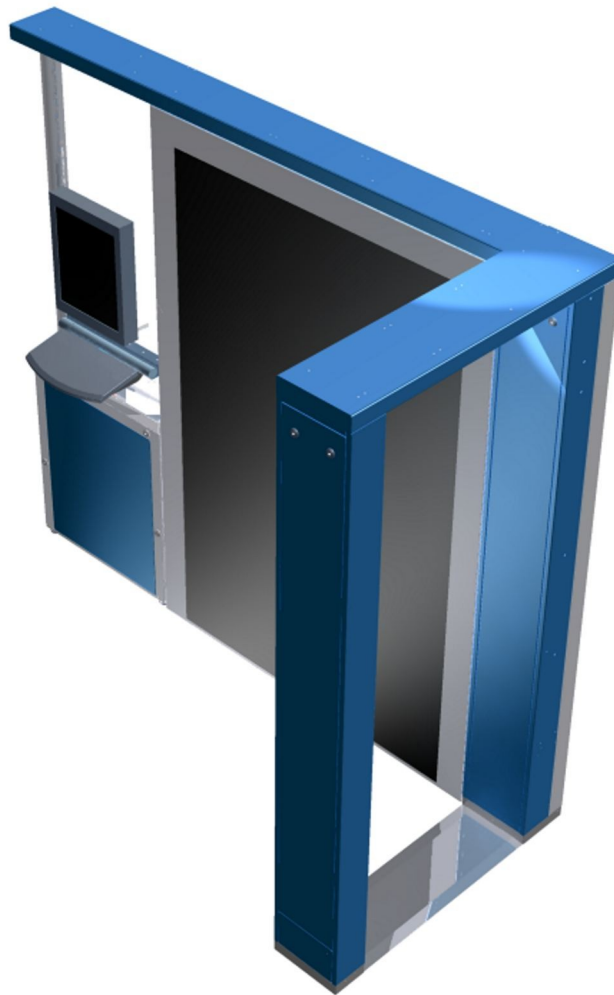


ego

Millimetre-Wave People Screening System



Operating Instructions

Initial Release v5.5

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General information

Preface

These operating instructions will enable you, as the operator, to operate the eqo system as intended.

These operating instructions do not, however, deal with the detection of objects in millimetre-wave images.

Using the functions of your eqo effectively and being able to detect threats requires a certain degree of expertise. It is possible to acquire these skills by attending an eqo operator training session.

It is recommended that you read these instructions carefully prior to using your eqo. In particular, please be sure to read the section entitled "Safety instructions", which contains important information concerning your safety.

About these operating instructions



Place to keep the documentation



These operating instructions along with the referenced product documents (min. 1 copy of each) should be stored next to the operator's workplace. This is to ensure that the operator can access at any time the information he requires to perform her/his work.



Classification of the safety instructions

Danger categories

The safety instructions in this manual are subdivided into three danger categories. These categories differ with regard to the severity of injuries that can result from the non-compliance with the instructions:

| | |
|--|---|
|  |  DANGER |
| <p>Indicates a directly threatening danger. Non-compliance leads to the most severe injuries or death!</p> | |

| | |
|--|--|
|  |  WARNING |
| <p>Indicates a possibly dangerous situation. Non-compliance can lead to the most severe injuries or death!</p> | |

| | |
|---|--|
|  |  CAUTION |
| <p>Indicates a possibly dangerous situation. Non-compliance can lead to slight or minor injuries!</p> | |

Classification of the indications

In addition to the safety instructions, you will find the following general notes and application tips:



Caution!

Indicates a possibly detrimental situation.
Non-compliance can lead to the damage of eqo!



Important!



Application tip or useful information for the user.

Text references

Example: (↗ 3) indicates a reference to page 3

Warning Signs Used

Explanation of the warning signs displayed on the eqo system.

| Sign | Meaning |
|---|--|
|  | <p>Hazard! Observe the instructions in the documentation!</p> |
|  | <p>Electric! Doors or panels marked by this symbol may only be opened by personnel with the appropriate training!</p> |

Product Description

eqo has been developed to enhance the capability of security screening personnel by enabling the detection of weapons, explosives, or contraband hidden under clothing using millimetre-wave technology.

The person to be screened stands with arms raised in the screening area of eqo and turns through 360°. All objects located in the screening area are scanned by means of millimetre-waves. The system then processes this data. A two-dimensional image of the person in the screening area is displayed on the local operator station.

The system consists of three main modules (see Fig. 1), the local operator station ①, the flat scanning panel ②, and an entrance arch ③ containing the transceiver, digital receiver and the power supply. The arch is attached at right-angles to the end of the flat scanning panel.

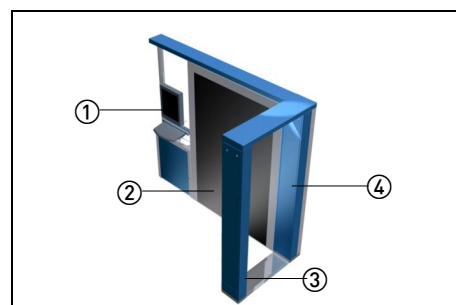


Fig. 1: Main components of the eqo system

Two different variants exist, a left-hand and a right-hand version. The variants differ in the position of the flat scanning panel ② which can be attached on either side of to the power supply pillar ④. Fig. 1 shows the right-hand version of the eqo, Fig. 2 the left-hand version. The right-hand version is defined as the configuration where the flat scanning panel is on the right-hand side of the person who will be scanned as they enter the system through the arch, and vice-versa for the left hand version.

