



72 dpi

# LaserHF<sup>®</sup>



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Dental Combination Device  
Laser plus radio frequency - V217-14  
User Manual

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LaserHF®  
■ ■ ■ ■ ■

72 dpi



LaserHF® „comfort“  
■ ■ ■ ■ ■

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If errors occur or if contents of this user manual are not clearly formulated, please inform Hager & Werken GmbH & Co KG.

## **Please carefully read this user manual!**

Read completely this user manual and get familiar with the use and functions of the unit and all accessories, before you start using the device clinically.

Unless you do not follow the directives as instructed, the following problems may occur:

- Serious injuries to the patient
- Serious injuries to the operator or to the service personal
- Damage of malfunction of the unit or of the accessories

## **Modifications**

The manufacturer has the right to modify the appearance and technical data because of new product developments.

The marks: “**WARNING**“, “**ATTENTION**“ and “**REMARK**“ contain important hints.

## **Responsibility of manufacturer**

Warranty and liability by Hager &Werken GmbH & Co KG is given, if:

- installation and start of operation is done by own personal or by personal authorized by the manufacturer
- installation and safety measures comply with national norms and regulations
- the unit is used in accordance with the user manual
- the unit is used under supervision of a LSO (Laser Safety Officer)
- no manipulations to the unit or to the accessories, if manufacturer does not agree.

## **Warranty**

The LaserHF unit has a legal warranty of 12 months.



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## Explanations to the user manual

Important directives, especially for technical safety and security, are mentioned:



### WARNING DANGER

The safety of patients, operator or third persons is in risk. If information is not considered, persons can be in danger.



### ATTENTION

This information advises to special service procedures or caution measures, which must be considered to avoid damage to the unit.



### REMARK

This is general and special information to clarify important and helpful instructions.

## Scope of Delivery

### LaserHF - REF 452 462

LaserHF bare fiber AS 200/240	REF 452 463
LaserHF bare fiber AS 320/385	REF 452 464
LaserHF hand piece 6W Laser Red	REF 452 465
LaserHF hand piece PDT Laser Orange	REF 452 466
HF set of instruments, 6 pcs	REF 452 440
HF hand piece Yellow 1,50 m	REF 452 423
HF hand piece Blue 1,50 m	REF 452 425
Neutral electrode	REF 452 421
Laser safety goggle, Lambda One, Filter P1002	REF 355 630
Laser safety goggle, Skyline Green, Filter P1002	REF 355 631
Laser safety goggle, Skyline Blue, Filter P0004	REF 355 632
Laser-Patient safety goggle, Filter PA000	REF 355 633
Plug door contact/interlock	
Foot pedal	
User manual	
Medical product journal	
(Bipolar forceps optional)	

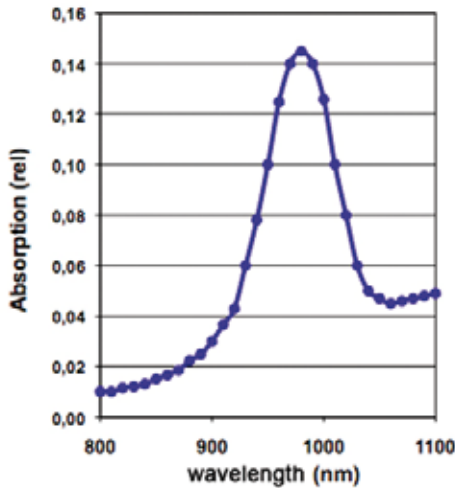
### LaserHF „comfort“ - REF 452 471

LaserHF Fiber Tip set of 3 pieces 320 µm	REF 452 469
LaserHF Fiber Tip set of 3 pieces 220 µm	REF 452 470
LaserHF FT- hand piece 6W red	REF 452 467
LaserHF FT- hand piece PDT orange	REF 452 468
HF set of instruments, 6 pcs	REF 452 440
HF hand piece Yellow 1,50 m	REF 452 423
HF hand piece Blue 1,50 m	REF 452 425
Neutral electrode	REF 452 421
Laser safety goggle, Lambda One, Filter P1002	REF 355 630
Laser safety goggle, Skyline Green, Filter P1002	REF 355 631
Laser safety goggle, Skyline Blue, Filter P0004	REF 355 632
Laser-Patient safety goggle, Filter PA000	REF 355 633
Plug door contact/interlock	
Foot pedal	
User manual	
Medical product journal	
(Bipolar forceps optional)	

Laser light as well as radio frequency energy can both be used to convert electromagnetic radiation into heat. The basic tissue interaction of laser and radio frequency applications are nearly the same, especially compared in the clinical appearance. Additional to heat effects the laser radiation can be used at low power to perform therapeutic and photoactive applications.

### Interaction of laser light

#### THERMAL INTERACTION



If laser light is transmitted by thin glass fibers an extreme power density can be created at the fiber output surface. Tissue with mainly water content strongly absorbs the laser radiation and creates heat. The water will be evaporated in shortest time, biological material then will be vaporized – this effect can be used to coagulate and cut tissue as well as to kill pathogen germs. For the most effective way it is necessary to use a wavelength, which is well absorbed in water – the LaserHF unit uses a wavelength of 975 nm, in a maximum of absorption.

#### THERAPEUTIC INTERACTION / LLLT

Laser light does not only perform tissue vaporization or coagulation of blood vessels, more than that it can stimulate cells in a therapeutic sense. In the LLLT (Low Level Laser Therapy) the laser power densities are less than in thermal applications, much smaller than 1 W/cm<sup>2</sup>. Appropriate wavelengths can be found in the red spectral range from 630 – 680 nm, the LaserHF unit uses 660 nm.

LLLT applications are wound healing (stimulation of cell growth), pain treatment (release of nerve irritation) and to treat eczema (stimulation of lymphatic vessels).

#### PDT

As an integral part of the LaserHF device, a second laser source with a red wavelength is added for PDT (Photo Dynamic Therapy).

Using an appropriate substance like Toluidine-Blue the bacteria in tooth pockets, root canals and caries cavities can be stained – the colour molecules will be accumulated in the cell walls of micro organisms, and then afterwards irradiated with red laser light. Due to the laser irradiation oxygen radicals are generated which mortify those cells. The exact treatment can be found in the user manual for PDT.

**WARNING DANGER**

Laser radiation is very dangerous to the high sensitive, unprotected eye. Therefore the use of appropriate laser protection goggles is mandatory, see PROTECTION GOGGLES.

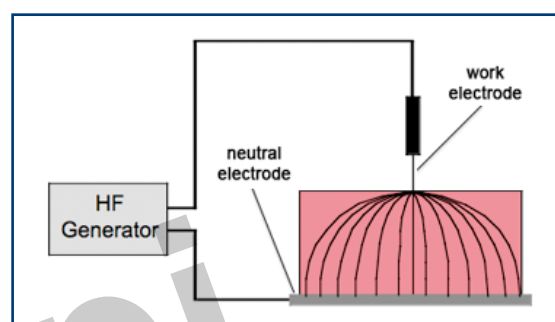
**Interaction of radio frequency (HF)**

If radio frequency is guided through very thin metal electrodes, a very large electro-magnetic power density is created in the tissue layer. The water is abruptly heated up in these cells which leads to cooking and rupture, respectively.

**THERMAL INTERACTION (MONOPOLAR)****CUTTING (CUT) / COAGULATION (COAG)**

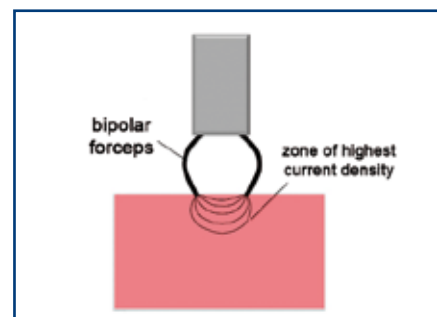
At monopolar cutting the radio frequency current is led from the device via a work electrode and a large neutral electrode back to the device. The current density at the treatment point is very high, but it is very low at the neutral electrode.

