Normal use

The medical equipment is intended for fluoroscopies in the field of surgery, e.g. in traumatology, orthopedics, neurosurgery, urology, cardiology. Third-party devices and components used in combination with this system must comply with the safety requirements according to IEC 60601-1 and/or IEC 60601-1-1 or furnish proof of an equivalent degree of safety.

To ensure CE conformity, these components must have a CE approval in accordance with Council Directive 93/42/EEC. In addition, a declaration in compliance with Article 12 of the said directive must be provided.

For components without CE approval, a conformity assessment procedure is obligatory.

Proper and safe operation of the system requires adequate transportation, storage, assembly and installation as well as appropriate use and maintenance.

The limit values indicated in the present document must not be exceeded; this applies also when putting the system into service.

The system is not suitable for interventional procedures acc. to IEC 60601-2-43.

Contraindications to the use of X-rays

The exposure of humans to ionizing radiation must always be medically justified. Especially on pregnant women, children and adolescents this procedure should be used with caution or be avoided altogether. However, the final decision lies with the attending physician or attending surgeon.

Ziehm 8000 product family

The Ziehm 8000 product family comprises the following systems:

- Ziehm 8000 (not available in the USA)
- Ziehm Compact (not available in the USA)
- Ziehm Compact Litho (not available in the USA)
- Ziehm 7000 Plus (available only in the USA)
- Ziehm 7000 Plus (Compact Version) (available only in the USA)

Unless stated otherwise, all information given here for the Ziehm 8000 also refers to the Ziehm Compact and Ziehm Compact Litho.

Authorized personnel

Only authorized personnel are allowed to assemble and repair the medical equipment described in this manual. Authorized personnel are persons who have attended an appropriate training course provided by the manufacturer. These persons will receive the entire documentation that is required for service work.

Exclusion of liability

The manufacturer accepts responsibility for the safety, reliability and performance of the system only if

- any installation, modification or repair work is carried out exclusively by persons authorized by the manufacturer;
- the electrical installation of the site where the system is operated complies with the requirements of VDE 0107 or the corresponding national regulations of the country of installation;
- only original spare parts or components that comply with Ziehm Imaging’s specifications are used;
- the system is used in accordance with the user manual.

The warranty becomes invalid in case that any repair, modification or installation work is carried out by unauthorized personnel, or any seals on components are broken. No consequential damages will be accepted either.

The equipment conforms to Class IIb according to Council Directive 93/42/EEC.

This document has been written and reviewed originally in German and translated.

Copyright

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All rights reserved.
Transmission or reproduction of these Operating Instructions, exploitation and disclosure of their contents to third persons is not permitted without express written consent of the manufacturer. Infringements shall entitle to damage claims.

Registered Trademarks

These Operating Instructions may contain the names of registered trademarks or brands, the use of which by third persons for their purposes may infringe the rights of their respective owners.

Quality Standards

These Operating Instructions were produced in accordance with a certified QM system as per DIN EN ISO 13485. It conforms to the requirements of Council Directive 93/42 EEC, Annex I, and other applicable norms. The information provided in this document may be updated at regular intervals. Subject to change without prior notice.

Manufactured by:
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e-mail: info@ziehm-eu.com
http://www.ziehm.com
Rev. 03/2009
## Contents

1 General Information .......................... 1-1
   1.1 Typographical conventions ......................................................... 1-2
   1.2 Conventions for safety instructions ............................................. 1-3
   1.3 Accessories ............................................................................... 1-4

2 Safety Instructions ............................ 2-1
   2.1 General safety instructions ......................................................... 2-1
   2.2 X-rays ..................................................................................... 2-2
   2.3 Electromagnetic compatibility .................................................... 2-4
   2.4 Protective grounding .................................................................. 2-4
   2.5 Equipotential grounding ............................................................... 2-4
   2.6 Laser radiation ......................................................................... 2-5
   2.7 Printers ..................................................................................... 2-6
   2.8 Mechanics ................................................................................. 2-7
   2.9 System failure ........................................................................... 2-7

3 Unpacking the System ....................... 3-1
   3.1 Unpacking the system on the pallet ............................................. 3-1
      3.1.1 Unpacking the pallet on delivery to distributors .................... 3-1
      3.1.2 Unpacking the pallet on drop shipments ............................... 3-3
      3.1.3 Unpacking the monitors ....................................................... 3-6
         3.1.3.1 Flat-screen monitors ....................................................... 3-6
      3.1.4 Unpacking the C-arm stand .................................................. 3-6
      3.1.5 Unpacking the monitor cart ................................................... 3-8

4 Assembling the System ...................... 4-1
   4.1 Assembly .................................................................................. 4-1
      4.1.1 Mounting the 23" or 24" flat-screen monitor ......................... 4-2
      4.1.2 Mounting the 18" flat-screen monitors .................................. 4-5
   4.2 Cable connections ...................................................................... 4-8
   4.3 DICOM connection .................................................................... 4-9

5 Putting the System into Service .......... 5-1
   5.1 Temperature ............................................................................. 5-1
   5.2 First power-up of the system .................................................... 5-1
   5.3 Setting up the system ............................................................... 5-2

6 Configuration ................................. 6-1
   6.1 Overview .................................................................................. 6-1
   6.2 User settings ............................................................................. 6-3
      6.2.1 Activating automatic image swapping .................................. 6-3
      6.2.2 Displaying a crosshair ......................................................... 6-4
      6.2.3 Function of the F key ........................................................... 6-4
      6.2.4 Storage medium for image retrieval .................................... 6-5
      6.2.5 Setting the cine loop speed .................................................. 6-5
      6.2.6 Setting the cine loop length .................................................. 6-5
      6.2.7 Combining DSA with a cine loop ........................................... 6-5
6.2.8 Showing or hiding the native image .................................................. 6-6
6.2.9 Selecting the storage medium for data retrieval with DICOM Dir...... 6-6
6.2.10 Defining the storage format for removable storage media .......... 6-6

6.3 Basic settings .......................................................................................... 6-7
6.3.1 Setting the system time and system date........................................... 6-7
6.3.2 Selecting the live screen ................................................................... 6-7
6.3.3 Entering the hospital data .................................................................. 6-8
6.3.4 Clearing storage media ...................................................................... 6-8

6.4 Screen settings.......................................................................................... 6-9
6.4.1 Ziehm 8000 with flat-screen monitor ................................................. 6-9
6.4.2 Setting flat-screen monitors of type 1.................................................. 6-10
   6.4.2.1 Built-in keypad ........................................................................ 6-11
   6.4.2.2 Setting the brightness, contrast and backlight ......................... 6-11
   6.4.2.3 Setting the menu language ....................................................... 6-13
   6.4.2.4 Setting the video source .......................................................... 6-14
   6.4.2.5 Setting the gamma value .......................................................... 6-16
   6.4.2.6 Setting up the display .............................................................. 6-17
   6.4.2.7 Setting up the menu ............................................................... 6-18
   6.4.2.8 Locking the menu .................................................................. 6-19
   6.4.2.9 Restoring the factory settings ................................................. 6-20
6.4.3 Setting flat-screen monitors of type 2.................................................. 6-21

6.5 Service settings ........................................................................................ 6-25
6.5.1 Step windowing .................................................................................. 6-26
6.5.2 Filter factors ...................................................................................... 6-27
   6.5.2.1 Filters for anatomical programs ............................................. 6-28
   6.5.2.2 Filters for subtraction modes .................................................. 6-30
   6.5.2.3 Filters for subtraction modes with CO2 .................................. 6-31
6.5.3 Windowing settings for subtraction modes ........................................ 6-32
6.5.4 DICOM settings .................................................................................. 6-33
   6.5.4.1 Network parameters ............................................................... 6-33
   6.5.4.2 Configuration of Storage and Storage Commitment ............... 6-34
   6.5.4.3 Configuration of Media Storage .............................................. 6-36
   6.5.4.4 Configuration of DICOM Query/Retrieve ............................... 6-38
   6.5.4.5 Configuration of Worklist and MPPS ................................... 6-42
   6.5.4.6 Configuration of the print servers .......................................... 6-46
   6.5.4.7 DICOM Verification error messages .................................... 6-51
   6.5.4.8 DICOM Retrieve error messages ........................................... 6-52
   6.5.4.9 Hardware with DICOM option ............................................. 6-52
6.5.5 System settings ................................................................................... 6-54
6.5.6 HEDIS data ...................................................................................... 6-57
6.5.7 Software update .................................................................................. 6-58

7 Technical Data .......................................................................................... 7-1
7.1 Ziehm 8000, Ziehm Compact and Ziehm Compact Litho .................... 7-1
7.2 Power plug specification ........................................................................ 7-5
   7.2.1 Systems with a voltage rating of 200V, 220V, 230V and 240V ...... 7-5
7.3 Laser positioning device ........................................................................ 7-5
7.4 Dose meter ............................................................................................ 7-6
7.5 Air kerma ............................................................................................... 7-7
7.6 Focal spot position ................................................................................. 7-8
7.7 Dimensions ........................................................................................... 7-9
   7.7.1 Ziehm 8000 ............................................................................... 7-9
   7.7.2 Ziehm Compact ......................................................................... 7-12
   7.7.3 Ziehm Compact Litho ................................................................. 7-13
8 Maintenance
8.1 General requirements ................................................................. 8-1
8.2 Electrics .................................................................................... 8-2
8.3 Mechanics ................................................................................ 8-4

9 Replacing Components
9.1 Hand switch and foot switch ....................................................... 9-1
9.2 Coupling cable ........................................................................ 9-2
9.3 Fuses ......................................................................................... 9-3

10 Problem Report
10.1 List of error and alert messages .............................................. 10-1
10.2 What to do if ........................................................................... 10-5
10.3 Failure of the power supply .................................................... 10-6

11 Disassembling the System
11.1 Dismounting the 23" or 24" flat-screen monitors ...................... 11-1
11.2 Dismounting the 18.1" flat-screen monitors .............................. 11-4

12 Mounting the System on a Pallet
12.1 Safety instructions and information ........................................ 12-1
12.1.1 Safety instructions ............................................................... 12-1
12.2 Information ............................................................................ 12-2
12.3 Environmental conditions ....................................................... 12-2
12.4 Packing material and contents ................................................. 12-3
12.4.1 Material ............................................................................. 12-3
12.4.2 Parts to be packed ............................................................. 12-4
12.5 How to pack the accessories ................................................... 12-5
12.6 Packing the monitor cart .......................................................... 12-6
12.7 Packing the C-arm stand .......................................................... 12-10
12.8 Packing the monitor head ........................................................ 12-15
12.9 Packing the ramp .................................................................... 12-17
12.10 Packing the full pallet ............................................................. 12-19

A.1 Manufacturer’s Declaration concerning Electromagnetic Compatibility acc. to IEC 60601-1-2 (Class B) ......................................................... A-1

Index


1 General Information

This manual is designed to enable owners and operators of the system to operate the systems described herein safely and efficiently.

Ziehm 8000 with the options Ziehm Compact and Ziehm Compact Litho, software version L2.04 or higher.

Scope of validity of these Operating Instructions

All illustrations in these Operating Instructions are exemplary only, and may differ from the actual situation.

The present Operating Instructions describe a system with maximum configuration. The system configuration chosen by you may not contain all options and functions described here.

Separate operating instructions

For several system options, separate operating instructions may be available. They are supplied with the system, provided that the system configuration includes the respective option. You will find a corresponding reference to those operating instructions in the relevant sections of this document.

Environmental compatibility

The system does not produce any waste during operation.

When the system has reached the end of its useful service life, the relevant waste disposal regulations of the country of installation must be observed.

Ziehm Imaging GmbH takes back your devices and undertakes to dispose of them appropriately in accordance with national regulations. If you want to return a device, please contact the Ziehm Imaging Service department.

The useful service life defined for this medical device is seven years. After this period, Ziehm Imaging GmbH must check whether the technology used is appropriate.
1.1 Typographical conventions

In this manual, the following notations and formats are used to highlight certain elements of the control panel or the documentation itself:

<table>
<thead>
<tr>
<th>Element</th>
<th>Format</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control panel elements</td>
<td>Bold</td>
<td>Fluoro</td>
</tr>
<tr>
<td>elements (buttons, tabs and boxes), operating modes, functions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cross-references</td>
<td>Italic, preceded by an arrow</td>
<td>→ Ch. 17, p. 17-1</td>
</tr>
<tr>
<td>Procedure steps</td>
<td>Preceded by a •</td>
<td>• Press the OK button.</td>
</tr>
</tbody>
</table>

Table 1-1 Notations and formats used in this manual
1.2 Conventions for safety instructions

The present document does not constitute a complete catalog of all safety measures necessary for the operation of the respective medical equipment, since special operating conditions may require further measures. However, it does contain instructions which must be observed in order to ensure the personal safety of operating staff and patients as well as to avoid damage to property. These instructions are highlighted as follows:

---

**DANGER**

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

---

**WARNING**

WARNING indicates a hazardous situation which, if not avoided, may result in death or serious injury.

---

**CAUTION**

CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.

---

**NOTICE**

NOTICE indicates a property damage message.

---

**NOTE**

Notes are merely informative. Additional useful information and hints are provided for the operator here.
### 1.3 Accessories

The accessories are in a separate cardboard box on the pallet. Depending on the system configuration (options), the cardboard box contains the following accessory items:

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Instructions</td>
<td>1</td>
</tr>
<tr>
<td>CD (Operating Instructions)</td>
<td>1</td>
</tr>
<tr>
<td>CD (Technical Manual)</td>
<td>1</td>
</tr>
<tr>
<td>Specifications and Certificates</td>
<td>1</td>
</tr>
<tr>
<td>Coupling cable (7.5 m)</td>
<td>1</td>
</tr>
<tr>
<td>Equipotential grounding cable (6 m) (Art. No. 24054)</td>
<td>1</td>
</tr>
<tr>
<td>Touch-up paint RAL 9001 (Art. No. 89655)</td>
<td>1</td>
</tr>
<tr>
<td>Touch-up paint RAL 6027 (Art. No. 89615)</td>
<td>1</td>
</tr>
<tr>
<td>Mounting material (Art. No. 88711)</td>
<td>1</td>
</tr>
<tr>
<td><strong>CD writer</strong></td>
<td></td>
</tr>
<tr>
<td>CD-RW (640 MB)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Video printer</strong></td>
<td></td>
</tr>
<tr>
<td>Operating instructions for video printer</td>
<td>1</td>
</tr>
<tr>
<td>Printer paper</td>
<td>1 roll</td>
</tr>
<tr>
<td>Printer transparent film (depending on printer model)</td>
<td>1 roll</td>
</tr>
<tr>
<td><strong>DICOM</strong></td>
<td></td>
</tr>
<tr>
<td>RJ45 interface with Cat.5 patch cable (10 m) (Art. No. 24452)</td>
<td>1</td>
</tr>
<tr>
<td>Wireless LAN transceiver</td>
<td>1</td>
</tr>
<tr>
<td>Fiber-optic connection (FOC); ST coupling, 10base-FL or 100base-FX</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 1-2 Accessories
### Accessories USA:

<table>
<thead>
<tr>
<th>All systems</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Instructions</td>
<td>1</td>
</tr>
<tr>
<td>CD (Operating Instructions)</td>
<td>1</td>
</tr>
<tr>
<td>Technical Manual</td>
<td>1</td>
</tr>
<tr>
<td>CD (Technical Manual)</td>
<td>1</td>
</tr>
<tr>
<td>CD (Service Manual)</td>
<td>1</td>
</tr>
<tr>
<td>CDRH Maintenance Report</td>
<td>1</td>
</tr>
<tr>
<td>Specifications and Certificates</td>
<td>1</td>
</tr>
<tr>
<td>Coupling cable with UL marking (7.5 m, Art. No. 24815)</td>
<td>1</td>
</tr>
<tr>
<td>Equipotential grounding cable (6 m) (Art. No. 24054)</td>
<td>1</td>
</tr>
<tr>
<td>Mounting material (Art. No. 88711)</td>
<td>1</td>
</tr>
<tr>
<td>Skin cone with safety label (Art. No. 89694)</td>
<td>1</td>
</tr>
<tr>
<td>Touch-up paint RAL 9001 (Art. No. 89655)</td>
<td>1</td>
</tr>
<tr>
<td>Touch-up paint RAL 6027 (Art. No. 89615)</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD writer</td>
<td></td>
</tr>
<tr>
<td>CD-RW (640 MB)</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Video printer</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating instructions for video printer</td>
<td>1</td>
</tr>
<tr>
<td>Printer paper</td>
<td>1 roll</td>
</tr>
<tr>
<td>Printer transparent film (depending on printer model)</td>
<td>1 roll</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DICOM</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RJ45 interface with Cat.5 patch cable (10 m) (Art. No. 24452)</td>
<td>1</td>
</tr>
</tbody>
</table>
2 Safety Instructions

2.1 General safety instructions

**WARNING**
You must be familiar with the contents of the present Operating Instructions in order to be able to operate the system as intended. Read and understand the present Operating Instructions before operating the system.

It is important to observe all directions, safety instructions and warnings!

The responsibility for any C-arm-assisted surgical intervention lies with the physician in charge.

**NOTICE**
Supplementary equipment used in combination with the Ziehm 8000 must comply with the safety requirements according to IEC 60601-1 and/or IEC 60601-1-1 or furnish proof of an equivalent degree of safety.

To ensure CE conformity, these components must have a CE approval in accordance with Council Directive 93/42/EEC. In addition, a declaration in compliance with Article 12 of the said directive must be provided.

For components without CE approval, a conformity assessment procedure is obligatory.

If you combine the Ziehm 8000 with equipment which does not comply with these requirements, the safety of the entire system is no longer given and the warranty will become invalid.

Please note that a combination with third-party devices must be approved by Ziehm Imaging. A combination must be possible in particular by the intended use of the two devices.

Only properly trained personnel are allowed to operate the system.

The system may only be operated by properly trained personnel under the direction of a physician.

**Operation**

**Operation (USA)**
2 Safety Instructions

Assembly and service

Only authorized personnel are allowed to assemble the system and to provide technical service. The necessary qualifications can only be obtained by attending a training course provided by the manufacturer.

CAUTION
Always observe the relevant regulations of the country of installation for putting the system into service, training of personnel and maintenance.

WARNING
Never use the system if you suspect any electrical or radiation-generating components to be defective or if the system exhibits unexpected malfunctions!

WARNING
Before opening any part of the equipment or removing the protective covers, you must disconnect the system from the power supply.

2.2 X-rays

General

The system produces X-rays. If you do not observe the safety measures and precautions required by your local radiation protection regulatory body or other national radiation protection measures and precautions, these X-rays can be hazardous both to operating staff and other persons within the radiation zone of occupancy.

WARNING
The system may only be operated by personnel who has undergone radiological training.

