



LaserHF[®]



Dental Combination Device
Laser plus radio frequency
User Manual



LaserHF[®] „standard“



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Please carefully read this user manual!

Read this user manual carefully, and familiarize yourself with the use and functions of the unit and all accessories, before you start using the device.

Should you fail to follow the instructions, the following problems may occur:

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

Intended purpose

The LaserHF device is used for cutting, coagulating, removal (laser and radio frequency surgical) and irradiation (laser therapeutic, photodynamic therapy, low level laser therapy, whitening „bleaching“) of soft tissue in dentistry. No essential performance features according to EN 60601-1 are assigned to the device.

Areas of application

The LaserHF device is intended for the use in professional dentistry, and must only be operated by personnel skilled or trained in dental laser and radio frequency surgery.

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 Tips.

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 changes are made to the device and its accessories, unless authorized by the manufacturer.

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 the patient, the operator, or a third person 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 handpiece 8W Laser Red	REF 452 465
LaserHF handpiece PDT Laser Orange	REF 452 466

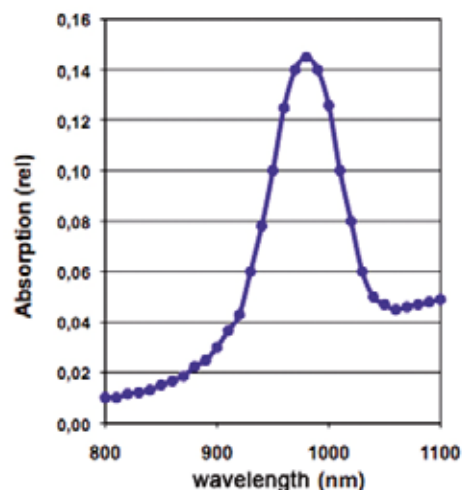
Electrodes:

HF-CUT electrode No. 1, yellow shaft	REF 452 403
HF-CUT electrode No. 2, yellow shaft	REF 452 404
HF-CUT electrode No. 15, yellow shaft	REF 452 407
HF-CUT electrode No. 13, yellow shaft	REF 452 411
HF-COAG electrode No. 31, blue shaft	REF 452 415
Hf-COAG electrode No. 33, blue shaft	REF 452 416
HF handpiece yellow 1,50 m	REF 452 423
HF handpiece blue 1,50 m	REF 452 425
Neutral electrode	REF 452 421
Hager iSpec laser protective glasses, yellow, 808-1064 nm	REF 355 630
Hager iSpec laser protective glasses, over glasses, yellow, 808-1064 nm	REF 355 631
Hager iSpec laser protective glasses, over glasses, blue 650-660 nm	REF 355 632
Hager iSpec laser protective glasses, for patients	REF 355 633
Plug door contact/interlock	
Foot pedal (Steute MKF 1S-MED-AP SK12 IP protection X8)	
User manual / Medical product journal	
(Bipolar forceps optional)	

Laser light and 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 their 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^2 . 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 the treatment of 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 color 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 way it works can be found in the user manual for PDT.

Laser protection and safety regulations in the dental practice



WARNING DANGER

- When separating the laser fiber from the laser device, always cover the connections with the protective caps provided.
- This laser device must not be used in the vicinity of flammable materials or in areas where there is a risk of explosion.
- Materials enriched with oxygen such as cotton wool can catch fire due to the high temperatures of the laser light.
- All flammable solutions that are used to clean and disinfect the LaserHF must have evaporated before the device is used.
- Be aware of the risk of fire from flammable gases.
- The laser vapor contains tissue particles. Bear the risk of infection in mind and wear a mask at all times.



WARNING DANGER

Laser radiation is very dangerous for the highly sensitive, unprotected eye. Therefore, when using laser radiation, both the staff and the patient must wear the safety glasses included in the scope of delivery.

When using the 975 nm laser (red handpiece), the user(s) must wear the glasses with a yellow filter and the patient must wear the full protective glasses.

When using the PDF laser (orange handpiece), the user(s) must wear the glasses with a blue filter and the patient must wear the full protective glasses.

Specifications of the eye protection: Protective filter yellow: 808 - 1064 nm D LB6 + IR LB8 + M LB10

Protective filter blue: 665 - <670 DIR LB4

Patient safety glasses: >315 - 1400 D LB6 + IR LB9 + M LB7

The explanation of the specification is included with every pair of glasses.



Attention

Take into account the maximum bending radius of the light guide:

- Short-term (during treatment): 100 x the radius of the light guide
- Long term (during storage) 600 x the radius of the light guide
- Never bend or jam the light guide, it could break.
- The light guide can get damaged if strongly bent within the handpiece or if improperly guided. This can pose health risks to patients, dentists and assistants.
- Never pull on the light guide.

Further information on laser fibers can be found in the separate UMN for laser fibers.

NOHD (eye safety distance) approx. 1.5 m when the unprotected eye is irradiated for ten seconds (passage of the light guide NA = 0.22).

Interaction of radio frequency (HF)

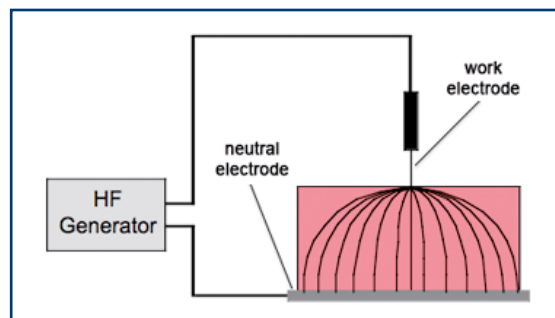
If radio frequency is guided through very thin metal electrodes, a very large electro-magnetic power density is created in the tissue layer. The water is abruptly heated up in these cells which leads to coagulation and rupture, respectively.

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.

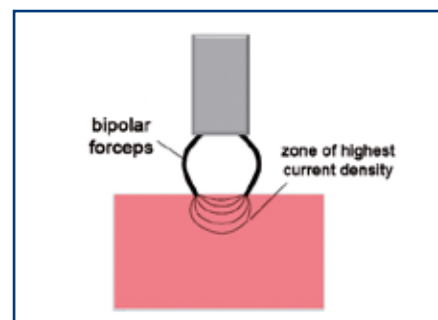
The electric current density leads to a fast and strong heating in tissue, which can be used for cutting and coagulation.



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 current flows into the tissue over one side of the instrument and back to the HF surgical device over the other side of the instrument.

