



# **Pre-Installation Manual**

for Installing the  
Patient Positioning System

**LAP "Dorado CT-4-3"**

identical to LAP PatPos CT-1-3

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**NOTE:**

This pre-installation manual is protected by copyright.

It is only made available to you and those individuals and companies that are involved in the installation of the Dorado CT-4-3-System for personal use and appropriate information purposes.

It may not be given to third parties.

## 1. Introduction

### 1.1 General Remarks

Dear Customer:

Having ordered a LAP Dorado CT-4-3 Patient Positioning System, you will receive a branded product.

The ideal positioning and functional integration of the components of a laser-based patient positioning system depends mainly on the room situation.

**We strongly advise you to adhere to the guidelines contained in this manual in order to ensure the proper functioning of all components and a trouble-free installation.**

To optimise the installation of your LAP-Laser System we require the following from you (for details see Chapter 4):

- short-term, an accurate scale drawing of the room which shows the exact position of the machine and other installed components, as well as
- on completion of all structural preparation, no later than 7 days prior to start of installation, a written installation qualification form should be completed.

Please understand that in such cases there will be an additional charge, in accordance with the agreed rates, for additional travel costs or costs incurred by delays.

## **1.2 If you have any further questions ...**

If you have any further questions, please do not hesitate to contact us, the manufacturers:



**LAP of America**  
1710 Costa del Sol  
Boca Raton, FL 33432

**Phone:** 561 416 9250

**FAX::** 561 416 9263

**eMail:** [america@lap-laser.com](mailto:america@lap-laser.com)

**Internet:** [www.lap-laser.com](http://www.lap-laser.com)

## **1.3 Who can we contact?**

Please provide us with all relevant details (**work address, department, phone, mobile, eMail** etc.) of the persons involved in the project, to ensure effective communication between you and us, for example:

- project manager
- physicist
- doctor
- architect
- planning office
- construction site manager
- facilities manager
- mailing address (Dept./Building).

Thank you very much.

## 2. Function of the Dorado CT-4-3 Laser System

### 2.1 Principle

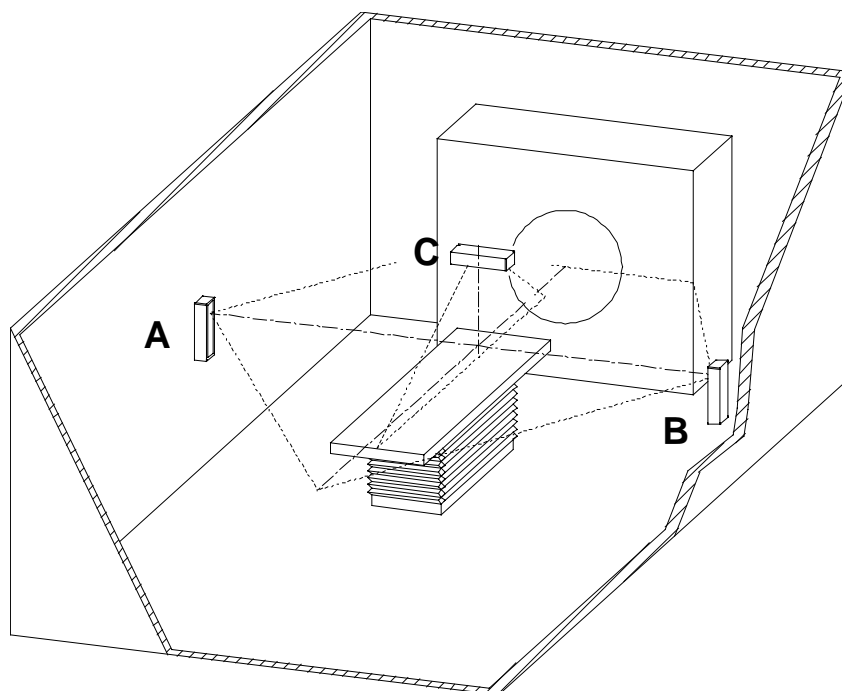
The fast and reproducible positioning of patients is of major importance in modern radiation oncology to ensure an accurate and dosage of radiation.

Precise and reproducible positioning is achieved by projecting fine coordinate planes onto the body of the patient.

Our Dorado CT-4-3 Laser System fulfils the following essential functions:

- Projection of the virtual isocenter with 3 marking lasers above the couch, typically 500 mm in front of the scan plane.
- Marking the patient in zero position of all lasers for reproducible positioning during further treatment.
- Reproducible marking of the necessary treatment fields on the patient, in conjunction with a RTP system connected via a network.

Our LAP IsoMark Software, which offers automated movement to the positions transferred and also records them, is included with the Dorado CT-4-3 Laser System.



**Positioning of the lateral (A,B) and overhead (C) devices of a Dorado CT-4-3-Patient Positioning System**

## 2.2 General Remarks



### Caution!

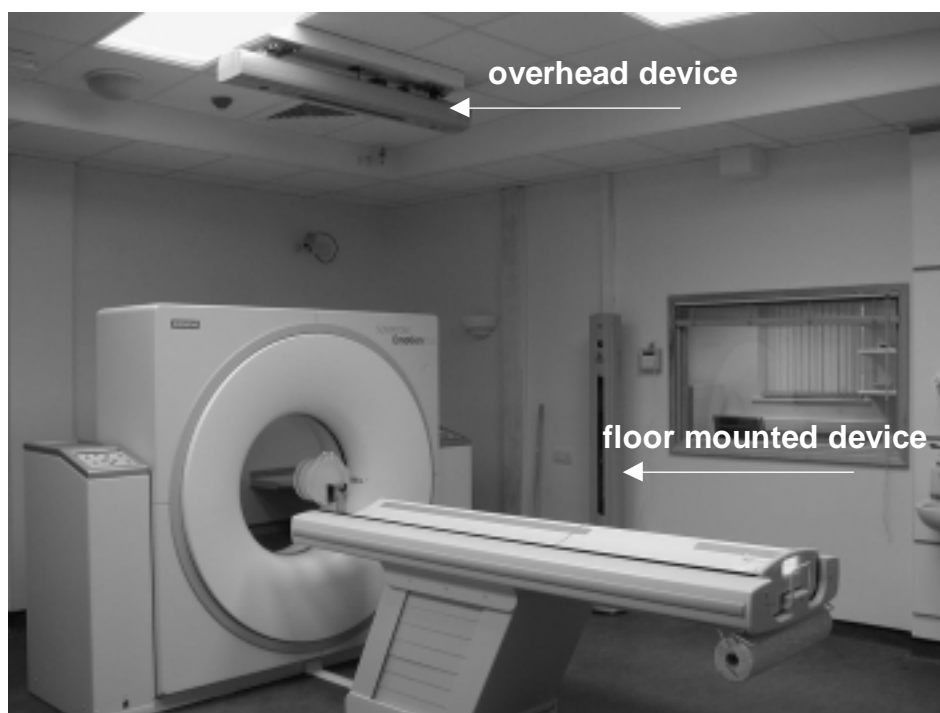
A Dorado CT-4-3-System usually consists of three separate laser devices: two lateral devices A,B (usually these are 2 floor mounted devices (Model: Dorado CT-1 "POST")) and one overhead device C. Each device comprises a movable and a fixed laser.