WARNING (USA)
The system may only be operated by properly trained personnel under the direction of a physician.
2 Safety Instructions

**Protection of staff**

Staff members who stay within the radiation controlled area must wear X-ray protective clothing.

The radiation controlled area depends upon the size of the image intensifier installed and has the following radius:

- 15 cm image intensifier: 3 m
- 23 cm image intensifier: 4 m

**Protection of the patient**

To minimize the radiation burden of the patient, you must keep the source/skin distance as large as possible. The generator design guarantees a minimum source/skin distance of 20 cm.

**WARNING**

Additional material located in the beam path (e.g. an operating table not suitable for X-raying) may result in a dose increase when using a fluoroscopy mode with automatic exposure rate control.

**WARNING**

When you initiate radiation and no live image is displayed although all necessary settings have definitely been made, please contact your after-sales service center!
2.3  Electromagnetic compatibility

Medical electrical equipment requires special precautionary measures with respect to EMC and must be installed and put into service in accordance with the EMC guidelines contained in the accompanying documents.

Portable and mobile RF communications equipment may interfere with medical electrical equipment.

All operating modes of the system have been considered in the EMC tests. There are no exceptions to the rules.

Only conductors, connecting cables and accessories that are specified by the manufacturer may be used.

**WARNING**

Using components other than those specified may result in increased electromagnetic emissions or reduced electromagnetic immunity.

Please observe also the *Manufacturer’s Declaration concerning Electromagnetic Compatibility according to IEC 60601-1-2* in the Technical Manual.

2.4  Protective grounding

The system must be connected only to power systems having a separate ground connection.

2.5  Equipotential grounding

**Heart and brain examinations**

If you use the system in combination with other equipment for examinations of the heart or brain or the surrounding anatomical regions, equipotential grounding is required for patient and operating staff safety (IEC 60601-1-1).
2.6 Laser radiation

As an option, the system may be equipped with a laser positioning device at the image intensifier and/or generator.

The laser positioning device uses diode laser modules which emit laser radiation. **Do not under any circumstances** look directly at the laser beam or any scattered laser radiation – either with the naked eye or with optical instruments.

The laser positioning device is a Class 2M laser product according to IEC 60825-1. Make sure to comply with all operating safety precautions when using the laser positioning device.

The maximum power output of continuous laser radiation, measured at the laser beam apertures, is <1 mW. The wavelength of the emitted radiation is 635 nm.

---

**WARNING**

Laser radiation – Do not stare into beam or view directly with optical instruments (Laser Class 2M according to IEC 60825-1).

Please observe the provisions of IEC 60825-1, Section 3, “User’s Guide” for operation of the laser positioning device.

Viewing the laser output with certain optical instruments (e.g. eye loupes, magnifiers and microscopes) within a distance of 100 mm may pose an eye hazard.

---

**CAUTION (USA)**

LASER RADIATION – DO NOT STARE INTO BEAM

CLASS II LASER PRODUCT (in accordance with FDA 21 CFR, Subchapter J, Section 1040.10-11)
2.7 Printers

**NOTICE**
When printing on the Sony® UP-990 video printer, always use the **CUT** button on the printer for cutting off the printer paper. Tearing off the printer paper may damage the video printer.

As opposed to that, on the Sony® UP-970 video printer you must tear off the printer paper!

Please refer to the *Operating Instructions* of the corresponding printer.

**NOTICE**
Temperatures above 40°C and relative air humidity above 60% may cause stains on the printer’s heat-sensitive paper.
2.8 Mechanics

**WARNING**
Never pull at the power cable or coupling cable of the monitor cart in order to move the cart to another position. Otherwise severe equipment damage may result, thus leading to severe injuries.

2.9 System failure

**CAUTION**
The system is a highly complex medical device that in rare cases can fail like any other electrical device in spite of comprehensive tests and maintenance. This may cause obstructions to the operational procedure. Please keep an emergency plan ready for this case.

**CAUTION**
Data transmission of the system can fail. This may cause obstructions to the operational procedure. Please keep an emergency plan ready for this case.

**CAUTION**
The system can fail due to mechanical defects. This may cause obstructions to the operational procedure. Please keep an emergency plan ready for this case.
3 Unpacking the System

3.1 Unpacking the system on the pallet

Upon delivery, the pallet contains the following system parts:
- Monitor cart (→ Ch. 3.1.5, p. 3-8)
- 23", 24" flat-screen monitor or 18" flat-screen monitors (→ Ch. 3.1.3, p. 3-6)
- C-arm stand (→ Ch. 3.1.4, p. 3-6)
- Ramp (for drop shipments) (→ Ch. 3.1.2, p. 3-3)
- Accessories (→ Ch. 1.3, p. 1-4)

3.1.1 Unpacking the pallet on delivery to distributors

To unpack the full pallet, do the following:

CAUTION
Only authorized personnel (→ p. 2) are allowed to unpack and assemble the system.

Fig. 3-1 Packed pallet
3 Unpacking the System

- Cut the plastic straps and remove them.
- Check the two shock watch devices.
- Remove the shipping tape from the cardboard box and open it.
- Remove the clout nails holding the cardboard box to the pallet.
- Lift the cardboard box off the pallet.

Fig. 3-2 Pallet with foil wrapping

- Cut the wrap foil open and fold it back.

Fig. 3-3 Unwrapped pallet
3.1.2 Unpacking the pallet on drop shipments

In drop shipments the pallet is equipped with a ramp. This ramp is required to move the C-arm stand off the pallet.

To unpack the full pallet, do the following:

- Cut the plastic straps and remove them.
- Check the two shock watch devices.
- Remove the shipping tape from the cardboard box and open it.
- Unfasten the screws that attaches board 4 to board 3 and 2 and remove board 4 (→ Fig. 3-5).

- Unfasten the screws on the outside of the box, attaching board 3 on the inside of the cardboard box (→ Fig. 3-6), and remove board 3.
3 Unpacking the System

Fig. 3-6 Screws for attachment of the lateral boards

- Unfasten the screws on the outside of the box, attaching board 2 on the inside of the cardboard box (→ Fig. 3-6), and remove board 2.

- Remove the clout nails holding the cardboard box to the pallet.

- Lift the cardboard box off the pallet.

Fig. 3-7 Pallet and ramp with foil wrapping

- Unfasten the two screws attaching board 1 on the ramp, and remove board 1.

- Lift the ramp off the pallet and place it to the short front side of the pallet.

- Remove the fixing clamps from the drill holes on the pallet.
3 Unpacking the System

- Attach the ramp to both sides of the pallet using the fixing clamps (→ Fig. 3-9).

- Cut the wrap foil open and fold it back.

Fig. 3-8 Fixing clamp hooked up in the drill holes on the pallet

Fig. 3-9 Fixing clamps attaching the ramp

Fig. 3-10 Unwrapped pallet
3 Unpacking the System

3.1.3 Unpacking the monitors

3.1.3.1 Flat-screen monitors

The monitors are on a transport rack that is mounted on the pallet.

To unpack the flat-screen monitors, do the following:

• Undo the wood screws holding the transport rack to the pallet.

• Remove the bubble wrap from the monitors.

• Lift the flat-screen monitors off the pallet and carefully place them on a suitable surface.

• Undo the four screws M6×12 that attach the transport rack to the monitor neck.

The screws M6×16 needed for attaching the monitor head to the monitor cart base are contained in the cardboard box with the accessories (→ Ch. 1.3, p. 1-4).

3.1.4 Unpacking the C-arm stand

The C-arm stand is attached to the pallet by means of retaining brackets.

To unpack the C-arm stand, do the following:

• Remove all packing materials (bubble wrap, foam rubber, styrofoam).

The C-arm stand is attached to the pallet by means of 5 retaining brackets:
Undo the screws holding retaining bracket 3 to retaining bracket 4, and remove retaining bracket 3.

Undo all screws holding retaining brackets 1, 2 and 4 to the pallet.

Remove all retaining brackets from the pallet.

Remove the wooden laths from below the C-arm stand (→ Fig. 3-13, p. 3-7). Lift the C-arm stand slightly for that purpose.

Put the C-arm into an upright position (orbital rotation).

Remove the styrofoam block jammed between the image intensifier and the horizontal carriage.

Carefully push the C-arm stand down from the pallet using a ramp.
3.1.5 Unpacking the monitor cart

The monitor cart is mounted on the pallet by means of a transport rack.

To unpack the monitor cart, do the following:

- Remove the foam rubber block and all other packing materials (bubble wrap, foam rubber).
- Undo the wood screws holding the transport rack to the pallet.
- Place a padding on the pallet and, with the assistance of a second person, lay the monitor cart down on its side on the pallet.
- Remove the bubble wrap from the monitor cart wheels.
- Undo the screws holding the transport rack to the monitor cart and remove the transport rack.
- Put the monitor cart back into an upright position with the help of a second person and remove the padding from the pallet.
- Carefully push the monitor cart down from the pallet using a ramp.
- Remove the wrap foil from the pallet.

You may now proceed to mounting the flat-screen monitors to the monitor head → Ch. 4.1.2, p. 4-5.
4 Assembling the System

4.1 Assembly

For international shipments on a pallet, the monitor head (23" or 24" flat-screen monitor, 18" flat-screen monitors) of the Ziehm 8000 has been dismounted. Consequently, you must reattach the monitor head to the monitor cart base.

In addition, you must establish all cable connections (→ Ch. 4.2, p. 4-8).

---

**CAUTION**

Only authorized personnel (→ p. 1-2) are allowed to unpack and assemble the system.
4.1.1 Mounting the 23" or 24" flat-screen monitor

**NOTICE**
Always wear cotton gloves when installing, testing or making settings on displays or screens.

To mount the 23" or 24" flat-screen monitor to the monitor cart base, do the following:

Fig. 4-1 Monitor cart base without monitor head

Fig. 4-2 23" or 24" flat-screen monitor on the transport rack

**NOTICE**
Never place the flat-screen monitor directly on some surface, always place them on the transport rack.
- Remove the rear cover of the monitor cart base.

![Holes for the four screws M6×16 for attaching the flat-screen monitor to the monitor cart base](image)

Fig. 4-3

- With the help of a second person, lift the flat-screen monitor and place them on the monitor cart base.

**WARNING**
The flat-screen monitor cannot be lifted by one person alone. Therefore always ask a second person to assist you in placing the monitor on the monitor cart base.

- Attach the flat-screen monitor from below using 4 screws M6×16.

**NOTE**
The screws M6×16 needed for attaching the flat-screen monitor to the monitor cart base are contained in the cardboard box with the accessories (→ Ch. 1.3, p. 1-4).

- Remove the rear cover of the monitor neck.

![Cables inside monitor neck and monitor cart base](image)

Fig. 4-4

- **Ground wire**
- **Ground connection (internal)**
- **Video cable (labeled LM)**
- **Power plug of the flat-screen monitor**
- **Radiation warning lamp cable (labeled Xray-Ind)**
• Pull the following cables from the monitor neck down into the monitor cart base:
  – video cables (golden)
  – Radiation warning lamp cable

• Pull the ground wire from the monitor cart base up into the monitor neck.

• Connect the video cables and the radiation warning lamp cable to the image memory module:
  – Video cable: connection labeled LM
  – Radiation warning lamp cable: Connection labeled X-ray Lamp

• To connect the ground wire to the monitor neck housing, remove nut and washer from the screw, fit the ground wire and washer onto the screw and retighten the nut.

  Fig. 4-5  Ground connection inside the monitor neck housing
  (→ Fig. 4-4, p. 4-3)

• Inside the monitor cart base connect the power plug of the flat-screen monitor with the power supply unit for the flat-screen monitors.

  Fig. 4-6  23" or 24" flat-screen monitor power plug connected to the power supply unit for the flat-screen monitors

• Reattach the rear cover of the monitor neck.

• Reattach the rear cover of the monitor cart base.
### 4.1.2 Mounting the 18” flat-screen monitors

**NOTICE**

Always wear cotton gloves when installing, testing or making settings on displays or screens.

To mount the flat-screen monitors to the monitor cart base, do the following:

**Fig. 4-7** Monitor cart base without flat-screen monitors

**Fig. 4-8** Flat-screen monitors on the transport rack

**NOTICE**

Never place the flat-screen monitors directly on some surface, always place them on the transport rack.
• Remove the rear cover of the monitor cart base.

![Fig. 4-9 Holes for the four screws M6×16 for attaching the flat-screen monitors to the monitor cart base](image)

• With the help of a second person, lift the flat-screen monitors and place them on the monitor cart base.

**WARNING**
The flat-screen monitors cannot be lifted by one person alone. Therefore always ask a second person to assist you in placing the monitors on the monitor cart base.

• Attach the flat-screen monitors from below using 4 screws M6×16.

**NOTE**
The screws M6×16 needed for attaching the flat-screen monitors to the monitor cart base are contained in the cardboard box with the accessories (→ Ch. 1.3, p. 1-4).

• Remove the rear cover of the flat-screen monitors. Pull the following cables from the monitor housing down into the monitor cart base:
  - 2 video cables (golden)
  - Radiation warning lamp cable
  - Ground wire
Assembling the System

Fig. 4-10  Connections on the flat-screen monitors

- Connect the video cables and the radiation warning lamp cable to the image memory module.

- Connect the power supply units of the flat-screen monitors (right/left) to the corresponding connectors for non-heating devices (labeled RM/LM) in the monitor cart base.

- To connect the ground wire to the monitor cart base, remove the nut, fit the ground wire onto the screw and retighten the nut.

- Reattach the rear cover of the flat-screen monitors.

- Reattach the rear cover of the monitor cart base.
4.2 Cable connections

Before switching on the system for the first time, or after each transport, you must establish different cable connections.

**Ziehm 8000**

To establish the cable connections, do the following:

- Unwind the coupling cable from the upper cable support on the back of the monitor cart.

- Plug the coupling cable connector into the socket located at the side of the C-arm stand and lock the connector by pulling the locking lever upward (→ Fig. 4-11, p. 4-8).

- Make sure that a suitable supply voltage is available and that the socket-outlet is properly grounded and fused.

- Check the power plug on the monitor cart power cable and the socket-outlet for compatibility.

- Connect the system to the power supply.

**WARNING**

Never connect the monitor cart and C-arm stand when the monitor cart is already connected to the power supply or switched on.

Damage to the electronics of the system cannot be excluded if this warning is ignored!
On a Ziehm Compact or Ziehm Compact Litho, do the following:

- Unwind the power cable from the combined foot switch/power cable support located at the side of the C-arm stand.
- Plug the power cable connector into the socket located at the side of the C-arm stand and lock the connector by pulling the locking lever upward.
- Make sure that a suitable supply voltage is available and that the socket-outlet is properly grounded and fused.
- Check the power plug and the socket-outlet for compatibility.
- Connect the system to the power supply.

### 4.3 DICOM connection

Depending on the system configuration, different technologies are used for connecting the system to the hospital's DICOM network:

- an RJ45 connection (Twisted Pair, 100 Mbit/s)
- a Wireless LAN connection

On systems with an RJ45 connection, a network cable runs directly from the network interface card of the image memory module out through the rear cover of the monitor cart and terminates in an RJ45 socket. The system must be connected to the hospital's DICOM network via this socket.

**To connect the system to the DICOM network, do the following:**

- Connect the RJ45 socket on the back of the monitor cart to a DICOM network socket using the appropriate cable.

On systems with Wireless LAN, a transceiver is located at the back of the monitor cart. A second transceiver comes with your accessories and must be connected to the hospital's DICOM network.

**To connect the system to the DICOM network, do the following:**

- Connect the transceiver included in the accessories to a DICOM network socket.

- Connect the DICOM port of the PC Workstation on the back of the monitor cart to another DICOM network socket using the appropriate cable.
4 Assembling the System
5 Putting the System into Service

5.1 Temperature

In case of major differences in temperature, all parts of the system must have reached room temperature before the system is put into service in order to avoid damage to the system as a result of condensation.

**WARNING**

Do not operate the system until the equipment has reached a safe operating temperature of +15 °C to +35°C with no condensation present.

Otherwise severe equipment damage may result.

5.2 First power-up of the system

- Make sure that the inclination of the system does not exceed 5° from the level in operating position.

- Ensure that all electrical connections are properly established (→ Ch. 4.2, p. 4-8).

- Put on suitable protective clothing.

- Switch on the system.

You can find an ON key and an OFF key on the control panels of both the C-arm stand and the monitor cart. Each of the two keys switches on or off both system components simultaneously.

During power-up, the system performs a self-test. The value 0 appears on the operating value displays. The radiation time display shows the global software version of the system. The temperature symbol and the X-ray symbol on the C-arm stand control panel light up for a few seconds.

After power-up, a test image appears on the live screen. The default settings after power-up vary from system to system, according to the customer-specific setup.
5.3 Setting up the system

After switching on the system for the first time, you can make various customer-specific settings for the system, if this has not already been done at the factory.

Entering the hospital data

As a minimum it is recommended that you enter the relevant hospital data under Configuration Menu → Basic Settings. This data will then be displayed automatically when you create new patient folders in the Patient Data Input menu, eliminating the need to enter it for each new patient.

Further settings

For a detailed description of all other setting options, please refer to → Ch. 6, p. 6-1.

NOTE

Due to background radiation, the dose display on the C-arm stand (if enabled) may indicate some small value after power-up of the system.

To reset the display to zero, press and hold down the min key on the C-arm stand control panel for a few seconds.

NOTE

As part of the power-up sequence, the radiation warning lamp may light up. This is a system test and does not mean that radiation is released.
6 Configuration

6.1 Overview

A large number of parameters can be preset for the Ziehm 8000. This is done in a configuration menu.

To switch between the different menu items, do the following:
- Press the up arrow or down arrow key until the cursor is on the desired menu item.

To select a setting option, do the following:
- Press the left arrow or right arrow key until the desired option appears.
- or
- Enter the desired value using the alphanumeric keypad on the control panel.
Opening the menu

To open the Configuration Menu, you use the MENU key on the monitor cart.

The Configuration Menu is divided into four submenus:

- Operation settings
- Basic settings
- Monitor settings (only Ziehm 8000 with 23" or 24" flat-screen monitor)
- Service settings
6.2 User settings

In the User Settings menu, you can make a number of settings which determine the operation conditions during fluoroscopy.

![User Settings menu]

6.2.1 Activating automatic image swapping

The Autotransfer menu item allows you to control whether the previous fluoroscopic image is moved automatically to the reference screen when you next initiate radiation.

- **Autotransfer: Off**
  
  When you initiate radiation, the previous fluoroscopic image on the live screen is replaced by the new image. If it was unsaved, it will be irretrievably lost.

- **Autotransfer: On**
  
  When you initiate radiation, the previous fluoroscopic image on the live screen is moved automatically to the reference screen.

  As long as the autotransfer function is active, the LEDs on the image swapping keys on the monitor cart and on the C-arm stand are illuminated.
6.2.2 Displaying a crosshair

**Positioning aid**

The **Crosshair** menu item allows you to control whether a crosshair is displayed as positioning aid (e.g. for foreign body localization) in the center of the live screen image during fluoroscopy. The central point of the crosshair corresponds to the position of the central X-ray beam.

