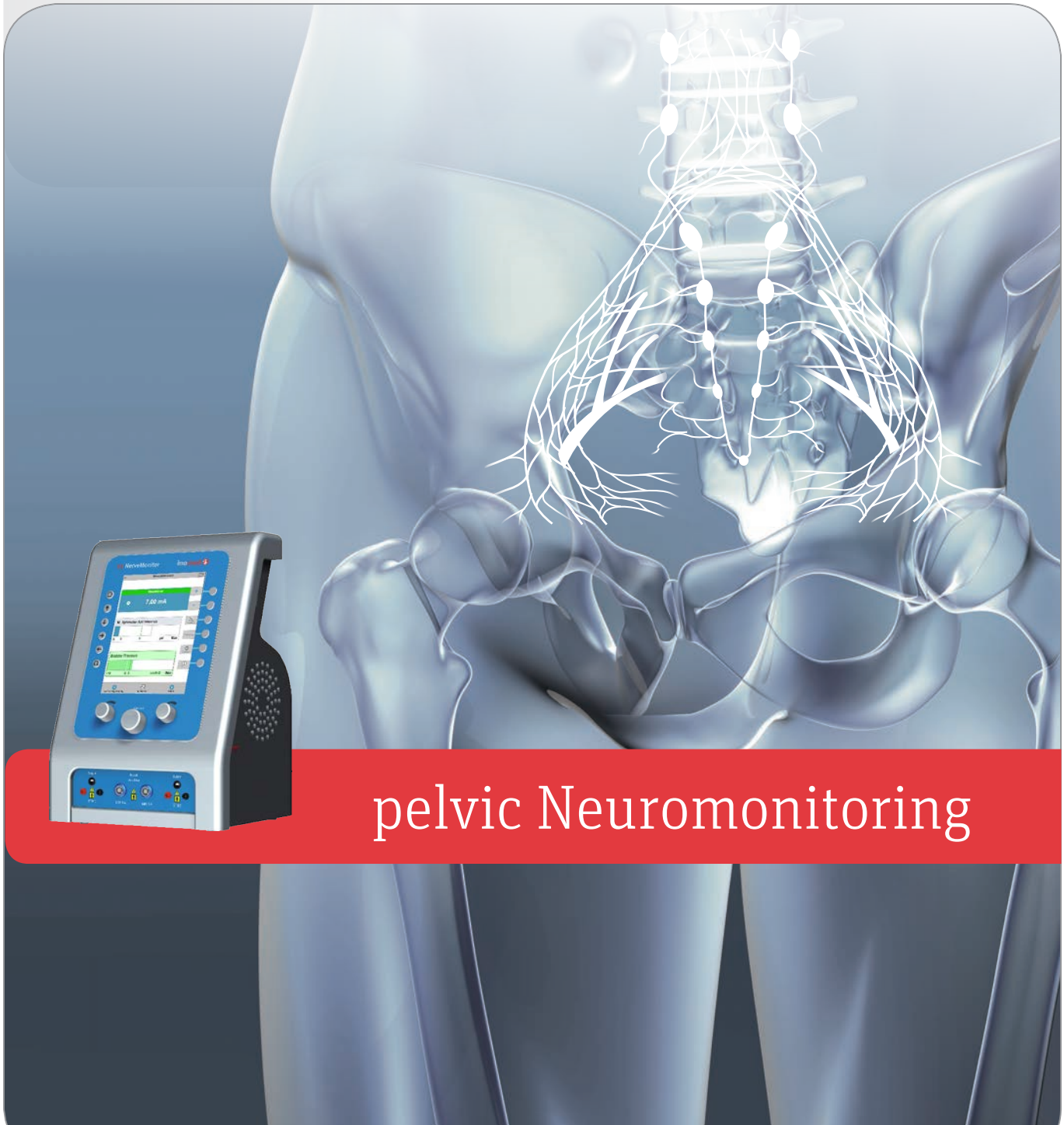
inomed

Intraoperative Neuromonitoring
Functional Neurosurgery
Pain Teratment
Neurological Diagnostic

pIOM®

APPLICATION NOTE

›› **PREPARATION AND APPLICATION**
pIOM METHOD
DURING MESORECTAL EXCISION



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 referred to as **electromyographic discharge (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.

pIOM®

GERMAN PATENT inomed TECHNOLOGY

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 minor 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 przeglad 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 C2

1. Plugging in and switching on the equipment

2. Entering patient data

NOTE: To continue, at least the patient last name or patient ID must be entered.

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.

