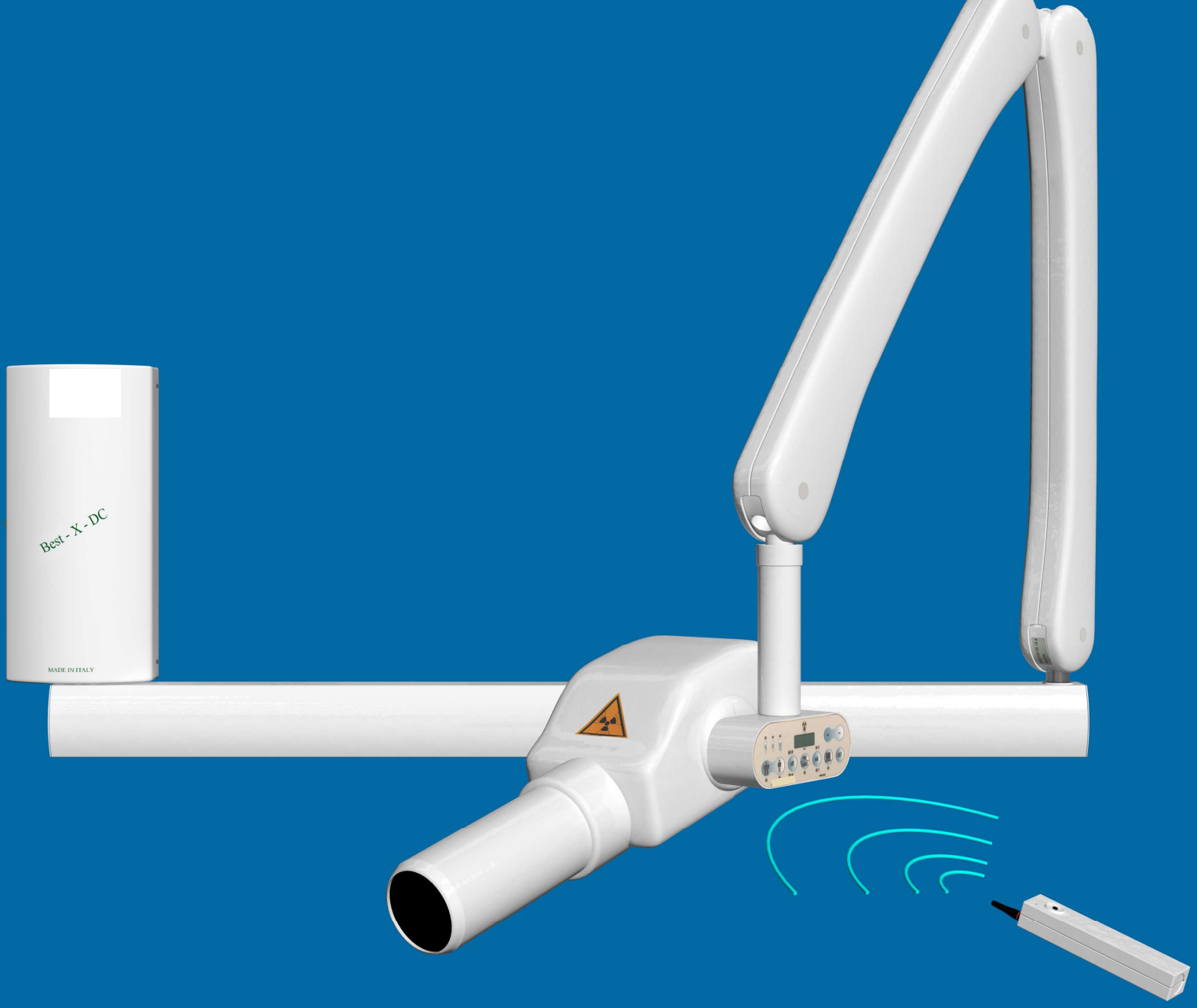


BEST-X LINE INSTALLATION AND USER MANUAL

Mod. MQI006-0 Doc. HBE070-2

mod. BEST-X-DC

INDEX

GENERAL ASPECTS

Introduction

Dear Customer,

Thank you for the preference granted to our product. We invite you to attentively read the present instructions that will help you to get the maximum of your X-ray diagnostic information with minimal x-ray use.

This manual has the purpose to provide the User with instructions for proper, safe and efficient operation.

The equipment must be used in accordance with the procedures contained in the manual and never for purposes other than those specified herein.

The User is responsible for what concern the fulfilments in legal matters facing installation and equipment functioning.

The plant can only be used by medical personnel in possession of the related licenses enablers and aware of the risks associated with the use of ionizing radiation sources. The use of X-ray sources for purpose of medical diagnostics is subject to specific authorizations and/or communications to the Authorities responsible for vigilance. The User is responsible for the use unauthorized of the plant. The User of the X-ray plant for dental complementary radiology is also required, without exception, to observe the regulations governing the safety of exposure to ionized radiations sources for workers, for member of the public, for population and patients.

If the equipment is not operated correctly or it is not made proper maintenance, the manufacturer can not be held responsible for any breakages, lesions and mal functioning.

Descriptions

"CAUTION: Do not modify this equipment without the manufacturer's permission."

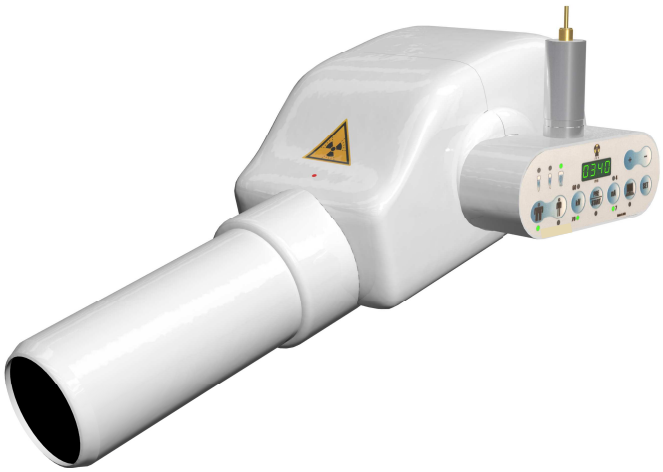
BEST-X-DC radiological unit is an equipment designed to obtain intraoral dental radiographs arranged to be used with acquisition systems (conventional films, phosphor plates and videoradiografie).

According to Directive 2007/47/CE (Legislative Decree 37/2010) it is classified in CLASS IIb.

The unit is manufactured in accordance with the actual international standards on the protection of ionizing radiation, electrical safety, mechanical safety and electromagnetic compatibility for electromedical equipment.

The equipment consists of the following parts:

Monoblock

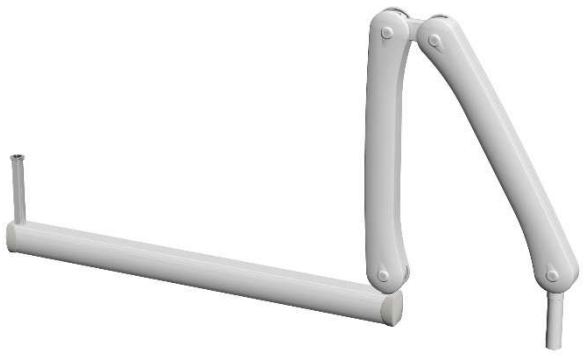


BEST-X-DC Monobloc require the use of X-ray tubes Toshiba DG-073B-DC; Toshiba D-045; Kailong KL11; Kailong KL21.

BEST-X-DC complies with EU directives on electromagnetic compatibility.

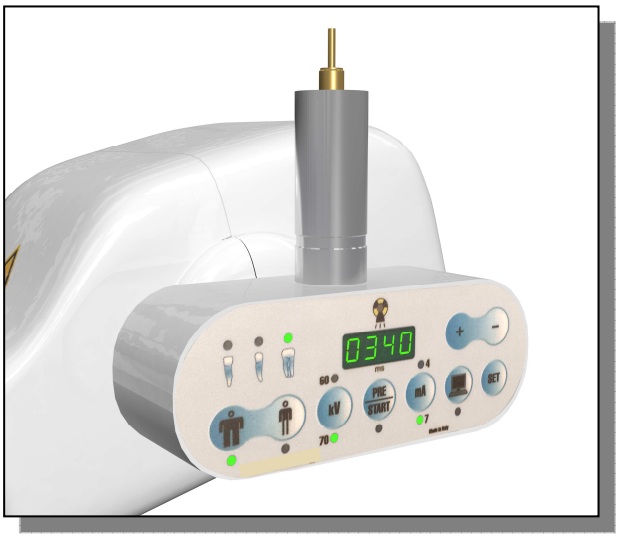
However, it may be appropriate to avoid installing the equipment in the immediate vicinity of other electrical equipment with which they could generate electromagnetic fields of mutual disturbance. It is also important to avoid using electrical appliances (eg. electrosurgery, cell phones, etc…) in the immediate vicinity of the apparatus during its use.

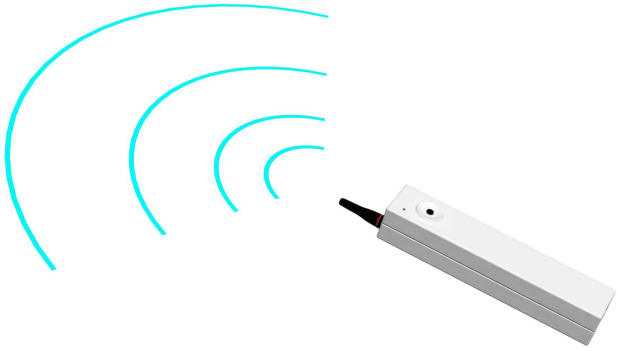
Articulated support double pantograph with wall support or mobile



The monoblock is directed within the installation area by an articulated arm double pantograph; this arm, coupled to the wall support through an extension cable of variable size (mm 400-800-1100), has a maximum extension which varies between 1730 mm and 2430, depending on the extension cord used.

Timer





The timer of the BEST-X-DC Unit is integrated in the monoblock, it allows managing the exposure times and adjustment of kV(60/70) and mA (4/7) and at the same time it guarantees maximum safety in the use of X-ray tubes for electromedical purposes for intraoral diagnostic;

The management of the timer occurs through the use of the RF radio control;

The control panel of the timer is provided with membrane digital buttons so as to facilitate its use;

The functioning of the timer is managed by RF radio control to vigilant device better known as dead man's device, in such a way as to guarantee maximum safety for both, the operator and the patient;

The timer does not permit use in the X-ray scopy;

The time scale set by the values of the factory complies with scale R10 relative to the standard EN60601-2-7 (IEC 60601-2-7);

The exposure times shown on the display of the timer are expressed in ms.

The maximum time that can be set is 3 s (the display will read 3000) while the minimum time is 20 ms. (the display will read 0020);

BEST-X-DC has a unique safety system against short circuits or malfunction of the unit, this system is the automatic fuse THERMOSWITCH.

This device intervenes in case of conduction for a time longer than 6 sec. In this situation it blocks the continuity between the control unit and the monoblock, thus preventing the emission of anomalous X-ray.

In case of intervention of the THERMOSWITCH, this will be replaced, this operation requires a service call to technical assistance.

Drawings, schematics, components lists, instructions for repairs:

The committed to providing, upon request, drawings, circuit diagrams, component parts lists, instructions, or other information that can serve for qualified technical personnel, to perform the repair of any parts that can be repaired.

The Manufacturer reserves the right to make changes at any time without notice.

Technical data

Classification:	Electro medical equipment of Class I With part applied type B
Head:	Monoblock with potential constant 100KHz model Toshiba DG-073B-DC; Toshiba D-045; Kailong KL11; Kailong KL21

Type:	60-70 kV_p selectable (±5%)
Feeding voltage:	230 V~ (50 Hz) monophase
Maximun Power absorbed from the net:	0,800 KW
Cone diameter:	60 mm
Max symmetrical rays field:	Ø60 mm to SSD 200 mm
Anodic current:	4 mA – 7 mA selectable
Anodic voltage:	60, 70 kV selectable
Emission time:	from 20 mS to 3000 mS scale R10
Exposition time:	predefined
Max anodic voltage:	70 kV
Reference current time:	7mAs to 70 kV, 7mA, 1 s
Max supplied power:	0,49 kW a 70 kV, 7mA
Maximum apparent resistance of the power supply:	0.44 Ω
Weight: Wall model Mobile model	 27 kg 40 kg

Accuracy Load Factors

Voltage accuracy	± 5 %
Current accuracy	± 3 %
Time accuracy	± 5 %
Dose accuracy	± 5 %

Other Data

Maximum current automatic switches for the feeding net	Magnetic thermal switch from 10 A (CEI 23-3)
High voltage measure method:	Not invasive method
Current measure method in the radiogenic pipe:	See page 50
Charge application time determination method:	Not invasive method
Interposition aluminium filter between rays window and cone collimator:	Al 1 mm (AIP99,9 UNI3567)

INSTALLATION AND USE

Use Conditions

The equipment is designed for continuous operation with intermittent charge.

The operating times are with intermittent charge with a duty cycle of 1.30 (for each working period will correspond to 30 pause)

Classification according to Directive 2007/47 / EC (Legislative Decree no. 37/2010)	**Class IIb**
Protection against electrical dangers:	Class I
Protection degree against the direct and indirect contacts:	Equipment with parts applied type B
Protection degree against water penetration:	Common equipment IPX0
Use safety degree in presence of inflammable anaesthetic mixture:	Equipment not suitable to an use in presence of an inflammable anaesthetic mixture with air or with oxygen or with nitrogen protoxide
Use conditions:	Equipment for continuous operation with intermittent charge
Installation:	Permanent e mobile

General symbols

Caution: consult annexed documentation

Ionizing radiation

Apparatus with Type B part applied

Earth protection

O

Switch open(disconnected from mains supply)

I

Switch close(connected to mains supply)

Red point, placed on the cover of the unit, indicate focal spot

Alternating current

Radiation emission symbol

Follow annex instructions

Symbol in conformity with European Directive 2002/96/Ec (Weee).

Manufacturer

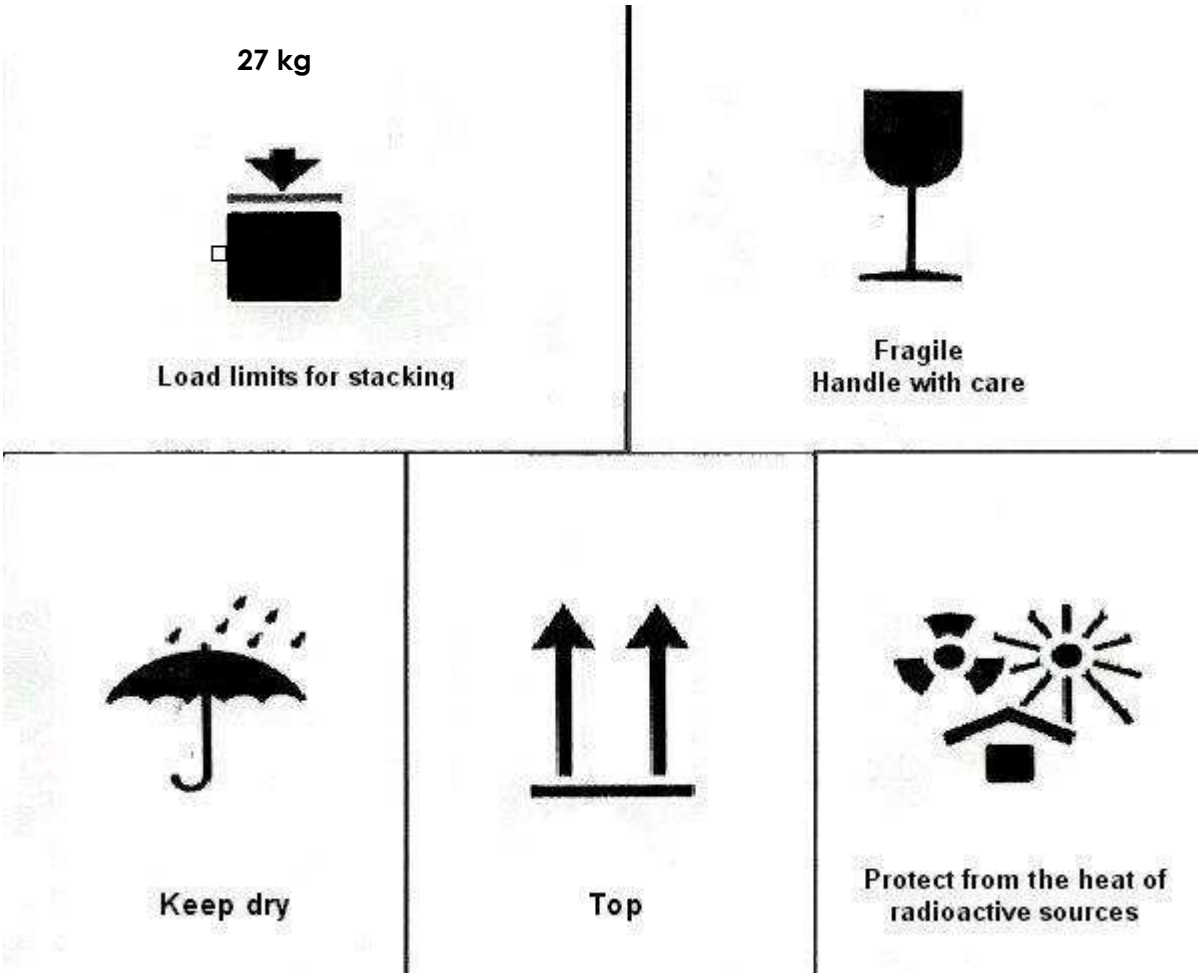
CE 0051 Symbol in conformity with Community Legislation. The symbol is followed by a number which identifies the notified organism which certifies and monitors such compliance

REF Product Code

SN Equipment Serial Number. To be used for all communication with manufacturer / service technician

TUBE X-ray Tube Serial number

Symbols for transportation and storage



Information for installation

PLASTIC MATERIAL PLUGS NOT ALLOWED

Utensils and tools required for installation (not supplied)

- ✓ 1 multi meter
- ✓ 1 meter
- ✓ 1 fixed key from 13 mm
- ✓ 1 nandle spanner from 5,5 mm
- ✓ 1 set of Allen spanner
- ✓ 1 spirit level
- ✓ 1 plastic mallet
- ✓ 1 percussion drill with points from Ø 3 to Ø 13 mm
- ✓ 1 thin screwdriver for electrical connection
- ✓ 1 medium screwdriver
- ✓ 1 net feeding cable with three wires (2 conductors + 1 ground) of section 1,5 mmq for a reduced length of not over 40 m (for superior lengths use the section cable corresponding to that indicated from the Country actual standards).

Electrical indications

All works for the feeding electric plant must be performed in conformance with the actual reference standards for plants and locals for medical use. (CEI 64-8-710).

A feeding of 230 V~ to 50 Hz. is required. For the phase conductors, neutral and ground, the minimum section must be of 1,5 mmq of **copper**. It recalls the necessity to perform the ground connection as required by current legislation.

The plant must be performed and tested by qualified personnel.

The warranty excludes damages caused by erroneous connection.

Wiring and connection conductors sections

A three conductors cable (3x1,5 mmq) is expected between the net switch and the equipment. For the assembled versions and in all cases of separate installation from the control unit, a second cable, always 3 x 1.5 sq mm, shall be provided between the control unit and the support. Please note that the radiological groups are supplied without a plug for leaving the buyer free to connect to equipment already on site.

Efficient grounding is a first necessary condition for the proper functioning of the system, respecting the symbols indicated for connection:

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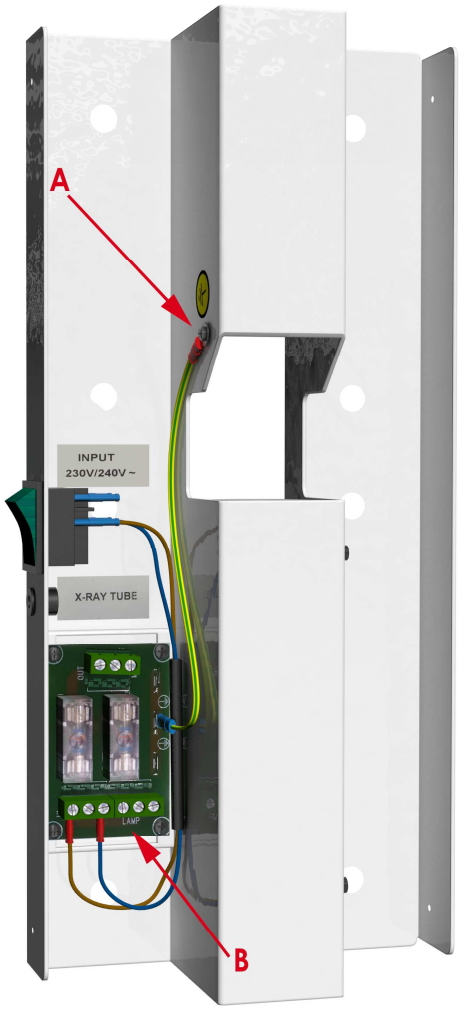


F – Line (brown) N – Neutral (blue) T – Ground (yellow-green)

Point A grounded power cord; Point B output external lamp

Check carefully all connection cables, plugs and line contacts.

Remember that the suppliers must support a current of at least 10A.

The connection to the external lamps must be done by connecting the output LAMP indicated with the letter A in the figure above. The lamp must be of value 30W 230-240 Vac. according to the actual reference standard for plants and locals for medical use (IEC 64-8-710).

