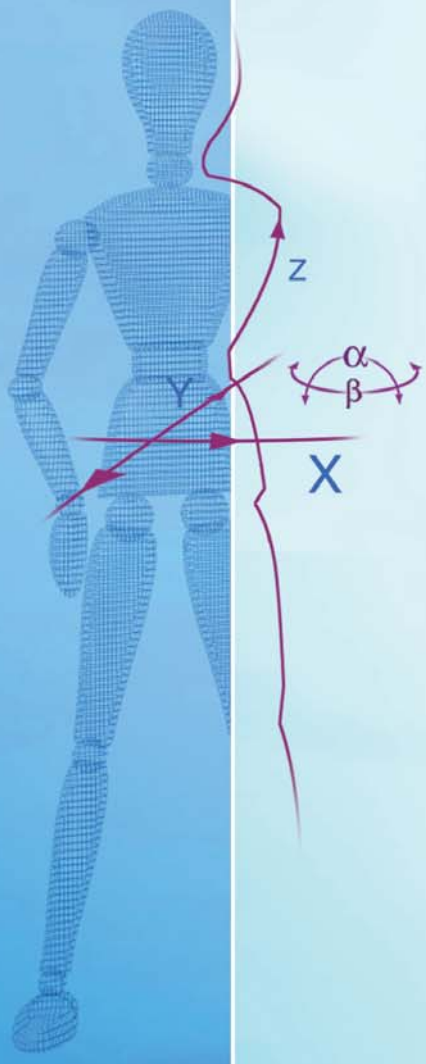
ARCOMA

Planning Guide

0180 System - Variant 4C



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Revision

Reason for changes	Chapter	Page	Document	Rev	Datum
First release				1.1	20140822
Graphic updates, New measures added to figure 3-9, Table dimensions corrected. Text correction Beta-Alpha.	Introduction, Installation and Servicing space, Component Specification, Technical Specification	3-8, 3-9, 6-1, 6-2, 6-5, 6-7, 6-8, 7-3	System Overview, Height direction, Front - Rear/Left - Right Direction,Ceiling suspended X-ray tube support,General Specification, Alpha/Beta movements, Table General Specification, Table Top	2.1	20150813

Contents

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Introduction

Intended Use

The 0180, Variant 4C is a stationary X-ray system intended for obtaining radiographic images of various portions of the human body in a clinical environment.

The 0180, Variant 4C is not intended for mammography.

System Overview

The 0180, Variant 4C is an X-ray system designed and manufactured in Sweden.

The *Figure 1-1* shows the main parts of the System.

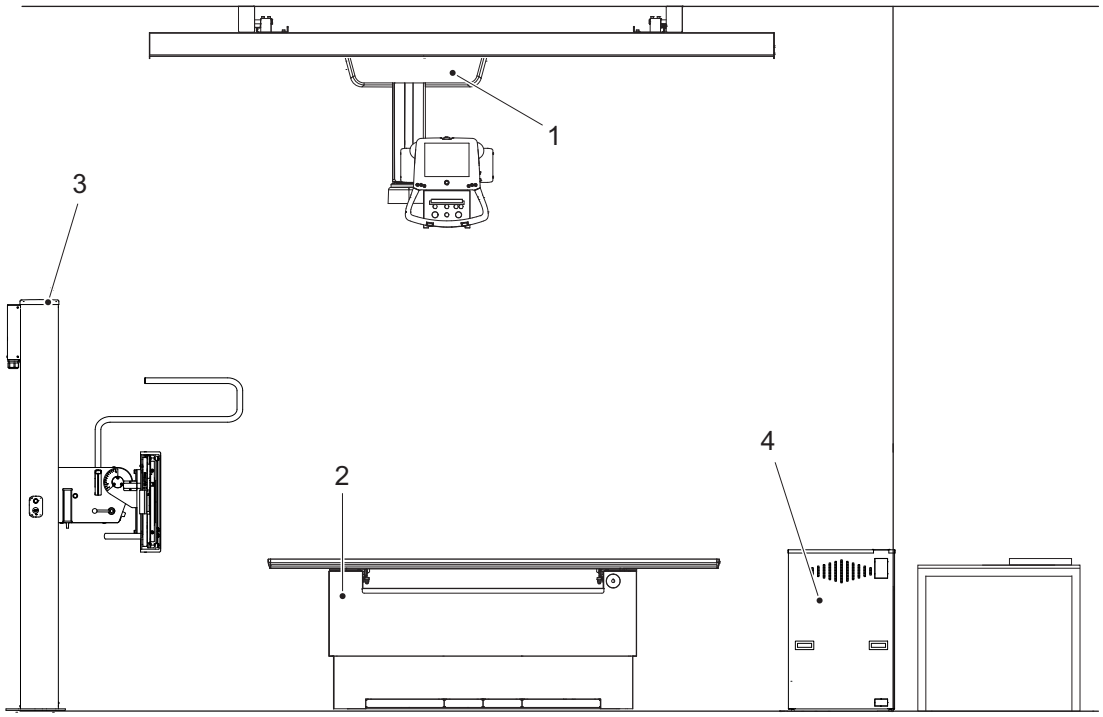

Figure 1-1

1. *Ceiling suspended x-ray tube support*
2. *Table*
3. *Wall stand*
4. *Cabinet*

Environment specification

Placement of Non-medical Components

Non-medical components may not be placed inside the patient environment according to regulations (IEC 60601-1).

The standard defines a sphere of 1.5m around the patient as the patient environment. The Ceiling support can be operated across the entire rail grid, i.e. the 1.5m boundary must be placed outside the rail grid. Also take into account the patient entries and exits and the possibility for the patient to walk around in the examination room. In practice, this means that no non-medical components can be placed inside the walls of the examination room.

Image System Computer

Image system computer used and other similar devices are normally non-medical components. The image system computer and the including touch-screen used in the 0180, Variant 4C is no exception and may therefore not be placed inside the examination room.

Room and Installation Specification

Wall Clearance

According to regulations (IEC 60601-1) a minimum distance of 500 mm between moving motorized parts and surrounding walls, and, or permanently installed objects must be considered when planning the room layout. Since the Ceiling suspended x-ray tube support and the Wall stand is manually operated (except from the z-movement of the ceiling suspended x-ray tube support), the clearance requirement does not apply to table.

The table top movement can be limited to allow a smaller room size, or if objects are placed within the 500mm zone. The stroke is adjustable via mechanical end stops, placed on each side of the table top.

Ceiling Height

The 0180, Variant 4C has three configurations allowing a ceiling height between 2500 mm and 3050 mm.

Table 2-1

Ceiling height (mm)	Vertical column stroke (mm)	Ceiling rails
2500-2700	1450	Low ceiling rails.
2700-2850	1450	Standard ceiling rails. (Standard configuration).
2850-3050	1700	Standard ceiling rails.

Installation cube

If it is not possible to mount the system in the ceiling, an installation cube is needed. There are two standard heights. For more information, please contact the manufacturer. The ceiling height configuration must be chosen when the system is ordered.

Environment specification

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Table 2-2

Ceiling height (mm)	Vertical column stroke (mm)	Installation cube
>2500	1450	Low ceiling
>2800	1700	Low ceiling

Ceiling / Floor / Wall Specification

The performance of the System is highly depending on the pre-installation work that has to be done on the ceiling, floor and wall.

The manufacturer does not take responsibility of the ceiling, floor or wall construction. The manufacturer recommend the ceiling, floor and wall to be levelled 1mm/m. Local regulations and specifications must be observed.

The specifications specified in this section do not apply for risk regions for earthquakes. For more information and specifications regarding risk assessments and calculations, please contact the manufacturer's sales department.

Local regulations and specifications must also be observed. The forces listed in this document are not always in correspondence to the local- and/or national regulations.

Included in Shipment

- Expansion bolts (standard type) for the Table and the Wall stand.
- Expansion bolts (standard type) for the Installation cube (option).
- A drilling template for the Table (*Fig.*) and a marking template for the Wall stand.
- Spacers for the Table, Wall stand and Ceiling suspended x-ray tube support installation cube (option).
- Insulation kits for all system components.
- Mounting kit for the ceiling rail Y (Unistrut mounting brackets, etc.). See *Figure 2-1*.

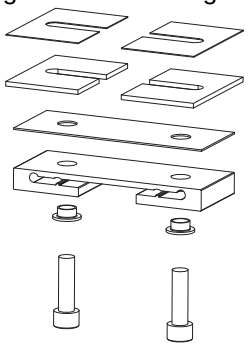


Figure 2-1

- Mounting kit for the installation cube (wall mounting brackets, etc.) (option).

General Information Not Included in Shipment

- Appropriate sub construction for the ceiling rail Y, e.g. Unistrut, must be provided (not included in shipment).
- Cable runs or similar must be supplied (not included in shipment).
- Screws, bolts, or similar for mounting the cable outlet for the Ceiling support must be supplied (not included in shipment).
- Alignment tools, such as rotating lasers or similar, must be supplied (not included in shipment).

Ceiling Specification

The Ceiling suspended x-ray tube support requires a ceiling with sufficient load capacity (not within the scope of this document), e.g. concrete. If the ceiling construction is not sufficient, an Installation cube solution is available.

The Installation cube solution is to be ordered as an option. The on-site sub construction, normally consists of Unistrut rails or other comparable support profiles (not included in shipment).

The Unistrut rails are mounted directly to the ceiling. The ceiling rails Y, with a standard length of 4000 mm, are then mounted on the Unistrut rails, see *Fig. 2-3* and *Fig. 2-2*. The ceiling rails Y can also be mounted directly to the ceiling, see *Fig. 2-4* and *Fig. 2-2*. As a third option, if the ceiling height is low (2500 mm-2700 mm), the Y rails of the Installation cube can be directly mounted to the ceiling (must be ordered separately), see *Fig. 2-4* and *Fig. 2-2*.

Each ceiling rail Y must have at least 5 fixation points with a suspended distance (A) that is depending on the length of the traverse rails Y. Each fixation point must withstand a load of at least 5kN.

At least 5 Unistrut rails, equally divided, must be used for a standard ceiling rail Y length (4000 mm). The total load each Unistrut rail must be able to withstand is minimum 7 kN. The Unistrut fixation points shall not be placed directly under the ceiling rails Y.

The ceiling rails Y must be levelled (+/- 1 mm) over the entire grid. Spacers for levelling the rails are included in the shipment. Also included is the cable outlet for the Ceiling suspended unit.

Manufacturer's specification of on-site sub construction and the "Service and Installation Manual", included at delivery, must be observed.

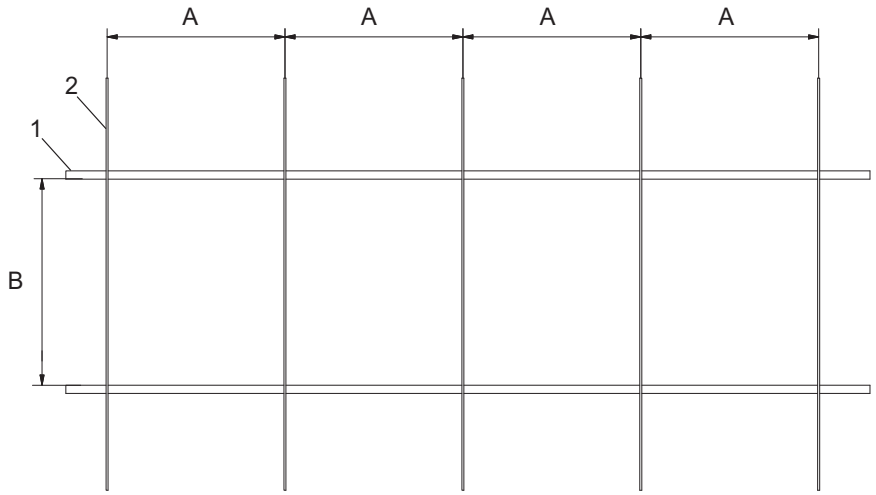


Figure 2-2 Ceiling rails Y mounted on Unistrut rails.

1. Ceiling suspended unit rail (Y)
2. Unistrut rail or similar

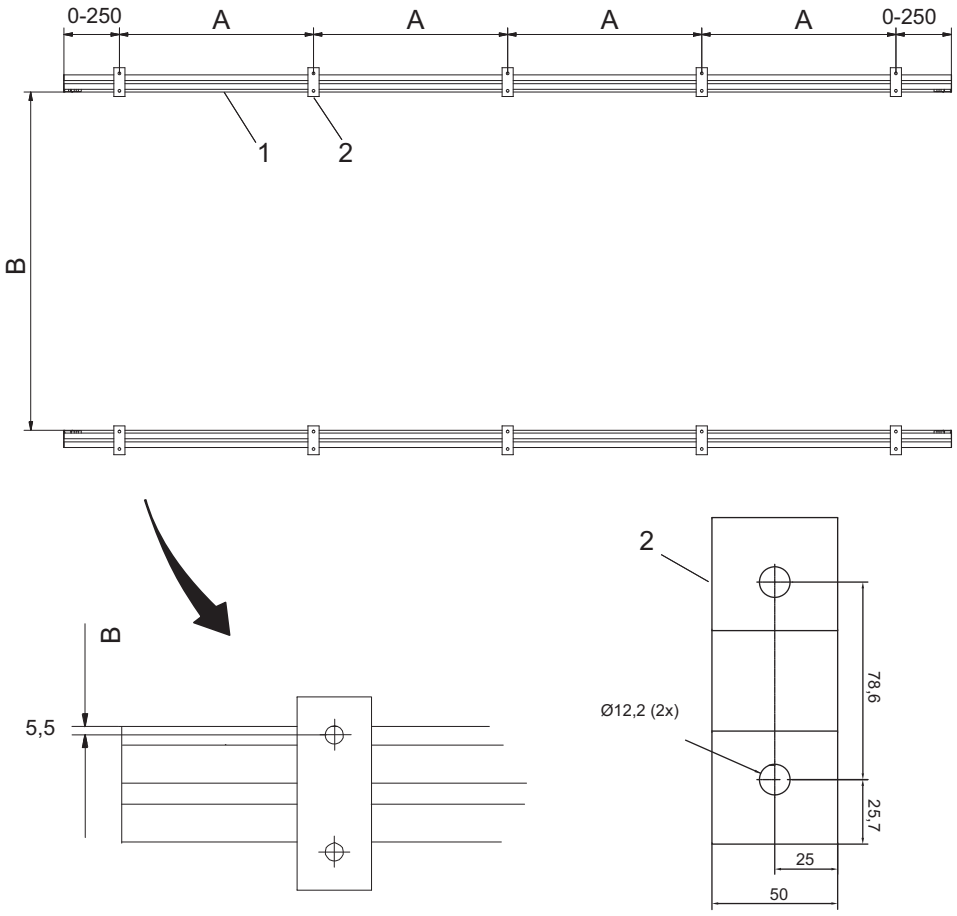


Figure 2-3 Ceiling rails Y mounted directly to the ceiling.

1. Ceiling suspended unit rail (Y) 2. Fixation block

Table 2-3

Length traverse rail X	**3000mm**	**2748mm (Low ceiling)**
Length ceiling rail Y	4000mm	3748mm
Min. nr. of fix points / Y rail	5	5
Measure A	850-1100mm	850-1100mm
Measure B	1800-2200mm	2778mm

NOTE!

The Ceiling suspended unit rails shall be parallel ± 1mm.

Floor Specification

The Table and the Wall stand must be installed on a solid base with sufficient load capacity (not within scope of this document), e.g. concrete.

The floor must be able to withstand the pull forces supplied on the expansion bolts. The pull forces for the components are listed in *Fig. 2-3* see also *Fig. 2-4* and *Fig.* .

The Table and the Wall stand must be levelled to 1 mm/m.

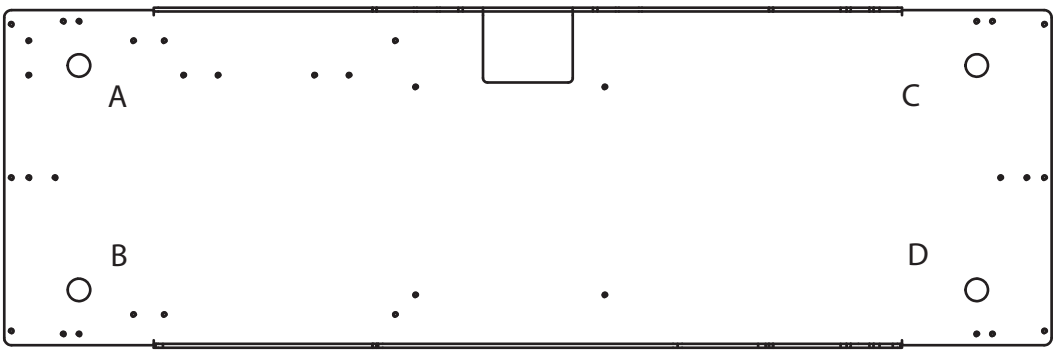


Figure 2-4 Drilling templateTable

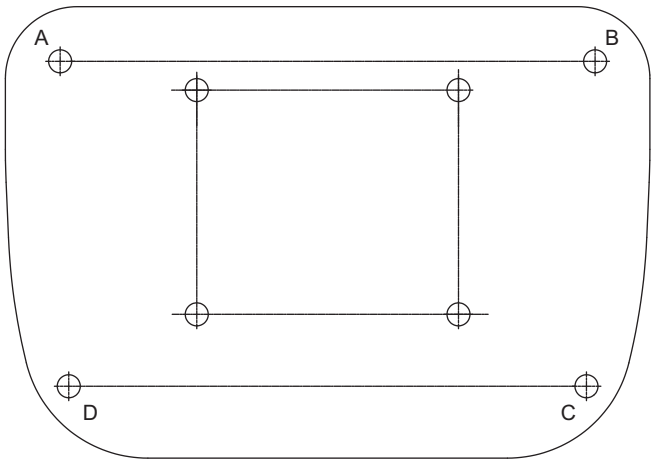
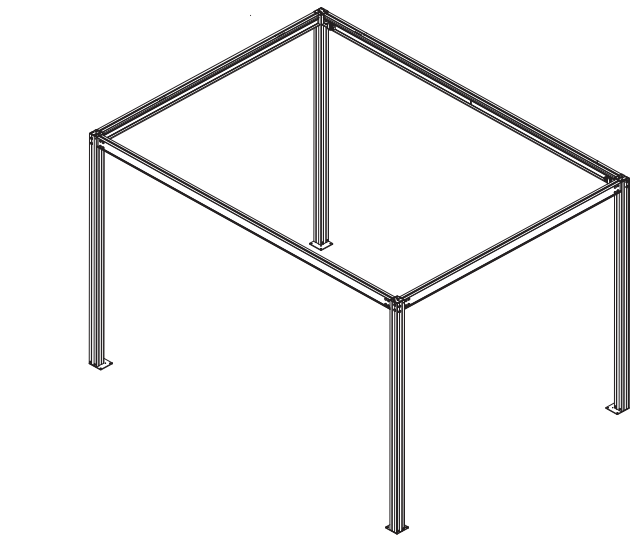


Figure 2-5 Marking template Wall stand (Isolation Plate)

NOTE!

Marking template Wall stand (Isolation Plate)The Isolation plate for the Wall stand shall only be used as a marking template and not as a drilling template, due to the large hole size.



