



# High Energy Inductive Therapy

COMPACT-II  
Therapy book



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# High Energy Inductive Therapy

## „Life is an electromagnetic event“

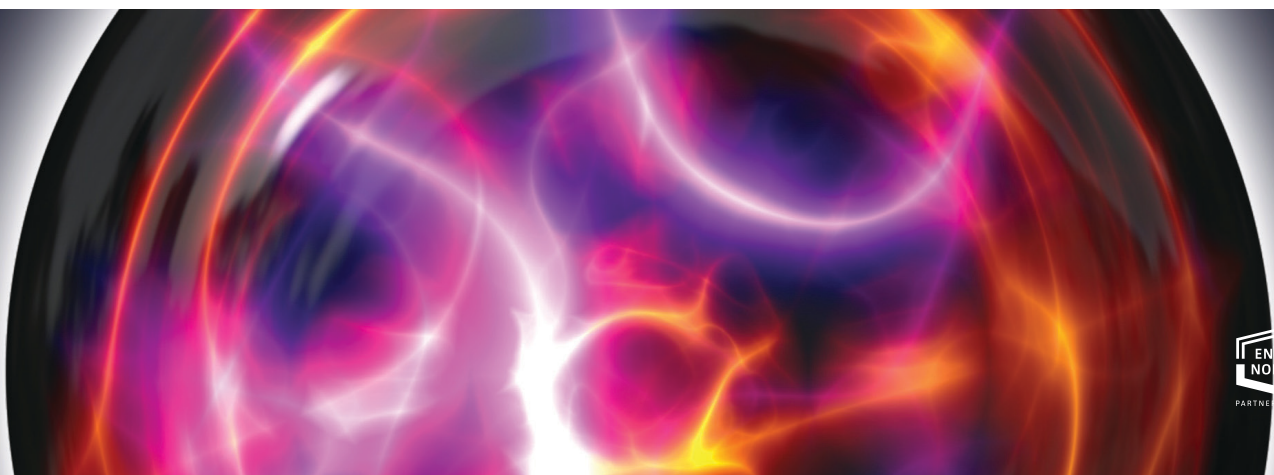
Research on the use of electronic fields for pain management focuses on the multiple mechanismus of pain production. These electromagnetic fields increases the threshold of pain sensitivity and activates the anticoagulation system. Besides that, strong electromagnetic fields stimulates the production of opioid peptides, activates mast cells and increases the electric capacity of muscular fibers.

It's a common observation that the benefits last considerably longer than the time of use. Analgetic effects were still observed at the 7th and even up to 14 days after the last treatment.

The COMPACT-II generates a magnetic field of 3 Tesla, which is about 600 times stronger than a normal magnet bar. This strong magnetic field stimulates nerve cells, muscles, and blood vessels consequently as this application of energy results in a physiological change and/or stimulation which is used to achieve therapeutic effects. By providing both a static and mobile applicator, the possibility to use one of the pre-programmed recommendations, or to create and store own program the end-user is assured to have maximum results with the COMPACT-II.

The voltage induced in the tissue acts on the cell membranes whose lipid membrane is an insulating dielectric and which form a capacitor with the highly conductive fluid spaces adjacent to the membrane. Proteins which cross the entire cell membrane (tunnel proteins) are stored in this phospholipid bilayer, however sometimes only on the outside or inside. Glycolipids and cholesterol are other components of the cell membrane.

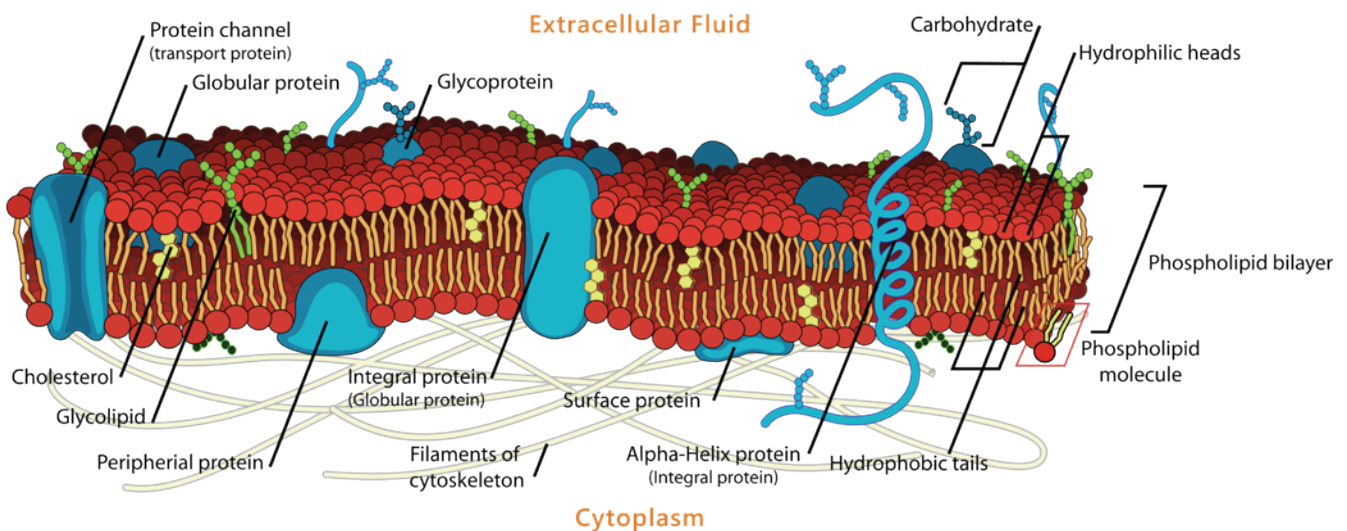
The membrane proteins have various tasks. The ion channels are for High Energy Inductive Therapy of greatest interest. While small molecules such as  $O_2$ ,  $CO_2$  and  $H_2O$  can diffuse through the cell membrane along a concentration gradient and since lipophilic substances can also cross the cell membrane purely passively, the cell membrane is practically impermeable for most ions.