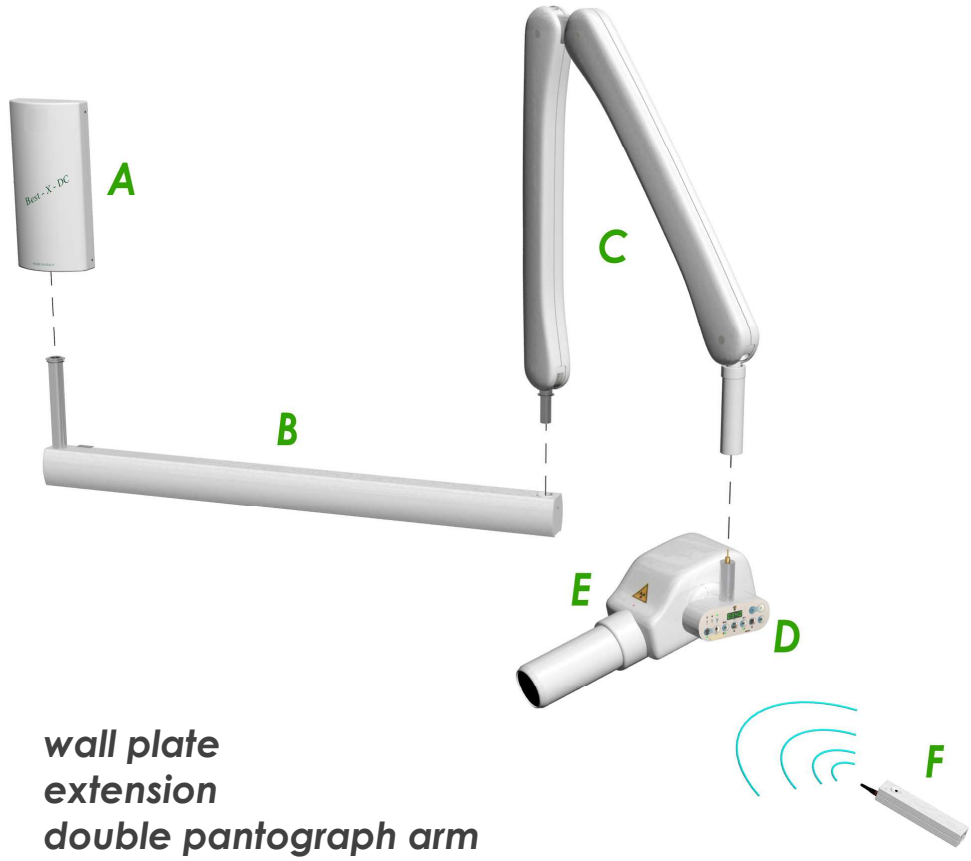
Installation

"CAUTION: To avoid the risk of any electric shock, this device must be connected only to power mains gifted with ground protection."

The installation is provided in both wall and mobile version on column.

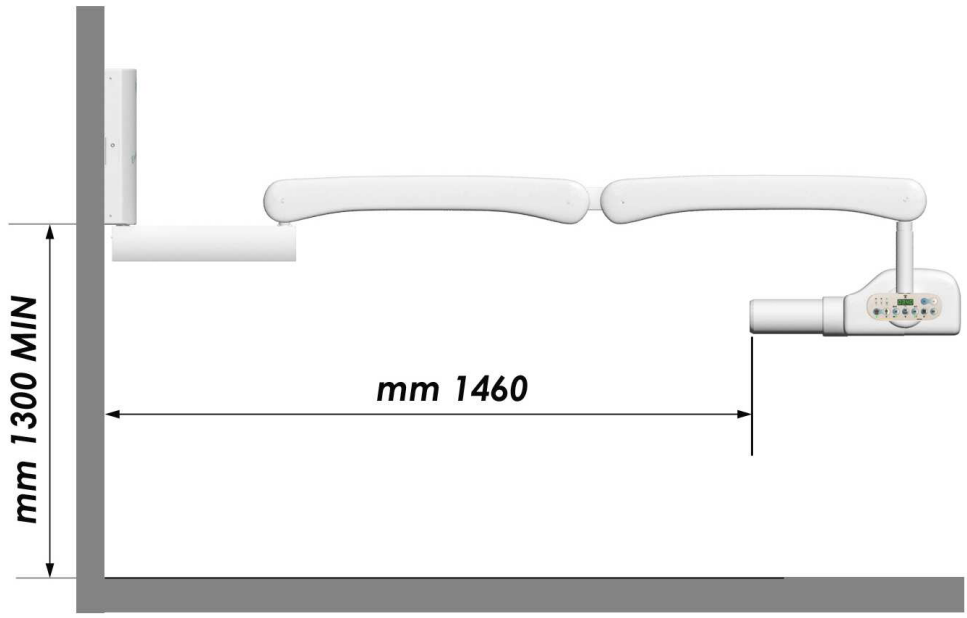
Instructions for installation in wall mode

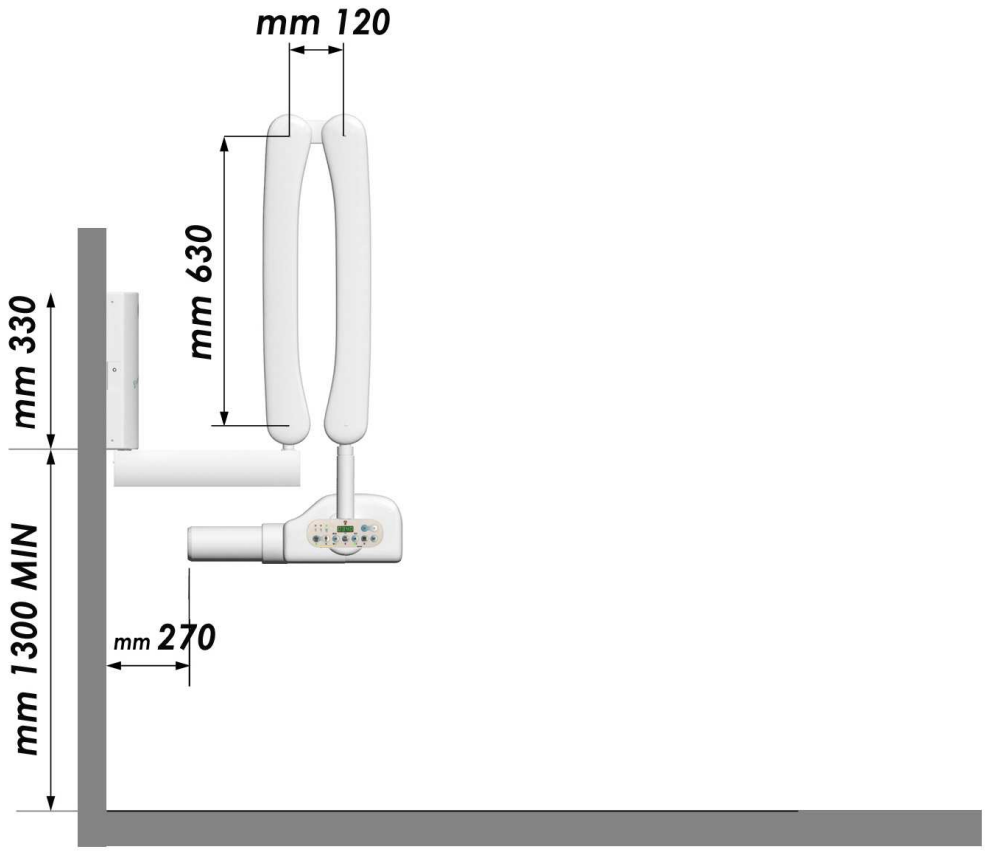
The system in wall version consists of the components shown in the following legend:



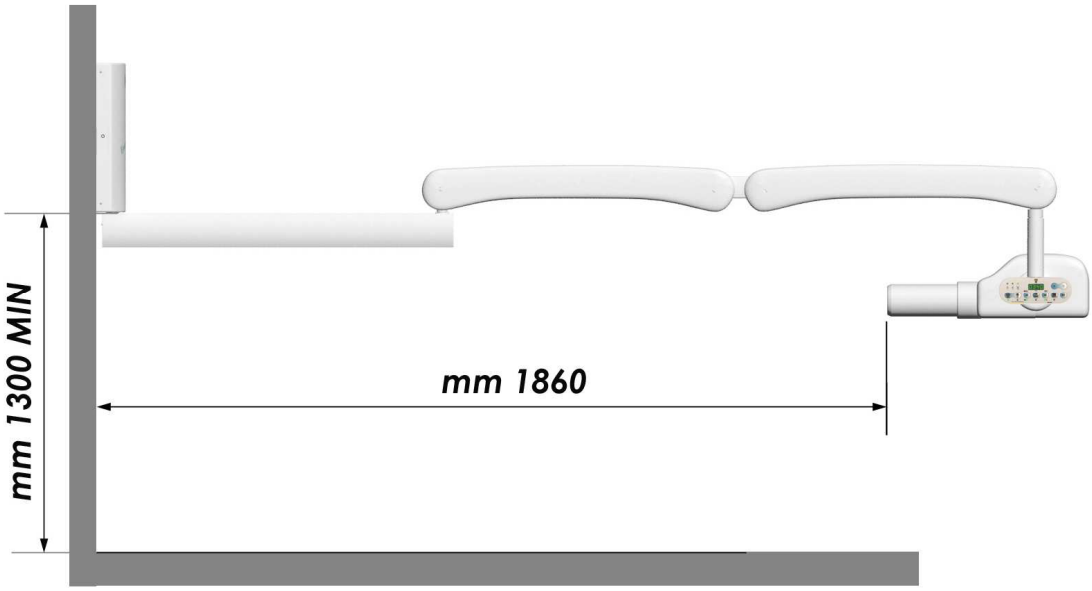
A	***wall plate***
B	***extension***
C	***double pantograph arm***
D	***timer***
E	***monoblock***
F	***radio control***

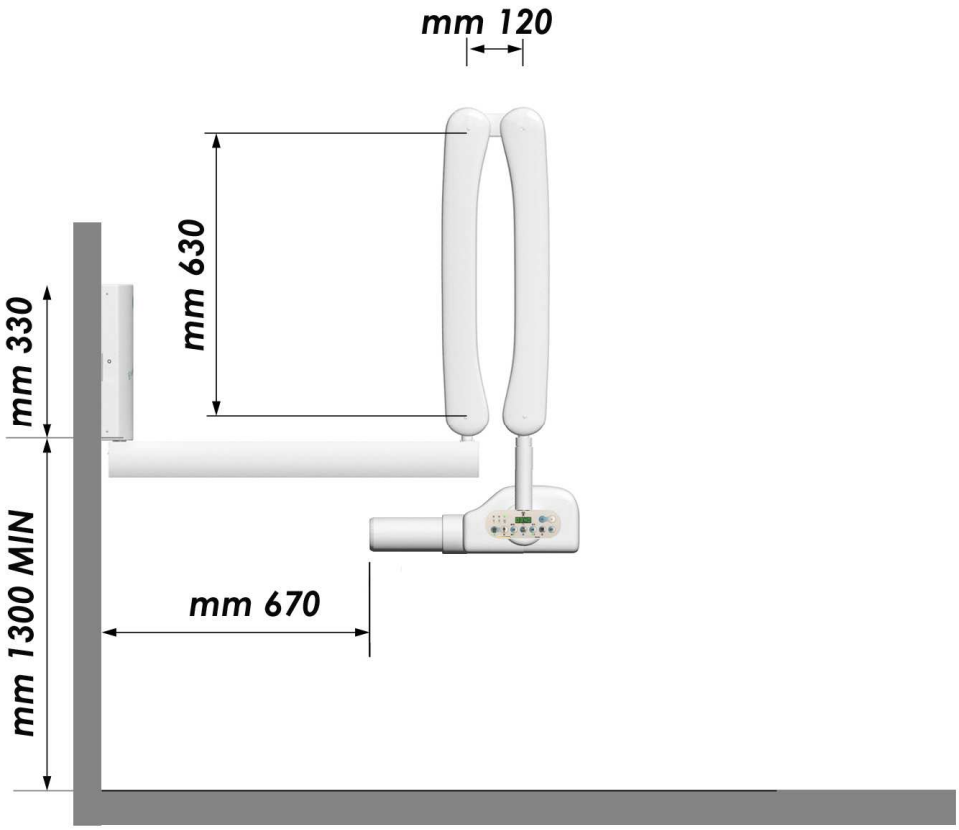
Quotas with relative useful space – EXTENSION FROM mm 400



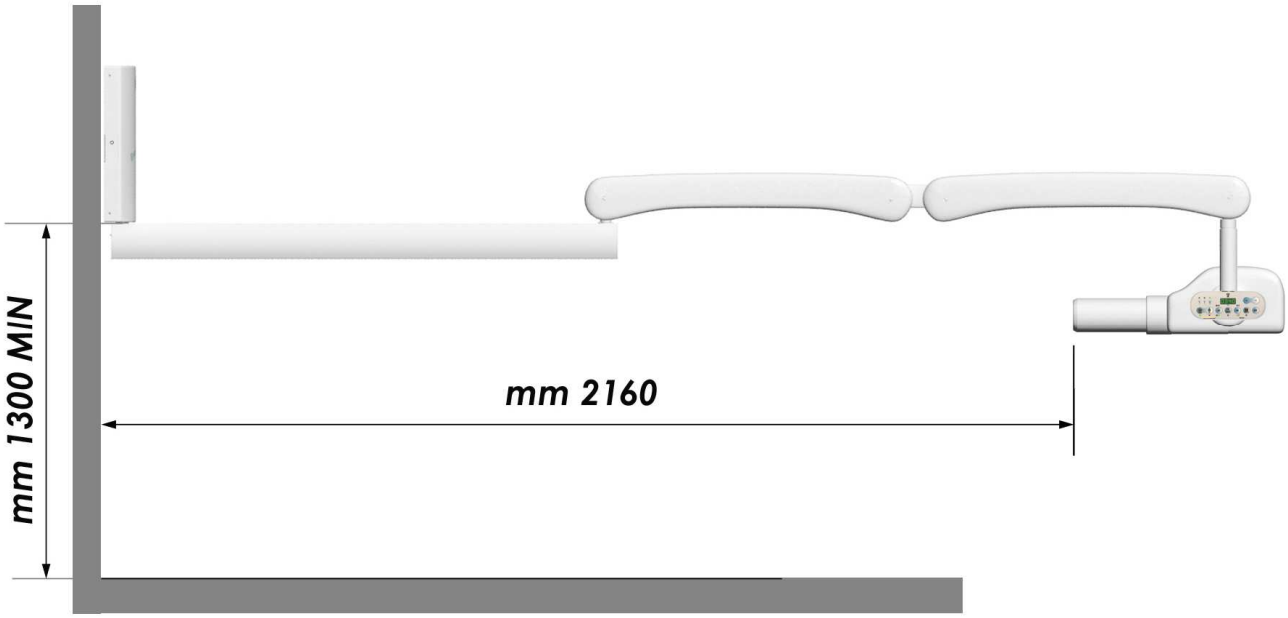


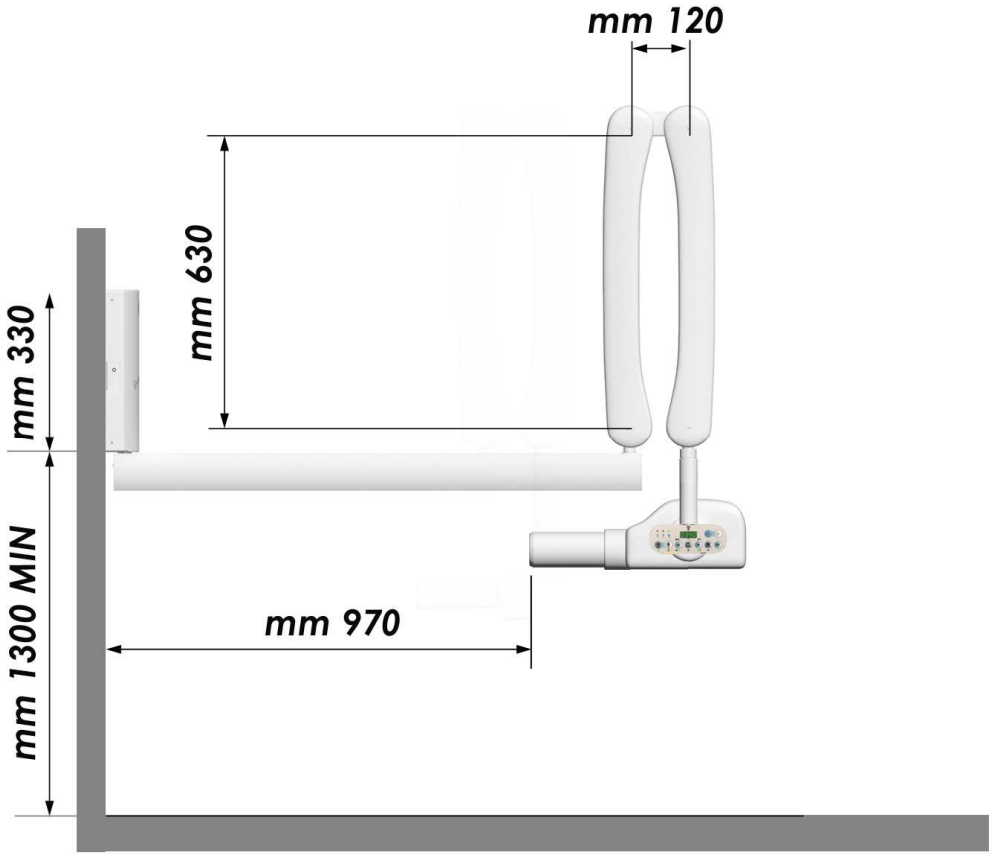
Quotas with relative useful space – EXTENSION FROM mm 800





Quotas with relative useful space – EXTENSION FROM mm 1100





Wall plate installation

- ✓ This equipment is supplied with a plate for mural fixing ***(A)***, closed by a plastic cover (fig.1). Remove the plastic cover.

fig. 1

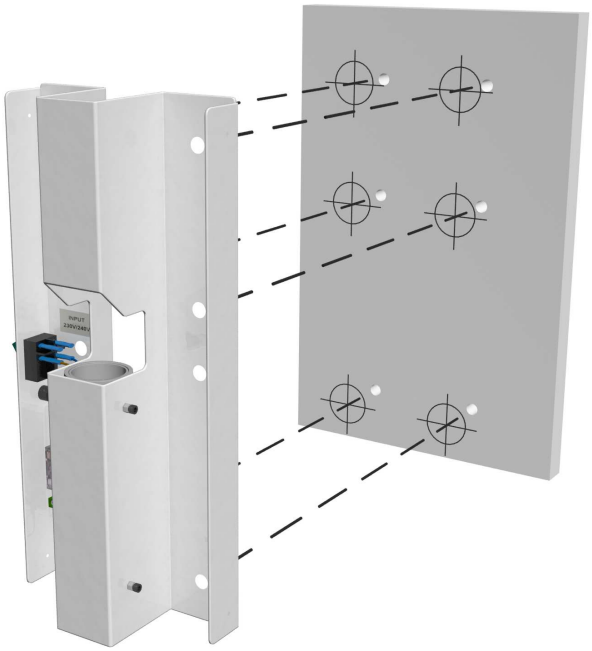


fig. 2

- ✓ Define the position on the wall of the WALL PLATE ***(A)*** with respect to the amplitude of the working field chosen and to the size of the structure that the same can assume right or left of the axis of the wall plate when it is inactive.
- ✓ Plot on the wall the position of the six holes making sure to check the perpendicularity with a plumb line. If the electric plant is recessed, track also the corresponding hole (Fig. 2)
- ✓ Drill six holes on the wall starting with the tip of ∅ 7, enlarging gradually. This to not demolish the stability and maintain under control the interaxes. For walls of full or holed or cement bricks use metallic plugs preferable of ∅ 12 equipped with unmissable female grain and separated screw ∅ 6 with hexagonal head and washer.
- ✓ For types of wall of insufficient reliability it is necessary to resort to the construction of a reinforcement to be defined case by case.
- ✓ Apply the wall plate and bring it closer parallel to the wall by tightening the 6 screws alternately, if the wall is not perfectly flat put adequate thicknesses so as not to deform the wall plate.