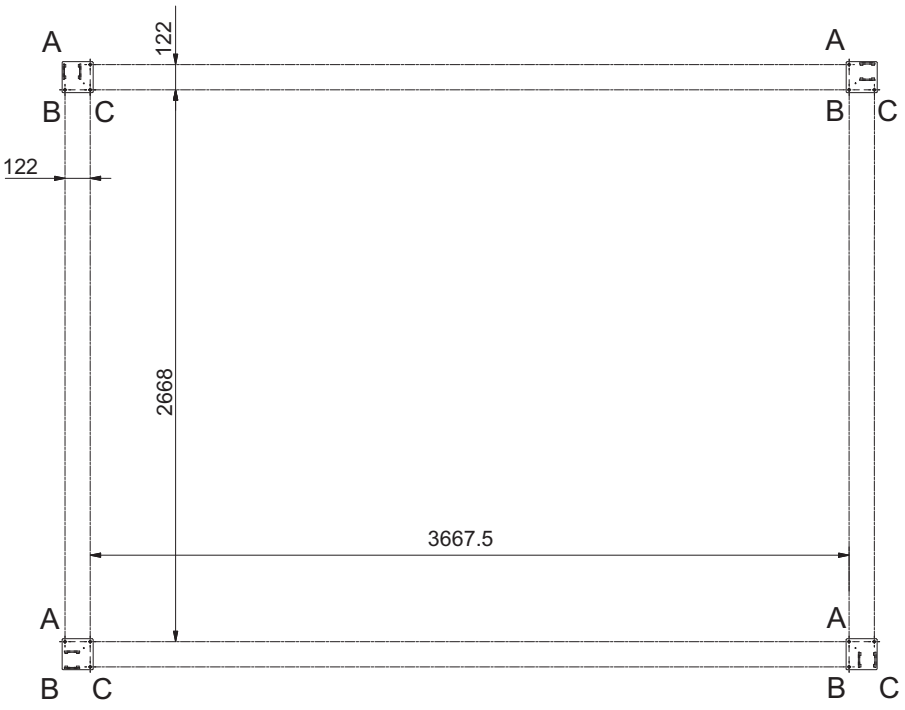


Figure 2-6 Installation cube

Mounting point	A	B	C	D	E	F
Force Table	5kN	5kN	5kN	5kN	5kN	5kN
Force Wall stand	5kN	5kN	5kN	5kN	-	-
Installation Cube	5kN	5kN	5 kN	-	-	-

Table 2-4

For the Table and the Wall stand M10, expansion bolts are provided. Manufacturer specification and the “Service and Installation manuals”, included at delivery for both components, must be ovserved.

Wall Specification

The walls are normally only used for mounting the cable outlets for the Ceiling suspended x-ray support, the Wall stand and the System cabinet. Therefore, the only specification for the walls is that it must be possible to mount and secure the cable outlets. Screws, bolts, or similar for mounting the cable outlets, must be supplied (not included in shipment). Also, the regulations and specifications on page 2-1 must be followed.

The Installation cube shall be mounted to the wall. There are four wall fixation points, and each fixation point must withstand a load of at least 0.5 kN. The wall attachment allows to place the installation cube 0-1000 mm from the wall. If the distance to the wall is small, the attachment must be shortened to a correct length. When the Installation cube is placed close to the wall, make sure that a suitable placement of the cable outlet is possible.

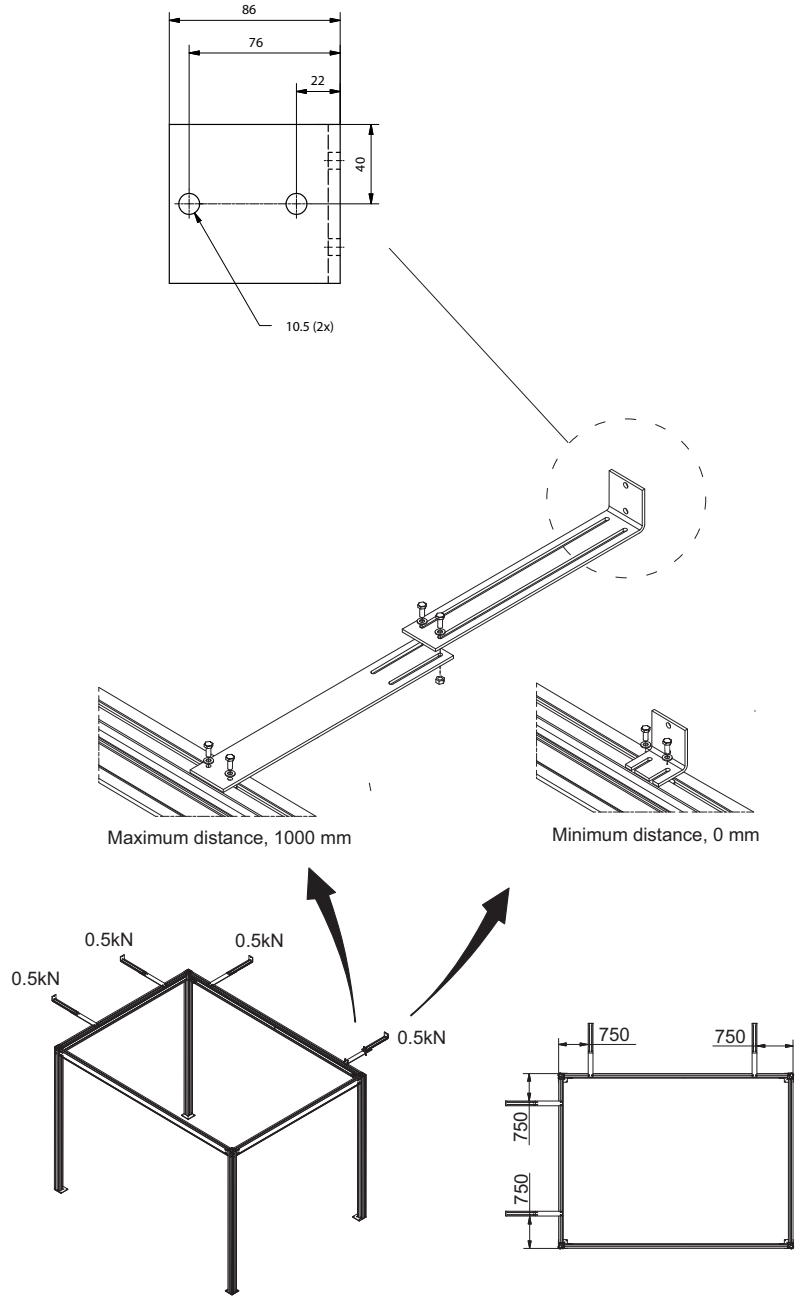


Figure 2-7

Electrical Building installation

The Machinery Directive 2006/42/EC requires the System to be fitted with means to isolate it from all energy sources.

NOTE!

When Service or Maintenance will be performed the technician shall lock the equipment from all energy sources.

Power ratings and Line requirements

The 0180, Variant 4C requires a three-phase electrical line with a protective earth ground (4 or 5 wires).

The transformers in the system cabinet requires a tap configuration (*1), the generator have an automatic main line selection (no transformer tap configuration required). A disconnecting device shall be incorporated external to the equipment according to the national wiring rules.

- 3 Phase VAC ±10%
- 400VAC 50Hz
- 400VAC with neutral 50/60Hz
- Maximum wire gauge 4 AWG (25mm²)
- Required fuse 63A thermal breaker, 3-phase, b-curve

NOTE!

**1 For more information about tap configuration see Installation and Service Instructions.*

Epsilon Configuration	Mains Voltage (V)	Apparent Resistance of Supply Mains (Ω)	Over-current Releases (1)	Nominal Electrical Power			
				Short Term		Long Term (2)	
				(A)	(KVA)	(A)	(KVA)
EPS 50R	400	0.17	100	102	68	0.8/ 5.0	0.7/2.4
	480	0.24	100	85	70	0.8/ 5.0	0.7/2.4
EPS 65R	400	0.17	100	124	85	0.8/ 5.0	0.7/2.4
	480	0.16	100	105	88	0.8/ 5.0	0.7/2.4
EPS 80R	400	0.11	100	150	102	0.8/ 5.0	0.7/2.4
	480	0.16	100	125	105	0.8/ 5.0	0.7/2.4

NOTE!

(1) Thermal breaker recommended. The over-current releases values are suggested figures only. The selected value should have current rating versus time curve characteristics higher than the ratings specified. Consult a qualified electrical contractor to comply with local electrical by law and site electrical installation.

NOTE!

(2) Values based on standby mode for EPS RAD configurations (no continuous X-ray for Rad High-Voltage generators).

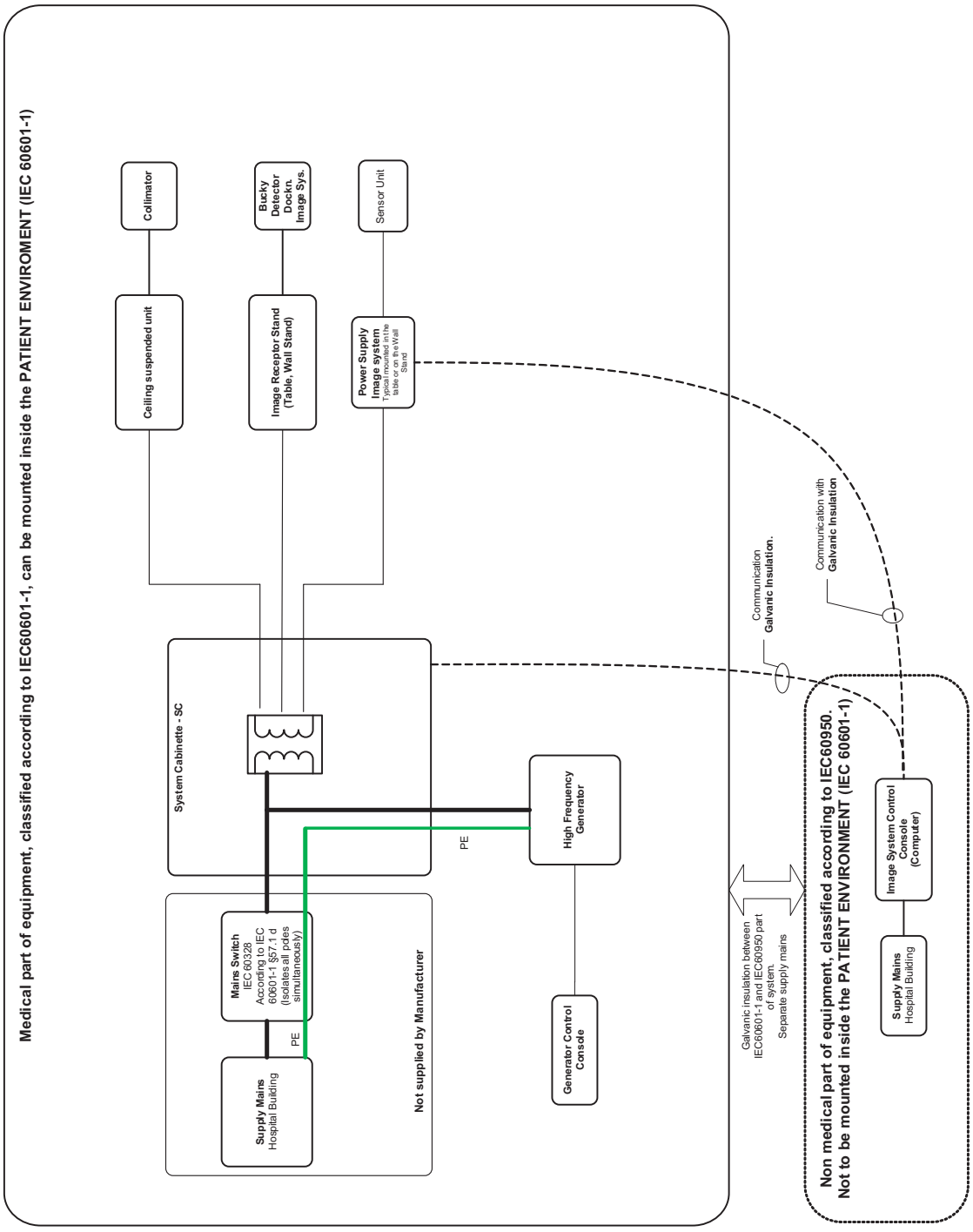


Figure 2-8 Medical part of equipment (can be installed inside Patient environment) and Non medical part of equipment (Not to be installed inside Patient environment).

Cable duct Specification

All cables shall be enclosed in cable channels, cable ducts or conduits according to regulations (IEC 60601-1).

The following notes shall be considered;

- Avoid cross-overs and forming of cable coils.
- Use appropriate dimensions.
- Consider the bending radius of the cables.
- If using conduits, consider that the connectors of the high voltage cables should be able to be pulled through.
- Cable channels or cable ducts shall be used for on-the-floor installations.

Installation and Servicing space

Wall stand

Tiltable Image receptor holder

Front - Rear Directon

If different values apply for a fixed detector, these are specified within brackets.

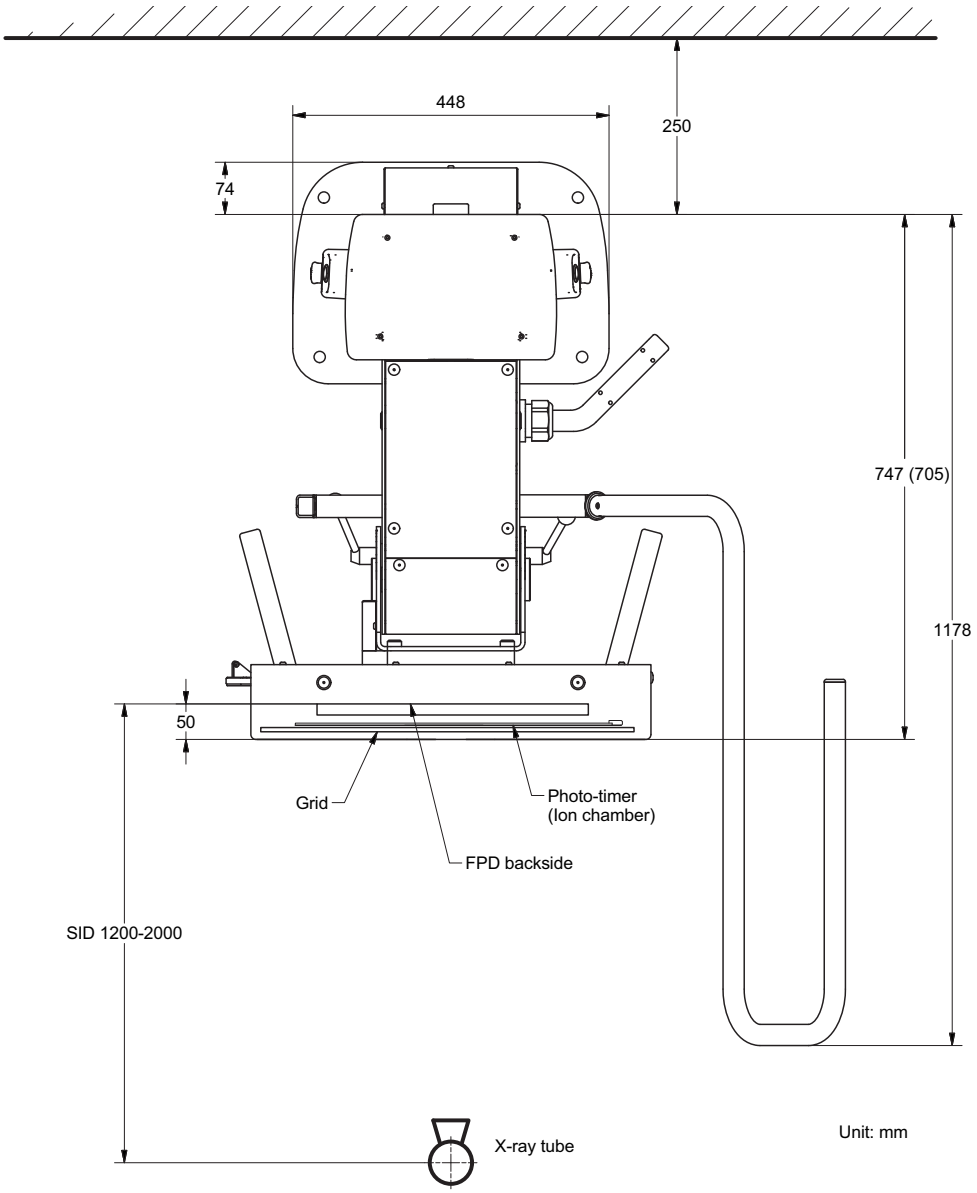


Figure 3-1

Exposure with Tilted Detector holder

The space for tilted exposure, see below.

If different values apply for a fixed detector, these are specified within brackets.

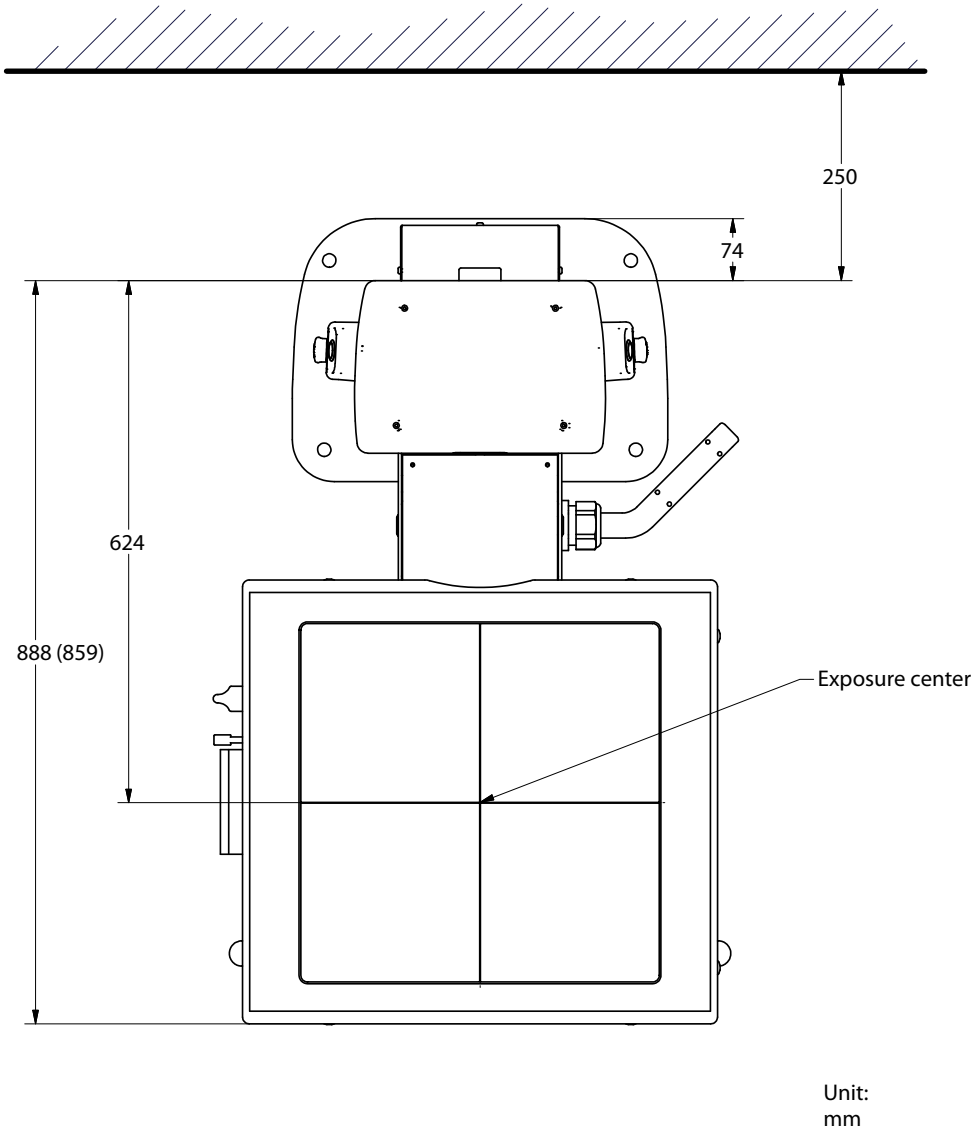


Figure 3-2

Left - Right Direction

With grid loading slot on the left-hand side (default).

If different values apply for a fixed detector, these are specified within brackets.