# High Energy Inductive Therapy

In the extracellular space, the most common ion is  $\text{Na}^+$ , and the most common ion of the intracellular space is  $\text{K}^+$ . Because of the high concentration gradient, a  $\text{Na}^+$  diffuses into the cell and a  $\text{K}^+$  diffuses out of the cell from time to time. In this process, there is also a displacement of electrical charges each time.

Since at rest in particular the  $\text{K}^+$  channels are open and the  $\text{Na}^+$  channels are closed, the inside of the cell becomes more negative as compared to the outside with each  $\text{K}^+$  ion which diffuses out of the cell at rest. Because the electrical gradient which is changed in this way counteracts the concentration gradient, equilibrium is reached after a certain amount of time. Generally speaking, a membrane potential at rest goes from -80 to -90 mV in this way (resting membrane potential). The resting membrane potential is primarily a  $\text{K}^+$  potential, but naturally also dependent on the other ions (if only  $\text{K}^+$  were affected, the resting membrane potential would be -97 mV).



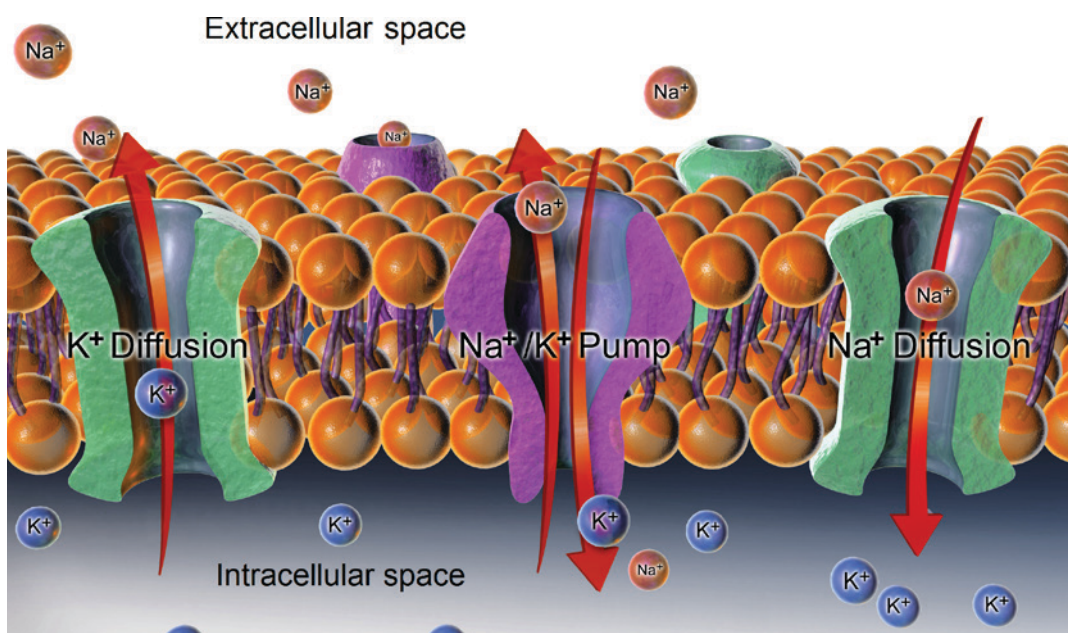
# High Energy Inductive Therapy

Over time, the concentrations would balance out purely passively, a condition which leads to cell death.

The concentration gradient for  $\text{Na}^+$  and  $\text{K}^+$  must therefore be maintained by an active, ATP-consuming process so that the cells can fulfil their tasks – in the nerve, for example, the electrical information transfer and processing. This is the task of the  $\text{Na}^+ / \text{K}^+$  pump which consumes between 50% and 70% of the entire ATP requirement of the cells.

The  $\text{Na}^+ / \text{K}^+$  pump can be influenced by various factors, such as toxins, drugs or a lack of energy. The resting membrane potential becomes increasingly positive and the cell functions are thus disrupted.

With the change in voltage induced by the High Energy Induction Therapy, the regeneration of a normal resting membrane potential is facilitated. Normally, the passively passing molecules can once again enter and leave through the cell membrane. The energy production in the mitochondria can once again start up and the normal function of the  $\text{Na}^+ / \text{K}^+$  pump is supported. As a result, the preconditions for normalisation of the cell functions are restored.



# Indications

Since obtaining approval worldwide, strong electromagnetic fields has been widely used to reduce pain for a wide range of indications. High Energy Inductive Therapy and more specific the COMPACT-II has a wide range of disorder treatment recommendations:

## Indications:

- Stimulation of muscular tissue
- Nerve regeneration
- General pain control
- Improvement blood circulation
- Urinary incontinence

## Objectives:

- Pain relief
- Elimination of the cause of the pain
- Effect on muscle tone
- Activation of regeneration processes
- Enhanced blood circulation

## Users:

- Orthopedic doctor / sports doctor /  
General Practitioner
- Physiotherapist
- Osteopath



# Basics

## Skeletal muscles

There are two different types of skeletal muscles fibers.

Type 1, also called red fibers contain a large amount of myoglobin and mitochondria. They carry out a high aerobic oxidation without accumulating much lactic acid. Therefore red muscles contract for a longer period without fatigue. So called red muscles have a low contraction rate, but can contract over a long period.

|                    | Type 1 (red) | Type 2 (white) |
|--------------------|--------------|----------------|
| Size               | small        | large          |
| Force              | low          | high           |
| Fatigue            | slow         | quick          |
| Speed              | slow         | quick          |
| Capillaries        | high         | low            |
| Mitochondria       | high         | low            |
| Myoglobin          | high         | low            |
| ATP synthesis      | low          | high           |
| Oxidative capacity | high         | low            |

Type 2, the so called white fibers, have a small amount of myoglobin and mitochondria. They depend much more on anaerobic oxidation and accumulate lactic acid in high amounts during work. Therefore they get soon fatigued. The white muscles have a fast rate of contraction for only a short period.

