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INSTRUCTIONS FOR USE

Dental units

DIPLOMAT CONSUL DC 170
DIPLOMAT CONSUL DC 180
DIPLOMAT ADEPT DA 110A

CONTENTS

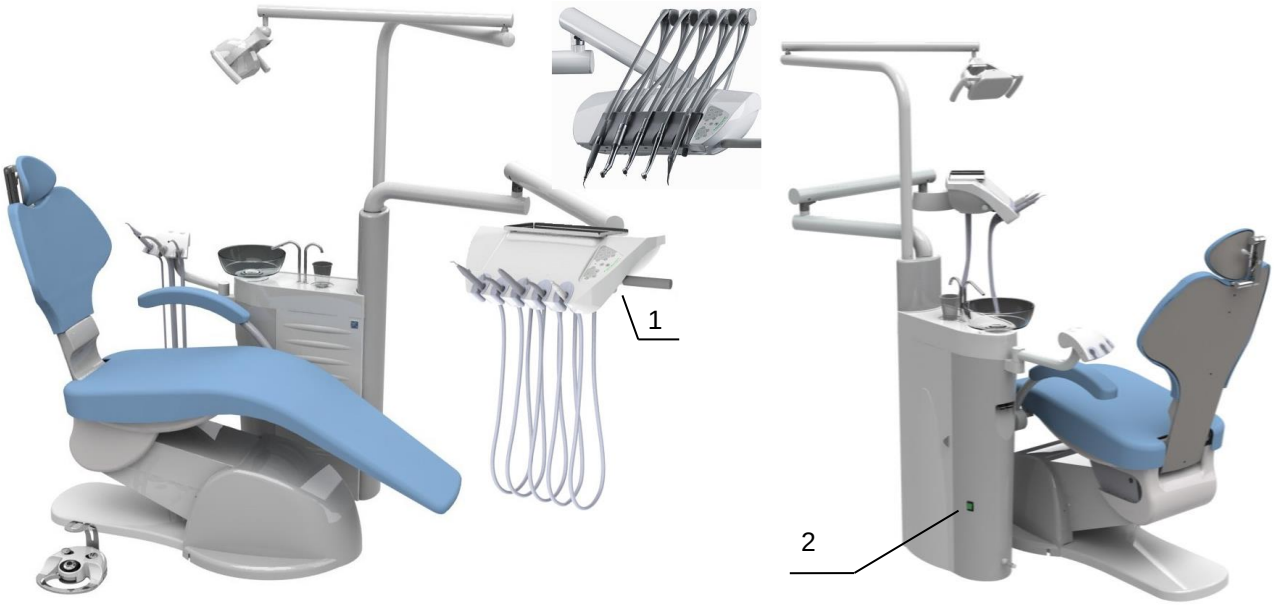
1 PURPOSE

These Instructions for Use are intended to provide you with necessary information about **DIPLOMAT CONSUL DC 170, DIPLOMAT CONSUL DC 180, DIPLOMAT ADEPT DA110A** dental unit.
Please, familiarize yourself with information provided in this handout before operating the unit.

It is expected, that dental unit will be used by a specialist, familiar with the following instructions for use as well as with the instructions for any other products and applications that are being used in conjunction with a unit. To ensure proper operation installations or adjustments should be done by authorized technicians of authorized organization. The utilities requirements as well as the installation requirements specified in **DIPLOMAT CONSUL DC 170, DIPLOMAT CONSUL DC 180, DIPLOMAT ADEPT DA110A.**
Instructions for Use must be observed.

Diplomat Consul DC 170

Diplomat Consul DC 180



Diplomat Adept DA 110A

1. Manufacturing label of dental unit location
2. Main switch location

2 PRODUCT DESCRIPTION

The **DIPLOMAT DC 170** and the **DIPLOMAT DC 180** are chair-mounted-type dental units with chair-integrated energy unit. The **DIPLOMAT DA 110A** is a stationary-type dental unit.
This unit can be mounted on the DM 20 or on the DE20 chairs. The pantographs of a control panel with instruments and handpieces and of operating light are mounted on the spittoon block. The instruments and handpieces, except for syringe, saliva ejector, large and small aspirators, polymerizing lamp are controlled with the foot controller. The keyboard with control buttons and light indicators is located on the control panel. The handle enables a smooth repositioning of control panel. In the standard configuration, the handle is mounted on the right side of the control panel. The control panel with left-side handle is available upon request. Depending upon the model, spittoon block can be equipped with saliva ejector and with large and small aspirators. The glass cuspidor bowl, rinsing and cup-filling spouts are detachable. The silicone pads on the tray table as well as the silicone handles are detachable and sterilizable. Large and small aspirators' handpieces are also detachable and are disinfection- and sterilization-friendly. Saliva ejector's tips are for single use only. As an optional furnishing, light console-mounted tray tables as well as the monitor's pantograph are available upon request. All the **DIPLOMAT DC 170, DIPLOMAT DC 180, DIPLOMAT DA 110A** units are equipped with a syringe on a control panel.

In the manual are used following shortcuts:
USS – ultrasonic scaler (calculus remover)
PLM - polymerizing lamp
DC motor – brushed motor
BLDC motor – brushless motor

Dentist's control panel can be fitted with the following instruments:

- 1x syringe
- max. 3 rotary instruments, among which are
  - max. 2 turbines
  - max. 2 micromotors (max. 2x DC motor or max. 2x BLDC motor)
- 1x ultrasonic scaler
- max. 5 instruments with lighting
- 1x polymerizing lamp

You can only configure the dental unit with one specific motor type.

The assistant panel can be fitted with the following instruments:

- 1x large aspirator
- 1x small aspirator
- 1x saliva ejector
- 1x camera
- 1x polymerizing lamp
- 1x syringe

Note
Optional equipment and supplementary equipment (see the current price list).

Parts of the dental unit coming into contact with the patient:

- Small and large aspirator
- Saliva ejector
- Instruments located on the control panel

3 TECHNICAL DATA

	DC170, DC180	DA110A
Supply voltage	220 ÷ 230 V ± 10 %	230 V ± 10%
Frequency	50/60 Hz ± 2 %	50/60 Hz ± 2 %
Max. power input at 230V/50 Hz	400 VA + 10%	
Input air pressure	from 0,45 to 0,8 MPa	
Input water pressure	from 0,3 to 0,6 MPa	
Dental unit weight DC 180, DC 170	50 kg + max.20 kg acc.to equipment	
Dental unit weight DA110A	55 kg + max.20 kg acc.to equipment	
Type of shock protection	Class I equipment	
Degree of shock protection	Applied parts of B type	
Degree of cover protection	IP21	
Water temperature for the cup	33 ± 5°C (with heater fitted)	
Max. recommended load of light arm tray table: • for stainless plate 180x280 mm • for stainless plate 290x370 mm	 0,5 kg 1,5 kg	
Max. recommended load of dentist's panel tray table	1,5 kg	

Detailed descriptions, schematics, parts list and instructions for servicing are available to each authorized service specialist who was trained in DIPLOMAT DENTAL.

3.1 Used Symbols

Symbol	Description
	Caution – injury or damage risk
	Warning – possible risk
	Warning
	Important Information
	Note
	Refer to instruction manual/booklet
IP21	Protected from touch by fingers and objects greater than 12 millimeters. Protection against vertically falling drops of water e.g. condensation
	Manufacturer
	Mandatory comformity marking for certain products sold within the European Economic Area
	Type B applied part
	Protective earth; protective ground
	Dangerous voltage
	Sterilizable in a steam sterilizer (autoclave) at temperature specified

4 GENERAL DESCRIPTION OF THE DENTAL UNIT DC 170

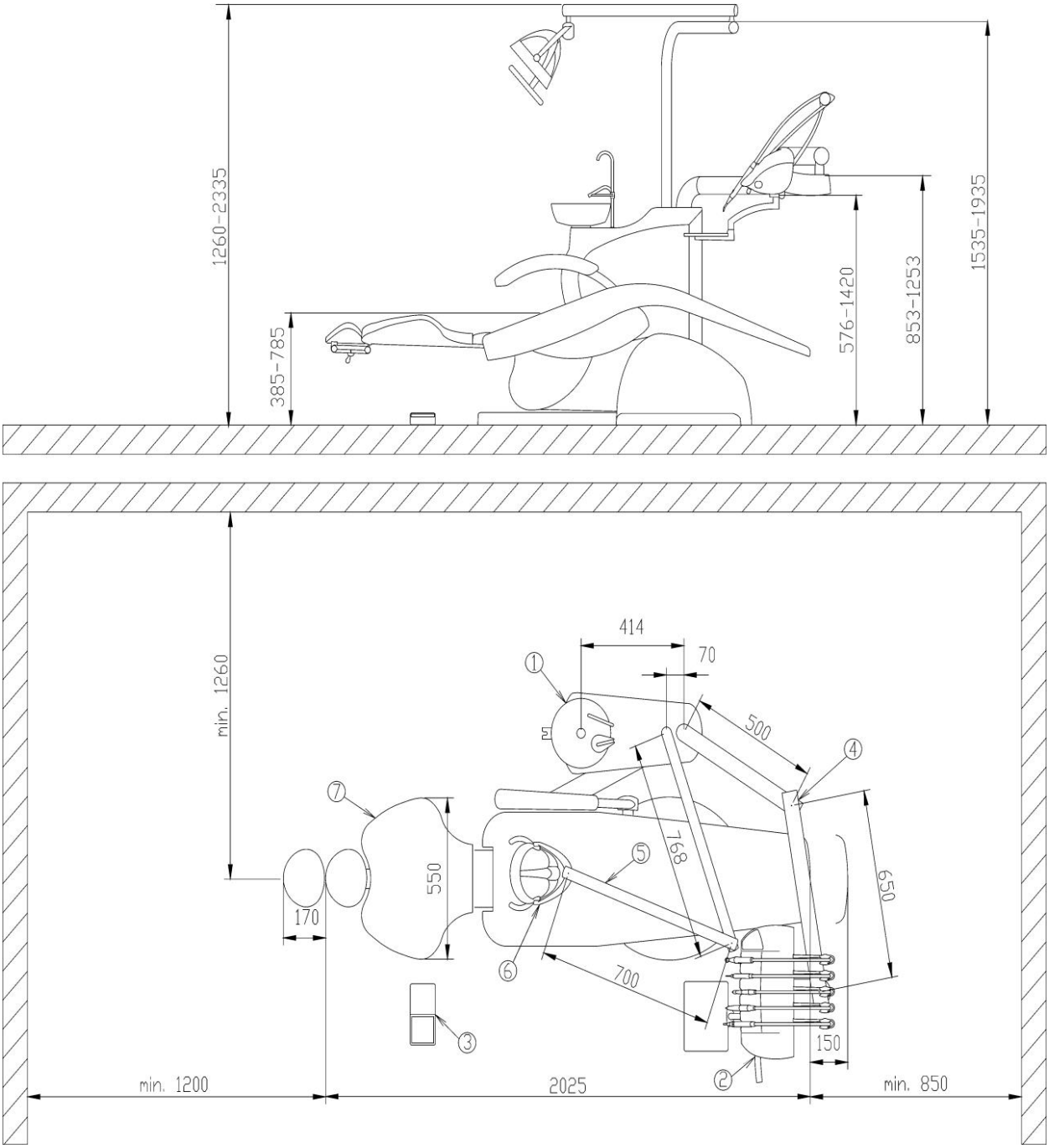
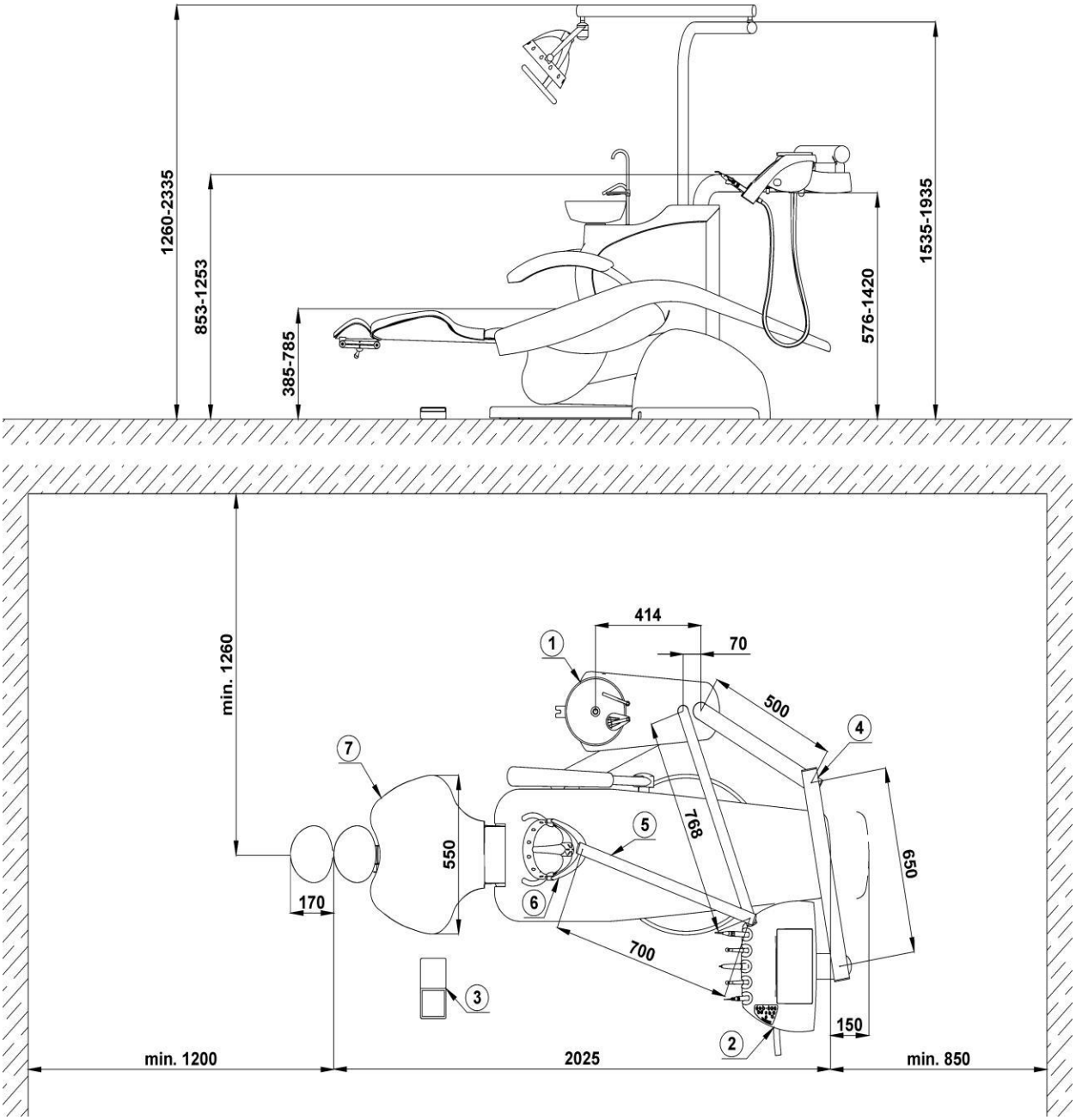