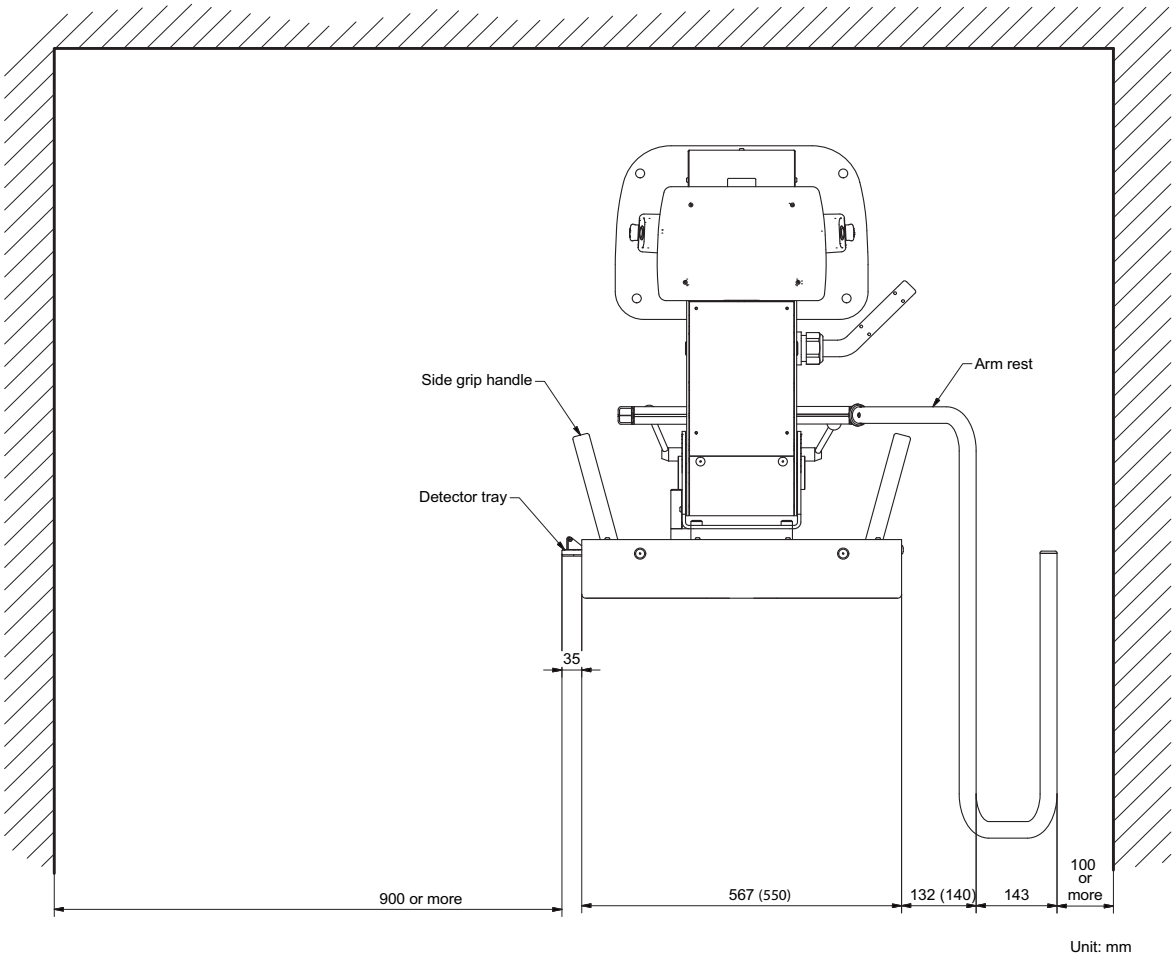


Figure 3-3

With the grid loading slot on the right-hand side.

If different values apply for a fixed detector, these are specified within brackets.

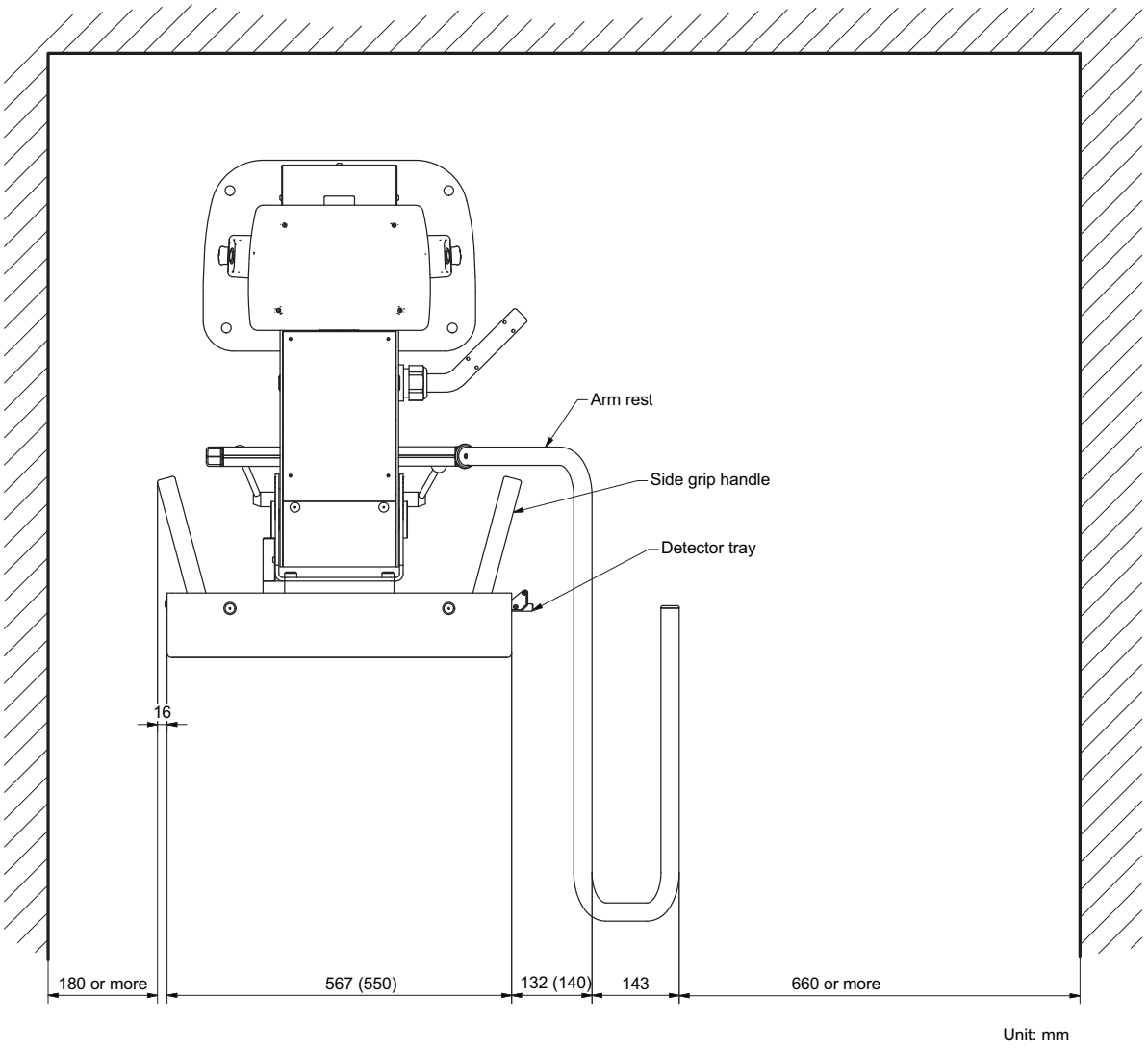


Figure 3-4

Non-tiltable Image receptor holder

Front - Rear Direction

If different values apply for a fixed detector, these are specified within brackets.

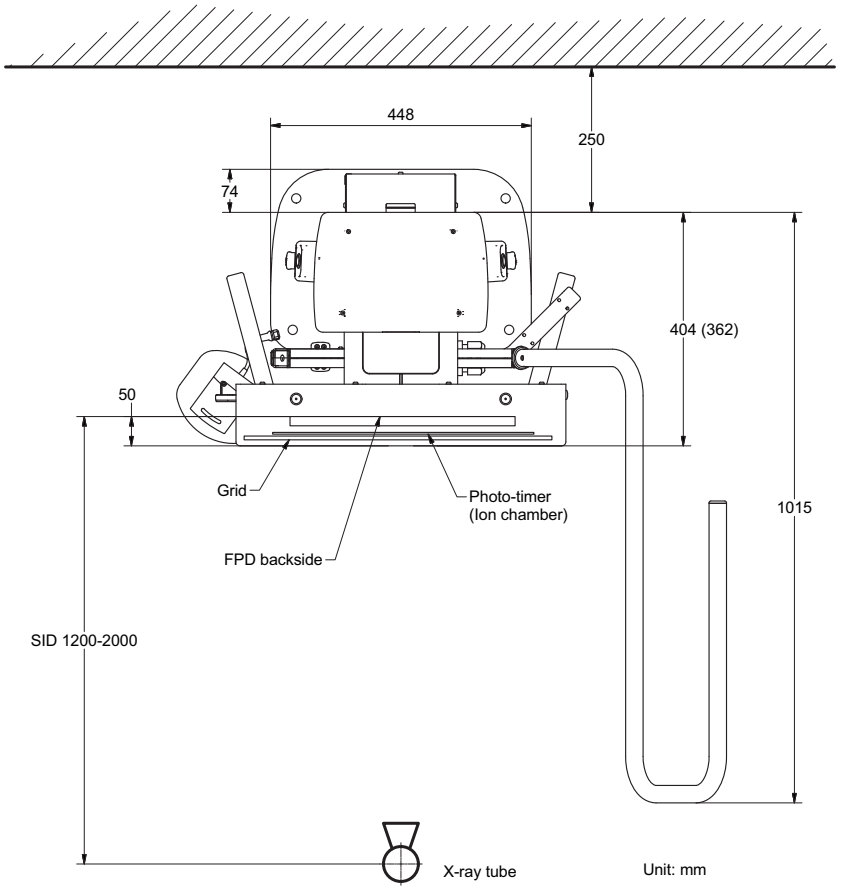


Figure 3-5

Left - Right Direction

With grid-loading slot on the left-hand side (default).

If different values apply for a fixed detector, these are specified within brackets.

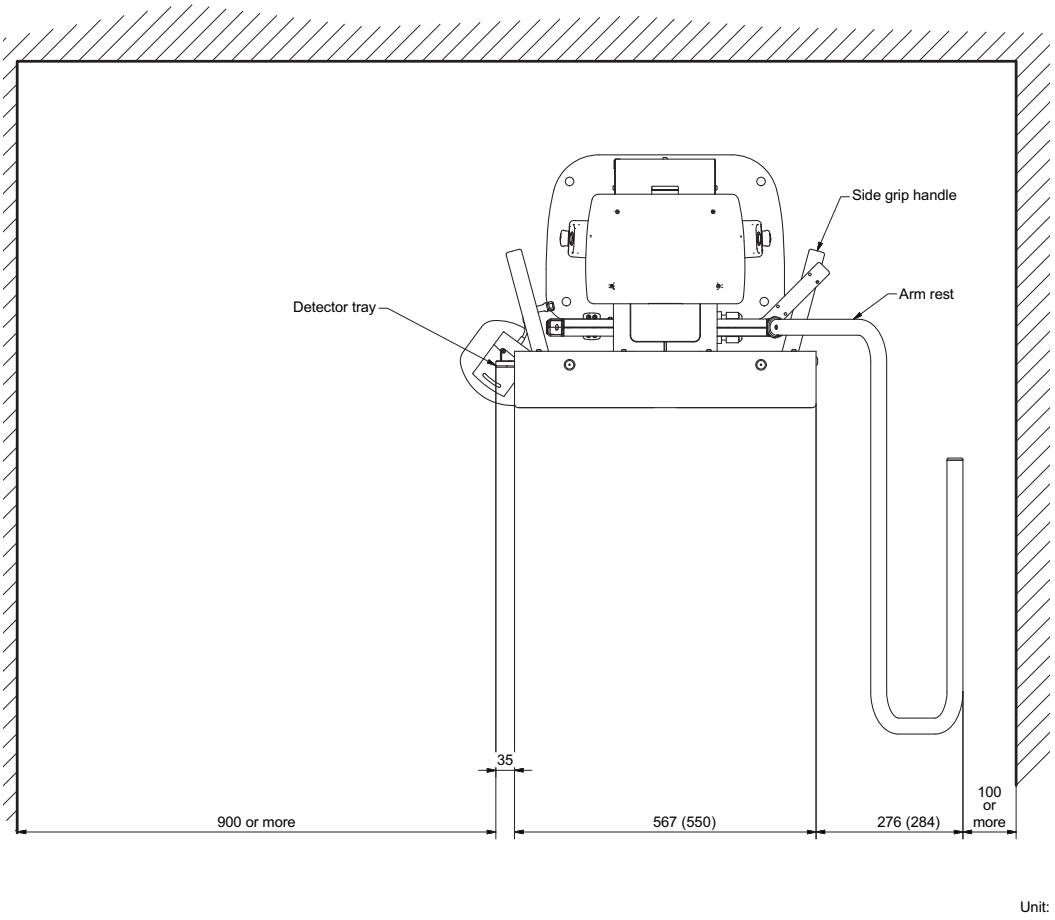


Figure 3-6

With the grid-loading slot on the right-hand side.

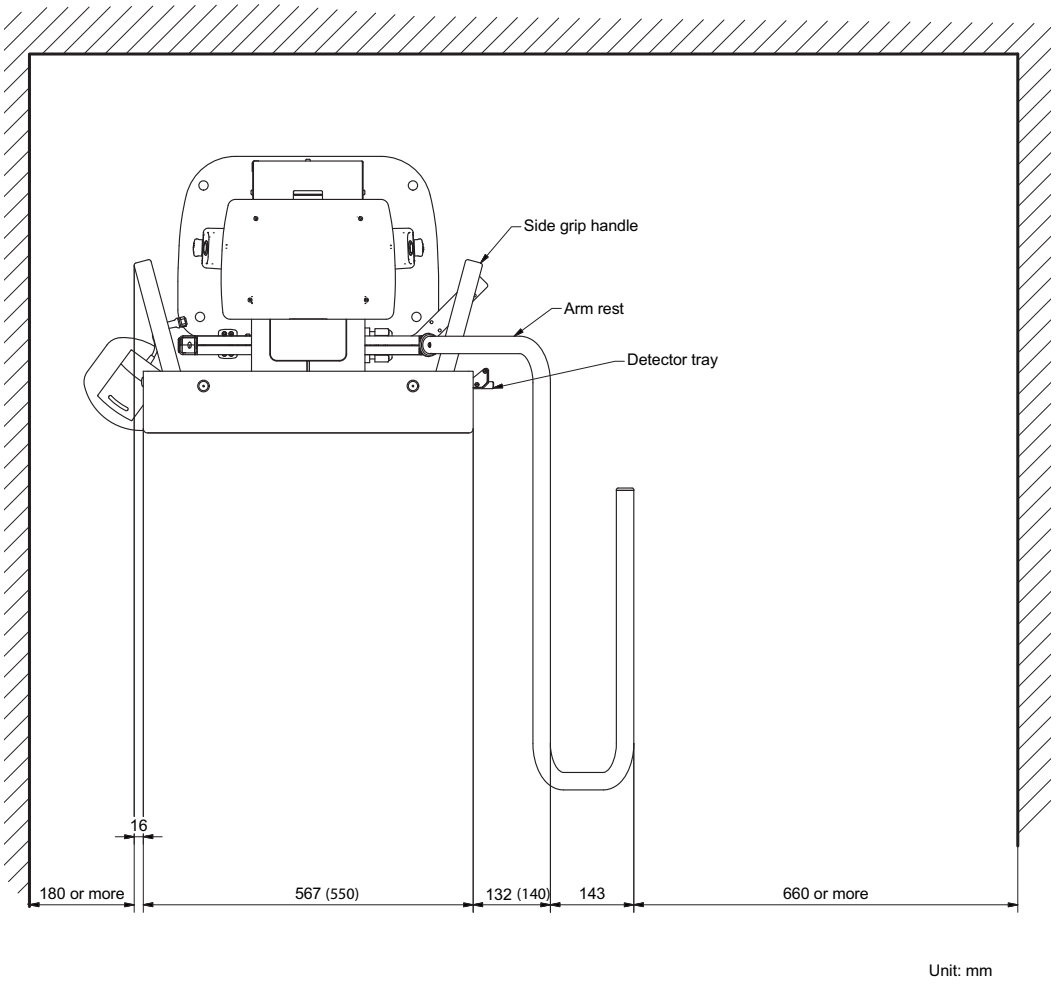


Figure 3-7

Installation and Servicing space

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Table

Front - Rear / Left - Right Direction

In the figure below, a lateral space required for: mounting/dismounting the Table top is not considered.

When the table top is to be mounted/dismounted for installation and maintenance, a space of 2424 mm or more need to be reserved either on the right or the left of the Table as a longitudinal space of the Table top.

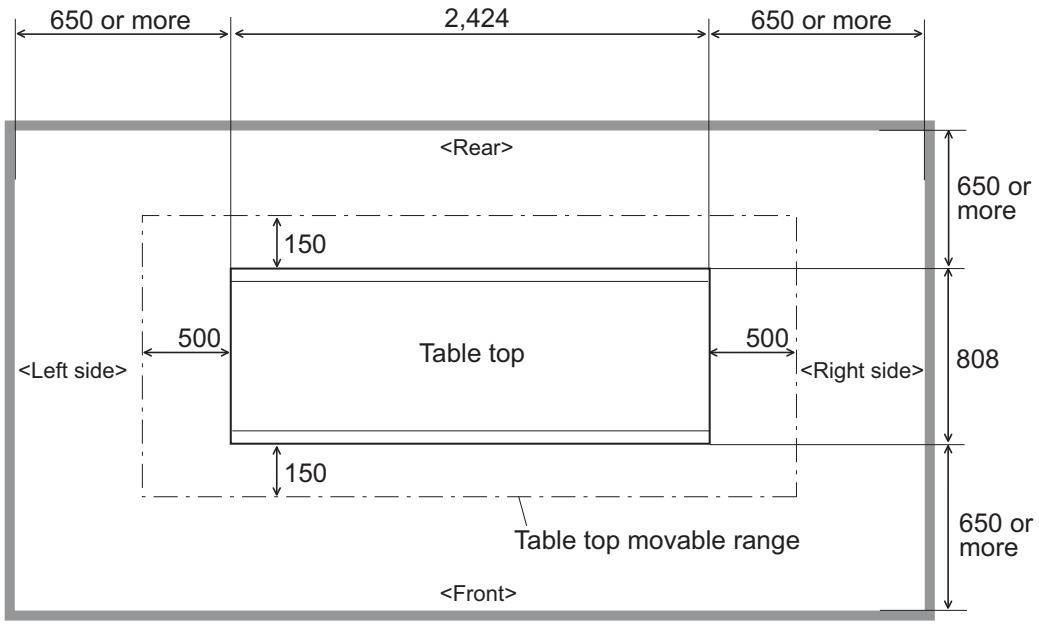

Figure 3-8

Height Direction

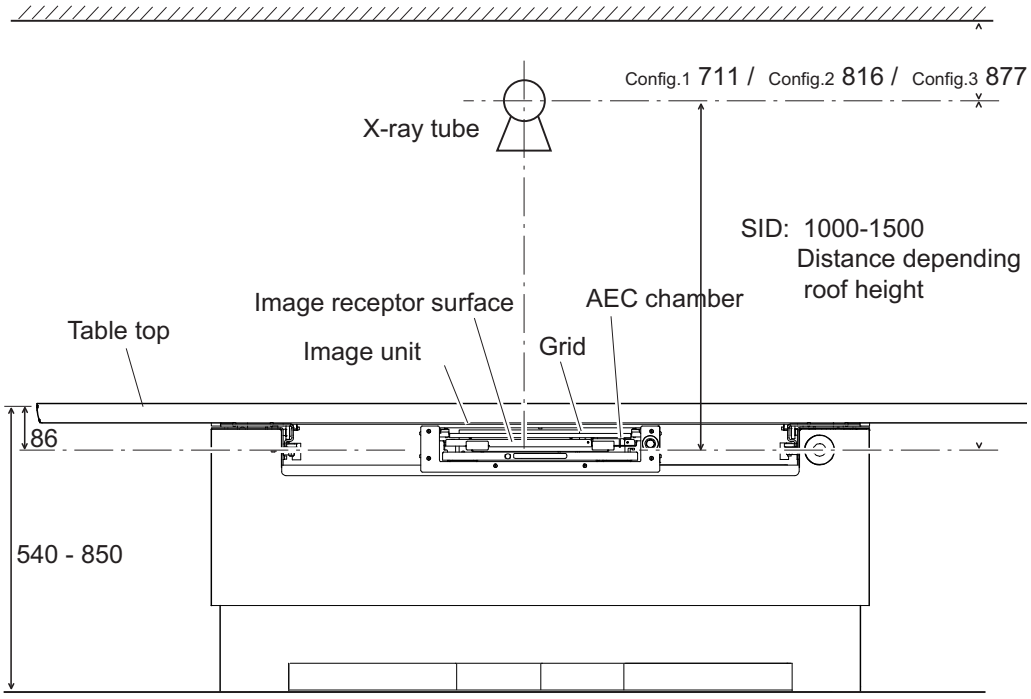

Figure 3-9

The x-ray transmission area of the Table top is as shown below.

