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CT Examination

Instructions for Use – SOMATOM Perspective

syngo CT VC30 - easyIQ version

Answers for life.

CT Examination

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syngo CT VC30 - easyIQ version

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
Blue	Is used to emphasize **particularly** important sections of the text
Courier	Is used for on-screen output of the system including code-related elements or commands
`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

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

WARNING

Legend

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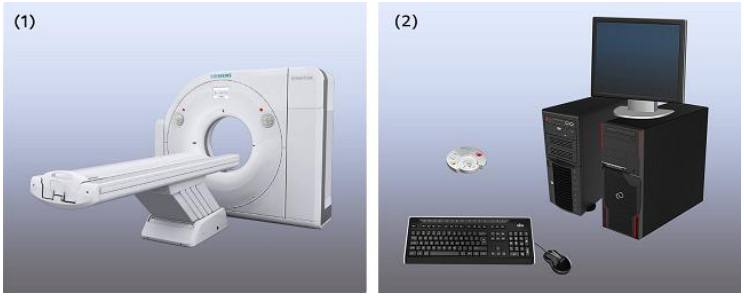
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1 Introduction

The SOMATOM CT system is used to generate tomographic images of the organs of a patient for diagnostic purposes in accordance with the computed tomography procedures. The tomographic images generated with this system can be viewed on a monitor, processed, filmed, and exported.

The system consists of the following components:



(1) Acquisition system: gantry and patient table

(2) Console: computers, input units, monitor, control box, etc.

SOMATOM Perspective can be operated in the X-ray department of a hospital or doctor's office. The CT system must be operated in rooms that are designated for medical use.

- Components or software functionalities that may not be part of your system configuration are described in your user documentation. Not all the optional components and software functionalities may be marked as optional. The availability of these components or software functionalities depends on your system configuration or your purchase contract.
- The pictures of the components shown here are only examples. The appearance of your components depends on the system configuration.

1 Introduction

1.1 Intended use

SOMATOM Perspective is a computed tomography system. This computed tomography system is intended to generate and process cross-sectional images of patients by computer reconstruction of X-ray transmission data. The images delivered by the system can be used by a trained physician as an aid in diagnosis.

1.2 Indications for use

This computed tomography system is intended to generate and process cross-sectional images of patients by computer reconstruction of X-ray transmission data.

- This computed tomography system is indicated for head, body, and vascular applications for patients of all ages.
- The images delivered by the system can be used by a trained physician as an aid in diagnosis.
- The images delivered by the system can be postprocessed to produce additional imaging planes or analysis results.
- The images delivered by the system can be used for planning, guiding, or monitoring therapy.

1.3 Authorized users

SOMATOM Perspective must be used by persons with the necessary specialist knowledge, for example, doctors, trained radiologists, or trained technologists, after appropriate application training.

United States Federal law restricts this device for sale by or on the order of a physician (21 CFR 801.109(b)(1)).

1.4 Patient population

No patient population restrictions are known.

1.5 Contraindications

There are no known specific situations that contraindicate the use of the SOMATOM CT system.

1.6 Names and parameters

All names and data of patients and institutions that are used in the user documentation are entirely fictional.

Any resemblance to names of existing people or organizations past or present is entirely coincidental.

All parameters and images shown in the user documentation are examples. Only the parameters displayed by your system are definite.

Configuration dependent designations, such as names of drives, network nodes, and databases that are used in the user documentation are usually not the same as the designations to be found on a particular installation of the system in a clinical environment.

1.7 Medical practice

The information presented in the documentation is for illustration only and is not intended to be relied upon by the reader for instruction as to the practice of medicine.

Any health care practitioner reading this information is reminded that they must use their own learning, training, and expertise in dealing with their individual patients. This material does not substitute for that duty and is not intended by Siemens, to be used for any purpose in that regard.

The drugs and doses mentioned are consistent with the approval labeling for uses and/or indications of the drug. The treating physician bears the sole responsibility for the diagnosis and treatment of patients, including drugs and doses prescribed in connection with such use.

1 Introduction

2 Safety advice

The basis for ensuring the safety of people and equipment are the statutory stipulations and guidelines as well as the information given in the user documentation.

The SOMATOM system was designed and built so that it cannot cause injury if used properly.

2.1 Basic safety rules

As the user, you must have the necessary qualification (for example, training in a relevant medical profession). You must also have been instructed in the use of the CT scanner.

⚠ CAUTION

Operation of the system by non trained users!

Incorrect diagnosis or treatment due to misinterpretation of image information.

- The SOMATOM system must only be used by persons with the necessary specialist knowledge, for example, physicians, trained radiologists, or trained technologists, after an appropriate application training.

Read the user documentation carefully and observe the instructions. This applies especially to guidelines that deal with function tests, mechanical safety and radiation protection.

⚠ CAUTION

Not observing the Instructions for Use of the system, system options and accessories!

Injury of the patient.

- Always use the Instructions for Use in conjunction with the Instructions for Use of the particular units used.
- Follow the safety instructions.

⚠ CAUTION

Not observing the Instructions for Use of the software and its applications!

Wrong basis for diagnosis.

- Always use this Instructions for Use in conjunction with all Instructions for Use provided.
- Follow the safety instructions.

⚠ CAUTION

User is not instructed in how to operate the applications!

Wrong basis for diagnosis.

- The operator must be qualified to use the applications.

Relevant statutory stipulations must be observed during installation, operation and maintenance. Supplementary safety information is given in System Owner Manual:

- Technical specification
- Standards and statutory regulations
- Dosimetry and imaging performance report
- Location of labels

Please observe the information given in System Owner Manual.

2.1.1 General safety practice

As an operator, you must observe certain basic rules.

- Patient registration

  Incorrect assignment of the patient's name to patient images can cause incorrect diagnoses.

  Make sure that you enter the personal data of the patient correctly. This applies especially to patient position, sex and date of birth.

- Patient positioning

  The patient must always be positioned on the patient table. *Never* position the patient directly in the gantry!

  Motion artifacts and/or injuries of the patient may occur if he/she moves uncontrollably during acquisition. Immobilize the patient, if necessary.

- Restraint straps

  The restraint straps are not permanently attached to the table. Thus, they cannot prevent the patient from falling off the table.

  Make sure that the patient, especially a restless patient, does not fall off the table.

- Special care

  Take special care when examining infants, small children, obese patients or patients who do not keep still or have accident injuries. Take the same care when using positioning accessories.

- System movements

  When the gantry or the patient table is moved, the patient or other people could be injured.

  – Make sure that the patient and other people are not in danger before you execute system movements or scans.

  – Ensure that no objects can obstruct movement.

- Information

  The better the patient is informed, the easier he or she will find it to follow the rules. Give the patient enough information about the examination you are about to perform.

- During scanning

  Despite the careful design of the CT scanner, it is not possible to completely eliminate the risk of injury (danger due to collision, crushing, radiation). Never leave the CT scanner unsupervised during an examination.

- Communication

  The patient can communicate with you during the examination through the intercom system. Leave the intercom system switched on during the examination (**Listen to patient** key).

- Stopping system movements and radiation

  All system movements and radiation can be interrupted in case of an emergency.

  – Make sure that you know where the **STOP** key is located. You will find **STOP** keys on the gantry and on the control box.

  – Always observe the patient directly. Press the nearest **STOP** key in case of danger.

  After you have pressed a **STOP** or **EMERGENCY OFF** key or if a power failure has occurred, no motorized system movements are possible. However, you can pull the patient out of the opening of the gantry manually.

- Artifacts

  Various influences can cause a distorted image. If you are not sure, repeat the acquisition, if necessary.

- Documentation

  Faults in the computer system can lead to loss of data. Document or export the patient images and studies *as fast as possible*.

- Warning messages

  Your system monitors important resources like memory or disk space. Warning messages may appear.

  To avoid system behavior like freezing or delayed response time to user due to lack of memory resources, immediately restart your system if possible or at least close some applications and background activities.

2.1.2 Proper and improper use

The SOMATOM system is suitable for acquiring tomographic images of patients for diagnostic purposes using the computed tomography procedure. A patient should be examined by doctors in accordance with the methods and precautions described in the user documentation.

Improper use means if the systems or parts of the systems are used for other purposes.



Siemens is not responsible for the loss of patient data and will refuse warranty in case of unauthorized (improper) use of the equipment (for example, surfing on the internet).

- Switching on and off

  Improper shutdown can damage the equipment and cause loss of data (on the computer). Always switch the unit on and off in the recommended way.

- Function checks / Maintenance intervals

  Only a regularly checked and serviced unit is safe. Perform the prescribed function tests. Make sure that maintenance is performed at the prescribed intervals. See System Owner Manual.

- Placing objects on surfaces

  Improper placement of objects on parts of the system may cause contamination and/or damage that may impair scanning results and/or cause image artifacts.

  Do not place objects on any parts of the system that are not intended to be supporting surfaces.

- Liquids, chemicals, heavy objects, and food

  Food and drinks *must not* be consumed in the vicinity of the console or placed on the console.

  In particular near the console (keyboard, control box), you must be careful with liquids and food. They can get into the equipment and cause malfunctions.

- Accessories

  Defective or not released accessories can cause artifacts, injuries to the patient and operating personnel or damage to the equipment.

  – Only use accessories approved by Siemens.

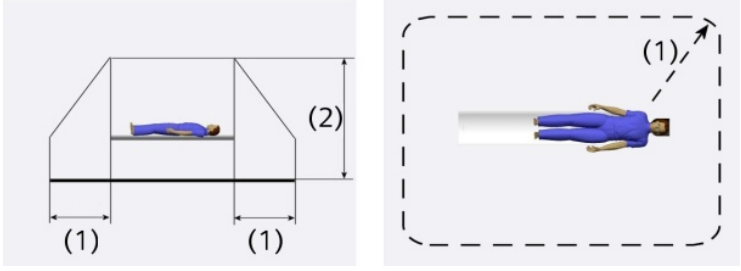
  – Replace defective accessories with new original accessories immediately.

You can expand a SOMATOM standard system individually and adjust it to your clinical requirements. Please refer to the listing in your purchase contract for information about the expansion levels of your system.

2.1.3 Console location

All console components (for example ICS, IRS, input units and monitor including second acquisition monitor) and nonmedical equipment shall only be operated outside the patient vicinity.

For minimum distances refer to the following diagrams.



(1) USA: 1.83m; all other countries: 1.5m

(2) 2.5m

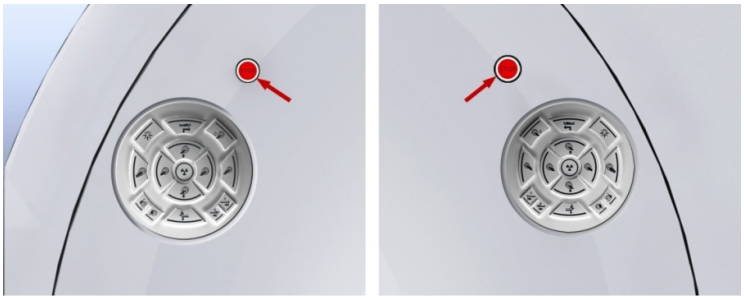
The minimum distances do not apply for the monitors mounted on the monitor trolley or the monitor ceiling system.

2.1.4 STOP keys

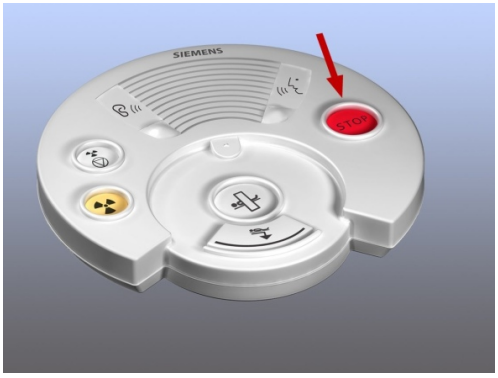
With the **STOP** keys, you can interrupt unit movements in an emergency (table movements and gantry tilting) and switch off radiation.



The **STOP** keys are located on the gantry front cover and the control box.



STOP keys on gantry front cover



STOP key on control box

In critical situations press one of the **STOP** keys. If you press one of the red **STOP** keys, unit movements are interrupted and radiation is stopped. The functions of the keys for system movements are blocked as well.

You can then pull out the patient table by hand. If you want to continue working, you must reactivate the system with **Continue** and lock the patient table into its original position.

CAUTION

Uncontrolled system movements and radiation!

Injury or radiation damage.

- Always observe the patient during system movements.
- Press STOP if a system movement is performed that has not been initiated on a gantry operator panel, on the control box or during a scan (especially at autorange).
- Press STOP if a key sticks or a movement does not stop immediately when the key is released.
- Press STOP if the patient table does not stop as expected.
- Press STOP if the patient table position displayed differs by more than 10 mm from the actual position.
- Press STOP if the patient is not correctly positioned during system movements.
- Press STOP if the patient table moves in the wrong direction.
- Press STOP if the HOLD key does not respond during a scan.
- Press EMERGENCY OFF if the system does not respond to the STOP keys and there is danger.
- Shut down the system and notify the Siemens Customer Service if system malfunctions are detected.

After you have pressed the **STOP** or **EMERGENCY OFF** key or if a power failure has occurred, the stopping distance of the patient table in the horizontal and vertical directions can be up to 10 mm and the stopping distance for the gantry up to 0.5°.

2.1.5 In case of emergency

In addition to the **STOP** keys at the CT unit, **EMERGENCY OFF** keys to be provided by the customer have to be easily visible and within easy reach. Country-specific regulations must be observed.

In extreme cases, you can press an **EMERGENCY OFF** key to shut down the whole system. Radiation and system movements will be stopped.

You must only press the **EMERGENCY OFF** key:

- If the **STOP** key on the CT system does not respond.
- If situations arise that could cause injury to the patient or user or damage to the equipment (for example, liquids or particles getting into the equipment, damage of cover parts, fire).

Only after all causes of danger have been found and remedied, the unit may be switched on again by a controlled restart.

The **EMERGENCY OFF** key interrupts the power supply of the system. Data can be lost.

2.1.6 System disposal

CAUTION

Improper disposal of the system or parts of the system!

Pollution of the environment.

- System components hazardous to persons or the environment must be disposed of with care and in compliance with legally binding ordinances.
- Examples of environmentally relevant components are accumulators and batteries, transformers, capacitors, monitor picture tubes, and phantoms.
- For details contact your local customer service representative or your Siemens regional office.

For more information, refer to System Owner Manual.

2.2 Personal safety

Despite the careful design of the CT scanner, it is not possible to completely eliminate the risk of injury (danger due to collision, crushing, radiation).

- Before a scan

  The patient must be positioned in such a way that he or she cannot collide with or be injured by table top movements or the tilting movement of the gantry.

- During a scan

  As long as the table or scanning unit is moving during scanning, the patient must always be visible and the intercom system must be switched on to hear the patient.

2.2.1 System movement safety

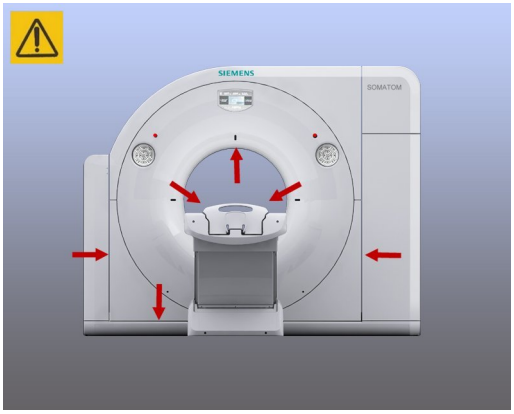
CAUTION

Movable parts of the CT system!

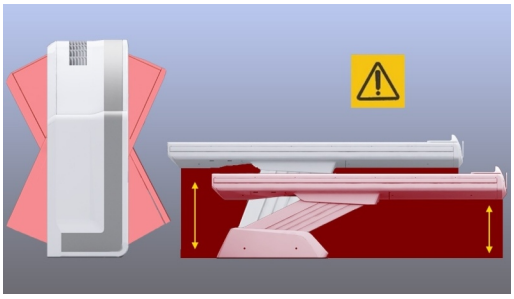
Possible injury of the patient by moving parts.

- Always observe the possible contusion points shown in the following pictures.

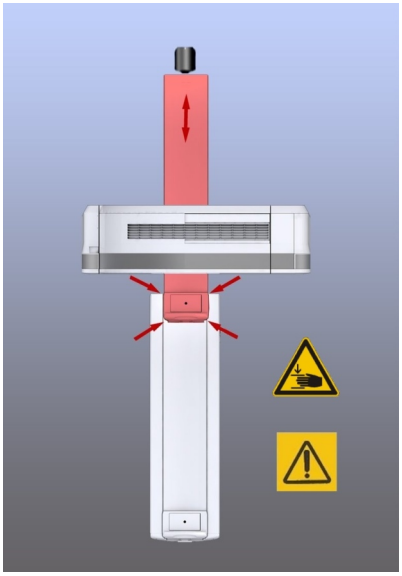
Movement of the table top or tilting of the gantry entails a danger of injury. Particularly dangerous points are marked with arrows and dangerous areas are colored red in the drawings below.



Danger points at gantry



Danger area at patient table



Danger points for the hands

The pictures of the components shown here are only examples. The appearance of your components will depend on the system configuration.

2.2.2 Electrical shock

Interior parts of the system carry voltage as long as the system is connected to the power supply.

CAUTION

The system carries line voltage!

Electrical shock

- Never open components of the system.
- Leave all repairs to the Siemens Service.
- Ensure that no objects, for example, necklaces, paperclips, or liquids can get into the interior of the system (electrical shock, short circuit).

WARNING

Cleaning of parts of the system while the system is connected to the power supply!

Electric shock due to possible contact with line voltage.

- Always switch the system off at the main power switch before cleaning or disinfecting.

The monitor bears a risk of electrical shock.

WARNING

Unauthorized manipulation on or improper use of the system!

Electrical shock

- Never open the monitor.
- Leave all repairs to the Siemens Service.
- Never place cups, glasses or other vessels containing liquid on or near the monitor, in case of accidental spillage.
- Ensure that no objects, for example, necklaces, paperclips, or liquids can get into the interior of the device (electrical shock, short circuit).

WARNING

Cleaning of the monitor housing during operation!

Electric shock

- Only clean the housing when the monitor is switched off.

Uninterruptible Power Supply batteries must be handled by qualified service personnel.

WARNING

Wrong handling of batteries!

Electrical shock or burn from high short-circuit current.

- Observe proper precautions.
- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions.
- Keep unauthorized personnel away from batteries.

2.2.3 Safety of laser light marker

The patient must be instructed not to look into the laser light marker. If necessary, the user must ensure that the patient's eyes are protected (for example, if the patient is not responsive or if the eyelid closing reflex is impaired).

The patient must not wear glasses or contact lenses.

CAUTION

Looking into laser beam with optical instruments!

Loss of sight possible.

- Do not look directly into the laser beam.

Laser product: do not view directly with optical instruments into the laser beam.

2.2.4 Safety of electronics used on patients

Electronic devices used on patients must be taken care of.

WARNING

Using a combination of different electronic devices on one patient!

The total leakage current may exceed safety limits.

- Do not use more electronic devices on the patient than absolutely necessary.

2.2.5 Hygiene standards

To minimize the risk of infection, all parts must be kept clean at all times.

CAUTION

Insufficient cleaning!

Risk of infection (bio hazard).

- Make sure that the table and the positioning aids are clean and covered with paper, if possible.

Blood and contrast medium are health risks. Take safety precautions when removing blood or residual contrast medium.

2.2.6 Patients with implants

Possible interference from the CT with implants must be clarified prior to examination.

CAUTION

Scanning patients with implanted devices such as pacemakers or neuro stimulators!

Interferences may cause malfunctions of the implanted device.

- Observe the patient closely during examination.

2.2.7 Patient monitoring

As long as the table or scanning unit is moving during scanning, the patient must always be visible and the intercom system must be switched on to hear the patient. Press the **Hear Patient** key to open the listening connection.



Special care is required if contrast medium is injected intravenously during an examination with table feed (for example, spiral scans).

CAUTION

Unintentional patient movement!

Injury of the patient.

- Always fix and observe the patient during measurement.

⚠ CAUTION

Unobserved moving of the patient table or gantry!

Risk of a collision of the patient with the gantry.

- Monitor the patient continuously as long as the table top and gantry are moving.
- Take special care with the tilt of the gantry other than 0 degree or a table height other than the isocenter for the patient.

⚠ CAUTION

Unobserved movement of the patient table or gantry when using accessories and other supports!

Collision of the patient with the gantry.

- Monitor the patient continuously during table movement and gantry movement.

  Take special care of the patient when tilting the gantry.

  Follow the marking on the accessories.

2.2.8 Tripping hazard

There is a risk of stumbling when accessories are connected via cables.

⚠ CAUTION

Tripping of user and other persons!

Injury of user, patient and other persons.

- Make sure that cables are installed in such a way that nobody can stumble over them.

2.2.9 Electrostatic discharge

Under normal conditions, the unit is resistant against electrostatic discharges. Refer to the System Owner Manual.

In extreme cases, faults cannot be ruled out. However, no dangerous operating states for the patient or the user will result from this.

2.3 Mechanical safety

The CT system must be operated in rooms that are designated for medical use. The room temperature and the humidity of the air must not exceed the values given in System Owner Manual.

Modifications or upgrades of the system must be made in compliance with all legal stipulations by the Siemens Service or other authorized personnel.

If damage or defects should occur to or on the system (patient table, gantry), on add-ons or accessories, safety of operation is no longer guaranteed. Watch out for such damage and have these parts repaired or replaced *immediately*.

2.3.1 Fire and explosion protection

In the event of a fire, you must know how to use fire extinguishers and where the escape routes are. We recommend using CO_2 fire extinguishers.

CO_2 fire extinguishers must be located in easily accessible and visible locations.

⚠ WARNING

Fire inside or in the vicinity of the system!

Injury of patient and personnel and damage to the property possible. Risk of gas poisoning caused by burning plastic.

- Switch off the acquisition system in the event of fire.
- Make sure that you and the patient know where the escape routes are.
- Make sure that you know where the fire extinguishers are located and familiarize yourself with the use of them.

The system and accessories are not suitable for operation or storage in areas with explosive gases. The same applies to the accessories.

2.3.2 System operating conditions

⚠ CAUTION

System is operated outside of the specified temperature range!

Wrong diagnosis possible (artifacts may occur).

- If the working conditions specified cannot be met, the room must be equipped with air-conditioning.

The system must be operated in rooms that are designated for medical use. The room temperature and the humidity of the air must not exceed the values given in System Owner Manual.

- Ventilation openings

  Blocked ventilation slots can cause damage to the equipment and loss of data (computer). Make sure that the ventilation openings on the equipment are *not* covered, for example, by cloths.

- Power connection

  The power supply must be provided to all products operated as part of an X-ray system through a fixed wiring connection and a multipole interrupting device provided by the customer. The equipment must be installed according to specification DIN VDE 0100, Part 710 or must meet the respective national regulations.

- Site on/off switch

  In compliance with the MDD (Medical Device Directive) an on/off switch must be installed on site by the customer.

  The on/off state must be visible.

- Radiation warning lamps

  Radiation warning lamps must be installed on all doors of the examination room. They must be visible from all areas where radiation can be released.

  A warning signal sounds when radiation is being generated.

2.3.3 Temperature monitoring of X-ray tube

The temperature of the X-ray tube assembly is permanently monitored and calculated in advance (this function is running in the background). If the temperature rises above the limit value, a warning is given.

If necessary, scanning is interrupted until the required cooling period has elapsed.



This means that you might have to wait a certain time before you can continue with the examination as planned.

2.3.4 System overheating

The possible causes of overheating are:

- Ambient temperature too high
- Ventilation openings covered
- Defective cooling system
- Dirty air filters

If certain parts of the equipment overheat, a warning is displayed on the monitor. In this case, finish the current measurement as quickly as possible.

For exchange of the air filters please refer to System Owner Manual.

2.3.5 Electromagnetic compatibility

The system complies with the EMC stipulations. Certain items of equipment, for example, radio telephones (“mobiles”) exceed the limit values of the EMC stipulations. In extreme cases, use of such items can cause interference.

Equipment such as monitors could be disturbed by magnetic fields (for example, MR unit). To some extent they can also interfere with ECG and EEG units.

Do not use a radio telephone or similar equipment in the vicinity of the system.

For more information, refer to the System Owner Manual.

2.3.6 Equipment modifications

Modifications or upgrades of the system must be made in compliance with all legal stipulations by the Siemens Service or other authorized personnel.

CAUTION

Impermissible or faulty manipulations or changes of the hardware or software can cause the system to malfunction!

Injury of the patient or damage to the equipment, or both.

- Do not open or remove the cover of the equipment nor install third-party software.

CAUTION

Impermissible or faulty manipulations, or changes of the software or hardware, or connection of the system to a network!

Unauthorized access; damage to the equipment.

- Make sure that all necessary precautions with respect to the existing level of security are considered when adding a functionality or altering the shipped configuration.
- You are not permitted to open or remove the housing of the equipment or to install third-party software.

As the manufacturer, assembler, installer or importer of the system, Siemens does not accept liability for the safety functions, reliability or performance of the system, if one of the following circumstances applies:

- Installation, upgrade, readjustment, modification, repair or upgrading by persons not authorized to do so by Siemens.
- Components not properly replaced by the original parts from Siemens.
- Electrical installation in the CT room that does not comply with the requirements of VDE standard 0107 or other binding codes of practice.
- Operation of the system in a way which deviates from the instructions given in the user documentation.

We therefore recommend that you obtain a certificate of conformity containing the following information:

- Type, extent and date of the work performed on the system
- Names of all those involved in the work (and their companies)
- Their signatures

Please note that this does *not* imply that the repairs are authorized. Siemens does *not* accept liability for repairs that are carried out without our written permission.

If you are planning to install equipment of other manufacturers, you must obtain information about potential dangers in connecting or using systems or equipment of other manufacturers. This information can be drawn from the system specification.

If this information is not sufficient, you must consult the manufacturer of such systems/equipment or a specialist about the following topics:

- Reliability and performance of the systems/equipment
- Potential safety risks for people and equipment

If you connect additional equipment, you have to ensure that the configuration complies with standards and statutory regulations. For more information, refer to *System Owner Manual - Standards and statutory regulations*.

- For more information, refer to System Owner Manual.
- Please contact your Siemens representative for more information.
- You can expand a SOMATOM standard system individually and adjust it to your clinical requirements. Please refer to the listing in your purchase contract for information about the expansion levels of your system.

2.3.7 Monitor failure

If no image is displayed on the monitor when the system is switched on, the monitor is likely to be defective. Call Siemens Customer Service.

CAUTION

Monitor failure!

Uncontrolled system.

- Do not make any more entries via the keyboard.
- Interrupt the examination.
- If necessary, press a **STOP** key or, in case of an emergency, an **EMERGENCY OFF** button.

2.3.8 Infusion tube tension

The infusion lines must not be under tensile stress. Make sure that the infusion lines are long enough and cannot become caught or crushed by table movements.

CAUTION

Use of short infusion tubes!

Tensile stress on the infusion tubes when moving the table top. Tubes can get caught.

- Only use infusion tubes that are long enough.

2.4 Radiation safety

For your own and the patient's protection, you must adhere to the radiation protection regulations.

CAUTION

Radiation in the examination room after the **Start** key has been pressed!

Undesired radiation exposure.

- Leave the examination room before initiating scanning or for interventional CT examination, wear protective clothing.

Special equipment is part of the radiation protection regulations.

- Radiation control area (→ Page 48 *Radiation control area*)
- Radiation warning lamps (→ Page 48 *Radiation warning lamps*)
- Radiation shielding (→ Page 49 *Radiation shielding*)

For the dose distribution information, please refer to System Owner Manual.

2.4.1 Radiation control area

The console is located outside the radiation control area. The patient can be observed through a lead glass window. The gantry and the patient table can be operated by remote control.

When scanning, operate the system from the console whenever possible.

2.4.2 Radiation warning lamps

The radiation warning lamps on the gantry operator panels, on the control box as well as site radiation warning lamps to be provided by the customer must light up if scanning has been triggered.



If a radiation warning lamp does not light up once a scan has been released, please contact Siemens Service.

The color of the illuminated indicator indicates the operating state of the system:

- *Blinking Green:* ready for scanning



- *Yellow:* radiation warning



A warning signal sounds when radiation is being generated.

2.4.3 Radiation shielding

If scans have to be released from inside the control area or if accompanying personnel have to remain there, safety measures have to be taken (lead aprons, protective walls, and so on).

Anyone who has to be near the patient during scanning must observe the following precautions:

- Wear protective clothing (lead apron, and so on).
- Wear a PEN dosimeter and/or film badge.
- Stay in the zone shielded by the system, i.e., to the side of the gantry or behind a mobile protective wall.

2.4.4 Radiation protection for patients

The physician is responsible for protecting the patient from unnecessary radiation.

- Always use a gonadal shield, if possible.
- Scan pregnant and breast feeding women cautiously, perform it under the direction of doctors of necessary.
- Avoid repeated scan for babies and children, use child protocols and apply necessary protection.
- Use *CARE* features.

You can avoid repeating a measurement and so reduce the radiation load on the patient by taking certain precautions.

- Inform the patient sufficiently. The patient must move as little as possible during scanning and follow the breathing instructions (to avoid motion artifacts).
- Ask the patient to remove all jewelry, hair clips, and so on (to avoid metal artifacts).
- Make sure that the system is clean. Residual contrast medium can cause artifacts.
- Observe the calibration and maintenance instructions in the user documentation.

2.4.5 Deterministic radiation effects

Certain modes of operation allow selections of scan parameters that may lead to a peripheral CTDI100 of more than 1 Gy. This dose may exceed the threshold for deterministic radiation effects on the patient's skin or eye lenses. For general dose information on the CT system, refer to the System Owner Manual.

2.4.6 Radiation in CT intervention

CARE Vision CT uses scan parameters and operating conditions which are unique and may require additional care and radiation protection measures. In any case the scan time should be kept as short as possible to avoid unnecessary exposure. Users should wear protective clothing to reduce exposure.

- Radiation exposure to patients

  CARE Vision CT applies continuous exposure at moderate mA levels. Due to the potentially long scan times and the limited scan volume, the dose for certain slices may increase to levels significantly higher than those known from standard CT applications. The patient's exposure level is usually estimated by CTDIvol which is designed to give the average dose in the scanned volume.

  Before starting the scan, the dose rate (CTDIvol in mGy per second) is displayed on the monitor. During the CARE Vision CT scan, the accumulated dose (CTDIvol) reflecting the patient exposure is displayed on the monitor. The display scale ranges from zero to 3000mGy. If the table is shifted during the exam, the accumulated dose will be distributed to different slices and will be lower than indicated by the display. When a new scan is loaded, the dose display again starts from zero.

- Radiation exposure to personnel

  During the procedure the physician is in the scan room and close to the exposed scan plane. Special care should be taken to avoid excessive and unnecessary radiation exposure.

- Protection against primary x-ray exposure

  Direct exposure to the x-ray beam should be avoided. Any body parts in the scan plane may, in the worst case, receive approximately the accumulated dose as shown on the CTDI display.

- Protection against stray radiation

  The x-ray beam is limited to the imaged scan volume, but a significant portion of the x-rays is scattered and distributed in the scan room (stray radiation). The measured dose distribution in the scan room is shown on diagrams. See System Owner Manual.

2.5 Software related safety

The SOMATOM CT scanner is equipped with the Siemens multi-modality software *syngo*® based on the operating system Windows 7®.

Please note that your system is delivered with currently known precautions regarding data security. Data is stored in a predefined directory by default. Data access is possible via **File Browser** only. For security reasons, the operating system is not accessible anymore.

2.5.1 Software operating system

The SOMATOM CT scanner is equipped with the Siemens multi-modality software *syngo*® based on the operating system Windows 7®.

⚠ CAUTION

Unauthorized access to the operating system!

Software manipulation

- Users are not authorized to work on operating system level. Any software manipulation is forbidden.

⚠ CAUTION

Native Windows configuration dialog box does not disappear while radiation is started. The dialog box remains visible, as it is a dialog box displayed by "Windows" and not a *syngo* dialog box!

This may cause confusion.

- Avoid opening this dialog box while radiation can be applied. The computer and the *syngo* system should never be configured during an acquisition.

CAUTION

The operating system may not support all characters for the received document!

The display of the name, for example, the patient name may be incomplete or misleading.

- *syngo* will not change the used characters, for example, minority characters, even if it cannot display them.
- Use other attributes for identification, if possible.

2.5.2 Virus prevention and protection

While Siemens takes measures to prevent computer viruses from being transmitted via Internet/Intranet, we cannot guarantee that hacker attacks or attachments do not contain computer virus code. Siemens customers are therefore advised to sign a service level agreement (SLA) or maintenance contract, which includes remote access and SW security updates both for virus pattern and operating system updates. Please contact your local Siemens Customer Services department.

CAUTION

System infected by computer virus!

Manipulation of the software.

- *Never* use a data medium that could contain a computer virus, for example game CD.
- Check disks for viruses *before* using them.

Depending on your modality and site installation, a virus scanner is installed and enabled at your system. A license is needed. To add virus protection to your system, ask your sales representative for the virus protection service. This service provides a virus scanner and update mechanism for scan engines and virus patterns and thus keeps your virus protection up to date.

- Virus prevention

  As a user of a networked PC, you should be aware of a possible infection with computer viruses or other malicious software. The focus lies on prevention of such an infection:

  – All precautions have been taken to ensure data security and to prevent access to your *syngo* system with malicious intent.

  – Data traffic through all unnecessary ports or "doors" is blocked. Data exchange is restricted to defined paths only.

- Virus protection

  Be sure to obtain the latest virus patterns (signature files) for your program when they are available, because new viruses are created every day. For additional protection, you should ensure the following:

  – Use technical network defenses.

  – Prepare policies, procedures, and user training.

  – Restrict physical access whenever possible.

  – Reduce logical interconnections to the minimum.

  – Establish secure remote access for servicing.

  – Keep close contact with the vendor.

  – Implement the Defense in Depth philosophy.

  For more information on viruses, consult the documentation of your virus detection software.

- Suitable network topology

  A good and secure network architecture is able to reject most attacks from virus, worms, and so on. The network architects and IT administrators of a hospital shall use a suitable topology with the best protection of the medical devices connected.

  – Medical devices shall always be connected within sub-networks, separated from the rest of the office equipment by a firewall PC.

  – Mail programs that may receive virus-infected attachments or browser software with connection to the Internet are a potential risk for all systems connected to the same subnet. We recommend to prohibit this type of data transfer into the subnets of medical devices.

2.5.3 Software licenses

Each time you start up the system the software checks whether it is correctly installed. Check if the operating system starts up without displaying a license error message.

Some of your scan protocols or software application modules are protected by licenses. A central license manager handles the software licensing. If the license of an application expires, a warning message appears when the application starts. It remains on top until you click **OK**. Read the message carefully. It provides information about the license expiration period. The warning message contains a **Don't show me** check box. You may select the check box to prevent the warning message coming up again. Contact your system administrator or Siemens service.

When a scan protocol you stored is loaded into Chronicle with a missing license, the protocol parameters may be adapted, or you are informed. You are also informed about the consequences for scanning and reconstruction.

- What happens if a license expires?

  If, for example, the license for the use of archive drives expires, a message box will remind you.

  - The corresponding archive and export menu commands and icons will not be available.
  - The list entries in the **Export to**, **Format** and **Eject from** dialog boxes are not available.
  - Media inserted in the corresponding device will not be mounted and not be visible for browsing. As a consequence, data import is not possible.

- 3D licenses

  The 3D package contains the licenses for several 3D functions. If one or more of these functions are not licensed or if the licenses have expired, icons and menu commands of these functions will not be available.

  If the license of the 3D package is not available at all, the **3D** task card shows the text: **No license exists for 3D**.

- Security license

  The management consoles of the security system are not accessible as long as the security license is not installed. You can only activate the security system in the **Service** software after the security license has been installed. With the license, the management consoles are accessible, regardless of whether the security system is switched on or off.

This documentation describes all software options, even though they may not necessarily be installed on your system. Contact your local sales representative if you wish to acquire an option.

2.5.4 Proper use of *syngo*

syngo is suitable for displaying and processing medical images of patients for diagnostic purposes using medical imaging systems. The manufacturer does not accept liability with regard to safety functions, reliability, or performance of the system in case of improper use.

CAUTION

Using *syngo* directly on a public or private network may lead to insufficient system performance!

Possible degradation of system performance or unexpected system behavior.

- Only use *syngo* in a secure and load-adapted network.

This medical software package is for authorized use only, and it is for use only by personnel with the necessary specialist knowledge, for example, physicians or technologists.

2.5.5 *syngo* Security Package

Based on diagnostic images and medical reports, decisions have to be made that affect the health of patients. Therefore, it is necessary to protect such sensitive documents from unauthorized access and to record all actions on the data.

- Security Package

  When the *syngo* Security Package is switched on, access to the *syngo* software package is protected by user identification and password. The system administrator sets a unique password for each user. Depending on the security policy in your hospital, the users may be allowed to change their password.

  Access to functions as well as to data is only permitted to authenticated and authorized users. Each user is identifiable at all times. The workstation only allows authorized users. Once you log onto the workstation, your user profile determines which applications and patient data you can access.

  If you are logged onto the workstation and try to access a restricted task card or patient data, you will receive an error message indicating that you do not have access to that patient or application. Though you may be able to view all of the task cards available across your institution, you may not have the permissions to work with all of them.

- Audit trail

  When the *syngo* Security Package is switched on, the activities of all users are recorded in an audit trail – including the identity of each user. The audit trail can only be seen by authorized users. Your system administrator is responsible for archiving the audit trail on a regular basis.

By activating the *syngo* security system, the customer service technician turns your system into a system with high data protection level. To secure your system, you will have to instruct a service technician as to which security options you want to be enabled.

⚠ CAUTION

After activating the security system, access is limited to only the defined users!

Limited access to the system.

- Make sure you have read and completed all preparatory steps.
- Back up your complete system as done after installation before activating the security system.

⚠ CAUTION

Behavior of secured systems. The hospital's security policy affects the behavior of the *syngo* system. For example, password strength requirements, enabled empty passwords, or locking of an account after a specific number of failed logins!

Inaccessible system or data.

- Establish a user model for your hospital and verify it before the security system is activated.
- Establish a proper procedure for emergency access.
- Note that if you enable an empty password for the emergency account, this is enabled for all other users as well. Nevertheless, instruct the users to use strong passwords.
- Always back up your system before enabling the security system and before any major changes.
- Inform all users about any changes and settings. The user shall contact administrators immediately in case of problems.

⚠ CAUTION

User access may be prevented due to forgotten or unknown accounts or passwords, or wrong setup, for example, in case of an emergency!

Inaccessible system

- Do not forget to define a general user account for emergency access and assign it to a group and a role both called **Emergency Access**.
- Regardless as to whether you specify a password for the emergency account or not, users shall be prohibited from changing any passwords (especially for the emergency account).
- The users shall contact you immediately in case of problems.

CAUTION

Protection of data is changed!

The access to the data is no longer possible.

- If not enough permissions for data access are available, the person responsible for user management in hospital should add users to the groups until access is possible.

CAUTION

The system blocks when the audit trail is filled due to too many records, or too much drive space covered!

In this case, it is not possible to work with the system. Emergency access is also not possible.

- To prevent system blockage, you must archive the log files and remove them from the audit trail on a regular basis.
- When the audit trail blocks, user with the **SecuritySystem** > **BypassBlockedSystem** and the **AuditTrail** > **Archive** privileges can login to the system and delete or archive the log files.

2.5.6 Safety on Expert-i

Expert-i is a technology that allows you to sit at a computer (the client computer) and connect to the remote *syngo* workstations. Expert-i works on the local area network (LAN) in your hospital. For exmaple, you can connect to a *syngo* workstation from another image reading room and have access to the exam data, as though you were in front the *syngo* workstation.

CAUTION

The display quality at the remote assistance workplace cannot be guaranteed!

Wrong basis for diagnosis.

- If the remote assistance workplace shall be used for diagnostic purposes, ensure that all necessary regulatory and legal requirements for the monitor are fulfilled.

CAUTION

Misuse of data handling!

Failure in diagnosis

- Ensure that only a trained user gets remote access to the system.

CAUTION

Remote and uncontrolled patient movement!

Possible injury of the patient by moving parts.

- Do not leave the *syngo* Acquisition Workplace unattended if full access is enabled. Local user still has full responsibility for appropriate usage of system.

CAUTION

Misuse of data handling!

Wrong diagnosis

- Ensure that only a trained user gets remote access to the *syngo* CT Workplace.

Only use remote access in high performance networks with powerful computers to avoid insufficient display quality.

2.6 Veterinary usage

The SOMATOM CT system can be used for both animal and human patients. Besides those restrictions implied by technical specifications of the SOMATOM CT system (for example, aperture of the gantry), there are no additional restrictions when using the system for animal patients.

United States Federal law restricts this device to sale by or on the order of a physician or veterinarian (21 CFR 801.109(b)(1)).

CAUTION

Body fluid (blood, urine etc.) comes into contact with electrical components!

Possibility of electrical shock.

- Always make sure that the animal cannot lose uncontrolled body fluid during scanning, for example by using catheters or diapers.

CAUTION

Using an animal protocol for scanning a human!

Injury of the human or radiation damage.

- The scan protocols must be uniquely assigned as animal protocols.
- Do not use animal protocols for humans.

Veterinary use shall not cover laboratory or other primary scientific animal use.

2.6.1 Immobilizing animal patients

Veterinary use of the SOMATOM CT system requires that you sedate or anesthetize the animal patient before scanning. This is done to prevent injury of the animal patient or attending personnel, damage to the equipment, or misdiagnosis due to movement of the animal patient during scanning.

CAUTION

The animal is not immobilized!

Contusion, fractures of the operator, personnel or attendant. Damage to the equipment.

- Always anesthetize or sedate the animal before scanning.
- Keep the number of persons in the examination room as low as possible.

CAUTION

The animal is not immobilized!

Wrong diagnosis due to wrong image information.

- Always anesthetize or sedate the animal before scanning.

2.6.2 Observing animal patients

If the effect of the sedation or anesthetization weakens during scanning, uncontrolled movements of the animal patient could also result in injury or misdiagnosis. Therefore the animal patient needs to be observed at all times.

2.6.3 Sanitization for veterinary usage

Veterinary use of the SOMATOM CT system requires that you sufficiently clean the table and positioning aids. In case of mixed operation for both animal and human patients, the cleaning media used should also be approved for humans. The cleaning agents and disinfectants are described in System Owner Manual.

CAUTION

Using of cleaning media not approved for humans!

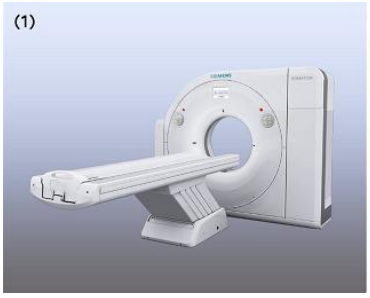
Allergic reaction or allergic shock.

- Always use cleaning media also approved for humans.

2 Safety advice

3 System description and operation

Your system consists of the following components:

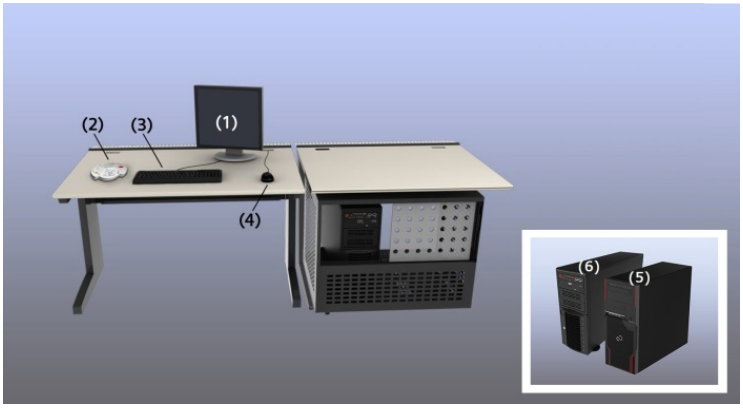




(1) Acquisition system: gantry and patient table

(2) Console

The console is your main workstation. Here you enter all characteristic values and patient data, perform examinations and view the tomographic images on the screen.



CT console

(1) Monitor

(2) Control box

(3) Keyboard

(4) Mouse

(5) Image control system (ICS)

(6) Image reconstruction system (IRS)

With the operating elements of the console, you switch the system on and off, enter patient data, plan the examination and trigger measurement. You acquire the CT data and use them to reconstruct the CT images, which you then evaluate. You can use keyboard, mouse and control box to inform the computer what actions to perform.

- The computer components of your system have already been installed and optimally configured by Siemens Service. However, if faults do occur, contact your Siemens Service.
- The pictures of the components shown here are only examples. The appearance of your components depends on the system configuration.

3.1 System on/off

The acquisition system and the console are switched on and off separately.

- The acquisition system is switched on using the power switch at the line connection box (LCB).
- The console is started up when you switch on the UPS.

You can either start the computer only (e.g., for evaluation and management), or the entire system (computer and the acquisition system). Before you can perform examinations, you must switch on both components. You can either shut down the acquisition system only, or the entire system (computer and the acquisition system).

CAUTION

Switch user, shut down, logoff or restart without saving data!

Possible loss of unsaved changes.

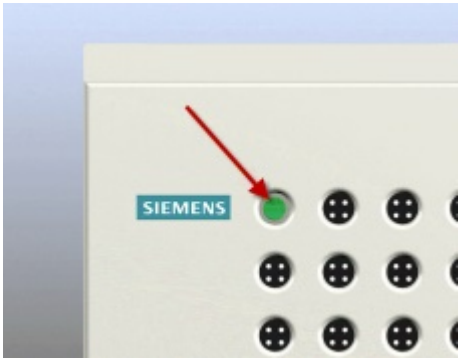
- Save data before switching user, shutting down, or restarting the system.

When you start a newly supplied system for the first time or after new software has been installed, you are asked once for the license number of the software. Enter your license number and confirm your entry. The license number is checked and stored in the system if it is correct. The software starts up.

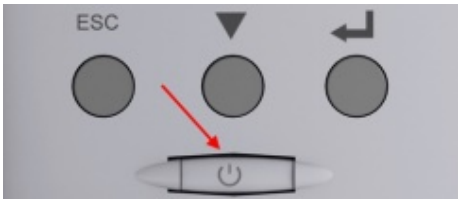
3.1.1 Switching on the system

syngo-based modalities and workstations are used together with other components within a system. To ensure a smooth data flow to and from these components, it is essential that all other components in the system also function correctly.

1 Switch on the power switch at the LCB for gantry and patient table.



2 Switch on the UPS.



The computer starts automatically when the UPS is switched on. Do not switch on the computer directly. Booting runs in the following phases:

- Start-up of the operating system

  When you switch on the system, the Windows operating system is started. If the security package is not active you are automatically logged on as a *syngo* user.

- Start-up of *syngo*

  After the operating system has started, *syngo* is started automatically.



  Check if *syngo* starts up without displaying an error message. After a short time, the entire system is ready for operation.

- The checkup procedure is started in the **Checkup** dialog box which will be displayed after system startup. It is recommended to perform the checkup or calibration once a day to assure best system performance.
- If you only wish to switch off the system for a few moments or have switched it off accidentally, do not switch it on again immediately. Wait for approximate 1 minute before switching the system on again.

A license error occurs and an error message is displayed.

You cannot use the system due to an incorrect license number.

◆ Call Siemens Service.

3.1.2 Switching on *syngo* workstations

For the purpose of viewing and evaluating images only, you can turn on a *syngo* Workplace computer individually.

1 Switch on all peripheral devices, such as drives and printers, before switching on a *syngo* Workplace computer.

2 Press the power button at the UPS for the computer.

The computer starts automatically when the UPS is switched on. Do not switch on the computer directly.

The computer carries out a power-on self-test. Once the self-test has been completed, the medical software package is starting. During this, the *syngo* splash screen is shown.

3.1.3 Switching off the system

CAUTION

Switching off the computer in Standby mode or without shutting down!

Possible loss of data, data corruption or system damage.

- Shut down the computer before switching off.

The system shuts down in three stages:

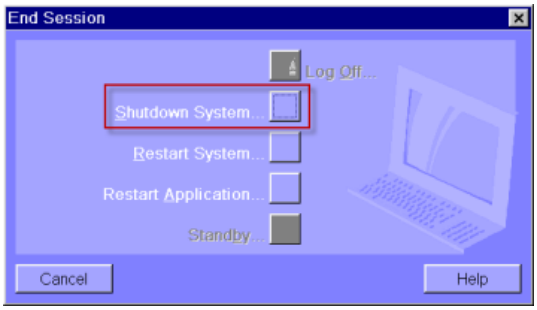
- Termination of *syngo*
- Shutdown of the operating system
- Shutdown of the scan system

✓ The gantry and the *syngo* Workplace are running.

1 Exit all examinations and applications.

2 Call up **System** > **End** in the main menu.

The **End Session** dialog box is displayed.

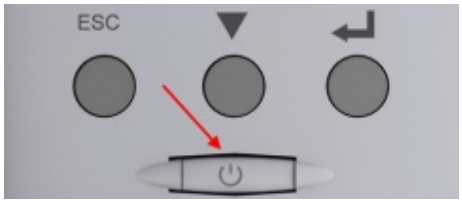


3 Click on **Shutdown System**. Confirm with **Yes** in the dialog box displayed.

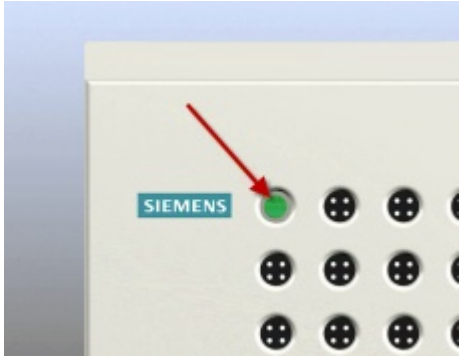
A dialog box is displayed if applications are still active. A similar dialog is displayed when a patient examination is still running. Click on **Yes**.

All applications will be closed. The system will continue to shut down. If no errors occur during shutdown, the computer will be switched off.

4 Press the **On/Off** button at the UPS for at least 3 seconds to switch off the UPS.



5 Switch off the gantry power switch at the LCB.



The gantry will be switched off.

- Unless absolutely necessary, do not switch off the system at the main switch provided by the customer or the **EMERGENCY OFF** switch. Otherwise you will have to calibrate the system several times when you restart it.
- If the entire system is running and you do not need the gantry any longer, you have the possibility to shut down the gantry only. The rest of the system will remain in operating state.

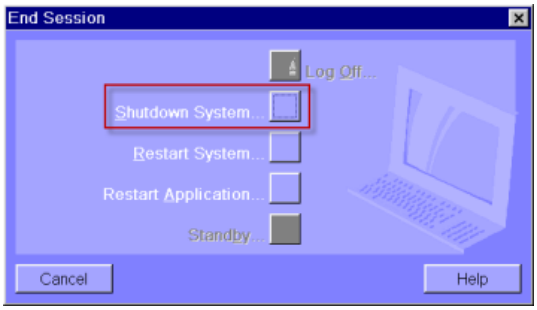
3.1.4 Shutting down *syngo* workstations

✓ Only the *syngo* Workplace is switched on.