Fig. 4.1

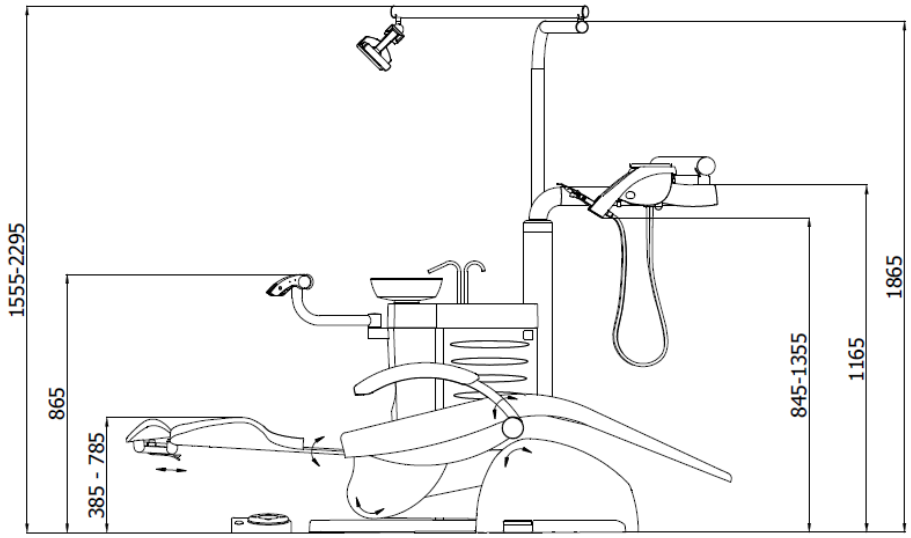
1. Spittoon block
2. Control panel
3. Foot controller
4. Control panel console
5. Dental light pantograph
6. Operating light
7. DIPLOMAT Dental chair

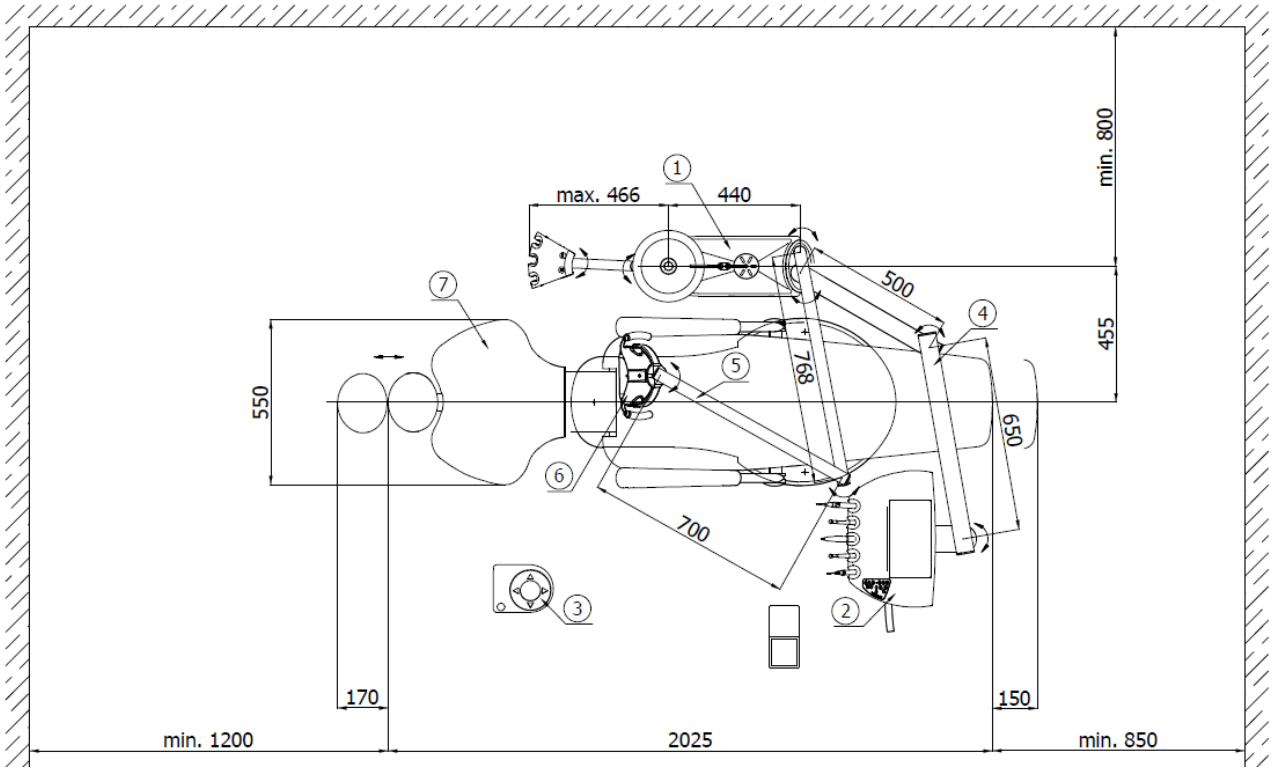
GENERAL DESCRIPTION OF THE DENTAL UNIT DC 180



1. Spittoon block
2. Control panel
3. Foot controller
4. Control panel console
5. Dental light pantograph
6. Operating light
7. DIPLOMAT Dental chair

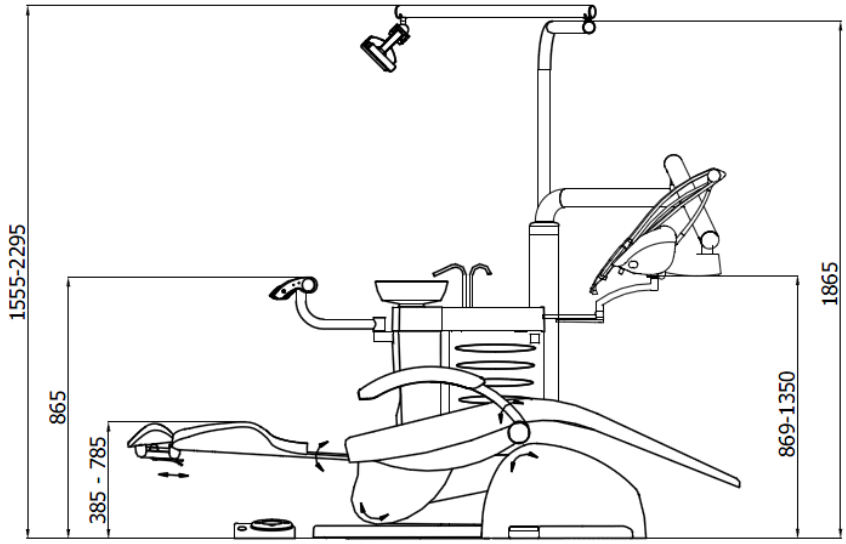
GENERAL DESCRIPTION OF THE DENTAL UNIT DA 110A (Bottom Hose Delivery)

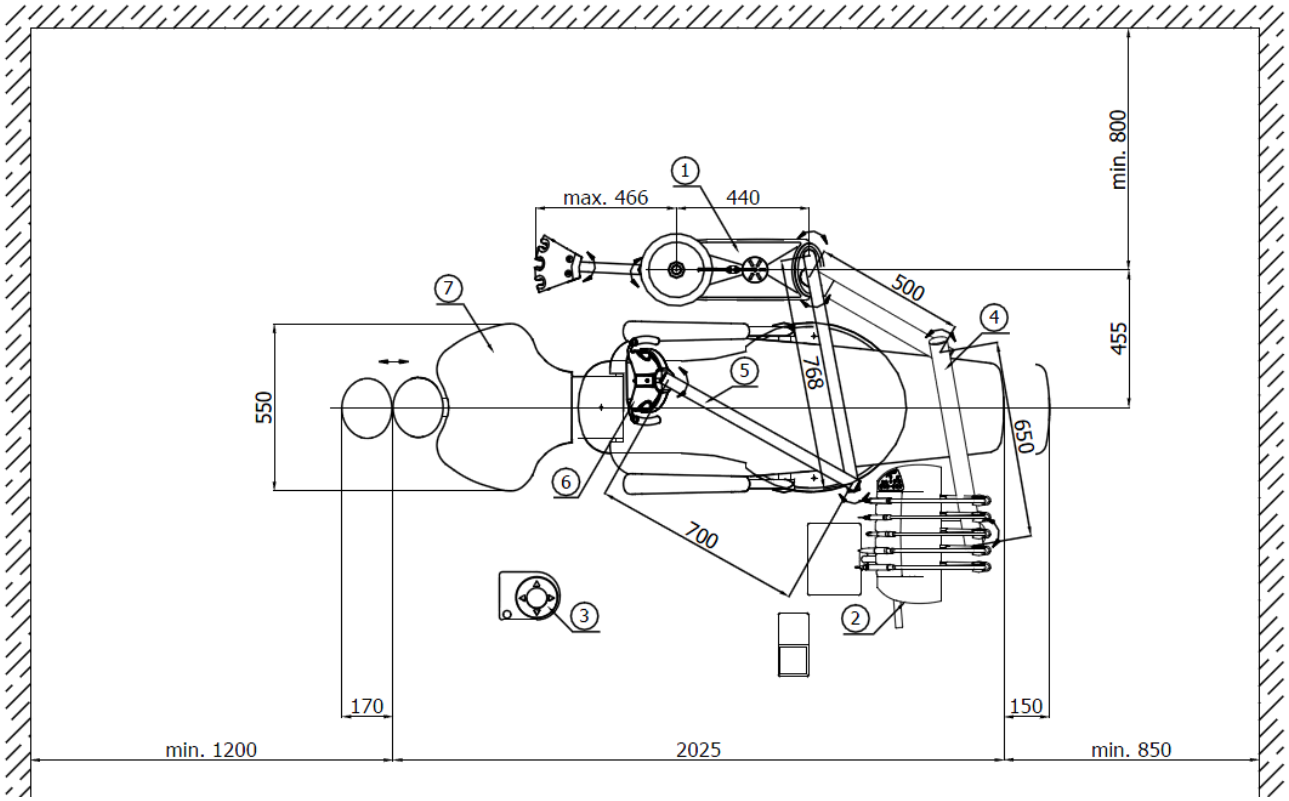




1. Spittoon block
2. Control panel
3. Foot controller
4. Control panel console
5. Dental light pantograph
6. Operating light
7. DIPLOMAT Dental chair

