ATTENTION:

THIS MANUAL OF INSTRUCTIONS REFERS TO THERMOPULSE COMPACT EQUIPMENT MANUFACTURED BY IBRAMED.

PLEASE READ THIS MANUAL CAREFULLY BEFORE USING THE EQUIPMENT AND ALWAYS REFER TO IT WHENEVER DIFFICULTIES APPEAR.

KEEP THIS MANUAL ALWAYS AT HAND.

Thermopulse Compact - Operation Manual Revised 4º Edition/06/ 2011

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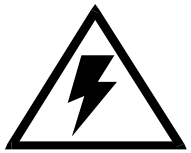
CAUTION!
RISK OF ELECTRICAL SHOCK
DO NOT OPEN IT



The lightning bolt symbol inside a triangle is a warning about the presence of “dangerous voltage”, without insulation in the internal part of the equipment which may be strong enough to cause risk of electrical shock.

An exclamation mark inside a triangle alerts the user about the existence of important operation and maintenance instructions (technical service) for this equipment.

ATTENTION: To prevent electrical shock do not use the equipment plug attached to an extension cable or to any other type of plug except that the terminals fit perfectly in the receptacle. Disconnect the input plug from socket when not using the equipment for a long period of time.

GENERAL CARE WITH THE EQUIPMENT

¨ Install the equipment on a firm and horizontal surface, in a place with perfect ventilation. Keep a near distance of 30 cm between the rear part of the equipment and the wall, in order not to block the hot air from coming out.

¨ During treatment, the electrode cables must always be away from each other and must not touch the patient or any metallic surface. It is advisable to use wooden furniture (with no metallic parts).

¨ The patient under treatment must not touch the equipment cabinet or metallic objects like furniture, windows, etc. Before starting the treatment, make sure that the patient is not using bracelets, rings, watches or any other metallic accessories.

¨ It is advisable to undress the patient in diathermy treatment and place towels between the skin and the electrode, thus avoiding the energy concentration due to transpiration or to the wearing of synthetic clothes.

¨ In case of fitted closet, make sure that there is not any blocking of the free air circulation in the rear part of the appliance.

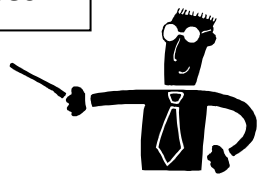
¨ Avoid places exposed to vibration.

¨ Place the cable in order to leave it free, out of places where it can be trodden on, and do not place any furniture over it.

¨ Do not insert objects into equipment orifices and do not place recipients with liquid on it.

¨ Do not use volatile substances (benzene, alcohol, thinner and solvents in general) to wipe the equipment cabinet because they can damage the finishing. Use only a soft, dry, and clean piece of cloth.

Explanation of the symbols used



Attention! Check and observe accurately the instructions contained in the operation manual.

Class I - Equipment with class I protection against electrical shock

- Equipment with BF-applied part.

- Risk of electrical shock.

IPX0 - Equipment is not protected against harmful water penetration.

In the transportation box:

- FRAGILE: The content in this box is fragile and should be handled with care.

- THIS SIDE UP: Indicates the correct position to ship the package.

50ºC

5ºC

- TEMPERATURE LIMITS: Indicates the limit temperatures for transportation and storage the package.

Keep it away from the rain: This package must not be shipped in the rain.

- Do not stack. This equipment cannot be stacked.

Electromagnetic Biocompatibility:

Thermopulse Compact was designed in such a way that it complies with the requirements of NORM IEC 60601-1-2 of electromagnetic compatibility. The objective of this norm is:

- Guaranteeing that the level of spurious signals generated by the equipment and irradiated to the environment are below the limits specified in norm IEC CISPR 11, Group 2, class A (Radiated Emission).
- Guaranteeing the immunity of the equipment to electrostatic discharges, by air contact, stemming from the accumulation of electrical discharges acquired by the body (Electrostatic Discharge – IEC 61000-4-2).
- Guaranteeing the immunity of the equipment when subjected to an electromagnetic field incident from external sources (Immunity to Irradiated RF IEC 61000 -4 -3).

Precautions:

- The operation at short distance (1 meter, for example) from a piece of short wave or microwave equipment may produce instability in the output of other equipment.
- Radio frequency communication equipment, mobile or portable, may cause interference and affect the functioning of Thermopulse Compact . Always install this equipment according to what is described in this instruction manual.

Attention:

- **Thermopulse Compact** complies with the technical norms of electromagnetic compatibility techniques when used with the cables, transducers, and other accessories provided by IBRAMED described in this manual. (Chapter: Accessories and Technical characteristics).
- The use of cables, transducers and other accessories from other manufacturers and /or different than the ones specified in this manual, as well as substituting internal components of Thermopulse Compact , may result in the increase in emission or decrease in the equipment immunity.
- Thermopulse Compact must not be used adjacently or stacked onto other equipment.

Directions and Manufacturer Statement– electromagnetic emissions		
The Thermopulse Compact is destined for use in the electromagnetic environment specified below. The user of the equipment must ensure that it is used in such an environment.		
Emission Assay	**Conformity**	**Electromagnetic Environment- directions**
RF Emissions NBR IEC CISPR 11 IEC CISPR 11	Group 2	Thermopulse Compact uses RF energy only for its internal functions. However, its RF emissions are very low and unlikely to cause any interference in nearby electronic equipment.
RF Emissions NBR IEC CISPR 11 IEC CISPR 11	Class A	Thermopulse Compact is adequate for use in all premises which are not residential and not directly connected to the public low tension electric power distribution line which supplies buildings appropriate for domestic use.
Harmonics Emission IEC 61000-3-2	Class A	
Emissions due to tension fluctuation/ scintillation IEC 61000-3-3	Class A	

Directions and Manufacturer's Statement - electromagnetic immunity			
The Thermopulse Compact is destined for use in the electromagnetic environment specified below. The user of the equipment must ensure that it is used in such an environment			
Immunity Assay	**Level of Assay IEC 60601**	**Level of Conformity**	**Electromagnetic Environment-directions**
Electrostatic Discharge (ESD) IEC 61000-4-2	± 6 kV per contact ± 8 kV by air	± 6 kV per contact ± 8 kV by air	The flooring must be either wooden, concrete or ceramic. If the flooring is covered with synthetic material, the humidity must be of least 30%.
Rapid electric transitory / train pulse (Burst) IEC 61000-4-4	± 2 kV in the Power lines ± 1 kV in the input /output lines	± 2 kV in the Power lines ± 1 kV in the input/output lines	The quality of the power supply should be equivalent to the one of a hospital or a typically commercial establishment.
Surges IEC 61000-4-5	± 1 kV differential mode ± 2 kV regular mode ±	± 1 kV differential mode ± 2 kV regular mode	The quality of the power supply should be equivalent to the one of a hospital or a typically commercial establishment.