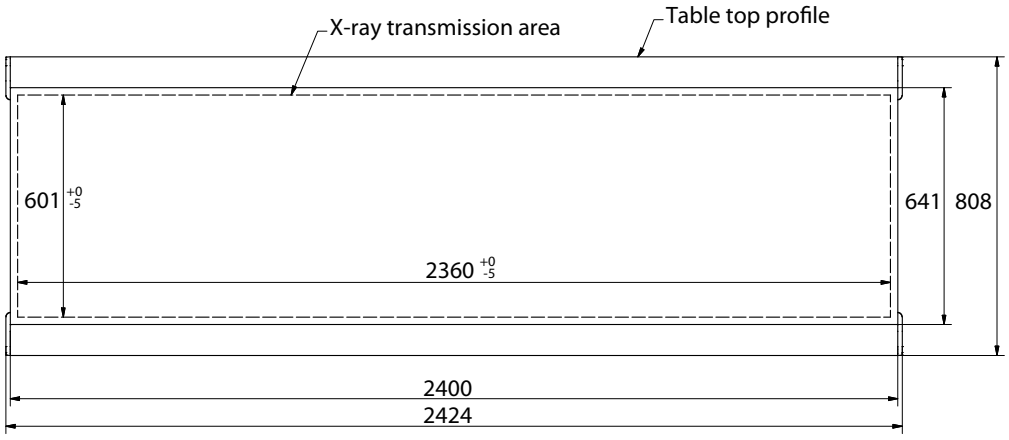

Figure 3-10

Installation and Servicing space

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Cabinet

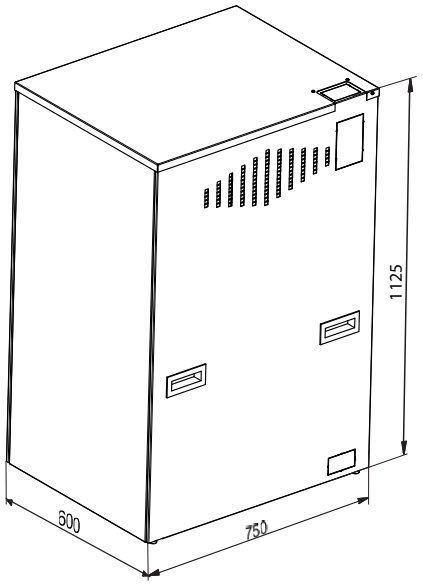

Figure 3-11

- Cabinet dimensions = W600 * D750 * H1125mm
- Cabinet weight = 150 kg

Anchoring locations

Anchor locations in the installation space and the servicing space are shown below.

Wall stand

Tiltable Image receptor holder

With the detector load on the left-hand side (default).

If different values apply for a fixed detector, these are specified within brackets.

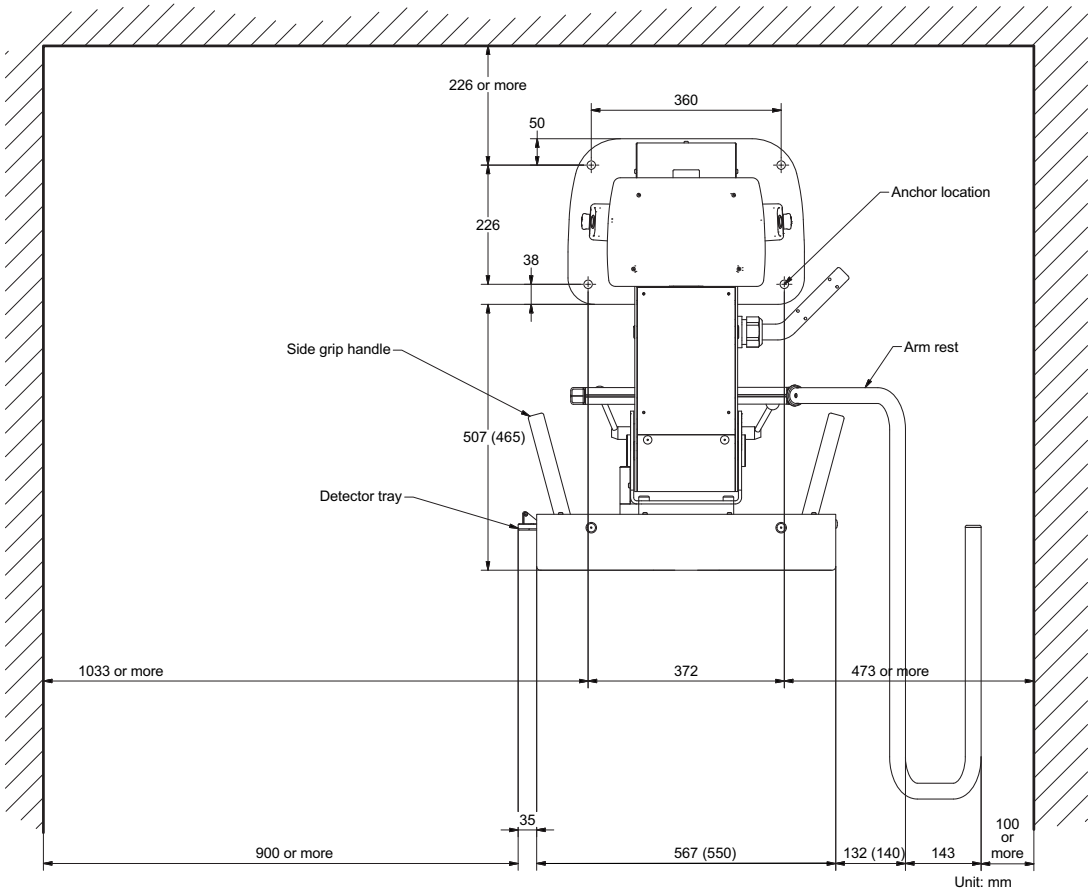

Figure 4-1

Anchoring Location

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With the detector load on the right-hand side.

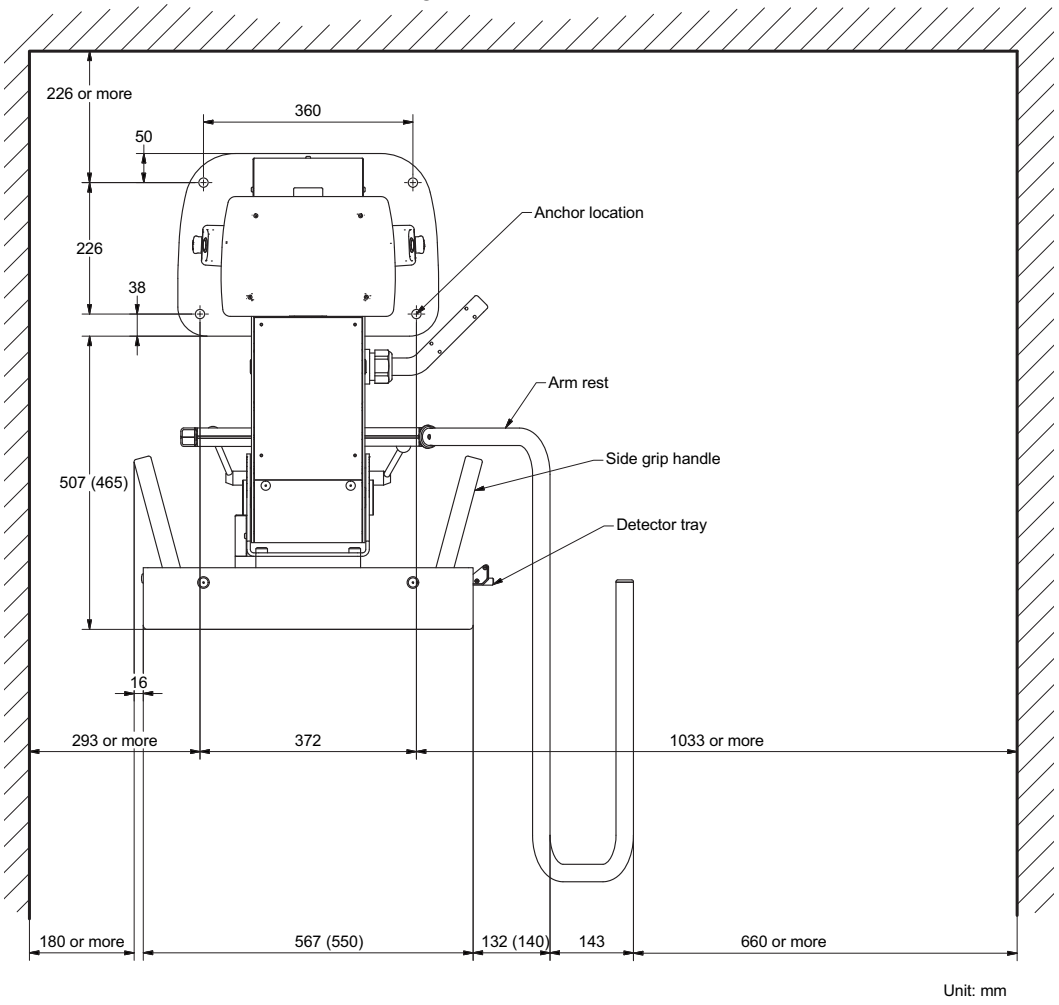

Figure 4-2

Non-tiltable Detector holder

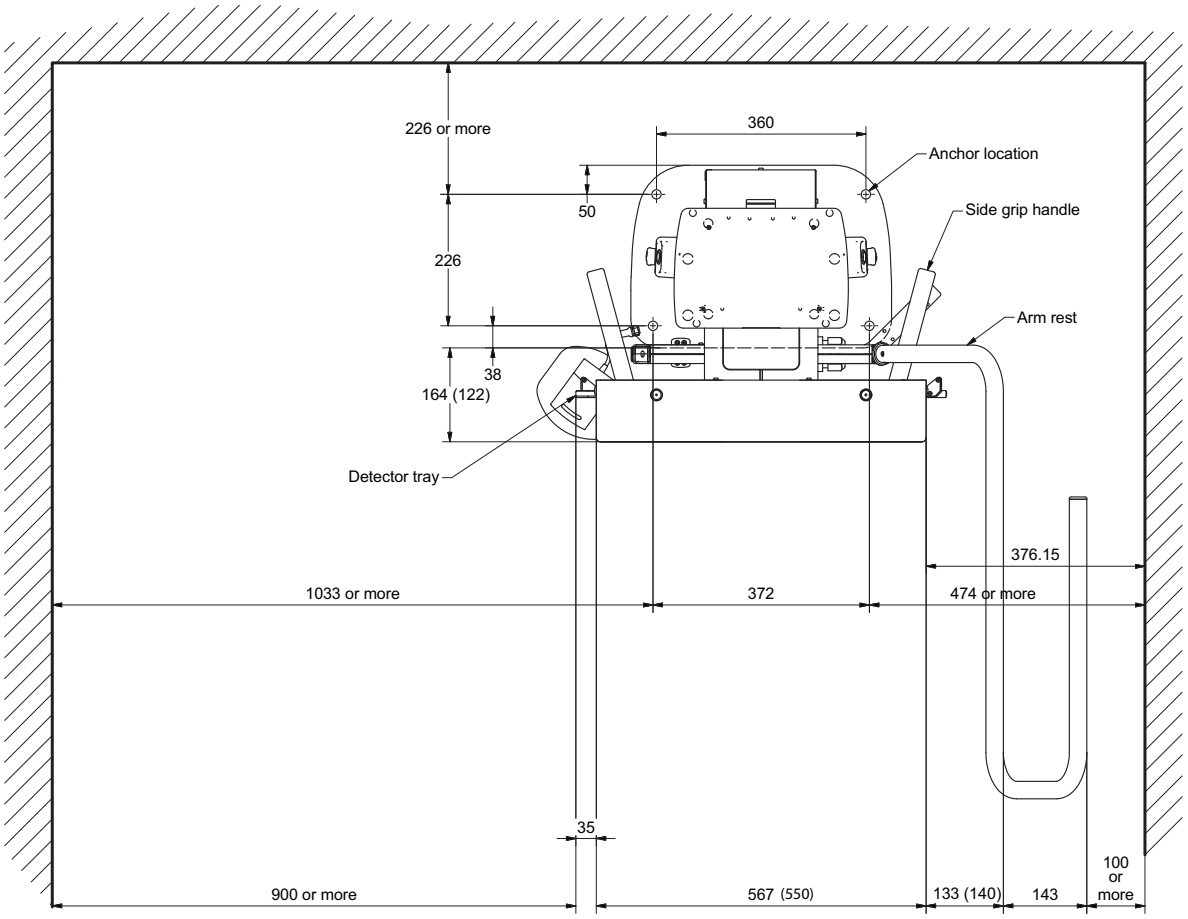

Figure 4-3

Anchoring Location

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When the detector load is on the right-hand side.

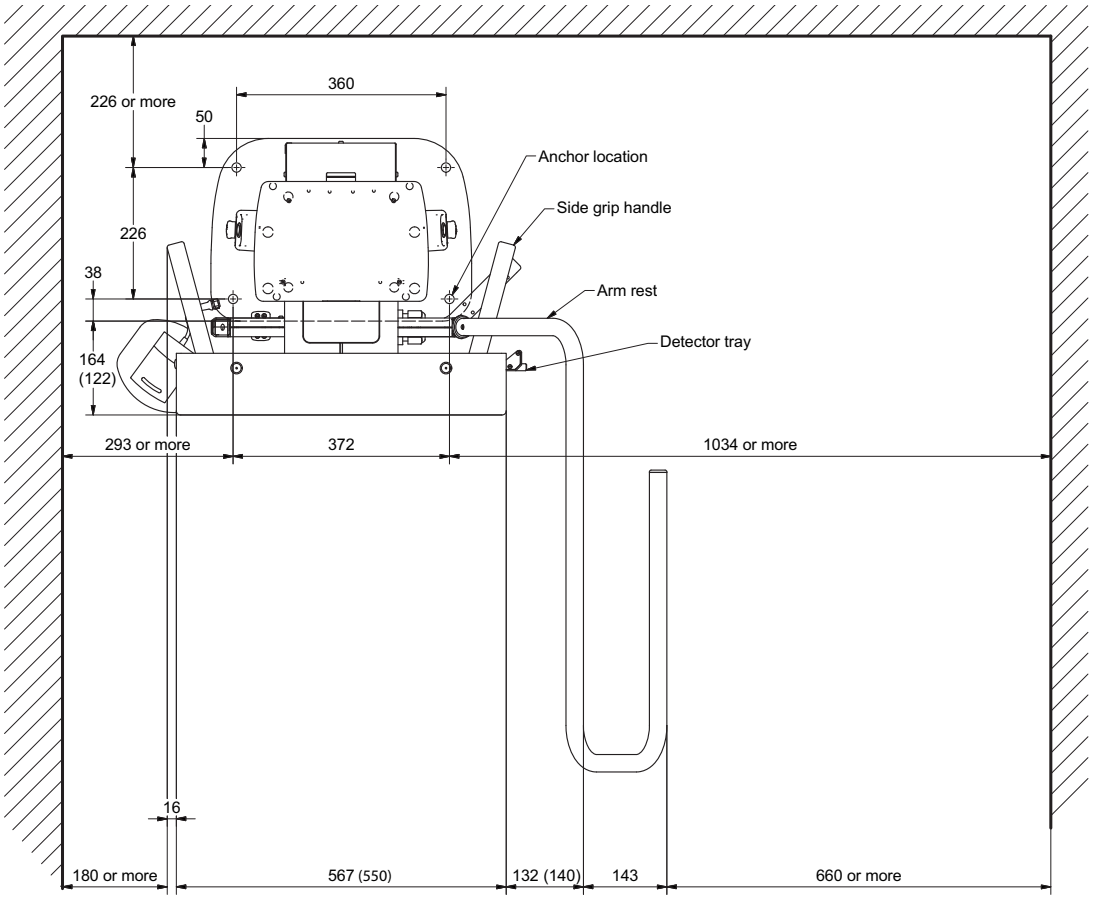

Figure 4-4

Table

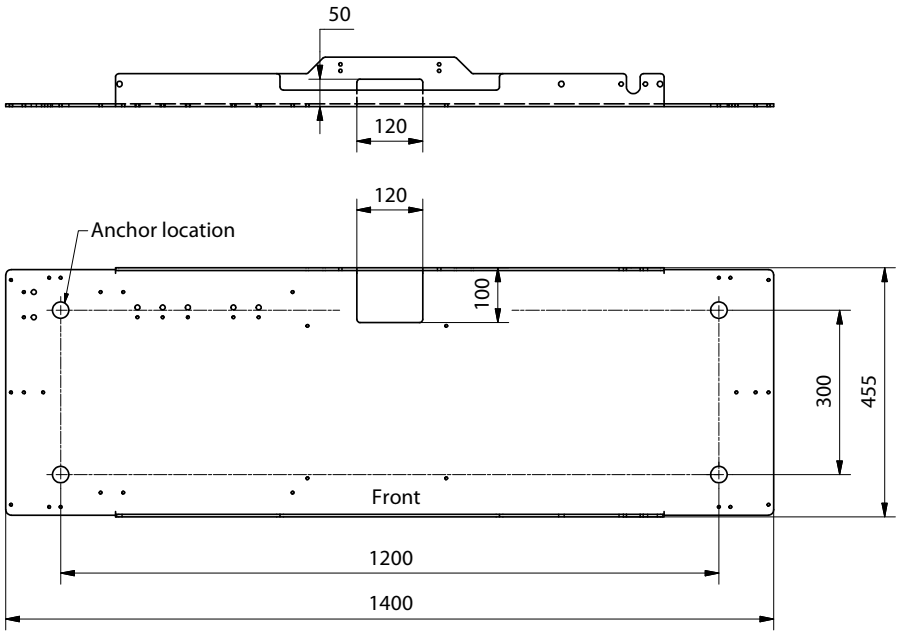

Figure 4-5

Anchoring Location

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Room Layout

Installation Proposal

The layout proposals, displayed in the drawings on the next pages, are chosen to optimize the performance of the system with usability and ergonomics in mind. The chosen layout proposal considers the tube heel-effect, cable conduits, work space etc, as well as safety issues such as wall clearance and possible collision zones. The room appearance (furniture, lights, fire protection devices etc.) is not considered in the layouts.

The versatility of the system allows a minimum room dimension of 3500*4500 mm. Implementing the system in a small room (<4200*4500) limits the moving range of the table top (see Wall clearance in chapter 2). The 4200*4500 mm room dimension allows an 800 mm table top stroke which gives total body coverage of a 2500 mm patient. The 800 mm table top stroke is used in all layout proposals, except for layout 6 and 7 where the table top is fixated in the longitudinal direction.

The layouts are valid for the tube Varian Rad 14/Diamond and collimator Ralco 302 (manual). For other types of tubes and collimators when planning the room, see page 6-2.

Implementing the system in a small room limits the moving range of the table top.

