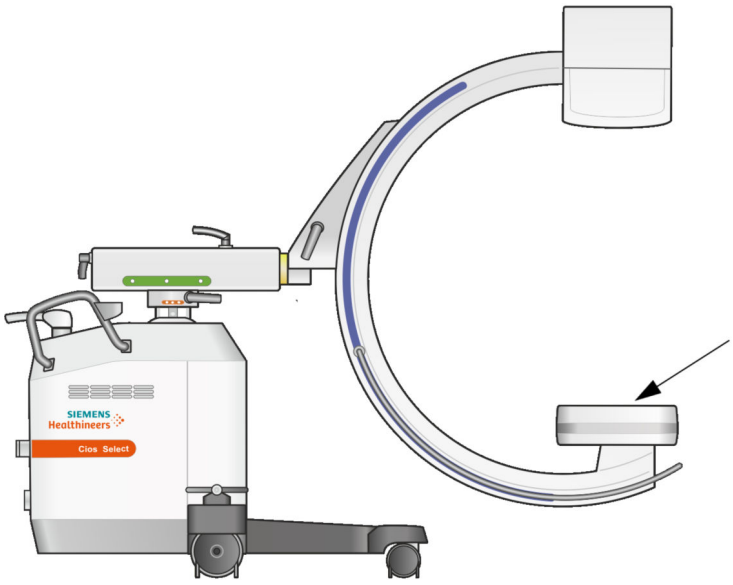
Use only dose measurement devices appropriate for the measurement range. In case of doubt, contact Siemens Healthineers Customer Services for suitable dose measurement devices.

If correctly adjusted, the displayed and calculated values should correspond within a maximum deviation of +/- 25%. If the deviation exceeds this percentage, please inform Siemens Healthineers Customer Services. Also consider the accuracy of your dose measurement device.

The rectangular collimator may no longer be adjusted.

6 Remove the lead ruler.

7 Center the dose measurement device on the flat detector (see figure).



Dose measurement device

Dose measurement

1 Release radiation for a short period and then actuate the **Tech Lock** key and set 70 kV.

2 Record the dose area product - value "A" (µGycm²) - shown on the monitor.

3 Set the measured dose area product to "0" on the measuring device.

4 Release radiation for approx. 10 s and record the measured dose (cGy).

5 Record the dose area product - value "B" - shown on the monitor.

6 Subtract value “A” from value “B”.

Calculation

Measured dose area product = measured dose (cGy) x 225 cm²

◆ Compare the measured value with the dose area product displayed on the monitor.

With a correct adjustment, the displayed and calculated values agree within a maximum deviation of +/- 25%. If the deviation exceeds this percentage, please inform service.

8.2 Service via network connection

The Cios Select must be connected to a network (DSL ≥ 1 Mbit/s) to enable remote access service measures.

8.2.1 Remote service

If the rights are granted accordingly, Siemens Healthineers Customer Service can access the Cios Select for maintenance and installation activities via an active network connection.

Software updates via remote access

CAUTION

Software installation interferes with system functions.

Interruption of patient examination and loss of patient data.

- Do not start the installation while working with patients.

CAUTION

Failure installing the update package.

A failed software installation means that the system is in an undefined state.

- Stop using the system and notify the UPTIME Service Center.

CAUTION

No restart after service session.

Changes to the service environment may not go into effect without a system restart.

- Restart the system after a service session.

Setting the access rights

In the **Remote Service** window you grant service personnel access rights so that they can perform maintenance in a remote session.

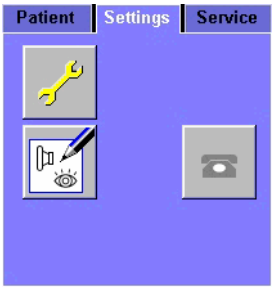
The patient must be closed; otherwise, there could be problems accessing the control panels.

1 Press this button on the monitor trolley control panel.

Manage Tool is displayed on the monitor.

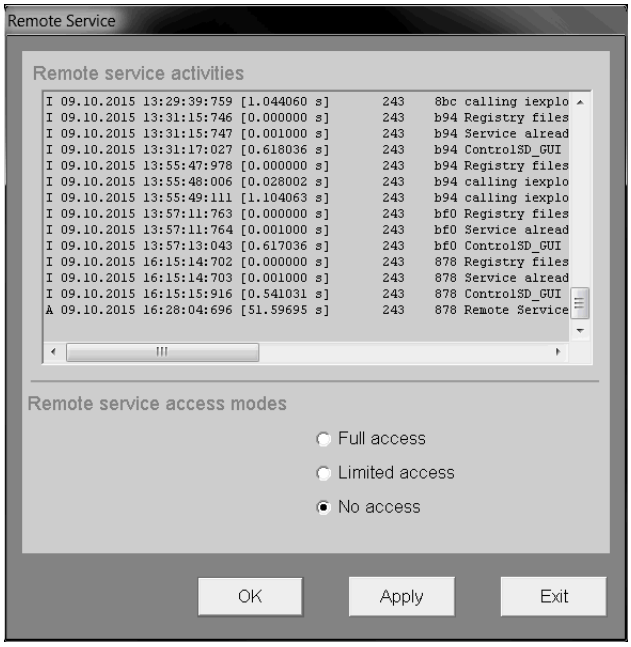
The control panel switches to keyboard mode.

2 Click the **Settings** subtask card on the monitor.



3 Double-click the Telephone icon.

The **Remote Service** window appears.



4 Click one of the following options to define the type of access:

- **Full access**: Service receives full access rights to your system.
- **Limited access**: Service receives limited access, that is, they can see error messages and reset passwords.
- **No access** (default setting): Service does not receive access to your system.

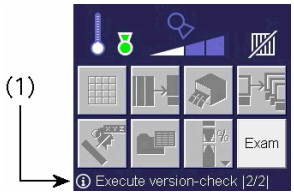
5 Click **OK** to apply all settings and exit the window.



6 Press the this button on the keyboard to exit the **Manage Tool**.

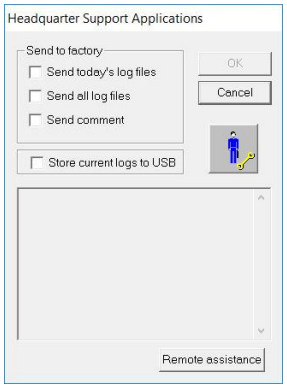
8.2.2 Application support

If you require online support for your system, you can grant access to the Cios Select as follows:



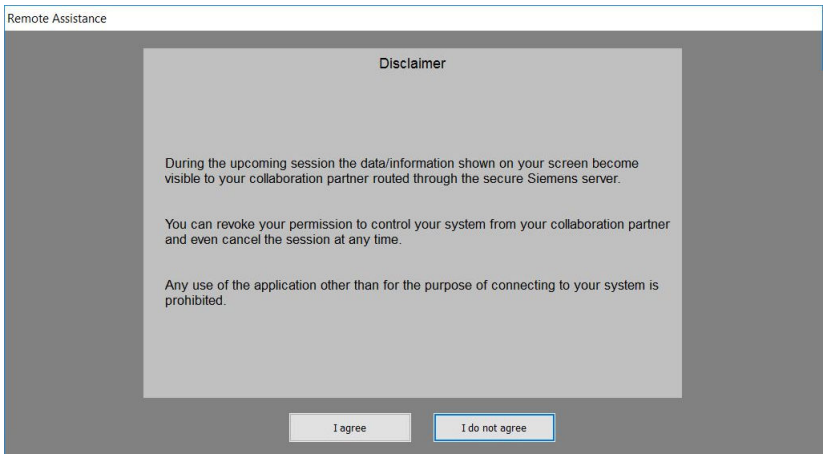
1 Right-click the **i icon** (1) on the monitor.

The **Headquarter Support Applications** screen opens:



2 Click **Remote assistance**.

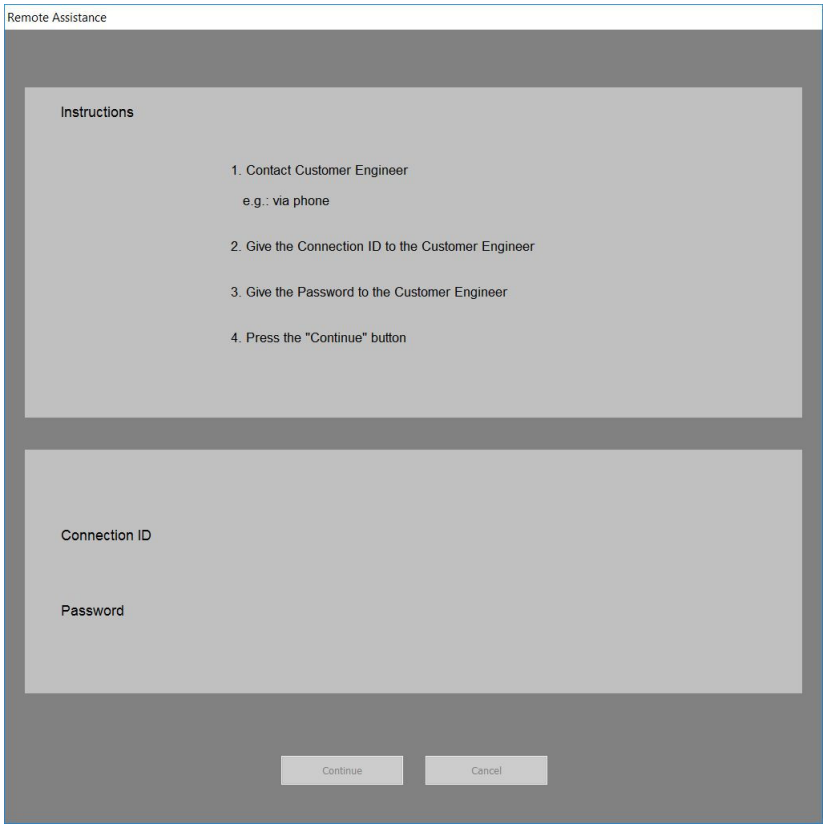
The **Remote Assistance** window opens.



3 To enable remote access to the system click **I agree**.

The dialog window with instructions and input fields for starting the remote service session opens.

If you click **I do not agree**, remote access to the system is rejected and the request canceled.



4 Enter the **Connection ID** and the **Password** that you have received from Service.

5 Click **Continue**.

The requesting technician receives the right to control the user interface.



The remote assistance status is displayed in the status area.

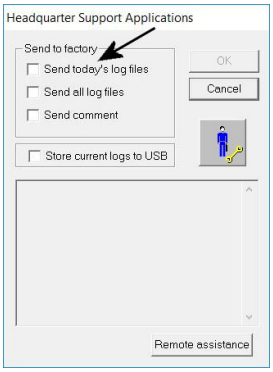
8.2.3 Transmitting error messages

You can transmit error messages directly to the factory or save them to a USB drive.

Transmitting to the factory

1 Click the **i** icon.

The **Headquarter Support Applications** screen opens.



2 Under **Send to factory** mark the appropriate check box.

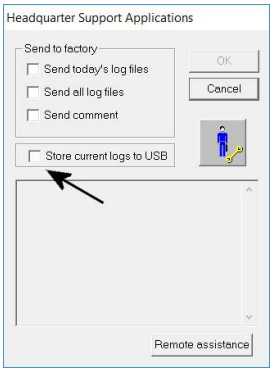
3 You can also enter a comment by marking the appropriate check box and entering text.

4 Confirm with **OK**.

The message and/or log files are sent.

If the system is not currently connected to the network, the files are placed in a transfer folder on the system. The files are sent the next time a network connection is established.

Saving to a USB drive



1 Insert the USB drive into a free USB slot on the monitor trolley.

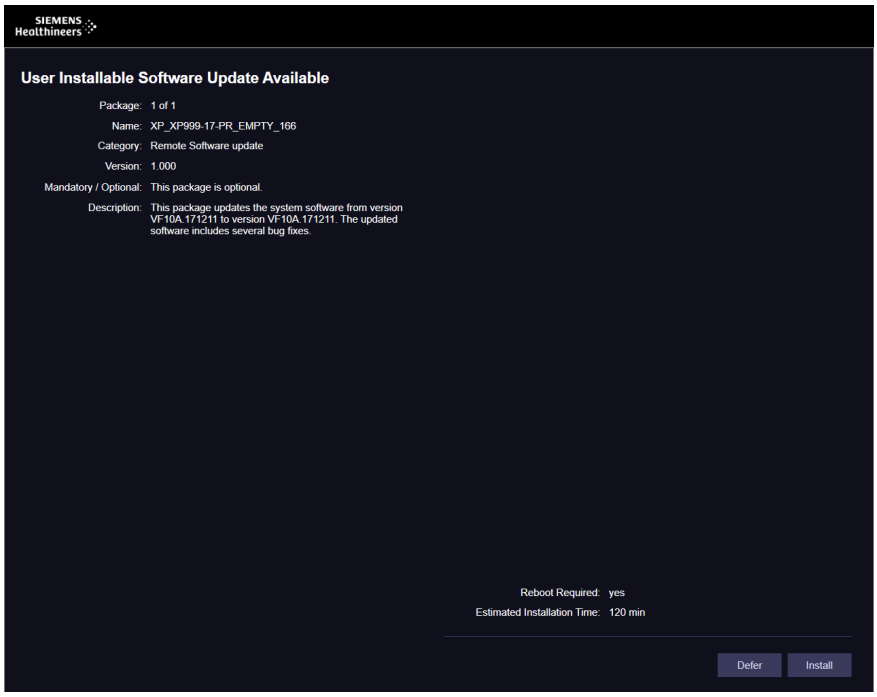
2 Click the corresponding box and confirm with **OK**.

The log files will be saved to the USB drive.

8.3 Software Update

The installation of a software update can be initiated by any user. Each available software update package on the system is indicated by a standard window, the so called SD GUI (Software Distribution Graphical User Interface).

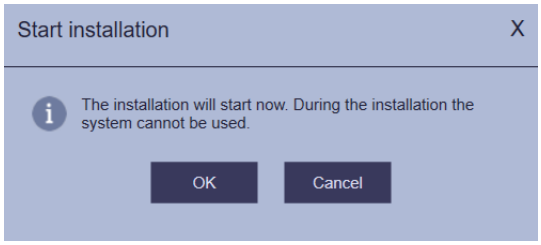
1 Press **Install**



An additional dialog is shown, which needs to be confirmed

The button **Defer** will close the window and provide the software update during the next system startup again.

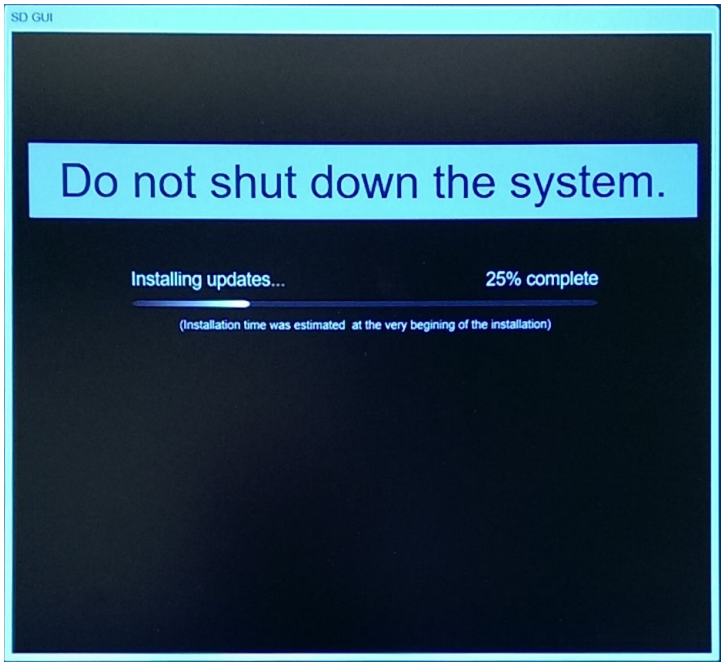
2 Press **OK** to start the software update



Pressing **Cancel** will close the dialog and the SD GUI and will not trigger the software update.

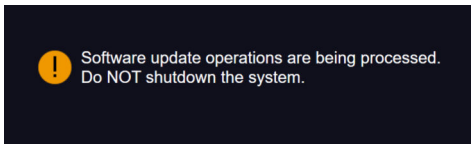
The installation progress and the estimated installation time is displayed in the next window. This window remains displayed during the entire installation process.

3 Follow the instructions on the monitor and do not shut down the system

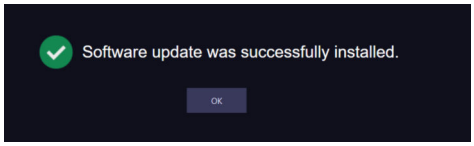


After the installation of the software update is finished an automatic reboot of the system is triggered. During the system startup the following dialog is displayed to indicate that additional tasks will be done in the background.