- **Crosshair: On**
  
  A crosshair appears on the live screen during fluoroscopy.

- **Crosshair: Off**
  
  No crosshair is displayed on the live screen during fluoroscopy.

**NOTE**

The **Crosshair On/Off** function can also be assigned to the F key on the C-arm stand (→ Ch. 6.2.3, p. 6-4).

6.2.3 Function of the F key

**Variable assignment**

The **F key** menu item allows you to control which function is assigned to the F key on the C-arm stand. This enables you to activate the corresponding function directly from the C-arm stand using the F key.

The following assignment options are available:

- **Crosshair**
  
  If you have activated this option, you can show or hide a crosshair as positioning aid in the center of the live screen image with the F key (→ Ch. 6.2.2, p. 6-4). The central point of the crosshair corresponds to the position of the central X-ray beam.

- **Cine**
  
  If you have activated this option, you can activate and deactivate the cine loop mode with the F key.

- **CO2**
  
  If you have activated this option, you can activate and deactivate the CO\(_2\) function (together with the DSA subtraction mode) with the F key.

- **Filters**
  
  If you have activated this option, you can reset the recursive filter to level 1 (= 2 images) during fluoroscopy by pressing the F key. This will minimize motion blurring (→ Ch. 6.5.2, p. 6-27). As long as the recursive filter is reset, the message **Filter off** is displayed on the live screen.
6.2.4 Storage medium for image retrieval

The CD recall menu item allows you to control which storage medium is used by the system for data retrieval in the Mosaic menu. Data retrieval from CD is subject to certain restrictions.

For systems with a CD writer, the following applies:

- **CD recall: Off (default setting)**
  The Mosaic menu retrieves the patient folders from the hard disk.

- **CD recall: On**
  The Mosaic menu retrieves the patient folders from a CD. For that purpose, you must insert a CD containing backed-up patient folders into the CD writer, which was written using the Backup function.

6.2.5 Setting the cine loop speed

The Cine speed menu item allows you to control the number of frames per second that the system uses for acquisition and playback of a cine loop.

Depending on the system configuration, you can choose between 1, 2, 4, 8, 12.5 or 25 frames per second.

6.2.6 Setting the cine loop length

The Cine length menu item allows you to control how many single images (frames) are saved automatically by the system during a cine acquisition run.

You can choose between 50, 100, 150, 200 or 250 images.

6.2.7 Combining DSA with a cine loop

The DSA + Cine menu item allows you to control whether the system automatically acquires a cine loop each time you activate the DSA mode.

- **DSA + Cine: On**
  When you press the DSA key on the C-arm stand and then initiate radiation, the system automatically acquires a cine loop after having acquired the DSA mask image.

- **DSA + Cine: Off**
  When you press the DSA key on the C-arm stand and then initiate radiation, the system automatically generates a single DSA image.
6.2.8  Showing or hiding the native image

Display native image or not

The DSA nativeimg menu item allows you to control whether the native image is displayed or not on the reference screen during generation of a DSA / MSA / RSA image.

- **DSA nativeimg: On**
  When you initiate radiation after injecting the contrast medium, the native image is displayed on the reference screen.

- **DSA nativeimg: Off**
  When you initiate radiation after injecting the contrast medium, no native image is displayed on the reference screen. In this case, you may open a reference image on the reference screen before generating the DSA / MSA / RSA image; this reference image remains displayed there during the entire subtraction procedure.

6.2.9  Selecting the storage medium for data retrieval with DICOM Dir

Storage medium for DICOM Dir

The DICOM Dir from menu item allows you to control which storage medium is used by the system for DICOM image retrieval.

- **DICOM Dir from: USB**
  The images are retrieved from the USB stick that is connected to the USB port.

- **DICOM Dir from: CD**
  The images are retrieved from the CD inserted in the CD writer.

6.2.10  Defining the storage format for removable storage media

**CD storage format**
If the system is equipped with a CD writer, the CD format menu item allows you to choose a storage format for writing images to CD.

The following options are available:

- TIFF format (for further use on a PC)
- DICOM format (for further use on a DICOM network or viewing with a DICOM viewer)

**USB stick storage format**
The USB format menu item allows you to control which storage format is used for saving images to a USB stick.

The following options are available:

- TIFF format (for further use on a PC)
- DICOM format (for further use on a DICOM network or viewing with a DICOM viewer)
### 6.3 Basic settings

The **Basic Settings** menu is used for making different settings which directly affect the user interface, e.g. default data for certain menu fields. In addition, you can clear different storage media.

Usually, the options in this menu are set by a service engineer during installation of the system.

#### 6.3.1 Setting the system time and system date

Under the **Time** menu item, the system time (format: hh:mm:ss) must be set once.

Under the **Date** menu item, the system date (format: dd-mm-yy) must be set once.

#### 6.3.2 Selecting the live screen

The **Live image** menu item allows you to choose whether the left or the right screen acts as live screen.

The live screen is the screen where the fluoroscopic image (live or saved) is displayed. The remaining screen then automatically becomes the reference screen.
6.3.3 Entering the hospital data

The Hospital, Department and Physician menu items allow you to define which data appears automatically in the corresponding fields in the Patient Data Input menu.

6.3.4 Clearing storage media

When you select one of the menu items Clear hard disk or Clear USB device and then confirm the clear command with the Enter key, all patient data are deleted from the corresponding storage medium after a confirmation prompt.

When you select the Clear NO NAME menu item and then confirm the clear command with the Enter key, all images in the NO NAME folder are deleted.
6.4 Screen settings

6.4.1 Ziehm 8000 with flat-screen monitor

The Ziehm 8000 is equipped with 18", 23" or 24" flat-screen monitors. The 18" flat-screen monitors are delivered as type1 and type 2.

The Monitor Settings menu is used for adjusting the resolution mode of the 23" or 24" flat-screen monitor.

Further screen settings can be made directly at the displays using a built-in keypad (→ Ch. 6.4.2, p. 6-10).

Fig. 6-4 Monitor Settings menu on a Ziehm 8000 with 23" or 24" flat-screen monitor

When you choose the option Scaled resolution, the fluoroscopic images and menus are displayed in the original resolution of the system.

When you choose the option Full size, the fluoroscopic images and menus are displayed so as to completely fill the left or right half of the screen.
6.4.2 Setting flat-screen monitors of type 1

Safety measures

**NOTICE**

The system may only be set up and put into service by service engineers who are authorized by the manufacturer.

If service is needed, the system may only be repaired by authorized service engineers.

**WARNING**

When the system is opened, there is a risk of electric shock. The system may only be opened by qualified service personnel.

To prevent fire or electric shock, the system must not be exposed to rain or moisture.

The system must not be operated next to flammable anesthetic gas mixtures of air, oxygen and nitrogen oxides.

Screen settings

On systems with flat-screen monitors, the screen settings are made directly at the monitors using a built-in keypad.

You can change the following screen settings yourself:

- Brightness
- Contrast
- Backlight
- Menu language for screen settings
- Video source (*Inputs*)
- Gamma
- Display settings (*Picture*), e.g. horizontal and vertical position, sharpness, scaling
- Menu setup (*Setup*), e.g. menu lock

In addition, you can restore the factory settings.

The factory-set menu language is English. Therefore, the English designations are used in this document.
6.4.2.1 Built-in keypad

Each flat-screen monitor has a built-in keypad with six keys, which are used for accessing the screen setting menus.

![Built-in keypad of the flat-screen monitor](image)

6.4.2.2 Setting the brightness, contrast and backlight

To set the screen brightness, do the following:

- Press the **Brightness/Contrast** key. The **Brightness** control appears on the screen.

![Brightness control](image)

- Press the + or – arrow key to increase or decrease the screen brightness.
  The settings become immediately active on the screen. After a few seconds, the **Backlight Brightness** control disappears automatically.

![Brightness control](image)
Contrast

To set the screen contrast, do the following:

- Press the Brightness/Contrast key twice. The Contrast control appears on the screen.

![Contrast control](image1)

Fig. 6-8 The Contrast control on a 18" or 23" flat-screen monitor

- Press the + or – arrow key to increase or decrease the contrast. The settings become immediately active on the screen. After a few seconds, the Contrast control disappears automatically.

Backlight

To set the screen backlight brightness, do the following:

- Press the Brightness/Contrast key three times. The Brightness or Backlight Brightness control appears on the screen.

![Brightness control](image2)

Fig. 6-10 The Brightness control on a 18" or 23" flat-screen monitor

- Press the + or – arrow key to increase or decrease the backlight. The settings become immediately active on the screen. After a few seconds, the Backlight or Backlight Brightness control disappears automatically.
NOTE
Lowering the backlight level will increase the backlight lifetime.

6.4.2.3 Setting the menu language

The factory-set menu language is English. You can choose one of the following languages as menu language:
- German
- French
- Italian
- Spanish
- Dutch
- Swedish

To define the menu language, do the following:
- Press the MENU key.
  The on-screen menu appears.
- Select the Setup tab with the help of the + or – arrow keys.

Fig. 6-12 The Setup control on a 18” or 23” flat-screen monitor
Fig. 6-13 The **Configuration** control on a 24" flat-screen monitor

- Move to the **Language** item with the help of the **SCROLL** key.

- Press the + arrow key until the desired language is displayed.
  
  All on-screen menu elements and controls are displayed immediately in the chosen language.

- Press the **MENU** key.
  
  The on-screen menu disappears.

### 6.4.2.4 Setting the video source

**18" or 23" flat-screen monitor**

To set the video source on the 18" or 23" flat-screen monitor, do the following:

- Press the **Input** key.
  
  The **Inputs** on-screen menu with the following options appears:
  
  - DVI – analog
  - BNC
  - DVI – digital

- Press the **SCROLL** key until the desired item is highlighted.
• Press the + arrow key.
  The highlighted item is marked as **selected**.

• Press the **Input** key.
  The **Inputs** on-screen menu disappears.

---

**To set the video source on the 24" flat-screen monitor, do the following:**

• Press the **Input** key.
  The **Inputs** on-screen menu with the following options appears:
  - DVI (graphic input)
  - SOG (video input)

• Press the **SCROLL** key until the desired item is highlighted.

• Press the **Minus** button.
  The highlighted item is marked as **selected**.

• Press the **Input** key.
  The **Inputs** on-screen menu disappears.
6.4.2.5 Setting the gamma value

The gamma value determines the contrast between the lightest and the darkest point of the screen display.

The Gamma tab furthermore shows the backlight operating hours clocked up so far and the BIOS version of the monitor.

### 18” or 23” flat-screen monitor

To set the gamma value on the 18” or 23” flat-screen monitor, do the following:

- Press the MENU key.
  
  The on-screen menu appears.

- Select the Gamma tab with the help of the + or – arrow keys.
  
  On the Gamma tab, the following gamma value options are available:
  
  - 1,5
  - 1,7
  - 2,2
  - 2,6
  - 3,0

- Press the SCROLL key until the desired value is highlighted in white.

- Press the + or – arrow key.
  
  The desired value is set.

- Press the MENU key.
  
  The on-screen menu disappears.

### 24” flat-screen monitor

To set the gamma value on the 24” flat-screen monitor, do the following:

- Press the MENU key.
  
  The on-screen menu appears.
• Select the Defaults tab with the help of the + or – arrow keys.

• Press the SCROLL key until the Gamma item is highlighted.

• Press the + or – arrow key until the desired parameter value is selected.

  On the Gamma tab, the following gamma value options are available:
  – 1.8
  – 2.0
  – 2.2
  – 2.4
  – 2.6

• Press the MENU key.
  The on-screen menu disappears.

6.4.2.6 Setting up the display

To set up the display, do the following:

• Press the MENU key.
  The on-screen menu with the Picture tab displayed on top appears.

  Depending on the set video source (→ Ch. 6.4.2.4, p. 6-14), the Picture tab shows the following items as a maximum:
  – Horizontal Position
  – Vertical Position
  – Sharpness
  – Phase
  – Frequency
  – Overscan (24" flat-screen monitor only)
  – Scaling (23" flat-screen monitor only)
  – (24" flat-screen monitor only)
  – SmartSync
• Press the SCROLL key until the desired item is highlighted.

• Press the + or – arrow key until the desired setting is displayed or marked as selected.
  The desired value is set.

• Repeat these two steps for any further parameter you want to set.
• Press the MENU key.
  The on-screen menu disappears.

6.4.2.7 Setting up the menu

On the Setup tab you can make different settings that affect the menu display. In addition, you may lock the menu (→ Ch. 6.4.2.8, p. 6-19) and select the menu language (→ Ch. 6.4.2.3, p. 6-13).

The Configuration tab on the 24" flat-screen monitor furthermore shows the backlight operating hours clocked up so far and the BIOS version of the monitor.

To make the basic menu settings, do the following:
• Press the MENU key.
  The on-screen menu appears.

• Select the Setup tab with the help of the + or – arrow keys.
  On the Setup or Configuration tab, the following controls are available:
  – Position menu
  – Language (→ Ch. 6.4.2.3, p. 6-13)
  – DPMS Enable (23" flat-screen monitor only)
  – DPMS Enable (24" flat-screen monitor only)
  – Auto Source Select
  – Lock menu (→ Ch. 6.4.2.8, p. 6-19)
• Press the SCROLL key until the desired item is highlighted.
6.4.2.8  Locking the menu

To disable access to the menu system, do the following:

- Press the **MENU** key.
  The on-screen menu appears.

- Select the **Setup** tab with the help of the + or – arrow keys.

- Press the **SCROLL** key until the **Lock** menu item is highlighted.

- Press the + arrow key.
  The menu disappears. The message MENU LOCKED is displayed.
  As long as the menu is disabled, the message MENU LOCKED is displayed whenever you press one of the keys on the keypad.

To re-enable the menu display, do the following:

- Simultaneously press the **MENU** and **Scroll** keys.
  A message saying that the menu is unlocked is displayed. When you press one of the keys on the keypad, the corresponding on-screen menu appears.
6.4.2.9 Restoring the factory settings

After having changed the screen settings, you may restore the factory-set values at any time.

To restore the factory settings, do the following:

- Press the **MENU** key.
  The on-screen menu appears.

- Select the **Defaults** tab with the help of the + or – arrow keys.

![Defaults tab on a 18" or 23" flat-screen monitor](image)

- Press the **Scroll** key.
  The **Factory Defaults** menu item is selected.

- Press the + arrow key.
  The on-screen menu disappears. All settings are reset to the factory values.
6.4.3 Setting flat-screen monitors of type 2

NOTE
The menu display for setting the brightness and contrast is not locked. Do not change the values in order to ensure optimum display settings.

Fig. 6-16 Flat-screen monitors of type 2

NOTICE
The system may only be set up and put into service by service engineers who are authorized by the manufacturer.

If service is needed, the system may only be repaired by authorized service engineers.

WARNING
When the system is opened, there is a risk of electric shock. The system may only be opened by qualified service personnel.

To prevent fire or electric shock, the system must not be exposed to rain or moisture.

The system must not be operated next to flammable anesthetic gas mixtures of air, oxygen and nitrogen oxides.
**Built-in keypad**

Each flat-screen monitor has a built-in keypad with four keys, which are used for accessing the screen setting menus.

![Built-in keypad](image)

**Fig. 6-17** Built-in keypad of the flat-screen monitor

**Brightness**

To set the screen brightness, do the following:

- Press the **SCROLL** key.
  
The **Brightness** control appears on the screen.

- Press the + or – arrow key to increase or decrease the screen brightness.
  
The settings become immediately active on the screen. After a few seconds, the **Backlight Brightness** control disappears automatically.

**Contrast**

To set the screen contrast, do the following:

- Press the **SCROLL** key twice.
  
The **Contrast** control appears on the screen.

- Press the + or – arrow key to increase or decrease the contrast.
  
The settings become immediately active on the screen. After a few seconds, the **Contrast** control disappears automatically.
To set the screen backlight brightness, do the following:

- Press the key sequence **MENU, SCROLL, MENU**.
  The OSD (Onscreen Display) appears on the screen.

![OSD Onscreen Display](image)

**Fig. 6-18 Onscreen Display (flat-screen monitor)**

- Press the **SCROLL** key three times.
  The **options 1** submenu is highlighted in white.

- Press the **MENU** key.
  The first function in the **options 1** submenu is selected.

- Press the **SCROLL** key three times.
  The **Backlight cd/m²** function is selected.

- Press the + or – arrow key to increase or decrease the backlight brightness.
  The settings become immediately active on the screen. After a few seconds, the control disappears automatically.

**NOTE**
Lowering the backlight level will increase the backlight lifetime.
Setting the menu language

The factory-set menu language is English. Alternatively, you can choose German as the menu language:

To define the menu language, do the following:

• Press the key sequence MENU, SCROLL, MENU.
  The OSD (Onscreen Display) (→ Fig. 6-18, p. 6-23) appears on the screen.

• Press the SCROLL key six times.
  The utilities submenu is highlighted in white.

• Press the MENU key.
  The first function in the utilities submenu is selected.

• Press the SCROLL key until the desired language is displayed.
  All on-screen menu elements and controls are displayed immediately in the chosen language. After a few seconds, the control disappears automatically.

Restoring the factory settings

After having changed the screen settings, you may restore the factory-set values at any time.

To restore the factory settings, do the following:

• Press the key sequence MENU, SCROLL, MENU.
  The OSD (Onscreen Display) (→ Fig. 6-18, p. 6-23) appears on the screen.

• Press the SCROLL key six times.
  The utilities submenu is highlighted in white.

• Press the MENU key.
  The first function in the utilities submenu is selected.

• Press the SCROLL key three times.
  The Factory reset function is selected.

• Press the + arrow key.
  All settings are reset to the factory values.
6.5 Service settings

The Service Settings menu is used for modifying different system parameters which affect both the quality of the fluoroscopic image and the user interface.

The Service Settings menu is password-protected. If you are an authorized person, you can obtain the password from your local Ziehm dealer.

Fig. 6-19 Service Settings menu
6.5.1 Step windowing

Function

The Step Windowing menu is used for presetting 4 fixed steps for the contrast window level \( L \) and width \( W \). During fluoroscopy, you can select these steps with the contrast keys on the C-arm stand.

NOTE

For the subtraction modes, no step windowing is available.

Parameter range

The available parameter range (0–255) is displayed as soon as the menu item is selected with the down arrow or up arrow key. The desired values must be entered with the alphanumeric keys.

Activating the step windowing mode

The Windowing menu item is used for setting either standard windowing mode or step windowing mode for the contrast keys on the C-arm stand.

- Windowing: Off
  
  The contrast keys on the C-arm stand work in standard windowing mode.

- Windowing: On
  
  The contrast keys on the C-arm stand work in step windowing mode.