1 Exit all examinations and applications.

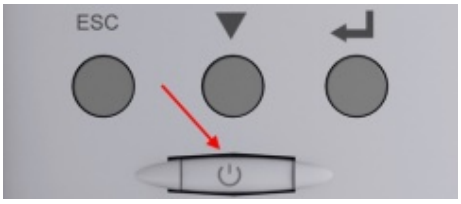
2 Call up **System** > **End** in the main menu.

The **End Session** dialog box is displayed.



3 Click on **Shutdown System**. Confirm with **Yes** in the dialog box displayed.

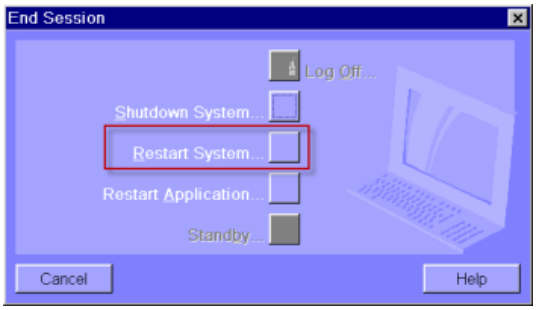
4 Press the **On/Off** button at the UPS for at least 3 seconds to switch off the UPS.



3.1.5 Restarting the system

If you want to restart the system, use the second option in the **End Session** dialog box.

1 Click on **Restart System** in the **End Session** dialog box.



2 Confirm with **Yes** in the dialog box displayed.

The system is restarted.

To assure best system performance it is recommended to reboot the system once a day.

3.1.6 Restarting after emergency stop

In case the system has been switched off by pressing the emergency key in the examination room (for example, by accident), a controlled restart has to be done.

✓ All causes of danger have been found and remedied.

1 Wait for approximately 1 minute after power switch off.

2 Release the **EMERGENCY OFF** key provided by the customer.

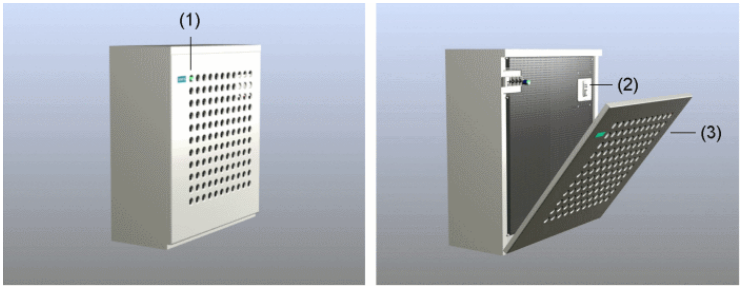
3 Switch the system on again.

4 Perform the usual checkup procedure to calibrate the system.

Country-specific regulations must be observed.

3.1.7 Line connection box

The line connection box (LCB) powers the gantry and the patient table. It is used for connection to the building power supply and for protection.



(1) Power On/Off switch for gantry and table

(2) Main power On/Off switch

(3) Front cover

To disconnect the entire system from the building power supply, open the front cover of the LCB and turn the main power On/Off switch to Off position.

3.1.8 Uninterruptible power supply

The Uninterruptible Power Supply (UPS) compensates for voltage fluctuations and provides backup power during power failures for a short time for the computer system.



On the rear of the UPS, you will find the output power connections for the monitor, the ICS computer, and the IRS computer as well as the input power connector.

WARNING

Wrong handling of batteries!

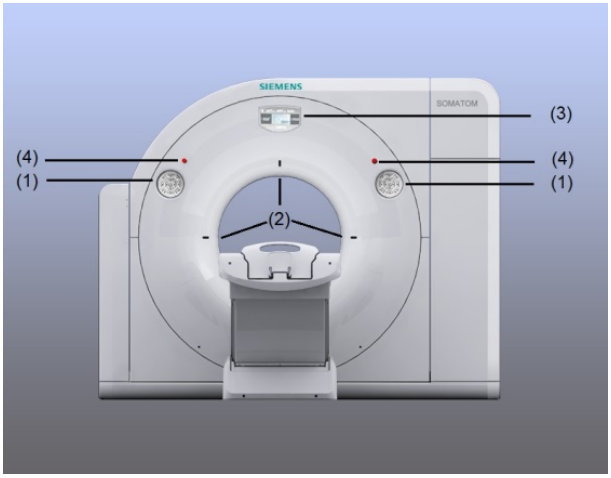
Electrical shock or burn from high short-circuit current.

- Observe proper precautions.
- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions.
- Keep unauthorized personnel away from batteries.

The pictures of the components shown here are only examples. The appearance of your components depends on the system configuration.

3.2 Gantry

You will find the following operating elements and displays on the gantry:



(1) Gantry operator panels

(2) Laser light markers

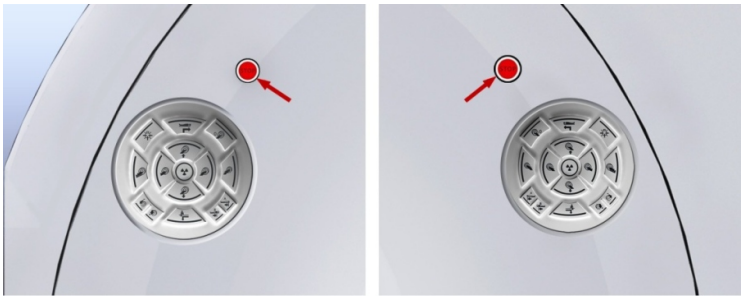
(3) Display panel or touch panel

(4) STOP keys

The pictures of the components shown here are only examples. The appearance of your components depends on the system configuration.

3.2.1 Gantry STOP keys

With the **STOP** keys, you can interrupt unit movements in an emergency (table movements and gantry tilting) and switch off radiation.



STOP keys on gantry front cover

In critical situations press one of the **STOP** keys. If you press one of the red **STOP** keys, unit movements are interrupted and radiation is stopped. The functions of the keys for system movements are blocked as well.

3.2.2 Laser light markers

The light markers are laser beams that emanate from three points in the gantry opening. These points are marked. The laser beams fan out so that you see lines as a mark or a cross at the intersection of the beams.

⚠ CAUTION

Lightmarker not positioned correctly!

X-ray not, or only partially, usable.

- Perform the lightmarker test regularly as part of the monthly constancy test.

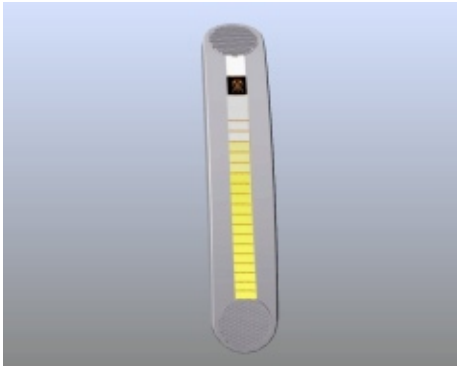
The laser beams visualize the gantry isocenter and the radiation exposure plane. To turn on the light marker, press the light marker key on the gantry operator panel.



After approximate 1 minute, the laser light marker is switched off automatically. If you want to switch off the light marker immediately, press the light marker key again.

3.2.3 Gantry intercom and respiration display

The gantry is equipped with a communication device which consists of an intercome system (a speaker and a microphone) and a respiratory display. It is located on the inner back of the gantry.



- Intercom system

  With the speaker and microphones, you can talk with the patient. You can operate the intercom with the keys on the control box.

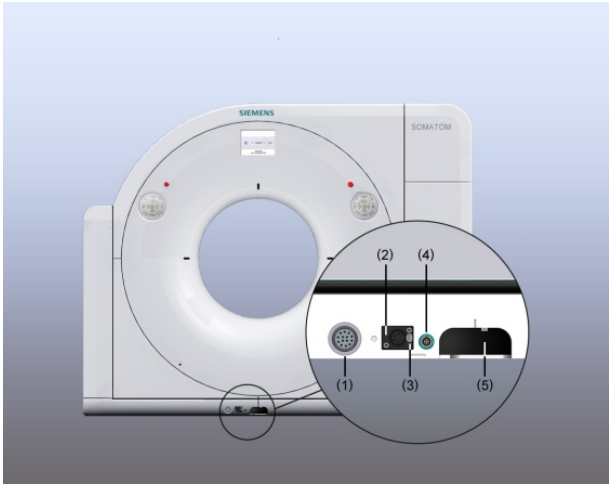
- Respiration display

  The respiration display indicates to the patient how long he/she has to hold his/her breath during a scan.

  A yellow light bar lights up to signal the start of the breath-hold period. The period ends with the extinction of the last light of this bar.

3.2.4 Gantry connectors

The front of the gantry provides connectors for the i-Control, the scanning footswitch, and the respiratory gating system. It also provides a hole for cables, including the bolus injector cable.



(1) i-Control connector

(2) Scanning footswitch connector

(3) Push button for plug release

(4) Respiratory gating connector

(5) Hole for cables, including bolus injector cable

- The pictures of the components shown here are only examples
- Availability of the connectors depends on your system configuration.
- Only connect equipment released by Siemens.
- The connectors may be blocked by the table footswitch if it is available for your system. In such a case, if you want to plug or unplug cables, first lift the cover of the table footswitch.

3.2.5 Gantry storage compartment

Do not put chemicals, liquids, heavy objects in the storage compartment on right side of the gantry.

CAUTION

Chemicals, liquids, heavy objects in the storage compartment!

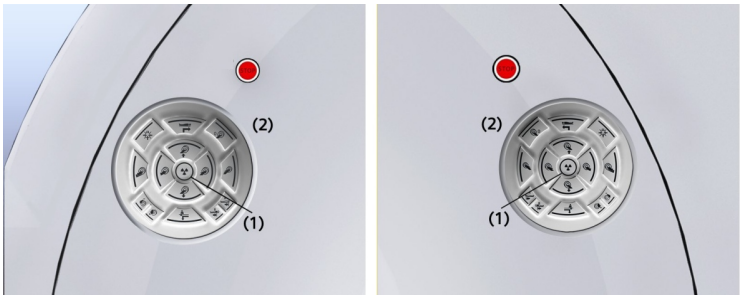
Risk of injury.

- Do not put chemicals, liquids, heavy objects in the storage compartment.

3.2.6 Gantry operator panel

With the gantry operator panels, you control the movement of the gantry and patient table.

Operating elements of the gantry are located on the right hand and left hand sides of the gantry on the front.

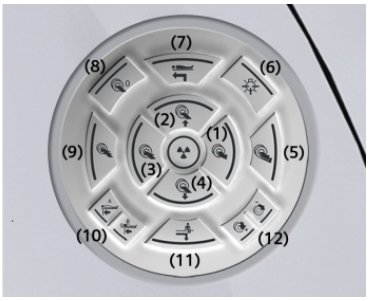


(1) Radiation warning lamp

(2) Operating elements

The operating elements on the left and right gantry panel are shown as below.





(1) Table out
(2) Table up
(3) Table in
(4) Table down
(5) Table out fast
(6) Laser light marker
(7) Offset
(8) Zeroing
(9) Table in fast
(10) Predefined table position
(11) Table retraction
(12) Tilt

Keys at gantry operator panel

The keys are backlit to inform about the current operation.

- Illuminated keys: possible operation/ready for operation
- Blinking keys: table is removed manually. To stop blinking, you must lock the table top back into its original position.

The following table lists the keys at the gantry operator panel:

Keys	Name	Function
	Offset	Loads a patient. With this key, you move the table top up to the minimum height of the gantry opening and then into the gantry. The key is active as long as it is pressed. This key may be used for patient positioning. This key can be used in combination with a scan position that is saved on the gantry touch panel. Press and hold this key to raise the table to a saved height and then into the gantry to stop at a saved horizontal position.
	Table retraction	Unloads a patient. With this key, you move the table top out of the gantry opening and lower it. The patient can then leave the table. The key is active as long as it is pressed. The gantry is automatically set vertical first, if the gantry tilt differs from 0°.
	Laser light marker	Switches on/off the laser light marker. The laser light marker indicates the position of the scan center and the slice plane in the middle of the detector rows.
	Predefined table position	Moves patient table to two predefined positions. With the keys **A** and **B**, you can move the table to two predefined positions. These positions can be preset.
	Tilt	Tilts the gantry. With the two keys, you can tilt the gantry from the vertical position (0°).

Keys	Name	Function
	Zeroing	Sets the table position to zero. With this key, you can set the display for the horizontal table top position to zero. Zeroing is only possible between patient registration and the beginning of the first scan.
	Table in/out fast	Moves patient table horizontally in/out fast. With these two keys, you can move the table into and out of the gantry twice as fast as the normal speed.
	Table movements	Moves the table vertically up and down; moves the table horizontally in and out. With the four table adjustment keys, you can adjust the table height and move the table into and out of the gantry.
	X-ray	The circle around the key turns green when the system is ready for X-ray exposure and turns yellow when the exposure starts.

- Press one key for motion control only at a time.
- The operating elements illustrated are from right gantry panel. You can use the operating elements on the left gantry panel as well.

Radiation warning lamp on gantry

The operating status of the system is indicated by the radiation warning lamps on the gantry front.

The radiation warning lamps on the gantry light up and a warning signal sounds when radiation is being generated.

The color of the illuminated indicator indicates the operating state of the system:

- *Blinking Green:* ready for scanning



- *Yellow:* radiation warning

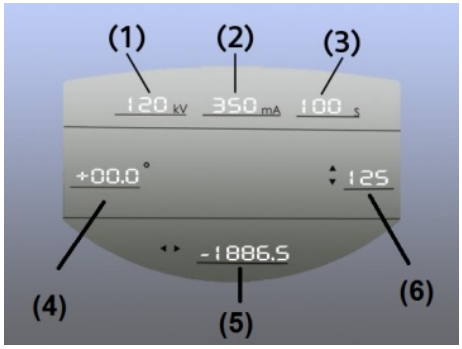


3.2.7 Gantry display panel

The gantry display panel is located at the front of the gantry. Depending on your system configuration, the display panel may or may not have the touch function.

Gantry LCD display panel

You can observe the operation of the system on the gantry LCD display panel. The display indicates the vertical and horizontal position of the table and the angle of inclination of the gantry as well as the radiation data.



(1) Tube voltage (kV)

(2) Tube current (mA)

(3) Scan time (topograms or sequences) / Rotation time (spirals)

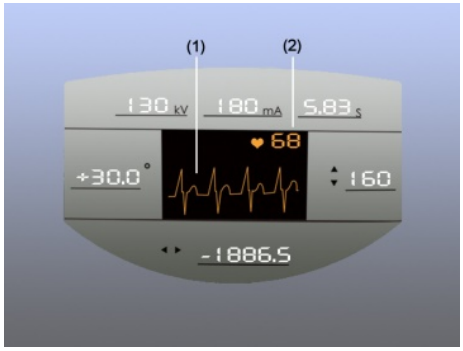
(4) Gantry tilt

(5) Horizontal table position

(6) Table height

The value of table height is measured relative to the scan field axis of the gantry. The value of the horizontal table position is displayed with reference to a zero position, which is generally an anatomical marking. Movement towards the gantry is displayed as a negative value and movement out of the gantry opening is displayed as a positive value.

The ECG monitor is integrated in the gantry display.



(1) ECG signal

(2) Heart rate

Gantry TFT display panel

The gantry display is located at the front of the gantry. With this display you can observe your system operation. The displays indicate the vertical and horizontal position of the table and the angle of inclination of the gantry as well as the radiation data.



(1) Tube voltage (kV)

(2) Tube current (mA)

(3) Scan time (topograms or sequences) / Rotation time (spirals)

(4) Table height

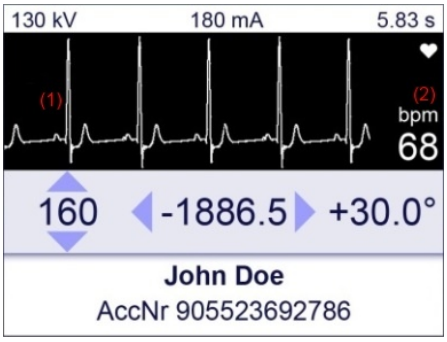
(5) Horizontal table position

(6) Gantry tilt

(7) Patient information

The value of table height is measured relative to the scan field axis of the gantry. The value of the horizontal table position is displayed with reference to a zero position, which is generally an anatomical marking. Movement towards the gantry is displayed as a negative value and movement out of the gantry opening is displayed as a positive value.

The ECG monitor is integrated in the gantry display.



(1) ECG signal

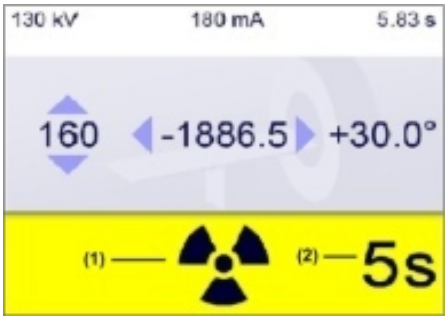
(2) Heart rate

If scan delay countdown starts, it is displayed instead of the patient information.



(1) Scan delay countdown

The radiation warning signal lights up in the gantry display after scanning has been triggered.



(1) Radiation warning

(2) Scan time countdown

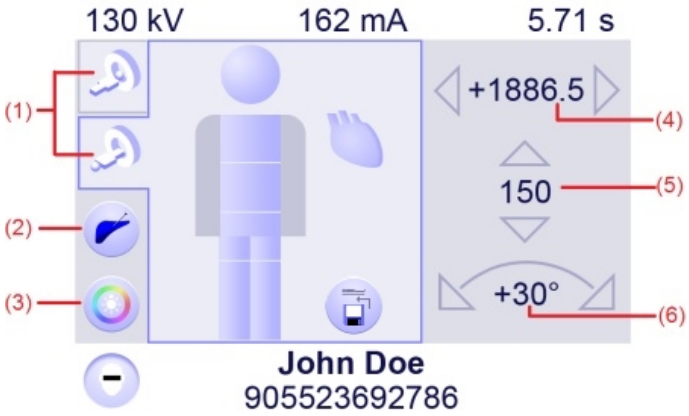
- The display of patient information can be set up in Examination Configuration.
- The patient information can be displayed in English, German, French or Spanish. Unsupported characters or symbols are displayed as spaces.

Gantry touch panel

The gantry touch panel is located at the front of the gantry. The panel shows exam data, such as patient information, scan information, patient table positions, and gantry tilt.

Operate the touch panel by tapping its screen.

- During patient positioning, you can move the patient table to a defined scan position of a body part for head first or feet first.
- During CT intervention, you can use the table footswitch to move the table top horizontally and to stop the table top at a defined position.
- You can show or hide patient information on the gantry touch panel.
- You can configure Illumination Moodlight.



(1) **Head/Feet first** icons

(2) **Intervention** icon

(3) **Illumination** icon

(4) Horizontal table position (mm)

(5) Table height (mm)

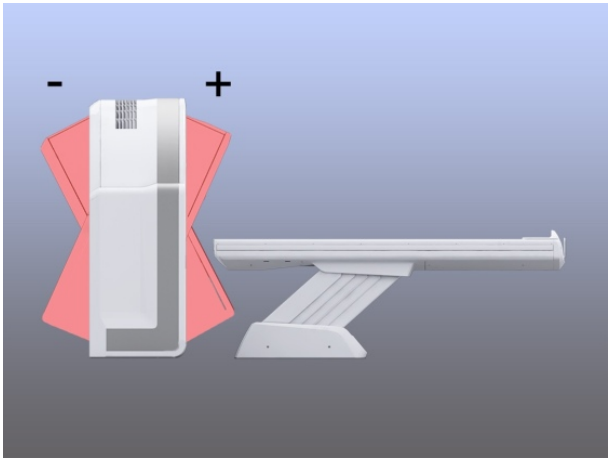
(6) Gantry tilt

Elements	Description
Horizontal table position	The value of horizontal table position is displayed with reference to a reference zero position, which is generally an anatomical marking. Movement towards the gantry is displayed as a negative value and movement out of the gantry as a positive value.
Table height	The value of table height is measured relative to the scan field axis of the gantry.
Gantry tilt	Angle of inclination of the gantry.

The panel also shows eSleep or eStart information when the CT system is in one of the two modes. You can wake up the system from eSleep by tapping the panel screen.

3.2.8 Tilting the gantry

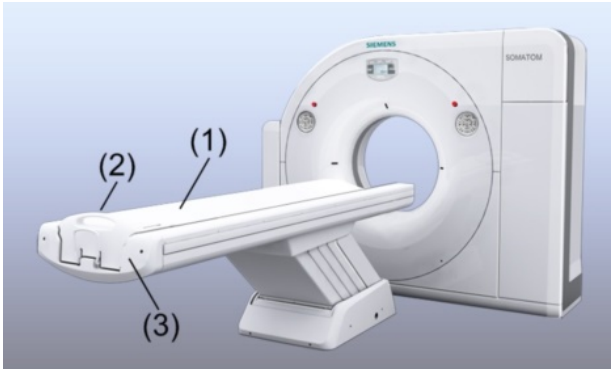
You can tilt the gantry up to +/– 30° from the vertical position. A positive tilt moves the gantry top towards the table top; a negative tilt moves the gantry top away from the table top.



When you specify a tilt that is outside the valid range or that conflicts with the current horizontal or vertical position of the patient table, the system will set the tilt to the nearest possible value.

3.3 Patient table

You place the patient on the patient table and position him or her for the examination.



(1) Patient table with movable table top

(2) Handle on the table top with locking device

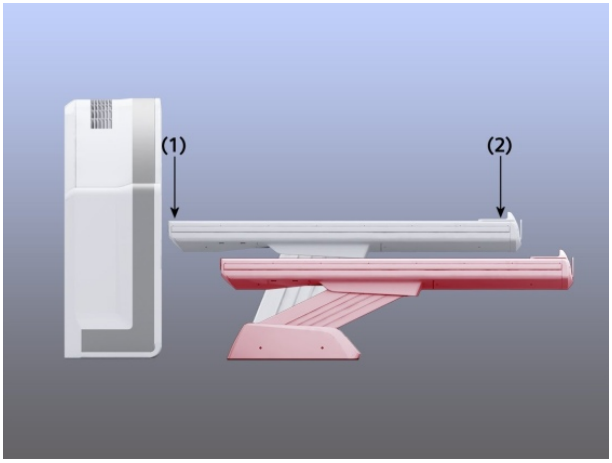
(3) Label: The patient table corresponds to type B applied part. It is protected against electrical shock by limiting admissible leakage currents in accordance with IEC 60601-1.

The table top consists of material which is impervious to water. The table, mattress and accessories are shaped such that they cause, if at all, only minimal artifacts. The markings on the table top and positioning mat mark the metal-free area of the patient table.

- Do not place any objects underneath the patient table.
- The patient table is equipped with a safety stop function. The patient table stops when a malfunction occurs.
- The pictures of the components shown here are only examples. The appearance of your components depends on the system configuration.

3.3.1 Table head end & foot end

The head end is the end of the patient table closer to the gantry. The foot end is the end of the patient table further away from the gantry.



(1) Head end

(2) Foot end

3.3.2 Patient table movement

You place the patient on the patient table and move the table into the examination position.

- Before an examination

  The horizontal and vertical position of the patient table can be adjusted by the user. Before starting the examination, make sure that table top movement toward the gantry opening is not obstructed.

- During an examination

  The patient table is adjusted automatically for slice positioning.

  – For sequence examinations, the table is moved in steps horizontally.

  – For spiral scans, the table is moved continuously in horizontal direction.

The table height and relative table feed are displayed both on the gantry and on the screen of your *syngo* Acquisition Workplace.

3.3.3 Table movement safety

CAUTION

Lowering the patient table!

Body parts can get caught.

- Make sure that the patients body parts are above the patient table.
- Make sure that neither body parts of anybody nor any objects are below the patient table.

CAUTION

Horizontal table top movement!

Possible injury of the hand (warning label).

- Do not place your hand in the gap of the table top support.

Do not place any objects underneath the patient table. Always ensure that the movement is not obstructed by any objects.

- Before you can lower the patient table to its minimum height, you must retract the table top entirely and set the gantry vertical.
- Safety advice for biopsy

  If the patient has a needle for biopsy always be aware of the location of the needle in relationship to the gantry. Unplanned advancement of the needle could occur.
- **STOP** keys

  With the **STOP** keys, you can interrupt unit movements in an emergency (table movements and gantry tilting) and switch off radiation.

If the patient table is not movable anymore, stop scanning and call Siemens Customer Service.

3.3.4 Table maximum load

Depending on your system configuration, the patient table supports one of the following options.

Option	Description
200 kg/440 lbs support	The patient table can carry a maximum load of 200 kg (440 lbs) in the center. Patients weighing up to 140 kg (300 lbs) can be examined without any restriction. Patients weighing up to 200 kg (440 lbs) can be positioned on the table and examined. The stability of the patient table is not at risk, however, the correct functioning of the table (lift, positioning precision) cannot be 100% guaranteed. The table top can be lowered to approximate 450 mm above the floor level (for example, during patient positioning).
227 kg/500 lbs support (not available in China)	The patient table can carry a maximum load of 227 kg (500 lbs) in the center. Patients weighing up to 140 kg (300 lbs) can be examined without any restriction. Patients weighing up to 217 kg (479 lbs) can be positioned on the table and examined. The stability of the patient table is not at risk. Yet, the correct functioning of the table (lift, positioning precision) cannot be guaranteed 100%. The table top can be lowered to approximate 550 mm above the floor level (for example, during patient positioning).

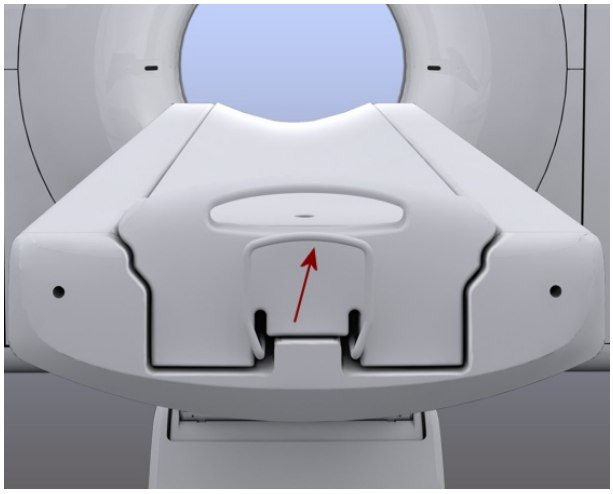
The limitation values for the vertical and horizontal table settings and the angle of inclination of the gantry are interdependent.

- The weight on the extended part at the table head end has to be lowered.
- Be extremely careful when positioning heavy patients on the table. Make sure that obese patients, in particular, climb onto the patient table as close to the center as possible.

3.3.5 Retracting the table top in emergency

In an emergency or power failure, you can position the table top manually. You can use the handle at the end of the table to move the table top out of the gantry.

- Press the lever towards the end of the table top and pull the table top out of the gantry.

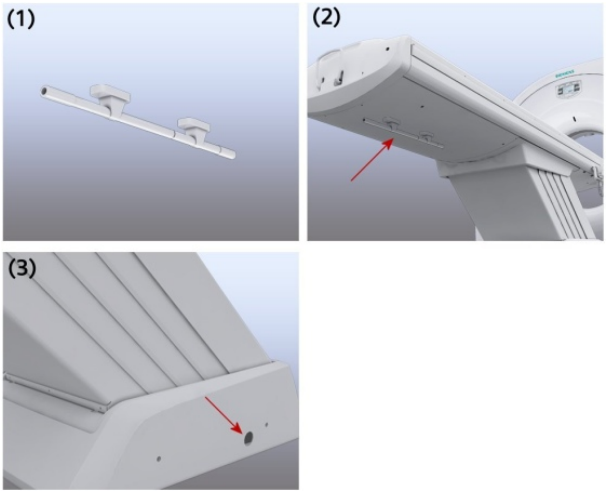


Before you continue work on the system, you must lock the table top back into its original position.

3.3.6 Lowering the table in emergency

You can use the hand crank at the bottom of the table to move the table up or down manually.

1 Insert the hand crank into the matching hole below the table as far as it will go.



(1) Hand crank

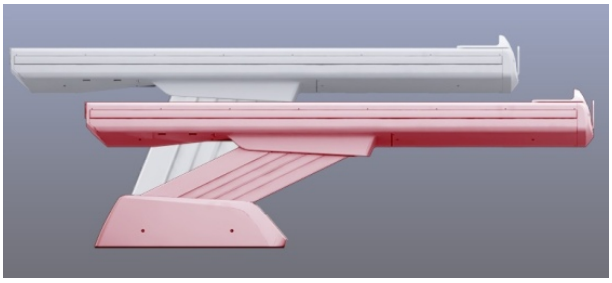
(2) Hand crank under the patient table

(3) Hole for the hand crank

2 Crank the table up or down.

3.3.7 Horizontal table compensation

The height adjustment mechanism of the patient table works on a principle called the cobra principle. Like the snake of that name, the horizontal position of the tabletop (“head of the cobra”) changes as it is raised or lowered.



- On raising, the table top (and therefore the patient too) moves toward the gantry.
- On lowering both move away from the gantry.

With horizontal table compensation on, the horizontal position of the tabletop does not change when it is raised or lowered. The horizontal table compensation option is configured in Local Service.

- With horizontal table compensation off, do not change the table height during the examination, because it changes the slice position, too.
- With horizontal table compensation on, use the Unload patient key, instead of the Table down key, to lower the patient table to a minimum height.
- Horizontal table compensation can only work if the table height is between 86~272mm. The working height corresponds to the isocenter of the system.

3.3.8 Moving the table vertically

You can adjust the table height directly on the gantry operator panel.

◆ Do one of the following:

- Moving the table up

  Press the **Table up** key and hold it down during table movement until the table is correctly positioned.



- Moving the table down

  Press the **Table down** key and hold it down during table movement until the table is correctly positioned.



- Press one key for motion control only at a time.
- Before you lower the patient table to a minimum height, you must completely retract the table top out of the gantry and position the gantry in the vertical position.

3.3.9 Moving the table horizontally

You can move the table into and out of the gantry directly on the gantry operator panel.

◆ Do one of the following:

- Moving *towards* the gantry

  Press the **Table in** key or **Table in fast** key and hold it pressed until the table is correctly positioned.



The table top moves *towards* the gantry.

- Moving *out of* the gantry

  Press the **Table out** key or **Table out fast** key and hold it pressed until the table is correctly positioned.



The table top moves *out of* the gantry.

Press one key for motion control only at a time.

3.3.10 Moving the table to saved positions

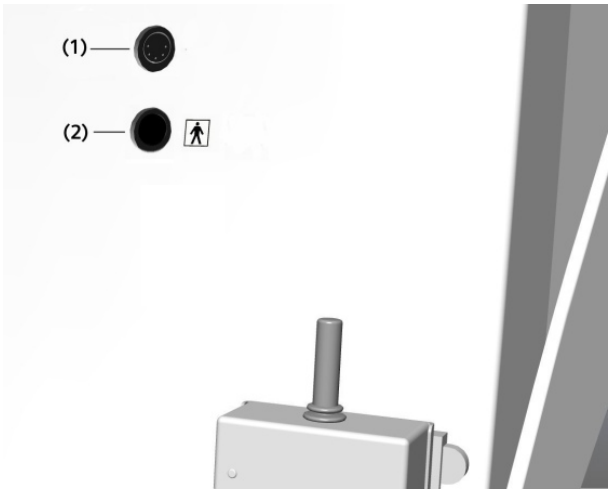
- When the patient table is not at the A position, the **A** key is illuminated. Hold down the **A** key then until the table stops at the A position. The same workflow applies to the **B** key.



- Hold down the **Zeroing** key and the **A** key simultaneously to save the current table position. You can save another position by performing the same step for the **B** key.
- If you save a new position for the **A** key or **B** key, the former position will be overwritten.
- Press only one key at a time for motion control.

3.3.11 Patient table connectors

The connectors for the joystick and the ECG electrodes are located at the table lift.



(1) Joystick socket

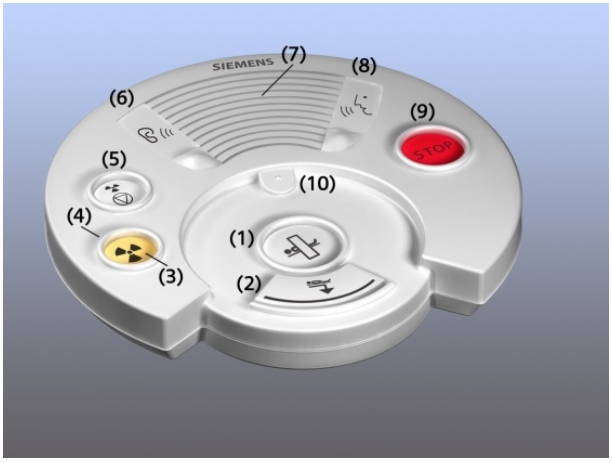
(2) ECG socket

The connector pin is used for potential equalization with other medical devices according to IEC 60601-1 and DIN 42801-2. The connector pin is required to connect the equipotential bonding system in the hospital.

The availability of the joystick socket or the ECG socket depends on your system configuration.

3.4 CT control box

With the operating elements of the control box, you can start and stop a measurement and move the gantry and table from outside of the examination room. The operating elements for the intercom system are also located on the control box.



(1) **Move** key: Use this key to move the patient table or tilt the gantry to the next measuring position.

(2) **Unload patient** key: Use this key to unload a patient.

(3) **Start** key: Use this key to trigger a scan. The radiation warning lamp on CT control box lights up during the scan.

(4) Radiation warning lamp: This display lamp lights up during radiation and a warning signal sounds.

(5) **Suspend** key: Use this key to hold the scan procedure. This is the preferred method for interrupting a scan before completion. You should not use the STOP key for this purpose.

(6) **Hear patient** key: Press this key if you want to hear what the patient is saying. The light diode indicates that the listening connection is active. Press the key again to release the listening connection.

(7) Loudspeaker

(8) **Call patient** key: Hold down this key while speaking to the microphone.

(9) **STOP** key: Use this key to stop scanning altogether in an emergency.

(10) Microphone

The picture shown here is only an example. The appearance of your device may be slightly different. The availability of the **Unload** patient key depends on your system configuration.

3.4.1 Control box safety

When operating the control box, the following safety precautions must be observed:

CAUTION

Unintentional use of table movement keys of the control box!

Possible injury of the patient by moving parts.

- Make yourself familiar with the function of the control box keys.
- Always keep an eye on the patient during table movements.

CAUTION

Patient intercom system nonfunctional!

Patient cannot be understood in case of an emergency.

- Leave the intercom system switched on during the examination (**Listen to patient** key).
- Keep eye contact with the patient when talking or listening to him or her.

CAUTION

Fluids in keyboard or control box!

Undesired radiation.

- Keep liquids, for example, coffee, and food away from the equipment.

3.4.2 STOP key on control box

With the **STOP** keys, you can interrupt unit movements in an emergency (table movements and gantry tilting) and switch off radiation.



STOP key on control box

In critical situations press one of the **STOP** keys. If you press one of the red **STOP** keys, unit movements are interrupted and radiation is stopped. The functions of the keys for system movements are blocked as well.

3.4.3 Radiation warning lamp on Start key

The **Start** key on CT control box is equipped with the radiation warning lamp. A warning signal sounds when radiation is being generated. The color of the illuminated ring indicates the operating state of the system.

Encircling ring:

- *Blinking Green:* ready for scanning



- *Yellow:* radiation warning



3.4.4 Talking to a patient

Using the speaker and microphones, you can talk to the patient or play back several permanently stored patient instructions.

- On CT control box, hold down the **Call patient** key.



You can now talk to the patient at the gantry.

3.4.5 Listening to a patient

1 On CT control box, press the **Hear patient** key.



You can now listen to the patient at the gantry. The light diode on CT control box indicates that the listening connection is active.

2 Press the key again to stop the listening connection.

3.5 Computers

The CT scanner is controlled by two main computers, the image control system (ICS) and the image reconstruction system (IRS).

You can use keyboard, mouse and control box to inform the computer what actions to perform. The workplace computer provides several components (for example, USB ports, DVD recorder). The location and the design of these components may vary.

Depending on the delivery date, the appearance of your computer may vary.

3.5.1 Image control system

Image control system (ICS) is the computer on which you make all your entries. With it, you control the CT scanner, evaluate your studies and store them.

- You work with this computer.
- On the back side of the image control computer (*syngo* Acquisition Workplace, or ICS), you will find the connections for the monitor, keyboard and mouse.

Depending on the delivery date, the appearance of your computer may vary.

3.5.2 Image reconstruction system

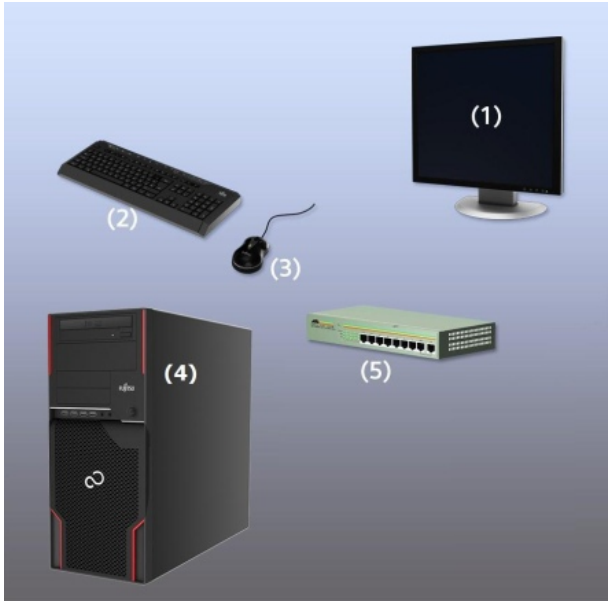
The image reconstruction system (IRS) is one of the main computers of the CT scanner. It calculates the images.

- The image reconstruction system communicates with the scan system.
- It uses the measured data of the detector system to calculate the images for each slice.
- It then passes on the data to the image control system (ICS).

- You work with ICS; the IRS does not require any special operation.
- Depending on the delivery date, the appearance of your computer may vary.

3.5.3 Image evaluation system

The image evaluation system (IES, or *syngo* CT Workplace) is a computer which is connected to the image control system (*syngo* Acquisition Workplace). It shares the database with the *syngo* Acquisition Workplace which mainly controls the data acquisition of the scanner.



(1) Monitor

(2) Keyboard

(3) Mouse

(4) Computer with DVD recorder

(5) Ethernet switch: The *syngo* CT Workplace is linked to the *syngo* Acquisition Workplace and other network nodes via the Ethernet switch.

The *syngo* CT Workplace is the primary site for image viewing, filming, exporting data, 3D reconstruction, and data postprocessing (including reconstruction). The high acquisition rate and volume of a spiral scanner allows optimized workflow for high patient throughput on the scanner. At the same time, undisturbed further patient data evaluation is possible on the virtually independent *syngo* CT Workplace.

The *syngo* CT Workplace is equipped with an uninterruptible power supply (UPS), separate from the UPS for ICS and IRS.



The uninterruptible power supply (UPS) compensates for voltage fluctuations and provides backup power during power failures for a short time for the computer system.

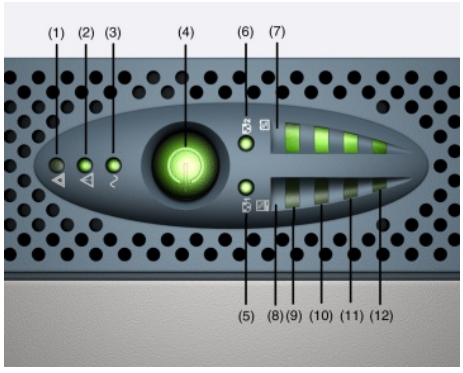
WARNING

Wrong handling of batteries!

Electrical shock or burn from high short-circuit current.

- Observe proper precautions.
- Servicing should be performed by qualified service personnel knowledgeable of batteries and required precautions.
- Keep unauthorized personnel away from batteries.

A warning signal sounds when the UPS has switched to battery power during power failure.



(1) Error indicator

(2) Battery mode indicator

(3) Load protected indicator

(4) ON/OFF

(5) Group 1 outlets powered

(6) Group 2 outlets powered

(7) Battery charge

(8) Load (percent)

(9) Load: 76 to 100%

(10) Load: 51 to 75%

(11) Load: 26 to 50%

(12) Load: 26 to 50%

- The pictures of the components shown here are only examples. The appearance of your components depends on the system configuration.
- The availability of the image evaluation system depends on your CT configuration.
- The computer contains drives for different data media.

3.5.4 Keyboard

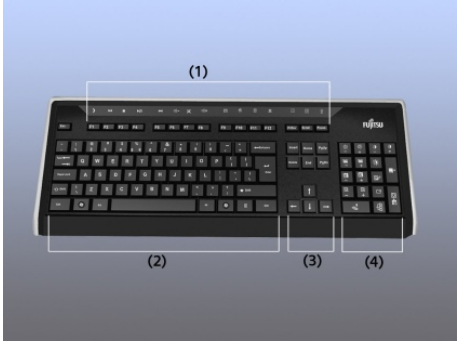
CAUTION

Fluids in keyboard or control box!

Undesired radiation.

- Keep liquids, for example, coffee, and food away from the equipment.

With the keyboard, you enter text, numbers and commands. The computer supports keyboards in different languages.



(1) Function keys

(2) Typewriter keyboard

(3) Cursor keys

(4) Symbol keypad

- The picture of the keyboard shown here is only an example. The appearance of your device may vary.
- Only use a keyboard approved by Siemens.

3.5.5 Monitor

On the monitor, you can see and control the examination procedure or view images.



The monitor on the console is a 19" Liquid Crystal Display (LCD) color monitor with high resolution. Your monitor has already been optimally configured by Siemens Service. The monitor has to be packed properly when transported.

- Do not touch the screen surface.
- Always leave the monitor switched on. It is switched on and off together with your CT workstations.
- This device complies with the relevant regulations for data processing equipment, including electronic office machines for use in an office environment. If you have any questions, contact your sales office or Siemens customer service.

Monitor safety information

WARNING

Unauthorized manipulation on or improper use of the system!

Electrical shock

- Never open the monitor.
- Leave all repairs to the Siemens Service.
- Never place cups, glasses or other vessels containing liquid on or near the monitor, in case of accidental spillage.
- Ensure that no objects, for example, necklaces, paperclips, or liquids can get into the interior of the device (electrical shock, short circuit).

CAUTION

Monitor failure!

Uncontrolled system.

- Do not make any more entries via the keyboard.
- Interrupt the examination.
- If necessary, press a **STOP** key or, in case of an emergency, an **EMERGENCY OFF** button.

CAUTION

Missing constancy test of the monitor!

Wrong basis for diagnosis.

- Perform the monitor test regularly at the recommended intervals.

Dual monitor configuration

The *syngo* software package is able to run on two monitors connected to one computer. An additional monitor for use in an examination room or doctor's room is available.



In second monitor mode, you can view a different image on the second monitor. So you can view two images simultaneously.

CAUTION

When working with several monitors, the patient name displayed in the folder of a task card belongs only to this task card. Any other visible task card may contain data from another patient!

Possible wrong diagnosis.

- Use patient demographics displayed in the image text for clear identification.

In these dual-monitor installations, the horizontal screen resolution is automatically doubled. The suitable setting is 2560x1024.

Some task cards have special features for use at dual monitor installation:

- Depending on the system configuration, the **Viewing** task card may run on the left or on the right monitor, but not on both simultaneously.
- The **3D** task card may be used in 2 modes:
  - Comparison mode: Each monitor shows data of a different series or patient.
  - Blow-up output mode: Output visualizations are shown enlarged on the second monitor.

When working with dual monitors, the positions of supplementary windows are determined as follows:

- A pop-up window appears on the screen where you invoke the action, for example, where you click a button. This is the default behavior.
- If the action is not located on a screen (for example, background jobs that lack a user interface), the pop-up window appears on the primary monitor. By default, the right screen is set up as the primary monitor.
- It is important to keep the Online Help window on the primary monitor to use the navigation features such as the Table of Content.



You can change the primary monitor of the system to interchange the contents of the two monitors.

Cleaning monitor screen

WARNING

Cleaning of the monitor housing during operation!

Electric shock

- Only clean the housing when the monitor is switched off.

The monitor screen has a sensitive anti-reflective coating which has to be treated with care. You can clean the screen even if the monitor is switched on.

- Always clean the housing with a damp but not wet cloth. Do not use cleaning solutions.
- Use a soft cloth to clean the screen. If necessary, dampen it with a domestic glass cleaner.
- Remove water drops immediately; extended contact with water discolors the surface.
- In order to avoiding damage to the surface coating, never use corrosive agents to clean the screen surface.
- Grease stains can also be removed from the monitor screen with water.

Using an anti-static cleaner will give you the best results when cleaning the screen surface.

3.6 Positioning accessories

For safe and comfortable positioning of the patient, positioning accessories are available, for example:

- Mats
- Supports for head/arm/knee
- Table top extension
- Cushions, pads, & straps

Positioning accessories that are used in the region of interest are made of special radiotranslucent material. They are shaped in such a way that they cause image artifacts as minimal as possible. Nevertheless, use the positioning accessories in such a way that they do not protrude into the slice plane, if possible.

- Remove all impurities, especially residual contrast medium, as quickly as possible.
- Bear in mind that only certain weights can be placed on positioning accessories.
- Some positioning accessories are optional.

3.6.1 Safety of positioning accessories

To avoid danger of injuring the patient during table or gantry movements, only positioning accessories approved by Siemens should be used. In this way also artifacts can be avoided which impair the image quality.

WARNING

Exceeding the maximum load of the accessories assembly!

Disruption of the table connection assembly for fixing accessories and thus injury of the patient.

- Do not use pluggable accessories for patients weighing more than 200 kg (450 lbs).

CAUTION

Use of non-original positioning aids!

Danger to the patient through collisions with the gantry. Image quality may also decrease.

- Do not use any positioning aids not mentioned in this section.

CAUTION

Improper use of positioning aids!

Injury of the patient or damage to the system are possible.

- Use the positioning aids exclusively for their original purpose: Head holder for positioning a head only, table top extension for positioning feet only.

CAUTION

Unobserved movement of the patient table or gantry when using accessories and other supports!

Collision of the patient with the gantry.

- Monitor the patient continuously during table movement and gantry movement.

  Take special care of the patient when tilting the gantry.

  Follow the marking on the accessories.

Bear in mind that only certain weights can be placed on positioning aids. For more information, refer to System Owner Manual.

CAUTION

Overloading of positioning aids!

Cuts and other injuries.

- Pluggable positioning aids must not bear weights of more than a special value shown on a warning label.

- Positioning aids are subject to wear and tear. They must be replaced with original parts if they become dirty or damaged.
- Replace damaged or worn positioning accessories, especially if mechanical strength is required.

3.6.2 Attaching a positioning accessory

The head holder and table top extension are all mounted in the same way at the head end of the table.

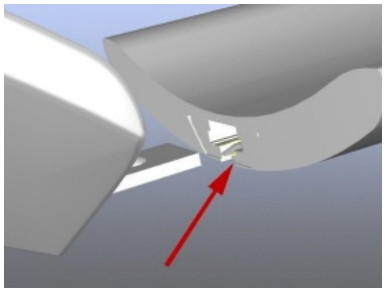
CAUTION

If a head holder or support does not engage securely, it can come loose!

Possible injury of the patient.

- Make sure that the pluggable positioning aids are seated firmly and securely engaged in the receptacle at the end of the table top.

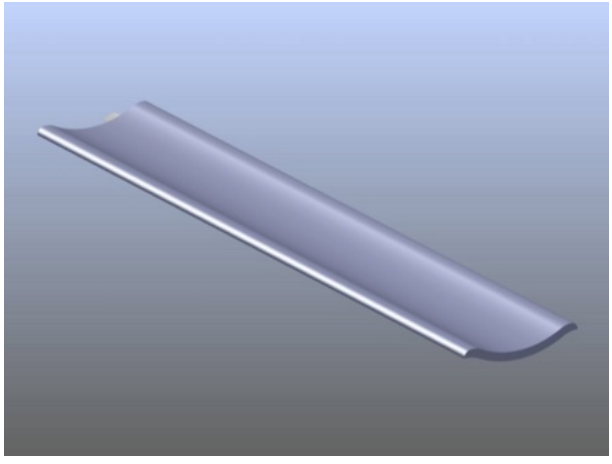
- Push the holding bracket into the receptacle at the head end of the table until it is firmly engaged.



The head holder has Velcro straps on both sides. Here, you attach the Velcro straps supplied to immobilize the head.

3.6.3 Positioning mat

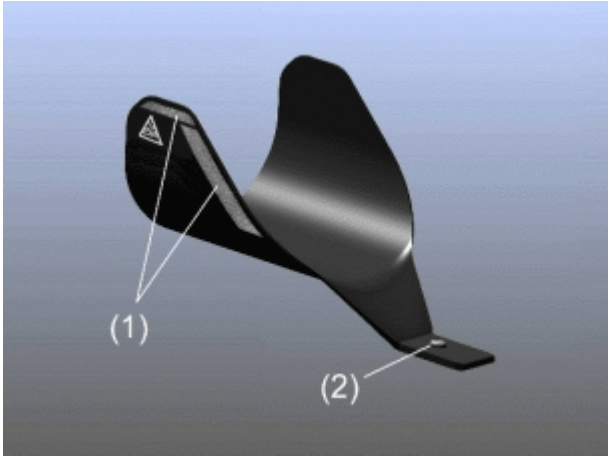
Use this accessory to provide a comfortable position for the patient on the table top.



- The positioning mat must be correctly secured.
- The positioning mat has to be fastened onto the table top so that its position marker is aligned with the corresponding marker of the table top. The markings on the table top and positioning mat mark the metal-free area of the patient table.
- We recommend covering the mat with paper, for example, with HOSTESS paper cloths No. 75312 (length 50 m, width 60 cm, perforation every 28 cm).

3.6.4 CFK head holder

Depending on the requirement, this head holder can be used in combination with the associated set of cushions for all standard examinations in the cranial area and for coronal scans (for example, sinuses).



(1) Velcro strips

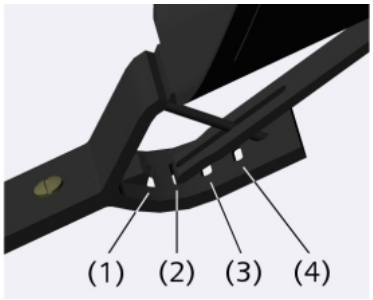
(2) Release button

Use this accessory for positioning the head for cranial examinations, for examinations in the neck region and for examinations of the cervical vertebrae.

3.6.5 Tiltable head holder

In contrast to the standard head holder, the angle of the tiltable head holder can be adjusted to the special requirements of the performed examination (four possible angles). It is supplied with different cushions (flat or wedge shaped), which can be placed inside.





(1) Tilt -15°

(2) Tilt - 0°

(3) Tilt +15°

(4) Tilt + 30°

The tiltable head holder will be attached at the head end of the table. Depending on the requirement it can be typically used for cranial examinations:

- Standard cranial examination, supine (all angles)
- Sinus paranasales, supine (-15°)

CAUTION

Handling of the tiltable head holder!