The electric current density leads to a fast and strong heating in tissue, which can be used for cutting and coagulation.

**THERMAL INTERACTION (BIPOLAR)**

At bipolar application the current is going from one side of an instrument (i.e. forceps) to the other side of the device.

The advantage of this technology is to apply the current in an exact defined area, so it can be used for selective coagulation and closing of small vessels.



## Technical Data

LASER	wavelength + power diode laser:	975 nm ± 10 nm, 6 Watt, LK 4
	pulse of duration:	mode: cw and pulsed: 5 ms - 50 ms
	wavelength + power PDT/LLLT:	660 nm ± 5 nm, cw, max. 100 mW, LK 3B
	wavelength + power pilot laser:	660 nm, 2 mW, LK1
HF	frequency + power:	2.2 MHz, max. 50 W
		mono- and bipolar
		permanently /pulsed
environment temperature		18 - 30 °C
storage temperature		5 - 40 °C
air humidity		< 90 % Rel.
power supply		230 V AC, 50/60 Hz
power consumption		max. 1.5 A
classification medical device		class 2b
duty cycle		continuous operation 1 min., interval time 4 min.
applicators	fiber with SMA	200 µm – endodontics 320 µm – periodontics, implantology 320 µm – PDT, LLLT Autoclavable
	hand piece	autoclavable



## Caution and safety regulations in the dental practice using the LaserHF device

The LaserHF device should only be used after successful introduction to the owner and in accordance to national/international relevant regulations and safety measures.



The area where the LaserHF device should be used, must be in accordance with national accident prevention regulations. Electrical installation must be in accordance with national rules. It is in the responsibility of the owner/user or the (LSO) laser safety officer.

### Each application requires its own laser safety goggle. The PDT/LLLT unit (660 nm) and the power laser (975 nm) have different goggles.

- During use the LaserHF should have a minimum distance to walls of about 20 cm. Besides the LaserHF should be used only on an even surface to guarantee a good air circulation.
- Only accessories mentioned by Hager & Werken like glass fibers, hand pieces and electrodes should be used.
- Do not use the LaserHF in a potential explosive atmosphere, regardless from what the explosive situation generates. Especially never use burnable or explosive anesthetics or remove it immediately by effective suction.
- Operator, patient and everybody in the room should wear a laser safety goggle during laser operation. Laser safety goggles will be recommended from Hager & Werken.
- Never look directly or with an optical instrument in the laser beam.
- Surgery with radio frequency should not be used on persons wearing a cardiac pace maker, please consult the cardiac specialist to make sure that the radio frequency does not interfere negatively with the cardiac pace maker.
- None of the cables of LaserHF should be in contact with the patient or in contact with other cables.
- The radio frequency power should be set on lowest level, to prevent from unwanted tissue damage.
- The unit must be free from power supply during cleaning.
- Service and maintenance should be done by authorized personal only.
- If other than the mentioned buttons will be used or if another regulation for the treatment is used, it may lead to serious and dangerous beam emission.
- Any noncompliance with this user manual leads to loss of warranty by manufacturer.

## Operator regulation

The LaserHF unit is classified as medical device unit class 2b (Europe). Thus all directions of the European operator regulation apply.

§ 5: Operation and execution

§ 6: Technical controls

§ 7: Medical product documentation

Technical controls:

The user is committed to perform on a regular basis technical controls after the following specifications:

Period: Every 12 months, starting with date of delivery and after each repair.

Covering:

Visual check of the unit and accessories

Check according to IEC 62353 (VDE 0751)

- Protective earth resistance
- Alternate leakage current
- Alternate patient leakage current

Function check

- Main switch
- Touch display
- Tubular switches
- Emergency switch

Measurement of radio frequency (HF) output power at a load of 1 k $\Omega$ :

- Output CUT (50W)
- Output COAG (45W)
- Output (45W)

Measurement of laser output power

- Output PDT (10mW and 100mW)
- Output Laser (100mW and 6W)

All results of measurements must be documented according to IEC 62353 (VDE 0751) concerning the first measured values. If defects occur during the controls, the user is responsible to initiate repair.

**Safety information!**

Invisible laser radiation - laser class 4

Avoid damage of eye and skin by direct or indirect irradiation.

**Preparation to start the device**

- Before the LaserHF unit gets started, make sure, that the unit is at room temperature for at least 30 minutes to avoid condensed water.
- It is important that the ventilation slots are not covered and that the unit has a minimum distance to walls and other units of 20 cm.

**Start up**

- All national safety aspects must be fulfilled.
- Connect interlock output with door contact or use a short cut plug.
- Connect foot switch with unit.
- Connect power supply cable first to the unit, then to house power output.
- Connect fiber with laser hand pieces: open fixture, carefully feed in the fiber from the rear side through the hand piece and into the fixture, then close fixture. Insert the plug into the socket matching the colour of the hand piece and screw it tight without using a tool.
- LaserHF „comfort“: To insert the Fiber Tips into the LaserHF FT-hand piece, remove rubber tip of front part of hand piece. Put the Fiber Tip onto the hand piece and screw it tight all the way to the stop (without using a tool).
- For LaserHF „comfort“: To connect the hand pieces with the unit, remove rubber tip at cable plug (black). Insert the plug into the socket matching the colour of the hand piece and screw it tight without using a tool.
- Open the fixture at radio frequency (HF) hand pieces and insert appropriate electrodes. Close fixture.
- Put the hand pieces in the tubular switches and connect laser light fibers and radio frequency (HF) cable with the unit. Pay attention to the colour codes
- Connect the neutral electrode.
- Power switch turn on (back side).
- The unit will IMMEDIATELY start with a self test.

**Label**

At the back of the unit:

<b>Laser-HF-Chirurgiegerät / surgical unit LaserHF</b> Netz / Mains: 230V / 50/60 Hz / 100 VA,  2x T1,6AH <b>HF-Leistung / power:</b> monopolar: 50 W an / at 1 kΩ Last / load bipolar: 45 W an / at 250 Ω Last / load HF-Frequenz / frequency: 2.2 MHz DAB mit 25% ED / duty cycle <b>LASER:</b> Pilotstrahl / pilot beam: 1 mW, 660 nm Hauptstrahl / main beam: max 10 W, 975 nm. Nicht sichtbar! / invisible! PDT/LLLT: max. 100 mW, 660 nm		
Seriennr. / Serial No.: LHF-0001		
		<b>Laserstrahlung / Laser Radiation</b> Bestrahlung vermeiden Avoid irradiation Laser Klasse / Class 4
		<b>Hager &amp; Werken GmbH &amp; Co KG D-47269 Duisburg</b>