Default setting

The default windowing steps which are activated after power-up can be programmed for each individual anatomical program under Configuration Menu → Service Settings → Filter Factors → Organ 0 / Organ 1 / Organ 2 / Soft (→ Ch. 6.5.2.1, p. 6-28).
6.5.2 Filter factors

The Filter Factors submenu is used for setting different filter factors for each anatomical program and each subtraction mode in separate submenus.

![Filter Factors Menu](image)

**Fig. 6-21** Filter Factors menu

<table>
<thead>
<tr>
<th>Menu item</th>
<th>Anatomical program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organ 0 = extremities &amp; children</td>
<td></td>
</tr>
<tr>
<td>Organ 1 = head, spine &amp; pelvis</td>
<td></td>
</tr>
<tr>
<td>Organ 2 = thorax &amp; abdomen</td>
<td></td>
</tr>
</tbody>
</table>

**Table 6-1** Anatomical programs
6.5.2.1 Filters for anatomical programs

Filter types

For each of the anatomical programs Organ 0, Organ 1, Organ 2 and Soft, the values for the following filters can be programmed:

- Recursive filter for continuous fluoroscopy
  (independent settings for normal view, magnification 1 and magnification 2)
- Stack filter for continuous fluoroscopy
- Edge filter
- Default windowing step after power-up
- Stack filter for continuous pulse fluoroscopy
- Stack filter for snapshot

Parameter values

The following parameter values can be set:

<table>
<thead>
<tr>
<th>Filter type</th>
<th>Fluoroscopy mode</th>
<th>Available parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recursive filter</td>
<td>Continuous fluoroscopy</td>
<td>Level 0, 1, 2, 3 (≡ 1, 2, 4, 8 images)</td>
</tr>
<tr>
<td>Stack filter</td>
<td>Continuous fluoroscopy</td>
<td>1, 2, 4, 8, 16 images</td>
</tr>
<tr>
<td>Edge filter</td>
<td>Continuous fluoroscopy, continuous pulse fluoroscopy, Snapshot</td>
<td>Level 1, 2, 0, 3, 4</td>
</tr>
</tbody>
</table>

Table 6-2 Filters for anatomical programs

Fig. 6-22 Filter Factors for Organ Key 0 menu
The recursive filter adds the preset number of images during fluoroscopy, whereby each newly-acquired image is superimposed by the result of the previous addition with a certain weighting factor. The higher the preset number of images, the greater the noise suppression, but also the greater motion blurring.

The values can be set independently for normal view, magnification 1 and magnification 2.

The stack filter generates and adds the preset number of images after radiation has been terminated. The higher the preset number of images, the greater the noise suppression, but also the greater motion blurring if the patient moves during image generation.

The edge filter is used for setting a greater or lesser degree of enhancement (sharpening) of edges within the image. 4 levels of edge enhancement are available:

<table>
<thead>
<tr>
<th>Level</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No edge enhancement (original fluoroscopic image)</td>
</tr>
<tr>
<td>1</td>
<td>Slight edge enhancement</td>
</tr>
<tr>
<td>2</td>
<td>Medium edge enhancement</td>
</tr>
<tr>
<td>3</td>
<td>Strong edge enhancement</td>
</tr>
<tr>
<td>4</td>
<td>Extreme edge enhancement</td>
</tr>
</tbody>
</table>

Increasing the level of edge enhancement will also cause any noise in the image to become more apparent, though.
Windowing step  This value determines which windowing step is automatically set by the system for the corresponding anatomical program after power-up, provided that the step windowing mode has been activated (→ Ch. 6.5.1, p. 6-26).

You can adjust these default settings later during operation using the contrast keys on the C-arm stand.

Continuous pulse  This setting defines how many images are used for the stack filter in continuous pulse fluoroscopy mode (overriding the value specified under Stack filter).

Snapshot  This setting defines how many images are used for the stack filter in snapshot mode (overriding the value specified under Stack filter).

6.5.2.2 Filters for subtraction modes

Filter types  For each of the subtraction modes DSA, RSA and MSA, the values for the following filters can be programmed:

- Recursive filter  (independent settings for normal view, magnification 1 and magnification 2)

- Stack filter

- Edge filter

![Filter Factors for DSA Key menu](image-url)
The following parameter values can be set:

### Parameter values

<table>
<thead>
<tr>
<th>Filter type</th>
<th>Fluoroscopy mode</th>
<th>Available parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recursive filter</td>
<td>Continuous fluoroscopy</td>
<td>Level 0, 1, 2, 3 (= 1, 2, 4, 8 images)</td>
</tr>
<tr>
<td>Stack filter</td>
<td>Continuous fluoroscopy</td>
<td>1, 2, 4, 8, 16 images</td>
</tr>
<tr>
<td>Edge filter</td>
<td>Continuous fluoroscopy, continuous pulse fluoroscopy,</td>
<td>Level 1, 2, 0, 3, 4</td>
</tr>
<tr>
<td></td>
<td>Snapshot</td>
<td></td>
</tr>
</tbody>
</table>

Table 6-4 Filters for subtraction modes

#### 6.5.2.3 Filters for subtraction modes with CO₂

If the system is equipped with the CO₂ option, the values for the following filters can be selected for each of the subtraction modes DSA, RSA and MSA in combination with CO₂ negative contrast medium:

- Recursive filter
  - (independent settings for normal view, magnification 1 and magnification 2)
- Stack filter
- Edge filter

![Filter Factors for CO₂ DSA menu](image-url)
Parameter values

The following parameter values can be set:

<table>
<thead>
<tr>
<th>Filter type</th>
<th>Fluoroscopy mode</th>
<th>Available parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recursive filter</td>
<td>Continuous fluoroscopy</td>
<td>Level 0, 1, 2, 3 (= 1, 2, 4, 8 images)</td>
</tr>
<tr>
<td>Stack filter</td>
<td>Continuous fluoroscopy</td>
<td>1, 2, 4, 8, 16 images</td>
</tr>
<tr>
<td>Edge filter</td>
<td>Continuous fluoroscopy, continuous pulse fluoroscopy, Snapshot</td>
<td>Level 1, 2, 0, 3, 4</td>
</tr>
</tbody>
</table>

Table 6-5 Filters for subtraction modes with CO₂

6.5.3 Windowing settings for subtraction modes

Function

This menu is used for setting default values for the width (W) and level (L) of the contrast window. This is done separately for DSA, MSA and RSA.

If the system is equipped with the CO₂ option, the default windowing values for each individual subtraction mode in combination with CO₂ can be set in addition.

The available parameter range (0–255) is displayed as soon as the menu item is selected with the down arrow or up arrow key. The desired values must be entered with the alphanumeric keys.

Function key F3 – CO₂ moves the cursor to the column where the default windowing values for the subtraction modes with CO₂ negative contrast medium are set.
Function key **F3 – Normal** returns the cursor to the column where the default windowing values for the subtraction modes with positive contrast medium are set.

### 6.5.4 DICOM settings

**CAUTION**

The settings in this menu must not be modified by any person other than an authorized service engineer or a properly trained network administrator.

This menu is protected by an additional password. If you are an authorized person, you can obtain the password from your local Ziehm dealer.

#### 6.5.4.1 Network parameters

To enable the system to establish a connection for a DICOM data transfer, you must specify the following network parameters:

- **IP addr. DICOM server** (*IP = Internet Protocol*)
  - Each host on the network is assigned an IP address consisting of a 32-bit number, e.g. 192.168.127.080 (192.168.127 = group address, .080 = individual host)
  - IP address ranges (examples, other configurations are possible):
    - Class A network: 10.0.0.0 to 10.255.255.255
    - Class B network: 128.16.0.0 to 172.31.255.255
    - Class C network: 192.168.0.0 to 192.168.255.255

- **IP subnet mask**
  - 255.255.255.0 (subnet mask, combined with IP address yields group address, see above)
  - IP address ranges (examples, other configurations are possible):
    - Class A network: 255.0.0.0
    - Class B network: 255.255.0.0
    - Class C network: 255.255.255.0

- **Host name DICOM server**
  - Name of the network host, e.g. **sun-server**, with unique IP address assignment

- **AE title DICOM server** (*Application Entity = name of the application*)
  - Name of the DICOM application on the server, e.g. **INOARCHIVE** for DICOM Storage
Port addr. DICOM server
At this address, the server “listens” for requests from Ziehm NetPort.

IP address gateway
If the server and Ziehm NetPort belong to different groups, a gateway must be specified, e.g. 192.168.127.254.

IP address ZiehmNetPort (IP address of Ziehm 8000)
AE title ZiehmNetPort (AE title of Ziehm NetPort, freely configurable)

The DICOM Verification function enables you to check whether all parameters have been entered correctly (error messages → Ch. 6.5.4.7, p. 6-51). The default port address for DICOM is set to 104 and cannot be reconfigured.

Entering special characters
In some lines of the network parameter input screen, you may enter certain special characters. Function keys F4 – < and F5 – > appear in this case. A list of the available special characters is displayed above these two function keys. As long as you hold down one of these two function keys, the available special keys are displayed one after the other in the order of the list. With F4 – < you can scroll forward in the list. With F5 – > you can scroll backward in the list.

6.5.4.2 Configuration of Storage and Storage Commitment

Storage information model
When configuring the storage server, you specify not only the general network parameters (→ Ch. 6.5.4.1, p. 6-33), but also the storage information model (SOP class = Service Object Pair). You can choose between the following options:

- XA = X-ray Angiography
- CR = Computed Radiography
- SC = Secondary Capture

The original images furnished by Ziehm NetPort are of type XA. Since some servers do not support the XA SOP class, CR and SC are provided as alternatives.

Image attributes
Under Image attributes included you define which HEDIS filter algorithms are applied to the DICOM image prior to transfer. By default, all attributes are set to Off, and the raw image is transferred.

To configure the storage server, do the following:

- Press the MENU key.

The Configuration Menu appears.
• Select the **Service settings** menu item.

• Type the password and press the **Enter** key.

• Select the **DICOM settings** menu item.

• Type the password and press the **Enter** key.

• Select the **Storage server** menu item.
  The **DICOM Settings Storage Server** menu appears.

![DICOM Settings Storage Server menu](image)

Fig. 6-26  **DICOM Settings Storage Server** menu

• Enter the network parameters.
  When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.

  - To enter lower case letters, press key **F3 – abc**...
  
  - To enter a special character, press and hold down key **F4 – <** or **F5 – >** until the desired special character appears.

• Activate or deactivate the desired image attributes.
• Press key F6 – Verify.
The system checks the network connection between SCU (Service Class User = Ziehm NetPort) and SCP (Service Class Provider = server) by means of a “ping”, the DICOM settings (e.g. AE title) and common SOP classes (“association negotiation”). It sends an ECHO request to the SCP and waits for an ECHO response.

If all network parameters have been entered correctly, the message Verification successful is displayed (error messages → Ch. 6.5.4.7, p. 6-51).

If your system includes the Storage Commitment function, the following message is displayed:

Do you want to activate NetCommit? Y/N

• Press the Y key if you want to activate the Storage Commitment function.

or

• Press the N key if you do not want to activate the Storage Commitment function.

• Press key F1 – Save.

6.5.4.3 Configuration of Media Storage

Storage information model

When configuring the storage server, you specify not only the general network parameters (→ Ch. 6.5.4.1, p. 6-33), but also the storage information model (SOP class = Service Object Pair). You can choose between the following options:

– XA = X-ray Angiography
– CR = Computed Radiography
– SC = Secondary Capture

The original images furnished by Ziehm NetPort are of type XA. Since some servers do not support the XA SOP class, CR and SC are provided as alternatives.

Image attributes

Under Image attributes included you define which HEDIS filter algorithms are applied to the DICOM image prior to saving. By default, all attributes are set to Off, and the raw image is saved.

DICOM storage format

The DICOM format must have been set as storage format for writing images to USB stick or CD (→ Ch. 6.2.10, p. 6-6).
To configure Media Storage, do the following:

- Press the **MENU** key.  
  The **Configuration Menu** appears.

- Select the **Service settings** menu item.

- Type the password and press the **Enter** key.

- Select the **DICOM settings** menu item.

- Type the password and press the **Enter** key.

- Select the **Media storage** menu item.  
  The **DICOM Settings Media Storage** menu appears.

![DICOM Settings Media Storage menu](image)

- Enter the **AE title** and the **SOP class**.  
  When the cursor is in certain lines of the input screen, additional 
  function keys for entering lower case letters and special characters 
  are displayed.

- To enter lower case letters, press key **F3 – abc...**
6.5.4.4 Configuration of DICOM Query/Retrieve

Query model

When configuring the query/retrieve server, you specify not only the general network parameters (→ Ch. 6.5.4.1, p. 6-33), but also the query model:
- **PATIENT ROOT**: Patient-level data
- **STUDY ROOT**: Study-level data

**NOTE**

If several patients with the same patient ID are stored in the PACS, you will get the patient with the respective ID who is sent by the PACS first.

Network parameters for Retrieve

To enable Ziehm NetPort to connect to the Query server for the Retrieve function, you must enter its AE title, IP address as well as port 104. Use the same **IP address** and **AE title** as in the **DICOM Settings Query Server** menu (→ Fig. 6-28, p. 6-39).

To configure the query server, do the following:
- Press the **MENU** key.
  - The **Configuration Menu** appears.
- Select the **Service settings** menu item.
- Type the password and press the **Enter** key.
- Select the **DICOM settings** menu item.
- Type the password and press the **Enter** key.
• Select the **Query server** menu item.
  
  The **DICOM Settings Query Server** menu appears.
  
  - Enter the network parameters.
    
    When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.
  
    - To enter lower case letters, press key **F3 – abc...**
  
    - To enter a special character, press and hold down key **F4 – < or F5 – >** until the desired special character appears.
  
  - Press key **F6 – Verify**.
    
    The system checks the network connection between SCU and SCP by means of a “ping”, the DICOM settings (e.g. AE title) and common SOP classes (“association negotiation”). It sends an ECHO request to the SCP and waits for an ECHO response.
  
    If all network parameters have been entered correctly, the message **Verification successful** is displayed (error messages → Ch. 6.5.4.7, p. 6-51).
  
    The retrieve server settings are entered in the **DICOM Settings Retrieve Server X** menu.
  
    If any requested images cannot be found on the query server, Ziehm NetPort will automatically select the appropriate retrieve server using the retrieve AE title (which is provided by the query server).
To configure a retrieve server, do the following:

- Press the **MENU** key.
  The **Configuration Menu** appears.

- Select the **Service settings** menu item.

- Type the password and press the **Enter** key.

- Select the **DICOM settings** menu item.

- Type the password and press the **Enter** key.

- Select the **Query server** menu item.
  The **DICOM Settings Query Server** menu appears.

- Place the cursor on the **IP addr. DICOM server** menu item.
• Press key F4 – < or F5 – >.

The DICOM Settings Retrieve Server menu for the selected retrieve server (1 or 2) is displayed.

Enter the network parameters.
The Gateway, IP address Ziehm NetPort and AE title Ziehm NetPort settings must be identical to the corresponding query server settings.

When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.

• To enter lower case letters, press key F3 – abc...

• To enter a special character, press and hold down key F4 – < or F5 – > until the desired special character appears.

• Press key F6 – Verify.
The system checks the network connection between SCU and SCP by means of a “ping”, the DICOM settings (e.g. AE title) and common SOP classes (“association negotiation”). It sends an ECHO request to the SCP and waits for an ECHO response.

If all network parameters have been entered correctly, the message Verification successful is displayed (error messages → Ch. 6.5.4.7, p. 6-51).
6.5.4.5 Configuration of Worklist and MPPS

Search arguments for Worklist Server
When configuring the worklist server, you specify not only the general network parameters (→ Ch. 6.5.4.1, p. 6-33), but also one or several search arguments:

- **Modality**: You can limit the Worklist to images of the XA or CR SOP class (→ p. 6-34)
- **Station AE title**: You can limit the Worklist to jobs that are assigned to the AE title ZiehmNetPort specified (= YES; NO = no limitation)
- **Time span**: The default setting for the time span is 0 – 24 o’clock of the current day. You may set a shorter period of time (full hours only).
- **Location**: You can limit the Worklist to jobs that are related to the location of the respective Ziehm NetPort, e.g. OR 1.

Operator’s name
In addition, you must enter the name of the radiological technologist under Operator’s Name.

To configure the worklist server, do the following:
- Press the MENU key.
  The Configuration Menu appears.
- Select the Service settings menu item.
- Type the password and press the Enter key.
- Select the DICOM settings menu item.
- Type the password and press the Enter key.
- Select the Worklist server menu item.
  The DICOM Settings Worklist Server menu appears.
Enter the network parameters.
When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.

- To enter lower case letters, press key **F3 – abc...**

- To enter a special character, press and hold down key **F4 – < or F5 – >** until the desired special character appears.

- Enter the desired search arguments.

- Enter the name of the radiological technologist under **Operator’s Name**.

- Press key **F6 – Verify**.
The system checks the network connection between SCU and SCP by means of a “ping”, the DICOM settings (e.g. AE title) and common SOP classes (“association negotiation”). It sends an ECHO request to the SCP and waits for an ECHO response.

If all network parameters have been entered correctly, the message **Verification successful** is displayed (error messages → **Ch. 6.5.4.7**, p. 6-51).

- Press key **F1 – Save**.
When configuring the MPPS server, you specify only the general network parameters (→ Ch. 6.5.4.1, p. 6-33). The search arguments are irrelevant for the MPPS server.

To configure the MPPS server, do the following:

- Press the MENU key.
  The Configuration Menu appears.

- Select the Service settings menu item.

- Type the password and press the Enter key.

- Select the DICOM settings menu item.

- Type the password and press the Enter key.

- Select the Worklist server menu item.
  The DICOM Settings Worklist Server menu appears.

- Place the cursor on the IP addr. DICOM server menu item.
• Press key F5 →.

The DICOM Settings MPPS Server menu appears.

![DICOM Settings MPPS Server menu](image)

**Fig. 6-33 DICOM Settings MPPS Server menu**

- Enter the network parameters.

- Enter the name of the radiological technologist under **Operator's Name**.

  When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.

  - To enter lower case letters, press key F3 – abc...

  - To enter a special character, press and hold down key F4 – < or F5 – > until the desired special character appears.

- Press key F6 – Verify.

  The system checks the network connection between SCU and SCP by means of a “ping”, the DICOM settings (e.g. AE title) and common SOP classes (“association negotiation”). It sends an ECHO request to the SCP and waits for an ECHO response.

  If all network parameters have been entered correctly, the message **Verification successful** is displayed (error messages → Ch. 6.5.4.7, p. 6-51).

  If the connection has been successfully established, the following message appears:

  **Do you want to activate MPPS? Y/N**
• Press the Y key if you want to activate the MPPS function.

or

• Press the N key if you do not want to activate the MPPS function.

If the system was unable to establish a connection, the MPPS function is automatically deactivated.

• Press key F1 – Save.