Instead of floor mounted devices, wall mounted devices (Model: Dorado CT-4-3 "WALL") can be supplied on request. However, these cannot be mounted on vibration free walls which cover for example the required radiation shielding, or on other unstable fixtures or fittings.

In the case of special room requirements, it is possible to integrate all devices in a closed free-standing housing (Model: Dorado CT-4-3 "BRIDGE").

Combinations of lateral lasers from Dorado CT-4-3 "POST" and CT-4-3 "WALL" can be supplied as required.

The following figures show examples of different Dorado CT-4-3 Systems.

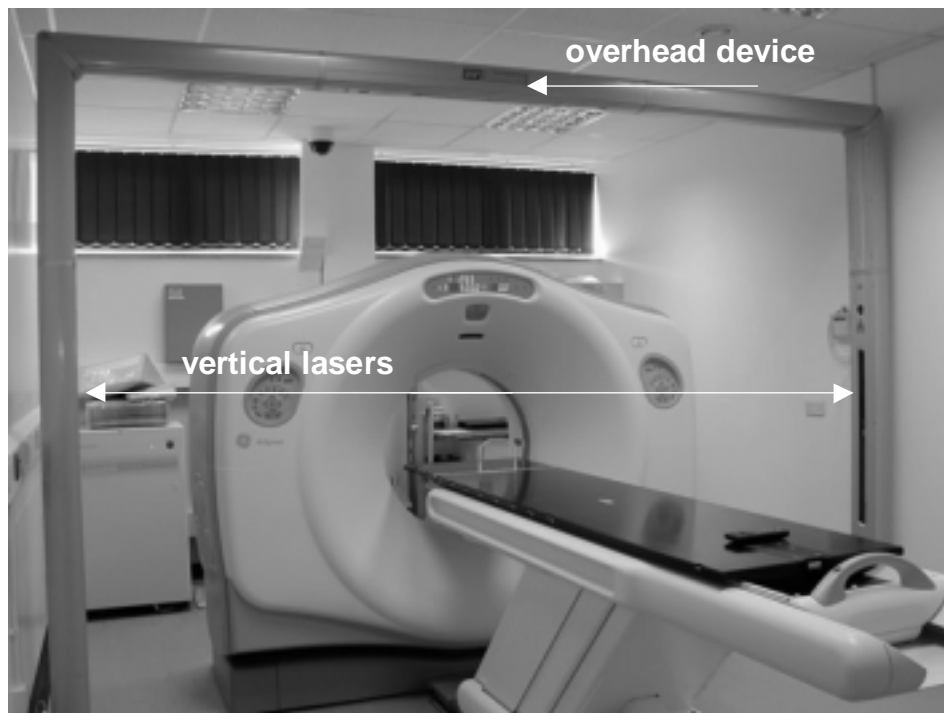


Example of a Dorado CT-4-3 "POST" System



wall mounted device  
(vertical laser)

Example of a Dorado CT-4-3 "WALL" System



Example of a Dorado CT-4-3 "BRIDGE" System

### 3. Components and Technical Specification

#### 3.1 Components of the Dorado CT-4-3 System

The standard version (Dorado CT-4-3 "POST") consists of:

- 1 overhead moving laser to project the sagittal line (X-axis) and a fixed laser for the transverse line (Y-axis), also see Chapter 3.3: System and Installation Diagram, pos. 3.
- 2 lateral lasers each with a vertically movable laser to produce the horizontal line ( $Z_A$ -axis and  $Z_B$ -axis) as well as one fixed laser each for the transverse line (Y-axis), also see Chapter 3.3: System and Installation Diagram, pos. 1 and 2.
- 1 hand terminal (keypad), also see Chapter 3.3: System and Installation Diagram, pos. 4.
- 1 set of cables:
  - 2 connection cables RS485 at 15 m each
  - 1 connecting cable for keypad, 10 m
  - 1 PC-cable with RS 232/485 adapter, 15 m
  - 1 Isolator
- 1 IR remote control
- 1 terminator for the RS485 network when the keypad is not in use (not necessary during operation)
- mounting plates to fasten the device (mounted to the device)
- 1 Wilke phantom
- 1 PC with IsoMark Software, also see Chapter 3.3: System and Installation Diagram, pos. 5., consisting of:
  - mini-tower housing,
  - 15"-TFT monitor,
  - mouse and keypad,
  - operating system: Windows 2000/XP (registered trademark of the Microsoft Corporation).

### 3.2 *Technical Specification*

#### LAP Dorado CT-4-3 System

<b>Laser modules</b>	<b>red</b>	<b>green*</b>
Laser type	Diode	DPSS
Wave length	635 nm	532 nm
Power output	≤ 1 mW	≤ 1 mW
Laser class	2	2
Line width (focusable)	<1 mm, distance up to 4 m	
Drift	not measurable	

#### Laser rails

Travel	600 mm (range –300 to + 300 mm)
Moving speed to fixed positions	> 100 mm/s
Manually adjustable	0,2-100 mm/s
Positioning accuracy of the laser rail with laser	+/- 0,25 mm
Projection accuracy of the laser line	+/- 0.5 mm at 4 m distance
Lateral range of adjustment of fixed laser module	± 15 mm
Power supply	100-250 VAC / 24 VDC auto-switching
Total power requirement individual device	max. 60 Watt
Total power requirement "BRIDGE"	max. 180 Watt
Protection class	IP 20

#### Interfaces

- to link several laser rail systems with keypad and micro processor control                      RS485
- for servicing purposes                      RS232

\* **NOTE:** Green laser devices are equipped with active fans. There must be no heat sources near the air intake grilles.