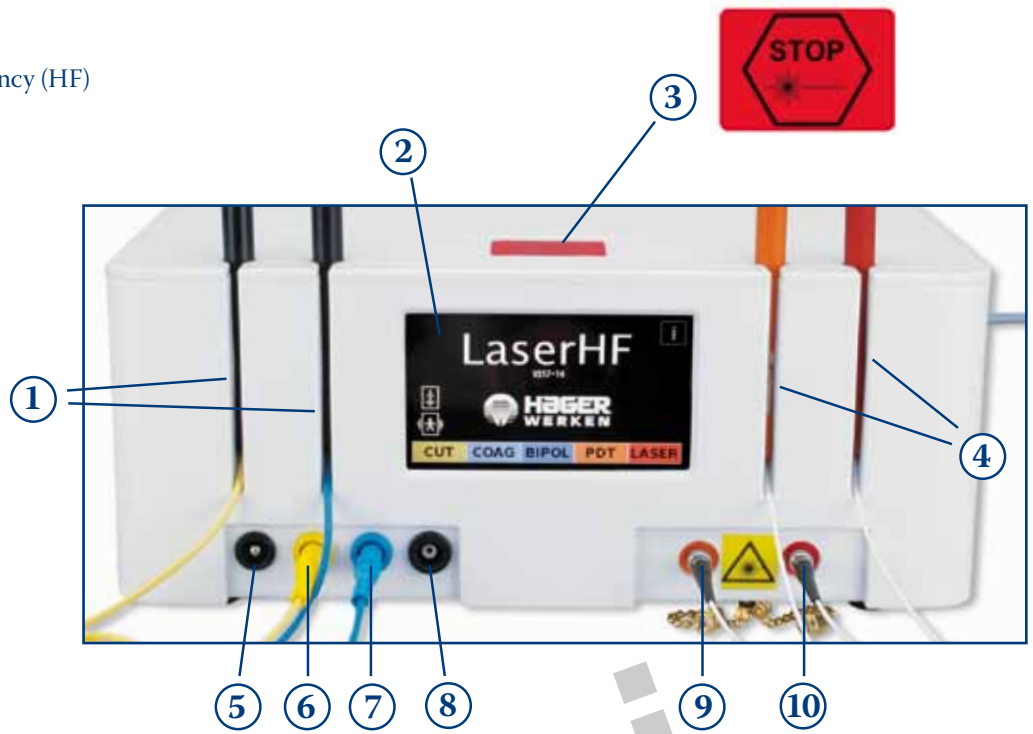
At the front of the unit:



between the two laser outputs

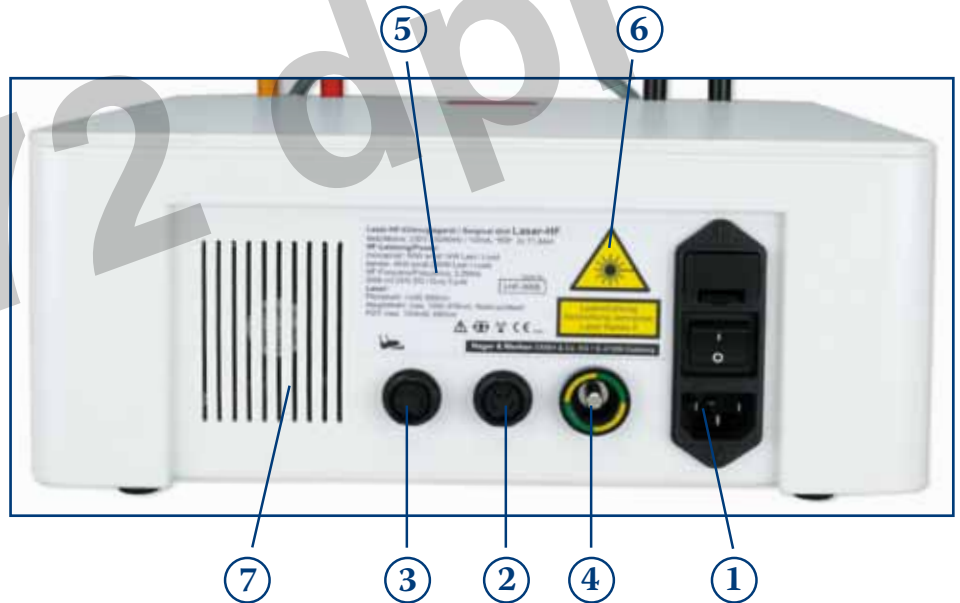
**Unit Front**

1. Tubular switch radio frequency (HF)
2. Display (touch screen)
3. EMERGENCY-switch (on top of unit)
4. Tubular switch LASER
5. Neutral electrode
6. Output HF CUT
7. Output HF COAG
8. Output HF BIPOL
9. Output laser 660 nm
10. Output laser 975 nm



**Unit Back**

1. Power supply with fuses
2. Interlock
3. Foot switch
4. Potential balance
5. Type label
6. Laser warning
7. Ventilation



**Dual User Conception:**

It is possible to choose every single application (mode) by using the touch screen as well as by using the tubular switches (except BIPOLAR). Because of safety reasons the simultaneous selection of a mode via touch screen or via tubular switch is intended in the following way:

- Always – if a button of mode is coloured – the mode can be started or finished using the touch screen or the tubular switches.
- Once a mode has been selected, it cannot be interrupted with another mode button or another tubular switch.
- The BIPOLAR MODE can be selected only by touch screen.
- It is possible to pre-select a mode by activating the mode button, even without taking the hand piece from the tubular switch.
- Except at BIPOLAR, to activate always the hand piece must be taken out of tubular switch.

**HF**



Standard hand piece



HF-electrode CUT



HF-electrode COAG



Neutral electrode

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**LASER**



Laser hand piece 975 nm



Laser hand piece 660 nm



Fiber



LaserHF FT-hand piece PDT orange for LaserHF „comfort“



LaserHF FT-hand piece 6W red for LaserHF „comfort“



LaserHF „comfort“ Fiber Tips

## Start

Start the unit by using the power switch at the back side of the unit.



Immediately with the start of the unit the display will ask for input of an user code. (Default is: 9999. Please change the code during the first use of the device for your own safety, p. 15/17).

If the user code matches the correct 4digit code, the main menu immediately appears.

If the code input is false, input of the code is requested again.



With acceptance of the user code the main menu will appear:

■ CUT

■ COAG

■ BIPOL


■ PDT

■ LASER

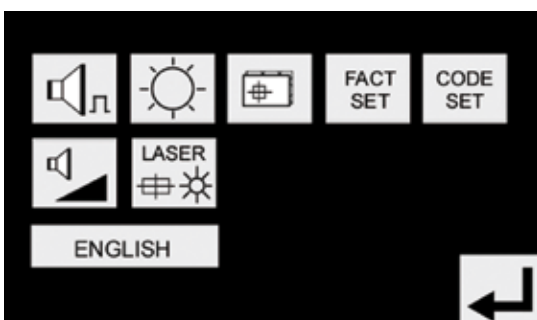
□ Information

SoftwareVersion / Warning Signals

Following possibilities are available:

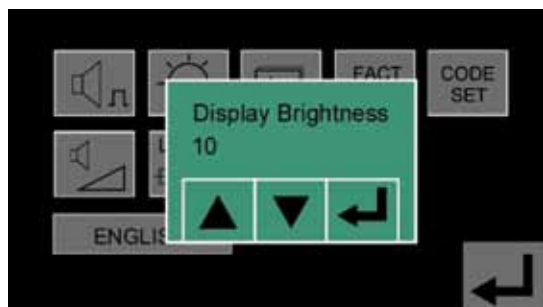
- Go to information menu by pressing the button  in the right upper corner
- Mode selection by buttons – pressing of one of the coloured buttons directly lead to a mode. If a mode selection button is GREY, it is not possible because another mode is active.
- Mode selection by tubular switch – by taking the hand piece from the tubular switch the appropriate mode will be selected, if no other mode is active.

## Information





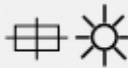


 = Information

- Loudness warning sound
- Return to factory settings
- Adjustment of display
- Brightness of display
- User code setting
- Language

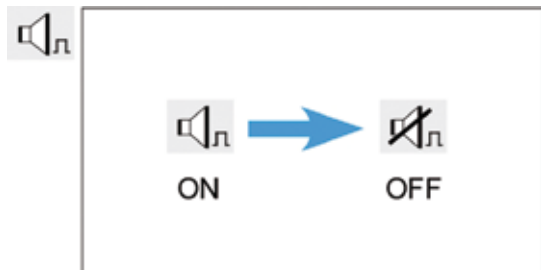


Touch one of the symbol buttons – with exception of FACT SET, SIGNAL ON/OFF, JUSTAGE DISPLAY, CODE SET – and a green window appears and settings can be changed by using the ▲ und ▼ buttons and accept by ↵ button.

