STIWELL med4

The comprehensive therapy concept

Conventional electrotherapy
Functional electrostimulation
EMG-triggered stimulation
Biofeedback games
Treatment of peripheral neural lesions and muscle pareses
Medium frequency
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STIWELL med4
makes people move
The “STIWELL med4” is the ideal therapeutic device for all pathologies requiring treatment with conventional electrotherapy, EMG-triggered stimulation and biofeedback – with all features included in a pocket-size device. Functional electrostimulation is easy to use in hospitals and at home. The comprehensive therapy concept is complemented by the device’s user-friendly features.

All In One
The Comprehensive Therapy Concept

4-channel stimulation and 2-channel EMG measurement allow:

- Synchronous/asynchronous extremity movements (coordination training)
- Control of complex movement patterns in one extremity or simple movements in several extremities simultaneously
APPLICATION: Physicians, physiotherapists, ergotherapists, speech and language therapists, sports scientists and patients use the STIWELL med4 in the areas of neurology, physical medicine and rehabilitation, accident surgery, orthopaedics, urology, pain therapy, dermatology, general medicine, sports medicine and sports training.

Depending on the neurological symptoms, **SYMPTOM-ORIENTED BIOFEEDBACK TRAINING** allows playful training of central innervation ability, maximum strength, strength endurance, muscle relaxation and intermuscular coordination. EMG-triggered stimulation combines biofeedback training and stimulation.

The STIWELL med4 is intended for use in hospitals but also for **HOME USE** by the patient. The responsible physician/therapist will adjust the programmes and follow up on therapy progress. Statistical data regarding the performed treatments can be recalled from the STIWELL med4 when linked to a personal computer.

**ATHLETES** apply neuromuscular stimulation to gain power, power stamina and to support muscle regeneration. Electrostimulation is intended to supplement conventional training.

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**Programmes**
- Conventional electrotherapy programmes
- Training programmes for functional movements
- Biofeedback games
- EMG-triggered stimulation
- Programmes to treat peripheral lesions and pareses

**Operation**
- Easy to operate
- Programme selection for home therapy
- Storing intensity
- Creating and saving of individual programmes
- Recording of treatment data
- PC-controlled patient data administration

**Technology**
- 4 stimulation channels
- 2 EMG-triggered measuring channels
- Rechargeable battery supply
- Medium frequency
- Low frequency
- Exponential current
Muscle strengthening

Electromyostimulation (EMS) is a conservative treatment for muscle contraction by electrically induced pulses. Decreasing muscle strength during immobilisation (e.g. postoperatively) and muscular dysbalance are avoided. Prophylaxis and therapy of muscular atrophies with EMS can help avoid secondary orthopaedic injuries and shorten the period of inpatient treatment.

Denervated muscles

A denervated muscle cannot be stimulated via the injured peripheral nerve. Preprogrammed, automatic STIWELL med4 programmes are based on a training unit with natural muscular activity. Triangular pulses are used to treat peripheral palsy as they are able to stimulate the peripherally paralysed muscles while simultaneously minimally stimulating the surrounding sensitive nerve fibres.

Feedback programmes

Symptom-oriented biofeedback training with cognitive re-learning effect is an efficient therapy method supplementing therapeutic treatment of neurological lesions. The STIWELL med4 is ideal for home use with this patient population. Depending on the neurological symptoms, maximum power, power stamina, intermuscular coordination and muscle relaxation can be trained. Visual and acoustic feedback helps the patient to consciously realise and modulate muscle tension.

Pain therapy

Transcutaneous electrical neurostimulation (TENS) is a symptomatic and conservative pain treatment. It is based on the application of electrical pulses through the skin (transcutaneous). Variable settings of stimulation parameters allow treating acute and chronic pain. The patient senses only a slight tickling sensation or minor muscle contraction under the electrodes. Treatment can be included in a daily routine conveniently and – in the best case – help reduce pain medication.
Urology

Biofeedback, electrostimulation and the combination thereof are treatments that aid the patient’s ability to consciously control, train and strengthen the pelvic floor. Internal or surface electrodes record even minute muscle activity which is not typically consciously noticed. The patient can read out the intensity of muscle contraction on the display of the device or is notified by an acoustic feedback.

