# Flexistim


## Application Guidance

TensCare™

# Contents

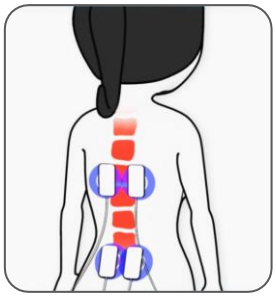
# 1 .TENS

## 1.1. How TENS works

T.E.N.S. stands for Transcutaneous Electrical Nerve Stimulation. T.E.N.S. stimulates your body's own natural defences against pain, namely the release of endorphins. TENS is totally safe and has been used successfully by thousands of pain sufferers.

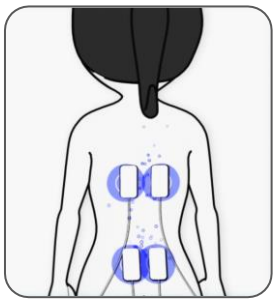
TENS sends a gentle stimulation through the skin which works in TWO ways:

**Pain Gate**



It stimulates the sensory nerves, which carry touch and temperature signals. These nerves go to the same connections in the spine as the nerves carrying pain. A strong sensory signal will block the pain signal travelling up the spine to the brain. This is known as closing the "Pain Gate" and takes effect quite quickly after the unit is switched on. When the gate is open, pain messages get through to the brain and we feel pain. When the gate is closed, these pain messages are blocked and we do not feel pain. Evidence suggests that TENS produce pain relief in a similar way to 'rubbing the pain better'. The pain gate can be closed by activation of mechanoreceptors through 'rubbing the skin'.
Scientifically, the pain gate works by release of chemical in the synapse at spinal level that inhibits transmission of pain signal.

**Endorphin Release**



At low frequency settings, and slightly stronger outputs, TENS drives the motor nerves to produce a small repetitive muscle contraction. This is seen by the brain as exercise, and this promotes the release of endorphins - your body's own natural pain killer. The relief builds up and normally takes about 40 minutes to reach a maximum level which can last for hours after the machine is switched off.

By using TENS, you can expect to achieve a significant reduction in pain - if not complete relief from pain.

- TENS is effective for pain from a very wide range of causes.
- TENS machines can be used to help reduce pain from problems in muscles, joints and nerves.
- It can be also used for people with musculoskeletal pain such as long-term (chronic) back pain or knee joint arthritis. They are also often used for pain relief in the early stages of labour (see perfect mamaTENS), particularly whilst a pregnant woman remains at home.
- TENS may also be used to treat many types of pain, such as migraine headaches, period pain and endometriosis (see Ova+), cystitis, sports injuries, fibromyalgia and neuralgia, plantar fasciitis, post-operative pain, TMJ disorder, diabetic neuropathy, osteo-arthritis and sometimes non-painful conditions such as travel sickness.
- You can use low frequency (<10 Hz) programmes on acupuncture points, to achieve similar effects to acupuncture.
- With neurogenic pain (caused by inflamed nerves) such as shingles and neuralgia, TENS may start by increasing the pain. We recommend that you only use TENS for these conditions under medical supervision.
- You can safely use TENS as long as it gives you pain relief. The effect may wear off after a few hours (this is called "accommodation"). If this happens, take a break of an hour or so before trying again. If you use settings that cause muscle movement for more than 40 minutes, you may experience aching muscles a few hours later.

## 1.2. T.E.N.S. Settings

**Frequency** (measured in Hz – pulses per second)

The Flexistim units offer a range of frequencies from 1 to 150Hz

PAIN GATE: Frequencies from 80 to 150Hz are good at blocking pain signals.
ENDORPHINE RELEASE: A low frequency of 4 or 10 Hz allows for the release of endorphins, the body's natural morphine-like substances.

**Pulse Width** (measured in µS – millionths of a second)

The Flexistim units offer a range of pulse widths from 50 to 300 µS.

Generally speaking, the higher the pulse width, the more "aggressive" the stimulation feels, and eventually, if the pulse width is set high enough, it will usually elicit a muscle contraction, which is typically not the desired result with a TENS unit. However, if the pulse width is too low, the patient may not perceive the stimulation. Pulse Rate is important because different frequency settings target different nerve groups and the setting will determine if the "Gate Theory" or "Endorphin Theory" of TENS will be used.

**Constant and Burst Modes**

Constant mode is when the sensation is continuous versus Burst mode when the sensation, as its name implies, is one of on and off.

Constant mode is often used for acute pain via Pain Gate Effect whereas Burst mode is useful in chronic pain relief. Burst gives a combination of Pain Gate and Endorphin Release, but the squeezing feeling may not be as comfortable. The sensation in Burst is more of a ‘grabbing’, ‘clawing’ type and usually more by way of muscle twitching than with the high or low frequency modes. The stimulation intensity will need to be relatively high. In Constant mode, the sensation is continuous and is more of a tingling pins and needles type.

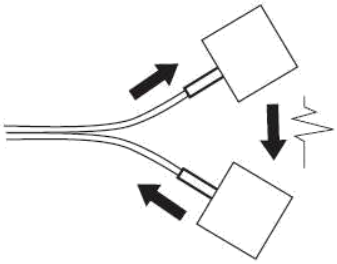
**Modulation Modes**

Modulation is when either the frequency or pulse width sweep across range of settings.

In modulation mode, the machine delivers a less regular pattern of TENS stimulation in an attempt to reduce or minimise the accommodation effects of regular, patterned stimulation. This is potentially most useful for patients who use TENS for several hours a day, if for no other reason than accommodation occurs at a slower rate and therefore less intensity adjustment may be required

## 1.3. Positioning the electrodes for TENS

The electrode pads must always be used in pairs (two electrode pads on each channel), so that the signal can flow in a circuit.



TENS works one vertebra at a time. You need to stimulate the sensory nerves that enter the spine at the same level as the nerve carrying your pain. Since you don't know exactly where your nerves are, the easiest way is to apply the electrode pads around/near the source of the pain.

TENS activates the nerves best if it travels along the nerve rather than across it. So place one pad further from the spine than the source of the pain, and one closer.
The nerves wrap around the limbs and torso, so you may have to try a few positions before you get the best effect.

If the pain is in, or close to, your spine you can place one pad either side of the spine.

You may feel more sensation in one pad than the other. This is normal – it depends on where the electrode pads are in relation to your nerves.

For areas that are difficult to reach, why not ask a friend to help you attach the electrode pads?

Since everyone's nervous system is slightly different, there is no one correct position for electrode placement and you will need to try several different positions until you find the one that works best for you.

TENS works by stimulating sensory nerves that enter the spine at the same level as the nerve carrying your pain. You can stimulate these nerves anywhere along their length.

1. The first choice is therefore to place the electrodes across the pain, with one electrode further away from the spine than the source of the pain, and one closer.

2. Second choice is to place the electrodes along the nerve, between the source of pain and the spine.

3. Third choice is to place the electrodes either side of the spine, but this is far more sensitive to positioning, as you need to find the correct level (vertebra).

4. Fourth choice is to place electrodes from top to bottom of the spine or cross over (see lower Back Alternative). This covers more nerves but, since it crosses them at an angle, may be less effective.

Always check that the unit is OFF before attaching or removing electrode pads.
Flexistim resets strength to zero if the pad or lead is disconnected from your body. This is to prevent sudden changes in sensation when the pad is re-connected.

Note: See examples of positioning in the instructions enclosed with your electrode pads.

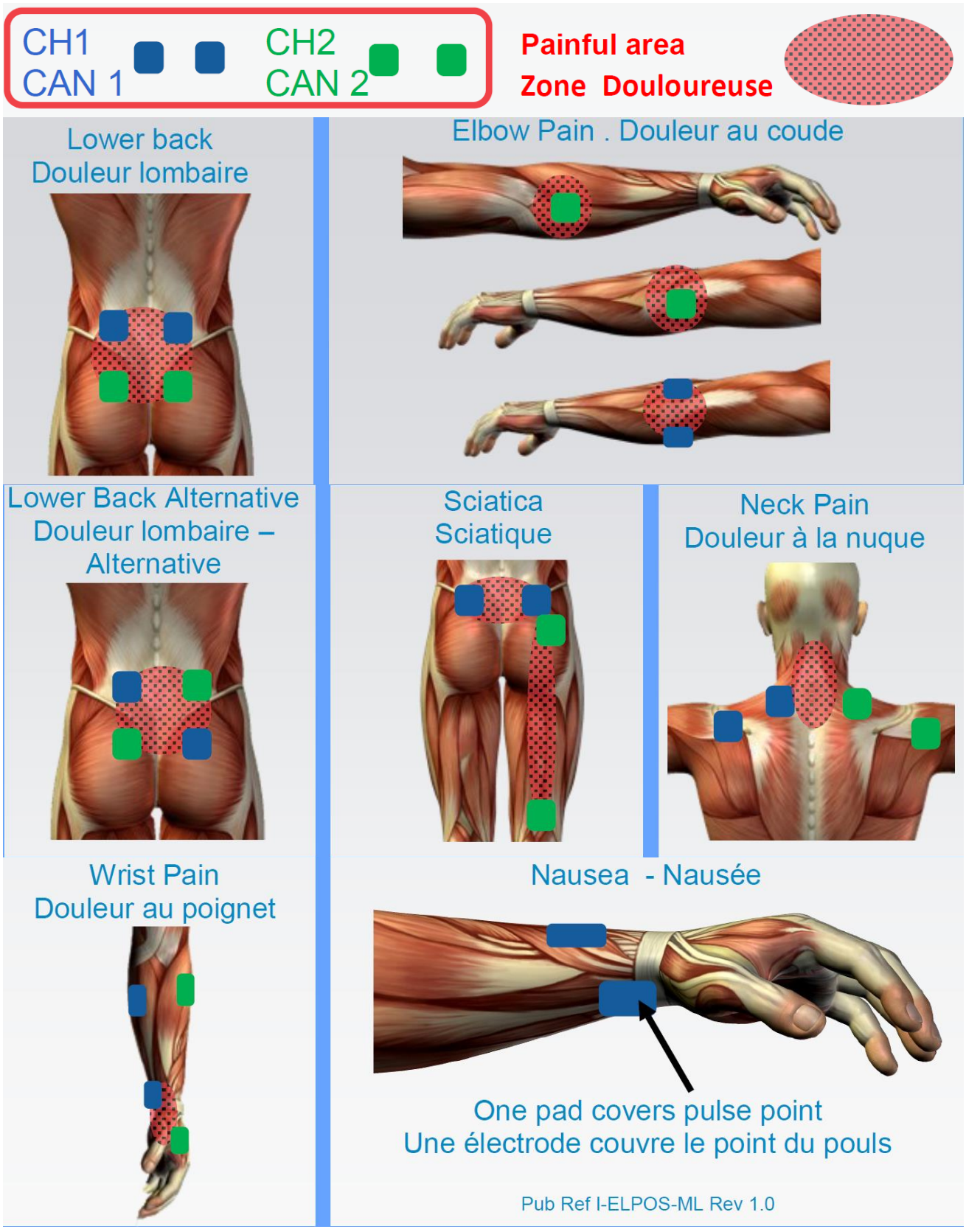
Electrodes are usually first placed where the greatest pain is felt.
Try different positions until you find the best for you.
Try moving the electrodes short distances to establish the positions that are most effective for you.

