SIEMENS Healthineers

COVID-19 Scan Workflow Best Practice Sharing on SOMATOM CT Scanners

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CT examination plan

CT examination plan

Disclaimer:
This is not an official Siemens Healthineers document. This is not intended to be a replacement of the national guidelines including the different radiological societies recommendations for Thoracic CT reading.

As this COVID-19 situation is new for our customers and us we see this training document as best practice sharing.

We mention some recommendations later in this document which can be found in open source papers, written and published from colleagues from Chinese hospitals.

In this document some relevant CT workflow and examination tips are highlighted.

Siemens Healthineers is not responsible for this document. Please always read the official Siemens Healthineers CT operator manual and instructions for use to your reference.

CT examination plan

1. Define a designated CT scan, personnel and timeframe for the diagnosis of patients suspected/infected with the COVID19 Virus.

2. The different departments (nosocomial infection, medical treatment, radiation and wards) coordinate the closed-loop procedure and path of "transport-examination-return to ward" for confirmed patients.

3. Cooperate with the hospital security and logistics staff before the start of the examination. They must clear all other patients and unnecessary personnel around the designated CT.

4. The patient as well as all staff working in the CT room must wear protective gear (facial masks, gloves,…) and consider applicable local regulations.

CT examination plan

5. The air conditioning system should be configured to avoid air contamination (negative pressure for example).

6. The medical staff (or nurses) assists the patient lying on the examination table and the imaging technician to operate the gantry to complete the positioning work.

7. CT technicians operate the system in the operating room, and complete the examination. After the completion of the examination, perform rapid hand hygiene disinfection.

CT examination plan

- **Note 1**: If the same CT is needed for the examination of confirmed cases and the examination of suspected cases in the clinic, the examination time of the two must be strictly distinguished and the interval between the two should be more than one hour, so as to fully clean and disinfect the machine room and the surrounding environment.

- **Note 2**: Computed Tomography (CT) Images used in evaluation of infectious disease.
  CT images can help Physicians differentiate between various types of infectious acquired diseases. Viral acquired pneumonia (incl. COVID-19) can be characterized by different patterns of lung changes and their locations*. High resolution (HR) lung images (slice thickness <= 1.5 mm) are required for evaluation of such lung diseases. Based on experiences reported to us from other countries impacted by COVID-19, we see a need for one CT system for every 100 ICU beds. In addition, our mobile CT workflow provides the capability for technologists to maintain a 1.5 m (6 ft) distance from potentially infected patients.

*Walker at al.: Imaging Pulmonary Infection: Classic Signs and Patterns AJR:202, March 2014

Preparation before examination

Preparation before examination

Staff preparation:

1. It is recommended to arrange two technicians: One technician to operate the CT equipment and another technician to enter the machine room full-time to position and train the patient's breathing and breath-holding essentials.

2. It is important to replace any disposables and also perform the required disinfections procedures before taking part in the next CT scan.

Preparation before examination

Preparation of auxiliary tools:

More important is that one must keep distance and that e.g. helpers should not change the rooms without proper hygienic measures.

1. The machine should have an independent operation room. In principle, not shared with other machines;
   if the above conditions cannot be met, the other machine rooms connected to the operation room shall be sterilized by air after examination.
2. For shared operating rooms measures must be taken to avoid contamination
   a) of the operating room itself and
   b) to spread viruses to other scanner rooms
3. Ensure that your air conditioning systems is set to right parameters and that measures are taken to avoid further spread of aerosols.
4. If there is a risk of contamination through the air conditioning system, a standby independent air conditioning shall be considered for this CT room.
5. The CT patient table should be covered with disposable sheet, avoid folding, cover the entire table surface.

Preparation before examination

Patient preparation:

1. Patients (including assistance personal) should be wearing medical surgical mask or N95 medical respirator throughout the examination.

2. Before entering the machine room, use hand sanitizer to disinfect hands. Remove neck, chest accessories and other high-density items (such as bra and zippers, buttons, etc.).

3. If possible, train the breathing instruction and ask the patient to cooperate during exam.

4. Perform the scan using a Thorax protocol with the recommended parameter adjustments mentioned in Chapter “Scan Parameter”.

5. After the patient left the room, clean and disinfect the CT Scanner and the room. The COVID-19 epidemic does not affect the official statements from Siemens Healthineers about the disinfection of CT scanners. Anything beyond our published instructions in terms of frequency of disinfection would be the decision of each hospital infection control department or done by the local authorities / hygienic departments of the hospital.