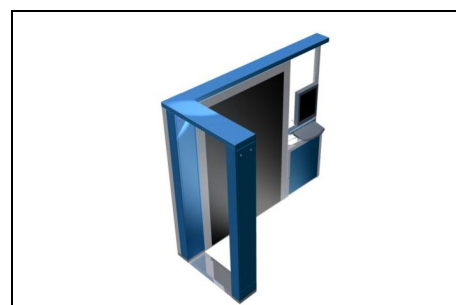


Fig. 2: Left-hand version of the eqo system

Furthermore, the local operator station can be placed at two different positions, either next to the flat scanning panel (see Fig. 3) or next to the arch.

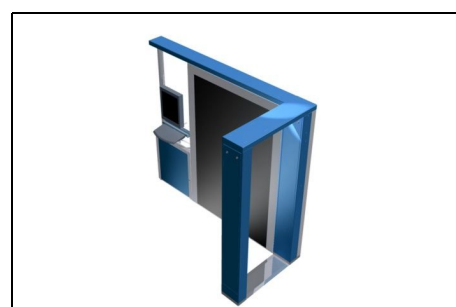


Fig. 3: Local operator station in position A

Legal requirements

Before operating eqo, you must acquaint yourself with any local accident prevention regulations!

Proper use of the system

Use as agreed

The only and exclusive purpose of the eqo is the screening of persons using millimetre-waves by appropriately trained personnel.



Important!

The functionality of the eqo system and its protection can only be guaranteed as long as the unit is operated in a manner described in the operating instructions. An impairment or, at worst, a loss of protection can result if eqo is used in a manner other than that described in the operating instructions. Smiths Detection assumes no liability for obvious or unintended misuse.

Obvious misuse

The components of the system may not be used for purposes other than those described in this operating manual and in the referenced product documents.

Operating conditions

User group



Caution!

The eqo system may only be activated and operated by appropriately trained personnel!



Caution!

The national accident prevention regulations are to be observed for all works.

The necessary know-how for operating eqo can be acquired by attending an operator training course offered by Smiths Detection, or its designated/authorised agents.

Climatic conditions

| | Operation | Transport & Storage |
|----------------------------|--------------------------------|--------------------------------|
| Temperature | 0°C to +40°C | -20°C to +70°C |
| Relative Humidity | 10% to 90% (not condensing) | 10% to 90% (not condensing) |
| Protection class IEC 60529 | IP 20 | IP 20 |

**Important!**

The functionality of the eqo system can only be guaranteed as long as the unit is operated or stored within the climatic limits specified above and the protection class according to IEC 60529 is observed.