	Adjustment of loudness for warning sound (window)
	On/Off for sound of button
<p>FACT SET</p>	Reset to factory setting
	Adjustment of display (special display)
	Adjustment of brightness display (window)
<p>LASER</p> 	Brightness of pilot laser (window)
<p>CODE SET</p>	User code setting
<p>DEUTSCH</p>	Language: Deutsch, English (window)

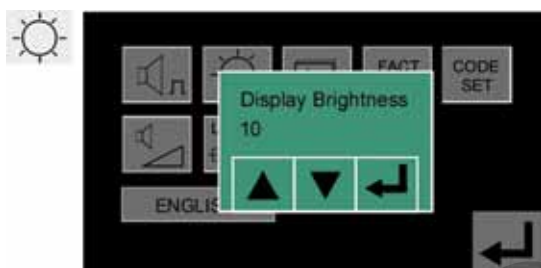
### Settings:

#### Sound for buttons



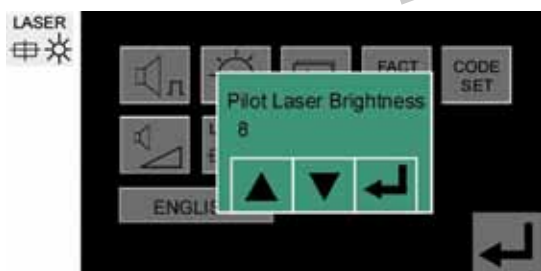
The sound for button confirmation can be set ON/OFF.

#### Brightness of display



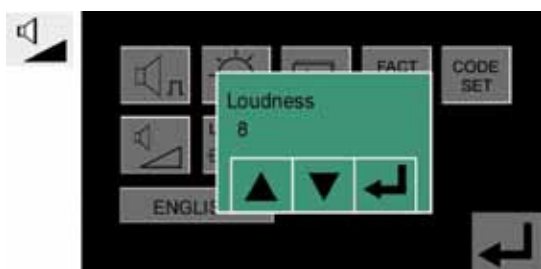
Brightness of the display can be set in steps 1 – 10, confirm with ↵ button.

#### Brightness of pilot laser



Brightness of the pilot laser can be set in steps 1 – 10, confirm with ↵ button

#### Loudness of warning sound



Loudness of the warning sound (ATTENTION: radio frequency and laser have different sounds) - can be set in steps 1 – 10, confirm with ↵ button.



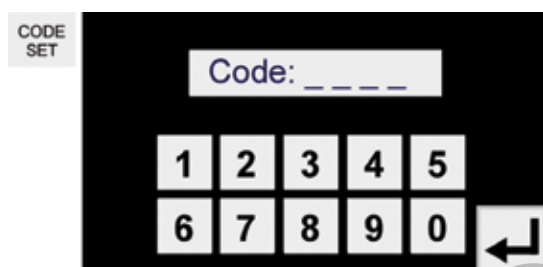
## Adjustment of display



The display can be adjusted horizontally and vertically. For this use a sharp instrument (i.e. pencil, ballpoint) and touch SLIGHTLY the main lines, until a long sound occurs. Short sound signals the ongoing adjustment.

Confirm with pressure on middle button, until sound occurs.

## User code setting



The user of the LaserHF device can change the 4 digit code and store with the return button ↵.

## FACT SET

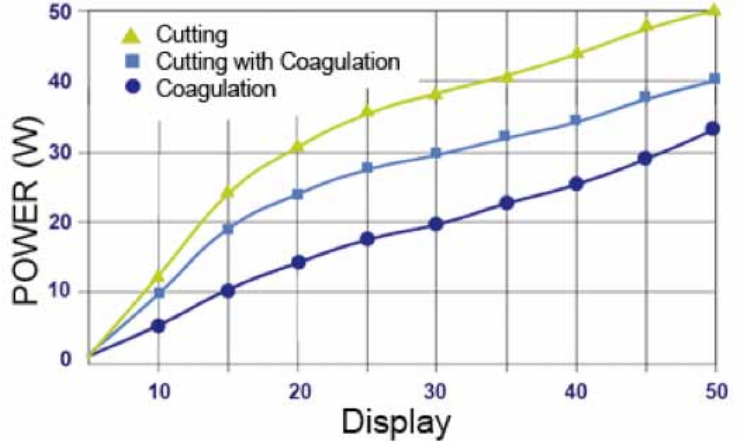
Reset to factory settings by long pressing of the button – until sound occurs. All storable parameters – except CODE – will be reset to factory settings.

In case the USER CODE has been lost, please contact HAGER & WERKEN by email: [info@hagerwerken.de](mailto:info@hagerwerken.de) and mention your unit number to get a new user code.



Precision of power setting radio frequency (HF)

The power of the radio frequency generator depends on the tissue specific resistance and can vary within limits. The specified 50 W are in accordance with a specific resistance of 1 k $\Omega$ . The settings of the radiofrequency will be displayed without the measuring unit [W] and will be scaled in accordance with the graph.



Precision of power settings LASER

The laser power will be permanently measured in the device and compared with a stored characteristic line of the laser module. A deviation of  $\pm 20\%$  leads to switch-off the device.

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## Selection of the correct radio frequency (HF) mode



### ATTENTION

All surgical applications with radio frequency need local or block anaesthesia.

### Cutting - CUT MODE

This mode – with a permanent power flow – is best rated for clean cuts in tissue without coagulation. In this mode cutting is with marginal heat and little hemostasis and can be used near to bones or to the periosteal tissue to avoid shrinking processes of the tissue.

Histological examinations can be done in this mode as well.

**Hint:** Activate the electrode by pressing the foot switch before touching the tissue. Then a regular cut will be produced from the beginning.

### Cutting / Coagulation - CUT / COAG MODE

This mode allows the precise cutting and simultaneous coagulation of the cut surface. Clinically the coagulation zone is marginal, but allows an effective hemostasis, does not disturb the primary wound healing and disappears spontaneously after the wound is healed. These cuts do not need suturing, thus this mode is very effective in cosmetic surgery.

**Hint:** Activate the electrode by pressing the foot switch before touching the tissue. Then a regular cut will be produced from the beginning.

### Coagulation permanently and pulsed - COAG MODE

This mode is for an immediate hemostasis – a coagulation electrode (i.e. a ball or a thick needle) should gently touch the area for coagulation, then the foot switch is activated. Bleedings from small vessels can be stopped using pulsed coagulation.

**Hint:** The electrode will be placed – gently touching – to the area. No pressure! Then the electrode will be activated.

**Hint:** Do not coagulate in a “blood lake“, instead remove most of the blood in advance of coagulation.

### Coagulation - BIPOLAR MODE

This mode is for immediate coagulation of smaller vessels with diameters up to max. 2,0 mm. In this case the pulsed coagulation is recommended.

**Hint:** First take the vessel with a bipolar forceps, then activate the radio frequency.

### Neutral electrode = NE

Always make sure the NE is connected, when working with the HF-mode. This ensures optimum performance during use.

The NE has to be placed between the patient's back and the treatment chair, as close to the head as possible.

### Correct power setting

The success of all radio frequency measures is strongly dependent on the right choice of electrodes, the mode and the correct power setting.

**Correct:** The electrode is sliding easily through the tissue without resistance and without spark formation.

**Wrong: too low power setting!**

The electrode must be dragged through the tissue and spark formation is found. Tissue residuals remain at the electrode.