Functional programmes

In the case of impairments or pathology caused by central neural problems, electrical pulses can support muscular function. Using electrical pulses, functional electrostimulation can partly rehabilitate or compensate motor functions failure due to injury or disease. Interaction with the nervous system leads to successful therapy in many neurological diseases.

Sports

The sports programmes of the STIWELL med4 were created based on training science. The following programmes can be selected: Stamina, Power, Snapping Power, Bodybuilding, Regeneration and Blood Circulation Improvement.

Medium frequency

These programmes are intended for muscle strengthening and indicated for muscle atrophy, diseases or injuries of the central nervous system (CNS), regenerable peripheral neural lesions and neuro-orthopaedic functional disorders. “MF 3 kHz (EMG)” additionally enables EMG-triggered stimulation.

Individual programmes and stored programmes

Individual programmes can be created with this feature. All parameters can be adjusted individually and stored for further application under a separate programme name.
Feedback and EMG-triggered training at the PC offers the therapist a choice of new therapy methods and motivates the patient. The STIWELL med4 stimulator is set to the patient’s individual muscle tone at the beginning of each session. The control keys allow fast and easy adjustment of the training intensity and display setup (vertical/horizontal) to the patient’s abilities and needs.

**Symptom-oriented biofeedback training**

The STIWELL med4 has different biofeedback programmes. Depending on the clinical symptoms (spasm, muscle degeneration, coordination problems), the a suitable programme can be selected.

**Indications**

- Disease or injury of the central nervous system (CNS) – e.g. spasticity or pareses after apoplexia, condition after craniocerebral injury
- Disease or injury of the spinal cord – e.g. incomplete paraplegia
- Regenerable peripheral neural lesions
- Neuro-orthopaedic functional disorders

Biofeedback applications should only be used after detailed neurological diagnosis with exact neuro-rehabilitative functional analysis.

**Spasticity control**

Visual feedback shows symptomatic increase of muscle tension (indicated by 2 balloons).
Suitable for more than 90% of all stroke patients

An evaluation study investigating the patient population benefiting from and the therapeutic indication of “symptom-oriented biofeedback training” was performed at the special clinic for neurological acute and rehabilitation medicine in Hochzirl (Tyrol, Austria). Study coordinator was Prof. Dr. Leopold Saltuari.

Results

:: FES with isolated EMG-triggered muscle stimulation is not sufficient for successful treatment. A combined therapy with biofeedback programmes is beneficial (see graph).

:: The integration of FES into the rehabilitation concept is possible for more than 90% of all stroke patients.

:: Daily treatment of central brain injuries requires electrotherapeutic procedures like the STIWELL feedback programmes (biofeedback, EMG-controlled stimulation therapies) and exponential current forms.

Symptom-oriented electrotherapy can contribute considerably to the treatment of neurologic patients with cerebrovascular pareses.

This study was performed with the previous model.

100% proven therapy success

Selected studies:

„Training by EMG-Triggered Electrical Muscle Stimulation in Hemiparesis“
B. Bocker; U.C. Smolenski, (Phys Med Rehab 2003; 13: 139-144)

„Electromyogram-Triggered Neuromuscular Stimulation for Improving the Arm Function of Acute Stroke Survivors: A Randomized Pilot Study“
Gerard Francisco, MD; John Chae, MD, ME; Harmeen Chawla, MD; Steven Kirshblum, MD; Richard Zorowitz, MD; Gerald Lewis, MS, PT; Schone Pang, MS, OTR, (Arch Phys Med Rehabil, 1998; 79: 570-575)

„Biofeedback therapy in poststroke rehabilitation: a meta analysis of the randomized controlled trials“
Glanz M; Klawansky S; Stason W; Berkey C; Shah N; Phan H, (Arch Phys Med Rehabil 1995; 76:508-15)
Programme selection for easy home therapy

The physician or therapist can select one or more programmes for a patient, with patient-specific parameters set and locked. The patient can only choose from the locked programmes in the programme overview. The physician or therapist can deactivate the blocking function via password.

Store intensity

The intensity for the patient can be set in the device and saved. The patient will automatically use the correct current intensity.