## Energy

The differences between the white and red fibers became important, as the neurophysiologist Elwood Henneman (\*1915, † 1996) described the relationships between properties of motor neurons and the muscle fibers they innervate. Motor neurons with large cell bodies tend to innervate fast-twitch fibers, whereas motor neurons with small cell bodies tend to innervate slow-twitch muscle fibers. In order to contract a particular muscle, motor neurons with small cell bodies begin to fire action potentials before motor neurons with large cell bodies.

The size principle states further that as more force is needed, motor units are recruited in a precise order according to the magnitude of their force output, and with small units being recruited first, thus exhibiting task-appropriate recruitment. This has two very important physiological benefits. It minimizes the amount of fatigue an organism experiences by using fatigue-resistant muscle fibers first and only using fatigable fibers when high forces are needed.

A correct diagnosis, identifying which muscle fibers are affected, is therefore important for determining the correct dosage.

# Basics

## Frequencies

Low pulse frequencies allow muscles to relax after each twitch. By increasing the pulse frequency muscle tension will be build up. At high frequencies muscles don't relax between pulses any more. In our treatment recommendations frequencies up to 9 Hz are functionally used for relaxation. Frequencies up to 30 Hz are used for muscle firming and up to 70 Hz for more volume. The higher frequencies, so up to 100 Hz are suitable for the development of muscle strength.

| Effect              | Frequency (in Hz) |
|---------------------|-------------------|
| Improved blood flow | 2 – 9             |
| Endurance           | 10 – 20           |
| Muscle firming      | 20 – 30           |
| Muscle volume       | 40 – 70           |
| Strength            | 75 – 100          |

## Treatment

Muscle contractions have an important role when it comes to the treatment of musculoskeletal problems. As stated before two parameters influence the effect: Energy and Frequency. The COMPACT-II has in total 15 standard programs, in which a wide variation of frequencies and proportionately energy levels are combined. You can find more details about these 15 programs in the chapter Treatment Protocols. For more personalized protocols the end-user has to possibility to create treatment protocols in the favourites mode. See page 22 of this treatment manual.



# Mechanism of action

High Energy Inductive Therapy has been found to have good results in a wide array of painful conditions. There is little risk when compared to the risk of toxicity, addiction and complications from medications.

## Inflammation

The pulsed inductive field reduces inflammation by recharging the cell surface. This recharge prevents the chain of inflammation inside the cell. In addition, it supplies blood and oxygen to the specified area, which is supporting a quick recovery.

## Pain

Pulsed Inductive Therapy is known to enhance the metabolism of fibroblasts, chondrocytes, osteoblasts, and the effects of hormones and neurotransmitters on the receptors of various cells. PEMF is used for the treatment of various pain such as back pain, neck pain, shoulder disease, knee osteoarthritis, postherpetic neuralgia, pelvic pain, multiple sclerosis, neuropathic pain. When you experience pain from a bump, a general reaction is an attempt to eliminate the pain by rubbing the painful bump.

If you experience an itchy bite, you will try to eliminate it by scratching. Two examples of how the Gate Control Theory works. The Gate Control Theory asserts that activation of nerves which do not transmit pain signals, called non-nociceptive fibers interfere with signals from pain fibers. A painful, nociceptive stimulus stimulates primary afferent fibers and travels via transmission cells. Increasing activity of the transmission cells results in increased perceived pain.



# Mechanism of action

## Contractions

Electromagnetic fields induce electrical currents and trigger the action potential on the motor nerve of muscles. This leads to the depolarization of the motor nerve with muscle twitches as result. A sequence of muscle twitches then develops muscle contractions.

## Fibromyalgia, Arthritis, Chronic Fatigue

Pulsed Inductive Therapy is known to have immediate pain relief in treating pain in patients with fibromyalgia, arthritis, and chronic fatigue. Several studies showing significant improvements in test scores at the end of therapy and at several follow-up moments. High Energy Inductive Therapy also affects the delivery of calcium ions, promotes the uptake of calcium in the bone, and helps in the synthesis of cartilage cells.



# Treatment with High Energy

## Treatment with High Intensity Inductive Therapy

Before using High Energy Inductive Therapy on a patient, the user should become acquainted with the operating instructions and individual treatment methods as well as the indications / contraindications, warnings and application information. Additional sources of information about types of therapy should be consulted. The user must be trained in how to use the device properly and have the appropriate skills.

## High Intensity Inductive Therapy with the COMPACT-II

### Static treatment

Use for static treatments the applicator, mounted on the applicator arm. Pain points and trigger points for static treatment are initially palpated. The treatment is then administered with the power output. Every pain point or trigger point is treated. It should be borne in mind that trigger points frequently lie outside the pain area.



Static treatment

### Dynamic treatment

For dynamic treatments no skin contact is needed. If skin contact is desired, make sure the skin is dry and clean. Pain or treatment zones are initially palpated. The treatment is administered with the power output. Make sure the whole treatment zone is treated.



Dynamic treatment

# Treatment with High Energy

## Combined application – static and dynamic

Very often, pain is not evenly distributed in the treatment area. With many pain syndromes, maximum points such as trigger or pain points lie within the painful region. Trigger points and principal pain points are treated statically whilst other painful areas are treated dynamically. With combined treatment, care should be taken to ensure that static therapy is initially applied to the pain and trigger points. Extensive treatment can then be continued with dynamic application. The dynamic treatment with the COMPACT II can be more intensified by an actively moving patient.

## Treatment energy and time

The maximum energy to be transmitted should be not higher than mentioned in the treatment recommendations. Nevertheless make sure never to use higher energy than the patient can endure.

Daily treatment sessions are recommended.

The minimum course of treatment is two sessions per week.



Combined treatment but no active patient



Combined treatment with active patient

# Treatment protocols

In the COMPACT-II are 15 programs (treatment recommendations) programmed.