Possible injury of the patient or the operator.

- Always observe the operating instructions of the tiltable head holder.

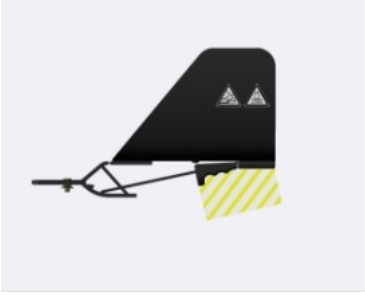
CAUTION

Tiltable head holder not correctly locked in place!

Undesired radiation exposure due to repetition of the scan.

- Always ensure that the tiltable head holder is correctly locked in place.

Only touch the areas marked in yellow with the palm of your hand to adjust the tiltable head holder.





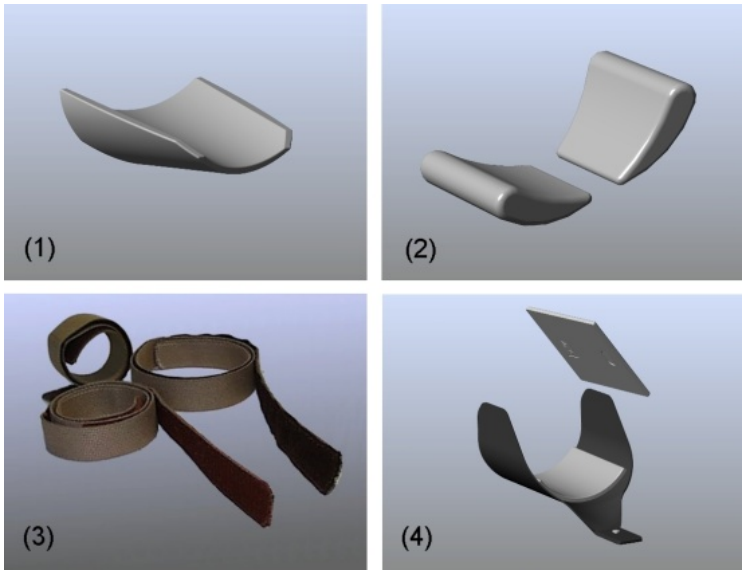
Take care not to pinch any movable parts. The head holder can get damaged when movable parts are pinched in the tilt adjustment. Movable parts are, for example, patient bedding, straps, cables, or tubes.

- Hold the bar of the tiltable head holder locked when changing the position from 0° to 30°, because the noise of the lock mechanism may make the patient uncomfortable.
- Do not lean or push laterally against the tiltable head holder.
- When the tilt adjustment does not fit properly anymore, the tiltable head holder is no longer usable. Contact your local customer service representative or your Siemens regional office.

3.6.6 Cushions and pads

The cushion set is used in conjunction with a head holder for correct positioning of the patient's head:

- Flat positioning with the flat cushion
- Positioning with head cushions (15° or 25°) for brain examinations.



(1) Head cushion

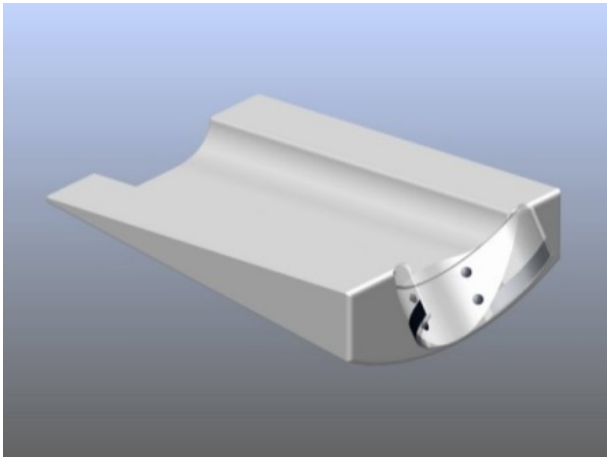
(2) Pad: thin, thick

(3) Velcro straps

(4) Cushion, flat

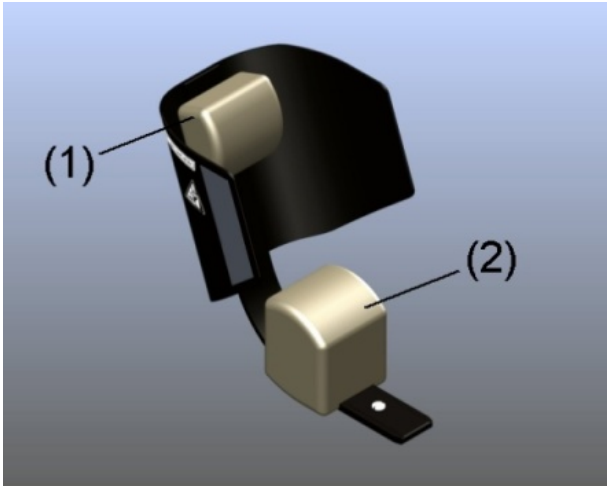
3.6.7 Coronal supine head holder

Use this accessory for positioning the head for cranial examinations in the supine position (coronal slices).



3.6.8 Coronal prone head holder

Use this accessory for positioning of the head for cranial examinations in the prone position (coronal slices).



(1) Adjustable forehead support

(2) Adjustable chin support

The coronal prone head holder has two supports:

- Chin support. This is fixed to the holder using a Velcro strap attachment. You can adjust its position for maximum patient comfort.
- Forehead support. Its vertical position can be adjusted by loosening the support screw, moving it to the desired position and retightening the screw firmly.

3.6.9 Straps

Straps are used to restrain the patient.

CAUTION

The restraint straps are not permanently attached to the table!

They cannot prevent the patient from falling off the table.

Patients who do not keep still may fall off the table.

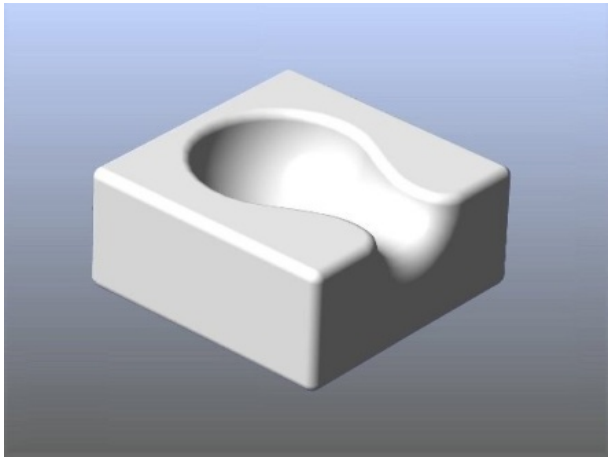
- ◆ Take special care with those patients.

- Position the straps below the mat.
- Close them on top of the patient with the Velcro strip.

- Be aware that the edges of the straps may cause artifacts.
- Remove any contamination, particularly contrast medium residues, as quickly as possible.

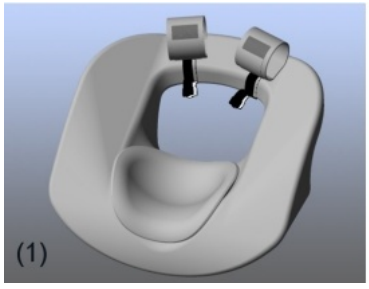
3.6.10 Headrest

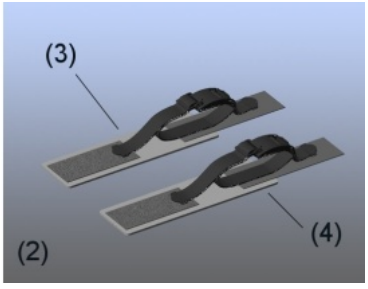
The Bocollo cushion (headrest) is for the comfortable positioning of the patient's head at the plate of the patient positioning table.



3.6.11 Head-arm support

The head-arm support is used for a comfortable positioning of the patient with his or her arms crossed above the head. It can be placed directly on the patient table wherever you want (head end/foot end or on the table top extension). The head-arm support is supplied with a flat cushion, which can be placed inside. For better immobilization the support has Velcro straps on both sides. Here, you can fix the patient's hands.





(1) Head-arm support with straps and cushion

(2) Straps

(3) Fixation for head-arm support

(4) Velcro strap for patient wrists fixation

Depending on the requirement it can be typically used for examinations of thorax, abdomen and pelvis.

CAUTION

Use of the head-arm support!

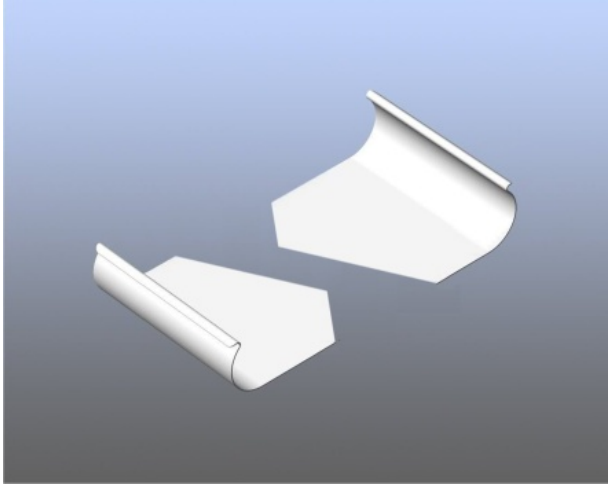
Increased risk that the gantry might collide with the arms of the patient.

- Always keep an eye on the patient during table movements.

The support is not recommended for head and neck examinations.

3.6.12 Arm support

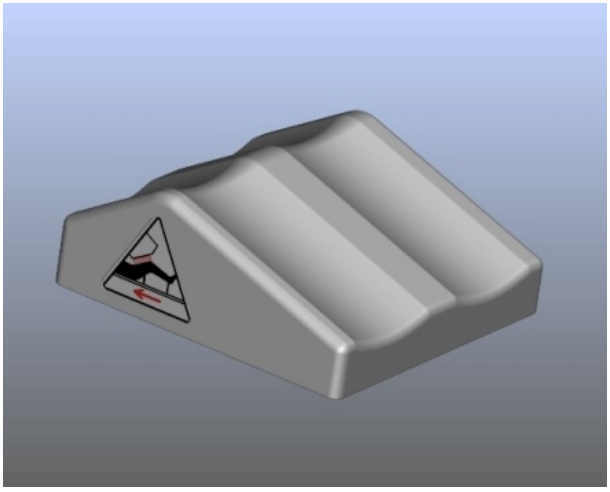
The arm supports can be used for examinations in which the patient's arms need to be positioned next to his or her body. The arm supports are used in pairs and allow a safe and more comfortable positioning of the arms.



Place the arm supports between patient and table and position the patient's arms in the arm supports.

3.6.13 Knee support

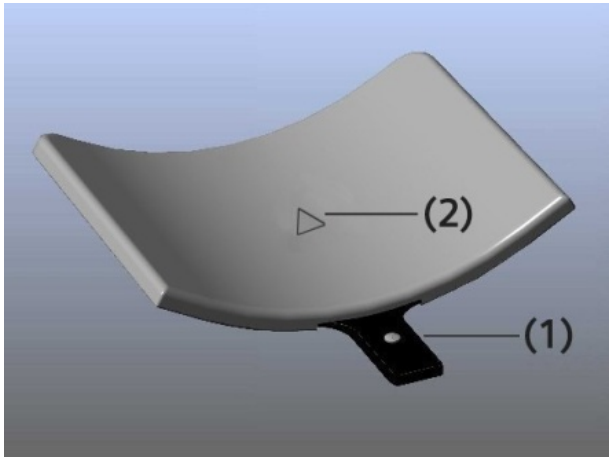
With the knee support, you can position the lower extremities comfortably and reduce lordosis of the lumbar vertebrae. The patient is positioned more stable.



Place the knee support under the knees and the lower legs.

3.6.14 Table top extension

The table top extension is intended to be an extension for the feet.



(1) Release button

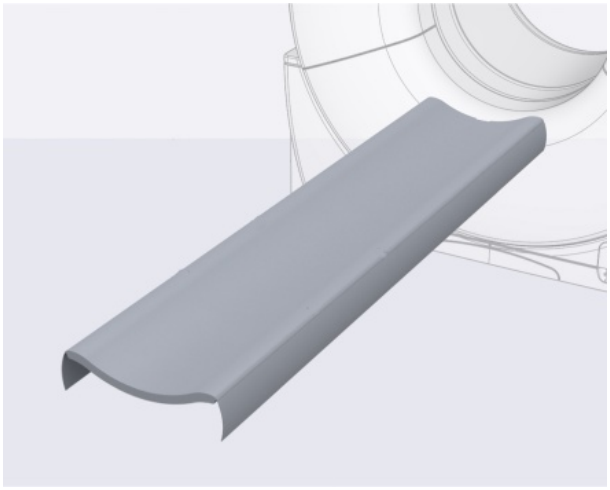
(2) Label

Use this accessory for positioning the feet for examinations of the lower extremities.

If you use the table top extension image artifacts might occur.

3.6.15 Mattress with spill protection

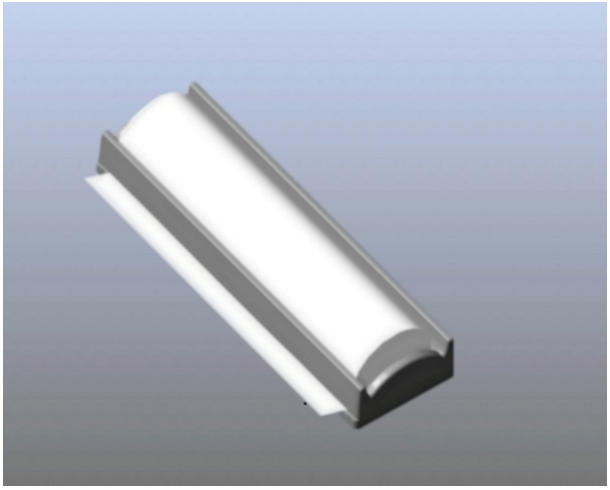
The mattress with spill protection provides you with an effective means of preventing body fluids from coming into contact with, and possibly damaging, the table. This is especially relevant for use with patients in a state of trauma.



The pictures shown here are only examples. The appearance of the positioning aids depends on the system configuration.

3.6.16 Paper roll holder

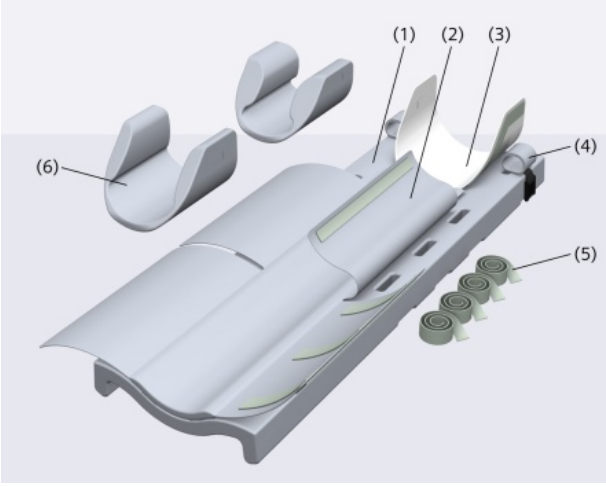
The paper roll holder is used for easy changing of the crepe paper on the table. It can be placed wherever you want, also on the table.



- To rule out collisions, the paper roll holder should not be placed on the head end of the table while table height is set to the minimum.
- You can order crepe paper suitable for the paper roll holder from Siemens. Disposal of this crepe paper has to be environmentally compatible.

3.6.17 Baby mattress

The baby mattress provides you with special equipment. With the baby mattress, you can position babies comfortably and securely on the patient table.



(1) Body support

(2) Mat

(3) Head support

(4) Velcro straps for arm fixation

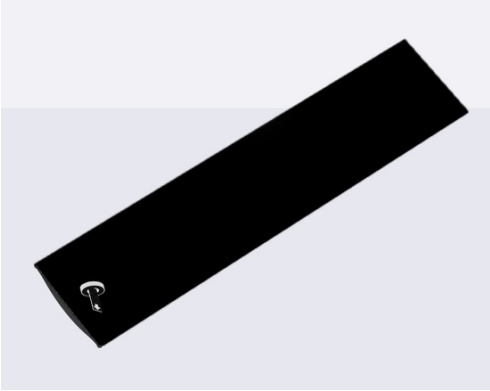
(5) Velcro straps for head and body fixation

(6) Cushions

- Clean and disinfect the equipment of the baby mattress in accordance with the cleaning instructions for corresponding accessories.
- The pictures shown here are only examples. The appearance of the positioning aids depends on the system configuration.

3.6.18 Mattress with flat surface

For clinical settings that require an even surface for patient positioning, the mattress with flat surface is used to even out concave table tops.



CAUTION

Use of the mattress with flat surface!

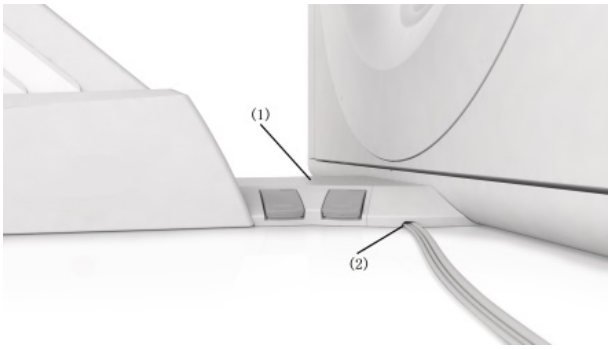
Contusion of patient's fingers during table movement.

- Always use both arm supports with the mattress with flat surface.
- Observe that the hands of the patient are completely covered by the arm support.
- Always fix and observe the patient during table movement.

- Please note that the shape and dimensions of the mattress with flat surface differ from those of the standard mattress. That might result in slight restrictions in operation.
- The pictures shown here are only examples. The appearance of the positioning aids depends on the system configuration.

3.6.19 Table footswitch

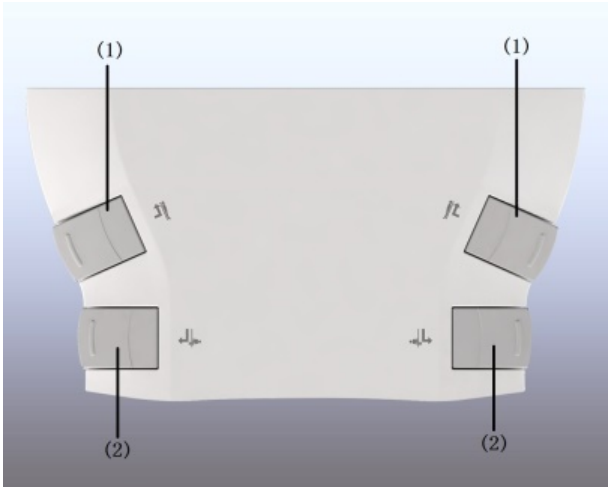
You can move the patient table by using the table footswitch as an alternative to using the keys on the gantry operator panel. The table footswitch is located between the gantry and the patient table.



(1) Table footswitch

(2) Cable channel

The table footswitch has the **Offset** pedal and the **Table retraction** pedal. The pedals are located on both sides of the table footswitch.



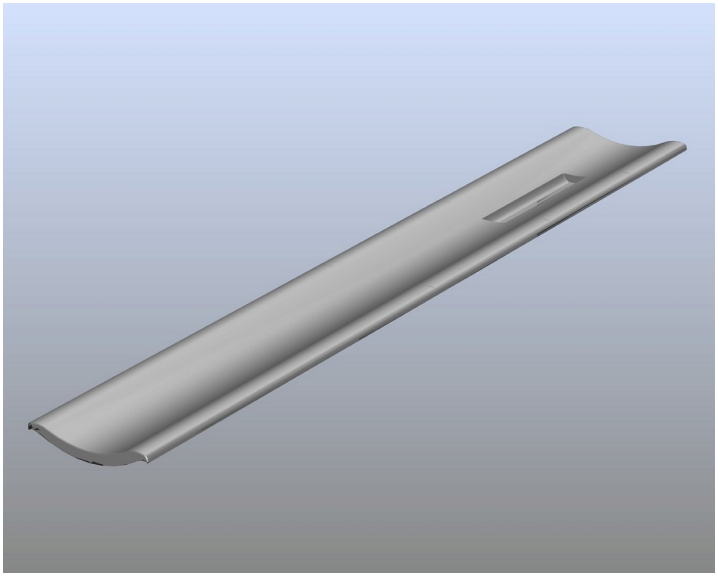
(1) **Offset** pedal: loads a patient. The pedal functions the same as the **Offset** key on gantry operator panel.

(2) **Table retraction** pedal: unloads a patient. The pedal functions the same as the **Table retraction** key on gantry operator panel.

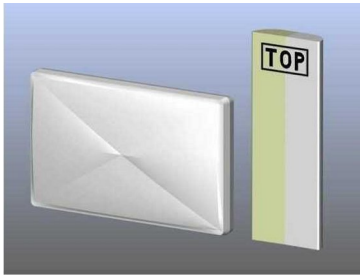
- This accessory is optional.
- Tapping the **Intervention** icon on the gantry touch panel switches the table footswitch into the interventional mode: the **Offset** pedal only moves the table top towards the gantry instead of loading a patient; the **Table retraction** pedal only moves the table top out of the gantry instead of unloading a patient.

3.6.20 Osteo CT accessories

Use the Osteo positioning mat to position the patient appropriately for the Osteo examination. It has a cut-out in the vertebral region for the reference phantom and the gel pack. Use the table top mat in combination with the reference phantom and the gel pack.



Osteo mat

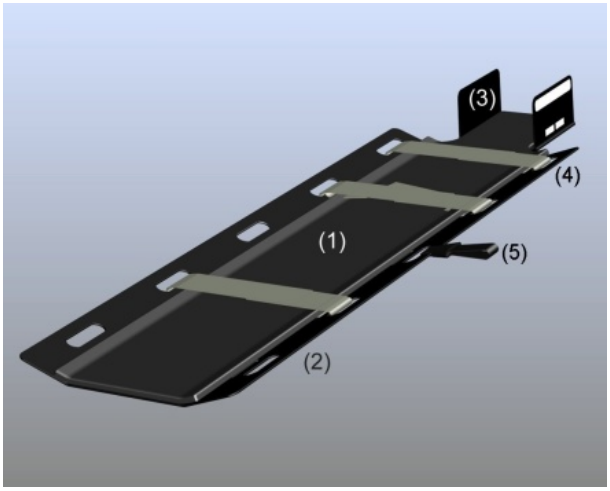


Gel pack and Reference phantom

3.6.21 CARE TransX

CARE TransX is a radiolucent, portable stretcher for universal patient transport and positioning. It can be used both for trauma patients as well as for fast patient transfer.

The CARE TransX stretcher comprises of the following parts and accessories. For comfortable patient positioning a mat and a headrest are available as an option.



(1) Mat (optional)

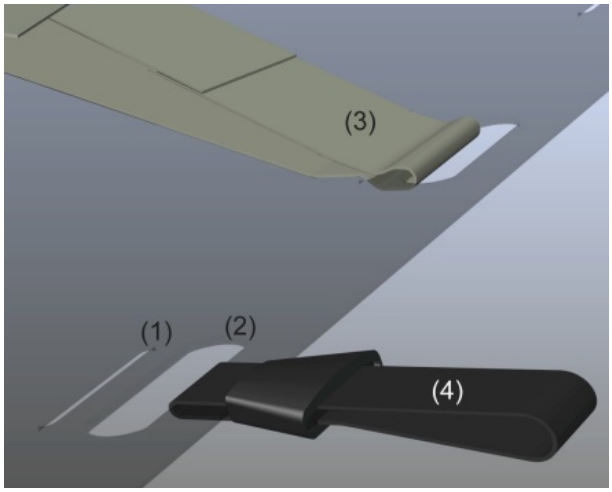
(2) Stretcher

(3) Headrest (optional)

(4) Restraining strap

(5) Transport strap

The CARE TransX stretcher is equipped with restraining and transport straps. The straps are attached to the five slots at each side of the stretcher. The transport straps can be attached to the hand grips of the stretcher. Use restraint straps, transport straps, and the headrest to prepare the CARE TransX.



(1) Strap slot

(2) Hand grip

(3) Restraining strap

(4) Transport strap

CARE TransX can be used with a trolley.

CARE TransX safety

When using CARE TransX, some safety precautions must be observed.

CAUTION

The patient is not fixed correctly with the restraint straps!

The patient may fall off the trolley.

- Always firmly close the restraint straps to prevent the patient from falling off the trolley.

⚠ CAUTION

The restraint straps are not permanently attached to the table!

They cannot prevent the patient from falling off the table.

Patients who do not keep still may fall off the table.

- Take special care with those patients.

⚠ CAUTION

During transport with the stretcher the patient is not firmly strapped to the stretcher!

The patient may fall off the stretcher.

- Strap the patient firmly to the stretcher before transport.

⚠ CAUTION

During patient transport the stretcher is not carried horizontally!

The patient may fall off the stretcher.

- Always carry the stretcher horizontally during transport.

⚠ CAUTION

During transport the transport straps are not correctly attached to hold the stretcher unit securely!

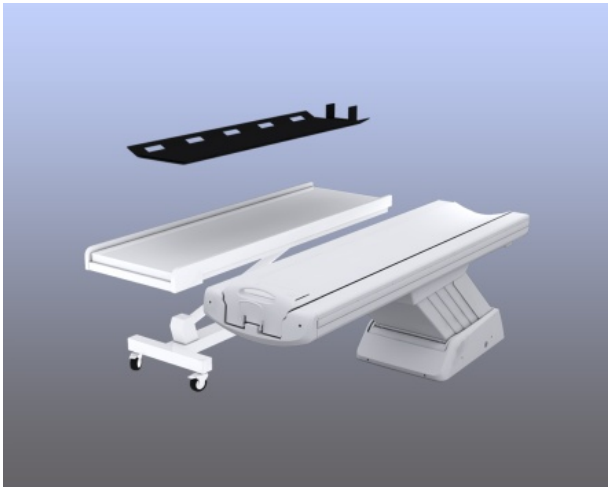
The patient may fall off the stretcher.

- Before transport make sure that the transport straps are correctly attached in order to ensure that you can hold the stretcher unit securely.

CARE TransX trolley

CARE TransX can be used with any trolley. Siemens recommends the use of the following trolley:

- Transmobile (MARQUET)



CAUTION

Not observing the operator manual of the trolley!

Injury of the patient.

- Study and observe the operating and safety instructions of the trolley.

CAUTION

Overload of the trolley!

Breakdown of the trolley.

- Always observe the permissible maximum load of the patient trolley.

CAUTION

Arms, legs or hairs are hanging down at the sides of the trolley!

Injury of the patient.

- Make sure that neither the patient's arms, legs nor hair can hang down at the sides.

CAUTION

Faulty patient positioning using the CARE TransX trolley!

The patient may fall off the trolley.

- Before transferring the patient between trolley and table, always ensure that the caster brakes are locked to render the trolley immobile, and that the table top is exactly level with the trolley stretcher top at the outwards end position to avoid collision.
- Ensure that any infusion tubes are not squeezed or displaced during the transfer procedure.
- Also ensure that patient hair does not become entangled.
- Position the CARE TransX stretcher in a way that it is centered about the longitudinal axis of the table top and cannot hang over at the foot end or the head end.

For instructions using the trolley please refer to the operator manual of the trolley manufacturer.

4 System maintenance

Regular maintenance and service are important for the safety of patients, personnel and people accompanying the patient as well as for the functional integrity of the system.

On request, you can have maintenance work performed regularly by the Siemens Customer Service. Please contact your Siemens Service to agree on a maintenance contract for your system.

CAUTION

Missing maintenance of the scanning system!

Scan abortion or reduced image quality due to malfunction of the scanner.

- Make sure that maintenance is performed at the recommended intervals.
- Check the imaging performance with the monthly constancy test.

If the system does not function perfectly, it must be checked immediately. Notify Siemens Customer Service. On request, technical documents can be obtained from Siemens.

- For further information on maintenance and maintenance intervals, please consult System Owner Manual.
- Please contact the Siemens Customer Service to exchange the consumable components of the CT system that must be exchanged by the trained and authorized technologists.

4.1 System functional check

To ensure that the system is ready for operation and all functions relevant to safety are working correctly, you must perform function tests daily before beginning with the actual examination procedures.

During the tests, the most important function procedures and the safety equipment of the system are checked.

4.1.1 Checking radiation warning lamps

You must check the radiation warning lamps on the control box, on the gantry and, if present, next to the doors of the examination room.

1 Check the proper function of the radiation warning lamps during the daily image quality tests. The radiation warning lamps must light up when radiation is generated.



2 Make sure that radiation stops immediately when a door of the examination room is opened

When the door is closed again you must restore system readiness with **Setup** > **Continue**.

4.1.2 Checking the STOP keys

1 Press one of the table setting keys on the gantry operator panel and hold it down.

2 When the table/gantry moves, press a **STOP** key.



The table/gantry movement must stop immediately.

3 Check that you can move the table out of the gantry manually after you have pressed a **STOP** key.

After you have applied a STOP key, you must restore system readiness with **Setup** > **Continue**.

4.1.3 Checking the patient table top

You must check the mobility and cleanness of the table top.

1 Make sure that you can manually retract the table top from the gantry.

2 Make sure that the scan field is free of residual contrast medium, blood or other contaminations.

4.1.4 Checking the laser light marker

- Switch on the laser light marker and check the projections of the light beams on a white sheet of paper.



The laser beam must project a line.

The laser light marker does not work.

- Stop scanning to rule out any danger to patients.
- Call Siemens Customer Service.

4.1.5 Checking gantry operator panels

You must check the following keys on the gantry operator panels:

- Gantry tilt
- Table positioning

- Predefined table position **A** and **B**
- Zeroing

◆ Check the keys when you switch on the unit.

Press one key for motion control only at a time.

4.1.6 Checking the intercom system

◆ Apply the **Hear Patient** and **Call Patient** keys on the control box.



The intercom system must work in both directions.

4.2 System optimization

A number of functions are available for you to optimize the CT system performance, such as:

- System calibration
- System check-up
- System maintenance shutdown
- System resource check
- eStart

4.2.1 System calibration

To ensure a constantly high quality of images, the CT scanner must be calibrated at least once a day. Calibration is part of the check-up routine (➔ Page 144 *System checkup*) that is prompted after a CT system restart.

CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

- Calibrate the system as part of the checkup. Repeat calibration (**Setup > Calibration**) if ring artifacts occur.

✓ No patient is loaded in the **Examination** task card.

1 Choose **Setup** > **Calibration** from the main menu.

The **Calibration** dialog box appears. The gantry tilts automatically back to the zero position and the patient table moves out of the gantry.

2 Press **Start** on CT control box.



- For best image results, it is recommended that you repeat the calibration when a stable thermal condition is reached in the gantry (approximately 1 hour after startup). An automatic message reminds you to do this before scanning the next patient.
- It is recommended that you calibrate the CT scanner after pauses of more than 4 hours, or whenever ring artifacts occur in images.

4.2.2 System checkup

The automatic check-up procedure executes a set of functions to ensure that the CT scanner is well conditioned and able to provide high quality images.

The checkup procedure is started in the **Checkup** dialog box which will be displayed after system startup. If the dialog box does not appear automatically, select **Setup** > **Checkup**.



You have the option of skipping the checkup. If necessary, you can calibrate the system later. The following table lists the elements of the **Checkup** dialog box:

Element	Description
Checkup	Starts the check-up procedure.

Element	Description
Cancel	Skips the check-up procedure.
Help	Opens help information.

✓ No patient is loaded in the **Examination** task card.

1 Click **Checkup**. You are prompted to press START.

2 Press **Start** on CT control box.



The system checkup is started. Scanning is initiated.

If the last checkup has been completed no longer than 12 hours ago, the time since the last complete checkup is indicated. It is recommended to perform the checkup or calibration once a day to assure best system performance.

The message "Scan system should not be used." is displayed.

The checkup failed several times. The system is not ready for examination.

- Call the system administrator or Siemens Customer Service.

4.3 System exceptions handling

Special circumstances can force the system to shut itself down or to reduce its function temporarily until a defined operating state is achieved.

There are three types of exceptional situations:

- Overheating or overcooling of the gantry
- Overheating of the computer system
- Power failure

The system responds to such exceptional situations in several steps:

- Countdown

  If the system reaches a critical state, a countdown is started. During this time, do not perform any examinations and terminate any current application(s).

- Recovery

  If the system returns to the normal state during countdown (temperature dropped, power supply restored), you can resume examination.

- Shutdown

  If the countdown has elapsed, the system or the components affected are shut down.

- Restart

  If the system or a component is shut down, a restart is performed once the exceptional situation has been remedied.

4.3.1 Continuing the CT system after halt

There are 2 reasons for which the CT system might be halted:

- A system error has occurred.
- You have pressed the **STOP** key on CT control box.

After this, use of the system needs to be resumed before you can begin with the next scan. The **Continue** dialog box appears.

◆ Click **Continue** in the dialog box.

- If continuing the CT system fails, switch the CT system off and on again.
- If the error cannot be eliminated, contact Siemens Service.

4.3.2 System delayed response

To avoid system behavior like freezing or delayed response time to user due to lack of memory resources, immediately restart your system if possible or at least close some applications and background activities.

CAUTION

Insufficient memory or disk space may lead to an instable or blocked system!

System is not available in emergency cases.

- Do not ignore the storage capacity warning icons.

4.4 System configuration

You can set up the system language, date, and time. You can view the system version, license, and event log. In addition, Siemens has established a software remote update process to provide software updates as early as possible.

4.4.1 Setting up date and time

You are recommended to use the following date formats:

- Default: dd-MM-yyyy
- For U.S. English: MM-dd-yyyy
- For Chinese and Japanese: yyyy-MM-dd

CAUTION

The internal identification of patient data, for example, studies, series and images, uses the system time for generation of the patient identification. If it is necessary to turn the system clock back, duplicate identifiers may be created!

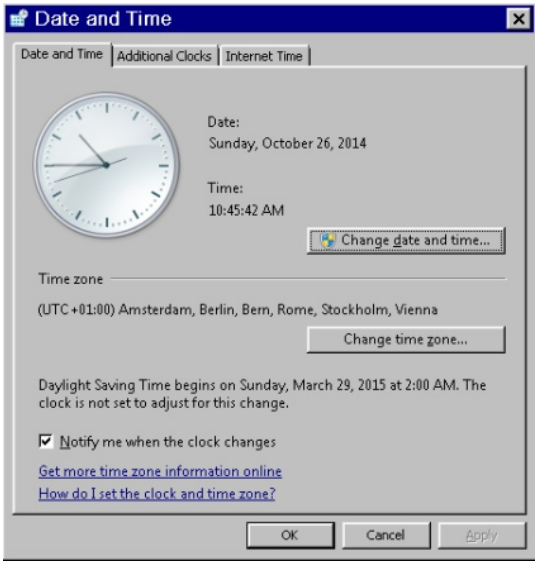
Data may be assigned to wrong patient.

- If it is necessary to turn the system clock back for synchronization purposes, wait until the previous clock setting has been passed before creating new patient data.

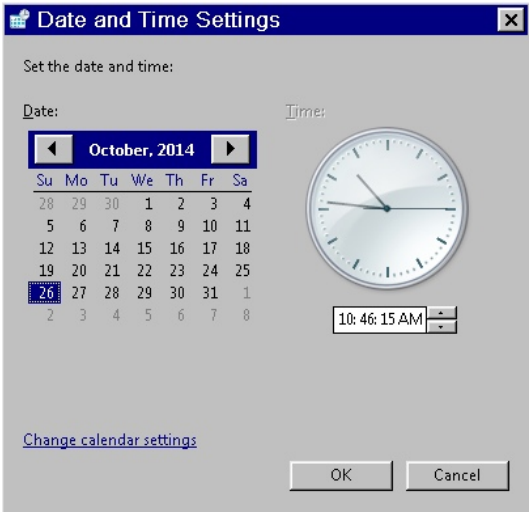
✓ End the current examination and close all patients.

1 Select **Options** > **Configuration** from the main menu.

2 Double-click the **Date and Time** icon in the **Somaris/5 – Configuration Panel** to open the **Date and Time** dialog box.



3 On the **Date and Time** tab card, click the **Change date and time** button.



4 In the **Date and Time Settings** dialog box, adjust the date and time settings, and confirm with **OK**.

5 Reboot the system to update these settings.

4.4.2 Dual monitor configuration

The *syngo* software package is able to run on two monitors connected to one computer. An additional monitor for use in an examination room or doctor's room is available.



In second monitor mode, you can view a different image on the second monitor. So you can view two images simultaneously.

CAUTION

When working with several monitors, the patient name displayed in the folder of a task card belongs only to this task card. Any other visible task card may contain data from another patient!

Possible wrong diagnosis.

- Use patient demographics displayed in the image text for clear identification.

In these dual-monitor installations, the horizontal screen resolution is automatically doubled. The suitable setting is 2560x1024.

Some task cards have special features for use at dual monitor installation:

- Depending on the system configuration, the **Viewing** task card may run on the left or on the right monitor, but not on both simultaneously.
- The **3D** task card may be used in 2 modes:
  - Comparison mode: Each monitor shows data of a different series or patient.
  - Blow-up output mode: Output visualizations are shown enlarged on the second monitor.

When working with dual monitors, the positions of supplementary windows are determined as follows:

- A pop-up window appears on the screen where you invoke the action, for example, where you click a button. This is the default behavior.
- If the action is not located on a screen (for example, background jobs that lack a user interface), the pop-up window appears on the primary monitor. By default, the right screen is set up as the primary monitor.
- It is important to keep the Online Help window on the primary monitor to use the navigation features such as the Table of Content.



You can change the primary monitor of the system to interchange the contents of the two monitors.

4.5 Cleaning and disinfecting

WARNING

Cleaning of parts of the system while the system is connected to the power supply!

Electric shock due to possible contact with line voltage.

- Always switch the system off at the main power switch before cleaning or disinfecting.

CAUTION

Not observing the instructions of the disinfectant manufacturer!

Injury of the cleaning personnel.

- Follow the cleaning instructions of the Instructions for Use.
- Follow the instructions of the disinfectant manufacturer.

Use cleaning agents and disinfectants in the concentration recommended by the manufacturer.

- Remove residual contrast medium on the gantry or patient table with a wet cloth (water).
- Surgical spirit is not suitable for cleaning the cushion set, the Bocollo cushion, the positioning mat, CARE TransX and the knee support. It could cause the surface material to become wrinkled.
- Use of disinfectants containing alcohols or quaternary compounds will discolor the surfaces of the accessories.
- Wipe the outside of the camera with a soft cloth in accordance with the manufacturer's instructions.
- Blow dust off the surface of the data medium with *compressed air*.
- Never rub or wipe the surface or use chemical solutions and cleaning liquids. Certain substances (for example, ammonia vapors) can contaminate the surface of the disk making it unreadable.

4.5.1 Proper cleaning

You can use the following commercially available cleaning agents with the given restrictions to clean the sides of the table, the tabletop cover, gantry cover, cushions, armrests, knee supports and head holder:

- Commercially available washing-up liquid can be used without restriction.
- Ethyl alcohol

  Ethyl alcohol impairs the surface of the immobilization straps, the protective goggles, the coronal prone head holder and the scanning footswitch. The surface of the head cushion and of the coronal prone head holder will fade with ethyl alcohol.
- Surgical spirit

  The surface of the air bellows of the patient table and the head cushion will fade with surgical spirit.

We recommend the following cleaning agents for the floor covering:

- For cleaning: Sofix (Thompson, Düsseldorf, Germany)
- For care: Conter liquid (Thompson, Düsseldorf, Germany)

4.5.2 Proper disinfecting

You can use commercially available disinfectants with the given restrictions for disinfecting the patient table and the accessories as classified below:

- Aldehyde
- Aldehyde decompositors
- Alcohols
- Quaternary compounds
- Organic acids
- Peroxide compounds



- Use of disinfectants containing aldehyde or aldehyde decompositors will discolor the surfaces of mattresses & head holders.
- Use of disinfectants containing alcohols or quaternary compounds will impair the surface of immobilization straps.
- Organic acids and peroxide compounds can be used without restriction.

4.5.3 Improper cleaning & disinfecting

Some agents cause damage to the equipment and must therefore not be used.

- Sprays

  Sprays can enter equipment and damage electrical components. They can also corrode various plastics and form flammable mixtures with air and solvent vapors.

- Abrasive agents or organic solvents

  The following agents can cause damage to surfaces or hairline cracks. Even the smallest load can then damage the material irreversibly.

  – Abrasive cleaning liquids
  – Organic solvents such as aldehyde, acetone, stain remover, cleaner's naphtha, benzine or alcohol
  – Agents that release ammonia when they are dissolved or decomposed and has a corrosive effect
  – Agents containing silicone

    Silicone decays over time and can form sticky deposits that interfere with electrical contacts.
  – Disinfectants based on substituted phenols or disinfectants that release chlorine

4.5.4 Cleaning monitor screen

WARNING

Cleaning of the monitor housing during operation!

Electric shock

◆ Only clean the housing when the monitor is switched off.

The monitor screen has a sensitive anti-reflective coating which has to be treated with care. You can clean the screen even if the monitor is switched on.

- Always clean the housing with a damp but not wet cloth. Do not use cleaning solutions.
- Use a soft cloth to clean the screen. If necessary, dampen it with a domestic glass cleaner.
- Remove water drops immediately; extended contact with water discolors the surface.

- In order to avoiding damage to the surface coating, never use corrosive agents to clean the screen surface.
- Grease stains can also be removed from the monitor screen with water.

Using an anti-static cleaner will give you the best results when cleaning the screen surface.

4.6 Siemens Remote Service

Siemens Remote Service (SRS) is the secure and certified network infrastructure to remotely service your CT system. With SRS, Siemens can deliver you software upgrade and monitor your CT system to proactively prevent system malfunctions.

CAUTION

Terminating remote service without consultation with the service engineers.

Terminating the remote service ends all service processes and may cause system malfunctions.

- Always coordinate termination with the service engineer before terminating remote service.

CAUTION

Service session, for example, with limited access, running in parallel to data acquisition!

A dialog box may appear and cause confusion.

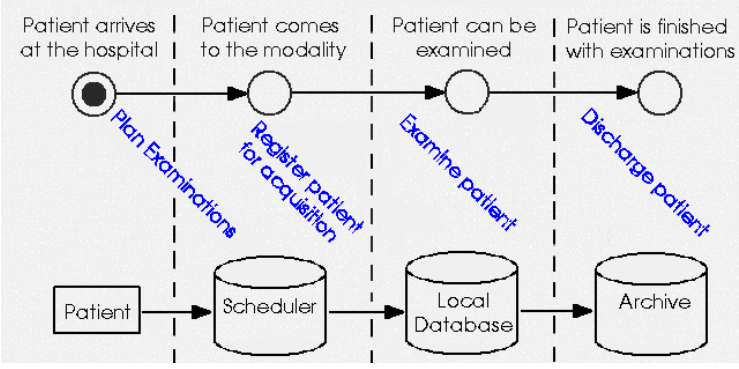
- Always close Service UI when work is done; do not minimize it.

4 System maintenance

5 Examination basics

Your Siemens SOMATOM CT scanner is a whole body CT scanner especially intended for spiral scans. These are obtained by a continuous and quick rotation of the X-ray detector system along with simultaneous motion of the patient table.

It may be helpful to outline basic clinical planning and to sketch the concept of the underlying databases derived from these assumptions.



Basically, it can be assumed that for each set of examinations, the patients go through several stages:

- First, they arrive at the hospital or practice where their examination is planned. For example the patients may come to a reception which is connected with the modalities via HIS/RIS, or they may go directly to a particular modality.
- Secondly, they go to one of the modalities where their examinations are actually performed and the relevant information for diagnosis is produced. Prior to the examination, images acquired during previous examinations can be transferred from the digital archive to your workstation.
- Thirdly, the images are acquired and stored in the database.
- At the end of the examination, the patients leave the modality and the information is archived.

If several examinations are planned, the patients may subsequently go to the next modality. The following 3 databases correspond with these patient stages:

- Scheduler
- Local database
- Archive

5.1 CT scan mode

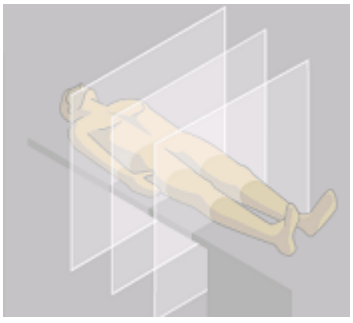
A tomo scan is in one of the scan modes as indicated by the watermark on the **Routine** sub-task card.

- Spiral
- Sequence
- Multiscan
- CARE Vision
- Control Scan

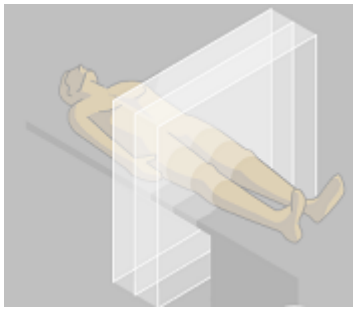
5.1.1 Sequence

In the sequence mode, scan data is acquired by the sequential slicing of a scan range.

- In the 2D sequence mode, a range can be scanned with or without gaps depending on the **Feed** value set on the **Scan** sub-task card.



- In the 3D sequence mode, the **Feed** value is equal or less than the z-coverage and cannot be changed. This ensures that a volume is adequately covered without gaps. **Recon increment** is available in the 3D sequence mode on the **Recon** sub-task card.



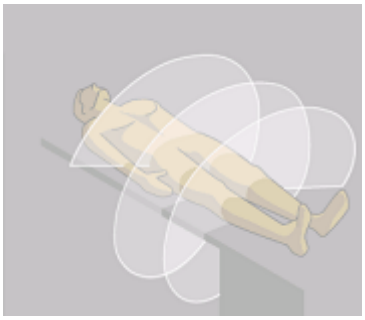
Two applications of the sequence mode are biopsy and Add scan.

A biopsy scan is used for CT intervention and made without table feed.

An Add scan is the acquisitions of one or more slice images in the sequence mode. The Add scan is inserted immediately after and as an extension to a scanned range. The parameters of the Add scan are derived from the preceding scan range. You can also change the Add scan's parameters, if necessary.

5.1.2 Spiral

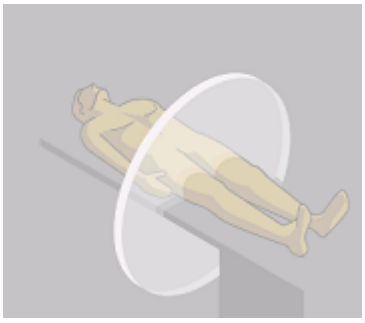
A spiral scan covers a volume with continuous X-ray exposure and table feed. Compared to the sequence mode, a spiral scan covers a longer range within less time. Because the scan acquires a continuous data stream, there are several ways in which you can reconstruct the acquired data, for example, by using a different slice width.



5.1.3 Multiscan

A multiscan is done with continuous X-ray imaging and no table feed.

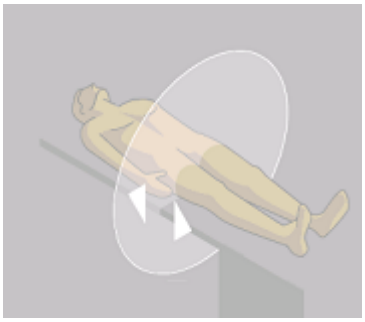
A multiscan works generally for perfusion studies (body perfusion & neuro perfusion). The perfusion protocols are available in the **Specials** group in Patient Model Dialog.



5.1.4 CARE Vision

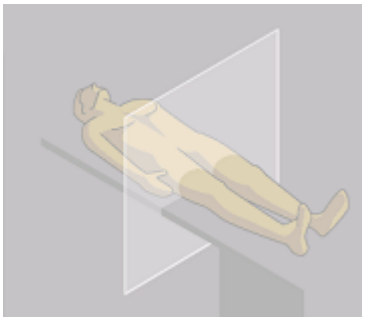
CARE Vision is a fluoroscopic mode for interventions like drainages under CT control. The physician executes a scan by *holding down* the scanning footswitch for a desired period and then release it. Radiation is on during this period. Images at the current table position and in different points of time are acquired. Therefore, you can observe the movement of the surgical instrument.

You use a CARE Vision scan protocol from the **Specials** group in Patient Model Dialog.



5.1.5 Control Scan

A control scan is a single acquisition of one slice image done before a diagnostic scan, using parameters derived from the diagnostic scan that is to follow. You cannot change most parameters of a control scan. Using the image acquired by a control scan, you can check whether the parameters (for example, mAs) are appropriate for the diagnostic scan.



5.2 CT basic parameters

A CT examination is controlled by scan parameters and recon parameters.

- Scan parameters include tube voltage in kV, tube current in mAs, acquisition (collimation), pitch in the spiral mode, feed in the sequence mode, and so on.
- Recon parameters include slice width, increment, window, kernel, Field of View (FoV) and so on.

5.2.1 Slice width and acquisition

The slice width is the thickness of the reconstructed tomographic images. It determines the image definition (spatial resolution). As a rule, the slice width should correspond to the smallest anatomic structure to be displayed.

A thicker slice leads to poorer image quality in spatial resolution. A thinner slice produces good image definition for better separation of neighboring structures, for example, in the inner ear.

The slice width is chosen on the **Routine** or **Scan** sub-task card in combination with scan **Acquisition**. Acquisition indicates the X-ray detector's physical construction used for a data acquisition, and consists of the multiplication of two factors:

- The number of the detector's physical slices used for a scan
- The width of one physical slice

The multiplication of these two factors equals to the z-coverage of a scan.

5.2.2 Pitch

The pitch parameter is used for a spiral scan.

Pitch = table feed per rotation / z-coverage

For a pitch less than 1, there is an overlap for data acquisition.

5.2.3 Feed

The **Feed** parameter (table feed) is used in the sequence mode:

- In the 3D sequence mode, table feed cannot be changed. It is equal or less than the z-coverage. This ensures that a volume is adequately covered without gaps.
- In the 2D sequence mode, table feed is equal to the z-coverage by default. You can, however, scan with gaps between slices for some rare diagnostic issues. Scanning with gaps bears the risk of not covering all anatomical sections. To scan with gaps in 2D sequence, set up **Feed** on the **Scan** sub-task card to be greater than the z-coverage.



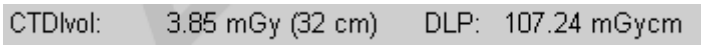
When you set **Feed** to be zero (0), multiple scans will be performed at the same table position.

5.3 Dose information

In radiology, the term dose or patient dose refers to the energy deposited in the body of the patient by ionizing radiation.

5.3.1 CTDI and DLP

The CT Dose Index volume (CTDIvol) and the Dose Length Product (DLP) are calculated and appear on the **Routine** and **Scan** sub-task cards for a selected scan entry in Chronicle.



The CTDIvol is measured using dedicated plastic phantoms:

- 16 cm diameter for the head
- 32 cm diameter for the body

This dose index gives a good estimation of the average dose applied in a scan plane, as long as the patient size is similar to the size of the respective dose phantoms.

The DLP is defined as follows:

DLP = CTDIvol * scan length

Therefore, the DLP is proportional to the total dose deposited in the scan volume during a scan.