Create and save individual programmes

The STIWELL med4 Stimulator allows to create programmes with individual parameters. These programmes can be saved under separate programme names.
LEONARDO
the PC patient administration programme

Patient and treatment data administration on your PC

LEONARDO is used to record, save and administer patient and treatment data. The STIWELL med4 stimulator saves treatment data directly to the PC programme database via a USB cable.

Save to and print compliance data from your PC

Compliance data can be printed immediately after import via the USB interface or saved as a Microsoft® Word document.
Daniel

Daniel, born 18 March 1990, suffers from cerebral paresis (tetraspasticity).

All four extremities are affected, the muscles of his left hand are already severely shortened but he can still use his right hand very well. He has severe bending contractures in the lower extremity.

Daniel was able to walk with four-point sticks. Due to a growth spurt at the beginning of puberty, muscle shortening caused a loss of many acquired skills. In August 2004 Daniel received his first botulinum toxin infiltration.

Daniel’s mother says:

“To be successful we supported this treatment with an active physioprogramme, increased stretching and the STIWELL myofeedback device. We placed the electrodes for strengthening on the back and thigh. We use myofeedback to innervate various leg and arm functions.

We saw the first progress within the first six weeks. Daniel broke through certain leg movement patterns, i.e. he does not tuck up his legs when he exerts himself. He became stronger which was particularly obvious in (supported) standing up. He can help more and support his weight for a short time. His newly gained strength is most obvious when he is trotting on horseback. His back is much straighter, his head stays up and under control, and he can push himself up with his legs.

We used the myofeedback particularly for the abductors (abduct leg laterally), the front thigh muscles (stretching the knee) and buttock muscle (prone position, raise bent leg); approximately three times a week. Improved control of the treated muscles was seen after 2-3 weeks.”
Stefan

Since the age of three years, Stefan has suffered from a rare form of thyroid cancer. He is not treated at a hospital but given loving care by his family at home.

Due to a tumour pressing on the nerves of his spinal cord, Stefan is paralysed from the chest down. In November 2002 Stefan began using the STIWELL electrotherapy device. His father helps him twice daily to use the programme for denervated muscles (rectangular pulse, trapezoid pulse). The electrodes are mainly attached to his legs.

Regular training has led to clear improvements. Stefan’s father says:

“Before that my son’s legs were absolutely still, but now I can see him move parts of his leg muscles.”

Theo Kelz

In 1994 the Austrian police officer Theo Kelz from Carinthia lost both lower arms when a bomb exploded while he was on duty. Shortly after the accident, Theo Kelz had the idea to have a dead person’s hands transplanted.

His dream of having real hands again was fulfilled in March 2000 when Univ.-Prof. Dr. Raimund Margreiter transplanted donor hands in a spectacular surgery at the University Clinic of Innsbruck – the second such surgery worldwide.

During rehabilitation Theo Kelz was supported by Dr. Marina Ninkovic. To activate functionality of the transplanted hands, he used the programme for denervated muscles of the STIWELL electrotherapy device. This programme is particularly suitable for nerve regeneration.

“The success was wonderful. Thanks to STIWELL I have complete control and use of my new hands.”

These patients used the previous model for therapy.
## Muscle Strengthening

<table>
<thead>
<tr>
<th>Atrophy – power endurance</th>
<th>Muscle strength training in case of atrophy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agonist / antagonist</td>
<td>Muscle strength training for agonist / antagonist</td>
</tr>
<tr>
<td>Maximum power training</td>
<td>Muscle strength training (maximum strength training)</td>
</tr>
<tr>
<td>Circulation improvement</td>
<td>Blood circulation improvement</td>
</tr>
</tbody>
</table>

## Denervated Muscles

<table>
<thead>
<tr>
<th>Mild atrophy</th>
<th>Mild atrophy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe atrophy</td>
<td>Severe atrophy / degeneration</td>
</tr>
</tbody>
</table>