Extension installation

- ✓ Extract the SEGER from the extension ***(B)***, and enter it in the wall plate ***(A)***, as shown in fig. 3

fig. 3

✓ Replace the SEGER, unhook the front cover and remove the lower strip cover strips (fig. 4)

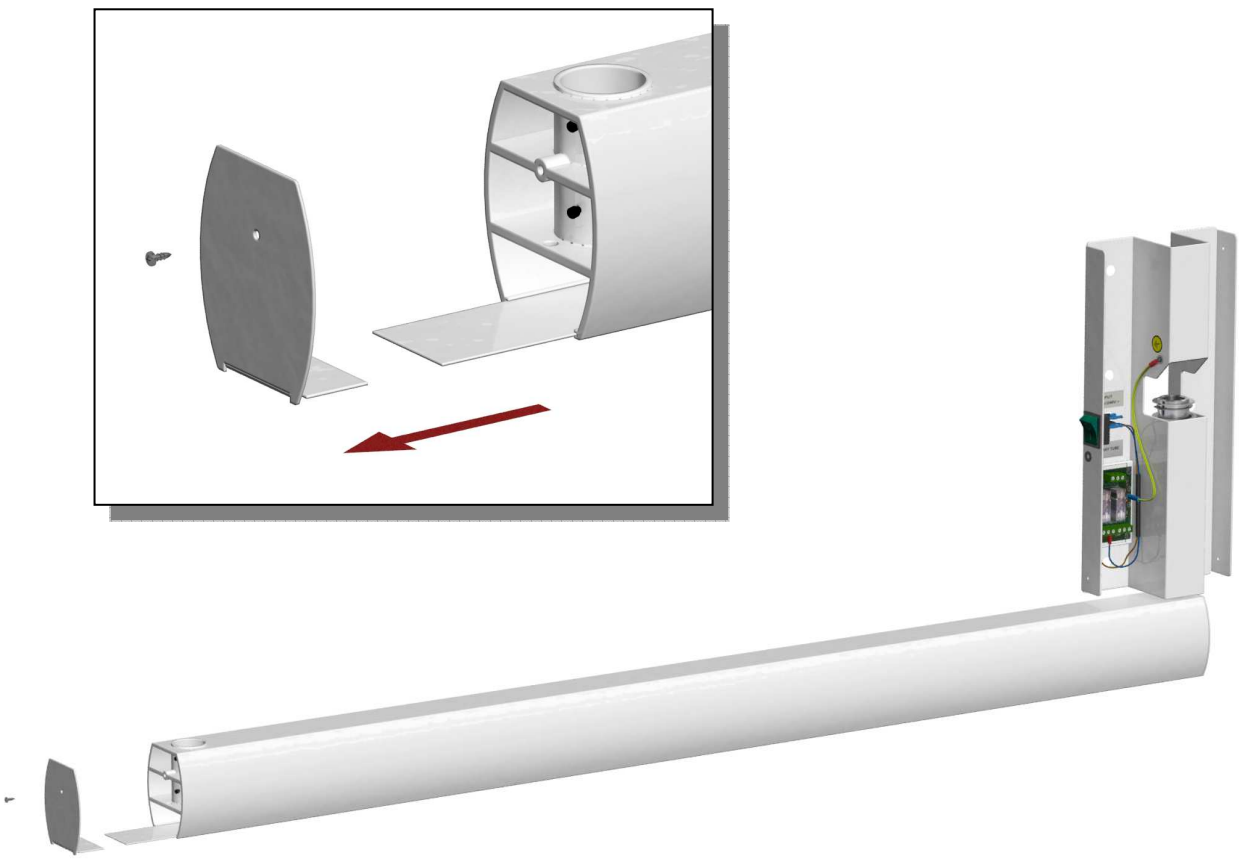


fig. 4

Double pantograph arm installation

- ✓ Enter the double pantograph arm ***(C)*** in the extension ***(B)*** and route the cable as shown in Figure 5. Close the extension repositioning the lower strip cover strips. Connect the cable from the double pantograph arm to output X-RAY TUBE and the ground wire IN in its slot.

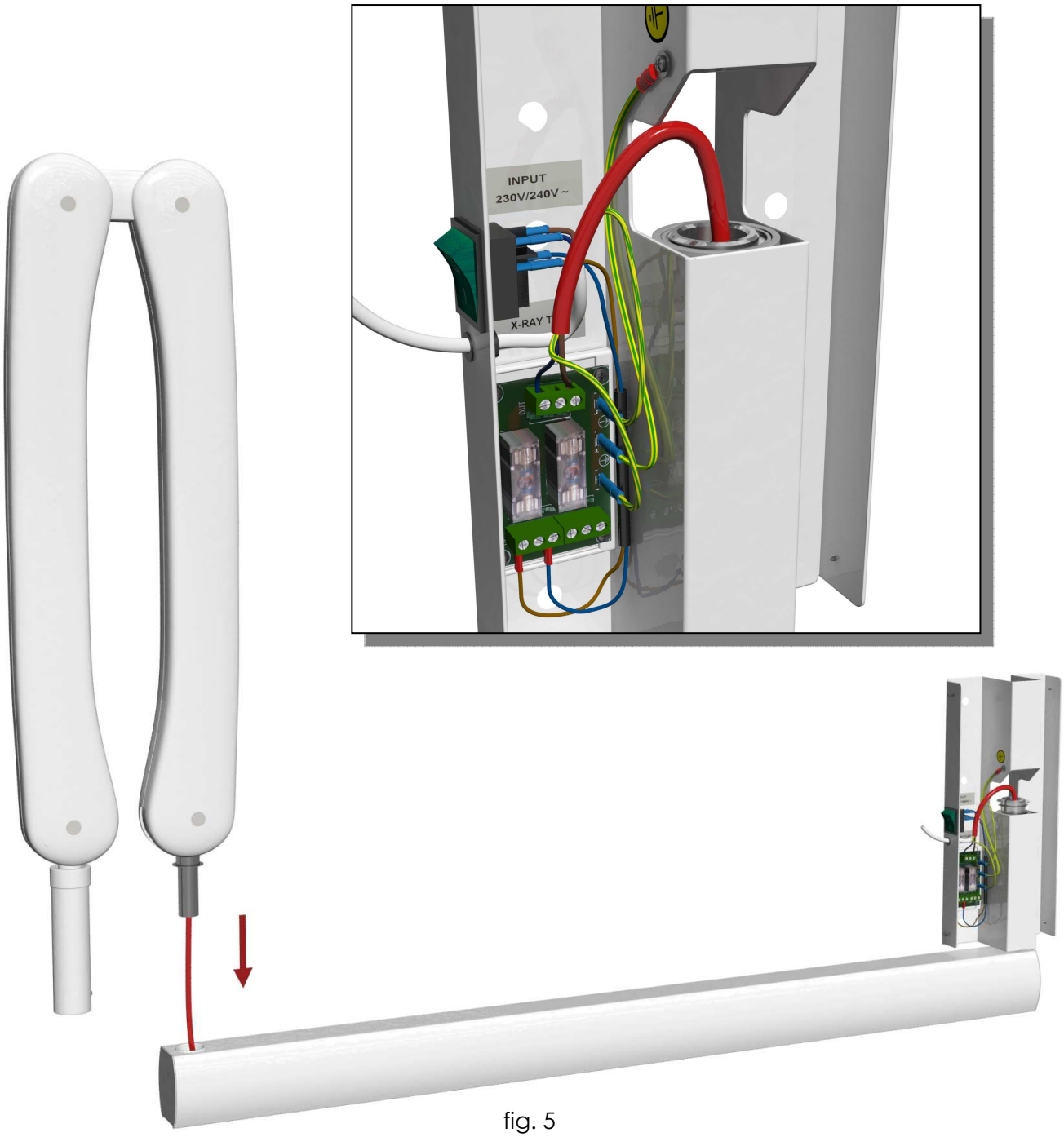


fig. 5

Monoblock installation

- ✓ **Before inserting the monoblock *(E)* it is essential to work in safety by opening the double pantograph arm *(C)* as shown in fig. 6, to avoid that it snaps abruptly since it has the springs charged and calibrated to support the weight of the monoblock.**

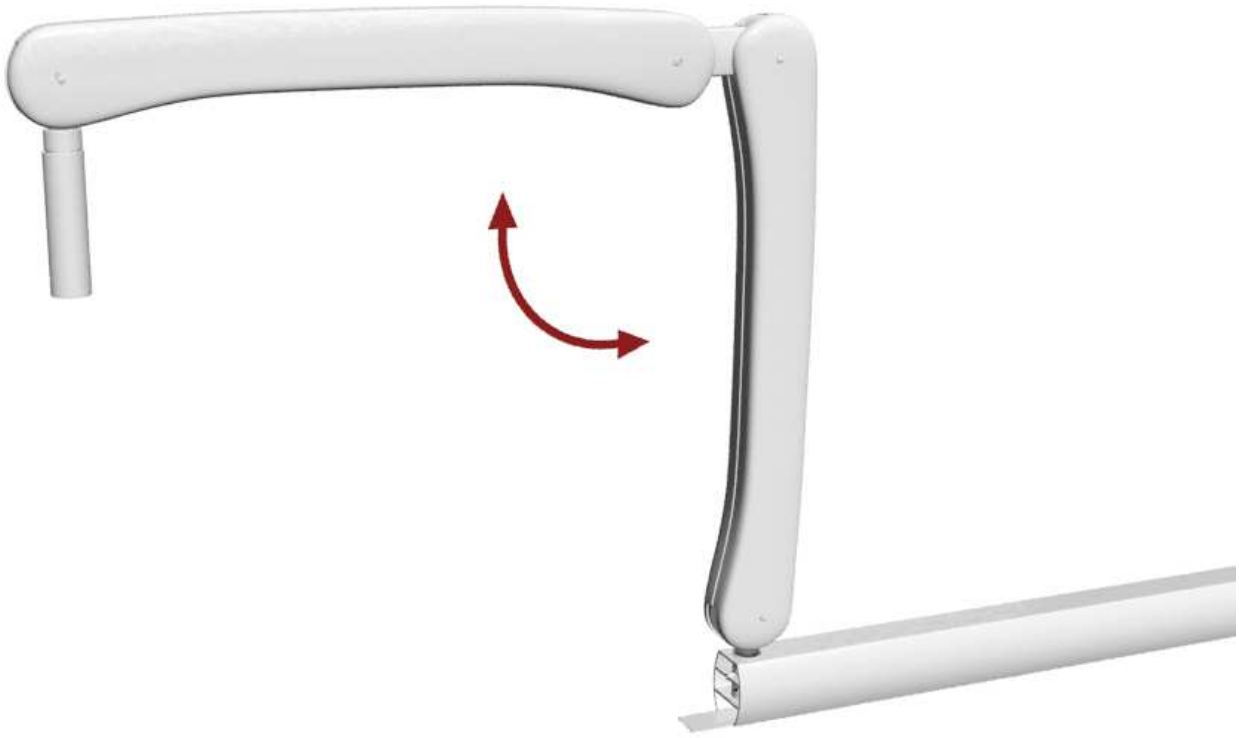


fig. 6

✓ Unscrew the screw from the front tubular carrier of the double arm pantograph ***(C)*** by lifting the cylinder and remove the half-moon(fig. 7)

fig. 7

✓ Insert Monoblock ***(E)*** in the double pantograph arm ***(C)*** as shown in Fig. 8

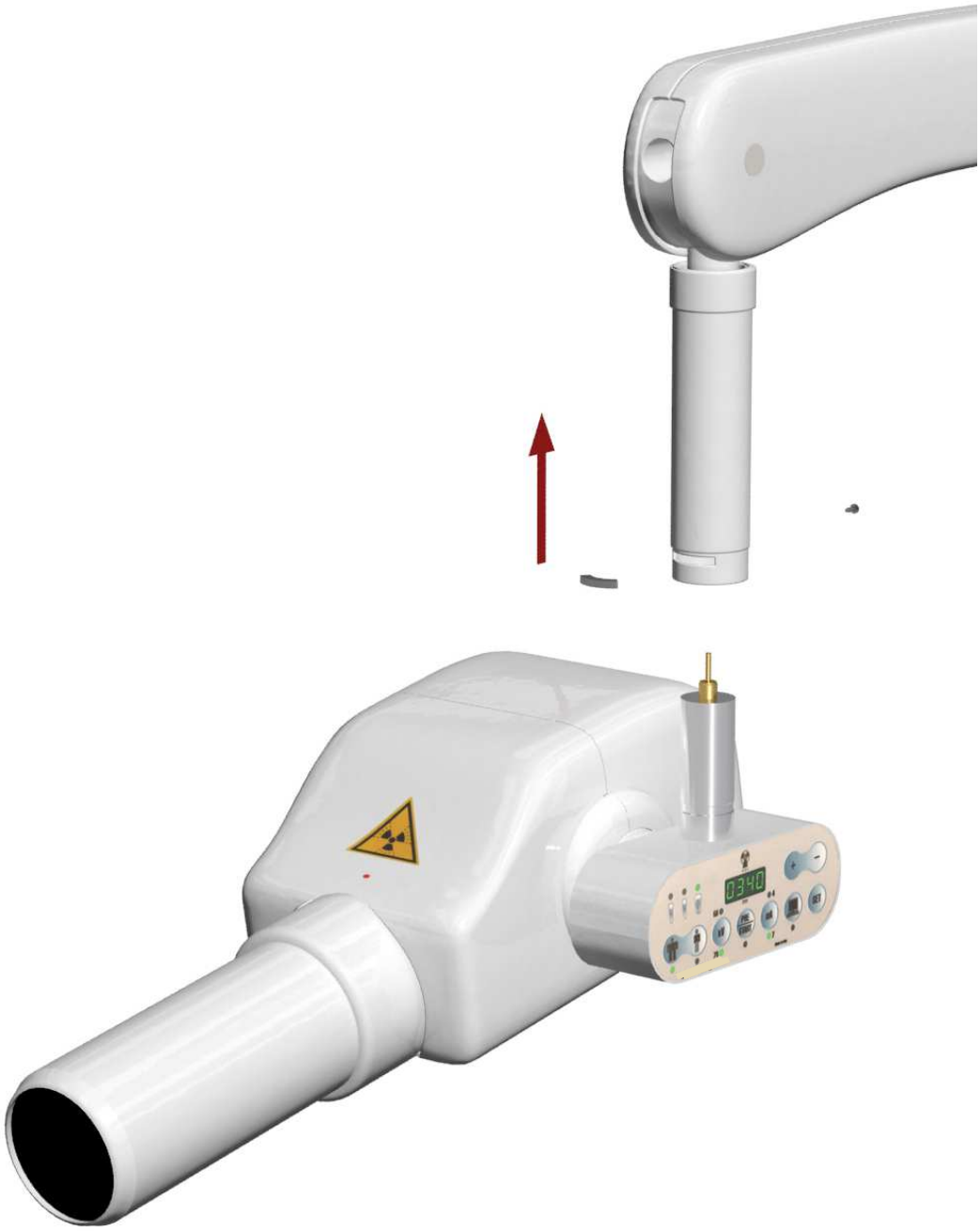


fig. 8

✓ Reinsert the half-moon in its slot. Lower the cylinder, securing the double arm pantograph with the screw.

fig. 9

Settings

After installing the equipment, make a dynamic test to ensure that the movements of the assembly are properly calibrated.

Clutch screws adjustment

- ✓ If necessary adjust the clutch screws of the wall plate ***(A)*** and the extension ***(B)*** as shown in fig.10 .

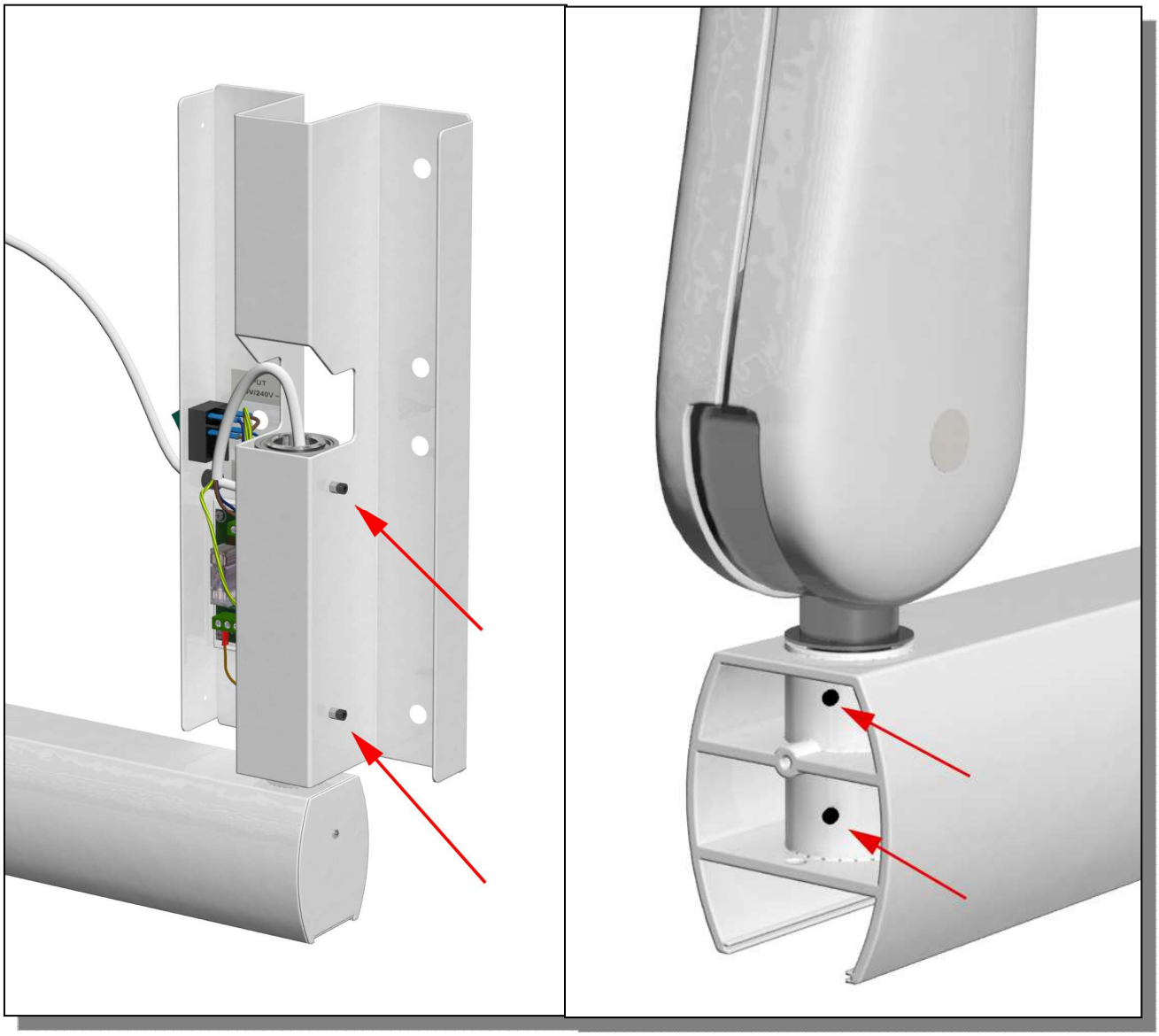


fig.10

- ✓ After making the adjustments necessary to close the wall plate with the respective cover, making sure to replace the lower back lining strip and the front cover of the extension.

Springs adjustment of the double pantograph arm

Do not intervene personally in the arm's settings, have this operation made exclusively by specialized personnel only.

- ✓ In the case in which the double pantograph arm does not remain stationary in all positions wanted by the user, it means that requires some adjustments. The calibration must be performed as follows: with reference to fig. 11, if it was found that the section A is spread when the double pantograph tends to go back, it means that the spring is too tight and in this case we must unscrew slightly the push-spring nut through the socket wrench supplied. To do this, tilt the section A of about 15 ° and insert the socket wrench into the hole 1 and unscrew slightly.
- ✓ If on the contrary it is found that stretching the double pantograph, the stretch A tends to fall forward, it means that the spring must be slightly loaded, then as before, tilt the stretch A of 15 ° and insert the socket wrench into the hole 1 and screw slightly.
- ✓ This procedure is identical for the section B in which the adjusting key must be inserted in the hole 2.