Immunity Assay	**Level of Assay IEC 60601**	**Level of Conformity**	**Electromagnetic Environment- directions**
Tension falls, short interruptions and tension variations in the input power lines IEC 61000-4-11	< 5% U_T (> 95% of tension fall in U_T) per 0.5 cycle 40% U_T (60% of tension fall in U_T) per 5 cycles 70% U_T (30% of tension fall in U_T) per 25 cycles < 5% U_T (> 95% of tension fall in U_T) per 5 seconds	< 5% U_T (> 95% of tension fall in U_T) per 0.5 cycle 40% U_T (60% of tension fall in U_T) per 5 cycles 70% U_T (30% of tension fall in U_T) per 25 cycles < 5% U_T (> 95% of tension fall in U_T) per 5 seconds	The quality of the power supply should be equivalent to the one of a hospital or a typically commercial establishment. If the user of the equipment requires continuous operation during energy interruption, it is recommended that the equipment should be fed by a source of uninterrupted power supply or a battery.
Magnetic Field in the frequency of Power feed (50/60 Hz) IEC 61000-4-8	3 A/m	3 A/m	Magnetic fields in the frequency of power supply must be in levels characteristic of a hospital environment or typically commercial.
NOTE: U_T is the c.a.power feed tension before the application of the assay level.			

Directions and Manufacturer Statement –Electromagnetic immunity			
Thermopulse Compact is destined for use in the electromagnetic environment specified below. The equipment user must assure that it is used in such an environment			
Immunity Assay	**Assay level IEC 60601**	**Conformity level**	**Electromagnetic Environment- directions**
RF Conducted IEC 61000-4-6 RF Radiated IEC 61000-4-3	3 Vrms 150 kHz to 80 MHz 10 V/m 80 MHz to 2.5 GHz	3 V 3 V/m	RF Communication equipment, portable or mobile, must not be used next to any part of NEURODYN, including cables, with a separation distance of less than the recommended, calculated from the equation applicable to the frequency of the transmitter. Separation distance recommended $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80 MHz up to 800 MHz $d = 2.4\sqrt{P}$ 800 MHz up to 2.5 GHz Where P is the maximum output nominal potency of the transmitter in watts (W) according to the transmitter manufacturer, and d is the separation distance recommended in meters (m). It is also recommended that the intensity of field established by the RF transmitter, as determined by an electromagnetic inspection at the site [a] be smaller than the conformity in each frequency band [b]. Interference around the do equipment marked with the following symbol might occur: 

NOTE 1: In 80 MHz and 800 MHz highest frequency band is applied.
NOTE 2: These directions may not be applicable in all situations. The electromagnetic propagation is affected by the absorption and reflection of structures, objects and people.

[a] The field intensities established by the fixed transmitters, such as base radio stations, telephone (cellular/wireless) and mobile terrestrial radios, radio amateur, transmission radio AM and FM and TV transmission cannot be theoretically predicted with accuracy. To evaluate the electromagnetic environment due to fixed RF, an electromagnetic inspection at the site is recommended. If the measure of intensity of field at the site where Thermopulse Compact is used exceeds the level of intensity used above the equipment must be observed in order to verify if the operation is normal. If an abnormal performance is observed, additional procedures may be necessary, such as reorientation or the reinstalling of the equipment.

[b] Above the 150 KHz to 80 MHz frequency band, the intensity of field must be smaller than 3 V/m.

Recommended Separation Distances between portable and mobile RF and Neurodyn			
Thermopulse Compact is destined for use in electromagnetic environment in which de RF disturbances are controlled. The user may help prevent electromagnetic interference by keeping a minimum distance between the portable and mobile RF communication equipment (transmitters) and Thermopulse Compact, as recommended below, according to the maximum potency of the communication equipment.			
Maximum Nominal Output potency of the transmitter W	**Separation distance according to the transmitter frequency m**		
	150 KHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.4\sqrt{P}$
0.01	0.12	0.12	0.24
0.1	0.38	0.38	0.76
1	1.2	1.2	2.4
10	3,8	3,8	7,6
100	12	12	24
For transmitters with a maximum nominal output potency not listed above, the separation distance recommended d in meters (m) may be determined by an equation applicable for the frequency of the transmitter, where P is the maximum nominal output potency in watts (W) according to the do transmitter manufacturer. NOTE 1: In 80 MHz to 800 MHz, the separation distance for the highest frequency band is applied. NOTE 2: These directions may not be applicable in all situations. The electromagnetic propagation is affected by the absorption and reflection of structures, objects and people.			

Preliminary Observations

THERMOPULSE Compact is a modern piece of equipment destined for all kinds of high frequency therapy (short wave). The equipment corresponds to **CLASS I BF-applied part** of safety and protection. It must be operated only by qualified professionals and in the medical departments duly authorized.

The use of this unit in sites where there may be explosion risk, as in anesthesia departments, or in the presence of an inflammable anesthetic mixture with air, oxygen or nitrous oxide is not predicted.

ELECTROMAGNETIC INTERFERENCE: Within the limits of electromagnetic disturbance, THERMOPULSE Compact is a piece of electro medical equipment which belongs to Group 2 Class A. The simultaneous use of other medical equipment along with diathermy devices can be dangerous to the patient. To prevent electromagnetic interference we suggest the use of a different power supply circuit for other medical equipment and another, separate group for the short wave equipment. We also suggest that patients and cables are installed at least 3 meters away from short wave therapy equipment. Radio frequency communication equipment, mobile or portable, may cause interference and affect the functioning of Thermopulse Compact.

Concerned for the safety of patient, operator and third parties, IBRAMED suggests the corroboration, at regular time intervals, of service safety and the operation capacity of the appliance according to the indications that are found in the technical papers supplied by the manufacturer.