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 \pm 10 nm, 8 Watt, Lk 4
	Pulse Of Duration:	Mode: cw and pulsed: 5, 25, 50, 100 Ms
	Wavelength + Power Pdt/LlIt:	660 nm \pm 5 nm, cw, max. 100 mw, Lk 3b
	Wavelength + Power Pilot Laser:	660 nm, 2 mw, Lk1
Hf	Frequency + Power:	Monopolar 2.2MHz max. 50 W at 1000 ohm load Bipolar 2.2 MHz max. 45 W at 250 ohm load Coagulation 2.2MHz max. 45 W at 1000 ohm load
		Permanently / pulsed
Operating temperature		+10 °C - +40 °C
Storage temperature		-20 °C - +60 °C
Air humidity		When in operation: <85 %, non-condensing When not in operation: < 90 %, non-condensing
Air pressure		When not in operation: 500 hPa - 1080 hPa When in operation: 700 hPa - 1080 hPa
Power supply		230 V Ac, 50/60 Hz Unplug the power plug for an all-pole disconnection of the device
Power consumption		Max. 1.5 A
Power fuse		2 x Tl. 6 AH
Classification medical device		Class IIb
Duty cycle		Continuous Operation 1 Min., Interval Time 4 Min.
Applicators	Fiber with SMA	200 μ m – endodontics 320 μ m – periodontics, implantology 320 μ m – pdt, LlIt Autoclavable
	Handpiece	Autoclavable (only standard version)
Safety		According to DIN EN ISO DIN EN ISO 60601-1
Electromagnetic Compatibility		According to DIN EN ISO 60601-1-2
Safety Hf Surgery Equipment		According to DIN EN ISO 60601-2-2
Safety Laser		According to DIN EN ISO 60601-2-22

Cables

HF handpiece cable, yellow	Length 1.50m
HF handpiece cable, blue	Length 1.50m
HF Bipolar cable, optional accessory	Length 1.50m
HF neutral electrode line	Length 1.50m
Foot switch cable	Length 2.50m
Cable for door contact switch	Unlimited
Power cable	Length 2.50m

Protection and safety provisions in the dental office for the use of radio frequency (HF) surgery of the LaserHF device

The LaserHF device may only be put into operation after the instructions have been given by the operator and in compliance with the prescriptions and safety provisions.



WARNING

The device must only be connected to a power supply with an earth wire in order to avoid the risk of an electric shock.

Check the cables, handpiece and electrodes as well as the foot pedal on visible damage before starting up the LaserHF device. Instruments with brittle or faulty insulation must not be used as they pose a danger of injury.

When operating the LaserHF device, unpredictable malfunctions might occur that could cause unwanted output power increase.

1. A minimum distance of approx. 20 cm from any wall must be kept at all times during operation.
2. The NEUTRAL ELECTRODE should be in close contact with a correspondingly prepared suitable area of the PATIENT'S body with its entire surface, as defined by the PRODUCER.
3. The PATIENT should not get in touch with any metal parts that are grounded or have a significant earth capacitance (e.g. operating table supports, etc.).
4. Skin-to-skin contacts (e.g. between the arms and the body of the PATIENT) should be avoided, e.g. by inserting dry gauze. The cable leading to the LaserHF device should neither touch the patient nor any other wires. Instruments which are temporarily not in use during the treatment have to be kept away from the patient, e.g. on the instrument table.
5. The output power should be set as low as possible for the corresponding purpose.
6. An obviously low output value or functional failure of the LaserHF device in usual operation can be caused by insufficient contact of the NEUTRAL ELECTRODE or insufficient contact in its connections. In such case, the contact of the NEUTRAL ELECTRODE and its connections should be checked before setting a higher output power.
7. The use of ignitable anesthetics or combustible gases like nitrous oxide (N₂O) and oxygen should be avoided if a surgical intervention is executed in the head area, unless these substances are aspirated. If possible, non-ignitable ingredients should be used for cleaning and disinfection. Ignitable ingredients used as cleaning and disinfection agents or as solvents for adhesives should have evaporated before the use of the HF Surgery.
8. For patients with pacemakers or other active implants, there is a potential DANGER of disturbance of the pacemaker function or damage to the pacemaker. In case of doubt, consult an expert.
9. The accessories must have a minimum accessory reference voltage of 500 V. Only use the original accessories contained in the scope of delivery and offered by the manufacturer to achieve maximum safety for the patient and the dentist. The characteristics of the applied parts and wires are adapted to the output power and output voltage of the device, so that a safe operation is ensured for all operation modes and settings.
10. The device must be disconnected from the power supply during cleaning.

11. Service and maintenance tasks must only be executed by authorized specialized personnel.
12. The radiation emitted by the LaserHF device during operation can interfere with the functionality of other electric devices. Computers, laptops and mobile phones should be kept away from the LaserHF device. Data on computers and laptops should be saved beforehand.
13. If any safety provisions and operating instructions contained in this manual are violated, any warranty and liability of the manufacturer is cancelled.
14. In operating rooms, the device must only be used with pedal switches with AP labeling.

Operator regulation

According to Council Directive 93/42/EEC, the device is classified as medical device unit class IIb. Thus all directions of the European operator regulation apply, including those for devices according to Appendix I.

§ 5: Operation and execution

§ 6: Technical controls

§ 7: Medical product documentation

Technical controls:

The user is committed to perform technical controls on a regular basis, in accordance with 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
- Receptacles
- Emergency switch

Measurement of radio frequency (HF) output power at a load of 1 kΩ:

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

Measurement of laser output power (calibration of the laser output)

- Output PDT (10mW and 100mW)
- Output Laser (100mW and 8W)

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.

Legend (for adjacent label)

- | | |
|-----------------------|---|
| ① Attention laser | ⑥ Follow the instructions for use |
| ② Manufacturer | ⑦ Disposal |
| ③ CE mark | ⑧ Defibrillation-protected applied part |
| ④ Foot control | ⑨ Non-ionising radiation |
| ⑤ Door contact switch | ⑩ Date of manufacture |



Safety information!