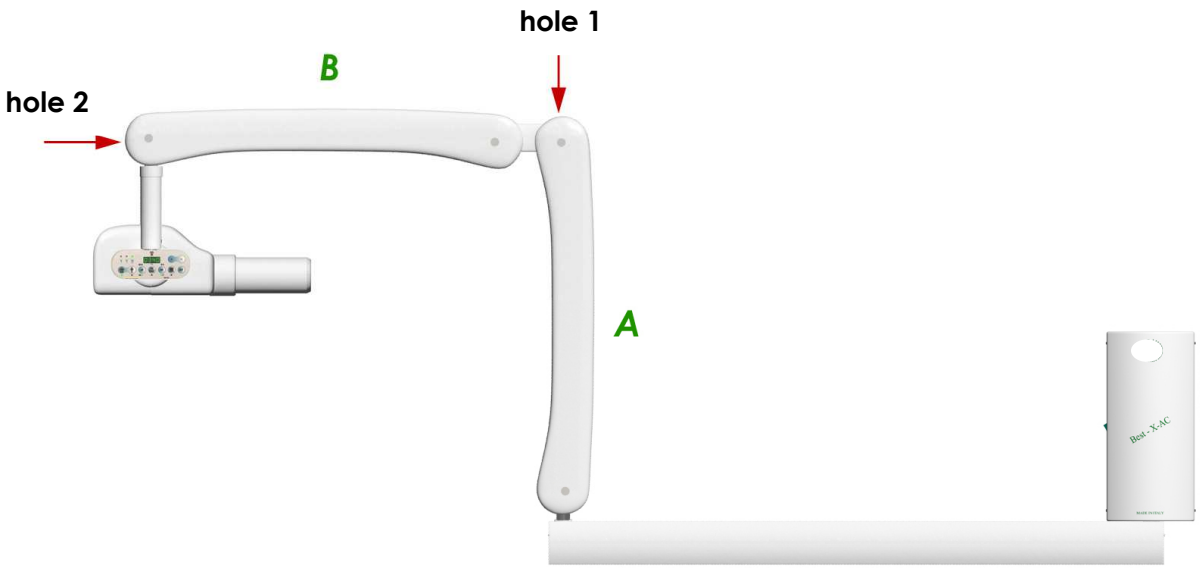
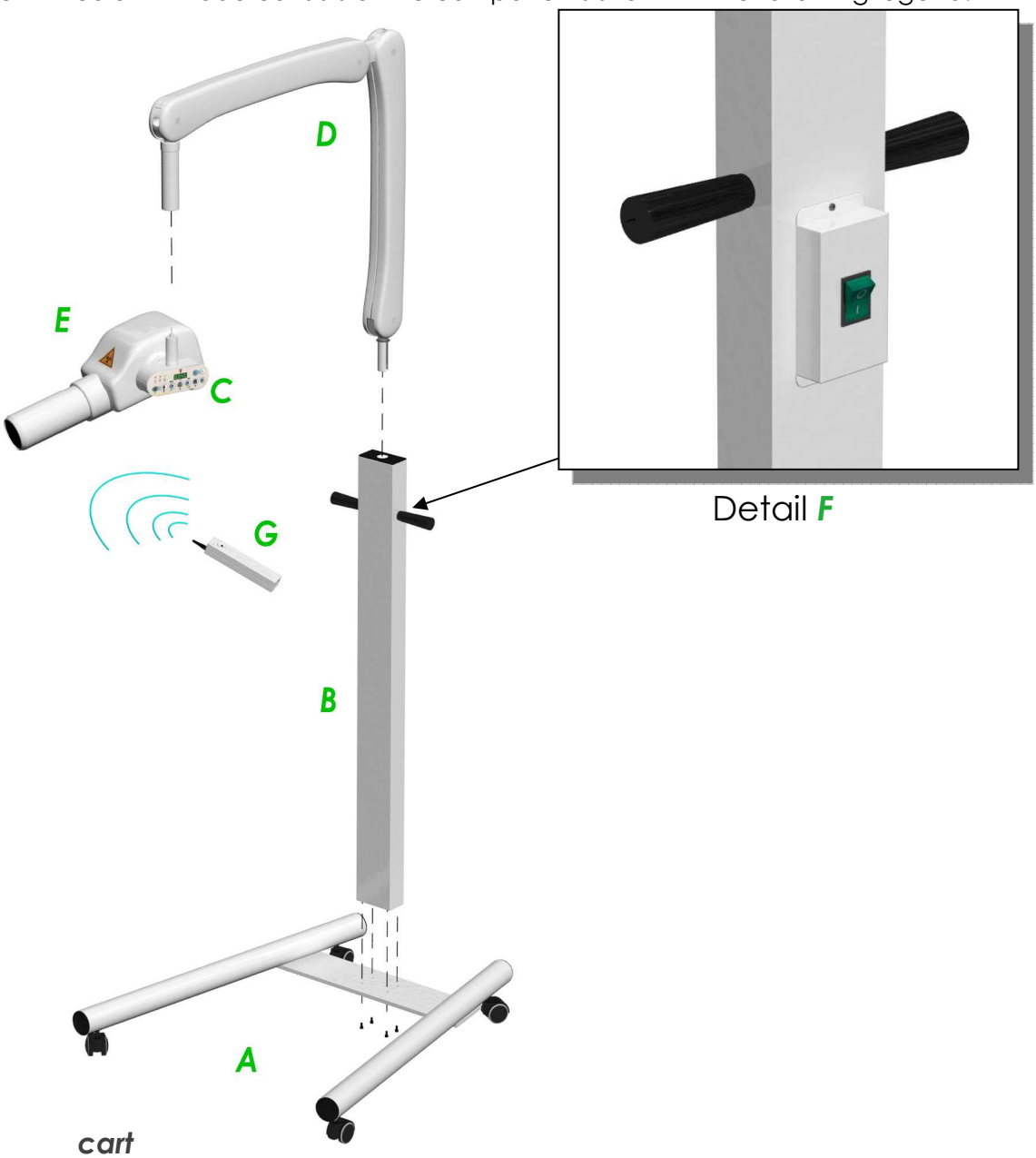


fig.11

Instructions for installation in column mode

This device is not intended for mobile use, the wheels are intended for a better positioning of the main appliance above the patient.

The system in column mode consists of the components shown in the following legend:



A	***cart***
B	***vertical support***
C	***timer***
D	***double pantograph arm***
E	***monoblock***
F	***fuse box***
G	***radio control***

Quotas with appropriate useful space

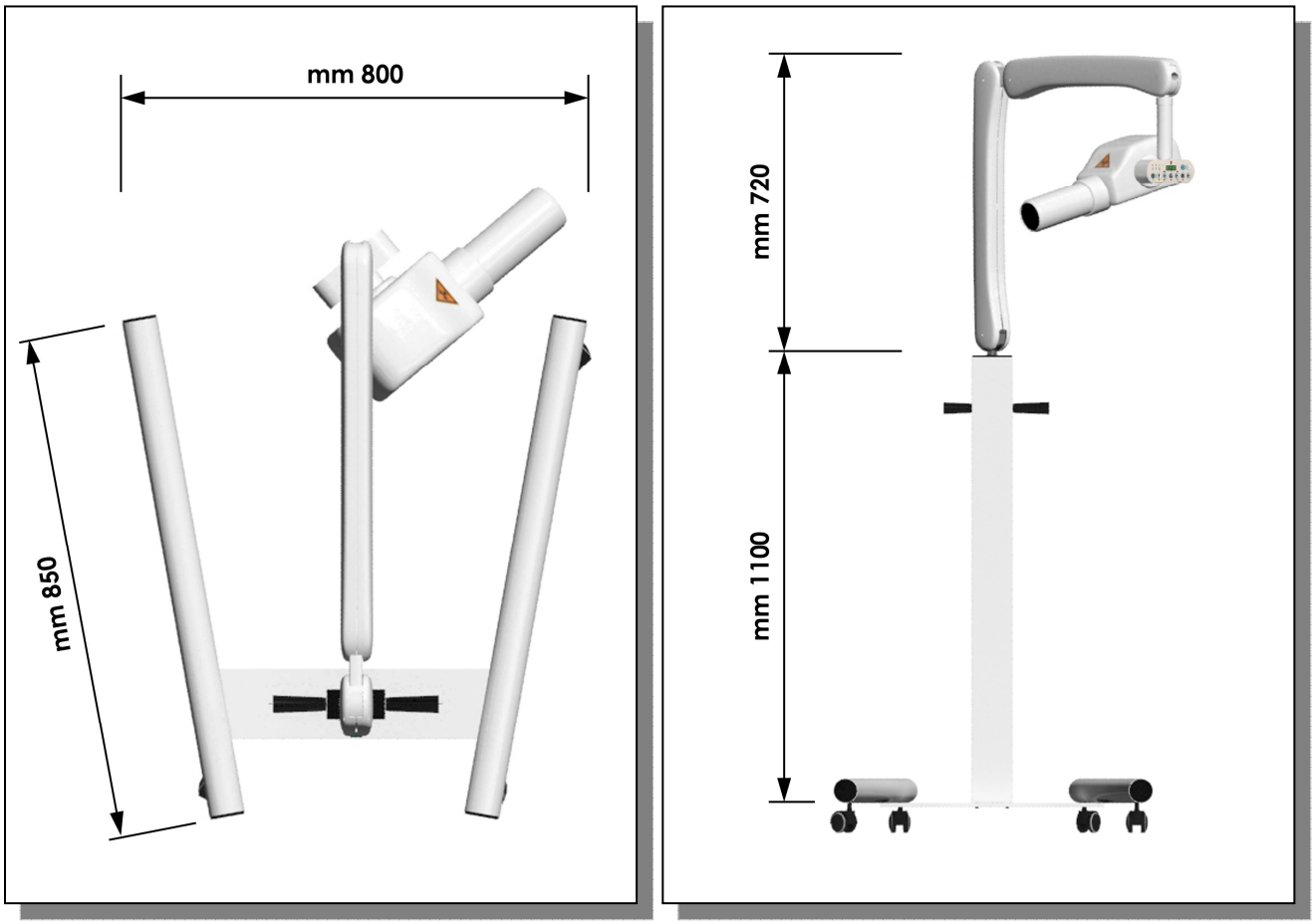


Fig. 12

Column assembly

- ✓ The first procedure to be carried out is to assemble the carriage ***(A)***, this is done by mounting the two tubular "1" and "2" on the base "3" using four screws 8x20, as shown in fig. 13

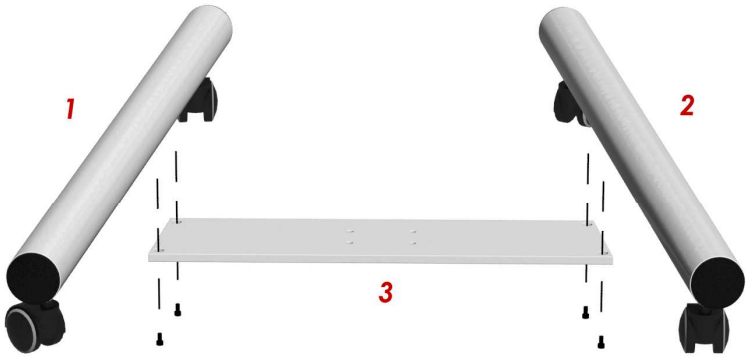


Fig. 13

- ✓ Once assembled the cart ***(A)*** is possible to fix on it the vertical support ***(B)*** using 4 screws 6x20 as shown in fig. 14

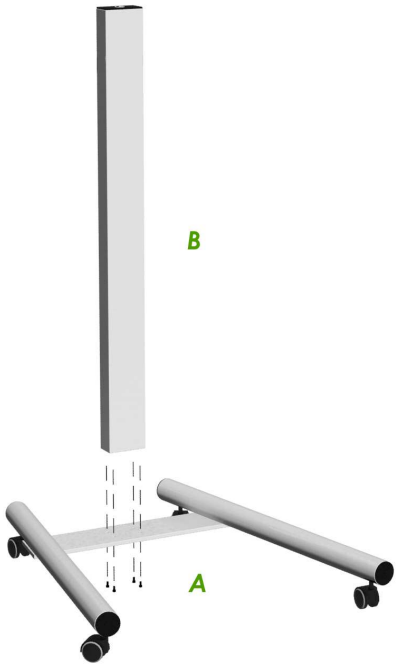


fig. 14

✓ Insert the two handles provided into the hole as in fig. 15

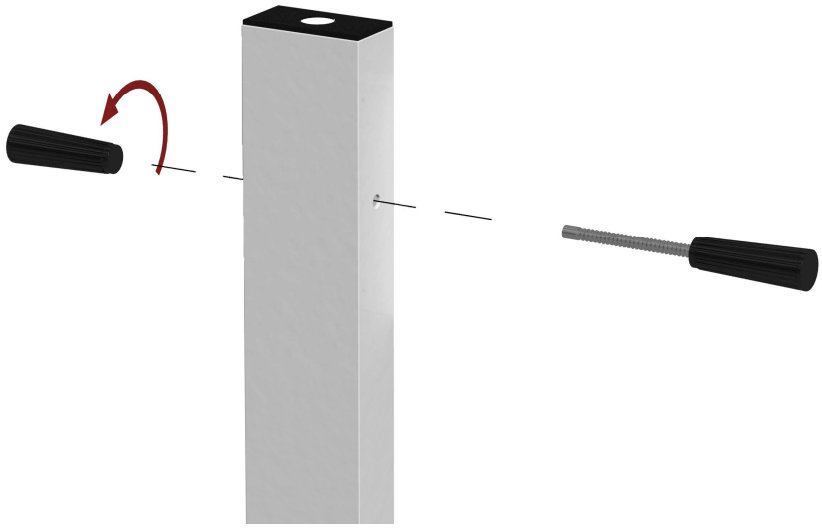


fig. 15

Installing double pantograph arm

✓ Remove the screws holding the card fuse holder ***(F)*** to the vertical support ***(B)*** as shown in Fig. 16

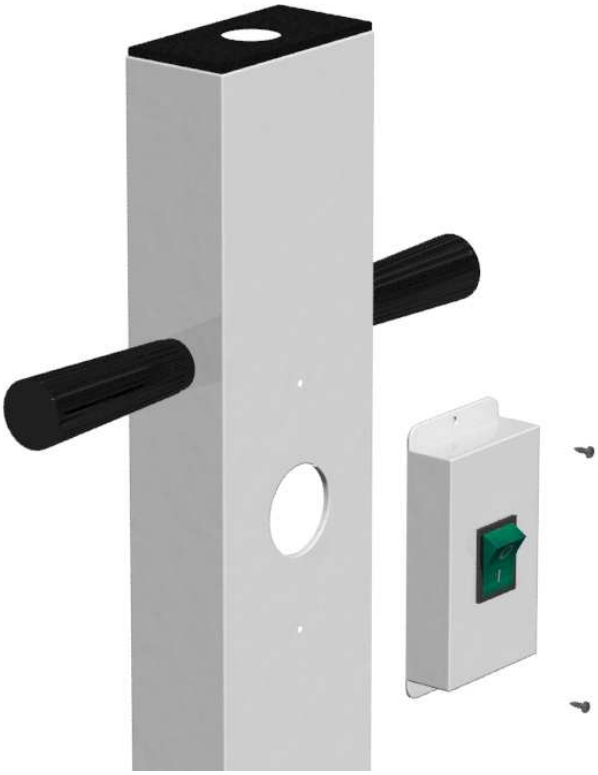


fig. 16

✓ Insert the double pantograph arm ***(D)*** in the vertical support ***(B)*** as shown in fig. 17

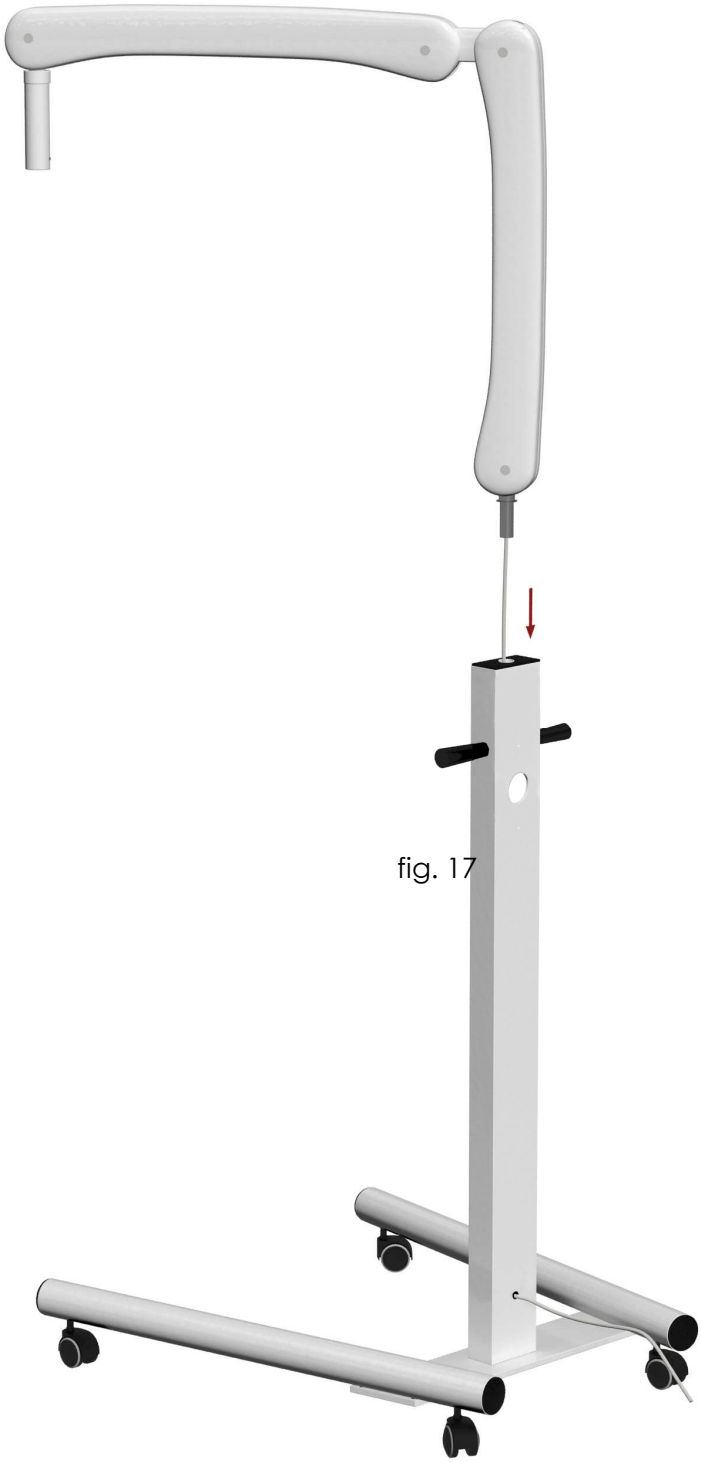


fig. 17

✓ Connect the cable coming from the double pantograph arm ***(D)*** to the switch board fuse holder ***(F)*** as shown in figure 18

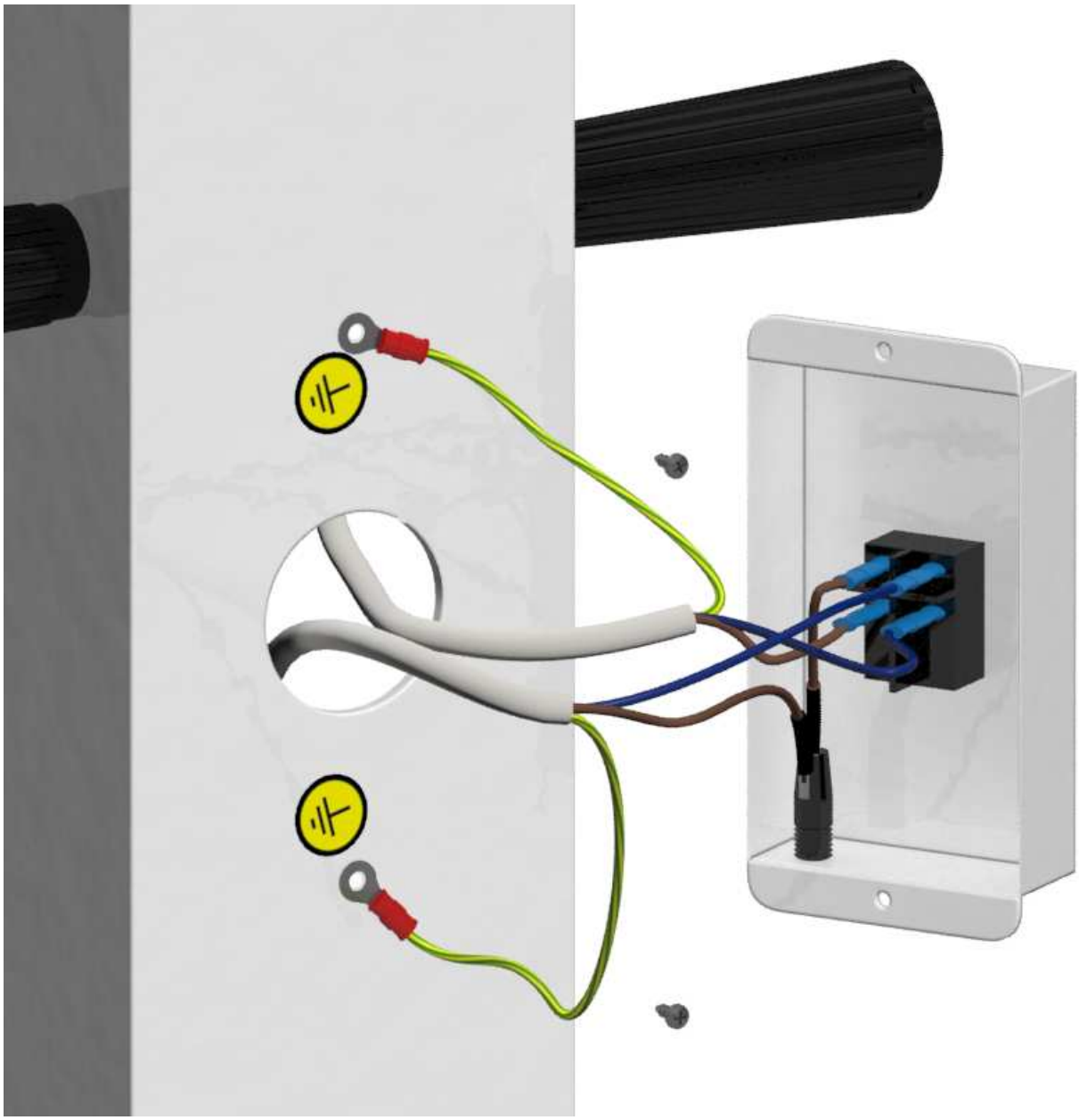


fig. 18

Monoblock installation

- ✓ To install the monoblock refer to the procedure described previously for the wall version from page 20.
- ✓ To adjust the springs of the double pantograph arm refer the procedures for the wall version on page 25.