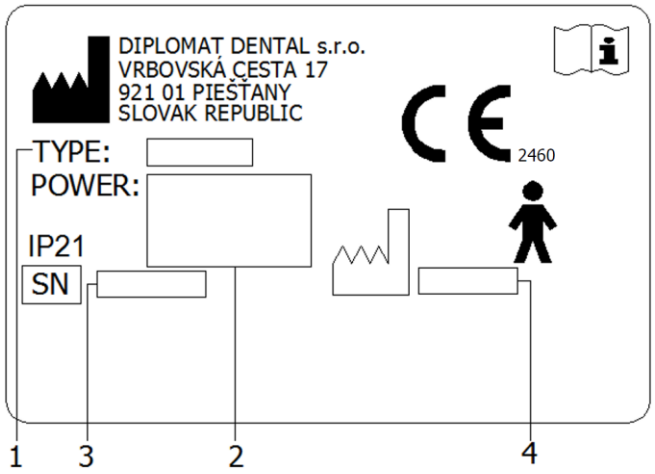
GENERAL DESCRIPTION OF THE DENTAL UNIT DA 110A (Upper Hose Delivery)





5. Spittoon block
6. Control panel
7. Foot controller
8. Control panel console
8. Dental light pantograph
9. Operating light
10. DIPLOMAT Dental chair

4.1 Label of dental unit



1. Model of the unit
2. Basic electrical parameters
3. Serial number
4. Production date

5 PRE-INSTALLATION REQUIREMENTS

Warning

Pre-installation and installation must be performed according to the applicable standards of the particular country and in accordance with the valid documentation of the manufacturer, which is owned by each authorized representative of DIPLOMAT DENTAL s.r.o.

Caution

To avoid the risk of electric shock, device must be connected to the power supply with a protective earthing
Do not modify this device without prior authorization of the manufacturer.

5.1 Environmental requirements

Do not install in premises with a potential explosion hazard!

5.2 Requirements to Input / Output Media

Water

It is required to use only drinkable water with input pressure of **0,3 MPa** to **0,6 MPa** with the flowrate higher than 5 l/min., without particles bigger than **50 µm**, which might clog the small cross sections of the pipes of the dental unit. If the water contains particles bigger than **50 µm**, then there must be introduced **50 µm** advance filter/strainer.
Water hardness must be less than 2,14 mmol/l.
The pH must be in the range of 6,5 to 8,5.
Maximal electrical conductivity of the water shall not exceed 2000 µS/cm.
Water must comply with the local regulations for drinking water.

Cooling of instruments using water from the central distribution

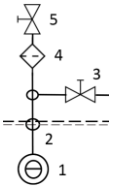
In the unit's central water distribution, there is included a shut-off valve and the valve to prevent reverse flow of water.

Requirements and recommendations:

- If the central water is used for cooling of dental instruments, then it is necessary to install particle filter with precision of **5 µm** before the water enters dental unit.
- Hard water can lead to dysfunction of the dental unit.
  If the water contains more than **50 mg** of **CaO/l** or **36 mg** of **MgO/l**, then it is necessary to include water softener device (for adjusting the hardness of the water) connected at the input of the water distribution.
  This water treatment device is required in case when distilled water is not used.
- When there is a requirement to install the mount point for the sampling input water, the following diagram shows the recommended location mount point for the sampling input water.

The said devices are not integral parts of the dental unit.

Connection diagram of input elements in dental unit (STN EN ISO 7494-2:2015)



1 - Input water from an external water supply
2 - Mount point of inlet water
3 - Mount point for taking the samples of the input water
4 - Filter of water particles
5 - Manual shut-off valve

Air
Oil-free, clean and dry air, with a minimum flow of 55 l/min and a pressure of 0,45 to 0,8 MPa.

Suction (for cuspidor block equipped with large and small aspirators)
Static vacuum index must be measured at the spot and must be within the range of min. 0,005 MPa (50 mbar) to max. 0,02 MPa (200 mbar). If the static vacuum index is higher than 0,02 MPa, then suction CONTROL valve should be connected to the suction branch in order to limit the max. vacuum to 0,02 MPa. This regulating valve is not a part of the kit. The suction unit must produce the flowrate of at least 450 Nl/min. measured at the spot.

Waste
The waste /drain/ branch must have continuous slope of min. 1% and min. flowrate of 10l/min. and must have no sharp bends and sections that might cause backflow. Do not use the same waste branch in conjunction with another dental unit or a basin. It is allowed to use polypropylene or cured polyethylene tubes.

Note

If the local regulations require an installation of an amalgam catcher, then the cuspidor block which is not equipped with the amalgam separator, must be connected to an external amalgam catcher. Amalgam catcher should be installed according to the manufacturer's instructions for the product.

Recommended mains fuse rating
Recommended fuse rating for the supply main is 16A. (If using a circuit breaker, use circuit breaker "C" type). No other equipment should be connected to the supply main! Max. Electrical power input of dental unit is 400 VA. The supply main must conform to prevailing local codes.

Recommendation
The manufacturer recommends installation of an instantaneous residual-current device with 30mA sensitivity, if installation of such does not contradict local regulations.
If all the conditions fit the pre-installation requirements, the dental unit can be installed and connected to the utilities.

5.3 Floor surface
The floor must have at least 100 mm thick concrete foundation. The floor slope should not exceed 1%. Antistatic floor is recommended.

5.4 Environment

	Ambient temperature range	from +10 °C	to +40 °C
	Relative humidity range	from 30 %	to 75 %
	Atmospheric pressure range	from 700 hPa	to 1060 hPa

6 ASSEMBLY AND INSTALLATION

The installation must be done by the certified service technician only; otherwise no possible future warranty claims will be accepted. The Registration form must be filled out and sent to the manufacturer or the seller.

Unpacking the unit and inspecting the delivery
Examine the package for any outside indication of damage. If any damage is found do not open the package and notify the forwarding agent or the seller immediately. In case no outside damage is found, carefully open the package and unpack the individual parts of the dental unit. Check all the parts for damage, quantity, etc. according to the list provided in chapter 13 of this Instruction for Use and according to the enclosed check-list.

Warning

In the case of the installation of the base (installation) plate, we recommend to isolate the installation plate around its perimeter by transparent silicone sealant against the floor.
When not isolated with a silicone sealant, it may occur damage of the product, caused by the influence of water and cleaning detergents, for which the manufacturer might not recognize any complaint.

7 PUTTING THE UNIT INTO OPERATION

Warning – disinfection of new dental unit before its first use

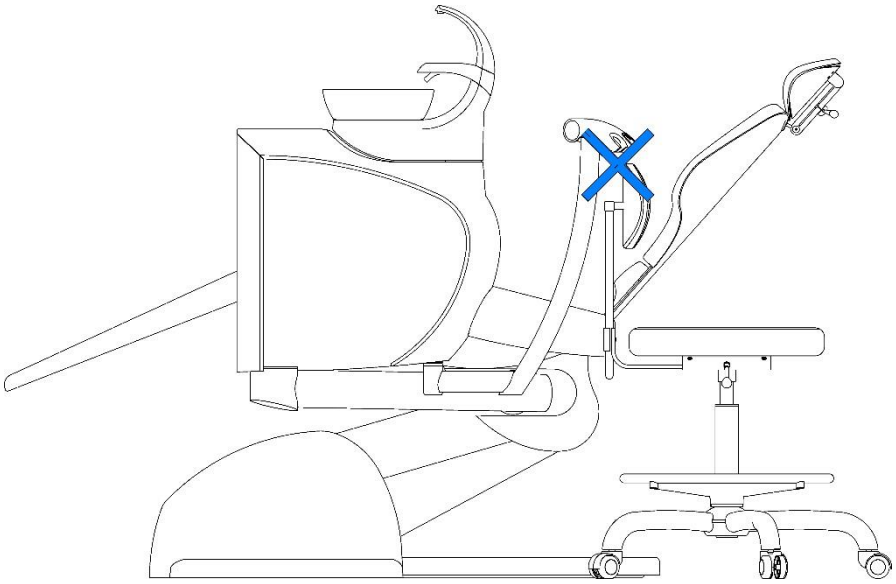
⚠	Before putting the unit into operation, your technician must carry out disinfection of waterlines of instruments, according to instructions in Installation manual.

1) switch on the compressor and let it get pressurized
2) open the central water supply
3) turn on the suction unit (for cuspidor block configuration with large and small aspirators)
4) turn on the main switch located on the chair – position I, the indication light lights on

The unit is connected to the water and air distribution. After approx. 5s have passed, the unit is ready for work. It is necessary to wait for approx. 2 mins. For the water to be warmed up to the desired temperature, if the electrical water heater is installed. Do not take out any instruments or press keyboard buttons when turning the dental unit on. The foot controller should be at a standstill.

Caution – Prevent collision between assistant's arm and dental chair

⚠	Assistant's arm and panel should be positioned so that they do not obstruct dental chair or dentist's stool motion



Caution

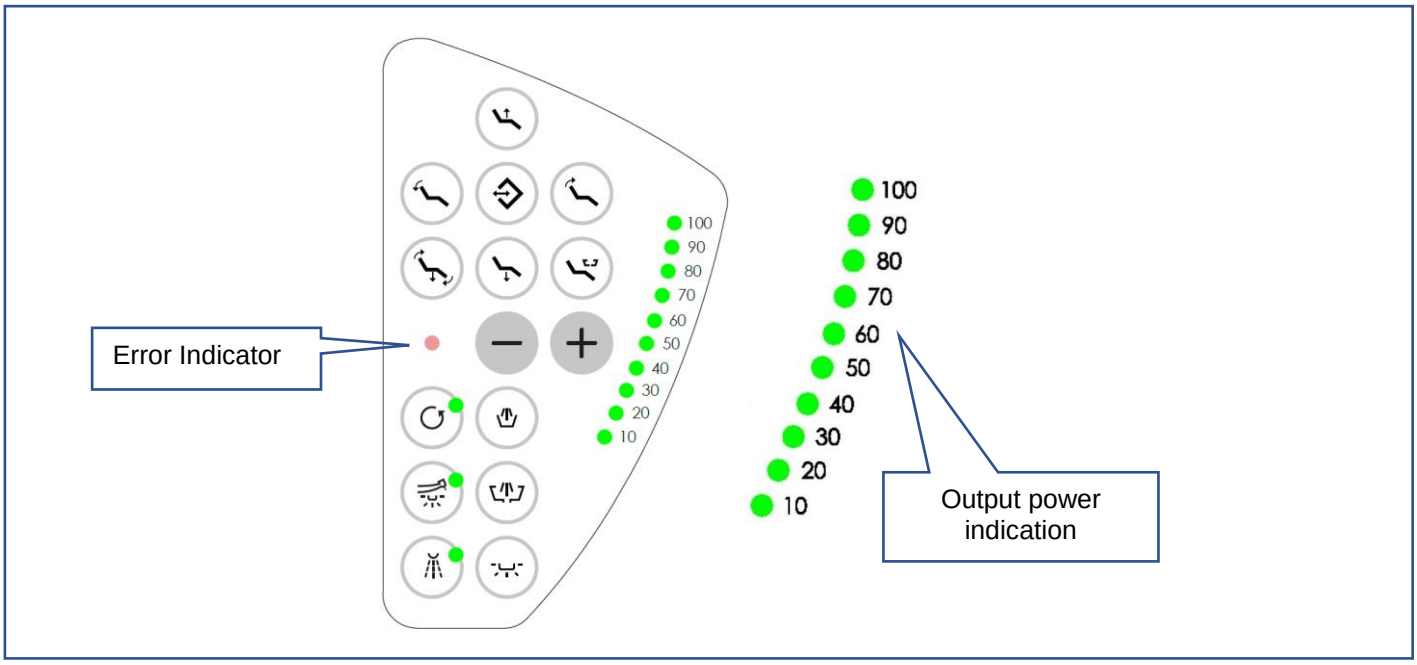
⚠ Except for the saliva ejector, large and small aspirators (depending on modification) polymerizing lamp and syringe (on the control panel and on the assistant table) only one instrument can be used or taken out at a time.