Preparation before examination

Other isolation matters:

1. For cooperative and mobile patients use intercom to explain the matters needing attention for examination.

2. For these patients, the technician can, on the promise of ensuring the safety of the patient, guide the patient to position in the operation room by voice control, or ask the accompanying personnel to assist the patient on the examination table.

3. The technician should keep a distance of 1-2m or more from the patient if possible.

How to position the patient and maintain distance?

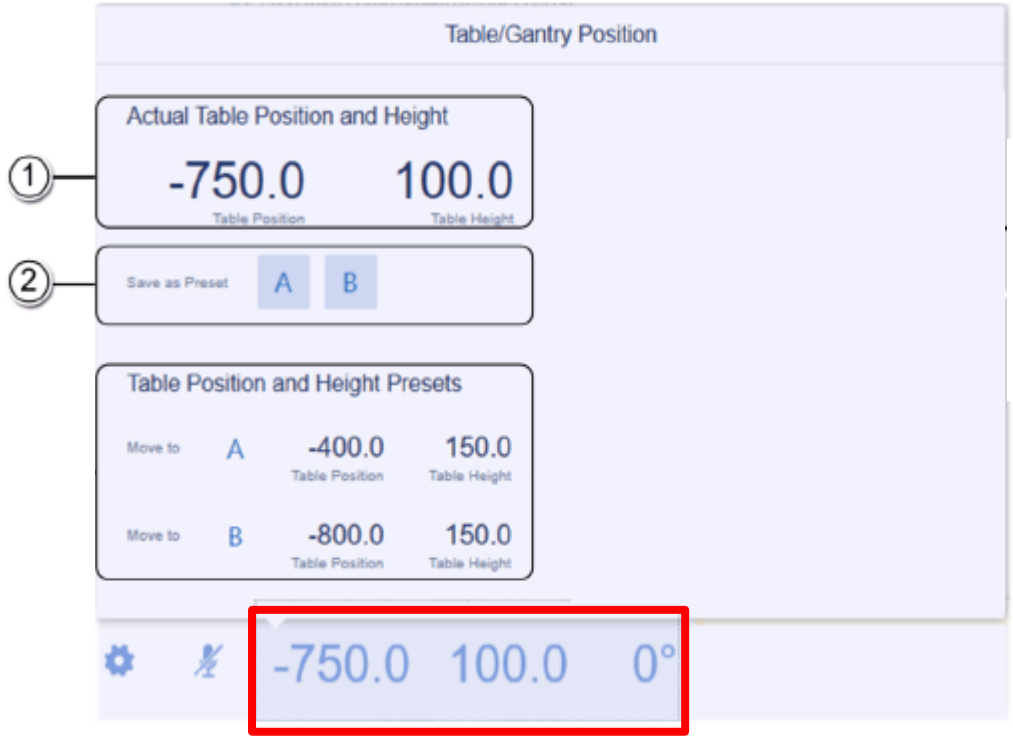
How to position the patient and maintain distance?

For SOMARIS 10[1)] *syngo* CT user:

Make use of the **Mobile Workflow** with the **tablet** and **remote scan control!**

1. Customer could use A/B button on the tablet to preset one table position and reduce the time standing right next to the patient.

2. Using the Remote Scan Control the user has the possibility to switch on the Gantry Laser Lights for proper iso-centric positioning of the patient.



(1) **Actual Table Position and Height** display

Displays the current values for the table position and the table height.

(2) **Save as Preset** buttons

Tapping the **A** or **B** button saves the current table position and table height respective of the **Presets** for **A** or **B**.

1) SOMATOM go. platform and SOMATOM X.cite

How to position the patient and maintain distance?

For SOMARIS 5[1] & SOMARIS 7[2] *syngo* CT user:

1. For SOMARIS 5 and SOMARIS 7, the A/B buttons are not suitable for positioning the patient from outside of the scan room because these buttons are located on the gantry.

2. One method is, user could record the number of preferred table position, and input these numbers to move table to the desired position without entering the scan room and then move the patient to the iso-center.