4 Follow the instructions on the monitor and do not shut down the system



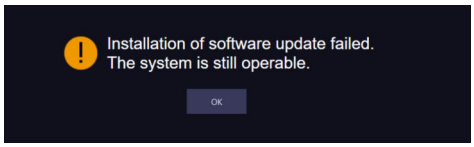
The successfully finished software update is displayed to the user



8.3.1 Software update failed but system recovery was successful

In case of any error during the installation of the software update the system will be automatically rolled back to the initial state (before the software update). The successful recovery is indicated by the following screen:

- Pressing the button **OK**

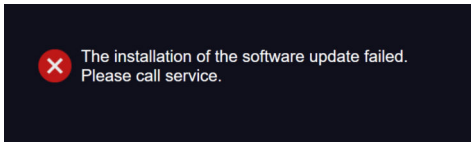


The window will close and the system is ready to use

8.3.2 Software update and system recovery failed

In case the software update and the attempt to recover the system to its initial state fails the system is locked. The following screen is displayed:

- The system cannot be operated. Please call your administrator to contact the service department



Even after switching the system off and on again the screen will show the same message. There is no way to confirm this screen, the system must be repaired by a service engineer

8.4 Protection classes/Protection measures

System Components	Protection Class	Protection Measures
X-ray tube assembly (Single-tank)	IPX3 waterproof	protect with sterile cover
Flat detector	IPX0 waterproof	protect with sterile cover
C-Arm	IPX3 waterproof	protect with sterile cover
Standard footswitch	IPX8 protected against immersion beyond 1 m	separate from chassis before cleaning
Hand switches	IPX1 dust protected, protected against splashing of water	separate from chassis before cleaning
Wireless footswitch[1)]	IPX8 protected against immersion beyond 1 m	separate from chassis before cleaning

1) Optional

CAUTION

Put the liquid on the system.

Risk of electrical hazard or damage to the system.

- Do not put the liquid on the system.

8.5 Cleaning and Disinfection

Clean and disinfect all parts that could have come into contact with the patient and personnel or body fluids immediately after each examination. In addition, if the Cios Select remains unused for a longer period of time, clean all parts that could come into contact with the patient and personnel or body fluids before the next examination. Any dust deposits on the housing of the flat detector, the single tank, and the C-arm need to be removed prior to operation.

Please follow the cleaning and disinfection instructions as described below.

8.5.1 Active ingredient classes

A non-protein-fixing VAH-listed disinfectant with proven cleaning effect based on peroxide chemistry is recommended.

Disinfectant wipes ECOLAB Incidin OxyWipes S or the disinfectant cleaner Dismozon plus were used to validate cleaning and disinfection instructions (➔ Page 246 *General cleaning and disinfection measures*).

Active ingredient classes compatible with the Cios Select are listed below.

Active ingredient class	Aldehydes, alkylamines, quaternary compounds, guanidine derivatives, peroxide compounds, organic acids, chlorine derivatives, alcohol, benzene, common household dishwashing liquids, detergents

Not recommended cleaning agents and products

CAUTION

Use of unsuitable cleaning agents.

Risk of contamination.

- Only use the recommended cleaning agents and disinfectants.

Certain substituted phenol-based or chlorine-splitting disinfectants can corrode materials and are therefore not recommended.

Cleaning agents and disinfectants containing chlorine derivatives can discolor cables, but will not negatively impact system functions.

8.5.2 Preparing the C-arm system

Before starting cleaning and disinfecting the Cios Select, the C-arm must be adequately positioned to reach the surfaces properly.

1 Have the C-arm raised beforehand using the vertical lift.

2 Make sure that all surfaces, grooves, notches etc of the Cios Select can be reached during the cleaning and disinfecting process.

CAUTION

Inadvertent actuation of the foot pedal.

Risk of radiation!

- Switch off the system before cleaning.

3 Switch off the Cios Select and disconnect from mains power supply

4 Separate hand switch, footswitch and additional accessories from the Cios Select.

8.5.3 General cleaning and disinfection measures

WARNING

Fluid or blood seeps into the system, use of inappropriate cleaning agents.

Risk of damage to the system, risk of infection or electrical hazard!

- Use sterile or sterilizable covers at least in the C-arm area (C-arm, cover of the detector and X-ray monobloc).
- Do not let cleaning liquids seep into the openings of the system (e.g. air openings, gaps between covers).
- Observe the cleaning and disinfection instructions.
- Only use the recommended substances for cleaning and disinfection.

CAUTION

Improper cleaning.

Risk of infection!

- After dealing with patients with highly infectious diseases, clean the unit wheels, in addition to regular cleaning.

Never immerse system parts (except for the footswitch) in liquid or autoclave system parts! Observe the respective protection and active ingredient classes in this regard.

1 While cleaning and disinfecting, wear chemical resistance gloves and protective gear.

2 Prepare the cleaning and disinfection solution according to the manufacturer's instructions (tap water, minimum drinking water quality at room temperature) or use ready-to-use wipe systems.

3 Always adhere to the disinfectant manufacturer's instructions for use regarding handling and exposure time of the disinfectant solution.

Some substances contained in disinfectants are known to be hazardous to health. The concentration of such substances in the air must not exceed the legally defined limit. We recommend that you follow the manufacturers' usage instructions for these products (active ingredient classes).

4 Prepare an adequate number of lint-free mops and lint-free wipes for the cleaning and disinfection of the Cios Select.

Do not use any brushes as they can damage the labels attached to the Cios Select.

5 If the floor is visibly soiled, disinfect the floor under and directly around the mobile C-arm.

6 Visually inspect all surfaces on the C-arm, C-arm chassis, and all surfaces of the monitor cart for visible contamination and proceed with the corresponding cleaning and disinfection steps as described in the respective sections:

(➔ Page 250 *Cleaning procedure*)

(➔ Page 250 *Disinfection procedure*)

7 Always work from top to bottom (top down) and from clean to dirty areas.
(➔ Page 248 *Cleaning and disinfection areas*)

8 If disinfectants with longer residence times are used, it may make sense for reasons of infection prevention to first disinfect surfaces near the patient and then the more distant surfaces.

9 Use lint-free mops and lint-free wipes only as long as they leave a closed liquid film on the surface.

10 Should blood be wiped off, discard the lint-free mop or lint-free wipe and use a new one to continue the cleaning and disinfection procedure.

11 Dispose used lint-free mops and lint-free wipes according to the instructions of your facility.

12 Let the surfaces of the Cios Select and the floor dry completely before further use.

Combining the cleaning and disinfection process

A cleaner-disinfectant enables in most cases a one-step process that eliminates the need for a cleaning step before each disinfection step. However, the use of a cleaner-disinfectant does not replace regular cleaning: If the mobile C-arm is heavily used, weekly cleaning of all regularly disinfected surfaces is strongly recommended. A regular cleaning step is required to ensure good hygiene practices, to maintain the integrity of the material in the long term and to avoid the formation of residues. This cleaning step is important regardless of whether cleaner-disinfectants or only disinfectants are used for disinfection.

Material damage

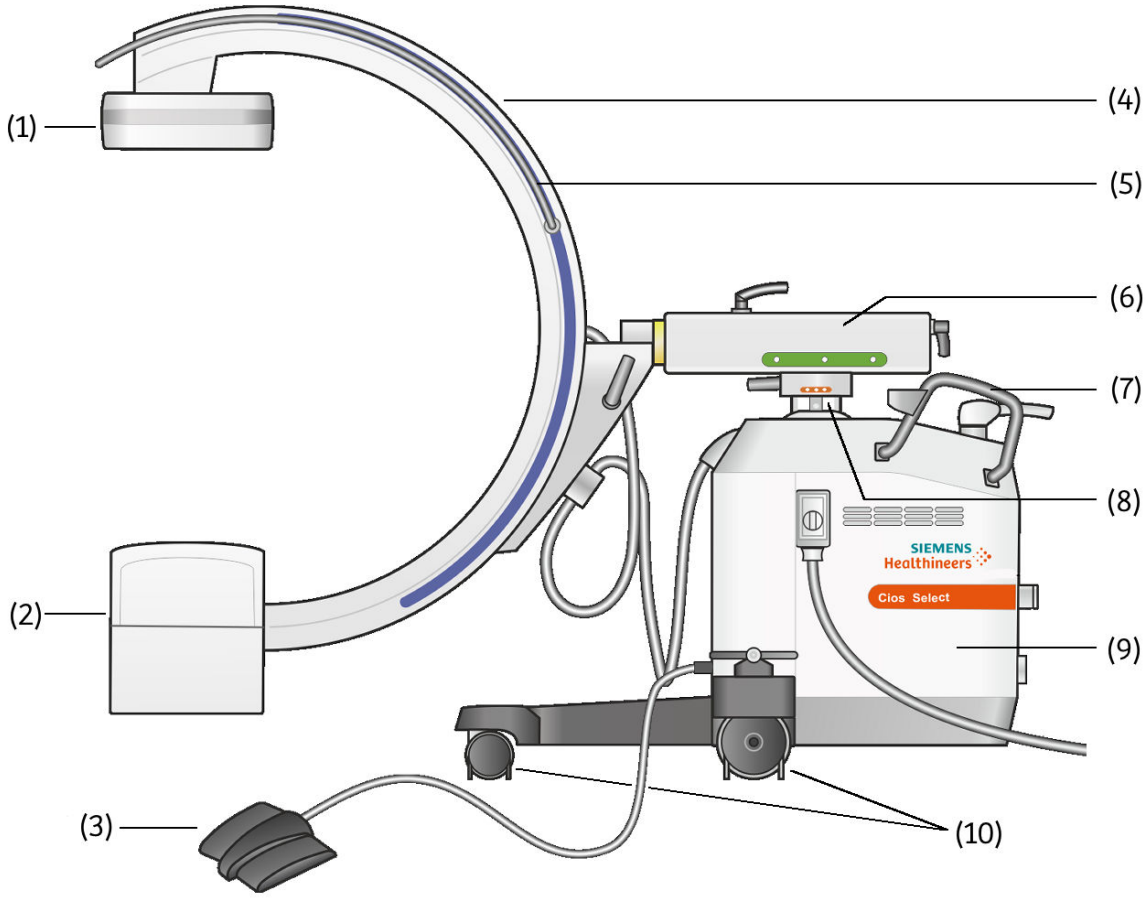
In the case of a material damage, please notify Siemens Healthineers Customer Service.

Transport and park position of the C-arm system and the monitor trolley

For transportation and parking position, please follow the instructions in the corresponding sections. (➔ Page 79 *Transporting the C-arm system*), (➔ Page 82 *Transporting the monitor trolley*)

8.5.4 Cleaning and disinfection areas

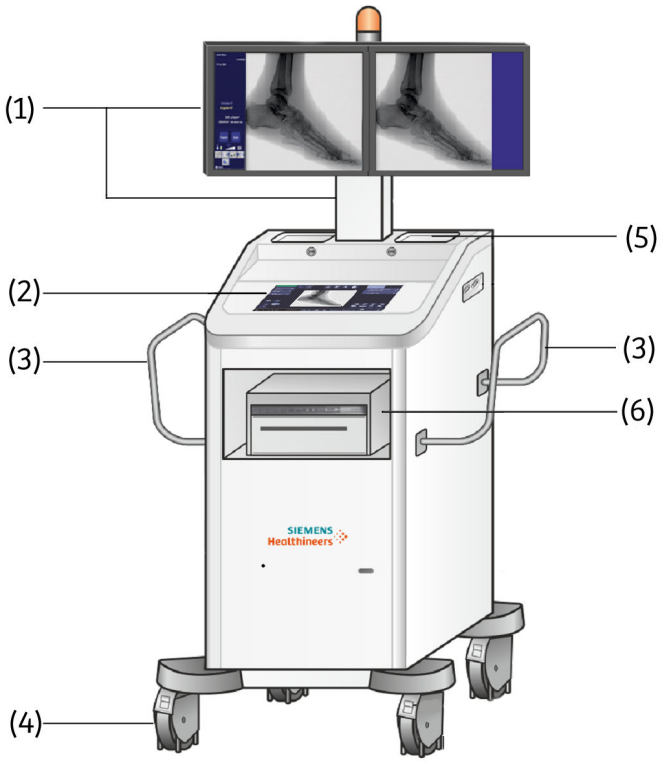
Surfaces of the C-arm system



Particular parts of the C-arm	Graphic reference number
Flat detector with grid	(1)

Particular parts of the C-arm	Graphic reference number
Single tank	(2)
Footswitch with cable (Standard)	(3)
C-arm	(4)
Handle for manual movement/positioning of the C-arm	(5)
Horizontal support arm	(6)
Handles on both sides with a hand switch holder, as well as a steering handle (center) for moving/transporting and braking the C-arm system	(7)
Lifting column	(8)
Electronics unit	(9)
Wheels with cable deflectors	(10)

Surfaces of the monitor trolley



Particular parts of the monitor trolley	Graphic reference number
Monitors with monitor column	(1)

Particular parts of the monitor trolley	Graphic reference number
Control panel	(2)
Handles for neat cable storage	(3)
Wheels with cable deflectors	(4)
Storage for mouse; USB connections	(5)
Shelf for printer	(6)

8.5.5 Cleaning procedure

The following steps must be followed for all surfaces listed (➔ Page 248 *Cleaning and disinfection areas*):

1 Wipe the surfaces of the product thoroughly with sufficiently saturated lint-free wipes for cleaning.

2 Make sure that all surfaces, existing grooves and bumps of the product are reached during the cleaning process and are completely moistened.

3 Soak a lint-free wipe with tap water and wipe all surfaces of the product thoroughly.

4 Check for cleanliness; if soiling is still visible, repeat the above steps

8.5.6 Disinfection procedure

The following steps must be followed for all surfaces listed (➔ Page 248 *Cleaning and disinfection areas*):

1 Thoroughly wipe the surfaces of the product one more time with a sufficiently saturated disinfection lint-free wipe.

2 Make sure that all surfaces, existing grooves and bumps of the product are reached during the disinfection process and are completely moistened.

3 Follow the manufacturer’s instructions regarding the exposure time of the disinfectant solution.

4 Soak a lint-free wipe with tap water and wipe all surfaces of the product thoroughly.

5 Let the device dry.

9 Technical information

9.1 Curves and diagrams 253
9.1.1 Anode heating and cooling curves 253
Heating and cooling curves of Single Tank unit 254
Small focus (0.6) emission curves 254
Position of focus and Source-to-Image Distance (SID) 255
9.1.2 Fluoro curves 255
Systems with 2.3 kW (peak power) generator 255
9.1.3 Dose rate at the flat detector input 256
Dose rate value deviation 256
Setting the dose rate value 256
9.1.4 Dosimetric information 256
Air kerma strength 256
Dosimetric information in accordance to IEC 60601-2-43:2017 259
9.2 Precautions for EMC – 2nd Edition 261
9.2.1 Guidelines and manufacturer's declaration – Electromagnetic emissions 262
9.2.2 Guidelines and manufacturer's declaration – Electromagnetic immunity 262
9.2.3 Guidelines and manufacturer's declaration – Electromagnetic interference immunity 263
9.2.4 Recommended separation distances between portable and mobile RF telecommunications equipment and the Cios Select 265
9.3 Precautions for EMC – 4th Edition 265
9.3.1 Guidelines and manufacturer's declaration – Electromagnetic emissions 266
9.3.2 Guidelines and manufacturer's declaration – Electromagnetic interference immunity 266
9.3.3 RF component description 268
9.3.4 Declaration of EMC environment 268
9.3.5 Adjacent or stacked equipment 268
9.3.6 List of cables, transducers and accessories 269
9.3.7 Usage of other accessories, cables and transducers 269
9.3.8 Portable RF communication equipment 269
9.3.9 Note for CISPR11 class A equipment 269
9.3.10 Instructions for maintaining basic safety and essential performance with regard to electromagnetic disturbances for the expected service life 269
9.3.11 Use of equipment nearby of emitters 269
9.4 Original equipment manufacturer 270
9.4.1 Introduction 270
9.4.2 For Open Source Software (OSS) only 270
9.5 System data 271
9.5.1 Entire system 271
General data 271
Dimensions and weight 271
Classification 272
Current/voltage values 272
9.5.2 Generation of radiation 272
X-ray generator 272
X-ray tube assembly (Single-tank) 273

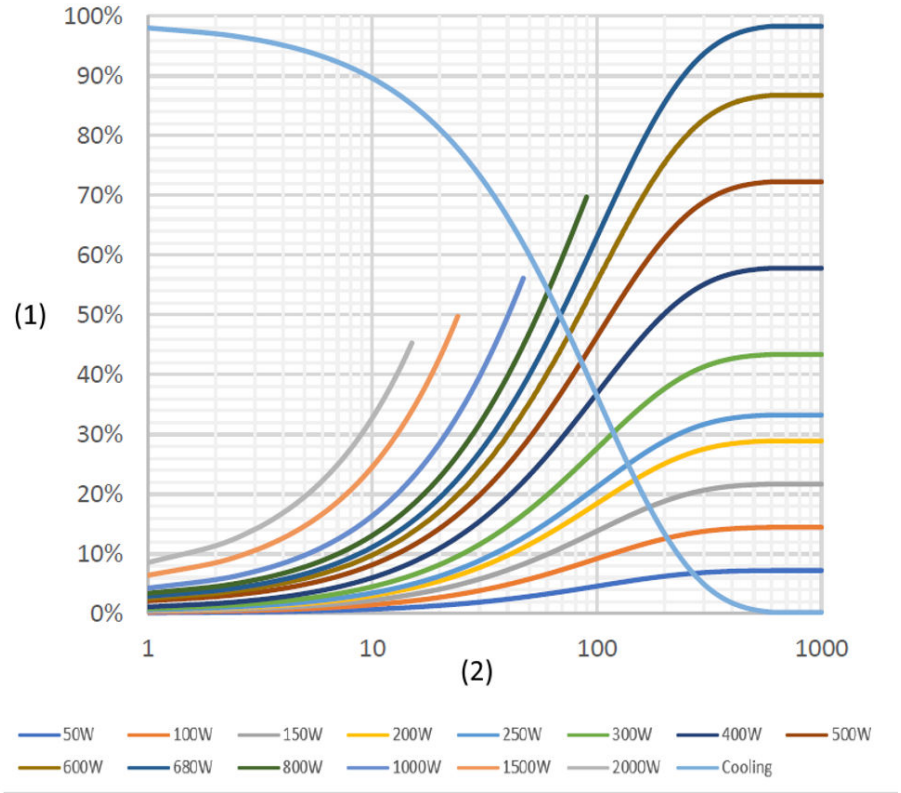
9.5.3 Flat detector 273
9.5.4 Unit components 274
C-arm 274
Collimator system 274
Digital video imaging system 275
Detector laser light localizer 275
Monitors 275
Dose measuring chamber (DAP meter) 275
9.5.5 Equipment options 276
Automatic dose rate control (ADR) 276
Single-tank laser light localizer 276
DVI video splitter 276
WLAN access point 276
9.6 List of standards to be maintained covering electrical and mechanical safety 277
9.7 Labels 278
9.7.1 C-arm system 278
C-arm travel frame 280
(1) Base system (Chassis) 280
(2) Horizontal support arm and C-arm 285
(5) Flat detector 287
(4) Single tank 289
9.7.2 Monitor trolley 289
9.7.3 Pictograms 291

Siemens Healthineers reserves the right to change the design and specifications without notification.