Invisible laser radiation - laser class 4

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

Preparation to start the device

- In order to avoid condensed water, make sure the unit has been at room temperature for quite some time (e. g. storage room or transportation for at least 2 hours) before you use it.
- 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 dummy connector.
- Connect foot switch to unit.
- Connect power supply cable first to the unit, then to house power output.
- Connect fiber optic cable to the laser handpieces: open fixture, carefully feed the fibercable from the rear through the handpiece and into the fixture, then close fixture. Insert the plug into the socket making sure to match the color of the handpiece. Screw hand-tight without using a tool.
- Open the fixture at radio frequency (HF) handpieces and insert appropriate electrodes. Close fixture.
- Put the handpieces in the receptacles and connect laser light fibers and radio frequency (HF) cable with the unit.
Pay attention to the color codes
- Connect the neutral electrode.
- Push the power switch (back).
- The unit runs an IMMEDIATE self-test in the background.

Label

At the back of the device:
(For legend see page 14)

At the front of the unit:

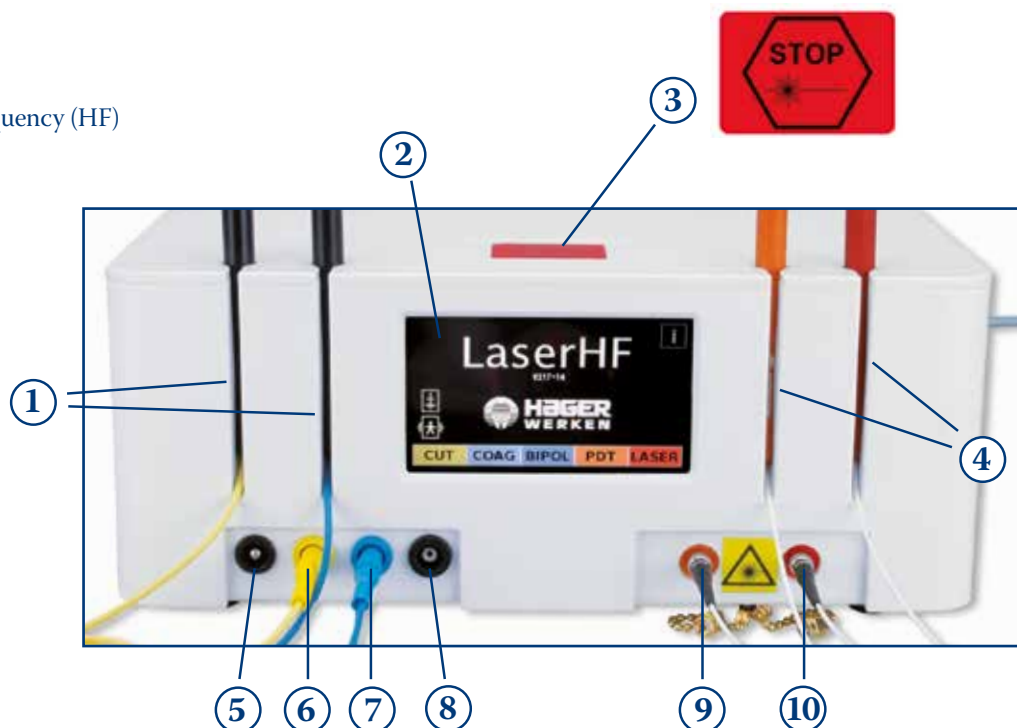


between the two laser outputs

SICHTBARE UND UNSICHTBARE LASERSTRAHLUNG VISIBLE AND INVISIBLE LASER RADIATION BESTRAHLUNG VON AUGE ODER HAUT DURCH DIREKTE ODER STREUSTRAHLUNG VERMEIDEN AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION LASER KLASSE/CLASS 4		
Laser-HF-Chirurgiegerät / Surgical Unit Laser-HF® Type: D001 Netz/Mains: 230 V / 50/60 Hz / 150 VA, 2x T1,6 AH 6450100009 HF-Leistung/Power: 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 Laser: Haupt/Main: <10 W, 975 nm • Pilot: <3 mW, 660 nm • PDT: <100 mW, 660 nm		
Hager & Werken GmbH & Co. KG • D-47269 Duisburg		

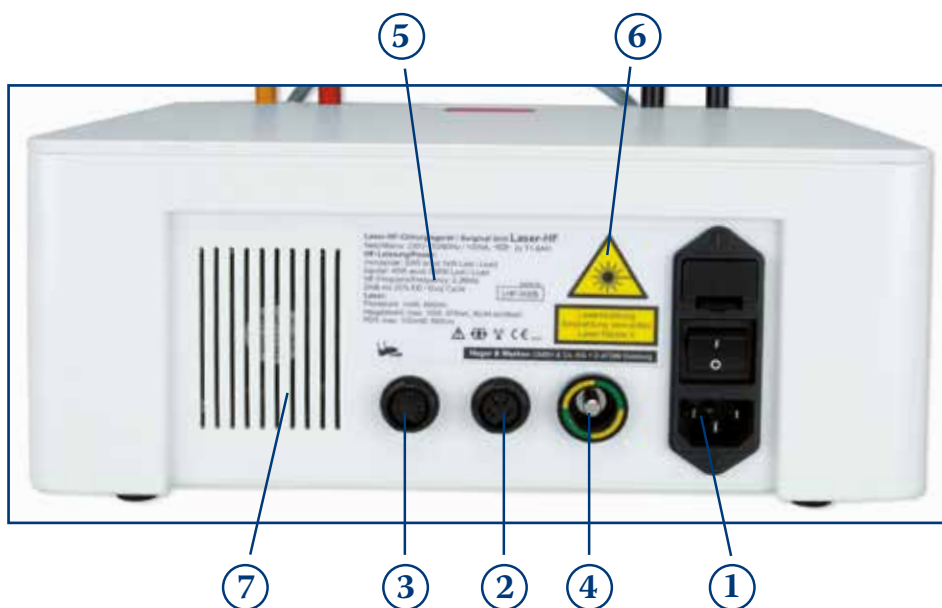
Front

1. Receptacle switch radio frequency (HF)
2. Display (touch screen)
3. EMERGENCY-switch
(on top of unit)
4. Receptacle 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



Back

1. 230 v power supply with fuses and main switch
2. Interlock
3. Foot switch
4. Potential equalization
A connection with good electrical conductivity that minimizes different electrical potentials. Colloqually often referred to as earthing.
5. Type label
6. Laser type
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 receptacle (except BIPOLAR). For safety reasons the simultaneous selection of a mode via touch screen or via receptacle is intended in the following way:

- Whenever a button of mode is displayed in color, the mode can be started or finished using the touch screen or the receptacle switches.
- Once a mode has been selected, it cannot be interrupted with another mode button and another receptacle.
- The BIPOLAR MODE can be selected only by touch screen.
- It is possible to „pre-select“ a mode by activating the according mode button, even without taking the handpiece from the receptacle.
- With the exception of BIPOLAR, the handpiece has always to be taken out of the receptacle for activation.