The following body maps in this instruction booklet will show you where to place the electrode pads for a range of common complaints, dependent on your symptoms.

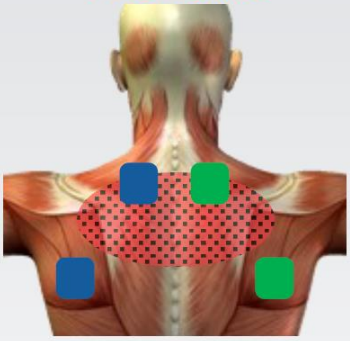
For symptoms not illustrated, apply the pads around/near to the source of the pain or seek advice from your doctor or physiotherapist.

**NOTE: Always check unit is OFF before attaching or removing pads.**

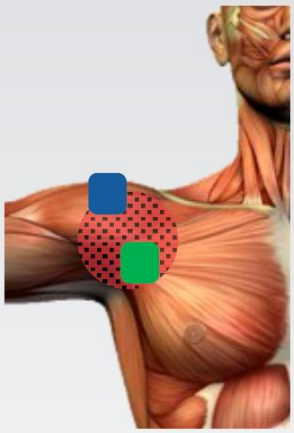
## 1.4. TENS electrode pad positions

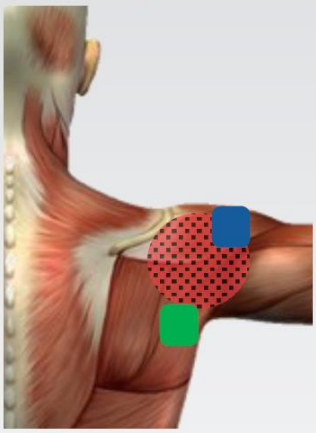


## Upper Back Pain
## Haut du dos
## Alternative



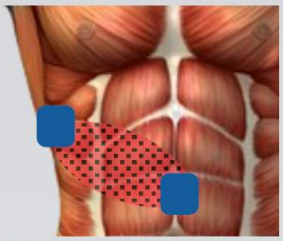
## Shoulder Pain  Douleur à l'épaule



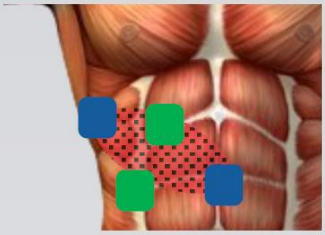


## Ankle and Foot Pain-
## Douleur à la cheville
## et au pied

## Shingles – 2 pads
## Zona — 2 électrodes



## Shingles - 4 pads
## Zona — 4 électrodes

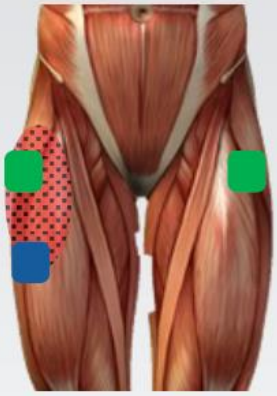


If too sensitive, you can try stimulating the opposite side of the body to the pain ( mirror image)
Si c'est trop sensible, vous pouvez stimuler le côté du corps opposé à celui de la douleur (image en miroir)

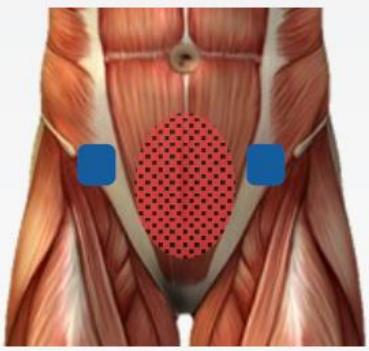
## Ankle and Foot Pain-
## Douleur à la cheville
## et au pied

Upper electrode is on the lower side of the knee at the top of the tibia
L'électrode du haut est sur le bas du genou/en haut du tibia

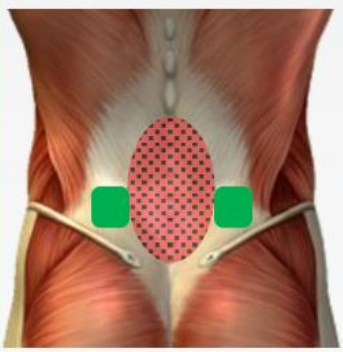
## Hip Pain  Douleur du hanche



## Period Pain
## Douleur de règles



## Period Pain
## Douleur de règles



# 2. E.M.S - Electrical Muscle Stimulation.

## 2.1. What E.M.S. does

EMS stands for Electrical Muscle Stimulation and is a widespread and generally recognised method which has been used for years in sports and rehabilitation medicine. In the sports and fitness field, one of the uses of EMS is as a supplement to conventional muscle training, in order to increase the efficiency of muscle groups and adapt physical proportions to the desired aesthetic results.
EMS has two main applications. Firstly, a targeted strengthening of musculature can be produced (Activating application) and secondly a relaxing, resting effect can also be achieved (Relaxing application).
Typical uses are:
• Muscle training to improve endurance performance
• Muscle training to support the strengthening of certain muscles or muscle groups in order to achieve desired changes to body proportions
• Sports training, covering - warm-up, strength, speed, power, resistance, endurance and recovery
• Rehabilitation in relation to sports injury
The effect on muscle tone of electrical stimulation (EMS) is generally only noticeable after regularly repeated application. Electrical stimulation does not replace regular exercising of the muscle but is able to reasonably supplement it.
Muscle wastage: EMS is used in the treatment of medical conditions involving muscle wastage including: Neuromuscular facilitation - Muscle re-education - Muscle training - Prevention/slowing of atrophy/hypotrophy - Preventing postoperative muscle weakness
- Reduction of spasticity - Maintaining or increasing range of motion - Training of partial peripheral nerve damage with signs of re-innervation - Treatment of scoliosis.

**EMS successfully rebuilds and tones muscles.** Different levels of muscle contraction are achieved by sending electrical impulses of various types, depending on the programme selected, into the body. These muscle contractions retrain the muscles, increase their effectiveness and improve their condition. This is beneficial where muscles - for whatever reason - have not been in regular use and have lost condition (muscle atrophy). For sports, the benefit is to increase the effect of training and enhance performance.

**Muscle wastage:** EMS is used in the treatment of:
Neuromuscular facilitation - Muscle reeducation - Muscle training - Prevention/slowing of atrophy/hypotrophy - Preventing postoperative muscle weakness - Reduction of spasticity Maintaining or increasing range of motion - Training of partial peripheral nerve damage with signs of reinnervation - Treatment of scoliosis - Incontinence treatment

**Sports:** EMS is used in:
sports training, covering - warm-up, strength, speed, power, resistance, endurance and recovery and also for rehabilitation in relation to sports injury.

EMS works as an excellent complement to regular training.

## 2.2. Mode of Operation

EMS uses external electrical impulses that act through the skin to stimulate the nerves supplying a specific muscle group.

The muscle reacts in different ways depending on the strength of current and duration and frequency of the electrical impulse.

Muscles are made up of two different type of fibre:

- Red fibre is slower contracting and aerobic working.
- White fibre is faster acting and capable of anaerobic working.

The proportions of red and white fibres depend on the way the muscle is used.
Fibre can be converted from one type to the other, depending on the signals it receives. This is known as the Trophic effect.

Different frequencies have different effects: Low (1-10 Hz) frequencies coupled with long impulse times have a purifying and relaxing effect through individual contractions, whereby the circulation in the treated muscle is simultaneously improved and removal of metabolic end products is supported (lymphatic drainage). The oxygen supply to the muscle is improved.

In contrast, medium (20-50 Hz) frequencies can put a high level of strain on the muscle, thus promoting the muscular structure.

Very high frequencies (60-90 Hz) can be used to promote muscle definition and bulk.

The body maps at the end of this section show pad positioning in order to stimulate specific muscle groups.

## 2.3. Treatment Time and Intervals

Treatment by EMS can vary between 15–60 minutes stimulation twice a week to treatment several times per day.

***CAUTION***
EMS is closely comparable to normal exercise: over-work can cause pain during the exercise AND may cause aching the following day. Always use caution and build up exercise slowly. As the muscle gets stronger and blood supply improves, you will be able to work harder.

As with all exercise, results are not short term. It can take up to 12 weeks of regular use to rebuild the tissues in a muscle.

## 2.4. Choosing the right strength

The object of EMS treatment is to produce powerful muscle contractions.

The strength of the current should be increased to **about three times the level at which you can first feel the tingling**, to as high as you can stand without causing pain.

You will probably feel that electrical contraction is being more powerful than a voluntary contraction, because the current also stimulates your sensory nerves. The signals have a pain-relieving effect.

You may find the sensation uncomfortable to start with, so that you may not get up to therapeutic strength at the start of treatment. The strength can be increased during the course of the treatment, as you become accustomed to the sensation.
Voluntary muscular activity is more effective than stimulation, and it may improve progress if you combine voluntary contraction with stimulation.

The powerful muscle contractions caused by electrical stimulation give rise to training aches, which usually disappear within a week.

After treatment tingling sensations may continue or your skin may feel numb, this is normal.

## 2.5. References and Treatment Protocols

**Ethne L. Nussbaum et al. Neuromuscular Electrical Stimulation for Treatment of Muscle Impairment: Critical Review and Recommendations for Clinical Practice. Physiotherapy Canada Special Issue 2017; 69;1–76;**

### NMES in Hemiplegic Shoulder Subluxation

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| Prevention or treatment of shoulder sublux resulting from UE flaccidity poststroke | **Electrode placement:** over muscle belly of supraspinatus and posterior deltoid. Avoid upper trapezius fibres and excessive shoulder shrug. Applying a second channel to stimulate the long head of biceps can be beneficial in correcting humeral head alignment.[7]<br>Body and limb position: patient sitting with arm support<br>**NMES waveform:** symmetric or asymmetric biphasic PC<br>**Frequency**: 30–35 Hz<br>**Pulse duration**: 250–350 μs<br>**Current amplitude:** sufficient to produce a smooth, sustained muscle contraction and reduction of shoulder sublux<br>**Work–rest cycle:** ON:OFF 10–15 s ON time with progressively shorter rest time (30 s ON time, 2 s OFF time). Ramp up time (1–4 s) is set to ensure patient comfort; longer ramp-down time may be required to prevent pain or tissue stretching when the arm sags due to gravity.<br>**Treatment schedule**: progress to 2–4 h/d on the basis of muscle fatigue<br>**Session frequency:** 7 d/wk for 4–6 wk or until voluntary control has been restored<br>**Initiation of NMES:** as soon as shoulder flaccidity occurs and before pain has manifested; applied in conjunction with other rehab strategies. Can be safely and comfortably applied within 24–72 h post-stroke. NMES can reduce existing sublux even 6 mo post-stroke; however, the likelihood of improvement markedly reduces with time post-stroke.<br>Concurrent arm support is needed when NMES is turned off to prevent further stretching of joint structures. | e Reduced sublux (X-ray)[8–15]<br>e Increased muscle strength (shoulder abduction and external rotation)[12]<br>e Increased ROM[9,10]<br>e Increased EMG activity[10,12]<br>e Reduced pain at rest and with shoulder movement with either passive or active ROM[9,10]<br>e Improved arm function (e.g., F-M, ARAT, MAS)[9,15] |