Caution

⚠ Except for common handling with the dentist control panel and permissible loading of the tray table, the pantographic arm of the control panel must not be loaded by persons or articles leaning against it, suspension of persons or articles or by other similar manners.

8 PRODUCT OPERATION

8.1 Dentist's Control panel



Button	Description	Button	Description
	Increasing output power (RPM)		Move chair up
	Decreasing output power (RPM)		Move chair down
	Reverse rotation of the micromotor/ENDO with indication		Move backrest forward
	Handpiece lighting with indication		Move backrest backward
	Instrument cooling with indication		Automatic entry/exit chair position
	Cup fill		Saving settings/quick key for programmed positions (valid only for the chairs with programming)
	Spittoon bowl rinse		Rinsing position
	Turn ON/OFF dental light XENOS		

8.1.1 Button functions description

Reversing rotations of the micromotor

Pressing this button will reverse the micromotor rotation or enable the ENDO function for the scaler. The indicator next to the button shows the status (lit when on).

Handpiece lighting

Pressing this button will turn on the lighting of the rotary instruments (turbine, micromotors) and scaler on or off. Take the handpiece out of the holder and press the button to turn on the lighting for this particular handpiece. The indicator next to the button shows the status (lit when on). The lighting turns on after a handpiece is put into operation by moving the lever of the foot controller to the right. The lighting turns off automatically when a handpiece is not in use for more than 10 sec. As soon as a handpiece is returned to its initial position the lighting turns off.

When using micromotor DX DENSIM BLUE, the button has following functionality:

- turn the white light on
- turn the blue light on
- turn the light off

By gradually pressing the button, these three actions are cyclically repeated.

Instrument cooling

Button to turn ON/OFF instrument cooling for micromotors, turbine or scaler.
Instrument cooling has 3 modes:

- Cooling with spray - LED indicator is on
- Cooling with water - LED indicator is blinking
- Cooling is turned OFF - LED indicator is off

To toggle between spray coolant and water coolant press and hold the button for 2 seconds.

Cup filling

Press the button to fill the cup with water. Another pressing of the button interrupts cup filling.
Pressing and holding the button for more than **4 seconds** allows you to set up the amount of water in the patient's cup (the cup is being filled until the button is released). Maximum programmable cup filling time is **25 secs**. Cup filling time is automatically saved in the memory and will activate automatically next time you use the unit.

Bowl rinse

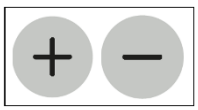
Press the button to rinse the bowl. Another pressing of the button interrupts bowl rinsing.
Pressing and holding the button for more than **4** secs. allows you to set up rinsing time (rinsing will end when the button is released). Maximum programmable bowl rinsing time is **40** sec. Bowl rinsing time is automatically saved and will activate automatically next time you use the unit.

Turn the dental light XENOS ON/OFF

Control of dental light XENOS has 3 modes:

- Turn ON (press the button)
- Switching between intensity of light (keep the button pressed for 0,2 s)
- Turn the light OFF (keep the button pressed for 0,6 s)

Plus and minus



The buttons set the following:

- the micromotor rotations (speed)
- the output power, if an instrument with output control is used (e.g. scaler)

By pressing of these buttons, you can increase or decrease the parameter being set from minimum up to the maximum value and vice-versa.

Rinsing position

Moving to rinsing position:
Press the button => 1x beep & chair moves to the rinsing position & bowl is rinsed & cup is filled
Returning from rinsing position:
Keep pressed the button in time interval from 0,6 seconds to 2 secs =>
2x beep & chair returns to its previous position & again bowl is rinsed. Cup filling is disabled.

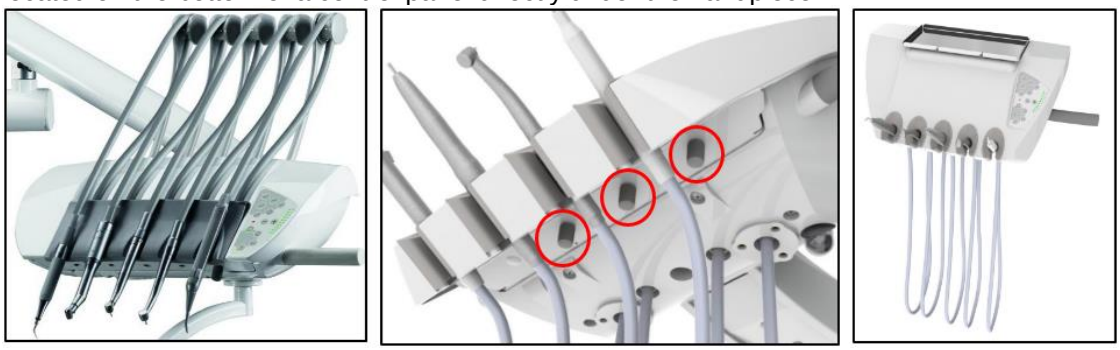
Activating/Deactivating function of cup filling:
Press the button in interval from 2 secs to 4 secs (triple beep).
Activating/Deactivating function of bowl rinse:
Press the button in interval from 4 secs do 6 secs (beeper beeps 4 times).
Programming of chair rinsing position:
see chapter 8.6.3 Chair Programming (applicable for programmable chairs DE20p, DM20).

8.1.2 Saving the customized settings

By pressing the instrument illumination button  while all the instruments are in their basic positions, the set values of the parameters of the instruments are saved in the internal memory of the unit and are read at starting the unit. Saving of the parameters is indicated by triple beep. The unit remembers the set parameters even after it has been turned off.

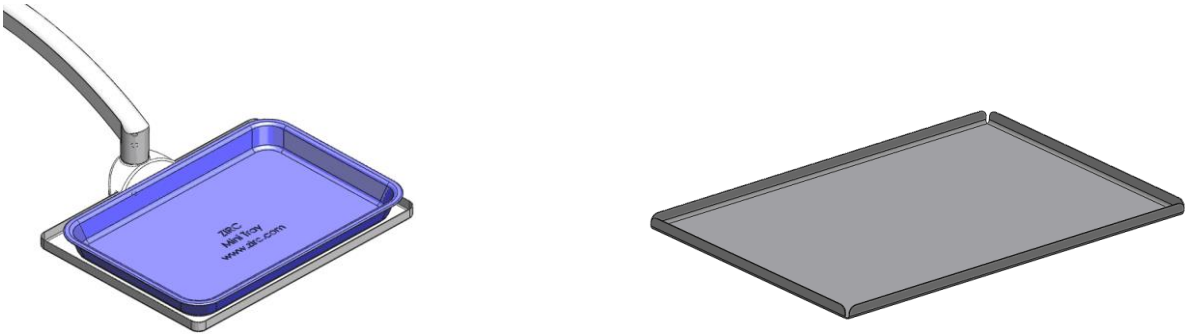
8.1.3 Adjusting flow intensity of cooling water

Use the needle valve on the right bottom side of the control panel to control a water coolant flow.
An individual water coolant flow control for each handpiece is available upon request. In this case, the needle valve is located on the bottom of a control panel directly under the handpiece.



8.1.4 Tray table

A tray table with a holder for a unit with upper delivery system (DC170) is available upon request.
Stainless plate with open corners is either available upon request. Its dimensions are: 181 mm x 280 mm or in a case when dentist's control panel is equipped with mechanical brake, it is possible to deliver bigger size plate with dimensions: 290 x 370 mm.



Models with hanging hoses (DC 180) are included in standard delivery with stainless plates with dimensions 140 x 260 mm for dentist's control panel. Upon order this unit can be equipped with double-plate where each plate has dimensions 177 x 239 mm, together it is 354 x 239 mm.

The size of both stainless tray table models allows placing „Mini Tray" - type plastic dishes (dimensions: 162 x 238 x 22,2 mm) by „ZIRC Color Code System" on them.

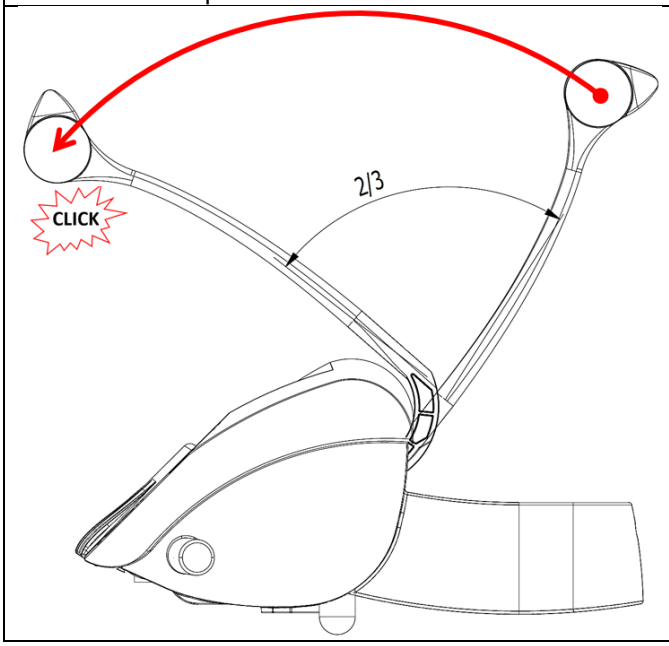
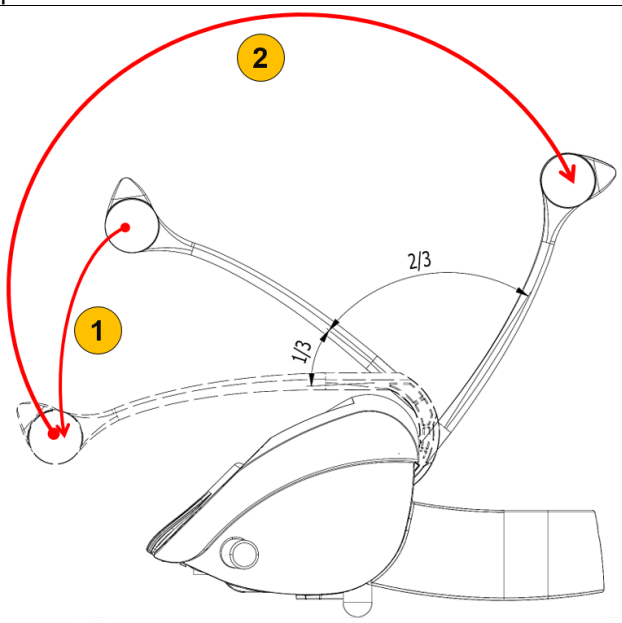
8.1.5 Operation of individual instruments

Control panel

In addition to below listed instructions, please, follow the instructions given by the manufacturer of a specific product.

Whips Position Locking

If control panel (with upper hoses delivery) is equipped with whips locking system, proceed the following way:

TO LOCK THE WHIP	WHIP UNLOCKING
Grasp the instrument and pull the hose towards you. Approximately in 2/3 of the runway you will hear a CLICK. The whip is locked.	Grasp the instrument and pull the hose towards you. Then let go the hose back and the whip returns back to its initial position.
	

