HI-SCAN 6040aTiX
HEIMANN X-RAY INSPECTION SYSTEM

General Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunnel dimensions / max. object size</td>
<td>620 (W) x 418 (H) [mm] / 615 (W) x 410 (H) [mm]</td>
</tr>
<tr>
<td></td>
<td>24.4” (W) x 16.5” (H) / 24.2” (W) x 16.1” (H)</td>
</tr>
<tr>
<td>Conveyor height 1)</td>
<td>approx. 800 mm / 31.5”</td>
</tr>
<tr>
<td>Conveyor speed at mains frequency 50/60Hz</td>
<td>approx. 0.2 / 0.24 [m/s]</td>
</tr>
<tr>
<td>Max. conveyor load (evenly distributed)</td>
<td>160 kg / 352 lbs</td>
</tr>
<tr>
<td>Resolution (wire recognition)</td>
<td>standard: 40 AWG (0.08 mm Cu), typical 2): 41 AWG (0.07 mm Cu)</td>
</tr>
<tr>
<td>Penetration (steel step wedge)</td>
<td>standard: 35 mm, typical 2): 37 mm</td>
</tr>
<tr>
<td>ASTM 792-01, Test 4 (simple penetration)</td>
<td>Typical: 34 mm</td>
</tr>
<tr>
<td>ASTM 792-01, Test 3 (spatial resolution)</td>
<td>Typical: 1.0 mm horizontal and vertical</td>
</tr>
<tr>
<td>ASTM 792-01, Test 1 (wire resolution)</td>
<td>Typical: 40 AWG (0.08 mm)</td>
</tr>
<tr>
<td>X-ray dose / inspection (typical)</td>
<td>HI-MAT: 11 μSv (1.1 mrem)</td>
</tr>
<tr>
<td>Film safety</td>
<td>guaranteed even for high speed films up to ISO 1600 (33 DIN)</td>
</tr>
<tr>
<td>Duty cycle</td>
<td>100%, no warm-up procedure required</td>
</tr>
</tbody>
</table>

X-Ray Generator

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling / Housing</td>
<td>Hermetically sealed oil bath / single tank</td>
</tr>
<tr>
<td>Anode voltage</td>
<td>Max. 176 kV cp, operated at 160 kV cp</td>
</tr>
<tr>
<td>Anode current (typical)</td>
<td>0.6 mA</td>
</tr>
<tr>
<td>Beam divergence / beam direction</td>
<td>60° / from different angles vertical and horizontal</td>
</tr>
</tbody>
</table>

Image Generating System

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-ray converter</td>
<td>MultiView sensor system with large scale monolithic amplifiers; conversion of X-radiation by means of scintillation crystals</td>
</tr>
<tr>
<td>Number of X-ray detectors</td>
<td>HiResolution detector system with 1400 - 1700 photo diodes, depending on the selected view (HI-MAT/XADA technology)</td>
</tr>
<tr>
<td>Digitalization (dynamic resolution)</td>
<td>A/D converter 14 bit</td>
</tr>
<tr>
<td>XADA detectors</td>
<td>Advanced data acquisition system improving overall performances of the X-ray system. The newly developed XADA technology maximizes the effectiveness and accuracy of data capture, giving improvements in all the physical parameters that are important for security when compared against conventional sensors.</td>
</tr>
</tbody>
</table>

www.smithsdetection.com
**Image Processing System**

- **Image memory**: 128 MB
- **Storage depth per picture element**: 24 bit (16 bit + 8 bit Overlay)
- **Maximum image resolution**: 1280 x 1024 / 75Hz non-interlaced
- **Resolution HI-SCAN 6040 aTiX**: 1280 x 1024 / 75Hz
- **Monitor 19” LCD (standard)**: TCO compliant
- **Computer specifications (minimum)**: 2 x 2.6 GHz CPU (dual processor), 2 GB RAM, >=120 GB hard disk, USB ports

**Media Bay**

System controller with built-in media bay to house various data storage modules:

- **CD R/W**: CD-RW drive module; CD burning process supported by HiTraX user interface OR
- **Hard Disk**: Removable Image Data Archive (RIDA); minimum 250 GB storage capacity

**Image Display Modes**

**Black / White Image**

In the black and white image, scanned objects are represented according to the X-ray absorption. The X-ray absorption of the inspected material is assigned to 4096 grey levels, where high absorbing materials are represented in dark grey tones and weak absorbers in lighter shades of grey.

More grey levels are used in the low and high areas of X-ray absorption than in the medium absorbing range. Therefore, more details are revealed in high and low absorbing areas.

**HI-CAT Color Image**

This image representation translates gray values from the B/W image into colors. The 4096 grey levels are assigned to 256 colors. Since the human eye is able to differentiate more colors than grey levels, this form of pseudo color representation helps the detection of contours in the scanned object.