Prior to using the device on a patient, the user should have sufficient medical and anatomical knowledge. The user should become familiar with the instructions for use and individual treatment methods as well as the indications / contraindications, warnings and application information.



The following treatment recommendations are programmed:

- Tonification
- Muscle strengthening
- Atrophy
- Recovery / drainage
- Muscle spasm
- Resistance force (endurance)
- Pre-rehab stimulation
- Pain (acute)
- Pain (chronic)
- Inflammation (chronic)
- Shoulder pain (chronic)
- Elbow pain (chronic)
- Cervical pain (chronic)
- Lower back pain (chronic)
- Knee pain or Arthritis (chronic and acute)

All the upcoming treatment recommendations regarding treatment location, duration and intensity require medical knowledge and should be given by authorised physicians, therapists and health (para)professionals.

# Treatment protocols

## Tonification

Therapy recommendation

### Program 1

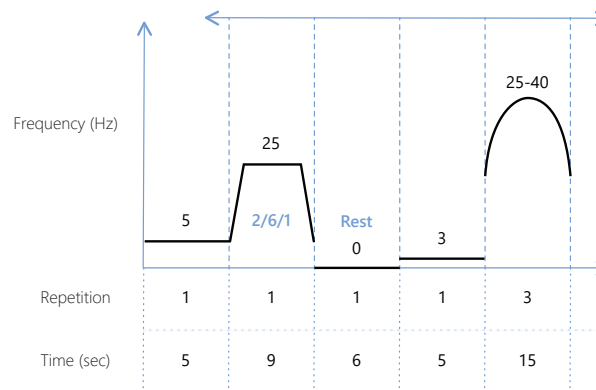
Therapy time 20 minutes

#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes) medium intensity  
muscle vibrations



## Muscle strengthening

Therapy recommendation

### Program 2

Therapy time 20 min 40 sec

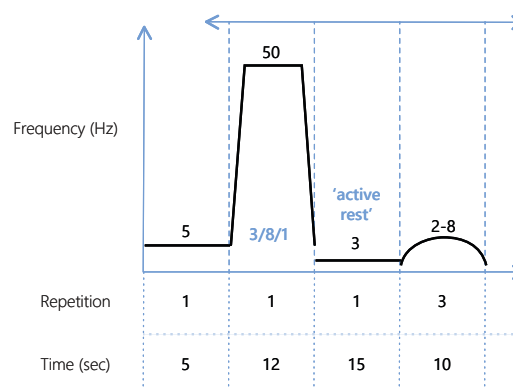
#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes) medium to strong  
muscle vibrations without pain.

Active rest (3 Hz) should generate  
muscle vibrations



# Treatment protocols

## Atrophy

Therapy recommendation

### Program 3

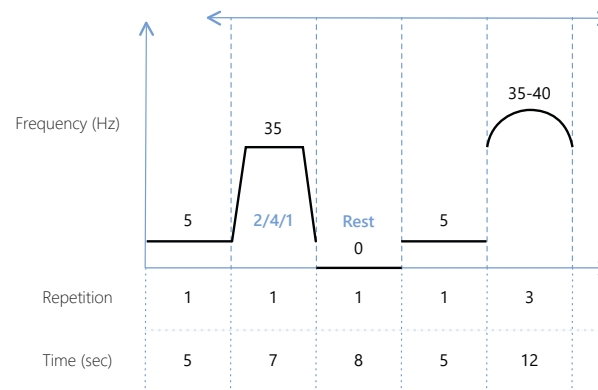
Therapy time 18 min 30 sec

#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes) visible muscle  
contractions without pain



## Recovery / drainage

Therapy recommendation

### Program 4

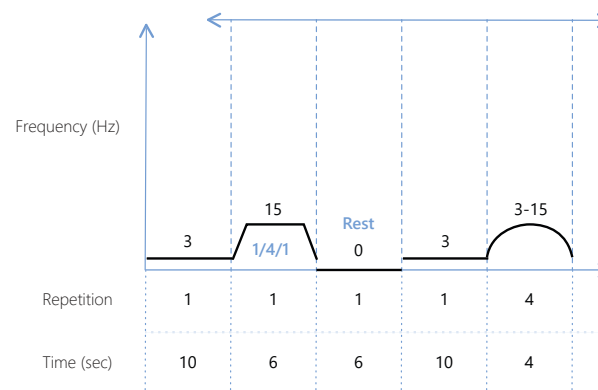
Therapy time 15 minutes

#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes) visible muscle  
contractions



# Treatment protocols

## Muscle spasm

Therapy recommendation

### Program 5

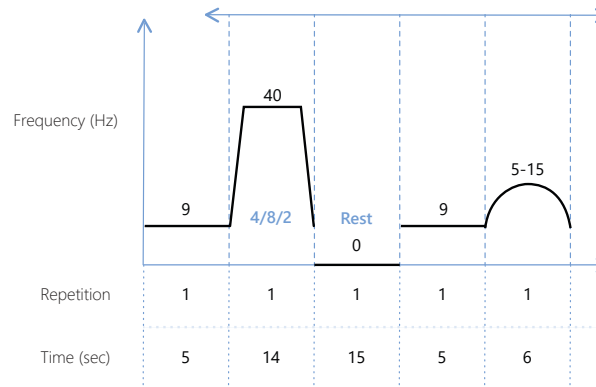
Therapy time 15 minutes

#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes) visible muscle  
contractions without pain



## Resistance force (endurance)

Therapy recommendation

### Program 6

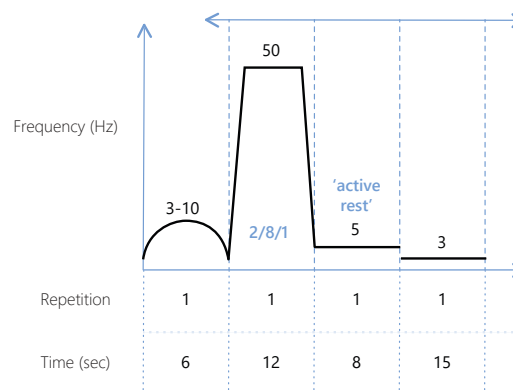
Therapy time 22 minutes

#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes) medium to strong  
muscle contractions. Active rest  
(5 Hz) should generate muscle vibrations