Timer operation

- ✓ The timer of the device allows the management of the exposure times of the monoblock and the regulation of kV (60/70) and mA (4/7), at the same time guarantees maximum safety in the use of X-ray tubes for electromedical purposes for intraoral diagnostic;
- ✓ The timer control panel is provided with membrane digital buttons so as to facilitate its use;
- ✓ The timer functioning is managed by radio-frequency remote control to dead man's device in such a way as to ensure maximum safety for both the operator and patient;
- ✓ The timer does not allow the use of X-ray in scopy;
- ✓ The time range set by the factory values complies with R10 range relative to standard EN60601-2-7 (IEC 60601-2-7);
- ✓ The exposure time displayed on the timer are expressed in ms
- ✓ The maximum time that can be set is 3 s (the display will read 3000) while the minimum time is 20 ms. (the display will read 0020);

Description of the timer control panel

Following is the symbolism used on the front panel of the timer:

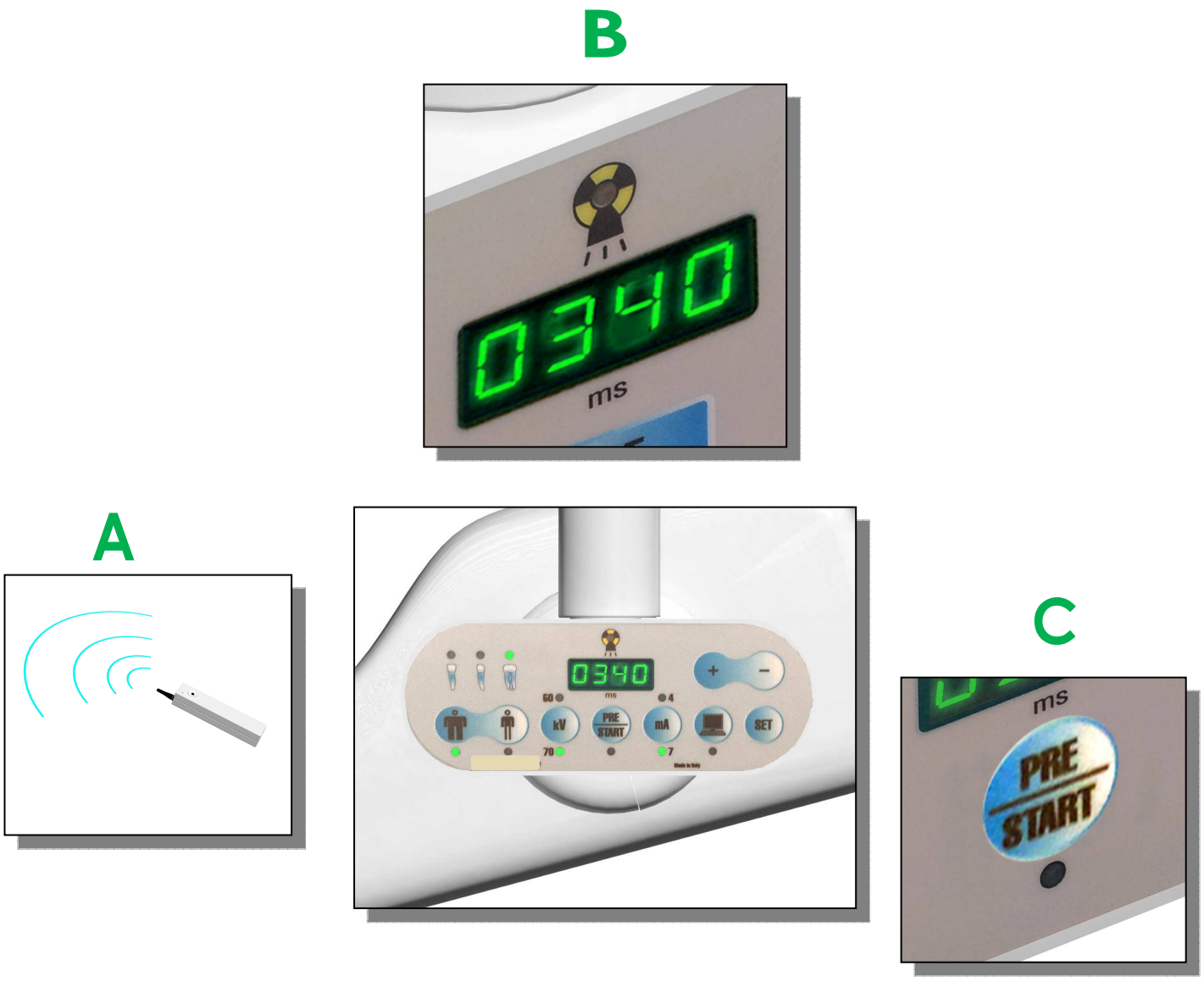
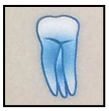


fig.19

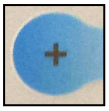
A	Radio control
B	Light emission radiation
C	Pre Start Button

Tooth type: Incisor

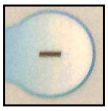
Tooth type: Pre molar



Tooth type: Molar



Selection button: increasing manual mode



Selection button: decreasing manual mode

Patient selection button: Normo-type

Patient selection button: Child

Selection button kV

Selection button mA

Selection button: Digital radiography

Times memorization button

Pre-Start button

4-digit display (the exposure time expressed in ms)

Timer use instructions

- ✓ **SWITCHING ON**: to switch on the timer set the switch on I as shown in fig.20 for both the mural and column version

"Wall" version

"Column" version

fig.20

When powering up the display will show, for about a sec, the number 325 that indicates the version of software installed; subsequently it will be referred to an exposure time (which can vary from 0020 to 3000 ms) which indicates the last time of exposure carried out. At this point the timer is ready for use.

FUNCTIONING E TIME SCALE:

On timer, by default, it is installed R10 time scale (in milliseconds [ms]), these values are intended as recommended values to get with less exposure time maximum image quality, they can be modified depending on the needs of the operator. In the tables below the time scales shows programmed depending on the type of film or sensor used with the relative dose value, expressed in milligray [mGy] which has to 20 cm from the fire tube (this value is to be considered an estimate of the dose issued and should not be understood as a measure of the same):

Film D			
70 kV / 7 mA	**Tooth type**		
Patient type			
	340 [ms] 3.25 [mGy]	220 [ms] 2.10 [mGy]	160 [ms] 1.53 [mGy]
	240 [ms] 2.29 [mGy]	180 [ms] 1.72 [mGy]	120 [ms] 1.14 [mGy]

Film D			
70 kV / 4 mA	**Tooth type**		
Patient type			
	600 [ms] 3.26 [mGy]	440 [ms] 2.39 [mGy]	320 [ms] 1.74 [mGy]
	480 [ms] 2.61 [mGy]	360 [ms] 1.95 [mGy]	240 [ms] 1.30 [mGy]

Film D			
60 kV / 7 mA	**Tooth type**		
Patient type			
	340 [ms] 2.27 [mGy]	240 [ms] 1.60 [mGy]	180 [ms] 1.20 [mGy]
	260 [ms] 1.74 [mGy]	200 [ms] 1.34 [mGy]	140 [ms] 0.93 [mGy]

Film D			
60 kV / 4 mA	**Tooth type**		
Patient type			
	600 [ms] 2.28 [mGy]	480 [ms] 1.82 [mGy]	360 [ms] 1.36 [mGy]
	500 [ms] 1.90 [mGy]	400 [ms] 1.52 [mGy]	280 [ms] 1.06 [mGy]

The timer is designed to work with systems of video radiography, by selecting the button  the times are reduced so as to be compatible with such systems. The following tables show the scales used for digital film and phosphor:

Digital			
70 kV / 7 mA	**Tooth type**		
Patient type			
	60 [ms] 0.57 [mGy]	40 [ms] 0.38 [mGy]	40 [ms] 0.38 [mGy]
	60 [ms] 0.57 [mGy]	40 [ms] 0.38 [mGy]	40 [ms] 0.38 [mGy]

Digital			
70 kV / 4 mA	**Tooth type**		
Patient type			
	100 [ms] 0.54 [mGy]	80 [ms] 0.43 [mGy]	80 [ms] 0.43 [mGy]
	100 [ms] 0.54 [mGy]	80 [ms] 0.43 [mGy]	80 [ms] 0.43 [mGy]

Digital			
60 kV / 7 mA	**Tooth type**		
Patient type			
	100 [ms] 0.67 [mGy]	100 [ms] 0.67 [mGy]	100 [ms] 0.67 [mGy]
	100 [ms] 0.67 [mGy]	100 [ms] 0.67 [mGy]	100 [ms] 0.67 [mGy]

Digital			
60 kV / 4 mA	**Tooth type**		
Patient type			
	180 [ms] 0.68 [mGy]	180 [ms] 0.68 [mGy]	180 [ms] 0.68 [mGy]
	180 [ms] 0.68 [mGy]	180 [ms] 0.68 [mGy]	180 [ms] 0.68 [mGy]

Phosphorus			
70 kV / 7 mA	**Tooth type**		
Patient type			
	200 [ms] 1.91 [mGy]	100 [ms] 0.95 [mGy]	100 [ms] 0.95 [mGy]
	100 [ms] 0.95 [mGy]	80 [ms] 0.76 [mGy]	80 [ms] 0.76 [mGy]

Phosphorus			
70 kV / 4 mA	**Tooth type**		
Patient type			
	300 [ms] 1.63 [mGy]	200 [ms] 1.08 [mGy]	100 [ms] 0.54 [mGy]
	180 [ms] 0.97 [mGy]	160 [ms] 0.87 [mGy]	120 [ms] 0.65 [mGy]

Phosphorus			
60 kV / 7 mA	**Tooth type**		
Patient type			
	200 [ms] 1.34 [mGy]	150 [ms] 1.00 [mGy]	120 [ms] 0.80 [mGy]
	180 [ms] 1.20 [mGy]	100 [ms] 0.67 [mGy]	100 [ms] 0.67 [mGy]

Phosphorus			
60 kV / 4 mA	**Tooth type**		
Patient type			
	400 [ms] 1.52 [mGy]	300 [ms] 1.14 [mGy]	200 [ms] 0.76 [mGy]
	300 [ms] 1.14 [mGy]	200 [ms] 0.76 [mGy]	200 [ms] 0.76 [mGy]

To change the time, you just select the type of patient and the type of tooth,

The tooth and the patient selected will be highlighted by the green LED in their correspondence;

To vary the type of tooth, simply press the patient button several times and in sequence will be selected molar, premolar, incisor.

If you have the need to manually increase or decrease the exposure time without following the preset scale, this can be done by pressing the button  to increase the time or by pressing the button  to decrease it; any increase/decrease of the time takes place in steps of 20 ms.. Press button  to save your edits of time.

When using the appliance we recommend the use of protective devices such as collars or aprons. Once placed the cone along the monoblock on the area to be examined and

after setting the time and set the appropriate kV and mA, you must press the button pre-start ***(C),*** to perform exposure; at this point the LED below will light and will activate a buzzer which takes about 30 seconds; to perform the exposure move away to an appropriate safety distance (minimum 2 meters) and press the button of the remote control ***(A)*** for the whole duration of the beep sound. If the exposure is not performed within the time that the horn is on, you must repeat the procedure from the beginning by pressing the pre start button ***(C).*** During the exposure time, the yellow led light emission will switch on ***(B).*** After exposure the timer pauses; during this time the display will flash the set time in the last exposure. At the end of the pause time the last time selected will remain fixed on the display and will be ready for the next exposure.

If the timer is left on without performing any activity for about 15 minutes, it will be on standby. In this mode, the display will be turned off and only the adult patient led will be turned on. To disable the standby mode, simply select any button.

ERROR TABLE

ERROR CODE	CAUSE	SOLUTION
Err_1	The remote control button ***(A)*** is released before the end of the set time	Turn off and on the equipment; If the problem persists there is an anomaly in the transmission of the signal going from the radio control to the receiver. One possible cause is a low-power signal due to flat batteries. Replace batteries
Err_2	Button ***(A)*** it's pushed even after exposure time and for all timer's pause period;	Release the button; If the problem persists there's an anomaly on the button which is always running, replace the remote control;
Err_3	The radio control button ***(A)*** is held down while pressing the pre-start button ***(C)***	Release the radio control button;

Possible failures

- ✓ Below there are some possible failures that might occur, and their recovery procedures

Must always disconnect the unit from the mains supply before starting any maintenance or inspection activities.

TIMER DISPLAY DOES NOT SWITCH ON

If the timer's display does not turn on, first check that the fuses are intact as shown in fig. 21

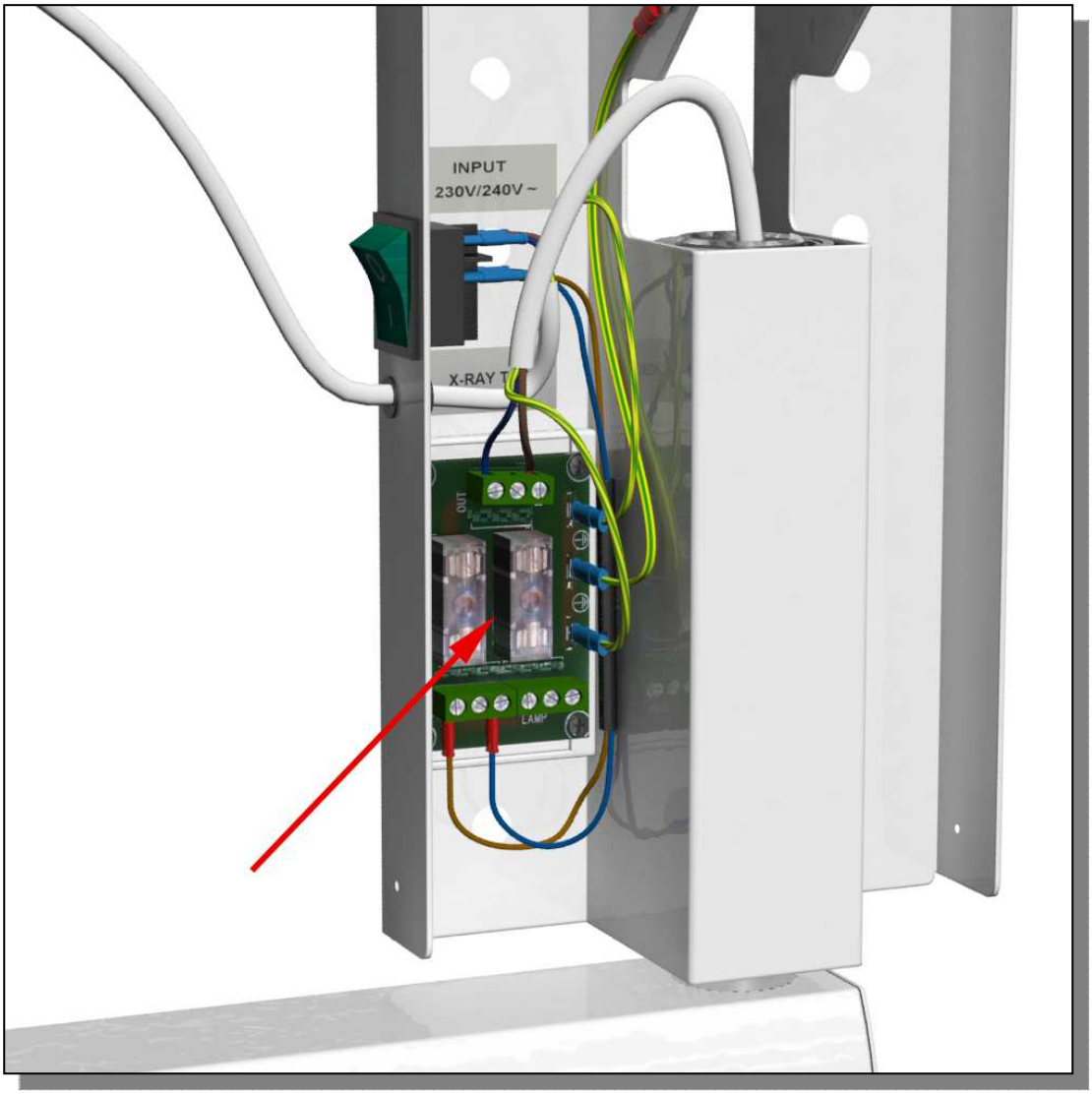


fig.21a (wall version)

fig. 21b (column version)

LOSS OF DATA SET IN THE TIMER

If there is a loss of data set on the timer, a possible solution is to reset it bringing it to the factory settings. This is done by turning on the equipment while holding down the button "-" for about a sec, as shown in fig. 22

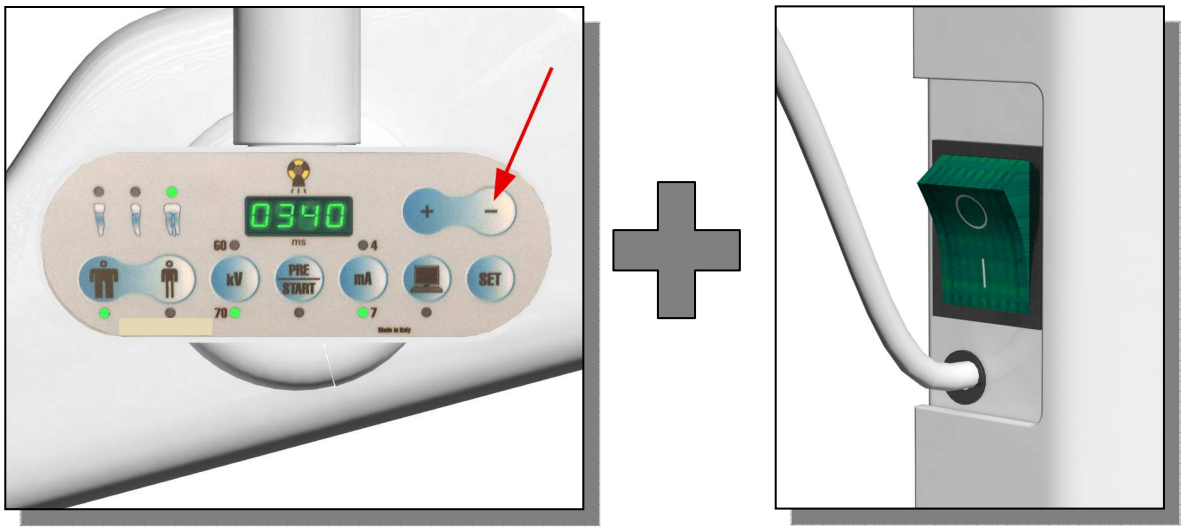


fig. 22a (wall version)

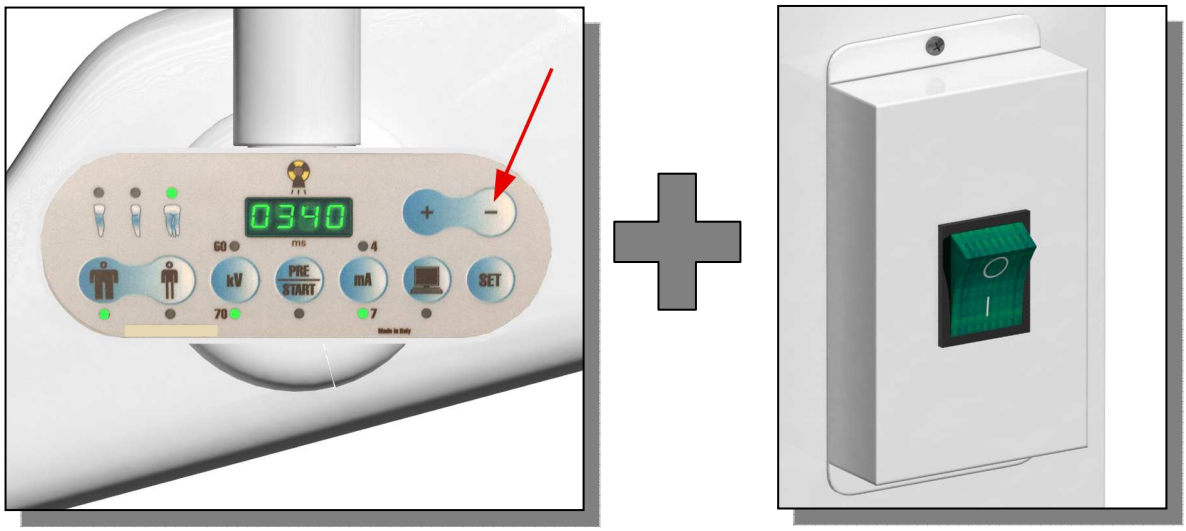


fig. 22b (column version)

THE MONOBLOCK DOES NOT EMIT X-RAYS

If the monoblock does not emit X-rays, as first check the continuity of the **THERMOSWITCH;** if this test is negative, you must bypass it as shown in fig.23

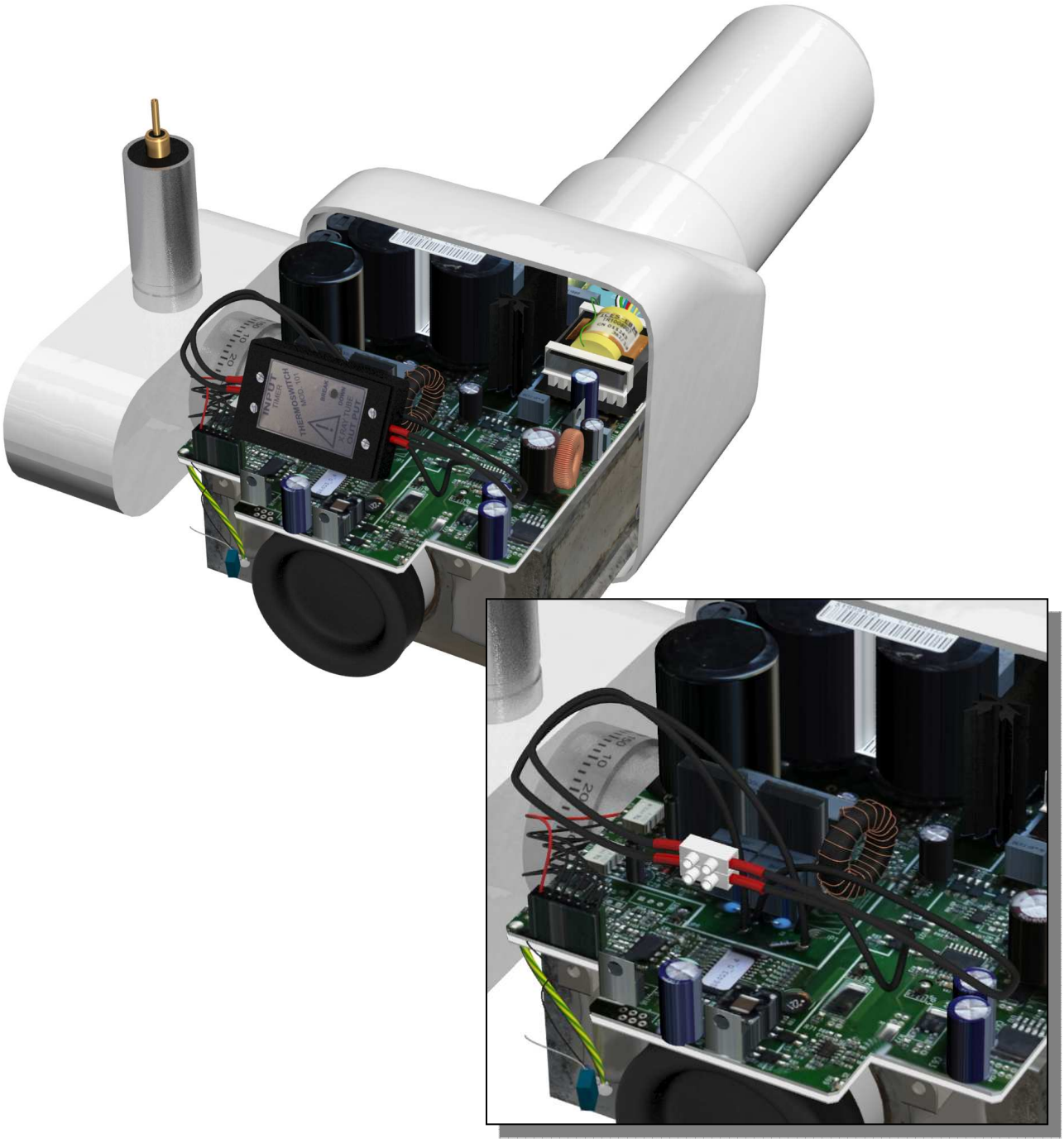


fig. 23

If after this operation there is still no x-ray emission, the problem must be sought through a tester in the continuity of the power cord that goes, if the wall version, from the monoblock to the output X-RAY TUBE card fuse placed on the plate at points A and B (Fig. 24a); while for the column version such continuity must be sought, always by means of a tester, between points A and B indicated in fig 24b.