### Wrist and Finger Extension

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| Wrist and finger extensor weakness | **Electrode placement:** Both recording EMG and stimulating electrodes were placed just distal to common extensor origin and halfway down the extensor surface of the forearm (on extensor carpi ulnaris, extensor carpi radialis, or both, aiming for a neutral position of the extended wrist in terms of radial and ulnar deviation)<br>**Body and limb position:** patient seated, elbow flexed 90———————, forearm pronated<br>**NMES waveform:** asymmetric biphasic PC<br>**Frequency**: 30–40 Hz to produce tetany[32–39]<br>**Pulse duration**: 200 μs[32,33,39–41] or 300 ms[37,38,42–44]<br>**Current amplitude:** individual maximum tolerated intensity; trying to achieve full wrist and finger ext<br>**Work–rest cycle:** 10:30–60 s to avoid muscle fatigue<br>**Treatment schedule**: average 30 min/d[33,34,37–39,44]<br>**Session frequency:** 5 d/wk[33,38–40,43–46] over 4–8 wk;[32,33,37,38,40,43,45,46] extra wk may be required if applied > 6 mo post-stroke | e Increased muscle recruitment[32]<br>e Increased wrist and finger extension[33,34,37,38]<br>e Increased grip strength[37,38,47]<br>e Increased wrist ROM[33,38,43]<br>e Reduced flexor spasticity and increased reach[32,44]<br>e Increased cortical activation[39]<br>e Improved function (e.g., B&B,[34,39] UE F-M,[35,40,41,44] Barthel Index[38,43,44]) |

### Foot Drop, Plantar Spasticity, and Gait Improvement

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| Lower extremity foot drop;<br>plantar (gastrocs) spasticity;<br>gait re-education | **Electrode placement:** 1 electrode over the common peroneal nerve, the other over the MP of tib ant or both tib ant and peronei. Additional channel might be considered for gluteus medius stimulation<br>**Body and limb position**: DFL against gravity during gait re-education or with patient sitting or standing (weight-shift Ex)<br>**NMES waveform:** biphasic PC<br>**Frequency:** 30–50 Hz to produce tetany[68–75]<br>**Pulse duration:** 300 μs[72–76]<br>**Current amplitude**: individual maximum tolerated to achieve ankle DFL (varying from neutral to max)[72–78]<br>**Work–rest cycle**: ON:OFF 5–10:6–30 s[70,72,75,76]<br>When using NMES as part of gait retraining, ON:OFF times are controlled by pressure-sensitive heel switch[71,74,76]<br>**Treatment schedule**: 30 min/d[70–76]<br>**Session frequency:** 5 d/wk[71,72,74,75,78] over 3–4 wk[70,72,73,75,78] | e Increase in muscle strength (torque, MMT)[71,73,74]<br>e Increase in ankle DFL[74]<br>e Increased EMG activity[75]<br>e Decrease in ankle plantar flexor (gastrocs) spasticity (Barthel Index, modified Ashworth Scale, CSS)[70,74,75]<br>e Increase in gait speed[68,69,78]<br>e Improved LE function (F-M, Mass Gen Hosp, ambulation)[68]<br>e Improvement in gait kinematics (symmetry, stride length)[68,70,71,76]<br>e Improved balance (Berg Balance Scale)[71] |

## Anterior Cruciate Ligament Reconstruction

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| ACL reconstruction | **Electrode placement**: No standardized location reported in the literature. Recommended placement based on a synthesis of the literature: (1) quads on femoral nerve or muscle belly of rec fem or vastus intermedius and on MP or muscle belly of VM[95–97]or (2) quads (as above) and on hams (over muscle bellies of biceps femoris and semitendinosis or semimembranosis). [98–101] Some studies placed electrodes on VL.[102,103]<br>**Limb position:** knee flexed to ~65_<br>**NMES waveform**: low-frequency biphasic[95,97,98,101,104–107] or medium-frequency burst-modulated AC[99,103,108–110]<br>**Frequency:** 30–50 Hz PC[95,97,101,104–107] or 2500 Hz AC in 50 Hz bursts[99,110,111]<br>**Pulse duration:** 250–400 μs[97,100,102,103,105–107,112,113]<br>**Current amplitude:** individual max tolerated intensity; minimum at strong but comfortable muscle contraction[95,97,99,100,105,106,109,112,113]<br>**Work–rest cycle**: ON:OFF 6–10:12–50 s;[95,98,101,103,105,106] use lower duty cycle–e.g., work–rest 1:3–1:5–if the muscle is weaker to limit fatigue associated with an electrically induced muscle contraction<br>**Treatment schedule**: initiate ideally within 1 wk post-op:[98–101] 12–15 contractions/session[98,99,102,103,108–110,112]<br>**Session frequency**: 3 _ wk | e Reduction in loss of muscle volume or thickness (CT, MRI, US imaging)[100,107,113]<br>e Self-reported function (ADL scale)[108]<br>e Gait parameters (motion analysis)[103]<br>e Achieving clinical milestones[108]<br>e Limb circumference (tape measure)[105,110]<br>e Functional performance (lateral step-up, anterior reach)[100,101] |

## PATELLOFEMORAL PAIN SYNDROME

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| PFPS | **Electrode placement**: No standardized location reported in the literature. Recommended placement is based on a critical review of the literature: 2 electrodes, 1 over the rec fem and vastus intermedius muscle bellies, the other over the VM.[122,123] Recommendation is to position electrodes in line with the orientation of the muscle fibres.[124,125]<br>**Limb position:** No standardized location reported in the literature. From a clinical perspective, it is advisable to avoid the portion of the ROM that is provocative – i.e., position within the pain-free range.<br>**NMES waveform:** low-frequency biphasic PC[122,123,126,127]<br>**Frequency:** 35–50 Hz[122,123,126,127]<br>**Pulse duration**: 250–500 μs[122,123,126,127]<br>**Current amplitude**: individual max tolerated intensity[122,123,126–128]<br>**Work–rest cycle:** ON:OFF 6–10:10–50 s; OFF times should be consistent with the treatment goals: shorter rest period (a10 s) for endurance training, 30–50 s for strengthening purposes[122,123,126–128]<br>**Treatment schedule:** 12–15 contractions per session, as is typically reported in NMES literature relating to quads weakness[98,99,102,103,108–110,112]<br>**Session frequency**: ideally, 3 d/wk over 4–6 wk[127] | Z Reduction in pain (VAS)[123,126,128]<br>Z Increased force-generating capacity (EMG)[127]<br>Z Deactivation of VL[127] |

## NMES in Knee OA

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| | **Electrode placement:** large electrodes placed on quads muscle belly proximally on rec fem and distally on VM, VL, or both[135–138]<br>**Limb position:** sitting; hip flexed to 90_, knee flexed 60–90_ 135,136,138<br>**NMES waveform**: low-frequency biphasic PC[135–139]<br>**Frequency:** 50 Hz[135–139]<br>**Pulse duration**: 250–300 μs[135–140]<br>**Current amplitude:** individual max tolerated intensity[135,138,140]<br>**Work–rest cycle:** ON:OFF 10:50 s (1:5 ratio)[135,137,139]<br>**Treatment schedule:** 15–20 contractions with Ex[135–137,139]<br>**Session frequency**: 3 d/wk, 4–8 wk[135–140] | Z Improved self-reported function (WOMAC, SF-36)[135–137,140,141]<br>Z Improved function (SCT, 6MWT, 25-metre walk test, TUG)[135,136,138–142]<br>Z Pain (WOMAC)[136]<br>Rationale for |

TOTAL JOINT REPLACEMENT

| Indication | Parameter Recommendations | Outcome Measures Demonstrating Benefit |
|---|---|---|
| | **Electrode placement:** quads; large electrodes placed proximally and distally on the belly of the muscles, typically rec fem and VM.[143,149–154] Recommendation is to position electrodes in line with the orientation of the muscle fibres.[124,125]<br>**Limb position:** sitting; knee flexed 60–90_[143,152–154]<br>**NMES waveform**: low-frequency biphasic PC[149–151,153–156] or 2500 Hz burst-modulated AC[143,152]<br>**Frequency:** 50 Hz PC (range 40–75 Hz) or AC @ 50 Hz burst rate<br>**Pulse duration:** 250–400 μs[149,150,153,155–157]<br>**Current amplitude:** individual max tolerated intensity (use large electrodes for better comfort and to reach more motor units)[143,149–155,157]<br>**Work–rest cycle:** ON:OFF 5–10:8–80 s. Ratio of 1:2 or 1:3 recommended when using 10–50 Hz PC.[153,154] Ratio of 1–8 recommended when using 2500 Hz AC.[143,152]<br>**Treatment initiation**: ideally on POD 1 or 2<br>**Session frequency**: For increasing quads activation and strength as well as function, 10–30 contractions/d, 3 d/wk, for 6 wk.[143,152,153] For increased function, 1–2 h/d, 5d/wk, for 6 wk.[149–151]<br>**Indication:** Use combined with (not simultaneously with) supervised active Ex, resisted Ex, or both. | e Improved muscle strength: isometric, isokinetic[143,152–155,157]<br>e Muscle activation[143,145,152–155]<br>e Reduction in loss of muscle volume or thickness[154,157]<br>Z Improved self-reported function or disability (WOMAC, KOOS, Knee Society Score, Oxford Knee Score)[153,154,156]<br>Z Improved function (SCT, 3MWT, 6MWT, TUG)[149,150,152–154,156]<br>Z Improved walking speed[149,150,152,153,156]<br>Z Perceived health status (SF-36)[149] |

Stevens-Lapsley JE, Balter JE, Wolfe P, et al. Early neuromuscular electrical stimulation to improve quadriceps muscle strength after total knee arthroplasty: a randomized controlled trial. Phys Ther. 2012;92:210–226.]

- Biphasic current, using a symmetrical waveform.
  50 Hz, 250 us. Work 15 s (including a 3 s ramp-up time) Rest 45 s

Sven Feil et al. The Effectiveness of Supplementing a Standard Rehabilitation Program With Superimposed Neuromuscular Electrical Stimulation After Anterior Cruciate Ligament Reconstruction A Prospective, Randomized, Single-Blind Study. The American Journal of Sports Medicine, Vol. 39, No. 6

- 50 Hz. 0 to 70 mA. Work rest ratio (1:2).
  Three 20-minute sessions per day,5 days per week.

Benito-Martínez E, Lara-Sánchez AJ, Berdejo-del-Fresno D, Martínez-López EJ. Effects of combined electrostimulation and plyometric training on vertical jump and speed tests. J. Hum. Sport Exerc. Vol. 6, No. 4, pp. 603-615, 2011.

- 150 Hz, 350 us, Work 3-12 s. 12 mins . 2 days / week. Current intensity applied was the maximum tolerated by the athlete.

LUCIANA LABANCA et al. Neuromuscular Electrical Stimulation Superimposed on Movement Early after ACL Surgery. MEDICINE & SCIENCE IN SPORTS & EXERCISE 2017

- 35 and 50 Hz alternately applied at each session. These two frequencies were chosen to stimulate both slow- and fast-twitch muscle fibers while at the same time promoting the highest comfort during stimulation.
  Intensity in accordance with patient tolerance up to 120 mA.
  Work.8 s, Rest 8 s.

