



Intraoperative Neuromonitoring
Functional Neurosurgery
Pain Treatment
Neurological Diagnostic

pIOM[®]

>> PREPARATION AND APPLICATION

pIOM METHOD
DURING MESORECTAL EXCISION

APPLICATION NOTE



pelvic Neuromonitoring

INTRODUCTION

IOM Definition

Intraoperative neuromonitoring (IOM) refers to the graphic and acoustic display and documentation of the neurophysiological activity of nerves during a surgical procedure.

Monitoring the electrophysiological functioning of nerve pathways makes it possible to keep track of their function during an operation. The electrical stimulation of nerves causes depolarisation and hence a modulation of the basic activity.

In the case of **pelvic IOM** the consequence of this is an increase in the activity of the innervated smooth muscles, which can be recorded by electrodes attached in or on the muscle. The electrical potentials which occur here are recorded via **electromyography (EMG)**.

Measurement of muscle activity, and hence also their intact innervation, can also be done indirectly. Therefore in **pelvic IOM** the activity of the M. detrusor vesicae can be determined by means of the pressure in the bladder.

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pIOM — Methods and Application

The stimulation point is in the minor pelvis, in particular the **Plexus hypogastricus inferior** and the **Nn. splanchnici pelvici**.

Urogenital functions and **anorectal function** are monitored by means of bladder pressure measurement and the electrical discharge at the internal anal sphincter. The continuous display of anal sphincter activity and a display of the activity of the bladder muscles allows the autonomous nerves in the lesser pelvis to be identified during surgery.

The aim of this monitoring is to locate and check the functional integrity of the nerves in the pelvis in order to avoid damage to these nerves during surgery.

In the worst case scenario, damage to the autonomous nerves in the pelvis can lead to urogenital, anorectal or sexual function disorders.

The monitoring of nerve function is documented and saved by the software. This means that **subsequent evaluation** of the monitoring is possible. On the basis of this, in the event that there is any reduced nerve conduction, targeted treatment can be commenced accordingly.

Many surgical procedures in the minor pelvis which put the autonomous nerve system at risk are possible fields of application. In addition disciplines such as PROCTOLOGY, GYNAECOLOGY or UROLOGY can profit from pelvic monitoring.

Additional literature and publications on pelvic neuromonitoring:

- [1] P. Wałęga, M. Romaniszyn, M. Wałęga, S. Świrta, and W. Nowak, "Intraoperative neuromonitoring of hypogastric plexus branches during surgery for rectal cancer - preliminary report," *Polski przegląd chirurgiczny*, pp. 69–72, 2017.
- [2] W. Kneist, S. Stelzner, L. I. Hanke, and T. Wedel, "Inferior rectal plexus is no longer isolated in no man's land: An encouraging outlook with TaTME," *coloproctology*, vol. 39, no. 2, pp. 85–87, Mar. 2017.
- [3] D. W. Kauff, H. Lang, and W. Kneist, "Risk Factor Analysis for Newly Developed Urogenital Dysfunction after Total Mesorectal Excision and Impact of Pelvic Intraoperative Neuromonitoring? a Prospective 2-Year Follow-Up Study," *Journal of Gastrointestinal Surgery*, vol. 21, no. 6, pp. 1038–1047, Jun. 2017.

Further information and the complete list of publications on: www.inomed.com

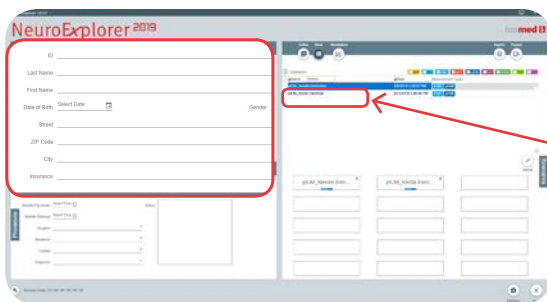
PREPARING

» Preparing the ISIS

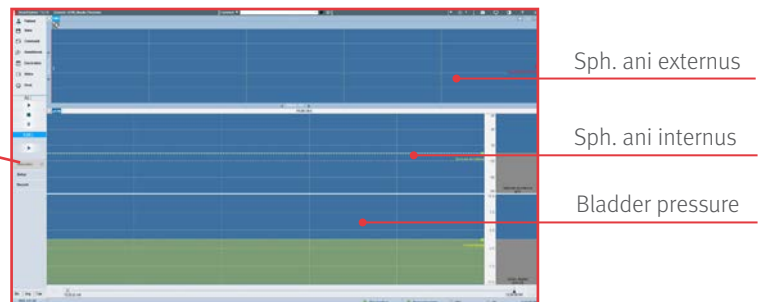
1. Plugging in and switching on the equipment