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**Generating the laser lines:**

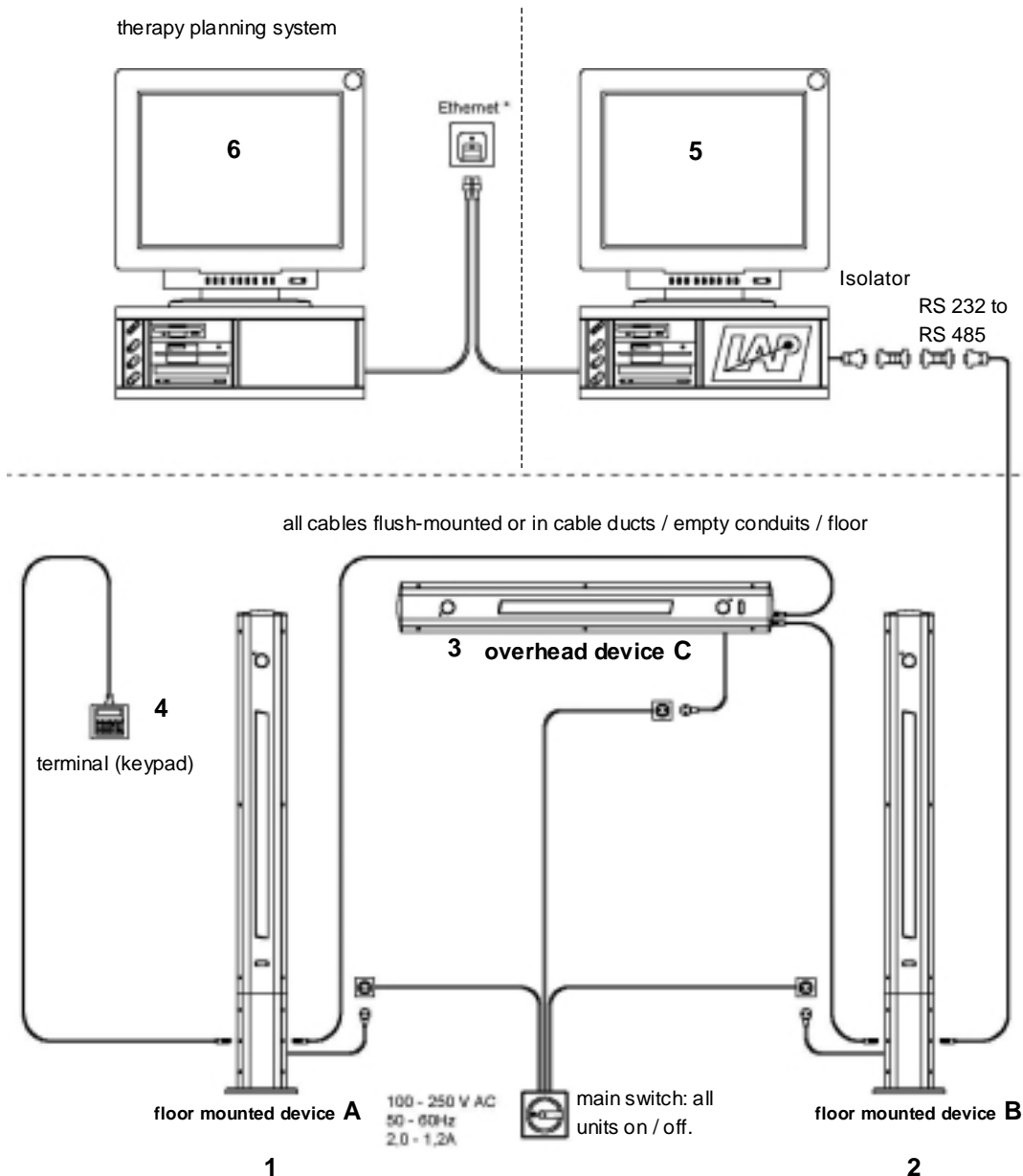
**Sagittal line (X-axis):** Movable sagittal overhead laser left and right of the longitudinal axis of the couch.

**Horizontal line(s) (Z-axis):** Coronal lasers in floor or wall mounted device.

**Transverse line (Y-axis):** Axial laser is generated from the overhead fixed laser and the fixed lasers in the two floor or wall mounted devices.

### 3.3 System and Installation Diagram

The following diagram shows the components of a Dorado CT-4-3 "POST" System and the required connections between the laser devices and the control room.



#### System and Installation Diagram Dorado CT-1-3 POST

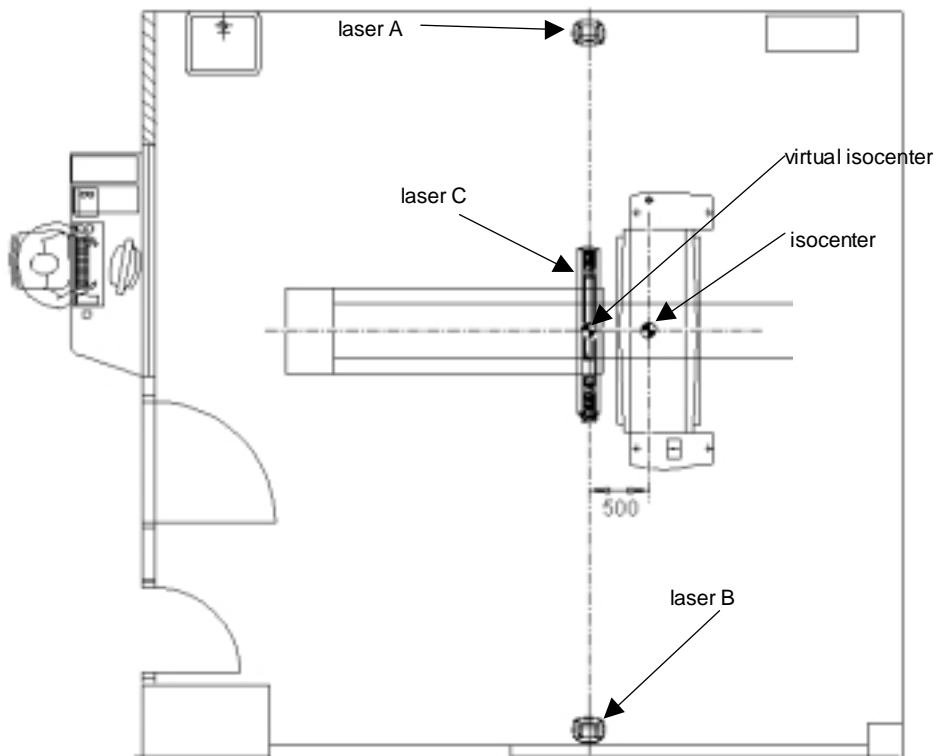
- |                                    |   |
|------------------------------------|---|
| 1: floor mounted device A (left*)  | 4: hand terminal (keypad)                                 |
| 2: floor mounted device B (right*) | 5: PC with IsoMark Software                               |
| 3: overhead device C               | 6: therapy planning system (RTP)<br>(not supplied by LAP) |