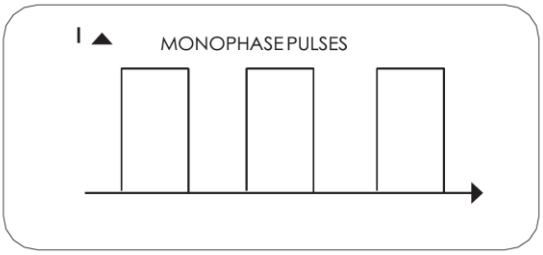
Hassan Abdelaziz Abu-Khaber, et al. Effect of electrical muscle stimulation on prevention of ICU acquired muscle weakness and facilitating weaning from mechanical ventilation. Alexandria Journal of Medicine (2013) 49, 309–315

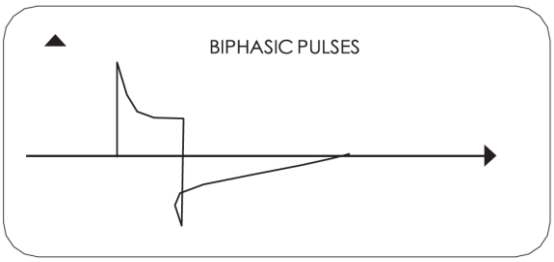
- Biphasic, symmetric
- 50 Hz, 200 us. 15 s Work (including 1 s rise time and 1 s fall time)
- at intensities able to cause visible contractions (mostly 100–150 MA).
- Daily for 1 h including 5 min for warm up and 5 min for recovery.

# 3. TENS and EMS Stimulation Parameters

The effect of electrical stimulation on the body depends on the following current settings:

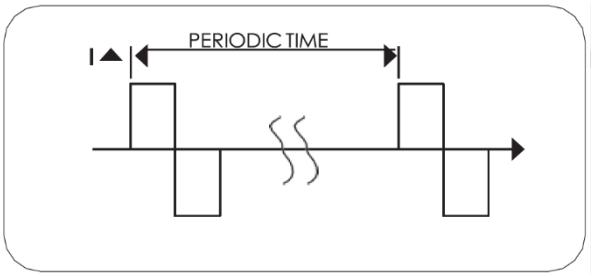
## 3.1. Pulse Waveform




This describes the time function of the excitation current which may be either monophasic or biphasic.
With monophasic pulse trains, the current flows in one direction. With biphasic pulses, the excitation current alternates its direction.
The Flexistim uses only biphasic pulse trains, as they reduce the strain on the muscle, leading to less muscle fatigue as well as safer application and reduce the risk of skin irritation under the electrode.

## 3.2. Pulse Frequency




Frequency indicates the number of individual pulses per second and is indicated in Hz (Hertz = pulses per second). It can be calculated by working out the inverse value of the periodic time.

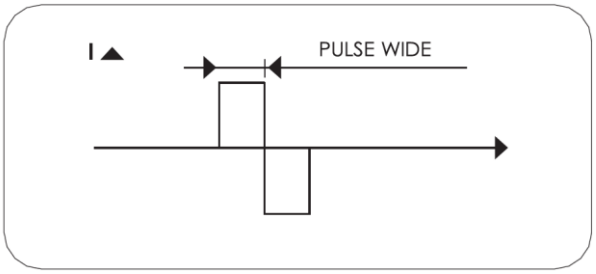
Different types of muscle fibres react preferentially to different frequencies:
Slow-response fibres tend to react to lower pulse frequencies up to 15Hz, while fast- response fibres only respond to frequencies over approx. 35Hz.
With pulses of approx.45~70Hz, there is permanent tension in the muscle (tetany) combined with premature muscle fatigue. Higher pulse frequencies can therefore preferably be used for elasticity and maximum strength training.

For TENS:
A frequency of 110 Hz is good at blocking pain signals.
A low frequency of 4 or 10 Hz allows for the release of endorphins, the body's natural morphine-like substances.

For EMS
Think of this as the size of a weight you might lift: Lower weights (20-40Hz) for stamina, or higher weights (50-90 Hz) for bulk and short term strength.

## 3.3. Pulse Width (Duration)

Pulse width is used to indicate the duration of an individual pulse in microseconds (millionths of a second). Pulse width also determines the penetration depth of the current. In general, a greater muscle mass requires a greater pulse width. A higher pulse width is also more likely to activate pain nerves, so there is a fine balance between maximum muscle stimulation and tolerable sensation.

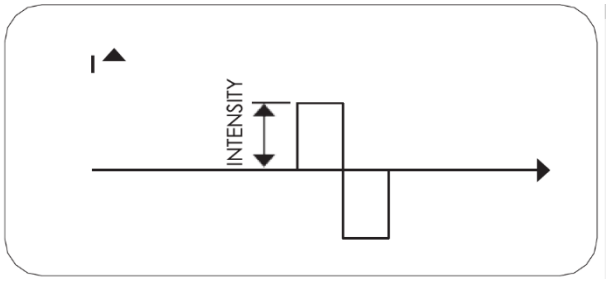



For TENS
50 to 250 µs.

For EMS
50-400 µs depending on frequency. A higher Pulse Width is more likely to activate muscles (motor nerves rather than sensory nerves). Larger muscles need higher Pulse Width.

## 3.4. Pulse Intensity

Setting the degree of intensity is dependent on the subjective feeling of each individual user and is determined by a number of parameters such as application site, skin circulation, skin thickness as well as quality of electrode contact. The actual setting should be effective but should never produce any unpleasant sensation such as pain at the site of application.

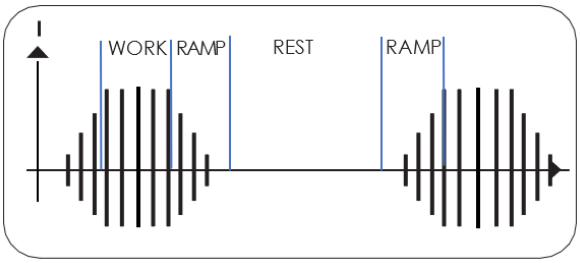



In TENS programmes, while a slight tingling sensation indicates sufficient stimulation energy, any setting which leads to pain must be avoided.
In EMS programmes, the intensity needs to be as high as possible for maximum benefit – so set just below the pain threshold.

With prolonged application, you may need to increase intensity as nerves get used to the stimulation and become less sensitive (known as accommodation).

## 3.5. Work

Work is the time in seconds that muscle is stimulated (not including Ramp time). The Flexistim offers a range of work periods from 1-40 sec. Think of this as the length of time you might hold a weight




## 3.6. Rest

Rest is the time in seconds at zero strength in between stimulation. The Flexistim offers a range of rest periods from 1-40 sec. The EMS programmes use an active rest - low frequency pulses help to clear metabolites in-between work periods.

At frequencies greater than 30Hz, REST time should always be more than twice WORK time. If you were lifting large weights, you would do a small number of repetitions, with a long rest in between. With small weights, you can do many, rapid, repetitions.

In general, there is a limit on the number of times a minute you can comfortably fire the muscle fibres. With a low frequency stimulation, you do not need much, if any, rest time. With a high frequency stimulation, you need a lot of time at or near zero (rest) to reduce the average.

## 3.7. Ramp

Ramp is the time in seconds taken to move up and down between zero and the set stimulation strength. The Flexistim has a fixed ramp time of 1.5 up and 0.75 down. This makes the start of each WORK period more comfortable.

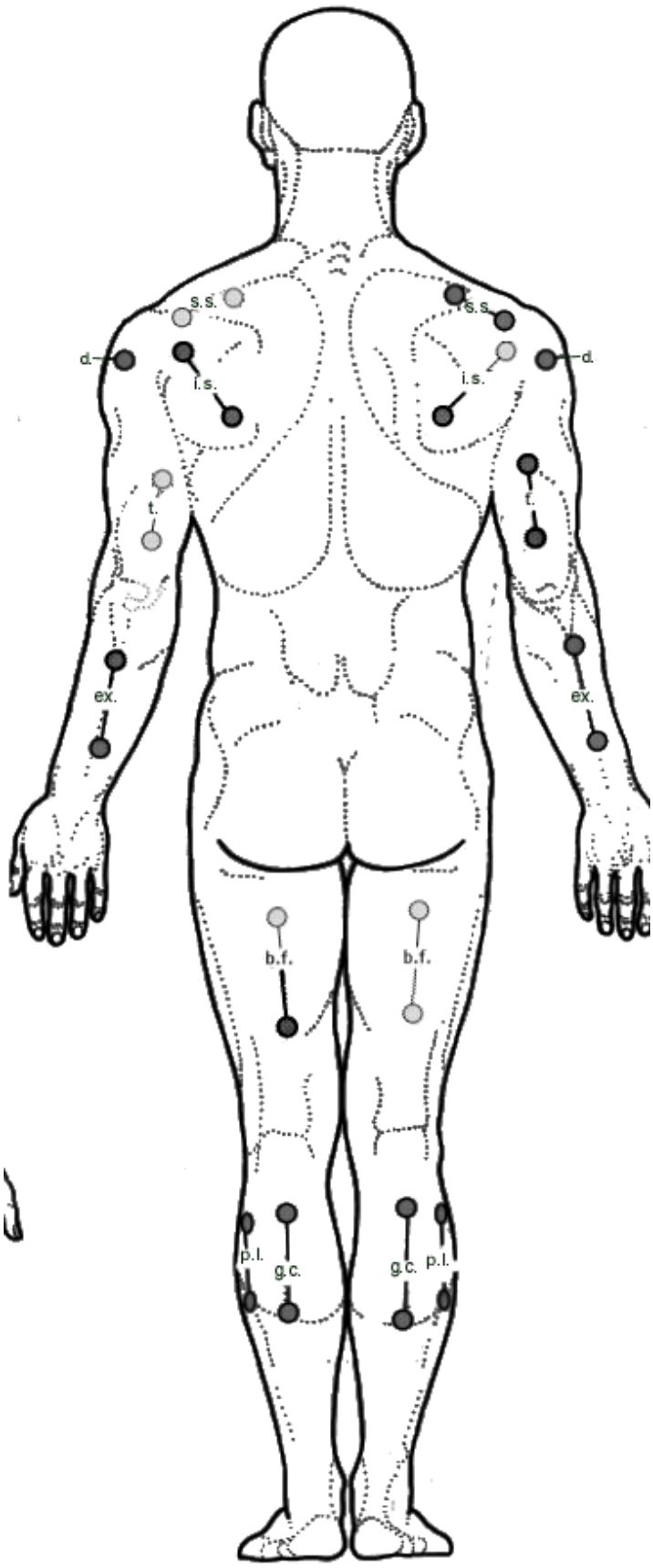
## 3.8. Synchronous / Alternating ( P1/P2 )

Flexistim has an **Alternating** mode. In this the output from Ch2 is active during the rest period of Ch1. So EMS can be used to flex joints.
The relative time of Ch1 and Ch2 can be adjusted with the **Delay (P3)**
Start of WORK period in CH2 is later than start of WORK period in Ch1 by te Delay set.