1) SOMATOM Perspective and SOMATOM Scope family; SOMATOM Emotion family
2) SOMATOM Definition family; SOMATOM Dual Source Scanner; SOMATOM Edge Plus, SOMATOM Confidence

Scan parameters

Scan parameters

CT scan protocol

1. Scanning body position: Head first for better control of positioning the patient and the arms above the head.

2. Scanning mode: spiral scanning.

3. Scanning range: include always the complete Lung by using **FAST Planning** (if available). In any case, verify the range include from the tip of the lung to the bottom of the diaphragm (including bilateral costal and diaphragmatic angles)

Scan parameters

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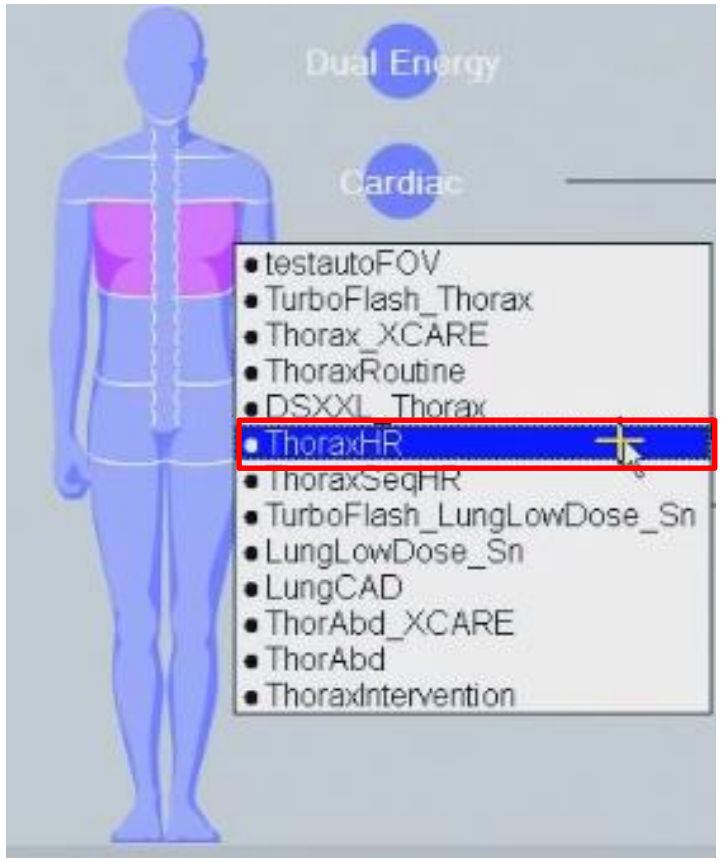
CT scan protocol

On **SOMARIS 5[1)] and SOMARIS 7[2)]** scanners, we recommend using the **default Thorax HR protocol** without further modifications of the scan and recon parameter.



1) SOMATOM Perspective and SOMATOM Scope family; SOMATOM Emotion family
2) SOMATOM Definition family; SOMATOM Dual Source Scanner; SOMATOM Edge Plus, SOMATOM Confidence