2. Entering patient data



3. Opening scenario



ANAESTHESIA

The patient must be completely relaxed during neuromonitoring. This is essential as otherwise it is not possible to monitor autonomic nerves reliably. The muscle activity of smooth and striated musculature tends to merge in the EMG measurement, meaning that allocation and interpretation becomes impossible. If the patient is relaxed, the activity of the striated musculature is suppressed and only the activity of the smooth musculature (the internal anal sphincter) can be seen in the EMG signal.

In addition TIVA is recommended. During anaesthesia under gas a weakening of the EMG signals has been observed. In the worst case, weak signals can be reduced to the extent that they are no longer recognised as a muscle response. This effect can be prevented by the use of TIVA.

Wherever possible epidural anaesthesia should only be done after all measurements have been completed in order to exclude any interference with the EMG signals.

See also:

Heid et al.: *Impact of inhalation vs. intravenous anaesthesia on autonomic nerves and internal anal sphincter tone.* Acta Anaesthesiol Scand. 2015 Oct; 59(9):1119-25. doi: 10.1111/aas.12535

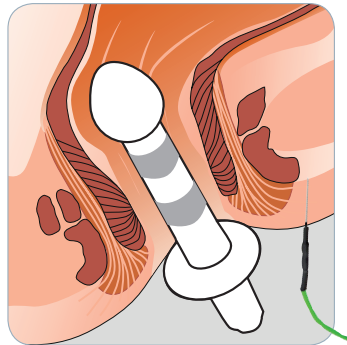
NOTE:

Please arrange temporary interruption of the flow of urine with the anaesthesia personnel as otherwise this may produce irregularities in determining the patient's fluid balance. If a urinary catheter with integrated temperature measurement is used, this may be affected during bladder pressure measurement.

For further information on anaesthesia during pIOM operations, please refer to the anaesthesia instructions.

>> Preparing the EMG

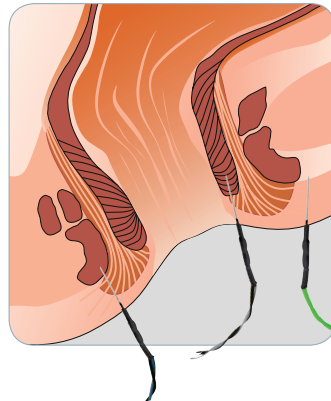
1. Positioning the rectal electrode



Note:
No lubricant may be used on the rectal electrode for positioning!

OR

1. Inserting the needle electrodes



2. Connecting the rectal electrode



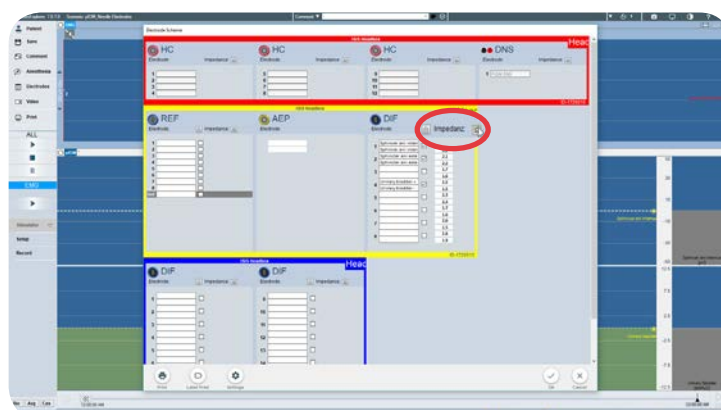
2. Connecting the needle electrodes



3. Connecting the adapter box to the ISIS system and the USB connector



4. Checking electrode contact



A good contact between the measurement electrodes and the patient's tissue is confirmed by displaying a value of less than 8-10 kOhm