## 3.9. Electrode Pad Placement for EMS

***Positive (red connector) pad should be placed in the centre of the muscle 1/3 of its length from the spine.***

**O.O** M.orbicularis oculi
**z.m** M. zygomaticus major
**o.f** M.occipito frontalis, pars frontalis
**L.L** M. levator latii
**s.c.m.** M. sternocleido-mastoideus
**d.** M. deltoideus
**b** M. biceps brachii
**fl.** Underarm flexors:
M. flexor carpi radialis et ulnaris
M. flexor digitorum superficialis
M. palmaris longus
**p.m.** M. pectoralis major
**r.a**. M. rectus abdominis
M. sartorius
**r.f.** M. rectus femoris
**v.l**. M. vastus lateralis
**v.m.** M. vastus medialis
**p.l.** M. peroneus (fibularis) longus
**t.a.** M. tibialis anterior



**s.s.** M. supraspinatus

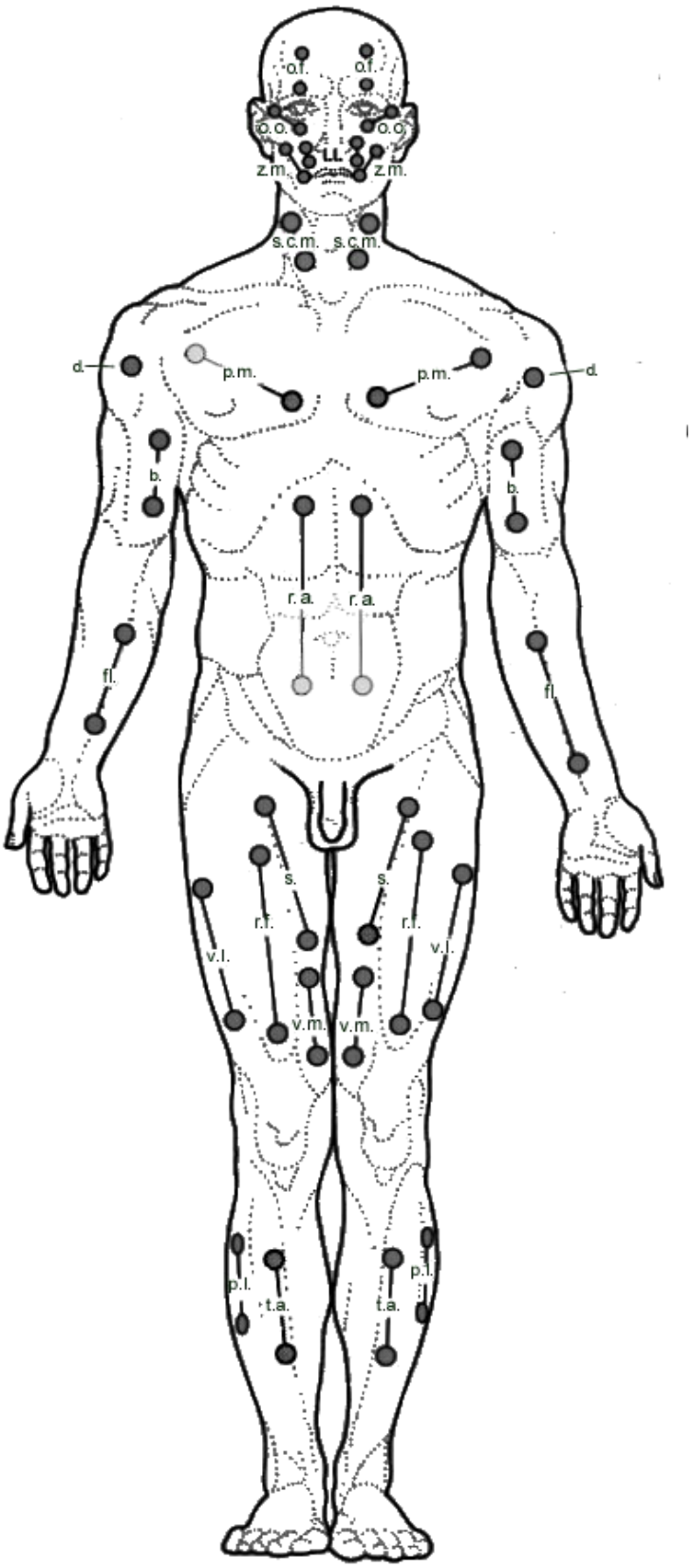
**i.s.** M. infraspinatus

M. triceps brachii

**ex.** Extensors on the underarm:
M. extensor carpi radialis
M. extensor carpi ulnaris
M. extensor digitorum

**b.f.+st.** M. biceps femoris
+ M. semitendinosus

**g.c.** M. gastrocnemius
(+ M. soleus)



# 4. INTERFERENTIAL THERAPY

## 4.1. How Interferential Therapy Works

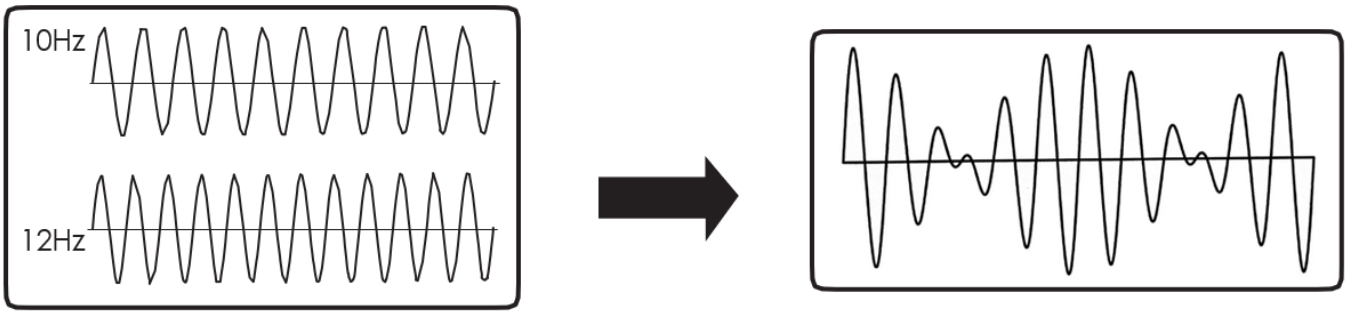
Flexistim produces a low frequency current treatment that uses two medium frequency currents, which “interfere” with each other to produce a beat frequency that the body recognizes as a low frequency energy source.

The rationale is to overcome the problems caused by low-frequency currents, while maintaining their claimed therapeutic effect. Unlike TENS, which delivers intermittent pulses to stimulate surface nerves and block the pain signal, Interferential Current Therapy delivers continuous stimulation deep into the affected tissue.

The actual stimulation is produced by crossing two alternating currents with medium frequencies simultaneously to a targeted body region. As a result, these two currents will superimpose to form a new low frequency current.

IFT achieves this deep penetration by using a 4000 Hz carrier wave to overcome the skin impedance. TENS signals travel around the top 1cm of the skin surface. IFT signals travel almost directly between the electrodes.

Interferential Therapy uses two medium frequency 4000 Hz currents that ‘interfere’ with each other to produce a beat frequency that the body recognises as a low frequency energy source.




The range of this beat frequency in the Flexistim is 1 to 160Hz.

In addition to providing pain relief by the same mechanism that TENS uses, some physiotherapists consider that IFT’s major role is to accelerate the inflammatory or healing rate.

There is some evidence that the 4000Hz carrier wave has an effect independent of the interference frequency.

Many practitioners use a “Sweep” treatment which uses constantly changing interference pulse frequency. Uncontrolled anecdotal experience suggested that there may be therapeutic benefits for these sweeps in addition to those of conventional nerve stimulation.

## 4.2. The Pads

### 4.2.1. Placement of pads:

**NB:** Always make sure that the skin is clean and dry before attaching the pads.

Due to the technology incorporated within the **FLEXISTIM** the positioning of the pads is important

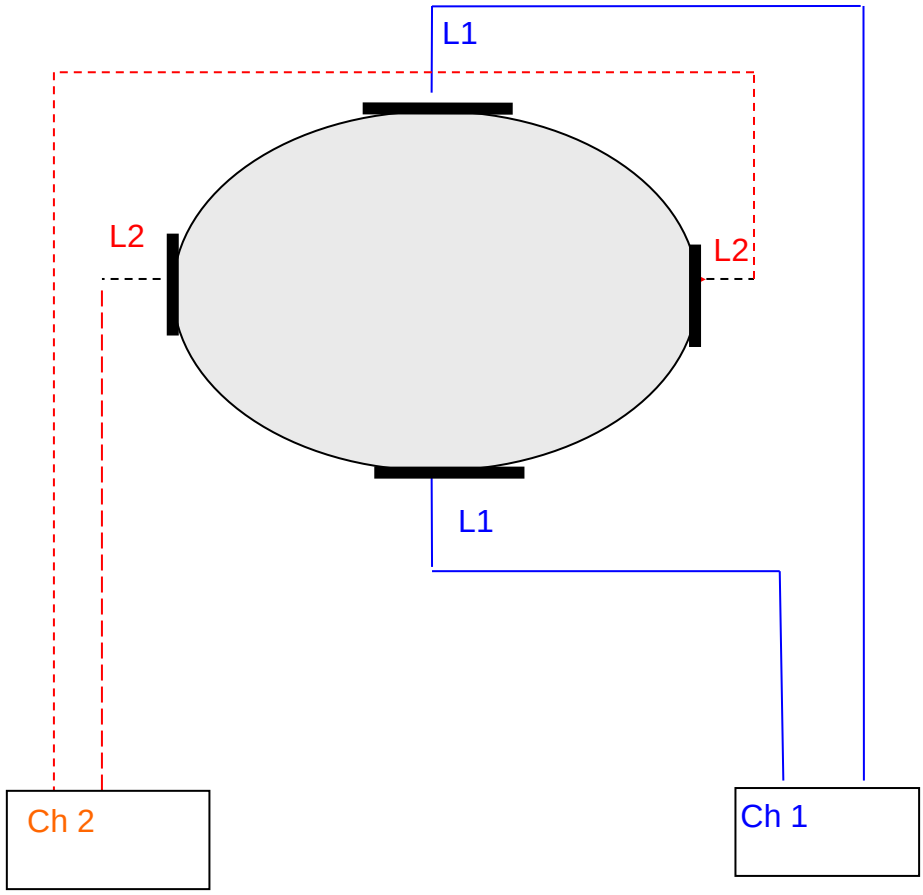
Place the four pads around the painful or stiff area.

Please refer to the photographs, which show positioning in respect of knees, elbows, backs and legs.

The two lead wires are described as coming from outlets Ch1 (channel 1) and Ch2 (channel 2).

To attach the pads to the body simply peel the pads off the plastic liner by lifting from any corner. The pads are self-adhesive and therefore will stick automatically.

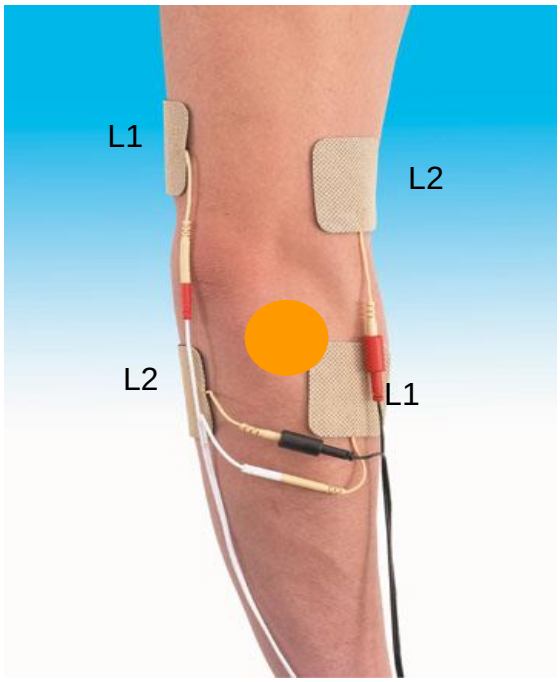
Do **NOT** switch on the **FLEXISTIM** until all the pads are on the body.