Reference

Recommended placement of doors

Alternative placement of components

Movement range

Orientation point, correspond to the mounting point E of the Table. For more information see *Floor specification* for the Table*,* in chapter *Environment specification*

Room Layout

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Room Layout 1

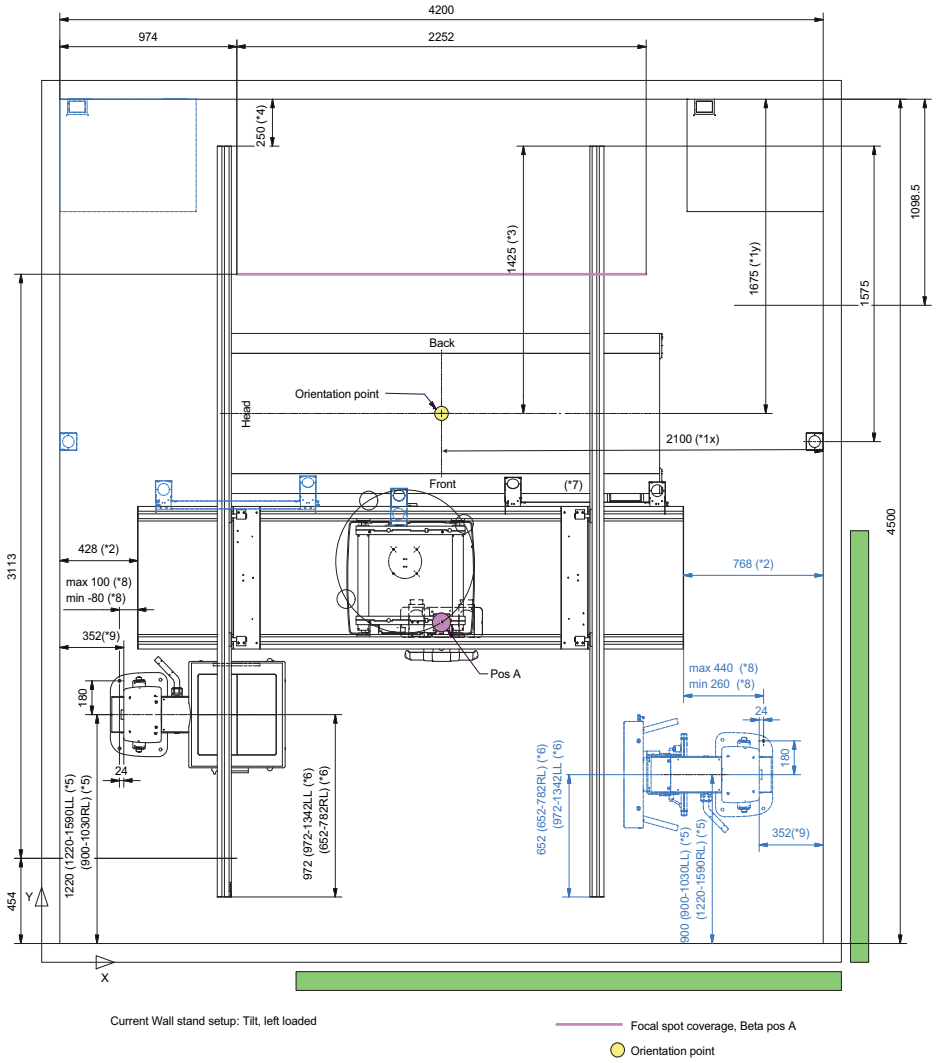


Figure 5-1

Layout 1 is the preferred layout. The layout enables quick and easy positioning of the system and minimizes the masses that need to be moved. The layout also enables a wide range of examination possibilities due to the large working area.

The placing of the Wall stand on the "left-hand" side is a result of the Heel effect of the X-ray tube.

The Wall stand has a detector holder with loading from the left side enabling the operator to work from an optimal position at all times. This option is also valid if the Wall stand is supplied with tilt.

A 0180, Variant 4C installed in a room with similar size and with the components placed as described in *Figure 5-1*, usually requires 16m cable length, which also is the standard configuration, see also System Connections in chapter 5.

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall or table. If non tilt wall stand is used there will be more space to place it since foot print is smaller and horizontal projection doesn't have to be considered.

If recommended dimension are overridden, necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorised movements according to IEC 60601-1 3rd edition.

- **(*1x) and (*1y)** is chosen considering a limited stroke of the table top (X +/- 400 y +/ -150) and a 500mm clearance to wall and cabinet. If cabinet is placed somewhere else **(*1y)** is minimum 1100mm. If lateral projection should be performed see **(*3)** for minimum requirements. Smaller rooms require further table top stroke limitations (max table top movement range X +/-500mm, Y +/-150).
- **(*2)** is chosen due to the room size in layout 1 (*Fig. 5-1*) and centers the focal spot coverage area in X-direction related to the room and table. **(*2)** must not be less than 100 mm.
- **(*3)** is chosen considering a lateral projection from the back side of the table. If the table top is centered over the table minimum distance is 1289mm. A minimal distance of 1189 mm can be chosen, but requires that the table top is moved to its outer position (towards the front of the table).
- **(*4)** is chosen to give the traverse cable outlet enough clearance to the wall.
- **(*5)** is chosen to give the operator enough space to work freely with the ceiling suspended unit and the wall stand (see also **(*6)**). It's allowed to mount arm rest on both sides when those min and max dimensions are withheld. Both left hand load detector holder (LL) and right hand load detector holder (RL) are described with min and max dimensions.
- **(*6)** is chosen to give the operator enough space to work freely with the bucky/detector holder since the chosen configuration is loaded from the left side. The traverse cable outlet **(*7)** shall, if possible, always be placed at the opposite side of the wall stand to avoid collisions. If the recommended placing of the traverse cable outlet is not possible, **(*6)** should not exceed 800 mm.
- Also consider the traverse cable conduits when placing the traverse cable outlet on the same side as the wall stand. The conduits will hang down over the head end of the table when choosing this option.
- **(*8)** is chosen to enable a SID of up to 2000 mm and to enable the ceiling suspended unit to be aligned with the image receptor when the wall stand bucky/detector holder is tilted.
- **(*9)** is chosen to enable exposures in the center of the tilted detector. See also **(*8).** The distance, measured from the back of the wall stand, is variable but must not be less than 250 mm due to the cable outlet of the wall stand.

Room Layout 2a

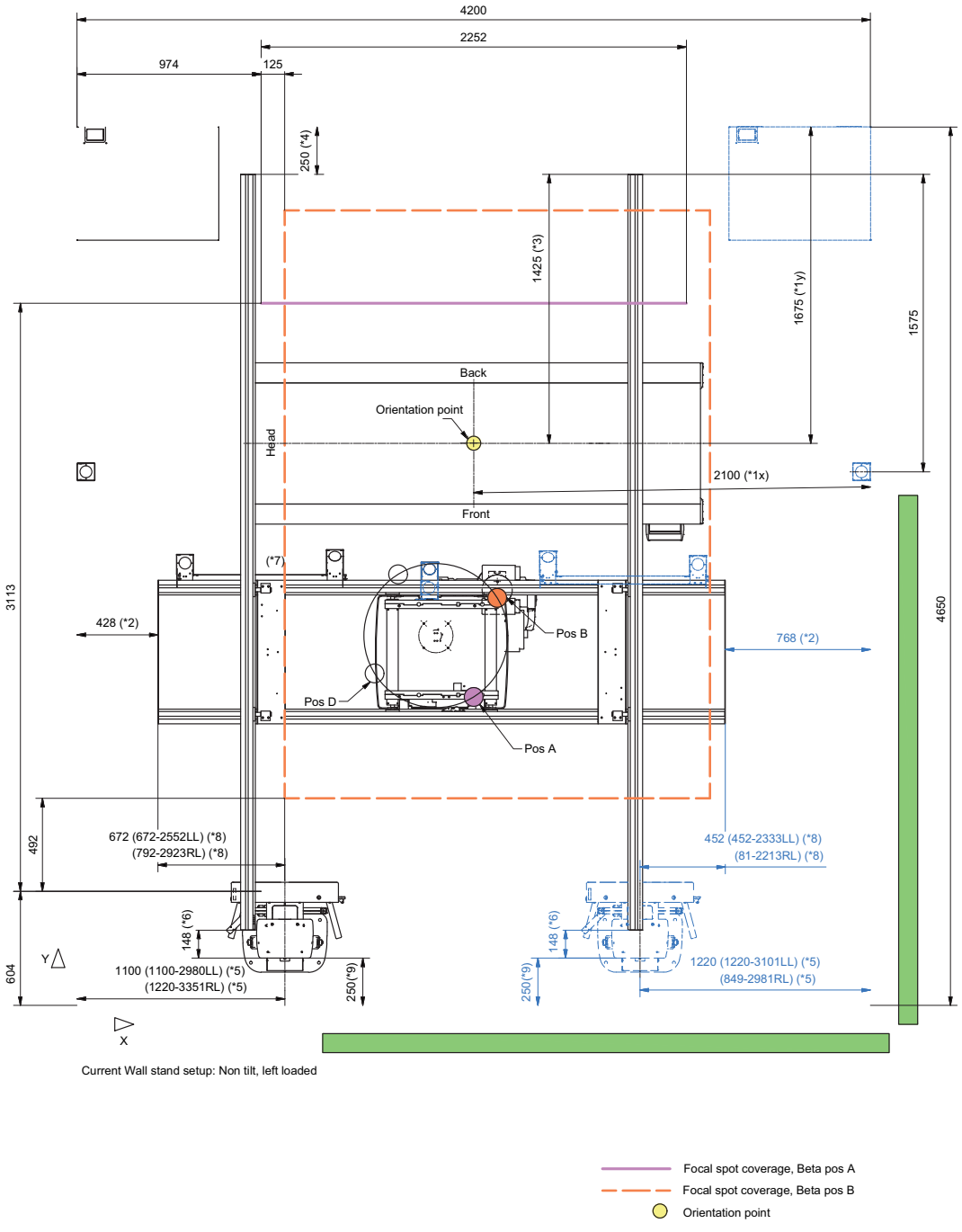


Figure 5-2

This layout is a variation of layout 1. It is only valid with a non-tilting wall stand and this option may be considered if the room layout, e.g. placement of doors, does not allow layout 1 to be chosen. The downside of selecting this layout is the larger room that is required and the extended amount of mass that has to be handled during examinations using the wall stand.

The wall stand has a detector holder with loading from the left side, enabling the operator to work from an optimal position at all times

A 0180, Variant 4C installed in a room with similar size and with the components placed as described in *Figure 5-2* usually requires 16m cable length, which also is the standard configuration, see also system connections in chapter 5.

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1x) and (*1y)** is chosen considering a limited stroke of the table top (X +/- 400 y +/ -150) and a 500mm clearance to wall and cabinet. If cabinet is placed somewhere else **(*1y)** is minimum 1100mm. If lateral projection should be performed see **(*3)** for minimum requirements. Smaller rooms require further table top stroke limitations (max table top movement range X +/-5 00mm, Y +/-150).
- **(*2)** is chosen due to the room size in layout 1 (*Figure 5-2*) and centers the focal spot coverage area in X-direction related to the room and table. **(*2)** must not be less than 100 mm.
- **(*3)** is chosen considering a lateral projection from the back side of the table. If the table top is centered over the table minimum distance is 1289mm. A minimal distance of 1189 mm can be chosen, but requires that the table top is moved to its outer position (towards the front of the table).
- **(*4)** is chosen to give the traverse cable outlet enough clearance to the wall.
- **(*5)** is chosen to give the operator enough space to work freely with the ceiling suspended unit and the wall stand (see also **(*6)**). It's allowed to mount arm rest on both sides when those min and max dimensions are withheld. Both left hand load detector holder (LL) and right hand load detector holder (RL) are described with min and max dimensions.
- **(*5)** is also chosen to give the operator enough space to work freely with the bucky/ detector holder since the chosen configuration is loaded from the left side. The traverse cable outlet **(*7)** shall, if possible, always be placed as suggested in *Figure 5-2*, since the cable conduits will be in the way of the operator in a projection against the wall stand. If the recommended placing of the traverse cable outlet is not possible, the projection against the wall stand requires that the tube is rotated to position D. (consider heel effect)
- **(*6)** is chosen to enable a SID of 1800mm (2000mm SID requires that the table top is moved towards the back of the table).
- **(*8)** is chosen to be able to align the tube and the wall stand. Max and min dimensions are stated on the drawing. See also **(*5).**
- **(*9)** must not be less than 250 mm due to the cable outlet of the wall stand.

Room Layout 2b

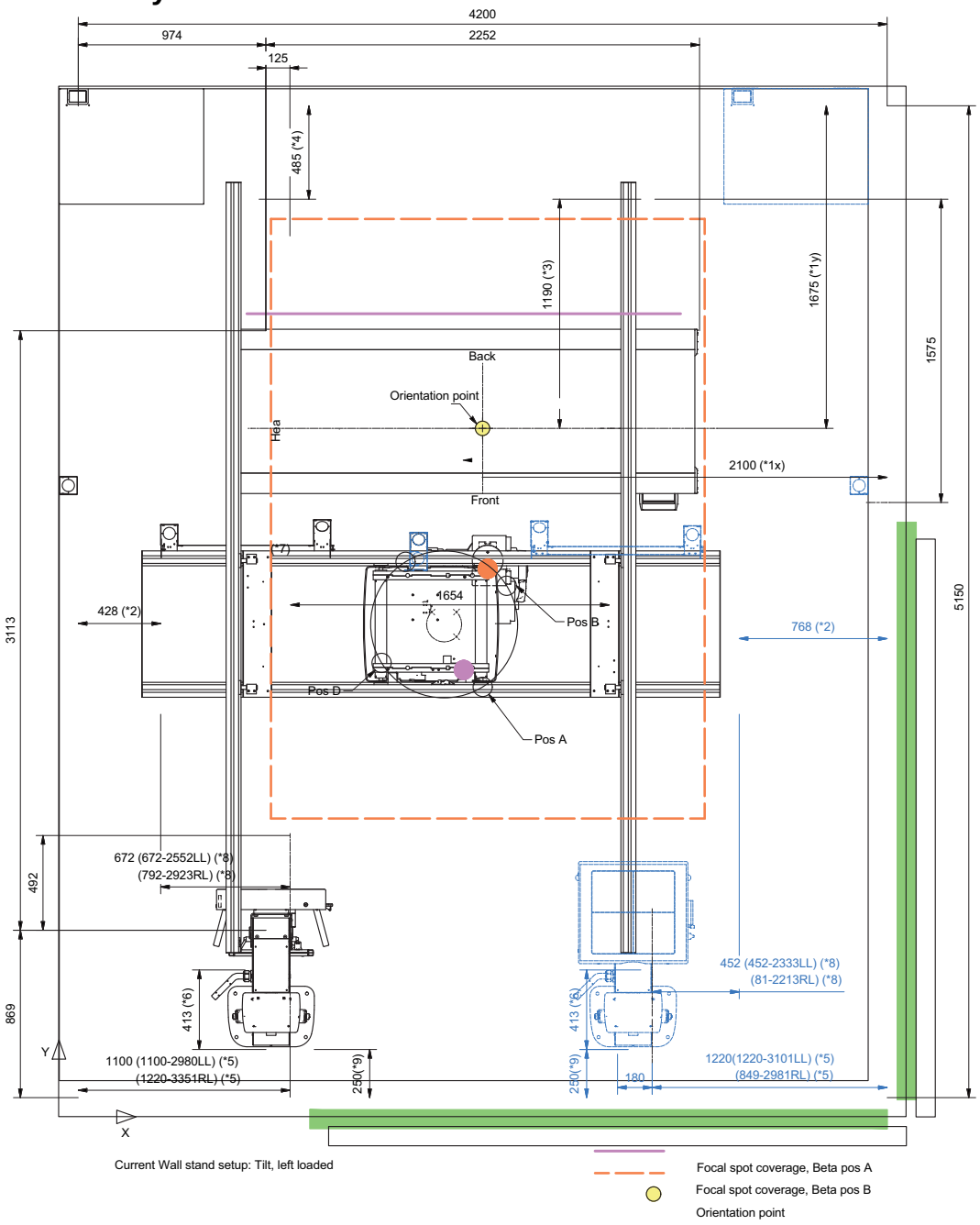


Figure 5-3

This layout is also a variation of layout 1. It is only valid with a tilting wall stand and this option may be considered if the room layout, e.g. placement of doors, does not allow layout 1 to be chosen. The downside of selecting this layout is the larger room that is required and the extended amount of mass that has to be handled during examinations using the wall stand. It is also limited when doing lateral projections and positioning over tilted detector (Pos. A).

The wall stand has a detector holder with loading from the left side enabling the operator to work from an optimal position at all times. Working with the wall stand detector holder tilted, will require additional operations to get the x-ray tube and the image receptor aligned (rotation of the beta axis) due to the placing of the Wall stand.

A 0180, Variant 4C installed in a room with similar size and with the components placed as described in *Figure 5-3*, usually requires 16m cable length, which also is the standard configuration, see also system connections in chapter 5.

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1x) and (*1y)** is chosen considering a limited stroke of the table top (X +/- 400 y +/ -150) and a 500mm clearance to wall and cabinet. If cabinet is placed somewhere else **(*1y)** is minimum 1100mm. If lateral projection should be performed see **(*3)** for minimum requirements. Smaller rooms require further table top stroke limitations (max table top movement range X +/-5 00mm, Y +/-150).
- **(*2)** is chosen due to the room size in layout 1 (*Figure 5-3*) and centers the focal spot coverage area in X-direction related to the room and table. **(*2)** must not be less than 100 mm.
- **(*3)** is chosen considering a lateral projection from the back side of the table. Lateral projection requires that the table top is moved to its outer position (towards the front of the table)
- **(*4)** is chosen to give the traverse cable outlet enough clearance to the wall.
- **(*5)** is chosen to give the operator enough space to work freely with the ceiling suspended unit and the wall stand (see also **(*6)**). It's allowed to mount arm rest on both sides when those min and max dimensions are withheld. Both left hand load detector holder (LL) and right hand load detector holder (RL) are described with min and max dimensions.
- **(*5)** is also chosen to give the operator enough space to work freely with the bucky/ detector holder since the chosen configuration is loaded from the left side. The traverse cable outlet **(*7)** shall, if possible, always be placed as suggested in Fig. 5-2, since the cable conduits will be in the way of the operator in a projection against the wall stand. If the recommended placing of the traverse cable outlet is not possible, the projection against the wall stand requires that the tube is rotated to position D. (consider heel effect)
- **(*6)** is chosen to enable a SID of 1800mm (2000mm SID requires that the table top is moved towards the back of the table). Ceil stand have to be in position A to be able to project in the center of the tilted detector holder.
- **(*8)** is chosen to be able to align the tube and the wall stand. Max and min dimensions are stated on the drawing. See also **(*5).**
- **(*9)** must not be less than 250 mm due to the cable outlet of the wall stand.

Room Layout 3

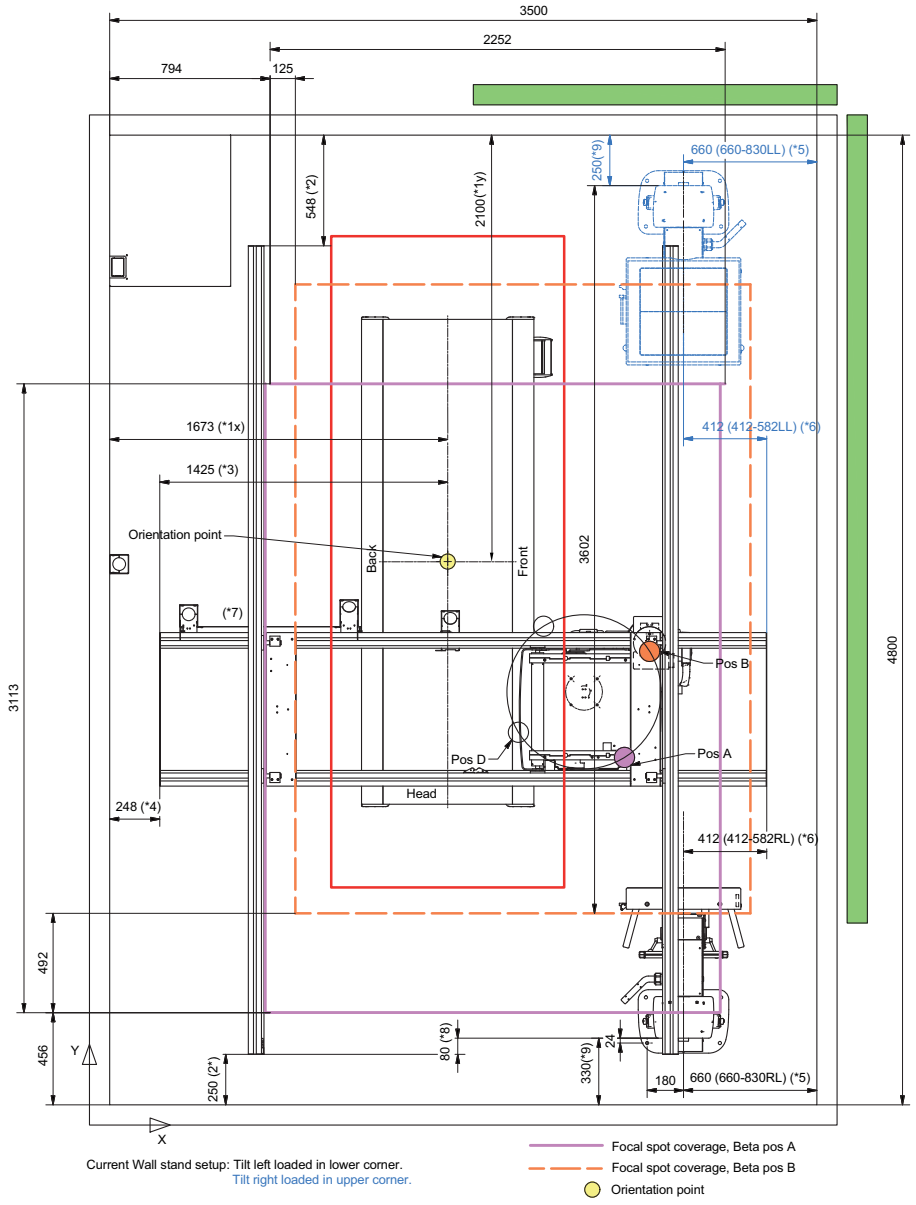


Figure 5-4

In this layout (and in layout 4) is the ceiling rail of the ceiling suspended unit, reversed which allows the system to operate in a long and narrow room. However, by reversing the ceiling rails the ergonomics is not optimized since the operator has to move more mass during positioning.