5.3.2 CARE Dose4D

CARE Dose4D optimizes the scan dose by adapting the X-ray tube current to the anatomy of a patient.

You specify the **Quality ref. mAs** value on the **Scan** sub-task card. This value is used to adjust the image quality to the diagnostic requirements or to the individual preference of a radiologist. CARE Dose4D controls the actual varying mAs applied during scanning.

⚠ CAUTION

mA proposal of CARE Dose not adequate due to wrong attenuation data from topogram!

X-ray not or only partially usable.

- Check plausibility of the automatically selected scan parameters before scanning.

CARE Dose4D combines three methods for dose adaptation:

- Dose adaptation to the patient size
- Dose adaptation along the z-axis
- Angular modulation

Dose adaptation to patient size

Larger patient sizes lead to more attenuation and a reduced number of X-ray quanta reaching the detector, resulting in increased noise in images. This adverse effect can be limited by adjusting the dose according to the body size.

A Quality Reference mAs is used to define a baseline image quality based on the selected scan protocols. The baseline image quality refers to a patient weighing 70 kg to 80 kg (155 lbs to 180 lbs).

The actual patient attenuation is determined from the topogram.

- Adult slim
- Adult obese
- Child

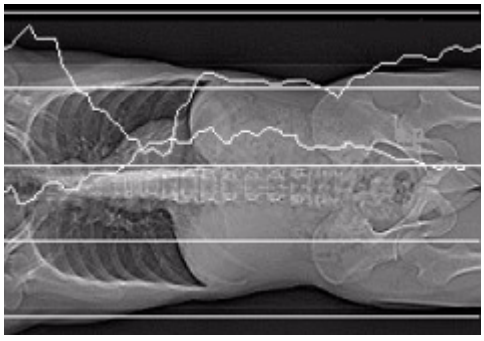
Depending on the actual patient size, CARE Dose4D automatically modifies the tube current during acquisition.

The **Quality ref. mAs** should be changed only for image quality purposes and *not* according to the size of an individual patient.

Dose adaptation along z-axis

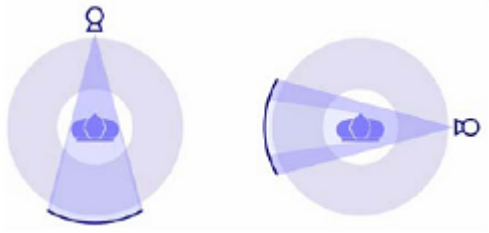
The X-ray attenuation profile along the z-axis is decided based on a single topogram. The profile consists of both the measured attenuation in the direction of the X-ray projection and the calculated attenuation in the direction perpendicular to the X-ray projection.

Based on the attenuation profile, the tube current values are calculated for every table position, resulting in an optimal dose in the acquisition of every slice image.



Angular modulation

Without modulation, the attenuation of the X-ray beam for elliptical body regions such as the shoulder varies strongly with the tube rotation angle.



The angular modulation adapts the tube current over each single tube rotation according to the angular attenuation profile:

- For the low attenuation areas, the tube current is reduced to avoid excessive dose.
- For the high attenuation areas, the tube current is increased to reduce image noise.

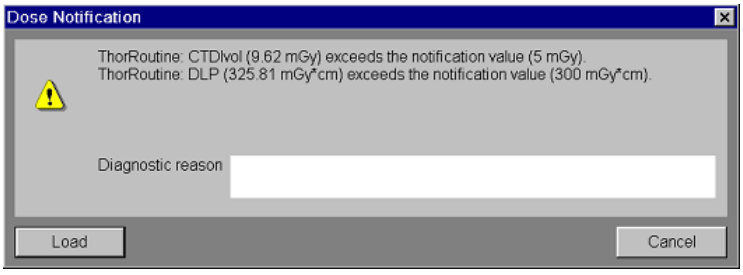
The angular attenuation profile is measured during each single tube rotation. The appropriate modulation is applied for the next rotation with a delay of only half a rotation so that consistent image quality can be achieved.

5.3.3 Dose notification

In Scan Protocol Assistant, you can set up the thresholds of CTDIvol and DLP for a scan range.

During an examination, when you click **Load** for the scan range, its CTDIvol and DLP values are checked. If they exceeds the thresholds, a **Dose Notification** dialog box appears. It shows the name of the scan range, its CTDIvol or DLP value that exceeds the threshold, and the threshold value.

On the **Routine** and **Scan** sub-task cards, the CTDIvol or DLP value that exceeds the threshold is highlighted in red.



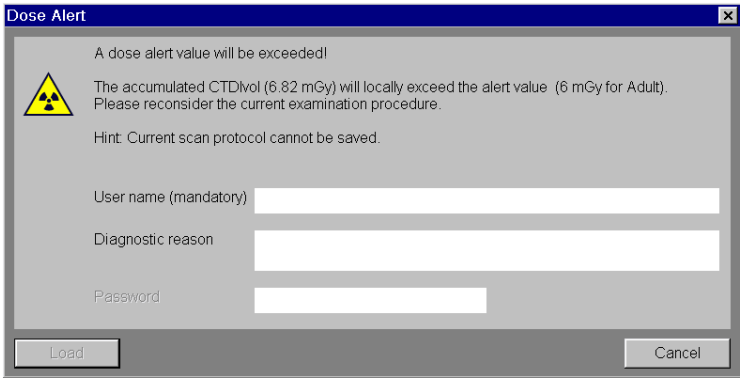
If you want to proceed with the current dose values, type your diagnostic reason and click **Load**. Otherwise, click **Cancel** to stop loading.

- The **Dose Notification** dialog box will not appear if you load a Biopsy or CARE Vision scan step.
- Your operation will be recorded and saved to H:\siteData \DoseLogs. Ensure that you back up the data in case of a system upgrade.

5.3.4 Dose alert

In Examination Configuration, you can set up the thresholds of CTDIvol and DLP for an exam.

During the exam, anytime you click **Load** for a scan, its CTDIvol and DLP are accumulated to the total CTDIvol and total DLP of the exam. If they exceeds the thresholds, a **Dose Alert** dialog box appears. It shows the exam's accumulated CTDIvol or DLP value that exceeds the threshold and the threshold value.



You are required to enter user name, diagnostic reason, and password (if set in Local Service) before you can proceed with the current dose values.

- Different exam dose thresholds can be set up for adult and child in Examination Configuration. The lower threshold value will be used if Chronicle includes both adult entries and child entries.
- To set a password for Dose Alert, click **Configuration** > **Application** in **Local Service**.
- Your operation will be recorded and saved to H:\siteData \DoseLogs. Ensure that you back up the data in case of a system upgrade.

5.4 Image artifacts

Even with a carefully manufactured, calibrated and maintained CT system, patterns can sometimes appear in images which are not part of the computed tomography image. Such patterns are called *artifacts*.

For best image quality results, we strongly recommend to position the patient such that the organ to be examined is in the center of the scan field. Exceptions are examinations of the aorta or the trachea, which should not be positioned in the very center in order to avoid ring artifacts.

Artifacts can have various causes which can in general be divided into two groups: *measurement related* artifacts and *system-related* artifacts.

5.4.1 Measurement related artifacts

The most significant measurement related artifacts are the following:

- Artifacts related to patient table accessories
- Partial volume effects
- Beam hardening
- Metal artifacts
- Motion artifacts

Artifacts of patient table accessories

Certain patient table accessories may cause image artifacts:

- If you use the table top extension image artifacts might occur.
- Be aware that the edges of the straps may cause artifacts.
- Overhanging material flaps

⚠ CAUTION

Flaps outside of the scan range!

Image artifacts.

- Always use patient restraint straps to fix the flaps on the patient.

⚠ CAUTION

Flaps at the head end outside of the scan range!

Image artifacts.

- Put these flaps under the patient.
- Try not to scan the footend region.

Partial volume effects

Thick slices are often preferred instead of thin slices. This helps to increase signal to noise ratio and to limit the examination time by reducing the number of slices. However, this may result in partial volume effects. These are caused by high density tissues (such as a bone) or objects (such as pacemakers) projecting only partly into the slice plane. One such well-known artifact is the so-called Hounsfield bar between the petrous bones. Other regions of the skull are also problematic with regard to partial volume effects which are visible as dark streaks. Additional correction and / or special parameter settings (head modes) help to minimize these effects.

- To avoid partial volume effects, use thinner slices.

Beam hardening

When X-ray beams pass through tissue, the average energy of the radiation spectrum is shifted towards higher energy. This is known as *beam hardening*. It depends on the material density and thickness of the tissue through which the X-ray beam passes.

For body parts similar in density to water, for example, soft tissue, the effect on the CT image can be compensated. In areas of high density such as hips, shoulders or lower skull, hypodense streaks and areas with reduced CT values can be seen. Along the sides of the upper part of the skull, the so-called “cupping effect” can be seen as a brightening of the CT values. The cupping effect also occurs in rare cases such as infant skull tomograms, due to residual extra focal radiation.

Additional corrections and/or special kernel parameter settings (head modes) help to minimize these effects. Yet, they cannot fully eliminate them.

Metal artifacts

Metal objects such as tooth fillings, surgical clips, jewelry, hair clips, belts or hip prostheses, and so on, can cause extreme forms of beam hardening artifacts. Depending on density and size, they can lead to total absorption of the radiation. This results in corresponding strong black or white streaks or star-shaped artifacts.

Motion artifacts

Movement of organs in the slice or displacement of the entire slice during scanning likewise causes bright and dark artifacts. These are usually seen as streaks or in areas of low density. To reduce motion artifacts use the automatic patient instructions (API) function for breathing and swallowing commands.

CAUTION

Motion-related artifacts may lead to suboptimal detection performance!

Wrong basis for diagnosis.

- Use single-breath hold technique for image acquisition.

Greater difficulties are encountered with peristalsis. Heartbeat artifacts are also problematic.

5.4.2 System related artifacts

System related artifacts may be due to the following:

- Uncalibrated system
- Detector deviations

Uncalibrated system

If the CT system is not properly setup (for example, no check-up performed) CT scale displacements and inhomogeneities can result. This may result just after switching on the unit, during warm-up to operational temperature (calibration), or due to an extended length of service of the X-ray tube. The same applies to defects in the measurement system.

The daily quality checkup usually detects and reports such discrepancies. Additional calibrations may also be necessary if large changes in temperature occur in the room.

⚠ CAUTION

When you restart the system, the detector has not yet reached operating temperature!

Wrong diagnosis due to image artifacts.

- Calibrate the system as part of the checkup. Repeat calibration (**Setup > Calibration**) if ring artifacts occur.

Other system defects or calibration deviations cause streaks or (partial) rings to appear in the CT image.

Detector deviations

In CT systems with a rotating combined tube-detector system even minimal deviations of individual detector channels from the original calibration level may lead to rings or partial ring artifact structures in the CT image. The closer such channels lie to the detector center, the greater are these effects.

In an extreme case, rings may appear concentrated as a blurred spot in the center of the scan field (the scan field center appears at the image center if the **Center X** and **Y** image parameters are both zero). Such rings are easily recognizable, but a blurred spot in the center of the scan field might lead to inaccurate diagnoses.

5.4.3 Scan repetition due to image artifacts

Measurement related or system related artifacts cannot always be excluded. Therefore the scan should be repeated if a tomographic structure appears questionable. This should be done after slightly shifting the patient's position within the slice, for example, by changing vertical position of the table by more than 5 mm. The result can be used to exclude system-dependent long-term or temporary equipment faults as the artifact cause.

⚠ CAUTION

Artifacts affecting the diagnosis are evident or suspected in a patient image, or the patient may have moved during scanning!

Improper diagnosis possible.

- Scanning must, under all circumstances, be repeated with a slight shift in patient position.

Persisting object related artifacts can be considered measurement-related with a high probability. They should be recognizable as such by an experienced radiologist.

5.5 Scan protocols

A scan protocol pre-defines examination steps. Scan protocols are the building blocks to set up the examination procedure. Siemens provides you with a large set of scan protocols that cover most of your routine CT examinations. You can also create your own scan protocols.

- You can create, edit, or delete scan protocols using **Scan Protocol Assistant**.
- During patient registration, you can select a scan protocol from the **Study** list in the **Patient Registration** dialog box.
- At any time before an exam is closed, you can modify the examination procedure by selecting scan protocols in **Patient Model Dialog**.

Siemens scan protocols provide an optimized set of default parameters balancing image quality, scan time, and patient dose. They are defined to be applied directly to your examination after minor adaptions of, for example, the language of the Automatic Patient Instructions. Special clinical conditions and applications may require the adaption of the default recommendations. As the final diagnosis is the sole responsibility of the user, the user always has to make sure that the chosen scan protocol meets the requirements of the examination.

5.5.1 Creating custom scan protocols

You can create a custom scan protocol based on either a Siemens default protocol or an existing custom protocol. When you modify a Siemens default protocol, the modified protocol becomes a custom protocol. You can create a custom scan protocol in the following ways:

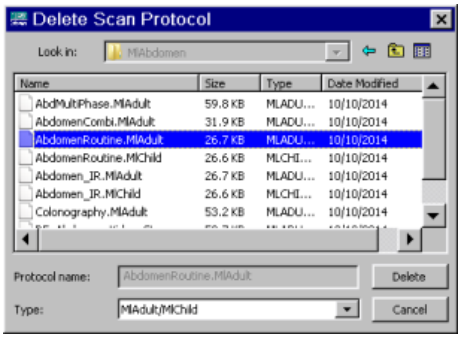
- Load a base protocol into Chronicle. Then, you can manipulate Chronicle, for example by adding/deleting exam steps or changing exam parameters. Finally, select **Edit** > **Save Scan Protocol** to save Chronicle in a new scan protocol.
- Use **Scan Protocol Assistant** to edit a scan protocol.

5.5.2 Deleting scan protocols

1 Select **Edit** > **Delete Scan Protocol** from the main menu.

2 In the **Delete Scan Protocol** window, double-click the folder of a protocol group. For example, abdomen protocols can be found in the **MIAbdomen** folder.

3 Select the protocols you want to delete.



4 Click **Delete**.

- You can select multiple protocols to be deleted.
- You need to enter a password to delete a scan protocol, if the password is set in **Configuration** > **Application** in Local Service.

5.5.3 Average CT

Scan protocols marked with the suffix “Avg” use Average CT mode. This allows the system to acquire a CT volume to show organ motion as blurred images. The very low pitch factor allows the blurry image to cover the full organ motion cycle.

CAUTION

Usage of the Average CT images for normal CT diagnosis!

Wrong diagnosis.

- The image generated by the Average CT mode shall not be used in normal CT diagnosis because of the possible artifacts and low resolution.

5.5.4 Osteo

The **Osteo** scan protocol is used for quantitative assessment of vertebral BMD (Bone Mineral Density) in the diagnosis and follow-up of osteopenia and osteoporosis.

The scan data of an **Osteo** exam is processed by the *syngo* **Osteo** application. The age and sex of the patient are taken into account in *syngo* Osteo CT evaluations.

CAUTION

Wrong entry of patient sex or age!

Wrong basis for diagnosis.

- Make sure that the patient sex and age are correct.

After you have finished the topogram scan, you can see one or more examination ranges marked in the topogram.

CAUTION

Scan lines at wrong position for osteo examination!

Wrong diagnosis caused by wrong image information.

- Check that position of scan lines is in the middle of the vertebral body.

Fractured vertebrae are *not* suited to *syngo* **Osteo** evaluation because the more compact nature of these vertebrae results in a BMD value that is much higher than expected.

5.5.5 Scan Protocol Assistant

Scan Protocol Assistant is a step-based wizard that guides you to set up scan protocols. The wizard contains up to 5 steps for various tasks.

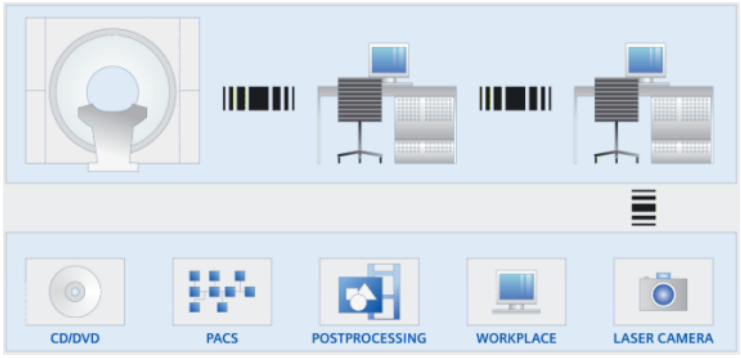
You can work with two types of protocols:

- Siemens protocols
- Custom protocols

Use of Scan Protocol Assistant requires a license.

5.6 *syngo* CT Workplace

For an efficient workflow, CT examination can be shared between two workstations: *syngo* Acquisition Workplace and *syngo* CT Workplace.



You scan a patient using *syngo* Acquisition Workplace. The scan data stored in Local Database of Patient Browser is shared between the two workstations. On the other workstation, *syngo* CT Workplace, you can load the same scanned patient for images processing, including the following tasks:

- Reconstructing images on the **Recon** task card
- Viewing images on the **Viewing** task card
- Filming images on the **Filming** task card
- Post-processing 3D images on the **3D** task card
- Evaluating images by using various CT applications, for example, *syngo* Volume or *syngo* Dynamic Evaluation
- Transferring or archiving images

- At the *syngo* CT Workplace, you can get the latest scan data from *syngo* Acquisition Workplace by choosing **View** > **Refresh** in Patient Browser.
- On *syngo* CT Workplace, all E-Logbook configuration changes take effect on E-Logbook Browser after a restart of *syngo* CT Workplace.
- The availability of *syngo* CT Workplace depends on your CT configuration.

5 Examination basics

6 Planning an examination

Proper patient positioning & instructions will smooth your exam workflow and avoid exam delays.

- Patient registration

  Before you examine a patient, you need to register the patient. Patient registration means that you provide the CT system with the patient information that is necessary for the examination, such as the patient's name, patient ID, date of birth, and sex.

- Selecting a scan protocol

  A scan protocol pre-defines exam steps. Scan protocols are the building blocks to set up the examination procedure. After you click the **Exam** button in the **Patient Registration** dialog box. Patient Model Dialog appears automatically for you to select a scan protocol.

- Patient positioning

  You place the patient on the patient table and position him or her for the examination. For safe and comfortable positioning of the patient, positioning aids are available.

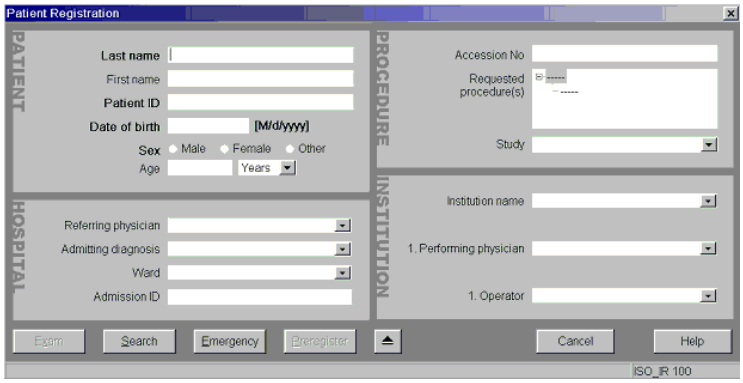
6.1 Patient registration

Before you examine a patient, you need to register the patient. Patient registration means that you provide the CT system with the patient information that is necessary for the examination, such as the patient's name, patient ID, date of birth, and sex.

Patient name, patient ID, date of birth and sex are used for unique identification of a patient in the databases or of exported data on devices.

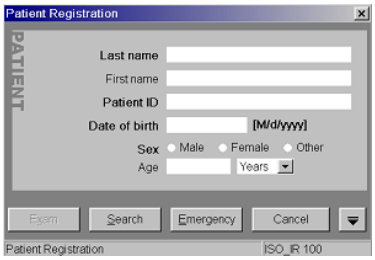
6.1.1 The Patient Registration window

Click the **Patient Registration** icon or press the patient registration key on the symbol keypad (Num 0) to open the **Patient Registration** dialog box.



Patient Registration dialog box (full-size view)

You can switch to the compact view of the registration dialog box by clicking the **Fold** button ( ). Click the **Unfold** button ( ) to switch back to the full-size view of the dialog box. When being opened a second time, the dialog box appears in the same view as being lastly closed.



Patient Registration dialog box (compact view)

- The items in **bold** must be filled in. Otherwise, the **Preregister** and the **Exam** buttons are not available.
- An easier way to fill in the patient's birth date is to enter the age and then click into the **Date of birth** box. The patient's year of birth will be calculated and automatically filled in, together with the current month and day. You just need to change the current month and day to match the patient's birth date.
- An easier way to get a patient ID is to click into the **Patient ID** box, and then click into any other box, an ID will appear automatically.

6.1.2 Registering an emergency patient

If a patient is in a critical condition and therefore has to be treated and examined immediately, you can use the emergency registration.

1 Click the **Patient Register** icon.



2 Click **Emergency** in the **Patient Registration** dialog box.

The emergency protocol is automatically added into Chronicle. The dialog box closes automatically. Proceed to scan the patient

- The emergency protocol is defined in **Scan Protocol Assistant**.
- Emergency patients are registered with provisional data. The data needs to be corrected and completed after the emergency exam.
- You cannot perform the emergency registration while a scan is being loaded or is in progress.

6.1.3 Registering a new patient

1 Click the **Patient Register** icon.



2 Enter the patient information in the **Patient Registration** dialog box.

3 Click **Exam**.

The **Patient Model Dialog** box appears, in which you select the scan protocol for a patient.

6.2 Patient positioning

You position a patient on the patient table for a scan. The patient should be positioned comfortably in an anatomically correct position. Positioning aids can be used to make it easier for the patient to rest securely and calmly. For best image quality, the body part to be examed should be as near to the gantry isocenter as possible.

✓ The patient table is lowered so that it is easy for the patient to sit down or to be placed on.

1 Ask the patient to lie down in an appropriate position and use positioning aids if necessary.

- Supine or prone
- Head or feet first
- Left or right lateral

2 Position the body part to be examed in the middle of the table top.

3 Turn on the laser light marker to visualize the gantry isocenter and the radiation exposure plane.



4 Align the radiation exposure plane at the body position where you want to start a scan, by moving the patient table into the gantry opening.



5 Adjust the table height so that the body part to be examed is vertically as near to the gantry isocenter as possible.



6 Turn off the laser light marker.



From now on, the patient must lie still.

- Jewelry, glasses, prostheses, and so on, must be removed from the body part to be examined.
- Keep an eye on the patient in case of any injury while moving the table.
- Prevent crushing of infusion lines, respiratory tubes, catheters, and ECG cables while moving the table.

6.2.1 Patient positioning safety

If the system is operated correctly and the patient is correctly positioned, there is very little risk of injury to the patient or personnel.

The patient must be positioned in such a way that he or she cannot collide with or be injured by table top movements or the tilting movement of the gantry.

- Immobilize the arms of the patient with the straps supplied to rule out collisions and injury to the hands under the table top.
- Special caution is required with obese, unconscious, apathetic, unresponsive, or pediatric patients. With obese patients, make sure that no collision occurs.

⚠ CAUTION

Improper patient positioning!

Injury of the patient by moving parts.

- Ensure that neither the patient's clothing nor hair can get caught in mechanical parts.
- It is very important to ensure that infusion lines and respiration tubes, catheters and ECG cables cannot get caught in the space between the table top and the side parts. These components must not be put under tensile stress in any other way.
- Make sure that patient bedding cannot get caught by moving parts of the patient table.
- Use positioning aids as described.

Before you start the examination convince yourself that the patient is not endangered either by the movement of the table or by the tilt of the gantry.

CAUTION

Unintentional patient movement!

Contusion of patient extremities at patient table and gantry.

- Always fix and observe the patient during system movements.

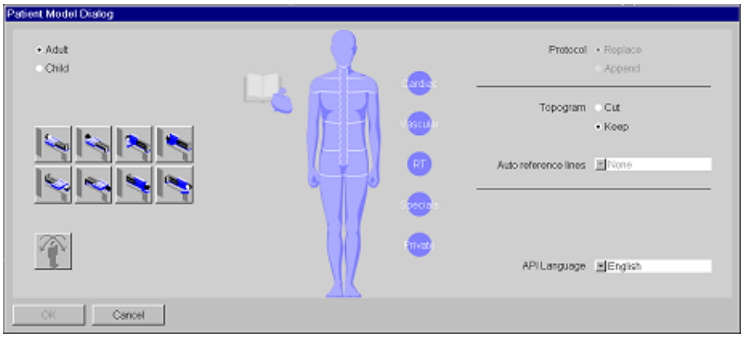
6.2.2 Patient instructions

If the patient must hold his or her breath during CT acquisitions, please ensure he or she is instructed how to prior to examination. This especially applies to examinations of the thorax and abdomen. However, the slight movement that respiration inevitably causes, can also lead to artifacts in other regions.

- Explain to the patient before the examination how he or she should breathe.
- Explain to the patient that he or she must hold his or her breath for a relatively long time.
- Use the intercom system to give the patient breathing instructions.

6.3 Patient Model Dialog

In Patient Model Dialog, you select scan protocols for an exam. You can also set up the patient position, auto reference lines, and the API language for an exam.



6.3.1 How is Patient Model Dialog accessed

Patient Model Dialog appears in the following situations:

- At the beginning of an exam

  After you click the **Exam** button in the **Patient Registration** dialog box. Patient Model Dialog appears automatically for you to select a scan protocol.

- Before an exam is closed

  You can open Patient Model Dialog anytime by clicking the **Select or change exam** icon in the lower-left corner of the **Examination** task card.

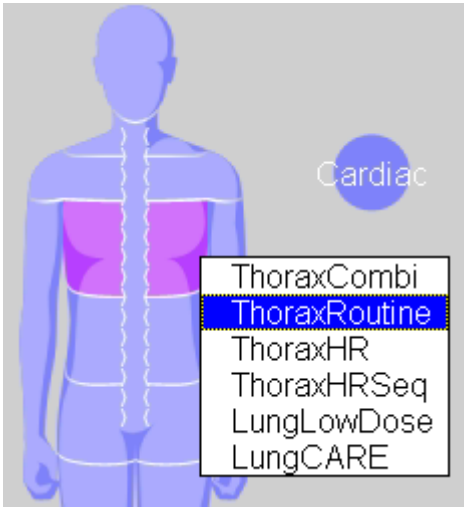


6.3.2 Selecting a scan protocol

1. In Patient Model Dialog, ensure that the correct patient size is clicked: **Adult** or **Child**.
2. If exam steps already exist in Chronicle, do *one* of the following:
   - To append a scan protocol after the last exam step, click **Append**. Click **Cut** if you want to remove the topo scan (if any) of the protocol for appending; otherwise, click **Keep**.
   - To replace the non-executed exam steps with a scan protocol, click **Replace**. Click **Cut** if you want to remove the topo scan (if any) of the protocol for replacing; otherwise, click **Keep**.

3 Do *one* of the following:

- To exam a body region, point to the body region and select a scan protocol.



- To perform a special exam, point to a non-anatomical group (for example, **Vascular**) on the right side and select a scan protocol.

It is *not* recommended to combine adult scan protocols with child scan protocols.

6.3.3 Setting up a patient position

Patient positions are indicated by the position icons in Patient Model Dialog. The patient position for an exam is indicated by the clicked position icon.

Icon	Patient position
	**Head first - supine (H-SP)**

Icon	Patient position
	Head first - prone (H-PR)
	Head first - right lateral (H-RL)
	Head first - left lateral (H-LL)
	Feet first - supine (F-SP)
	Feet first - prone (F-PR)
	Feet first - right lateral (F-RL)
	Feet first - left lateral (F-LL)

A wrongly selected position will result in invalid orientation information on CT images.

CAUTION

Wrong entry of patient position!

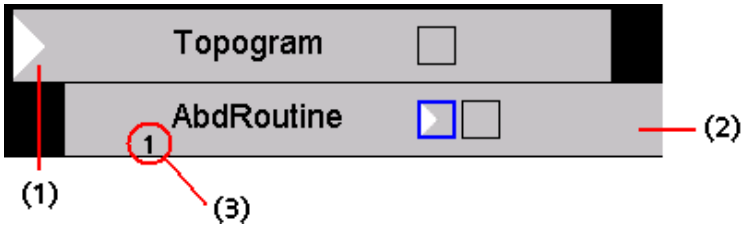
Wrong basis for diagnosis.

- Make sure that you enter the patient position correctly.

- In Patient Model Dialog, click the position icon corresponding to the current position of the patient on the patient table.

6.4 Chronicle

Chronicle is a list of exam steps. It controls the entire examination procedure.



Chronicle

(1) White arrow: the exam step to be executed

(2) Selected exam step

(3) Scan step No.

- If an exam step is selected, it is shifted to the right side. The parameters of the step appear on the neighboring sub-task cards, for example, the **Routine** sub-task.
- The exam step to be executed is marked by a white arrow.
- Exam steps are executed one after another, in the order they are listed.

For performance reasons, it is *not* recommended to have more than 20 non-performed scan steps in Chronicle.

6 Planning an examination

7 Routine examination

A CT examination consists of the following steps:

- Preparing an examination
  - Patient registration
  - Patient positioning
- Loading a scan protocol

  A scan protocol pre-defines exam steps. After you click the **Exam** button in the **Patient Registration** dialog box. Patient Model Dialog appears automatically for you to select a scan protocol. The scan protocol is then loaded into the **Examination** task card.
- Scanning a patient
  - Acquiring a topogram
  - Acquiring tomograms
- Reconstructing images

  A CT scan collects the image raw data. From the raw data, it is possible to reconstruct several sets of diagnostic images with different recon parameters. Image reconstruction is done in recon jobs. Every scan comes with at least one default recon job. if necessary, you can create additional recon jobs to reconstruct more images.
- Evaluating images
- Documenting exam results

7.1 General safety of CT examinations

CAUTION

Superimposition by subfunctions, for example, SOMATOM life!

Scan parameters are superimposed. Dose not as desired.

- Close subfunctions before scan start.

CAUTION

Wrong entries!

Dose not as desired.

- Check scan parameters before scanning.

CAUTION

Wrong table feed direction!

X-ray not, or only partially, usable.

- Always keep an eye on the patient.
- Stop scanning in case of wrong table feed direction.

CAUTION

Wrong correction tables are used for reconstruction!

X-ray not, or only partially, usable.

- Run daily quality tests.

The **Examination** task card offers you several functions regarding the dose safety of a scan:

- If the dose efficiency of a scan is below 70%, you are informed by a message box when you load the scan.
- When more than one scan is planned without table feed in the sequence mode, you need to confirm this in a message box.

- If you stop a scan shortly after its x-ray is activated, the acquired raw data of the scan may not be sufficient for images reconstruction. The scan does not produce any images but it yields dose whose information will be recorded in relevant reports.

  The Chronicle entry for the stopped scan will be automatically repeated.

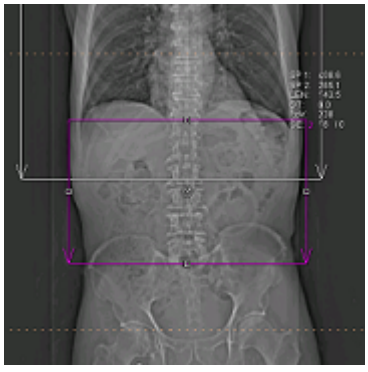
7.2 Acquiring a topogram

The first step in a CT examination is typically a topo scan. The resulting image - a topogram - appears in the topo segment (upper-left segment) on the **Examination** task card.

A topogram is represented in following ways in the topo segment:

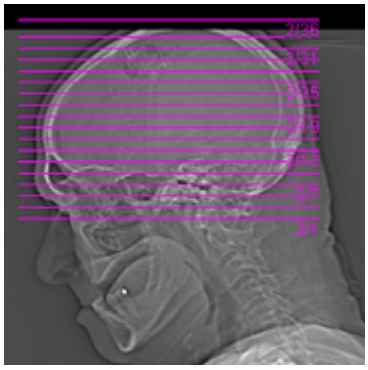
- AP view

  The X-ray tube position is **Top** or **Bottom**. A topo scan produces a topogram in the anterior-posterior view.



- Lateral view

  Using the **Lateral** tube position, a topo scan produces a topogram in the lateral view. The patient table is always at the right side of the topogram.



A topogram is used for the following purposes:

- To plan the ranges for scanning and reconstructing tomograms
- To watch the progress of a tomo scan
- To document reference lines



If desired, you can acquire tomograms without a topogram.

7.2.1 Starting a topo scan

✓ The patient table has been moved to the starting position of the topo scan.

1 Close the door of the scan room.

2 In Chronicle, select a topo entry and check the exam parameters on the sub-task cards.

CAUTION

Wrong entries!

Dose not as desired.

- Check scan parameters before scanning.

3 Click **Load**.



4 Press **Start** on CT control box when prompted.



Radiation starts. The topogram appears in the topo segment.

The topogram is displayed in real-time to indicate the scan progress. As soon as the desired portion of the topogram appears, you can suspend the topo scan, thereby reducing the patient's exposure to radiation.

7.2.2 Suspending a topo scan

✓ A topo scan is in progress.

◆ Do *any* of the following:

- Click **Suspend**.



- Press **Suspend** on CT control box.

The topo scan is stopped. Part of the topogram remains in the topo segment.

If you suspend a topo scan during the scan start delay, the scan is unloaded.

7.3 Planning an exam range

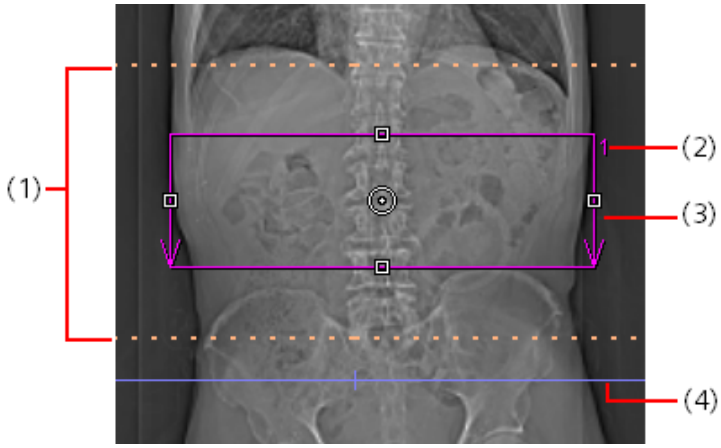
The exam range should be planned on a topogram to cover the desired anatomic region for diagnosis. First of all, you can zoom or pan the topogram for a better view. Several ways help you to define a range efficiently.

◆ Do one of the following:

- Use the **Recon region** list on the **Recon** sub-task card for automatic region detection, if available.
- Move or resize the range object in the topo segment to define a range approximately.
- Edit the range parameters on sub-task card to define a range precisely.
- Ctrl-drag a range object to enable or disable auto FoV, if applicable.
- Shift-drag a range object to prevent operations on a range group.

7.3.1 About an exam range

The range of a tomo scan is graphically represented in the topo segment.



Graphic objects in the topo segment

(1) Radiation exposure range

(2) Scan step No.

(3) An exam range

(4) Table position

Colors are used to identify the status of a range:

- Magenta: the active (selected) range
- White: all other (unselected) ranges
- Yellow: an invalid range

The exposure range is larger than the exam range. The exposure range is shown by default. You can hide it in Examination Configuration.

7.3.2 Exam range object

An exam range is graphically represented with rectangles, cutlines, or parallelograms in the topo segment.

The upper and lower borders (decided by scan **Begin** & scan **End**) of a rectangle indicate the scan range. Left and right borders (decided by **Center X** & **FoV**) indicate the image recon scope of the selected recon job. Arrows indicate the scan direction.

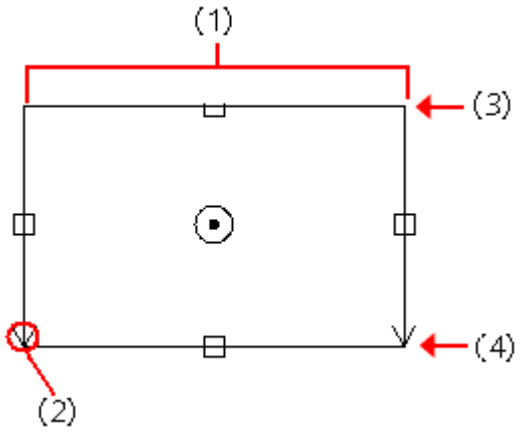


Illustration of an exam range object

(1) FoV

(2) Scan direction

(3) Scan begin position

(4) Scan end position

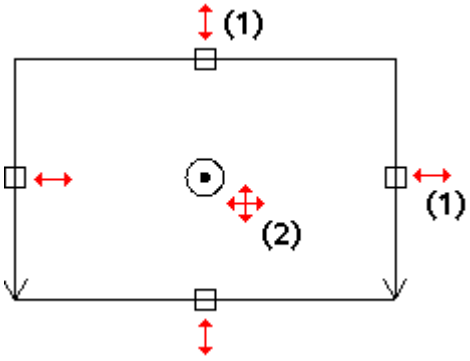
If the patient table does not move, the exam range is graphically represented as a cutline.



If the gantry is tilted, the exam range is represented as a parallelogram on a lateral topogram. Inclination of the parallelogram corresponds to **Tilt**.

To select an exam range object, you can click it in the topo segment, or select the corresponding tomo entry in Chronicle. Handles appear around a selected exam range object, allowing you to manipulate it.

To manipulate an exam range object, use drag-and-drop operations at different places, as shown below:



Manipulation of an exam range object

(1) Resize

(2) Move

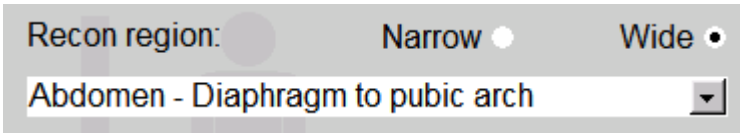
The following table lists the manipulation of an exam range object:

To...	Point at...	Cursor shape
Move range object	The pivot / area near the four borders	
Change range object width	Left/right handles	
Change range object length	Upper/lower handles	
Title range object (on a lateral topogram only)	Corners / upper & lower borders	

When a range object is resized or moved, the corresponding range parameters are updated on sub-task cards, and vice versa.

7.3.3 FAST Planning

The FAST Planning function automatically locates a desired body region on a topogram. On the **Recon** sub-task card, you can select the body region from the **Recon region** list. To turn off FAST Planning, select **None** from the list.



Depending on the patient physique, **Narrow** or **Wide** can be selected on the **Recon** sub-task card. The **Narrow** option does not include soft tissue. The **Wide** option includes soft tissue.

- Once you change a range manually during an exam, FAST Planning will be turned off.
- Auto FoV cannot be used for a range for which FAST Planning is available.

7.4 API & image comments

The API (Automatic Patient Instruction) function plays recorded instructions automatically to guide a patient through an exam. Each API recording consists of two pieces of text: text A and text B.

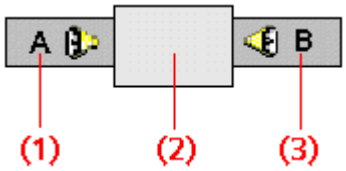
Text A, for example, “Breathe in and hold breath”, is played before a scan. Text B, for example, “Breathe again”, is played after the scan or when the scan is suspended.

You can comment an image with pieces of text. The comments appear at the lower border within the segment showing the image.

7.4.1 About API

The API (Automatic Patient Instruction) function plays recorded instructions automatically to guide a patient through an exam. Each API recording consists of two pieces of text: text A and text B.

Text A, for example, “Breathe in and hold breath”, is played before a scan. Text B, for example, “Breathe again”, is played after the scan or when the scan is suspended.



Automatic Patient Instruction

(1) Text A

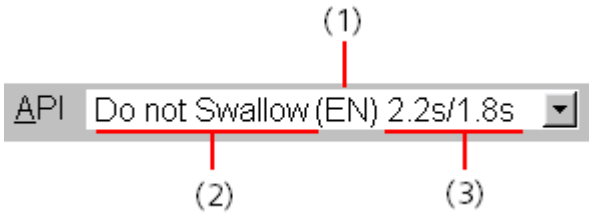
(2) Scan

(3) Text B

The system is delivered with pre-defined API recordings in multiple languages. You can also create custom API recordings in the **API/ Comment Setup** window.

7.4.2 Creating or editing an API recording

The following figure illustrates an API recording.



API recording

(1) API language

(2) API name

(3) Duration of text A and text B

1 Choose **Setup** > **API/Comment**.

2 In the **API/Comment Setup** window, select an API language from the **Language** list.

3 In the **API** list, do *one* of the following:

- To create an API recording, select **New Entry**, overwrite with a new name, and press **Enter**.
- To edit an API recording, select its name.

4 Click **Record**.

5 On CT control box, hold down the **Talk to Patient** key and speak clearly into the microphone to record text A. Release the key to complete the recording.

6 Repeat step 5 to record text B.

The API recording is created or edited.

7.4.3 Using API

To use API during a scan, you need perform the following tasks:

- Selecting an API recording
- Turning on/off API for an exam

Selecting an API recording

1 In Chronicle, select the scan step to which you want to apply an API recording.

2 On the **Scan** sub-task card, select the API language in the **Language** list if necessary.

3 In the **API** list, select the name of the API recording.

An API icon (a speaker) appears on the scan entry.



- The API recording will be played only if you also switch on the API function for an exam (→ Page 202 *Turning on/off API for an exam*).
- To prevent the API recording from being played, select **None** from the **API** list.

Turning on/off API for an exam

The **API** button controls whether your selected API recordings are played in an exam.

API button	Status	Description
	Clicked	Any scan step for which you specified an API recording will play the recording during the exam.
	Un-clicked	API recordings will *not* be played, even if they have been specified for scan steps.

- Do *one* of the following:
  - To switch on API, make sure that the **API** button is clicked.
  - To switch off API, make sure that the **API** button is un-clicked.

If none of the scan steps are specified with an API recording, the **API** button is unavailable.

7.5 Acquiring tomograms

Tomograms are the cross-sectional views of a body region. You acquired tomograms for diagnosis, typically in either spiral or sequence scan mode.

7.5.1 Starting a tomo scan

✓ The exam range of a tomo scan has been planned properly .

1 In Chronicle, select a tomo entry and check corresponding exam parameters on sub-task cards.

CAUTION

Wrong entries!

Dose not as desired.

- Check scan parameters before scanning.

2 Click **Load**.



After a scan has been loaded, any user interaction on sub-task cards should be avoided.

3 If prompted, hold down **Move** on CT control box to move the patient table to the scan starting position.



4 Press **Start** on CT control box.



Radiation starts. Tomograms appear in the tomo segment.

The blue line in the topo segment indicates the position of the patient table.

7.5.2 Suspending a tomo scan

✓ A tomo scan is in progress.

◆ Do *any* of the following:

- Click **Suspend**.



- Press **Suspend** on CT control box.

The tomo scan is stopped.

If you suspend a tomo scan during the scan start delay, the scan is unloaded.

7.5.3 Repeating a tomo scan

1 In Chronicle, right-click a tomo entry.

2 Choose **Repeat** from the shortcut menu.

The tomo entry is repeated before the next non-executed scan step.

7.6 Common recon parameters

Some parameters for CT images reconstruction:

- Slice width
- Recon increment
- Window
- Kernel

7.6.1 Slice width

The slice width is the thickness of the reconstructed tomographic images. It determines the image definition (spatial resolution). As a rule, the slice width should correspond to the smallest anatomic structure to be displayed.

A thicker slice reduces the number of images to be reconstructed and may speed up an examination, but results in poorer image definition. A thinner slice produces good image definition for better separation of neighboring structures, for example, in the inner ear.

On the **Recon** sub-task card, you can select the slice width of a recon job in the **Slice** list. This recon slice is no thinner than the scan slice defined in the scan collimation.

7.6.2 Recon increment

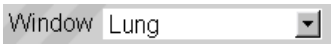
The recon increment defines the distance between recon images.

If the increment is smaller than the slice width, the images are reconstructed with overlaps. This improves the image quality for 3D post-processing. If the increment is larger than the slice width, the images are reconstructed with gaps in between.

7.6.3 Window

Window values (window width and window center) define the brightness and contrast of recon images, based on organ-specific CT values. Appropriate window values produce images with an optimized appearance for a particular organ.

On the **Recon** sub-task card, you can choose the organ-specific window values in the **Window** list.



7.6.4 Kernel

On the **Recon** sub-task card, kernels are selected in the **Kernel** list, for example, B90s. A kernel is a recon parameter affecting image sharpness and noise.

Each kernel's name starts with a capitalized letter representing the body region or a special application. **B** stands for body; **H** stands for head; **U** stands for Ultra High Resolution; **C** stands for child head; **S** stands for a special application (for example, *syngo* Osteo CT).

The image sharpness is defined by the number in the kernel's name. The higher the number, the sharper the image.

Image appearance	Typical kernel number
Smooth	10-20
Medium	30-50
Sharp	60-70
High resolution	80-90

7.6.5 Iterative metal artifact reduction

Metal objects, such as metal implants or metal markers, can cause beam hardening artifacts. Depending on density and size, these metal objects can lead to a total absorption of radiation resulting in strong black or white streaks or star-shaped artifacts. Such artifacts can be reduced by the iterative Metal Artifact Reduction (iMAR) algorithm.

iMAR can be used in conjunction with several other recon options:

- iMAR works for both axial and 3D recon.
- iMAR works with extended FoV.
- iMAR works with an Iterative Reconstruction method.

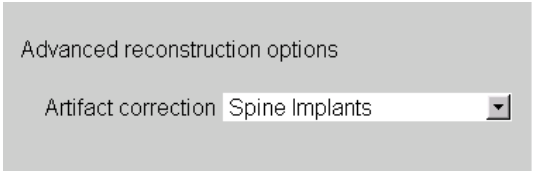
- The iMAR algorithm cannot be applied to images with a high sharpness level. Therefore, smooth and medium kernels up to 40, 41, or 42 are supported with iMAR. For example, kernels up to *Q40s*, *B41s*, *I41s*, *H42s*, or *J42s* are supported. Kernels with a higher sharpness level (for example, *B50s* or *H45s*) are not supported with iMAR. *U* and *V* kernels are also not supported.
- The images reconstructed with iMAR may not be exactly the same as the images reconstructed using a conventional method. Therefore, it is recommended to use both reconstruction methods.

✓ A recon job to which you want to apply iMAR is selected.

1 On the **Recon** sub-task card, make sure an iMAR-compatible kernel is selected (for example, B41s).

2 Click the **iMAR** icon ( ).

The iMAR options appear.



iMAR supports the following implants:

- Neuro coils (iMARne)
- Dental fillings (iMARde)
- Spine implants (iMARsp)
- Shoulder implants (iMARsh)
- Pacemaker (iMARpa)
- Thoracic coils (iMARth)
- Hip implants (iMARhi)
- Extremity implants (iMARex)

The parenthesized abbreviations are made up of "iMAR" and the first two characters of the implant name, for example "iMARne" for neuro coils. The abbreviation will be inserted into the **Series description** box and the **Comments** box for recon jobs using iMAR.

3 In the **Artifact correction** list, select the implant type.

- Use of iMAR requires a license.
- Use of iMAR can be defined in a scan protocol.
- Do not use iMAR images for *syngo* Osteo evaluation.
- iMAR is not applicable to some special scan types, such as Control scan, CARE Vision, Bolus Tracking, and TestBolus.

7.6.6 SAFIRE & SAFIRE Excel

SAFIRE and SAFIRE Excel are both iterative reconstruction methods. Compared with the common reconstruction method, SAFIRE and SAFIRE Excel help achieve similar image quality with reduced dose.

Depending on your system configuration, you have either SAFIRE or SAFIRE Excel, but not both.

About SAFIRE

Sinogram Affirmed Iterative Reconstruction (SAFIRE) is a raw data-based iterative reconstruction method using a special algorithm. Compared with the common reconstruction method based on the same image raw data, the reconstruction with the SAFIRE algorithm produces images with less noise and enhanced image sharpness.

To activate SAFIRE, click the **SAFIRE** check box on the **Recon** sub-task card. Then, specify a value in the **Strength** box. The higher the strength value, the more artificial the images become.



When a recon job is set up to use SAFIRE, the recon job number is marked in blue.



When you select the **SAFIRE** check box, the **Kernel** list on the **Recon** sub-task card changes to the **Algorithm** list. An algorithm's name starts with the character *I* , *J* or *Q*, for example, I30s or J40. Algorithm I corresponds to kernel B. Algorithm J corresponds to kernel H. Algorithm Q corresponds to kernel D.

- Use of SAFIRE requires a license.
- SAFIRE *cannot* work with extended CT scale.
- Do *not* use SAFIRE images for evaluation with the *syngo* Osteo or CaScoring applications.

About SAFIRE Excel

Sinogram Affirmed Iterative Reconstruction (SAFIRE) Excel is a raw data-based iterative reconstruction method using a special algorithm. Compared with the common reconstruction method based on the same image raw data, the reconstruction with the SAFIRE Excel algorithm produces images with less noise and enhanced image sharpness.

To activate SAFIRE Excel, click the **SAFIRE Excel** check box on the **Recon** sub-task card.



When a recon job is set up to use **SAFIRE Excel**, the recon job number is marked in blue.

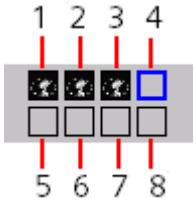


When you select the **SAFIRE Excel** check box, the **Kernel** list on the **Recon** sub-task card changes to the **Algorithm** list. An algorithm's name starts with the character *I* , *J* or *Q*, for example, I30s or J40. Algorithm I corresponds to kernel B. Algorithm J corresponds to kernel H. Algorithm Q corresponds to kernel D.

- Use of SAFIRE Excel requires a license.
- SAFIRE Excel *cannot* work with extended CT scale.
- Do *not* use SAFIRE Excel images for evaluation with the *syngo* Osteo or CaScoring applications.

7.7 Working with recon jobs

A recon job defines a group of parameters used to generate a set of diagnostic images from the image raw data acquired by a scan. Recon jobs of a scan are represented by the recon icons on a scan entry, sorted from left to right, and from the first line to the second line.



When you click a recon icon, its corresponding recon job number is selected on the **Recon** sub-task card, where the recon parameters are available.



On the **Auto Tasking** sub-task card, if you select the **Auto recon** check box for a recon job before a scan, the recon job is automatically executed after the scan.

7.7.1 Status of a recon job

A different recon job icon represents the status of a recon job.

Status	Icon	Description
Open (axial)		The axial recon job has been created, but not executed.
Open (3D)	3D	The 3D recon job has been created, but not executed.
RTR planned		All images of a recon job will be reconstructed parallel to a scan (realtime reconstruction). As soon as the scan is done, the recon job is finished.

Status	Icon	Description
RTD planned		This icon is only available for the default (the first) recon job of a scan. To ensure realtime display of images in the tomo segment, one image per gantry rotation will be reconstructed during a scan. However, gaps are left between the recon images.
RTD processed		This icon is only available for the default (the first) recon job of a scan. The recon job has been processed automatically for realtime display during a scan. After the scan, further execution of the recon job is necessary for a complete set of recon images.
Running		The recon job is running (being executed). Images are being reconstructed.
Queued		The recon job has been queued for execution.
Suspended		The recon job has been suspended.
Finished		The recon job is completed.
Finished (256 matrix)		Only for the recon job using the 256 matrix option of a cardiac spiral scan. The recon job is completed.