## Feedback Programmes

<table>
<thead>
<tr>
<th>EMG-triggered (1 EMG)</th>
<th>Muscle atrophy, diseases / lesions of the CNS, neuro-orthopaedic functional disorders, regenerable peripheral nerve injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMG-triggered (2 EMG)</td>
<td>Muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Muscle tension</td>
<td>Increased muscle tone (spastic pareses), neuro-orthopaedic tension syndromes (e.g. tension headache, vertebragenic pain syndromes)</td>
</tr>
<tr>
<td>Relaxation training</td>
<td>Muscle tone control exercises, neuro-orthopaedic coordination deficits, muscle atrophy, diseases/lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Coordination training</td>
<td>Muscle tone control exercises, neuro-orthopaedic coordination deficits, muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Myosymmetry</td>
<td>Muscle tone control exercises, neuro-orthopaedic coordination deficits, muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
</tbody>
</table>

## Feedback Games On Display

| Power training               | Muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury |

## Feedback Games On Pc

<table>
<thead>
<tr>
<th>EMG-triggered (1 EMG)</th>
<th>Muscle atrophy, diseases / lesions of the CNS, neuro-orthopaedic functional disorders, regenerable peripheral nerve injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMG-triggered (2 EMG)</td>
<td>Muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Power training</td>
<td>Increased muscle tone (spastic pareses), neuro-orthopaedic tension syndromes (e.g. tension headache, vertebragenic pain syndromes)</td>
</tr>
<tr>
<td>Endurance training</td>
<td>Muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Relaxation training</td>
<td>Muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Myosymmetry</td>
<td>Muscle tone control exercises, neuro-orthopaedic coordination deficits, muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
<tr>
<td>Coordination training</td>
<td>Muscle tone control exercises, neuro-orthopaedic coordination deficits, muscle atrophy, diseases / lesions of the CNS, regenerable peripheral nerve injury</td>
</tr>
</tbody>
</table>
## Pain Therapy

<table>
<thead>
<tr>
<th>Method</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENS conventional</td>
<td>Phantom pain, scar pain, postoperative pain, lumbar back pain, acute pain</td>
</tr>
<tr>
<td>TENS frequency modulated</td>
<td></td>
</tr>
<tr>
<td>TENS burst</td>
<td>Deeper pain zones, myopathic pain, chronic pain</td>
</tr>
</tbody>
</table>

## Urology

<table>
<thead>
<tr>
<th>Condition</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urge incontinence</td>
<td>Urge incontinence</td>
</tr>
<tr>
<td>Stress incontinence</td>
<td>Stress incontinence</td>
</tr>
<tr>
<td>Mixed incontinence, continence anal</td>
<td>Mixed incontinence</td>
</tr>
<tr>
<td>EMG-triggered (1 EMG)</td>
<td>Stress incontinence, mixed incontinence</td>
</tr>
<tr>
<td>EMG-triggered (2 EMG)</td>
<td></td>
</tr>
<tr>
<td>EMG-triggered anal</td>
<td></td>
</tr>
<tr>
<td>Peak speed (feedback)</td>
<td>Stress incontinence, urge incontinence</td>
</tr>
</tbody>
</table>

## Functional Programmes

<table>
<thead>
<tr>
<th>Programme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasp / release (EMG)</td>
<td>Training of motion sequences, strength training</td>
</tr>
<tr>
<td>Open / close (EMG)</td>
<td>Training of motion sequences, strength training</td>
</tr>
<tr>
<td>Hand to mouth (EMG)</td>
<td>Training of motion sequences, strength training</td>
</tr>
<tr>
<td>Arm extension (EMG)</td>
<td>Training of motion sequences, strength training</td>
</tr>
</tbody>
</table>

## Sports

<table>
<thead>
<tr>
<th>Programme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall endurance</td>
<td>Stamina training</td>
</tr>
<tr>
<td>Power endurance</td>
<td>Power stamina training</td>
</tr>
<tr>
<td>Peak speed</td>
<td>Snapping power training</td>
</tr>
<tr>
<td>Bodybuilding beginners</td>
<td>Bodybuilding for beginners</td>
</tr>
<tr>
<td>Bodybuilding advanced</td>
<td>Bodybuilding advanced</td>
</tr>
<tr>
<td>Agonist / antagonist power</td>
<td>Agonist / antagonist strength training</td>
</tr>
<tr>
<td>Agonist / antagonist time</td>
<td>Agonist / antagonist stamina training</td>
</tr>
<tr>
<td>Regeneration</td>
<td>Regeneration</td>
</tr>
<tr>
<td>Circulation improvement</td>
<td>Blood circulation improvement</td>
</tr>
<tr>
<td>Stimulation programme</td>
<td>Warm-up and regeneration training</td>
</tr>
</tbody>
</table>