This layout may be considered if the ceiling preparation does not allow the previous options to be selected or if the size of the room is more suitable.

For cable length see *System Connections in chapter 5.*

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall or table.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1x) and (*1y)** is chosen considering a limited stroke of the table top (X +/- 400 y +/ -150) and a 500mm clearance to wall and cabinet. If cabinet is placed somewhere else **(*1y)** is minimum 1100mm. If lateral projection should be performed see **(*3)** for minimum requirements. Smaller rooms require further table top stroke limitations (max table top movement range X +/-500mm, Y +/-150).
- **(*2)** is chosen due to the room size in layout 1 (*Figure 5-4*). It makes it possible to cover the table and horizontal wall stand when beta is in position B. **(*2)** must not be less than 100 mm.
- **(*3)** is chosen considering a lateral projection from the back side of the table. If the table top is centered over the table minimum distance is 1276mm. A minimal distance of 1176 mm can be chosen, but requires that the table top is moved to its outer position (towards the front of the table). Considering the cable outlet of the Ceiling suspended unit, the distance should preferably be increased to the stated dimension on the drawing.
- **(*4)** is chosen to give the traverse cable outlet enough clearance to the wall. The distance must not be less than 100mm
- **(*5)** is chosen to give the operator enough space to work freely with the ceiling suspended unit and the wall stand and avoid collision with the table top (see also **(*6)**). It's allowed to mount arm rest on both sides when those min and max dimensions are withheld. Right loaded is recommended in the lower corner and left loaded in the upper corner.
- **(*6)** is chosen to give the operator enough space to work freely with the bucky/detector holder since the chosen configuration is loaded from the right side (lower corner). The traverse cable outlet **(*7)** shall, if possible, always be placed at the opposite side of the wall stand to avoid collisions.
- **(*8)** is chosen to enable a SID of 2000mm (current drawing will give a SID larger then 2800mm). It also enables ceil stand to project in the center of the tilted detector holder.
- **(*9)** must not be less than 250 mm due to the cable outlet of the wall stand.

Room Layout 4

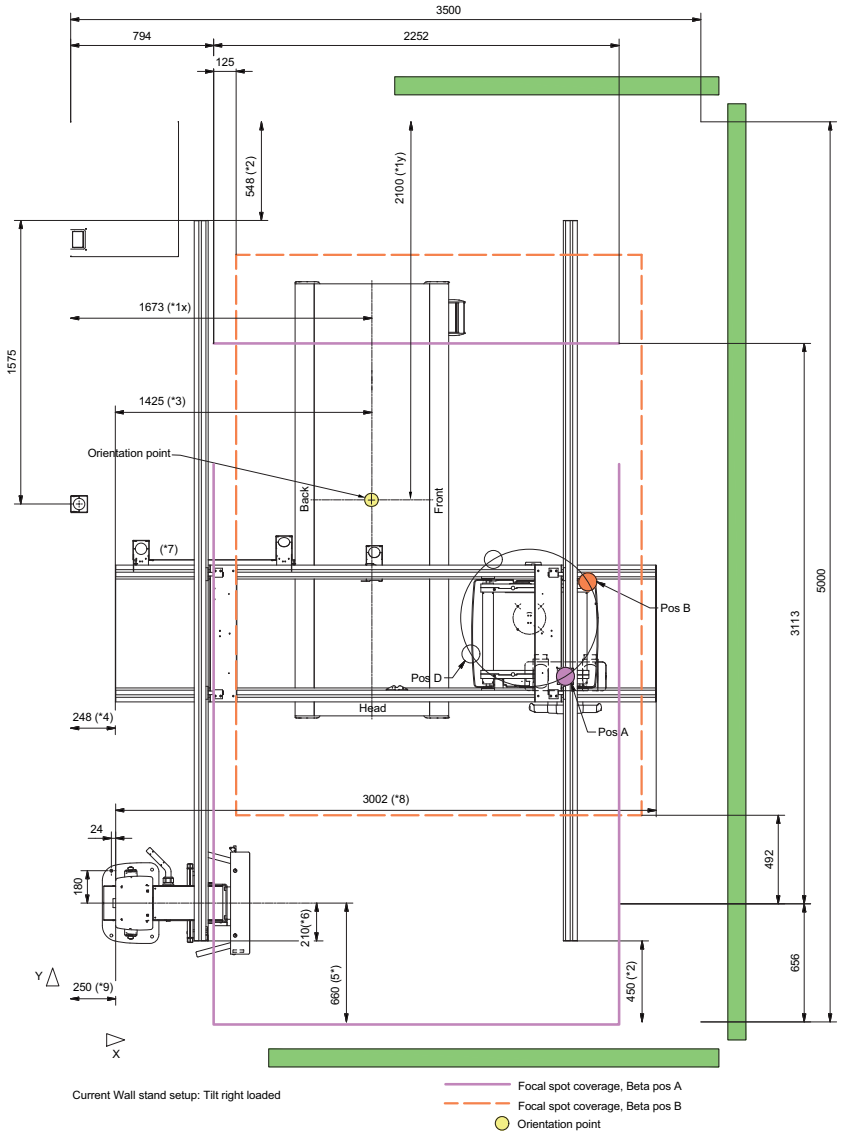


Figure 5-5

Layout 4 shall be considered if the room is long and narrow. In this layout (as well as in layout 3) is the ceiling rail of the ceiling suspended unit reversed which allow the system to operate in a long and narrow room. However, by reversing the ceiling rails the ergonomics is not optimized since the operator has to move more mass during positioning.

The working area is considerably larger than in layout 3 as well as door placement possibilities. The detector holder has a right loading configuration in this layout.

For cable length see *System Connections in chapter 5.*

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall or table.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1x) and (*1y)** is chosen considering a limited stroke of the table top (X +/- 400 y +/ -150) and a 500mm clearance to wall and cabinet. If cabinet is placed somewhere else **(*1y)** is minimum 1100mm. If lateral projection should be performed see **(*3)** for minimum requirements. Smaller rooms require further table top stroke limitations (max table top movement range X +/-500mm, Y +/-150).
- **(*2)** is chosen due to the room size in layout 1 (*Figure 5-5*). It makes it possible to cover the table and horizontal wall stand when beta is in position A. **(*2)** must not be less than 100 mm.
- **(*3)** is chosen considering a lateral projection from the back side of the table. If the table top is centered over the table minimum distance is 1276mm. A minimal distance of 1176 mm can be chosen, but requires that the table top is moved to its outer position (towards the front of the table). Considering the cable outlet of the Ceiling suspended unit, the distance should preferably be increased to the stated dimension on the drawing.
- **(*4)** is chosen to give the traverse cable outlet enough clearance to the wall. The distance must not be less than 100mm
- **(*5)** is chosen to give the operator enough space to work freely with the ceiling suspended unit and the wall stand and avoid collision with the table top (see also **(*6)**). It's allowed to mount arm rest on both sides when those min and max dimensions are withheld. Layout is valid for right hand load unit.
- **(*6)** is chosen to give the operator enough space to work freely with the bucky/detector holder since the chosen configuration is loaded from the right side. The traverse cable outlet **(*7)** shall, if possible, always be placed at the opposite side of the wall stand to avoid collisions.
- **(*8)** is chosen to enable a SID of min 2000mm (**(*8)** min 2900). It also enables ceil stand to project in the center of the tilted detector holder.
- **(*9)** must not be less than 250 mm due to the cable outlet of the wall stand.

Room Layout 5

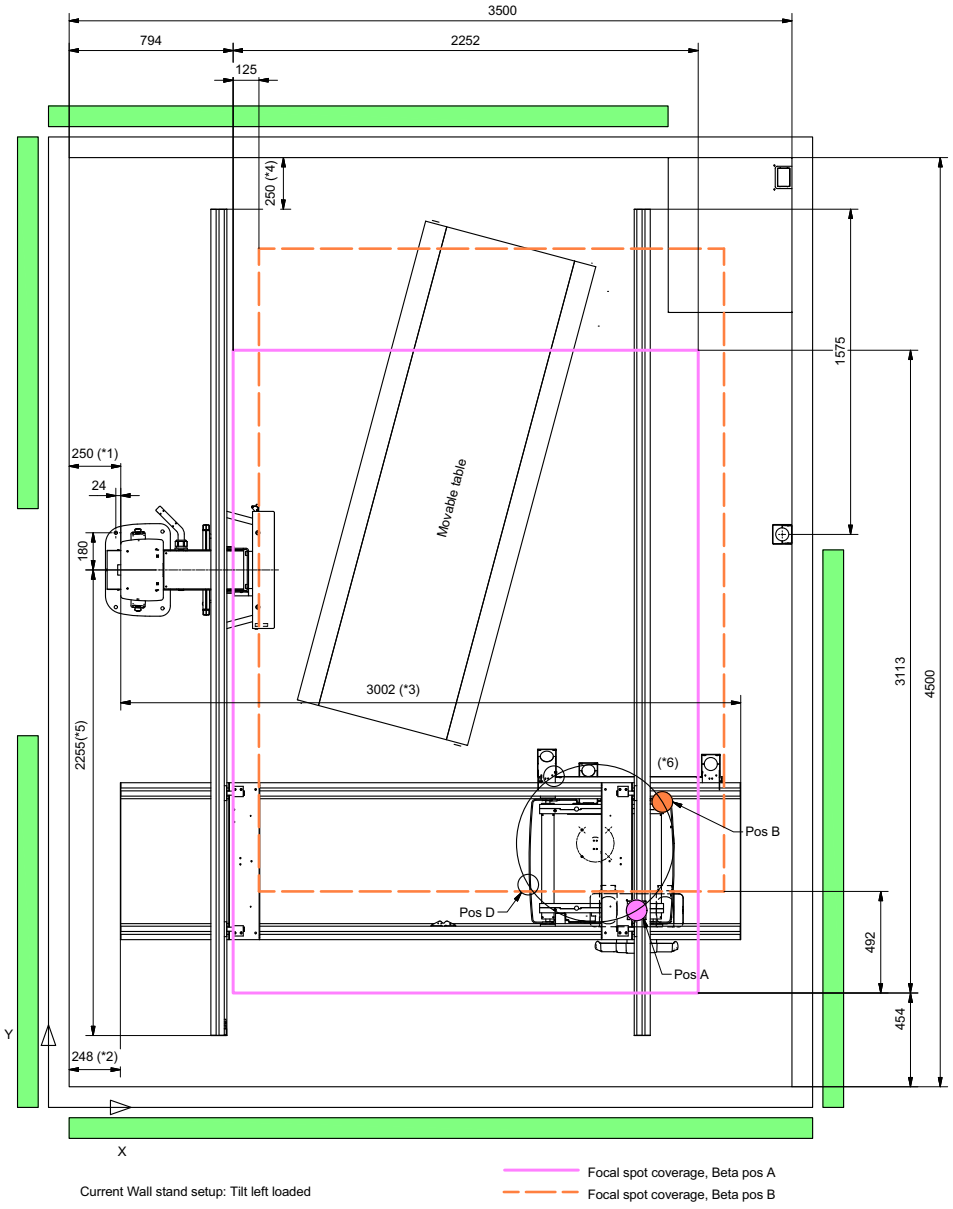


Figure 5-6

This layout should be used if the system configuration consists of a Ceiling suspended unit, wall stand with tilt and a movable table. The ceiling rail of the Ceiling suspended unit must be reversed to enable the tube and the detector/cassette to be aligned, when the image receptor is placed under the movable table top. The detector holder has a left loading configuration in this layout

For cable length see *System Connections in chapter 5*

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall or table.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1)** must not be less than 250 mm due to the cable outlet of the wall stand.
- **(*2)** is chosen due to the room size in layout 1 (*Figure 5-6*). It makes it possible to cover the table and horizontal wall stand when beta is in position A. **(*2)** must not be less than 100 mm.
- **(*3)** is chosen to enable a SID of min 2000mm (**(*3)** min 2900). It also enables ceil stand to project in the center of the tilted detector holder.
- **(*4)** is chosen to give the traverse cable outlet enough clearance to the wall. The distance must not be less than 100mm
- **(*5)** is chosen to get an equal moving distance of tube in beta position B in both directions (y-movement of the ceiling suspended unit) related to the wall stand.
- The traverse cable outlet **(*6)** shall always be placed as suggested in *Figure 5-7* to minimize obstructions of the cable conduits.

Room Layout 6

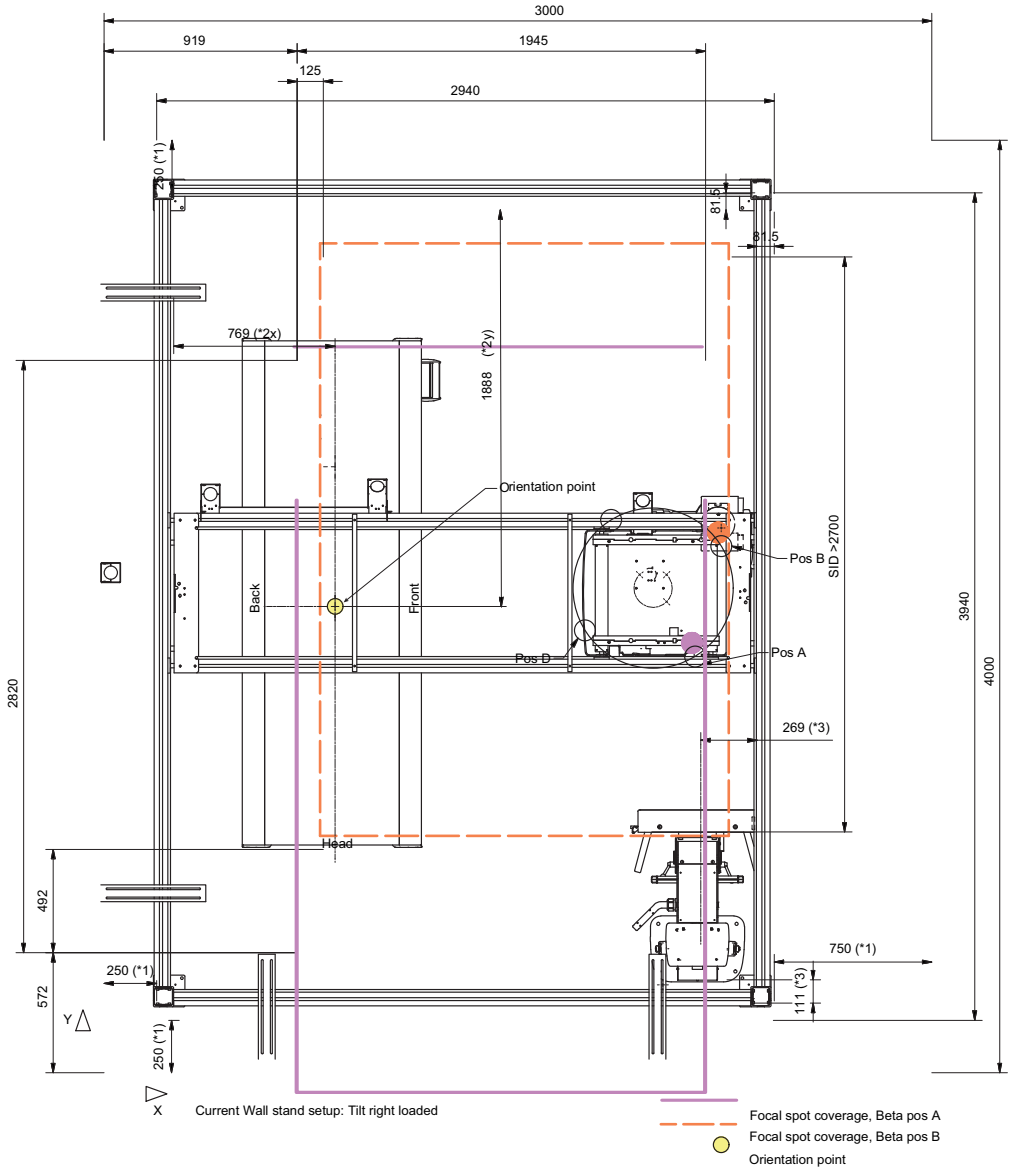


Figure 5-7

Layout 6 is designed for very small rooms, with a low ceiling height (>=2500). To minimize the required room space, the table top could be fixed (in longitudinal direction) and the system cabinet is not placed within the room.

This layout enables the same possibilities as the other options but with some restrictions and limitations. If the table top is fixed, a full patient coverage is not possible without moving the patient.

Lateral projections from behind the table are also restricted due to the limited space available.

The table top must be pushed to the front to be able to position the tube for a lateral projection, but even then the position flexibility is restricted.

The detector holder has a right loading configuration in this layout.

For cable length see *System Connections in chapter 5*

Wall stand loading and position should be carefully planned since it will have large impact on the final layout of the room. If the use of arm rest is restricted to one side it is also possible to move wall stand closer to wall or table.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1)** must not be less than 30mm to be able to install the cube.
- **(*2y)** is showing the table centered in Y-direction. It makes it possible to cover the table and horizontal wall stand when beta is in position B. **(*2x)** has to be 1100 to make it possible to have full lateral projection functionality. Still the table top has to be in front position. Working area of wall stand has to be considered when moving table in X-direction.
- **(*3)** enables ceil stand to project in the center of the tilted detector holder.
- Dimensions states relation between components and have to be adapted to the planned site.

Room Layout 7

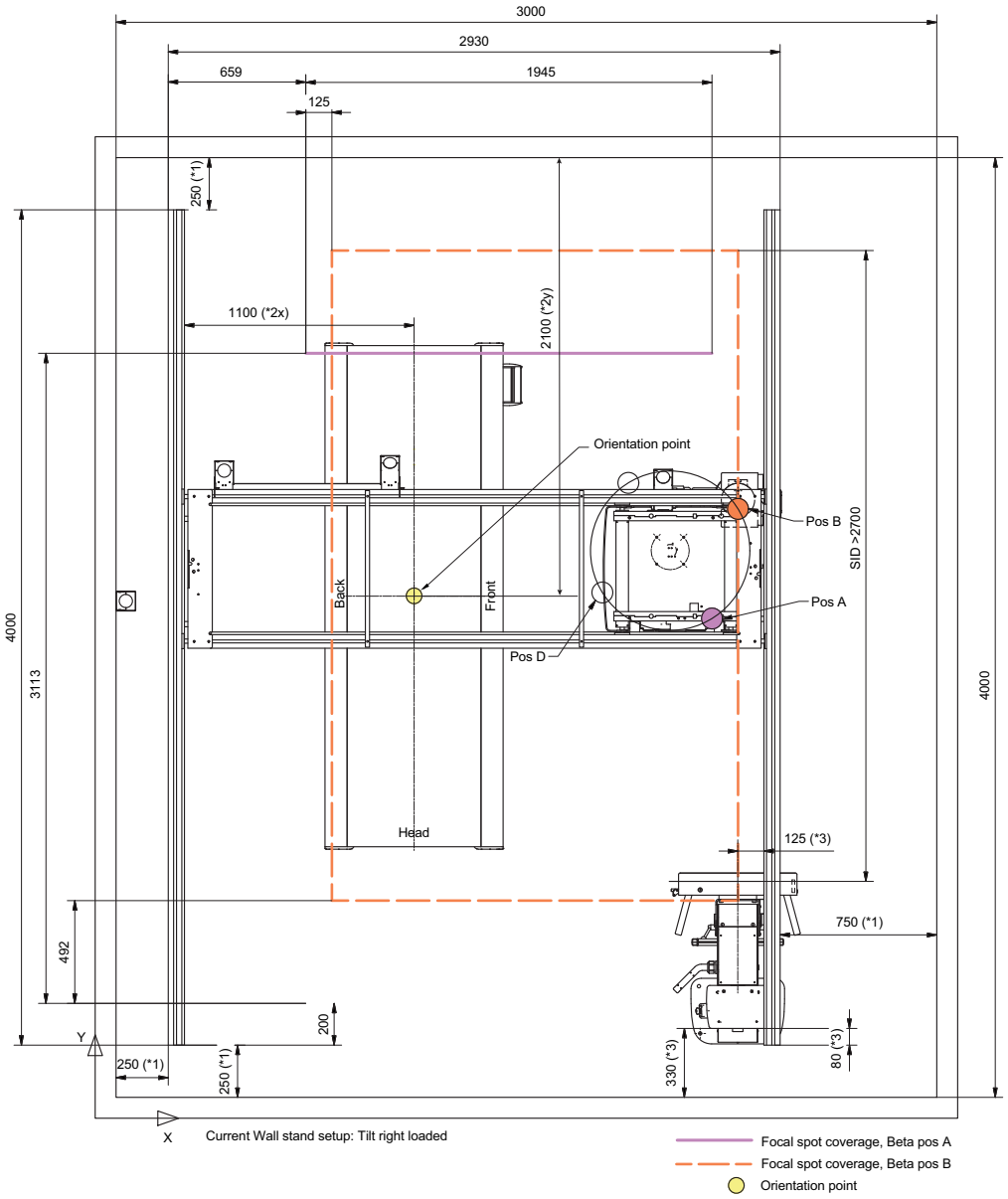


Figure 5-8

Layout 7 is designed for very small rooms with a low ceiling height (>=2500). In this layout the Y rails of low ceiling rail type are mounted directly to the ceiling. To minimize the required room space, the table top could be fixed in the smallest room (in longitudinal direction) and the system cabinet is not placed within the room.

