Advanced Neuromonitoring Solutions

Oxygen Partial Pressure, Intracranial Pressure and Temperature Measurement

800-961-2122
Microchip catheters with maximum precision

NEUROVENT®

NEUROVENT® microchip catheters are used for the reliable measurement of:

- ICP (intracranial pressure)
- ICT (intracranial temperature)
- \( p_{iO_2} \) (oxygen partial pressure)

ICP is measured using semiconductor pressure sensors. The quenching process of fluorescence is used to measure \( p_{iO_2} \). Consequently the level and changes in the parameters are measured safely, quickly and accurately.

RAUMEDIC offers a wide range of microchip catheters for parenchyma as well as ventricular measurement.

NEUROVENT®-PTO:
Pressure (ICP), Temperature, Oxygen Partial Pressure (\( p_{iO_2} \))

References:

Technical Data

**Pressure measurement range**
-50 to +250 mmHg
(-6.7 to 33.3 Pa)

**Bandwidth**
> 100 Hz

**Measurement range temperature sensor**
+25°C to +45°C
+77°F to +113°F

**Temperature accuracy in measurement range**
±0.1°C

**Catheter material**
Polyurethane

**Pressure sensibility**
5 µV/V/mmHg

**Zero Drift Pressure**
Less than 1 mmHg during the first 24 hours at 37°C (98.6°F)
Less than 2 mmHg during the first week at 37°C (98.6°F)
Average deviation 0.6 mmHg after 5 days*

* Bench test assessment of the new Raumedic Neurovent-P ICP sensor: a technical report by the BrainIT group Citerio G., Piper I., Cormio M., Galli D., Cazzaniga S., Enblad P., Nilsson P., Constant C., and Chambers I., BrainIT Group

Intracranial pressure and temperature measurement NEUROVENT®-P and NEUROVENT®

Intracranial pressure (ICP) and temperature measurement can be achieved safely, quickly and accurately using RAUMEDIC’s innovative catheters with semiconductor sensors.

- Parenchyma monitoring of ICP with NEUROVENT-P, with integrated temperature measurement using NEUROVENT-P-TEMP
- Ventricular monitoring of ICP and CSF drainage with NEUROVENT, with integrated temperature measurement using NEUROVENT-TEMP
- Parenchyma monitoring of ICP and ventricular drainage using NEUROVENT-Sleeve Housing

**Catheters**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Diameter</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parenchyma</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEUROVENT-P</td>
<td>ICP</td>
<td>5F</td>
<td>092946-002</td>
</tr>
<tr>
<td>NEUROVENT-P-TEMP</td>
<td>ICP + temperature</td>
<td>5F</td>
<td>094268-002</td>
</tr>
<tr>
<td>Ventricular</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEUROVENT</td>
<td>ICP + drainage, stylet</td>
<td>9F</td>
<td>092956-002</td>
</tr>
<tr>
<td>NEUROVENT-IFD-S</td>
<td>ICP + drainage, inset guide wire soft</td>
<td>9F</td>
<td>091678-002</td>
</tr>
<tr>
<td>NEUROVENT-IFD-R</td>
<td>ICP + drainage, inset guide wire rigid</td>
<td>9F</td>
<td>095317-002</td>
</tr>
<tr>
<td>NEUROVENT-TEMP</td>
<td>ICP + drainage + temperature, stylet</td>
<td>9F</td>
<td>094278-002</td>
</tr>
<tr>
<td>NEUROVENT-TEMP-IFD-S</td>
<td>ICP + drainage + temperature, inset guide wire soft</td>
<td>9F</td>
<td>094288-002</td>
</tr>
<tr>
<td>NEUROVENT-TEMP-IFD-R</td>
<td>ICP + drainage + temperature, inset guide wire rigid</td>
<td>9F</td>
<td>095327-002</td>
</tr>
<tr>
<td>NEUROVENT-Sleeve Housing</td>
<td>ICP in parenchyma + ventricular drainage</td>
<td>9F</td>
<td>091576-002</td>
</tr>
</tbody>
</table>