Scope of delivery

eqo
local operator station with computer
flat screen monitor
keyboard

Components and connectors

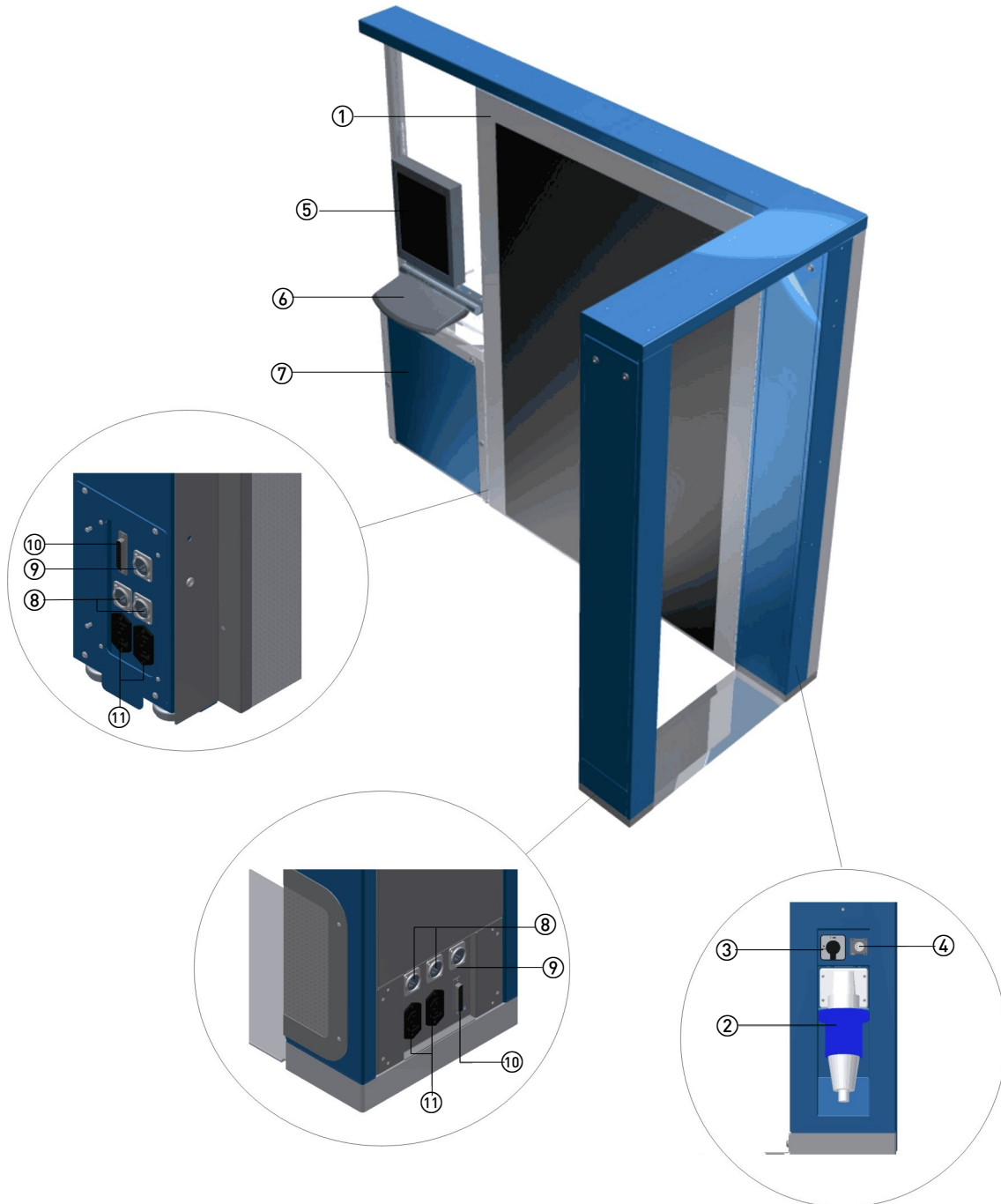


Fig. 4: Components and Connectors of eqo

| No. | Description | |
|-----|---|--|
| ① | Flat scanning panel | |
| ② | Mains power supply socket | |
| ③ | Mains switch | Mains ON/Off switch of the eqo system; acts as a disconnecting device. |
| ④ | Network connection point (RJ45-Socket) | Network connection point to customers network if required |
| ⑤ | Flat screen monitor | |
| ⑥ | Keyboard | |
| ⑦ | local operator station including computer | |
| ⑧ | Data Connector (2 x RJ45-Socket) | Connection points between main system (digital receiver) and local operator station (PC) |
| ⑨ | Data Connector (1 x RJ45-Socket) | connection point between network connection point ④ and PC |
| ⑩ | Data Connector (25-way D-Sub-Socket) | Connection point between local operator station (PC) and main system |
| ⑪ | IEC Power Outlets (IEC 60320-C14) | Power Outlets which provides power from the mains power supply to the PC and the flat screen monitor |

Description of the keyboard

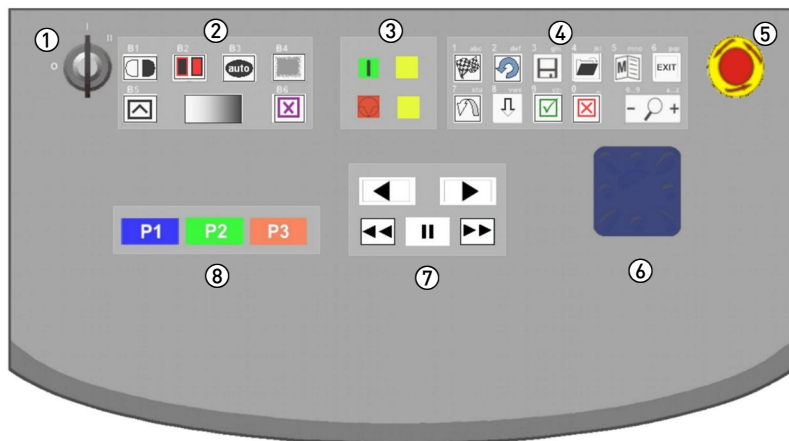



Fig. 5: Keyboard

① Key switch



| Symbol | Name | Description |
|--------|------------|---|
| | Key switch | Turn the key switch to the right (into position II) in order to switch on the unit. The key switch will backslide automatically to position I. In order to switch the unit off, turn the key switch to the left (into position 0). |

② Image filtering key panel












| Symbol | Name | Description |
|--------|----------------------------------|---|
| | Invert | Inverts the image colours. |
| | N/A | Not enabled in this version. |
| | N/A | Not enabled in this version. |
| | Blur | Blurs the bottom half of the image. |
| | Contrast / Brightness Selector | Pressing this key switches between the adjustment of brightness or contrast |
| | Contrast / Brightness Adjustment | Adjusts the image brightness or contrast, depending on which one is currently being adjusted. |

| Symbol | Name | Description |
|---|-----------|--|
|  | Face blur | Blurs the area around the face for privacy reasons. Pressing the key turns the face blurring feature on/off. |

③ Indicator panel


| Symbol | Name | Description |
|---|---------------------|---|
|  | Operating indicator | Indicates that the keyboard is provided with power. |
|  | Wait indicator | Indicates that the system is not ready. |

④ Function key panel


| Symbol | Name | Description |
|---|------------|--|
|  | Finish | Completes the scanning procedure. After pressing this key the unit is ready to start with a new scanning procedure. P1 and P2 will be enabled again. The current sequence will be removed from memory. |
|  | N/A | Not enabled in this version. |
|  | Save | Saves an image sequence to external USB, first stopping the scan if necessary |
|  | Load | Opens the image sequence load dialog |
|  | Menu | Opens the main menu |
|  | Exit | Returns to the default image display |
|  | Jump | Jumps between tags in the sequence |
|  | Tag/ Clear | Tag or clear tags in areas of interest in the timeline. A new tag will appear yellow and a cleared tag will appear black on the timeline. |
|  | N/A | Not enabled in this version |
|  | N/A | Not enabled in this version |
|  | Selector | Switches between numbers and letters |




Important!

The function keys are not only used for the functions explained above. When inside an input field the lowercase numbers and letters [1 abc] ... [0 _.] written above each function key are active. This gives the operator the ability to enter letters and numbers. The numbers are used by default. To switch between the entry of letters and numbers press  .

⑤ Emergency Stop Switch

| Symbol | Name | Description |
|---|-----------------------|---|
|  | Emergency Stop Switch | When activated in an emergency situation, it shuts off the electrical power for the high frequency parts of the eqo system. The computer will shut down but still be powered by the supply voltage and the 24 V auxiliary supply. |

⑥ Navigator






| Symbol | Name | Description |
|---|-----------|---|
|  | Navigator | Navigates inside the menu structure of a displayed menu |



Important!

Move between adjacent items in screen menus or windows by directing the navigator up or down. If you direct the navigator to the right or to the left, you change the entries or call up a selected menu item or function. You can delete wrong text entries by moving the cursor to the left using the navigator.