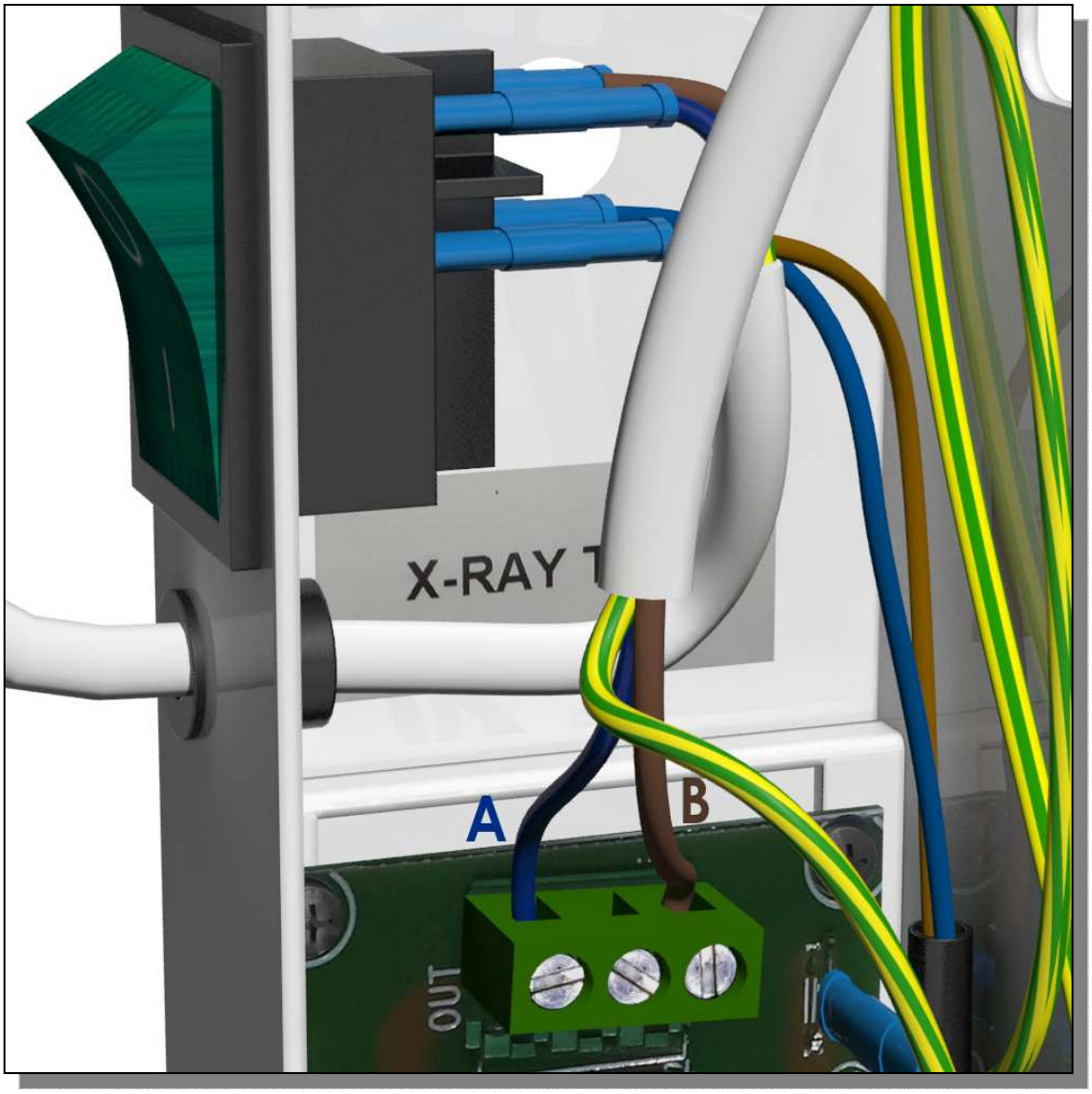


fig.24a (wall version)

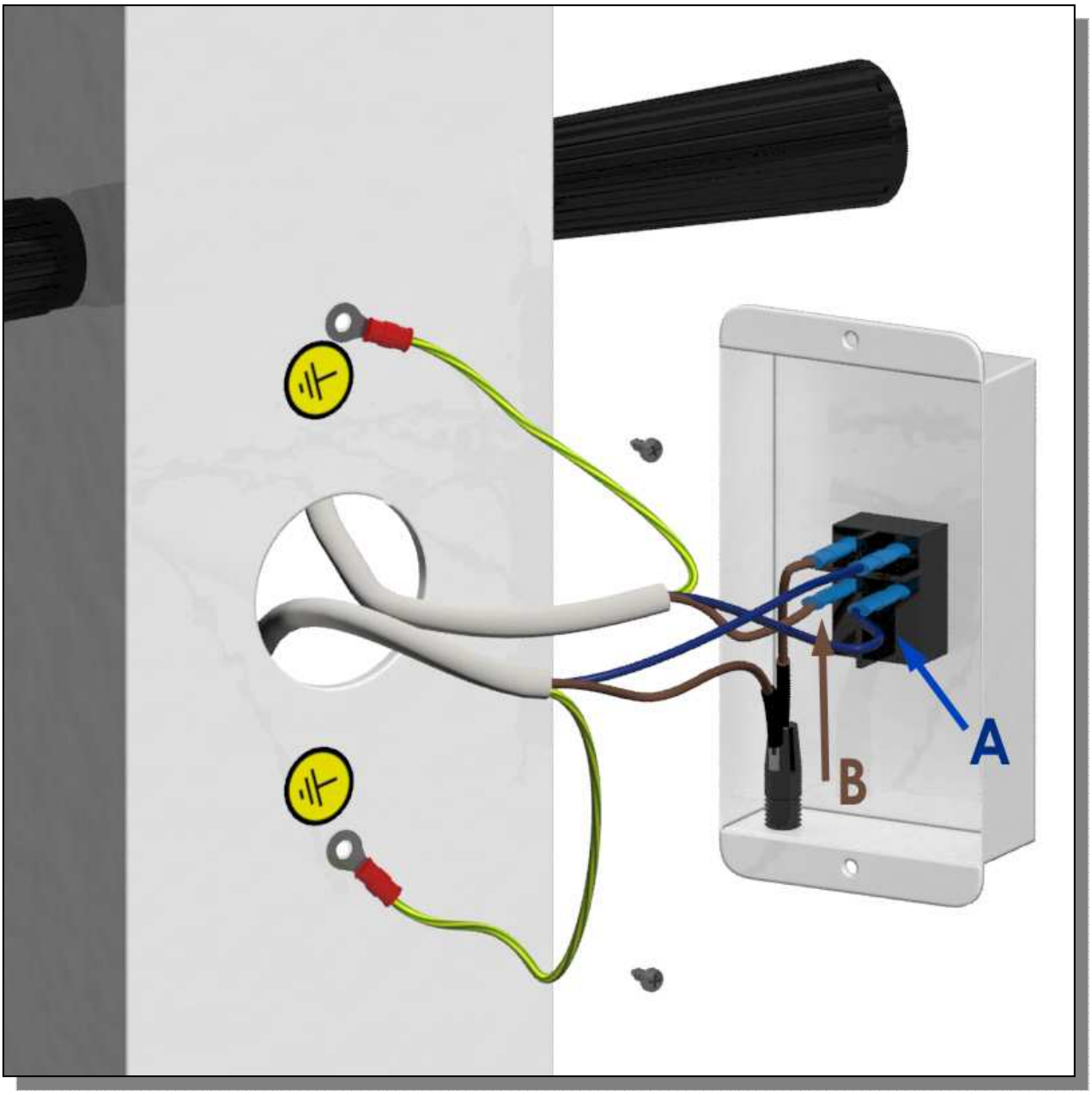


fig.24b (column version)

Reduction of the transmission range of the radio control

If there is a reduction in the transmission range of the radio control it may be due to the flat batteries. To replace the batteries, proceed as follow

- Unscrew the fixing screws of the back cover

fig.25

- Replace the batteries by inserting them into their slots
- The batteries used are AAA-LR03-1.5 V "

Coding of a new radio control

If you need to associate an additional radio control to the timer or to replace the one supplied at the time of sale, proceed as shown in fig.26:

- As you turn the equipment on, hold the timer button  for about a second; in these conditions the leds of the teeth will begin to flash for about ten seconds; in this time hold down the radio control button until the led of the same stops blinking. At the end of this operation the new radio control is associated with the timer.

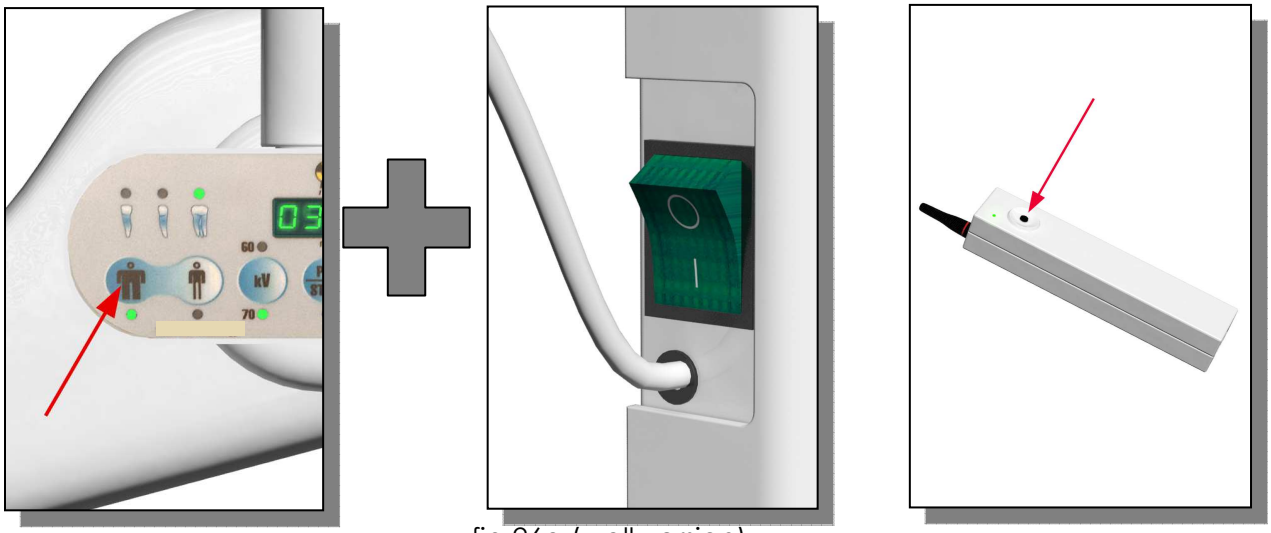


fig.26a (wall version)

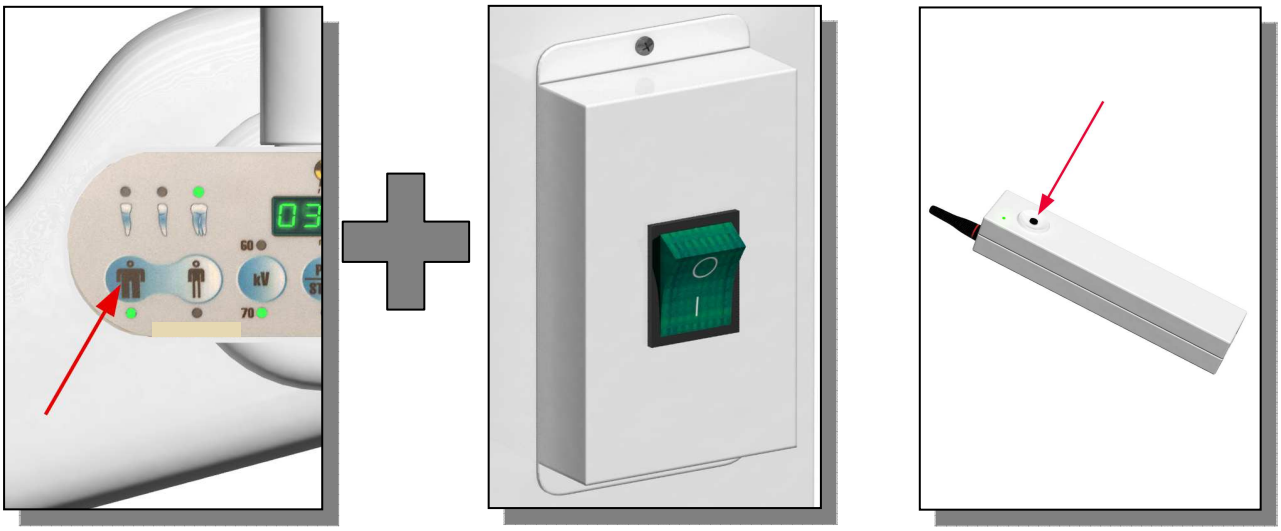


fig.26a (column version)

Procedures for the filament current measures:

Measurement of the filament current

The measurement of the filament current can be carried out through the use of an oscilloscope or by means of a digital multimeter. To perform this measurement, proceed as follows:

- ✓ After removing the back cover, making reference to fig.27, connect oscilloscope / tester terminals across the resistor to 1KΩ.

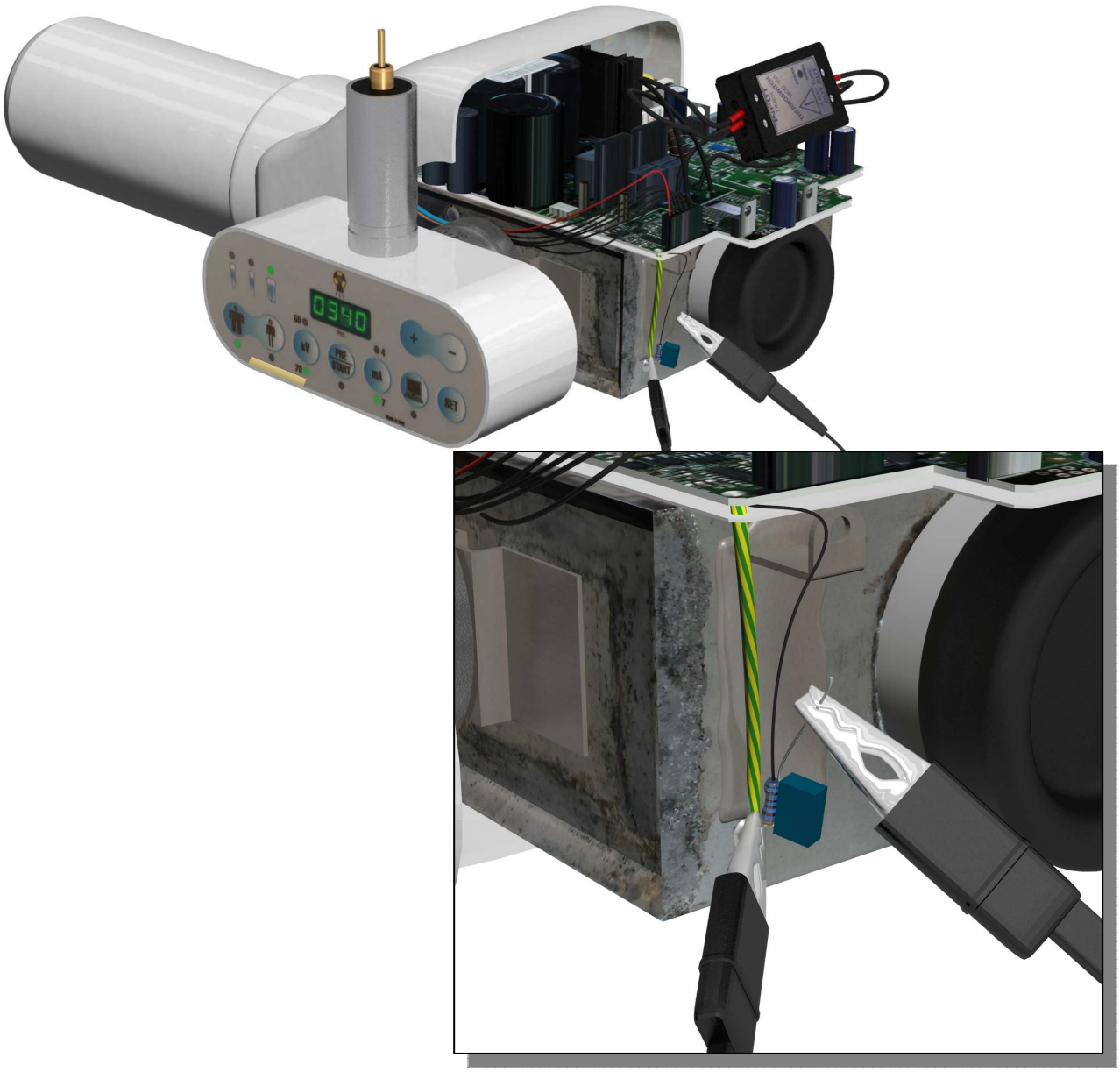


fig. 27

Measurement using the oscilloscope:

Measure across the resistor the voltage value. To make the measurement with an oscilloscope, you need:

set the time base [SEC/DIV] and Volt time scale [VOLTS/DIV] of the oscilloscope in an appropriate manner, so that the waveform of the measured voltage fills the screen of the oscilloscope, as shown in fig.28 (the order of magnitude of exposure time to perform the current measurement is of a few hundred ms)

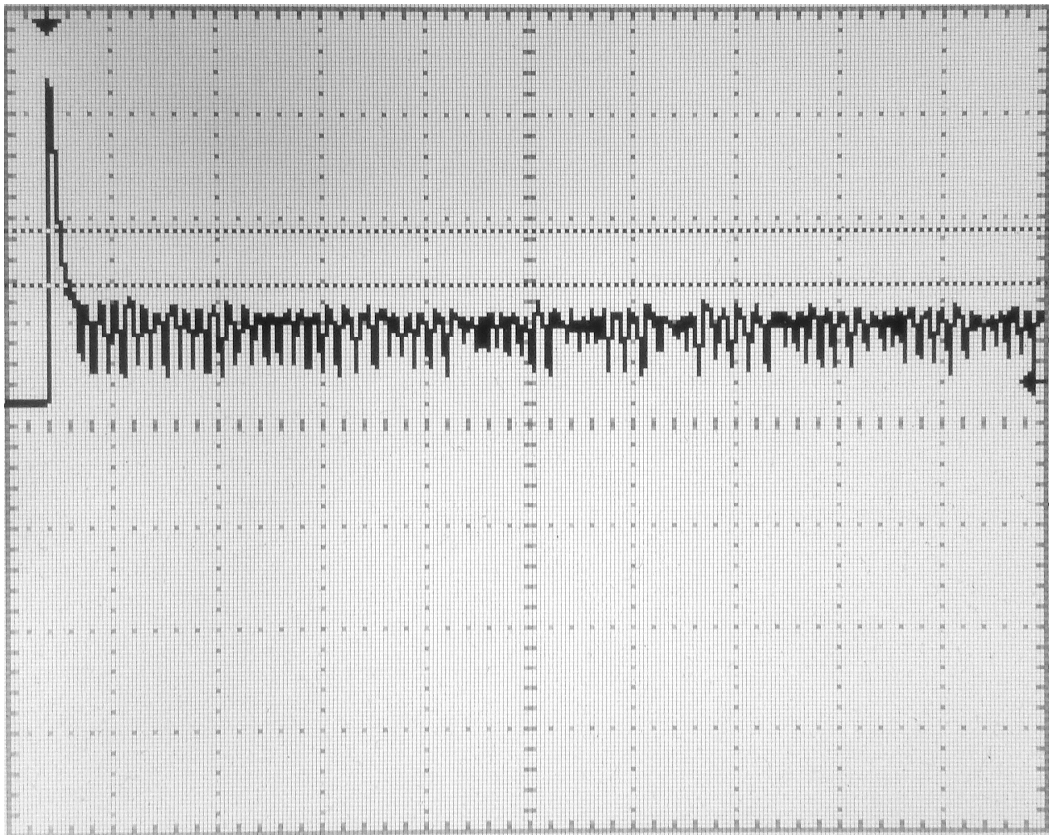


fig. 28

By setting the timer on 7 mA, if the measurement is performed correctly it is expected to see an average value of about 7 V (to each V corresponds 1 mA). As if 4 mA are set on timer the average value that is expected to read is about 4 V.