HF



Standard handpiece



HF-electrode CUT

HF-electrode COAG



Neutral electrode



LASER



Laser handpiece 975 nm



Laser handpiece 660 nm



Fiber

Start

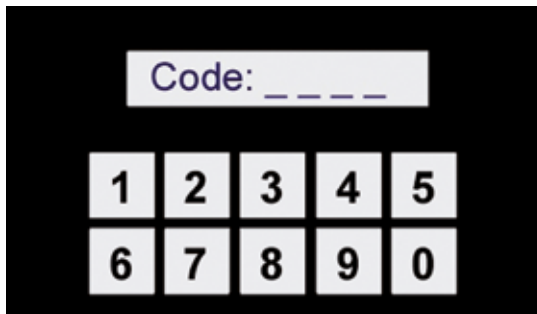
Start the unit by using the power switch at the back of the unit.



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

- CUT
- COAG
- BIPOL
- PDT
- LASER
- i Information

As well as display of software version



The unit's HF-mode is ready for use without requiring a code. When starting the Laser and PDT program, you are asked to enter a User Code.

Laser: Master code 9-9-9-9

(both program, Laser and PDT become activated)

PDT: User Code 0-0-0-0

(User code for persons being entitled to use the PDT Laser)

The master code entitles the operator to use the 975 nm and 600 nm Laser. Should the master code have been used to activate the device and should a PDT-Laser use be indicated, switch off/on the device and activate it by entering the user code.

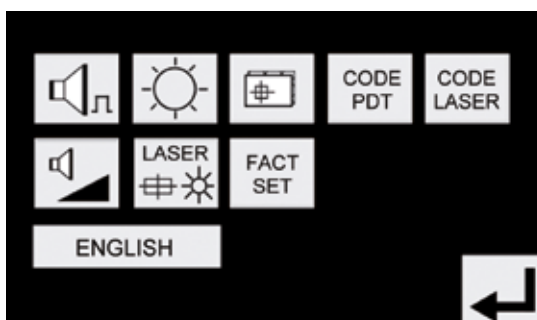
For your own safety, make sure to change the code during first use, see pages 17/19.

If the user code matches the correct four-digit code, the according menu appears. If however, the code input fails, you will be asked to enter the code again.

Following possibilities are available:

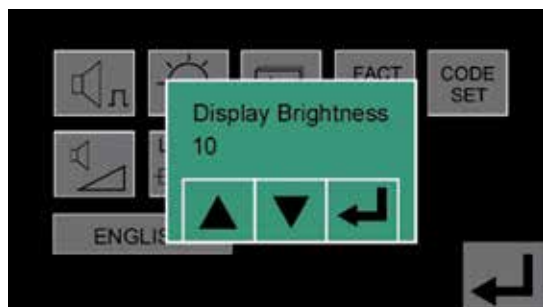
- Go to information menu by pressing the button i in the right upper corner
- Mode selection by buttons – pressing of one of the colored buttons directly lead to a mode. If a mode selection button is GRAY, it is not possible because another mode is active.
- Mode selection by receptacle – by taking the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

Information





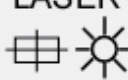


i = Information

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

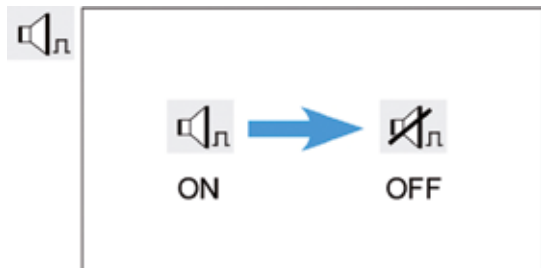


Touch one of the symbol buttons – with exception of FACT SET, SIGNAL ON/OFF, JUSTAGE DISPLAY, CODE SET – and a green window appears. Settings can be changed by using the ▲ and ▼ buttons and accepted by using the ↩ button.

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

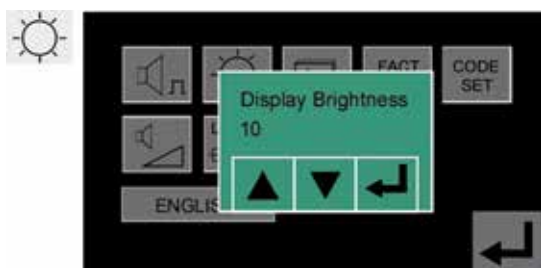
Settings:

Sound for buttons



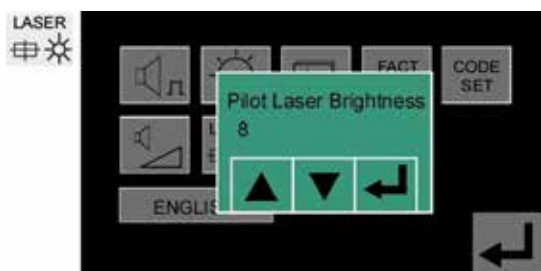
The sound for button confirmation can be set ON/OFF.


Brightness of display



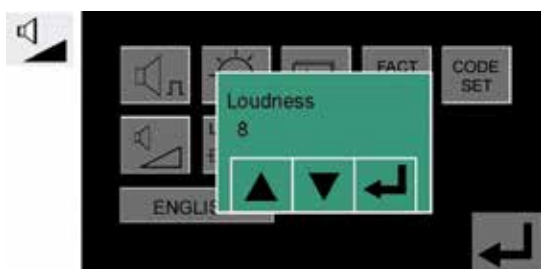
Brightness of the display can be set in steps 1 – 10, confirm with  button.


Brightness of pilot laser



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

Loudness of warning sounds



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

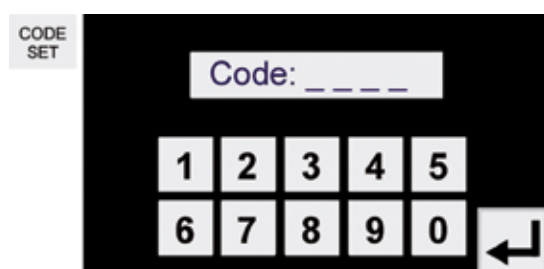
Adjustment of display



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

Confirm by pressing the middle button, until sound occurs.

User code setting



The user of the LaserHF device can change the 4 digit codes and store with the ↩ button.