This layout enables the same possibilities as the other options but with some restrictions and limitations.If the table top is fixed, a full patient coverage is not possible without moving the patient.

Lateral projections from behind the table are also restricted due to the limited space available.

The table top must be pushed to the front to be able to position the tube for a lateral projection, but even then the position flexibility is restricted.

The detector holder has a right loading configuration in this layout.

For cable length, see *System Connections on page 18*.

If recommended dimension are overridden necessary notifications, warnings and instructions have to be considered. This includes safety distances and trapping zones around motorized movements according to IEC 60601-1 3rd edition.

- **(*1)** is just reference dimensions, if less than 100 mm special arrangements regarding ceil attachment might be considered.
- **(*2y)** is showing the table position in Y-direction. It makes it possible to cover the table and horizontal wall stand when beta is in position B. **(*2x)** has to be 1100 to make it possible to have full lateral projection functionality. Still the table top has to be in front position. Working area of wall stand has to be considered when moving table in X-direction.
- **(*3)** enables ceil stand to project in the center of the tilted detector holder when beta is in position B.
- Dimensions states relation between components and have to be adapted to the planned site.

System Connections

Cables

The cables from the Ceiling suspended unit have two configurations; 16 m or 24 m. The cable configuration is selected when the system is ordered. The length of the cables is measured between the generator and the X-ray tube.

The lengths, displayed in the column “Length from outlet” are excluding the cable length needed inside the System cabinet, i.e. the 16 m configuration has 6 m of cables between the wall attachment cable hose outlet (A) and the System cabinet.

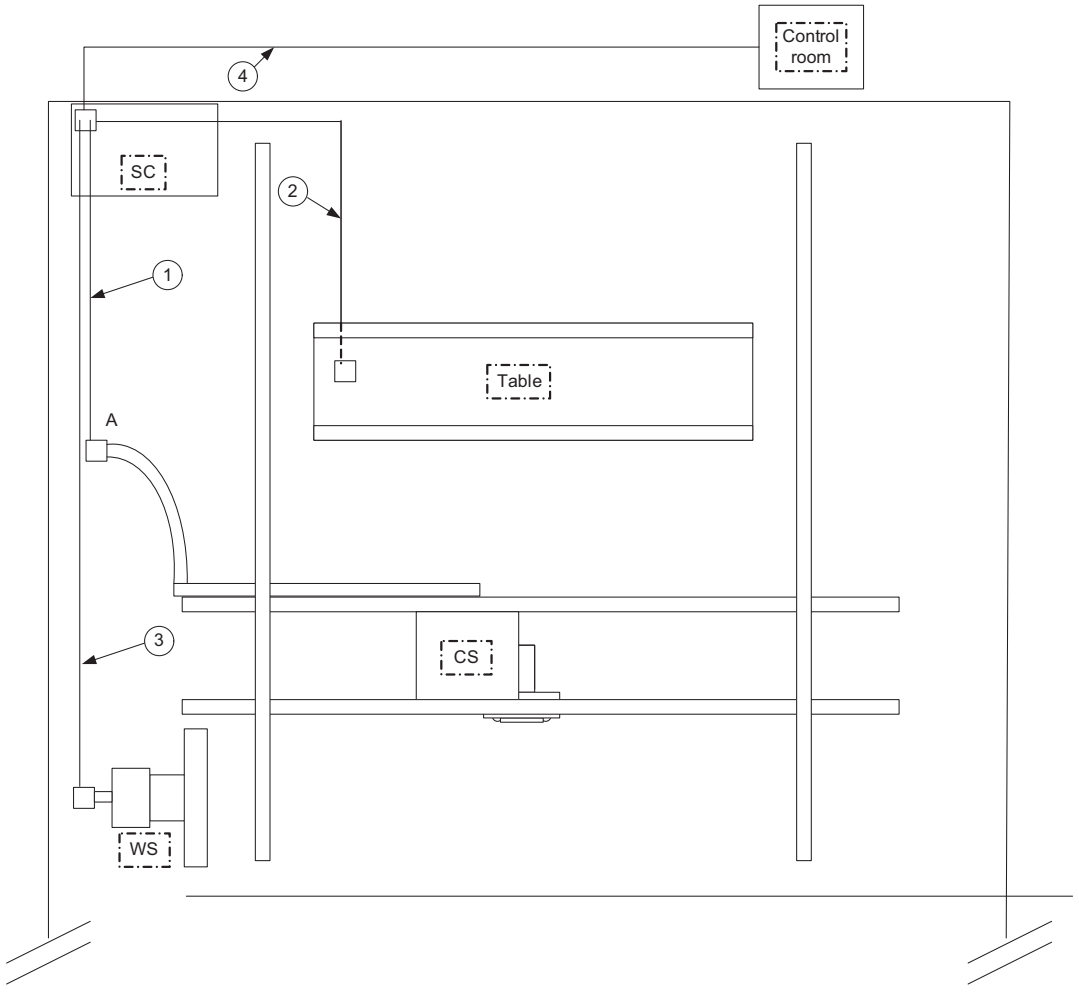


Figure 5-9

No.	From	To	Cable channel cross section (min)	Conduit, diame-ter (min)	Length from outlet (max)
1	CS	SC	1320mm^2	60mm	6m (16m) and 13m (24m)
2	Table	SC	525mm^2	70mm	15m
3	WS	SC	420mm^2	70mm	15m
4	SC	C. Room	81mm^2	45mm	21m

The length of the cables between the outlet and the System cabinet restricts where the System cabinet can be placed.

Room Layout

Page 5-20

Component specification

Ceiling suspended X-ray tube support

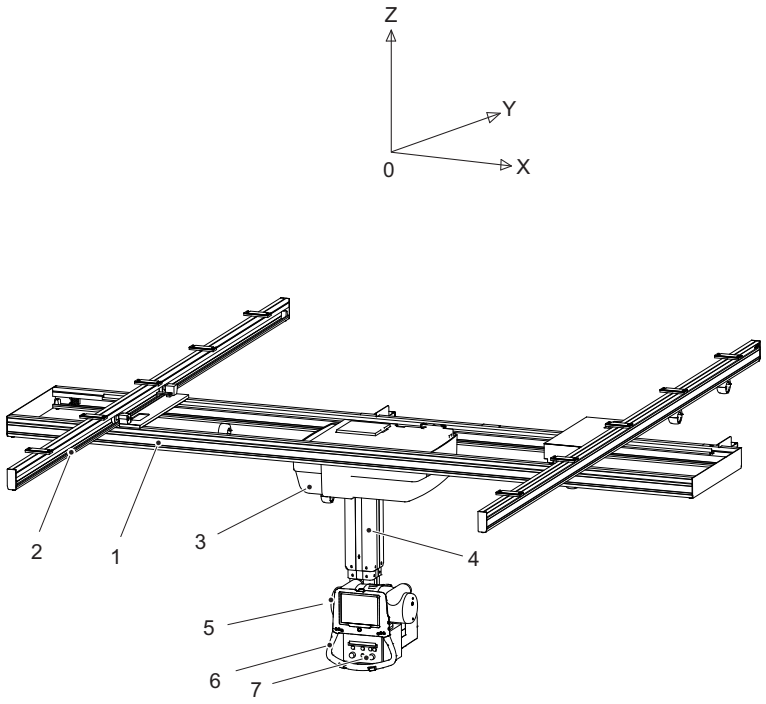
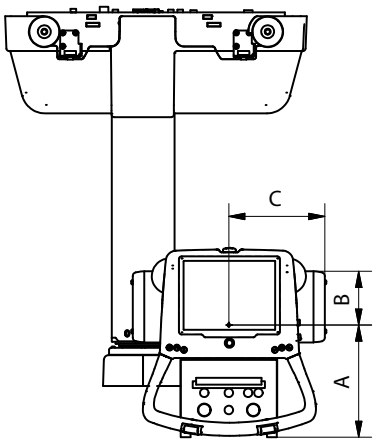


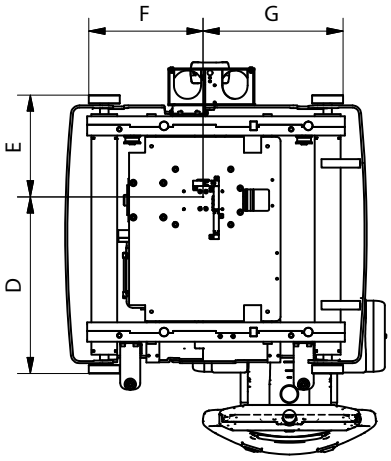
Figure 6-1

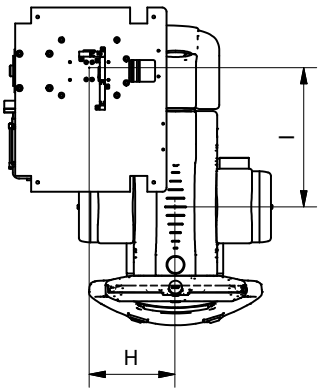
1. *Traverse rail (X)*
2. *Ceil suspended unit rail (Y)*
3. *Ceiling wagon*
4. *Column (Z)*
5. *X-ray tube*
6. *Manoeuvre handle*
7. *Collimator*

General Specification



Alpha/Beta dimensions



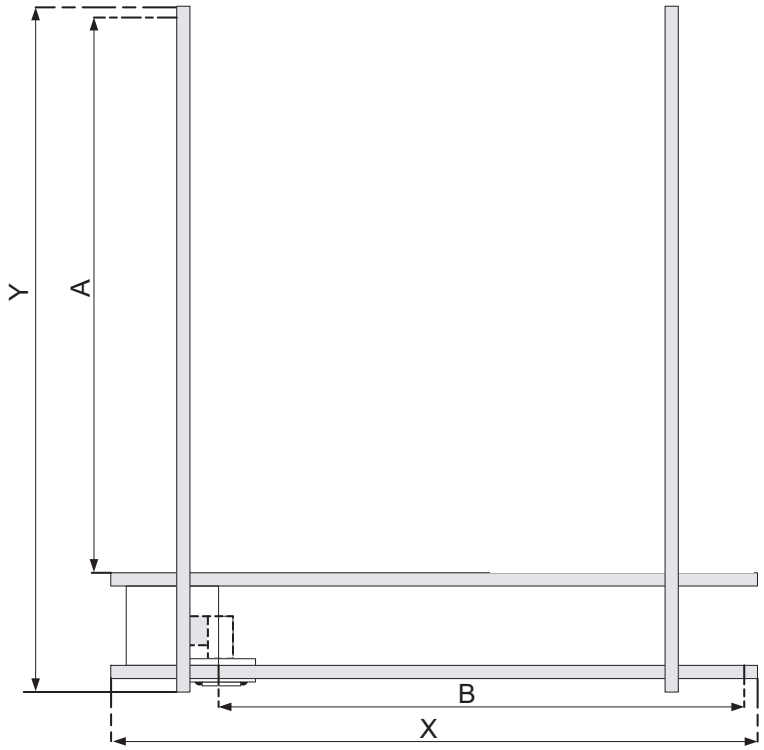


Tube	Collimator	A	B	C	D	E	F	G	H	I
A292. G296/B130 Varian	Ralco R302	286	125	224	412	237	270	330	201	324
A292, G296/B130 Varian	Siemens AL02II	262	125	224	412	237	270	330	201	324

Movements

Ceiling wagon Movements

The manual movements of the ceiling wagon is defined by the dimensions of the ceiling wagon itself and of which rail configuration that is selected. The movement range is also limited by the mechanical end stops that are placed on the ends of each rail.



Direction	X-rail (mm)	Y-rail (mm)	Stroke A (mm)	Stroke B (mm)
Standard	3000	4000	3113	2352
Installation cube/Low ceiling	2748	3748	2820	1945

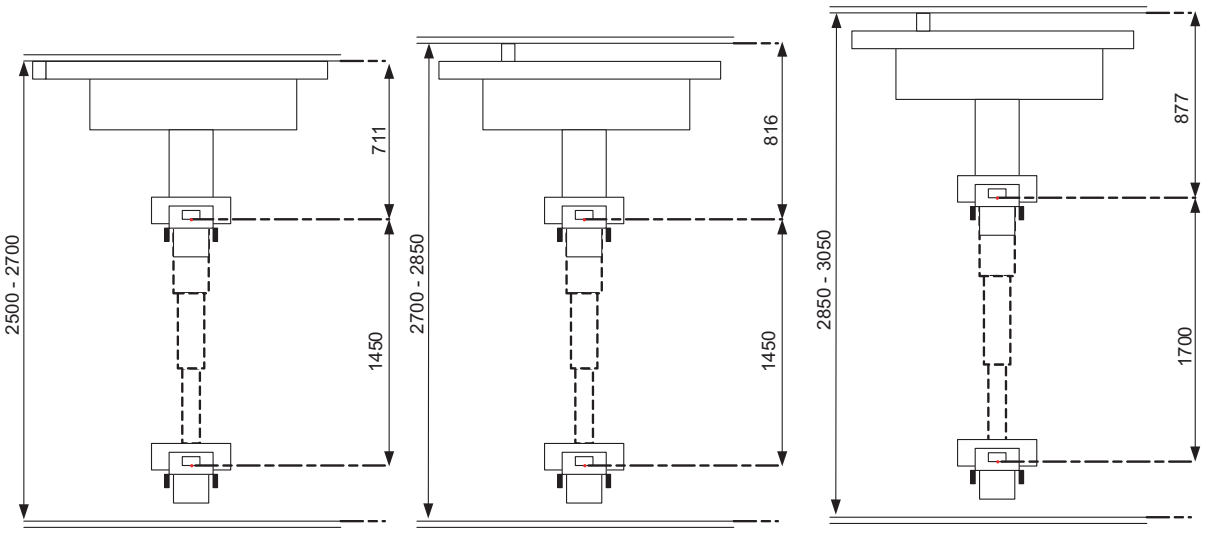
Vertical Movement range

To be able to accomodate three different ceiling heights, one short and one long column are used. The shorter column is used in configuration 1 and 2 wheras the longer column is used in configuration 3. Fully extracted, the short column reaches a length of 2180 mm and the longer column reaches a length of 2530 mm. Adding the built-in measurements. from the suspension, gives the total length of the columns. The longer column (used in configuration 3) is also 100 mm longer when fully retracted, giving a minimum length of 830 mm (short column, 730 mm).

Considering these facts, a trade-off between a high and low elevation must always be considered. For more information about the configurations, *see page 2-1.*

NOTE!

Configuration 1 is always delivered with a 2748 mm traverse (Low ceiling), limiting the movement range of the ceiling wagon.



Configuration 1 Configuration 2 Configuration 3

Figure 6-2

Alpha/Beta movements

The Alpha movement has a total stroke of 337º, limited by fixed mechanical end stops. The Alpha movement has three mechanical indexes (-90º, 0º, 90º). The current Alpha angle is always shown in the display, placed in front of the x-ray tube.

The Beta movement has a total stroke of 343º, limited by a mechanical end stop. The mechanical end stop is adjustable allowing the system to be configured to suit all possible room layouts. The Beta movement has four mechanical indexes (-180º, -90º, 0º, 90º).

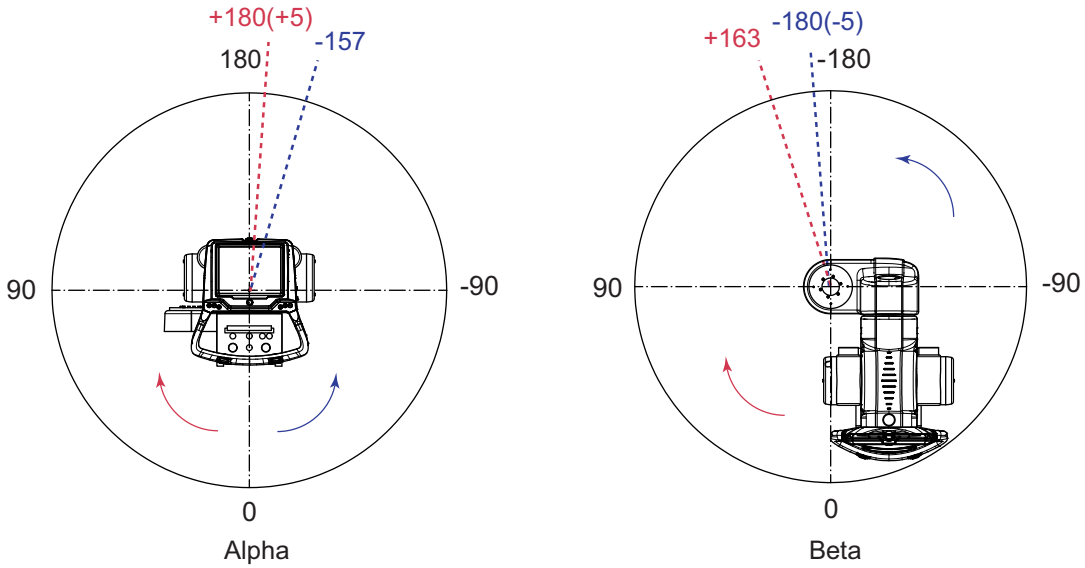


Figure 6-3 Movement range Beta/Alpha.

Wall attachment Cable hose

Placement

The wall attachment of the Ceiling suspended unit is designed to be placed on the wall. The placement of the wall attachment is critical due to the optimized length of the cables. The wall attachment shall be placed as high as possible from the floor and on the distance (B) according to *Figure 6-4*

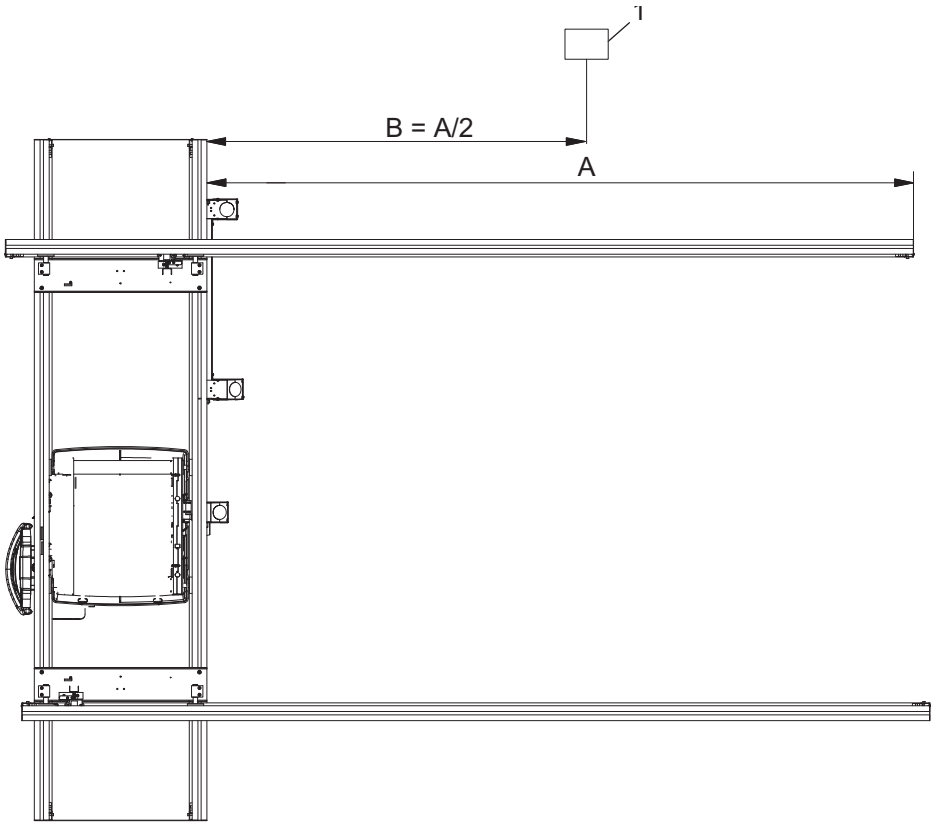


Figure 6-4 Placing of wall attachment cable hose (1), Ceiling suspended unit.