## Medium Frequency

<table>
<thead>
<tr>
<th>Programme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MF 3kHz + MF 3 kHz (EMG)</td>
<td>Muscle atrophy, diseases/lesions of the CNS, regenerable peripheral nerve injury, neuro-orthopaedic functional disorders</td>
</tr>
</tbody>
</table>

## Individual Programmes

<table>
<thead>
<tr>
<th>Programme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single phase programme</td>
<td>For individual programming – all parameters are individually programmable</td>
</tr>
<tr>
<td>Single phase programme (EMG)</td>
<td></td>
</tr>
<tr>
<td>Three phase programme</td>
<td></td>
</tr>
</tbody>
</table>

## Saved Programmes

<table>
<thead>
<tr>
<th>Programme</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programme 1</td>
<td>To save individual settings</td>
</tr>
</tbody>
</table>
STIWELL med4
Scope Of Delivery
And Accessories

Scope of delivery
- Stimulator STIWELL med4
- Charger and line cord
- Main cable
- 4 electrode cables
- Reference cable
- USB cable
- Self-adhesive electrodes (5x5 cm)
- Instructions for use
- Software CD
- Transport case
STIWELL med4 Accessories

Self-adhesive electrodes
- 4 self-adhesive electrodes round 2.5 cm
- 4 self-adhesive electrodes round 3 cm
- 4 self-adhesive electrodes 5 x 5 cm
- 4 self-adhesive electrodes 5 x 9 cm
- 2 self-adhesive electrodes 8 x 13 cm

Rubber electrodes
- 1 rubber electrode round 5.5 cm
- 1 rubber electrode round 7.5 cm
- 2 rubber electrodes 4 x 6 cm
- 2 rubber electrodes 6 x 8 cm
- 4 sponge bags for rubber electrode 4 x 6 cm
- 4 sponge bags for rubber electrode 6 x 8 cm

Special electrodes
- Vaginal electrode
- Anal electrode

Other
- External trigger
- Carrying clip
- Fixation band 30 cm
- Fixation band 70 cm
- Electrode gel Spectra 360
- Holder for STIWELL med4 device
The STIWELL med4 is a medical device with internal power supply (rechargeable Li-Ion battery). It is intended for indoor (at room temperature) use only.

### STIMULATOR:
- **Stimulation channels:** programme-dependent, max. 4
- **EMG measuring channels:** 2
- **Current forms:** low-frequency, biphasic and direct current-free rectangular, triangular and trapezoid pulses
- **Power supply:** Li-Ion battery, 1950 mAh, 11.1 V
- **Charging time:** max. 170 min.
- **PC interface:** USB 1.1 and USB 2.0 compatible
- **Dimensions:** H x W x D: 175 x 95 x 30 mm
- **Weight:** 440 g
- **EMG measuring range:** 1µV–2000µV

### PROGRAMMES:
- **Programmes for denervated muscle:**
  - output voltage: 80 V at 1000 Ohm
  - output current: max. 80 mA
  - pulse width: 2*1 ms–2*250 ms
  - pulse frequency: 0.1 Hz–50 Hz

- **Programmes for innervated muscle:**
  - output current: 100 mA at 1000 Ohm
  - pulse width: 2*50 µs–2*500 µs
  - pulse frequency: 1 Hz–140 Hz

- **MF programmes:**
  - output current: 80 mA at 1000 Ohm
  - fundamental frequency: 3 kHz
  - amplitude modulation frequency: 5–70 Hz

### CHARGER:
- **Input voltage:** 90–264 VAC
- **Mains frequency:** 47–63 Hz
- **Power consumption:** 15.1 W
- **Output:**
  - 12.6 V=/ 1.2 A
  - EN 60950
  - EN 60601-1
  - EN 60335-2-29
  - UL 60601-1
  - EN 60601-1-2

### ENVIRONMENTAL CONDITIONS:
- **Operating conditions:**
  - operating temperature / humidity: 0°C to 40°C/10%–90%
- **Storage and transport conditions:**
  - storage temperature/humidity: -20°C to 70°C/10%–90%
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