Returning to the Worklist server configuration

To return from the DICOM Settings MPPS Server menu to the DICOM Settings Worklist Server menu, do the following:

• In the DICOM Settings MPPS Server menu, place the cursor on the IP addr. DICOM server menu item.

• Press key F4 – <.

The DICOM Settings Worklist Server menu appears.

6.5.4.6 Configuration of the print servers

Two print servers

You can configure two print servers if you wish. Print server 1 can be configured to perform one of the following functions:

− Print = DICOM Print
− Navigation
− Storage2 = DICOM Store

Print server 2 can only be configured for the Print function.

Additional parameters

When configuring the print server, you specify not only the general network parameters (→ Ch. 6.5.4.1, p. 6-33), but also the following additional parameters:

− Number of copies: Here you define the number of hard copies (default setting: 1; setting options: 1–10).
− Print priority: Here you may define a certain priority for the print jobs (default setting: none; setting options: HIGH, MED, LOW).
− Medium type: Here you may define a certain printer medium (default setting: none; setting options: PAPER, CLEAR FILM, BLUE FILM).
− Film destination: Here you may define a certain output tray for the printed film, according to its intended use (default setting: none; setting options: MAGAZINE, PROCESSOR, BIN_1, BIN_2 ... BIN_9).
− Film session label: Here you may enter any text for labeling the film (default setting: none).
Film size ID: Here you may specify the film size (default setting: none; setting options: 8INX10IN, 8_5INX11IN, 10INX12IN, 10INX14IN, 11INX14IN, 11INX17IN, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM, A4, A3)

Number / Page: Here you may specify how many images you want to print on one page (default setting: 1, setting options: 1, 2, 4, 6, 9, 12, 15, 20, 24)

Min. Density or Max. Density: Here you define the desired minimum or maximum print density (default setting: none, setting options 0 ... 65535).

User Configuration: Here you define whether an additional dialog for making the print settings is displayed or not when the user selects the DICOM Print function (default setting: Off; setting options: Off, On).

Function: Here you define which function is assigned to function key F5 – NetOutput in the Mosaic menu, Output submenu (default setting: Print; setting options: Print = DICOM Print, Storage2 = DICOM Store, Navigation = Navigation for Brainlab)

Print Server 2: Only the Print = DICOM Print function is available.

To configure print server 1, do the following:

- Press the MENU key.
  The Configuration Menu appears.

- Select the Service settings menu item.

- Type the password and press the Enter key.

- Select the DICOM settings menu item.

- Type the password and press the Enter key.

- Select the Print server menu item.
  The DICOM Settings Print Server 1 menu appears.
6 Configuration

Fig. 6-34  **DICOM Settings Print Server 1** menu

- Enter the network parameters.
  
  When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.

- To enter lower case letters, press key **F3 – abc...**

- To enter a special character, press and hold down key **F4 – <** or **F5 – >** until the desired special character appears.

- Specify the print configuration parameters.

- Press key **F1 – Save**.

**Configuring print server 2**

To configure print server 2, do the following:

- Press the **MENU** key.

  The **Configuration Menu** appears.

- Select the **Service settings** menu item.

- Type the password and press the **Enter** key.
• Select the **DICOM settings** menu item.

• Type the password and press the **Enter** key.

• Select the **Print server** menu item.

  The **DICOM Settings Print Server 1** menu appears.

  ![DICOM Settings Print Server 1 menu](image)

  Fig. 6-35 **DICOM Settings Print Server 1** menu

• Place the cursor on the **IP addr. DICOM server** menu item.

• Press key **F5 – >**.

  The **DICOM Settings Print Server 2** menu appears.
Fig. 6-36 **DICOM Settings Print Server 2** menu

- Enter the network parameters.
  When the cursor is in certain lines of the input screen, additional function keys for entering lower case letters and special characters are displayed.

  - To enter lower case letters, press key **F3 – abc...**

  - To enter a special character, press and hold down key **F4 – <** or **F5 – >** until the desired special character appears.

- Specify the print configuration parameters.

- Press key **F1 – Save**.

**Returning to the print server 1 configuration**

To return from the DICOM Settings Print Server 2 menu to the DICOM Settings Print Server 1 menu, do the following:

- In the **DICOM Settings Print Server 2** menu, place the cursor on the **IP addr. DICOM server** menu item.

  - Press key **F4 – <**.

  The **DICOM Settings Print Server 1** menu appears.
6.5.4.7 DICOM Verification error messages

The DICOM Verification function enables you to check whether all parameters have been entered correctly. If the verification procedure is not successful, one of the following error messages is displayed:

<table>
<thead>
<tr>
<th>Error message</th>
<th>Cause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No connection to server (is displayed in the respective interface language)</td>
<td>Server is missing or not switched on, or wrong IP address.</td>
</tr>
</tbody>
</table>
| PC/TCP resident module is not loaded; aborting program up to SW 15: No connection to server | Network interface card driver is not loaded  
PCTCP in autoexec.bat is not set |
| Failed to connect to remote host [v5] up to SW 15: No connection to server    | Server is not switched on  
IP address of DICOM server is wrong  
IP subnet mask is wrong |
| Unable to resolve host name to ip address [v5] up to SW 15: No connection to server | Host name of DICOM server is wrong |
| Association negotiation failed [v5] up to SW 15: SYSTEM ERROR 23               | AE title of DICOM server is wrong  
Port address of DICOM server is wrong  
AE title of Ziehm NetPort is wrong (when trying to connect to the server)  
no common SOP classes (mergecom.app) |
| Connection aborted before association negotiation was completed [v5] up to SW 15: No response from server | Port address of DICOM server does not exist  
Application on the server is not running |
| Required Configuration Info Missing [v5] up to SW 15: No response from server  | Wrong mergecom.app |
| MERGE.INI file cannot be located [v1] up to SW 15: SYSTEM ERROR 3             | Entry in autoexec.bat is missing |
| (Communication takes too long (> 20 s))                                      | dicom\pctcp\pctcpsrv.drv file is incompatible |

Table 6-6 DICOM Verification error messages
6.5.4.8 DICOM Retrieve error messages

The following error messages frequently occur at user level:

<table>
<thead>
<tr>
<th>Error message</th>
<th>Cause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network unexpectedly shutdown [v11]</td>
<td>Server does not send an ECHO response, but association negotiation is okay</td>
</tr>
<tr>
<td>Message service unacceptable for this association [v8]</td>
<td>Wrong mergecom.app</td>
</tr>
<tr>
<td>Timed out waiting on network partner [v11]</td>
<td>Server does not recognize ECHO request or STANDARD_ECHO service</td>
</tr>
<tr>
<td></td>
<td>It may be necessary to restart the server (e.g. HIPAX server)</td>
</tr>
<tr>
<td>Network partner sent an invalid message [v11]</td>
<td>Server does not recognize ECHO request or STANDARD_ECHO service</td>
</tr>
<tr>
<td></td>
<td>It may be necessary to restart the server (e.g. HIPAX server)</td>
</tr>
</tbody>
</table>

Table 6-6  DICOM Verification error messages  (cont.)

<table>
<thead>
<tr>
<th>Response from server</th>
<th>Cause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0xa801</td>
<td>Ziehm NetPort is not properly connected to the server: wrong network settings</td>
</tr>
<tr>
<td>0xC000, 0xC001</td>
<td>Ziehm NetPort is not properly connected to the server: wrong DICOM settings, or image data is not stored on the query server</td>
</tr>
</tbody>
</table>

Table 6-7  DICOM Retrieve error messages

6.5.4.9 Hardware with DICOM option

There are two hardware versions:
- an RJ45 connection (Twisted Pair, 100 Mbit/s)
- Fiber-optic connection (FOC): ST coupling, 10base-FL or 100base-FX

RJ45 connection  On systems with an RJ45 connection, a network cable runs directly from the network interface card of the image memory module out through the rear cover of the monitor cart and terminates in an RJ45 socket. The system must be connected to the hospital network via this socket.
On systems with a fiber optic connection, a network cable runs to a fiber optic converter built into the monitor cart. From there, two fiber optic cables run to the TX and RX sockets. The sockets are located at the rear side of the monitor cart above the power supply connection. Via these two sockets, the two fiber optic links are connected to the hospital network.

### FO connection

### Hardware faults

<table>
<thead>
<tr>
<th>Error</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image memory module fault</td>
<td>Replace image memory module</td>
</tr>
<tr>
<td><strong>Defective cables</strong></td>
<td></td>
</tr>
<tr>
<td>Visible damage (kinks, pinches, abrasion, cuts)</td>
<td>Replace cables</td>
</tr>
<tr>
<td>No connection between two correctly functioning components (e.g. hub – hub), simple continuity test can be performed with a multimeter</td>
<td></td>
</tr>
<tr>
<td><strong>Defective socket(s)</strong></td>
<td>Replace FOC sockets on the monitor cart</td>
</tr>
<tr>
<td>Visible damage</td>
<td>If the defective sockets are within the hospital network: Plug the monitor cart into another socket for checking</td>
</tr>
<tr>
<td>No connection between correctly functioning components (e.g. hub – cable – socket – server)</td>
<td></td>
</tr>
<tr>
<td><strong>Cable connection interrupted</strong></td>
<td>Establish cable connection</td>
</tr>
<tr>
<td>Cable is not plugged in, cable is defective, socket is defective</td>
<td></td>
</tr>
<tr>
<td><strong>FOC version: RX and TX cables are swapped</strong></td>
<td>Swap the RX and TX cables</td>
</tr>
<tr>
<td>The LINK LED on port 2 of the fiber optic converter is not lit.</td>
<td></td>
</tr>
</tbody>
</table>

Table 6-8 Possible hardware faults
6.5.5 System settings

In the System Settings menu, you can set or modify the following system parameters with the cursor keys:

- Vario 3D function
- DSA mask
- Ambient light sensor
- Histogram
- Dose area product
- File check
- Collimators
- Language

Fig. 6-37 System Settings menu

Vario 3D function

On a Ziehm 8000, the Vario 3D function must always be set to Off.

DSA mask

If the option Always is set, a new mask image is acquired during each DSA.

NOTICE

You must always set the Always option under DSA mask.

Ambient light sensor gain

Under Bri sensor gain you define to which extent the system adjusts the screen backlight brightness to the ambient light conditions. You can select a value between 1 (weak gain) and 20 (strong gain).
Under **Bri sensor limit** you specify a maximum value for the screen backlight brightness. You can select a value between 0 and 32.

Under **Bri sensor speed** you define how long it takes to adjust the screen backlight brightness to changes in ambient light conditions. You can select a value between 10 s and 60 s.

Here you define whether the histogram is displayed or not.

Here you define whether the dose area product is displayed on the live screen or not.

Here you define whether the system checks the internal image data list for corrupt files during power-up. Always set the option **On** here.

**To match the virtual collimator to the iris collimator, do the following:**

- Press the **up arrow** or **down arrow** key until the cursor is on the **Collimator offset** menu item.

- Press the **close iris collimator** key until the collimator is closed as far as possible.

- Initiate radiation and terminate it again.

- Press the **close iris collimator** key. The virtual collimator appears on the screen.

- Press the **left arrow** or **right arrow** key until the actual and the virtual collimator coincide.

- Press key **F1 – Save**.

- Press the **up arrow** key. The **Collimator factor** menu item is selected.

- Press the **open iris collimator** key until the collimator is completely open.

- Press the **left arrow** or **right arrow** key until the actual and the virtual collimator coincide.
• Press key F1 – Save.

• Repeat the collimator offset and collimator factor adjustment alternately until the deviations are minimal.

Language

You can choose between the following languages for the user interface:

− DEUTSCH
− ENGLISH
− FRANÇAISE
− ITALIANO
− ESPAÑOL
− SVENSKA
− POLSKI
− CZECH

To apply the settings, do the following:

• Press key F1 – Save.

• Switch off the system.

• Switch the system back on.

The new settings are valid now.

To discard system settings that have not been applied yet, do the following:

• Press key F2 – Cancel.

or

• Quit the Service Settings menu without applying the settings.
6.5.6 HEDIS data

To upload data from the system to a USB stick, do the following:

- In the Service Settings menu, press the up arrow or down arrow key until the cursor is on the HEDIS data menu item.

- Press the Enter key.

The keys F1 – Export and F2 – Import appear on the screen.

To download data from a USB stick to the system, do the following:

- In the Service Settings menu, press the up arrow or down arrow key until the cursor is on the HEDIS data menu item.

- Press the Enter key.

The keys F1 – Export and F2 – Import appear on the screen.
6.5.7 Software update

To perform a software update, do the following:

- In the Service Settings menu, press the up arrow or down arrow key until the cursor is on the Software update menu item.

- Plug the USB stick that contains the first part of the backup copy into the USB port.

- Press the Enter key.

The following confirmation prompt appears:

Do you really want to update? Y/N
Press the Y key on the alphanumeric keypad. The software update is installed.

Once the complete software update package has been installed, the following message is displayed:

**Software update is completed**

*Please switch the system OFF and ON*

Switch the system off and back on.
7 Technical Data

7.1 Ziehm 8000, Ziehm Compact and Ziehm Compact Litho

In compliance with the requirements of international standards (e.g. 21 CFR 1020.32-d, IEC 60601-2-43), the system emits less than 88 mGy/min in any operating condition.

<table>
<thead>
<tr>
<th>Voltage / frequency rating</th>
<th>230 V$_{AC}$ ±10 %, 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td></td>
</tr>
<tr>
<td>Power supply fuse rating</td>
<td>C 16 A (tripping characteristic C acc. to VDE 0641, Part 11; DIN EN 60898 + IEC 898)</td>
</tr>
<tr>
<td>Required residual current circuit breaker (RCD)</td>
<td>$I_N \geq 16$ A, $I_{AN} = 30$ mA</td>
</tr>
<tr>
<td>Typical current consumption</td>
<td>8 A continuous, 15 A momentary</td>
</tr>
<tr>
<td>Power input fuse</td>
<td>15 A, slow (2 pcs.)</td>
</tr>
<tr>
<td>Maximum line impedance</td>
<td>$\leq 0,6 \Omega$</td>
</tr>
<tr>
<td>Equipment protection classification</td>
<td>Protection Class I, Type B (★), ordinary equipment, continuous operation</td>
</tr>
<tr>
<td>Radiation controlled area (with generator in lowermost position and C-arm vertical)</td>
<td>15 cm i.i.: 3 m 23 cm i.i.: 4 m</td>
</tr>
</tbody>
</table>

Table 7-1 Technical data Ziehm 8000, Ziehm Compact and Ziehm Compact Litho
### Voltage / frequency rating

<table>
<thead>
<tr>
<th></th>
<th>230 V&lt;sub&gt;AC&lt;/sub&gt; ±10 %, 50/60 Hz</th>
</tr>
</thead>
</table>

### Power

- **Fluoroscopy**: 40–110 kV / 0.2–6 mA
- **Direct radiography**: 40–110 kV / 20 mA
- **Operating frequency**: 20 kHz

### Max. operating data

- **Fluoroscopy**: 110 kV / 0.2–6 mA
- **Direct radiography**: 110 kV / 20 mA
- **Exposure time**: 0.1–4 s

### Max. power output

- **Fluoroscopy**: 660 W
- **Single pulse**: 880 W
- **Direct radiography**: 2200 W

### Nominal electric power

- 2000 W at 100 kV / 20 mA / 0.1 s

### X-ray tube

- Dual-focus stationary-anode tube

### Focal spot nominal size

- **Fluoroscopy**: 0.5 mm
- **Direct radiography**: 1.5 mm

### Total filtration

- > 3.9 mm aluminum equivalent

### Tube

- **Input screen**: Cesium iodide
- **Nominal sizes**:
  - Ziehm 8000 and Ziehm Compact: 23 / 15 / (10) cm or 15 / 10 cm
  - Ziehm Compact Litho: 23 / 15 / (10) cm

### Anti-scatter grid

- Pb 8/40

### Flat-screen monitors

- **Screen size**: 61 cm (24")
- **Luminance**: max. 400 Cd/m<sup>2</sup>
- **Resolution**: 1920 × 1200 pixels
- **Refresh rate**: 85 Hz

- **Screen size**: 59 cm (23")
- **Luminance**: max. 500 Cd/m<sup>2</sup>
- **Resolution**: 1280 × 720 pixels
- **Refresh rate**: 50 Hz

- **Screen size**: 46 cm (18.1")
- **Luminance**: max. 600 Cd/m<sup>2</sup>
- **Resolution**: 1280 × 1024 pixels
- **Refresh rate**: 75 Hz

**Table 7-1** Technical data Ziehm 8000, Ziehm Compact and Ziehm Compact Litho (cont.)
### Technical Data

<table>
<thead>
<tr>
<th>Voltage / frequency rating</th>
<th>230 V&lt;sub&gt;AC&lt;/sub&gt; ±10 %, 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact monitors</td>
<td></td>
</tr>
<tr>
<td>Flat-screen monitor</td>
<td>Screen size: 46 cm (18.1&quot;)</td>
</tr>
<tr>
<td></td>
<td>Luminance: 600 Cd/m²</td>
</tr>
<tr>
<td></td>
<td>Resolution: 1280 × 1024 pixels</td>
</tr>
<tr>
<td></td>
<td>Refresh rate: 75 Hz</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td></td>
</tr>
<tr>
<td>During storage and transport</td>
<td>Temperature: −5 °C to +55 °C</td>
</tr>
<tr>
<td></td>
<td>Relative air humidity: 20 % − 70 %</td>
</tr>
<tr>
<td>During operation</td>
<td>Temperature: +15 °C to +35 °C</td>
</tr>
<tr>
<td></td>
<td>Relative air humidity: 20 % − 70 %</td>
</tr>
<tr>
<td>Ziehm 8000 and Ziehm Compact</td>
<td>Source/image receptor distance: 97 cm</td>
</tr>
<tr>
<td></td>
<td>Vertical free space generator-i.i.: 76 cm</td>
</tr>
<tr>
<td></td>
<td>C-arm depth: 68 cm</td>
</tr>
<tr>
<td></td>
<td>Orbital rotation: 115° / 135° a</td>
</tr>
<tr>
<td></td>
<td>Angulation: ± 225°</td>
</tr>
<tr>
<td></td>
<td>Swiveling (panning): ±10°</td>
</tr>
<tr>
<td></td>
<td>Horizontal movement: 22 cm</td>
</tr>
<tr>
<td></td>
<td>Vertical movement: 43 cm / 63 cm a</td>
</tr>
<tr>
<td>Ziehm Compact Litho</td>
<td>Source/image receptor distance: 97 cm</td>
</tr>
<tr>
<td></td>
<td>Vertical free space generator-i.i.: 76 cm</td>
</tr>
<tr>
<td></td>
<td>C-arm depth: 68 cm</td>
</tr>
<tr>
<td></td>
<td>Orbital rotation: 115° / 135° a</td>
</tr>
<tr>
<td></td>
<td>Angulation: ± 225°</td>
</tr>
<tr>
<td></td>
<td>Swiveling (panning): 0°</td>
</tr>
<tr>
<td></td>
<td>Horizontal movement: 0 cm</td>
</tr>
<tr>
<td></td>
<td>Vertical movement: 23 cm</td>
</tr>
</tbody>
</table>