\* line of sight from the foot of the couch to the gantry

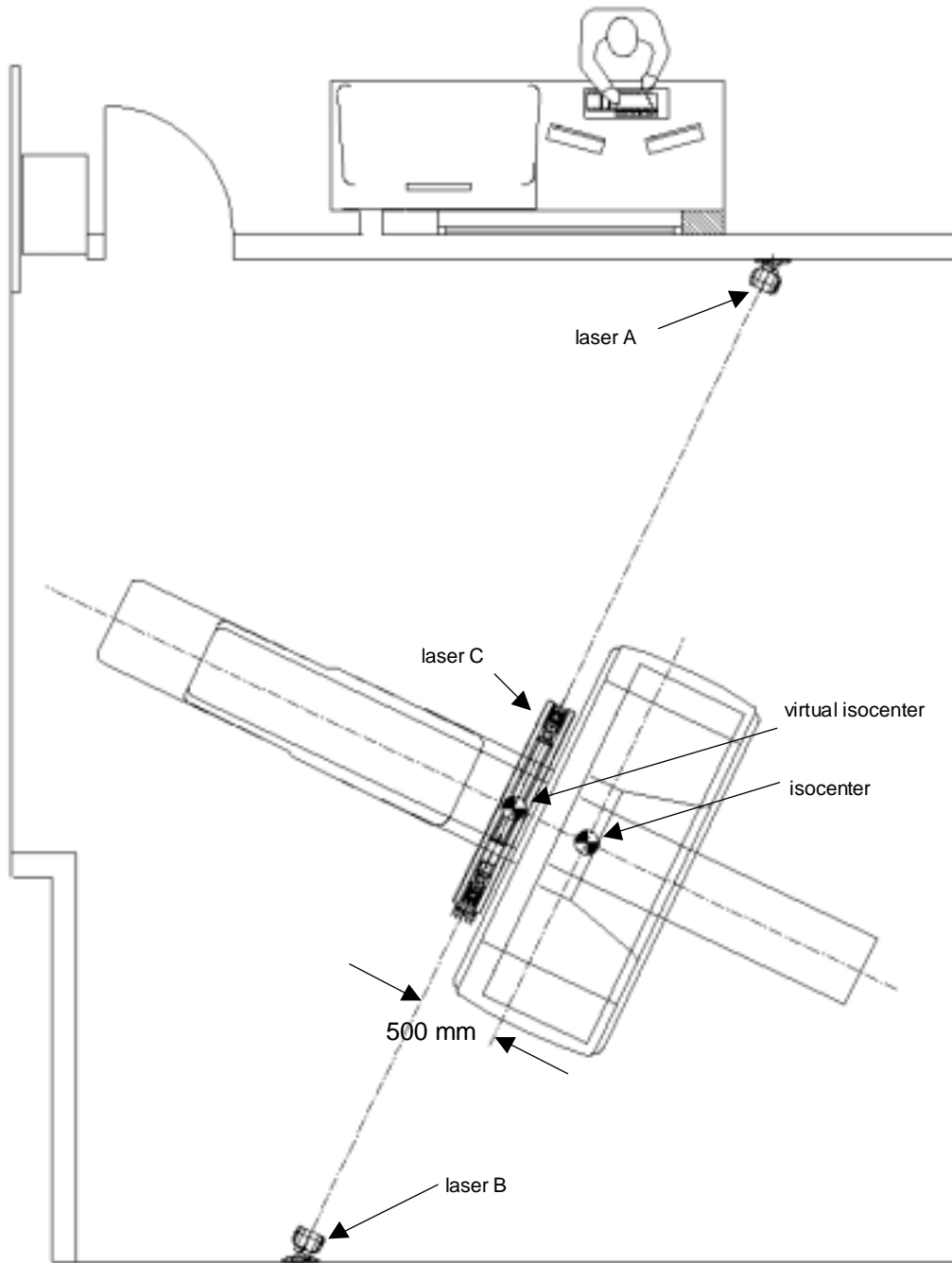
### 3.4 Remarks on special room situations

The following figures show how Dorado CT-4-3 Systems with floor mounted devices and wall mounted devices as well as the "BRIDGE" model can be positioned.

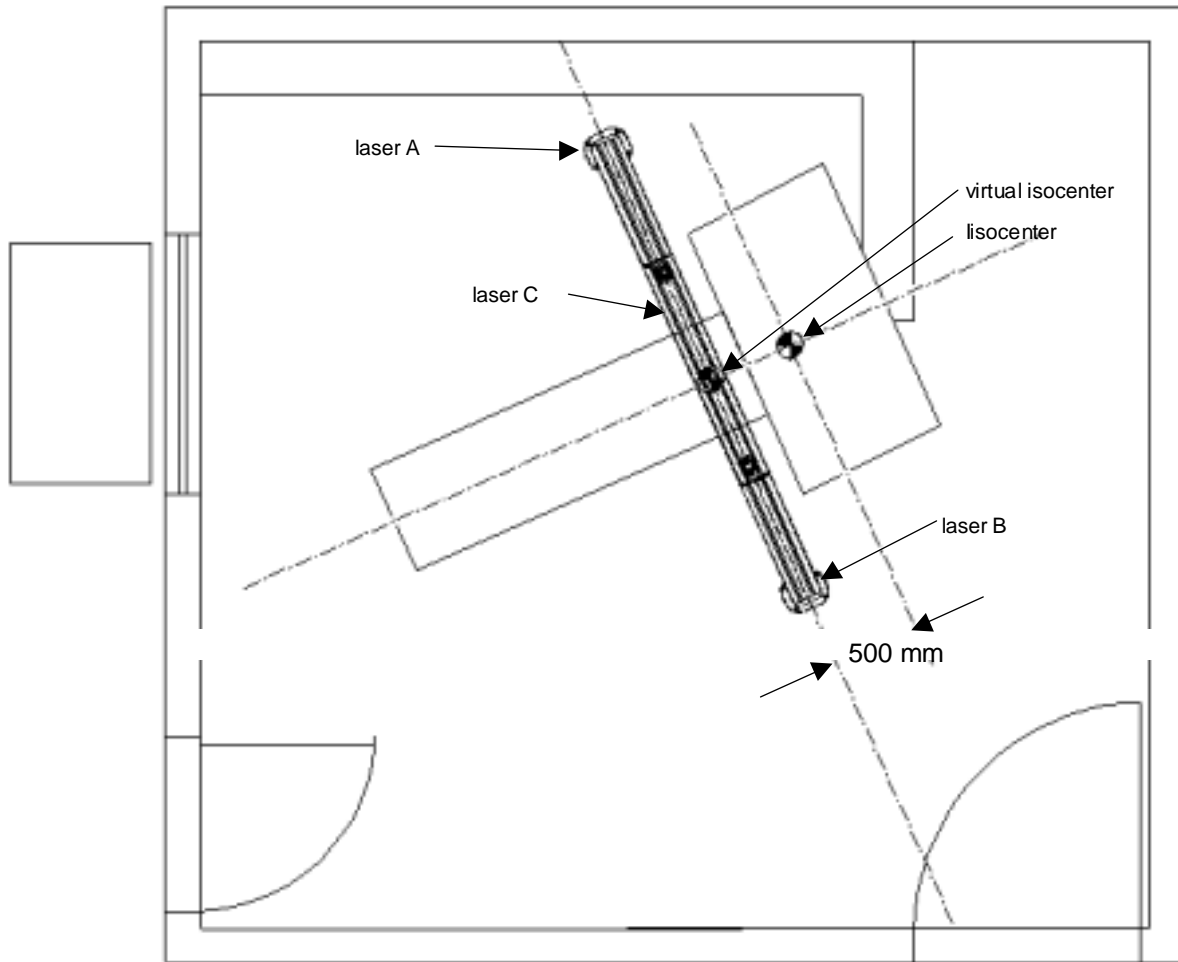
It can be seen that the optimum solution can be found even in the case of more difficult room situations.