9.1 Curves and diagrams

9.1.1 Anode heating and cooling curves

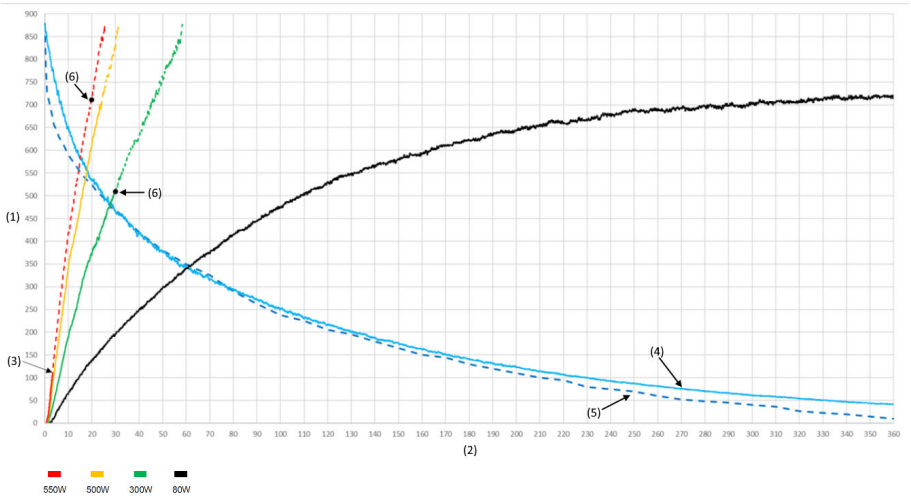
IEC 60613: 1989



Heating and cooling curve

(1) Heating capacity
(2) Loading time [s]

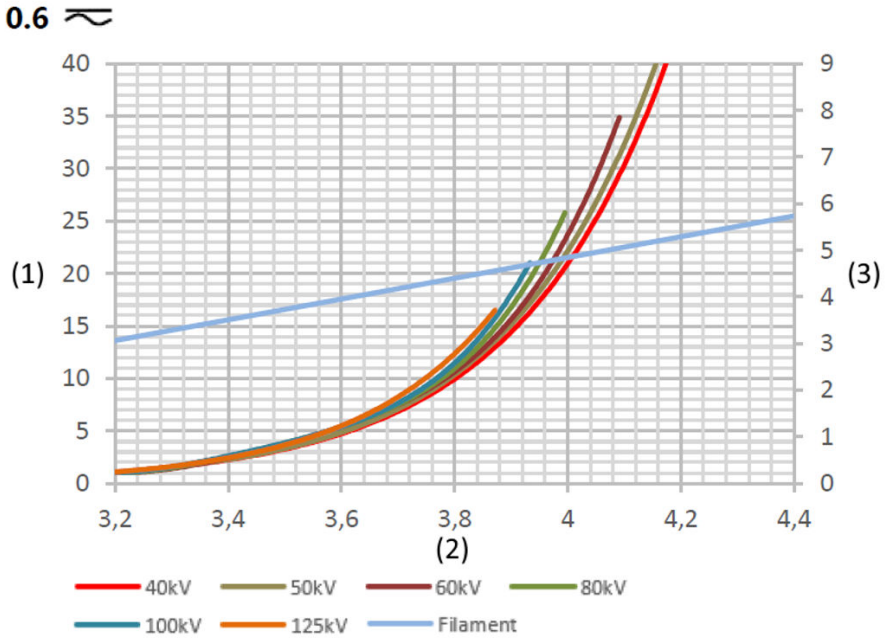
Heating and cooling curves of Single Tank unit



(1) Heat storage capacity [kJ]
(2) Time [min]
(3) Cooling curve with the Single tank inside an open testing box
(4) Cooling curve with the Single tank connected to a S3P C-arm.

Small focus (0.6) emission curves

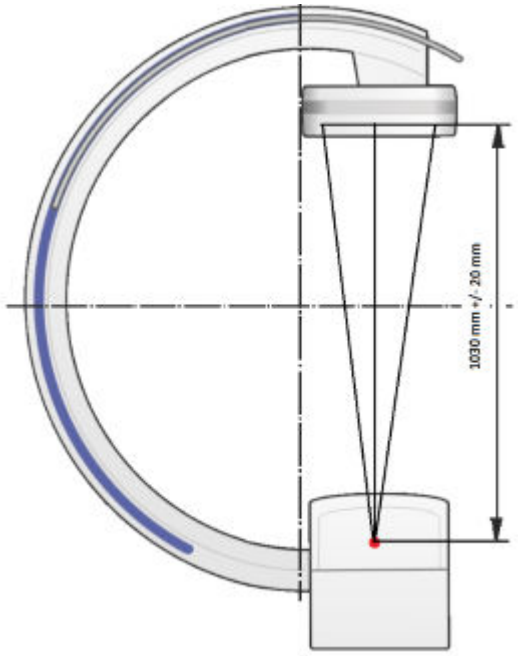
IEC 60613: 2010



Filament and emission characteristics of F1

(1) Tube current [mA]
(2) Filament current [A]
(3) Filament voltage [V]

Position of focus and Source-to-Image Distance (SID)



***Note: Source-to-Image Distance is also known as FOCAL SPOT TO IMAGE RECEPTOR DISTANCE acc. to IEC60601-2-43**

9.1.2 Fluoro curves

The following fluoro curve properties are available in the system for clinical use.

The following base values apply for all systems and fluoro curves:

- Minimum kV = 40
- Maximum kV = 110

The currents (mA) shown in the following tables indicate effective values.

Systems with 2.3 kW (peak power) generator

Characteristic curves for fluoroscopy

The maximum average power for normal fluoroscopy characteristic curves is 600 W. Characteristic curves with the HL add-on have a maximum average power of 1000 W (limited to 30 s radiation).

Characteristic curve	Min mA (Continuous 30 f/s)	Max mA (Continuous 30 f/s)	kV	Ø mA	Ø power (W)
FL- Card[1)]	0.2	7.5	80	4.2	336
FL- Card HL[2)]	0.2	13	80	7.9	632

Characteristic curve	Min mA (Continuous 30 f/s)	Max mA (Continuous 30 f/s)	kV	Ø mA	Ø power (W)
FL-HC[1)]	0.2	8.4	74	7.9	584.6
FL-HC HL[2)]	0.2	14	76	13	988
FL IOD[1)]	0.2	8.9	74	7.9	584.6
FL IOD HL[2)]	0.2	15	76	13	988
FL LD[1)]	0.2	5.3	90	1.5	135
FL- S[1)]	0.2	5.3	85	2.6	221
FL-S HL[2)]	0.2	8.9	86	4.4	378.4

[1)] With the same image receptor dose

[2)] With the same image receptor dose

9.1.3 Dose rate at the flat detector input

The dose rate is set by the manufacturer, depending on the flat detector format; it is measured behind the scattered radiation grid at the input of the flat detector. Refer to the acceptance protocol §16 RöV for the system-specific dose values (Federal Republic of Germany only).

The dose rate is set in the kV range between 70 and 80 kV using a technical phantom.

Dose rate value deviation

Depending on the examined object, different fluoroscopy data (kV, mA) arise. Because flat detector sensitivity depends on beam quality (kV), the same gray values in the image may correspond to different dose rate values at the detector input.

When examining a patient in fluoroscopy mode, additional scattered radiation values are produced in comparison to the phantom values, affecting the dose rate at the flat detector input.

Setting the dose rate value

If desired, the preferential position for the dose rate can be reprogrammed.

9.1.4 Dosimetric information

Air kerma strength

The REFERENCE AIR KERMA and REFERENCE AIR KERMA RATES were measured at a distance of 30 cm (patient entry reference point) from the image receptor input with a 20 cm PMMA phantom (equivalent to a typical patient) in accordance with IEC 60601-2-43 and the content of Annex AA “Particular guidance and rationale”.

Fluoroscopy

Program[1)] with anti-scatter grid	Zoom level	Dose level	Voltage [kV]	Current [mA]	Pulse rate [p/s]	Dose rate display [µGy/s]
ortho standard	Zoom 0	low	64	24	15	86.93
		medium	66	24	15	122.2
		high	68	24	15	161.1
	Zoom 1	low	65	24	15	100.9
		medium	67	24	15	141.6
		high	68	24	15	178.1
	Zoom 2	low	67	24	15	137.5
		medium	69	24	15	180.9
		high	71	24	15	239.5
ortho extremity	Zoom 0	low	67	24	15	218.5
		medium	74	21	15	258.9
		high	83	19	15	307.4
	Zoom 1	low	66	24	15	206.9
		medium	71	22	15	245.1
		high	80	20	15	289.8
	Zoom 2	low	72	22	15	249.2
		medium	80	20	15	293.6
		high	88	18	15	351
ortho adipose	Zoom 0	low	62	24	10	48.44
		medium	63	24	10	60.96
		high	63	24	10	61.43
	Zoom 1	low	63	24	10	57.09
		medium	63	24	10	66.98
		high	63	24	10	66.79
	Zoom 2	low	64	24	10	76.43
		medium	65	24	10	90.81
		high	65	24	10	96.22
ortho Pediatric	Zoom 0	low	85	14	10	43.87
		medium	87	18	10	60.1

Program[1] with anti-scatter grid	Zoom level	Dose level	Voltage [kV]	Current [mA]	Pulse rate [p/s]	Dose rate display [µGy/s]
		high	91	24	10	84.09
	Zoom 1	low	85	14	10	43.36
		medium	87	17	10	54.99
		high	91	24	10	77.62
	Zoom 2	low	88	19	10	62.73
		medium	91	24	10	81.43
		high	94	24	10	104.3
The highest Air kerma rate[3]						
FL HC, High dose (Manual setting)	Zoom 0	high	110	8.9	30	970
	Zoom 1	high	110	8.9	30	970
	Zoom 2	high	110	8.9	30	970

[1] Only valid as delivered from factory. Technical changes reserved.

[2] Recommended program for interventional procedures.

[3] Highest deliverable air kerma rate.

Above dosimetric information depends on OPGs settings.

Pediatric

Reference air kerma rate values were measured at a distance of 30 cm (patient entry reference point) from the image receptor input with a 10 cm PMMA phantom (equivalent to a typical patient) in accordance with IEC 60601-2-43.

Program[1] without anti-scatter grid	Zoom level	Dose level	Voltage [kV]	Current [mA]	Pulse rate [p/s]	Dose rate display [µGy/s]
ortho Pediatric	Zoom 0	low	58	5	10	4.999
		medium	61	5.3	10	6.294
		high	65	5.6	10	8.097
	Zoom 1	low	59	5	10	5.159
		medium	62	5.3	10	6.477
		high	65	5.9	10	8.379
	Zoom 2	low	62	5.6	10	6.704
		medium	66	5.9	10	8.472
		high	70	6.3	10	11.3

[1] Only valid as delivered from factory. Technical changes reserved.

[2] Recommended program for interventional procedures.

[3] Highest deliverable air kerma rate.

Above dosimetric information depends on OPGs settings.

Dosimetric information in accordance to IEC 60601-2-43:2017

Measuring conditions

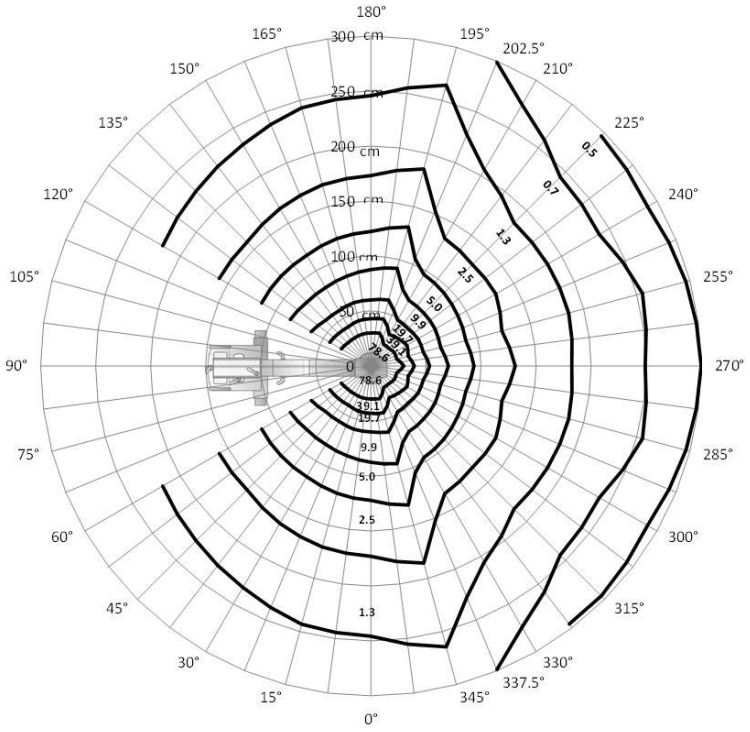
- Specifications for interventional systems acc. to EN/IEC 60601-2-43
- Reference air kerma strength and ranges of air kerma strength according to EN/IEC 60601-2-43

Isokerma curves

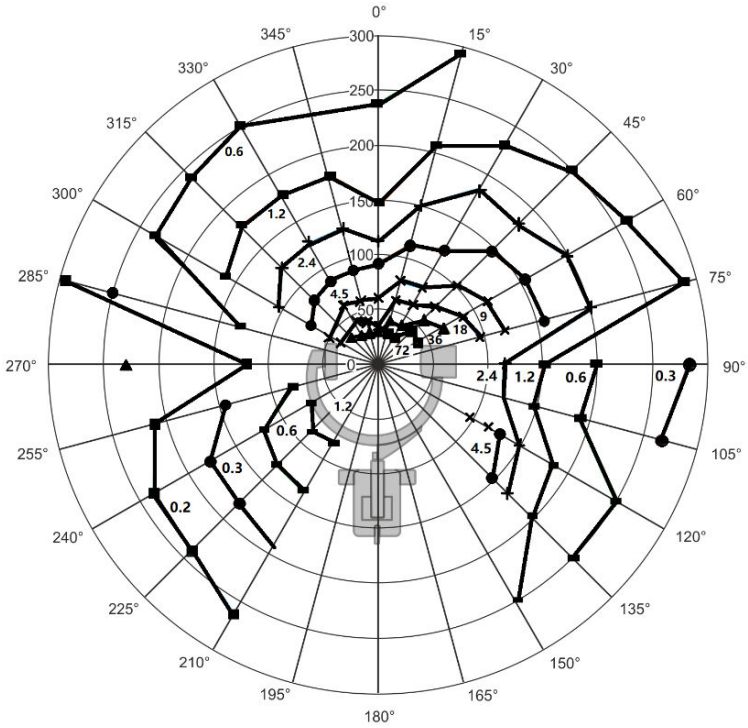
All following curves were recorded as follows:

- Beam projection vertical (tube unit above)
- SID 103 cm
- 25 cm x 25 cm x 25 cm PMMA Phantom centered/aligned central beam axis
- Entrance Surface of the Phantom is at the PATIENT ENTRANCE REFERENCE POINT
- Radiation field size 10 cm x 10 cm at entrance of PMMA Phantom
- Isokerma curves 100 cm and 150 cm above the floor
- Scattered radiation of isokerma curves in µGy/(Gy cm^2) at 110 kV/5.3 mA and continuous according to IEC 60601-2-43:2017

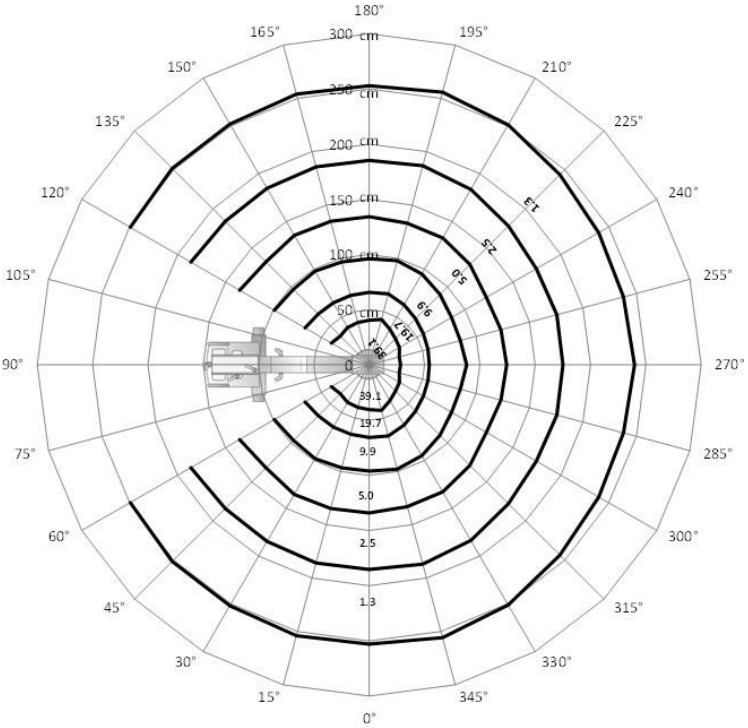
The values in µGy/(µGy m^2) according to IEC 60601-2-43:2017 can be calculated by a factor of 0,01.



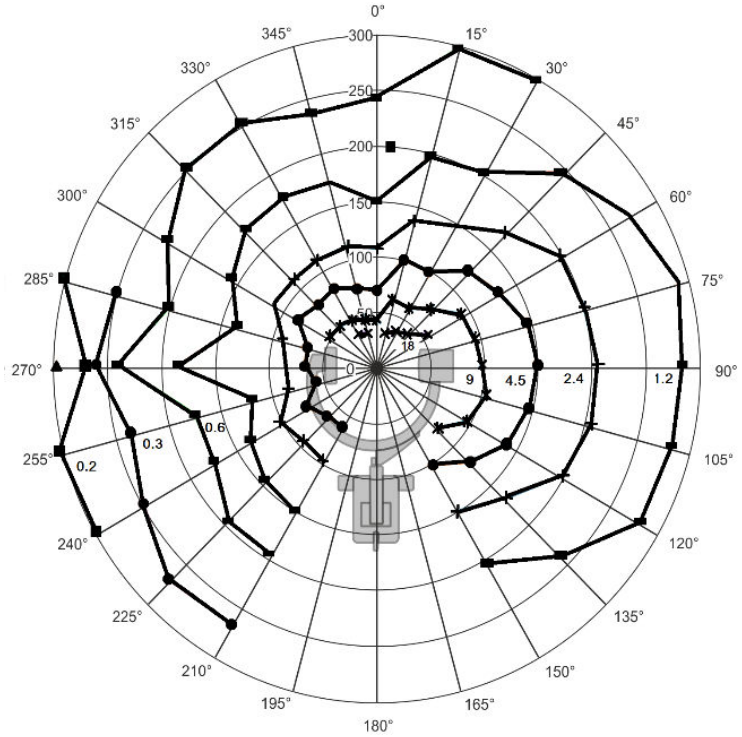
Cios Select 100 cm vertical µGy/(Gy cm^2)



Cios Select 100 cm horizontal µGy/(Gy cm²)



Cios Select 150 cm vertical µGy/(Gy cm²)



Cios Select 150 cm horizontal µGy/(Gy cm^2)

9.2 Precautions for EMC – 2nd Edition

Medical electrical equipment is subject to special precautions regarding EMC. These systems must be installed and put into service according to the EMC information provided in the accompanying documents.

Portable and mobile RF communications equipment can affect medical electrical equipment.

Permanently connected equipment or system cabling that cannot be removed by the user is not listed. This cabling is part of the system and was considered in all EMC measurements. Without this cabling the equipment or system would not function.

The use of accessories, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the equipment or system as replacement parts for internal components, may result in increased emission or decreased immunity of the equipment or system.

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.

The equipment or system may be disturbed by other equipments even if the other equipments meet the requirements of the corresponding national standard.

9.2.1 Guidelines and manufacturer's declaration – Electromagnetic emissions

The system is intended for use in the electromagnetic environment as specified below. The customer or the user of the system should ensure that it is operated in such an environment.

Emission tests	Compliance	Electromagnetic environment - guidance
RF emissions GB 4824	Group 1	The Cios Select 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 GB 4824	Class A	The Cios Select 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 current emissions GB 17625.1	Not applicable	
Voltage fluctuations/ flicker emissions GB 17625.2	Not applicable	

9.2.2 Guidelines and manufacturer's declaration – Electromagnetic immunity

The system is intended for use in the electromagnetic environment as specified below. The customer or the user of the system should ensure that it is operated in such an environment.

Immunity tests	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) GB/T 17626.2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wooden, concrete or ceramic tiles. If the floors are covered with synthetic material, the relative humidity must be at least 30 %.
Electrical fast transients/ bursts GB/T 17626.4	± 2 kV for power cables ± 1 kV for input/ output cables	± 2 kV for power cables ± 1 kV for input/ output cables	Mains power quality should be that of a typical commercial or hospital environment.

Immunity tests	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
Surges GB/T 17626.5	± 1 kV line to line ± 2 kV line to earth	± 1 kV line to line ± 2 kV line to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines GB/T 17626.11	< 5 % U_T for 0.5 cycle (>95% dip in U_T) 40% U_T for 5 cycles (60% dip in U_T) 70% U_T for 25 cycles (30% dip in U_T)	Not applicable	Equipment with a rated input current of more than 16 A per phase can be exempted from Voltage dips test.
	< 5 % U_T for 5 sec (>95% dip in U_T)	< 5 % U_T for 5 sec (>95% dip in U_T)	The mains power quality should be that of a typical commercial or hospital environment. 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.
Power frequency (50/60 Hz) magnetic field GB/T 17626.8	3 A/m	3 A/m	Power frequency magnetic field should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the a.c. mains voltage prior to application of the test level.			

9.2.3 Guidelines and manufacturer's declaration – Electromagnetic interference immunity

The system is intended for use in the electromagnetic environment as specified below. The customer or the user of the system should ensure that it is operated in such an environment.

Immunity tests	IEC 60601 test level	Compliance level	Electromagnetic environment - guidance
			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 equation applicable to the frequency of the transmitter. **Recommended separation distance:**
Conducted RF GB/T 17626.6	3 Vrms 150 kHz - 80 MHz	3 V	d = 1.2√P
Radiated RF GB/T 17626.3	3 V/m 80 MHz - 2.5 GHz	3 V/m	d = 1.2√P 80 MHz to 800 MHz d = 2.3√P 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

a. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site study should be considered. If the measured field strength in the location in which the Cios Select is used exceeds the applicable RF compliance level specified above, the Cios Select should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Cios Select.

b. Over the frequency range of 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

9.2.4 Recommended separation distances between portable and mobile RF telecommunications equipment and the Cios Select

The Cios Select is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Cios Select can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Cios Select as recommended below - according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter	**Separation distance according to frequency of transmitter** **m**		
w	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

9.3 Precautions for EMC – 4th Edition

According to the IEC 60601-2-54 Standard the product provides following /

Essential Performance

- Accuracy of Loading Factors
- Reproducibility of the Radiation output
- Automatic Control System
- Imaging performance

According to the IEC 60601-2-43 Standard the product provides following

Essential Performance

- Recovery management
- Radiation dose documentation

Medical electrical equipment needs special precautions regarding EMC. EMC information provided in the accompanying documents must be followed where appropriate.

Portable and mobile RF communications equipment can affect medical electrical equipment.

Accessories, transducers and cables listed in this document do not affect the compliance of the system according to IEC 60601-1-2.

Fixed product cabling that cannot be removed by the user is not listed. This cabling is part of the system and was considered in all EMC measurements. Without this cabling the equipment or system would not function.

The use of accessories, transducers and cables other than those specified, with the exception of transducers and cables sold by the manufacturer of the equipment or system as replacement parts for internal components, may result in increased emission or decreased immunity of the equipment or system.

9.3.1 Guidelines and manufacturer's declaration – Electromagnetic emissions

The system is intended for use in the electromagnetic environment as specified below. The customer or the user of the system should ensure that it is operated in such an environment.

Emission (IEC 60601-1-2)		
Item	**Reference Standard Limit**	**Remarks**
Conducted emission (150 kHz - 30 MHz) AC Mains Terminal	Group 1 Class A	-
Radiated emission (30 MHz - 1 GHz)	Group 1 Class A	Measurement distance: 10 m

9.3.2 Guidelines and manufacturer's declaration – Electromagnetic interference immunity

The system is intended for use in the electromagnetic environment as specified below. The customer or the user of the system should ensure that it is operated in such an environment.

The system complies with the Essential Performance Requirements according to IEC 60601-1-2.

Immunity (IEC 60601-1-2)		
Item	**Reference Standard Test Level**	**Remarks**
Electrostatic discharge, air discharge	IEC 61000-4-2 ± 2.0 kV, ± 4.0 kV, ± 8.0 kV, ± 15.0 kV	-
Electrostatic discharge, contact discharge	IEC 61000-4-2 ± 8.0 kV	-
Radiated RF electromagnetic fields	IEC 61000-4-3 80 MHz - 2.7 GHz, 3 V/m, 1 kHz, 80% AM	-
Electrical fast transients (Burst) Power supply lines	IEC 61000-4-4 ± 2.0 kV 100 kHz repetition frequency	-
Electrical fast transients (Burst) Signal input/output ports	IEC 61000-4-4 ± 1.0 kV 100 kHz repetition frequency	-
Surge Power supply lines line to ground	IEC 61000-4-5 ± 0.5 kV, ± 1.0 kV, ± 2.0 kV	-
Surge Power supply lines line to line	IEC 61000-4-5 ± 0.5 kV, ± 1.0 kV	-
Conducted disturbances, induced by RF fields	IEC 61000-4-6 1 kHz, 80% AM 3 V; 150 kHz - 80 MHz 6 V; in ISM and amateur radio bands between 150 kHz and 80 MHz	-
Magnetic fields	IEC 61000-4-8 30 A/m, 50 Hz or 60 Hz	-
Voltage dips and short interruptions on power supply input lines	Voltage short interruptions: 0% UT 250/300 cycles (single phase)	-

Immunity (IEC 60601-1-2)		
Item	**Reference Standard Test Level**	**Remarks**
Proximity fields from RF wireless communications equipment	IEC 61000-4-3 385 MHz: 27 V/m; Pulse modulation 18 Hz 450 MHz: 28 V/m; Frequency modulation ± 5 kHz deviation 1 kHz sine 710, 745, 780 MHz: 9 V/m; Pulse modulation 217 Hz 810, 870, 930 MHz: 28 V/m; Pulse modulation 18 Hz 1720, 1845, 1970 MHz: 28 V/m; Pulse modulation 217 Hz 2450 MHz: 28 V/m; Pulse modulation 217 Hz 5240, 5500, 5785 MHz: 9 V/m; Pulse modulation 217 Hz	-

9.3.3 RF component description

	Frequency range	Bandwidth	Modulation type	Effective radiated power
Wireless footswitch	2.400 - 2.4835 GHz	2.400 - 2.4835 GHz	BT 4.0 LE (Bluetooth Low Energy)	7 mW transmission power at maximum
W722 WLAN	2412 - 2480 MHz 4920 - 5875 MHz	2412 - 2480 MHz 4920 - 5875 MHz	WLAN IEEE 802.11	Typically 100 mW, max. 200 mW

9.3.4 Declaration of EMC environment

The Cios Select is only suitable for professional healthcare facility environment according IEC60601-1-2.

9.3.5 Adjacent or stacked equipment

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.

9.3.6 List of cables, transducers and accessories

Fixed product cabling, which cannot be removed by the user, is not listed. This cabling is part of the product and was present at all EMC-measurements. Without this cabling there is no complete functionality of the product. Deviations or additions to this document are added to the product-specific documents.

9.3.7 Usage of other accessories, cables and transducers

Use of accessories, transducers 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.

9.3.8 Portable RF communication equipment

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

9.3.9 Note for CISPR11 class A equipment

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

9.3.10 Instructions for maintaining basic safety and essential performance with regard to electromagnetic disturbances for the expected service life

Perform an annual visual inspection of accessible connectors, screws and conducting cabinet door to ensure that its electrical connection has not deteriorated. In case of any degradation call Siemens Healthineers Customer Service to replace or repair the corresponding part. With this it is ensured that the design measures regarding to the electromagnetic compatibility of the equipment remain effective during the whole service life time.

9.3.11 Use of equipment nearby of emitters

This equipment has been tested for radiated RF immunity only at selected frequencies; use of emitters in close proximity at other frequencies could result in improper operation.

9.4 Original equipment manufacturer

Original Equipment Manufacturer (OEM), Open Source Software (OSS) from third-party providers in Siemens Healthineers products

9.4.1 Introduction

The product can contain OEM and OS software licensed and developed by third-party providers (depending on the system configuration and options).

These OEM and/or OS files are protected by copyright. Your right to use OEM and/or OS software beyond the mere execution of the Siemens Healthineers program is governed by the relevant terms of the OEM and/or OS software license.

Complying with these licensing conditions authorizes you to use the OEM and/or OS software as provided in the respective license. In case of conflicts between the licensing conditions of Siemens Healthineers and the OEM and/or OS software license conditions, the OEM and/or OS software conditions govern the OEM and/or OS portions of the software.

The OEM and/or OS software licenses (license conditions) are available on the USB (open source/legal concept) delivered together with the system.

9.4.2 For Open Source Software (OSS) only

Open source software is licensed free of charge (meaning that exercising the licensing rights is free of charge, while fees may be charged to recover the costs borne by Siemens Healthineers). If programs contained in this product are licensed under GNU General Public License (GPL), GNU Lesser General Public License (LGPL), or another open source license that requires source code, the corresponding code is delivered together with the device on USB.

Warranty regarding the further use of software from third-party providers:

Siemens Healthineers makes no warranty regarding the OEM and/or OS software programs in this device, when such programs are used in a manner other than the program execution intended by Siemens Healthineers. The licenses mentioned previously define the warranty, if any, from the authors or licensors of the OEM and/or OS software. Siemens Healthineers specifically disclaims any warranties for defects caused by altering any OEM and/or OS software program or the product's configuration. If the OEM and/or OS software violates the intellectual property of a third party, you have no warranty claim against Siemens Healthineers.

Technical support is available only for software that has not been modified.

9.5 System data

9.5.1 Entire system

General data

Power requirements	100 V (- 6% - +10%), 50/60 Hz (± 1 Hz); 110 V, 120 V, 127 V, 200 V, 220 V, 230 V, 240 V (± 10%), 50/60 Hz (± 1 Hz)
Unit fuse protection (internal)	100 V to 127 V 20 A slow-blow fuse 200 V to 240 V 15 A slow-blow fuse
Maximal power consumption	3.8 kW
Standby power consumption (for 230 V)	350 W
Internal line impedance	Ri max. 0.3 Ohm for 100 V - 127 V Ri max. 0.8 Ohm for 200 V - 240 V
Ambient conditions for operation	Temperature range: +10 °C to +35 °C Relative humidity: 20% to 75%, non-condensing Barometric pressure: 700 hPa to 1060 hPa
Ambient conditions for transport and storage	Temperature range: -20 °C to +50 °C Relative humidity: 10% to 75%, non-condensing Barometric pressure: 700 hPa to 1060 hPa

For ambient conditions that fall outside the specified values, a waiting time of one to twelve hours must be factored in for radiation operation, depending on the location of the system.