IBRAMED

Description of Thermopulse Compact

With a modern "design", the cabinet of THERMOPULSE TOWER was designed following the existing medical equipment construction standards (NBR IEC 60601-1 and NBR IEC 60601-2-3). There is a frontal panel which allows the therapist to easily adjust the equipment.

Essential Performance: Thermopulse Compact is a piece of medical equipment by short wave diathermy which generates radio frequency energy (high frequency in 27.12 Mhz) in form of electromagnetic radiation intended for the treatment of several pathologies. The interest in the use of radio frequency (short wave) for therapeutic purposes dates from 1892, when D'Arsonval (physiologist) observed that 10 KHz frequencies or higher had the ability to produce heating in tissues without causing painful muscular contractions or other harmful consequences which might occur in lower frequencies. This type of therapeutic heating became popular because the high frequency currents can penetrate more profoundly in the tissues, presenting more advantages when compared to other methods which heat the tissues in a more superficial manner. Thermopulse Compact does not have a timer and allows the emission of short waves only in the continuous mode. The intensity of radio frequency potency necessary for treatment depends on the sensation of the patient. Therefore, the intensity will generate heating from readily perceivable to little perceivable or slightly perceivable.

THERMOPULSE Compact – ELECTRICAL SUPPLY

Thermopulse Compact is a monophasic CLASS I BF-applied part of safety and protection equipment. Thermopulse Compact is a bi-volt equipment, that is, commutation 110/220 is automatic. There is no need to be concerned about the local power supply line. It is enough to turn on the equipment and it will automatically select 110Volts or 220Volts.

The connection cable is detachable. It has a triple plug with a special terminal for grounding. Therefore, the equipment installation site must have an electric outlet with grounding protection.
The equipment uses the power plug as a resource to electrically separate its circuits in relation to the power supply line in all the poles.
Remember: the "ground wire" connection will be assuring the perfect operation of the equipments and specially the patient's and the operator's safety.

ATTENTION:

Lids providing access to the inner part of the equipment cannot be opened by non-authorized people as it may cause alterations in the equipment functioning and safety risks.

At the rear part of THERMOPULSE Compact, you will find the safety fuses. To change them, turn the equipment off the electrical outlet, remove the protective lids, disconnect the fuse and proceed with the substitution, replacing the lids back in place.
When switching the voltage (110 or 220 volts), place the proper fuses:

Place the adequate fuses, model 20AG of 5A.

SAFETY RISKS MIGHT OCCUR IF THE EQUIPMENT IS NOT PROPERLY INSTALLED.

BIOCOMPATIBILITY of the materials in contact with the patient (ISO 10993-1): IBRAMED declares that the electrodes provided along with the equipment do not cause allergic reactions or potential skin irritation. They should be placed only in contact with the intact surface of the skin, respecting a time period of 24 hours of this contact. There is no risk neither of harmful effects to the cells, nor of allergic reactions or of sensitivity.
Environmental Protection: IBRAMED declares that there are no risks or special techniques associated with the discharge of this equipment and its accessories at the end of their useful life.

RADIOFREQUENCY CABLE COMPATIBILITY

The cables used in the radiofrequency electrodes in this equipment are made of high-insulation-capacity silicone. They are specially made for IBRAMED (Reference: CS 2.50 IB Argensil NA 200 ^{o} C).

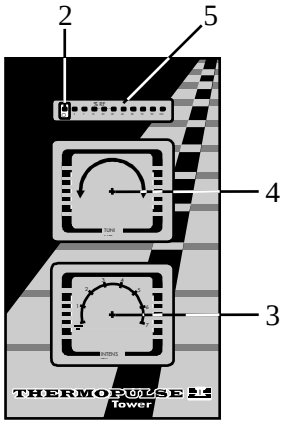
Therefore, in order to prevent risks to the patient, **never replace this cable with another, inappropriate one**. Never use radiofrequency cables and/or electrodes by other manufacturers in the Thermopulse Compact equipment.

Always use cables supplied by IBRAMED.

ELECTRODES – RECOMMENDATIONS

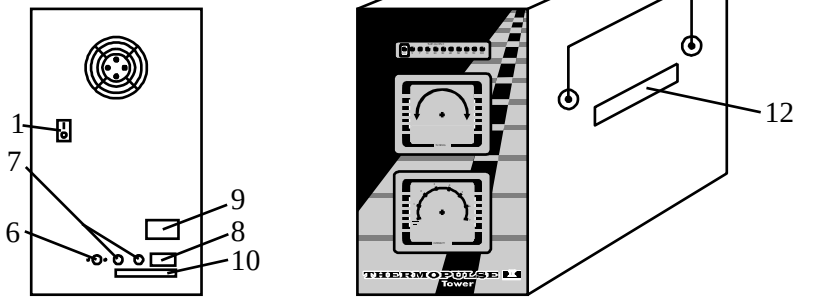
As already seen, the supplied electrodes with THERMOPULSE Tower are made of silicone rubber electrode.
The size (area in cm^2) of the electrodes used in the short-wave diathermy is very important.
We recommend that the user use only the electrodes provided as THERMOPULSE Tower accessories in the near size of 180 x 140 mm.
Despite its contraindication, if the user wants to use another type of electrode, we always recommend the ones bigger than the ones provided as accessories.
Electrodes smaller than the ones provided as accessories will concentrate the radiofrequency on a smaller area and can cause burns on the patient.
Remember that it is advisable to undress the patient for the diathermy treatment and place towels between the skin and the electrode, avoiding, thus, the energy concentration due to transpiration or the wearing of synthetic clothes. Never use the rubber electrode directly on the skin, although the silicone rubber electrodes provided with the equipment do not cause allergic or sensitivity reaction.

THERMOPULSE Compact: Controls, indicators and operation



SIDE

REAR



1- Turn on / Turn off switch: 0 - off I – on

2- Led ON - Indicates the equipment is on and ready for the operation.

3- INTENSITY control - potency intensity necessary for the treatment:. Allows selecting the potency intensity to be applied to the patient. There are 7 levels of potency which properly regulate the power supply even at a short electrode-skin distance, without overheating the skin. On the stand by position, the equipment will remain at rest. If in some application the level 1 is still excessively "strong", you can take it out of tuning thus decreasing the potency transferred to the patient.