# Treatment protocols

## Pre-rehab stimulation

Therapy recommendation

## Program 7

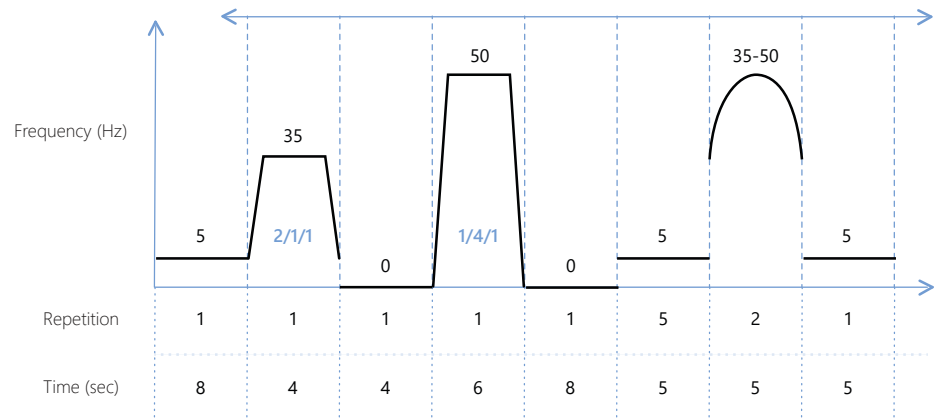
Therapy time 15 minutes

### Dose level:

At start of the treatment:  
up to maximum tolerable.

### After familiarization:

(2 minutes) visible muscle  
contractions without pain



## Pain acute

Therapy recommendation

## Program 8

Therapy time 15-20 minutes

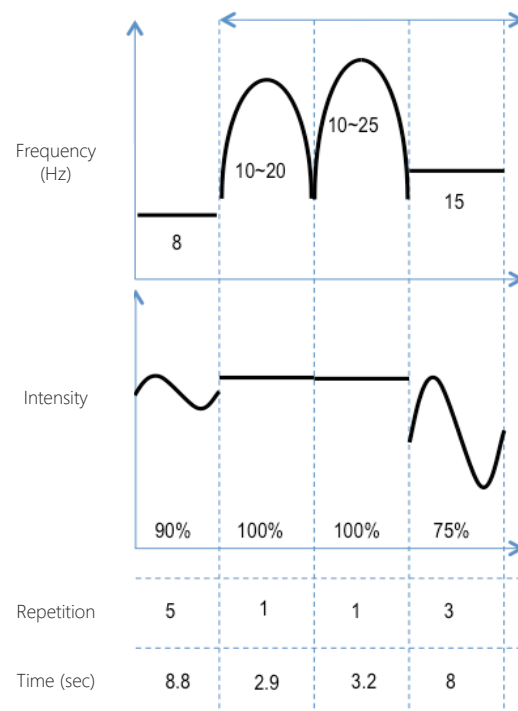
### Dose level:

At start of the treatment:  
up to maximum tolerable.

### After familiarization

(2 minutes)

maximum energy level 80-100%



# Treatment protocols

## Pain chronic

Therapy recommendation

## Program 9

Therapy time 10-15 minutes

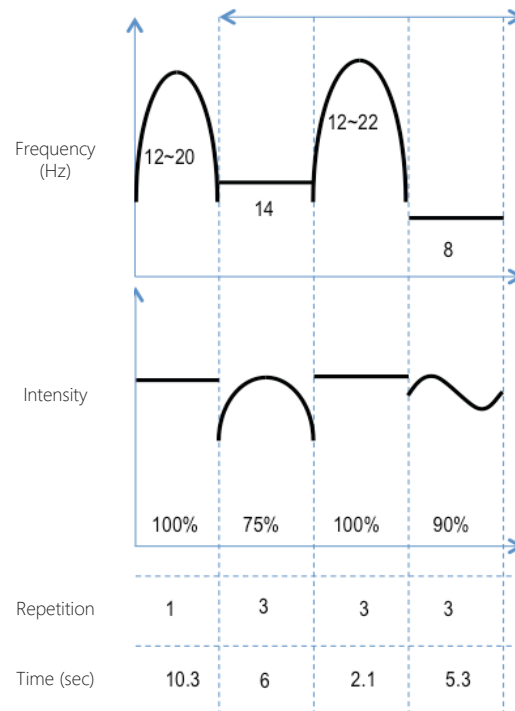
## Dose level:

At start of the treatment:  
up to maximum tolerable.

After familiarization:

(2 minutes)

maximum energy level 80-100%



## Inflammation chronic

Therapy recommendation

## Program 10

Therapy time 10-15 minutes

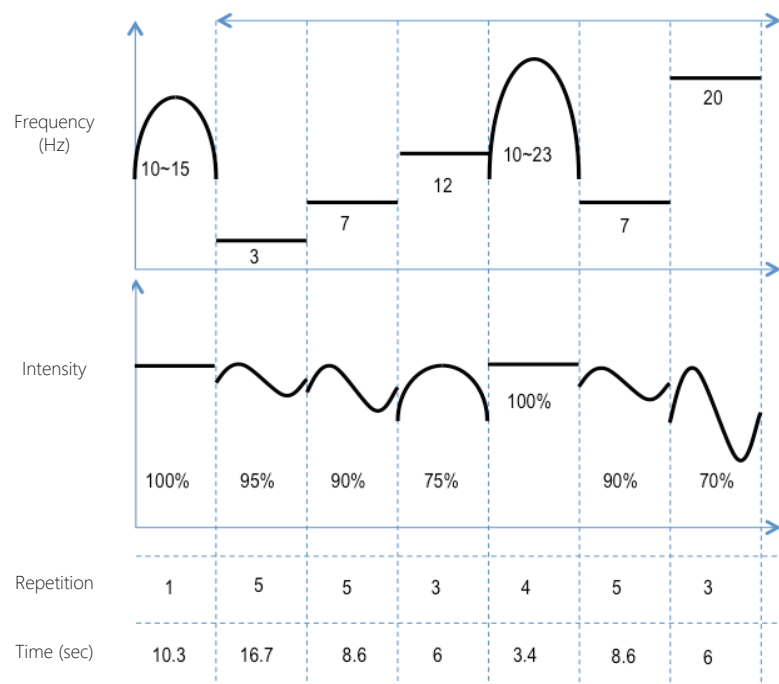
## Dose level:

At start of the treatment:  
up to maximum tolerable.