›› Preparation for bladder pressure

›› ARRANGEMENT WITH ANAESTHETISTS

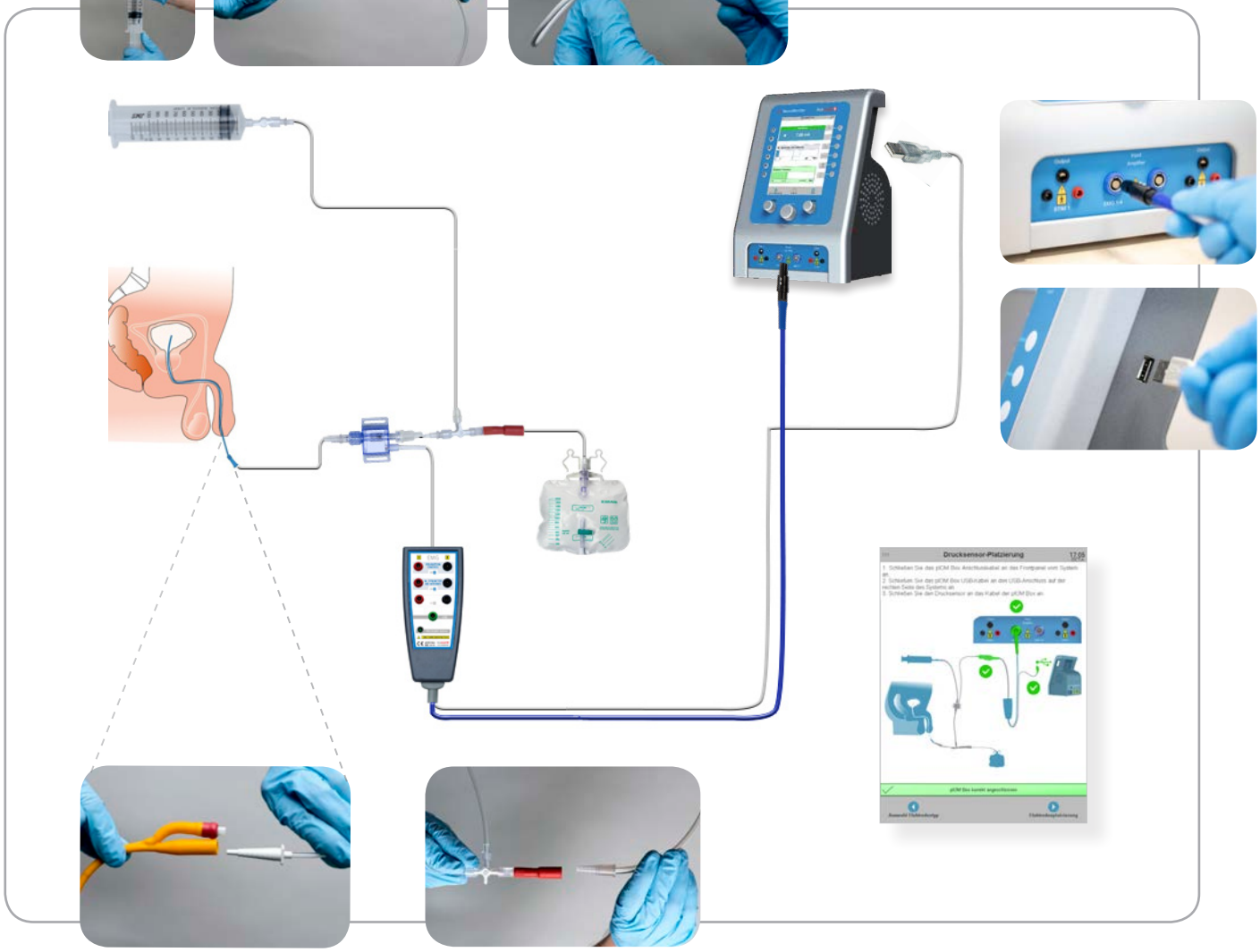
1. Venting the catheter connection set

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



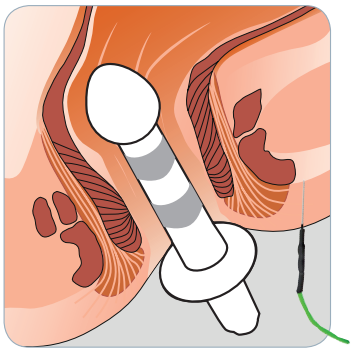



3. Connecting the urine bag

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.