4- TUNING Control - Appliance tuning command. This control is connected to a set of LED indicators (5) and allows adjusting the "patient circuit" to the electronic circuit of the appliance. Turn up this control until most of the indicator lights are on. This condition indicates perfect tuning and transference of energy to the patient's body.

5- Set of LEDs indicating the tune - % RF OUTPUT:- As mentioned above, it indicates the ideal tuning point. It will also tell us the approximate RF percentage transmitted to the patient. Example: Supposing that the tuning point was in the indicator LED 70. The equipment provides the maximum of 100 watts to the patient circuit. Therefore, at this moment it will be “passing" to the patient 70% of these 100 watts, or, 70 watts.

6- Supply voltage switch: (110/220 volts). Read in this manual the chapter: Electrical Supply.

7- Protective fuses - Never use fuses of different values than the original. Read in this manual the chapter: Electrical Supply.

8- Power cable connection to be connected to the power supply system.

9- Characteristics plate.

10- Potency plate and power supply system voltage.

11- Electrodes output connection.

SHORT-WAVE DIATHERMY - INTRODUCTION

Short-Wave therapy is a treatment modality known for more than 50 years. Originally used in muscle-skeletal conditions and joints that require increased circulation and other benefits of the temperature increase, the Diathermy is currently used for the treatment of a broad range of pathologies that also require these benefits.

The analgesic qualities of heat, the ability to relax the skeletal musculature and the capacity to increase the circulatory drainage put the Diathermy as a safe, comfortable and effective treatment modality.

THE USE OF HIGH FREQUENCY CURRENTS FOR THERAPEUTIC PURPOSES

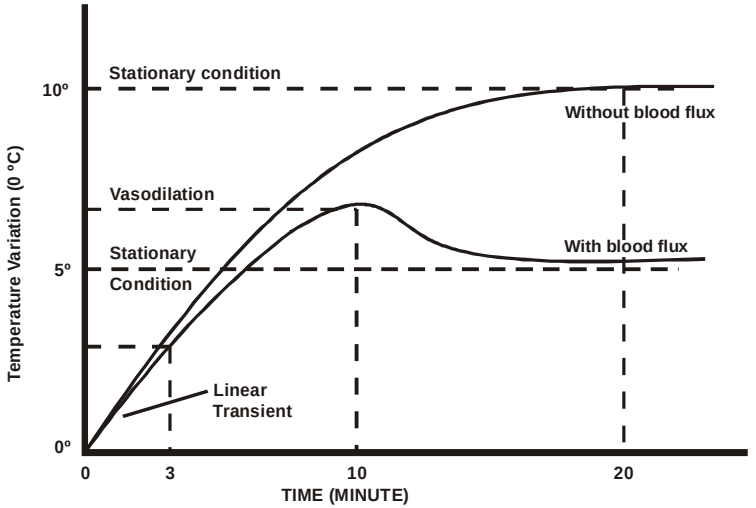
The interest in the use of high frequency currents (short waves) for therapeutic purposes began in 1982 when d'Arsonval (physiologist doctor) observed that currents applied at frequencies of 10 KHz or higher had the ability to heat the tissues without causing painful muscle contractions or other damaging consequences that may occur in lower frequencies.
This kind of therapeutic heating became popular because the high frequency currents can penetrate deeper into tissues, presenting superior advantages when compared to the other methods that heat the tissues in a superficial way. While through a light bath it can be observed a stressed decline in the temperature 15 minutes after the end of the treatment, with the use of the high frequency currents (short waves), it is observed an initial increase in the temperature which is kept for up to 90 minutes after the end of the treatment. This interesting comparison considers the thermal effect considerably the most lasting of the short-wave therapy.

The tissues are composed of cells encapsulated by thin membranes containing an intracellular fluid composed of many ionic salts, polar protein molecules and polar water molecules. The extra-cellular fluid has similar ions and polar molecules concentrations, although some of the elements are different.

There are basically two effects caused by the high frequency currents that control the dielectric behavior of tissues: one of them is the fluctuation of the free electric charges or ions, while the other one is the rotation of the molecules dipoles that follow the same frequency of the electromagnetic field applied. Those are the effects responsible for the appearance of electrical currents and therefore, the tissues heating.

HEATING CHARACTERISTICS

Intending to evaluate and understand the therapeutic efficiency of the power deriving from the high frequency currents, we present the picture 1 graph, in which the blood vascularization and the thermal condition become important factors in the dispersion of the power applied.



Picture 1

In tissues with small or insufficient blood flow, the temperature gets monotonically a stationary condition. Meanwhile, for vascularized tissues, there is an accentuated increase in the blood flow due to vasodilatation (when the temperature increases from 42º to 44ºC)

As a result, the heat is taken off and the temperature goes down to a stationary value. For a right and safe therapeutic action it is necessary to increase the temperature sufficiently in the deep vascular tissues in order to start the vasodilatation, without exceeding the safe limits for the tissues with poor blood irrigation.
The clinical trials show that when the tissues normally vascular are exposed to diathermy, a painful sensation is experienced by the patient, which serves as an indicator that the temperature has reached the values required for vasodilatation (from 42º to 44º C), without causing damages to the tissues and bringing the related therapeutic effects.
Besides the effects described above, the dielectric characteristics of tissues can also cause different temperature variations in them, since they offer variable resistance to the current passage.

Thus, tissues like the adipose offer a high resistance to the current passage, and present a superior heating when compared to the muscular tissue, which due to its greater amount of electrolytes, presents a lower resistance to the radiofrequency currents.

THERAPEUTIC DIATHERMY USES

Effects on Inflammation

The diathermy produces heat that causes arteries and capillaries dilatation, resulting in the blood flow increase to the affected area. Consequently, there is greater oxygen supply as well as antibodies and white blood cells.
Additionally, there is an increase in the fluids absorption by the tissues, what causes a type of removal of the undesirable products from the local of the inflammation.
The short-wave diathermy is particularly valuable for lesions in deep structures, as the hips joint, which can not be easily reached by other ways of electrotherapy and radiation. It is also very helpful when applied jointly with other ways of Physiotherapy to the solution of many inflammatory processes as: tendinitis and capsulitis, as well as the inflammation problems that occur often associated to the joint ligaments.

Effect on Bacterial Infections

The inflammation is the normal answer from tissues in the presence of bacteria, where the main characteristics are vasodilatation, fluids absorption by the tissues and an increase in the white blood cells and antibodies concentration in the area.