Dimensions and weight

Chassis (l x w x h)	182.5 cm x 80 cm x 159.8 cm (71.9“ x 31.5“ x 62.9“)
Monitor cart (l x w x h)	68.6 cm x 73.6 cm x 178.6 cm (27“ x 29.1“ x 70.3“)
C-arm system (without accessories)	275 kg (605 lbs)
Monitor trolley (including 2 monitors, UPS)	150 kg (330 lbs)

Classification

Protection against electric shock	Class 1, no applied part according to IEC 60601-1
Protection against ingress of fluids	X-ray tube assembly: IPX3, waterproof C-Arm: IPX3, waterproof Standard footswitch: IPX8, against immersion beyond 1 m Wireless foot switch: IPX8 protected against immersion beyond 1m Hand switch: IPX1 dust protected, protected against splashing of water Flat detector: IPX0 waterproof
Operating mode	Fluoro Single image SUB Roadmap

Current/voltage values

Voltage (V AC)	Long-term current consumption (A)	Short-term current consumption (A)
100	15	28.5
110	14	25
120	13	25
127	12	25
200	8	18
220	7	17
230	7	16
240	7	15

9.5.2 Generation of radiation

X-ray generator

The values in the table provide the technical thresholds of X-ray generation. Whether these threshold values can be reached during clinical operation depends on the set configuration values.

Type of generator	HF-Generator (Single tank with dual-focus stationary-anode tube)
Nominal peak output power	2.3 kW (96 kV, 24 mA)
Inverter control frequency	25 kHz to 44 kHz

kV range	40 kV to 110 kV
mA range	3 mA - 24 mA single image
	0.2 mA - 14 mA continuous fluoro
	3 mA - 24 mA pulsed fluoro
Loading factors	40 kV, max value 3 mA
	110 kV, max value 15mA
Pulse width	7 ms to 160 ms single image
	7 ms to 40 ms pulsed fluoro
Single tank heat storage capacity (physical)	800,000 J/1100 kHU
mAs range	0.02mAs to 3.76 mAs
Pulse rate	Variable frame rate 0.5; 1; 2; 3; 5; 7.5; 10; 15 f/s; 30 f/s in continuous fluoro mode
Tolerances kV	± 8 %
Tolerances mA	± 20 % (minimum ± 0.1 mA)
Tolerances mAs	± (10 % + 0.2 mAs)

X-ray tube assembly (Single-tank)

The X-ray tube assembly and image receptor are geometrically aligned such that the emitted radiation cone (radiation axis) is always perpendicular to the plane of the image receptor.

Type of tube	S3P-Monoblock (single tank with dual-focus stationary-anode tube)
Focal spot nominal value	0.6/1.0
Nominal voltage	110 kV
Anode heat storage capacity (IEC 613)	75,000 J (101,000 HU)
Anode heat dissipation	40,800 J/min (55,000 HU/min)
Optical anode angle	9°
Inherent filtration (IEC 601)	3 mm Al with 70 kVp/0.1 mm Cu
Single-tank heat storage capacity (physical)	800,000 J (1,100,000 HU)
Continuous heat dissipation	80 W

9.5.3 Flat detector

Material	aSi with CsI scintillator
Detector size	21 cm x 21 cm (8.3" x 8.3")

Pixel size	205 µm ± 10%
Matrix	1004 x 1004 pixels
Digitalization depth	16 bits
Detective quantum efficiency (DQE) (typical) DQE at 80 nGy, RQA5, 1 x 1 (Fluoro) and 400 nGy, RQA5 1 x 1 (Single Image)	80% at 0 lp/mm 65% at 1 lp/mm 40% at 2 lp/mm 22% at 2.43 lp/mm (Nyquist frequency)
Modulation transfer function (MTF), typical MTF	22% at 2 lp/mm 55% at 1 lp/mm (Nyquist frequency)
Resolution on monitor with 1004 x 1004 Flat detector (measured in accordance with DIN 6868-150)	Overview (Mag 0) - acquisition: 2.43 lp/mm Overview (Mag 0) - fluoroscopy: 2.43 lp/mm Format switchover (Mag 1) - acquisition: 2.43 lp/mm Format switchover (Mag 1) - fluoroscopy: 2.43 lp/mm Format switchover (Mag 2) - acquisition: 2.43 lp/mm Format switchover (Mag 2) - fluoroscopy: 2.43 lp/mm
Anti-scatter grid (detachable)	Pb 12:1, 70 lines/cm, f_0=100 cm
Attenuation factor	1.62

9.5.4 Unit components

C-arm

Orbital movement	130° (- 40° to + 90°)
Angulation	± 190°
Horizontal movement	20 cm (7.9")
Immersion depth	73 cm (28.7")
Swivel range	± 12°
Vertical travel	43 cm (16.9"), motorized
Source to image-receptor distance	103 cm (40.6")
Free space	81 cm (31.9"), with attached grid

Collimator system

Iris collimator (lead)	For concentric, radiation-free collimation
Semitransparent slot diaphragm (lead)	For symmetric, radiation-free collimation, with unlimited rotation

Digital video imaging system

Video matrix	1 K[2]
Digital image rotation	± 360° (continuous)

Detector laser light localizer

Laser class	Class 1 (IEC 60825-1)
Laser type	Semiconductor laser (laser diode)
Wave length	520 nm
Color	Green
AEL power	≤0.39 mW
Output power	3 mW

Monitors

Image display	**TFT display**
Image display	1280 x 1024 (pixels)
Screen diagonal	48 cm (19")
Brightness (DICOM calibrated), typical	400 cd/m² for high brightness display[2)] 180 cd/m² for standard display
Max. brightness, typical	≥700 cd/m² for high brightness display[1)] ≥350 cd/m² for standard display
Horizontal/vertical viewing angle	178°/178°

Dose measuring chamber (DAP meter)

Technology	Semiconductor chamber
Active area	Rectangle - 90 mm x 90 mm
DAP resolution	0.01 µGym²
Maximum measurable DAP	0.1 µGym²/s - 2500 µGym²/s
Reproducibility	< 1%
Energy range	40 kV - 150 kV ± 6%
Attenuation equivalent (Inherent filtration)	< 0.30 mm Al

2) Optional

Dose rate linearity	≥ 10 µGym^2, 2% < 10 µGym^2, 5%
Measuring readiness	20 seconds after power on
Work environment	Temperature range: +10 °C to +70 °C Rel. humidity: 15% to 75% (without condensation) Barometric pressure: 700 hPa to 1060 hPa

9.5.5 Equipment options

Automatic dose rate control (ADR)

Precision of automatic dose rate control (ADR)	± 6% (value depends on measurement setup)

Single-tank laser light localizer

Laser class	Class 1 (IEC 60825-1)
Laser type	Semiconductor laser (laser diode)
Wave length	520 nm
Color	Green
AEL power	≤0.39 mW
Output power	3 mW

DVI video splitter

Outputs	DVI (2x)
Conditions for use	The displays or monitors used must be compatible with the SXGA standard 1280 x 1024 at 60 Hz

WLAN access point

	W722
Ethernet transfer rate	BASE-T max. 100 MBit/s
Wireless transfer rate	max. 150 MBit/s
Radiated power	typically: 100 mW, max. 200 mW

Supported wireless standards	IEEE 802.11a IEEE 802.11b IEEE 802.11e IEEE 802.11g IEEE 802.11h IEEE 802.11i IEEE 802.11n
Supported standards for power supply	IEEE 802.3at Type 1 (802.3af) and 802.3at Type 2 (power supply via Ethernet)

9.6 List of standards to be maintained covering electrical and mechanical safety

Siemens Healthineers hereby certifies that the Cios Select is compliant with the following generally recognized standards covering electrical and mechanical safety:

Standard organization	Reference number and date	Title of standard
IEC	60601-1:2012 ed. 3.1	Medical Electrical Equipment - Part 1: General Requirements for Safety, 2012 (Medizinische elektrische Geräte - Teil 1: Allgemeine Festlegungen für die Sicherheit)
IEC	60601-1-2 4th 2014	Medical Electrical Equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests
IEC	60601-1-3: 2013 edition 2.1	Medical Electrical Equipment - Part 1-3: General requirements for basic safety and essential performance - Collateral Standard: Radiation protection in diagnostic X-ray equipment
IEC	60601-1-6: 2013 edition 3.1	Medical electrical equipment – Part 1-6: General requirements for basic safety and essential performance – Collateral standard: Usability
IEC	62366-1: 2015	Medical devices - Application of usability engineering to medical devices
ISO	14971: 2019	Medical devices - Application of risk management to medical devices
IEC	62304: 2015	Medical device software - Software life cycle processes
IEC	60601-2-28: 2017 edition 3.0	Medical electrical equipment - Part 2-28: Particular requirements for the basic safety and essential performance of X-ray tube assemblies for medical diagnosis
IEC	60601-2-54: 2018 edition 1.2	Medical electrical equipment - Part 2-54: Particular requirements for the basic safety and essential performance of X-ray equipment for radiography and radioscopy
IEC/PAS	61910-1: 2014	IEC PAS 61910-1 First Edition 2007-07, Medical electrical equipment - Radiation dose documentation - Part 1: Equipment for Radiography and Radioscopy
DICOM	PS 3.1 - 3.20 (2011)	Digital Imaging and Communications in Medicine (DICOM) Set
IEC	60825-1:2014	Safety of laser products - Part 1: Equipment classification, and requirements

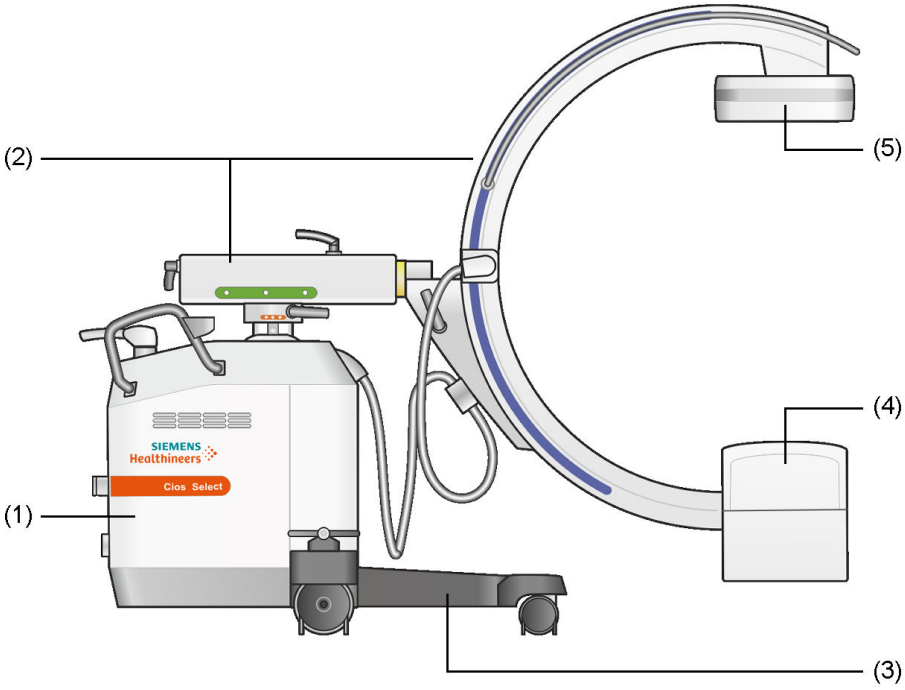
Standard organization	Reference number and date	Title of standard
IEC	60601-2-43:2019 edition. 2.2	Medical electrical equipment - Part 2-43: Particular requirements for the safety and essential performance of X-ray equipment for interventional procedures
IEC	60601-1:2020 ed. 3.2	Medical electrical equipment – Part 1: General requirements for basic safety and essential performance
IEC	60601-1-3:2021 ed. 2.2	Medical electrical equipment – Part 1-3: General requirements for basic safety and essential performance – Collateral Standard: Radiation protection in diagnostic X-ray equipment
IEC	60601-1-6:2020 ed. 3.2	Medical electrical equipment – Part 1-6: General requirements for basic safety and essential performance – Collateral standard: Usability
IEC	62366-1:2020 ed. 1.1	Medical devices – Part 1: Application of usability engineering to medical devices

9.7 Labels

All labels displayed in the operator manuals are examples only and may differ from the labels attached to the system and components.

9.7.1 C-arm system

The labels shown below are attached to the following sub-assemblies.



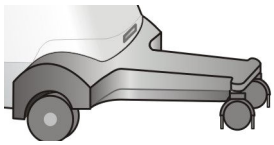
(1) Base system (chassis)
(2) Horizontal support arm and C-arm
(3) C-arm travel frame
(4) Single tank
(5) Flat detector

Example of a system identification label:



(1) **SN**: Serial number
(2) **CONFIG**: Configurable device
(3) **MD**: Medical device
(4) **UDI**: Unique device identification

C-arm travel frame



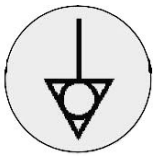


This product complies with DHHS regulations 21 CFR Subchapter J, applicable at date of manufacture.
Manufactured: XXXXXXXXX
Siemens X-ray Vacuum Technology Ltd., Wuxi No.112, Meiyu Road, 214028 Wuxi, Jiangsu, P.R.China

S3P Monoblock label

Rev.	00	01	02	03	04	05	06	07	08	09	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36	37

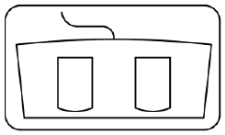
Main unit revision label



Equipotential bonding label

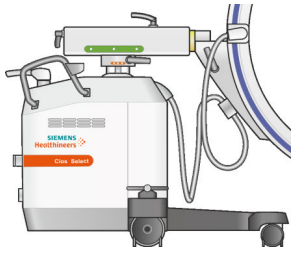


Foot crush hazard



Footswitch connector label

(1) Base system (Chassis)

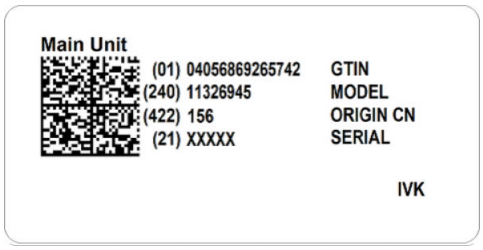


Cios Select
(01)04056869267180 GTIN
(240)11515088 MATERIAL
(422)156 ORIGIN CN
(21)10001 SERIAL SN
CE 0123
UDI
SYSTEM IVK
2020
MD CONFIG
EC REP Siemens Healthcare GmbH, Henkestr. 127
91052 Erlangen, Germany
Siemens Shanghai Medical Equipment Ltd. 278 Zhouzhu Road
201318 Shanghai, P.R.China
Made in China

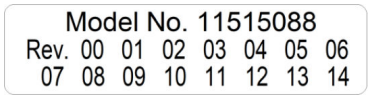
System identification label



Combi label



Main unit label



System revision label



Brazil label (only for Brazil)



Brazil ANVISA label (only for Brazil)



EAC label

This label is only for Eurasian Economic Union (EEU) with EAC declaration done.

وزارة الصحة
Ministry of Health

MoH label (only for Saudi Arabian)

Input voltage: Single Phase,
100V/110V/120V/127V/200V/220V/230V/240V
Input current,
Long time current: 15A/14A/13A/12A/8A/7A/7A/7A
Momentary current: 28.5A/25A/25A/25A/18A/17A/16A/15A
Input frequentcy: 50Hz/60Hz
Continous operation with intermittent loading

Power label



Caution! Read Operator Manual



Hand crush hazard



Operation on incline warning label

WARNING!