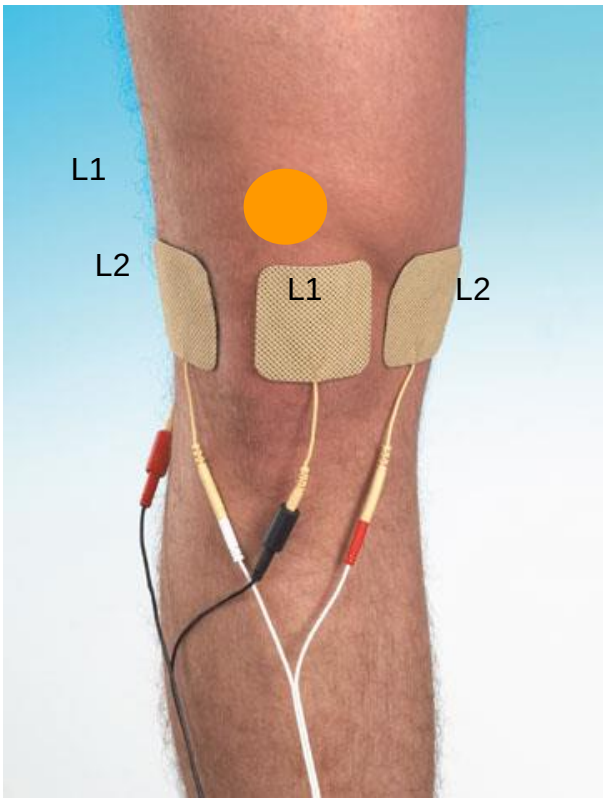
## 4.3. Pad Positioning

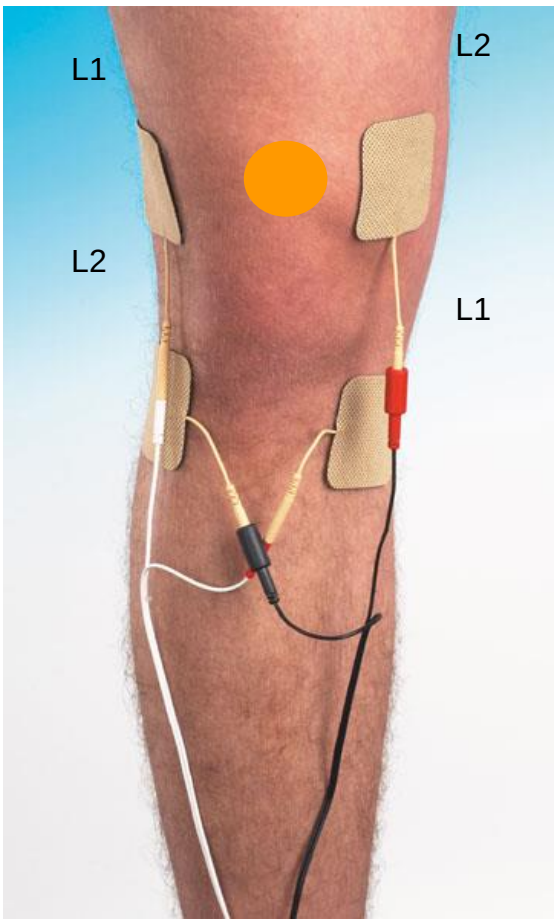
This symbol indicates the site of injury to be treated

### 4.3.1. ELBOW



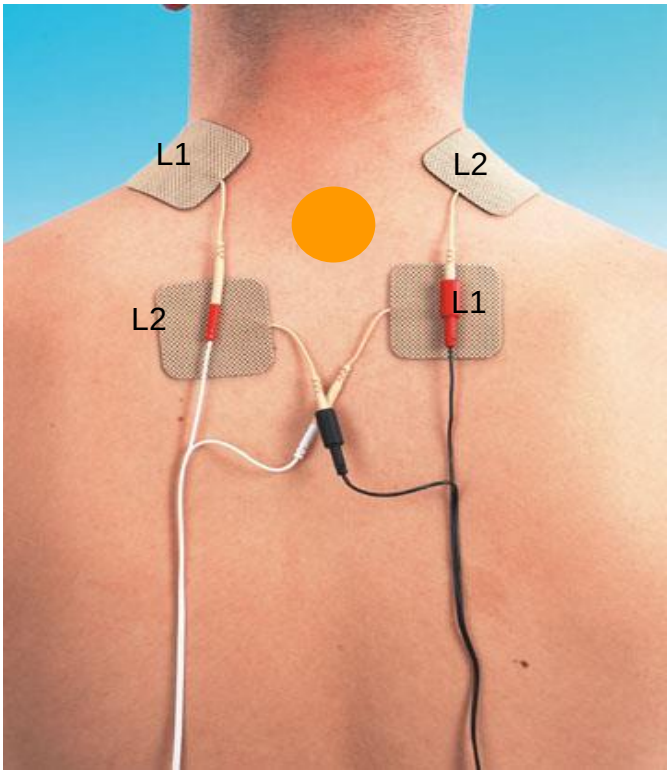

### 4.3.2. KNEE



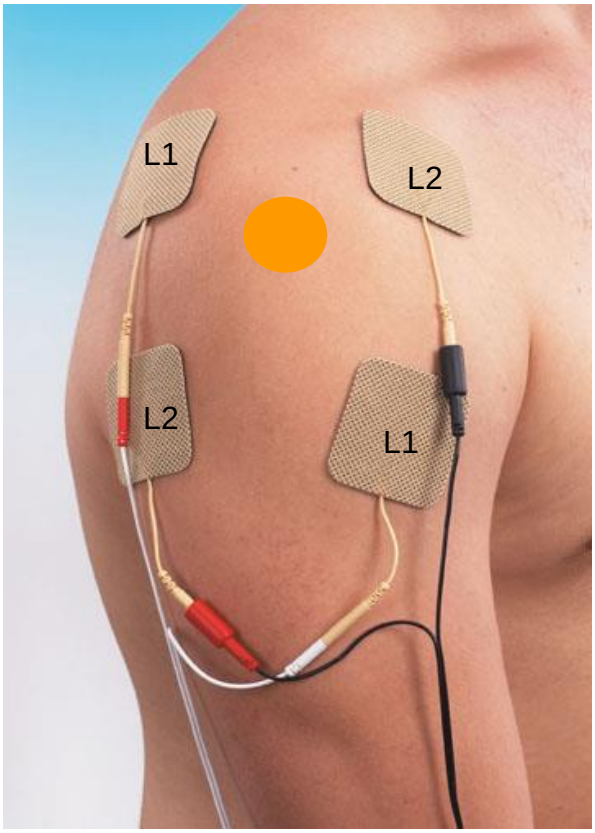



Alternative setting,

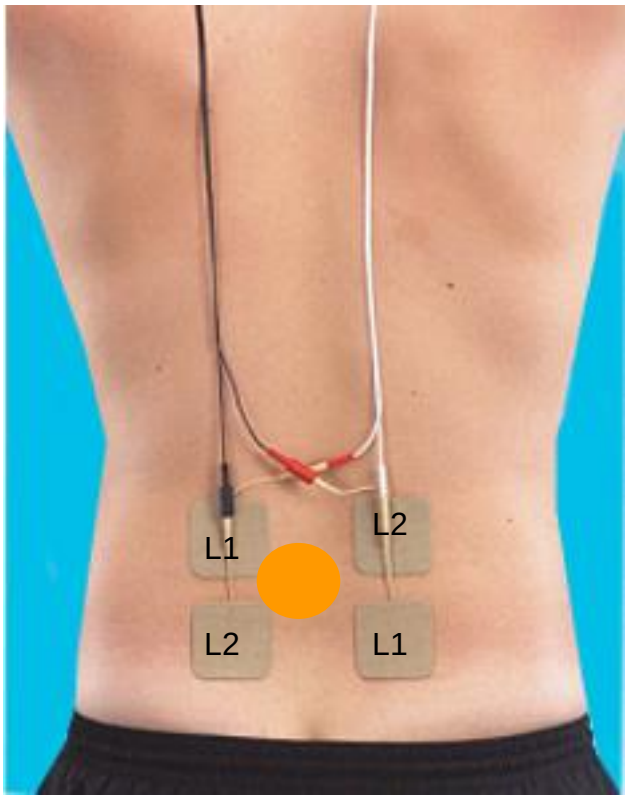
## 4.3.3. NECK




## 4.3.4. SHOULDER



### 4.3.5. LOWER BACK




## 4.4. Removal of pads:

Always switch **OFF** the **FLEXISTIM** before removing the pads.

Remove the pads individually and replace onto the liner. The pads are multi use and therefore can be used repeatedly, normally about 20 times.

## 4.5. Interferential Therapy as part of a whole treatment

The use of IFT should be considered a part of the whole treatment of the condition.

The whole treatment may include:
exercises to stretch injured muscles
exercises to move stiff joints
exercises to strengthen muscle groups to support the joints
and your physiotherapist will advise you accordingly.
Stiff joints are invariably painful so it is important to appreciate that gentle movement is generally better than resting.

A TENS unit, which also treats pain using electrotherapy but in a different way, can be used *simultaneously* if you need extra pain control to enable you to keep the joints or muscles moving.

NB NOTE If you are interested in knowing more, please speak to your physiotherapist.

## 4.6. Treatment Protocols

The following protocols are derived from previously published literature and from clinical advice derived from practical experience.

Unless otherwise indicated, these IFT protocols are not the results of controlled, peer reviewed, research and should be treated as general guidance only.

Interferential Therapy should not be commenced before the cause of the problem has been properly diagnosed by a medical practitioner

### 4.6.1. Back Pain

**Application**: Non-surgical approach in conjunction with other therapies.
Post-op procedures

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode Position**:
Current should cross so that most of the stimulation is felt in the area of pain.

**Settings:**

| | First half of treatment | Second half of treatment |
|---|---|---|
| **Program** | **P4** | **P4** |
| **Frequency** | **60-137 Hz (set at 85) Hz** | **10-23 Hz (set at 14)** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | Set at maximum comfort level |

**Treatment Duration**:
• Combined (30) minute treatment daily for 3 weeks

**References**

Ligia Maria Faccil et al. Effects of transcutaneous electrical nerve stimulation (TENS) and interferential currents (IFC) in patients with nonspecific chronic low back pain: randomized clinical trial. Sao Paulo Med J. 2011; 129(4):206-16

Manuel Albornoz-Cabello et al. Effect of interferential current therapy on pain perception and disability level in subjects with chronic low back pain: a randomized controlled trial. Clinical Rehabilitation. 2017, Vol. 31(2) 242–249
.
A Beatti et al.A double-blind placebo-controlled clinical investigation into pain reduction effect of placing the pain spot outside the intersection area of the two currents of interferential therapy compared to traditional method. Physical Therapy Reviews, 2018

### 4.6.2. Osteoarthritis of the knee joint

**Application**
Non-surgical approach in conjunction with other therapies
Post-op procedures

**Aims of Treatment**
Reduce pain
Increase blood flow

**Electrode Position:**
With the knee joint, some patients find that 2 Pole treatment is more effective than 4 Pole. Here, one pad is placed over the most painful area and the other directly opposite directing the current straight through the joint. The patient usually reports that the current is 'picking out the painful spot' if he does not, the electrode is moved until he does. The increased pain dies away after a few minutes and relief continues after treatment.