**Clinical benefits:**

- No additional ICP monitor
- Plug & Play system – no catheter calibration required
- Simultaneous ICP measurement, CSF drainage and temperature measurement
- Connection directly to the patient monitor
- Compatible with all standard patient monitors
- Pressure measurement during transport
- Consistent reproducibility of pressure curves with high precision resolution for wave analysis
- Excellent stability and linearity of measuring values
- Zero Point Simulator allows for easy replacement of patient monitor without losing measured values

Intracranial pressure (ICP) and temperature measurement can be achieved safely, quickly and accurately using RAUMEDIC’s innovative catheters with semiconductor sensors.

- Parenchyma monitoring of ICP with NEUROVENT-P, with integrated temperature measurement using NEUROVENT-P-TEMP
- Ventricular monitoring of ICP and CSF drainage with NEUROVENT, with integrated temperature measurement using NEUROVENT-TEMP
- Parenchyma monitoring of ICP and ventricular drainage using NEUROVENT-Sleeve Housing

**Technical Data**

- **Pressure measurement range**: -50 to +250 mmHg (-6.7 to 33.3 Pa)
- **Bandwidth**: > 100 Hz
- **Measurement range temperature sensor**: +25°C to +45°C (+77°F to +113°F)
- **Temperature accuracy in measurement range**: ±0.1°C
- **Catheter material**: Polyurethane
- **Pressure sensibility**: 5 µV/V/mmHg
- **Zero Drift Pressure**
  - Less than 1 mmHg during the first 24 hours at 37°C (98.6°F)
  - Less than 2 mmHg during the first week at 37°C (98.6°F)
  - Average deviation 0.6 mmHg after 5 days*

* Bench test assessment of the new Raumedic Neurovent-P ICP sensor: a technical report by the BrainIT group Citerio G., Piper I., Cormio M., Galli D., Cazzaniga S., Enblad P., Nilsson P., Constant C., and Chambers I., BrainIT Group
BOLT and DRILL KIT

Components of the RAUMEDIC BOLT KIT
1. BOLT including seal and fixing cap
2. Dura opener
3. Screwing in tool

Components of the RAUMEDIC DRILL KIT
4. DRILL bit with stopper
5. Allen key

Implantation Accessories

<table>
<thead>
<tr>
<th>Product</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOLT KIT CH5 (parenchyma)</td>
<td>091868-002</td>
</tr>
<tr>
<td>DRILL KIT CH5 (parenchyma)</td>
<td>091878-002</td>
</tr>
<tr>
<td>BOLT KIT CH9 (ventricular)</td>
<td>091688-002</td>
</tr>
<tr>
<td>DRILL KIT CH9 (ventricular)</td>
<td>091668-002</td>
</tr>
<tr>
<td>Tunneling Sleeve CH8 (parenchyma)</td>
<td>090506-002</td>
</tr>
<tr>
<td>Tunneling Sleeve CH12 (ventricular)</td>
<td>090717-001</td>
</tr>
</tbody>
</table>

BOLT KIT Advantages:
- Low profile
- Self-cutting conical thread with sealing function

Cables and Adapters

<table>
<thead>
<tr>
<th>Product</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICP-TEMP-Cable</td>
<td>094328-001</td>
</tr>
<tr>
<td>ICP-TEMP-Adapter Philips/HP</td>
<td>094323-001</td>
</tr>
<tr>
<td>ICP-TEMP-Adapter Philips/HP</td>
<td>094047-001</td>
</tr>
<tr>
<td>NPS2 Philips/HP</td>
<td>092638-001</td>
</tr>
<tr>
<td>NPS2 GERMANIQUE</td>
<td>093807-001</td>
</tr>
<tr>
<td>NPS2 Siemens/Düger Infinity</td>
<td>092627-001</td>
</tr>
<tr>
<td>NPS2 Nilsson Kohlén 8800</td>
<td>091676-001</td>
</tr>
<tr>
<td>NPS2 Datex Ohmeda</td>
<td>090924-001</td>
</tr>
<tr>
<td>NPS2 SpaceLabs</td>
<td>091715-001</td>
</tr>
<tr>
<td>NPS2 Nakula Dentschi</td>
<td>096039-001</td>
</tr>
<tr>
<td>NPS2 Schlüer</td>
<td>094527-001</td>
</tr>
<tr>
<td>NPS2 Hellége</td>
<td>092617-001</td>
</tr>
</tbody>
</table>