Scan parameters

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CT scan protocol

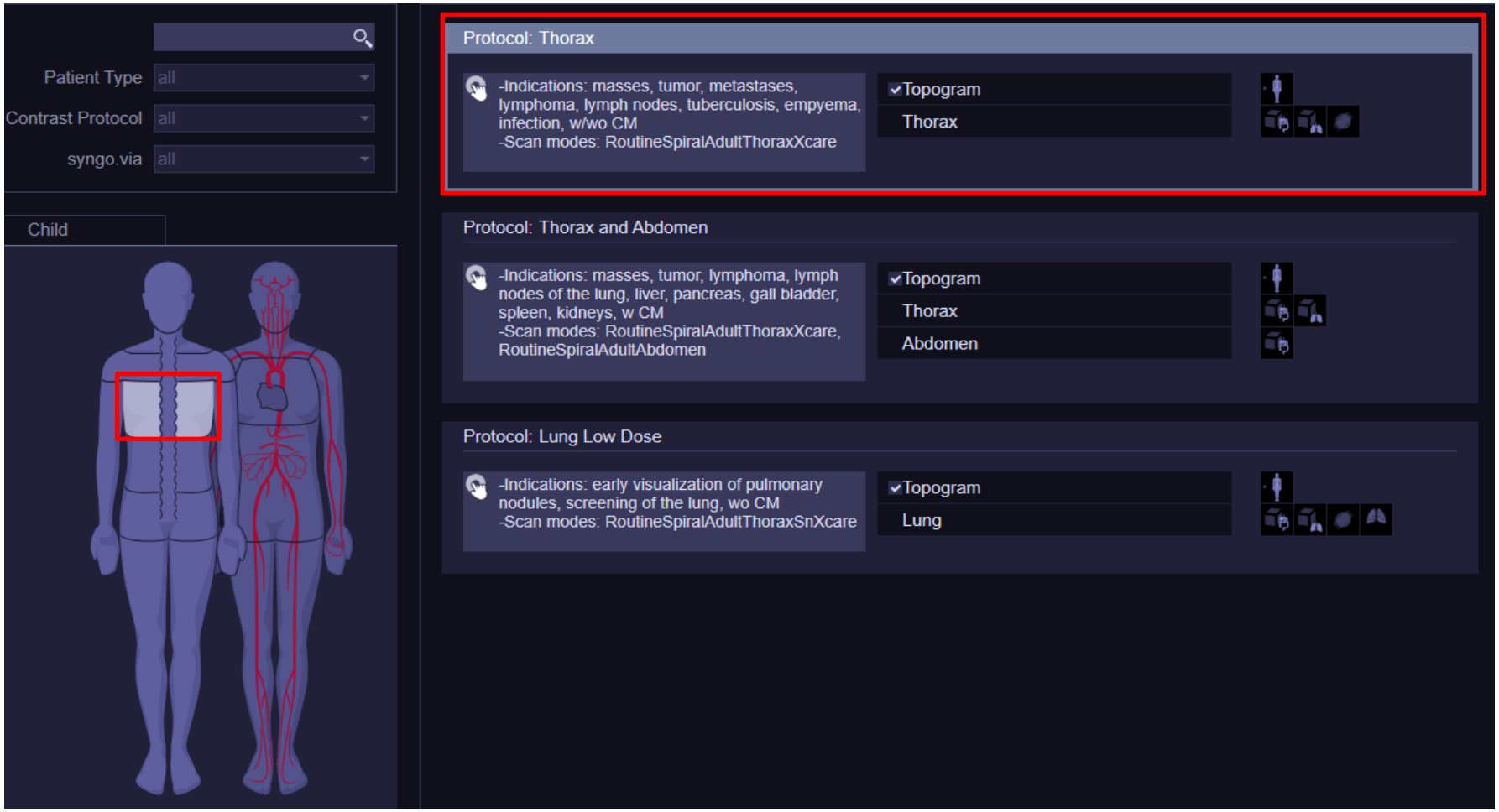
With **SOMARIS 10**[1)] scanners please use the **default Thorax protocol** with some changes to optimize image quality:

- Set parameter **CARE kV optimized for** to **Non-Contrast**, because scans are done without contrast media
- On **go.Top** set the **rotation time to 0.5 s** to acquire more readings. To compensate the scan time increase, set the **pitch to 0.8**
- Add a **lung thin slice recon job** e.g. Multi Orientation with 1.5 mm slice thickness and maybe **more dose** to compensate for the increased noise, e.g. **~40% more Q. ref. mAs**
- If necessary, for **obese patients on go.Now** you can set up an additional obese scan protocol with a **lower pitch of 0.8**, but this is done automatically with Adjust button

1) SOMATOM go. platform and SOMATOM X.cite

Scan parameters

What scan protocol to use on SOMARIS 10[1)] scanners?



1) SOMATOM go. platform and SOMATOM X.cite

Scan parameters

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Described protocol adaptations for SOMARIS 10[1)]:

Scan Favorites | General Scan | Dose | Timing | Config | Phys

Scan/Recon	CARE Dose4D & CARE kV	CARE kV optimized for	Rot. Time [s]	Pitch	CARE kV Quality ref. mAs @120 kV
Thorax	Full	Non-Contrast	0.50	0.80	70

Recon Favori... | General Recon | Image Impression | Recon Box | Physio Recon

Scan/Recon	Slice Thickness [mm]	Increment [mm]	Window	Kernel	FAST Planning	FAST Planning Width	FAS
Thorax 1.50 Br60 S3 cor	1.50	1.50	Lung	Br60	Thorax - Lung	Narrow	
Thorax 1.50 Br60 S3 sag							
Thorax 1.50 Br60 S3 ax							

1) SOMATOM go. platform and SOMATOM X.cite

Scan parameters

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CT scan protocol

For **follow up or dose sensitive patients** a low dose protocol could be a good alternative.