7.7.2 Creating a recon job

1 In Chronicle, select a scan entry.

2 On the entry, right-click any recon icon and choose **Add Recon Job** from the shortcut menu.



A new recon icon appears and is selected.



- You can also click one of the recon job numbers (**1** to **8**) on the **Recon** sub-task card. If the clicked number is greater than the quantity of existing recon jobs, one more recon job is added.
- You can add up to 8 recon jobs in one batch. If you want to reconstruct more than 8 sets of images, delete some of the finished recon jobs. The corresponding images will *not* be deleted from the local database in Patient Browser. Then, recon jobs can be added again.

7.7.3 Starting a recon job

You can start an open recon job, a RTD processed recon job, or a suspended recon job, after a scan.

✓ No recon job is running.

1 In Chronicle, click the icon of the recon job you want to start.

2 Click **Recon**.



The recon job is started. Recon images appear one after another in the tomo segment. A blue progress bar appears right to the tomo segment.

7.8 Performing axial recon

An axial reconstruction produces slice images in the axial view.

- First, create a recon job and select **Axial** as the recon type on the **Recon** sub-task card.
- Then, plan an axial recon range. (→ Page 216 *Planning axial recon range*)

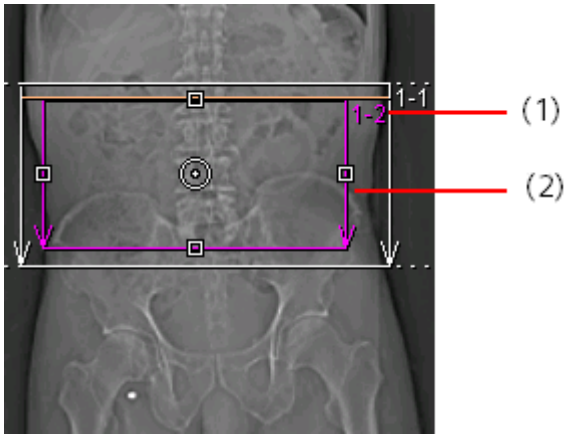
  Other recon parameters, such as slice width and recon increment, are given default values for the recon job. If necessary, you can edit these parameters.

  Before the image is reconstructed, you can click the **Overview** button on the **Recon** sub-task card to reconstruct a test image. This is used to check whether recon parameters are suitable for a proper image quality.
- Finally, start the recon job. Images are reconstructed and appear one after another in the tomo segment.

7.8.1 About axial recon range

After a scan is done and you click the icon for one of the scan's unperformed axial recon jobs, two graphic objects representing the job's recon range appear in magenta in the topo and tomo segments, respectively.

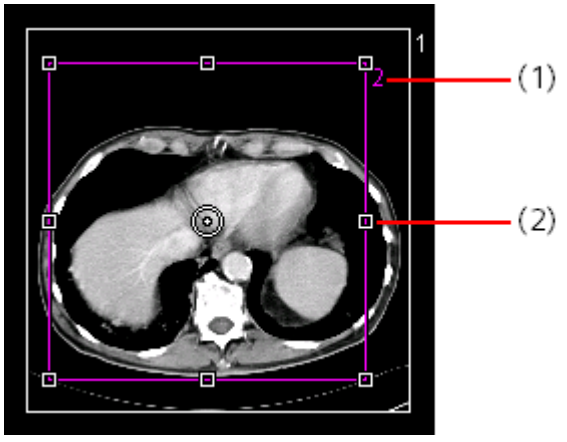
You can manipulate these graphic objects in order to plan a recon range.



Topo segment after a scan

(1) Scan step No. and recon job No. (e.g. 1-2)

(2) Graphic object of a recon range in the topo segment



Tomo segment after a scan

(1) Recon job No. (e.g. 2)

(2) Graphic object of a recon range in the tomo segment

7.8.2 Planning axial recon range

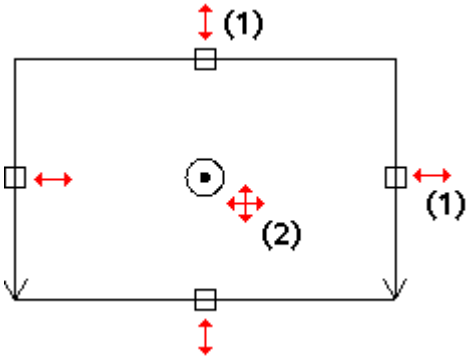
There are several possibilities for you to plan a recon range:

- To plan a range quickly but approximately, you can manipulate range objects in the topo and tomo segments.
- To plan a range precisely, you can edit range parameters on the **Recon** sub-task card.
- You can use the **Recon region** list on the **Recon** sub-task card for automatic region detection, if available.
- You can also copy an axial recon range from another axial recon job.

7.8.3 Editing axial range objects

After a scan is done and you click the icon for one of the scan's unperformed axial recon jobs, two graphic objects representing the recon job's range appear in magenta in the topo and tomo segments, respectively. You can manipulate these graphic objects in order to plan an axial recon range.

The following figure shows the drag-and-drop operations you can perform to a recon range object in the topo segment:



Changing recon range in topo segment

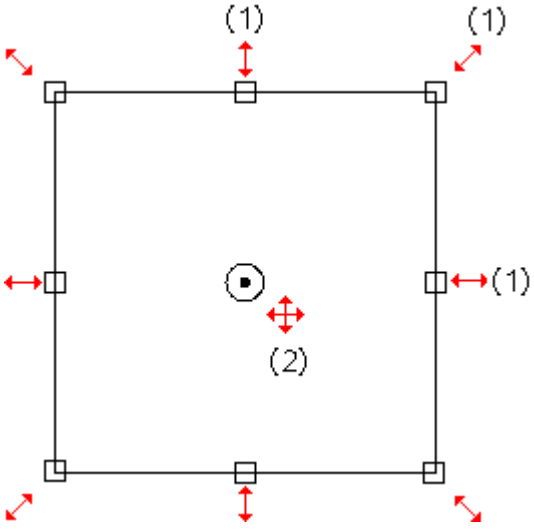
(1) Resize

(2) Move

The following table lists the drag-and-drop operations to a recon range object in the topo segment:

To...	Point at...	Cursor shape
Move the range	The pivot / area near the object borders	
Change FoV	Left and right handles	
Change the recon starting and ending positions	Upper and lower handles	

The following figure shows the drag-and-drop operations you can perform to a recon range object in the tomo segment:



Changing recon range in tomo segment

(1) Resize

(2) Move

The following table lists the drag-and-drop operations to a recon range object in the tomo segment:

To...	Point at...	Cursor shape
Move the range	The pivot / area near the object borders	
Change the FoV	Any handle	

- When a range object is resized or moved, the corresponding range parameters are updated on the sub-task cards, and vice versa.
- Zoom or pan the topogram or tomograms for a better view.
- Use the **Recon region** list on the **Recon** sub-task card for automatic region detection, if available.
- **Ctrl**-drag a range object to enable/disable auto FoV, if applicable.
- **Shift**-drag a range object to prevent operations on a range group.

7.8.4 Using extended FoV

The extended FoV (Field of View) is used when the standard FoV cannot cover the body region for which you want to reconstruct images.

CAUTION

Reduced image quality caused by extended field of view!

Wrong diagnosis caused by wrong image information.

- For diagnosis, do not use the image area outside the regular field of view. It has reduced quality and may contain artifacts.

The images reconstructed with the extended FoV are marked with a red circle, indicating the standard FoV range. To delete this red circle, select it and press the **Delete** key.



- On the **Recon** sub-task card, select the **Extended FoV** check box.

- The image area outside of the red circle has a reduced image quality and is *not* suitable for diagnostic purposes.
- Use of extended FoV requires a license.

7.8.5 Using extended CT scale

Using an extended CT scale, a wider range of CT values (from -10240 to +30710 Hounsfield units) can be distinguished on images. When this option is selected, objects with a higher attenuation, such as metal implants, are shown within the gray scale instead of in white.

- On the **Recon** sub-task card, select the **Extended CT scale** check box.

7.9 Performing 3D recon

To improve workflow efficiency, you can perform 3D image reconstruction directly on the **Recon** sub-task card. This is more convenient than evaluation using the separate **3D** task card. You can reconstruct both MPR and MIP images.

Before you plan a 3D reconstruction, make sure that a spiral scan has been finished and at least one axial recon job has been finished. The axial recon images are used as the base images for planning a 3D reconstruction.

- Firstly, create a recon job and select **3D** as the recon job type on the **Recon** sub-task card. An open 3D recon job is indicated by a 3D recon job icon.

  On the 3D recon toolbar, select the desired planning base in the **Planning base** list. The axial recon jobs that have been finished and that are listed before the 3D recon job are available for you to select.

- Secondly, you need to plan the 3D recon orientation. In a standard 3D orientation, you can reconstruct coronal, axial, or sagittal images. If you want to reconstruct images at sloping slices, you need to define an oblique axis.

  Next, plan the 3D recon volume by setting up the recon starting & ending positions, and by setting up the recon FoV.

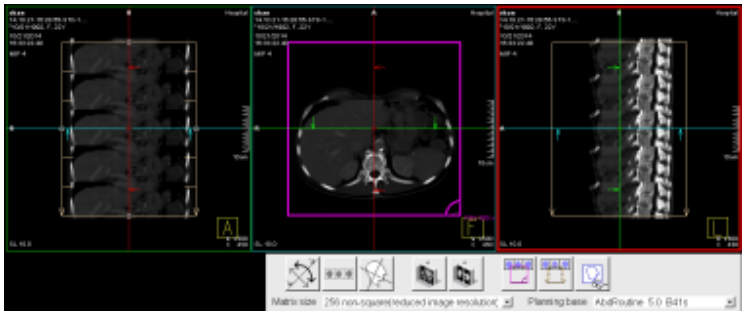
  Other recon parameters, such as slice width and recon increment, are given default values for a recon job. If necessary, you can edit these parameters. Before the image is reconstructed, you can click the **Preview Image** icon on the 3D recon toolbar, and check the preview image to decide whether current recon parameters are appropriate.

- Finally, start the 3D recon job.

- Use of 3D recon on the **Recon** sub-task card requires a license.
- 3D recon can be done using the raw data acquired only by spiral scans without gantry tilt.

7.9.1 3D recon segments

When the **3D** recon job type is selected on the **Recon** sub-task card, the 3D recon segments appear instead of the standard topo and tomo segments.



Each 3D segment shows one plane of a scanned image volume. The following views are shown from left to right:

- Coronal view
- Axial view
- Sagittal view

7.9.2 Using a standard 3D axis

◆ In the **Recon axis** list of the **Recon** sub-task card, do *one* of the following:

- Select **axial** if you want to reconstruct axial images. The second segment (in the axial view) is marked as the FoV segment.
- Select **coronal** if you want to reconstruct coronal images. The first segment (in the coronal view) is marked as the FoV segment.
- Select **sagittal** if you want to reconstruct sagittal images. The third segment (in the sagittal view) is marked as the FoV segment.

7.9.3 Setting up an oblique axis

If you want to reconstruct images at sloping slices, you need to define an oblique axis.

1 On the 3D recon toolbar, make sure that the **Free Mode** icon is activated.

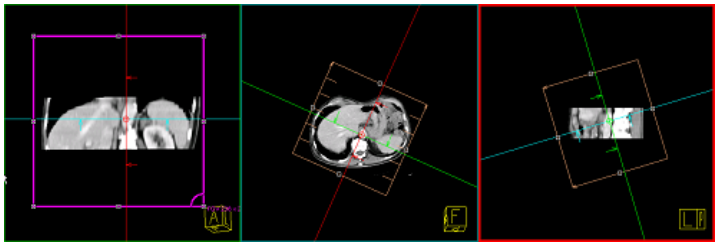


2 Make sure that the **Hide Reference Lines** icon is not activated so that reference lines are shown.



3 In the reference segments, position the mouse pointer close to one of the reference lines. The cursor shape changes into a rotation icon ( ).

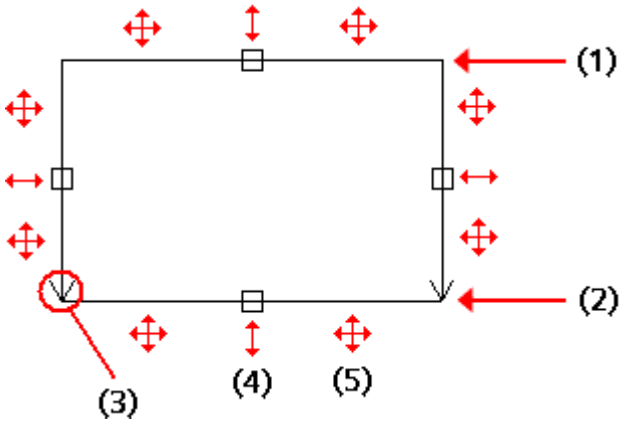
4 Rotate the reference lines by dragging them clockwise or counterclockwise, until the FoV segment shows the image view that you want.



- As soon as any reference line is rotated, the value in the **Recon axis** list changes to **oblique**.
- If the **Free Mode** icon is not clicked, you cannot rotate the reference lines.

7.9.4 Setting 3D recon start and end positions

The recon starting & ending positions are graphically represented in the reference segments by the borders perpendicular to the recon direction, as shown in the following figure:



3D recon range object in a reference segment

(1) Recon starting position

(2) Recon ending position

(3) Recon direction

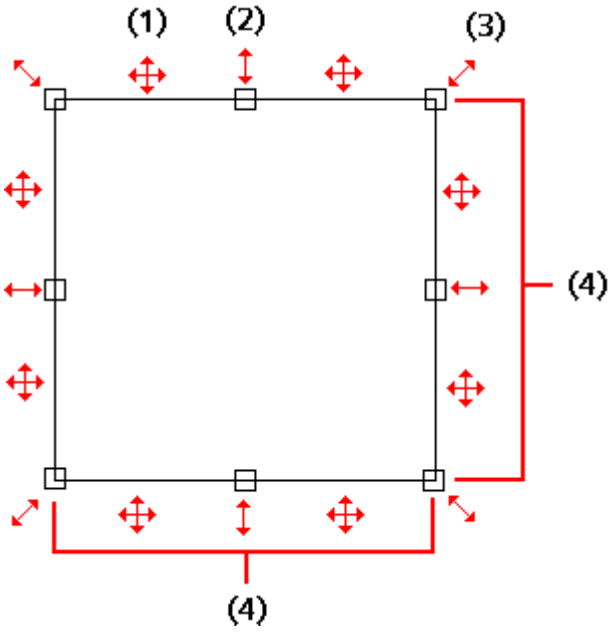
(4) Resize

(5) Move

- In any of the reference segments, drag the borders for the recon starting & ending positions.

7.9.5 Setting up 3D recon FoV

The FoV of a 3D recon job is graphically represented by the FoV object in the FoV segment, as illustrated by the following figure:



3D recon range object in the FoV segment

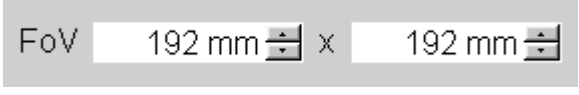
(1) Move

(2) Resize

(3) Resize

(4) FoV

- Do *one* of the following:
  - To set up FoV quickly but approximately, manipulate (drag to move or resize) the FoV object in the FoV segment.
  - To set up FoV precisely, enter values in the **FoV** area on the **Recon** sub-task card.



Images are typically reconstructed in squares, for example, 512 by 512 pixels. If necessary, you can reconstruct non-square images, by selecting an option from the **Matrix size** list on the 3D recon toolbar: **512 non-square** or **256 non-square**. Please note that the 256 non-square option leads to a reduced image resolution.

7.9.6 Using FAST 3D

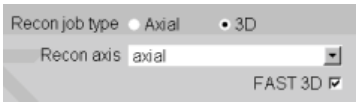
FAST 3D helps you to plan a 3D recon range more efficiently by automatically completing the following tasks:

- Detecting the shape of a scanned body part and its z-axis centerline
- Using the centerline as the 3D recon axis
- Setting the 3D recon volume (recon starting position, recon ending position, & FoV) approximately
- Panning or zooming images in 3D segments

As a result, you see images that can be automatically rotated to fit the patient's anatomy. In 3D segments, recon range boxes and the FoV box approximately cover the body region, resulting in no black recon images. The coronal, axial, and sagittal images are placed in the segment center and properly sized.



FAST 3D can be turned on in a scan protocol. If a protocol has FAST 3D off, you can still activate it on the **Recon** sub-task card after the protocol is loaded into **Examination**. For any new 3D recon job you add from the **Recon** sub-task card, FAST 3D is turned on by default.



If FAST 3D is on for a 3D recon job before a scan, the 3D alignment takes place automatically as soon as you switch to the 3D segments after the scan. You can trigger this automatic 3D alignment any time by activating the **FAST 3D** option on the **Recon** sub-task card.

- FAST 3D results are well suited to be automatically reconstructed. It is also possible to tilt the reconstruction axis manually to further improve the alignment.
- If **Auto recon** has been selected in **Auto Tasking**, FAST 3D is activated by default.
- Use of FAST 3D requires a license.

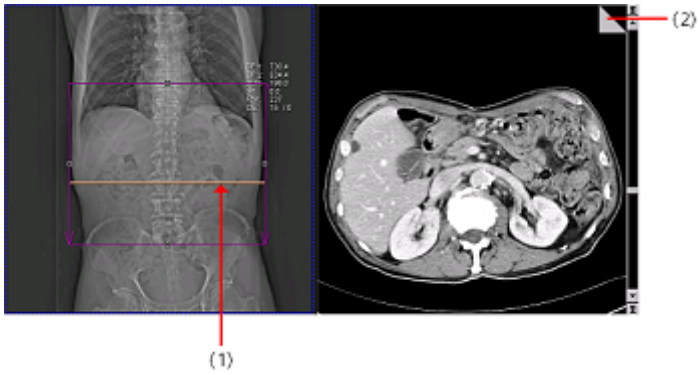
7.10 Images evaluation

In the **Examination** task card, you can perform basic images evaluation after scanning a patient:

- Scrolling through tomograms and view reference lines
- Using the **Graphics** and **Image Manipulation** toolbars
- Sending images to the *syngo* **Viewing** task card.
- Sending images to CT postprocessing applications.

7.10.1 Scrolling through tomograms

An orange line on the topogram indicates the position along the z-axis for the axial image currently appearing in the tomo segment.



Scrolling through tomograms

(1) Z-axis position for the currently shown tomogram

(2) Dog-ear

- In the tomo segment, do *one* of the following:
  - Click the outer part of the dog-ear to scroll forwards through images.
  - Click the inner part of the dog-ear to scroll backwards through images.

You can also scroll through images by rotating the wheel button of your mouse.

7.10.2 The Graphics toolbar

The **Graphics** toolbar provides graphic tools for the evaluation of images.

CAUTION

Distance and angle measurements in the topogram!

Incorrect measurement values due to the projection technique used.

- Only perform distance measurements in the topogram in the longitudinal direction (head-foot direction).
- Do not perform angle measurements.

To open the toolbar, choose **Image** > **Graphics** from the main menu.

- Measure distances



- Draw a Region of Interest (ROI) in a circle



- Draw an irregular shape to evaluate a ROI



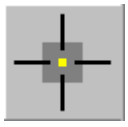
- Write annotation text on images



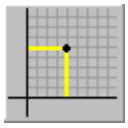
- Measure angles



- Measure the HU value of a small area in pixels



- Set measurement points on crosshair



7.11 Troubleshooting exam

The system informs you when there are scan conflicts. Functionalities such as Scan Assistant help you solve the conflicts.

7.11.1 Exam parameters conflict

The system detects any invalid exam parameters that are highlighted in yellow. To solve an invalid parameter, adjust its value until the highlight disappears.

7.11.2 Using FAST Adjust

The FAST Adjust function assists you in solving the following issues by adjusting scan parameters automatically:

- X-ray tube cooling delay
- Impossible range
- Peak exposure limit
- eMode conflict

If the FAST Adjust function is available, the **Adjust** button appears left to the **Load** button.

The Adjust button	Description
	The FAST Adjust function is available, but not used. Rest the mouse pointer on the button to view the defined adjusting strategies for scan parameters.
	The FAST Adjust function is used. Rest the mouse pointer on the button to view how scan parameters have been adjusted.

The **Adjust** button does not appear in the blow-up view.

- Click the **Adjust** button.



The corresponding scan parameters are adapted.

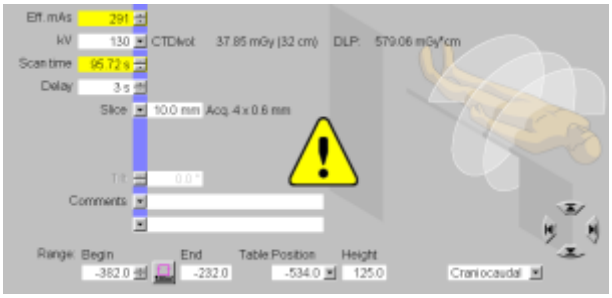
If a problem is not solved by using the **Adjust** button, try to adapt scan parameters manually or use Scan Assistant, if available.

7.11.3 Using Scan Assistant

Scan Assistant assists you in solving the following issues:

- X-ray tube cooling delay
- Impossible range

Scan Assistant is indicated by a warning triangle appearing on the **Routine** sub-task card.



1 Click the warning triangle.

2 In the **Scan Assistant** window, drag the sliders from the red zone to the green zone for the following parameters.

- Scan delay
- Scan time
- Quality ref. mAs / Eff. mAs

- Moving one slider may affect the boundaries of the green and red zones of the other sliders.
- Scan Assistant is only available for a spiral scan.
- Click the **Proposals** button to get further help.

7.12 Closing a scan

◆ Click the **Close current patient** icon.



If E-Logbook is activated, it appears in the sub-task card area. Enter the info about an examination and click **OK**.

The current examination is closed.

7 Routine examination

8 Contrast examination

CT examinations often involve the intravenous (IV) injection of contrast medium. Such contrast examinations improve the characterization of tissue and lesions, as well as increase the opacity of vessels.

There are 3 methods to carry out a contrast examination:

- Bolus Tracking
- TestBolus
- Fixed delay: the radiologist estimates the scan delay for the contrast examination.

8.1 Contrast timing and volume

For contrast examinations, the exact timing for a scan is essential. The scan must be performed when the organ or vessel of interest has the optimal contrast enhancement. Therefore, it is essential to initiate the scan with an appropriate delay.

In multi-phase examinations, the countdown of the delay starts after a preceding phase has finished. In the three-phase liver examination, for example, the scan delay can be set to 600s.

CAUTION

Misunderstanding of reference point for start delay in bolus examination!

Faulty synchronization between bolus and scanning.

- Ensure that the chosen delay time fits to the characteristics of the bolus injection.

CAUTION

Wrong start delay!

X-ray not, or only partially, usable.

- For acquisition with contrast medium, select the flooding time of the contrast medium as the delay.

The amount of contrast medium needed depends on the patient's weight, circulatory condition, and scan duration. In general, no more than 3 ml per kg of body weight for adults and 2 ml per kg of body weight for children should be applied. The scan delay also plays a role. For a CTA study (the arterial phase), the principle is to keep the contrast medium flowing for the scan duration. Thus, the contrast volume can be calculated using the following formula:

Contrast volume = (scan delay + scan duration) × flow rate

8.2 Bolus injector

The system provides a connector for released injectors. Only use injectors that are released for your system. Please contact your Siemens representative for more information.

The injector is connected to the CT system via a permanently installed cable. The installation of the cable must be done by a Siemens service technician.

For installing a permanent connection to the interface unit of rack mounted injectors, an interface connection line is available at the console.

- For further instructions concerning the injector, please refer to the operator manuals of the injector manufacturers.
- In some countries, the bolus injector is only supplied with the additional monitor.

8.3 Bolus Tracking

Bolus Tracking monitors the flow of contrast medium in a vessel, and can trigger a diagnostic spiral scan when the vessel enhancement reaches an optimum level.

- Use of Bolus Tracking requires a license.
- The Bolus Tracking feature is also referred to as CARE Bolus.

8.3.1 Workflow of Bolus Tracking

Before you perform Bolus Tracking, make sure that a topogram has been acquired as usual, and that the parameters for a diagnostic spiral scan are set up properly.

First, insert the Bolus Tracking steps. You can insert the Bolus Tracking steps by right-clicking a spiral entry in Chronicle and choosing **Bolus Tracking** from the shortcut menu. The Bolus Tracking steps are added immediately before the spiral entry.

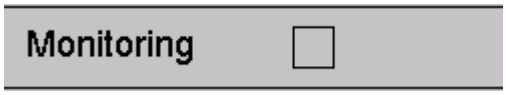
- Pre-monitoring



- IV bolus



- Monitoring



Then, prepare for Bolus Tracking.

In the pre-monitoring step, you acquire an axial image at a reference slice. The image acquisition uses the sequence mode without any contrast medium.

The IV Bolus step provides a pause for the injection of contrast medium. In this step, you place a trigger ROI inside the cross-sectional view of a vessel on the pre-monitoring image. Contrast enhancement in the vessel is indicated by an increase in HU at the ROI. You also activate the auto-trigger option and specify a trigger threshold in HU.

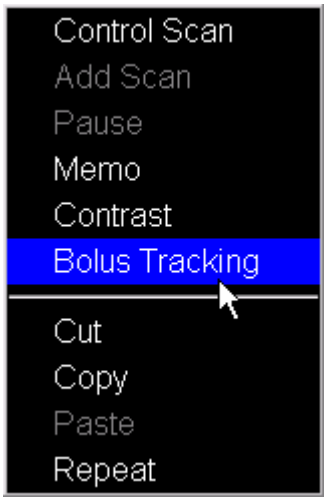
Finally, start Bolus Tracking.

You must start the monitoring step of image acquisitions and start the injection of contrast medium simultaneously. Scans at the reference slice and the HU evaluation of the trigger ROI are carried out repeatedly. When the trigger ROI's HU value reaches the trigger threshold, the monitoring step stops automatically and its next spiral scan is triggered.

8.3.2 Inserting Bolus Tracking

1 In Chronicle, right-click a spiral entry.

2 Choose **Bolus Tracking** from the shortcut menu.



Bolus Tracking steps are added immediately before the spiral entry:

- Pre-monitoring
- IV Bolus
- Monitoring

An injector symbol appears on the monitoring entry, indicating that the injection of contrast medium is needed.

A bracket symbol ([) connects the monitoring entry to the next spiral scan, indicating that these two scan steps are performed with one manual start.

- The pre-monitoring and the monitoring parameters are derived from the following spiral scan. Therefore, you need to set up the parameters of the spiral scan properly before inserting the Bolus Tracking steps.
- Bolus Tracking steps can also be inserted by choosing **Insert** > **Bolus Tracking** from the main menu.

8.3.3 Premonitoring

In the premonitoring step, you acquire an axial image at a reference slice. The image acquisition uses the sequence mode without any contrast medium.

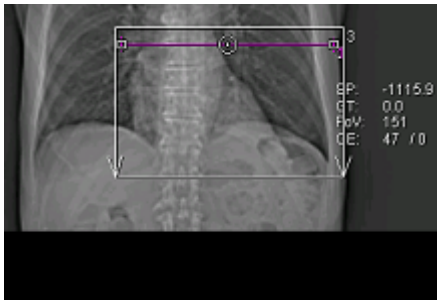
Positioning a pre-monitoring scan

The pre-monitoring scan is a single acquisition of a slice image in the sequence mode for which no contrast medium is used. You need to position the scan properly to acquire the cross-sectional view of a vessel, as required for Bolus Tracking.

✓ A topogram has been acquired.

1 In Chronicle, select a pre-monitoring entry.

2 To place the pre-monitoring cutline at the proper position, do *one* of the following operations on the topogram:



- To move the cutline, drag the line center.
- To change the width of the cutline, drag the side handles.

- When you insert Bolus Tracking steps before a spiral scan, the pre-monitoring & the monitoring cutlines are positioned, by default, slightly ahead of the starting position of the spiral scan. The patient table stays at the cutlines for the Bolus Tracking procedure. After the procedure, the table does not have to move to a new position to initiate the spiral scan. When you drag a cutline towards this default position, the cutline will snap to the position.
- You can define the snapping distance in **Bolus Tracking Configuration**.

Starting a pre-monitoring scan

✓ You have positioned the pre-monitoring scan properly.

1 In Chronicle, select a pre-monitoring entry.

2 Click **Load**.



3 Move the patient table, following the guidance of the yellow message bubble.

4 Press **START** on CT control box.



The pre-monitoring image appears in the tomo segment. The **IV bolus** entry becomes selected in Chronicle.

8.3.4 IV Bolus

The IV Bolus step provides a pause for the injection of contrast medium. In this step, you place a trigger ROI inside the cross-sectional view of a vessel on the pre-monitoring image. Contrast enhancement in the vessel is indicated by an increase in HU at the ROI. You also activate the auto-trigger option and specify a trigger threshold in HU.

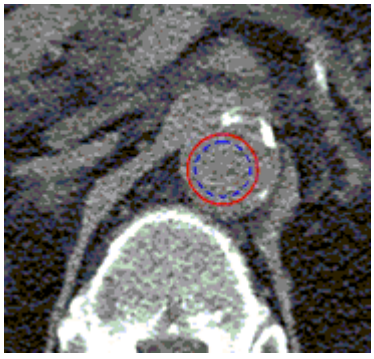
Placing trigger ROI

✓ The pre-monitoring image has been acquired.

1 In the tomo segment, zoom in or pan the pre-monitoring image for a clear view of the vessel to be monitored.

2 Click at the central point of the vessel.

The trigger ROI appears.



3 Make sure that the ROI is positioned well inside the vessel, by moving or resizing the ROI, if necessary.

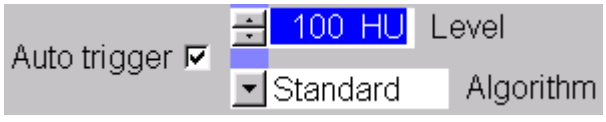
4 Click the **Accept** button.

The ROI is defined.

Specifying trigger threshold

1 In Chronicle, select an **IV Bolus** entry.

2 Make sure that the **Auto trigger** check box is selected and specify the threshold in HU in the **Level** box.



- You need to enter a differential HU value, that is, the relative density increase caused by the CM.
- If you do not select **Auto trigger**, you have to manually start the spiral scan after Bolus Tracking (→ Page 241 *Starting spiral manually after Bolus Tracking*).
- You can change the trigger threshold graphically by dragging the blue line on the **Trigger** sub-task card of the **Monitoring** entry. The threshold value appears to the right of the blue line.

8.3.5 Monitoring

You must start the monitoring step of image acquisitions and start the injection of contrast medium simultaneously. Scans at the reference slice and the HU evaluation of the trigger ROI are carried out repeatedly. When the trigger ROI's HU value reaches the trigger threshold, the monitoring step stops automatically and its next spiral scan is triggered.

Starting monitoring

✓ The trigger ROI has been defined (→ Page 239 *Placing trigger ROI*).

✓ Auto trigger is activated and the trigger threshold has been defined (→ Page 239 *Specifying trigger threshold*).

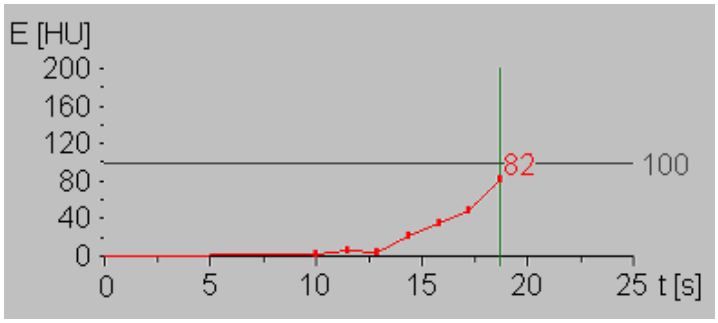
1 In Chronicle, select a **Monitoring** entry.

2 Click **Load**.



3 Press **START** on CT control box to initiate the monitoring step of image acquisitions. Meanwhile, start the injection of contrast medium via your injector.

The system switches to the **Trigger** sub-task card, and shows the time-density curve for the contrast enhancement under each image acquisition.



The countdown of executed image acquisitions appears on the **Monitoring** entry. The tomo segment shows the real-time monitoring images one by one.

As soon as the curve reaches the threshold as indicated by the blue line on the **Trigger** sub-task card, the monitoring step is stopped and the next spiral scan starts automatically.

During the monitoring process, any user interaction should be avoided.

Starting spiral manually after Bolus Tracking

This action is activated in Examination Configuration. You may start a spiral scan manually after Bolus Tracking in the following situations:

- **Auto trigger** is *not* selected in the IV Bolus step. You want to have a manual control of when to initiate the spiral scan.
- **Auto trigger** is selected. However, during the monitoring process, you decide to start the spiral scan in advance to the scan trigger because you have detected the optimal vessel enhancement by observing the images in the tomo segment.
- **Auto trigger** is selected. However, the spiral scan is not triggered due to an improperly placed trigger ROI, a trigger threshold that is too high, or movement of the patient. In these cases, you either repeat the monitoring step or start the spiral scan manually.

- To manually start the spiral scan, do *one* of the following:
  - During the monitoring process, click the **Start Spiral** button or press **START** on CT control box. The spiral scan starts immediately.
  - If the monitoring step does not trigger the next spiral scan, follow the guidance of the yellow message bubble to press **START** on CT control box.

8.4 CARE Contrast

CARE Contrast provides the option to use the injector coupled mode in a contrast examination. You can connect an injector to your SOMATOM CT scanner so that the communication between both devices is synchronized. You can start or stop a scan either via the CT scanner or via the injector. If you press **START** on CT control box, both devices are started simultaneously.

8.4.1 CARE Contrast safety

Use of CARE Contrast requires a license. Refer to the operator manual of your injector manufacturer for more information about scanning in the coupled mode. Siemens will not be responsible for any problems resulting from use of unapproved injectors.

CAUTION

Scanning with coupled contrast medium injection!

Contrast medium not or only partially usable.

- Follow the instructions in the Instructions for Use of your bolus injector.

CAUTION

Scanning with coupled contrast medium injection!

Undesired radiation

- Take care of the modes of scanning and CM injection.

CAUTION

Scanning with coupled contrast medium injection!

Undesired radiation

- Check whether a coupled start is activated or not.

If the injector is not loaded properly, the yellow message bubble reads **Check Injector**.

8.4.2 Working with CARE Contrast

1. In Chronicle, select a scan step that will be executed with the injection of contrast medium and click the **Scan** sub-task card.
2. In the **Scan Start** list, select *one* of the following:
   - **Injector coupled (start button)**: the START key of the CT scanner starts the injector.
   - **Injector coupled (foot switch)**: the foot switch of the CT scanner starts the injector.
3. Load the scan step.

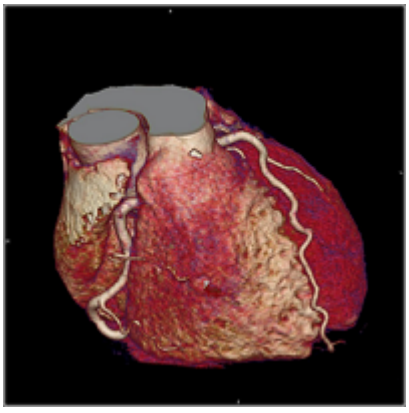
   The system prompts you to arm the injector if it is not loaded properly. When the yellow message bubble shows **Press START**, both the injector and the CT scanner are ready for the examination.
4. Do *any* of the following:
   - Press **START** or the foot switch at the CT scanner.
   - Press **START** on the injector panel outside the scan room or directly at the injector inside the scan room.

   The CT scan and the injection of contrast medium (CM) are started simultaneously.

- When you press **STOP** on CT control box or on the injector panel, CT radiation and the CM injection are stopped immediately.
- When a Control scan is inserted or a coupled range is repeated, the **Scan Start** will be reset to the uncoupled state.
- After you have set up the injector coupled mode for a scan step, you can save the current entries in Chronicle as a custom scan protocol for future use, by choosing **Edit** > **Save Scan protocol** from main menu.

9 Cardiac examination

The motion of the heart makes it difficult to capture static images. A cardiac exam monitors a patient's electrocardiograph (ECG) and uses the ECG signals to control image acquisition. The ECG signals ensure that images are reconstructed during the same cardiac phase. This suppresses motion artifacts.



Cardiac examinations are available in two modes:

- ECG-gated spiral
- ECG-triggered sequence

The availability of the cardiac function depends on your system configuration.

9.1 Cardiac exam safety

WARNING

ECG is used as survival or diagnostic equipment!

ECG leads to wrong diagnosis.

- The ECG monitor may only be used in conjunction with the HeartView/Cardiac CT option. It is not intended for monitoring the patient.

WARNING

Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or arrhythmia!

ECG leads to wrong diagnosis.

- Keep pacemaker patients under close surveillance.

CAUTION

Use of defibrillator!

Patient injury (burn) and destroying the ECG unit.

- The CT plate is grounded. Follow the instructions in the Instructions for Use of the defibrillator before using it.

CAUTION

Use of unsuitable ECG cables or electrodes!

Wrong diagnosis possible.

- Only original Siemens recommended ECG cables shall be used.
- Only CE-marked electrodes shall be used.

CAUTION

Contact between conductive parts of the ECG electrodes and other conductive parts!

Heart arrhythmia.

- To ensure patient safety, the conductive parts of the ECG electrodes (including associated connectors) and other patient-applied parts, should not contact other conductive parts, including earth ground, at any time.

9.2 Preparing a cardiac examination

To prepare a cardiac examination, you need the following basic steps:

- Patient positioning for cardiac
- Placing ECG electrodes
- Observing ECG signals
- Defining heart range

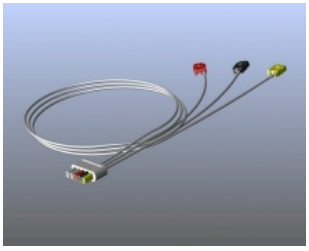
9.2.1 Patient positioning for cardiac

It is important that you position the patient well before a cardiac examination.

- Center the patient in the scan field.
- Immobilize the patient using positioning accessories, if necessary.
- Ensure that the patient's torso is straight.
- Use knee support to improve the patient's comfort.
- Warn the patient of the warm sensation if a contrast agent is going to be administered.

9.2.2 ECG electrodes

The ECG electrodes are connected to the receptacle at the patient table. When applying the ECG electrodes to the patient, the color coding according to IEC or AHA is recommended.



Europe version

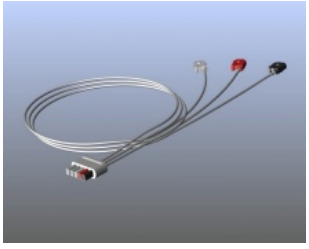
Color coding according to IEC:

- *Red electrode*

  On the right mid-clavicular line, directly below the clavicle.
- *Yellow electrode*

  On the left mid-clavicular line, 6 or 7 intercostal space.
- *Black electrode*

  Right mid-clavicular line, 6 or 7 intercostal space.



USA version

Color coding according to AHA:

- *White electrode*

  On the right mid-clavicular line, directly below the clavicle.
- *Black electrode*

  On the left mid-clavicular line, 6 or 7 intercostal space.
- *Red electrode*

  Right mid-clavicular line, 6 or 7 intercostal space.

The ECG cable should be cleaned with isopropyl alcohol or another mild disinfectant only. Other agents, especially substances which contain acetone should not be used. This accessory may not be steam sterilized.

9.2.3 Placing ECG electrodes

Please be aware that different color schemes are used in Europe and the United States.



European version



US version

1 Attach the ECG electrodes to the patient's body.

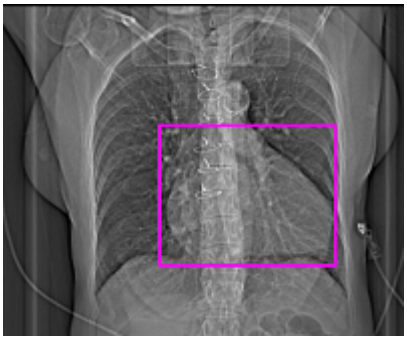
2 Plug in the ECG cables to the ECG sockets on the CT patient table.

3 Arrange the ECG cables properly along the patient's side and away from the scan field.

- Use ultrasound gel to improve ECG signal conduction.
- If the ECG electrodes have not been connected properly such that ECG signals are not available, a message box appears. Connect the ECG electrodes and click **Try again** on the message box.

9.2.4 Defining heart range

- On a topogram, place a scan range over the heart from the carina to the apex.



9.2.5 Using synthetic ECG

With synthetic trigger/sync, in the case of ECG signal loss during a scan, the system calculates the sync pulses by averaging over the last few measured heart beats. A simulated ECG is then used to continue the scan.

CAUTION

Missing ECG-Sync due to the disconnection of the patient's ECG-electrodes!

X-ray not, or only partially, usable.

- A contrast enhanced scan should not be aborted but operated with synthetic ECG-data.

The synthetic trigger/sync option is activated by default for a cardiac scan. It is recommended that you keep this option always activated for a scan using contrast medium. If this option is deactivated, a scan will be aborted in the case of ECG signal loss during the scan.

1 Choose **Options** > **Configuration**.

2 Click the **HeartView** icon.

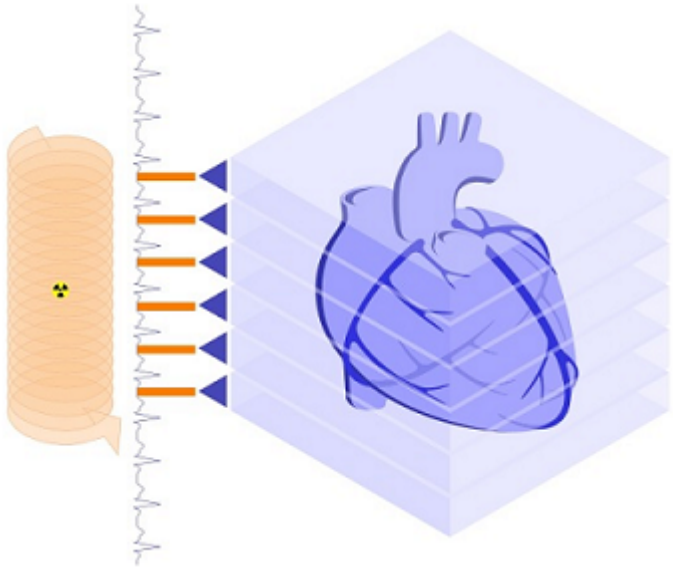
3 On the **General** tab, select the **ECG Synthetic Trigger/Sync** check box.



If the synthetic trigger/sync option is activated and ECG pulsing is on, the pulsing will be switched off if the ECG signal is lost during a scan. Then, the scan dose will be always at the 100% level.

9.3 CorCTA spiral

Retrospective ECG gating uses the spiral mode for imaging. Continuous exposure to radiation is applied for the entire cardiac cycle over several consecutive heart beats. The ECG is recorded simultaneously with the spiral data acquisition to allow for retrospective selection of the cardiac phase for images reconstruction.

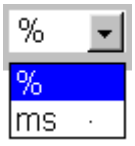


The ECG-gated spiral mode is recommended for patients with arrhythmia or a higher heart rate.

9.3.1 Setting up ECG pulsing

1 On the **Trigger** sub-task card, select the **ECG Pulsing** check box.

2 In the **ECG Pulsing** area, select **%** (relative time) or **ms** (absolute time) as the unit in the third list.



3 In the first and second boxes, specify the starting point and the ending point of the pulsing window.



9.3.2 CorCTA spiral scan prerequisites

Make sure that the following pre-requisites are fulfilled before you start a CorCTA spiral scan:

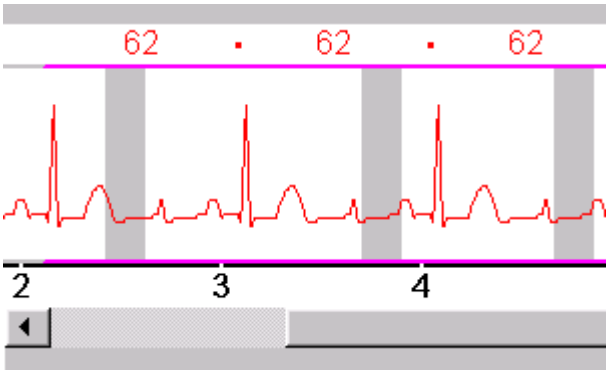
- The patient is positioned properly.
- ECG electrodes are placed properly and stable ECG signals are available.
- A proper cardiac scan protocol has been chosen.
- Bolus timing has been planned.
- A topogram is available, on which the heart range is defined for the CorCTA scan.
- ECG pulsing has been set up.

9.3.3 CorCTA spiral scan information

First, please observe the pre-requisites of a CorCTA spiral scan (→ Page 253 *CorCTA spiral scan prerequisites*).

A coronary CTA scan is carried out in a similar way as a typical contrast-enhanced examination. For a CTA scan, bolus timing is important. The scan should be initiated when the vessel of interest has an optimal contrast enhancement.

After a cardiac scan is done in the spiral mode, the ECG that is used for the cardiac scan is updated on the **Trigger** sub-task card. Continuous pink lines appear to indicate the uninterrupted radiation exposure over a few heart beats.

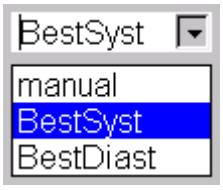


9.3.4 Setting up BestPhase

For an inexperienced user, determining the optimal cardiac phase or phases may be challenging. Moreover, it is time-consuming to perform multiple reconstruction jobs that may not yield the desired results. The **BestPhase** function is a tool that can adapt to the individual patient's heart motion and automatically identifies the optimal diastolic and systolic phases for cardiac reconstruction. It helps the inexperienced user by predicting the optimal phases for image reconstruction and speeds up the workflow by reducing the number of unsuccessful recon jobs.

1 Click the **Trigger** sub-task card.

2 Select *one* of the following in the **BestPhase** list:



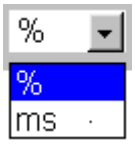
- **BestSyst**: lets the system decide the optimal systolic phase.
- **BestDiast**: lets the system decide the optimal diastolic phase.

9.3.5 Selecting a cardiac recon phase

1 Make sure that **Manual** is selected in the **BestPhase** list of the **Trigger** sub-task card.



2 Select **%** (relative time) or **ms** (absolute time) as the unit in the third list.

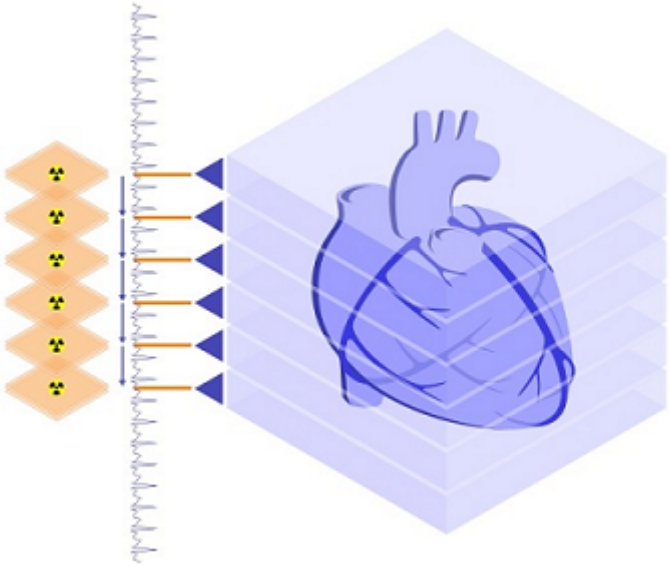


3 Specify the phase value in the second box.

A negative value (unit: %) defines starting points before R-peaks.

9.4 CorCTA sequence

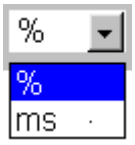
Prospective ECG triggering uses the sequence mode for imaging. The appropriate cardiac phase is used to trigger a scan. To time the trigger, the mean RR interval of the three preceding heart beats is used to predict the arrival of the next heart cycle. A reliable prediction is only possible if the heart rhythm is regular.



Use this dose-saving sequence mode for patients with a lower and stable heart rate.

9.4.1 Setting up phase start

1 In the **Phase Start** area of the **Trigger** sub-task card, select **%** (relative time) or **ms** (absolute time) as the unit in the second list.



2 Specify the phase starting time in the first box.



- A negative value (unit: **%**) defines starting points before R-peaks.
- For a scan with an irregular heart rate, try **%** instead of **ms**.

9.4.2 CorCTA sequence scan prerequisites

Make sure that the following pre-requisites are fulfilled before you start a CorCTA scan in the sequence mode:

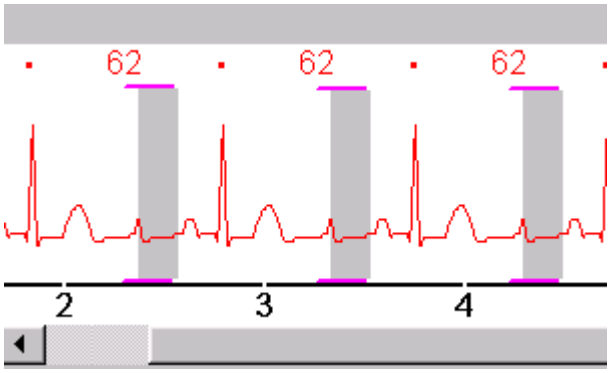
- The patient is positioned properly.
- ECG electrodes are placed properly and stable ECG signals are available.
- A proper cardiac scan protocol has been chosen.
- Bolus timing has been planned.
- A topogram is available, on which the heart range is defined for the CorCTA scan.
- Phase start has been set up.

9.4.3 CorCTA sequence scan information

First, please observe the pre-requisites of a CorCTA sequence scan (→ Page 256 *CorCTA sequence scan prerequisites*).

A coronary CTA scan is carried out in a similar way as a typical contrast-enhanced examination. For a CTA scan, bolus timing is important. The scan should be initiated when the vessel of interest has an optimal contrast enhancement.

After a cardiac scan is done in the sequence mode, the ECG that is used for the cardiac scan is updated on the **Trigger** sub-task card. Dashed pink lines appear to indicate the periodical radiation exposure over a few heart beats.



The scan duration in the sequence mode depends on the heart rate. The more irregular the heart rate, the longer the cardiac scan will last.

9.4.4 CorCTA sequence recon

In the sequence mode, scan data is only acquired in a pre-defined cardiac phase. This is done by specifying the **Phase start** before a scan. Therefore, after the scan, you cannot reconstruct the images in a different cardiac phase.

Functional analysis of the heart is *not* possible. However, you can work with general recon parameters, for example, setting up the slice width and recon increment for coronary evaluation.

9 Cardiac examination

10 Respiratory scan

Imaging of the chest or abdomen may produce motion artifacts because organs move with respiration. A respiratory scan is used to precisely detect the respiratory motions. It allows for synchronized imaging to avoid diagnostic artifacts.

A respiratory scan is available in two scan modes:

- Respiratory gated spiral
- Respiratory triggered sequence

To provide breathing signals during a scan, two signal modes are available:

- ANZAI mode
- Open interface mode

- The connectors for the respiratory signal device are located at the gantry.
- It is not possible to use both triggering and gating simultaneously.
- A trolley for storage and transport of the respiratory gating equipment is part of the Respiratory Gating package.