After familiarization:

(2 minutes)

maximum energy level 70-100%



# Treatment protocols

## Shoulder pain chronic

Therapy recommendation

### Program 11

Therapy time 10-15 minutes

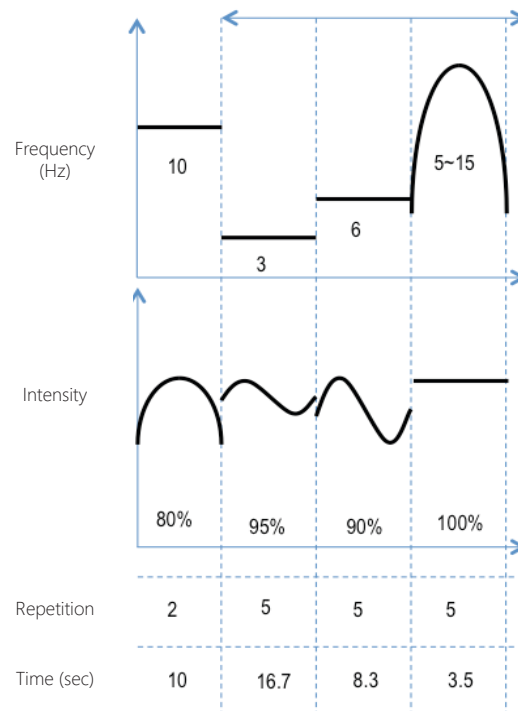
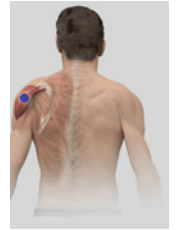
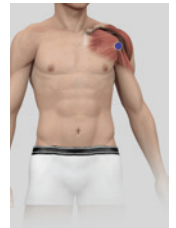
#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes)

maximum energy level 80-100%



## Elbow pain chronic

Therapy recommendation

### Program 12

Therapy time 10-15 minutes

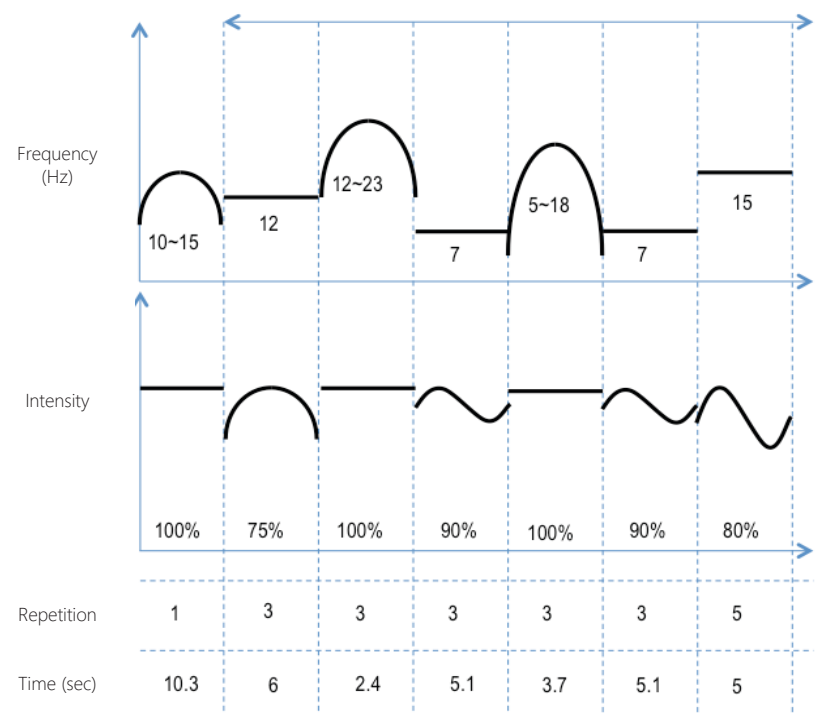
#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes)

maximum energy level 75-100%



# Treatment protocols

## Cervical pain chronic

Therapy recommendation

### Program 13

Therapy time 10-15 minutes

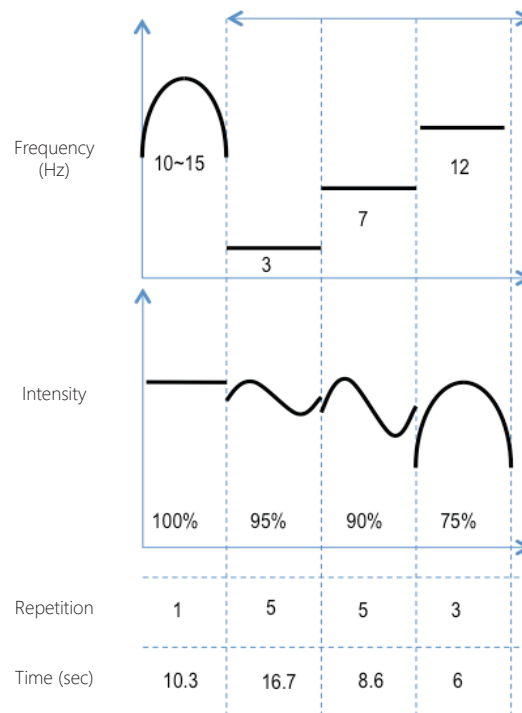
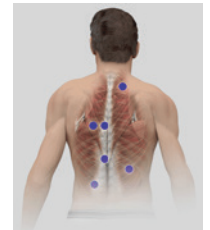
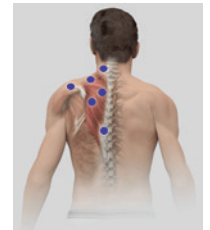
#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes)

