

Advanced
Neuromonitoring
Solutions



The microchip catheter program

for diagnostic applications
in neurosurgery clinics
and practices



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References:

Acta Neurochirurgica (2019) 161:1605, <https://doi.org/10.1007/s00701-019-03959-5>, Home telemonitoring of intracranial pressure, C. Tschan, V. Velazquez Sanchez, M. Heckelmann, S. Antes;

Journal of Neurotrauma 35: 1–9 (2018), DOI: 10.1089/neu.2017.5589, Feasibility of Telemetric Intracranial Pressure Monitoring in the Neuro Intensive Care Unit, A. Lilja-Cyron, J. Kelsen, M. Andresen, K. Fugleholm und M. Juhler;

World Neurosurgery 91 133-148 July 2016, <http://dx.doi.org/10.1016/j.wneu.2016.03.096>, Telemetric Intracranial Pressure Monitoring with the Raumedic NEUROVENT-P-tel, Sebastian Antes, Christoph A. Tschan, Michael Heckelmann, David Breuskin, Joachim Oertel;

Clinical Neurology and Neurosurgery 120 (2014) 36-40, Clinical experience with telemetric intracranial pressure monitoring in a Danish neurosurgical center, Alexander Lilja, Morten Andresen, Amer Hadi, Dorte Christoffersen, Marianne Juhler;

Poster (2015) Medstar Washington Hospital Center, Washington, D.C., Raumedic Bolt: Initial clinical experience in a neurosurgical population, MD Rocco Armonda, MD Daniel Felbaum, MD Kyle Mueller, MD Anthony Conte, MD R. Bryan Mason, MD Edward Aulisi;

Childs Nerv Syst (2013), DOI: 10.1007/s00381-013-2324-0, Feasibility of telemetric ICP-guided valve adjustments for complex shunt therapy, Florian Baptist Freimann, M. Schulz, H. Haberl, Ulrich-Wilhelm Thomale;

Journal of Clinical Neuroscience (2011), DOI:10.1016/j.jocn.2011.04.026, An outcome analysis of two different procedures of burr-hole trephine and external ventricular drainage in acute hydrocephalus, Petra Schödel, Martin Proescholdt, Odo-Winfried Ullrich, Alexander Brawanski, Karl-Michael Schebesch;

www.neurosurgery-online.com (2010), Neurosurgery 67:1716-1723, Evaluation of a Novel Brain Tissue Oxygenation Probe in an Experimental Swine Model, MD Berk Orakcioglu, MD Oliver W. Sakowitz, MD Jan-Oliver Neumann, MD Modar M. Kentar, MD PhD Andreas Unterberg, MD PhD Karl L. Kiening;

Acta Neurochir (2009) DOI 10.1007/s00701-009-0532-x, Brain tissue oxygen monitoring: a study of in vitro accuracy and stability of NEUROVENT-PTO and Licox sensors, Karlis Purins, Per Enblad, Bo Sandhagen, Anders Lewén;

Acta Neurochir (Wien) (2004) DOI 10.1007/s00701-004-0351-z, Bench test assessment of the new RAUMEDIC NEUROVENT-P ICP sensor: a technical report by the BrainIT group, G. Citerio, I. Piper, M. Cormio, D. Galli, S. Cazzaniga, P. Enblad, P. Nilsson, C. Contant, and I. Chambers on behalf of the BrainIT Group;

Journal of Neuroscience Methods 139 (2004) 161-165, Accuracy and stability of temperature probes for intracranial application, Beat Alessandri, Bernd M. Hoelper, Robert Behr, Oliver Kempfski;

Acta Neurochir (2003) 145: 185-193, DOI 10.1007/s00701-002-1052-0, Clinical evaluation of a new intracranial pressure monitoring device, R. Stendel, J. Heidenreich, A. Schilling, R. Akhavan-Sigari, R. Kurth, T. Picht, T. Pietilä, O. Suess, C. Kern, J. Meisel, and M. Brock.