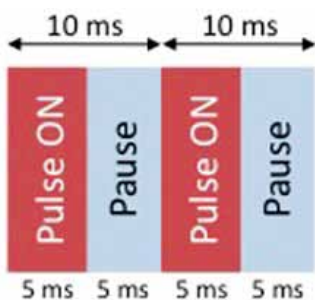
**Wrong: too high power setting!**

The electrode is sliding easily through the tissue, but with strong spark formation and discolouration of the tissue.

### Setting of level of coagulation (C)

Coagulation with radio frequency is done with high power, usually this is performed not permanently but in a pulsed way. It means that the power applied to the tissue is not permanent, but in quick cycles with periodical pauses. An average lower power results. The power is getting lower the longer pauses are in relation to the periods of power output. A pulse always is 10 ms long, power emission and pauses can be adjusted in 8 steps as level of coagulation (C) – see table.

Value of coagulation	Time of pause (ms)	Time of pulse (ms)	Maximal possible average power (W)
C1	1	9	45
C2	2	8	40
C3	3	7	35
C4	4	6	30
C5	5	5	25
C6	6	4	20
C7	7	3	15
C8	8	2	10



Example: C5 (1:1, 5 ms Pulse, 5 ms Pause)

In principle: The bigger the coagulation area at the tissue, the more power is needed and the level of coagulation C is lower.

Big areas: C1 - C3, small areas: C4 - C6, very small areas and special applications: C7 - C8, the fine control by power adjustment.

If high voltage is needed due to physiological conditions at the tissue, the level of coagulation should be at that maximum value that the application is still possible.

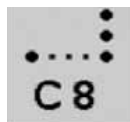
## Description of the modes

### HF-CUT MODE

#### Symbols



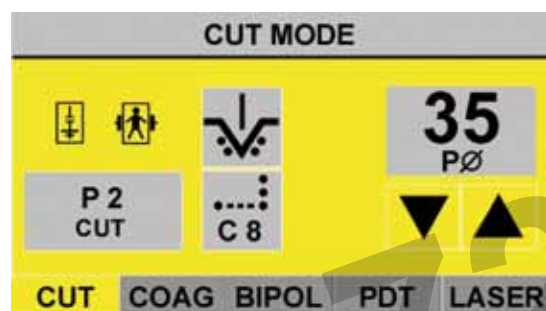
Permanent cutting  
(CUT PERM)



Level of coagulation



Cutting with coagulation  
(CUT COAG)



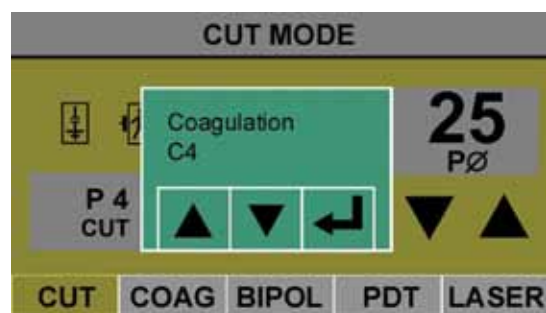
In CUT MODE – yellow display – the parameter for monopolar radio frequency can be selected.

Power: from 10 – 100 % of nominal power, selectable with ▲ and ▼

Permanent cutting (CUT PERM) or cutting with coagulation (CUT COAG)

Level of coagulation C1 – C8

P1 – P5 = storage places



If the button for level of coagulation is touched, a green window opens and the level of coagulation can be adjusted from C1 – C8 with ▲ and ▼

Confirm with ↵.

P1 CUT PERM	26 Pø
P2 CUT COAG	2 Pø C8
P3 CUT PERM	28 Pø
P4 CUT COAG	15 Pø C5
P5 CUT COAG	18 Pø C6

5 storage places are available in CUT MODE.

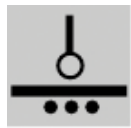
The actual selected parameters will be stored by touching one of the areas 1 – 5 for longer than 2 sec.

Recall of stored values by simple touching of the area number.

Back to CUT MODE with ↵.

## HF-COAG MODE

### Symbols



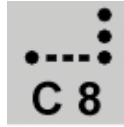
Permanent coagulation  
(COAG PERM)



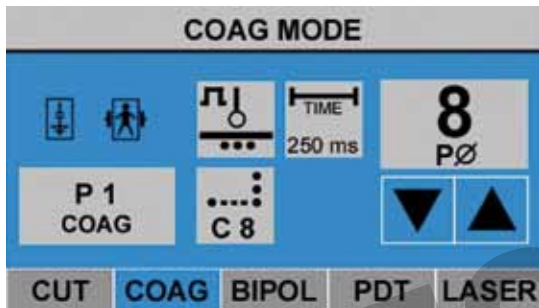
Pulsed coagulation  
(COAG PULSE)



Pulse duration



Level of coagulation



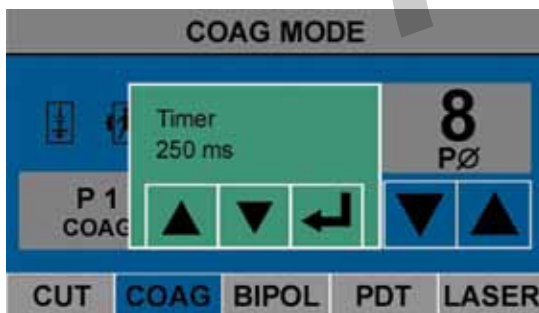
In COAG MODE – blue display – the parameters for monopolar coagulation can be selected.

Power: from 10 – 100 % of nominal power, by selection with ▲ and ▼.

Permanent or pulsed coagulation

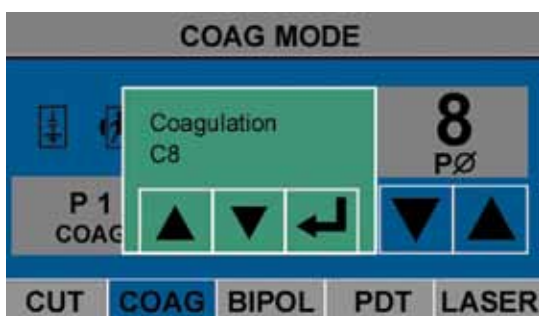
Level of coagulation C1 – C8.

P1 – P5 = memory places



In pulsed mode the pulse duration can be selected from 50 ms – 1 s with the ▲ and ▼ buttons.

Confirm with ↵.



If the button for level of coagulation is touched, a green window opens and the level of coagulation can be adjusted from C1 – C8 with ▲ and ▼.

Confirm with ↵.

P1 COAG PULSE	7 Pø C8 250 ms
P2 COAG PULSE	17 Pø C3 350 ms
P3 COAG PERM	17 Pø C1
P4 COAG PULSE	18 Pø C3 200 ms
P5 COAG PERM	19 Pø C3

5 memory places are available.

Pressing the area 1 – 5 for more than 2 sec the actual parameter will be stored.

Recall of stored parameter simply press the area number.

Back to COAG MODE with ↵.

## HF-BIPOLAR MODE

Symbols



Permanent coagulation  
(COAG PERM)



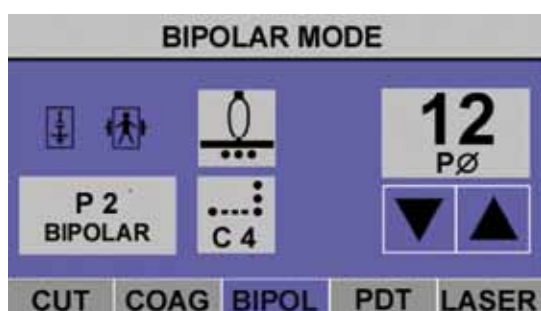
Pulsed coagulation  
(COAG PULSE)



Pulse duration



Level of coagulation



In COAG MODE – blue-violet display – the parameters for bipolar coagulation can be selected.