⑦ Control key panel

| Symbol | Name | Description |
|---|------------------------|--|
|  | Advance a single frame | <i>Press button once:</i> Move scan forwards by one frame <i>Hold button down for half a second and release:</i> Move scan forwards at half pace. |
|  | Rewind a single frame | <i>Press button once:</i> Move scan backwards by one frame <i>Hold button down for half a second and release:</i> Move scan backwards at half pace. |
|  | Scan forward | <i>Press button once:</i> Move scan forwards in normal time <i>Hold button down:</i> Move scan forwards at double speed |
|  | Scan backward | <i>Press button once:</i> Move scan backwards in normal time <i>Hold button down:</i> Move scan backwards at double speed |
|  | Pause | Pauses the image playback. During a scan process the image capture will continue in the background. |

⑧ Priority key panel

| Symbol | Name | Description |
|--------|----------------|--|
| P1 | Priority Key 1 | <p><i>Within screen messages and menus, the key can have different functions:</i></p> <ul style="list-style-type: none"> ▷ Acknowledge a message with “OK” ▷ Select a highlighted menu option with “SELECT” ▷ Accept a suggested function with “YES” <p><i>Within the title bar:</i></p> <ul style="list-style-type: none"> ▷ Start the video capture for a male scan. |
| P2 | Priority Key 2 | <p><i>Within screen messages and menus, the key can have different functions:</i></p> <ul style="list-style-type: none"> ▷ Discard a selected menu option with “CANCEL” ▷ Reject a confirmation with “NO” <p><i>Within the title bar:</i></p> <ul style="list-style-type: none"> ▷ Start the video capture for a female scan |
| P3 | Priority Key 3 | <ul style="list-style-type: none"> ▷ Stop the video capture during a male/female scan |

Safety instructions for operation



CAUTION

Risk of falling!

When walking through the arch there is a potential trip hazard. Persons to be scanned should be made aware of this!

Startup

Switching on eqo

- ▷ Turn the main switch of the eqo system clockwise into the ON position (see Fig. 6). The unit is now ready to switch-on.

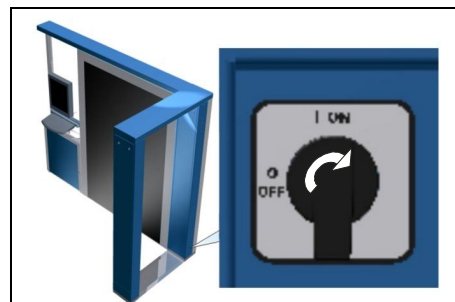


Fig. 6: Main switch

- ▷ Turn the key switch of the eqo system clockwise (into position II) in order to switch on the unit (see Fig. 7). The key switch will backslide automatically to position I.

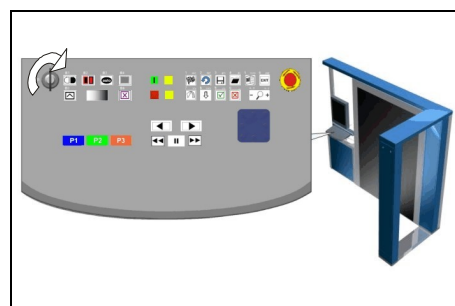


Fig. 7: Keyboard

Login procedure

- ▶ After the initial boot sequence, a splash screen will appear (see Fig. 8) on the monitor, which will clear after approximately five minutes when the system has started.



Fig. 8: Splash screen

The splash screen is followed by the login screen (see Fig. 9).

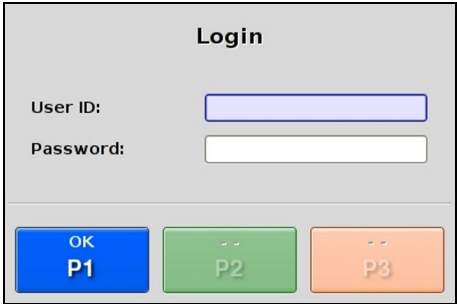


Fig. 9: Login screen

- ▶ Enter your login data by using the function keys (see Fig. 10).
- ▶ The default user login is:

User-ID: 135
Password: 135

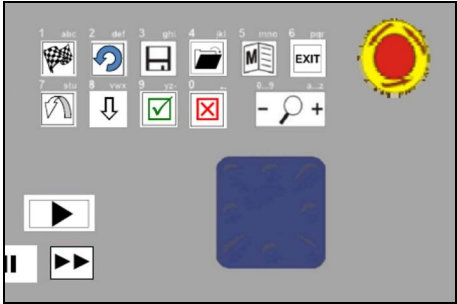



Fig. 10: Function keys

Important!



Inside an input field the lowercase numbers and letters [1 abc] ... [0 _.] written above each function key are active. This gives the operator the ability to enter letters and numbers. The numbers are used by default. To switch between the entry of letters and numbers press .

You can delete wrong text entries by moving the cursor to the left using the navigator.

- ▷ In the event of a failed log-in, Fig. 11 is displayed. Press **P1** on the keyboard to return to the log-in screen (see Fig. 9)



Fig. 11: Login Failed screen

After a successful login, the main screen is displayed (see Fig. 12).

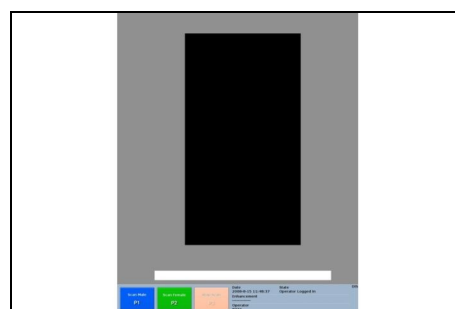


Fig. 12: Main screen



Important!

One should wait 5 minutes before performing scans, as there is a “background collection” task initiated, which needs to be completed, to enable the system to prepare to capture images correctly. People should not be allowed to stand in the scanning area during this 5 minute period.

Operation

Description of the main screen

Viewing window

The viewing window (see Fig. 13) displays an image of the current data in real time. The time line at the base of the screen displays the current length of the scan. A maximum scan will contain 30 seconds worth of image data. The blue bar shows the current position of the LIVE scan. The green bar shows the amount of the sequence that the operator has reviewed.