**Example installation Dorado CT-4-3 "POST"**



**Example installation Dorado CT-4-3 "WALL"**



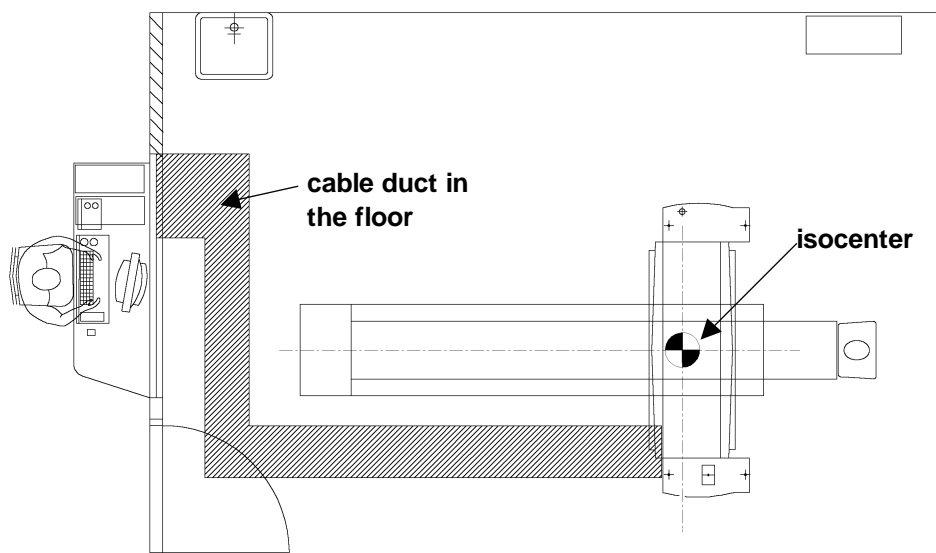
**Example installation Dorado CT-4-3 "BRIDGE"**

## 4. Room requirements

### Preparing a scale drawing of the installation room

In order to determine the optimum mounting positions for your LAP Laser System and to produce solutions in the case of difficult room situations, we always need an **accurate scale drawing** of the installation room **prior to start of production**, if possible as a file in DXF or DWG format (ACAD < version 14).

The following figure shows an example of a drawing



**Example of an installation drawing**

The drawing must provide at least the following information:

- the exact position of the machine in the room and the position of the isocenter,
- the position of doors, windows and changing cubicles,
- **all** fixtures and fittings on, in and behind walls, such as cupboards, sinks, cable, and air-conditioning ducts in the ceiling and floor (in particular raised floor) as well as radiators, pipes etc.,
- the composition and material of the walls, the ceiling and the floor,
- the exact height of the room (in the case of a suspended ceiling, the distance from the solid ceiling to the lower edge of the false ceiling is also required),
- the exact type and composition of the ceiling directly above the machine, in particular in the case of false ceilings.

**NOTE:**

We must be informed without delay of any changes to the room (position of the machine, isocenter, room dimensions, supply pipes etc.) which take place after submission of your accurate scale drawings.

If additional expenditure is incurred or if an extra visit to your facility is required due to changes of which we were not informed beforehand, additional costs maybe incurred.

Such additional expenditure may also be incurred if the position of the machine - and as a consequence the position of the isocenter - is changed during installation.

## 5. Different installation types

The following describes the different installation types of the Dorado CT-4-3 System. Each type is ideally suited for certain room situations. With the following information you will be able to pre-select the installation type which is most likely the best solution for your room situation.

For all installation types, it should be noted

- that the virtual isocenter usually lies 500 mm IN FRONT OF the isocenter/the scan plane of the machine and
- that all lasers must be level with the same plane of the virtual isocenter.

**NOTE:**

If the lasers cannot be installed in the same plane, the overhead device can be equipped with two fixed modules. In this case the fixed modules in the lateral lasers will be omitted.

If you have any questions please contact our installation specialists.

### 5.1 Lateral Lasers

(also see Chapter 3.3: System and Installation Diagram, pos. 1 and 2).

The lateral lasers are available as floor mounted lasers (Model: "POST"), as wall mounted lasers (Model: "WALL") or in combination with the overhead device, as a bridge version (Model: "BRIDGE").

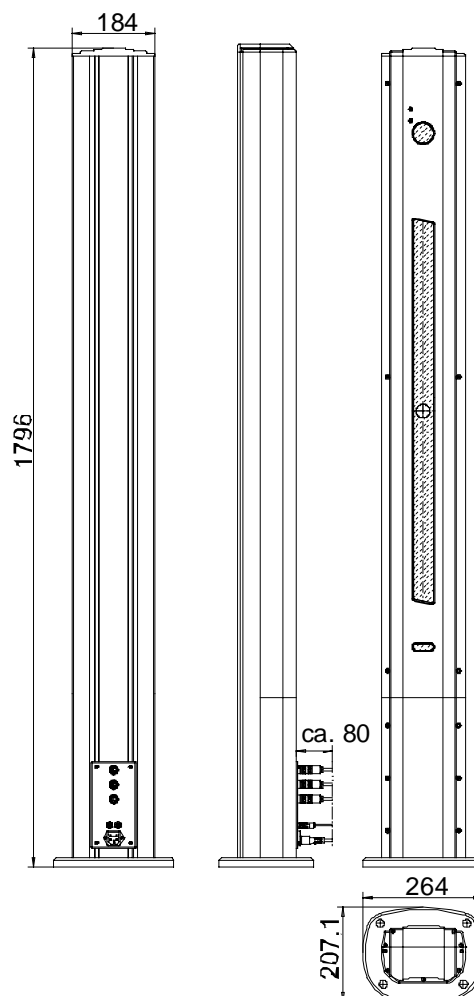
### 5.1.1 Example: Floor mounted devices (Model: "POST")