**Settings:**

| | **First half of treatment** | **Second half of treatment** |
|---|---|---|
| **Program** | **P3** | **P2** |
| **Frequency** | **80-150 Hz** | **2-100 Hz** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | Set at maximum comfort level |

**Treatment Duration:**
Treatment is given two or three times a week for 12 treatments. Daily treatment is not necessary, but once a week is ineffective. After 12 treatments the patient should cease treatment for a month to prevent over-tiredness.

**References**

Elnaggar RK & Elshafey MA. Effects of combined resistive underwater exercises and interferential current therapy in patients with juvenile idiopathic arthritis: a randomized controlled trial. Am J Phys Med Rehabil 2016;95:96-102.

Buenavente et al. Evidence on the effectiveness of interferential current therapy in the treatment of knee osteoarthritis: A meta-analysis. OA Arthritis 2014 May 10;2(1):7.

Gundog M, Atamaz F, Kanyilmaz S, KirazliY,Celepoglu G. Interferential current therapy in patients with knee osteoarthritis. Am J Phys Med Rehabil.2012;91:107Y113

Atamaz F, Durmaz B, Baydar M, et al. Comparison of the Efficacy of Transcutaneous Electrical Nerve Stimulation, Interferential Currents, and Shortwave Diathermy in Knee Osteoarthritis: A Double-Blind, Randomized, Controlled, Multicenter Study. Arch Phys Med Rehabil. 2012; 93:748-756

### 4.6.3. Post-Operative Pain, Edema, and Range of Motion of the Knee

**Application** Chondroplasty /Menisectomy

**Aims of Treatment** Reduce pain / Reduce edema /Increase range of motion

**Electrode Position:** Across the joint

**Settings:**

| | First half of treatment | Second half of treatment |
|---|---|---|
| **Program** | **P1** | **P4** |
| **Frequency** | **2-10 Hz** | **60-137 Hz (set at 85)** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | Set at maximum comfort level |

**Treatment Duration:**
3 times daily for 7-9 weeks.

**Reference**
Gregg J. Jarit,et al. The Effects of Home Interferential Therapy on Post-Operative Pain, Edema, and Range of Motion of the Knee. Clin J Sport Med, Vol. 13, No. 1, 2003

### 4.6.4. Epicondylitis (Tennis & Golfer's Elbow)

**Application:** Post-op procedures
Non-surgical approach in conjunction with other therapies

**Aims of Treatment**: Reduce pain and increase blood flow

**Electrode position:**
Current should cross so that most of the stimulation is felt in the area of pain. Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.

**Settings:**

| | First half of treatment | Second half of treatment |
|---|---|---|
| **Program** | **P4** | **P4** |
| **Frequency** | **60-137 Hz (set at 85) Hz** | **10-23 Hz (set at 14)** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | |

**Treatment Duration:**
• Combined (30) minute treatment three times daily
• Suggested treatment period: one to three months

**Reference**
B Savage, Interferential therapy. 1984. No supporting evidence

### 4.6.5. Treatment of recent injuries - Relief of pain

**Application**
Relief of pain is of first importance not only as an end in itself but because pain produces spasm, unnatural movement and production of further strains. However, it must not be forgotten that

spasm may be protective and its removal may leave the injured structure open to repetition of the original injury.

Therefore when spasm has been relieved, support must be given with bandage or strapping to prevent uncontrolled or excessive range of movement.

**Aims of Treatment**
Reduce pain

**Electrode Position:**
Four-electrode method:; Two electrodes are placed immediately above and two below so that the currents cross at the site of injury .

**Settings:**

| | **First half of treatment** | **Second half of treatment** |
|---|---|---|
| **Program** | **P3** | **P4** |
| **Frequency** | **80-150 Hz** | **60-137 Hz (set at 86 Hz)** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Definite prickling sensation well within patients tolerance.<br>If a single point of acute tenderness can be located, a strong dose may be given to anaesthetise the part but this may well not be indicated at the first treatment. Use the maximum current the patient can tolerate for three minutes. | Same as first half |

**Treatment Duration:**
To produce the most rapid and satisfactory result, start treatment as soon as possible. Daily treatment is given until the pain does not return significantly between treatments, then dropped to alternate days.
After treatment avoid prolonged exercise for at least an hour. The longer the period of rest between treatment and exercise, the longer the freedom from pain will last.

**References**
B Savage, Interferential therapy. 1984.

Thusharika Dilrukshi Dissanayaka et al. Comparison of the Effectiveness of Transcutaneous Electrical Nerve Stimulation and Interferential Therapy on the Upper Trapezius in Myofascial Pain Syndrome - A Randomized Controlled Study. 0894-9115/16/9509-0663 American Journal of Physical Medicine & Rehabilitation

Mary Kamal Nassif Takla. Low-frequency high-intensity versus medium-frequency low-intensity combined therapy in the management of active myofascial trigger points: A randomized controlled trial. Physiother Res Int. 2018;e1737.

### 4.6.6. Carpal Tunnel

**Application**: Post-op procedures
Non-surgical approach in conjunction with other therapies

**Aims of Treatment:** • Reduce pain and increase blood flow

**Electrode Position**:
• Current should cross so that most of the stimulation is felt in the area of pain.

**Settings:**

| | First half of treatment | Second half of treatment |
|---|---|---|
| **Program** | **P4** | **P4** |
| **Frequency** | **60-137 Hz (set at 85) Hz** | **10-23 Hz (set at 14)** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | Set at maximum comfort level |

**Treatment Duration:**
• Combined (30) minute treatment three times daily
• Suggested treatment period: one to three months

**Reference**
B Savage, Interferential therapy. 1984. No supporting evidence

### 4.6.7. Plantar Fasciitis

**Application**: Non-surgical approach in conjunction with other therapies

**Aims of Treatment:** Reduce pain and increase blood flow

**Electrode Position:**
Current should cross so that most of the stimulation is felt in the area of pain. Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.

**Settings:**

| | First half of treatment | Second half of treatment |
|---|---|---|
| **Program** | **P4** | **P4** |
| **Frequency** | **60-137 Hz (set at 85) Hz** | **10-23 Hz (set at 14)** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | Set at maximum comfort level |

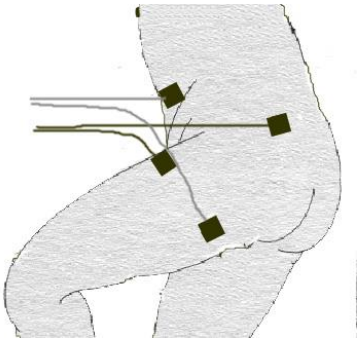
**Treatment Duration:**
• Combined (30) minute treatment three times daily
• Suggested treatment period: one to three months

**Reference**
B Savage, Interferential therapy. 1984. No supporting evidence

### 4.6.8. Osteoarthritis of the hip joint

**Aims of Treatment**
Reduce pain
Increase blood flow

**Electrode Position:**
Four Pole mode illustrated
Current should cross so that most of the stimulation is felt in the area of pain.



Placement adjustments may be made to allow for surgical site, density of tissues, underlying nerve position, etc.

**Settings:**

| | First half of treatment | Second half of treatment |
|---|---|---|
| **Program** | **P3** | **P2** |
| **Frequency** | **80-150 Hz** | **2-100 Hz** |
| **Timer** | **15 min** | **15 min** |
| **Level** | Set at maximum comfort level | Set at maximum comfort level |

**Treatment Duration:**
Treatment is given two or three times a week for 12 treatments. Daily treatment is not necessary, but once a week is ineffective. After 12 treatments the patient should cease treatment for a month to prevent over-tiredness.

After treatment the patient should rest for at least 15 minutes, preferably longer, and undertake no severe exercises for at least an hour. The longer the rest period, the longer the relief of pain will last. If an exercise class is to be undertaken this must *precede,* not follow, treatment. Immediately after treatment the patient has less pain and the range of movement is increased. This may last only a short time at first but is more prolonged after each treatment.

**Reference:**
B Savage, Interferential therapy. 1984.

Elnaggar RK & Elshafey MA. Effects of combined resistive underwater exercises and interferential current therapy in patients with juvenile idiopathic arthritis: a randomized controlled trial. Am J Phys Med Rehabil 2016;95:96-102.

Buenavente et al. Evidence on the effectiveness of interferential current therapy in the treatment of knee osteoarthritis: A meta-analysis. OA Arthritis 2014 May 10;2(1):7.

Gundog M, Atamaz F, Kanyilmaz S, KirazliY,Celepoglu G. Interferential current therapy in patients with knee osteoarthritis. Am J Phys Med Rehabil.2012;91:107Y113

Atamaz F, Durmaz B, Baydar M, et al. Comparison of the Efficacy of Transcutaneous Electrical Nerve Stimulation, Interferential Currents, and Shortwave Diathermy in Knee Osteoarthritis: A Double-Blind, Randomized, Controlled, Multicenter Study. Arch Phys Med Rehabil. 2012; 93:748-756

# 5. MICROCURRENT ELECTRICAL THERAPY

The following information is derived from previously published literature and from clinical advice derived from practical experience. Unless other wise indicated they are not the results of controlled, peer reviewed, research, and should be treated as general guidance only. TensCare can accept no responsibility for their clinical effectiveness.

Microcurrent Therapy should not be commenced before the cause of the problem has been properly diagnosed by a medical practitioner.

## 5.1. How it works

Microcurrent stimulation is a type of therapy in which very low current is sent into the cells of the body.

Microcurrent is a very faint current that is so small it is measured in millionths of an amp (Microamps). Human cells generate a current that is in the microamp range which is why you can't feel it - the current is so low it doesn't stimulate the sensory nerves. Microcurrent is a physiological electric modality that increases ATP (energy) production in the cells of your body. This dramatically increases the tissue's healing rate. The immediate response to the correct microcurrent frequency suggests that other mechanisms are involved as well. The exact effects or changes in the tissue are unmistakable; scars will often suddenly soften; trigger points often become less painful within minutes when the "correct" frequency is applied. In many situations the changes seen seem to be long lasting and in many cases permanent.
Microcurrent has been shown to give very effective pain relief. In patient surveys over 90% of patients reported significant improvement.
The results of MET can be seen after only a minute or so of treatment in most people

## 5.2. Choosing the Settings

For most conditions, use a low frequency from 1 to10 Hz, starting at 1Hz in programme P1.

A higher frequency up to l00 Hz may give faster results when treating inflammatory problems (e.g. arthritis, tendonitis, etc.).
However, you should always follow this up a short treatment at low frequency.