maximum energy level 75-100%



## Lower back pain chronic

Therapy recommendation

### Program 14

Therapy time 10-15 minutes

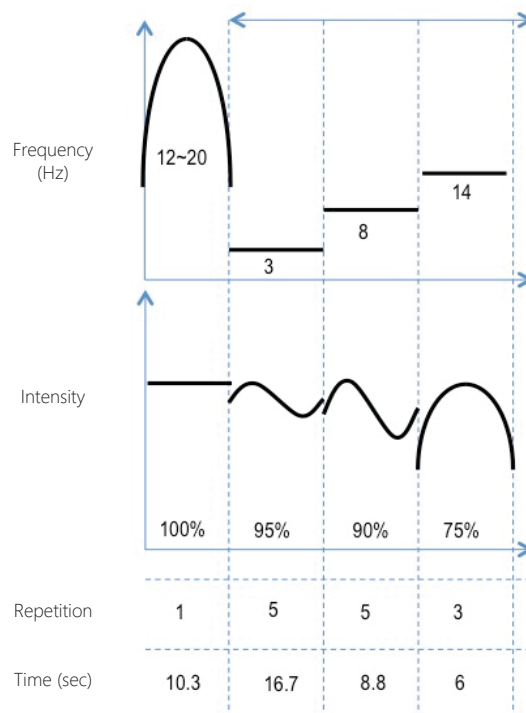
#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes)

maximum energy level 75-100%



# Treatment protocols

## Knee pain or arthritis chronic

Therapy recommendation

### Program 15

Therapy time 10-15 minutes

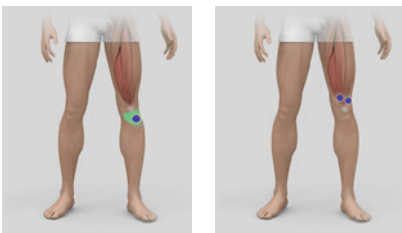
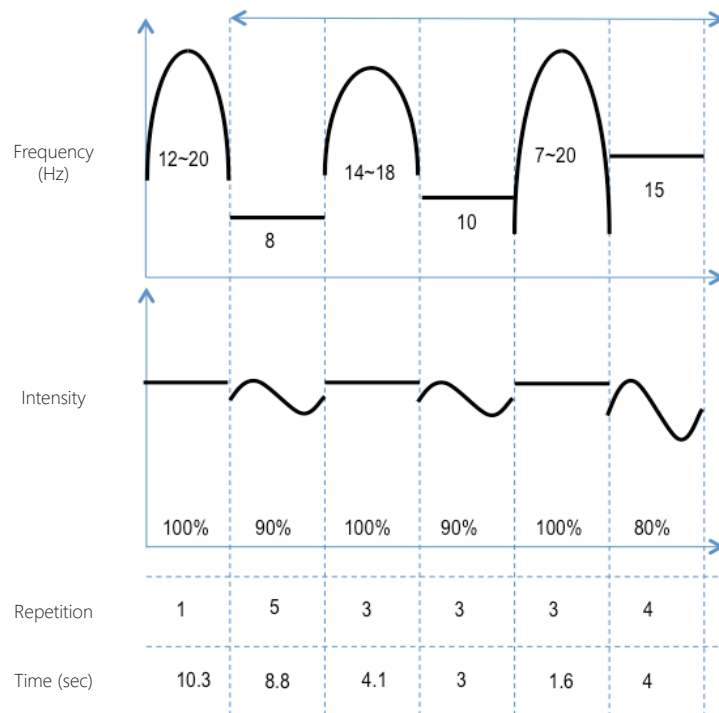
#### Dose level:

At start of the treatment:  
up to maximum tolerable.

#### After familiarization:

(2 minutes)

maximum energy level 75-100%



# Treatment protocols

Besides 15 treatment recommendations the end user can store 10 favourites.

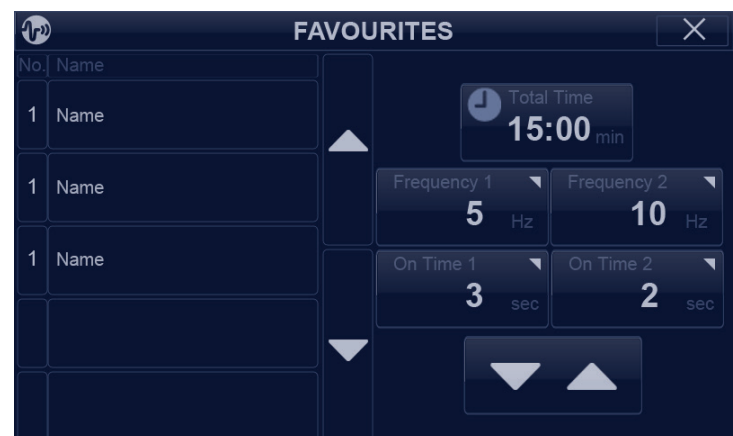
The favourites mode has 10 „free to store“ programs. Frequency of the magnetic field, continuous output time and pause time are set in advance. The waveform of the selected mode is applied repeatedly during the operating time, set by the user.

The parameter setting ranges are as follows:

- F1: 1 ~ 100 Hz
- F2: 1 ~ 100 Hz
- Ton: 1 ~ 4s (The setting ranges are different according to the value of F1 and F2)
- Toff: 0 ~ 10s (The setting ranges are different according to the value of F1 and F2)

For more detailed Information about change or delete treatments in favourites please refer to the instructions for use.