NPS2 for additional monitor types upon request

Mobile Pressure Measurement

<table>
<thead>
<tr>
<th>Product</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPS3</td>
<td>091656-001</td>
</tr>
</tbody>
</table>

Measuring chain from the catheter to the patient monitor

NPS2
Available for all standard monitor types

Alternative NPS3
Oxygen partial pressure measurement

**NEUROVENT®-PTO**

Measurement of oxygen partial pressure \( (p_{O_2}) \) shows the available oxygen in the brain tissue and allows for early detection of cerebral damage to help prevent secondary injury. The quenching process of fluorescence is used to measure \( p_{O_2} \).

- **NEUROVENT-PTO**: provides oxygen partial pressure, ICP and temperature measurements in the parenchyma.
- **NEUROVENT-PTO 2L**: provides oxygen partial pressure, ICP and temperature measurements in the parenchyma. Catheter designed specifically for BOLT KIT PTO 2L (two lumen BOLT), to be used with microdialysis.
- **NEUROVENT-TO**: provides oxygen partial pressure and temperature measurements in the parenchyma.

---

**Catheters**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Dimension</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEUROVENT-PTO</td>
<td>ICP + temperature + ( p_{O_2} )</td>
<td>5F</td>
<td>095008-002</td>
</tr>
<tr>
<td>NEUROVENT-PTO 2L</td>
<td>ICP + temperature + ( p_{O_2} ) for use with BOLT KIT PTO 2L</td>
<td>5F</td>
<td>095108-002</td>
</tr>
<tr>
<td>NEUROVENT-TO</td>
<td>Temperature + ( p_{O_2} )</td>
<td>3F</td>
<td>095908-002</td>
</tr>
</tbody>
</table>

**Technical Data**

- **Pressure measurement range**: \(-50 \text{ to } +250 \text{ mmHg}\) \((-7.1 \text{ to } +33.3 \text{kPa})
- **Bandwidth**: \( \geq 100 \text{ Hz} \)
- **Measurement range temperature sensor**: \(+25°C \text{ to } +45°C \) \(+77°F \text{ to } +113°F \)
- **Temperature accuracy in measurement range**: \( \pm 0.1°C \)
- **Catheter material**: Polyurethane
- **Pressure sensibility**: \( 5 \text{ µV/V/mmHg} \)
- **Measurement process \( p_{O_2} \)**: Fiber optic
- **\( p_{O_2} \) measuring surface**: \( 22 \text{ mm}^2 \)
- **Measurement range \( p_{O_2} \)**: \( 0-150 \text{ mmHg} \)

**Zero Drift Pressure**

- Less than 1 mmHg during the first 24 hours at 37°C (98.6°F)
- Less than 2 mmHg during the first week at 37°C (98.6°F)
- Average deviation 0.6 mmHg after 5 days**

---

**Clinical advantages:**

- Parenchyma pressure, temperature and \( p_{O_2} \) measurement in one catheter
- Plug & play system – no catheter calibration required
- No oxygen consumption by the \( O_2 \) sensor
- Large oxygen sensor window
- No refrigeration of catheter required
- Data acquisition using RAUMEDIC EASY logO
- Excellent long-term stability and linearity of measuring values
- Compatible with standard patient monitors

---

**NEUROVENT-PTO**

One catheter; three measurement functions

- ICP
- ICT
- \( p_{O_2} \)

**NEUROVENT-TO**

Catheter for measuring temperature and \( p_{O_2} \)

**NEUROVENT-PTO 2L**

Application with BOLT KIT PTO 2L and Tunneling Sleeve.