Lung Low Dose factory protocols are available on all scanners.
Depending on the specific scanner and license settings, lung low dose protocols of different technical flavors might be available, e.g. in high pitch mode (TurboFlash), in high resolution (HR), with tin filter (Sn) or with iterative reconstruction (IR).

Reconstructions

Reconstructions

Reconstruction Parameter:

1. **Conventional image reconstruction**: lung window images (window width 1000 ~ 1500HU, window level -650 ~ -500 HU) and mediastinal window images (window width 250 ~ 300HU, window level 30 ~ 50HU) were reconstructed with 3mm layer thickness respectively. HR kernel not needed.

2. **Thin slice image reconstruction**: the thin-layer lung window image (HR kernel, window width 1000 ~ 1500HU, window level -650 ~ -500HU) is routinely constructed with a thickness of 1,5 mm or less. For SOMARIS 10[1)] scanners, simply add a lung thin slice recon job e.g. Multi Orientation with 1.5 mm slice thickness

1) SOMATOM go. platform and SOMATOM X.cite

Additional information for cleaning and disinfecting

Additional information for cleaning and disinfecting

The United States Environmental Protection Agency provides a list of products that meet EPA's criteria for use against SARS-CoV-2, the novel coronavirus that causes the disease COVID-19:

https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2

Please always refer to the official Operator Manual[1)] and Instruction for Use[1)] (IFU)!

See the document "Instructions for Use – Cleaning and disinfection syngo CT VB20" [2)] for most SOMARIS 7[3)] systems

"♦" indicates tested and approved cleaning agents or disinfectants.

	Cleaning agents and disinfectants (MFR 890/009 - 2017)													
System component / accessory	Antistatic cleaner	pH-neutral cleaning agent	Surgical spirit	Alcohols	Aldehyde	Quaternary compounds	Guanidin derivatives	Pyridin derivatives	Chlorine derivatives	Benzene	Alkylamines	Phenol derivatives	Organic acids	Peroxide compounds
Gantry														
Gantry cover		♦	♦	♦[1)]	♦	♦	♦	♦	♦	♦	♦		♦	♦
Gantry operator panel		♦	♦	♦[1)]	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Touch Panel	♦	♦	♦	♦[1)]	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Patient table														
Patient table		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦
Surgical rail		♦	♦	♦	♦	♦	♦	♦	♦	♦	♦	♦		♦
Mattress		♦					♦		♦		♦			
Monitor														
Monitor housing		♦		♦[1)]	♦	♦	♦		♦	♦	♦		♦	♦
Monitor screen	♦													
Other system components														
Foam material (for example, positioning aids)		♦					♦		♦		♦			
Monitor ceiling system		♦	♦	♦	♦	♦	♦		♦		♦		♦	♦
Image Reconstruction System (IRS)		♦			♦	♦	♦	♦	♦	♦	♦		♦	♦
Body straps		♦			♦		♦		♦		♦		♦	♦
ECG cables				♦[1)]										
Foot switch		♦			♦	♦	♦		♦		♦		♦	♦
3D camera assembly		♦		♦[1)]	♦	♦	♦	♦	♦		♦		♦	♦

[1)] ≤ 70 Vol% alcohol

1) Available at: https://doclib.siemens-healthineers.com/home
2) https://doclib.siemens-healthineers.com/rest/v1/view?document-id=636773
3) SOMATOM Definition AS, SOMATOM Definition Edge, SOMATOM Confidence, SOMATOM Edge Plus, SOMATOM Definition Flash, SOMATOM Drive, SOMATOM Force

Additional information for cleaning and disinfecting

Please always refer to the official Operator Manual and Instruction for Use (IFU)!

Monitor

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.

Cleaning and disinfecting the tablet

CAUTION

Using improper cleaning solvents!

Injury to the cleaning personnel (allergic reaction or allergic shock) and damage to the equipment.

- Follow the cleaning and disinfecting instructions of the Instructions for Use.

  Do not use unsuitable cleaning agents. Always use cleaning media also approved for humans.

  Follow the instructions of the disinfectant manufacturer and observe the dosage instructions.

Cleaning and disinfecting the equipment

The following safety information has to be followed in general.

CAUTION

Insufficient cleaning or disinfection of the equipment!