Syringe

The syringe is active straight away after withdrawal from the holder. For air press the right button, for water rinse, press the left button and for spray, press both buttons simultaneously.

Turbine

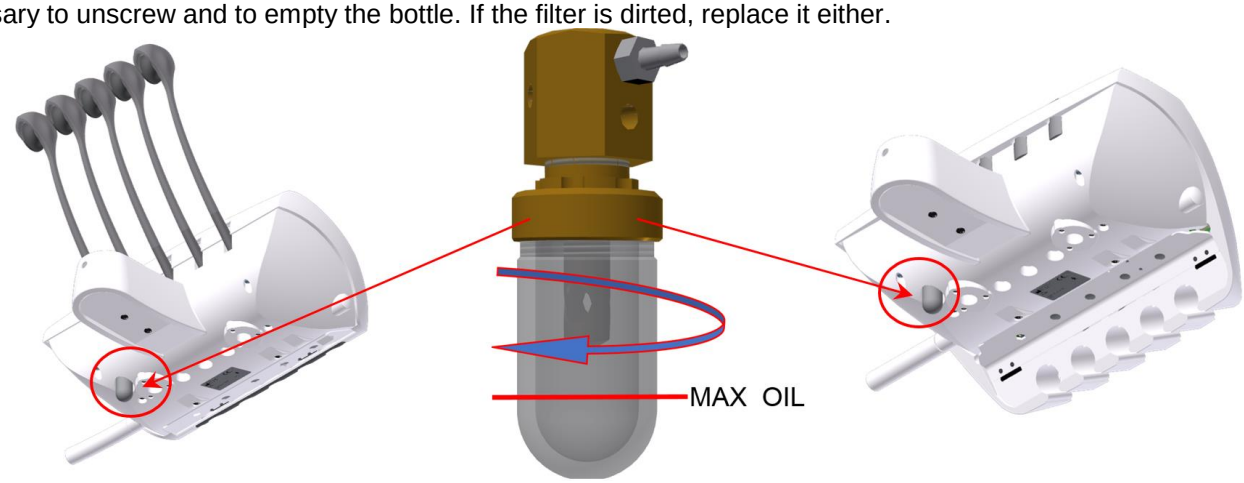
Activate the turbine by withdrawing it from the holder and press a foot controller pedal. To turn the turbine off, release the pedal. It is recommended to run CHIPBLOWER function after use, if dental unit is equipped with UNO or NOK foot controller.

It is impossible to adjust rotations of a turbine without regulation. Only possible statuses are ON and OFF.

Turbine with regulation (with proportional valve)

Turbine with proportional valve allows to regulate output power by buttons + − in range 20-100% or via foot controller.

Used oil is being collected in the small bottle (as shown on the picture). If the oil exceeds marked maximum level, it is necessary to unscrew and to empty the bottle. If the filter is dirted, replace it either.



Micromotor
Activate the micromotor by withdrawing it from the holder and press a foot controller pedal. To turn the micromotor off, release the pedal. It is recommended to run CHIPBLOWER function after use. (Only possible with UNO or NOK foot controllers).

Press + − buttons to adjust the RPM in a range of 0-100%. To change micromotor rotations direction, press ↻ button on the keyboard or press and hold "spray" button on the foot controller for minimum 0,6 seconds. It is impossible to change the direction when micromotor is active.
It is possible to adjust RPM from "0" and up until the desired value is reached (as shown on the indicator). Adjust RPM by moving the lever (pedal) on the foot controller.
(Only possible with UNO or NOK multi-function foot controllers.)

Micromotors Bien Air MCX, DENSIM DX and DENSIM DX BLUE
Range of rotation speed of the micromotors Bien Air MCX, DENSIM DX and DENSIM DX BLUE is 4000 – 40000 rpm.
The maximum torque for Bien Air MCX is 2,5 Ncm.
The maximum torque for DENSIM DX and DENSIM DX BLUE is 3,5 Ncm.
To activate the motor, withdraw it from the holder and then press the pedal (lever) on the foot controller. Release the pedal to turn off the motor. It is recommended to run CHIPBLOWER function every time after using the motor (function is available for UNO or NOK foot controllers). Use + − buttons to adjust RPM from 0-100 %. See Table 1.

Bar graph [%]	10	20	30	40	50	60	70	80	90	100
RPM	4000	8000	12000	16000	20000	24000	28000	32000	36000	40000

To reverse the direction of rotation, press the key ↻ on the keyboard or press and hold for minimum 0,6 seconds the "spray" key on the foot controller. Reversing of rotation is only possible when the motor is idle.
If you use a multifunctional foot controller (UNO or NOK), you can increase the RPM value by pressing down the pedal. The RPM can be adjusted from 100 to the max. preset value.

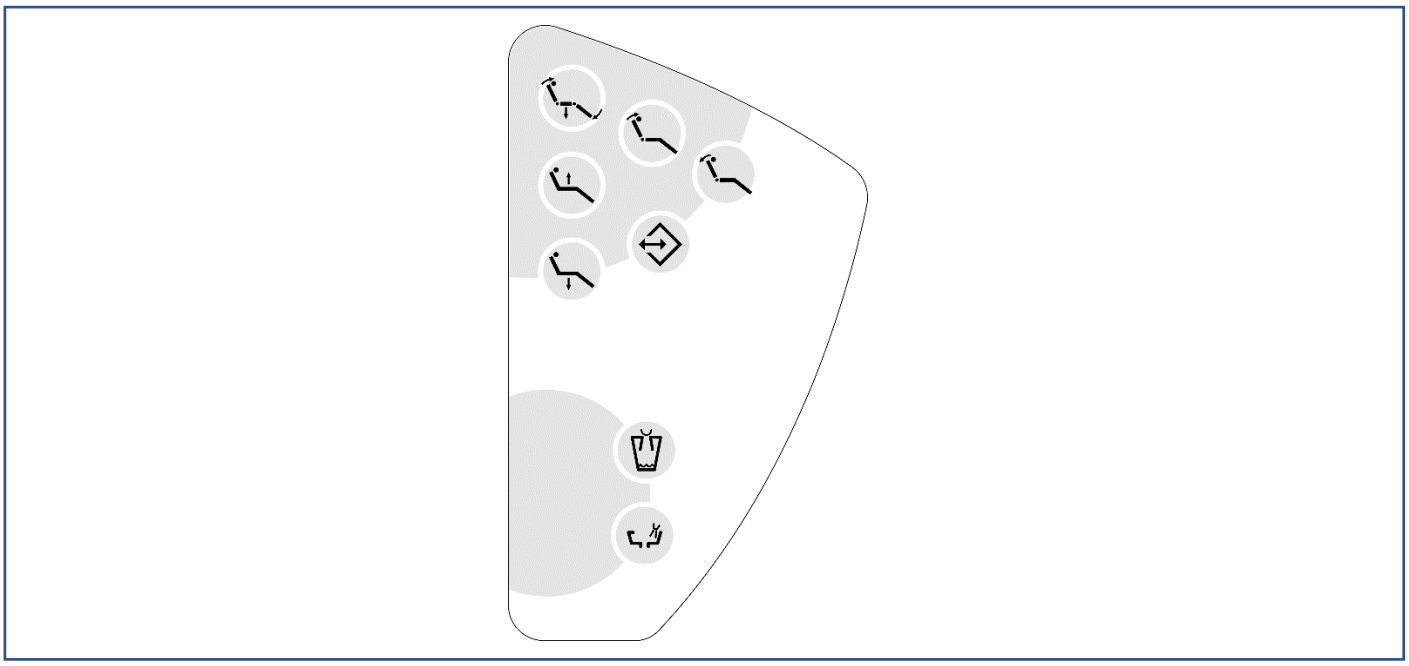
Note
Pedal's initial position equals 0 and a minimum rpm for motor's activation is 1000 rpm. Thus, when set to 10% (= 4000 RPM), you need to press the pedal quarter way down to activate the motor.

Retraction of procedural water
Upon the termination of use of dental instrument (after release of the foot controller lever / pedal), dental unit software automatically performs blowing of instrument head (micromotor, turbine) using cooling air of the instrument in a duration of 0.5 seconds.

Scaler
Activate the scaler by withdrawing it from the holder and pressing the lever on the foot controller.
Press + − buttons to adjust the output power either during scaler operation.
Press ↻ to enable ENDO function. When ENDO function is active the light indicator is on.
It is possible to adjust output from "0" and up until the desired value is reached (as shown on the indicator). Adjust output power by moving the lever on the foot controller.
(Only possible with UNO or NOK multi-function foot controllers.)

Polymerizing lamp
The polymerizing lamp is active straight away after withdrawal from a holder. Before using polymerizing lamp reference the manual that came with it.

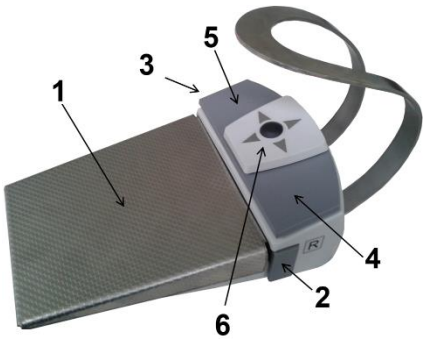
8.2 Assistant's Control Panel



Button	Description
	Automatic entry/exit chair position
	Move chair up
	Move chair down
	Move backrest forward
	Move backrest backward
	Saving settings/quick key for programmed positions (valid only for the chairs with programming)
	Cup fill
	Spittoon bowl rinse

The functionality of the buttons is identical as in the control panel of the doctor (see the previous chapter 8.1)

8.3 Foot controller

UNO	NOK	MARQUARDT
		

1	lever (pedal)	4	chair programming
2	chipblower	5	entry-exit position
3	spray (reverse/endo)	6	joystick for controlling the chair

The **CHIPBLOWER** function sets a jet of a cooling air through the micromotor and turbine handpieces. Press "Chipblower" button for activation.

The SPRAY (REVERSE/ENDO) button on the foot controller has the following 3 functions:

1) Pressing the button will turn instrument cooling on or off. Function status is shown on the indicator on the control panel.

2) Pressing and holding the button (for minimum **0,6 seconds**), will change the micromotor's rotation direction; if scaler is active, press to enable SCALLING/ENDO mode. Function status is shown on the button indicator .

3) Pressing and holding the button for more than **2 secs**, will switch cooling modes between the spray cooling and the water cooling mode.

Selected mode is indicated by the indicator next to the button :
LED indicator is on (spray coolant)
LED indicator is blinking (water coolant)

Pressing the foot controller lever activates the instruments and adjusts micromotor's rotations and scaler power output in range from the lowest value up to the value set on power output indicator.

To control the dental chair use ENTRY-EXIT POSITION, CHAIR PROGRAMMING and JOYSTICK buttons. See chapter Operating the dental chair for details.

If all instruments are in their initial positions:

- **Holding the lever (pedal)** will activate bowl rinse. Holding the lever for more than **4 s,** will set up rinsing period until the lever is released. Moving the lever to the right, stops bowl rinsing.
- **Pressing the CHIPBLOWER button** starts cup filling. Holding the button for more than **4 s,** will set up cup filling period until the button is released. Pressing the chipblower (the right) button, stops cup filling.

Caution

When cleaning the floor (PVC floor covering) with a disinfecting agent, it is forbidden to place the foot controller onto the wet floor.

8.4 Spittoon block

Possible spittoon configuration (depending upon request):

- swiveling or fixed spittoon bowl
- spittoon bowl flush and cup fill
- Cattani miniseparator system
- Cattani Mechanical amalgam trap
- saliva ejector
- depressurization of the bottle
- camera
- electric water heater for the cup

The spittoon bowl is detachable and sterilizable.

8.4.1 Distilled water bottle

The distilled water bottle is located inside the spittoon block and can be accessed after the door on the side of the block is opened. Distilled water from the bottle supplies the micromotor, turbine, scaler, syringe on the dentist's control panel and syringe on the assistant table.