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

DHHS radiation emission (only for USA)



DHHS label (only for USA)



Ukraine label (only for Ukraine)



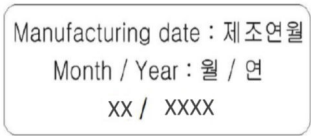
Registered Malaysia label



Name label (only for Malaysia)



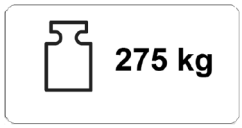
Korean label



Korean manufacturing label



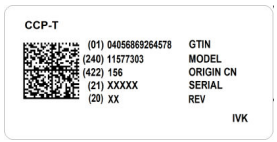
SGS label (only for USA and Canada)



Main unit weight label



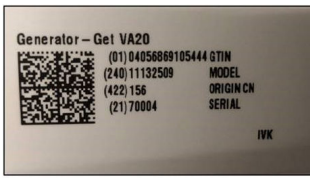
Country Specification label (only for Indonesia)



CCP ID label



Second set of CCP label



Generator ID label



Second set of generator label

(2) Horizontal support arm and C-arm

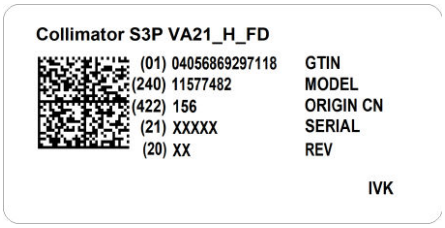




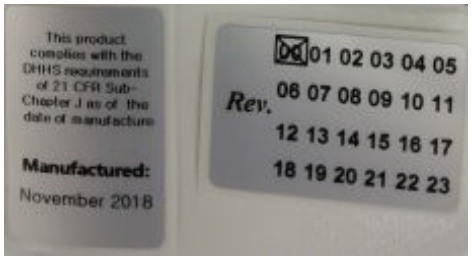
Hand crush hazard



Arrow label



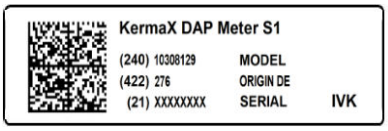
Collimator ID label



Collimator revision label



Second set of collimator label



Second DAP ID label



Second set of DAP label



Zero position label



Horizontal label



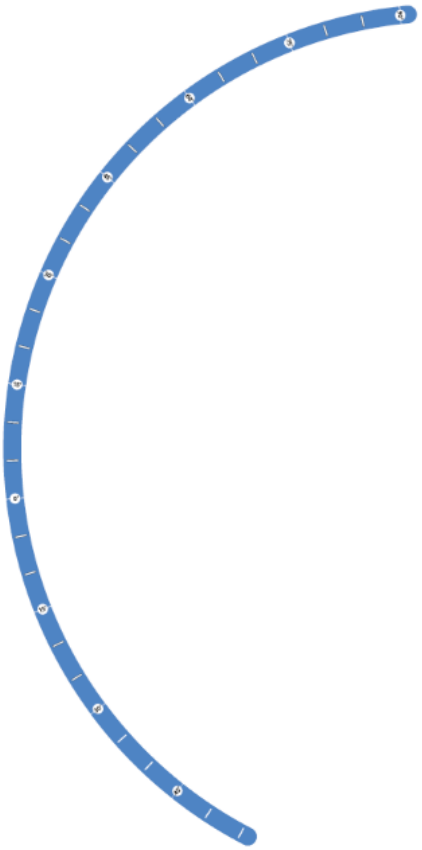
Swivel label



Angular label

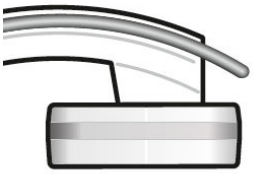


Vertical label



Orbit label

(5) Flat detector





No sitting label



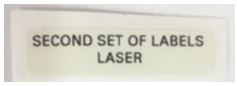
Laser warning label (only for the system with the optional laser light localizer)



Laser radiation label (only for the system with the optional laser light localizer)



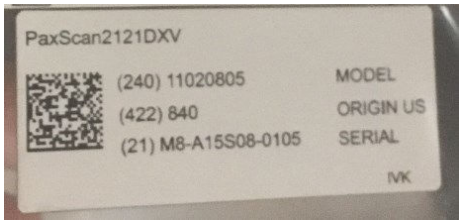
FD Laser ID label (only for the system with the optional laser light localizer)



Second flat detector laser labels (only for the system with the optional laser light localizer)



DHHS label (only for USA)



Second flat detector ID label

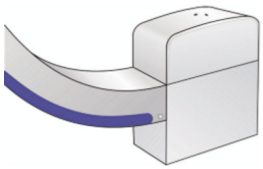


Flat detector second set of labels



DHHS label (only for USA)

(4) Single tank





High voltage label



Danger of hot surface label



Radiation warning label



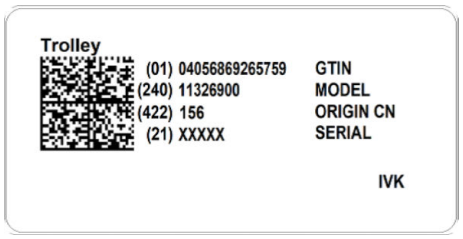
No stepping label



IPX3 label

9.7.2 Monitor trolley





Trolley label



TCP-T ID label



Second set of TCP label



Caution! Read Operator Manual

Rev.	00	01	02	03	04	05	06	07	08	09	10	11
12	13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36	37

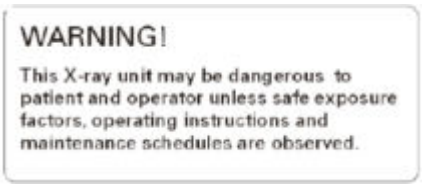
Revision label



Caution label



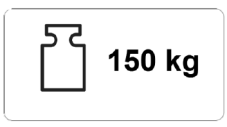
Grounding label



DHHS radiation emission label (only for USA)



DHHS label (only for USA)



Trolley weight label

9.7.3 Pictograms

The following pictograms apply to your system.

Pictogram	Short description
	Equipotentiality
	Hot surface
	Risk of crushing hand
	Risk of crushing foot
	Laser radiaton
	Monitor transport
	Read operator manual

10 Options

10.1 Advanced Security Package to protect imaging system and patient data (HIPAA) 293
10.1.1 Logging on to the system 293
10.1.2 Performing an emergency login 294
10.1.3 Changing the password 295
10.1.4 Changing an expiring password 295
10.1.5 Resetting HIPAA Password 296
10.2 Wireless network connection (WLAN) 297
10.2.1 Activating WLAN 297
10.2.2 Operation via Ethernet cable 298
10.3 Spacer 298
10.4 Grounding cable 299
10.5 Wireless multifunctional footswitch 299
10.5.1 Using the wireless multifunctional footswitch 300
10.5.2 Selecting the operating mode 301
10.5.3 Release radiation 301
10.5.4 Storing images (during radiation) 302
10.5.5 Storing images (after radiation) 302
10.5.6 Replacing the batteries 302
10.5.7 Storage for transport 302
10.6 Extended wired footswitch 303
10.7 Sterile cover on the detector, single tank and C-arm 304
10.7.1 Affixing the sterile cover 304
10.8 Laser light localizer 306
10.8.1 Detector laser light localizer 306
10.8.2 Single-tank laser light localizer 306
10.9 DVI video splitter 306
10.10 Printer 306
10.11 Lithotripsy 307
10.11.1 Selection of lithotripsy functionality 307
10.11.2 Litho Crosshair 307
Manually activating/deactivating the display 307
10.11.3 LithoReport 307
Opening the report 308
Editing a report 309
Exporting a report 310
Printing a report 311
Export for statistical evaluations 311

Anyone who connects additional equipment to the medical device is considered to be configuring the system and is therefore responsible for ensuring that the current system configuration complies with the relevant standards (e.g. system standard IEC/EN 60601-1-1 and/or other applicable standards). In case of queries please speak with your local contact person.

If one of the listed accessory parts requires special operating conditions (e.g. temperature, air pressure, humidity), appropriate attention will be drawn to such in the description. Please follow the Operator Manual provided by the manufacturer.

The following accessories have been approved for use with the Cios Select:

- Spacer
- Grounding cable
- Wireless network connection WLAN
- Wireless multifunctional footswitch
- Sterile cover for flat detector
- Sterile cover for single tank
- Sterile cover with plastic brackets
- Integrated laser light localizer for flat detector
- Single tank laser light localizer

CAUTION

Inappropriate accessory.

The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system.

◆ Use only original Siemens accessories or accessories approved by Siemens.

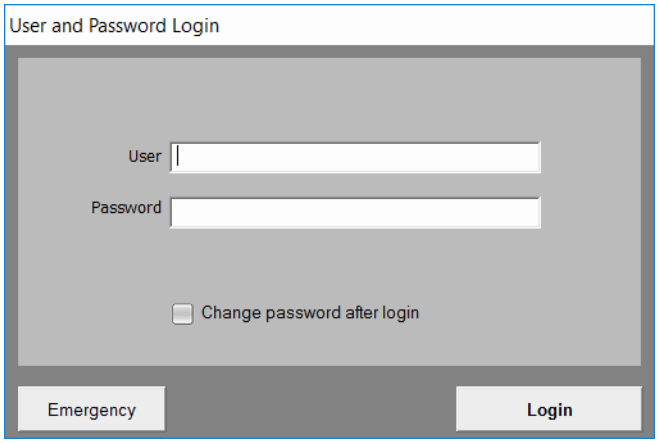
10.1 Advanced Security Package to protect imaging system and patient data (HIPAA)

The HIPAA (Health Insurance Portability and Accountability Act) feature provides mechanisms to secure the Cios Select imaging system, patient data and images from misuse by unauthorized persons.

If HIPAA is licensed and activated, you must log-in using your login name and password. Your system administrator must create user accounts and assign groups and privileges to them. For more information concerning user management, please refer to the Cios Select Administrator Manual.

10.1.1 Logging on to the system

After starting or restarting the system, the login window is displayed.



1 Enter your login name and your password.

2 Click **Login**.

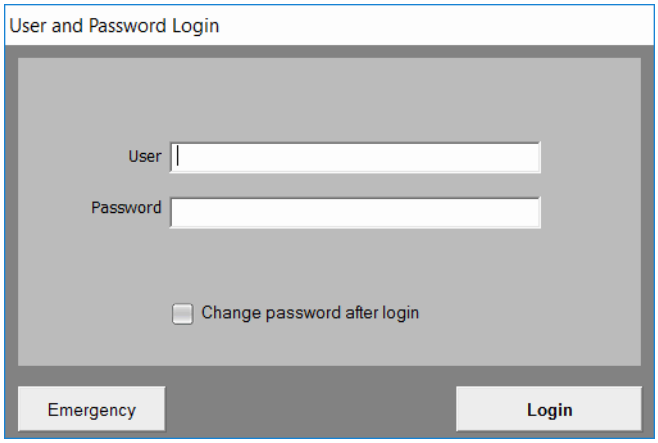
The user interface of the Cios Select imaging system is displayed.

Depending on the rights given to a user by the administrator, not all patients can be seen and some functions of the imaging system may not be available.

After a predefined maximum of unsuccessful login attempts the login for that user will be disabled. Please contact your system administrator to re-enable your account.

10.1.2 Performing an emergency login

If you forgot your password or you do not have an account for this system and must perform an emergency examination, you can perform an emergency login.

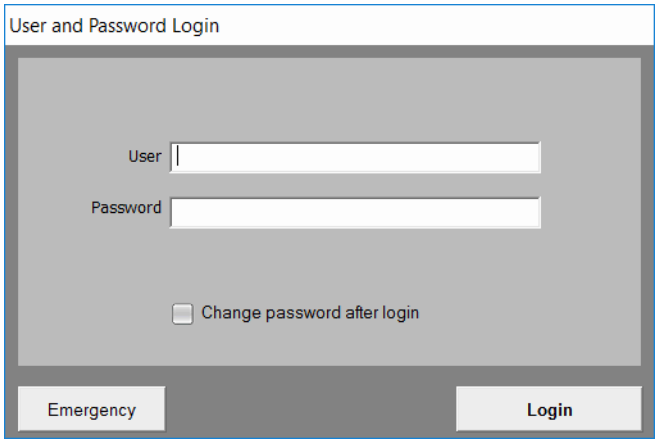


- Click **Emergency** in the login window.

When logged-in as the emergency user, it is only possible to perform fluoroscopy and acquisition. Only emergency patients can be seen. No other functions can be performed and no other patients can be seen.

10.1.3 Changing the password

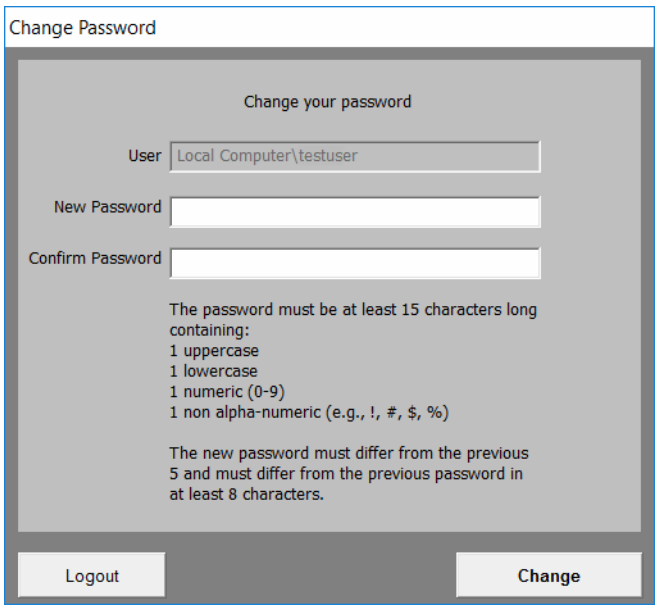
For the first login, the system administrator creates a login account with login name and initial password.



1 Enter your login name and initial password.

2 Activate **Change password after login** and click **Login**.

The password change dialog is displayed.



3 Enter your new password.

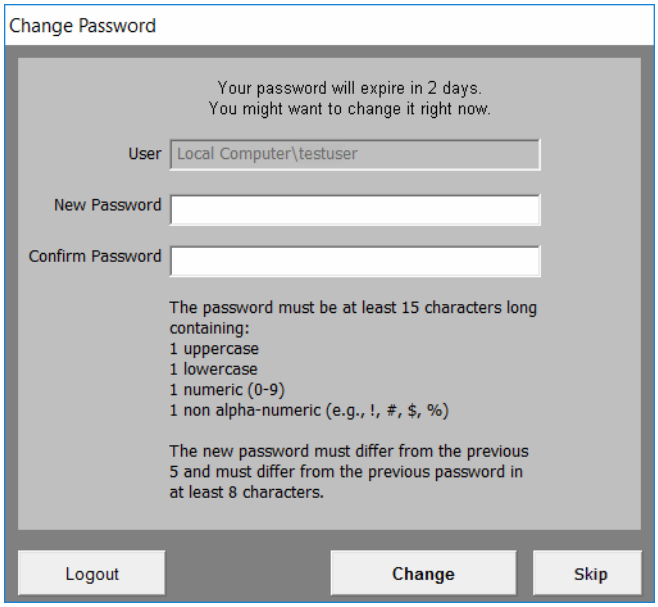
The rules for acceptable passwords are indicated in the window.

4 Re-enter your new password.

5 Confirm with **Change**.

10.1.4 Changing an expiring password

When your password will expire within the next 14 days, the password expiration warning window is shown after you have logged in.



- To change your password now: Enter the new password (twice) and click **Change**.

  The rules for acceptable passwords are indicated in the window.

  – or –

  Click **Skip** to proceed without changing your password.

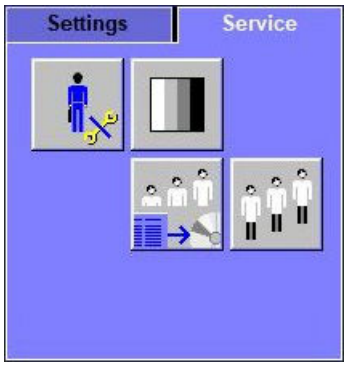
10.1.5 Resetting HIPAA Password

The following information is referring to the Cios Administrator Manual.

If the login with a certain user is not possible because the password is expired, select a new password and write it down.



1 Press the button to open the **Service** menu.



2 Click **User Administration**.

3 Right-click the user from the list and select **Set Password**.

  The **Set password for hipaalocal** dialog box is displayed

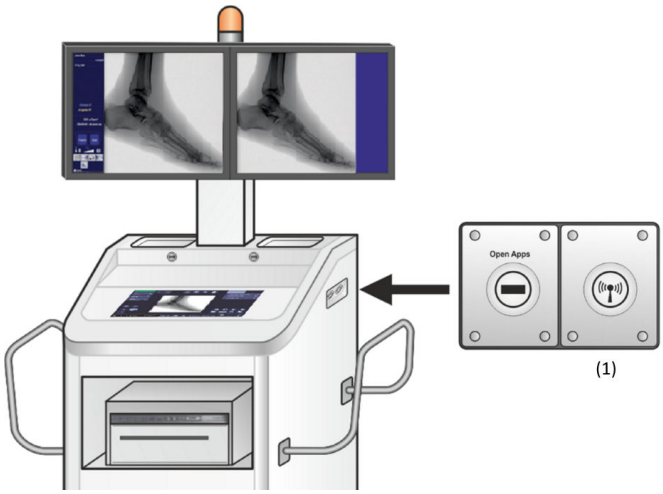
4 Confirm with **Proceed**.

5 Insert the new password and confirm this new password once again.

6 Confirm with **OK**.

10.2 Wireless network connection (WLAN)

The WLAN option enables a wireless connection between the Cios Select and a (hospital) network. The dedicated WLAN unit is integrated into the monitor trolley housing and is completely set up. Its On/Off switch is found on the side of the monitor trolley.



(1) WLAN On/Off switch

10.2.1 Activating WLAN

- To activate WLAN, use the switch on the side of the monitor trolley.

  The WLAN switch illuminates.

Once the WLAN unit is switched on, it takes less than a minute for the WLAN connection to be functional.

CAUTION

Interference

Effect on persons with implants.

- Maintain a minimum distance in accordance with IEC 60601-1-2. Is this not possible, the WLAN-client is to be turned off.