10.1 Respiratory signal modes

To provide breathing signals during a scan, two signal modes are available:

- ANZAI mode
- Open interface mode

10.1.1 ANZAI mode

The ANZAI mode uses the integrated ANZAI respiratory device (Anzai Medical, Japan) to provide breathing signals during a respiratory scan.

For a spiral scan, the patient's respiratory curve appears on the **Trigger** sub-task card after the ANZAI device has been connected.

- The ANZAI mode is available for both respiratory gated spiral and respiratory triggered sequence.
- The raw data of breathing signals is saved in Patient Browser.
- For more information, refer to the Anzai user manual.

10.1.2 Open Interface mode

The open interface mode supports an external device (for example, VARIAN RPM) instead of the integrated ANZAI device to acquire breathing signals.

In the open interface mode, the **Trigger** sub-task card does *not* show a patient's respiratory curve during a respiratory scan. The breathing signals collected by the external device must be imported after the scan.

CAUTION

Assigning wrong respiratory data to the selected patient!

Wrong reconstruction result. Reconstruction has to be repeated.

- Ensure that respiratory and patient data match, for example, by defined naming.

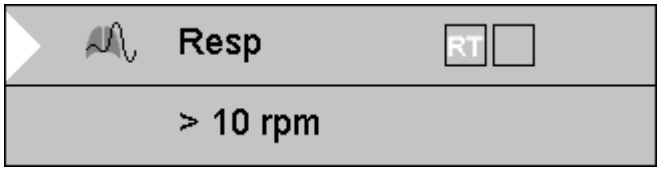
- The open interface mode is only available for respiratory gated spiral.
- For more information about supported VARIAN RPM devices for the Open Interface mode, contact your Siemens service.

10.2 Preparing a respiratory scan

First, position the patient on the patient table and apply the respiratory belt. When using an external respiratory device, confirm the connection between the device and your CT system.

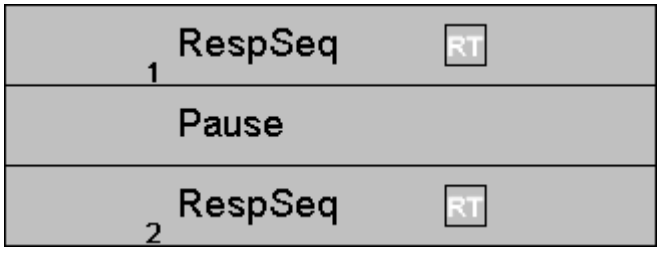
Next, register the patient for an examination and select an appropriate respiratory scan protocol.

- Spiral entries



The **> 10 rpm** is a memo entry indicating the applicable breathing rate.

- Sequence entries



Two entries are provided. One is for the inhalation phase, and the other is for the exhalation phase.

When using the ANZAI mode in a spiral scan, make sure the patient's respiratory curve is available on the **Trigger** sub-task card and the card's parameters are configured properly.

If the open interface mode is used, breathing signals from the external device must be imported after a respiratory scan.

10.2.1 Respiratory belt

Correct placement of the respiratory belt around the abdomen is essential in order to receive clear breathing signals. Improper placement of the respiratory belt will result in unstable breathing signals which are sensitive to patient movements during a respiratory scan.

CAUTION

Conductive parts become live!

Heart arrhythmia.

- Ensure patient safety and make sure the conductive parts of the respiratory belt (including associated connectors) and other patient-applied parts do not contact other conductive parts, including earth ground, at any time.

Improper positioning of the respiratory belt can cause image artifacts. Position the belt outside the scan region. Image artifacts can also be caused by the small metallic components of the respiratory sensor.

10.2.2 Respiratory synthetic sync

If breathing signals are lost during a respiratory scan, the synthetic sync option can be used to provide simulated signals that allow the scan to be continued.

The synthetic sync option is activated by default. It is recommended that you keep it always activated for examinations using contrast medium. If this option is deactivated, a scan will be aborted in case of breathing signals loss during the scan.

1 Choose **Options** > **Configuration** from the main menu.

2 Click the **Respiratory Gating** icon.

3 Select the **Synthetic Sync** check box.



10.3 Respiratory gated spiral

With retrospective respiratory gating, the lung volume is continuously covered by a spiral scan. The patient's breathing signals are recorded simultaneously to allow for retrospective selection of the respiration level at which images are reconstructed.

CAUTION

Respiratory gating device not available or not active during measurement!

X-ray not or only partially usable.

- Ensure that the respiratory gating device is ready to use before scanning.

10.3.1 Setting respiratory phase for RTD

This functionality is only available for a respiratory spiral scan in the Anzai mode.

A non-performed respiratory scan comes with a recon job that is planned for real-time display (RTD). The recon icon is marked by "RT". It means that you will view real-time images of the recon job while the scan is in progress. If necessary, you can set up the respiration level for the real-time imaging.

1 Ensure that a "RT" recon icon is clicked.

2 On the **Trigger** sub-task card, set up the respiration level in the **Phase Start** area.



The real-time images have gaps in between. The complete set of images have to be reconstructed by clicking **Recon** after a scan.

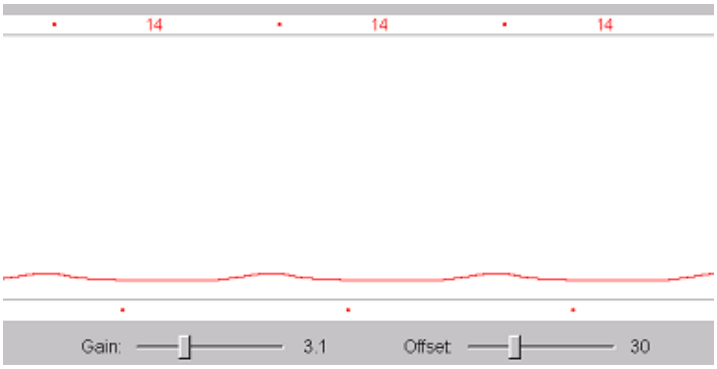
10.3.2 Facilitating peak detection

In order to facilitate peak detection, you can adjust the respiratory curve before starting a respiratory scan. This functionality is only available for a respiratory spiral scan in the Anzai mode.

1 On the **Trigger** sub-task card, click the **Curve Setup** icon.



2 Do *one* the following:



- Move the **Gain** slider to modify the curve's amplitude.
- Move the **Offset** slider to shift the entire curve along the y-axis.

Curve adjustment is relevant for the ANZAI mode. The external respiratory device (for example, VARIAN RPM) is responsible for breathing signals in the open interface mode. In this case, curve adjustment is *not* available.

10.3.3 Activating open interface mode

1 Choose **Option** > **Configuration** from the main menu.

2 Double-click the **Respiratory Gating** icon.



3 Select the **Open interface** check box.

On the **Trigger** sub-task card, the following message appears: **OPEN INTERFACE - respiratory data file has to be imported after scan**. No respiratory curve will appear.

10.3.4 Connecting VARIAN device

◆ Connect the VARIAN or other external respiratory device to your CT system.

The data format produced by the external device can be converted to the internal format of the Siemens CT system.



For more information, refer to the user manual of the external respiratory device.

10.3.5 Respiratory spiral scan prerequisites

Make sure that the following pre-requisites are fulfilled before scanning a respiratory spiral range:

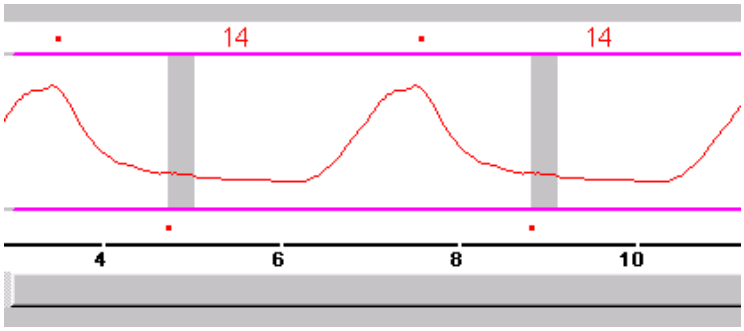
- The respiratory belt is placed properly.
- An appropriate respiratory scan protocol has been chosen.
- Either the ANZAI mode or the open interface mode is configured to provide breathing signals:
  - In the ANZAI mode, the patient's respiratory curve should appear on the **Trigger** sub-task card.
  - In the open interface mode, the external respiratory device is connected to your CT system.
- The respiratory scan range is defined.

10.3.6 Respiratory spiral scan information

First, please observe the pre-requisites of a respiratory spiral scan (→ Page 265 *Respiratory spiral scan prerequisites*).

Load and start a respiratory spiral scan as usual.

If you use Anzai, after the respiratory spiral scan is done, the respiratory curve that is used for data acquisition is updated on the **Trigger** sub-task. Continuous pink lines appear to indicate the uninterrupted radiation exposure over several breathing cycles.



10.3.7 Importing breathing signals

✓ A respiratory scan in the open interface mode is done.

◆ In the **Import Respiratory** dialog box, select the VARIAN file of the breathing signals and click **Import**.

The respiratory curve appears on the sub-task card.

- Version 1.6 of the VARIAN file format is supported.
- You can also import the VARIAN file via the **Import** icon ( ) on the **Trigger** sub-task card.

10.3.8 Setting respiratory recon phase

In the spiral mode, scan data is acquired during the entire breathing cycle. Therefore, images can be reconstructed at any respiration level.

There are two methods to set up a respiration level:

- Amplitude-based reconstruction (**% In** or **% Ex**)

  This method is based on the percentage of inhalation or exhalation (0% inhalation = 100% exhalation, and vice versa), and is recommended for use in the ANZAI mode.

- Phase-based reconstruction (**% Pi**)

  This method can be used when the phase information is provided in the breathing signals. It is available and recommended for use in the open interface mode.

1 On the **Trigger** sub-task card, select *one* of the following phase units in the **Phase Start** list:



- **% In** or **% Ex** for amplitude-based reconstruction
- **% Pi** for phase-based reconstruction

2 Specify the phase value in the first box.



10.4 Respiratory triggered sequence

With prospective respiratory triggering, the lung volume is covered using a step-and-shoot technique. The patient's breathing signals are used to trigger the slicing acquisitions of lung images at a pre-defined respiration level. Reconstruction of images at a different respiration level is *not* possible. Prospective respiratory triggering has the benefit of a reduced patient dose when compared to retrospective respiratory gating.

However, this sequence mode depends on reliable prediction of the patient's next inhalation maximum and exhalation minimum. You should *not* use this sequence mode for patients with irregular respiratory rates and an affinity to cough or sigh.

10.4.1 Setting up respiratory sequence scan

- Enter the triggering parameters using the terminal connected to the Anzai respiratory device.

10.4.2 Respiratory sequence scan

Make sure that the following pre-requisites are fulfilled before scanning a respiratory sequence range:

- The respiratory belt is placed properly.
- An appropriate respiratory scan protocol has been chosen.
- The ANZAI mode is engaged to provide breathing signals.
- The respiratory scan range is defined.
- Triggering parameters have been set up, by using the terminal to the ANZAI device.

◆ Load and start the scanning of a respiratory sequence range.



The scan duration in the sequence mode depends on the respiration rate. The more irregular the respiration rate, the longer a respiratory scan will last.

10.4.3 Respiratory sequence recon

In the sequence mode, image data is only acquired at the respiration level that is defined before a scan. Therefore, you *cannot* reconstruct images at a different respiration level after the scan.

However, you can work with general recon parameters, for example, setting up the slice width and recon increment.

11 Interventional CT

An interventional CT examination facilitates applications such as biopsy, abscess drainage, pain therapy, minimum invasive operations, joint studies, and arthrograms.

Two intervention modes are available:

- Biopsy
- CARE Vision

You use a Biopsy or a CARE Vision scan protocol from the **Specials** group in Patient Model Dialog. You can append any of the Biopsy or CARE Vision scan protocols after a common exam step.

11.1 Intervention general options

For the interventional procedures of both Biopsy and CARE Vision, some tools and options are available:

- Intervention screen layout
- Setting up HandCARE
- Switching windowing options
- Intervention toolbar
- Documenting key images

11.1.1 Intervention screen layouts

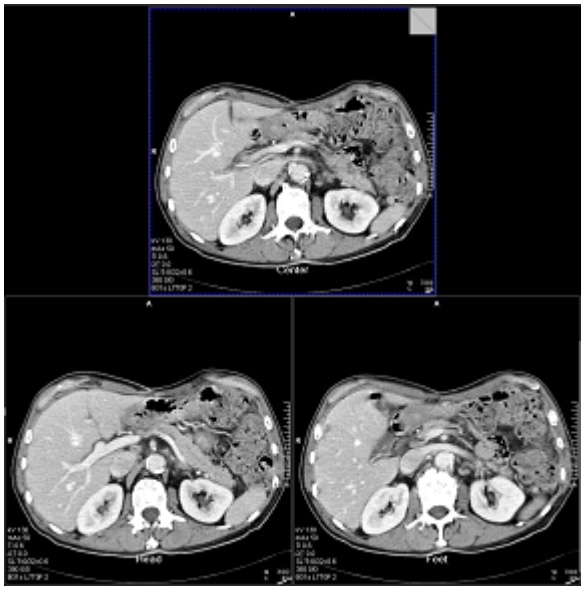
During an interventional procedure, the **Examination** task card switches to one of the following special layouts:

- CARE View
- CARE View Blow Up
- Blow Up
- Biopsy Two Segments

If you quit the interventional procedure, the **Examination** task card changes back to the normal layout consisting of the topo and tomo segments.

CARE View

The CARE View layout consists of three segments of the same size. In the upper center segment, the slice in the middle position of the interventional scan range is shown. Adjacent slices - one towards the head and the other towards the feet - are shown in the lower segments.



On the **Intervention** toolbar, you can click the **CARE View** icon to switch to the CARE View layout.



- To use CARE View, a slice width shown in bold in the **Slice** list of the **Routine** sub-task card must be selected.
- On the **Recon** sub-task card, you can configure whether the image towards the head appears in the lower left segment or in the lower right segment.
- Use of CARE View requires a license.

CARE View Blow Up

In the CARE View Blow Up layout, the main segment is blown up to the full screen size, showing the slice in the middle position of the interventional scan range. Two small sub-areas are in the main segment's lower left and lower right corners, showing adjacent slices - one towards the head and the other towards the feet.



On the **Intervention** toolbar, you can click the **CARE View Blow Up** icon to switch to the CARE View Blow Up layout.



- To activate CARE View Blow Up, a slice width shown in bold in the **Slice** list of the **Routine** sub-task card must be selected.
- To avoid an inaccurate result, do *not* measure distances in a sub-area.
- On the **Recon** sub-task card, you can configure whether the image towards the head appears in the lower left sub-area or in the lower right sub-area.
- Use of CARE View Blow Up requires a license.

Blow Up

In any other screen layout of CT intervention, you can double-click a segment to blow it up to full screen. Double-click the segment again to exit the Blow Up layout.

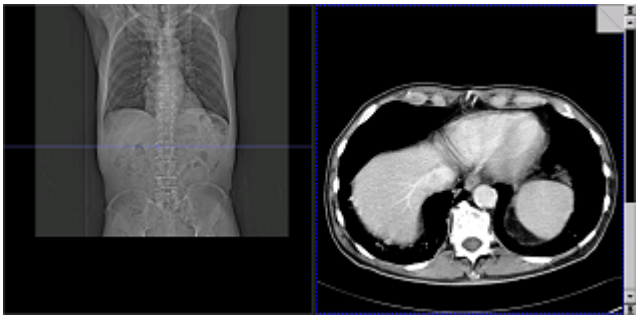


On the **Intervention** toolbar, you can click the **Blow Up** icon to switch to the Blow Up layout.



Biopsy Two Segments

In the Biopsy Two Segments layout, the typical topo segment and the tomo segment are shown.



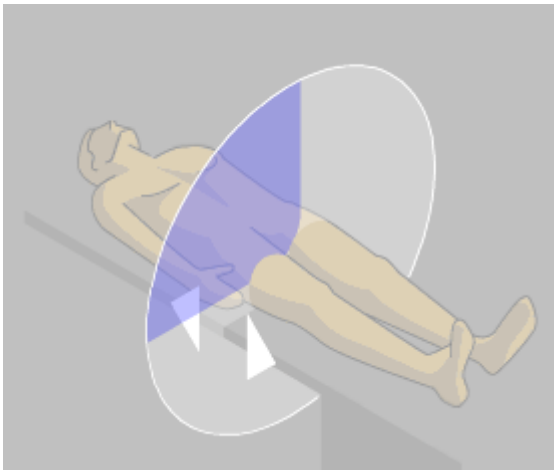
On the **Intervention** toolbar, you can click the **Biopsy Two Segments** icon to switch to the Biopsy Two Segments layout.



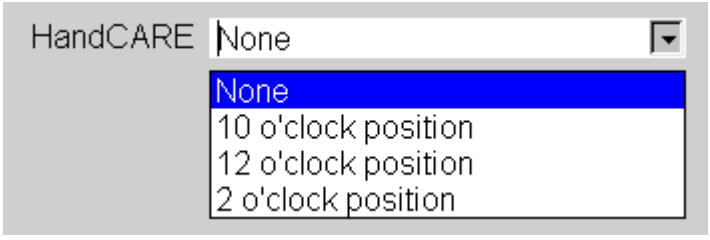
11.1.2 Setting up HandCARE

With the HandCARE feature, radiation is interrupted for a very short time whenever the X-ray tube is in a specified position. In this way, the physician's hands are protected from direct radiation.

The watermark on the **Routine** sub-task card indicates whether HandCARE is activated. In the following figure, exposure to X-ray radiation is switched off in the blue area.



- On the **Scan** sub-task card, select a tube position from the **HandCARE** list.



- In the **HandCARE** list, a tube position (for example, the **10 o'clock position**) is specified in the clockwise direction when looking at the front side of the CT gantry.
- Select **None** to deactivate HandCARE.

11.2 Moving table during intervention

During an interventional procedure, you have the following possibilities to move the patient table:

- Moving to saved position
- Moving to last scan position

- Moving table continuously
- Moving table in steps of half slice width
- Moving table in customized steps

There are several tools with which you can move the patient table during an interventional procedure, such as:

- The Intervention toolbar
- Move buttons on the **Examination** task card
- Move keys on the gantry operator panel
- Table in/out joystick

11.2.1 Saving a table position

You can save a patient table position so that you can later move the table to the saved position.

◆ Do *any* of the following:

- On the **Intervention** toolbar, click the **Save Current Table Position** icon.



- Press the following key on i-Control:



A message appears on the status bar showing that the current table position has been saved.

11.2.2 Moving to saved position

✓ A table position has been saved.

◆ Do *any* of the following:

- On the **Intervention** toolbar, ensure that the **Auto Stop at Saved Table Position** icon has been clicked. Then, use the gantry operator panel to move the table towards the saved position. The table automatically stops when it reaches the saved position.



- In the **Position** list, select **Saved TP**. Then, press and hold down the **Move** key on CT control box.
- Press the following key on i-Control:



11.2.3 Moving to last scan position

- Do *any* of the following:
  - On the **Intervention** toolbar, ensure that the **Auto Stop at Last Interventional Scan Position** icon has been clicked. Then, use the gantry operator panel to move the table towards the position of your last scan. The table automatically stops when it reaches the last scan position.



  - In the **Position** list, select **Last SP**. Then, press and hold down the **Move** key on CT control box.
  - Press the following key on i-Control:



11.3 Interventional CT accessories

Special equipment can be used during an interventional CT examination, for example:

- Table in/out joystick
- Scanning footswitch
- Monitor ceiling system and trolley for monitors

11.3.1 i-Control

i-Control is a hardware device that can be mounted on the patient table for in-room operation during CT intervention procedures. The following CT functions can be controlled using the i-Control:

- Horizontal and vertical table movements
- Software actions on the *syngo* Acquisition Workplace

Some of the software functionalities can be operated via the i-Control. You use the mouse joystick to move the mouse cursor, similarly to using your standard computer mouse. Additionally, you can use the software keys, e.g., to scroll through the image stack.



The i-Control is delivered with the following components:

- The i-Control panel
- Charger lead
- Trolley for i-Control
- Two mounting fixtures for the surgical rail
- Cable
- Cable clips
- Sterile cap

i-Control safety

CAUTION

Disturbance of peripheral electrical devices, for example, pace makers, due to electromagnetic emission!

Heart arrhythmia

- To ensure patient safety, keep the intervention module (i-Control) at a minimum distance of 10 cm away from the patient.

CAUTION

Uncontrolled system movement due to unintended signal activation by users.

Injuries of the patient or damage to the system.

- Always keep the activated intervention module (i-Control) at the CT scanner to prevent unauthorized use.

CAUTION

Uncontrolled system movement due to unintended signal activation by users!

Injuries of the patient or damage to the system.

- Always observe the patient directly. Press the nearest **STOP** key immediately if an undesired system movement is performed.

CAUTION

Unintentional patient movement!

Unintentional activation of the i-Control by the patient.

- Always fix and observe the patient when using the i-Control.

CAUTION

Operation of the i-Control in the wrong examination room!

Injury of the patient or damage to the system.

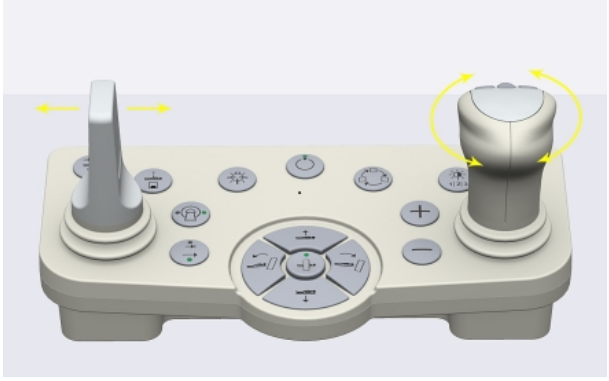
- Always keep the i-Control at the associated CT scanner.

It is within the responsibility of the personnel to make sure that no conflictive table movements or software actions are performed when both the control box and the i-Control are in use.

Using table & mouse joysticks

With the mouse joystick, you can control the software similarly to using the standard computer mouse of the *syngo* Acquisition Workplace.

With the joystick for patient table movement, you move the table top into or away from the gantry.



- Use the mouse joystick and the mouse buttons to control the mouse cursor of the *syngo* software.

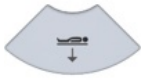
  – or –

  Move the table joystick to the left or to the right to cause a horizontal movement of the patient table.

Using i-Control keys

The following table lists the keys on the i-Control panel:

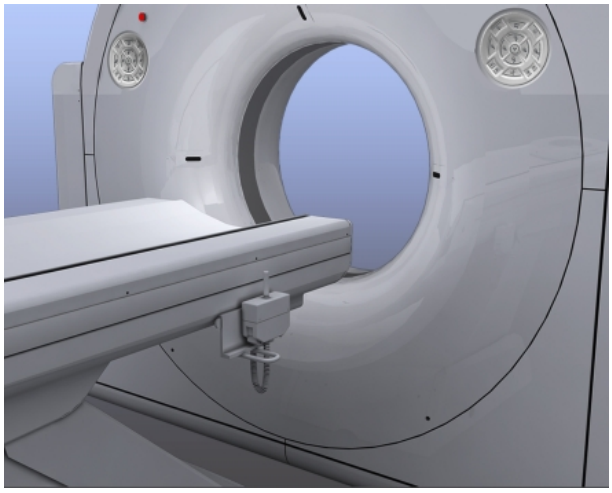
Key	Description
	Tilt gantry to positive direction (toward the patient table) or tilt the gantry by 1° steps. The tilt value is indicated by the image text on interventional images.
	Tilt the gantry into the negative direction (away from the patient table) or tilt the gantry by 1° steps. The tilt value is indicated by the image text on interventional images.

Key	Description
	Elevate the patient table.
	Lower the patient table.
	Move the table to the preselected scanning position.
	Save the current table position.
	Move the table to the saved position.
	Move the table to the position of the last scan.
	Toggle between incremental and continuous table movement. The current mode is displayed by two LEDs on the key.
	Navigate forward through the image stack of the selected segment.
	Navigate backward through the image stack of the selected segment.

Key	Description
	Toggle between three organ windowing settings. The windowing settings are configured in Examination Configuration.
	Switch to images of the previous recon job in Chronicle. You will exit the interventional procedure with this key.
	Set the direction of table movements corresponding to the table joystick, if the i-Control is *not* mounted at the surgical rail. The corresponding LED indicates the side of the patient table where the i-Control is operated.
	Switch the i-Control on and off.
	Switch the laser light marker on and off.

11.3.2 Table joystick

A joystick is available for table feed into and out of the gantry as an accessory for interventional CT examinations.



The joystick plug is connected to the corresponding socket at the head end of the patient table.

CAUTION

Table movement due to accidental actuation of the joystick by the patient!

Collision with the gantry possible.

- Always observe the patient when the joystick is mounted.
- Place the joystick out of the reach of the patient (parking position) when it is not in use.

Note that the joystick socket is labeled with the joystick symbol.

11.3.3 Scanning footswitch

With the optional scanning footswitch, you can trigger scanning as an alternative to using the Start key.

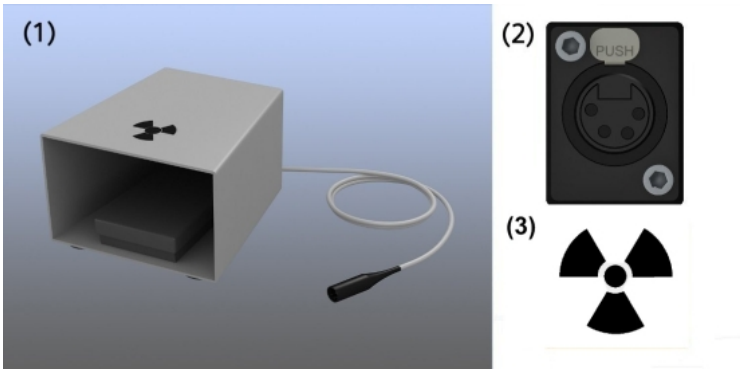
CAUTION

Use of unsuitable foot switches!

Incorrect function possible.

- Only an original Siemens foot switch must be installed.

In interventional CT examinations, a scan can be controlled with the scanning footswitch in the examination room.



(1) Scanning footswitch

(2) Connector on the gantry front bottom for scanning footswitch

(3) Warning label: Existing ioning radiation

In some countries, the scanning footswitch is only supplied with the second monitor.

11.3.4 Monitor ceiling system

The monitor ceiling system is used to mount monitors in the examination room. The monitor ceiling system can be used for one or two monitors.





With the second monitor, you can operate the system in second monitor mode.

CAUTION

Dirt and liquid in the monitor arm of the ceiling mounted monitor!

Infection possible

- Clean the monitor and monitor arm after use.

WARNING

Liquids in the monitor ceiling system, power supply cables are laid inside!

Electrical shock

- Ensure that no liquids, for example cleaning fluids, can get into the interior of the monitor ceiling system.

CAUTION

Raising and moving the monitor ceiling system!

Damage to the monitor ceiling system.

- Do not use force when moving the device into the limit positions.
- Make sure that the monitor ceiling system does not collide with other components.

The monitor ceiling system consists of several components, ensuring a safe mounting of the monitors.

- Horizontal arm

  This component is used to adjust the horizontal position of the monitor frame.



- Lift arm

  This component enables the horizontal and vertical adjustment of the monitor frame.

- Monitor frame

  This component allows vertical rotation of the monitors. The monitors can be tilted to adjust the viewing angle.



The monitor ceiling system is movable.

- Pull or push the monitor frame gently into the desired horizontal or vertical position.
- Hold the monitor frame and gently rotate it around its vertical axis.
- Tilt the monitors by pivoting them around their horizontal axis.

Select a parking position for the monitor ceiling system and the trolley that is outside the working range.

11.3.5 Trolley for monitors

The trolley is used to mobilize the monitors inside of the examination room. The trolley can carry two monitors at most.



- Move the trolley by using the handle only.
- Select a parking position for the monitor ceiling system and the trolley that is outside the working range.

11.4 Biopsy

The Biopsy mode is used for CT guided biopsies. A detailed representation of the organ structures in tomograms allows for a precise localization of the lesion and the surrounding region. A physician can therefore precisely plan the path of the puncture in the transversal cut, avoiding critical structures such as vessels, nerves, or the intestine.

- The number of scans should be defined before you load a Biopsy entry in Chronicle. During the Biopsy procedure, scans are performed one after another. Between the scans, you can move the patient table in/out freely or tilt the gantry.
- The physician starts each scan at the current table position, by pressing either the **Start** key or the scanning footswitch. Images of the scan appear on a second monitor in the exam room.
- You can quit the Biopsy procedure at any time, or it is automatically ended when the defined number of scans are used up.

11.4.1 Changing sequence range into Biopsy

1 In Chronicle, click a sequence entry.

2 On the **Routine** sub-task card, click the **Biopsy Mode** icon.



11.4.2 Indication of Biopsy dose

After a Biopsy step in Chronicle is loaded, a dose scale appears at the upper right corner on the **Examination** task card.



- The dose scale shows the accumulated scan dose for all the Biopsy steps in Chronicle.
- The maximum value of the dose scale showing the Biopsy dose is 2000 mGy by default. This is configured on the **Intervention** tab in Examination Configuration.

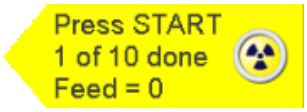
11.4.3 Scanning in Biopsy

1 In Chronicle, select a Biopsy entry and click **Load**. Move the patient table if prompted by a yellow message bubble.



2 Press the **Start** key, following the guidance of the yellow message bubble.

One scan is done at the current table position. Images of the scan appear on the **Examination** task card. A yellow message bubble indicates the number of finished scans and the number of planned scans.



3 Repeat Step 2 to start a second scan, a third, and so on.

4 If necessary, click **Cancel**.



The Biopsy mode is ended.

- You can move the patient table in/out freely between scans, if necessary.
- You can tilt the gantry between scans by using the gantry operator panel.
- The Biopsy mode is ended automatically if the planned number of scans are used up.

11.5 CARE Vision

CARE Vision is a fluoroscopic mode for interventions such as drainages under CT control.

- During the CARE Vision procedure, scans are performed one after another. Between the scans, you can move the patient table in/out freely or tilt the gantry.
- The physician executes a scan by *holding down* the scanning footswitch for a desired period and then releasing it. Radiation is switched on during this period. Images at the current table position are acquired in different points of time. This allows you to observe the movement of the surgical instrument.
- The number of scans is not limited. The duration of one scan is limited to 100 seconds.

- Use of CARE Vision requires a license.
- A scan will be aborted in case of tube overload or lack of disk space for image storage.

11.5.1 Indication of CARE Vision dose

After a CARE Vision step in Chronicle is loaded , a dose scale appears at the upper right corner on the **Examination** task card.



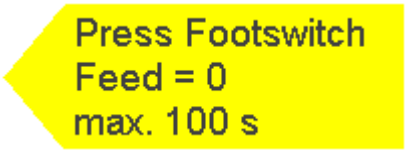
- The dose scale shows the accumulated scan dose for all the CARE Vision steps in Chronicle.
- The maximum value of the dose scale showing the CARE Vision dose is 2000 mGy by default. This is set up on the **Intervention** tab in Examination Configuration.

11.5.2 Scanning in CARE Vision

1 In Chronicle, select a CARE Vision entry and click **Load**. Move the patient table if prompted by a yellow message bubble.



2 *Press and hold down* the scanning footswitch, following the guidance of the yellow message bubble.



A scan is started. Radiation is switched on while the scanning footswitch is being pressed. Images are acquired repeatedly at the current table position and appear on the **Examination** task card.

3 Release the scanning footswitch to stop radiation.

The scan ends.

4 Repeat Step 2 to Step 3 to perform a second scan, a third, and so on.

5 Click **Cancel** to quit the CARE Vision mode.



- You can move the patient table in/out freely between scans, if necessary.
- You can tilt the gantry between scans by using the gantry operator panel.
- Each scan is limited to 100 seconds.

12 Examination reports

Examination results can be reported in several ways:

- Filming & printing
- Dose report
- Patient protocol
- E-logbook

12.1 Filming and printing

You can expose the images of an examination on film or print them on paper for documentation and reporting.

The regular page mode is the default print mode. The scalable page mode provides images with reduced quality and does not support original size.

CAUTION

Using scalable page mode may reduce the image quality. The resulting image quality may no longer be sufficient. The scalable page mode does not support real size!

Possible wrong diagnosis.

- Be aware of image quality reduction if scalable page mode is configured.

CAUTION

The printed flag is set if the images are successfully transferred to the printer control. Not all printers, for example, paper printers, may be able to solve printing problems themselves!

Possible loss of image printout.

- Verify that the printouts are available before you delete images.

Do not open the print dialog while radiation is applied.

12.1.1 Camera

Various cameras are supported to commit the CT images to film. You can obtain an up-to-date list of cameras supported from your Siemens representative.

CAUTION

Exposing images with a non-verified camera!

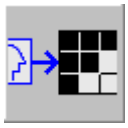
Wrong basis for diagnosis.

- Only use cameras that have been released by Siemens.

12.1.2 Loading images to Filming

There are two methods for sending images to the **Filming** task card:

- Set up **Auto filming** on the **Auto Tasking** sub-task card *before* you start images reconstruction. Images are transferred to the **Filming** task card as soon as they have been reconstructed.
- *After* images have been reconstructed, open Patient Browser and load the series for the images into the **Filming** task card.



You can also send images to **Filming** by clicking the **Copy to Film Sheet** icon on the Image Manipulation toolbar.

12.1.3 Editing film sheets

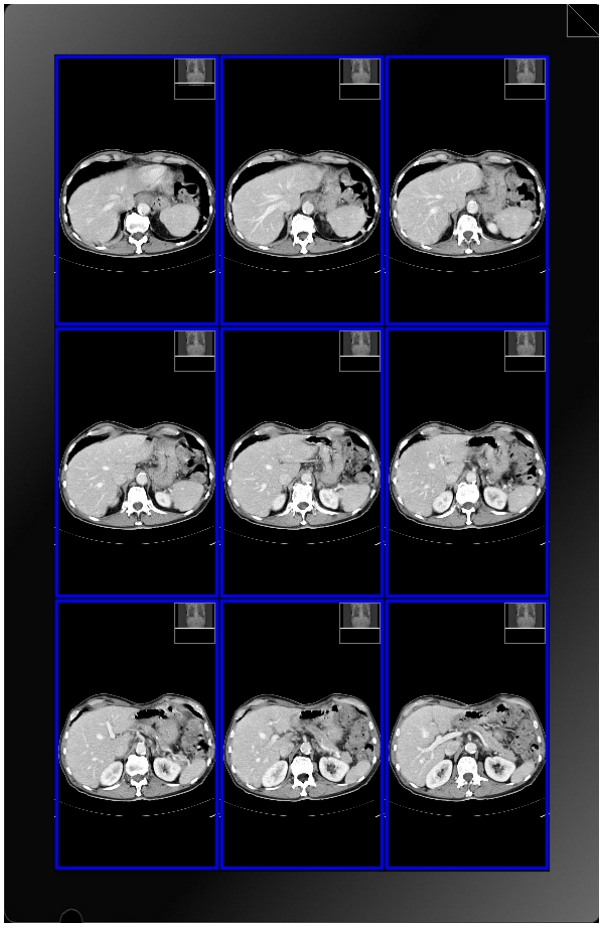
On the **Filming** task card, you can delete, move, or copy selected images. If you want to add new images from the **Patient Browser** to a film job, you can do that easily by drag-and-drop.

Then, you can do several tasks such as:

- Applying a film layout
- Changing the reference image
- Windowing images
- Showing or hiding image text/graphics

12.1.4 Selecting images in Filming

- Do one of the following:
  - Click the border of the film sheet to select all the images it contains.



  - You can select all the film sheets with all images of one film job. Click the opened film job. Or, double-click the border of a film sheet.



The folder icon of a selected film job is highlighted (blue). All the images of this job are shown with a continuous blue line border.



- Use the **Ctrl** key to select non-consecutive images.
- Use the **Shift** key to select consecutive group of images.

12.1.5 Deleting images in Filming

1. Select one or more images or film sheets.
2. Click the **Delete** icon or push the **Del** key on the keyboard.



- You can also delete images with **Film** > **Clear Document(s)** in the main menu.
- Turn on the **Film** > **Repack** option to automatically reorganize the film sheet or the entire film job (gaps are filled again) after deletion.

12.1.6 Moving and copying images in Filming

1. Select the images/film sheets that you want to copy or move.
2. Do one of the following:
   - To move selected images, select **Edit** > **Cut** in the main menu.
   - To copy selected images, Select **Edit** > **Copy** in the main menu.
3. Select the image in front of which you want to insert the images to be copied or moved.
4. Insert the images with **Edit** > **Paste** in the main menu.

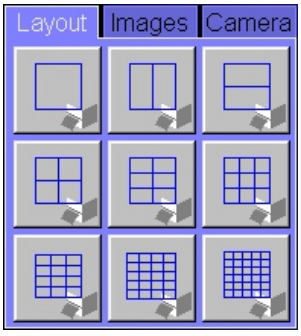
If you only want to move images within a film sheet, you can also do that easily by drag-and-drop. In this case, deselect the **Zoom/Pan** icon.

12.1.7 Applying film layout

With the layout of the film sheet, you define the number and size of the segments on a film sheet.

1 Select individual images or a film sheet or select an entire film job.

2 Click the **Layout** subtask card on the **Filming** task card into the foreground.



3 Click the icon for a film layout to display the selected images in this format.

– or –

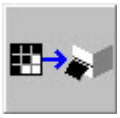
From the **Layouts** selection list in the lower right-hand control area, select a layout.



12.1.8 Exposing film sheets

1 Select one or more film sheets in the **Filming** task card.

2 Click the **Expose Film Task** icon.



You can call up the **Film Job Status** dialog box by clicking the **Film Job Status** icon on the **Filming** task card. In the dialog box, you can get information about film jobs that are waiting to be executed in the queues for each camera and printer.



12.1.9 Printer

A Siemens CT system is a medical device where under no circumstances other software than the released *syngo* CT software may be installed. This also applies to printer drivers for postscript printers.

Your software includes the generic Adobe Postscript Driver. With this generic printer driver, different postscript printers can be connected to a Siemens CT system without the need of installing any specific printer driver for the individual printer.

⚠ CAUTION

The image quality on paper printouts might be reduced so that the printouts may not be sufficient for diagnosis.

Possible wrong diagnosis.

- Only use images on film for diagnostic purposes.
- You may use printouts for diagnosis if the printer has been evaluated and released for this purpose by the manufacturer.

CAUTION

The image quality on paper printouts might be reduced so that the printouts may not be sufficient for diagnosis.

Possible wrong diagnosis..

- Only use images on film for diagnostic purposes.

  You may use printouts for diagnosis if the printer has been evaluated and released for this purpose by the manufacturer.

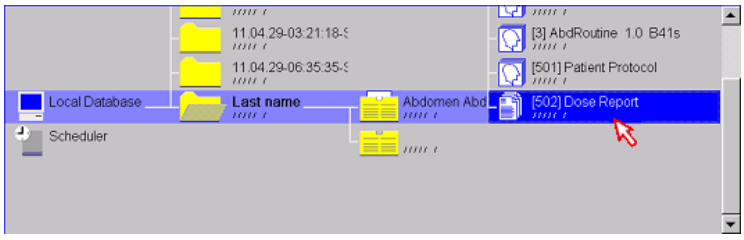
Siemens only allows the connection of a postscript printer via a TCP/IP network port or locally at the parallel interface. Connected postscript printers shall be used primarily for printing the reports that are created in the different applications available on the system. Postscript Printers might also be used to print medical images. These printouts are not for diagnostic use.

More information about the recommended printers can be obtained from your Siemens representative.

12.2 Dose report

A dose report is introduced according to the DICOM standard for dose evaluation purposes.

A dose report can be automatically generated at the end of an examination and cannot be modified. It is available as a separate series in Patient Browser.



The dose report uses DICOM terminologies that vary from the phrases appearing on the user interface of the *syngo* CT software.

A dose report contains the following information:

- Patient data

  For example, patient name and ID.

- Administrative data

  For example, referring physician and ward number.

- Dose parameters

  For example, $CTDI_{vol}$ and DLP.

12.2.1 Setting up dose report

You can let the system automatically create the dose report at the end of an exam.

1 Choose **Options** > **Configuration** from the main menu.

2 Click the **Examination** icon to open the **Examination Configuration** dialog box.

3 On the **Dose** tab, select the **Activate dose report** check box.



You can also set up auto transferring by selecting the **Auto transfer dose report** check box.

12.2.2 Viewing dose report

1 In Patient Browser, select a dose report.

2 Double-click the dose report icon.



The dose report is opened using the SR Viewer.

3 Scroll down to view the detailed dose information.

12.2.3 Exporting dose report

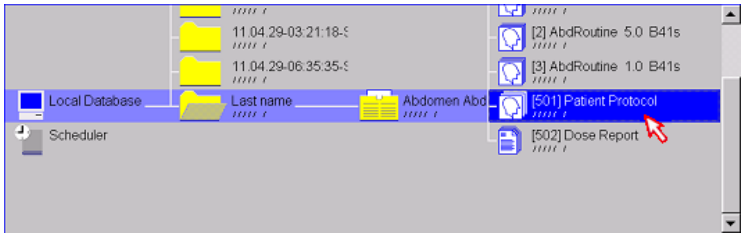
- In the SR Viewer, choose **File** > **Export** > **Dicom SR** (or **PDF**, **HTML**, **XML**).

  The dose report is exported from the SR Viewer.

12.3 Patient protocol

A patient protocol summarizes the information about a finished examination and can be used to document examinations, for example, in case the MPPS (Modality Performed Procedure Step) feature is not available.

A patient protocol can be automatically generated at the end of an examination and cannot be modified. It is available as a separate series in Patient Browser and can be sent to **Viewing** or **Filming**.



A patient protocol consists of the following information:

- Patient data

  For example, patient name and ID.

- Administrative data

  For example, referring physician and ward number.

- Examination data

  For example, patient position and total mAs.

- Contrast data

  For example, CM quantity and injection parameters.

- Scan protocol data

  For example, scan type and gantry tilt.

- Dose parameters

  For example, $CTDI_{vol}$.

12.3.1 Setting up patient protocol

You can let the system automatically create the patient protocol at the end of an exam.

1 Choose **Options** > **Configuration** from the main menu.

2 Click the **Examination** icon to open the **Examination Configuration** dialog box.

3 On the **Workflow** tab, select the **Patient Protocol** check box.



You can also set up auto filming and auto transferring by selecting the **Auto film patient protocol** check box and the **Auto transfer patient protocol** check box.

12.3.2 Viewing patient protocol

1 Switch to the **Viewing** task card, if necessary.

2 Open Patient Browser.

3 Double click a patient protocol.

The patient protocol appears in the **Viewing** task card.

12.4 E-Logbook

E-Logbook is a tool used to collect, view, and export examination information for statistics and documentation. It offers an alternative to a paper logbook.

The examination information recorded by E-Logbook has two types:

- System fields are collected automatically and shown read-only, for example, patient name, ID, and examination date.
- Manual fields are entered by you at the end of an examination, for example, history, storage medium, and custom fields.

Use of E-Logbook requires a license.

12.4.1 Activating E-Logbook

While E-Logbook is turned on, it prompts you to input the information about an examination when you close the examination.

1 Choose **Options** > **Configuration**.

2 Double-click the **E-Logbook Configuration** icon to open the **Configuration Overview** dialog box.



3 On the **General** tab, make sure to select *both* of the following check boxes:

- **Activate E-Logbook**
- **Show E-Logbook**

If some manual fields are defined under the **Manual Entries** tab, the **Show E-Logbook** check box is selected by mandatory.

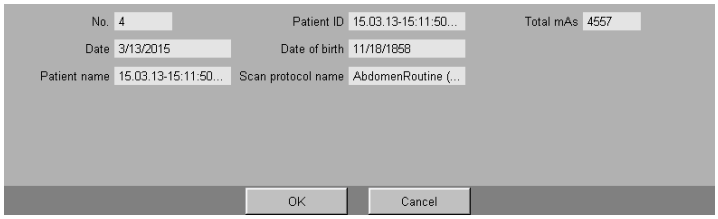
12.4.2 Inputting E-Logbook records

✓ E-Logbook is activated.

1 Click the **Close current patient** icon.



In the sub-task card area, the E-Logbook input panel appears.

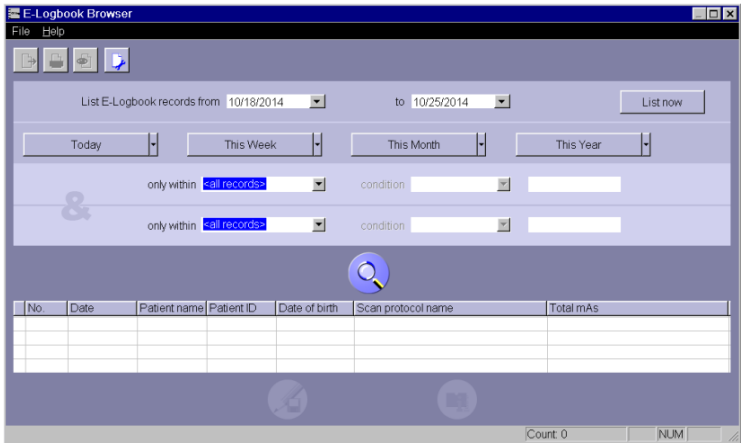


2 Specify the info about an examination.

- E-Logbook system fields are read-only; manual fields are editable.
- For text longer than the width of a box, "..." is displayed. To see the entire text, rest your mouse pointer on the box and a tool tip will appear.

12.4.3 E-Logbook Browser

On the *syngo* Workplace, you can use the E-Logbook Browser to view, search, edit, sort, export, and print E-Logbook records.



12.4.4 Opening E-Logbook Browser

◆ Choose **Patient** > **E-Logbook** from the main menu.

The **E-Logbook Browser** window appears.

- Every time it is opened, the E-Logbook Browser lists the records within the default date period that you define in **E-Logbook Configuration**.
- You can also open the **E-Logbook Browser** by pressing **F12** on the computer keyboard.

12.4.5 Editing E-logbook records

You can modify an E-Logbook record in E-Logbook Browser. E-Logbook manual fields appear in a white background and can be modified. E-Logbook system fields appear in a deeper color background and are read-only.

1 Right-click a manual field to enter the editing mode.

2 Type or select a new field value.

3 Click outside the field.

The background of the field turns green, indicating that the modification is made, but not saved.

4 Click the **Apply** icon.



All green fields are saved. Their background changes to white again.

12.4.6 Exporting E-logbook records

E-Logbook records can be exported to an XML (Extensible Markup Language) file. You can view the XML file on an external computer by using Internet Explorer or Microsoft Excel.

1 In the E-Logbook Browser, click the **Export** icon to open the **Save As** dialog box.



2 Specify a file name and click **Save**.

The current list of records in E-Logbook Browser is saved to *H:\SiteData\E-Logbook* in File Browser.

- You cannot save the records to a path other than *H:\SiteData\E-Logbook*.
- In addition to the XML file, an *.xslt file is generated. This file is required for viewing the content of an XML file properly.
- You can also choose **File** > **Export** in E-Logbook Browser to export records.

12.4.7 Printing E-logbook records

✓ A default printer and default print template have been set up.

◆ Click the **Print** icon ( ).

- You can use the **Print Preview** icon ( ) to check the page layout before printing.
- You can use the **Page Setup** icon ( ) to set up page properties before printing.

12.4.8 Searching E-Logbook records

You can search E-Logbook records in E-Logbook Browser by using the following methods:

- Search using a specified date range

  Specify a date range (the starting date and the ending date) and click the **List now** button.

- Search using a pre-defined date period

  Click *one* of the following buttons:

  - **Today/Yesterday**
  - **This Week / Last Week**
  - **This Month / Last Month**
  - **This Year / Last Year**

- Search using specified E-Logbook field values

  You can set up a search statement by specifying a field name, an operator, and a field value. Up to two search statements can be specified. For example:

  - Field name: *Date of birth*
  - Operator: *is less than*
  - Field value: *28-Jan-1979*

  You can use the following operators with E-Logbook fields defined as text strings:

  - **wild card**
  - **equals**
  - **has substring**

  You can use the following operators with E-Logbook fields defined as numbers:

  - **is greater than**
  - **greater or equal**
  - **is less than**
  - **less or equal**
  - **equals**

13 Data storage and exchange

The SOMATOM CT system comes with functionalities for easy access and exchange of the patient data and exam data.

CAUTION

Use of external tools to alter the stored results!

Retrieved results could be potentially incorrect.

- Do not modify the stored results.

CAUTION

Wrong configuration of **Presentation State** support when configuring network nodes!

Loss of post-processing results.

- When configuring network nodes, enable **Presentation State** support only after verifying the remote node for PR support.

13.1 File Browser

The File Browser provides you with access to a well-defined part of the file system in your CT computer. It includes the following functions:

- Access to exported or imported CT images
- Transfer of CT raw data
- Access to generated reports and AVI videos
- Access to downloaded files

CAUTION

Manipulation of file system!

Software manipulation.

- Do not manipulate data in the file system, except within folders explicitly allowed by the Instructions for Use. Any software manipulation is forbidden.

13.2 Storage media

Your *syngo* workstation is equipped with a DVD recorder and USB ports to connect to USB storage devices.

CAUTION

Switching off a device while writing to the device!

Possible loss of all data and damage of media.

- Never switch off the device while writing to the device.

CAUTION

When you simultaneously export data to a device (like CD-R/DVD-R/Blu-Ray/USB/Network share drive) and try to read data from the same device with external (non-*syngo*-based)applications, one job or both jobs can fail (depending on the timing).

A loss of data is possible. When data is being written to adrive, any external access at the same time will destroy the current write job and could even damage the storage disk. Data already stored on a multi-session disk might also become unreadable.

- Do not try to access the device with non-*syngo*-based applications while it is writing data or reading data.
- To ensure successful writing or reading, check the **Local Job Status** to see if there are any write or import jobs in progress.

CAUTION

DVD-R/Blu-Ray Medium used for export/archive may get corrupted or may not be readable with other DVD/Blu-Ray devices.

Loss of data or user perception of loss of data.

- Configure and use local media only as archive media if the requirements regarding retention and readability are sufficient fulfilled, for example, the media is approved by the manufacturer for archiving.
- Verify readability of the data on the medium before the data is deleted in the database.

CAUTION

Archiving to media already containing clinical data.

Loss of data due to corruption of removable media.

- Avoid recording on removable media which already contains clinical data.

13.2.1 DVD recorder

With the DVD recorder, you can read and write data onto/from CDs and DVDs. You can export your CT acquisitions to recordable CDs (Compact Discs) and DVDs (Digital Versatile Discs).

From recorded CDs and DVDs you can, for example, import the examination data stored on them into your database. As soon as you have switched on the system or computer, the DVD recorder is also ready for operation.



(1) DVD tray

(2) LED

(3) Opening for manual ejection of discs

(4) Open/Close/Stop button

You can use the following types of discs on your system:

- CD-ROM
- CD-R/RW

- DVD-ROM
- DVD-R

The appearance of the DVD recorder may vary and depends on the delivery date of the computer.