Table 7-1 Technical data Ziehm 8000, Ziehm Compact and Ziehm Compact Litho (cont.)
## Technical Data

### Dimensions

<table>
<thead>
<tr>
<th>C-arm stand</th>
<th>Width:</th>
<th>80 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth:</td>
<td>230 cm</td>
<td></td>
</tr>
<tr>
<td>Height:</td>
<td>214 cm</td>
<td></td>
</tr>
<tr>
<td>Monitor cart</td>
<td>Width:</td>
<td>71 cm</td>
</tr>
<tr>
<td>Depth:</td>
<td>69,5 cm</td>
<td></td>
</tr>
<tr>
<td>Height:</td>
<td>169 cm</td>
<td></td>
</tr>
</tbody>
</table>

### Weight

<table>
<thead>
<tr>
<th>C-arm stand</th>
<th>Ziehm 8000:</th>
<th>approx. 264 kg (23 cm i.i.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ziehm Compact:</td>
<td>approx. 270 kg (23 cm i.i.)</td>
<td></td>
</tr>
<tr>
<td>Ziehm Compact Litho:</td>
<td>approx. 280 kg (23 cm i.i.)</td>
<td></td>
</tr>
<tr>
<td>Monitor cart</td>
<td>Ziehm 8000 with 24” flat-screen monitor:</td>
<td>approx. 150 kg</td>
</tr>
<tr>
<td>Ziehm 8000 with 23” flat-screen monitor:</td>
<td>approx. 148 kg</td>
<td></td>
</tr>
<tr>
<td>Ziehm 8000 with 18.1” flat-screen monitors:</td>
<td>approx. 153 kg</td>
<td></td>
</tr>
</tbody>
</table>

Table 7-1  Technical data Ziehm 8000, Ziehm Compact and Ziehm Compact Litho (cont.)

a. Option, not available for Ziehm Compact

---

**NOTICE**

Temperatures above 40°C and relative air humidity above 60% may cause stains on the printer’s heat-sensitive paper.
7.2 Power plug specification

7.2.1 Systems with a voltage rating of 200V, 220V, 230V and 240V

<table>
<thead>
<tr>
<th>Cables</th>
<th>2.5 mm² three-wire</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>supply voltage: two wires</td>
</tr>
<tr>
<td></td>
<td>ground wire: one wire</td>
</tr>
<tr>
<td>Phase</td>
<td>single-phase</td>
</tr>
<tr>
<td>Strain relief</td>
<td>required</td>
</tr>
<tr>
<td>Voltage</td>
<td>250 V&lt;sub&gt;AC&lt;/sub&gt;</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>≥ 2000 V</td>
</tr>
<tr>
<td>Current-carrying capacity</td>
<td>16 A continuous (min.)</td>
</tr>
<tr>
<td>Flammability rating</td>
<td>acc. to UL 94 V0</td>
</tr>
<tr>
<td>Temperature</td>
<td>−40 °C to +80 °C</td>
</tr>
<tr>
<td>Mark of conformity</td>
<td>VDE or equivalent safety testing and national mark of conformity of country of installation (if required)</td>
</tr>
<tr>
<td>Equipment protection classification</td>
<td>IP 20 or higher</td>
</tr>
</tbody>
</table>

Table 7-2 Power plug specification

7.3 Laser positioning device

<table>
<thead>
<tr>
<th>Laser Class</th>
<th>Class 2M acc. to IEC 60825-1:2001-11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. power output of continuous laser radiation, measured at the laser beam apertures</td>
<td>&lt; 1 mW</td>
</tr>
<tr>
<td>Wavelength of the radiation</td>
<td>635 nm</td>
</tr>
</tbody>
</table>

Table 7-3 Technical data of laser positioning device
7.4 Dose meter

<table>
<thead>
<tr>
<th>Additional absorption</th>
<th>2.8 mm Al</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity (75 kV; 2.7 mm Al HVL)</td>
<td>≥ 800 pC = \frac{mGy \cdot \text{cm}^2}{\text{cm}^2}</td>
</tr>
<tr>
<td>Measuring range of DAP power</td>
<td>(0.1–10^4) mGy • cm^2/s</td>
</tr>
<tr>
<td>Voltage range</td>
<td>(35–150) kV</td>
</tr>
<tr>
<td>Voltage correction</td>
<td>\rightarrow Fig. 7-1, p. 7-6</td>
</tr>
<tr>
<td>Aluminum equivalent</td>
<td>&lt; 0.4 mm</td>
</tr>
</tbody>
</table>

Table 7-4 Technical data of dose meter

**Voltage correction**
Additional absorption: 2,8 mm Al filtration

Fig. 7-1 Voltage correction of dose meter
### 7.5 Air kerma

In compliance with the requirements of international standards (e.g. 21 CFR 1020.32-d (1), IEC 60601-2-43), Ziehm fluoroscopy systems with automatic exposure rate control are not operable at any combination of tube voltage and tube current which will result in an exposure rate in excess of 88 mGy/min at the point where the center of the useful beam enters the patient.

The air kerma that is displayed on the system’s user interface refers to the interventional reference point according to IEC 60601-2-43 and 21 CFR 1020.32-d.

![Diagram of a fluoroscopy system with labels for Image intensifier input plane, Lead blocker, Dose probe, Interventional reference point, Focal spot, Voltage in kV, Deviation in %]

**Fig. 7-2**  Intervventional reference point (Ziehm 8000)

**Fig. 7-3** Typical deviation of dose as compared to an external calibrated measurement system
7.6 Focal spot position

Fig. 7-4 Focal spot position on systems with 23 cm i.i.
7.7 Dimensions

7.7.1 Ziehm 8000

C-arm stand with 23 cm i.i.

Fig. 7-5 Dimensions of C-arm stand on systems with 23 cm i.i.
Tolerances of C-arm movements

Fig. 7-6  Tolerances of C-arm movements on systems with 23 cm i.i.

C-arm stand with lower C-arm position

Fig. 7-7  Dimensions of C-arm stand with lower C-arm position
Monitor cart with 24” flat-screen monitor

Fig. 7-8 Dimensions of a monitor cart with 24” flat-screen monitor

Monitor cart with 23” flat-screen monitor

Fig. 7-9 Dimensions of a monitor cart with 23” flat-screen monitor
Monitor cart with 18.1” flat-screen monitors

Fig. 7-10  Dimensions of a monitor cart with 18.1” flat-screen monitors

7.7.2  Ziehm Compact

Ziehm Compact with flat-screen monitor and 23 cm i.i.

Fig. 7-11  Dimensions of a Ziehm Compact with flat-screen monitor and 23 cm i.i.
7.7.3 Ziehm Compact Litho

Fig. 7-12 Dimensions of Ziehm Compact Litho with 23 cm i.i.
8     Maintenance

8.1     General requirements

WARNING
Maintenance of this system must be carried out by trained personnel only.

Some checks may only be performed by authorized service engineers. Those checks are marked accordingly.

The regulation for designing, operating and using medical devices (MPBetreibV) in Germany or other relevant federal regulations applicable in other countries require regular inspections (safety-related inspections).

In general the equipment owner is held liable for performing them.
Ziehm Imaging GmbH recommends safety-related inspections every 12 months and will gladly assist you in performing them.

Keep a record of all checks and inspections the equipment is subject to and include them with the medical devices log book, which you are obliged to keep as the equipment owner.

The Food and Drug Administration (FDA) requires that the checks and inspections described in the related document CDRH Maintenance Report. be performed at least every six months, in order to ensure that the X-ray system complies with federal regulations (specifically, the applicable sections of CFR 21, Subchapter J – Radiological Health).

The equipment owner is responsible for ensuring that the maintenance steps described in the said document are performed every six months. Failure to comply with this requirement relieves the Manufacturer and his agents of all responsibility in this matter.

The equipment owner is furthermore responsible for ensuring that only service engineers certified by the manufacturer perform the tests and adjustments described in the above document.

Service engineers are responsible for performing the procedure in the sequence shown in the CDRH Maintenance Report.
### 8.2 Electrics

**WARNING**

Maintenance of this system must be carried out by trained personnel only. Some checks may only be performed by authorized service engineers. Those checks are marked accordingly.

Check the following functions at the specified time intervals:

<table>
<thead>
<tr>
<th>Person in charge</th>
<th>Object</th>
<th>Action required</th>
<th>Whenever necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained personnel</td>
<td>Consistency test</td>
<td>Perform according to relevant national regulation of the country of installation</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Power cable</td>
<td>Inspect for physical damage</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Electrical safety</td>
<td>Check according to relevant national regulation of the country of installation</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Hand switch</td>
<td>Inspect cable for damage</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Foot switch</td>
<td>Inspect cable for damage</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Motorized vertical travel</td>
<td>Move up and down to respective limit stops</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>C-arm stand control panel</td>
<td>All segments are activated during power-up</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Flat-screen monitors</td>
<td>Contrast and brightness can be adjusted</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clean screens with a mild detergent mixed with water</td>
<td>X</td>
</tr>
<tr>
<td>Trained personnel</td>
<td>Fluoroscopy modes</td>
<td>Activate each mode, the corresponding LED must light up</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Coupling cable</td>
<td>Inspect cable, plug-and-socket connections and anti-kink sleeves for physical damage</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Swivel harness</td>
<td>Inspect hose for physical damage</td>
<td>X</td>
</tr>
</tbody>
</table>

Table 8-1: Regular electrical checks without radiation release

**Checks involving radiation**

To be able to check the following functions, you must initiate radiation:
**WARNING**

Always observe the safety and precautionary measures required by the relevant national X-ray and radiation protection regulations.

<table>
<thead>
<tr>
<th>Person in charge</th>
<th>Object</th>
<th>Action required</th>
<th>Whenever necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trained personnel</td>
<td>Radiation warning lamp</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Must be lit during radiation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trained personnel</td>
<td>Hand switch</td>
<td>Monthly, Yearly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Must function with fluoroscopy and direct radiography</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dead man’s control for direct radiography</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trained personnel</td>
<td>Foot switch</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Must not release radiation in <strong>direct radiography</strong> mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trained personnel</td>
<td>Fluoroscopy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The X-ray symbol on the control panel is lit</td>
<td>Monthly, Yearly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The <strong>radiation time</strong> display is counting up during radiation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Unsaved” marks on the live screen disappear</td>
<td>Monthly, Yearly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>An audible alarm sounds after 5 minutes of radiation time</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Press <strong>min</strong> key briefly: The audible alarm is switched off</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Press <strong>min</strong> key for more than 3 s: The <strong>radiation time</strong> display is reset to zero</td>
<td>Monthly, Yearly</td>
</tr>
<tr>
<td></td>
<td>Iris collimator</td>
<td>Open and close</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Slot collimator</td>
<td>Open and close, turn in both directions until reaching the right/left limit stops</td>
<td>Monthly</td>
</tr>
<tr>
<td></td>
<td>Direct radiography (option)</td>
<td>Exposure time can be set between 0.1 and 4 s.</td>
<td>Monthly, Yearly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All film sizes can be selected, the LED of the corresponding key must light up</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>An audible alarm sounds throughout the exposure time</td>
<td>Monthly</td>
</tr>
</tbody>
</table>

Table 8-2  Regular electrical checks with radiation release
## 8.3 Mechanics

**WARNING**

Maintenance of this system must be carried out by trained personnel only. Some checks may only be performed by authorized service engineers. Those checks are marked accordingly.

Check the following functions or perform the following maintenance work at the specified time intervals:

<table>
<thead>
<tr>
<th>Person in charge</th>
<th>Object</th>
<th>Action required</th>
<th>Whenever necessary</th>
<th>Monthly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained personnel</td>
<td>X-ray generator</td>
<td>Inspect for physical damage (e.g. oil leakage)</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>C-arm stand wheels</td>
<td>Clean tread surfaces, cable guards and bearings</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor cart wheels</td>
<td>Clean tread surfaces, cable guards and bearings</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check proper locking of the parking brake</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>C-arm</td>
<td>Clean gliding surface</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check retention force of orbital rotation brake in all C-arm positions</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check C-arm bearing for running noise</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Motorized vertical travel</td>
<td>Clean gliding surface of lifting column</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C-arm stand and monitor cart control panels</td>
<td>Inspect foil for damage</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Labels on the unit</td>
<td>Check whether all warning and information labels are legible</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Table 8-3  Regular mechanical checks
<table>
<thead>
<tr>
<th>Person in charge</th>
<th>Object</th>
<th>Action required</th>
<th>Whenever necessary</th>
<th>Monthly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorized service engineer</td>
<td>C-arm stand wheels</td>
<td>Readjust or replace brake blocks</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check firm seat of wheel brackets</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Monitor cart wheels</td>
<td>Check firm seat of wheel brackets</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Steering</td>
<td>Check mechanical play between steering lever and wheels</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Clamping levers of mechanical brakes</td>
<td>Grease thread with Varilub extreme pressure lubricant</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Motorized vertical travel</td>
<td>Grease lifting spindle with Varilub extreme pressure lubricant</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inspect bearings for damage</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Table 8-3  Regular mechanical checks (cont.)
9  Replacing Components

9.1  Hand switch and foot switch

To replace the hand or foot switch, do the following:

- Unscrew the safety sleeve of the twist lock using an Allen key (2 mm).
- **Foot switch:** Unscrew the strain relief using an Allen key (2.5 mm).
- Open the twist lock.
• Unplug the cable.
• Plug in the cable of the new switch.
• Close the twist lock.
• **Foot switch**: Screw down the strain relief using an Allen key (2.5 mm).
• Screw down the safety sleeve of the twist lock using an Allen key (2 mm).

### 9.2 Coupling cable

![Fig. 9-3 Coupling cable connection](image)

To replace the coupling cable, do the following:

• Press the locking lever toward the unit.
  The latches open.

• Unplug the coupling cable.

• Plug in the new coupling cable.

• Pull the locking lever away from the unit so that the latches lock.
### 9.3 Fuses

#### Transformer TR1 (11079)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Art. No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2</td>
<td>10A, slow (5×20 mm)</td>
<td>17007 Supply of lifting motor</td>
</tr>
<tr>
<td>F3</td>
<td>10A, slow (5×20 mm)</td>
<td>17007 Supply of U326 – heating current</td>
</tr>
</tbody>
</table>

#### Transformer TR2 (11081)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Art. No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>2A, slow (5×20 mm)</td>
<td>17006 Line-side fuse TR2</td>
</tr>
<tr>
<td>F4</td>
<td>4A, slow (5×20 mm)</td>
<td>17021 Supply for component 1 (18V) on U333</td>
</tr>
<tr>
<td>F5</td>
<td>4A, slow (5×20 mm)</td>
<td>17021 Supply for different 5V voltages on U334</td>
</tr>
<tr>
<td>F6</td>
<td>1A, slow (5×20 mm)</td>
<td>17019</td>
</tr>
<tr>
<td>F7</td>
<td>1A, slow (5×20 mm)</td>
<td>17019</td>
</tr>
<tr>
<td>F8</td>
<td>1A, slow (5×20 mm)</td>
<td>17019</td>
</tr>
<tr>
<td>F9</td>
<td>1A, slow (5×20 mm)</td>
<td>17019 Supply for monitor rotation</td>
</tr>
</tbody>
</table>

#### Fuses on U333

<table>
<thead>
<tr>
<th>Rating</th>
<th>Art. No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>15 A, fast (6.3×32 mm)</td>
<td>17076 230V power supply</td>
</tr>
<tr>
<td>F4</td>
<td>15 A, fast (6.3×32 mm)</td>
<td>17076</td>
</tr>
<tr>
<td>F5</td>
<td>1A, slow (5×20 mm)</td>
<td>17019 Load resistor (RL) for transformer 11079</td>
</tr>
<tr>
<td>F7</td>
<td>100 mA, slow (5×20 mm)</td>
<td>17056 Input of transformer 11080 on U333</td>
</tr>
<tr>
<td>F8</td>
<td>250 mA, slow (5×20 mm)</td>
<td>17001 Output of transformer 11080 on U333</td>
</tr>
</tbody>
</table>

#### Fuses on the transformer mounting plate

<table>
<thead>
<tr>
<th>Rating</th>
<th>Art. No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F2</td>
<td>20 A, slow (6.3×32 mm)</td>
<td>17044 120V power supply</td>
</tr>
<tr>
<td>F3</td>
<td>20 A, slow (6.3×32 mm)</td>
<td>17044</td>
</tr>
</tbody>
</table>
### Table 9-4  External fuses on the monitor cart

<table>
<thead>
<tr>
<th>Name</th>
<th>Rating</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1A</td>
<td>15 A, slow</td>
<td>Power fuse for 210-220-230-240 V&lt;sub&gt;AC&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>20 A, slow</td>
<td>Power fuse for 105-110-115-120 V&lt;sub&gt;AC&lt;/sub&gt;</td>
</tr>
<tr>
<td>F1B</td>
<td>15 A, slow</td>
<td>Power fuse for 210-220-230-240 V&lt;sub&gt;AC&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>20 A, slow</td>
<td>Power fuse for 105-110-115-120 V&lt;sub&gt;AC&lt;/sub&gt;</td>
</tr>
</tbody>
</table>
10 Problem Report

10.1 List of error and alert messages

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
<th>Measures</th>
</tr>
</thead>
</table>
| E 16 | Alert  | Hand switch 1 pressed during power-up| Release hand switch and acknowledge alert message by briefly pressing hand or foot switch.  
**Caution:**  
On systems with four-pedal foot switch, hand switch 1 = foot switch 1 (left to right) |
| E 17 | Alert  | Foot switch 1 pressed during power-up | Release foot switch and acknowledge alert message by briefly pressing hand or foot switch.  
**Caution:**  
On systems with four-pedal foot switch, foot switch 1 = foot switch 3 (left to right) |
| E 18 | Alert  | Hand switch 2 pressed during power-up | Release hand switch and acknowledge alert message by briefly pressing hand or foot switch.  
**Caution:**  
On systems with four-pedal foot switch, hand switch 2 = foot switch 2 (left to right) |
| E 19 | Alert  | Foot switch 2 pressed during power-up | Release foot switch and acknowledge alert message by briefly pressing hand or foot switch.  
**Caution:**  
On systems with four-pedal foot switch, foot switch 2 = foot switch 4 (left to right) |
| E 20 | Error  | Short circuit in hand or foot switch cable | Please contact after-sales service! |
| E 21 | Alert  | Radiation warning lamp defective    | Please contact after-sales service! |
| E 22 | Alert  | Internal fault                      | Please contact after-sales service! |
| E 23 | Alert  | Internal fault                      | Please contact after-sales service! |
| E 24 | Alert  | Internal fault                      | Please contact after-sales service! |