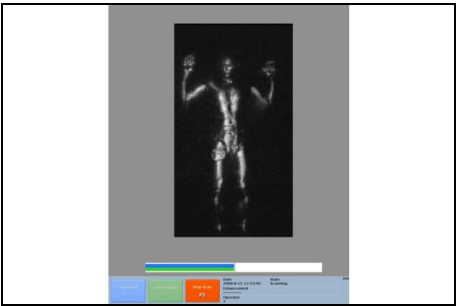


Fig. 13: Viewing window

Title bar

The title bar of the viewing window (see Fig. 14) shows information such as status, current enhancement functions, etc. as detailed in the following table.

| Symbol | Description |
|-------------------|---|
| Date/Time | Current date and time |
| System State | <ul style="list-style-type: none"> ▷ Ready ▷ ScanningScan ▷ Scan Completed ▷ Error ▷ Menu name – if the user is currently in a menu. |
| Image Enhancement | The current image enhancement function: <ul style="list-style-type: none"> ▷ Zoom factor ▷ Brightness ▷ Contrast |
| Operator | Name of the current user |
| Remote Users | Not used in this version |



Fig. 14: Title bar

Scanning process

Conducting the person into the scanning area

- ▷ Direct the person to be scanned inside the scanning area. The optimum position for the person is marked by a symbol on the floor. Instruct the person to be scanned to raise their arms. Fig. 15 shows a top view of the eqo including the operational area ①.

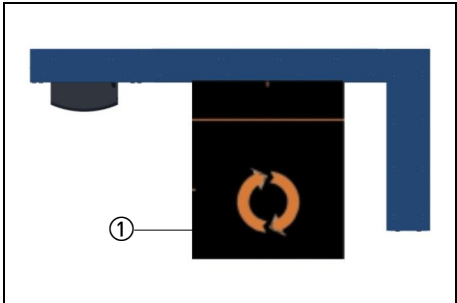


Fig. 15: Top view of the scanning area



Important!

Remember that the minimum distance between the person to be scanned and the flat scanning panel of the eqo system is 30 cm. The person should stand at the centre of the operational area as indicated by the symbol on the floor.



CAUTION

Risk of falling!
When walking through the arch there is a potential trip hazard. Persons to be scanned should be made aware of this!

Start the screening process

Selecting either **P1** or **P2** begins the screening process. This initiates the image capture. Fig. 21 shows the main screen.

- ▷ Instruct the person to turn in slow motion through 360 degrees with their arms raised (as shown in Fig. 21).

Tag areas of interest

Pushing the \downarrow key while the image plays allows the operator to mark areas of interest where potential threats are identified. Yellow marker positions in the green and blue bar identify these positions in the image data (see Fig. 16). They can be used to quickly find these positions in the retained image to playback that portion of the image for further analysis.

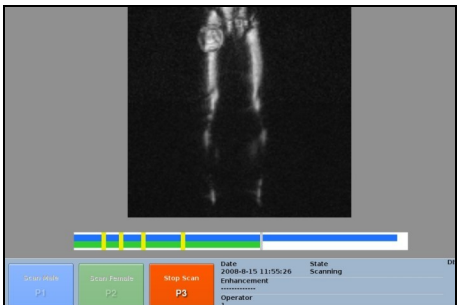


Fig. 16: Tagged areas of interest

Review areas of interest

To review areas of interest, the image playback must be paused, either by pressing the **⏸** key during a scan, or after a screening process has been stopped by pressing **P3**.

While the image playback is paused, it is possible to review areas of interest by pressing **⏮**. This will skip the tags in sequence, if there have been any marked. After reviewing a tag, the operator can clear the tag by pressing the **⏭** key again. The tag will then appear black on the timeline (see Fig. 17).

Using the control keys allows the operator to move the image backwards or forwards in the image sequence and in different speeds on the timeline. The following table describes the usage of the different control keys.

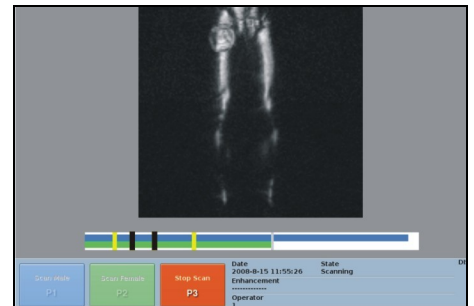


Fig. 17: Cleared tags

| Symbol | Name | Description |
|-----------|------------------------|--|
| ▶ | Advance a single frame | <i>Press button once:</i> Move scan forwards by one frame <i>Hold button down for half a second and release:</i> Move scan forwards at half pace. |
| ◀ | Rewind a single frame | <i>Press button once:</i> Move scan backwards by one frame <i>Hold button down for half a second and release:</i> Move scan backwards at half pace. |
| ▶▶ | Scan forward | <i>Press button once:</i> Move scan forwards in normal time <i>Hold button down:</i> Move scan forwards at double speed |
| ◀◀ | Scan backward | <i>Press button once:</i> Move scan backwards in normal time <i>Hold button down:</i> Move scan backwards at double speed |
| ⏸ | Pause | Pauses the image playback. During a scan process the image capture will continue in the background. |

Stop image capture

- ▷ Press **P3** to stop image capture. Image capture will also stop after the maximum scanning time of 30 seconds has elapsed. However this does not actually end the screening process. You can continue to review previously tagged areas using the control keys (⇧ 13) and the function keys (⇧ 11).

If no threat is detected, the person who has been scanned can then be told that they are free to proceed.

In the case where a potential threat object has been identified, any site specific standard operating procedure (SOP) should be followed. For example a targeted pat-down should be performed as indicated by the position of the threat on the image.


Finish the screening process

- ▷ Press the Finish key on the function key panel to end the screening process.

This will clear the person displayed in the viewing window and reset the timeline. Once the priority keys **P1** and **P2** are available the system is ready to start a new screening process.

