

TOF-Watch®

Objective neuromuscular
transmission monitors

*because patients should
not be extubated until
 $\text{TOF} \geq 0.9$*



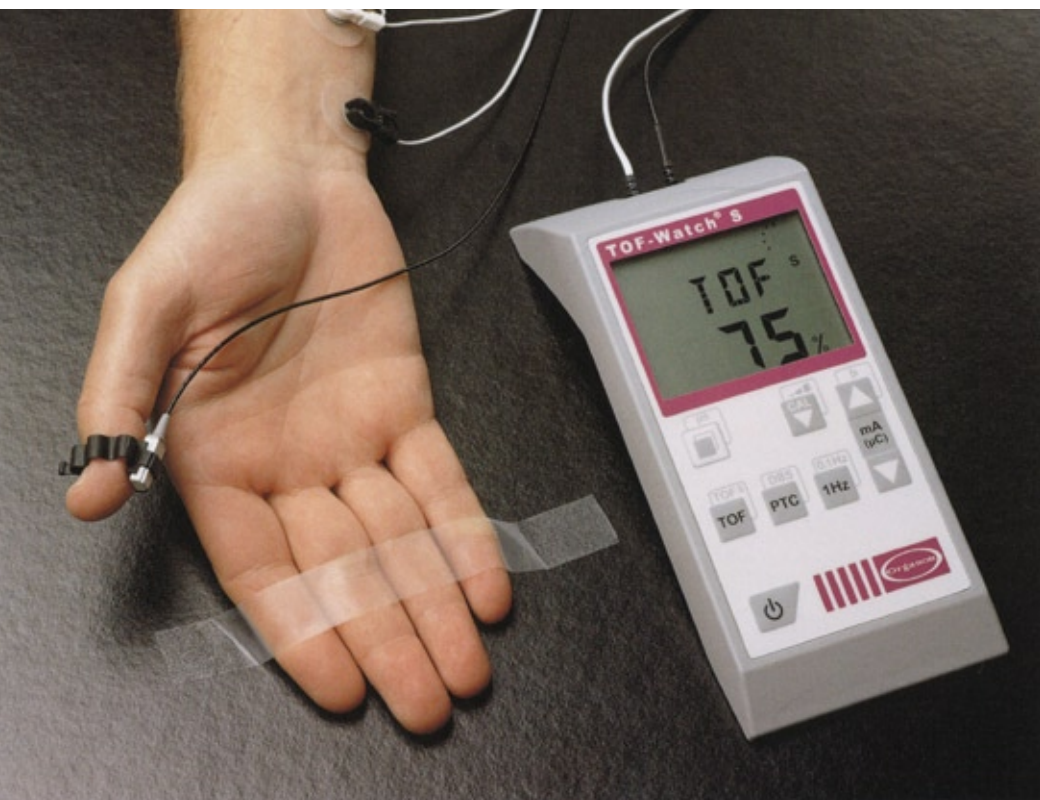
Never miss a twitch

TOF-Watch® Monitoring NMBA use pays dividends

As a leader in the field of neuromuscular blocking agents (NMBAs), Organon has acquired a wealth of insight into clinical muscle relaxation.

We have become aware of the desirability for proper monitoring of the effects of muscle relaxants in both clinical and research settings. The major benefits of this include efficient and cost-effective neuromuscular block management.

Our aim is to offer compact and convenient equipment that provides precise and objective information contributing to patient safety. With the TOF-Watch monitors, we present a range of instruments that reflect our overall goals in this critical sector.



Neuromuscular transmission monitoring technology

Objective neuromuscular transmission monitoring is the continuous measurement of the effect of muscle relaxants on skeletal muscles in the human body. To do this effectively, a motor nerve is stimulated and the muscle response that follows is objectively evaluated.