The heating of tissues through diathermy increases these activities and reinforces the disposition of the normal body mechanisms to fight against infective organisms. In this case, diathermy is used to successfully treat infections like: boils, carbuncles and abscesses.

In the first phase of treatment, there may be a decrease in the inflammation resolution through suppuration. While the free drainage does not occur, the treatment must be carefully observed. After the abscess starts the drainage, stronger doses must be applied to cause higher blood vascularization and the resultant cicatrization. If there is ongoing worsening, meaning that the organism defense mechanisms have already reached their action limit, the treatment by diathermy will not be efficient, since it will not be enough to reinforce the aforementioned mechanisms.

Effects on Traumatic Lesions

The beneficial effects of the short-wave diathermy on traumas associated with lesions are similar to those produced in inflammations.

Recent traumas must be treated under the same conditions as in cases of acute inflammation, where the heating contributes to increase the fluid transpiration from traumatic vessels. Stiffened joints and other trauma post-effects require stronger doses which are helpful as a preliminary treatment for the exercises that are normally an important part of the treatment.

Pain Relief

The therapeutic practice shows that a medium level heating is very efficient to alleviate the pain, probably as a result of a sedative effect. Many authors suggest that the pain may arise due to the accumulation of product residues from the metabolism and the heating can contribute to increase the blood vascularization and therefore remove these products.

When the pain follows inflammatory processes, the solution for inflammation is usually followed by the pain relief.

Thus, when the diathermy treatment is used for inflammatory processes and post-traumatic lesion, a relief in pain is expected; besides other beneficial effects.

Effects on Muscles

The heating effect on tissues leads to a muscular relaxation, and therefore, the short-wave diathermy can be used to relieve the muscular spasms associated with inflammations and traumas, or secondary muscular pains that appear in consequence of intervertebral disc hernia, degenerative articular diseases, bursitis, rheumatic spondylitis or other processes where there is a sub acute or chronic inflammatory reaction.

PHYSIOLOGICAL EFFECTS - CONTINUOUS SHORT-WAVE THERAPY

Thom (7) observes that every research regarding the short-wave therapy effects shows that the dosage is of vital importance. Countless experiences with plants and animals reveal that a temperature increase within certain limits has beneficial effects on the body processes. On the other hand, an excessive heating supply causes considerable damage.

Effects on Blood and Lymphatic Vessels

Almost all the authors who researched the continuous short-wave therapy effect emphasize its blood circulation-stimulating effect. According to Thom, experiences with animals show that after an initial constriction, there is a marked dilatation of all vessels, including the veins. He also observes that the dilatation occurs specially in the arterial vessels and that it differentiates the short-wave treatment from the superficial heating ways. Barth and Kern (8) emphasize the connection between dosage and effects on the blood vessels. Their research showed that a low intensity administration (dosage ranging from "submitis" to "mitis") for up to 10 minutes stimulates the blood flow very much, and that, on the contrary, a higher intensity for a longer treatment time produces opposite effects, to wit, the vasoconstrictor effect and the blood flow decrease even to the stasis point. Scott (9) observed increased blood supply in the tissues, but emphasizes that the direct local heating should not be applied in the case of impaired arterial circulation. The increased metabolic activity caused by heating demands more oxygen and nutrient, while the arterial impairment makes impossible the extra supply of these elements. Scott prefers the abdomen treatment (abdominal vessels). The vasomotor center, he says, would be activated by the blood heating taking to a general dilatation of the surface vessels.

To sum up, it is possible to establish that a moderate short-wave thermal treatment has a clear effect in promoting the circulation, which is reflected in a dilatation of all blood vessels (specially the arterial vessels) and followed up by a lymph amplified removal. An excessive heating supply may produce opposite effects as vasoconstrictions or blood stasis.

Effects on the Metabolism

In accordance with Thom's propositions which consider the stimulation of all body processes through moderately dosed short-wave treatment, Rentsch reports metabolic processes of "activation". The local vasodilatation results in an increased supply of the nutrient and oxygen, and in an accelerated removal of the metabolic products.

Effects on the Nervous System

Peripheral Nervous System - although another research contradicts him, Thom states that the motor nerves excitability increases in response to the short-wave treatment. A direct inhibitor effect on the sensorial fibers (of the pain) is defended by some but very combated by others.

According to Scott, the pain is also relieved by the amplified blood circulation; metabolic products that cause pain may in this way, may be removed faster.

General Effects

Temperature increase and blood pressure reduction are called general effects by Thom. Thom reports effects such as "unusual tiredness" and a need to sleep. It is clear that such effects occur when big bodily proportions are heated up.

Thom, however, emphasizes the "cumulative effect" of countless small dosages that may occur in the therapists who work in depth with short-wave equipment.

Particularly in the first years after the introduction of the short-wave equipment, the operators presented the same symptoms as the ones who operated powerful short-wave transmission radios. They used to complain about anxiety, tiredness, depression, headache and insomnia.
Although the current short-wave equipment produces less radiation effects, a certain precaution seems to be proper and it is advisable to

place the appliances as far as possible from places where people often remain, or spend a long period of time

PULSED SHORT-WAVE THERAPY

In the short-wave therapy, heating is generated in the treated tissue. As briefly shown in the previous chapters, this heat may produce therapeutic effects. Physiological effects occur in the short-wave therapy, but the researchers' opinions regarding the fact that they occur due to heat differs considerably. This debate is important in the present chapter, since some or any perceptive heat is rarely generated during the power application with pulsed short waves.

THE HEAT IN THE SHORT-WAVE THERAPY

For many years, the development of heat in the tissues during the short-wave treatment was one of the most important ones. The patient had to "feel hot". Researchers like Nicola Tesla and Schiliephake, for instance, thought the heat produces the most important effects during the short-wave treatment.

Recently, there has been a perceptive reduction in the use of any way of physiotherapeutic treatment where the heat is the active agent. The reason of that is that the treated tissue has often little circulation and it is not properly able to get rid of the heat produced during the treatment. Thus, the temperature will be able to reach high levels in the local. Therefore, the dosage when using the short- wave therapy was reduced from normal to mitis or submitis, that is, from promptly perceptive to little perceptive or just a little imperceptive.

Pulsed Short-Wave Therapy

The first utilization of pulsed short waves happened around 1940. Extensive researches about the effects on the body were carried out.

