
magstim®
The Leading Provider of Advanced Neurostimulation Products

magstim®

Advanced Neurostimulation

The Magstim range of magnetic stimulation systems provide a variety of high quality solutions for researchers and clinicians working within Neurology, Neuroscience, Psychiatry and Rehabilitation.

Magstim has substantial expertise in magnetic stimulation, and is a leader in the field, offering a wide range of magnetic stimulators and stimulating coils to suit a variety of clinical and research applications.

Non-invasive Neuromodulation

Magnetic stimulation is a non-invasive and painless method of stimulating human tissue using strong, time varying magnetic fields to induce small currents in nerve tissue. These are able to stimulate the human cortex, spinal roots and peripheral nerves.

Depending on the application a variety of output waveforms may be used to excite or inhibit nerve response. These pulses can be either monophasic or biphasic, or a combination of the two.

This brochure is intended for users of TMS equipment outside of the USA.

“a leader in the field

Users of Magstim Transcranial Magnetic Stimulators in the USA please note:
Caution - Investigational Device. Federal (or United States law) limits device to investigational use.

Monophasic single pulse systems are favoured in neurological applications due to the accuracy of the stimulation and the low heat output. For repetitive stimulation that is used in neuroscience and psychiatry, biphasic systems are the preferred option due to their ability to produce short and efficient pulses at high frequency.

Magstim stimulators can be used in combination with equipment such as:

- fMRI[i]
- EMG
- EEG[ii]
- Image-guided TMS[iii iv]
- tDCS / tACS

	Magstim 200²	Magstim BiStim²	Magstim Rapid²	Magstim Rapid² Plus¹
Output Type	Monophasic	Monophasic Twin Pulse	Biphasic	Biphasic
Maximum voltage	2.80kV	2.50kV*	1.67kV	1.67kV
Maximum repetition rates (230V configuration) 30%	2.0s	2.0s	Single PSU - 50Hz Dual PSU - 100Hz	100Hz
50%	3.0s	3.0s	Single PSU - 30Hz Dual PSU - 50Hz	97Hz
100%	4.0s	4.0s	Single PSU - 15Hz Dual PSU - 25Hz	41Hz
Minimum Inter Stimulus Interval	N/A	1.0ms	N/A	N/A
Minimum Inter Train Interval	N/A	4.0s	0.5s	0.5s

* Also available as 2.80kV

of magnetic stimulation ”

Magstim 200² & BiStim² - Monophasic

Magstim produce two monophasic systems; the **Magstim 200²** and **BiStim²**, which are used extensively within the fields of neurology and neurophysiology. For accurate single pulse functionality, monophasic waveform systems are favoured for:

- Neurological research
- Cortical mapping and brain research
- Functional assessment of central motor pathways
- Early diagnosis, assessment and monitoring of nervous diseases, such as Multiple Sclerosis and Motor Neurone Disease.

Single pulse

Magstim 200² provides users with the ability to elicit cortical evoked potentials, quickly and easily, as a routine component of clinical and research assessment techniques, including:

- Triple Stimulation Technique[v]
- Resting Motor Threshold
- Active Motor Threshold
- Central Conduction Time
- Motor Evoked Potential
- Input-Output Curve
- Cortical Silent Period
- Motor Mapping

Magstim 200² offers complete flexibility and can be interfaced with a wide range of commercially available EMG systems. The monophasic waveform provides a high degree of hemispheric accuracy, low noise and less coil heating than other pulse waveforms.

The Magstim 200² is backward compatible with all Magstim stimulating coils, via the coil adaptor.

Controlled Trains

Magstim BiStim² offers the potential to combine two Magstim 200² units to provide fully programmable paired pulse stimulation through a single stimulating coil. The ability to change pulse intervals and to independently control the power level of each Magstim 200² allows for precise sub- and supra-threshold conditioning and test pulses. This is invaluable for the investigation of Inter-Cortical and Intra-Cortical Inhibition and Facilitation.

The inter-stimulus interval (ISI) of the two pulses is adjustable using either the integral stimulator controls, remote control coil or externally via triggering software offering complete user flexibility. Two ISI options offer maximum controllability:

- 1ms - 999ms in 1ms resolution
- 1.0ms - 99.9ms in 0.1ms resolution

BiStim² has the added advantages of being able to sum the two single pulses provided by the Magstim 200² stimulators to produce a single high power pulse equal to 113% of a single Magstim 200², as well as having the functionality to connect two individual coils for interhemispheric stimulation.