Power: from 10 – 100% of nominal power, by selection with ▲ and ▼  
Permanent or pulsed coagulation .

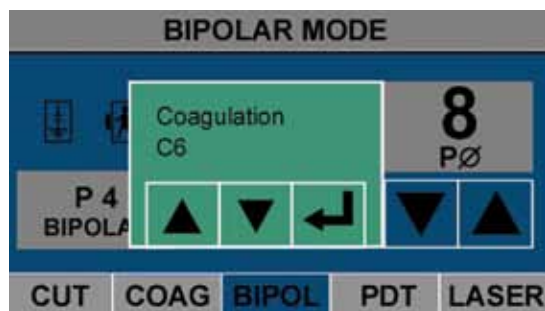
Level of coagulation C1 – C8

P1 – P5 = memory places



In pulsed mode the pulse duration can be selected from 50 ms – 1 s with the ▲ and ▼ buttons.

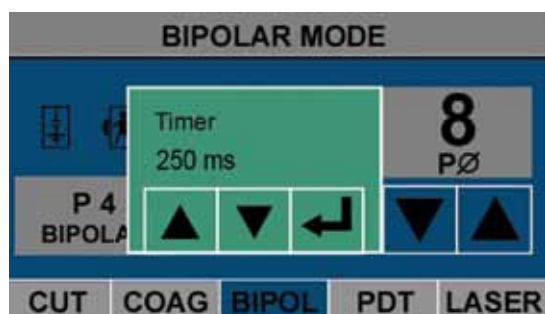
Confirm with ↵.



If the button for level of coagulation is touched, a green window opens and the level of coagulation can be adjusted from

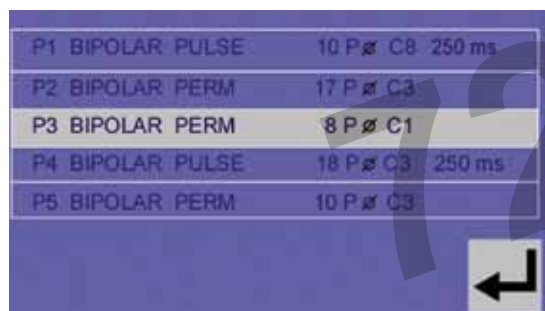
C1 – C8 with ▲ and ▼.

Confirm with ↵



In pulsed mode the pulse duration can be selected from 50 ms – 1 s with the ▲ and ▼ buttons.

Confirm with ↵.



5 memory places are available.

Pressing the area 1 – 5 for more than 2 sec the actual parameter will be stored.

Recall of stored parameter simply press the area number.

Back to BIPOLAR MODE with ↵.



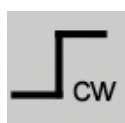


IMPORTANT REMARK:

For optimal guiding of the laser fiber we recommend to use a Miraject PL Super cannula (REF 254 214). Please consider that sufficient fiber length should be positioned, in case the cannula should be bended.

## LASER MODE

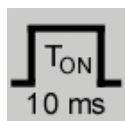
### Symbols



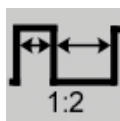
Permanent LASER  
(LASER cw)



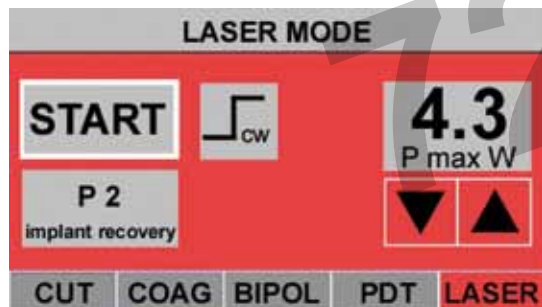
Pulsed LASER  
(LASER pulse)



Puls on



PPR: Pulse-Pause-Ratio



In LASER MODE – RED display – parameters of the power laser 975 nm can be adjusted.

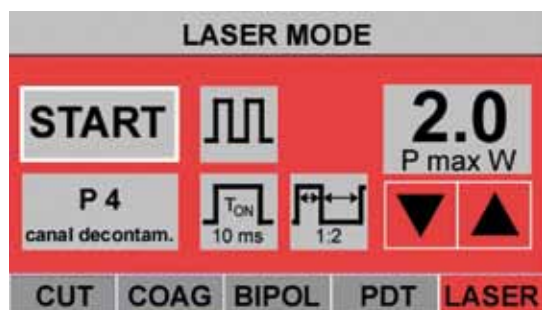
Power: 0,1–6 W, adjust with ▲ and ▼

Mode: cw (continuous wave)/pulsed, activation by pressing button cw

Pressing START activates the unit.

P1 – P10 = preset programs

P4: Program is limited to 2 Watt

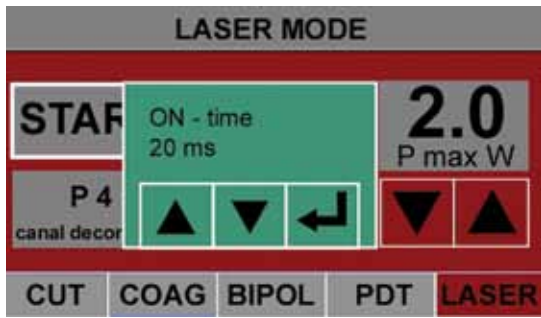


In pulse mode the pulse duration ( $T_{on}$ ) and the Pulse-Pause Ratio (PPR) relation can be set.

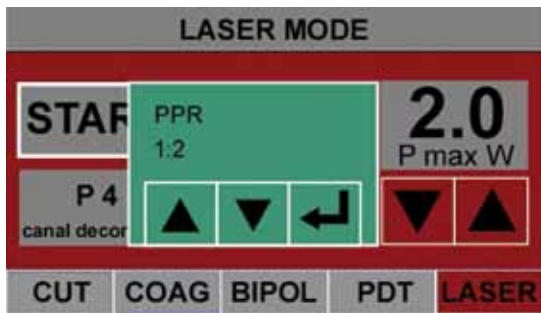
$T_{on}$ : is the pulse time laser ON

PPR (Pulse-Pause Ratio): can be set from 1:1 up to 1:20

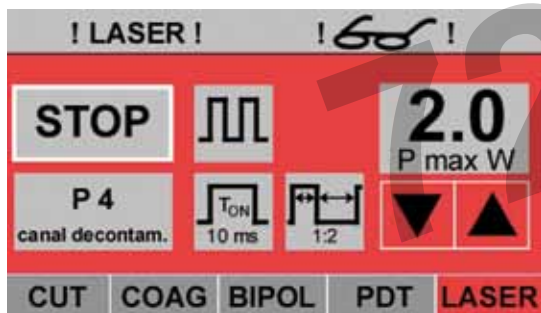
Pressing START activates the unit.



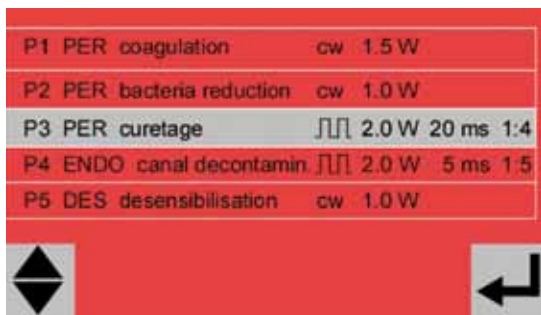
Ton: adjustable with ▲ and ▼  
 Confirm Ton with ↵



PPR: activation by pressing the button PPR adjustable with ▲ and ▼  
 Confirm with ↵



Once the laser is activated, the status bar shows !LASER! and a symbol for safety goggle.  
 Pressing STOP switches the unit into standby



10 memory places (2 pages)  
 Pressing an area 1 – 5 recalls a preset program  
 Changes to the program with pressing for more than 2 sec.  
 Back to LASER MODE with ↵.