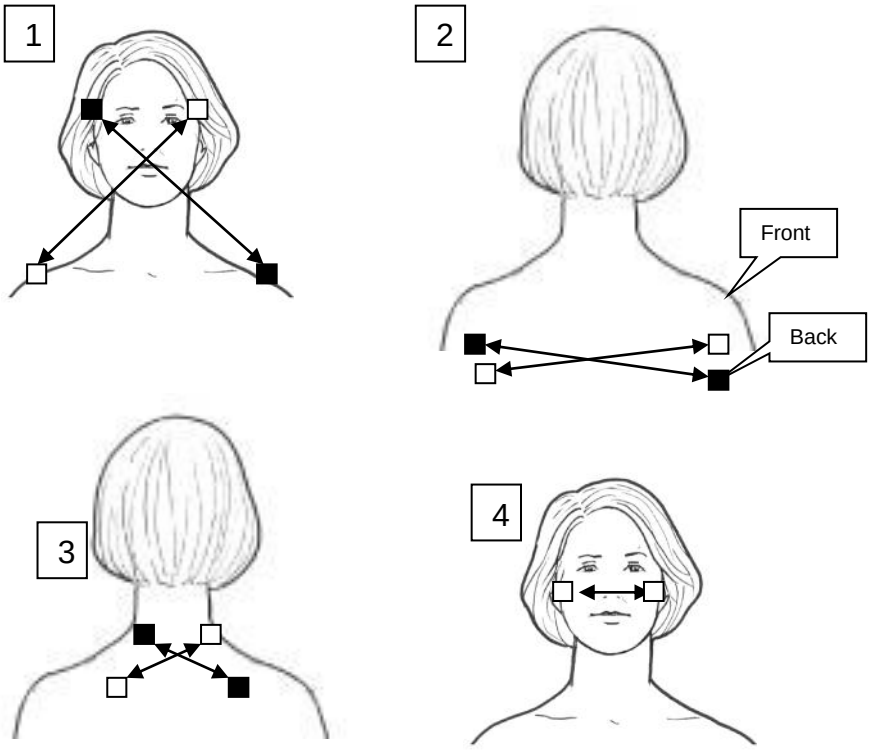
Set the current intensity level at the highest comfortable position. This is usually 500 to 600 µA, which most people can barely feel.
If you have a very sensitive condition like neuralgia, you can start with a very low current – unlike TENS there is no lower threshold.

## 5.3. Preparing for Treatment

To gain the best results make sure that you are in a relaxed position for the treatment. Make sure you do not have tense muscles.

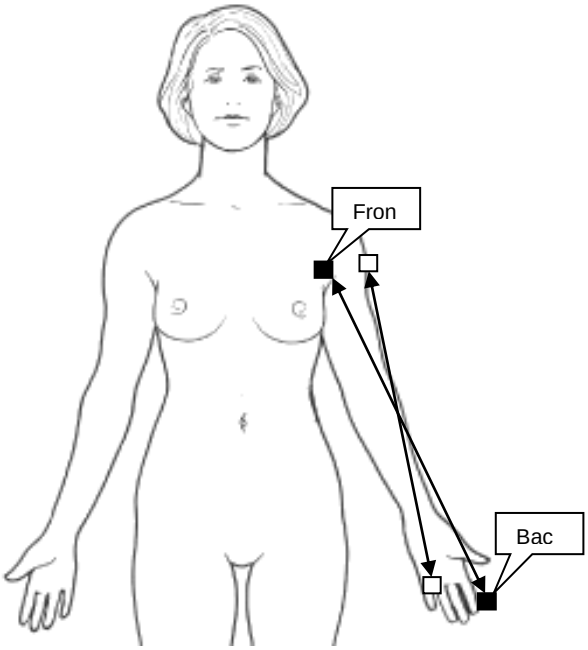
## 5.4. Electrode Pad Positioning

Pad positioning is NOT like TENS, and is closer to Interferential.
The pads should be placed so that a straight line between them passes through the problem area. This is different to TENS, where the aim is to stimulate the correct sensory and motor nerves.
Since the body is three dimensional, this often means going from front to back, and side to side. The four alternatives for headache below show how many possibilities there are :-




There is no single correct placement, and the best position may vary from day to day.

*One position for treatment of arm pain.*



Microcurrent seems to work better if you also treat the OPPOSITE side of the body to where the pain is felt (with the second pair of pads). Also try connecting both sides of the body by placing one pad at the site of the pain, and the other on the opposite side( ie left hand to right hand), for 10 mins.

## 5.5. How long should each session last?

Start with 10 minutes, then pause to re-evaluate your pain. Stop treatment when the pain is completely gone or when there is no further improvement. This could take an hour or more. However, continuing to treat after the pain has gone may cause it to return :- More is not necessarily better when using microcurrent to relieve pain.

## 5.6. Follow-Up

Although results will usually be seen immediately, in some people the effects will be delayed, continuing to improve from several hours to over a day or two after the treatment. In others, it may take several treatments before you start to see noticeable improvement. The effects of microcurrent therapy are cumulative.
Use daily for 1-2 weeks, then switch to every other day.

## 5.7. Problems

While microcurrent therapy can provide a noticeable improvement on more than 90% of users, it will not work for everyone. Where there appear to be no effects, try the following:-

Increase your fluid intake. If you are dehydrated you may not respond well.

Some people who have had a significant exposure to strong electrical current may be poor candidates for microcurrent therapy. If you have had a severe electric shock n the past, or have used TENS for a long time, microcurrent may not work as quickly for you. You may need prolonged treatment to gain results.

Microcurrent electrical therapy works through very small electrical flows in the body. These can be affected by earlier surgical scars and traumatic injuries some distance from the present pain. It is possible to clear the body of these “blocks”. By covering the scar with the electrodes or, on larger scars, putting one electrode at each end, and treating for 10 minutes four days in a row. As this treatment “unblocks” your body’s electrical flow, you may feel increased energy and the pain may also temporarily increase. After treating the scar, allow time to treat the painful area as well.

Try using a lower current setting of 100 µA for longer – an hour or more.

## 5.8. Microcurrent References

**Chronic Pain**

K Armstrong, R Gokal, A Chevalier, W Todorsky, M Lim Microcurrent Point Stimulation Applied to Lower Back Acupuncture Points for the Treatment of Nonspecific Neck Pain THE JOURNAL OF ALTERNATIVE AND COMPLEMENTARY MEDICINE Volume 23, Number 4, 2017, pp. 295–299

- Low frequency, concentrated, microcurrent stimulation (at 10k ohms). MPS application time was 30 sec per point, for a total of 18 points located in the lower back, hips, and legs

AM Atya. Efficacy of Microcurrent Electrical Stimulation on Pain, Proprioception Accuracy and Functional Disability in Subacromial Impingement : RCT. Indian Journal of Physiotherapy and Occupational Therapy. Jan-Mar., 2012, Vol.6, No.1, p. 15

- intensity 30–40 µA , pulse frequency 10 Hz, pulse width 50 ms, with a duration 20 min /session.

**Pain- diabetic neuropathy**

G Gossrau, M Wähner, M Kuschke, B Konrad. Microcurrent transcutaneous electric nerve stimulation in painful diabetic neuropathy: a randomized placebo-controlled study. Pain Medicine 2011; 12: 953–960

- Treatment sessions lasted 30 minutes each. Patients in the treatment group obtained a low-frequency (bursts of 2 Hz) microcurrent of 30–40 µA. Bipolar electrical stimuli via skin-applied electrodes.

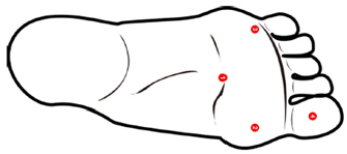
Park RJ et al 2011. The effect of microcurrent electrical stimulation on the foot blood circulation and pain of diabetic neuropathy. J. Phys. Ther. Sci. 23: 515-518, 2011

- Pulsed <300uA

**Wound Healing**

A Jung, J Choen, K Park, JY Choi, MS Lee, K Kim Efficacy and safety of microcurrent stimulation of acupoints on the sole of the foot of children with short stature in 25th percentile of height by age: A randomized controlled trial European Journal of Integrative Medicine Volume 8, Issue 2, April 2016, Pages 122-127.

- 1 Hz, 32–35 mA



G Lessiani, V Galati, G Franzone, P Iodice. Efficacy of Modulated Microcurrent Stimulation in Pressure Ulcers Treatment: A Monocentric, Prospective, Double-Blind, Randomized Study. J Nov Physiother 2014, 4:4

Guest JF et al. Clinical outcomes and cost effectiveness of an externally applied electroceutical device in managing venous leg ulcers in clinical practice in the UK. Journal of Wound Care Vol 24, No 12, Dec 2015

Turner N & Ovens E. The results of a clinical evaluation of Accel-Heal® electroceutical treatment in a large NHS Trust.Wounds UK | Vol 13 | No 4 | 2017

EW Malin,et al. Silver-Coated Nylon Dressing Plus Active DC Microcurrent for Healing of Autogenous Skin Donor Sites. Annals of Plastic Surgery. 2013

- 15-50 uA

**Inflammatory problems (arthritis, tendonitis) Knee OA**

C Joosung, C Namjeong. Micro-current Treatment Effects on Pain, Balance of the Degenerative Knee Arthritis.Journal of The Korean Society of Integrative Medicine, 2015, 3(2), 9~16

- 200μAstrength and frequency of 5pps for 20minutes

**Tennis elbow**

TA Ammar. Microcurrent Electrical Nerve Stimulation in Tennis Elbow. Bull. Fac. Ph. Th. Cairo Univ., Vol. 16, No. (2) Jul. 2011

**Beauty**

A Noites et al. Effects of microcurrents and physical exercise on the abdominal fat in patients with coronary artery disease. European Journal of Integrative Medicine Volume 7, Issue 5, October 2015, Pages 499-507

Park RJ et al 2011 The effect of wearing shoes generating micro-currents on body composition and blood lipid concentrations of overweight females "J. Phys. Ther. Sci. 23: 177–180, 2011"

**DOMS**

D Curtis, S Fallows, M Morris, C McMakin. The efficacy of frequency specific microcurrent therapy on delayed onset muscle soreness. Journal of Bodywork & Movement Therapies (2010) xx, 1e8

Jeong-Woo Lee et al. Effects of Inter-electrode Distance on Delayed Onset Muscle Soreness in Microcurrent Therapy. J. Phys. Ther. Sci. 25: 1451–1454, 2013

**Muscle function/tone**

DH Kang, JK Joen, JH Lee. Effects of low-frequency electrical stimulation on cumulative fatigue and muscle tone of the erector spinae. J. Phys. Ther. Sci. 27: 105–108, 2015

SW Han, JW Lee. Effects of integrated treatment with LED and microcurrent on muscle tone and stiffness in the calf muscle during moderate aerobic exercise J. Phys. Ther. Sci. 30: 816–819, 2018

**Sleep**

M Cheung, AS Chan, J Yip. Microcurrent Stimulation at Shenmen Acupoint Facilitates EEG Associated with Sleepiness and Positive Mood: A Randomized Controlled Electrophysiological Study. Hindawi Publishing Corporation Evidence-Based Complementary and Alternative Medicine Volume 2015, Article ID 182837, 11 pages

7.0 Microcurrent

Microcurrent Stimulation (MIC) is a type of therapy where very low current is sent into the cells of the body. MIC is a very faint current that is so small it is measured in millionths of an amp (microamps). Human cells generate a current that is in the micro amp range which is why some can’t feel it - the current is so low it doesn’t stimulate the sensory nerves.

MIC is a physiological electric modality that increases ATP (energy) production in the cells of your body. This dramatically increases the tissue’s healing rate. The immediate response to the correct MIC frequency suggests that other mechanisms are involved as well. The exact effects or changes in the tissue can be noticeable; scars can suddenly soften; trigger points often become less painful when the “correct” frequency is applied. In many situations the changes can be long lasting and even permanent in some cases.

Microcurrent has been shown to give very effective pain relief. In patient surveys over 90% of patients reported significant improvement.

The results of MIC can be seen after only a minute or so of treatment in most people.

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