» Preparation for bladder pressure

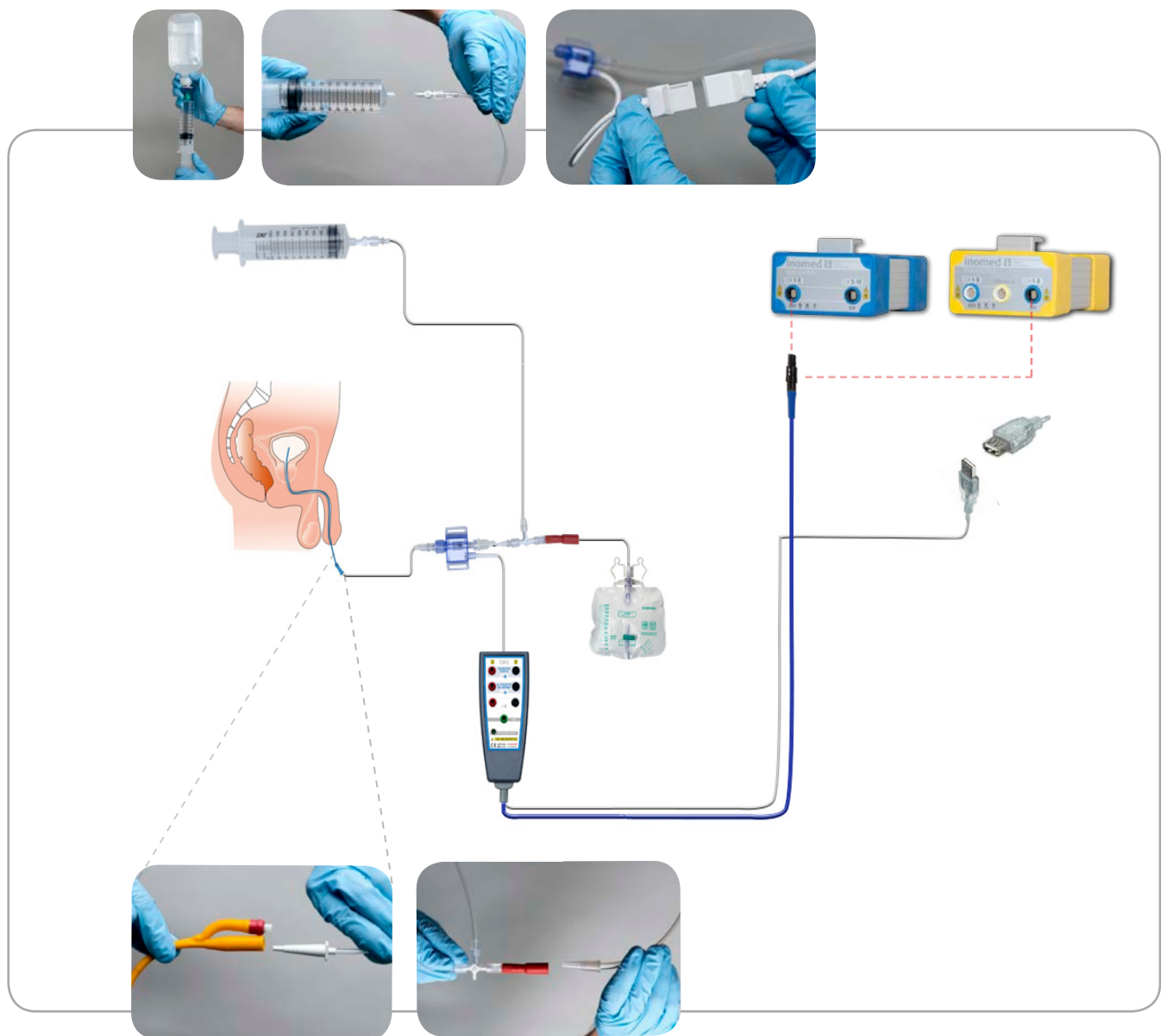
» ARRANGEMENT WITH ANAESTHETISTS

1. Venting the catheter connection set

The catheter connection set can be connected to normal commercially available urinary catheters. Special catheters, e.g. with integrated temperature measurement, are also possible. The only requirement for connection is a stepped cone adapter as shown below.