#### Housing Floor Mounted Laser Device

Material:  
aluminium/steel

Dimensions  
(length x width x depth):  
1.796 x 184\* x 127\*  
mm  
(\*:without foot plate,  
otherwise 264 x 207)

Weight: 30 kg



#### Housing of floor mounted laser device

#### Notes and installation requirements for floor mounted devices

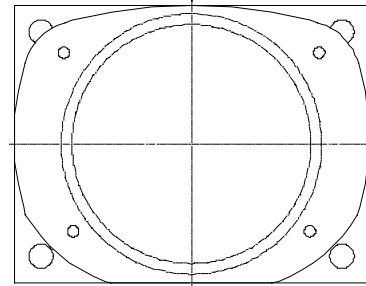
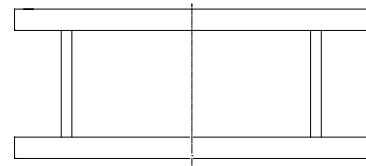
We usually use floor mounted devices for the lateral devices as most CT-rooms are not equipped with vibration free walls.

A smooth horizontal concrete floor is a necessary requirement for installing floor mounted devices.

#### Important:

Floor mounted laser devices cannot be mounted on cable ducts in the floor.

In the case of double floors, either a solid concrete installation-base must be built or a **steel base**.



**Steel base for floor mounted devices and bridge installation in the case of double floors**

If supply pipes/ducts run through the floor, these must be built over, e.g. by a traverse.

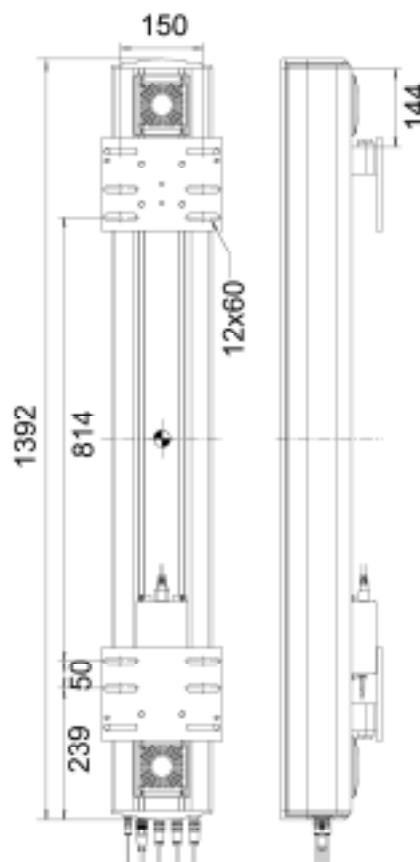
### 5.1.2 Example: Wall mounted devices (Model: "WALL")

#### Housing wall mounted device

Material:  
aluminium/steel

Dimensions  
(length x width x depth):  
1.392 x 184 x 183\* mm  
(\*: incl. wall bracket)

Weight:  
26 kg



#### Housing of wall mounted device

#### Notes and installation requirements for wall mounted devices

Wall mounted devices can be used in the case of solid walls. The swivel mounting also allows the use of wall mounted devices, if the machine is positioned diagonally across the room.

Please note:

There must be no switches, sockets or supply pipes in or on the wall within 200 mm to the left and right of the central axis of the devices.

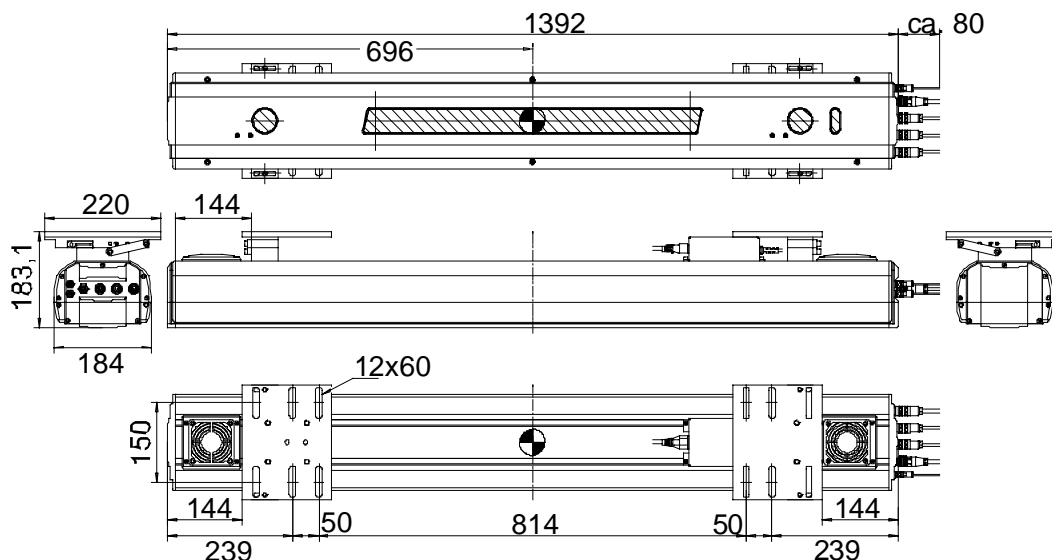
## 5.2 Overhead device

(also see Chapter 3.3: System and Installation Diagram, pos. 3).

The overhead devices are identical with the wall mounted devices and can either be mounted directly on the solid ceiling, or in the case of an false ceiling using two parallel pieces of 48" P1000 Unistrut centered on isocenter offset 500mm (see drawings).

### 5.2.1 Direct installation of the overhead device

The overhead device is (usually) mounted on the ceiling at right angles to the couch, at a centre distance of typically 500 mm in front of the scan plane, using two mounting plates (also see Chapter 2.1).