Magstim Rapid² - Biphasic

Magstim Rapid² repetitive Transcranial Magnetic Stimulation (rTMS) devices are highly effective non-invasive biphasic magnetic stimulators designed to meet the exacting needs of those involved at all levels of clinical and academic research. Highly efficient, short duration biphasic pulses makes it very well suited to bilateral cortical stimulation and is used in many different areas of research, including:

Cognitive Neuroscience[vi] - in the investigation of learning[vii viii], memory[ix], speech[x], hearing, visual, perception and functional connection

Psychiatry[xi] - to influence specific brain function within the dorsolateral prefrontal cortex

Neurophysiology - used in the stimulation of the peripheral and central nerve pathways

Rehabilitation - used in the promotion of muscle recovery and the relief of nerve spasticity

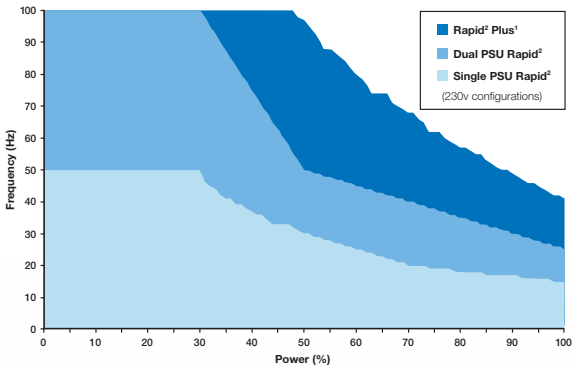
The Magstim Rapid² range of repetitive stimulators has been developed to maintain a consistent pulse amplitude/frequency during the delivery of stimulation trains through Single Pulse, Repetitive, Burst and Session modes of operation. Rapid² stimulators offer frequencies of up to 100Hz, with a 0.1Hz frequency resolution for the first 30Hz.

Magstim Rapid² has an unique inbuilt two channel EMG amplifier with integral system acquisition software including latency and amplitude measurements. The dedicated touch screen user interface with internal and external memory makes storage and retrieval of results straightforward. Connecting the optional thermal printer allows for the provision of hardcopies.

Rapid² can be used with other investigation tools such as fMRI, EMG, EEG, tDCS, tACS and Image-guided TMS over a broad range of protocols and is fully compatible with existing Magstim coils through customised hardware.

Magstim Rapid² Plus¹ is an innovative enhancement to the Rapid² and is the only system able to offer a significantly higher repetition rate at stimulation output of 30% and higher. This is particularly useful in applications using protocols such as Theta Burst[xii], as the Magstim Rapid² Plus¹ is capable of up to 89% output at 50Hz.

With the addition of a Plus¹ module a single PSU Rapid² can be easily upgraded to dual PSU performance, whereas the addition of the Plus¹ module to a dual PSU Rapid² make high powered protocols feasible.



Magstim Rapid² Performance

Stimulating coils

There is a wide range of stimulating coils available for use with Magstim systems, offering a great level of flexibility to both research and clinical users: Single, Double and Placebo coils are available in a variety of sizes for specific, targeted stimulation and research protocols.

It is now possible to achieve prolonged periods of stimulation with the innovative Air Film Coil, created to work in combination with Magstim Rapid² stimulators.

The Air Film Coil uses innovative, ambient air flow and temperature regulated fan technology to enable the cooled coil to run indefinitely under certain protocols.

Key features of the Air Film Coil include:

- Delivers up to 3,000 pulses at 75% stimulator output at 10Hz stimulation (Biphasic waveform) over a 37.5 minute period and remains within allowed temperature limits (with a starting temperature of 22˚C).
- Extends the useful range of stimulating protocols available to researchers and clinicians
- Unlimited running time with certain protocols
- Quiet running

Single Coils		
50mm Small Coil	Peripheral stimulation	• Facial nerve • Superficial peripheral nerves
70mm Medium Coil	Peripheral stimulation or paediatric and infant TMS	• Peripheral nerves • Cortical stimulation (paediatric)
90mm High Power Coil	Adult TMS	• Cortical stimulation (adult) • Cervical nerve roots • Lumbrosacral nerve roots
90mm Remote Control Coil	Adult TMS - user interface on coil handle for easier control of stimulator	• Cortical stimulation (adult) • Cervical nerve roots • Lumbrosacral nerve roots
Double Coils		
Double 25mm B.I. Coil	Accurate peripheral stimulation - handle is perpendicular to coil head	• Facial nerve • Superficial peripheral nerves • Somatosensory evoked potentials
Double 40mm Coil	Accurate peripheral stimulation or accurate paediatric and infant TMS	• Peripheral nerves • Cortical stimulation (paediatric)
Double 50mm Coil	Accurate adult TMS	• Cortical stimulation (adult) • Peripheral nerves
D70² Coil (New design)	Accurate adult TMS	• Cortical stimulation (adult) • Spinal roots • Peripheral nerves
Double 70mm Remote Control Coil	Accurate adult TMS - user interface on coil handle for easier control of stimulator	• Cortical stimulation (adult) • Spinal roots • Peripheral nerves
Double 70mm B.I. Coil	Accurate adult TMS - handle is perpendicular to coil head	• Cortical stimulation (adult) • Femoral nerve • Back and neck
Double 110mm Cone Coil	Deep adult TMS - elicits responses from relaxed muscles of the lower pelvic floor and lower limbs	• Central motor disorders • Spinal injuries • Urology
Specialised Coils		
Double 70mm Air Film Coil	Built-in, active cooling for long stimulation protocols	• Psychiatry • Cognitive neuroscience • Neurology • Neurophysiology • Rehabilitation
Double 70mm Air Film Placebo Coil	Identical to the active coil (see above) other than the stimulating output. Suitable for double-blind trials	• Psychiatry • Cognitive neuroscience • Neurology • Neurophysiology • Rehabilitation
Double 70mm Cooled Coil	Powerful active cooled coil with external air extraction unit	• Power intensive protocols • Long duration protocols
Double 70mm MR Compatible Coil	Suitable for use in MRI scanners up to 3T	• Brain imaging research
Custom Coils	Coils of various configurations and dimensions can be designed for specific customer applications	• Specifications can be defined by the customer