How to refill distilled water bottle:

- turn off the main switch - position „0"
- open the door on the spittoon block
- screw the water bottle loose
- refill the bottle with distilled water
- screw the bottle. Avoid air leakage during the work
- turn on the main switch, position „I"
- check the bottle for air leakage
- close the door on the spittoon block

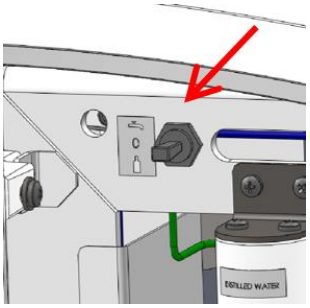
In case of air penetration to the water system caused by low water level in the bottle, it is recommended to de-aerate water paths of the instruments. It can be done by letting the water flow through the water paths until there is no air bubbles observed in the water.

Warning

When replenishing distilled water, care must be taken, not to allow foreign substances penetrate into the water or cause changes in its quality or composition. Distilled water for medical purposes must be used with maximal electrical conductivity of the water up to 2000 µS/cm.
Do not use de-mineralized water for industrial purposes!
The manufacturer recommends to replace the bottle once a year.

8.4.2 Central distribution of water

If water from the central distribution is used for cooling the instrument, distilled water in the bottle need not to be replenished – function CENTRAL. The said function is activated by turning the selector switch located in the spittoon block to the position CENTRAL



8.4.3 Three-position handpiece holder

3-position holder allows various handpiece configurations. With the large aspirator in the middle socket, small aspirator or saliva ejector, or polymerizing lamp, or syringe can be fitted in the right and left sockets.
The mounting of external fourth holder for camera on the side is also possible. All the handpieces are immediately activated after withdrawn from the holder. There are also „cup fill" and „bowl rinse" buttons with functions identical to that of the buttons on the control panel.

8.4.4 Saliva ejector

Saliva ejector is activated automatically after withdrawal from a holder. If the output is insufficient, check and clean the sieve. See Chapter 10. Cleaning and Disinfecting for details.

8.4.5 Spittoon block configuration

Large and small aspirators

Aspirator activates immediately after withdrawal from the holder. To turn the aspirator off place it back in the holder. To control the suction, slide the regulating flap on the aspirator up or down (when the regulating flap is in the lowest position, suction is shut down). It is recommended to rinse both aspirators with 100 ml of water after each patient. Inside the aspirator there is the sieve which needs to be cleaned at least once a day (see Chapter 10 cleaning and disinfection).

Polymerizing lamp

Polymerizing lamp activates immediately after withdrawal from the holder. Please, consult accompanying instructions before using the lamp.

Intraoral camera

The camera serves to provide better visualization during the dental treatment but not to establish final diagnosis.

Camera consists of:

- holder
- connection - connector
- camera

Caution

The product must be protected against water. Keep it dry.

8.5 Operating the dental chair

Chair can be controlled either from the:

- control panel or
- with a multi-function foot controller (UNO/NOK)

Basic movements are controlled by the chair move buttons.  .

To bring the chair into entry/exit position press the quick key  .

To get the chair to rinsing position, press key  .

For programming or activating previously saved chair positions, use button  .
For more detailed information, please, refer to DM20 or DE20 Instructions for Use.

While working with a handpiece, controlled with a foot controller, the safety block function is on. The dental chair is protected from any accidental movement caused by pressing the buttons on the foot controller or on the control panel.

8.6 Programming of the chair (applies to programmable chairs DE20p, DM20)

8.6.1 Writing-in of the program position

Use these keys  to move the chair to the desired position.

To save the position use following key:  . Release the key and press this key  within five seconds; to assign a hot-key for the position, press one of the following keys  within the next five seconds, otherwise your custom settings will not be saved (factory settings will be recovered).

If it happens, that the chair has moved during programming of chair positions (while pressing buttons  ), then it will be necessary to repeat the process of programming.

8.6.2 Programming of Sit-in (Entry/Exit) position

Move the chair to the desired operating position using these keys:  .

Power off the chair, wait for approx. 10 seconds, and then press  key.

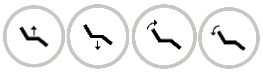
Turn on the chair, wait for approx. 15 seconds, and release the  key.
The new Entry-Exit position setting is now programmed into memory.

8.6.3 Programming of Rinsing position

Chair position must be programmed under the button **MOVE DOWN**  using this combination:  +  + 

In case when somebody changes the position under the button MOVE DOWN, it will cause that Rinsing position will be changed too.

8.6.4 Choosing the desired pre-set position

First press  key then press one of the following four keys  within the next 5 seconds to move the chair to the desired pre-set position.

Double-press the  key to recall the most recent position (LAST) of the chair.

8.6.5 Toggling between programmable sets P1/P2

Use the  key to toggle between two separate sets of programmable settings (P1 and P2) for each user.

To switch from P1 to P2 and vice versa, press and hold the  key for more than five seconds.
The acoustic signal indicates that the set has been switched: one beep indicates the P1 mode, and two beeps indicate P2 mode.
The user settings remain unchanged even after the chair has been turned off.
Acoustic signal (one or two beeps) indicates the current programmable sets the next time the chair is turned on.

Note

Power supply shortage may cause a detuning of the previously programmed chair position settings. Fixing the problem: move the chair from its maximum to its minimum height (or vice versa) using the two actuating mechanisms: pre-programmed positions will restore automatically. It is also advised to do so every time before reprogramming the existing chair positions.

8.7 Dental operating light

Sirius or Xenos

Please, consult accompanying instructions before using the dental operating light.

8.8 Completion of work

It is important to do the following:

- toggle the main switch to position „0“ to depressurize the whole system
- shut off the main water supply at the workplace
- turn off the compressor – open the sludge valve
- turn off the aspirator (depending upon the model)

9 PRODUCT MAINTENANCE

For appropriate handpieces and instruments maintenance, please, follow the instructions given by the manufacturer. If the cuspidor block is connected to the central distribution system, check the cleanliness of the strainer and the water hardness treatment system condition (in reference to the manufacturer's instructions).

Inspections within the warranty period

It is required to have the dental unit checked by authorized service technician every 3 months within the warranty period.

The preventive inspection focuses on the following:

- checking the input filters (with regard to the cleanliness of utilities)
- checking the suction system
- checking the waste hose
- providing additional information and practical advices concerning the maintenance dental unit
- check if the dental unit and the instruments are used and maintained properly (according to the Instructions for Use)
- the manufacturer estimates the duration of a service check to be approx. from 1 up to 1,5 hours
- checking and/or adjusting all utilities (input, setting of turbine pressures etc.)
- authorized service technician is obliged to confirm the periodical inspection in the warranty card.

Inspection and revision upon the expiration of the warranty period:

It is required to have the dental unit checked by authorized service technician every 6 months.

The following should be done:

- complex inspection of the dental unit and its functional parts
- checking and adjustment of the water and air working pressure
- checking the input air filter in the power block
- checking of the integrity of the electronics and electrical wiring (electrical safety).

Revision of electrical safety

Is performed according to prevailing local codes of the country where the unit is installed.

10 CLEANING, DISINFECTION AND DECONTAMINATION

10.1 Disinfecting of instrument's waterlines

It is recommended to use Alpron or Sanosil S003, alternatively Dentosept P cleaning agent. A 1% solution with distilled water is poured into reservoir for distilled water and can be used continuously. The 1% concentration is harmless to the patient. The continuous use solution helps to keep the cooling system clean and it is not necessary to use other disinfecting agents. For additional information and purchase details, please, contact your dealer.

In the event that water from the central distribution is used for the cooling of instruments, disinfection of the internal distributions of the instruments is made as follows:

- Fill the reservoir of distilled water with 1% solution of Alpron or Sanosil S003, alternatively Dentosept P with distilled water.
- Turn the 3-position selector switch to the position „DISTIL“ 
- Rinse the water path of an instrument for 30s; other instruments that use cooling water are rinsed for 10s.
- Turn the 3-position selector switch to the position „CENTRAL“

The manufacturer recommends to carry out the above disinfection at least once a day, preferably at the end of the working day.

10.2 Semi-automatic disinfection of instrument's waterlines (optional)

Purpose of this disinfection of waterlines is to remove, respectively to reduce biofilms formed by microcolonies of bacteria, fungi and protozoa which are formed on the inner surface of the hose on the dentist's table of a dental unit. Disinfection of waterlines is performed on all instruments that use water for cooling. The syringe has to be disinfected individually. (see below).

Disinfection consists of 2 phases:

- Filling hoses with disinfecting solution (which takes approx. 20 seconds) and its subsequent reaction inside of the hoses (at least 60 minutes – the time length depends on the user choice)
- Rinsing of hoses with distilled water (2 minutes)

Requirements and Recommendations

Accessories of manual disinfection consist of:

- Bottle for disinfecting solution (A)
- Package of disinfectiong solution, Alpron (1000ml) (B)
- Holder of hoses for tools (C)

Manual disinfection accessories

We recommend using one of the following disinfecting solutions for disinfection of waterlines:

- Alpron (100% concentration)
- Sanosil S003
- Dentosept P

Use any of the above solutions in 100% concentration.

Disinfection of waterlines is most effective when carried out at the end of the day or before the weekend. Following strinsing of waterlines at the beginning of the working day ensures washing-out of biofilms.

The manufacturer recommends to carry out disinfection of waterlines at least 4 times a year and also after a long period of not using of the dental unit.

Note

During whole disinfection process of the waterlines (from the start to the end of the program), the seat lock is set on, preventing accidental or involuntary movements of the chair.

Disinfection Procedure

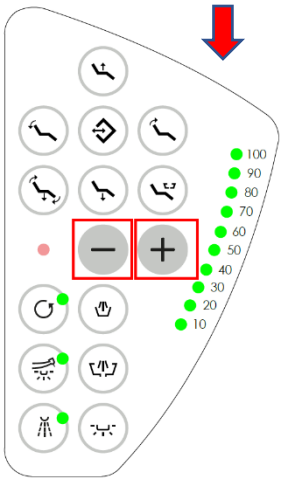
Preparation of Disinfection

Position of the switch to pressurize the bottle

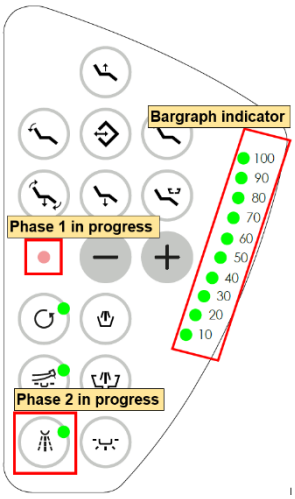
- Prepare a bottle for disinfecting solution (A), fill it with the disinfecting solution (B)
- Open the door of the spittoon block
- If the unit is equipped with a depressurized bottle or central water supply accessories switch the three-position switch in the spittoon block to the position "0" - depending on the unit equipment. Otherwise, turn off the main switch of the dental unit to ensure depressurization.
- Remove the bottle with distilled water
- Screw the bottle that contains disinfecting solution
- Set three-position switch to the position "DESTIL" or  turn on the dental unit.
- The bottle will pressurize.
- Close the door of the spittoon block
- Place the holder of the hoses for tools to a bowl. (C)

Program control

The program is controlled from the main keyboard using the buttons: plus (+) and minus (-).



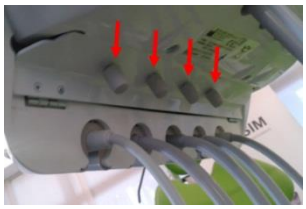
Status indication or the process stage is signalized also Through the main keyboard and through the buzzer.



Start the program (transition to a disinfection program)	Simultaniously press Plus a Minus	+ −
Stage 1 - Starting the filling of hoses with disinfecting solution and disinfection reaction	Press Plus	+
Stage 2 - Starting rinsing of hoses with water	Press again Plus	+
Completion of the program (leaving the disinfection program)	Press Mínus	−

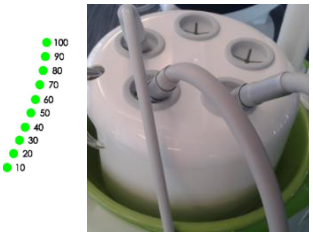
Starting the Disinfection

Before starting the program, the tools must be in their positions on the dentist's table. Needle valves must be open to the maximum to regulate the pressure of waterlines.