The favourites mode has 10 free to store modes; the user can set the parameter values directly. Each parameter setting ranges are as follows.



# FAQ

Can the COMPACT-II be used on an area of the body with artificial joints or plate pins?

No, due to the nature of the magnetic field deep heat will be generated, which may cause deep-seated burns.

Do I achieve same effect when my patient has his/her clothes on?

One of the characteristics of a magnetic field is that it is permeable with a similar therapeutic effect. Therefore, it can be used on clothes.

Are there any precautions when using on clothes?

If there is a metallic decoration on the clothes, the magnetic field may cause burns on the surface of the skin. (e.g. bra strap rings, underwear metal ornaments, metal-containing fibers).



# Precautions and contraindications

## Precautions

As a strong magnetic field is generated around the magnetic field generating section, equipment operation technicians, assistants, and patients must not hold any items which can be affected by the magnetic field.

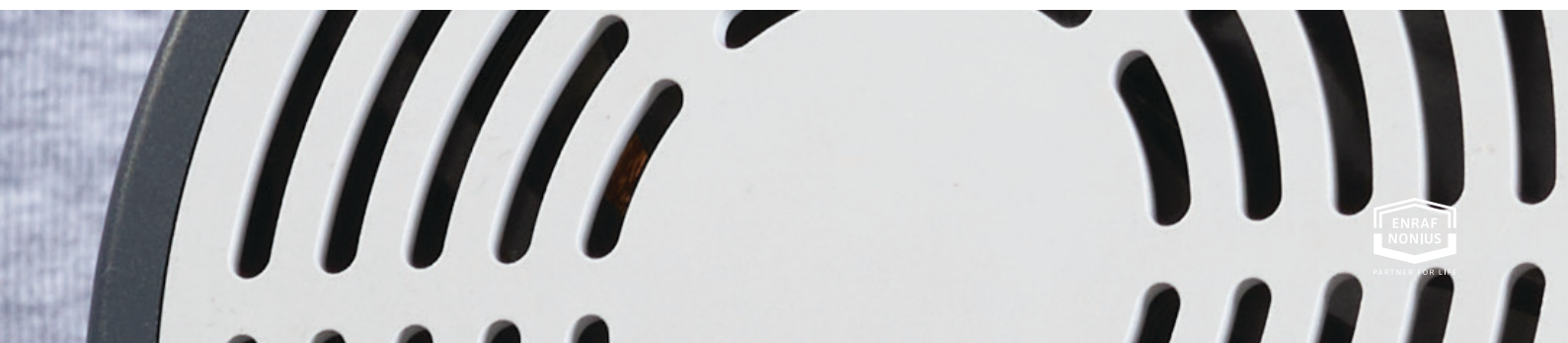
Items such as wristwatches, mobile phones may be damaged by magnetic fields, so please be careful and keep them separately.

During the operation of the equipment, the patient shall not take drinks, water, etc. which can influence the equipment.

Be careful to ensure that magnetic stimulation does not penetrate the heart region.

## Contraindications

- Do not use the equipment in parallel with other electronic medical equipment.
- Be careful to ensure that magnetic stimulation does not penetrate the heart region.
- In general, patients in the following categories cannot be treated with this equipment. Prior to any treatment with this equipment, permission of the doctor in charge must be obtained.
  - Patient with high fever, pregnant women and the elderly and children
  - Patient with a history or status of epilepsy or seizure disability
  - Patient with suspected status of epilepsy on the basis of electroencephalography
  - Patient with evidence of external wound at brain and neck
  - Patient with cardiac pacemakers, drug injecting pumps or hearing aids
  - Patient with cranial implants



# References / Instructions

- Clinical evaluation Report Salus-Talent-Pro, Remed Co., Ltd
- Electro-magnetic Stimulator; Remed Co., Ltd,
- Magnetic Therapy, [www.electrotherapy.org](http://www.electrotherapy.org), Prof. tim Watson
- Magnetic Fields for Pain Control; William Pawluk, MD, 2015
- Efficacy of PEMT for chronic lower back pain, PB Lee, ZC Kim, UJ Lim et al, 2006
- Fundamental and practical aspects of therapeutic uses of PEMFs, Basset CA, 1989
- Regeneration Devices Ltd
- Watson T (2008) electrotherapy: Evidence based practice
- Watson T (2010) Narrative Review: Key concepts with electrophysical agents
- Magnetism in Medicine, Wiley-VCH Verlag
- Electrotherapy, Springer Verlag
- Therapeutic Electrophysical Agents, Wolters Kluwer Health
- Electrotherapy, Evidence Based Practice, Elsevier Health
- Battisti E, Biancardi L, Albanese A, Piazza E, Rigato M, Galassi G, Giordano N (2007) The new magnetic therapy TAMMEF in the treatment of simple shoulder pain, Clin Ter, 2007 Sep-Oct; 158(5):397-401; field (TAMMEF) in patients affected by knee osteoarthritis, Clin Exp Rheumatol 2004, Sep-Oct; 22(5):568-72
- Fischer G, Pelka RB, Barovic J (2005) Adjuvant treatment of knee osteoarthritis with weak pulsating magnetic fields. Results of a placebocontrolled prospective clinical trial, Z Orthop Grenzgeb 2005 Sep-Oct; 143(5):544-50
- McCarthy CJ, Callaghan MJ, Oldham JA (2006) Pulsed electromagnetic energy treatment offers no clinical benefit in reducing the pain of knee osteoarthritis: a systematic review, BMC Musculoskelet Disord 2006 Jun 15;7:51
- Vavken P, Arrich F, Schuhfried O, Dorotka R (2009) Effectiveness of pulsed electromagnetic field therapy in the management of osteoarthritis of the knee: a metaanalysis of randomized controlled trials, J Rehabil Med 2009 May; 41(6):406-11
- Images Cell membrane page 4: Presentation Ludwig-Maximiliansuniversität München / Dr. von Hauner Children's Hospital





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