Injury to the patient or the personnel (bio hazard).

- Always clean or disinfect the equipment after use. Observe the instructions for cleaning and disinfecting.

  Check if system components or accessories are worn out to ensure proper cleaning. Replace worn out components or accessories immediately.

  Make sure that the table and the accessories are clean and covered with paper, if possible.

CAUTION

Using improper cleaning solvents!

Injury to the cleaning personnel (allergic reaction or allergic shock) and damage to the equipment.

- Follow the cleaning and disinfecting instructions of the Instructions for Use.

  Do not use unsuitable cleaning agents. Always use cleaning media also approved for humans.

  Follow the instructions of the disinfectant manufacturer and observe the dosage instructions.

Monitor ceiling system

WARNING

Liquids in the monitor ceiling system, power supply cables are laid inside!

Electric shock

- Make sure that no liquids, for example cleaning fluids, can get into the interior of the monitor ceiling system.

CAUTION

Dirt and liquid in the monitor arm of the ceiling mounted monitor!

Infection possible

- Clean the monitor and monitor arm after use.

Additional information for cleaning and disinfecting

Please always refer to the official Operator Manual and Instruction for Use (IFU)!

SOMARIS 10[1)] user could use a sterile cover for better usage of the tablet with the mobile workflow.

1) SOMATOM go. platform and SOMATOM X.cite

Additional information for cleaning and disinfecting

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Please always refer to the official Operator Manual and Instruction for Use!

This document pertains to all HP Tablets (SOMATOM go.Now, go.Up, go.All, go.Top, go.Sim, go.Open Pro, guide&go option in SOMATOM X.cite)

How to clean your HP tablet screen and case: Dust, dirt, and other particles can accumulate on the tablet. These particles can scratch hardware components or build up around buttons, ports, and sensors affecting functionality. Cleaning your HP Tablet can make it last longer by removing potentially damaging buildup. Perform the steps in this document at least once a month as part of a regular maintenance program.

Use the following products to safely clean your tablet:

- Disposal wipes made for electronics containing dimethyl benzyl ammonium chloride 0.3 percent maximum concentration (For example: germicidal disposable wipes. These wipes come in a variety of brand names.)
- Alcohol-free glass cleaning fluid
- Water with a mild soap solution
- Dry microfiber cleaning cloth or a chamois (static-free cloth without oil)
- Static-free cloth wipes that are designed for cleaning electronics

Additional information for cleaning and disinfecting

Please always refer to the official Operator Manual and Instruction for Use!

CAUTION:

Avoid the following cleaning products:

- Strong solvents, such as alcohol, acetone, ammonium chloride, methylene chloride, and hydrocarbons, which can permanently damage the surface of the tablet.
- Fibrous materials, such as paper towels, which can scratch the tablet.

To prevent electric shock or damage to components, do not attempt to clean your tablet while it is turned on:

1. Turn off the tablet.
2. Unplug the power cord from the tablet.
3. Unplug any powered external devices.
4. Remove any memory cards and SIM cards

Additional information for cleaning and disinfecting

Please always refer to the official Operator Manual and Instruction for Use!

Use a soft microfiber cloth or chamois moistened with one of the cleaning solutions listed under Cleaning Materials or use an acceptable germicidal disposable wipe to clean the back and sides of the tablet case.
When cleaning the cover of the tablet, use a circular motion to aid in removing dirt and debris.

CAUTION:

Do not spray cleaning agents or liquids directly on any tablet surface. Liquids dripped on the surface can permanently damage internal components!

Cleaning the screen.

Use a clean, lint-free cloth moistened with an alcohol-free glass cleaner to clean the tablet display. For a more thorough cleaning, use an antistatic screen cleaner and a clean cloth. Anti-static screen cleaning wipes can be purchased from many computer supply stores online at minimal cost.

Additional literature and sources

Additional literature and sources

Follow the national and international radiological society guidelines!

Please use and search for the latest COVID-19 paper on the known radiology platforms such as:

https://www.acr.org/

https://www.ajronline.org/

http://tools.ovid.com/coronavirus/

https://pubs.rsna.org/2019-ncov

https://www.european-radiology.org/highlights/covid-19/

https://academy.mevis.de/oa/-/covid/

Additional literature and sources

Follow the national and international radiological society guidelines!