Start the program by pressing both buttons  and hold (the system will beep 6 times) until all LEDs are shining green.
You are in disinfection mode.

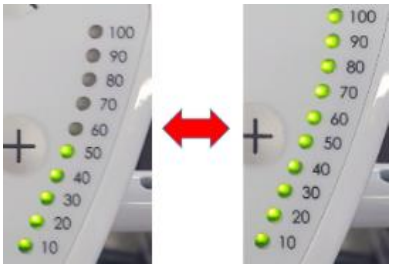
Step by step take out all the hoses and put them to the hoses holder.



If any tool remains in its position on the dentist's table, you are at risk of being splashed by disinfecting solution.

Phase 1 – Filling of hoses with solution

By pressing button  you start hoses filling with disinfection solution.
System will beep 3 times and the red LED shines up – stage 1. has started.
The ongoing process of hoses filling is indicated on the LED bargraph – green LEDs gradually shine up
When bargraph indicator shines at 100%, the hoses are filled in. System is automatically switched to the mode of reacing of disinfection.



After several seconds the LED bargraph indicator starts blinking between 50% and 100%.
This means that you are in the mode of reaction of disinfecting solution

Note

Due to the fact that syringe is controlled by autonomous valve, you have to perform filling of its hose manually: Put the tip of the syringe to the tools holder, press the left button and hold until the disinfection solution flows out from the tip. Leave the syringe in the hoses holder. Same procedure applies when rinsing with water after the disinfection.

Switch the depressurasing switch to position „0“ or turn the dental unit off with the main switch. Let the disinfection solution react whole night or at least 60 minutes.

Phase 2 – Rinsing of hoses

If you decided to stop the disinfection process, then:

- Take off the disinfection solution bottle and replace it with distilled water bottle (system is depressurized from stage 1)
- Pressurize the system: Switch the three-position toggle switch to position "DESTIL" or turn on the dental unit with the main switch. The bottle will pressurize (If the dental unit was turned off then during turning on the program will automatically return to the mode of reacting of disinfecting solution). Make sure the hoses are correctly placed in the hose holder in the rinsing bowl.
- Press button and hold it at least for 4 seconds. System will shortly beep 3 times, the green LED starts shining and the rinsing starts. Rinsing progress is indicated by continual shinning up of LED diodes on the LED bargraph.

- End of stage 2 (rinsing of hoses) and end of the program of disinfection are indicated by:
- Green LED diode lights off
- System beeps 3 times
- PROGRAM IS AUTOMATICALLY FINISHED.
- System returns to the standard user mode.
- Step by step take out the hoses, fit in the hand-pieces and put the tools back to working positions.

Due to the fact that syringe is controlled by autonomous valve, its rinsing is necessary to be performed manually. Put the syringe over the tools holder, press the left button and hold until clear water goes out from the tip (hold it for 2 minutes).
After the syringe rising you can position it back to its working position on the dentist’s table.

Troubleshooting

Switch Off or Power Off of the Unit.

If accidental Switch Off or Power Off happens during one of these stages:

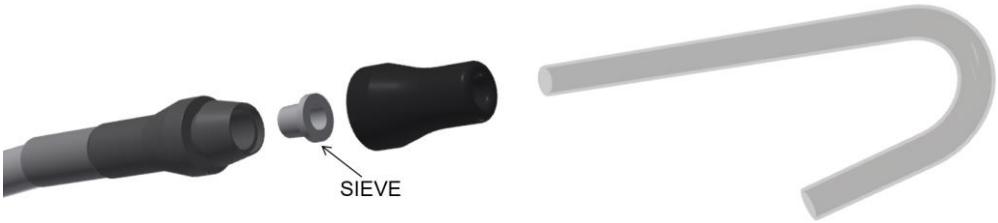
- During hoses Filling in with disinfection solution
- During disinfection solution reacts in the hoses
- During hoses rinsing with water

then after Switching-On or Powering-On, triple beeping sound occurs and the system automatically loads itself into the program mode of reacting of disinfecting solution in the hoses (Stage 2).

If the interruption happened during the hoses filling with disinfecting solution (stage 1) then close the program by pressing button and start it again.

10.3 Cleaning and decontaminating the saliva ejector

It is required to perform a decontamination of the saliva ejector at least once a day (e.g. after finishing the work). Prepare at least 1 dcl of a 1% SAVO Prim solution and suck in this solution with the tip of a saliva ejector. Rinse ejector's hose with min. 1dcl of water after each patient. Saliva ejector handpieces are for single use only! Clean the ejector's sieve at least once a day to avoid contamination. fig. 10.1.



10.4 Cleaning and decontaminating the large and small aspirators

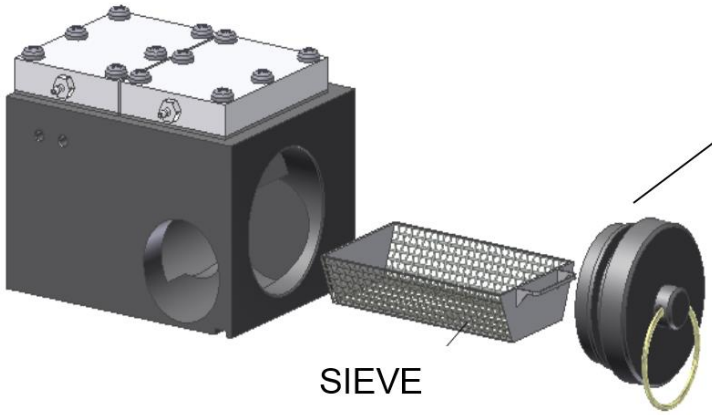
It is required to check the catcher sieve in the cuspidor for solid particles at least once a day. Clean the sieve if needed to avoid contamination. Rinse aspirators' hoses with min. 1dcl of water after each patient

Aspirator tips are sterilizable up to the 134°C, pressure 2,1 bar and time of sterilization 10 min.
Max. number of sterilization cycles allowed: 100.

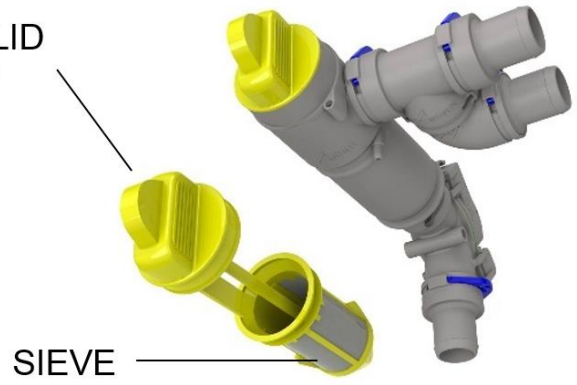
1 - big aspirator
2 - small aspirator
3 - filter, rough P 22
4 - filter, rough P 16
6 - regulating flap of suction

10.5 Cleaning of the sieve of the separation block

Pull the lid and the sieve of rough particles out of the separating block and then clean (rinse) them under running water and return back into the separation block. The cleaning should be done at least once a day.



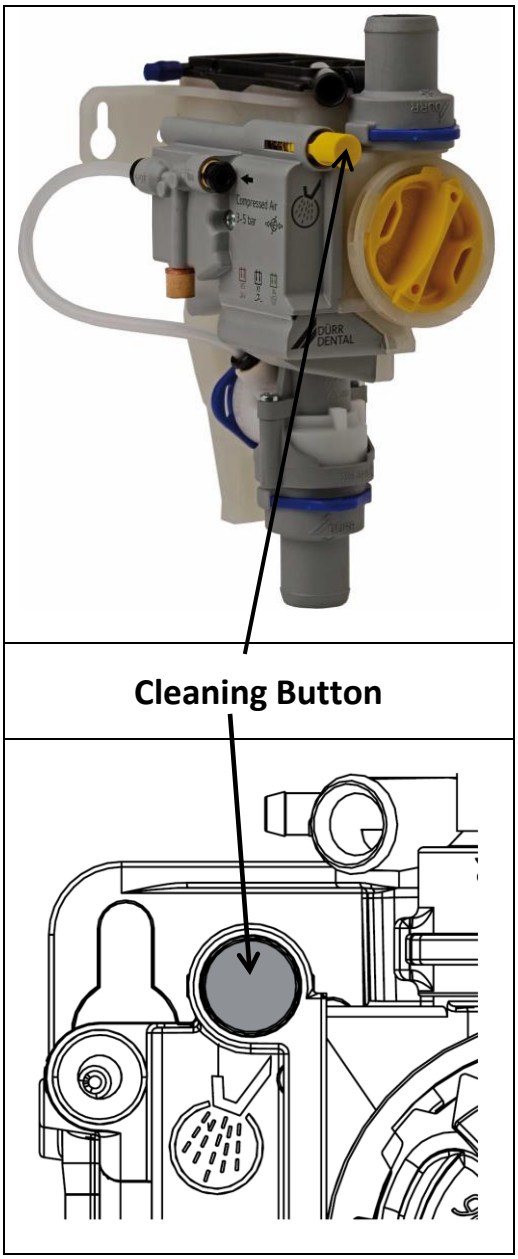
Double-diaphragm separation block



Separation block without diaphragm

10.6 Cleaning and Disinfection of Dürr spittoon valve on wet suction system
(optional)

If DIPLOMAT unit is equipped with Dürr spittoon valve, the following are required for disinfection/cleaning:
Material-compatible, non-foaming disinfection/cleaning agents that have been approved by Dürr Dental,
e.g. Orotol plus or Orotol Ultra.

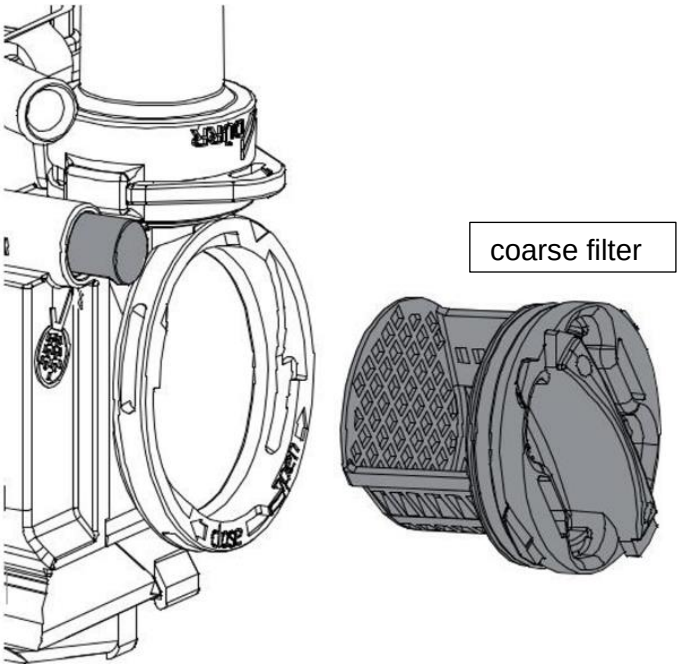


The procedure
1. Switch on the rinsing for the spittoon.

2. Keep pressing the cleaning button on the yellow switch control panel, until rinsing of the spittoon is finished.

3. Pour disinfection solution into the spittoon and at the same time press the yellow cleaning button on the switch control panel, until the disinfection solution has been aspirated.

Monthly maintenance:
Press the cleaning button to empty the collection vessel.
Clean the yellow coarse filter or replace it if required.
The yellow coarse filter prevents larger dental particles from reaching the suction pipe.



NOTICE:
Device malfunctions or damage due to use of incorrect media. Guarantee claims may become invalid as a result.

- Do not use any foaming agents, e.g. household cleaning agents or instrument disinfection agents.
- Do not use abrasive cleaners.
- Do not use agents containing chlorine.
- Do not use any solvents like acetone.

10.7 Decontaminating the cuspidor bowl

1. It is recommended to use SAVO Prim cleaning agent, if the dental unit is configured with saliva ejector only. Decontamination of the cuspidor bowl should be performed at least once a day (e.g. after finishing the work). Pour at least 200ml of a 1% SAVO Prim solution into the cuspidor bowl.
2. It is required to use PULI - JET PLUS cleaning agent, if the unit is configured with an aspirator and Cattani separator. Use at least 200ml. of a 0,8% solution to clean the cuspidor bowl.