FACT SET

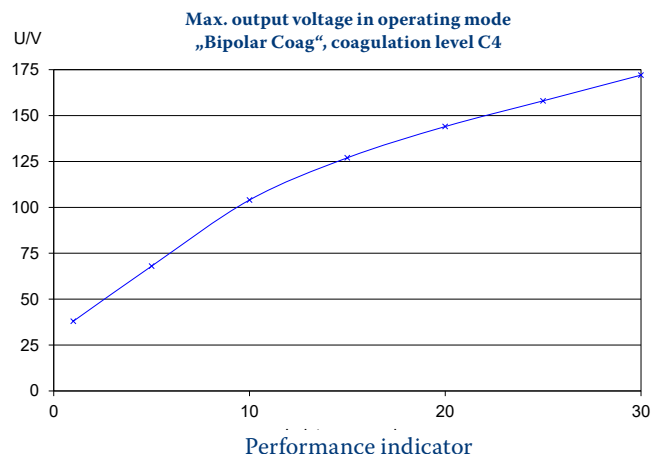
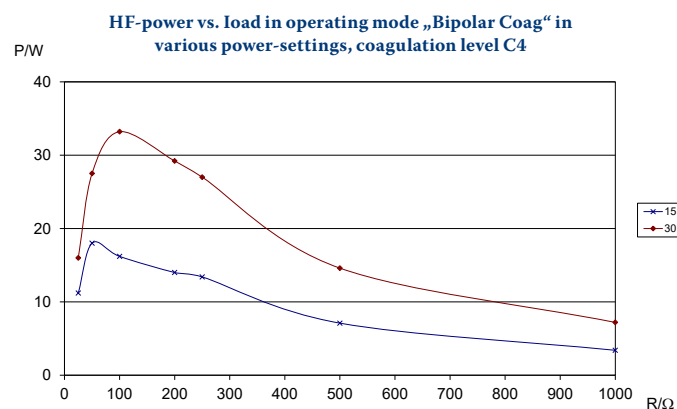
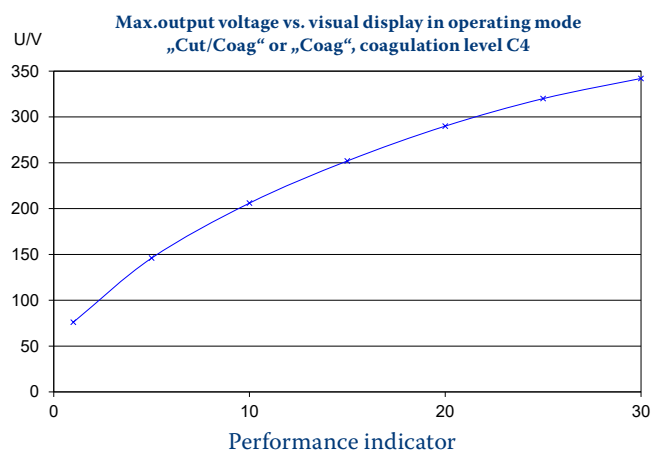
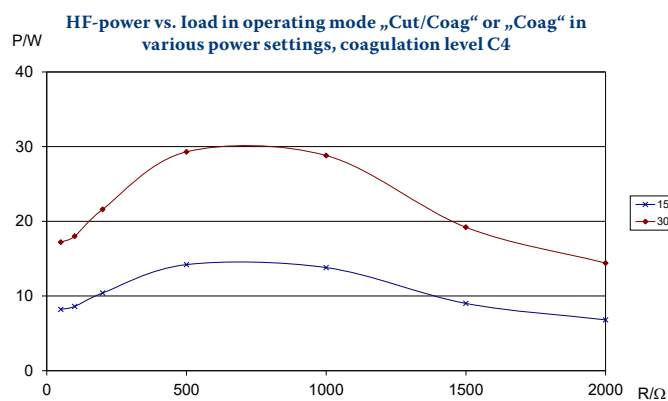
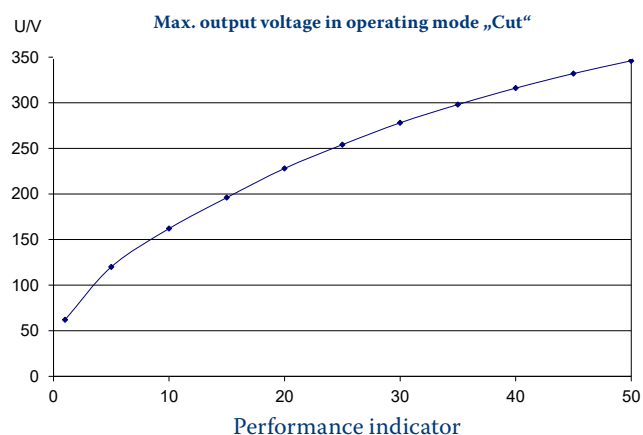
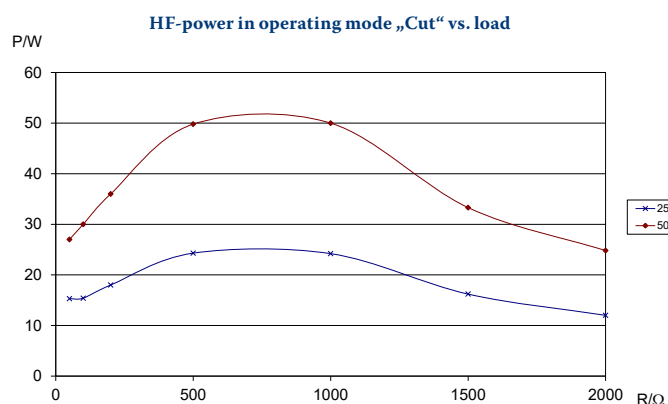
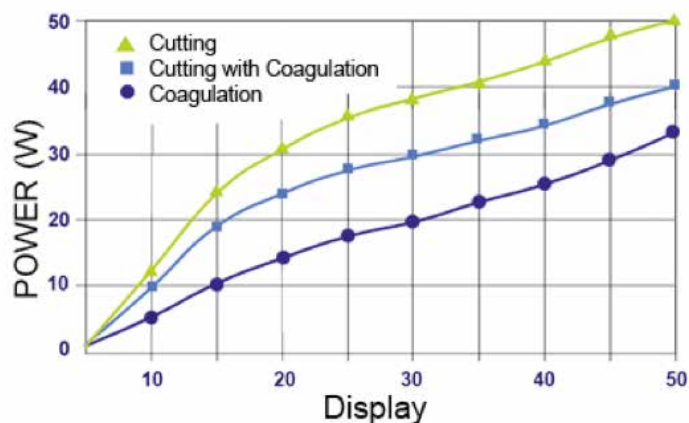
Reset to factory settings by pressing and holding the button – until sound occurs. All storable parameters – except CODE – will be resetted to factory settings.