#### Installation of overhead device

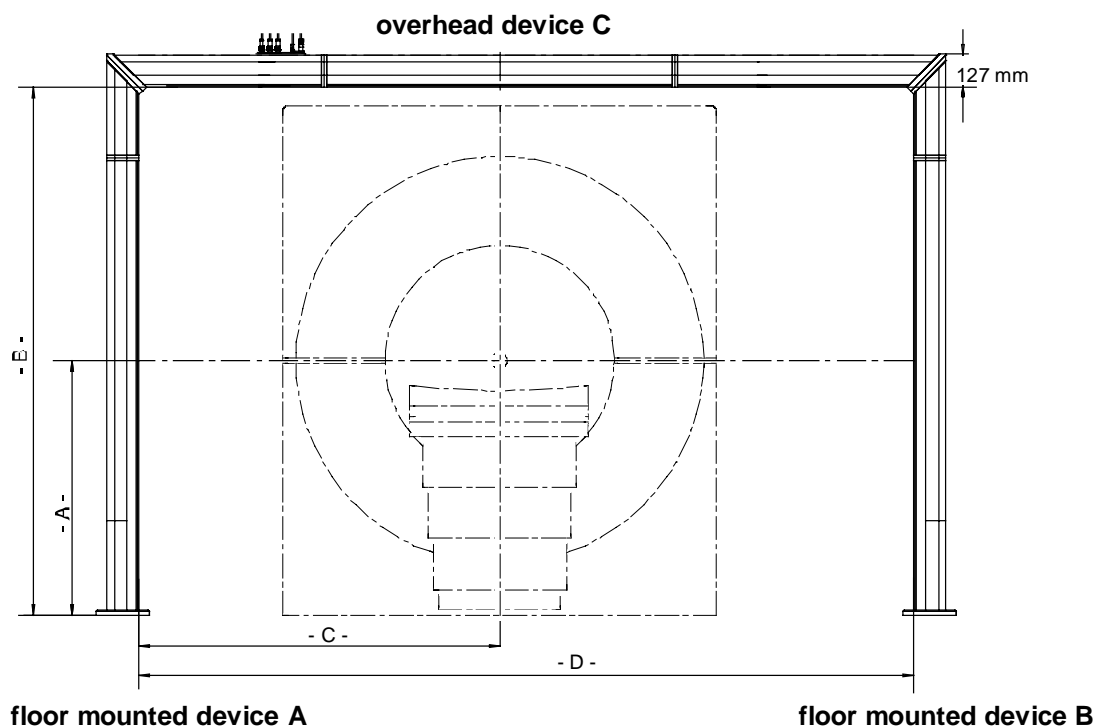
#### Notes and installation requirements for overhead devices without braced support system

Overhead devices can be mounted directly - that is without a braced support system - if there is no false ceiling. However, there must be no supply pipes or other fixtures and fittings within 200 mm to the left and right of the central axis of the overhead device. Sockets are on the right (line of sight gantry).

### 5.3 Bridge

For the installation model "BRIDGE", the floor mounted devices and the overhead device are combined in a bridge construction.

This model is chosen if an overhead device cannot be mounted to the ceiling for structural reasons or the ceiling cannot support the required load or the lateral lasers cannot be mounted on the walls



Dimensions of installation model "BRIDGE"

#### Housing Bridge

Material: aluminium/steel

Dimensions:

A:	standard = 1.000 mm,	optional: 900 - 1.100 mm
B:	standard = 2.475 mm,	optional: 2.150 - 3.000 mm
C:	standard = 1.300 mm,	optional: 950 - 3.800 mm
D:	standard = 2.600 mm,	optional 2.000 - 4.700 mm

Weight: approx. 100 kg, depending on size

Sockets:  
 optional: standard: top left corner,  
 top right corner or bottom left/right corner.

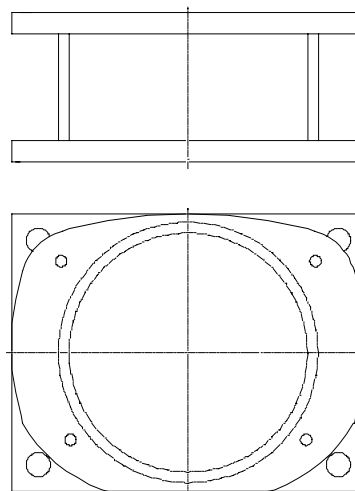
## Notes and installation requirements for installation model "BRIDGE"

For determining the dimensions of a "bridge" please note:

- the height of the sockets on the top girder (approx. 80 mm), if they are to be positioned there,
- any permanently installed lights, sprinklers, fire alarm systems, air-conditioning ducts, medical equipment etc.
- the opening width of lids of the machine.

A smooth horizontal concrete floor is a necessary requirement for installing a bridge.

In the case of double floors, either solid concrete installation-bases must be built or **steel bases** (see figure on the right).



### **Steel base for floor mounted devices and bridge installation in the case of double floors**

If supply pipes/ducts run through the floor, these must be built over, e.g. by a traverse.