The X-ray operator can choose between 6 color designs, depending which color selection best suits the image under analysis. The colors, however, do not allow any conclusions on the material origins of the inspected objects.
HI-MAT\textsuperscript{Plus} MULTI-ENERGY METHOD

Material Classification

HI-MAT\textsuperscript{Plus} offers the advantage of an improved recognition of items inside a piece of luggage by distinguishing material of different origins. Material information is evaluated by means of the multi-energy method, where high and low energy radiation signals obtained after penetration of the object are compared. Conclusions concerning material origins can be made. The classification of material is done according to the atomic numbers (Z). Three main groups of elements are distinguished by colors of a continuous color scale:

\begin{itemize}
  \item \(0 < Z < 10\) - orange
    lighter elements e.g. hydrogen, carbon, nitrogen, oxygen and the molecular compounds of the latter, the \textit{organic materials}
  \item \(10 < Z < 15\) - green
    medium heavy elements: \textit{pure aluminum}, sodium, chlorine, cooking salt
  \item \(15 < Z < 56\) - blue
    heavier elements: the \textit{metals} titanium, chromium, iron, nickel, copper, silver etc.
\end{itemize}

Standard Features

\textbf{Standard Functions}

Insertion of date/time, luggage counter, user ID number, luggage marking system (acoustic), display of operating mode, REVIEW feature, programmable priority keys, standard network interface.

\textbf{Zoom}

Continuous electronic zoom, stepless enlargement up to 16x.
Pixel interpolation (disengageable).
Permanent display of a miniature image overview with zoom positioning.

\textbf{Review}

Approximately 8 images of previously scanned objects can be recalled on the monitor. Image processing functions can be operated simultaneously.

\textbf{High}

This function facilitates the identification of objects obscured by highly absorbing material. The contrast of darker objects is increased and, at the same time low absorbing objects are filtered out. An image with a virtual higher penetration is created. Even thicker layers of light organic material (explosives, drugs) are significantly emphasized.

HIGH is available for B/W and HI-MAT\textsuperscript{Plus} image display modes.
Low

This function facilitates the identification of low absorbing objects. The contrast of brighter image sections is increased and, at the same time high absorbing objects are displayed in black. An image of virtually lower penetration is created. Details of low absorbing items become more clearly visible.

LOW is available for B/W and HI-MAT\textsuperscript{Plus} image display modes.

Neg

This function creates a negative image: highly absorbing objects appear bright and low absorbing objects appear dark. Smaller and slimmer objects of higher density (e.g. wires) become more visible.

NEG is available for B/W and HI-MAT\textsuperscript{Plus} image display modes.

Organic Only (O\textsuperscript{2})

This function suppresses all non-organic material from the image by representing them in grey shades. Objects made of organic material are emphasized.

Organic Stripping (OS)

This function suppresses all organic material from the image by representing them in grey shades. Objects made of non-organic material are emphasized.

The functions O\textsuperscript{2} and OS enable the selective inspection of objects by fading out in grey values non-organic or organic material respectively.

This "stripping" of organic or non-organic material is especially advantageous when parts of objects, which do not belong to the material group sought after, appear on the screen and partially overlap the substance searched for.

VARI

Unlike a regular image where all objects are displayed independently of their X-ray absorption degree, VARI allows X-ray operators to select a range or absorption. Only objects whose absorption degrees are within the selected range are displayed. They are displayed with highly increased contrasts while all other objects are suppressed.

VARI is available for all image display modes: VARI-MAT, VARI-CAT and VARI-B/W. Moreover, VARI can be combined with Organic Only (VARI-O\textsuperscript{2}) and Organic Stripping (VARI-OS).
Optional Advanced Image Processing Functions

**SEN**
Super-Enhancement

This unique function supports the operator in evaluating X-ray images of inspected objects faster and more effectively than any other conventional enhancement filter. An optimum contrast throughout the image is achieved, independent of the prevailing image brightness. By means of electronic real time image processing, the contrast enhancement is calculated automatically for every single image section. As a result, an X-ray image with highest detailed resolution is obtained. Recognition of single objects like plastic weapons, explosives and drugs is significantly improved. Due to high penetration and resolution low density, objects can be clearly identified even if they are covered by metal sheets.

**HDA**
High Density Alert

The HDA option automatically alerts screeners of the presence of high absorbing material by drawing a frame around such objects. An audible alarm can also be configured.

**HI-SPOT**

The HI-SPOT option offers an automated procedure for the recognition of areas with high X-ray absorbing material. Detected areas are locally highlighted by the HIGH function. This function facilitates the identification of objects hidden behind highly absorbing objects.