The coexistence of wireless sources operated in the same environment may affect the quality of data transfer.

The transmission speed is reduced if additional WLAN clients are operated simultaneously in the same environment.

For reasons of data security, it is recommended to encrypt the data in the WLAN according to WPA or WPA2.

In case the wireless connection is interrupted, impaired or overloaded, it is recommended to keep an Ethernet cable on hand, provided there are connection options nearby.

If WLAN is activated, no devices sensitive to high frequencies should be placed on top of the unit. Otherwise, damage to such devices or impairment to WLAN functionality could result.

10.2.2 Operation via Ethernet cable

When operating the Cios Select via Ethernet cable, the WLAN at the monitor trolley needs to be deactivated prior to switching on the system.

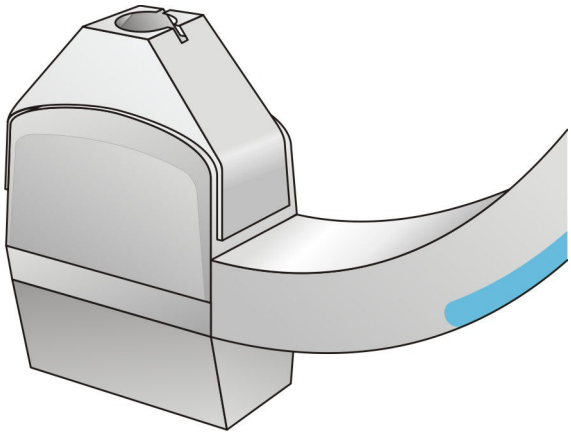
Simultaneous operation via Ethernet cable and WLAN is not possible and should be avoided by all means.

After inadvertent simultaneous operation or after a change between both options, the system must be switched off and on again.

10.3 Spacer

The distance between the source and tube assembly cover (shortest possible source-skin distance) is ≥ 200 mm with the standard system (according to IEC 60601-1-3).

Country-specific regulations may require a larger source-skin distance (≥ 300 mm according to DHHS 21CFR). This is achieved by attaching an additional spacer to the C-arm system.



If this source-skin distance is too large for special examinations, the spacer can be removed by taking off the screws.

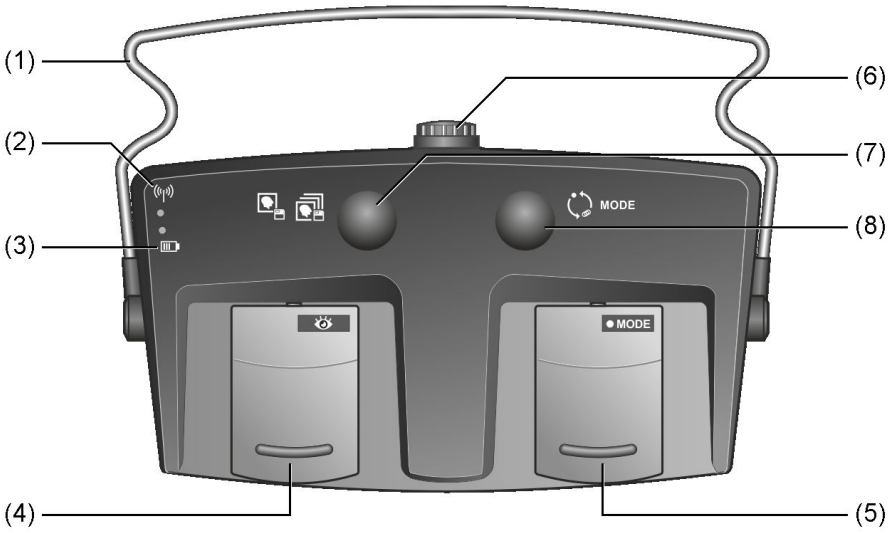
The spacer must be reattached after this type of examination to ensure the reduction in skin dose resulting from a greater source-skin distance.

10.4 Grounding cable

An optional grounding cable is available for equipotential bonding.

Use the grounding cable for examinations of the heart and open skull (in addition to the equipotential bonding connection; also refer to (➔ Page 61 *Establishing the connection for potential equalization*)

10.5 Wireless multifunctional footswitch



(1) Stirrup for preventing unintended actuation
(2) Connection status LED
(3) Battery status LED
(4) Radiation release pedal for the selected operating mode
(5) Radiation release pedal for fluoroscopy (standard setting)
(6) Rotary knob of battery compartment
(7) Save button for storing images or scenes
(8) Operating mode button

States of the status LEDs:

LED	Subject	Mode
Battery status LED	Battery capacity	Green: Battery full or nearly full Orange: Battery almost full Orange (flashing): Battery low
Connection status LED	Radio link or pairing mode	Green: Connection active Orange: No connection active Orange (flashing): Footswitch not paired Green and orange (alternately flashing): Pairing mode activated

LED	Subject	Mode
Battery status LED and Connection status LED	Fatal error or footswitch update	Orange (both LEDs flashing): Fatal system errors (for example, battery exhausted or memory error) Green and orange (both LEDs alternately flashing): Firmware update process running

The battery capacity is also shown on the monitor's status bar:

Symbol on status bar	Battery capacity [%]
	100 - 75
	75 - 50
	50 - 25
	25 - 0
	0

10.5.1 Using the wireless multifunctional footswitch

CAUTION

Radiation released by a footswitch in another room.

Non-clinical exposure to ionizing radiation

- As part of the system installation, the wireless footswitch must be labeled to show which system it belongs to.

CAUTION

The wireless footswitch may be subject to interference from other equipment, including portable and fixed RF communication equipment, even if such equipment meets the applicable emissions requirements.

Fluoroscopy or acquisition may sporadically be interrupted.

- The operator must ensure that other wireless devices in the 2.4 GHz ISM band are not operated within a radius of approx. 5m around the system.
- Please observe and verify normal operation of the wireless footswitch prior to using it.

1 Take the wireless multifunctional footswitch out of the footswitch holder and place it horizontally on the floor.

This will switch on the footswitch, automatically.

2 Swivel the stirrup into the upright position until it locks.

The footswitch is now ready for use.

The wireless multifunctional footswitch automatically switches to standby mode if it is not used for a certain period of time. It is activated again by actuating any button or pedal.

10.5.2 Selecting the operating mode

The MODE (operating mode) button of the multifunctional footswitch allows you to select one of the operating modes: Single image, fluoro, SUB, Roadmap or a video source (depending on the configuration level).

● MODE

◆ If necessary, press this button on the multifunctional footswitch several times.

The selected operating mode is indicated in the Examination task card and on the control panel of the C-arm system.

The set video source alters the image content of the right-hand monitor on the monitor trolley.

A confirmation sound acknowledges successful operating mode/video source switchover. You can then release radiation again right away.

10.5.3 Release radiation

The left pedal is always used to activate fluoroscopy (Preferred setting).

The right pedal is used to activate the currently selected operating mode. **Exception**: If Fluoroscopy mode is selected, the right pedal is assigned the single image operating mode.

The functionality of the pedals can optionally be changed.

CAUTION

X-ray release may be possible from remote location.

Unnecessary dose!

◆ Do not release X-ray mistakenly if not in viewing distance to the patient.

◆ Keep the foot pedal pressed during radiation release.

10.5.4 Storing images (during radiation)

- Press the save button (7) on the wireless footswitch during radiation.

  The image currently generated and displayed is saved in the local database.

10.5.5 Storing images (after radiation)

- Press the save button (7) on the wireless footswitch.

  Holding the key for < 2 seconds: saves the image last recorded (LIH).

  Holding the key for > 2 seconds: saves the scene last recorded (LSH).

The images are stored in the local database. They are transferred from the left monitor to the right monitor unless the **Hold reference** function is active.

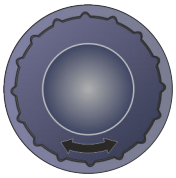
10.5.6 Replacing the batteries

CAUTION

Weak batteries in wireless footswitch.

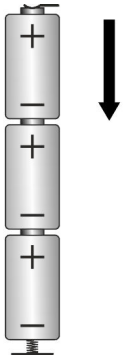
Discontinuation of interventional treatment.

- Before starting an examination, make sure the batteries have sufficient charge.

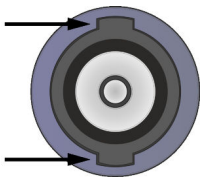


1 To open the battery compartment on the bottom, lightly press in the knob and turn it.

2 Remove batteries.



3 Insert new batteries (LR14) into the wireless multifunctional footswitch as shown in the diagram (see arrow for insertion direction).

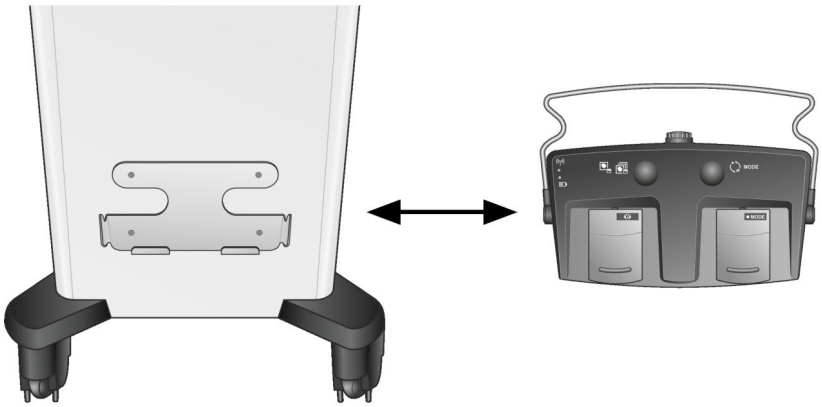


4 To close the battery compartment, insert the knob into the depressions. Press lightly and turn it until it clicks into place.

10.5.7 Storage for transport

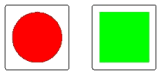
To transport the multifunctional wireless footswitch properly, proceed as follows:

- Insert the multifunctional wireless footswitch into the holder provided on the side of the monitor trolley.



When inserting the wireless footswitch in the holder, make sure that the colored symbols on the footswitch match the ones on the holder to avoid that the wrong footswitch is inserted!

Marking signs: The wireless multifunctional footswitch is marked with a colored sign of different shape. The same mark is attached to the holder on the monitor trolley during installation. So you can avoid a mix up for installations with a multitude of wireless multifunctional footswitches. The following colored symbols are used for unique allocation of the footswitch to the holder:



10.6 Extended wired footswitch

The footswitch pedals assignment can be configured.



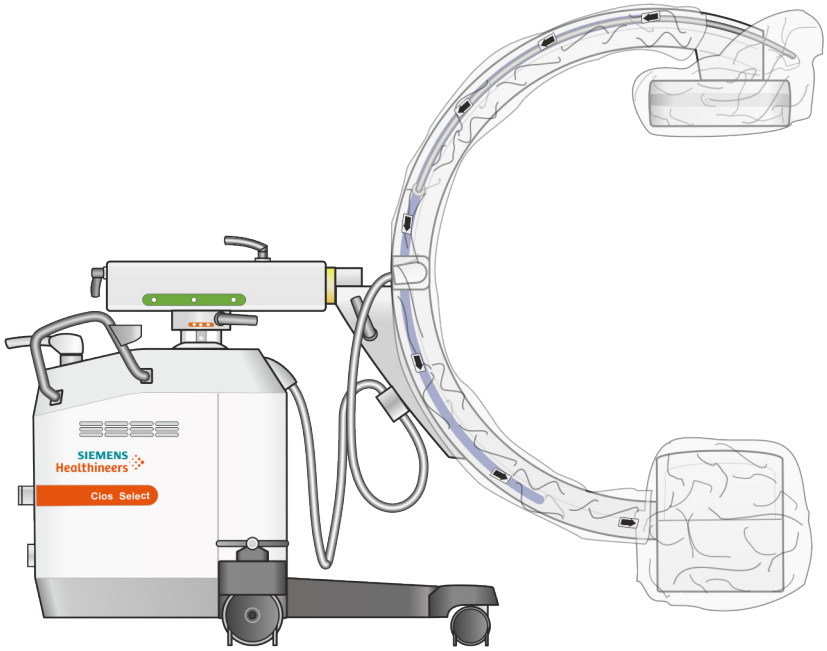
Configuration for foot pedal assignment

(1) Radiation release in preselected operating mode (standard setting)
Exception: Single image when fluoroscopy operating mode is preselected
(2) Radiation release for fluoroscopy (Standard setting)

In addition, the image saving function can be allocated to a pedal if desired. (Standard footswitch only).

10.7 Sterile cover on the detector, single tank and C-arm

To protect it against contamination, the C-arm including the flat detector and the X-ray tube assembly are completely covered with a three-piece sterile disposable cover of transparent polythene sheet.



C-arm completely covered

CAUTION

Improper attachment of the sterile cover on the C-arm.

Risk of infection!

- Follow the instructions for handling the sterile covers.

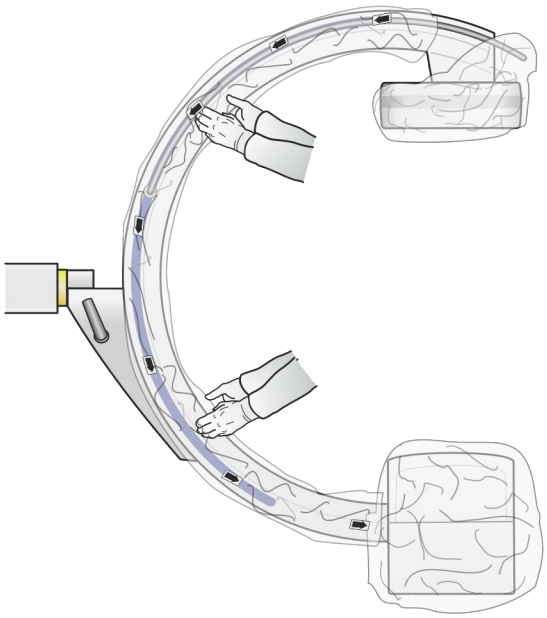
Always use sterile covers during interventions to protect the flat detector against the ingress of liquids!

Never use the sterile cover when the packaging is damaged!

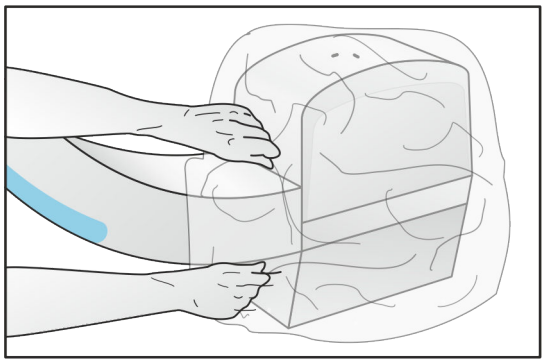
10.7.1 Affixing the sterile cover

Follow these instructions to wrap the C-arm in the sterile cover:

1 Attach the sterile cover to the inside of the C-arm using the adhesive strips.

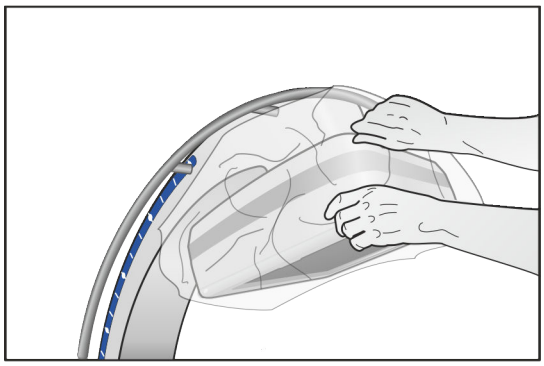


2 Pull the plastic cover over the single tank.



The plastic cover is fixed in place with an elastic cord.

3 Pull the other plastic cover over the flat detector.



The plastic cover is fixed in place with an elastic cord.

The C-arm is now covered completely.

10.8 Laser light localizer

CAUTION

Looking into laser-beam

Risk of impaired vision

- There is a risk of eye injury!
- Do not look directly into the laser beam.
- Do not observe directly with optical instruments.

10.8.1 Detector laser light localizer

To project the target crosshairs, two Class 1 lasers are used whose exit windows are arranged in the detector cover.

10.8.2 Single-tank laser light localizer

To project the target crosshairs, two Class 1 lasers are used whose exit windows are arranged in the single tank cover.

10.9 DVI video splitter

The Cios Select has an additional DVI video splitter option available for outputting the image signals to an external live monitor (Monitor A) and an external reference monitor (Monitor B) via the DVI connection.

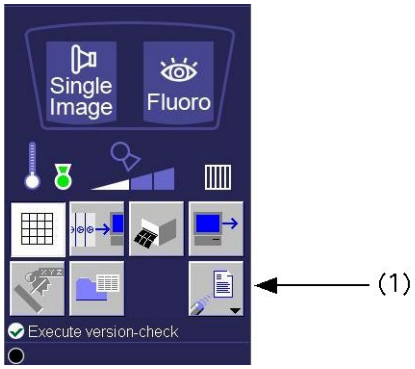
To connect an external monitor, insert the DVI connection cable into the respective interface for Monitor A or B on the monitor trolley.