Measurement using the digital multimeter:

It is necessary to set the full scale of the multimeter in an appropriate manner in order to measure the voltage across the resistance; then after positioning the end sleeves of the multimeter across the resistor (as shown previously in fig.27) set an exposure time long enough to allow the multimeter to read this voltage (the order of magnitude of the exposure is approximately 1 sec). The value that is expected to read is like in the previous case of about 7 V / 4 V depending on the current value set on the timer (to each V corresponds 1 mA)

Procedure for dosimetric measurements:

During an inspection test are carried out dosimetric measurements to verify correct operation. These measures are carried out by a special instrument cluster with the following procedure:

- ✓ The instrument used for dosimetric measurements is the RTI ELECTRONICS PIRANHA 255;
- ✓ Is positioned the instrument at a distance of 50 cm from the fire hose and found the dose values expressed in mGy;
- ✓ It checks the performance of the X-ray tube is in compliance with the project specifications;
- ✓ The tests are stored in digital format and made available for those who request them;

Plates positioning

- ✓ Below, in fig.23 it shows the layout plates positioning on BEST-X-DC

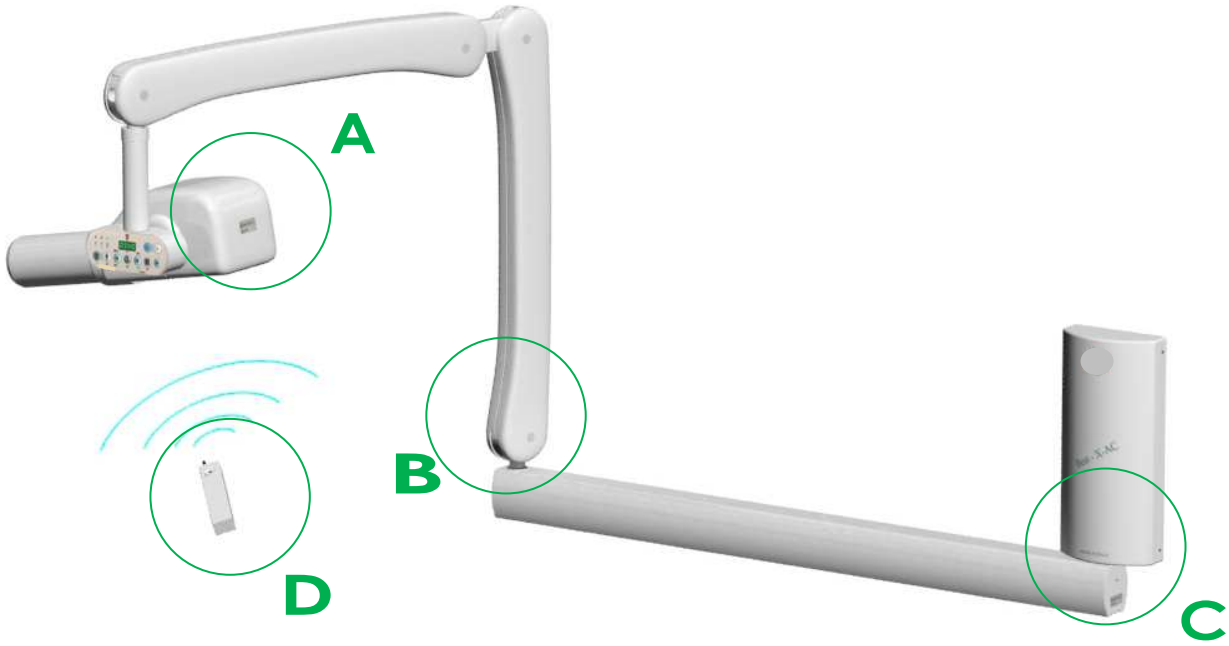
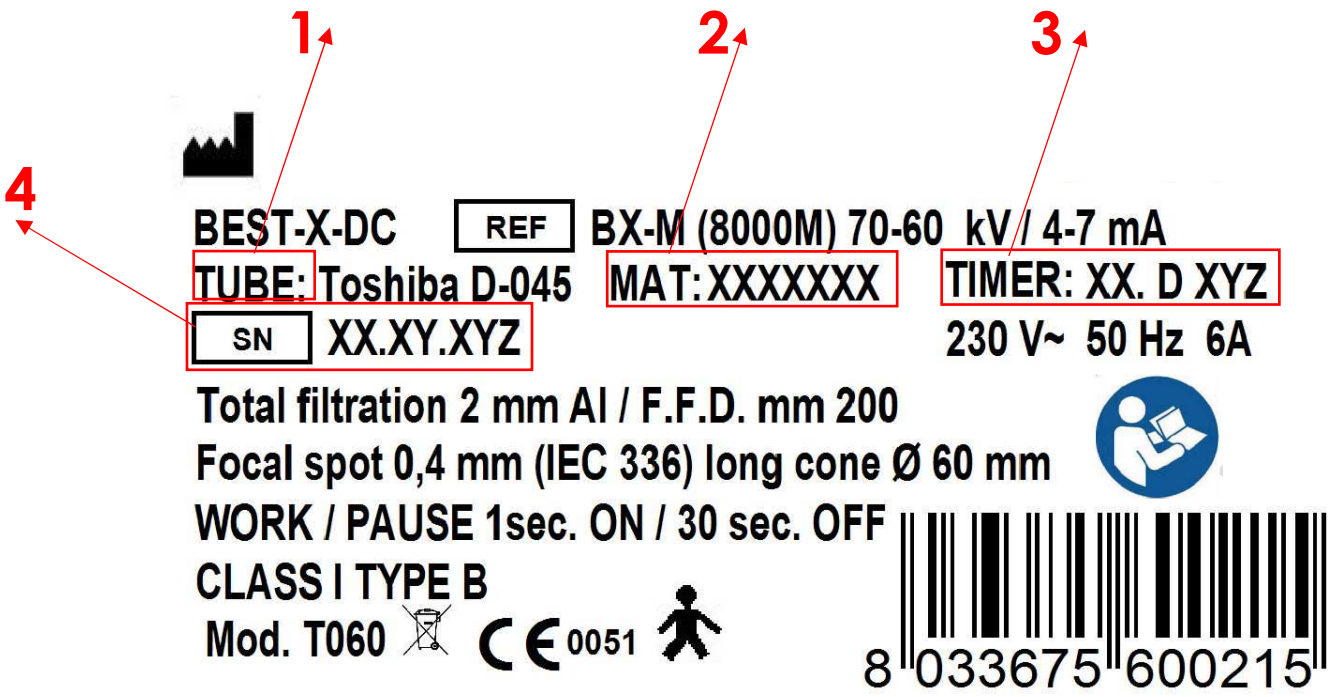


fig.29

("A" wall version)

("A" column version)



Description plate fields:

1. TUBE:

It indicates the model of the X-ray tube used;

2. MAT: XXXXXXXX

It indicates the serial number of the X-ray tube;

3. TIMER: XX. D XYZ

XX It indicates the year of manufacture;

D XYZ It indicates the number of the timer series;

4. S/N XX.XY.XYZ (It represents the device serial number)

XX It indicates the year;

XY It indicates the month;

XYZ indicates the serial sequential number;


MOD F01 SN XX.X
Mod.T036

("B")


MOD S01 SN XX.X
Mod.T034
MOD M01 SN XX.X
Mod.T035

("C")


BEST - X - DC Radio Wave Remote Control
CE 0051
TL1
XX. D XXXX
REF
SN
MOD.T063

("D")

Servicing of the x-ray unit

CARRIED OUT BY THE DENTAL LABORATORY OPERATOR, WITH ANNUAL CADENCE

Informations for programming routine maintenance on the plant are provided to ensure the best conditions of use by fully exploiting the diagnostic potential, without compromising any safety and reliability aspect that characterize the Company.

The verifications and controls are divided into blocks and the operator before starting the procedures of controls must ensure the availability of the instruction manual:

Radiogenic head monoblock:

plate integrity with the identification data;

Ionizing radiations warning signals integrity;

oil leaks absence verification;

complex integrity: covers shells, spacer cone attachment, rotation system;

monoblock's correct anchoring verification at the pantograph;

verify the correct 360 ° rotation of the monoblock on the horizonthal plane;

verify the correct 355 ° rotation of the monoblock on the vertical plane;

Wall and column support,and pantograph:

verify the correct fixing of the wall support (only for wall version);

move the pantograph in all directions to verify the stability and bilance;

verify that the movement of the complex is fluid, flexible, without obstacles and that it is not hardening;

check for drawings from fluidifying liquid;

Supply unit

plate integrity with the identification data;

verify the integrity of the snap command and its spiral cable;

integrity of the signal lights (yellow);

integrity of the acoustic signaling system;

If that anomalies are found on the plant during all of the above checks, these should be reported to your distributor maintenance technician's.

The extraordinary maintenance interventions are not carried out by the operator

Extraordinary maintenance

CARRIED OUT BY TECHNICAL ASSISTANCE IN CASE OF NEED AND IN ANY CASE AFTER RELEVANT REPAIRS .

We provide a guideline on controls, on minimum checks that are to be performed in any technical intervention on the plant:

monoblock, support and pantograph stability;

wear of the joints of rotation, of the plant balance and of the springs;

power supply's sliding contact of the head;

power cord of the head and of the control unit;

TESTING SERVICES

The frequency of checks carried out by a qualified expert on the performance of the X-ray (high voltage values, the dose rate, etc ..) will allow to always obtain perfect images. The X-ray, and in particular the single unit, does not contains parts subject to maintenance or external assistance.

Manufacturer responsibility

- ✓ The manufacturer is responsible for the effects of safety, reliability and performance of the equipment only if:
- ✓ assembly and any intervention on the equipment have been made by specialists;
- ✓ if the environment electrical system in which the equipment is installed is in compliance with current standards in the field of plant safety;
- ✓ if the equipment is used in accordance with use

Parts of input and output signal

It is not provided for the equipment connections with other parts of entry and exit signal outside.

Cleaning and disinfection of the unit and the parts in contact with the patient

You should always disconnect the unit from the mains power supply before starting cleaning activities and / or disinfection.

The method used for disinfection must meet the regulations and the recommendations in force, including those regarding the prevention of risks of explosion.

Cleaning and disinfection of the parts in contact with the patient

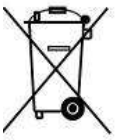
- ✓ The parts in contact with the patient are represented by the cone collimator (cod. CL01). This part should be carefully disinfected after the use through disposable disinfectant wipes category "medical surgical".

Cleaning and disinfection of the unit

- ✓ For these operations can be used a cloth moistened with neutral water-based detergent products. Make sure that no liquid seeps inside the equipment because it may cause short circuits and corrosion. Do not use abrasive polishing.
- ✓ The accessories and connection cables must be disinfected only with a cloth soaked in disinfectant solution. Do not use solvents or corrosive disinfectants.

- ✓ Spray disinfectants are not recommended because they may enter into the device and cause short circuits and corrosion. If the spray use is essential, take the following precautions:
- ✓ If the room where the appliance is installed is subjected to disinfection treatment, the same must be carefully covered with a protective sheet, taking care to turn it off well in advance so as to cool completely.
- ✓ After the dispersion of the vaporized disinfectant, remove the protective sheet and disinfect the device as described above.
- ✓ Do not use the device in the presence of disinfectants which vaporize to form explosive mixtures and wait until the vapors have dissipated before using it.

Environmental protection and dismantling



- ✓ The symbol indicates that this product is in conformity with European Directive 2002/96/Ec (Weee). It should not be treated as household waste but should be handed in at the appropriate collection centre for the recycling of electrical and electronic equipment. Discard it according to local regulations for waste disposal.
- ✓ The monoblock unit is made of lead parts and contains oil. The dismantling at end-of-life of these parts must be done in a controlled way through authorized disposal companies according to current regulations.
- ✓ In case of monoblock's damage for impact or crushing with a consequent oil leaking, prevent dispersal into the environment, proceeding to decommissioning as indicated above.

Radio control characteristics

RX BUTTON:

The device is powered by 2 batteries AAA-LR03-1.5 V.
Make sure of the polarity in the assembly.
Battery life is a few years, it is advisable to replace the batteries once a year; when the brightness of the LED becomes low, it is time to replace the batteries.

DESCRIPTION:

AM OOK transmitter module, with quartz through SAW resonator
"Buffer" phase which ensure power and low harmonics on output allowing high immunity to mismatching.

TECHNICAL SPECIFICATIONS:

Characteristics:	Min	Type	Max	Unit
Power supply Unit:	1.8	3	3.5	Vdc
Current Absorbed with Modulation:	2.4	5.5	7	mA
Transmission Frequency:	433.82	433.92	434.02	MHz
RF spurious emissions in antenna:			-36	dBm
Working temperature:	-20		+80	°C

Characteristics of the X-ray tubes Toshiba DG-073B-DC, Toshiba D-045, Kailong KL11, Kailong kl21

X-ray tube Technical description

Target material that characterizes the radiation spectrum :	Tungsten
Reference axis for target angle and focal spot characteristics:	Orthogonal to the anode-cathode axis
Target angle compared to the reference axis:	12.5° (Toshiba D-045); 12° (Kailong KL11); 16° (Kailong KL21);20° from the axis (Toshiba DG-073B-DC)
Focal spot value for the reference axis:	0,7mm (Toshiba DG-073B-DC, Kailong KL21); 0.4 mm (Toshiba D-045, Kailong KL11)
Filtration:	eq. 1 mm + 1 mm Al added, not removable without tools

X-ray tube nominal voltage:	70kV
Current intensity and frequency:	4mA-7mA 50 Hz
Operating cycle:	1/30

X-ray tube- sheath assembly technical description

Reference axis for angle of the target and characteristics of the focal spot:	Orthogonal to the anode-cathode axis
Target angle compared to the reference axis:	12.5° (Toshiba D-045); 12° (Kailong KL11); 16° (Kailong KL21);20° from the axis (Toshiba DG-073B-DC)
Focal spot value for the reference axis:	0,7mm (Toshiba DG-073B-DC, Kailong KL21); 0.4 mm (Toshiba D-045, Kailong KL11)
Load factors values concerning radiation leakage:	1/30
Classification:	Class IB (IEC 60601-1)
Data for high voltage connections:	See detailed figures
High voltage connection polarity:	Phase and Neutral (sinusoidal alternating current)
Precautions to be observed to installation completed before the first load:	None

Beam limiting devices technical description

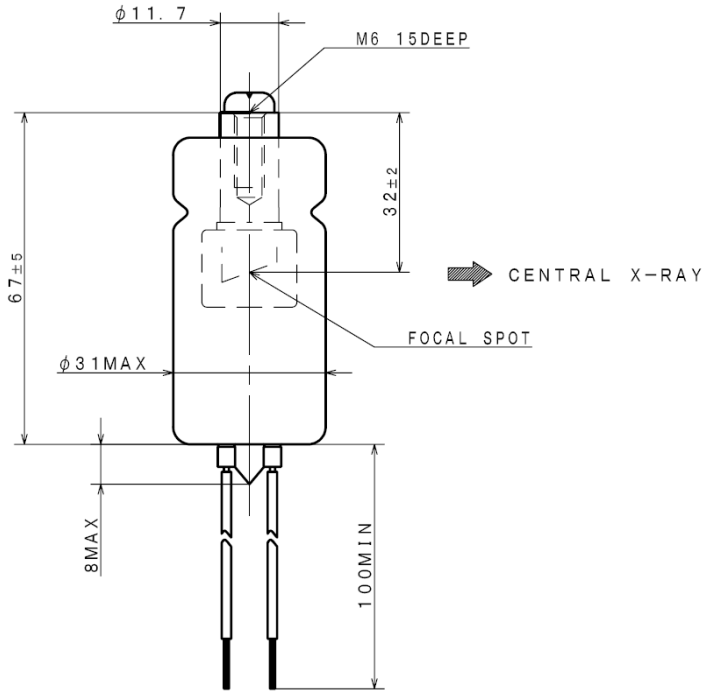
Limiter beam (cone collimator) coated in lead:	distance FFD 200 mm max ∅ 60 mm mod. C.L.01

Technical description of the X-ray radiant complex for diagnostic

Reference axis at which the slope of the anode and the characteristics of the focal spot refer:	Orthogonal to the anode-cathode axis
Anode slope compared to the specific reference axis:	12.5° (Toshiba D-045); 12° (Kailong KL11); 16° (Kailong KL21);20° from the axis (Toshiba DG-073B-DC)
Focal spot position on the reference axis:	See detailed figures
Focal spot value for the reference axis:	0,7mm (Toshiba DG-073B-DC, Kailong KL21); 0.4 mm (Toshiba D-045, Kailong KL11)

X-ray tube type Toshiba DG-073B-DC

Unit: mm



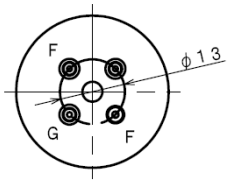


fig.30

CENTRAL X-RAY

F : FILAMENT
G : GRID

Reference curves

High Voltage Circuit

Constant Potential High-Voltage Generator

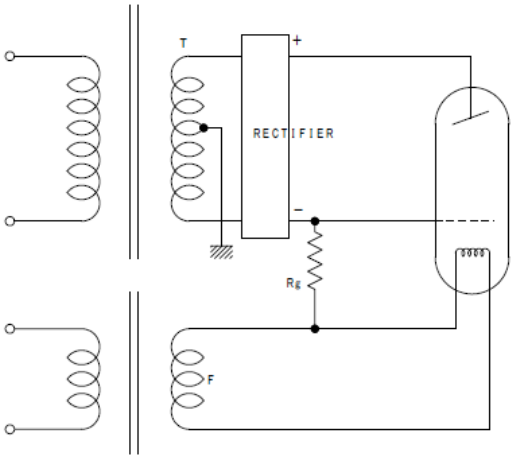
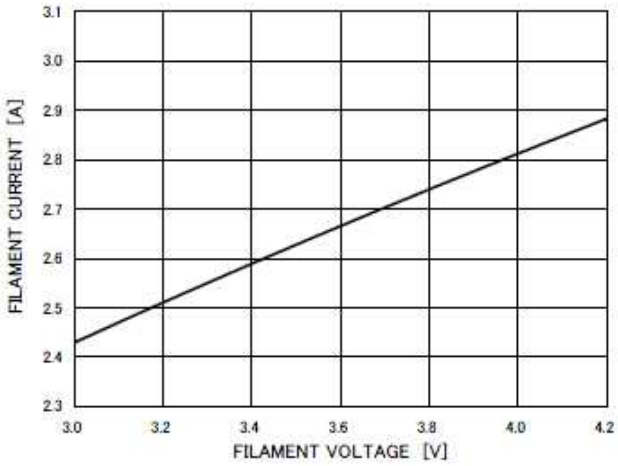


fig.31

Filament Characteristics



Note 1) This graph indicates typical characteristics.
Note 2) Refer to IEC60613:2010

Anode Heating / Cooling Curve

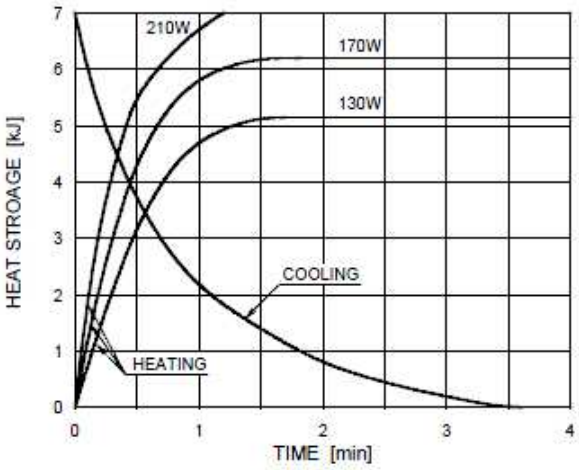
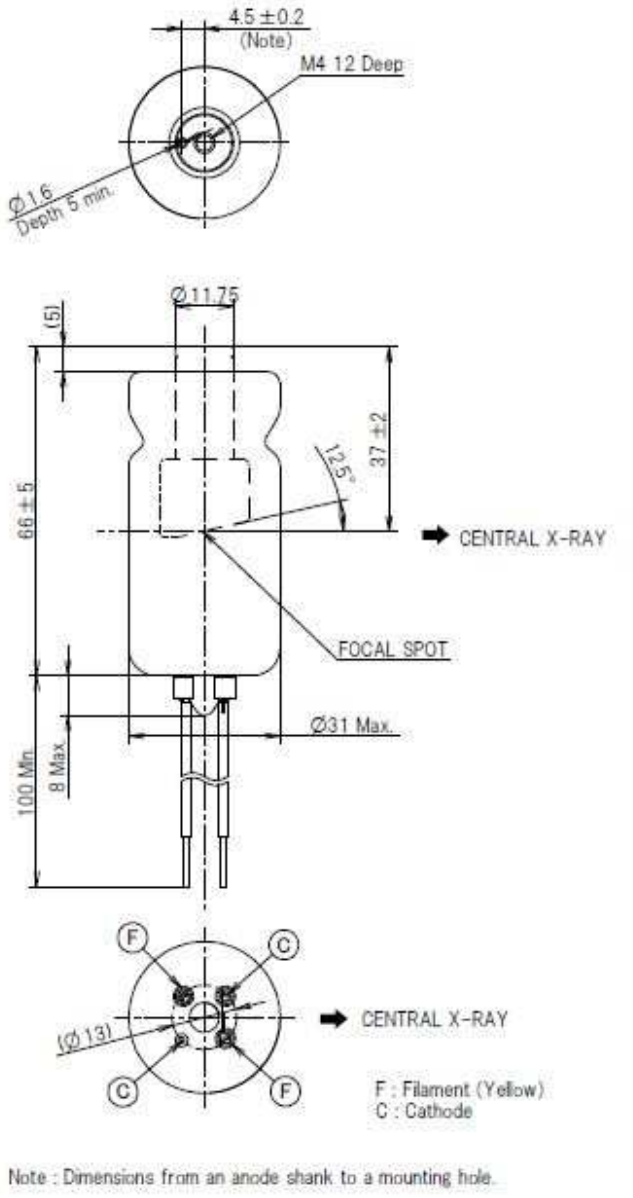


fig.32

X-ray tube type Toshiba D-045

Unit: mm



Note : Dimensions from an anode shank to a mounting hole.