Image enhancement features

Face-blur

The face-blur feature is used to blur the areas around the face for privacy reasons. It may be turned on/off by pressing the „face-blur“-key . Fig. 18 shows an image with the face-blur feature activated.

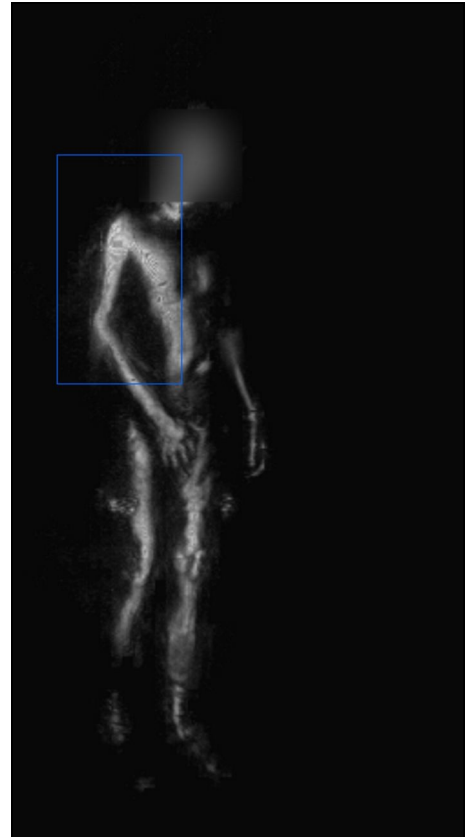





Fig. 18: Image display with activated face-blur

Brightness

Pressing the  key switches between brightness and contrast adjustment. Fig. 19 shows the title bar with activated brightness adjustment.

- ▷ Use the  key to switch to brightness adjustment if necessary.
- ▷ Press the „Contrast / Brightness Adjustment“ key  to increase/decrease the contrast of the displayed image in steps of 8 from -64 to +64.

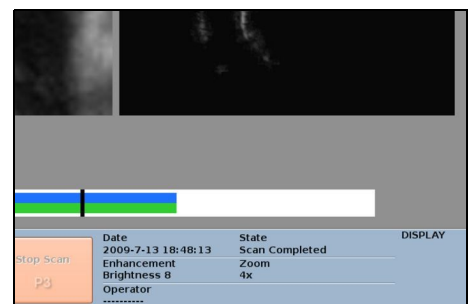





Fig. 19: Title bar

Contrast

Pressing the  key switches between contrast and brightness adjustment. Fig. 20 shows the title bar with activated contrast adjustment.

- ▷ Use the  key to switch to contrast adjustment if necessary.
- ▷ Press the „Contrast / Brightness Adjustment“ key  to increased/decreased in steps of 1 from -28 to +7.

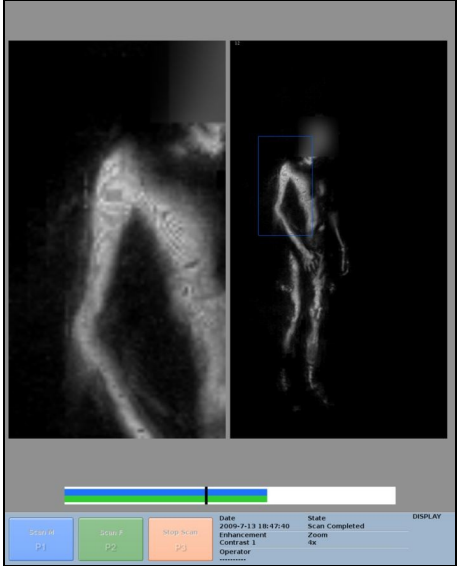




Fig. 20: Title bar

Zoom

When the magnifying glass key  is pressed the screen splits in two as shown in Fig. 21.

One frame shows the normal (non-zoomed) image, and the other the zoomed image. The zoom factor can be increased / decreased from 2x to 4x to 8x, by pressing .

A blue box appears on the standard frame, and it may be moved using the blue navigator key. This blue box indicates the region which is to be zoomed in on.

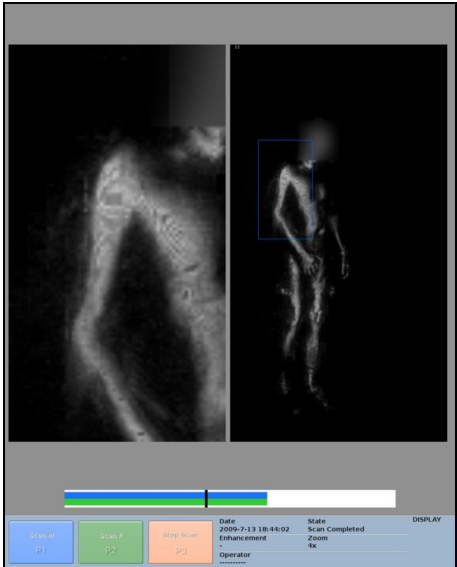







Fig. 21: Image display with activated zoom

Example scenarios



Single scan with operator adding suspect tags

- ▷ The operator starts a male scan by pressing **P1**. The **P1** and **P2** keys are then disabled and the **P3** key is enabled.
- ▷ The operator presses the  key once during the live image for each suspect item identified on the subject, which adds suspect tags to the timeline.
- ▷ The operator presses the stop key **P3**.
- ▷ The sequence is stopped and the image is not cleared until the operator presses the finish key.
- ▷ The suspect tags are dealt with as previously described
- ▷ When the Finish key  is pressed the **P1** and **P2** keys are enabled once more.