Instructions for using DVD drive

Please observe the following instructions for using the DVD drive:

- Do not leave a disc in the drive when turning off your system. However, if a disc was left in the drive, remove the media shortly after you turned on the unit by pressing the release button.
- Make sure that the DVD drive is not subject to vibrations during operation. Vibrations can cause the drive to stop.
- Only open the drawer to insert or remove the disc.
- Do not place any objects on the open drawer.
- Never press down on the open drawer.

DVD session mode

The process of writing data on a CD or DVD is called “Recording”. You can write new data onto recordable CDs (CD-R) and DVDs (DVD-R) in one action (single session mode) or in several recording steps (multi session mode).

CAUTION

Switching to multi-session mode may destroy data previously recorded on this medium!

Previously stored data can no longer be read.

- Only delete the data that you have exported on a CD-R from the local database after you have completed the session.

⚠ CAUTION

A recording error may make a medium unusable!

In multi-session mode, all data previously stored on that medium could be lost, too. If this happens, any archive flags set to this data in the database become invalid.

- Only delete the data that you have archived on a media from the local database after you have successfully finalized and verified the media.

The setting of multi-session or single-session mode can be changed by Siemens Service. Factory default is multi-session.

Inserting a disc

✓ The DVD recorder is switched on and the status LED lights up green.

1 Press the insert/eject key briefly.

The drawer moves out.

2 Insert the disc into the drawer with the label side up.

3 Press the insert/eject key again briefly.

The drawer is retracted.

As soon as the disc has been inserted and the drive is ready for reading and writing, the status LED lights up green.

»

If the status LED does not light up green after you have inserted the disc, the disc is damaged or dirty.

- Take the disc out of the drive.

Writing & reading disc data

It takes some time to write data onto a CD or DVD. During recording, the read/write status LED lights up green.

- Use the appropriate menu entries of the user interface to write to and read from the CD or DVD.

- Depending on the volume of data, the recording process can take several minutes.
- Do not write data onto CD or DVD during a patient examination.
- While data is being read, the read/write status LED lights up green.

Ejecting a disc

CAUTION

Taking out the CD-R, CD or DVD too early!

Loss of data and destruction of the CD-R, CD or DVD possible.

- Do not remove the CD-R, CD or DVD from the recorder until the recording process has been completed and the status LED has gone out.
- Use the **Transfer** menu to eject media.

CAUTION

A medium is not finalized.

Another system/device may show this medium as empty, or defective or the data of the last session is missing.

- Use **Eject with finalize** to complete the work on this medium and to ensure that the medium is readable on other systems/devices.
- If a medium on which you expected to find data seems to be empty or defective or which the last data is missing, try to use original or another *syngo* system to finalize the medium for further read-only access.

✓ Reading and writing has been completed and the drive is not being accessed.

✓ The read/write status LED has gone out.

1 Call up **Transfer** > **Eject from CD** in the main menu.

The drawer moves out.

2 Take the CD or DVD out of the drawer when the mechanism stops and put it back in its cover.

3 Press the insert/eject key.

The drawer is retracted.

» **If the status LED flashes red, a drive fault has occurred.**

- Contact Siemens Service.

13.2.2 USB device

You can store data on USB (Universal Serial Bus) devices. The location of the USB ports may vary and depends on the delivery date of the computer. To provide the maximum storage space, USB devices must be NTFS formatted.

⚠ CAUTION

Plugging or unplugging USB devices during acquisition can make the system unstable which may affect other processes like running acquisition tasks!

Loss of data, acquisition process disturbed.

- Do not plug in or unplug USB devices during acquisition tasks or other critical processes.

Only use USB devices approved by Siemens. More information about the supported USB devices can be obtained from your Siemens representative.

Instructions for using USB device

It is recommended to use a USB disk without additional hardware function, for example backup, encryption, and so on. Please click **Cancel** if **Found New Hardware** window pops up, the USB disk function is still available.

CAUTION

Use of non-integrated USB storage device!

Reboot request of the operating system.

- Ignore the reboot request and press **Cancel**.
- Finish your examination or application.
- Restart the system with **System** > **End** > **Restart System**.

CAUTION

Using USB devices without own power supply!

The USB controller can be permanently damaged.

- Use USB devices as recommended by the manufacturer of the device.

It is necessary to format your USB hard drive as NTFS file system to transfer raw data > 4 GB to your USB hard drive. The entire process consists of two main steps:

- Formatting the USB hard drive
- Setting **Full Control** access to group **Everyone**

- We recommend not to insert, or to remove USB devices during an interventional examination.
- For instructions using the USB device, please refer to the operator manual of the USB device manufacturer. More information can be obtained via internet.

Inserting a USB device

- Insert the USB device into the USB port at the front of the computer.

  The USB icon appears in the status bar.



Removing a USB device

CAUTION

Removal of USB device without deactivation by the software!

Possible loss of data, damage of the operating system, and damage of media.

- Do not immediately unplug a USB device.
- Always use the software functionality for safe removal before unplugging.

✓ Reading or writing from or to the USB device has been completed.

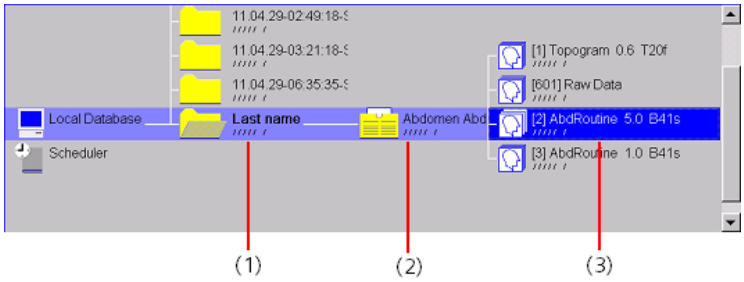
1 Double-Click the USB icon in the status bar, when USB icon disappears in the status bar, USB device can be safely unplugged.



2 Pull the device out of the USB port.

13.3 Patient Browser

In the **Patient Browser** dialog box, the hierarchical structure of the patient and examination data is displayed. Patient data from the databases and the connected drives is displayed.



Exam data in Patient Browser

(1) Patient

(2) Study

(3) Series

CAUTION

Patient folders containing data from other patient or series, for example, after patient merge, import of data from external media!

The diagnosis or treatment may be made on the basis of incorrect information.

- Check that data is assigned to the correct patient and series before using the data.

CAUTION

Not all graphic and evaluation results created by one software can be interpreted.

Not all information from post processing available for diagnosis.

- A message box will inform you if not all information can be loaded and displayed.
- Please be aware when using such data for diagnosis.
- Use original application to view the post processing results.

13.3.1 Correcting or rearranging patient data

The images of a patient are grouped together by examination and series into hierarchical groups. If you find that the structure is not correct, you can regroup the examinations and series by moving them.

CAUTION

Correcting or rearranging objects containing references!

Possible loss of references.

- Rearrange the entire hierarchical group containing all objects with references in order to maintain the references.
- Only references found within the selection will be adapted.

CAUTION

Rearranging series/images to another series may lead to wrong image information if the selected images/series are not compatible.

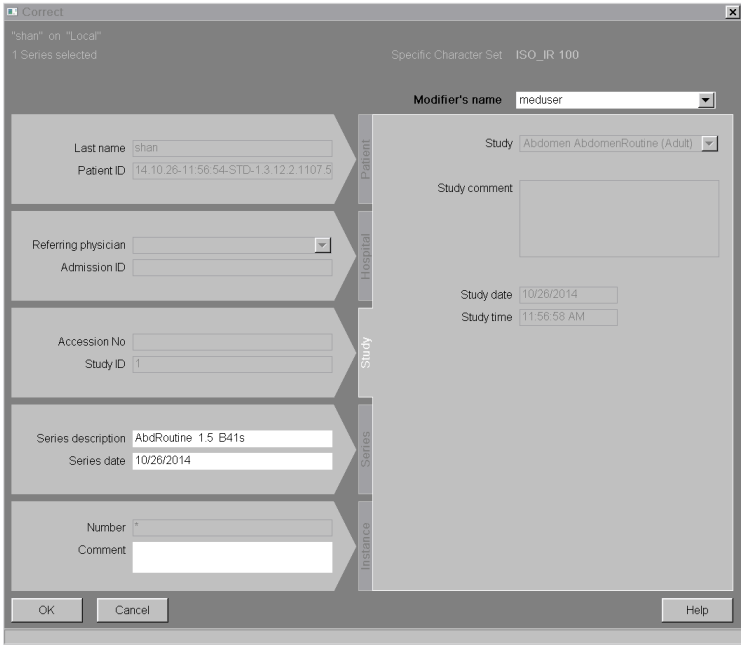
Wrong diagnosis caused by wrong image information.

- Correct the attributes which do not correspond first and then rearrange the series/images.

You use the **Correct** dialog box for correcting or modifying patient data and information. Click the **Correct** icon on the tool bar.



The **Correct** dialog box opens.



You can view the modifications history of the patient data. Click the **History** icon on the tool bar.



CAUTION

Inconsistent patient data or image information for *syngo* applications like Osteo CT, Pulmo CT, Volume, Circulation, Dental CT, LungCARE CT or Calcium Scoring!

Wrong basis for diagnosis.

- Do not modify patient data (**Edit > Correct** in the **Browser** menu) after results have been calculated.

13.3.2 Deleting patient data

You can explicitly delete patient data in the **Patient Browser** manually. Select the data that you want to delete in the navigation area or content area. Click the **Delete** icon on the tool bar.



You can turn off the confirmation dialog box, when selecting **Options** > **Configure Browser** from the main menu and deactivate the **Confirm Deletion** checkbox.

⚠ CAUTION

Deletion confirmation deactivated!

Possible loss of data.

- The option in the **General** tab card to configure the **Delete Confirmation** dialog box should not be switched off.
- Be careful when setting permissions to delete documents without check if flags are not set.

⚠ CAUTION

Deletion confirmation deactivated!

Possible loss of data.

- The option in the **General** tab card to configure the **Delete Confirmation** dialog box should not be switched off.
- Be careful when activating a filter for auto deletion of data sets that it fits to your workflow as well.

You can configure the automatic deletion in the **Auto Delete Configuration** dialog box to be performed regularly meeting selected criteria. To open the configuration dialog box select **Options** > **Configuration** from the main menu and select the **Auto Delete** icon.

CAUTION

Deactivation of the **Delete Confirmation** dialog box for **Auto Delete**!

Loss of data, delay of diagnosis or therapy.

- The **Delete Confirmation** dialog box for **Auto Delete** should always be switched on, especially on modalities.
- If the **Delete Confirmation** dialog box for **Auto Delete** is switched off, **Auto Delete** will start without user confirmation.

CAUTION

The **Delete Confirmation** dialog box for auto deletion is kept open for a long time on scanner systems!

Loss of data if objects chosen for auto deletion are updated by acquisition when the Delete Confirmation dialog box is open.

- Do not keep the **Delete Confirmation** dialog box open for a long time in parallel during a patient examination, and close it before a patient registration.

CAUTION

Conflicting **Auto Delete Configuration** and **Transfer Configuration**!

Loss of data if both functionalities start in parallel.

- Do not use the **Sent** flag for rule **Delete all Series with flags** if auto transfer is configured to start when the **Sent** flag is set in combination.
- Use storage commitment whenever the sending and receiving systems supported it.
- If this combination is not avoidable, always crosscheck if the data chosen for auto deletion is actually stored on the receiving system before confirming auto deletion.

13.3.3 Exporting patient data

Patient data can be exported for exchanging it with other computers or to a server in your hospital's network, for the purpose of imaging reading, reporting, or archiving outside of the *syngo* workstations.

On the **Trasnfer** menu of Patient Browser, several commands for exporting data are available:

- **Export to** to transfer data, for example, to USB devices.
- **Send to** to transfer data to other workstations over network.
- **Export to Off-line** to export data to a local directory of File Browser.
- **Record Off-line Files** to burn data from the **CDBurn** folder in File Browser.

Please note that not all these functionalities are available and they depend on your system configuration.

CAUTION

Lossy JPEG compression is selected for data transfer.

Image quality of the lossy compressed images may no longer be adequate for diagnostic purpose.

- Do not use the lossy JPEG compression for sending data to a report or primary diagnosis workstation.
- Do not use the lossy JPEG compression for archiving.

CAUTION

Transferring manipulated non-square matrices or viewing segments!

Diagnostically relevant areas of images may be lost.

- When manipulated images are exported or sent to another workstation, the related original images should be sent, as well. It is strongly recommended to base the final diagnosis always on the original images and not on modified or manipulated images.

13.3.4 Importing patient data

Patient data from external sources (for example, DVD disc, USB device, & network node) can be imported into the local database of Patient Browser for you to view or process on *syngo* workstations.

- You can import patient data from DVD discs or USB devices by using **Import** or **Import from Off-line** on the **Transfer** menu of Patient Browser.
- With **Patient** > **Search** in Patient Browser, you can retrieve patient and examination data from network DICOM nodes into the local database of Patient Browser.

CAUTION

If *syngo* receives images but the study or series UID is already available in the local database, the data will be assigned to this locally existing patient. This happens regardless of the patient identification (name, date of birth, gender and patient ID) of the received images. Changes of patient information on other systems will not automatically change the patient information in *syngo*!

Data retrieved from PACS or other nodes seems to be misaligned or lost, but is stored elsewhere in the database.

- Imported data will always be appended to the already existing patient on the local system, based on matching DICOM UIDs.
- If you imported data, but cannot find them on the local system under a certain name, use other criteria from the study or series to search for the imported data, or filter the data.
- To completely avoid these inconsistencies, always delete the local patient data after you have successfully archived them.

CAUTION

If the Patient ID is not unique, studies may be listed which do not belong to the patient selected and displayed in the information area!

Import of wrong patient data possible.

- Always check the patient data before importing them into your system.

13.3.5 Archiving patient data

You archive patient data for long-term storage. The data archiving can be done either by recording patient data to medical grade DVD discs or by sending the data to the archiving servers on your hospital's network.

There may be legal regulations pertaining to archiving of digital image data. The archive operator is responsible for observing these regulations.

When archiving to network nodes, we strongly recommend the use of the "Storage Commitment" service. It can be enabled in the Local Service software, if the remote system supports it.

⚠ CAUTION

Systems that do not use storage commitment only report back to the sending system when the data has been fully received (flags A and S). A user or an auto-delete mechanism at the sending system might subsequently delete the sent data. However, this response does not imply that the data has already been stored at the receiving system!

In the case that the receiving system cannot store the data, the data might irrevocably be lost.

- Double-check that the data is actually stored on the receiving system. Use storage commitment whenever it is supported by the sending and receiving systems.

⚠ CAUTION

Misleading or misinterpretation of the storage commitment flags AC/SC. Storage Commitment means storage to hard disk but this may not fulfill or guarantee regulatory requirements about long-term archiving. You can delete the committed objects!

Possible loss of data within the required period for retention.

- Observe the regulatory requirements regarding long-term archiving.

13.4 Data set conversion

The **Data Set Conversion** tool prepares DICOM images of other manufacturers that are already imported into the *syngo* database, making them accessible for CT applications. The tool can be started alongside other applications.

Additionally, the tool splits up a series from Siemens CT multi-phase heart reconstruction into series of different heart phases or slice positions.

13.4.1 Setting up lossy image compression

In case pixel values of the original data exceed the range compatible with existing Siemens systems, the original images are lossy compressed during data set conversion.

⚠ CAUTION

Compression method is set to irreversible compression (Lossy JPEG)!

The resulting images are no longer completely identical to the original images. Information of medical relevance may be lost.

- Lossy compressed images should not be used for primary diagnosis, the image quality may not be sufficient.
- Lossy compression is indicated in the image displayed. The indication will be displayed except if “No Text” is in effect.
- Pay attention to corresponding entries in the image text.

1 Select the **Options** > **Configurations** menu item.

The **Somaris/5 – Configuration Panel** appears.

2 Double-click the **Conversion** button.



The **DICOM Converter Configuration** dialog box appears.

3 Deselect the option **Mark images as lossy compressed**, if indispensable, if you do not want images with modified pixel range to be marked.



As the option **Mark images as lossy compressed** is activated by default, images with modified pixel range are labeled with, for example, CQ!, CF 10 (Compressing Factor 10). If marked as lossy compressed, images are not accepted for further processing by CT applications.

13.4.2 Converting data set

You start **Data Set Conversion** via the **Patient Browser**.

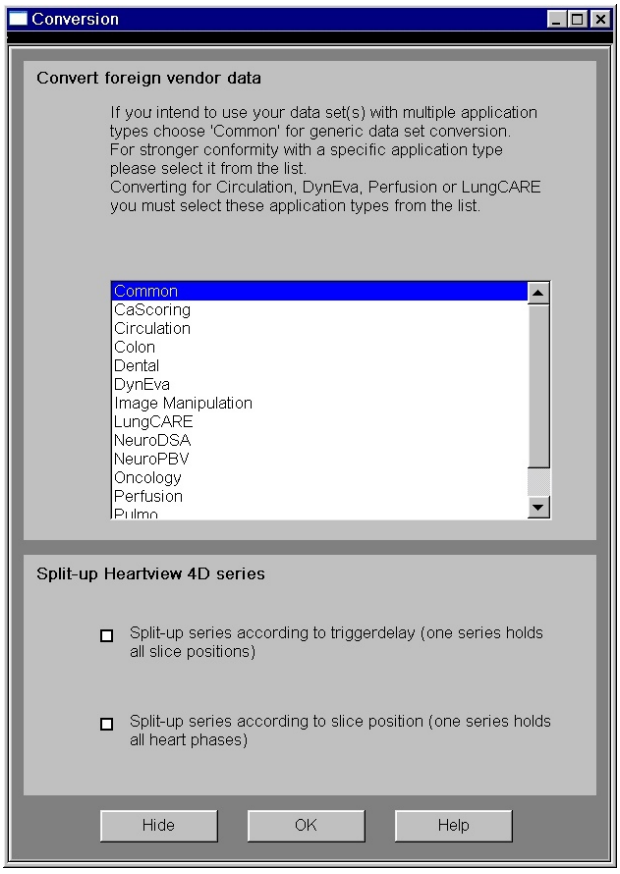
1 Call up the **Patient Browser** by selecting **Patient** > **Browser** from the main menu.

2 Select one or more series of a study in the navigation or content area of the **Patient Browser**.

If you want to convert more series simultaneously, merge the series first. You can select all the series you want to convert, and drag-and-drop the selected series onto the remaining series. One series has to remain unselected.

3 Select **Applications** > **Conversion** from the menu of the **Patient Browser**.

The **Conversion** dialog box opens.



4 Do one of the following:

- Select **Common**, if you intend to use the converted series for more than one application type.
- Select a specific application from the list for which you want to convert the data, for example, **DynEva**, or **Perfusion**.

5 For cardiac data, do one of the following:

- Select **Split-up series according to trigger delay**, to split-up the series of multi-phase heart reconstruction according to the different heart phases included.
- Select **Split-up series according to slice position** to split-up the series according to the different slice positions it contains.

6 Click **OK** to start the conversion.

You are informed of the status of conversion on the status bar, where any conversion risks are indicated by error messages.

13.5 HIS/RIS integration

A HIS/RIS system is an integrated information system designed to manage the administrative, financial, and clinical aspects of a hospital, and it is used by radiology departments to store, manipulate, and distribute patient radiological data and imagery. HIS/RIS system generally consists of patient tracking and scheduling, result reporting, and image tracking capabilities.

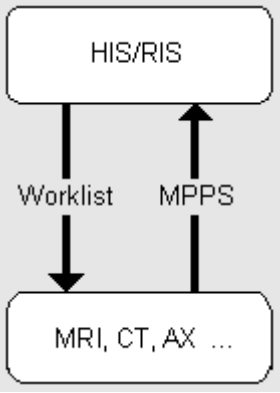
13.5.1 HIS/RIS patient registration

If your CT modality is linked to, licensed, and registered for an HIS/RIS system, a patient can be registered via the HIS/RIS system. After registration, the patient information is saved in the **Scheduler** of Patient Browser.



13.5.2 MPPS

The exchange of information based on Modality Performed Procedure Step (MPPS) closes the gap between the modalities and the HIS/RIS. The information documents which actions have been performed for a patient. The DICOM worklist, generated in the RIS, was handed over to the modalities. A MPPS object containing certain information can be sent back from the modalities to the HIS/RIS.



The purpose of MPPS is to provide features that will help to integrate the modalities with the supervising information system in the hospital. Thus a smooth clinical flow is ensured, and billing, dosage, and other information is generated within the hospital system.

When you register a patient, the system creates an MPPS object. An MPPS object is generated according to the DICOM Standard for archiving and evaluation purposes.

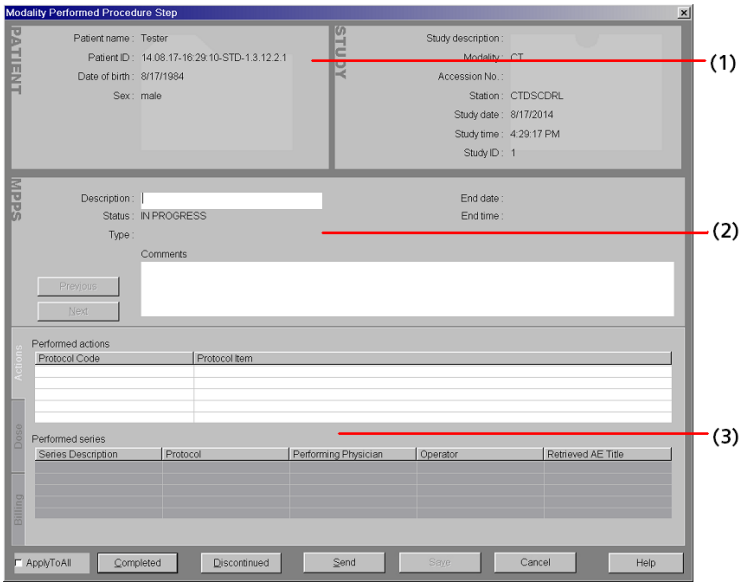
If a study is continued with additional scans, a new MPPS is created.

During the examinations and during the post–processing of the examination results all MPPS relevant information (protocol information, radiation dose information, film consumption information, etc.) is automatically filled into the related MPPS object.

The MPPS function is available by an optional software license. If this license is not available, only local MPPS management is possible, and no feedback is sent to the HIS.

The MPPS window

Select the patient, the examination, or one of the associated series or images from the **Patient Browser**; choose **Patient** > **Show MPPS** to open the **Modality Performed Procedure Step** window.



(1) **PATIENT** and **STUDY** areas

(2) Upper part of the **MPPS** area

(3) Lower part of the **MPPS** area

Examination data sorted by various aspects and displayed in three tab cards (not all of them may be available at your modality):

- The performed persistent series are listed on the **Action** tab card of the MPPS (for example, RTD series are not referenced).
- The dose information is automatically filled in the comment field on the **Dose** tab card.
- The contrast media data is filled in the **Billing** tab card.

  Contrast media information for billing, for example, name and catalog ID, is set in the **Contrast** tab card of the **Examination Configuration** dialog box.

MPPS status

In the **Patient Browser**, the MPPS series are marked by the following flags:

- IN PROGRESS
- DISCONTINUED
- COMPLETED

Viewing & editing MPPS

You can also add information, for example, volume & contrast medium, to an MPPS object.

1 Open the **Modality Performed Procedure Step** window. By default, the latest MPPS object is displayed.

2 Do one of the following:

- Click the **Previous** button to have the earlier MPPS object displayed again.
- Click the **Next** button to have the later MPPS object displayed.
- Click the **Save** button to save your changes of the document.

  Saving an MPPS does not complete the examination. No message is sent to the HIS/RIS. If you consider further steps, you can at first save the document, and send it later.



- In case you cannot edit the MPPS information, you do not have appropriate access rights. Security in *syngo* ensures that access to functions and data is always provided in accordance with the privileges and permissions granted to a user.
- Click the **Cancel** button to close the dialog box if you only have opened the document for printing or viewing.

Sending MPPS

Information about status and changes of the MPPS is sent to the HIS/RIS every time you click one of the following buttons in the **Modality Performed Procedure Step** dialog box:

- **Completed**
- **Discontinued**
- **Send**

- Do one of the following:
  - Click the **Completed** button when all data shown in the performance document are correct, and complete the examination.
  - To complete all the MPPS documents of a patient or a study, click the **Complete MPPS** icon in the **Patient Browser**.



  - Click the **Discontinued** button if the examination is canceled.
  - Click the **Send** button to mark the MPPS as being processed and to inform the HIS/RIS about changes in the MPPS. The **Send** button is displayed only, if an MPPS node is configured.

  A corresponding message is forwarded to the HIS/RIS.

The usage of the DICOM with MPPS service depends on the availability of the corresponding RIS system. Even if no RIS with MPPS service is connected, the **MPPS** icon is displayed in the **Patient Browser**.

MPPS auto-sending

In the **Workflow** tab card of the **Examination Configuration** dialog box, you can activate the checkbox **Auto Complete MPPS**. All MPPS are then automatically set to **COMPLETED** after all recon jobs were reconstructed and the patient was closed.

- Make sure that you printed all film sheets before closing the patient. Otherwise MPPS does not consider the film sheets anymore.
- If autofilming is active, all the images sent to **Filming** will be inserted in the MPPS and not the ones that were really printed.

MPPS messages

In the status bar of any task card, you can easily confirm whether the message was successfully sent from MPPS to HIS/RIS.

Click in the center of the status bar of the task card to check the corresponding entry in the History of Events. Look for an entry in the list concerning the MPPS. If you do not find such an entry, it is already removed, because the information was sent successfully to the HIS/RIS. If you find an entry concerning the MPPS, click it.

If an error occurred, a message appears. Check also the status bar at the bottom of the task card for any error information.

14 Quality assurance

To ensure a constantly high image quality, you must perform quality measurements regularly. Quality tests are usually performed in several steps:

- Daily quality measurements
- Monthly quality measurements (constancy test)
- Camera test
- CTDI test (once every six months)

You require the set of phantoms for the quality measurement and possibly additional accessories for the constancy test.

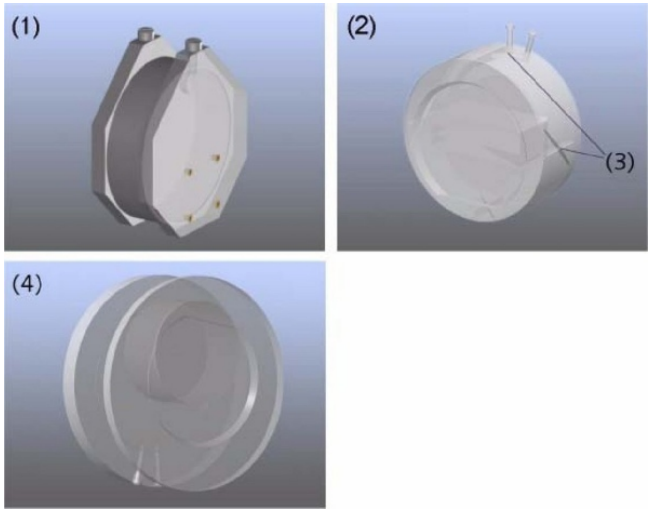


We recommend having the constancy test performed by Siemens Customer Service as part of a service contract.

14.1 Quality assurance accessories

You require the set of phantoms for the quality measurement and possibly additional accessories for the constancy test.

The set of phantoms comprises the water phantom, the slice thickness phantom and the wire phantom.



Quality assurance phantoms

(1) Water phantom

(2) Slice thickness phantom

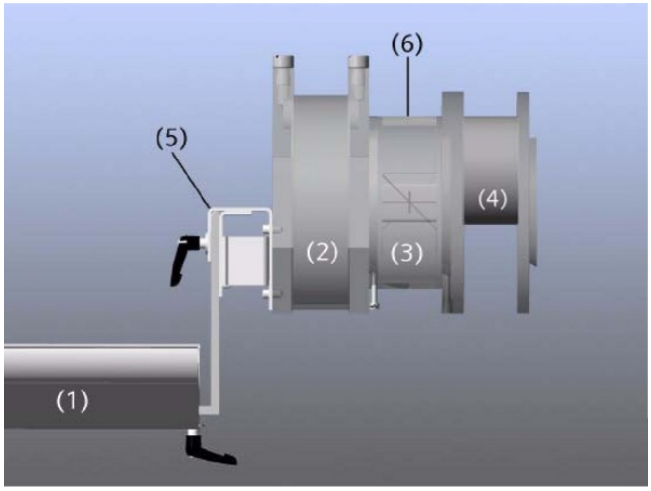
(3) Reference marks

(4) Wire phantom

After delivery, the phantoms are assembled by a technician into one set.

14.1.1 Mounting the test phantoms

- Mount the phantoms at the head end of the patient table with the phantom holder in the following order: water phantom – slice thickness phantom – wire phantom.



(1) Patient table top

(2) Water phantom

(3) Slice thickness phantom

(4) Wire phantom

(5) Phantom holder bracket

(6) Reference marking

- The pictures of the phantoms shown here are only examples. Please refer to the phantom guide.
- The phantom holder is secured by a locking key in the receptacle on the underside of the patient table. You must press this key in when you pull the holder out of the guide again after removing the phantom set.

14.1.2 Positioning the test phantoms

1 Set the gantry vertical (0°).



2 Activate the light marker.



3 Set the appropriate table height using the light marker.



4 Move the patient table into the gantry.

The beam of the light marker must be aligned with the reference marking of the slice phantom.



14.2 Daily Quality

It is recommended that you perform a quality check of the CT scanner after long pauses, or whenever ring artifacts occur in images.

The daily quality measurements only require checking of three parameters on the water phantom:

- The CT value of water is calculated in Hounsfield units (HU).
- The Pixel noise of images is calculated as a standard deviation.
- Tube voltages are measured directly on the x-ray tube.

These measurements are carried out for all available kV values.

CAUTION

Wrong correction tables!

X-ray not, or only partially, usable.

- Perform the daily quality tests every day before you start the actual examinations.

The CT value of water can be measured in Constancy Test \Homogeneity Test.

14.2.1 Equipment for Daily Quality

The following components are required for the daily quality measurement:

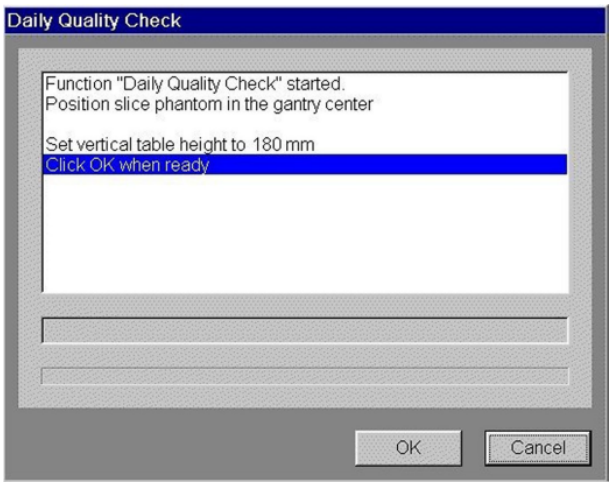
- Phantom holder
- Set of phantoms

14.2.2 Performing Daily Quality

You must perform calibration before you start quality measurement. Position the phantom set. Call up **Setup** > **Quality**.

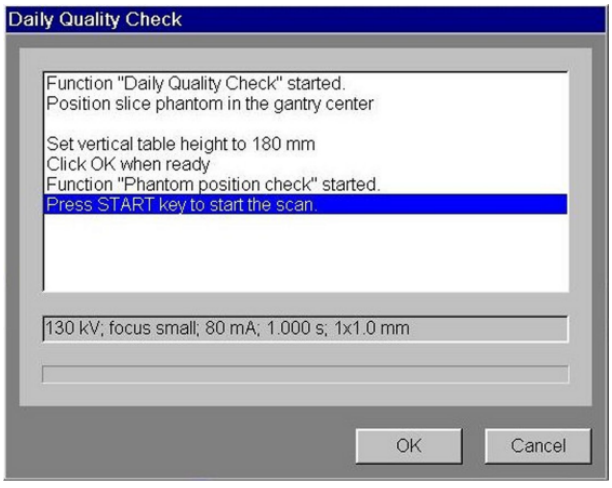
1 Call up **Setup** > **Quality**.

The **Daily Quality Check** dialog box is displayed.



2 Click on the **OK** button.

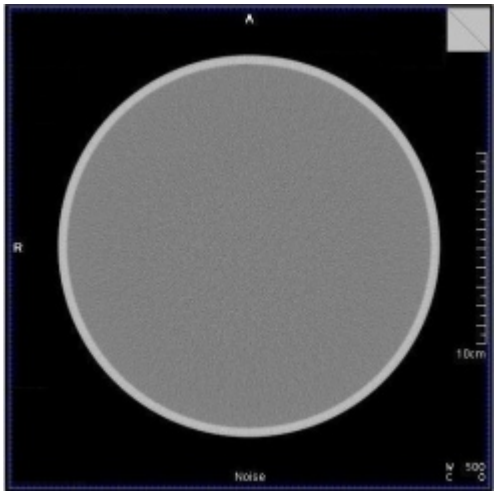
The tilt of the gantry is automatically set to 0°, if necessary. The "Quality Assurance Patient" is automatically selected. The patient table is positioned such that the water phantom is in the scan plane.



3 Press the **Start** key on the control box.

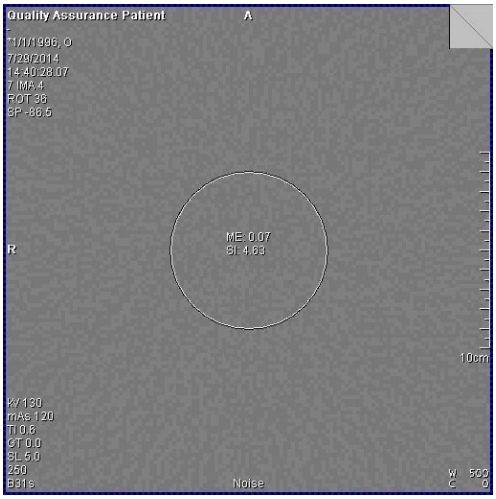


The position of the phantom set is checked and displayed. The measurements are started automatically. For each tube voltage (kV step), two measurements are performed. After each measurement, a CT-image of the water phantom is displayed in the active segment.

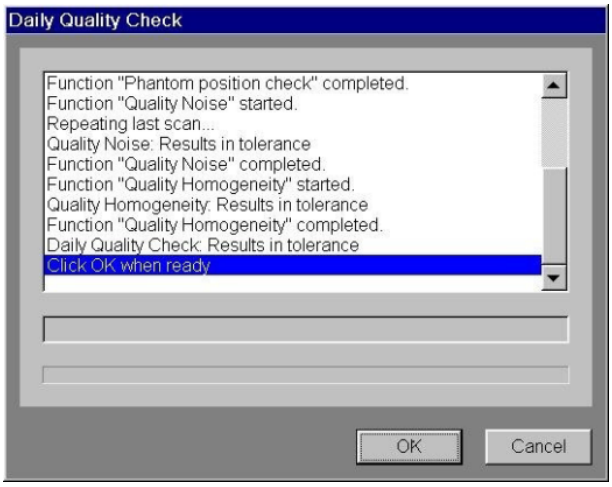


The difference between the first and the second measurement is calculated and displayed. The following evaluations are shown:

- ROI
- Mean value of the CT value
- Sigma value (measure for pixel noise)



All measurements were performed and evaluated. Test results are displayed in the **Daily Quality Check** dialog box.



4 Click on the **OK** button.

- All parameters and images shown are examples. Only the parameters displayed by your system are definite.
- For incorrect positioning of the phantom set, a message is displayed. Correct the position, if necessary.
- You can cancel quality measurement in any phase. Click on the **Cancel** button. Then, you have to repeat the quality measurement from the beginning before you start the actual examinations.

Test results of the Daily Quality measurement are out of tolerance.

- Call your Siemens Customer Service.

14.2.3 Daily Quality report

The images of the **Daily Quality** measurements are stored as images of the "Quality Assurance Patient" in Patient Browser. New images overwrite older images.

All values of the **Daily Quality** measurements are stored in the constancy test reports.

14.3 Constancy tests

Together with other characteristic values, the daily test values are checked for constancy monthly. These tests are performed on the complete set of phantoms. The monthly quality test is performed via the **Quality Constancy** dialog box of the **Local Service** window.

In addition, the CTDI (CT Dose Index) must be measured at least once every six months. The CTDI must also be measured after any maintenance work that might have altered the test results.

For the monthly constancy test, you require the following phantoms and accessories:

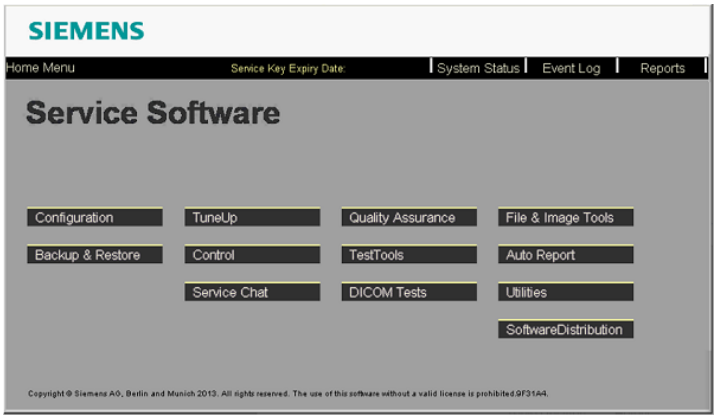
- Phantom holder
- Set of phantoms
- 100 kg weight
- Ruler, 40 cm or longer

We recommend having the constancy test and the CTDI measurement performed by proper personnel. If you want to conduct the constancy test and the CTDI measurement yourself, you must perform all steps of the constancy test or the CTDI measurement under your own responsibility.

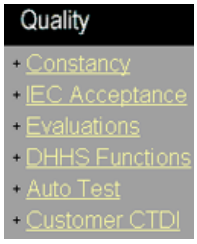
14.3.1 Calling up constancy tests

1 Call up **Options** > **Service** > **Local Service**, delete the password entries, and click **OK**.

The **Home Menu** dialog window is displayed.



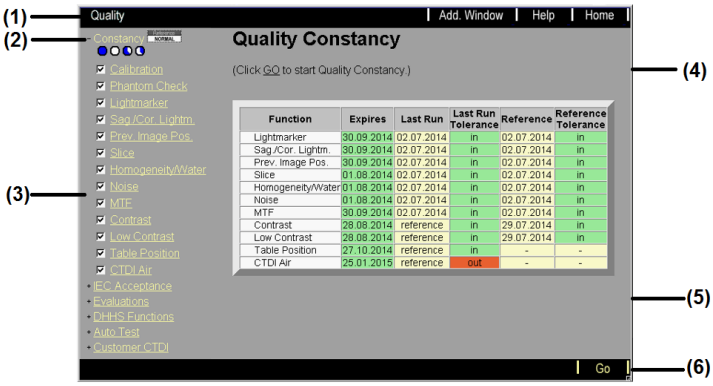
2 Click the **Quality Assurance** button to display the **Quality** dialog window.



Quality/Constancy

3 Select the **Constancy** procedure.

The **Quality Constancy** dialog box is displayed.



The Quality Constancy window

(1) Title bar

(2) Mode button

(3) Quality functions

(4) Content area

(5) Status and error message area

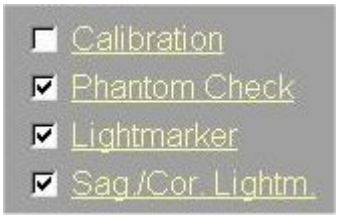
(6) Command buttons

4 Do one of the following:

- Click the tests that you want to include in addition in this constancy test.

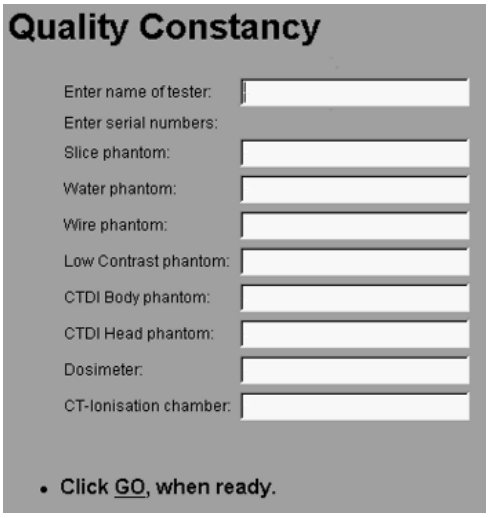
  The system calibration and phantom position check are typically required and run before any other individual constancy test.

- Deselect the tests that you do not require by clicking them again.



5 Confirm selection of the constancy test with **Go**.

You are prompted to enter the name of the tester and the serial numbers of the phantoms.



6 Click **Go** when you have completed your preparations.



- After you called up the constancy test, follow the instructions given on the screen. The system starts the first quality measurement. After successful completion of the first test the next test is started automatically without pressing the **Start** key.
- After you finish the constancy test, click **Done** and then **Home**. You return to the home page of Local Service.
- You can interrupt each test within a constancy measurement. Click the **Cancel** button. The current measurement is aborted.

14.3.2 Normal or reference test

Evaluation of the constancy test results are based on a comparison with reference data that are stored in your system. These are determined by Siemens Service.

If you have any of the system parts replaced (for example, tubes), the reference data must be determined again. You can do this with a reference measurement.



- Click the field **Reference/NORMAL** to toggle between a normal constancy measurement and a reference measurement.



In reference mode, the individual selected tests are marked by an “R”. The test results will be used as reference data in the future.

A reference measurement follows the same sequence as a normal constancy test.

- In **Reference** mode, click the **Save** button first before terminating the constancy test with **Done**. Without **Save** the old reference values will be retained.
- We recommend that Siemens Service always performs your reference measurements.

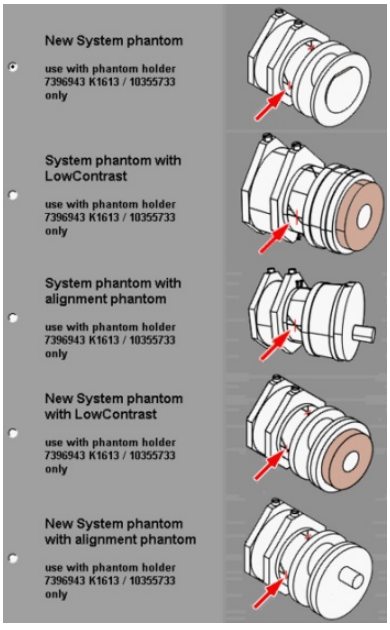
14.3.3 Phantom check

Before the individual test starts, phantom check may be required by the system.

✓ The phantom check step is initiated.

✓ The set of phantoms is positioned in such a way that the inner light marker hits the reference marking on the slice thickness phantom.

1 Click the phantom type corresponding to the phantoms that have been positioned on the patient table. The available sets of phantom for you to select depend on the CT system configuration.



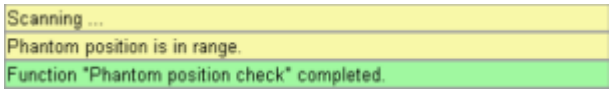
2 Click **Go**.

3 Press the **Start** key on the control box.



Scanning is started.

The result of the scan will be displayed in the status and error message area.



14.3.4 Inner light marker test

With the quality measurement, you determine the deviation of inner light marker from the current slice plane.

✓ The set of phantoms is positioned in such a way that the inner light marker points on the reference marking on the slice thickness phantom.

✓ The **Lightmarker** test mode is loaded.

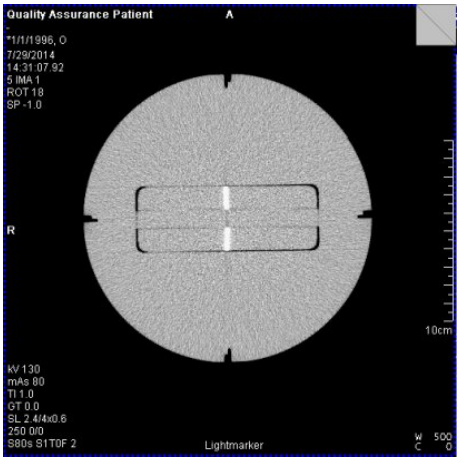
✓ You are prompted to press **Start**.

1 Press the **Start** key on the control box.

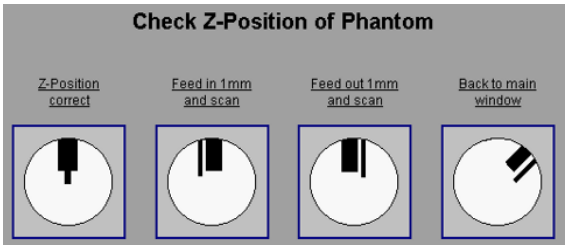


Scanning is started.

In the image area, the phantom is displayed as a circle in the image. For the light marker test, both the short and the long strip in the 12 o'clock position are important.



2 Compare the position of the short/long strip on the image with the options displayed in the content area of the **Quality Constancy** dialog box.



3 Correct the table position by clicking **Feed In** or **Feed Out**. With **Feed In** and **Feed Out**, you can move the table by 1 mm.



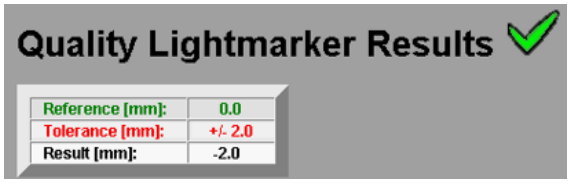


A new image is acquired.

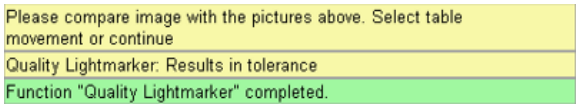
4 Repeat step 2 to step 3 until you have set the correct z-position.

5 Click **Continue**.

The internal z-position is set to 0, the display of the table position shows 0. The result of the test is output in the content area of the **Quality Constancy** dialog box.



In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.5 Sagittal and coronal light marker test

With the quality measurement, you determine the position of the sagittal/coronal lightmarker.

✓ The slice thickness phantom is positioned in such a way that the sagittal and horizontal lightmarkers mark the horizontal and vertical center.

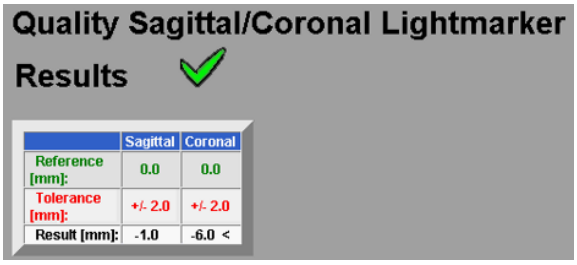
✓ The **Sag/Cor. Lightm.** test mode is loaded.

✓ You are prompted to press **Start**.

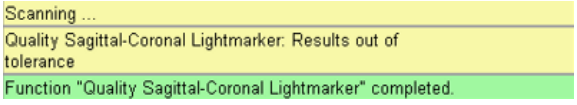
- Press **Start** on the control box.



Scanning is started. In the image, the middle of the phantom is determined. The result is the deviation from the horizontal and vertical middle of the image to the middle of the phantom. The result of the test is output in the content area of the **Quality Constancy** dialog box.



In the status and error message area the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.6 Preview image positioning test

With the quality measurement, you determine the automatic positioning of the tomographic plane using a preview image.

✓ The set of phantoms just before the scanplane. The internal lightmarker must not hit the phantom.

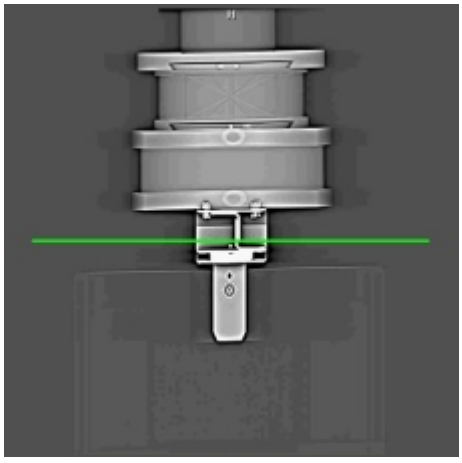
✓ The **Prev. Image Pos.** test mode is loaded.

✓ You are prompted to press **Start**.

1 Press **Start** on the control box.



In the image area, the Quality Assurance Patient image is displayed. You can see a horizontal line in the image and the corresponding table position to the line position is shown.



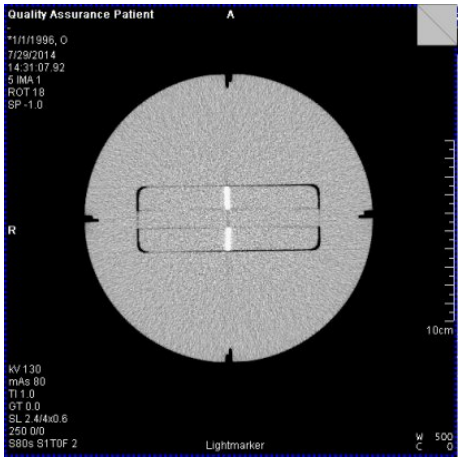
2 Move the horizontal line and mark the position of the middle of the slice thickness phantom.

3 Click **Go**.

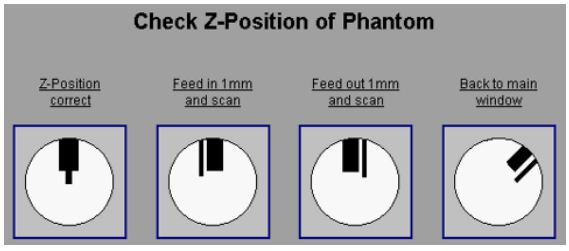


The patient table moves automatically to the marked position. Scanning is started.

In the image area, the phantom is displayed as a circle in the image. For the preview image test, both the short and the long strip in the 12 o'clock position are important.



4 Compare the position of the short/long strip on the image with the options displayed in the content area of the **Quality Constancy** dialog box.



5 Correct the table position by clicking **Feed In** or **Feed Out**. With **Feed In** and **Feed Out**, you can move the table by 1 mm.





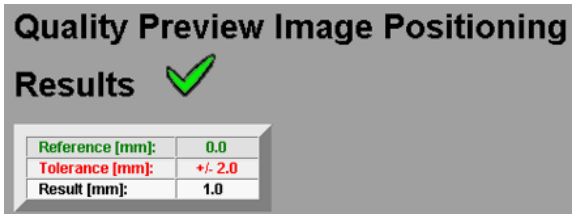
A new image is acquired.

6 Repeat image recording and correction of the table position until you have set the correct z-position.

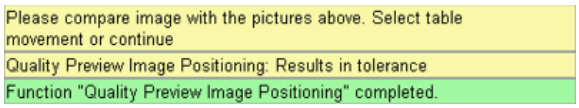
7 Click **Continue**.



The result of the test is output in the content area of the **Quality Constancy** dialog box.



In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.7 Slice thickness test

The slice thickness is determined with the slice thickness phantom. For each slice thickness, a tomogram of the phantom is recorded and the real slice thickness is calculated from this.