P6	SUR	crown lengthening	ΠΠ	4.0 W	10 ms	1:2
P7	SUR	fibroma removal		cw	3.0 W	
P8	SUR	gingivectomy	ΠΠ	4.0 W	10 ms	1:2
P9	IMPL	implant recovery		cw	4.0 W	
P10	BLEA	bleaching		cw	2.0 W	



Pressing an area 6 – 10 recalls a preset program.

Changes to the program with pressing for more than 2 sec.

Back to LASER MODE with ↵.

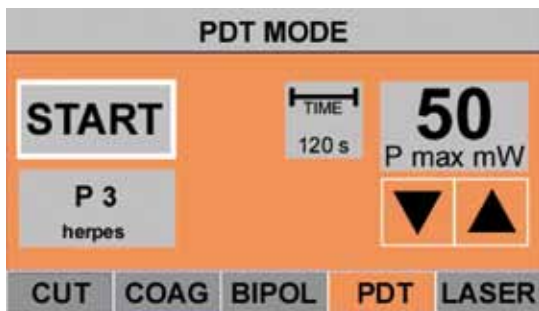
72 dpi



**IMPORTANT REMARK:**

For optimal guiding of the laser fiber we recommend to use a Miraject PL Super cannula (REF 254 214). Please consider that sufficient fiber length should be positioned, in case the cannula should be bended.

**PDT/LLLT MODE**



In PDT/LLLT MODE – ORANGE display – the following parameter for PDT/LLLT-laser (660 nm) can be adjusted.

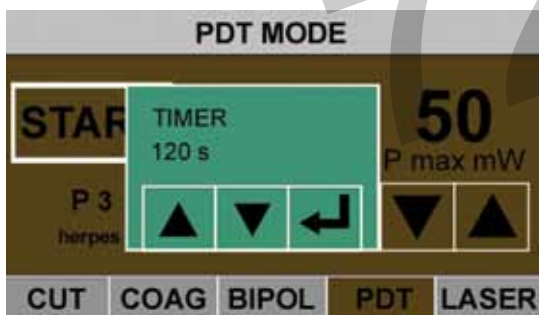
Power: 10 – 100 mW cw

Time of Irradiation: 1 – 300 s

PRG = preset programs

MEM = memory

Pressing button START activates the unit.



Set timer with ▲ and ▼

Confirm with ↵.

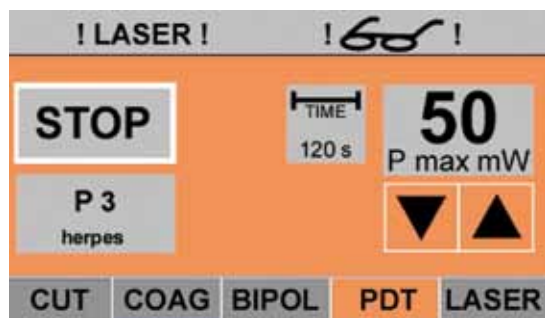
P1	PDT photodyn. therapy	50 mW	60 s
P2	acupuncture pain treatment	90 mW	180 s
P3	herpes	50 mW	240 s
P4	aphthae	100 mW	60 s
P5	pressure points	100 mW	120 s

5 memory places

Pressing an area 1 – 5 recalls a preset program.

Changes to the program with pressing for more than 2 sec.

Back to PDT MODE with ↵.



Once the laser is activated, the status bar shows !LASER! and a symbol for safety goggles.

Pressing STOP switches the unit into standby.

72 dpi

## Conditioning advice for hand pieces of LaserHF (DIN ISO 17664:2004)

### General advice

- Only use cleaning and disinfection materials, which are checked and permitted by local advisory boards.
- Do never clean the laser hand pieces with bleaching agents, chloric cleaning substances, liquid or chemical disinfection solutions or other products based on sodium hydrate (i.e. bull cleaner) – the anodized aluminum surface can be damaged.

### For cleaning and disinfection please follow this direction:

- Open the fixture (clamp bolt).
- Remove light fiber from the clamp bolt.
- Remove canula from the clamp bolt.
- Rinse handle, clamp bolt and canula using a pH-neutral cleanser. Remove all blood and tissue residuals.
- Use disinfection spray for handle, clamp bolt and canula.
- Clean handle, clamp bolt and canula with ultrasound before autoclave.

### Sterilization (cleaning as above) of radio frequency (HF) hand pieces

- Remove electrode from hand piece.
- The radio frequency (HF) hand piece can be sterilized including the cable (i.e. steriCLIN-bag).
- The hand piece should be sterilized in an autoclave using 134 °C at 5 minutes exposure time at 2 bar overpressure.

### Sterilization of the laser hand piece

- Hand piece and clamp bolt can be autoclaved in a bag (i.e. steriCLIN-bag).
- The hand piece should be sterilized in an autoclave using 134 °C at 5 minutes exposure time at 2 bar overpressure.
- Only autoclaves should be used which comply with EN 13060 or which at least work with fractioned streaming processes and are adequate for sterilization of hand pieces.
- Sterilization of laser fibers – separate directive.

**For disinfection and sterilisation of LaserHF „comfort“ hand pieces and Fiber Tips, see separate instructions.**



#### IMPORTANT ADVICE:

NEVER autoclave hand piece and clamp bolt WITH interposed laser fiber.

## ERROR management

Every ERROR will be displayed in a picture-in-picture function in the display.

Then a purple sub-window appears with ERROR status and ERROR number. The ERRORS are arranged by priorities, always only the most serious ERROR will be displayed.

### ERROR Groups:

INFORMATION – can be acknowledged with the return button

- If the laser or PDT fiber is not recognized at the laser outputs
- If the interlock connection is open
- If – after START of LASER / PDT – the foot switch is not used for 2 minutes
- If a hand piece is in the tubular switch and should be activated

DATA ERRORS – can be acknowledged with the return button

- All relevant data will be always checked on plausibility and double stored
- AN ERROR will be displayed, if
  - > an ERROR is detected during reading/storing
  - > parameter will show wrong values

ERRORS, which stop the initiation

- ERROR in hardware
- ERROR in monitoring
- ERROR in communication
- ERROR in ROM
- Power down / Emergency

If any errors occur, please contact the HAGER & WERKEN Service.

**List error messages**

Message	Error no.	Description
Check Laser-Fiber	0001	Laser fiber not connected
Check PDT-Fiber	0002	PDT-fiber not connected
Interlock	0003	Interlock not closed
No Hand Piece	0004	Hand piece not taken from tubular switch
Start-Timeout	0006	Timeout during initiation of Laser/PDT
Backup-Data	0016	Backup of configuration parameter
Backup-Data	0001	Backup of working parameter
Backup-Data	0256	Backup of mode parameter
Standard-Data	0032	Default value configuration parameter loaded
Standard-Data	0002	Default value work parameter loaded
Standard-Data	0512	Default value mode parameter loaded
Data-Error	0064	Correction configuration parameter
Data-Error	0004	Correction Work parameter
Data-Error	1024	Correction Mode parameter
Hardware-Error	0001	ERROR_VOLTAGE_NOT_LOW
Hardware-Error	0002	ERROR_CURRENT_NOT_LOW
Hardware-Error	0003	ERROR_DRVBACKLAS_NOT_HIGH
Hardware-Error	0004	ERROR_DRVBACKPDT_NOT_HIGH
Hardware-Error	0005	ERROR_HFBACKM1_NOT_HIGH
Hardware-Error	0006	ERROR_HFBACKM2_NOT_HIGH
Hardware-Error	0007	ERROR_HFBACKB_NOT_HIGH
Hardware-Error	0008	ERROR_HFDRVMON_NOT_LOW
Hardware-Error	0009	ERROR_FIN1_NOT_HIGH
Hardware-Error	0010	ERROR_FIN2_NOT_HIGH
Hardware-Error	0011	ERROR_FOOT_NOT_HIGH
Hardware-Error	0012	ERROR_VOLTAGE_OUT_OF_RANGE
Hardware-Error	0013	ERROR_CURRENT_OUT_OF_RANGE
Hardware-Error	0014	ERROR_DRVBACKLAS_NOT_LOW
Hardware-Error	0015	ERROR_DRVBACKPDT_NOT_LOW
Hardware-Error	0016	ERROR_HFDRVMON_NOT_HIGH
Hardware-Error	0017	ERROR_VOLTAGE_OUT_OF_RANGE_HF1
Hardware-Error	0018	ERROR_VOLTAGE_OUT_OF_RANGE_HF3
Hardware-Error	0019	ERROR_CURRENT_OUT_OF_RANGE_HF3
Hardware-Error	0020	ERROR_CURRENT_OUT_OF_RANGE_PDT