Go one step further with Magstim Innovations

As well as the comprehensive range of standard products, Magstim provides a unique design service through the expertise of the “Magstim Innovations” team. Inspired by forward thinking researchers, the Magstim Innovations team is a dedicated group of engineers who are able to develop to order the products required to meet the exact needs of the research community. Magstim Innovations helps push the boundaries of neuromodulation and brain stimulation to new levels.

magstim® innovations

Based on 20 years experience, Magstim has developed a simple '7 Step' pathway to successful product production. This process ensures the product is delivered to the customer's exact requirements and needs, when it is needed.

the ‘7 Step’ Pathway

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References

[i] **Combining TMS and fMRI: From 'virtual lesions' to functional-network accounts of cognition.**
Ruff CC, Driver J, Bestmann S.
Cortex. 2008 Dec 6. [Epub ahead of print]

[ii] **Combining TMS and EEG to study cognitive function and cortico-cortico interactions.**
Taylor PC, Walsh V, Eimer M.
Behav Brain Res. 2008 Aug 22;191(2):141-7. Epub 2008 Apr 1.

[iii] **Mapping of the human visual cortex using image-guided transcranial magnetic stimulation.**
Fernandez, E., Alfaro, A., Tormos, J.M., Climent, R., Martinez, M., Vilanova, H., Walsh, V., and Pascual-Leone, A.
Brain Research Protocols 10:115-124, 2002.

[iv] **Complementary localization and lateralization of orienting and motor attention.**
Rushworth, Matthew F.S., Ellison, Amanda, and Walsh, Vincent.
Nature Neuroscience, 4(6), June 2001.

[v] **Triple stimulation technique (TST) in amyotrophic lateral sclerosis**
Leonid Komissarow, Jens D. Rollnik, Dessislava Bogdanova, Klaus Krampfl, F. A. Khabirov, Andon Kossev, Reinhard Dengler and Johannes Bufler
Clinical Neurophysiology, Volume 115, Issue 2, Pages 356-360

[vi] **Transcranial magnetic stimulation and cognitive neuroscience**
Vincent Walsh and Alan Cowey
Nature Reviews – Neuroscience, Volume 1, October 2000, 73-79

[vii] **The Contribution of Primary Motor Cortex is Essential for Probabilistic Implicit Sequence Learning: Evidence from Theta Burst Magnetic Stimulation**
Leonora Wilkinson, James T. Teo, Ignacio Obeso, John C. Rothwell and Marjan Jahanshahi
Journal of Cognitive Neuroscience

[viii] **Transcranial magnetic stimulation can measure and modulate learning and memory**
J Grafman E Wassermann
Neuropsychologia 37 (1999) 159-167

[ix] **Contribution of noninvasive cortical stimulation to the study of memory functions**
A. Floela, L.G. Cohen
Brain Research Reviews 53 (2007) 250–259

[x] **Stimulating language: insights from TMS**
Joseph T. Devlin and Kate E. Watkins
Brain 130, (2007) 610–622

[xi] **Applications of TMS to Therapy in Psychiatry.**
Lisanby, Sarah H.; Kinnunen, Leann H.; Crupain, Michael J.
Journal of Clinical Neurophysiology. 19(4):344-360, August 2002.

[xii] **Exploring Theta Burst Stimulation as an intervention to improve motor recovery in chronic stroke**
P. Talelli, R. Greenwood, J. Rothwell
Clinical Neurophysiology, Volume 118, Issue 2, Pages 333-342

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Caution - Investigational Device. Federal (or United States law) limits device to investigational use.

All standard products carry the CE mark, comply with the Medical Device Directive 93/42/EEC, and are manufactured under a Quality System certified to ISO 13485.

All specifications are subject to change. All material in this literature is produced in good faith

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EUROPEAN UNION OBJECTIVE 1
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Welsh Assembly Government

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