Pause and review

- ▷ The operator first starts a male scan by pressing **P1** and then pausing it by pressing the  key.
- ▷ After the  key has been pressed the operator can then review the static image.
- ▷ When the operator presses the **P3** key to stop the scan the priority keys are disabled but the review functions are still available to the operator.
- ▷ The operator presses the Finish key  and the priority keys **P1** and **P2** are then enabled


Add a tag, stop and review

- ▷ The operator starts a male scan by pressing the **P1** key.
- ▷ After the stop key **P3** is pressed the image collection is complete.
- ▷ The operator then jumps to the section of the image that contains the suspect tag by pressing the jump key.
- ▷ During the review process the operator presses the  key which will then clear the tag on the timeline.
- ▷ The operator then presses the Finish key  to complete the scan session.

Pause, review and resume

- ▷ The operator starts a scan by pressing the **P1** key.
- ▷ The operator presses the  key. The image is paused and operator can then review the static image.
- ▷ The operator presses  again and the display is continued from the point the operator paused the sequence.
- ▷ The operator presses the stop key **P3** to stop the live image and enter the review mode.
- ▷ The operator presses the Finish key  to complete the scanning procedure.

Shutdown

- ▷ Press  and the main menu is displayed (see Fig. 22).
- ▷ Use the navigator control on the keyboard (⌘ 12) to select the Logout menu item and confirm it by pressing **P1**. Choosing **P2** will bring you back to the main screen. The logout confirmation screen (see Fig. 23) is displayed.

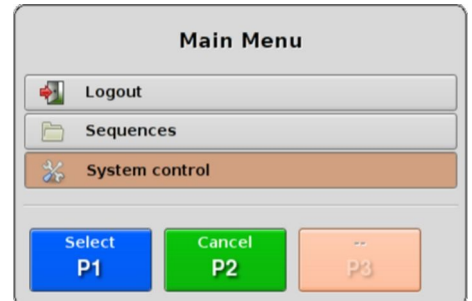


Fig. 22: Main menu

- ▷ Press **P1** to confirm the logout process or **P2** to cancel it (see Fig. 23)

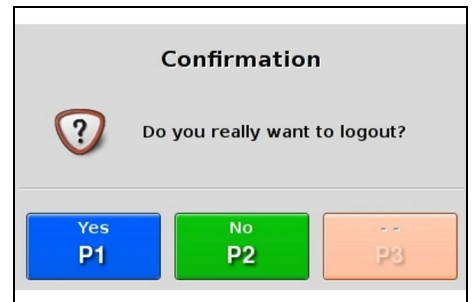


Fig. 23: Logout confirmation screen

- ▷ Turn the key switch to the left (into position 0) in order to switch off the unit (see Fig. 24).

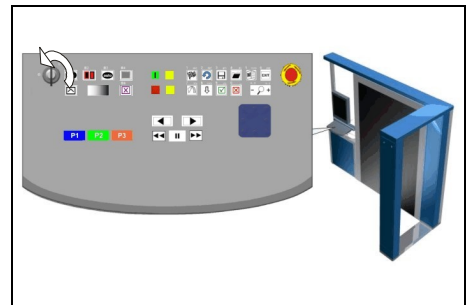


Fig. 24: Keyboard

- ▷ Turn the main switch to the left into position OFF (see Fig. 25).

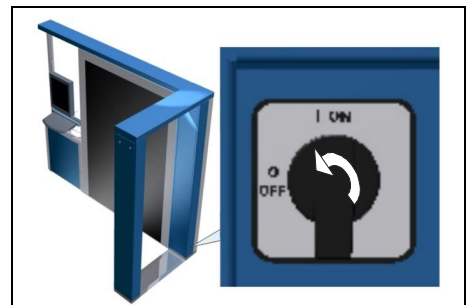


Fig. 25: Main switch

Technical data

Electrical data

| | |
|-------------------|--------------------|
| Power Supply | 100-240 VAC, N, PE |
| Power Consumption | 1.36 kVA |
| Frequency | 50 - 60 Hz |
| Fuse | 2 x 10 A |

Sound Pressure Level

| | |
|----------------------|----------|
| Sound Pressure Level | < 55 dBA |
|----------------------|----------|

Weight

| | |
|--------|----------|
| Weight | < 400 kg |
|--------|----------|

Temperatures

| | |
|-----------------------|-------------------|
| Storage Temperature | -20° C to + 70° C |
| Operating Temperature | 0° C to +40° C |

Environment

| | |
|------------------------------------|------------|
| Relative Humidity (non-condensing) | 10% to 90% |
| Altitude | 2 km max |