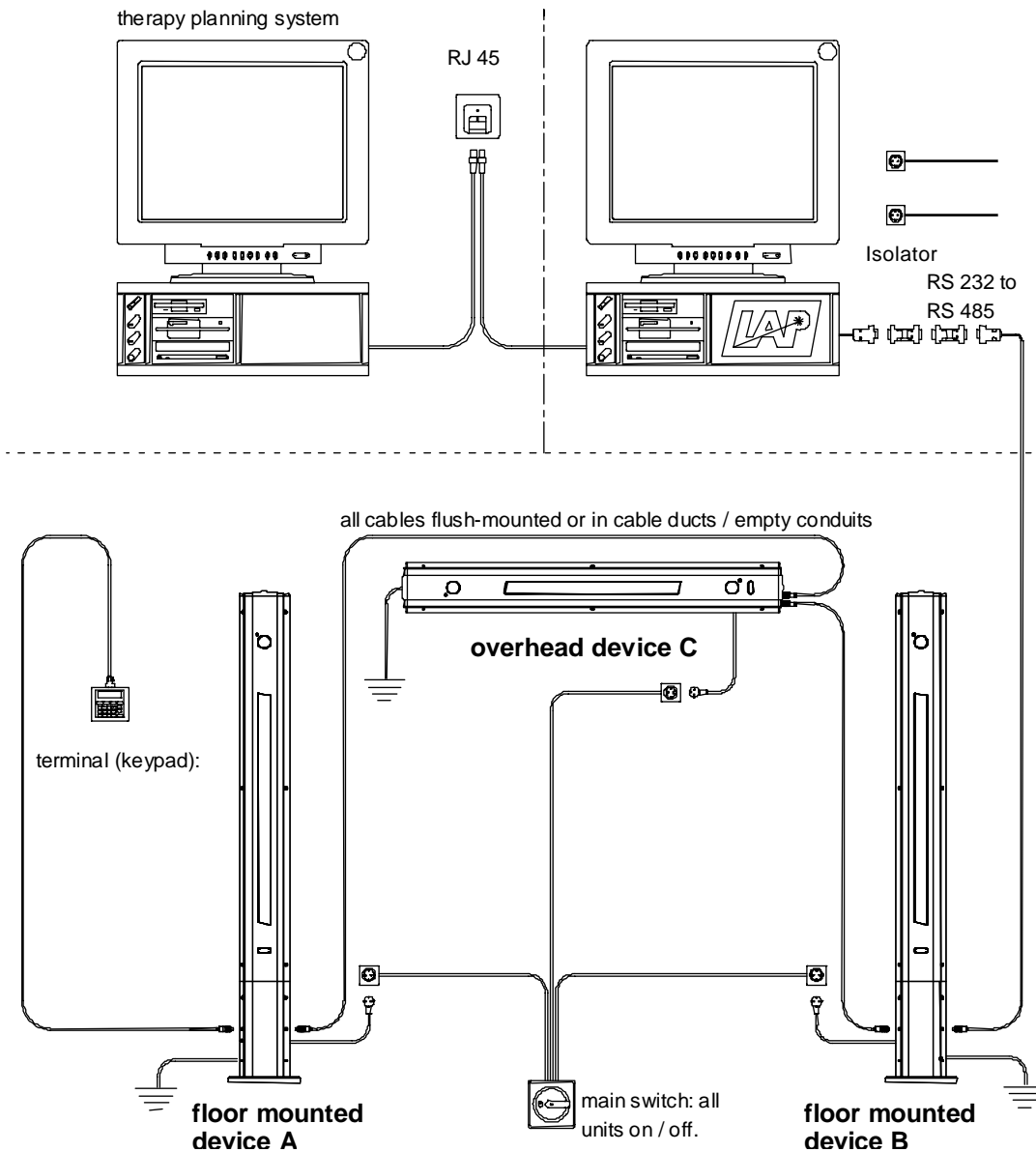
## 6. Electrical Requirements



**Caution!**

The electrical installation of the equipment must be carried out by qualified electricians. This service is not provided by LAP.

The following diagram describes the electrical requirements.



**Electrical installation (Geounding Wires Optional)**

### **Power supply**

A shared power supply (110/230 VAC) with sockets must be provided at the fixed mounting position of each device. However, in the case of wall mounted devices not within  $\pm 200$  mm of the central axis of the devices.

Additionally, two sockets (110/ 230 VAC) are required for the LAP-PC.

### **Interface cables**

Unlike the Dorado CT-4-3 "BRIDGE"-System, in which all integrated devices are connected with each other in the bridge, the devices A, B and C of the Dorado CT-4-3 "POST/WALL"-System are connected via interface cables. These should usually be run in empty conduits (1" in diameter) or in cable ducts of corresponding size. Sharp 90°-angles and T-connections should be avoided. Pull wires should already be placed in the empty conduits during the installation, in order to simplify later insertion of the data lines.

In the case of false ceilings the cables can be run in the ceiling. Cable ducts/empty conduits are then used for the connection to the wall mounted devices.

In addition, a connection between the PC-workstation and one of the two lateral lasers or the overhead device is required.

### **Network connection**

A RJ 45 socket is required for the network connection of our PC to the RTP; glass fibre connections are not supported.

### **Opening partition walls, fire walls and radiation shielding walls**

If existing partition walls, fire walls and/or radiation shielding walls must be opened for installation purposes, you must professionally close them or have them closed professionally immediately on completion of installation.

## **7. Installation of the Laser System by LAP**

### ***7.1 General pre-installation work***

Pre-installation work is usually required in order to ensure a smooth installation, start of operation and training on your LAP Laser System.

We therefore ask you to read the following information carefully and to apply it consistently and in keeping with your respective room situation. In this way you will ensure from the start, a successful, time and cost-saving installation of the laser system.

In the following chapters we will highlight the following steps:

- **Preparing the installation room**
- Installation Qualification Form

### **7.2 Preparing the installation room**

Install all necessary devices, cable ducts, power points and, if required, data lines as indicated on the drawing.

### ***7.3 Preparing the machine and the RTP***

The machine, to which the lasers are to be adjusted, must of course have been installed properly and put into operation. In addition, trained personnel must be available, who are thoroughly familiar with the operation of the machine and the RTP.

Unless this has already been carried out, make sure that the RTP interface is activated for data transfer to the LAP System and that the required RTP licenses are in place.

If necessary, contact your RTP system supplier in this matter.

## **7.4 Requirements of the completion note**

Before before the installation can take place, the following requirements must be completed.

1. the room must be fully prepared in accordance with our instructions and must be accessible.
2. the power supply to the individual devices must be available,
3. the cable ducts /empty conduits for the data lines must be in place,
4. the machine must be properly installed and ready for use,
5. an existing therapy planning system must be installed in CT-simulation applications,
6. the name of a competent contact person with responsibility for the course of installation at the construction site must be given to us,
7. our installation personnel must be guaranteed access to the machine for the duration of the installation.
8. the agreed installation aids (e.g. work platform / scaffold, ladder etc.) must be available,
9. if necessary, the ceiling must be opened and closed again on completion,
10. the person(s) who shall be trained by us after the inspection, and who will therefore be deemed as operator(s) according to the user, must be named.

## **7.5 Installation Qualification Form**

On completion of all works, please return the completed and signed **installation** qualification form at least 7 days prior to the installation date.

Unfortunately, we can only install our devices once you have returned the qualification form, which is at the same time an acknowledgement of receipt and acceptance of our terms and conditions.

## 7.6 *Installation on site*

### 7.6.1 **Installation procedure on the agreed date**

#### **Installation procedure**

The following steps are generally required for installing the Dorado CT-4-3 devices and for putting them into operation:

- Determination of isocenter** and scan plane of the machine with the help of the **contact person in charge**,
- Determination of the mounting positions,
- Rough positioning and installation of the devices,
- Fine adjustment,
- Installation of network connection and connection of the devices to the therapy planning system,
- Inspection,
- Training of personnel.

#### **Duration of installation**

Please allow for the following general installation periods, during which the machine cannot be used for any other purpose:

Dorado CT-4-3 "POST" or "WALL":	2 days
Dorado CT-4-3 "BRIDGE":	2 days

#### **NOTE:**

**Installation on the weekend** is possible on request and at extra cost. However, in this case you must ensure that trained operating personnel is available.

### 7.6.2 **Your support at the start of installation**

The following is required at the start of installation, in order to ensure smooth installation:

1. The named contact person or his/her competent proxy must be present at the installation site,
2. The contact person must definitely and finally determine the isocenter of the machine,
3. When requested by our installation personnel, authorised persons must be available for operation of the machine (and possibly the RTP system).

### **Important!**

**If the situation on-site does not correspond to the information provided by you, or if there are delays for which LAP is not responsible, our installation personnel will discuss further measures with the contact person you have named. additional costs maybe incurred**

### **7.6.3 Your support at the end of installation**

Once installation is complete, the devices will be put into operation and will then be ready for inspection.

The named contact or his/her proxy must be present/available for this purpose.

**If the contact person is not available at the inspection site within one hour, our installation personnel will prepare an inspection report and the devices will be deemed to have been inspected.**

### **7.6.4 Introducing/Training**

Once the system has been inspected, we will provide introducing/ training for your operating personnel. Please ensure that the designated personnel are available for this purpose.