If you have forgotten your USER CODE, please contact HAGER & WERKEN by email: info@hagerwerken.de and mention the device number of your laser to receive 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 Ω . The settings of the radiofrequency will be displayed without the measuring unit [W] and will be scaled in accordance with the graph.



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.

Tip: Activate the electrode by pressing the foot switch before it touches the tissue. This ensures an even cut from the even cut is possible right from the start.

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 effective hemostasis, does not interfere with primary wound healing and disappears spontaneously after the wound has healed. These cuts do not need suturing, thus this mode is very effective in cosmetic surgery.

Tip: Activate the electrode by pressing the foot switch before it touches the tissue. This ensures an even cut from the even cut is possible right from the start.

Coagulation permanently and pulsed - COAG MODE

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

Tip: The electrode is placed lightly touching the vessel to be coagulated. No pressure! Then the electrode will be activated.

Tip: Do not coagulate in a “blood lake“, but press, spray or aspirate the blood beforehand.

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.

Tip: 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 slides easily through the tissue without resistance and without spark formation.

Wrong: intensity setting too low!

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

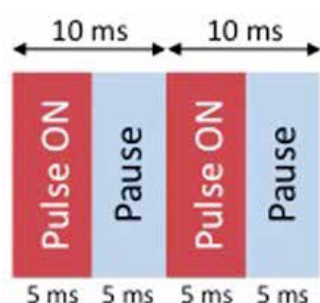
Wrong: intensity setting too high!

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

Setting of level of coagulation (C)

In high-frequency coagulation, the LaserHF device is operated at high power, often not continuously, but in a pulsed manner. This means that the power is not delivered continuously, but in rapid succession with regular pauses. This results in a lower average power output. The longer the pauses in relation to the duration of the power output, the lower the power. A pulse always is 10 ms long, power output 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)
C 1	1	9	45
C 2	2	8	40
C 3	3	7	35
C 4	4	6	30
C 5	5	5	25
C 6	6	4	20
C 7	7	3	15
C 8	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 on the tissue, the maximum level of coagulation should be set at which the delivered power is sufficient for the application.

Description of the modes

HF-CUT MODE

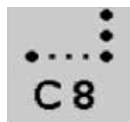
Symbols



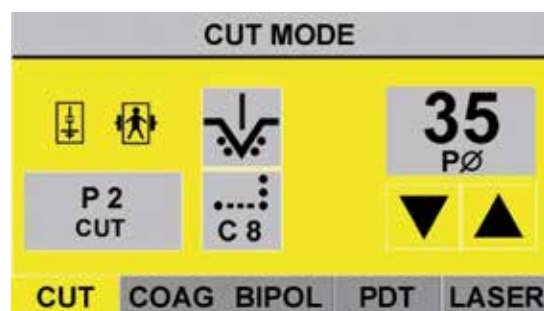
Permanent cutting
(CUT PERM)



Cutting with coagulation
(CUT COAG)



Level of coagulation



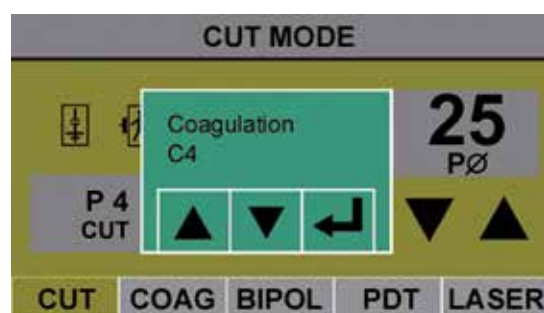
In CUT MODE – yellow display – the parameter for monopolar radio frequency can be selected.

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.

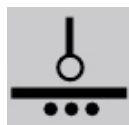
The actual selected parameters will be stored by touching one of the areas 1 – 5 for longer than 2 sec.

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

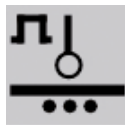
Back to CUT MODE with ↵.

HF-COAG MODE

Symbols



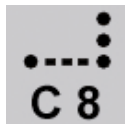
Permanent coagulation
(COAG PERM)



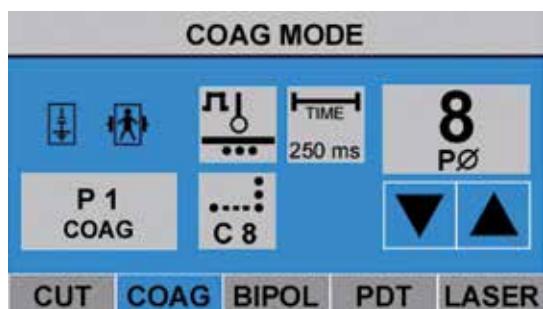
Pulsed coagulation
(COAG PULSE)



Pulse duration



Level of coagulation



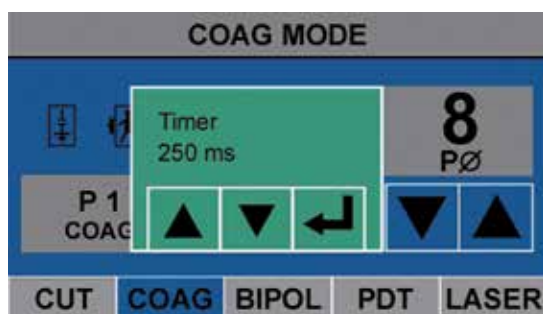
In COAG MODE – blue display – the parameters for monopolar coagulation can be selected.

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

Permanent or pulsed coagulation

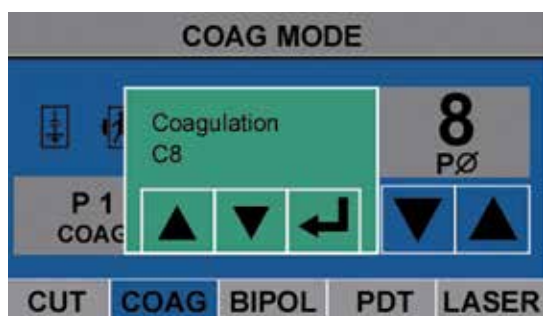
Level of coagulation C1 – C8.