›› Preparing the EMG

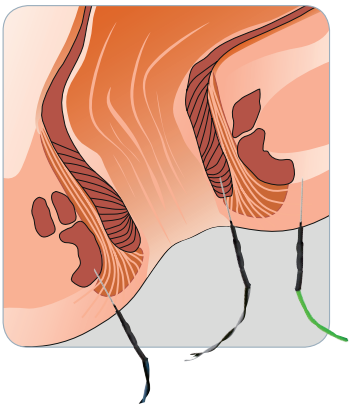
1. Positioning the rectal electrode



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

OR

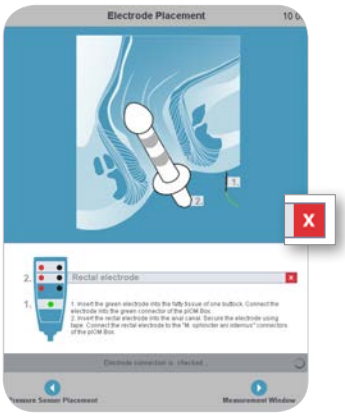
1. Inserting the needle electrodes

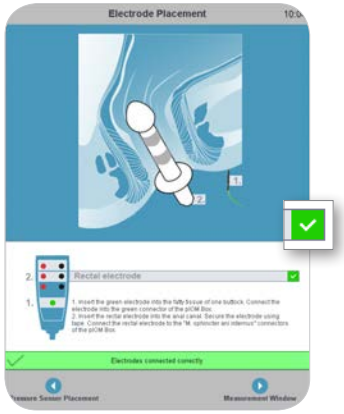


2. Connecting up the rectal electrode

2. Connecting up the needle electrodes

3. Checking electrode contact





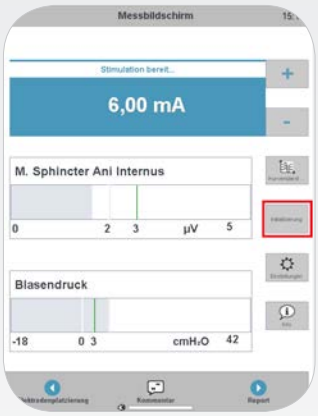
A good contact between the measurement electrodes and the patient's tissue is confirmed by a green display

›› At the beginning of the operation

1. Starting the measurement

The measurement starts automatically. As soon as a response is detected, the recording starts automatically.

2. Setting the threshold



In order for the software to recognize the signals correctly, the threshold values need to be adjusted. Pressing the initialization button on the right will automatically adjust the threshold values slightly above the physiological resting signal. This process takes five seconds. Within this period, all manipulation and stimulation should be avoided.

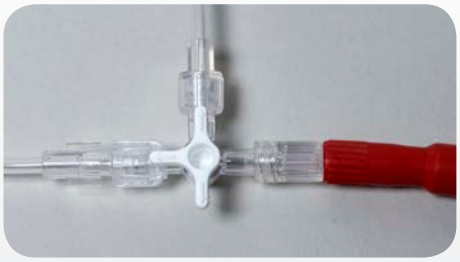
3. Connecting the stimulation probe

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



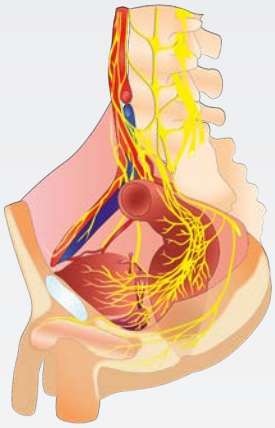
In order to be able to achieve a bladder pressure response during the stimulation, the 3-way valve must be turned as shown in the illustration. This will cause the flow of urine to the urine bag to be interrupted.

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



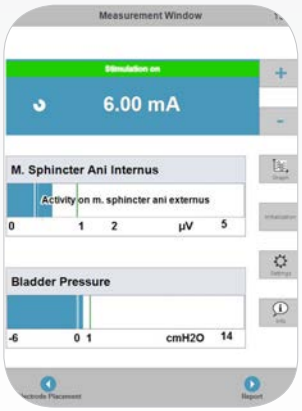
The nerve structures in the minor pelvis are stimulated with the bipolar probe. This stimulation probe is used for **localisation**, **function control** and **mapping**. A stimulation current of 8 mA is recommended here. The point of stimulation lies exclusively in the minor pelvis. Best suited for 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, also 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. Graph interpretation

Active stimulation without muscle response
Stimulation starts automatically as soon as the stimulation probe is in contact with the tissue and should be performed at one location for at least 5 seconds. This time frame is depicted by the white circle in the stimulation window, after which completion a beep tone sounds.

Active stimulation with muscle response
If the preset threshold values for pressure and/or EMG signal are exceeded the corresponding bar is colored and a visual signal plus a change of the beep tone is triggered. In addition, the time of such a signal is automatically marked for the OP report of the system.

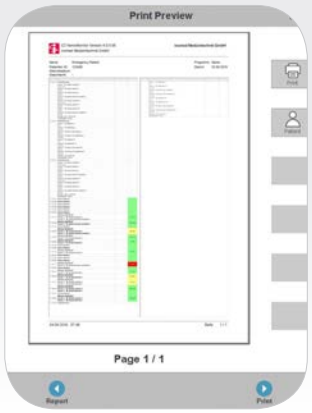


Muscle response of the EAS
If an EMG signal at the EAS is triggered by mechanical or electrical stimulation, a warning appears. Such a signal indicates insufficient muscle relaxation and should be reported to the anaesthetist.

8. 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.

9. Creating a report



The C2 NerveMonitor records all events such as stimulation, signal changes and commented time periods with the corresponding parameters. The print preview then displays the finished document based on the intervention and can be printed digitally or on paper.
The C2 NerveMonitor can now be switched off.

›› Accessories information

pIOM®

pIOM Box
for bladder pressure measuring
Art.-No. 520 300

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 consiting 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 consiting of
Catheter Connection Set
for bladder pressure measuring
- rectal electrode
- fork probe 400mm
- single-use
- ETO-sterilized

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›› Partnership
›› Precision
›› Innovation

Pioneer in pelvic Monitoring

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