In order to ensure accurate pressure measurement the air in the catheter connection set must be extracted. NaCl solution is used for this. The two syringes included in the supply can be connected to a corresponding infusion bottle with the help of the spike, also supplied. Normally one completely filled syringe is sufficient for extracting the air.

2. Connecting up the catheter connection set

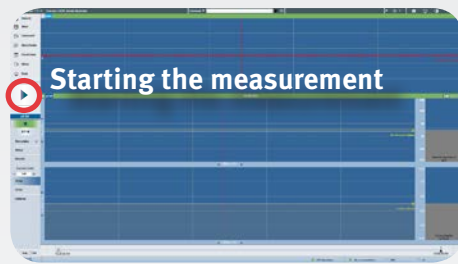


3. Connecting the urine bag

In order to allow the urine to flow from the bladder through the urinary catheter and into the urine bag, the 3-way valve is aligned as shown in the picture.

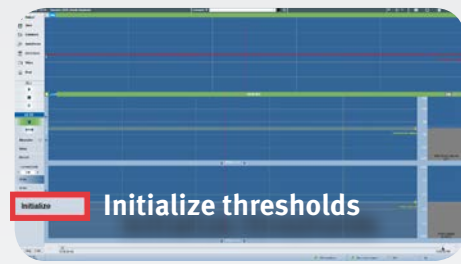
»» At the beginning of the operation

1. Starting the measurement



Measurement is started using the button shown above.

2. Setting the threshold



So that the software can correctly recognise the muscle response signals, the threshold values need to be adjusted. To do this, the „initialization“ button on the left is pressed, which sets the threshold values automatically slightly above the physiological resting signal in each case. (see illustration)

3. Connecting the stimulation probe



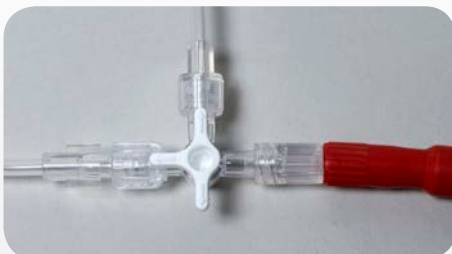
4. Function testing of the probe



In order to confirm that the stimulation probe is functioning correctly it should be moistened shortly before the first nerve stimulation. This causes a stimulation tone to sound as confirmation.

»» During the operation

5. Preparing for stimulation



In order to be able to achieve a bladder pressure response during the stimulation, the 3-way valve must be turned as shown in the illustration. This will cause the flow of urine to the urine bag to be interrupted.



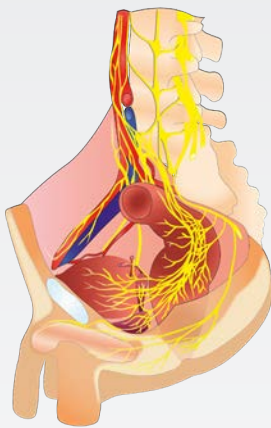
Then the bladder must be filled with 200 ml NaCl solution. The two syringes enclosed can be used for this. In order to enable a bladder pressure measurement to be taken, the 2-way valve must then be closed as shown in the illustration.

NOTE:

Please discuss the procedure with the anaesthetist to avoid any misunderstandings here.

Please repeat the initialization process each time the bladder is refilled or the OR-table position is adjusted.

6. Stimulation

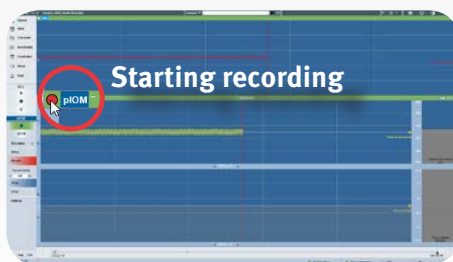


The nerve structures in the minor pelvis are stimulated with the bipolar probe. This stimulation probe is used for **localisation**, **function control** and **mapping**. A stimulation current of 8 mA is recommended here. The point of stimulation lies exclusively in the minor pelvis. Best suited for this are the **inferior hypogastric plexus** and the **pelvic splanchnic nerves**. Especially at the nerve structures coming from S3 and S4 very clear response signals are to be observed in the bladder pressure and also in the EMG signal from the internal anal sphincter. All nerve structures which are supplied by the nerves just mentioned or which innervate

them can, in principle, can be stimulated with the stimulation probe. Furthermore attention must be paid to ensure that there is as little tissue as possible between nerve and stimulation probe. Otherwise the response signal may be weakened or no longer triggered. If the nerves are covered with tissue and the measurement of response signals is not possible, there is the possibility of increasing the stimulation current slightly. However this is possible up to a maximum of the limit value set to 12 mA.