Table

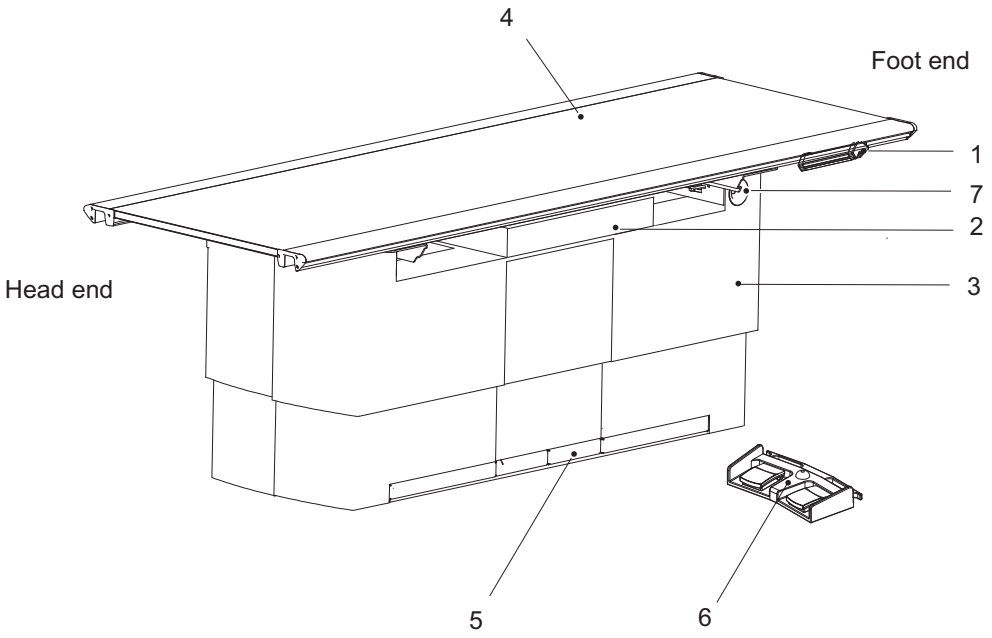


Figure 6-5

1. *Table hand control (X/Y/Z)*
2. *Image receptor holder*
3. *Vertical lift*
4. *Table top (X/Y/Z)*
5. *Foot control, kick list*
6. *Foot control table top (X/Y/Z)*
7. *Emergency stop*

General Specification

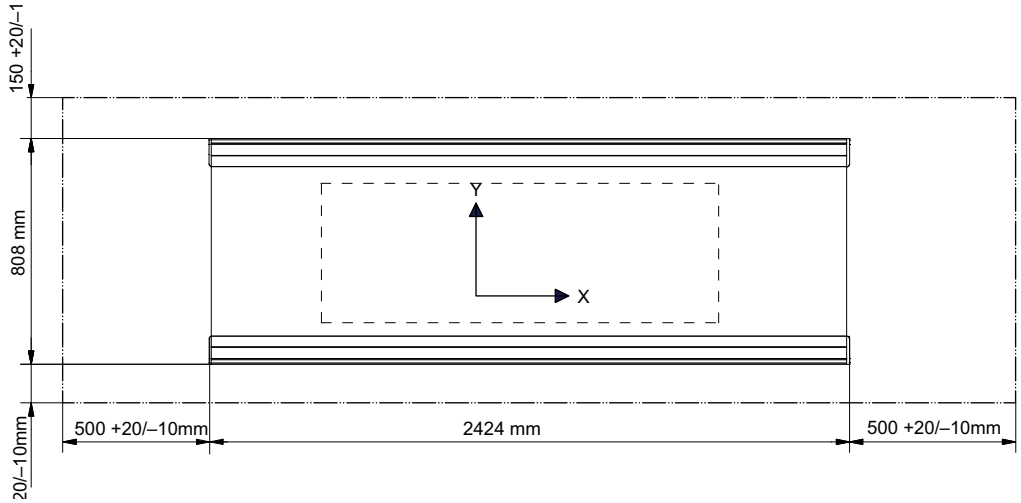


Figure 6-6

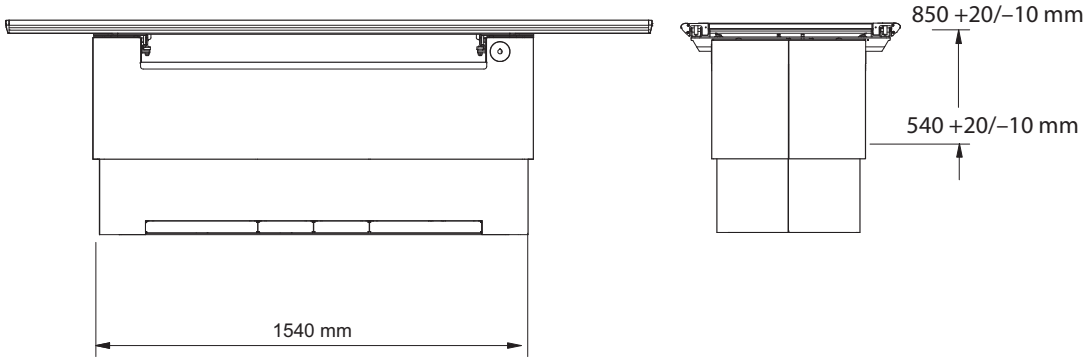


Figure 6-7

- Table top dimensions = W2424 * H540 - 850mm (with the table top)
- Table frame dimensions = W795 *L1570 *H520mm (without the table top)
- Table top dimensions = W2424 * D808mm

- Table top transparent area = 2400 * 601mm
- Table top thickness = 21mm
- Table top aluminium equivalence = 0.9mm
- Patient load = max 250kg
- Vertical travel speed = up to 40 mm/sec
- Table top weight = 47 kg
- Table weight = 150 kg
- Table weight = 171 kg (including the imaging unit of approx. 21 kg)

Movements Table top

- Movement range, lateral direction (Y) = 300 mm (±150 mm from centre).
- Movement range, longitudinal direction (X) = 0-1200 mm (±600 mm from centre).

Movements Detector holder

- Movement range, longitudinal direction = up to 800 mm .

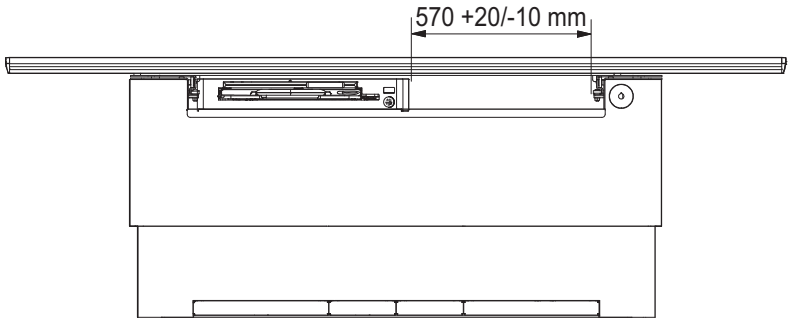


Figure 6-8

Cable Outlet

All cables are led through a cable outlet at the bottom of the head end foot plate. It is recommended to lead the cables in a cable duct from foot plate to the closest wall, however a cable run/channel may also be used. The cables must be enclosed.

Wall stand

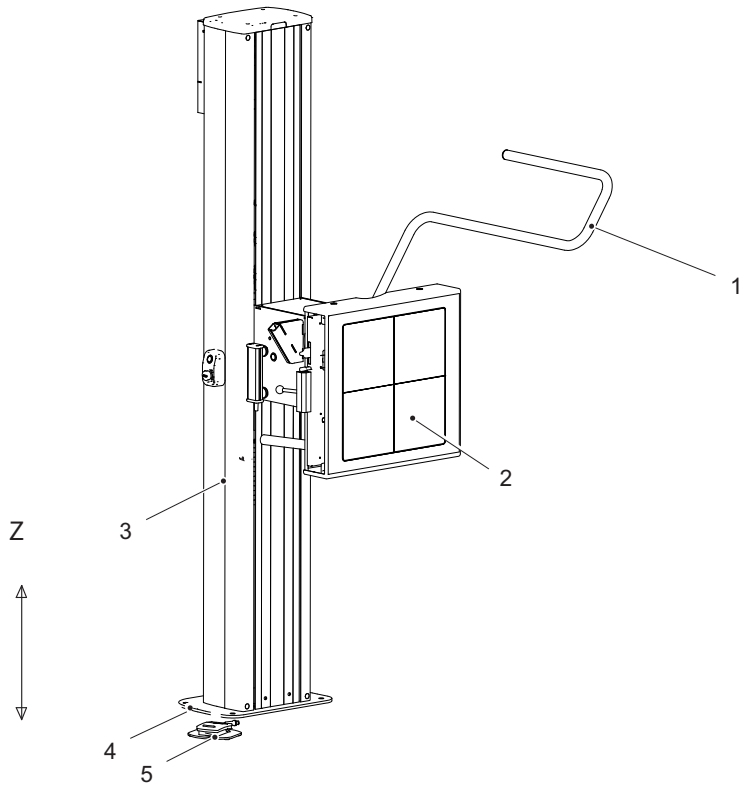


Figure 6-9

1. *Arm rest (option)*
2. *Imaging receptor holder*
3. *Column*
4. *Foot pedal (option)*
5. *Bottom plate*

General Specification

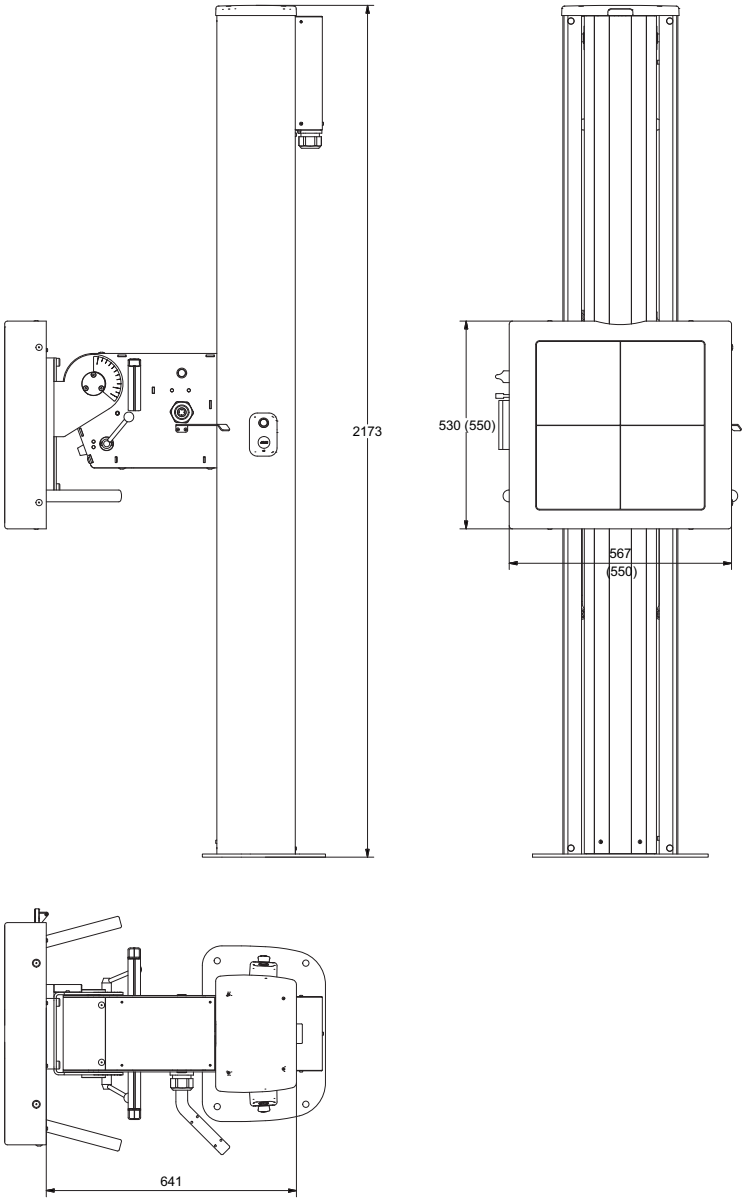


Figure 6-10 Dimensions Wall stand / Image receptor

Movements

The Wall stand is supplied with a counter-weighted vertical movement. The movement is locked via an electro-mechanical brake which is normally active, thus the brake must be activated (released) before moving.

The tilt option enables the Wall stand to be used as a complement for a complete system solution (including a table) but may also be used as a supplement since the tilting function enables vertical projections, e.g. under a table or for extremities. The tilt is manually locked in any positions (form -20 º to 90º) and is also supplied with mechanical indexes in three positions (-20º, 0º, 90º).

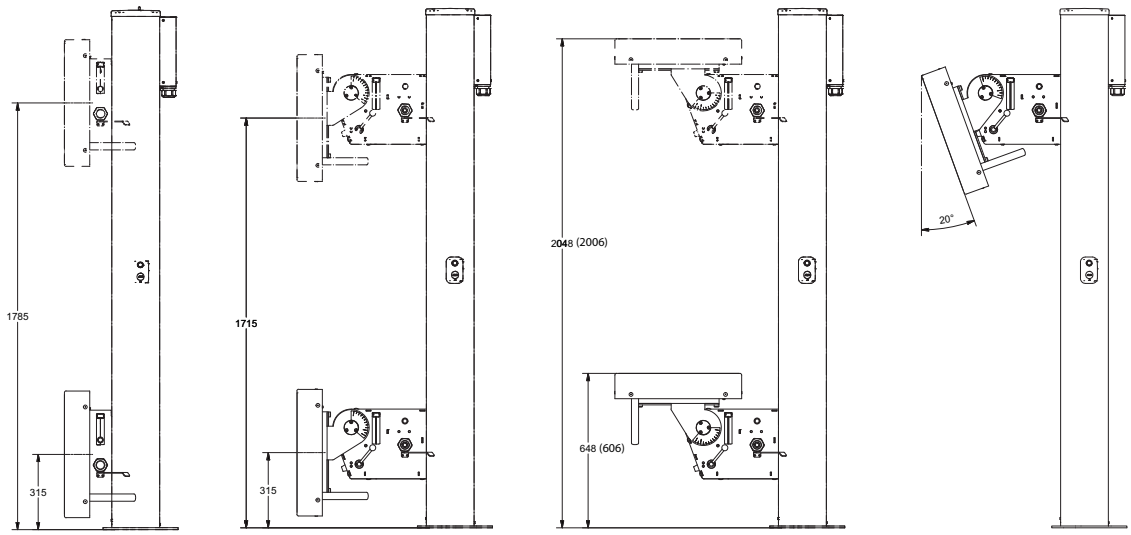


Figure 6-11 Wall stand movement

System Cabinet

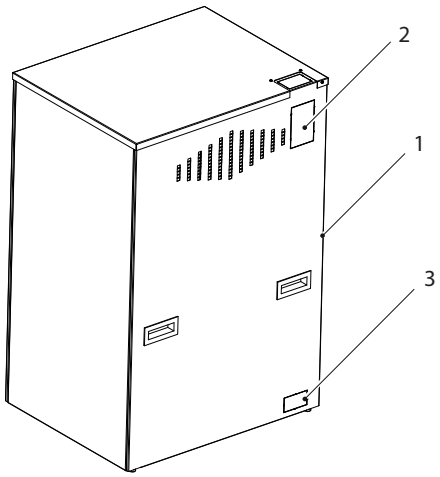


Figure 6-12

1. *Cabinet*
2. *Cable outlet*

Alt. cable outlet

Component Specification

Page 6-14

Technical Specification

0180, Variant 4C

Electrical Characteristics

Mains voltage for the system	400V 3N, 50-60 Hz 400V 3~ 480V 3~ 150A (Short term peak value), recommended fuse 63 A thermal breaker).

Environmental Requirements

Ambient transport and storage temperature	-40^{o}C - +70^{o}
Ambient operating temperature	+10^{o}C - +40^{o}
Transport and storage humidity (relative)	10-90%, non-condensing
Operating humidity (relative)	30-75%, non-condensing
Maximum transport and storage altitude	500-1060 hPa
Maximum operating altitude	700-1060 hPa

Ceiling suspended X-ray tube support

General

Rotation range ceiling (beta)	-180^{o} (-5^{o}) - >+163^{o}
Rotation range tube arm (alpha)	-180^{o} (-5^{o}) - >+157^{o}
Column (Z stroke)	1700 mm, 1450 mm
Heat dispation	689 BTU/hr

Configuration

Ceiling suspended x-ray tube support	The Ceiling suspended x-ray tube support is a mechanical part of an X-ray system.

Weight

Ceiling suspended x-ray tube support	127 kg
Tube and Collimator	40 kg Max allowed weight
Traverse rail X	60 kg
Ceiling rail Y (4m standard)	16 kg

Classification

Classification according to IEC 60601-1

Class	Class I equipment. All dead metal parts of the equipment are electrical connected to protective earth.
Applied part	Type B
Protection against ingress of wter	IPXO
Mode of operation	Intermediate use 20%, max 1 min ON / 4 min OFF
Use of anesthetics mixtures	The equipment if not suitable for use in the presence of flammable anesthetics mixtures with air or with oxygen or with nitrous oxide.

Speed

	Low speed	**Maximum speed**
Z movement	40 mm/s	150 mm/s

X-ray

Loading factors	150 kV, 18 mAs, 19 times/hour

Leakage radiation

G292	0.064 mGy/hour

Table

Column

Lowest table top position (from the floor to the table top surface)	540 +20/-10 mm
Column (Z stroke)	310 +40/-20 mm
Max travel speed	25 mm/s

Table top

Aluminium equivalence	<= 0,7 mm
Table top dimension	2424 X 808 mm
Table top transparent area	2360 X 601 mm
Table top thickness	21 mm
Length of stroke, X direction	±500 +20/-10 mm
Length of stroke, Ydirection	±150 +20/-10 mm

Weight

Table (with table top and vertical lift)	241 kg
Vertical lift	14 kg
Detector holder (with detector)	Max. 40 kg
Table top	47 kg
Patient load	max 295 kg

Classification

Classification according to IEC 60601-1.

Class	Class I equipment. All dead metal parts of the equipment are electrical connected to protective earth.
Applied part	Type B
Protection against ingress of water	IPX0
Mode of operation	Intermediate use: 20% 1min ON / 4min OFF
Use of anaesthetics mixtures	The equipment is not suitable for use in the presence of flammable anaesthetics mixtures with air or with oxygen or with nitrous oxide.

Technical Specification

Page 7-4

Wall stand

General

Column, Z stroke, tilt option	1400 +40/-10 mm
Column, Z stroke, non-tilt option	1470 +40/-10 mm
Rotation range detector arm (alpha)	-20º - 90º

Configuration

Wall stand	The Wall stand is the mechanical part of an X-ray system.

Weight

Wall stand	max. 180 kg (160 +20/-20 kg).
Counterweight dependant	max. 30 kg
Image receptor holder	max. 30 kg

Attenuation equivalent

Cassette holder	≤0.6 mm AL

Cabinet

General

Dimensions (L x W x H)	750 x 600 x 1125 mm

Transport Specification

Crates

Dimensions and Weight

Crate	Dimensions mm	Weight kg	Pcs
Ceiling suspended x-ray tube support	W800 x H1300 x D1500	310	1
Table	W800 x H850 x D2150	350	1
Table top	W900 x H100 x D2500	75	1
Wall stand	W800 x H1150 x D2420	250	1
System Cabinet	W870 x H1330 x D720	186	1
Traverse	W830 x H390 x D4180	240	1
Installation cube	W800 x H500 x D4000	375	1

Transport Specification

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