Please use and search for the latest COVID-19 paper on the known radiology platforms! E.g:

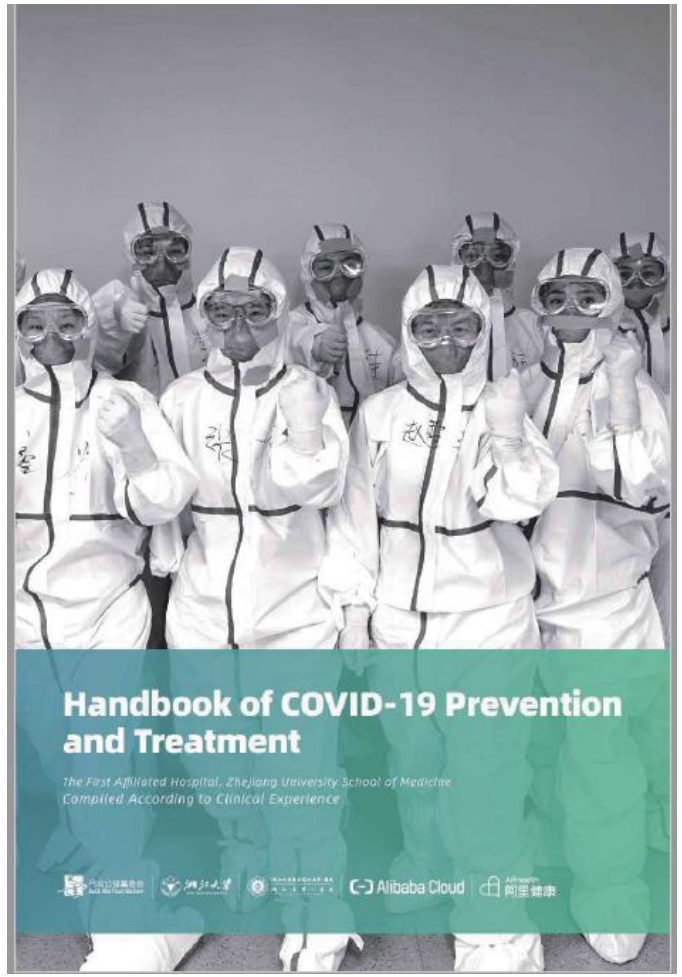
1. Eur Radiol. 2020 Mar 19. (Describes the Force ultra-low dose 100Sn kV CT protocol with effective dose of ~0.2 mSv)
Recommendation of low-dose CT in the detection and management of COVID-2019.
Kang Z, Li X, Zhou S.

2. Radiology. 2020 Apr;295(1):202-207.
CT Imaging Features of 2019 Novel Coronavirus (2019-nCoV)
Chung M, Bernheim A, Mei X, Zhang N, Huang M, Zeng X, Cui J, Xu W, Yang Y, Fayad ZA, Jacobi A, Li K, Li S, Shan H.

Additional literature and sources

A good reference is the “Handbook of COVID-19 Prevention and Treatment”, which was co-written by dozens of medical experts and doctors at the First Affiliated Hospital in Zhejiang. You can download this for free at **https://covid-19.alibabacloud.com/**

Another source: 2020, 5 (1): 1-9. Radiological Technology Committee of Chinese Medical Association Expert Group of Specialized Committee for Technologists on Infectious Diseases. Expert consensus of radiological examination scheme and infection prevention of the 2019 novel coronavirus pneumonia (First version) [J] .Electronic Journal of Emerging Infectious Diseases,2020,5(1):1-9.



Please note that the learning material is for training purposes only!

For the proper use of the software or hardware, please always use the Operator Manual or Instructions for Use (hereinafter collectively “Operator Manual”) issued by Siemens Healthineers. This material is to be used as training material only and shall by no means substitute the Operator Manual. Any material used in this training will not be updated on a regular basis and does not necessarily reflect the latest version of the software and hardware available at the time of the training.

The Operator's Manual shall be used as your main reference, in particular for relevant safety information like warnings and cautions.

Note: Some functions shown in this material are optional and might not be part of your system.

Certain products, product related claims or functionalities (hereinafter collectively “Functionality”) may not (yet) be commercially available in your country. Due to regulatory requirements, the future availability of said Functionalities in any specific country is not guaranteed. Please contact your local Siemens Healthineers sales representative for the most current information.

All names and data of patients, parameters and configuration dependent designations are fictional and examples only.

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