fig.33

Reference curves

High Voltage Circuit

Constant Potential High-Voltage Generator

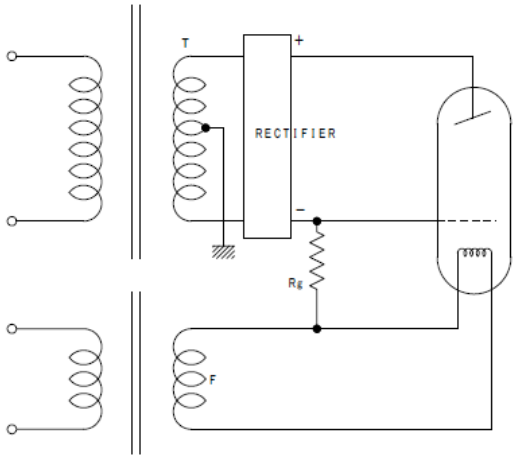
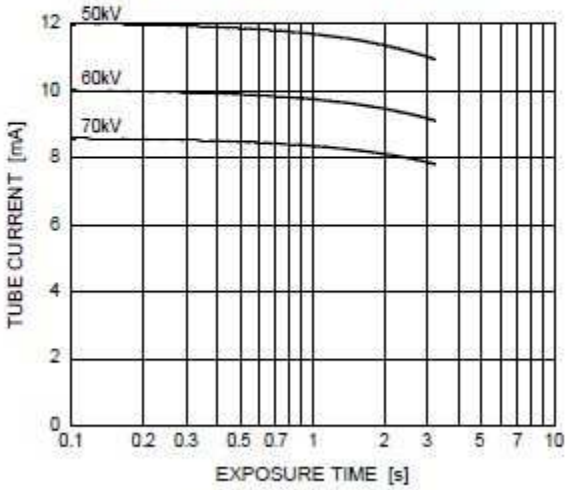


fig.34

Maximum Rating Charts
(Absolute maximum rating charts)

Constant Potential High-Voltage Generator

Nominal Focal Spot Value: 0.4



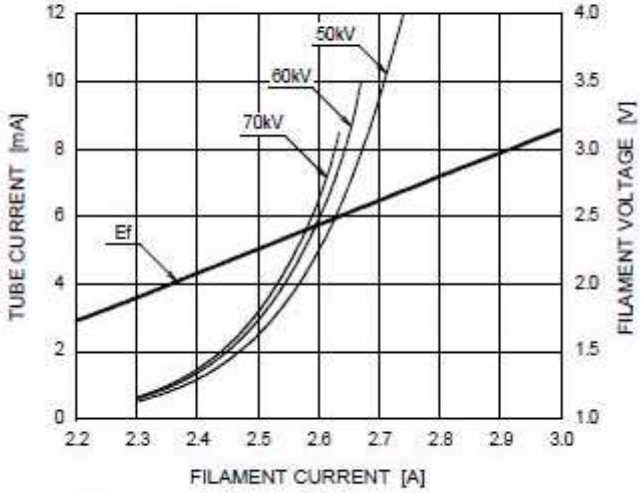
Refer to IEC60613:2010

fig.35

Emission & Filament Characteristics

Constant Potential High-Voltage Generator

Nominal Focal Spot Value: 0.4



Note1) This graph indicates typical characteristics.
Note2) Refer to IEC60613:2010

fig.36

Anode Heating / Cooling Curve

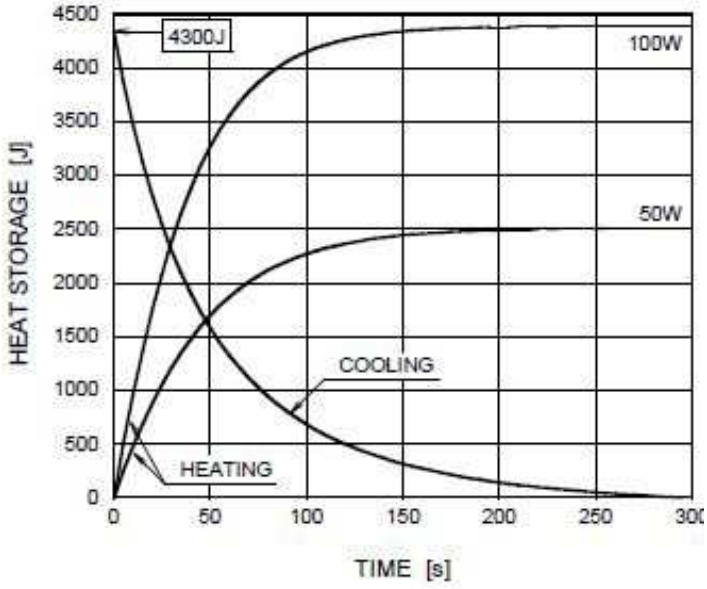


fig.37

X-ray tube type Kailong KL11

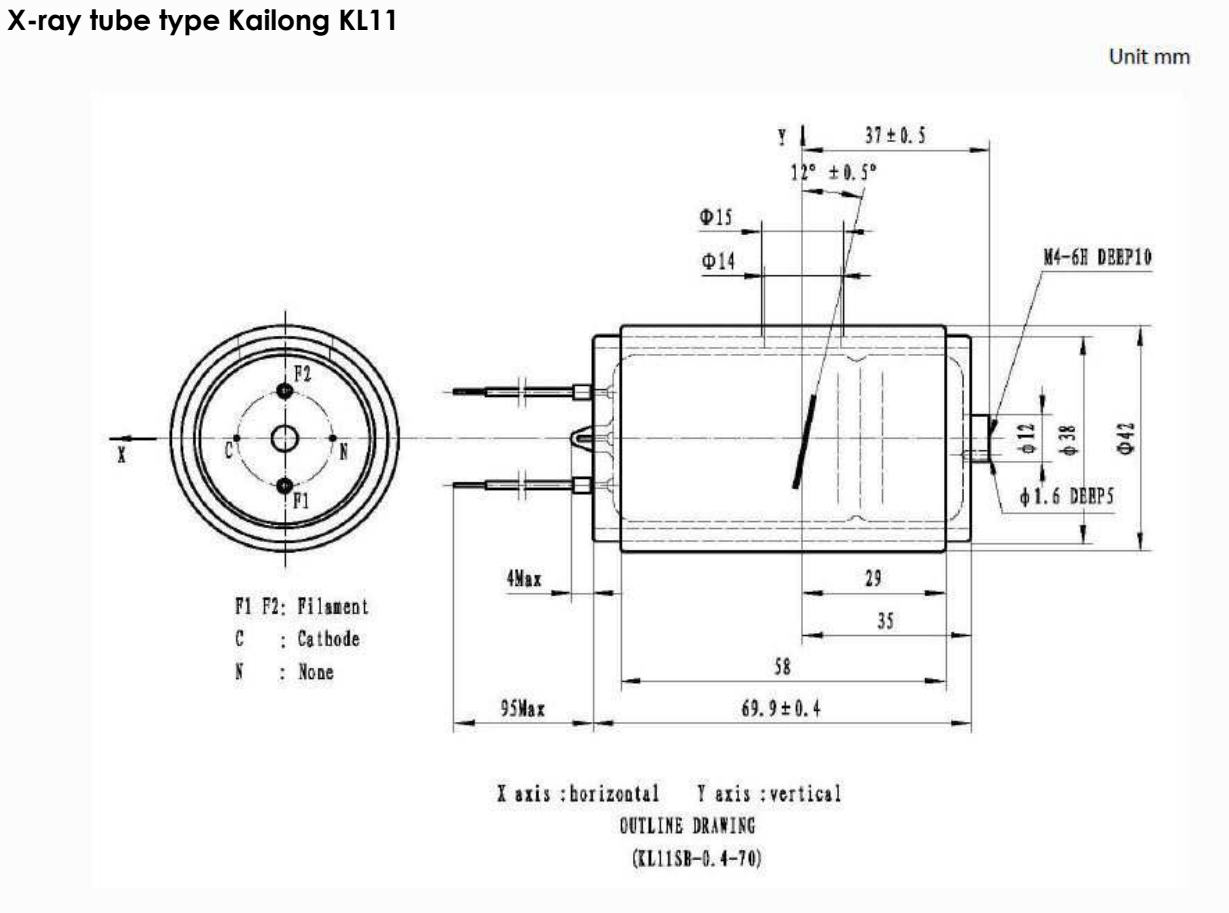


fig.38

Reference curves

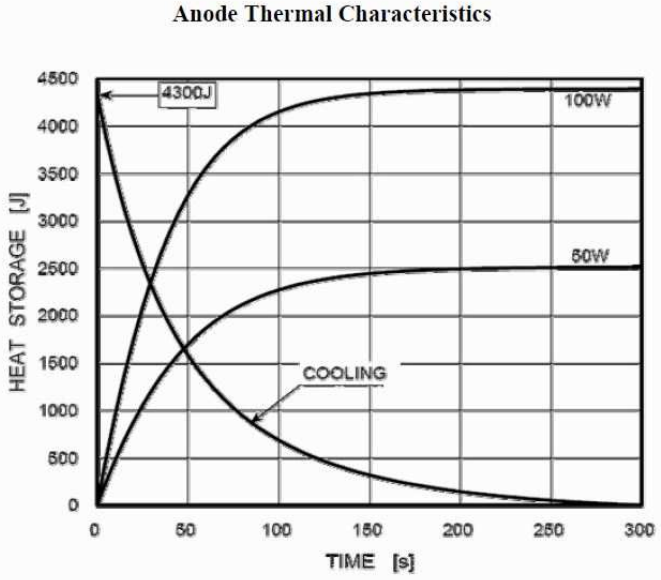


fig.39

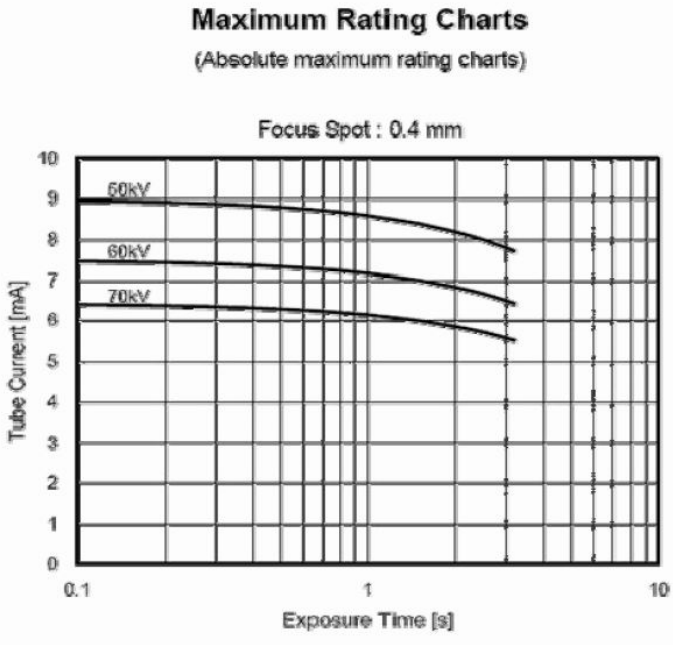


fig.40

X-ray tube type Kailong KL21

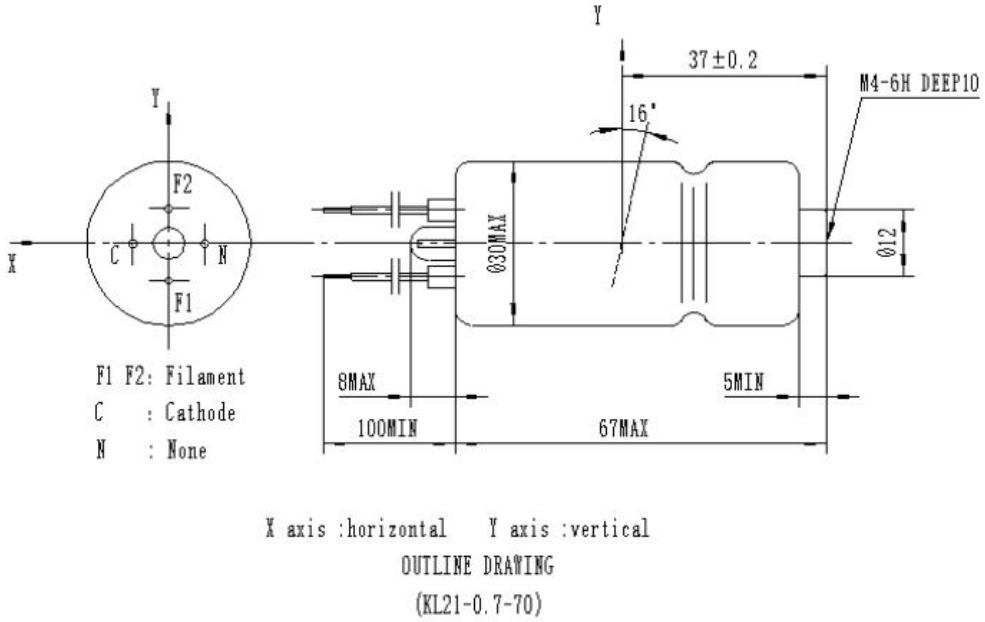


fig.41

Reference curves

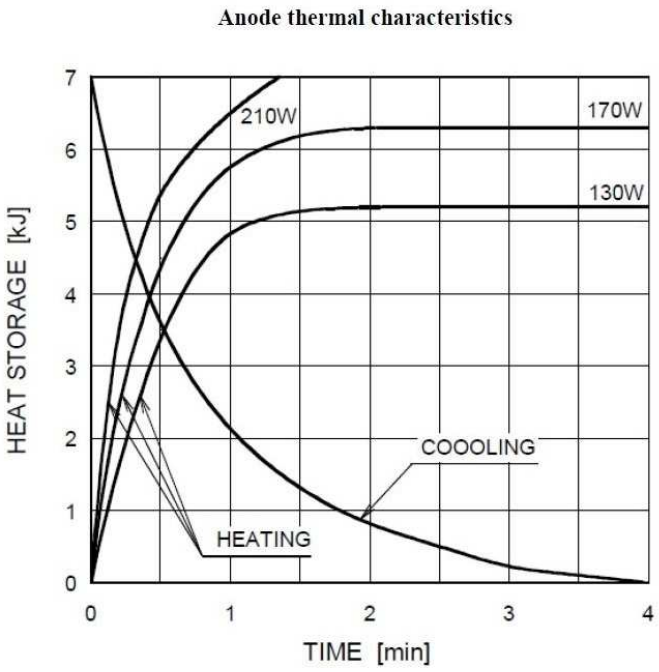


fig.42

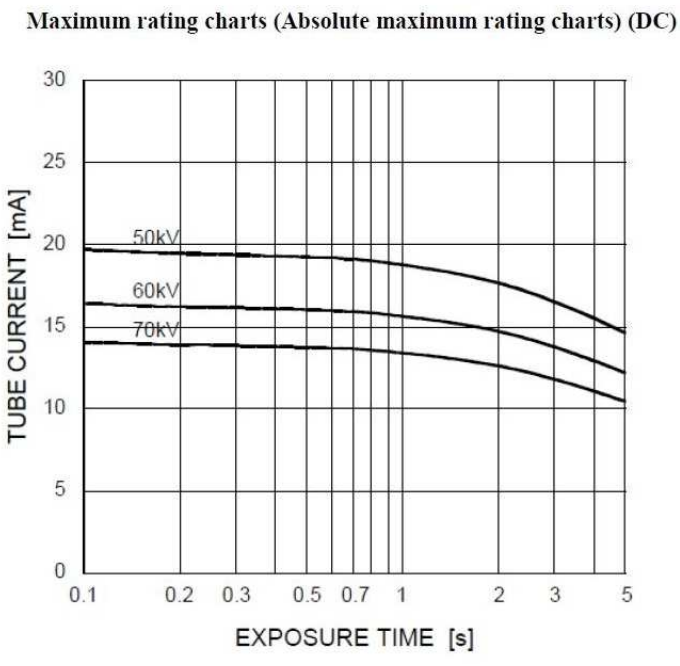


fig.43

Safety aspects

- ✓ The equipment is not designed to be used in the presence of explosive gases or vapours.
- ✓ It is forbidden to pour water or other liquids on the equipment so as not to cause short circuits and corrosion
- ✓ Only service technicians are authorized to remove the monoblock from its support.
- ✓ The personnel authorized to the radiological examinations performance must observe the protection rules against radiation.
- ✓ To protect the patient from diffused radiations, it is recommended the adoption of protective clothing for dental use.
- ✓ While executing x-ray examinations, there must not be other people in the room in addition to the patient.
- ✓ All personnel present during an x-ray examination must comply with safety regulations concerning protection against radiation. For their own safety, the operator must always keep a distance of more than 2 meters and out of the path of the x-ray beam, in order to avoid the exposition to the stray radiation.
- ✓ The plate must be placed in the oral cavity of the patient, and must be kept on site by the patient.
- ✓ Before using this x-ray system please refer to the regulation in force in your area concerning paediatric patients, pregnant women and anyone with health issues that contraindicate the use of x-rays. Investigate and make sure of this condition before starting the exposure.

Possible drawbacks found in the intraoral radiographs results

Clear image
Possible causes:

- Exhausted development liquid
- Excessive dilution of the developing liquid
- Too short exposure time to X-rays
- Insufficient development time
- Exposure liquid temperature below the recommended range

Dark image

Possible causes:

- Wrong dilution of developing liquid
- Too long exposure time to X-rays
- Excessive development time
- Exposure liquid temperature higher than the recommended

Not detailed image

Possible causes:

- Patient movement
- Monoblock movement

Radiography partially exposed

Possible causes:

- Error in the centering between rays's beams and film
- Liquid development too low with a consequent film partial development
- Contact between two or more films during development

Veiled Image

Possible causes:

- Films that exceeded the expiration date
- Film accidental exposure to rays
- Film accidental exposure to heat sources
- Film accidental exposure to daylight or safety lamp darkroom no longer suitable

Black line occurrence on X-rays

Possible causes:

- A sharp film folding can be the cause of the appearance of a black line on the film

Radiography with elongated apexes of the teeth

Possible causes:

- Excessive film folding in the oral cavity

Recommendations

For maximum radiological image quality with minimal X-ray dose, we recommend the use of films with high sensitivity and the respect of development time proposed by the manufacturer of the films, shaking continuously films during the development itself. If the image thus obtained is too dark, it is necessary to decrease the X-ray exposure time and not the development duration.

In the case of manual development it is good to know that the developer liquid preserves its efficiency in average for a week regardless of the number of films processed. Please note that the treatment liquids are harmful to the environment and must be disposed of as indicated by the manufacturer

Film positioning

During normal operation, the film must be positioned at 90 ° with respect to the cone collimator, as shown in fig.44

Upper jaw *Lower jaw*

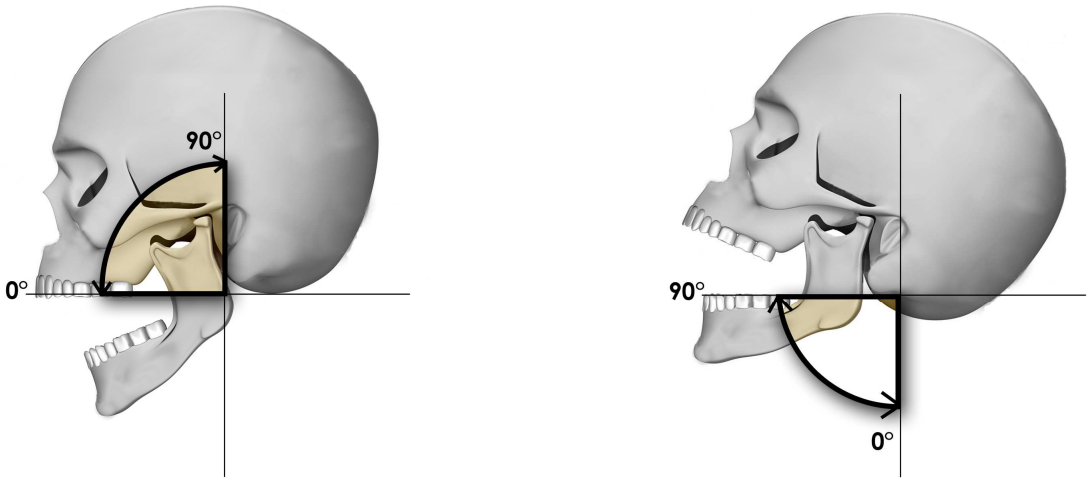


fig.44

Although every effort is made to ensure the accuracy of the information contained in this manual, we do not assume responsibility for any mistakes, omissions or inaccuracies.