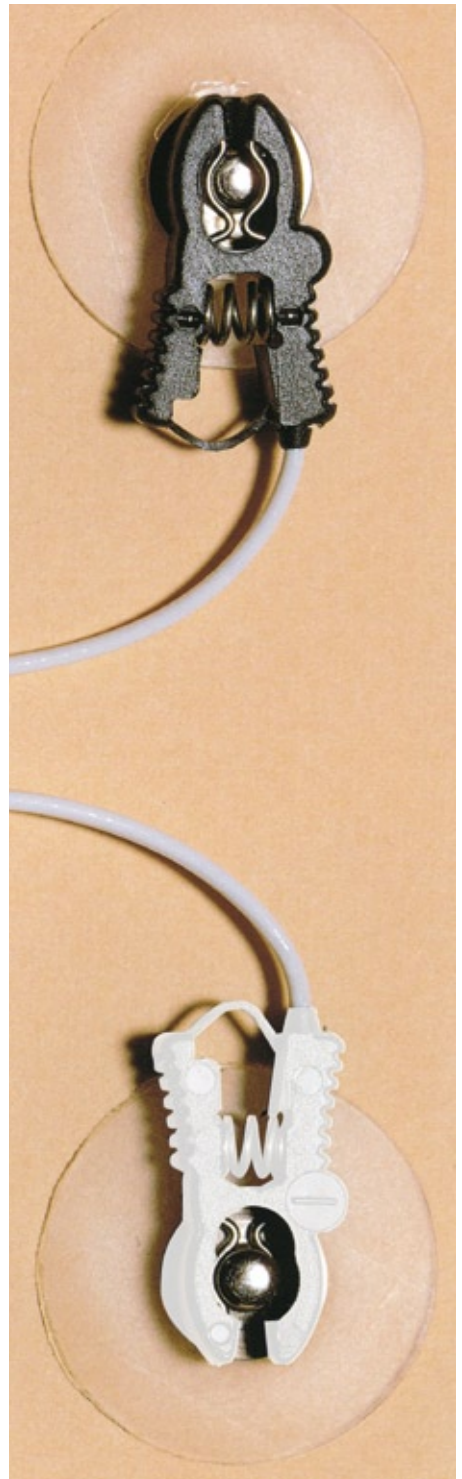
Acceleromyography

Acceleromyography (AMG) is a proven technique for recording evoked muscle responses. In AMG, a small piezoelectric transducer converts measured acceleration into electrical signals, which are then processed and presented as clear measures for neuromuscular transmission. Acceleration is directly proportional to the force, provided that mass is constant (Newton's second law: $F = M \times A$).

The most common site for acceleration measurement is the thumb. Alternatives include measurement of the response of the orbicularis oculi muscle and flexor hallucis brevis muscle.

Typical advantages of AMG devices represented by the TOF-Watch series are:

- Simplicity
- Suitability for clinical routine in both the operating theatre and intensive care unit
- Robustness



Nerve stimulation pattern

The degree of neuromuscular block is monitored by applying various patterns of electrical stimulation to the nerve. All stimuli are 0.2msec in duration and are delivered at regular intervals depending on the stimulation pattern required.

Train-of-Four (TOF)*

This is the most common stimulation pattern. Four supramaximal electric stimuli are applied in a 1.5 second period, and repeated every 12 seconds. Each train of four stimuli potentially elicits four muscle twitches (T1 – T4). The level of block when four twitches are present is shown as a percentage: TOF ratio = $(T^4/T_1) \times 100$. When there are less than four twitches, the actual number of twitches is displayed.

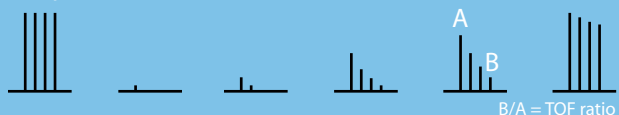
In this way TOF provides a convenient and reliable method of assessing the depth of muscle relaxation. This assists the anaesthetist in deciding if a repeat dose of an NMBA is required, and determining if a patient can be safely extubated.

Adequate control of the duration and quality of NMB during surgery is essential. Residual paralysis increases the risk of dysphagia, aspiration and partial airway obstruction, even in the absence of respiratory symptoms, when the TOF ratio is <0.9 .^{1,2,3,4,5} Following these observations a TOF ratio of ≥ 0.9 is accepted as the criteria for acceptable recovery of neuromuscular function prior to extubation.¹

Stimulation:



Response:



*Stimulation patterns adapted from:
Viby-Mogensen. *J Anesthesia*.
Editor R.D.Miller,
Churchill Livingstone, Fifth Edition,
36: 1351-1366

Objective neuromuscular transmission monitoring

Why use objective neuromuscular transmission monitoring

Objective neuromuscular transmission monitoring contributes to patient safety. It assists neuromuscular block management in the following ways:

- Detecting under or over-dosing and residual curarisation
- Cost-effectiveness
- Easy documentation

When to use objective neuromuscular transmission monitoring?

All patients benefit from the advantages provided by objective neuromuscular transmission monitoring.

The AAGBI recommend that a nerve stimulator is available whenever a muscle relaxant is used⁶.

How easy is objective neuromuscular transmission monitoring?

Objective neuromuscular transmission monitoring in clinical practice is achieved with TOF-Watch in four steps:

1. Place the two stimulation electrodes and attach the transducer.
2. Switch **ON** the TOF-Watch.
3. After induction of the patient, press the **Calibration** button (optional).
4. Press the **TOF** button just before administration of the NMBA.

The TOF-Watch is now tuned to the patient and is continuously monitoring the level of neuromuscular blockade.