Dimensions

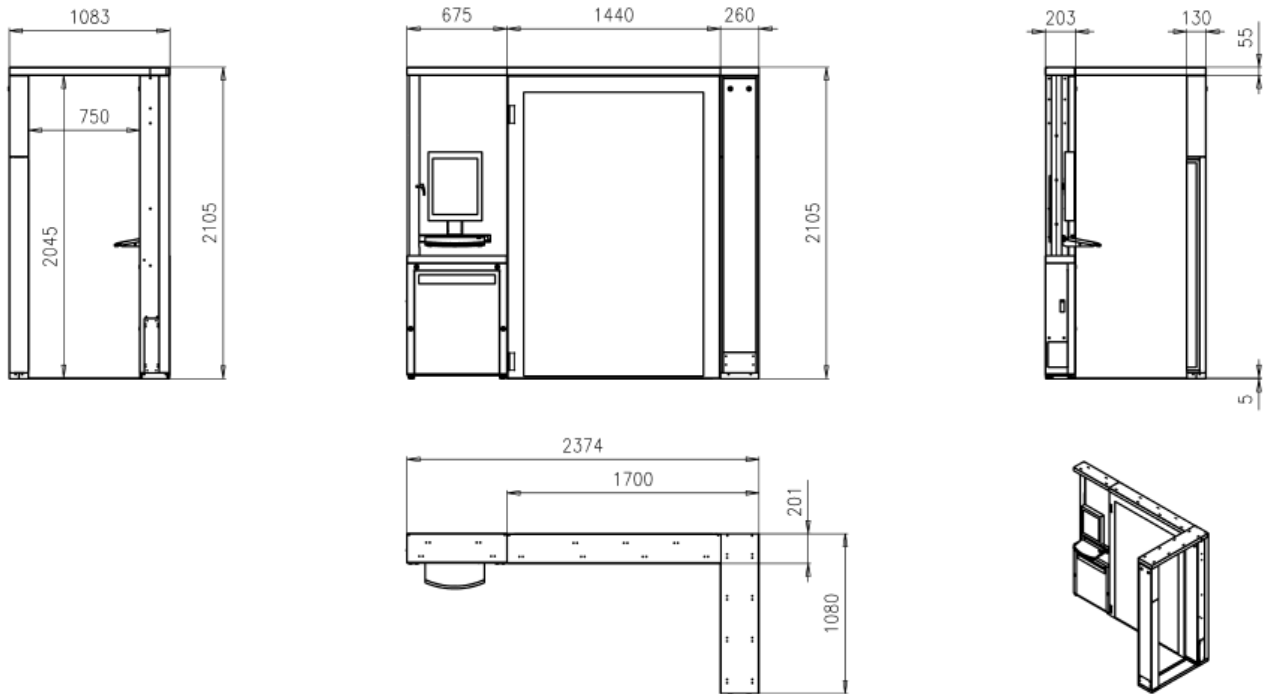


Fig. 26: Dimensions of the eqo system

FCC Statement

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Appendix

Daily Test Procedure

Test card

After starting eqo each morning, the operator is advised to perform a test card scan. This is done using a specifically designed test card (see Fig. 27). The card is manufactured from a plastic material which is transparent to millimetre waves. Metal strips of different widths are attached to the surface of the card. The number next to each section signifies the width of each strip in that section and the gap between adjacent metal strips.

During the test the operator holds the card vertically in front of the system (i.e. in the orientation shown in Fig. 27), in the centre of the scan volume (this is identified by the centre of the symbol on the floor mat), at a height of approx. 1.5 m from the floor to the top of the test card.

It is expected that at the centre of the scan volume, a properly setup imager will be able to resolve lines (horizontal or vertical) of 6mm width. The results of the test will be different depending on the distance from the panel and the location in the scanned volume. Moving the test card closer to the panel should result in the resolution of lines down to 4mm.

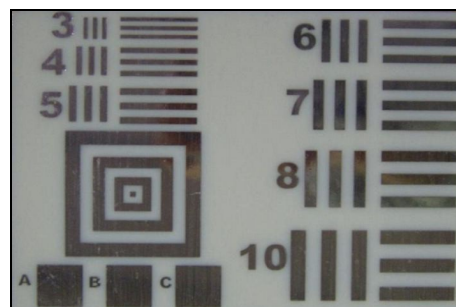


Fig. 27: Test card



Important!

The card may need to be rotated in the vertical plane (max. 10 degrees) to achieve optimum results.

The test procedure is as follows:

- ▷ Start the system according to the procedure outlined in the operator manual.
- ▷ Allow the system to run for a minimum of 5 minutes after log on - make sure there are no objects in the scan volume during this time.
- ▷ Rotate or tilt the card to achieve best image, as described above.
- ▷ Review the image after the test using ◀◀ and ▶▶ keys.
- ▷ Make sure the number of lines on the image corresponds to the number of lines in the test card.

- ▷ Watch out for blurring or double lines in the image.

In the event of the image result not being acceptable, a system set-up should be carried out by a suitably trained technician.

Test card example images

Fig. 28 shows an image where the test card is out of focus. The test card has been placed too far away from the flat scanning panel.

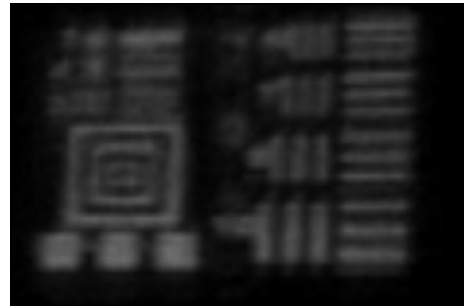


Fig. 28: Image with test card too far away

Fig. 29 shows an image where the test card has been placed at an incorrect angle to the flat scanning panel.

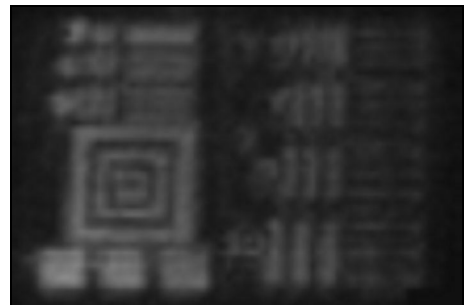


Fig. 29: Image with test card at incorrect angle

Fig. 30 shows an image where the test card has been positioned correctly.

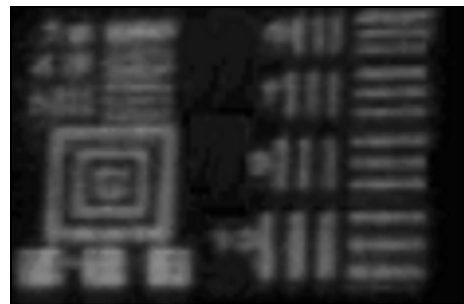


Fig. 30: Image with test card positioned correctly

Fig. 31 shows an image where the test card has been placed closer to the flat scanning panel.

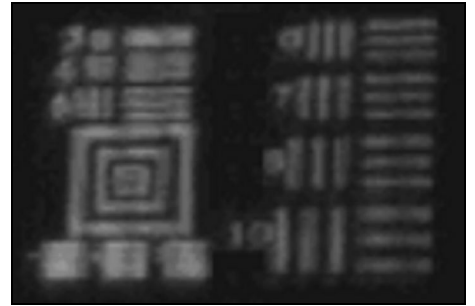


Fig. 31: Image with test card placed closer