---

*Measurement accuracy \( \pm 2.5 \text{ mmHg} p_{O_2} \) for \( <120 \text{ mmHg} p_{O_2} \)

**Zero drift assessment of the new Raumedic Neurovent® ICP sensor: a technical report by the BrainIT Group: Citerio G., Piper I., Cormio M., Galli D., Cazzaniga S., Enblad P., Nilsson P., Contant C., and Chambers I., BrainIT Group

### Data Acquisition and Accessories

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASY logO</td>
<td>Acquisition of ICP + ICT + p\textsubscript{O}2 measurement values</td>
<td>095264-001</td>
</tr>
<tr>
<td>Cable LWL</td>
<td>Fiber optic connecting cable for p\textsubscript{O}2 to EASY logO</td>
<td>095657-001</td>
</tr>
<tr>
<td>Cable PTO</td>
<td>Connecting cable for pressure and temperature to EASY logO</td>
<td>095624-001</td>
</tr>
<tr>
<td>Stand Holder</td>
<td>Pole mounting device for EASY logO</td>
<td>283957-001</td>
</tr>
<tr>
<td>Table Stand</td>
<td>Table mounting device for EASY logO</td>
<td>283959-001</td>
</tr>
</tbody>
</table>

### Implantation Accessories

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Dimension</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOLT KIT PTO</td>
<td>BOLT with single lumen, only for NEUROVENT-PTO/TO</td>
<td>CH5</td>
<td>096026-001</td>
</tr>
<tr>
<td>DRILL KIT CH5</td>
<td>Drill bit and allen key</td>
<td>CH5</td>
<td>091878-002</td>
</tr>
<tr>
<td>BOLT KIT PTO 2L</td>
<td>BOLT with two lumens, only for NEUROVENT-PTO 2L</td>
<td>CH9</td>
<td>096076-001</td>
</tr>
<tr>
<td>DRILL KIT CH9</td>
<td>Drill bit and allen key</td>
<td>CH9</td>
<td>091668-002</td>
</tr>
<tr>
<td>Spliceable Tunneling Sleeve</td>
<td>Parenchyma Tunneling Sleeve for NEUROVENT-PTO 2L</td>
<td>CH8</td>
<td>090506-002</td>
</tr>
</tbody>
</table>

### Connecting Cables (EASY logO to patient monitor)

<table>
<thead>
<tr>
<th>Product</th>
<th>Article No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable DATALOGGER GE/MARQUETTE</td>
<td>094858-001</td>
</tr>
<tr>
<td>Cable DATALOGGER Philips/HP</td>
<td>094868-001</td>
</tr>
<tr>
<td>Cable DATALOGGER Siemens/Dräger Infinitiv</td>
<td>094878-001</td>
</tr>
<tr>
<td>Cable DATALOGGER Datex Ohmeda</td>
<td>094888-001</td>
</tr>
<tr>
<td>Cable DATALOGGER Hellige</td>
<td>094898-001</td>
</tr>
<tr>
<td>Cable DATALOGGER SpaceLabs</td>
<td>094967-002</td>
</tr>
<tr>
<td>Cable DATALOGGER Nihon Kohden</td>
<td>096006-001</td>
</tr>
</tbody>
</table>

---

**EASY logO**

Acquisition of ICP, ICT and p\textsubscript{O}2 measurement values using a single device

- Simple and safe operating interface
- Light weight
- Analog output
- Compatible with standard patient monitors

**BOLT KIT PTO 2L**

BOLT with two lumens for safe and functional implantation of the NEUROVENT-PTO 2L and a microdialysis catheter
Service Worldwide!
RAUMEDIC Brain Competence

RAUMEDIC, INC.
1501 Edwards Ferry Road
Leesburg, Virginia 20176, USA
www.RAUMEDIC.com/neuro

Toll Free: 888 647 0070
Tel: 516 224 3393
Fax: 516 224 3380
hospitalcare@raumedic.com

800-961-2122
106 Commerce Street, Suite 108
Lake Mary, FL 32746
www.FlaSurgical.net