Liebesny et al. investigated the continuous and pulsed short-wave effects on diluted milk, showing that the adipose molecules are formed in chains. These "pearl necklace-like formations" occur particularly when exposed to pulsed waves. During the exposure to continuous waves, this phenomenon happened only in a very low dosage. At the highest dosage, there was coagulation that, different

from the "pearl necklace-like phenomenon" was irreversible. Tests like blood, lymph and proteins also show that the "pearl necklace-like formations" occur when pulsed short waves are used.

It is possible that with pulsed waves for which there is rarely any palpable temperature change, the basic therapeutic effect is caused by minimum temperature elevation in the tissue. No specific physiological effect was proved. Thus, like in the most of the reference literature, it is made a distinction between the temperature increase (thermal effect) and other physiological effects (non-thermal).

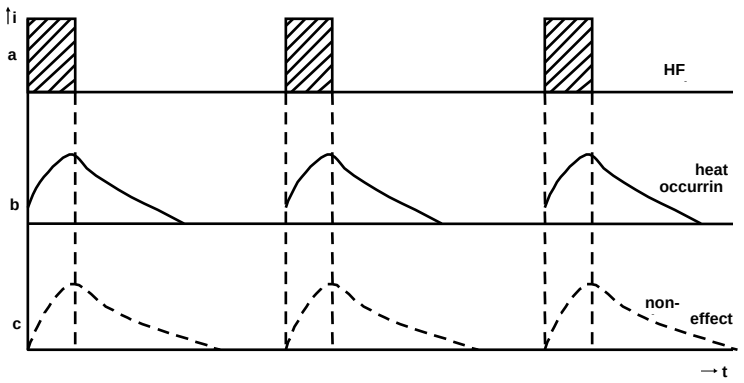
THERAPEUTIC EFFECTS

Great results with pulsed short waves were registered. The research show that the following effects occurred:

- Fast hurt cure (10)
- Fast pain reduction (11)
- Fast bruise and edema re-absorption.
- Fast fracture recovery
- Large stimulation of the peripheral circulation

ADDITION THEORY

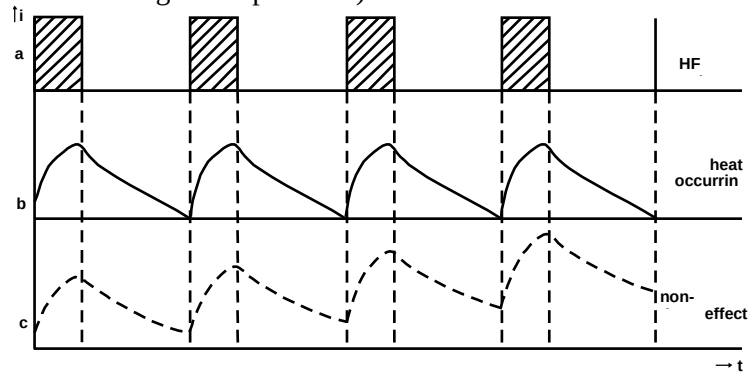
An acceptable theory for the pulsed short-wave effect is the addition theory, which is also used for pulsed ultrasound. As previously mentioned, the heat and other physiological effects in the treated tissues occur as a result of the pulsed short waves. The model of picture 2 illustrates the behavior of these effects for a low frequency of pulse repetition. It is possible to notice that the non-thermal effects remain for a longer time than the heat seen in the tissues, but provided that the pulse repetition frequency is low and the interval between the pulses consequently long, both reactions were reduced to zero before the arrival of the following pulse. The temperature in the tissue, therefore, does not increase and the patient will not feel hot at all.



Picture 2

a- Three pulses of certain intensity (i), certain duration (t) and a relative long interval between pulses.
b- Thermal effect.
c- Non-thermal effect.

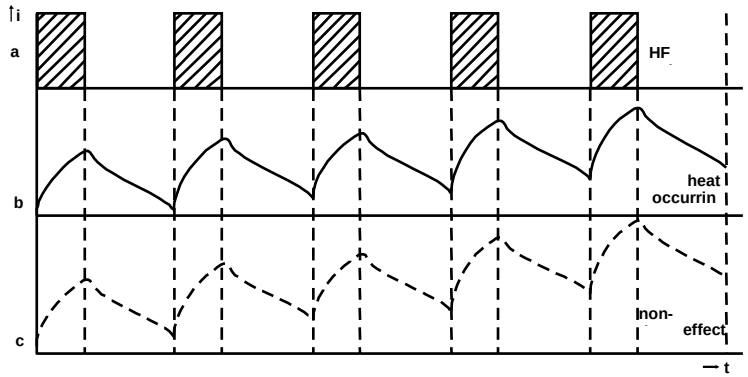
If the pulse repetition frequency is increased and the interval between pulses consequently shortened, the heat generated in the tissue will fall down to zero, but the most persistent physiological effects will not fall down.
Therefore, when the next pulse arrives, there is still a non thermal residual effect to which the effect of the second pulse is added. As in the case of a lower pulse repetition frequency, the heat generated will not accumulate; there is no temperature increase in the tissue (submitis dosage - see picture 3).



Picture 3

a- Four pulses of certain intensity (i), certain duration (t) and a relative short interval between pulses.
b- Thermal effect.
c- Non-thermal effect.

When the pulse repetition frequency is increased even more, the heat generated will also be added. The resultant temperature increase in the tissue, now, in fact, will make the patient feel a hot sensation, "mitis" dosage for normal (picture 4)



Picture 4

a- Five pulses of certain intensity (i), certain duration (t) and a very short interval between pulses.
b- Increasing thermal effect.
c- Increasing non-thermal effect.

In most of the treatments with pulsed short waves, the situation illustrated in picture 3 is almost ideal: no temperature increase and an additional non-thermal effect. Because of that, the number of indications for pulsed short waves therapy is higher and the number of contraindications is smaller than in the continuous short-wave therapy (12).

DOSAGE - the dosage is the total short-wave energy administrated to a patient during an only treatment. It can be greater or smaller, depending on the intensity set in the equipment, on the treatment duration and (if it is carried out with pulsed short waves) on the pulse repetition frequency selected.