NOTE: Complete relaxation of the patient should be requested at the beginning of stimulation from the anaesthetist. Unless there is complete relaxation, false-positive response signals may be produced.

7. Starting recording



In order to be able to document the data measured, it is possible to produce a recording. In this case, confirm this by the corresponding button just before stimulation. Stop the recording again using the same button after the stimulation. Alternatively key F10 can be used to produce screen recordings.

9. After the end of a stimulation interval

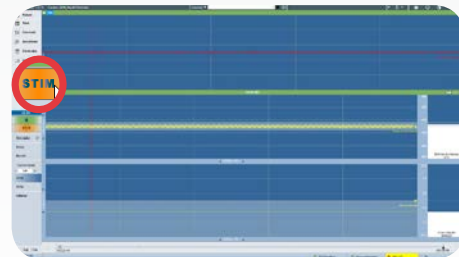


It is recommended that the fluid injected before the beginning of stimulation is extracted again. The two syringes can be used for this. Subsequently the 3-way valve must be turned to its original position to allow fluid flow into the urine bag.

8. Graph interpretation

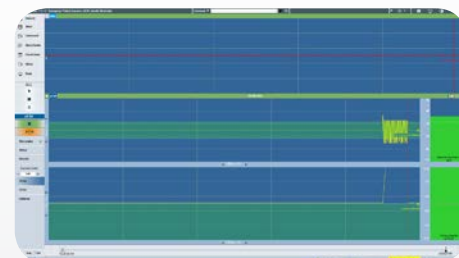
Starting stimulation

To start the stimulation function for the first time, press the STIM button in the left menu band.



Active stimulation without muscle response

Stimulation starts automatically as soon as the stimulation probe is in contact with the tissue. In this case an intermittent beep tone sounds for 5 seconds during which the stimulation probe should not be moved.

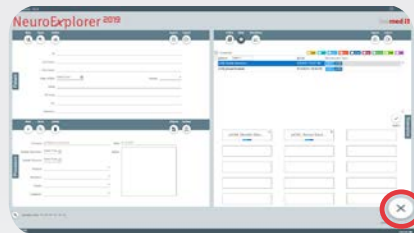
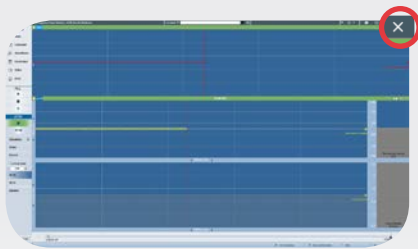


Active stimulation with muscle response

If the threshold values set are exceeded in the pressure and/or EMG signal, this triggers a visual and acoustic confirmation signal.

Additionally, the point in time of such a signal is marked automatically by the system for the OR report.

10. Closing the measurement window and the programme



To close the measurement window, click on the top right button. The programme can now be closed by the “Quit” button.

NOTE: Please shut down the equipment as otherwise this may result in memory failure. Then switch off at the green button as shown in the illustration and only then should you pull out the plug.

» Accessories information

pIOM[®]



pIOM Box

for bladder pressure measuring

Art.-Nr. 520 300

for ISIS IOM systems before Q4 2018

Art.-Nr. 520 302

for ISIS IOM systems from Q4 2018

for connection to IONM devices,
for use with disposable pressure
converter with 1.5mm touchproof
female connector

- USB powered
- delivered non-sterile
- non-autoclavable



pIOM Set

with SDN Electrodes

Art.-No. 520 335

complete set consisting of
Catheter Connection Set
for bladder pressure measuring

- SDN Electrodes
- fork probe 400mm
- single-use
- ETO-sterilized



pIOM Set

with rectal electrode

Art.-No. 520 336

complete set consisting of
Catheter Connection Set
for bladder pressure measuring

- rectal electrode
- fork probe 400mm
- single-use
- ETO-sterilized

» Partnership

» Precision

» Innovation



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Pioneer in pelvic Monitoring