10.10 Printer

A print from the printer is not suitable for diagnosis.

10.11 Lithotripsy

10.11.1 Selection of lithotripsy functionality



(1) "Reports" selection button

With the lithotripsy system connected and turned on and a patient registered, select the "Reports" button to display the buttons for the lithotripsy-specific functions.



The Lithotripsy submenu contains the following buttons:

- Launch Litho Report Dialog
- Launch Litho Statistics Dialog
- Litho Target Mark

If the lithotripsy function is active, it takes longer to close patient data.

10.11.2 Litho Crosshair

Litho crosshair provides an electronic crosshair in the center of X-ray image that can be used to align the C-arm with a third party lithotripsy device.

Manually activating/deactivating the display



Touch the button on the control panel or click the button on the monitor to display or hide the electronic crosshair at any time.

If the litho crosshair display is active, the laser crosshair does not display on the monitor.

10.11.3 LithoReport

LithoReport is used to document examination and treatment data. You can read, edit/complete, print and export them.

Additionally, a patient must be registered in the system in order to generate a LithoReport.

Please note that a new patient must be registered prior to every treatment session (even if radiation will not be used). Only then will the treatment data be reset on the lithotripter. A shock wave can always be triggered on the lithotripter regardless of a patient being registered in the imaging system.

Opening the report

✓ A lithotripsy study or a series/image is selected.



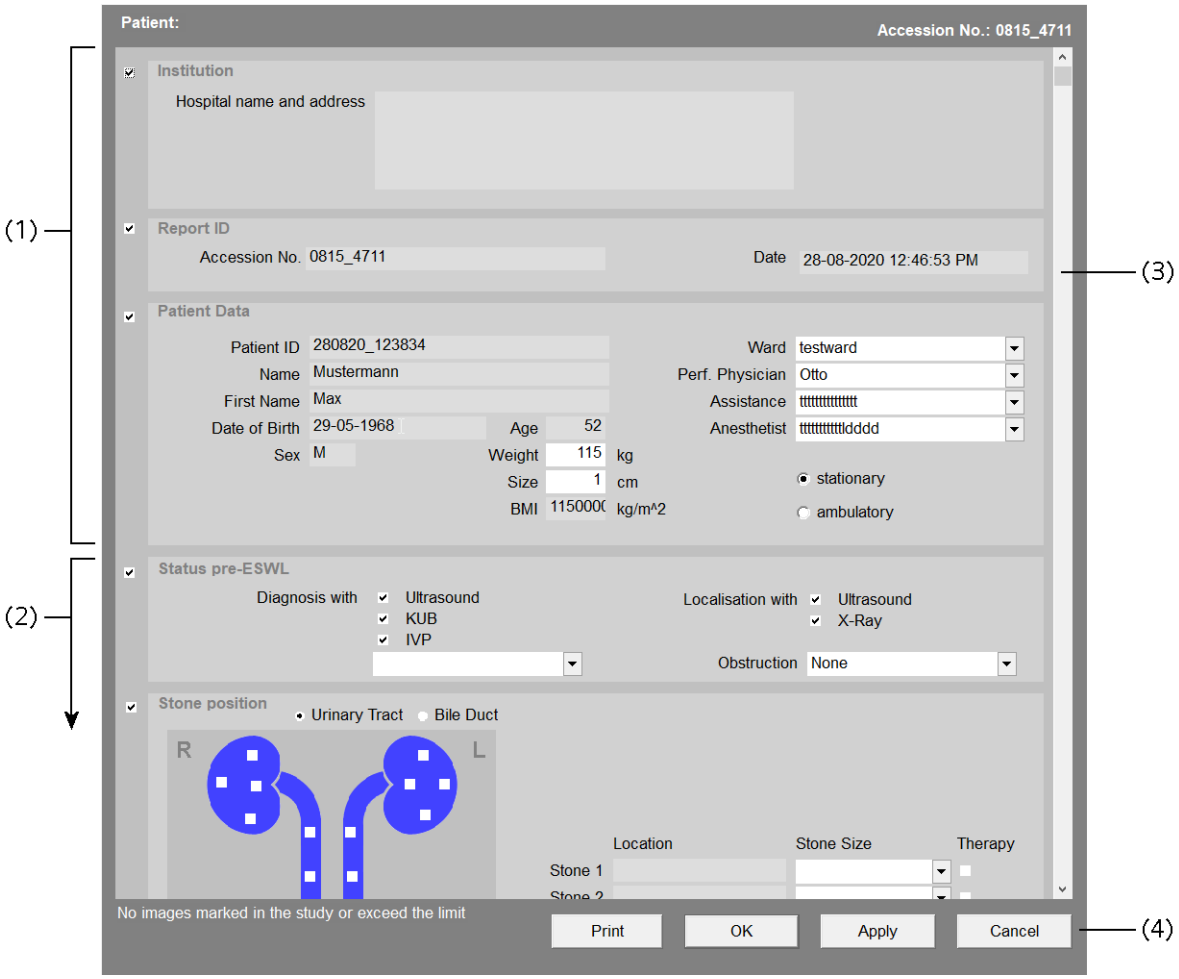
1 Click this button on the left monitor (lower left).

The LithoReport tools are displayed on the left monitor (top left).



2 Click this button.

The LithoReport is displayed on the monitor.



(1) Identification data (hospital, report, and patient information)
(2) Diagnostic and therapeutic data on the lithotripsy
(3) Image scroll bar to scroll through the LithoReport
(4) Buttons for applying changes and closing the dialog window

Editing a report

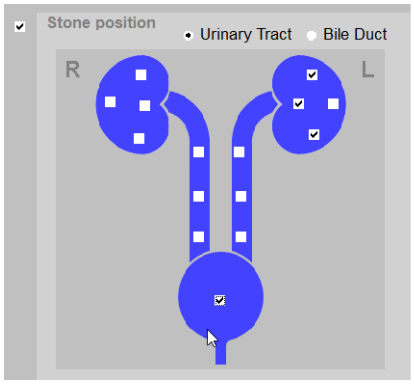
Part of the data are automatically recorded during treatment. You can add and postprocess any other data.

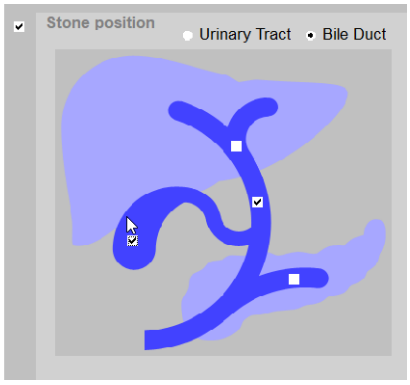
1 Check the sections that belong in the LithoReport.

2 Use the scroll bar to scroll through the sections of the report that are not currently on the monitor.

3 Add to or correct the entries in the individual fields using the keyboard and mouse.

Marking the stone position Document the stone position in pictograms of the urinary and/or biliary tract.





1 Select **Urinary Tract** or **Bile Duct** to display the appropriate pictogram.

2 Use the mouse to place a checkmark at each stone position.

Attaching images

You can integrate up to 25 images of the lithotripsy study in the LithoReport.



1 Select the desired images and mark them (➔ Page 159 *Selecting images*).

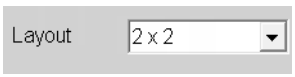
2 Scroll to the end of the report using the scroll bar in LithoReport.



3 Click this button.

Thumbnails of the attached images are displayed in the LithoReport.

To delete attached images, use the **Remove Selected Images** button after selecting their thumbnails.



4 Select the image layout on the pages of the report.

Applying the changes

◆ Click **Apply** to save your previous changes.

The LithoReport remains open for further processing.

– or –

Click **OK**.

The modified LithoReport is saved and closed.

The LithoReport is stored in the local database in DICOM SC format and as PDF within the study.

Exporting a report

Exporting the LithoReport works just like exporting examination images.

1 Select the LithoReport in the image overview.



2 Export the LithoReport to the desired address (➔ Page 190 *Exporting with changed settings*).

If "USB device" or "CD/DVD" is selected for **Target Type**, the LithoReport is always transmitted as a PDF file regardless of the data format selected under **Format**.

Printing a report

Printing the LithoReport can be started from the Litho Report Dialog, only.

1 Open the LithoReport, if required.



2 Click this button.

The report is printed on the configured default printer (➔ Page 209 *DICOM Properties - Printing*).

Export for statistical evaluations

You can combine a selection of LithoReports from the local database and export them in metaformat for statistical purposes. The exported file can be opened and edited with different programs, e.g. Microsoft Excel.

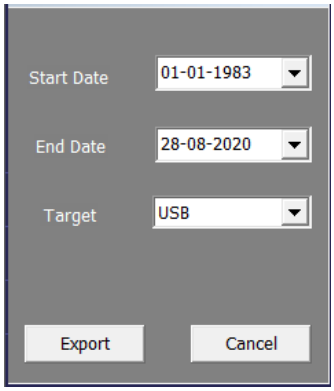


1 Show the LithoReport tools.



2 Click this button.

A dialog window is displayed on the monitor.



3 Define a report period from which to compile the data.

4 Select USB device or CD/DVD as the export destination.

The selected storage medium must be connected or inserted.

5 Click **Export**.

The combined data are exported as a csv file.

1, 2, 3 ...

2D image processing 155

A

Accessories
- original 40

Acquisition 120

Air kerma strength 256

Angle
- measuring 170

Annotating
- images 171

Anode heating and cooling curves 253

Application
- selecting 98

Attenuation equivalent 41

B

Batteries
- maintenance intervals 234

Brakes
- operating 64

Brightness 161

C

C-arm
- aligning 96
- angulating 68
- brakes 65
- Control panel 70
- labels 278
- lifting and lowering 65
- movements 63
- moving horizontally 67
- orbital movement 69
- positioning safety 39
- sterile cover 304
- swivelling 68
- technical data 274

C-arm control unit 55

C-arm system 49
- crushing hazards 30

Cable deflectors 82

Calibration 167
- detector 232
- dose measurement chamber 233

Cardiopulmonary resuscitation (CPR) 88

Collimator
- setting 113
- technical data 274

Combination
- with other systems 40

Conditions of use 10

Configuration 202

Consistency test 235

Contrast 161

Control panel
- on the C-arm 55
- on the monitor trolley 55

CPR 88

Crushing hazards
- on the C-arm system 30

Curves 253

D

Daily checks 231

DAP meter 50
- technical data 275

Data
- correcting 147
- deleting 149
- importing 150
- selecting 147

Deleting
- individual images/series 160

Detector
- calibration 232
- sterile cover 304

Detector zoom
- selecting 116

Deterministic radiation effect 33

Diagrams 253

DICOM Properties
- General 206
- Printing 209
- Sending 208
- user settings 205

Digital video imaging system
- technical data 275

Disconnecting
- the power plug 26

Display Layout 210

Disposal 44

Distance
- measuring 169

Dose level
- selecting 114

Dose measurement chamber
- calibration 233

Dose measuring chamber 50
- technical data 275

Dose rate
- at the flat detector input 256

Dose test 235

Dosimetric information 256, 259

During the examination
- safety information 92

DVI video splitter 306
- technical data 276

E

Edge enhancement 163

Electrical safety 42

Electrical systems
- malfunction 25

Electromagnetic compatibility (EMC) 261, 265

Electromagnetic emissions 262

Electromagnetic interference 21, 42

Electromagnetic interference immunity 262, 263, 265

EMC 261, 265

Emergency power supply
- switching to 26

Emergency registration 100

EMERGENCY STOP 27
- function 85

Equalization 21

Equipment safety 38

Examination
- acquisition 120
- ending 133
- safety information 91
- settings 110

Examination properties
- user settings 209

Explosion protection 29

Export destinations 185

Export procedures 184

Export settings 191

Exporting 184
- manually 190
- using default settings 189

F

Failure 26

FD 50

Fire protection 28

Flag 145

Flat detector 50
- input dose rate 256
- technical data 273

Flipping
- images 165

Fluoro curves 255

Fluoro timer 123

Fluoroscopy
- display images 122
- operating mode 57
- warning signal 123

Fluoroscopy parameters 111

Footswitch 56, 303
- operating 76
- wireless multifunctional (optional) 299

Full screen image
- displaying 158

Functional checks 231

G

Grid
removing/inserting 93
Grounding cable 299

H

Hand switch
operating 75
Hand switches 56
High frequency 22

I

Image display 58
changing 161
user settings 210
Image orientation
selecting 118
Image overview
displaying 155
Image parameters
setting 118
Image processing 155
Image quality 42
Image storage 77
Images
annotating 171
deleting 160
deleting automatically 213
evaluating 166
inverting 163
loading and displaying 155
rotating/flipping 165
saving 173
saving and displaying 125
selecting 159
windowing 161
zooming and panning 163
Input format
selecting 116
Inspection 22
Installation 39
Interference 21, 42
Interference immunity 262, 263, 265
Interventional examinations 96
Inverting
images 163
Isokerma curves 259

L

Labels 278
Languages 43
Laser light localizer 95, 306
technical data 275, 276
Laws 16

M

Magnification
selecting 116
Maintenance 22
Maintenance intervals 234
Maintenance plan 233
Malfunction
of electrical systems 25
Malfunctions 23
Measuring
angle 170
distance 169
Mechanical damage 31
Metal correction
switching on 115
Monitor trolley 52
control panel 55
labels 289
moving 83
transporting 82
Monitors
technical data 275
Monthly checks 231
Multiselection 159

N

Names 11
Network
importing data 152
Network connection
wireless 297
New patient
registration 101
Noise filter
selecting 116

O

OEM 270
Open heart examinations 30
Operating areas
location and size 34
scatter radiation 34, 37
Operating elements 54
Operating mode
selecting 111
Operating modes 56
Options 48
Orbital movement
of the C-arm 69
Original accessories 40
Original Equipment Manufacturer (OEM) 270
Overload protection 29

P

Panning
images 163
Parameters 11
Password
for radiation release 214
Patient data 144
correcting 147
deleting 149
importing 150
searching for and selecting 144
selecting 147
Patient list 144
Patient registration
user settings 204
Pediatric use 140
Personal safety 30
Physical functionality 10
Potential equalization 21
Power failure 86
Power plug
disconnecting 26
Previous patient
registration 105
Print Layout 211
Print preview 183
Print properties
user settings 210
Print settings 182
Printer 306
Printing
a report 199
using default settings 181
Prior to the examination
safety information 91
Product
use 7
Product service life 44
Protection classes 244
Protection measures 244
Protocol codes
editing 207
Pulse rate
setting 117

R

Radiation
technical data 272
Radiation effect 33
Radiation information 124
Radiation interruption 38
Radiation protection 31
Radiation release 76
unlocking/locking 96
Radiation summary report 198
Rebooting 86
Reference images 128

Registration
new patient 101
previous patient 105
worklist patient 107
Regulations 16
Remote service 237
Removable devices
importing data 151
Repair 39
Reports 197
RESET 87
Resetting
image display 165
Reviewing
a scene 158
Road 136
Roadmap
operating mode 57
Roadmap (Road) 136
Rotating
images 165

S

Safety
equipment 38
personal 30
Safety checks 231
Safety information 16
Saving
images 173
Scatter radiation
in operating area 34, 37
Scattered radiation grid
removing/inserting 93
Scene
reviewing 158
saving and reviewing 126
Scrolling 157
Series
deleting 160
Service
via network connection 236
Settings 202
Single image
operating mode 57
Single tank
sterile cover 304
Site info
user settings 202
Skin dose 256
Skull examinations 30
Software
safety 17
Spacer 298
Special examinations 135
Standards 277
Start-up 59
functions 62
Sterile cover
on the C-arm 304
on the detector 304
on the single tank 304
STOP 27
Sub 135
Subtraction
operating mode 57
Subtraction angiography (Sub) 135
Subtraction processing 173
Switching off 77, 78
System
technical data 271
System data 271
System failure 26
System overview 47

T

Technical data 271
Technical information 251
Temperature monitoring 124
Transfer
checking 194
Transfer capabilities 186
Transport 79
Trolley 52
labels 289
moving 83
transporting 82
Tube
technical data 273

U

UPS display field 53
Use
of the product 7
User settings 202

V

Values 11

W

Warning signal
for fluoroscopy 123
WC 161
Weight counterbalance 41
Window center 161
Window values 161
Window width 161
Windowing
images 161
Wireless multifunctional footswitch (optional) 299
WLAN 297
Worklist patient
registration 107
WW 161

X

X-ray generator
technical data 272
X-ray parameters
setting manually 117

Z

Zoom
selecting 116
Zooming
images 163

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Original language: English

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Published by Siemens Shanghai Medical Equipment Ltd. / Print No. ATSC-200.620.61.02.24 / © Siemens Shanghai Medical Equipment Ltd., 05/2024