TOF-Watch® Series

Compact, convenient and user-friendly

The TOF-Watch range of monitors has been developed to provide maximal benefits in specific settings. Common to all of the TOF-Watch series is their small size, useability and extensive monitoring capabilities.

Advantages include:

Ease of use

- Push button activation
- Optional calibration
- Continuous monitoring results are shown immediately on a clear display

Convenient

The TOF-Watch is designed to provide train-of-four stimulation (TOF) – the most commonly used stimulation pattern.

TOF-Watch is suitable for continuous or intermittent monitoring with optional calibration.

Common features to all of the TOF-Watch series

- Rapid set-up
- User-friendly interface
- Transducer & stimulation lead detection
- Large, clear display
- Low current mode for nerve localisation
- User-definable default values
- Low battery warning
- Easy-to-clean membrane keyboard



Choosing the right TOF-Watch®

TOF-Watch

This model forms the basis of the TOF-Watch range and is especially suited to routine monitoring of neuromuscular transmission during surgical procedures. Applying the latest acceleromyography techniques, it accurately measures the degree of neuromuscular block produced after the administration of NMBA. In addition, it can also be used in loco-regional anaesthesia for nerve localisation.



TOF-Watch S

The added capabilities of the TOF-Watch S make it particularly suitable for neuromuscular block monitoring in the ICU setting. The availability of a user-selectable Slow TOF stimulation mode enables the user to programme Train-of-Four repetition time intervals within a range of 1 to 60 minutes. Applying the same advanced acceleromyography principles as other TOF-Watch monitors, it ensures accurate results, is flexible and contributes to optimal and cost-effective neuromuscular block management.



TOF-Watch SX

The TOF-Watch SX is the most sophisticated instrument in the range. Incorporating all the features relevant to routine use during surgery and in the ICU, it is also fully compliant with Good Clinical Practice guidelines for use in clinical studies and research. A surface sensor for measuring skin temperature completes the instrument. The easy-to-read display presents all the relevant data. This data can be simultaneously uploaded, via a USB fibre-optic connection, to a computer running the TOF-Watch SX Monitor Programme.



TOF-Watch SX Monitor Software

While recording the measured data from the TOF-Watch SX, pre-programmed or other user comments can be added to the patient's recordings very easily. Comments can later be edited while all changes are logged in an audit trail (GCP). The TOF-Watch SX Monitor Software makes storing, printing and viewing of the recorded data easy. In addition, the programme is username and password protected.

Accessories

Complete TOF Watch S cable

- Part Number 79950214

Tof Watch S and SX stimulation cable -

Part Number 10103

Complete TOF Watch SX cable

- Part Number 79950213

Hand Adapter - Part Number 79950209

Thumb Adapter - Part Number 79950152

TOF-Watch Features

Device	TOF-Watch	TOF-Watch S	TOF-Watch SX
Stimulation patterns			
• TOF	✓	✓	✓
• PTC	✓	✓	✓
• 1Hz ST	✓	✓	✓
• 0.1Hz ST	✓	✓	✓
• DBS (3.3 or 3.2)	✓	✓	✓
• TET (50 Or 100Hz)	✓		✓
• Slow TOF (TOFs) programmable 1-60 minutes		✓	✓
Stimulation current (0-60mA at impedance ≤ 5kOhm)	✓	✓	✓
Stimulation pulse width monophasic 200µs	✓	✓	✓
Stimulation pulse width monophasic 300µs		✓	✓
Calibration with user-set current	✓	✓	✓
Calibration with automatically set supramaximal current		✓	✓
Manual transducer sensitivity		✓	✓
User-programmable upper and lower TOF and TOFs alarms (OFF, count or %TOF)			✓
User programmable audible alarm: ON/OFF			✓
Automatic power switch off (after 2 hours of non operation)	✓	✓	✓
Surface temperature sensor (20-41.5°C)			✓
Interface for data upload to PC (Fibre-Optic to USB line)			✓
Nerve localisation – LA (1Hz stimulation)	✓	✓	✓
• Current 0-6mA			
• Impedance ≤ 5kOhm			
• Pulse width 40µs monophasic			

1. Viby-Mogensen J. *BJA*. 2000; 84(3): Editorial 1
2. Sundman E et al. *Anesthesiology*. 2000; 92: 977-984
3. Eikermann M et al. *Am J Respir Crit Med*. 2006 (Oct 5); [E-pub ahead of print]
4. Eikermann M et al. *Anesthesiology*. 2003; 98: 1333-1337
5. Berg H et al. *Acta Anaesthesiol Scand*. 1997; 41: 1095-1103
6. AAGBI Recommendations For Standards Of Monitoring During Anaesthesia And Recovery 4th Edition

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