Cattani disinfecting anti-foaming tablets for dental aspirators. Instructions for Use

Even if the unit is regularly and properly cleaned, blood and mucus under negative pressure create a great amount of foam anyway. This may result in frequent undesired abruption of suction.

Simply place the tablet (do not remove the protective dissolvable film, that ensures safe keeping and handling, even though the product is not classified as dangerous) in the filter of the tip and suck in the small amount of water through it for immediate antifoaming effect. When placing the tablet in very small slots, protective film should be removed (wear suitable gloves) and the pill broken in two parts (press along the marked line) to allow insertion of the two halves into the filter system. As the liquid passes through the tablet will release disinfecting and anti-foaming agents for the whole working day.

High efficiency is enabled by ortho-ftalaldehyde as the active disinfecting component. Its efficiency has been proven by the official tests for Staphylococcus aureus, Pseudomonas aeruginosa, Enterococcus hirae and Candida Albicans.

Internal disinfection of the suction system and sucked-off debris is combined with the anti-foaming effect for safe and odour-free system operation.

PULI – JET PLUS cleaning agent.

PULI – JET PLUS is a non-foaming aldehyde-free concentrate used for disinfection, deodorizing, cleaning and maintaining dental aspirators of all types (semi-wet, wet, dry). It is recommended to disinfect the suction system at the end of each working day and clean it at least once in the middle of the day. PULI – JET PLUS leaves a residue on the inside of the pipes to prevent the accumulation of bacterial growth. PULI – JET PLUS is certified as germ-killer, fungicidal and antiviral agent. It is generally recommended to improve and refine the quality of disinfecting procedures to minimize the contamination risk.

Instructions for use

How to fill the doser: place the bottle in the vertical position, preferable on a flat surface. Unscrew the lid and fill the doser to the edge by squeezing the bottle gently at the points marked with two labels (take care not to overfill it). Release the pressure: excessive amount of the liquid returns back to the bottle while the exact amount (10ml) of the concentrate remains in the doser. Concentrated PULI – JET PLUS after dilution to 0,8% cleans and disinfects, to 0,4% it is only sanitary cleaning agent. Free sample of concentrated Puli-Jet PLUS (10 ml) equals to the content of one doser. 1,25l disinfecting and 2,5l sanitary solution can be prepared out of it. For cleaning and disinfection dilute two doses of the doser (two free samples) in 2,5l of warm water (50°C) and suck 1l with big aspirator and 1l with small aspirator and pour 0,5l into the bowl. For the very cleaning of the system dilute one dose of the doser (one free sample). Do not rinse, proteolytic and disinfecting effect of PULI – JET PLUS reveals with time.

Useful notes

Puli-Jet PLUS is supplied commercially in 1 liter bottles: out of 1 liter of Puli-Jet PLUS concentrate you will prepare 250 litres of sanitary solution or 125 litres of disinfecting solution. Puli-Jet PLUS enables you to save on transport cost (70 %), the dispensive nozzle fitted in the lid, 1-litre bottle is easy to handle and it is not graduated. We recommend Puli-Jet PLUS as, when used regularly, it contributes to good maintenance of the aspirator by keeping it clean and protecting it against corrosion and wearing.

10.8 Cleaning, disinfection and decontamination of other parts of the dental unit

- Clean the unit's external surfaces and the chair upholstery with a wet cloth
- Manufacturer recommends to use **Incidin™ Foam** - spray (HENKEL - ECOLAB)
- Cleaning should be carried out regularly or when the surface of the product has become contaminated with biological material incidentally.

Warning	• It is forbidden to clean the upholstered parts of the unit with agents that have detrimental effect upon the structure of the leatherette, such as acetone, trichloro, perchloro, alcohol, abrasive cleaning agents, polishing agents • Do not use phenol- and aldehyde-based cleaning agents to clean other parts of the unit; they can permanently damage the structure of varnish and plastic surfaces

Clean the following parts at least once a day (according to the version):

- sieve of the separation block located in the spittoon block
- sieve at the input to the amalgam trap
- sieve of the saliva ejector
- filter of the small and big aspirator
- sieve in the spittoon bowl

Instruments and handpieces
Cleaning, disinfection and sterilization of the instruments and their handpieces should be carried out according to the instructions of their manufacturer, furnished with the instrument.

Caution	When cleaning the floor (PVC floor) with a cleaning agent, it is forbidden to place the foot controller on the wet floor

Caution	The manufacturer shall not be taken responsible for damages arisen due to the use of other disinfecting and cleaning agents than those recommended.

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11 EQUIPMENT DISPOSAL

Part	Basic material	Recyclable material	Storable material	Hazardous material
Metal	Steel Aluminum	X X		
Plastic	PUR PVC PA, ABS Laminated glass Other plastic	 X X	X X 	 X
Rubber			X	
Ceramics (glass)			X	
Instruments			X	
Electronics		X		
Cables	Copper	X		
Transformer		X		
Amalgam separator	Filters Collecting vessel with amalgam			X X
Package	Wood Cardboard Paper PUR	X X X 	 X	

Equipment has to be disposed according to the regulations specific to your local area.
Clean the surface, rinse the suction and waste systems, remove the amalgam from the trap and pass it on to a scrap material collecting facility. It is recommended to hire a specialist for disposing the unit.
Cleaning should be done prior to dismantlement.

Not to be disposed of with the communal waste. Waste material can be handed in at destined places, e.g. electro waste drop-off.

12 REPAIR SERVICE

In case of a breakdown, contact the nearest service centre or your dealer, who will provide you with information about the service network.

13 WARRANTY

The manufacturer covers the warranty in accordance with the warranty card.
The responsibility for any damage is shifted to the buyer after the item has been passed over to the forwarding agent for expedition and/or after the item is has been received directly by the buyer.

The information in this manual is subject to change subsequently to the further product innovations without notice.

Caution
The warranty does not cover the damage resulting from misuse or/and failure to maintain the product in accordance with instructions for use that came with it.

14 CONTENTS OF THE PACKAGING/PACKAGE CHECK LIST

Standard configuration:

	DC 170, DC 180, DA110A
Control panel pantograph with the control panel	1
Spittoon block	1
Spittoon block holder (DC170, DC180)	1
Light pantograph	1
Dental operating light	1
Foot controller	1
Tray table (depending upon order)	1
Side table (depending upon order)	1
Power block	1
Cuspidor Bowl	1
Instruments, accessories, small parts and completion sheet, sealed in cardboard	1

Accompanying documentation:

- Instructions for Use
- Warranty Card
- Manuals from subcontractors
- Completion sheet (in the sealed together with instruments)
- Registration form
- Wiring diagrams

15 TRANSPORTING

Packages should be transported in covered vehicles in max. 3 plies and secured to prevent movement. Do not drop or tilt the package while loading or unloading.

16 STORAGE

Dental units can be stored in dry indoor warehouses in max. 3 plies with no dramatic temperature changes. Protect non-varnished parts from corrosion with rust-preventive treatment. Do not store together with chemicals! Required environmental conditions: relative humidity at max. 75 %, temperature range for transporting and storage: -25 °C to +50 °C.

17 REQUIREMENTS ON ELECTROMAGNETIC COMPATIBILITY ACCORDING TO EN 60601-1-2

Caution

The use of accessories other that those stated in the Instructions for Use of the dental unit may result in increased electromagnetic emissions or decrease electromagnetic immunity and invoke disfunction of the dental unit.

Portable RF communications equipment must not be used at the distance of less than 30 cm from any part of the dental unit. Otherwise the functionality of the dental unit may be impaired.

17.1 Electromagnetic emissions

Emissions test	Compliance	Electromagnetic environment
RF emissions CISPR11	Group 1	The dental unit uses RF energy only for its function. Its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR11	Class B	The dental unit is designed to be used in all environments, including residential area and it can be directly connected to the public mains network.
Harmonic emissions EN 61000-3-2	Class A	
Voltage fluctuations/flicker emissions EN 61000-3-3	Complies	

17.2 Electromagnetic immunity

The dental unit is intended for use in the electromagnetic environment meeting the requirements in Table 17.2.
The customer and/or the user of the dental unit must assure that the dental unit is used in such an environment.
Table 17.2

Immunity test	EN 60601 test level	Compliance	Electromagnetic environment
Immunity to electrostatic discharge according to EN 61000-4-2	Contact discharge ±6 kV Air discharge ± 8 kV	Contact discharge ±6 kV Air discharge ±8 kV	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Immunity to electrical fast transients and bursts according to EN 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Immunity to surges according to EN 61000-4-5	±1 kV line(s) to line(s) ±2 kV line(s) to earth	±1 kV line(s) to line(s) ±2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Immunity to power frequency magnetic field according to EN 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should not exceed values typical for commercial or hospital environment.
Immunity to voltage dips, short interruptions and voltage variations on power supply input lines according to EN 61000-4-11	< 5% UT (> 95% dip in UT for 0,5 cycle) 40% UT (60% dip in UT for 5 cycles) 70% UT (30% dip in UT for 25 cycles) < 5% UT (> 95% dip in UT for 5 cycles)	< 5% UT (> 95% dip in UT for 0,5 cycle) 40% UT (60% dip in UT for 5 cycles) 70% UT (30% dip in UT for 25 cycles) < 5% UT (> 95% dip in UT for 5 cycles)	Mains power quality should be that of a typical commercial or hospital environment. If the user of the dental unit requires continued operation during power mains interruption, it is recommended that the dental unit be connected to a backup source.

17.3 Electromagnetic immunity

The dental unit is intended for use in the electromagnetic environment meeting the requirements in Table 17.3. The customer or the user must assure that the dental unit is used in such an environment.

Table 17.3

Immunity test	EN 60601 Test level	Compliance	Electromagnetic environment
Immunity to conducted disturbances, induced by radio-frequency fields according to EN 61000-4-6	3 Veff 150 kHz to 80 MHz	3 Veff	Portable and mobile RF communications equipment should be used no closer than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended minimum distances: $d = 1{,}167\sqrt{P}$ 150 kHz to 80 MHz $d = 1{,}167\sqrt{P}$ 80 MHz to 800 MHz $d = 2{,}333\sqrt{P}$ 800 MHz to 2,5 GHz P[W]- rated maximum output power d[m] – recommended separation distance Field strengths from fixed RF transmitters should be less than the compliance level in each frequency range. Interference may occur in the vicinity of equipment marked with the symbol  .
Immunity to radiated, radio-frequency electromagnetic field according to EN 61000-4-3	3 V/m 80 MHz to 2,5 GHz	3 V/m	

Note 1

For frequency of 80 MHz the frequency range of 80 MHz to 800 MHz applies and for the frequency of 800 MHz the frequency range of 800 MHz to 2,5 GHz applies.

Note2

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

Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones, mobile radios, amateur radio, AM and FM radio and TV broadcast and the like cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to the fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the dental unit is used exceeds the applicable RF compliance level above, its normal operation must be verified. If abnormal performance is observed, the dental unit must be relocated.

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

17.4 Recommended separation distances between portable and mobile RF communications equipment and the dental unit

The dental unit is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the dental unit can help prevent electromagnetic interference by maintaining minimum distances between portable and mobile RF communications equipment and the dental unit according to Table 17.4.

Table 17.4

Rated maximum output power of transmitter P[W]	**Separation distance according to frequency of transmitter d[m]**		
	150 kHz to 80 MHz $d = 1{,}167\sqrt{P}$	80 MHz to 800 MHz $d = 1{,}167\sqrt{P}$	800 MHz to 2,5 GHz $d = 2{,}333\sqrt{P}$
0,01	0,117	0,117	0,233
0,1	0,369	0,369	0,738
1	1,167	1,167	2,333
10	3,69	3,69	7,377
100	11,67	11,67	23,33

P[W]- rated maximum output power

d[m] – recommended separation distance

For transmitters rated at a maximum output power not listed above, the distance is calculated using the equation applicable to the respective frequency.

Note 1

For frequency of 80 MHz the frequency range of 80 MHz to 800 MHz applies
and for the frequency of 800 MHz the frequency range of 800 MHz to 2,5 GHz applies.

Note2

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

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