Hardware-Error	0021	ERROR_CURRENT_OUT_OF_RANGE_LAS
Hardware-Error	0022	ERROR_HFBACKM1_NOT_LOW
Hardware-Error	0023	ERROR_HFBACKM2_NOT_LOW
Hardware-Error	0024	ERROR_HFBACKB_NOT_LOW
Hardware-Error	0025	ERROR_VLASER_NOT_LOW
Hardware-Error	0026	ERROR_FOOT_NOT_LOW
Hardware-Error	0027	ERROR_UNKNOWN_OPMODE
Hardware-Error	0028	ERROR_ROM_CHECK
Hardware-Error	0029	ERROR_RAM_CHECK
Hardware-Error	0030	ERROR_EE_CHECKSUM
Hardware-Error	0031	ERROR_VLASER_TOO_LOW
Hardware-Error	0032	ERROR_VLASER_TOO_HIGH
Diagnosis-Error	0257	HF-Powertoo high
Diagnosis-Error	0258	HF-Power too low
Diagnosis-Error	0259	HF analog voltage too high
Diagnosis-Error	0260	Laser-Power too high
Diagnosis-Error	0261	Laser-Power too low
Diagnosis-Error	0262	Laser analog current too high
Diagnosis-Error	0263	PDT-Power too high
Diagnosis-Error	0264	PDT-Power too low
Diagnosis-Error	0265	PDT analog current too high
Diagnosis-Error	0266	Idle analog voltage too high
Diagnosis-Error	0267	Idle analog current too high
Diagnosis-Error	0511	HF-Power out of Range
Communication-Error	0513	No connection to Power supply electronics
ROM-Error	Checksum	Failed check of program storage
Power-Off/Emergency	--	Unit switched off / Emergency

## Application examples: Laser

High Power Laser 975 nm						
PRG No.	program / indications	Power (W)	modus (ms) Ton	PPR (Pulse-Pause-Relation)	fiber (µm)	remarks
1	periodontics coagulation	1,5	cw		320	
2	periodontics bacteria reduction	1,0	cw		320	up and down movement, circular around the tooth
2	periimplantitis	1,0 - 1,5	cw		320	contact
2	stomatitis aphtosa	0,5 - 1,0	cw		320	with increasing power 3 – 4 times, about 60 s
2	direct overcapping and vital amputation	1,0 - 1,2	cw		320	contact, no pressure 5 – 10 s
3	periodontics, curetage	2,0	20	1:2 – 1:3 ~ 12 – 15 Hz	320	
4	endo – canal decontamination	2,0	5	1:4 – 1:5 ~ 35 – 40 Hz	200	First dry the root canal with paper tip. Insert fiber up to 3 mm distance from apex and pull out slowly within 10 – 30 s, with circular movement. 320 µm fiber is also possible!
5	desensibilization (tooth necks, stubs)	0,1 - 0,5 [= Limit]	cw		320	non-contact 0.5 – 1.0 cm distance to the treatment area, steady circular movement
6	surgery – crown lengthening	3,0 (max. 4,0)	10	1:1 – 1:3 ~ 35 – 50 Hz	320	
7	surgery – fibrom removal	5,0	cw		320	incision / excision
8	surgery – gingivectomy	3,0	10	1:2 – 1:3 ~ 35 – 50 Hz	320	
9	implant recovery	4,0	cw		320	
10	bleaching	2,0	cw		320	first apply bleaching material irradiate each tooth in a distance of 3 – 5 mm for 30 s. if bubbles occur stop irradiation and continue without laser
10	Apthae	2,0 - 3,0	cw		320	non-contact in a distance of 5 - 8 mm, about 30 s/cm <sup>2</sup>
<b>Attention!</b> Avoid to irradiate with a high power laser at a single point as it may lead to burnings of the mucosa!						

Therapy Laser 660 nm					
PRG No.	program / indications	power (mW)	time (s)	fiber (µm)	remarks
1	PDT photodynamic therapy (periimplantitis, periodontics, endo – root canals)	10 - 100	10 - 300	320	apply the color liquid / gel for a period of 30 – 60 s flush with water irradiate with the laser 30 – 60 s
2	acupuncture, pain treatment	90	250	320	contact / non-contact time: about 120 – 300 s
3	Herpes	50	300	320	non-contact time; about 120 – 300 s keep the laser fiber under steady movement start with 1 cm distance to treatment area, than closer up to 2 mm
4	Apthae	100	100	320	non-contact about 120 – 300 s
5	pressure points and wound management	100	100	320	

## Application examples: HF

HF CUT & CUT COAG				
PRG No.	programm	power (Watt)	coagulation grade	Indications & remarks
1	CUT	35		(filtered wave) - sulcus dilatation - gingivectomy - internal gingivectomy
3	CUT	28		- open curetage - tumor resection - lap preparation - vestibulum plastic - excision
2	CUT COAG	26	C2	(slightly modulated or non filtered wave) - gingivoplastic - exposure of teeth, stubs, approximal steps or crown edges
4	CUT COAG	15	C5	- removal of hyperplasia for ablation of tissue if simultaneous coagulation is requested with the cut
5	CUT COAG	18	C6	(Attention: 10% loss of tissue about 24 h post operatively due to extended lateral heat) Use only if distance to bone or periost is sufficient!

HF COAG PERM & COAG PULSE					
PRG No.	programm	power (Watt)	coagulation grade	time (ms)	Indications & remarks
1	COAG PERM	25	C3		(strong modulated wave = half wave modulated) - only for coagulation
2	COAG PERM	30	C1		- little use in the oral cavity!
3	COAG PERM	7	C3		- a continuous coagulation should be considered merely in patients, which are therapeutet by blood thinning medication <b>Attention: plane and deep areas!</b>
4	COAG PULSE	35	C3	200	pulse coagulation (patented in HF-Surg and LaserHF units) - punctual with a thick needle electrode, optimal for COAG
5	COAG PULSE	30	C1	200	- denaturation of top cell layer, hemostasist

HF BIPOLAR PERM & BIPOLAR PULSE					
PRG No.	programm	power (Watt)	coagulation grade	time (ms)	Indications & remarks
1	BIPOLAR PERM	25	C3		(strong modulated wave = half wave modulated)
2	BIPOLAR PERM	30	C1		- plane and deep areas - very intensive
3	BIPOLAR PERM	7	C3		- better use the pulse coagulation
4	BIPOLAR PULSE	35	C3	200	- coagulation of larger vessels in the oral cavity
5	BIPOLAR PULSE	30	C1	200	- use of bipolar forceps may replave suturation or fibrin glue, respectively.

72 dpi

Updated: July 2012



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