Table 10-1 List of error and alert messages
<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>E 25</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 26</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 27</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 28</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 29/</td>
<td>Alert</td>
<td>Ziehm 8000 without Active Cooling:</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 26</td>
<td></td>
<td>General generator fault or Generator overheated</td>
<td>or</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>(temperature symbol on the C-arm stand illuminated)</em></td>
<td>Allow generator to cool down</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ziehm 8000 with Active Cooling:</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 30</td>
<td>Error</td>
<td>General generator fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 31</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 32</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 33</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 34</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 35</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 36</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 37</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 38</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 39</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 40</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 41</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 42</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 43</td>
<td>Error</td>
<td>Dose meter check (VacuDAP, VacuDAP C): Value measured is outside the tolerance range</td>
<td>Repeat dose meter check. If the error message appears again, contact after-sales service.</td>
</tr>
<tr>
<td>E 44</td>
<td>Error</td>
<td>Control connection to monitor cart interrupted</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 45</td>
<td>Error</td>
<td>Internal fault (VacuDAP duo)</td>
<td>Acknowledge error message by briefly pressing hand or foot switch.</td>
</tr>
</tbody>
</table>

Table 10-1  List of error and alert messages  (cont.)
<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
<th>Measures</th>
</tr>
</thead>
</table>
| E 46 | Error | During power-up:  
Error in VacuDAP duo dose meter system | Acknowledge error message by briefly pressing hand or foot switch.  
During operation:  
Error in VacuDAP duo dose meter system | Press min key (long keystroke). |
| E 47 | Error | Measuring value limit of 9999.9 cGy cm² or 999.99 mGy has been exceeded.  
If the measuring value limit for the air kerma rate (999.99 mGy/min.) is exceeded during an exposure, radiation is not interrupted. The error number appears after radiation has been terminated. It is not possible to reinitiate radiation. | Press min key (long keystroke). |
| E 48 | Error | Dose meter check (VacuDAP duo): Error in dose meter system | Acknowledge error message by briefly pressing hand or foot switch to be able to continue working with the system.  
Please contact after-sales service! |
| E 51 | Error | Internal fault | Please contact after-sales service! |
| E 52 | Error | Internal fault | Please contact after-sales service! |
| E 53 | Error | Internal fault | Please contact after-sales service! |
| E 54 | Error | Internal fault | Please contact after-sales service! |
| E 55 | Error | Internal fault | Please contact after-sales service! |
| E 56 | Error | Internal fault | Please contact after-sales service! |
| E 57 | Error | Internal fault | Please contact after-sales service! |
| E 58 | Error | Internal fault | Please contact after-sales service! |
| E 59 | Error | Internal fault | Please contact after-sales service! |
| E 60 | Error | Internal fault | Please contact after-sales service! |
| E 61 | Error | Internal fault | Please contact after-sales service! |
| E 62 | Error | Internal fault | Please contact after-sales service! |
| E 63 | Error | Internal fault | Please contact after-sales service! |
| E 64 | Alert | Internal fault | Please contact after-sales service! |
| E 65 | Error | Internal fault | Please contact after-sales service! |
| E 90 | Alert | Internal fault | Please contact after-sales service! |

Table 10-1  List of error and alert messages  (cont.)
<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Description</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>E 91</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 92</td>
<td>Alert</td>
<td>Radiation warning lamp on the monitor cart defective</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E 93</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E100</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E101</td>
<td>Alert</td>
<td>CD-Recall is selected, fluoroscopy inhibited</td>
<td>Deactivate CD recall under <strong>Configuration Menu → User Settings</strong></td>
</tr>
<tr>
<td>E102</td>
<td>Error</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E105</td>
<td>Alert</td>
<td>Not enough hard disk space available for operation</td>
<td>Delete a protected patient folder after unprotecting it with the key combination <strong>Shift+F4</strong>. Perform a backup of the hard disk as soon as possible and then delete the backed-up patient folders</td>
</tr>
<tr>
<td>E106</td>
<td>Error</td>
<td>Hard disk access error</td>
<td>Please contact after-sales service!</td>
</tr>
<tr>
<td>E151</td>
<td>Alert</td>
<td>Internal fault</td>
<td>Please contact after-sales service!</td>
</tr>
</tbody>
</table>

Table 10-1  List of error and alert messages  (cont.)
## 10.2 What to do if ...

<table>
<thead>
<tr>
<th>Situation</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The monitor screens remain dark for more than approx. 1 min after switching on the system.</td>
<td>• Press the <strong>MENU</strong> key. The LED of the <strong>MENU</strong> key lights up. The memory software is running.</td>
</tr>
<tr>
<td></td>
<td>• Check the voltage supply of the monitors and the video connection. If all of the green LEDs on the monitor chassis plate are lit, the monitor voltage supply and the video connection are O.K.</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>• Check whether the I²C bus cable is connected to the I²C connector (and not to the CRT connector).</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>• Check whether the flat-screen monitors are switched on (small switches on the back of the monitors).</td>
</tr>
<tr>
<td>The monitor screens remain dark for more than approx. 1 min after switching on the system.</td>
<td>• Press the <strong>MENU</strong> key. The LED of the <strong>MENU</strong> key does not light up. The memory software is not running.</td>
</tr>
<tr>
<td></td>
<td>• Check the voltage supply of the image memory module. The main switch may be off.</td>
</tr>
<tr>
<td></td>
<td>or</td>
</tr>
<tr>
<td></td>
<td>• Check the voltage supply and the data cable of the CD writer.</td>
</tr>
</tbody>
</table>

Table 10-2 Troubleshooting
10.3 Failure of the power supply

If the power supply fails, the system switches off automatically. Any unsaved patient data and/or images are lost.

Patient data and images that were saved to hard disk with the save function are preserved even after a power supply failure.

**NOTE**

Save all images that you might need later to hard disk with the save function during operation of the unit.
11 Disassembling the System

11.1 Dismounting the 23" or 24" flat-screen monitors

**NOTICE**
Always wear cotton gloves when installing, testing or making settings on displays or screens.

To dismount the flat-screen monitor from the monitor cart base, do the following:

- Remove the rear cover of the monitor cart base.

- Remove the rear cover of the monitor neck.

- To detach the ground wire from the monitor neck housing (→ Fig. 11-1, p. 11-2), remove nut and washer from the screw, remove the ground wire from the screw, place the washer on the screw again and retighten the nut.

- Unplug the video cable (labeled LM) and the radiation warning lamp cable (cable labeled Xray-Ind, connection labeled X-ray lamp) from the image memory.

- Inside the monitor cart base detach the flat-screen monitor power plug from the power supply unit.

- Pull the following cables from the monitor cart base up into the monitor neck (→ Fig. 11-1, p. 11-2):
  - Video cable (labeled LM)
  - Radiation warning lamp cable (labeled Xray-Ind)
• Pull the ground wire from the monitor neck down into the monitor cart base.

![Cables inside monitor neck and monitor cart base](image)

Fig. 11-1 Cables inside monitor neck and monitor cart base

• Undo the 4 screws M6×16 that attach the flat-screen monitor to the monitor cart base.

**NOTE**
Since the flat-screen monitor will be mounted onto a transport rack, you do not need the screws (M6×16) that held the monitor head to the monitor cart base at this point. Put these screws in the accessories box (→ Ch. 12.5, p. 12-5).

• With the help of a second person, lift the flat-screen monitor off the monitor cart base.

**WARNING**
The flat-screen monitor cannot be lifted by one person alone. Therefore always ask a second person to assist you in lifting the flat-screen monitor off the monitor cart base.

**NOTICE**
Never place the flat-screen monitor directly on some surface, always place them on the transport rack.

• Carefully place the monitor head on the transport rack.
Mount the monitor head to the transport rack using four screws.
Reattach the rear cover of the monitor neck using four screws.
Reattach the rear cover of the monitor cart base.
Inside the monitor cart tape the power plug to the side panel.
11.2 Dismounting the 18.1" flat-screen monitors

To dismount the flat-screen monitors from the monitor cart base, do the following:

- Remove the rear cover of the monitor cart base.
- Remove the rear cover of the flat-screen monitors.
- To disconnect the ground wire from the monitor cart base, remove the nut, withdraw the ground wire from the screw and retighten the nut.
- Unplug the video cables and the radiation warning lamp cable from the image memory module.
- Disconnect the power supply units of the flat-screen monitors from the corresponding connectors for non-heating devices.

![Connections on the flat-screen monitors](image_url)

**NOTICE**
Always wear cotton gloves when installing, testing or making settings on displays or screens.

- Pull the following cables from the monitor cart base up into the monitor housing (→ Fig. 11-4, p. 11-4):
  - 2 video cables (golden)
  - Radiation warning lamp cable
  - Ground wire
- Undo the 4 screws M6×16 that attach the flat-screen monitors to the monitor cart base.

**NOTE**
Since the flat-screen monitors will be mounted onto a transport rack, you do not need the screws (M6×16) that held the monitor head to the monitor cart base at this point. Put these screws in the accessories box (→ Ch. 12.5, p. 12-5).

- With the help of a second person, lift the flat-screen monitors off the monitor cart base.

**WARNING**
The flat-screen monitors cannot be lifted by one person alone. Therefore always ask a second person to assist you in lifting the monitors off the monitor cart base.

**NOTICE**
Never place the flat-screen monitors directly on some surface, always place them on the transport rack.

- Reattach the rear cover of the monitor cart base.
12 Mounting the System on a Pallet

12.1 Safety instructions and information

12.1.1 Safety instructions

WARNING
Only authorized personnel is allowed to pack and unpack the system. Authorized personnel are persons who have attended an appropriate training course provided by the manufacturer.

WARNING
Always observe the general occupational safety and accident prevention regulations!

WARNING
When handling detergents and solvents, strictly observe the safety instructions provided by the respective manufacturer!
12.2 Information

Scope of validity  These instructions apply to the shipment of Ziehm 8000 X-ray systems on pallets. Please pay special attention to the additional information referring to sea transport.

12.3 Environmental conditions

The system must not be exposed to extreme ambient conditions. The following minimum/maximum values must not be exceeded during storage or operation:

Storage/transport:
- Temperature: -5 °C to +55 °C
- Relative air humidity: 20 % - 70 %

Operation:
- Temperature: +15 °C to +35 °C
- Relative air humidity: 70 % max.

**WARNING**
Do not put the system into service at temperatures below 15 °C!

**NOTICE**
Temperatures above 40°C and relative air humidity above 60% may cause stains on the printer’s heat-sensitive paper.
### 12.4 Packing material and contents

#### 12.4.1 Material

<table>
<thead>
<tr>
<th>Article</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pallet</td>
<td>26374</td>
</tr>
<tr>
<td>Transport rack with</td>
<td>66245</td>
</tr>
<tr>
<td>4 screws M10×25 with washers and</td>
<td>56172,</td>
</tr>
<tr>
<td>4 wood screws 10×40</td>
<td>57032</td>
</tr>
<tr>
<td>Steel retaining brackets:</td>
<td>56285</td>
</tr>
<tr>
<td>Retaining bracket 1 with</td>
<td>65827</td>
</tr>
<tr>
<td>2 wood screws 10×40</td>
<td>56285</td>
</tr>
<tr>
<td>2 retaining brackets 2 with</td>
<td>65828</td>
</tr>
<tr>
<td>4 wood screws 10×40</td>
<td>56285</td>
</tr>
<tr>
<td>Retaining bracket 3 with</td>
<td>65829</td>
</tr>
<tr>
<td>2 Allen screws M8×20</td>
<td>56137</td>
</tr>
<tr>
<td>Retaining bracket 4 with</td>
<td>65830</td>
</tr>
<tr>
<td>2 wood screws 10×40</td>
<td>56285</td>
</tr>
<tr>
<td>Rigid foam</td>
<td>26240</td>
</tr>
<tr>
<td>Wooden laths 380mm × 80mm × 60mm with</td>
<td>13112</td>
</tr>
<tr>
<td>rubber strips</td>
<td>54067</td>
</tr>
<tr>
<td>Cardboard box for the pallet</td>
<td>26372</td>
</tr>
<tr>
<td>Cardboard box for accessories</td>
<td>26392</td>
</tr>
<tr>
<td>Bubble wrap</td>
<td></td>
</tr>
<tr>
<td>Foam rubber</td>
<td></td>
</tr>
<tr>
<td><strong>Detergents:</strong></td>
<td></td>
</tr>
<tr>
<td>Bioclean</td>
<td></td>
</tr>
<tr>
<td>Foam-Cleaner</td>
<td></td>
</tr>
<tr>
<td>Nitro solvent</td>
<td></td>
</tr>
<tr>
<td>Styrofoam material</td>
<td></td>
</tr>
</tbody>
</table>

Table 12-1 Packing material
12.4.2 Parts to be packed

- Monitor cart
- C-arm stand
- Flat-screen monitors (monitor head)
- Ramp (for drop shipments)
- Accessories

<table>
<thead>
<tr>
<th>Article</th>
<th>Art. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particle board 740mm × 460mm × 20mm with 4 particle board screws, 80mm long</td>
<td></td>
</tr>
<tr>
<td>Clout nails</td>
<td></td>
</tr>
<tr>
<td>2 boards</td>
<td></td>
</tr>
<tr>
<td>Cross lath</td>
<td></td>
</tr>
<tr>
<td>2 shock watch devices</td>
<td></td>
</tr>
<tr>
<td>Label “Transportkontrolle – Monitored shipment”</td>
<td></td>
</tr>
<tr>
<td>Address label</td>
<td></td>
</tr>
<tr>
<td>Label “Vorsicht Glas” [Glass – Handle With Care]</td>
<td></td>
</tr>
<tr>
<td>Monitors:</td>
<td></td>
</tr>
<tr>
<td>Transport rack for flat-screen monitors with 4 screws M6×12 and 4 wood screws 10×40</td>
<td>6.03364.1 56232 56285</td>
</tr>
</tbody>
</table>

Table 12-1 Packing material (cont.)

Fig. 12-1 Packing material
12.5 How to pack the accessories

To pack the accessories on the pallet, do the following:

- Assemble the cardboard box for the accessories.
- Pad the cardboard box with bubble wrap.
- Place all accessories (→ Ch. 1.3, p. 1-4) inside the cardboard box.
- Close the cardboard box and tape shut it with shipping tape.
- After having mounted the monitor cart, the C-arm stand and the monitor head on the pallet (see Ch. 12.6 and Ch. 12.7), place the accessories box on the pallet as illustrated in Fig. 12-2.

Fig. 12-2 Position of the accessories box on the pallet

- Place a styrofoam block between cardboard box and retaining bracket to prevent the box from moving back and forth.
12.6 Packing the monitor cart

To mount the monitor cart on the pallet, do the following:

- Place the ramp to the short front side of the pallet.

**NOTE**

If you use the ramp supplied with a drop shipment, then attach the ramp to the sides of the pallet using both fixing clamps (→ Fig. 12-3).

- Place a sufficiently dimensioned piece of wrap foil on the pallet.
- Fold the excessive wrap foil to the sides of the pallet.
- Carefully push the monitor cart onto the pallet using a ramp.
Mounting the System on a Pallet

12

12-7

Ziehm 8000

P_26471_CD_28218 - EN-11/05/2009

12

Mounting the System on a Pallet

Fig. 12-5  Monitor cart base without monitor head

- Place a foam rubber block as padding on the pallet and put the monitor cart into the position shown below (→ Fig. 12-6) with the help of a second person.

Fig. 12-5  Monitor cart base without monitor head

Fig. 12-6  Monitor cart lying flat on the pallet

- Tape foam rubber to the cable support (→ Fig. 12-7).

- Wrap the wheels in bubble wrap.

- WARNING

Due to the heavy weight of the monitor cart there is a risk that it will tilt over if not blocked. Therefore never move the unit alone into the position illustrated (→ Fig. 12-6), always ask a second person to assist you!
• Fasten the transport rack at the bottom plate of the monitor cart using the four screws provided for that purpose.

Fig. 12-7 Monitor cart with transport rack attached

• Put the monitor cart back into an upright position with the help of a second person and remove the foam rubber block from the pallet.

• Position the monitor cart on the pallet as illustrated in Fig. 12-8 (at a distance of 180 mm / 80 mm from the pallet edge).

Fig. 12-8 Position of the monitor cart on the pallet

• Attach the transport rack to the pallet using the corresponding wood screws.
USA:
Drill three holes for the round head square neck bolts.
Fasten the transport rack with the corresponding wood screw (from above, because of the pallet stringers) and the round head square neck bolts (from below) to the pallet.

- Clean the monitor cart with Bioclean (n/a for USA).

**NOTE**
At this point, you must interrupt the monitor cart packing procedure and prepare the C-arm stand first (→ p. 12-12), as the C-arm stand needs to be connected to the monitor cart and the monitor cart to the power supply for proper packing (→ Ch. 12.7, p. 12-10).

- Wrap the monitor cart in foam rubber and bubble wrap.
- Attach a styrofoam block (20 mm to 50 mm) on top of the monitor cart.

Fig. 12-9 Wrapped monitor cart
12.7 Packing the C-arm stand

To mount the C-arm stand on the pallet, do the following:

- Carefully push the C-arm stand onto the pallet using a ramp.
- Position the C-arm stand as illustrated in Fig. 12-10.
- Position the C-arm as illustrated in Fig. 12-10.

![Position of the C-arm stand and the C-arm on the pallet](image1)

- Remove the ramp.

**NOTE**

To use the ramp supplied with a drop shipment, do the following:

- Remove the fixing clamps attaching the ramp.
- Hook up the fixing clamps into the drill holes on the pallet provided for that purpose (→ Fig. 12-11).

![Fixing clamp hooked up in the drill holes on the pallet](image2)

- Clean the C-arm stand with Bioclean (n/a for USA).
• Wrap the generator and image intensifier in bubble wrap.

• Jam a 40mm styrofoam block between the image intensifier and the horizontal carriage.

Fig. 12-12  Styrofoam block between image intensifier and horizontal carriage

• Glue the corresponding rubber strips on top of the wooden laths.

• Place the wooden laths below the C-arm stand as illustrated in Fig. 12-13 and Fig. 12-14. Lift the C-arm stand slightly for that purpose.

Fig. 12-13  Position of the wooden laths

Fig. 12-14  C-arm stand with wooden laths placed below
• First place foam rubber and then retaining bracket 1 over the C-arm stand foot as illustrated in Fig. 12-14.

• Place retaining brackets 2 over the laterally protruding feet as illustrated in Fig. 12-15.

• Connect the C-arm stand by means of the coupling cable to the monitor cart.

• Connect the monitor cart to the power supply.

• Switch on the C-arm stand.

**WARNING**

When you press the hand or foot switch, the system starts to emit radiation!

• Press the **Move Up/Down** keys to adjust the vertical position of the C-arm so that retaining bracket 4 can be placed below the C.