**X-PLORE**

Detection of organic material can be further refined with the function X-PLORE. X-PLORE allows the automatic detection of organic substances with relative atomic numbers ($Z_{eff}$) 7, 8 or 9. Material with the chosen atomic number is displayed in red while other areas are presented in black and white.
## Additional Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opti-ZOOM</strong></td>
<td>By pressing just one key, the option Opti-Zoom optimizes the magnification of the image to fit screen size.</td>
</tr>
<tr>
<td><strong>IMS</strong></td>
<td>IMS is the image management system which allows users to save, archive, and organize X-Ray images. Up to 20,000 X-ray images of scanned baggage can be stored on the local hard disk of the X-ray inspection system. Various image recording and recall modes can be selected to meet the requirements of different applications. IMS provides a flexible image management library divided into categories, where folders can be added, edited or deleted. For archiving or training purposes, images can be saved on a variety of media or downloaded to external computers via network.</td>
</tr>
<tr>
<td><strong>Bar Code Reader</strong></td>
<td>For X-ray units equipped with IMS, the bar code reader allows to save images using the bar code. Images can also be recalled simply by reading the bar code.</td>
</tr>
<tr>
<td><strong>Xport</strong></td>
<td>The Xport function allows the automatic transmission of X-ray images to an external computer via network. X-Ray images can be transferred as HIF files (Heimann Image format) or as standard commercial formats (.jpg, .tif, .bmp).</td>
</tr>
<tr>
<td><strong>HI-TIP</strong></td>
<td>HI-TIP is a system that projects fictional threats on a random basis over real X-ray images of scanned baggage. It aims at helping X-ray operators improving their threat recognition skills. HI-TIP is a process which is transparent to X-ray operators. Their task is to recognize and mark threat objects. The full range of image enhancement functions in support to the evaluation process is available during this procedure. HI-TIP is fully configurable by high level users, where parameters such as type of threats, frequency of projection, etc. can be configured. Complete reports on users performance can be created. Conclusions as to the efficiency of the security checkpoint can be drawn. HI-TIP is approved and accepted by US-FAA/TSA and UK-DfT.</td>
</tr>
</tbody>
</table>
**Xtrain**

**On-the-job Training System**

The Xtrain module offers a powerful on-the-job training system specifically matched to HI-SCAN X-ray inspection systems. Xtrain is based on the HiTraX system platform and therefore contains all the prerequisites for optimal operator training and effective monitoring of its success. This ensures that there is absolutely no difference between training and live operation in terms of system behavior and control features.

**Networking**

The system can be integrated into network solutions. Typical applications are:

- **Recheck** Image evaluation at remote HiTraX workstation
- **Printer** Network printer interface
- **CIDA** Central Image Data Archive
- **HMS** Centralized system management server
- **3iTIP** Integrated adaptive TIP and operator training system
- **InLine** Baggage handling and conveyor system interface

**Nuclear Sensor System**

Integrated sensor system for the detection of radioactive material. The X-ray images of suspicious objects are marked by colored frames. Additional alarm information is shown on the monitor.

**Proline Accessories**

Proline products are a selection of accessories for HI-SCAN units.

- Adjustable monitor support (on a stationary base or attached to the X-ray unit)
- Operator control desk for single or dual monitors
- Ergonomic operator rest bar
- Input and Output roller conveyors of various lengths
- Tunnel access protection
- Modular Reinspection desks
**Installation Data**

X-ray leakage

Meets all applicable laws and regulations with respect to X-ray emitting devices.

Standard: dose rate $< 2\mu$Sv/h (0.2mrem/h) at a distance of 5 cm from external housing.

Optional: dose rate $< 1\mu$Sv/h (0.1mrem/h) at a distance of 5 cm from external housing in configuration with 0.6mm lead equivalent value lead curtains.

CE labeling / Rules

In compliance with:
- Directive 2006/42/EC Machinery
- Directive 2006/95/EC Low Voltage

Designed in compliance with IEC, EN, UL, CSA

Sound pressure level

< 65 dB(A)

Operating / Storage temperature

0º - 40ºC / -20º - +60ºC

Humidity

10% - 90% (non-condensing)

Power supply $^3$

Standard: 100, 120, 200, 230, 240 VAC +10% / -15% • 50 Hz / 60 Hz ± 3 Hz

Power consumption

Approx. 2.2 kVA

Protection class system / keyboard

IP20 / IP43

Dimensions / Weight $^1$

3300 (L) x 1310 (W) x 1400 $^1$ (H) [mm] / approx. 1,600 kg

129.9" (L) x 51.6" (W) x 55.1" (H) / approx. 3,528 lbs

Mechanical construction

Steel construction with steel panels, mounted on roller castors

Standard colors

RAL 7016 / RAL B-11/W1

**Dimensions**

1) Approximate values (adjustable)

2) Steel stepwedge, copper wires

3) Different values optional

4) Without control desk, keyboard, monitor(s), etc.