In the continuous short-wave therapy, the operator is guided in his / her selection by the suitable intensity of the patient's subjective sensation to heat. As stated before, the intensity will be just a little perceptive ("mitis" dose) or just a little imperceptive ("submitis" dose). When treating very strong pains, the best choice is the "submitis" dose because the heat generation is undesirable in most of cases. In case of sub acute pains, the "mitis" dose will be chosen since it will be desirable a limited heat generation as a result of the energy supply.
In the pulsed short-wave therapy, the dosage is generally the "submitis", because it is specially indicated where the heat is not desired. The intensity when pulsed short waves are used will always be at the highest levels. In THERMOPULSE, when the pulsed and self-pulsed modes are used, the intensity will be automatically on level 7 (maximum).

PULSE REPETITION FREQUENCY

The amount of energy applied may be influenced by the pulse repetition frequency. In cases of recent problems, a low pulse frequency (< 80 Hz) is chosen since the region to be treated is very sensitive. In a subsequent level, the treatment may be changed for a higher pulse repetition frequency. The duration of treatment of recent problems with pulsed short-wave therapy will be relatively short. Treatment times from 10 to 15 minutes are common.

Treatment Example: a patient with a traumatic lesion of a knee medial collateral ligament.
The treatment is performed twice a day. "Submitis" dose; 10 minutes with pulse repetition frequency of nearly 60 Hz.
In sequence, a 15-minute treatment is performed daily with a pulse repetition frequency of nearly 100 Hz.
NOTE: in the self-pulsed mode, you do not need to worry about these frequencies because everything is set automatically.

Indications for pulsed short-wave therapy

A- Post-traumatic Illnesses – like for instance: sprain / contusion / abruption / fracture /bruises / lacerations. It is very important that the

treatment of these wounds and illnesses starts as soon as possible.

B- Post-operative Illnesses – like for instance: after mandible operation (maxillary), foot and thigh. It is important to mention here the preventive value of the therapy connected with possible post-operative inflammations.

C- Inflammation – such as: chronic osteitis / bursitis / sinusitis.

D- Peripheral Circulatory Illnesses

E- Internal Organs Illnesses

CONTRAINDICATIONS OF DIATHERMY USE

In all these years a great number of contraindications for the short-wave therapy was identified. Some of them are clearly filed; other ones are based on suppositions. Others depend on the dosage or the localization. For these reasons, the contraindications are divided in:

Absolute Contraindications

MALIGNANT TUMORS - although some publications mention the possibility of the short waves use, it nice should be emphasized that these theories were based on experiences with animals and until there is any evidence to the contrary, the malignant tumors must be considered an absolute contraindication. That is due to the possibility of the short waves increase the tumor cells activity provoking its division.

PACEMAKER - if submitted to short waves, the pacemakers may develop rhythmic irregularities. The pacemaker holders, therefore, must not remain nearby the short-wave equipment when it is turned on.

PREGNANCY - based on the rapid embryonic tissue division and the blood supply to the placenta, it is not advisable to treat pregnant women with short waves. It is also advisable to reduce at the most the influence of the short-wave equipment operation not only in pregnant women but also in therapists.

TUBERCULOSIS - in certain types of tuberculosis, the heating in the deep tissue may cause a considerable decrease in the number of leukocytes.

FEVER - short waves in fever conditions may have the effect of increasing the metabolism even more. It would cause an increase even bigger of the temperature, leading to the hyperthermia.

RHEUMATOID ARTHRITIS - many researchers report that the deep heating in the joints increases very much the collagenase activity, a cartilage which can destroy enzymes in the joints. Mason and Currey (13) also state that the deforming arthritis should not be treated with short waves. Although other researchers refute the clinical value of the theories above, it is inadvisable to treat the chronic rheumatoid arthritis thermally with short waves.

Relative Contraindications

IMPLANTED METALS - the metals concentrate electromagnetic power. In order to prevent a possible power concentration around the implant and the hazards deriving from it (burns), the continuous short-wave therapy should be used only if the indications are more important than possible adverse effects. Example: treatment after a complete pelvis surgery is not advisable, although the treatment of a maxillary with metal fillings in the tooth may be allowed. However, when the pulsed short waves are applied, no heat is generated in the tissue, and thus making this kind of therapy possible in such cases.

PROBLEMS WITH HEAT SENSITIVITY - the correct dosage is extremely hard to find in these cases. The intensity may be derived from the contralateral part, applying this intensity reduced 1/3 of the affected side.

SERIOUS ARTERIAL AND VENOUS CIRCULATORY PROBLEMS like ARTERIOSCLEROSIS, TROMBOSIS, ETC. - do not apply on the local (except "submitis" dose), since it is difficult for the tissue to adapt to the heat supplied.

ACUTE INFECTIVE ILLNESSES, ACUTE INFLAMMATIONS - depending on the nature and gravity of the problem, select a low

dosage. With local thermal applications, there is the hazard that the bacteria may be dragged (and spread) through the blood.

Unproven Contraindications (but particularly traditional)

OSTEOPOROSIS – short-wave therapy is considered as stimulator of this process.

RAPIDLY DIVIDED TISSUES - the tissues cells division like for instance the sex glands, can possibly be stimulated by the short waves effect.

HEMOPHILIA - it is not clear which adverse effects the short waves can exert on this illness.

USE OF ANTICOAGULANT DRUGS - it is not known that the use of short-wave therapy offers any adverse consequences to patients using such drugs.

General Note: the short-wave diathermy must be used with precaution on the sensorial affectation zone. It is also necessary a special care for debilitated patients, once the dosage depends mostly on the hot sensation felt by the patient. The pain is an indication that an overheating is being produced. There are indications that a located heating might occur if the eye wearing contact lenses was exposed to diathermy.
The treatment on ischemic tissues must be avoided, because the increase of the metabolic demand can not be satisfied with a corresponding vascular response, whose consequences could be pain and necrosis.

ELECTRODES CLEANING

Always wipe the electrodes clean before reserving them. Before putting the electrodes away, check the connection pins, cable and inspect them. Clean them using only a soft, dry cloth.

MAINTENANCE

We suggest that the user make an inspection and maintenance to prevent the equipment in IBRAMED or in the authorized technical service centers every 12 months of use of the equipment. As manufacturer, IBRAMED is responsible for the technical characteristics and safety of the equipment solely when the unit is used according to the instructions contained in the owner’s manual, where maintenance, repairs and modifications have been performed by the manufacturer or agents specially authorized; and where the components that may cause security risk to the performance of the equipment have been replaced in case of damages by a original part.