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

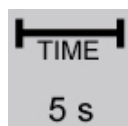
Symbols



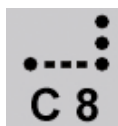
Permanent coagulation
(COAG PERM)



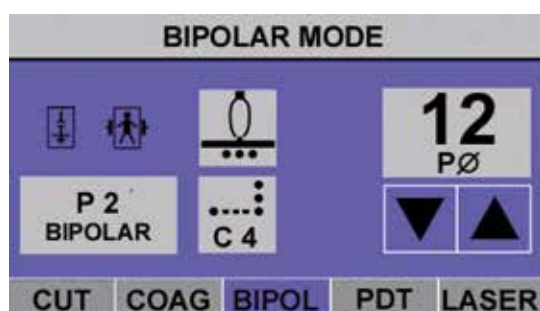
Pulsed coagulation
(COAG PULSE)



Pulse duration



Level of coagulation

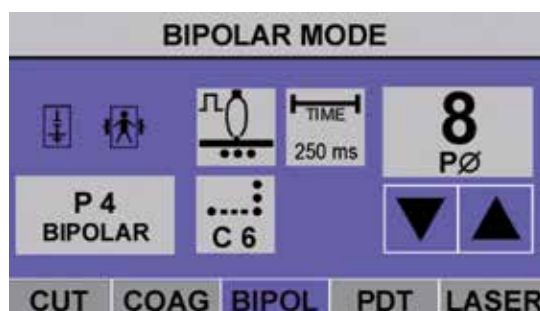


In COAG MODE – blue-violet display – the parameters for bipolar coagulation can be selected.

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

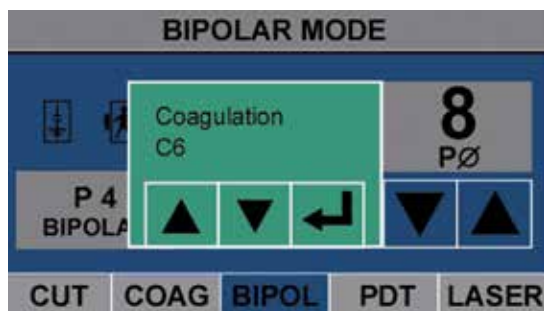
Level of coagulation C1 – C8

P1 – P5 = memory places



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

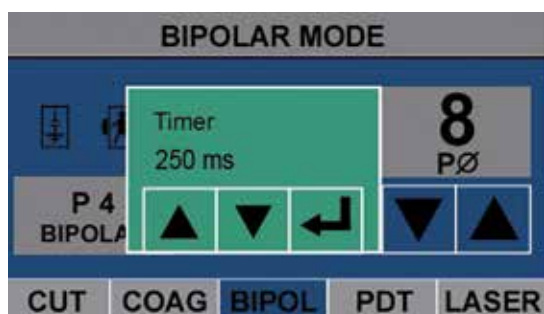
Confirm with ↵.



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

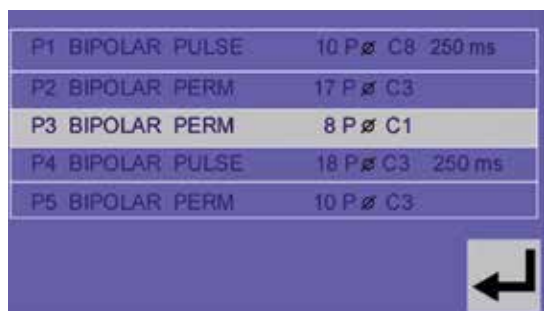
C1 – C8 with ▲ and ▼.

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 ↵.

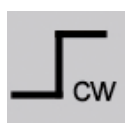


IMPORTANT NOTICE:

For optimal guiding of the laser fiber we recommend placing a Miraject PL Super (REF 254 214) cannula on the bare fiber and handpiece. Please note that there must be sufficient fiber length at the tip of the handpiece if the cannula is to be bent.

LASER MODE

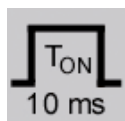
Symbols



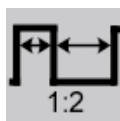
Permanent LASER
(LASER cw)



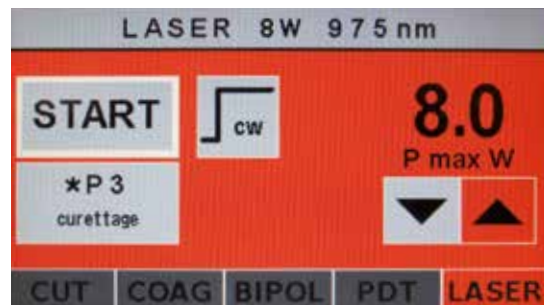
Pulsed LASER
(LASER pulse)



Puls on



PPR: Pulse-Pause-Ratio



In LASER MODE – RED display – parameters of the power laser

975 nm can be adjusted.

Power: 0,1–8 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

P5: Program is limited to 1 Watt

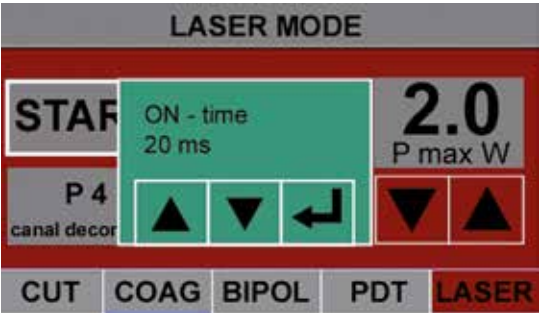


In pulse mode the pulse length (Tone) and the Pulse-Pause Ratio (PPR) relation can be set. This mode shows the Hz-frequency.

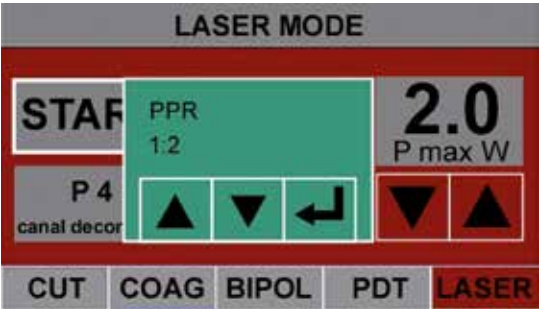
Tone: is the time that the laser is on, activate by touching the Tone button.