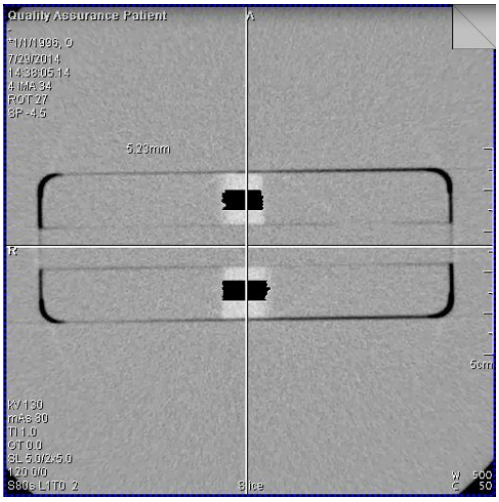
After the previous test has been completed, the **Slice** test is started automatically.

- Press the **Start** key on the control box, if prompted.

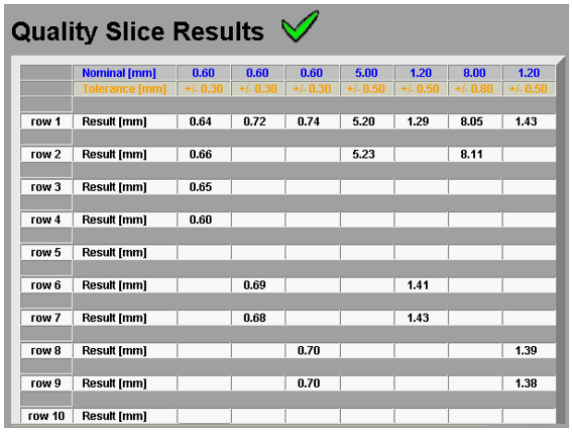


Scanning is started.

An image of the slice thickness phantom is displayed in the image area and the slice thickness is calculated. The procedure is repeated automatically.



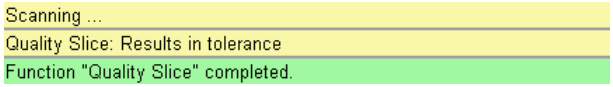
After all slice thicknesses have been evaluated, the result of the test is output in the content area of the **Quality Constancy** dialog box.



Quality Slice Results

	Nominal [mm]	0.60	0.60	0.60	5.00	1.20	8.00	1.20
	Tolerance [mm]	+/- 0.30	+/- 0.30	+/- 0.30	+/- 0.50	+/- 0.50	+/- 0.80	+/- 0.50
row 1	Result [mm]	0.64	0.72	0.74	5.20	1.29	8.05	1.43
row 2	Result [mm]	0.66			5.23		8.11	
row 3	Result [mm]	0.65						
row 4	Result [mm]	0.60						
row 5	Result [mm]							
row 6	Result [mm]		0.69			1.41		
row 7	Result [mm]		0.68			1.43		
row 8	Result [mm]			0.70				1.39
row 9	Result [mm]			0.70				1.38
row 10	Result [mm]							

In the status and error message area the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.8 Homogeneity test

With this test, you measure the homogeneity of the CT values in five regions of the water phantom. After the previous test has been completed, the **Homogeneity** test is started automatically.

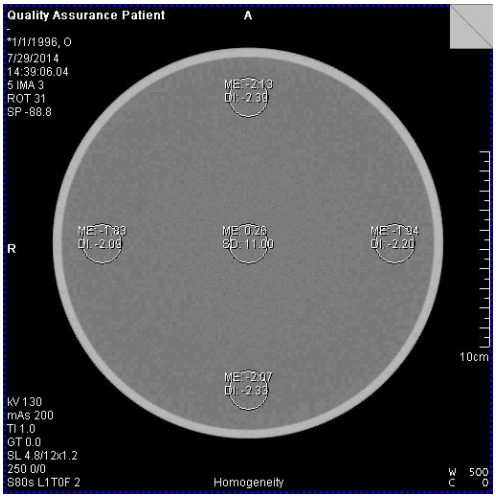
- Press the **Start** key on the control box, if prompted.



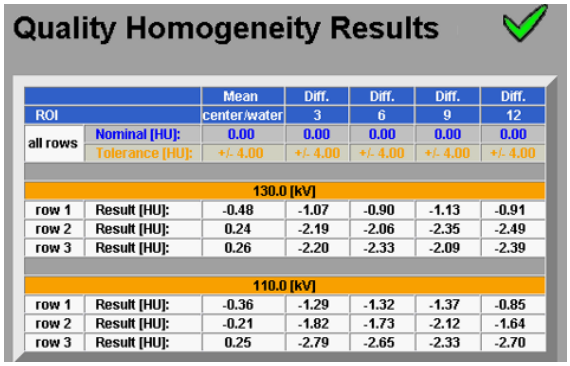
Scanning is started.

An image of the water phantom is recorded. 5 ROIs are marked in the image, one central and four peripheral.

In addition to the ROIs, the mean values and standard deviations of the CT values are displayed. The difference between the mean values of the central ROI and the peripheral ROIs is displayed.



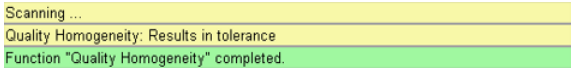
The measurement is repeated automatically for other tube voltages. The results of the test are output in the content area of the **Quality Constancy** dialog box.



Quality Homogeneity Results

ROI		Mean center/water	Diff. 3	Diff. 6	Diff. 9	Diff. 12
all rows	Nominal [HU]:	0.00	0.00	0.00	0.00	0.00
	Tolerance [HU]:	+/- 4.00	+/- 4.00	+/- 4.00	+/- 4.00	+/- 4.00
130.0 [kV]						
row 1	Result [HU]:	-0.48	-1.07	-0.90	-1.13	-0.91
row 2	Result [HU]:	0.24	-2.19	-2.06	-2.35	-2.49
row 3	Result [HU]:	0.26	-2.20	-2.33	-2.09	-2.39
110.0 [kV]						
row 1	Result [HU]:	-0.36	-1.29	-1.32	-1.37	-0.85
row 2	Result [HU]:	-0.21	-1.82	-1.73	-2.12	-1.64
row 3	Result [HU]:	0.25	-2.79	-2.65	-2.33	-2.70

In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.9 Pixel noise test

The pixel noise is determined from two tomograms of the water phantom in the same way as for the daily quality measurement.

After the previous test has been completed, the **Noise** test is started automatically.

- Press the **Start** key on the control box, if prompted.

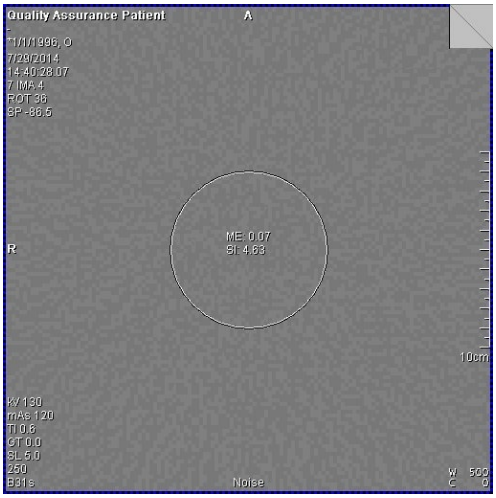


Scanning is started.

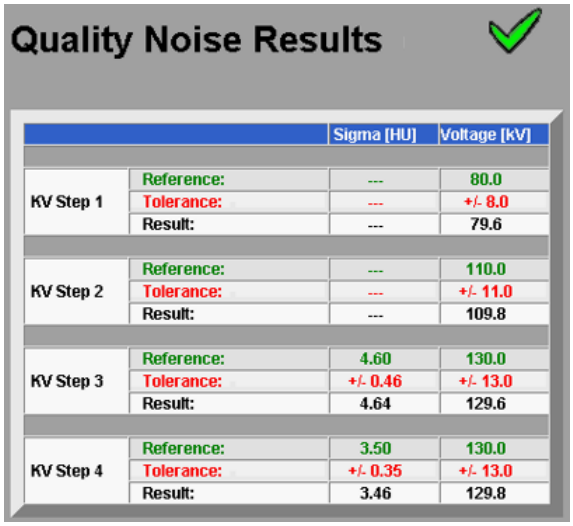
Two images of the water phantom are recorded with identical parameters. The difference between the first and the second measurement is shown.

The following evaluations are displayed:

- ROI
- Mean value of the CT value
- Sigma value (pixel noise)



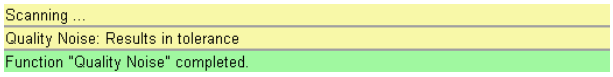
The measurement is repeated automatically for every tube voltage. The results of the test are output in the content area of the **Quality Constancy** dialog box.



Quality Noise Results

		Sigma [HU]	Voltage [kV]
KV Step 1	Reference:	---	80.0
	Tolerance:	---	+/- 8.0
	Result:	---	79.6
KV Step 2	Reference:	---	110.0
	Tolerance:	---	+/- 11.0
	Result:	---	109.8
KV Step 3	Reference:	4.60	130.0
	Tolerance:	+/- 0.46	+/- 13.0
	Result:	4.64	129.6
KV Step 4	Reference:	3.50	130.0
	Tolerance:	+/- 0.35	+/- 13.0
	Result:	3.46	129.8

In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.10 MTF test

The *spatial resolution* is characterized through the modulation transmission function (MTF). It describes the contrast amplitude of bar patterns with different local frequencies shown in the image relative to an ideal transmission.

The 2 % value of the MTF is the local frequency at which the contrast of periodical bar patterns of this local frequency is reduced to 2 %. In practice, the MTF values are determined using a single thin wire.

After the previous test has been completed, the **MTF** test is started automatically.

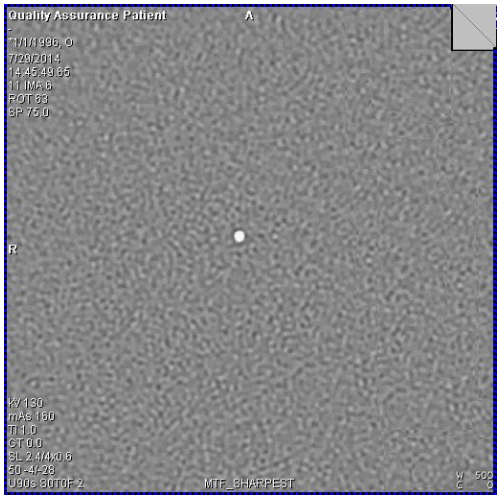
- Press the **Start** key on the control box, if prompted.



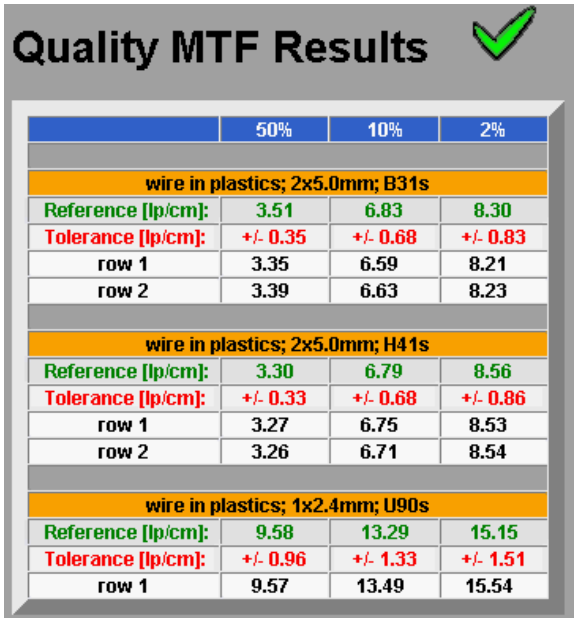
Scanning is started.

The MTF is represented graphically as a function of the local frequency (LP/cm). In addition, three characteristic values, 50 % MTF, 10 % MTF and 2 % MTF are displayed.

The scan is displayed in the image area. The result image is calculated and stored in the local database.



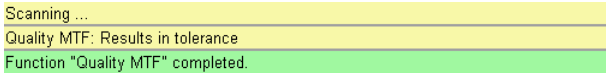
The evaluation is done for all detector rows using different kernels. The results of the test are output in the content area of the **Quality Constancy** dialog box.



Quality MTF Results

	50%	10%	2%
wire in plastics; 2x5.0mm; B31s			
Reference [lp/cm]:	3.51	6.83	8.30
Tolerance [lp/cm]:	+/- 0.35	+/- 0.68	+/- 0.83
row 1	3.35	6.59	8.21
row 2	3.39	6.63	8.23
wire in plastics; 2x5.0mm; H41s			
Reference [lp/cm]:	3.30	6.79	8.56
Tolerance [lp/cm]:	+/- 0.33	+/- 0.68	+/- 0.86
row 1	3.27	6.75	8.53
row 2	3.26	6.71	8.54
wire in plastics; 1x2.4mm; U90s			
Reference [lp/cm]:	9.58	13.29	15.15
Tolerance [lp/cm]:	+/- 0.96	+/- 1.33	+/- 1.51
row 1	9.57	13.49	15.54

In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.11 Contrast test

With this test, you measure the contrast scale by a measurement in air and water.

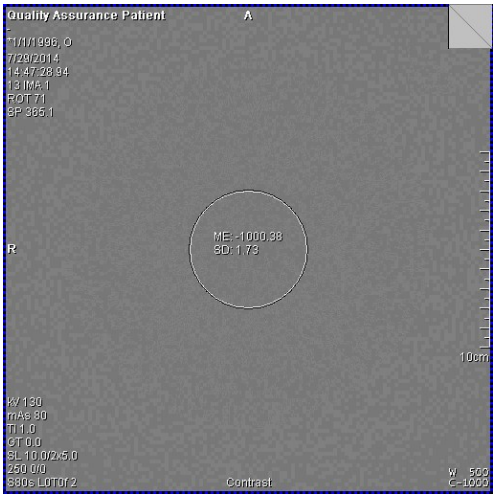
After the previous test has been completed, the **Contrast** test is started automatically.

- Press the **Start** key on the control box, if prompted.

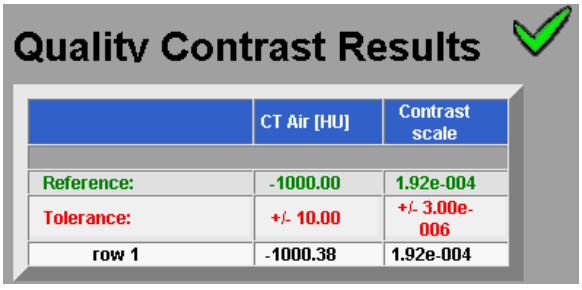


Scanning is started.

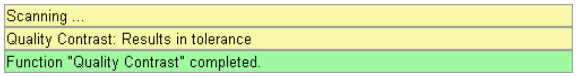
A central ROI is evaluated, the corresponding mean value (ME) and standard deviation (SD) are displayed, see the following image.



The results of the test are output in the content area of the **Quality Constancy** dialog box.



In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.12 Table position test

With this quality measurement, you test whether the actual table position matches the table position displayed.

The **Table Position** test is performed without triggering radiation. It is started with **Go** in the **Quality Constancy** dialog box.

After the previous test has been completed, the **Table Position** test is started automatically.

1. Mount a ruler at the mobile part of the patient table so that the 0 mm mark of the ruler is aligned with the stationary part of the table.
2. Place the 100 kg weight on the patient table.
3. Start measurement with **Go**.

   The horizontal table position is set to 0. The table top moves 300 mm in the direction of the gantry.
4. Read the 300 mm position on the ruler.

5 Enter the value in the entry field of the content area.

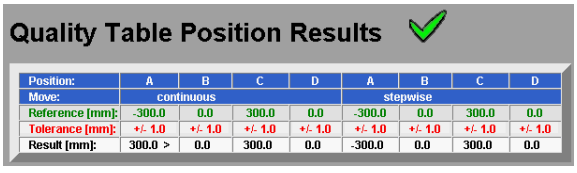


6 Click **Continue**. The table top now moves stepwise into the gantry (300 mm) and back.



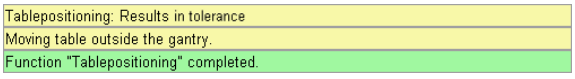
7 Enter the actual values at the 300 mm and the 0 mm position in the entry field again.

The deviations of the actual from the displayed positions are calculated. The results of the test are output in the content area of the **Quality Constancy** dialog box.



Position:	A	B	C	D	A	B	C	D
Move:	continuous				stepwise			
Reference [mm]:	-300.0	0.0	300.0	0.0	-300.0	0.0	300.0	0.0
Tolerance [mm]:	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0	+/- 1.0
Result [mm]:	300.0 >	0.0	300.0	0.0	-300.0	0.0	300.0	0.0

In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.13 CTDI Air test

With this test, you measure the dose in the system axis.

✓ The ionization chamber is centered in the axial direction in the system axis. The slice plane has to run through the center of the chamber. An appropriate dosimeter is connected to the ionization chamber.

✓ The **CTDI Air** test mode is loaded.

✓ You are prompted to press **Start**.

1 Press the **Start** key on the control box.



Scanning is started.

2 Read off the value on the dosimeter and enter it in the protocol.



3 Continue with the next kV values.

The results of the test are output in the content area of the **Quality Constancy** dialog box.



In the status and error message area, the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.

CTDI Air = 35.00 mGy/100mAs
Quality CTDI Air: Results out of tolerance
Function "Quality CTDI Air" completed.

All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

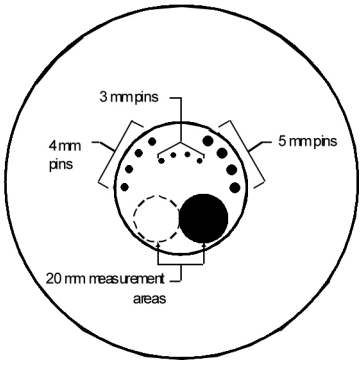
14.3.14 Low contrast test

The Low Contrast test is performed in the **Quality Constancy** dialog box of the **Local Service** window.

The availability of the low contrast test is country-specific. It has to be activated by Siemens Service.

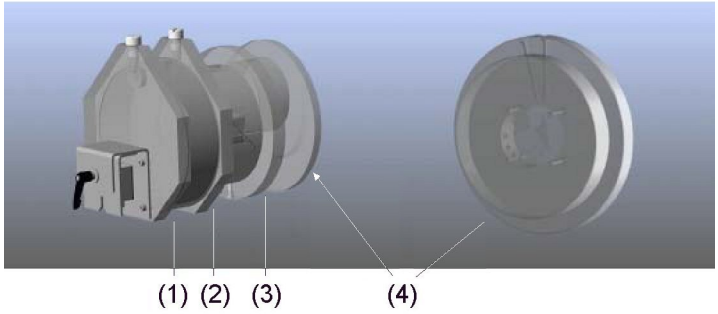
Low contrast phantom

The low contrast phantom section consists of a 165 mm diameter, 25 mm thick, water-equivalent, brown plastic cylinder. A clear plastic insert at the center contains three sets of low contrast pins (with diameters of 3, 4, and 5 mm, each set with 4 pins), together with two 20 mm diameter measurement areas.



The two 20 mm diameter measurement areas are used to establish low contrast differences between the pins and the surrounding area. The rated contrast between the pins and the surrounding area is 6 HU +/- 1 HU (0.6 % +/- 0.1 % contrast).

1 Attach the low-contrast phantom section to the Siemens phantom combination, using the mounting bracket and four mounting screws.



(1) Water phantom

(2) Slice thickness phantom

(3) Wire phantom

(4) Low contrast phantom

2 Mount the phantom assembly on the patient table at normal body height.

3 Position the phantom set.

Acquiring low contrast image

1 Call up **Options** > **Service** > **Local Service**, delete the password entries, and click **OK**.

2 Click the **Quality Assurance** button to display the **Quality** dialog window.

3 Select the **Phantom Check** and the **Low Contrast** test.

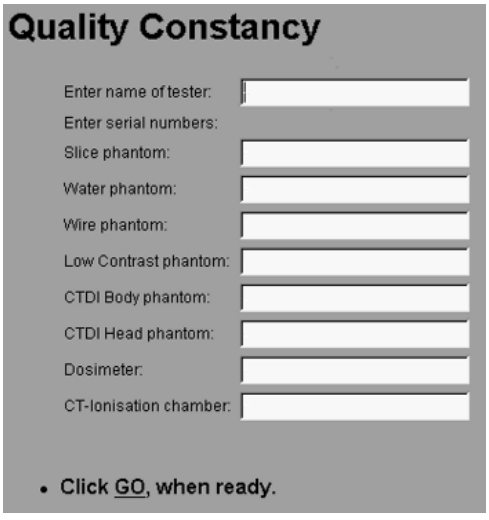


4 Confirm selection of the constancy test with **Go**.



You are prompted to enter the name of the tester and the serial numbers of the phantoms.

5 Enter your name and the data required.



6 Move the table until the inner light marker points on the reference marking on the slice thickness phantom.

7 Start the low contrast test with **Go**.

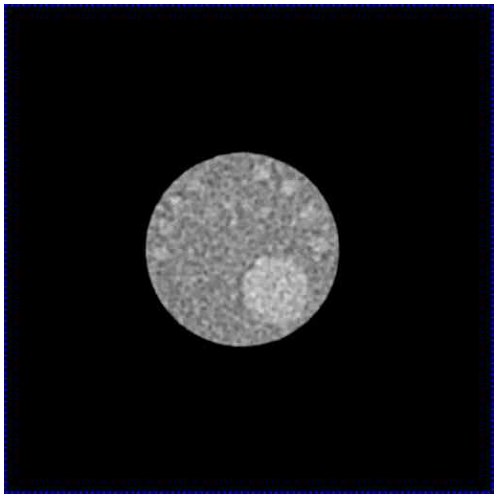


You are prompted to press **Start**.

8 Press the **Start** key on the control box.



The phantom position and the gantry inclination are checked. The image of the low contrast phantom is displayed in the image area.



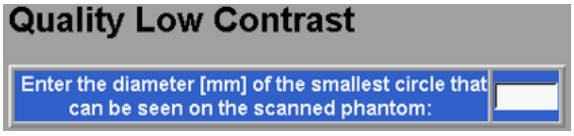
Evaluating low contrast image

Normally one scan is sufficient to discern the pins in the row with the smallest diameter (3 mm). However, the procedure may be repeated if desired. Low contrast measurements are directly affected by the level of noise (“sigma”) in the CT system, which may vary from scan to scan within a specified range. Low contrast estimations involve visual verification methods that are somewhat subjective. It is normal to expect some variations in assessing low contrast of the smallest (3 mm) pins.

1 Adjust the window width and center to improve visualization (adequate starting values: 40 width/90 center).

2 Observe the region where the small pins are located just below the two 20 mm measurement areas.

3 Enter the resolution in the corresponding entry field of the content area.



The low contrast test is in tolerance if the resolution is at least 5.0 mm.

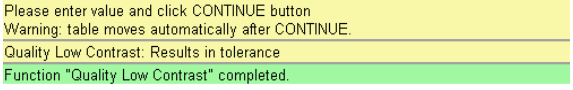
4 Click **Continue**.



The result of the test is output in the content area of the **Quality Constancy** dialog box.



In the status and error message area the result of this test (in tolerance or out of tolerance) is output. Use the vertical scroll bar to view all test results.



- It may help to observe the image in a semi-darkened room and from distance of up to 5 feet.
- All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.3.15 Constancy test results

A defined number of results are stored. Older values are overwritten by new values.

The images recorded during measurement are stored as images of the “Quality Assurance Patient”.

Viewing QA test report

You can view the results of the daily and monthly quality test with the **Report** function of the **Local Service**.

1 Call up **Options** > **Service** > **Local Service**, delete the password entries, and click **OK**.

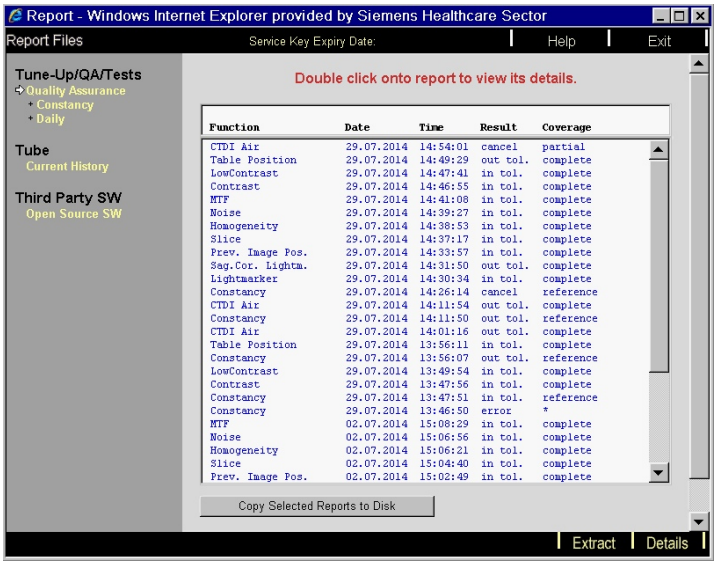
2 Click **Reports** in the **Home Menu** dialog window.



The **Report Files** dialog box is displayed.

3 Select **Quality Assurance**.

A list of the quality measurements performed (daily quality tests and constancy tests) is displayed sorted by date.



4 Double-click a quality test in the list to have more detailed information displayed.

The results of the selected quality test are displayed in the content area. Any test results outside the tolerance range are marked “<” or “>”.

- A click of the **Extract** button generates a compressed file of report data and stores this file in a specific folder. This function is for service purposes only.
- Click **Home**. You return to the **Home** window.

Viewing QA test images

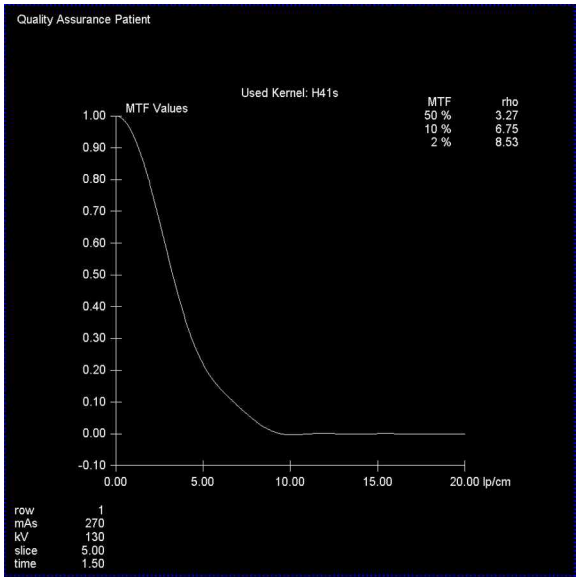
You can view the quality images (i.e., the result images of the MTF test) in the **Viewing** task card.

1 Open the **Patient Browser**.

2 Select the desired images of the “Quality Assurance Patient”.

3 Call up **Patient** > **Load into Viewing**.

The images are displayed in the **Viewing** task card.



Result images of the MTF test

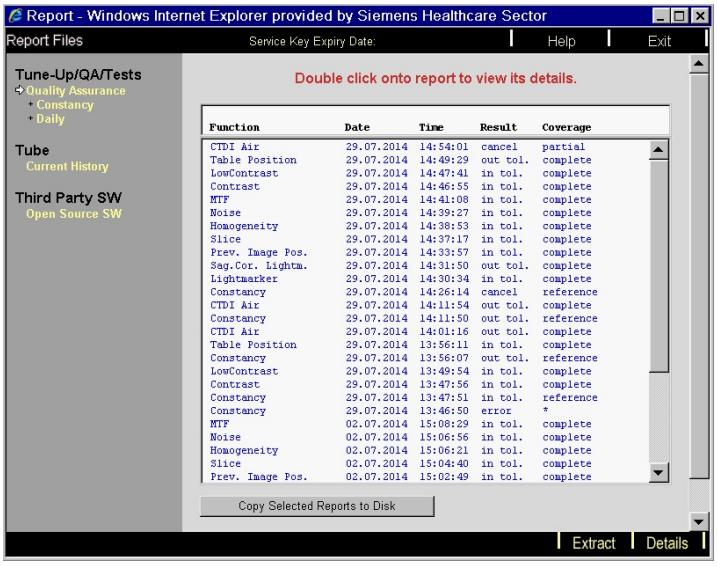
All parameters and images shown are examples. Only the parameters displayed by your system are definite.

Documenting QA test report

1 Call up **Options** > **Service** > **Local Service**, delete the password entries, and click **OK**.

2 Click **Reports** in the **Home Menu** dialog window.

The **Report Files** dialog box is displayed. Select **Quality Assurance**.



3 Do one of the following:

- You can copy individual report files to diskette. In the Report Files dialog box, select the quality tests in the list. Click **Copy Selected Reports to Disc**.

  The selected reports are transferred to the diskette drive.

- You can print out an individual report. Double-click a report. Then click **Print**.

  The displayed report is sent to the connected printer.

- You can enter the test results in the forms supplied in System Owner Manual.
- Test films and test forms must be stored for at least two years.
- Click **Home**. You return to the **Home** window.

14.4 Camera test

In the camera test, the image quality and the camera settings are checked. You can also film test images of the quality measurement in order to meet requirements for documentation.

⚠ CAUTION

Missing camera test!

Wrong basis for diagnosis.

- Perform the camera test regularly at the recommended intervals.

Please note the following points:

- Use the correct film type (emulsion number).
- Keep the developer bath at a constant temperature.
- Use the correct chemicals.
- Follow the development instructions supplied by the film manufacturer.

If the equipment or the emulsion number of the film is changed, the camera must be readjusted by a customer service technician who is authorized to do so. After this, another camera test is required.

14.4.1 Camera test references

The camera was set for optimum image quality during installation and should not be changed.

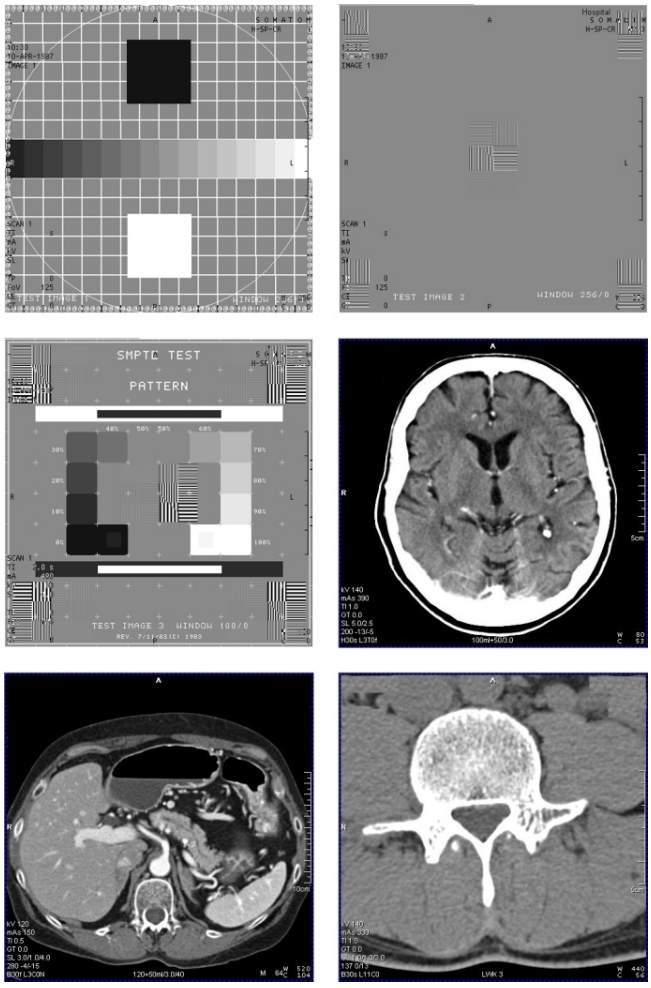
After installation, a test film is recorded and evaluated. The results are summarized in a table. These values are used as reference values for the daily quality check of the camera.

14.4.2 Performing the camera test

With the camera test (Film Demo), you can check the settings of the camera by filming the images of the “Reference Images” patient. You also have the option of filming the images of a previous constancy test to check the camera settings.

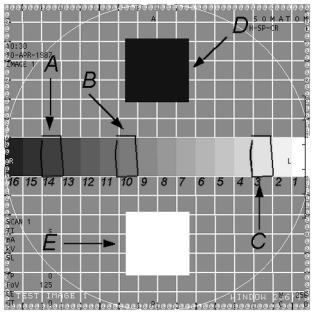
1 In the **Patient Browser**, transfer the test images of the “Reference Images” patient to the **Viewing** task card.

2 In the **Viewing** task card, film the test images of the “Reference Images” patient.



Examples of test images

3 Measure the fields marked in the first test image with the densitometer X-RITE 331.



Example of measurement fields marked by technologist

4 Enter the measured values in the constancy test report.

5 Compare the test results with the reference values.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.4.3 Camera test report

You will find a form for the test report in System Owner Manual.

14.5 Monitor test

Monitors are subjected to a constancy test to ensure that the image quality and measured values lie within a defined range.

In the **Patient Browser** window, you can select the test images stored in the database under **Local database** /**Reference** /**Images**. Load the test image of your choice in the **Viewing** task card.

To ensure that the criteria of the constancy test are met, make sure that the requirements for the room lighting are fulfilled or restored according to the acceptance test performed during initial start-up.

14.5.1 Monitor test requirement

Constancy test requirements for image display devices (monitors) may vary according to different national regulations. The constancy test described herein complies with the German X-ray regulations (Deutsche Roentgenverordnung) and is based on requirements given in DIN V 6868-57.

⚠ CAUTION

Missing constancy test of the monitor!

Wrong basis for diagnosis.

- Perform the monitor test regularly at the recommended intervals.

The acceptance test performed during initial start-up commissioning ensures optimum image quality of the device. The results of these measurements are documented in an acceptance test report and serve as reference values for the follow-up constancy test.

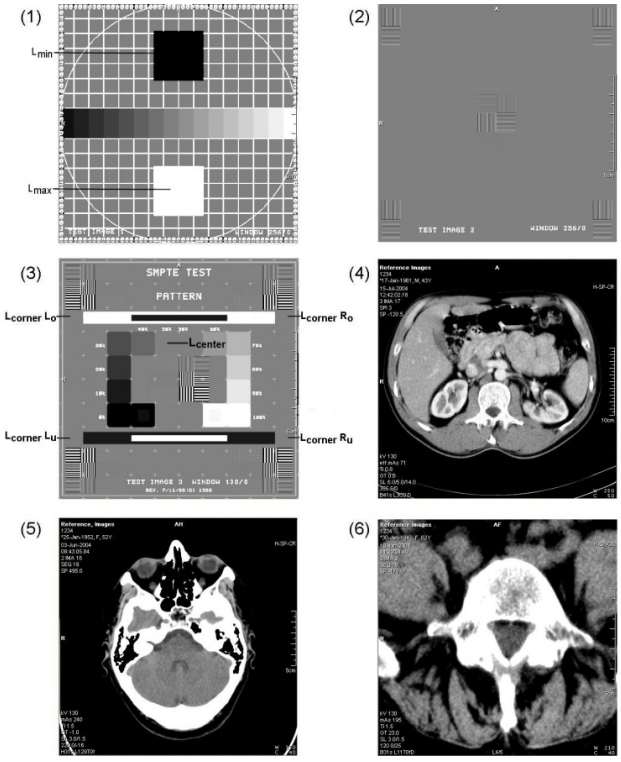
If any alterations are made to the device that affect the image quality, for example, repairs, replacement of parts, or readjustments, the acceptance test according to the Germany X-ray regulations must be repeated.

14.5.2 Monitor test equipment

The constancy test is performed using the following test equipment:

- Luminance meter for LCD monitors

  Specification: Class B (DIN 5032-7) with valid calibration, range 0.05 cd/m^2 – 1000cd/m^2 (recommended device: Spotmeter SMfit Act for LCD monitors)
- Test image source (imaging device)
- Test images



(1) Technical images

(2) Clinical reference images

14.5.3 Measuring monitor luminance

In this test the veiling luminance (environmental lighting) and the maximum contrast are tested.

1 Switch the monitor off and wait at least 30 seconds.

2 Adjust then the room lighting to the operating conditions using the dimmer switch.

3 Measure veiling luminance Ls at the center of the screen with the luminance meter.

4 Switch on the monitor.

5 Select test image 1 to measure the minimum and maximum luminance, with the luminance meter.

In test image 1, the squares for the maximum grayscale value (L_{max}, bright field) and the minimum grayscale value (L_{min}, black field) are used.

The ratio L_{max}/L_{min} is calculated as maximum contrast MK (≥ 40:1).

- When taking measurements with the luminance meter, observe the distance recommended by the manufacturer (40 – 60 cm).
- You can simply increase the contrast ratio by reducing the environmental lighting intensity. However, make sure that enough light is available for reading and writing.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.5.4 Monitor spatial resolution test

The visual resolution is checked in this test.

1 Select test image 2 or test image 3.

2 Check the lines of the grid with a modulation of 100 % high contrast (HC) at the center and in the four corners.

The lines of the grid must be recognizable.

14.5.5 Monitor homogeneity test

This test ascertains any deviations in the luminance (L) within the image.

1 Select test image 3.

2 With the luminance meter measure a point close to the center (L_{center}) and four measuring points in the corners (L_{corner}).

3 Calculate the deviation in % = 100 × (L_{center} – L_{corner})/L_{center}.

Maximum deviation of the corner points: Flatscreen ± 20 % (max.)

Visual interference such as ghosting, artifacts, overshoots, light or dark spots, flickering, and so on, encountered.

- Please consult your service technician.

Test is out of tolerance.

- Contact Siemens Customer Service.

14.5.6 Monitor test report

Enter the test results in the forms supplied in System Owner Manual. All measurement and test results must be confirmed with the date and initials.

We recommend that the constancy test and collection of the reference values is performed and documented by authorized personnel.

15 Appendix

This topic provides additional information.

- Technical Specification

  The technical specification for the SOMATOM system equipment is given in *System Owner Manual*.

- Standards and Statutory Regulations

  The respective dates of issue of the standards are listed in the Standards and statutory regulations chapter of the *System Owner Manual*.

- Forms

  The samples of the appropriate quality assurance forms and users opinion form are contained in *System Owner Manual*.

- DIP Report

  The doimetry and imaging performance reports are given in *System Owner Manual*.

- Location of Labels

  For an overview of the location of warning and identification labels displayed on the system and its accessories, see *System Owner Manual*.

15 Appendix

16 Glossary

Algorithm General computation procedure.

In this case: image reconstruction from the measured *raw data*.

Anode Positive electrode in the x-ray tube (source of radiation).

AP **A**nterior-**P**osterior from front to back.

API **A**utomatic **P**atient **I**nstruction; breathing instructions to the patient.

Artifact Structure in a medical image which does not represent any anatomical structure and which impairs the representation of the anatomical structure (e.g., streaks).

Attenuation The ratio of x-ray beam intensity prior to and after passing through an attenuating object.

Attenuation profile Local distribution of attenuation values from one direction of projection of the fan beam.

Beam hardening artifact *Artifact* caused by the change in the x-ray spectrum as radiation passes through the object being scanned.

Bolus tracking A *CARE* application (optional). With the bolus tracking function, you can directly monitor the contrast medium bolus in the ROIs of a reference scan defined by the user.

As soon as the preset contrast medium threshold is reached, the acquisition is automatically started.

Calibration Procedure for adjusting the sensitivity of the individual detector channels; used for correction of measurement data.

CARE **CARE** (**C**ombined **A**pplications to **R**educe **E**xposure) aims to achieve optimum image quality while reducing the radiation and contrast medium dose for the patient.

CD-R **C**ompact **D**isk **R**ecordable.

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Cluster A chain of slices acquired rapidly in Sequence CT mode within a breath-hold.

Convolution Mathematical procedure for image reconstruction in computed tomography.

CPU **C**entral **P**rocessing **U**nit, part of the computer that performs the calculations.

The speed of the CPU not only determines factors such as the *RAM* configuration but also the processing speed of the computer.

CT **C**omputed **T**omography.

CTA **CT A**ngiography Display of the vascular system using CT.

CTDI **CT D**ose **I**ndex, calculated as absorbed dose to PMMA (lucite) according to 21CFR, § 1020.33. The Integral of the dose profile is calculated along a line perpendicular to the tomographic plane (from **-7T** to **+7T**, T is the nominal tomographic slice thickness).

CTDI 100 **CT D**ose **I**ndex, calculated as absorbed dose to air according to IEC 60601-2-44. The Integral of the dose profile is calculated along a line perpendicular to the tomographic plane (from **-50 mm** to **+50 mm**).

CTDI vol The **CT D**ose **I**ndex **vol**ume (IEC 60601-2-44) is the approximation of the average dose over a single slice in the standard head or body CT dosimetry phantom, expressed in terms of absorbed dose to air (mGy).

CT value Number used to quantify the beam attenuation capability of an object. The scale uses water as a reference with a CT value of 0 (air : CT value of -1000).

Density determination Quantitative evaluation of the *CT values* in a CT image.

Detector Component of the scanning system which measures the beam intensity after radiation has passed through the object being scanned.

Detector array System of *detectors* for acquiring radiation intensities.

DICOM **D**igital **I**maging and **CO**mmunications in **M**edicine. Standard for exchanging medical images.

Digital camera Camera to which image data is digitally transferred.

DLP Dose Length Product. When examining with CARE Vision CT the DLP value is displayed in the **Patient Protocol**.

The DLP is calculated as follows: DLP [mGy x cm] = CTDIvol [mGy] x SliceWidth x NoOfSlicePositionsPerScan

Documentation Transfer of image results to transparent film.

Dose The total effect of radiation on a defined absorption volume of the body.

Dual Topo Combination of *two Topograms* with different tube positions (AP and lateral).

Dynamic Multiscan Scanning technique of continuous data acquisition of *multiple scans* at the same slice position.

Exporting Image data can be transferred to an external medium (*CD-R*, *MOD*, magnetic tape, *PACS*) for storage.

Fan beam device CT system in which an arc-shaped detector array and an x-ray tube generating a fan-shaped beam rotate about the patient.

File Unit of data stored on the storage medium in the computer. A file might be an image, a database or a program.

Flying focal spot Electromagnetic deflected focal spot for sampling each object detail from two slightly different perspectives. Used to reduce sampling artifacts.

Focal spot Focal spot of an x-ray tube.

FOV (Reconstruction) **F**ield **O**f **V**iew, Used as an aid to calculate the tomogram.

Gantry Scanning unit of a CT system including the x-ray tube and the *detector array*.

Hard disk Part of the computer on which data and programs are stored for quick access.

Hardware Technical physical equipment of a computer system, in contrast to software.

High contrast resolution Spatial resolution; ability to display minute structures.

Highlighting Bright display of a range of CT values during windowing.

HIS **H**ospital **I**nformation **S**ystem.

Network for transmitting patient data and images within a hospital.

Histogram Graphic and numerical display of frequency of CT values in a selected region.

Homogeneity Characteristic of image quality which describes how accurately CT values are measured when a homogeneous object is scanned and displayed by the CT system.

Hounsfield unit Unit used to measure the *CT value*.

HU Abbreviation of **H**ounsfield **U**nit.

i-Control Component that can be used during interventional examinations to control the functionalities of the CT system or software.

ICT Interventional Computed Tomography.

Acquisition method providing more space between the patient table and gantry, e.g., for use of a C-arm.

Image control system (ICS) Computer on which the CT scanner is controlled (Navigator).

Image data compression Data is compressed when storing images for more efficient use of the storage capacity of the data carrier. The *image matrix* is maintained.

Image matrix Size of a medical image in *pixels*, e.g.: 512 x 512, 1024 x 1024.

Image mode In image mode filming, the transfer of the images to the camera takes place image by image (see also *page mode*).

Image reconstruction Computation of the CT image from the measured *raw data*.

Image reconstruction system (IRS) Computer for reconstruction of the CT images from the measured *raw data*.

Isocenter Center of the *scan plane*.

kV Kilovolt (1 kV = 1 000 Volt); unit used to measure the tube voltage.

Laser camera Camera which utilizes a laser beam for exposing images.

LED **L**ight **E**mitting **D**iode, semi-conductor element that lights up like a bulb.

Low contrast resolution Resolution of minute image details when there is little differentiation in density. For example, in soft tissue.

mA Milliampere (1 mA = 1/1000 A); unit used to measure the tube current.

mAs Milliampere per second product; unit used to measure the product of the tube current (mA) and scan time (s). Equivalent to the applied radiation dose.

MCA **M**otion Artifact **C**orrection **A**lgorithm: algorithm correcting motion artifacts.

Measurement field The field from which the *detector array* acquires data in the *gantry*.

MinIP **Min**imum **I**ntensity **P**rojection, like *MIP* but visualization of the darkest *voxels* (areas of least absorption).

MIP **M**aximum **I**ntensity **P**rojection is a method for 3D display: Along the viewing direction through a volume, the voxel with the strongest absorption is displayed in the result image in each case.

MOD Magneto Optical Disk resp. Drive; system for exchange data.

Motion artifact *Artifact* caused by patient movement during the scan.

Mouse Operating element at the computer to direct the input cursor on the monitor and to adjust window values.

MPR **M**ulti **P**lanar **R**econstruction : using an image data set you have the ability to perform retrospective reconstruction in different planes of orientation (i.e., from axial images create coronal, saggital, and paraxial images).

MTF **M**odulation **T**ransfer **F**unction ; the frequency-dependent ratio of object contrast to image contrast. The MTF permits qualitative determination of the spatial resolution of an imaging system.

Multiformat camera Camera with selectable segmented film format; allows for exposures of multiple images on a single film.

Noise Unwanted interference in the signal caused by random factors and containing no information regarding the object being scanned.

Operating system Group of computer programs required for general operation of the computer and its periphery.

Osteo CT Semiautomatic bone mineral density measurement and evaluation method for the quantitive assessment of bone mineral content in the lumbar spine.

PA **P**osterior **A**nterior.

PACS **P**icture **A**rchiving & **C**ommunication **S**ystem.

Siemens network for archiving and transmitting medical images.

Page Mode In page mode filming, the entire film sheet is composed in the computer and then transferred to the camera (see also *image mode*).

Partial scan *Scan* for which only a section (240˚) of the revolution of the X-ray tube is used to measure a body slice.

Partial volume artifact *Artifact* caused by bone structures which are only partially included in the slice being scanned.

Phantom Measuring object whose weakening properties is similar to human; Reference body used for functional and quality assurance tests.

Pitch factor Term applicable only for spiral CT. It is defined as the ratio of table feed per rotation to the collimated width of the entire detector. Example: 64 * 0.6 mm collimation, table feed 96 mm/sec, rotation time 0.6 s. This gives a pitch factor of (96 * 0.6) / (64 * 0.6) = 57.6 / 38.4 = 1.5.

Term applicable only for spiral CT. It is defined as the ratio of table feed per rotation to the collimated width of the entire detector. Example: 16 * 0.75 mm collimation, table feed 18 mm/sec, rotation time 1 s. This gives a pitch factor of 18 / (16 * 0.75) = 18 / 12 = 1.5.

Pixel Image element of the two-dimensional image.

PSB The **P**ower **S**witch **B**ox is a small power distribution device to connect the console to the main power.

RAM Fast, non-permanent memory (**R**andom **A**ccess **M**emory) with which the computer operates. The size of the available RAM determines other factors, including the processing speed. Data are stored long term on *hard disk*, *MOD* or *CD-R*.

Raw data Preprocessed measurement data. A raw data file corresponding to each scan is used to reconstruct the CT image.

Real Time Display Displaying of the measured image synchronous to the scanning and just after the acquisition of a slice (rotation) is finished.

Real Time Recon Reconstruction synchronous to scanning with an additional delay for displaying the first image.

Reconstruction FOV see FOV.

Rendering General procedure for constructing images using a computer.

RIS **R**adiology **I**nformation **S**ystem.

Network for transmitting patient data and displays to radiology departments, see also HIS.

ROI A region of the CT image which can be selected with respect to position, size and shape, and in which quantitative evaluations are performed (**R**egion **O**f **I**nterest).

RTD **R**eal **T**ime **D**isplay, see there.

Scan CT acquisition of a slice.

Scan FOV Determines the size of the area that you expose during acquisition. The Scan FOV is the maximum possible reconstruction FOV.

Scanning footswitch Component that can trigger scanning as an alternative to using the start key. It is connected to the gantry.

Scan plane Plane in which the X-rays penetrate the patient's body.

Scan time Period in which radiation is released during a CT scan.

Scatter radiation Radiation whose direction of dispersion is modified through the interaction with a material.

Secondary slice Calculation of a selectable slice from a series of adjacent or overlapping slices.

Sequence CT Scanning technique with single scans and optional table feed between the scans.

Slice thickness Thickness of slice to be reconstructed. The slice thickness determines the collimation during scanning.

Software Programs of a computer.

Spiral CT Scanning technique with continuous rotation, continuous data acquisition and continuous table travel.

SSD **S**haded **S**urface **D**isplay: Rendering technique for the 3D surface construction ; only *voxels* the *CT values* of which exceed a defined threshold value are considered.

Tomogram *Scan* of a slice perpendicular to the longitudinal axis of the patient.

Topogram Frontal or lateral survey *scan*, similar to a conventional x-ray exposure.

UFC **U**ltra-**F**ast **C**eramic.

Detectors from Siemens with short decay time for fast *scans*.

UPS **U**ninterrupted **P**ower **S**upply ensures operation even during short power failures.

VAR **V**olume **A**rtifact **R**eduction.

Procedure for reducing *partial volume artifacts*.

Volume Pitch Term applicable only to *Spiral CT*. It is defined as the ratio of table feed per rotation to slice width of one detector row.

Voxel Mapped volume element determined by the pixel size of the image matrix and the slice thickness.

VRT **V**olume **R**endering **T**echnique.

Rendering technique for 3D visualization.

Windowing Display of a selectable portion of the CT values using optimized contrast range of the monitor.

Working memory see *RAM*.

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CE 0123

Manufacturer's note:

This device bears a CE mark in accordance with the provisions of Council Directive 93/42/EEC of June 14, 1993 concerning medical devices and the Council Directive 2011/65/EU of June 08, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

The CE marking applies only to Medical Devices which have been put on the market according to the above-mentioned EC Directives.

Unauthorized changes to this product are not covered by the CE mark and the related Declaration of Conformity.

Products with serial numbers between 59401 and 59519 or 77701 and 77869 may contain RoHS non-conforming material, and therefore are not covered by the respective Declaration of Conformity.

Federal law restricts this device to sale by or on the order of a physician (21 CFR 801.109(b)(1)).

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Global Business Unit
Siemens AG
Medical Solutions
Computed Tomography &
Radiation Oncology
Siemensstraße 1
DE-91301 Forchheim
Germany
Phone: +49 9191 18-0
www.siemens.com/
computedtomography

Global Siemens Headquarters
Siemens AG
Wittelsbacherplatz 2
80333 Muenchen
Germany

Global Siemens Healthcare Headquarters
Siemens AG
Healthcare Sector
Henkestraße 127
91052 Erlangen
Germany
Phone: +49 9131 84-0
www.siemens.com/healthcare

Legal Manufacturer
Siemens AG
Wittelsbacherplatz 2
DE-80333 Muenchen
Germany

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www.siemens.com/healthcare