If requested, IBRAMED may provide the necessary technical papers for eventual equipment repairs, but it does not imply a repairing authorization.

We do not assume any responsibility for repairing performed without our express written authorization

WARRANTY

IBRAMED, Indústria Brasileira de Equipamentos Médicos LTDA, herein identified to the consumer at the address and telephone number: Rua Milão, 50 – Amparo – SP, telephone number +55 (19) 38179633, guarantees this product for the period of eighteen (18) months, (except valves 812, which are certified for 6 months) observed the conditions of the warranty terms attached to the documentation of this equipment.

TECHNICAL ASSISTANCE

Any question or problem related to the performance of your equipment, please call our technical department.

WARRANTY TERM

1) Your IBRAMED product is certified against manufacture defects, if considered the established conditions in this manual for 18 following months (EXCEPT VALVES 812, WHICH ARE UNDER 6 MONTHS WARRANTY).

2) The period of warranty will count from the first purchase date by the consumer, even when the product is transferred to a third party. The replacement of parts and the cost in repairs of malfunctions originated from manufacturing will be comprehended in the warranty.

3) The warranty procedures will be exclusively made by IBRAMED sales points, by IBRAMED itself or by other parties specifically designated by IBRAMED.

4) WARRANTY DOES NOT COMPREHEND DAMAGES WHICH COULD OCCUR TO THE EQUIPMENT IN CASE:

- The equipment is not used exclusively for medical purposes.
- The specifications and recommendations in the user's manual are not observed in the installation and use of the equipment.
- Accidents or natural hazards, connection to electrical system with inappropriate voltage, and/or excessive fluctuation or overcharge/ overvoltage occur.
- The equipment is not handled properly, is not taken proper care of, or suffers alterations or repairs made by not certified people or companies.
- There is removal or adulteration of serial number of the equipment.
- Any accident in transportation occurs.

5) Legal warranty does not cover: expenses with installation of product, installation of software, installation of microcomputer, transport of product to the factory or sales point, labor cost, materials, parts and adaptations necessary to the preparation of the premises where the equipment will be used, such as: electric wiring, computer technician expertise, masonry, hydraulic installations, grounding system, as well as its adaptations. The warranty does not cover either parts subjected to wear and tear such as: command switches, control keys, handles and mobile parts, sucker applicators, application pens for microderm abrasion, power cable, connection cables to the patient, transducer cables, conductive silicon rubber applicators, diathermy applicators, batteries, ultra-sonic transducer (when improper use or its fall is proved), equipment cabinet.
6) No sales point of IBRAMED has authorization to alter the conditions here mentioned, or to take any commitment in the name of IBRAMED

Accessories that are supplied with the equipment

- Operation Manual
- A pair of malleable electrodes
- Warranty Term (attached to manual)
- Detachable Power cable
- 2 spare protection fuses

The use of cables, electrodes and other accessories different from the ones specified above may result in an increase of emissions or decrease in the equipment immunity.

THERMOPULSE - Technical Characteristics

THERMOPULSE was designed for continuous operation mode. It is a CLASS I equipment with type BF part applied of safety and protection against electrical shock. It is not protected against harmful water penetration (IPXO). As for the limits for electromagnetic disturbance, the THERMOPULSE is electro medical equipment which belongs to GROUP 2 class A.

Input.....110 / 220 volts 60Hz
Consumption.....400 VA (max)
Timer..... 15 minutes.
Short Waves Frequency.....27, 12 MHz

Maximum potency intensity output at an electrode/skin distance of about 1 to 1.5 cm (with resistance charge of 50 ohms):
Continuous mode:.....100 W

Approximate Dimension (mm).....340 x 325 x 870 (WxDxH)

Weight (approximate without

accessories).....30 Kg.

Maximum stacking height.....DO NOT STACK BOXES

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TROUBLESHOOTING

Sometimes what seems a problem may not be a real failure. Therefore before calling the technical assistance, please verify the items described below:

Problem	Solution
The equipment does not turn on. I	• Is the power cable properly connected? • If it is not, connect it. Also check the power outlet on the wall.
The equipment does not turn on. II	• Have you checked the protection fuse? This model of IBRAMED equipment uses external fuses. Check if they are properly connected. Check also if the value is in accordance with the indicated in the user's manual
The equipment is turned on but does not emit current for the patient I	• Have you followed the recommendations and instructions in the operation manual correctly? • Check and go through the steps described in the chapter about *controls, indicators e operation.*.
The equipment is turned on but it does not emit current for the patient II.	• Have you checked the electrodes and the connection cables with the patient? Check if the cable plug is properly connected to the equipment.
The equipment does not turn on and / or is working but seems to be weak	• Is the commutation key 110 / 220 volts correctly adjusted for the local power line? Some IBRAMED equipment uses this switch. Verify and if necessary

	adjust this key properly

CONTRACT OF FREE TECHNICAL ASSISTANCE

DETACH AND SEND THIS PAGE TO IBRAMED

By returning this page to IBRAMED, the appliance will remain covered by the Free Technical Assistance Contract by the time and conditions described on the Warranty Term.

For a better service in the long run, we kindly ask you to answer the following questions:

1- Your choice for this IBRAMED product was based on:

( ) newspaper or specialized magazines
( ) sales representative advice
( ) friend's advice
( ) exhibitor or showroom
( ) manufacturer's image
( ) technical assistance

2- Have you already owned similar equipment before?

( ) yes, IBRAMED
( ) yes, other brands
( ) no

3- In your opinion, what is considered as being more important in an equipment:

( ) appearance
( ) resources – versatility, assistance, technology, etc.
( ) price

4- How old are you?

( ) under 25 years old
( ) from 25 to 40 years old
( ) over 40 years old

5- Compared to your monthly wages, would you say the price of the equipment is:

( ) inexpensive
( ) reasonable
( ) expensive
( ) exaggerating

6- Which was the payment `modality`?

( ) cash
( ) installments

7- Please, make any comments here, either positive or negative, which you find relevant:

.....
.....
.....
.....

Name: ----------
---------- D.O.B. ----/----/---

Address: - ----------

District: ---------- **City**: ----------
----------S**tate**: ----------

ZIP code: ---------- **Phone number.**:----------
Equipment: ----------**Serial N.:** ----------