• Place retaining bracket 3 over the C-arm so that its feet rest on retaining bracket 4.

• Attach retaining bracket 3 to retaining bracket 4 by means of the corresponding screws, as illustrated in Fig. 12-15.

• Press the **Move Up/Down** keys to adjust the vertical position of the C-arm so that retaining bracket 4 rests on the pallet.

*Fig. 12-15  Retaining brackets 1–4*
12-13 Mounting the System on a Pallet

- Switch off the C-arm stand.
- Disconnect the monitor cart from the power supply.
- Disconnect the C-arm stand from the monitor cart.

**NOTE**
After having disconnected the C-arm stand from the monitor cart, you must finish the monitor cart packing procedure (→ p. 12-9).

- Screw down all retaining brackets using the corresponding screws.
  **USA:**
  Place the small wooden blocks with pre-drilled holes below retaining bracket 2 over the left lateral wheel (→ Fig. 12-16).
  Drill 8 holes for the round head square neck bolts.
  Attach all retaining brackets from below to the pallet using the corresponding round head square neck bolts.

---

Fig. 12-16 Retaining bracket 2 over left lateral wheel for USA
12 Mounting the System on a Pallet

• Wrap the C-arm stand in bubble wrap and pad it with foam rubber and styrofoam material.

• Attach styrofoam material to the C-arm stand as illustrated in Fig. 12-17.

Fig. 12-17 Wrapped C-arm stand

• Jam a foam rubber block between the generator and the monitor cart.

Fig. 12-18 Foam rubber block between generator and monitor cart
12.8 Packing the monitor head

To pack the monitor head, do the following:

- Clean the screen with Foam-Cleaner.
- Wrap the monitor head in bubble wrap (→ Fig. 12-19).

![Monitor head on the transport rack](image)

Fig. 12-19 Monitor head on the transport rack

- Place the transport rack with monitor head on the pallet between monitor cart and C-arm stand (Fig. 12-20).
  - The screws M6×12 that held the monitor head to the monitor cart base are not required at this point. Put them in the accessories box (→ Ch. 1.3, p. 1-4).

![Transport rack with packed monitor head on the pallet](image)

Fig. 12-20 Transport rack with packed monitor head on the pallet
• Attach the styrofoam material on the rear of the monitor head (→ Fig. 12-20).

• Attach the transport rack to the pallet using the corresponding wood screws (→ Fig. 12-21).

USA:

Drill the holes for the round head square neck bolts and attach the transport rack to the pallet using the round head square neck bolts.

Fig. 12-21 Mounted transport rack with packed monitor head
12.9 Packing the ramp

Prerequisites

Before packing the ramp, do the following:

- Fold the wrap foil on the pallet around the system components and heat-seal them but leave a small opening.

- Remove the air from the wrap foil through the opening using vacuum suction.

- Heat-seal the small opening.

- Tape the wrap foil with shipping tape.

To mount the ramp on the pallet, do the following:

- Position the ramp on the pallet as illustrated in Fig. 12-22.

- Position board 1 on the side of the ramp and attach it using two screws (5 × 60 mm) (→ Fig. 12-23).

- Put the big cardboard box over the pallet.

- Attach the cardboard box to the pallet using clout nails.

- Position board 2 between cardboard box and board 1 already attached to the ramp.
12 Mounting the System on a Pallet

12-18 Ziehm 8000

Fig. 12-23 Packing of the ramp

- Attach board 2 to the outside of the cardboard box using three screws (5 × 40 mm) (→ Fig. 12-24).

Fig. 12-24 Attachment of the lateral boards

- Position 3 on the opposite inside of the cardboard box and attach board 3 using three screws (5 × 40 mm) from the outside of the cardboard box.

- Attach board 4 to the boards 2 and 3 using two screws (4 × 40 mm).

- Now continue with the packing procedure of the full pallet not yet performed (→ Ch. 12.10, p. 12-19).
12.10 Packing the full pallet

To complete packing of the full pallet, do the following:

- Fold the wrap foil on the pallet around the system components and heat-seal them but leave a small opening.
- Remove the air from the wrap foil through the opening using vacuum suction.
- Heat-seal the small opening.
- Tape the wrap foil with shipping tape.
- Put the big cardboard box over the pallet.
- Attach the cardboard box to the pallet using clout nails.
12 Mounting the System on a Pallet

- Close the cardboard box and tape shut it with shipping tape.

Fig. 12-27 Closed cardboard box

- Affix one of the shock watch devices on the cardboard box as illustrated, and a second one on the long side of the cardboard box.

Fig. 12-28 Position of the labels on the short side

- Affix a “Transportkontrolle – Monitored shipment” label above each shock watch device on the outside of the cardboard box (→ Fig. 12-28).

- Affix the address label as well as the label “Vorsicht Glas” [Glass – Handle With Care] on the cardboard box as illustrated in Fig. 12-28 and Fig. 12-29.
Secure the cardboard box together with the pallet with plastic straps as illustrated in Fig. 12-28 and Fig. 12-29.
Appendix A

A.1 Manufacturer’s Declaration concerning Electromagnetic Compatibility acc. to IEC 60601-1-2 (Class B)

Guidance and Manufacturer’s Declaration – electromagnetic emissions

The Ziehm 8000, Ziehm Compact and Ziehm Compact Litho are intended for use in the electromagnetic environment specified below. The customer or the user of the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho should assure that the systems are used in such an environment.

<table>
<thead>
<tr>
<th>Emissions tests</th>
<th>Compliance</th>
<th>Electromagnetic environment – guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF emissions acc. to CISPR 11</td>
<td>Group 1</td>
<td>The Ziehm 8000, Ziehm Compact and Ziehm Compact Litho use RF energy only for their internal function. Therefore, their RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.</td>
</tr>
<tr>
<td>RF emissions acc. to CISPR 11</td>
<td>Class B</td>
<td>The Ziehm 8000, Ziehm Compact and Ziehm Compact Litho are suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.</td>
</tr>
<tr>
<td>Harmonic emissions acc. to IEC 61000-3-2</td>
<td>Class A</td>
<td></td>
</tr>
<tr>
<td>Voltage fluctuations/ f flicker emissions acc. to IEC 61000-3-3</td>
<td>Complies</td>
<td></td>
</tr>
</tbody>
</table>

Table A-1 Guidance and Manufacturer’s Declaration – electromagnetic emissions
Guidance and Manufacturer's Declaration – electromagnetic immunity

The Ziehm 8000, Ziehm Compact and Ziehm Compact Litho are intended for use in the electromagnetic environment specified below. The customer or the user of the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho should assure that the systems are used in such an environment.

<table>
<thead>
<tr>
<th>Immunity tests</th>
<th>IEC 60601 test level</th>
<th>Compliance level</th>
<th>Electromagnetic environment – guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic discharge (ESD) acc. to IEC 61000-4-2</td>
<td>± 6 kV contact discharge</td>
<td>± 6 kV contact discharge</td>
<td>Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.</td>
</tr>
<tr>
<td></td>
<td>± 8 kV air discharge</td>
<td>± 8 kV air discharge</td>
<td></td>
</tr>
<tr>
<td>Electrical fast transient/burst acc. to IEC 61000-4-4</td>
<td>± 2 kV for power supply lines</td>
<td>± 2 kV for power supply lines</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>± 1 kV for input/ output lines</td>
<td>± 1 kV for input/ output lines</td>
<td></td>
</tr>
<tr>
<td>Surge acc. to IEC 61000-4-5</td>
<td>± 1 kV differential mode</td>
<td>± 1 kV differential mode</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>± 2 kV common mode</td>
<td>± 2 kV common mode</td>
<td></td>
</tr>
<tr>
<td>Voltage dips, short interruptions, and voltage variations on power supply input lines acc. to IEC 61000-4-11</td>
<td>&lt; 5% $U_T$ for 0.5 cycle (&gt; 95% dip)</td>
<td>&lt; 5% $U_T$ for 0.5 cycle (&gt; 95% dip)</td>
<td>Mains power quality should be that of a typical commercial or hospital environment.</td>
</tr>
<tr>
<td></td>
<td>40% $U_T$ for 5 cycles (60% dip)</td>
<td>40% $U_T$ for 5 cycles (60% dip)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70% $U_T$ for 25 cycles (30% dip)</td>
<td>70% $U_T$ for 25 cycles (30% dip)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt; 5% $U_T$ for 5 s (&gt; 95% dip)</td>
<td>&lt; 5% $U_T$ for 5 s (&gt; 95% dip)</td>
<td></td>
</tr>
<tr>
<td>Power frequency (50/60 Hz) magnetic field acc. to IEC 61000-4-8</td>
<td>3 V/m</td>
<td>3 V/m</td>
<td>Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.</td>
</tr>
</tbody>
</table>

NOTE: $U_T$ is the AC mains voltage prior to application of the test level

Table A-2 Guidance and Manufacturer’s Declaration – electromagnetic immunity
Guidance and Manufacturer’s Declaration – electromagnetic immunity

The Ziehm 8000, Ziehm Compact and Ziehm Compact Litho are intended for use in the electromagnetic environment specified below. The customer or the user of the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho should assure that the systems are used in such an environment.

<table>
<thead>
<tr>
<th>Immunity tests</th>
<th>IEC 60601 test level</th>
<th>Compliance level</th>
<th>Electromagnetic environment – guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portable and mobile RF communications equipment should be used no closer to the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance:</td>
<td>3 Vrms</td>
<td>d = 1.2 × SQRT(P)</td>
<td></td>
</tr>
<tr>
<td>Conducted RF disturbances acc. to IEC 61000-4-6</td>
<td>3 Vrms</td>
<td>150 kHz to 80 MHz</td>
<td>d = 1.2 × SQRT(P)</td>
</tr>
<tr>
<td>Radiated RF disturbances acc. to IEC 61000-4-3</td>
<td>3 V/m</td>
<td>80 MHz to 2.5 GHz</td>
<td>d = 2.3 × SQRT(P)</td>
</tr>
<tr>
<td></td>
<td>3 V/m</td>
<td>80 MHz to 2.800 MHz</td>
<td></td>
</tr>
</tbody>
</table>

Table A-3  Guidance and Manufacturer’s Declaration – electromagnetic immunity
where $P$ is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and $d$ is the recommended separation distance in meters (m).

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range.

Interference may occur in the vicinity of equipment marked with the following symbol:

**NOTE 1:** At 80 MHz and 800 MHz, the higher frequency range applies.

**NOTE 2:** These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

---

**a** Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho are used exceeds the applicable RF compliance level above, the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho.

**b** Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

---

<table>
<thead>
<tr>
<th>Immunity tests</th>
<th>IEC 60601 test level</th>
<th>Compliance level</th>
<th>Electromagnetic environment – guidance</th>
</tr>
</thead>
</table>

Table A-3  Guidance and Manufacturer’s Declaration – electromagnetic immunity (cont.)
Appendix A

Recommended separation distances between portable and mobile RF communications equipment and the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho

The Ziehm 8000, Ziehm Compact and Ziehm Compact Litho are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho as recommended below, according to the maximum output power of the communications equipment.

<table>
<thead>
<tr>
<th>Rated maximum output power of transmitter W</th>
<th>Separation distance according to frequency of transmitter m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150 kHz to 80 MHz d = 1.2 × SQRT(P)</td>
</tr>
<tr>
<td></td>
<td>80 MHz to 800 MHz d = 1.2 × SQRT(P)</td>
</tr>
<tr>
<td></td>
<td>800 MHz to 2.5 GHz d = 2,3 × SQRT(P)</td>
</tr>
<tr>
<td>0,01</td>
<td>0,12 0,12 0,23</td>
</tr>
<tr>
<td>0,1</td>
<td>0,38 0,38 0,73</td>
</tr>
<tr>
<td>1</td>
<td>1,2 1,2 2,3</td>
</tr>
<tr>
<td>10</td>
<td>3,8 3,8 7,3</td>
</tr>
<tr>
<td>100</td>
<td>12 12 23</td>
</tr>
</tbody>
</table>

For transmitters rated at a maximum output power not listed in the above table, the distance can be determined using the equation in the respective column header, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1: An additional factor of 10/3 is used in calculating the recommended separation distance for transmitters in the frequency range 80 MHz to 2.5 GHz to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas.

NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Table A-4   Recommended separation distances between portable and mobile RF communications equipment and the Ziehm 8000, Ziehm Compact or Ziehm Compact Litho
# Index

## A
- Accessories 1-4, 12-4
- Alphanumeric keys 6-26, 6-32
- Authorized personnel 12-1
- Autotransfer 6-3

## B
- Backup to CD
  - Data retrieval from CD 6-5
- Basic settings 6-7
  - Entering the hospital data 6-8
  - Erasing storage media 6-8
  - Selecting the live screen 6-7
  - Setting system time and system date 6-7

## C
- Cables
  - Power cable 4-9
- C-arm stand
  - Dimensions 7-9
  - Dimensions of C-arm stand with lower C-arm position 7-10
  - Illustration 4-8
  - Mounting on the pallet 12-10
  - Position on the pallet 12-10
  - Unpacking 3-6
  - Weight 7-4
- CD recall 6-5
- Cine loop
  - Frame rate 6-5
  - Length 6-5
- CO₂ 6-4, 6-32
  - Default windowing values 6-32
  - Filter settings 6-31
- Configuration 6-2
- Configuration Menu 6-2
- Crosshair 6-4

## D
- Deleting
  - Hard disk 6-8
  - NO NAME folder 6-8
  - USB stick 6-8
- DICOM
  - DICOM format 6-6
  - Settings 6-33
- Dimensions
  - C-arm stand 7-9
  - C-arm stand with lower C-arm position 7-10
  - Monitor cart with flat-screen monitors 7-11, 7-12
  - Tolerances of C-arm movements on systems with 23 cm i.i. 7-10
  - Ziehm Compact 7-12
  - Ziehm Compact Litho 7-13
- Displays
  - Dose display 5-2
  - Temperature symbol 5-1, 10-2
  - X-ray symbol 5-1
- Dose display 5-2
  - Reset 5-2
- Dose meter
  - Technical Data 7-6
- DSA
  - Showing or hiding the native image 6-6
- DSA + Cine 6-5
- DSA native image 6-6

## E
- Edge filter 6-28, 6-29, 6-31, 6-32
- Environmental compatibility 1-1
- Environmental conditions
  - Operation 7-3
  - Storage 7-3
Index

F

F (key) 6-4
Filter settings
  Edge filter 6-28, 6-29, 6-31, 6-32
  Recursive filter 6-28, 6-29, 6-31
  Stack filter 6-28, 6-29, 6-31, 6-32
  Stack filter for continuous pulse 6-30
  Stack filter for snapshot 6-30
  Windowing step 6-29, 6-30
First power-up of the system 5-1
Flat-screen monitors 7-12
  Dimensions of monitor cart 7-11, 7-12
  Unpacking 3-6
Focal spot position 7-8

H

Hospital data
  Department 6-8
  Hospital name 6-8
  Physician 6-8

I

Illustrations
  C-arm stand 4-8
Image swapping
  Automatic 6-3

K

Key ‘F’ 6-4
Key ‘MENU’ 6-2
Key ‘min’ 5-2
Key ‘OFF’ 5-1
Key ‘ON’ 5-1
Keys
  Alphanumeric keys 6-26, 6-32

L

Laser
  Laser Class 2-5
  Laser positioning device 2-6
  Laser radiation 7-5
  Technical Data 7-5
Live screen 6-7

M

Maintenance schedule
  Electrics 8-2
  Mechanics 8-4
Material 12-3
  MENU (key) 6-2
  Menus
    Configuration Menu 6-2
    min (key) 5-2
  Monitor cart
    Dimensions flat-screen monitors 7-11, 7-12
    Mounting on the pallet 12-6
    Position on the pallet 12-8
    Unpacking 3-8
    Weight 7-4
  Monitor cart with flat-screen monitors 7-11
  Monitor head
    Packing 12-15
    Motion blurring 6-4, 6-29
    MSA
      Showing or hiding the native image 6-6

N

Noise in the image 6-29
Noise suppression 6-29

O

OFF (key) 5-1
ON (key) 5-1
Operation settings 6-3
  Activating automatic image swapping 6-3
  Combining DSA with a cine loop 6-5
Index

P

Packing material 12-3
Pallet
  Mounting the C-arm stand 12-10
  Mounting the monitor cart 12-6
  Packing 12-19
  Position of the accessories box 12-5
  Position of the C-arm stand 12-10
  Position of the monitor cart 12-8
  Unpacking 3-1, 3-3
  Unpacking the C-arm stand 3-6
  Unpacking the monitor cart 3-8
Parts to be packed 12-4
Personnel, authorized 12-1
Power cable 4-9
Power plug
  Specification 7-5
Printer media
  Paper 2-6, 7-4
Protective grounding 2-4
Putting the system into service
  Assembling the system 3-1, 4-1
  Unpacking the system 3-1, 4-1

R

Radiation protection
  Laser radiation 2-5
  X-rays 2-2
Recursive filter 6-4, 6-28, 6-29, 6-31
Reset
  Dose display 5-2
RSA
  Showing or hiding the native image 6-6

S

Safety instructions 12-1
  Definition 1-3
  Electromagnetic compatibility 2-4
  Equipotential grounding 2-4
  Laser radiation 2-5
  Protective grounding 2-4
  System failure 2-7
  X-rays 2-2
Scope of validity 12-2
Screen settings
  23" flat-screen monitor 6-9
  Flat-screen monitors 6-10
Service life 1-1
Service settings 6-25
  DICOM settings 6-33
  Filter factors 6-27
  HEDIS data 6-57
  Software update 6-58
  Step windowing 6-26
  System settings 6-54
  Windowing settings for subtraction modes 6-32
Settings 6-2
  software version 1-1
Stack filter 6-28, 6-29, 6-31, 6-32
  For continuous pulse 6-30
  For snapshot 6-30
Step windowing
  Activating 6-26
  Default windowing step after power-up 6-30
  Defining windowing steps 6-26
Storage formats
  DICOM 6-6
  Selecting 6-6
  TIFF 6-6
Switching off 5-1
Switching on 5-1
System date 6-7
System time 6-7

T

Technical Data
  Dose meter 7-6
  Generator 7-2
  Image intensifier 7-2
  Laser 7-5
Index

Monitors 7-2
Temperature symbol 5-1, 10-2
Typographical conventions 1-2

U

Unpacking the system 3-1, 4-1

W

Weight
  C-arm stand 7-4
  Monitor cart 7-4
  Ziehm Compact 7-4
Windowing
  Default values for CO2 6-32
  Default values for DSA 6-32
  Default values for MSA 6-32
  Default values for RSA 6-32

X

X-ray symbol 5-1

Z

Ziehm Compact
  Cable connections 4-9
  Dimensions 7-12
  Weight 7-4
Ziehm Compact Litho
  Dimensions 7-13