PPR (Pulse-Pause Ratio): can be set from 1:1 up to 1:7

Pressing START activates the unit.



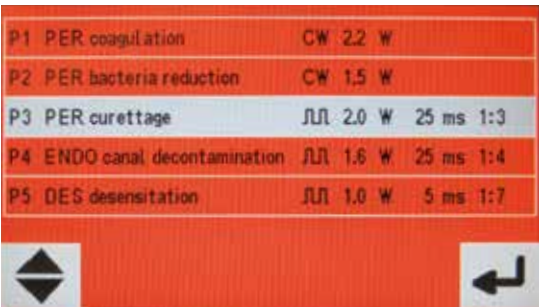
Tone: adjustable with▲ and▼
Confirm Tone with←



PPR: activate 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 goggles.
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	ЛЛ 4.0 W 100 ms 1:1
P7 SUR fibroma removal	CW 5.5 W
P8 SUR gingivectomy	ЛЛ 4.0 W 100 ms 1:1
P9 IMPL implant recovery	CW 4.5 W
P10 BLEA bleaching	CW 3.5 W



Pressing an area 6 – 10 recalls a preset program.

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

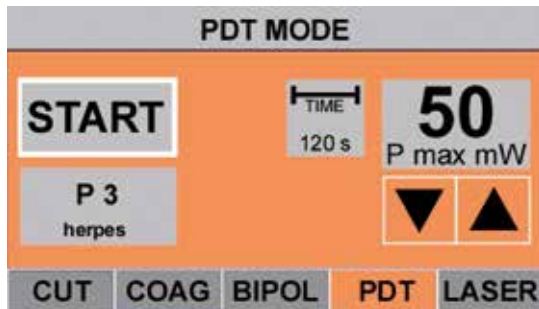
Back to LASER MODE with ↵.



IMPORTANT Notice:

For optimal guiding of the laser fiber we recommend placing a Miraject PL Super (REF 254 214) cannula on the bare fiber and handpiece. Please note that there must be sufficient fiber length at the tip of the handpiece if the cannula is to be bent.

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

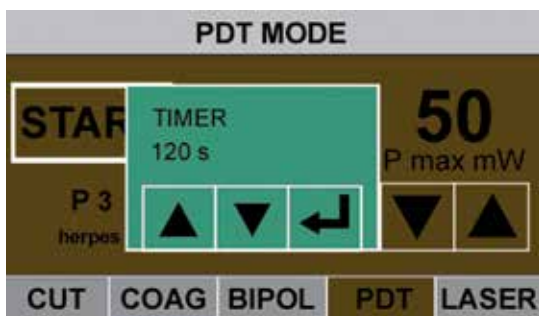
PRG = preset programs

MEM = memory

Pressing button START activates the unit.

Set timer with ▲ and ▼

Confirm with ↵.



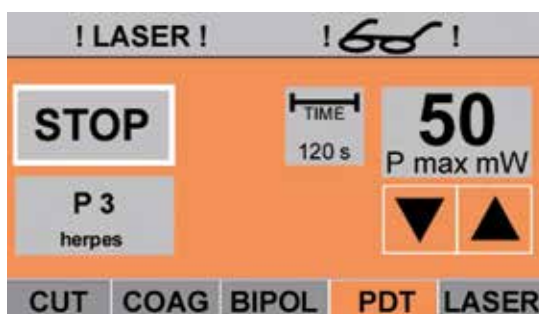
P1	PDT photodyn. therapy	50 mW	60 s
P2	acupuncture pain treatment	90 mW	180 s
P3	herpes	50 mW	240 s
P4	aphthae	100 mW	60 s
P5	pressure points	100 mW	120 s

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 goggle.

Pressing STOP switches the unit into standby.

Cleaning and disinfection of the LaserHF Device

- Only use cleaning and disinfecting wipes approved by the manufacturer for plastic housings.

Reprocessing advice for handpieces of LaserHF (DIN ISO 17664:2004)

General information

- Only use cleaning agents and disinfectants that have been tested and approved by the responsible national bodies.

For information on disinfecting and cleaning the LaserHF handpieces standard version, HF handpieces, and HF electrodes please refer to the instructions included in the concerned packaging.

ERROR management

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

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

ERROR groups:

INFORMATION – can be confirmed 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 operated for 2 minutes or longer.
- If a handpiece is in the receptacle and should be activated

DATA ERRORS – can be confirmed with the return button

- All relevant data is constantly checked for plausibility and stored twice.
- AN ERROR will be displayed, if
 - > an ERROR is detected during reading/storing
 - > parameter will show wrong values

ERRORS that 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.

Environmental protection guideline

According to EU Directive 2012/19 / EU, the following applies to the disposal of electronic and electrical devices:

These devices must not be disposed of with household waste. The user is legally obliged to dispose of these devices at the end of their service life to the public end to collection points or return to the point of sale.

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 Handpiece	0004	Handpiece not taken from receptacles
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-Power too 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) Tone	PPR (Pulse-Pause-Relation)	Fiber (µm)	Remarks
1	Periodontics coagulation	2.2	cw		320	
2	Periodontics bacteria reduction	1.5	cw		320	up and down movement, circularly around the tooth
2	Periimplantitis	1.5	cw		320	contact
2	Stomatitis aphtosa	1.5	cw		320	with increasing power 3 – 4 times, about 60 s
2	Direct overcapping and vital amputation	1.5	cw		320	contact, no pressure 5 – 10 s
3	Periodontics, curetage	2.0	25	1:3	320	
4	Endo – canal decontamination	0.1	25	1:4	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! Limit: 2W
5	Desensibilization (tooth necks, stubs)	0.1	5	1:7	320	non-contact 0.5 – 1.0 cm distance to the treatment area, steady circular movement. Limit: 1W
6	Surgery – crown lengthening	0.2	100	1:1	320	
7	Surgery – fibrom removal	5.0	cw		320	incision / excision
8	Surgery – gingivectomy	0.2	100	1:1	320	
9	Implant recovery	4.5	cw		320	
10	Bleaching	3.0	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 ²
Attention! 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.	Program	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.	Program	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		- hardly necessary in the oral cavity!
3	COAG PERM	7	C3		- a continuous coagulation should be considered merely in patients, which are therapeutized by blood thinning medication Attention: plane and deep areas!
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, hemostasis

HF BIPOLAR PERM & BIPOLAR PULSE					
PRG No.	Program	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	- the use of the bipolar forceps can replace the needle and thread or tissue adhesive



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