Microchip catheters with maximum precision NEUROVENT®

NEUROVENT precision pressure catheters are used in neurosurgical procedures for the reliable measurement of:

- ICP (intracranial pressure)
- ICT (intracranial temperature)
- $p_{ti}O_2$ (oxygen partial pressure)

The multi-modal neuromonitoring performed with the measuring catheter in the field of neurosurgery enables early recognition of potential cerebral damages. ICP is measured using semiconductor pressure sensors. The quenching process of fluorescence is used to measure $p_{ti}O_2$. Consequently, the level and changes in the parameters are measured safely, quickly and accurately.

RAUMEDIC offers a wide range of microchip catheters for parenchymal as well as ventricular and epidural pressure measurement.



Epidural pressure measurement

Parenchymal pressure measurement

Ventricular pressure measurement



NEUROVENT precision pressure catheters are used to perform the following measurements:

Parenchymal	→ NEUROVENT-P / NEUROVENT-PX
	Parenchymal ICP measurement
	→ NEUROVENT-P-TEMP / NEUROVENT-PX-TEMP
	Parenchymal ICP and temperature measurement
Ventricular	→ NEUROVENT-PTO
	Parenchymal ICP, temperature and p_{tO_2} measurement
	→ NEUROVENT-TO
	Parenchymal temperature and p_{tO_2} measurement
Epidural	→ NEUROVENT
	Ventricular ICP measurement and CSF-Drainage
	→ NEUROVENT-TEMP
	Ventricular ICP and temperature measurement with CSF-Drainage
	→ NEUROVENT-Sleeve Housing
	Ventricular CSF-Drainage and parenchymal ICP measurement
	→ NEUROVENT VP 16
	Ventricular CSF-Drainage and parenchymal ICP measurement, neuro-navigable
Epidural	→ NEURODUR
	Epidural ICP measurement
	→ NEURODUR-TEMP
	Epidural ICP and temperature measurement

Clinical advantages:

- Parenchymal pressure, temperature and p_{tO_2} measurement in one catheter
- Easy handling via Plug & Play system – no catheter calibration required
- Direct connection without an intermediate monitor to the patient monitor (Except NEUROVENT-PTO/-PTO 2L/-PTO 2L BOLT and -TO)
- Compatible with all standard patient monitors
- MR conditional at 1,5 T and 3,0 T¹ – no surgical intervention and disposition of the catheter required
- Easy monitor change without measurement loss of ICP is possible using zero point simulator (NPS2)
- Excellent measurement stability and linearity
- Reproducible pressure curve rendition with highly accurate rendering capabilities of fine structures for wave analysis
- Range suitable for all applications (parenchymal, ventricular, epidural)
- Centimeter scale (numeric every 5 cm and BOLT-mark)

¹ Indicated within non-clinical laboratory tests

RAUMEDIC precision multiparameter catheters prevent measuring errors:

▲ Opening of CSF-Drainage ▼ Closing of CSF-Drainage



Figure 1: Pressure measurement with slit ventricles

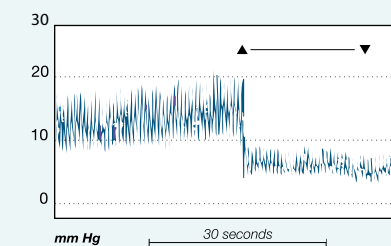


Figure 2: Comparison catheter

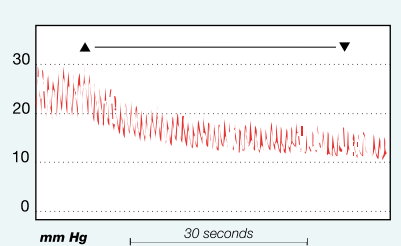


Figure 3: NEUROVENT

- 1) Precise measurement of the pressure variation (red curve) using RAUMEDIC-NEUROVENT in comparison with measurement using a catheter with an external transducer (blue curve); the latter reveals failures and incorrect measurements. [Figure 1](#)
- 2) Opening and closing of a CSF-Drainage: Measurement using a ventricular catheter with an external transducer. The jump in pressure upon opening of the CSF-Drainage represents an artefact. [Figure 2](#)
- 3) Continuous, artefact-free measuring of the ICP using RAUMEDIC-NEUROVENT. [Figure 3](#)

Microchip catheter program

Parenchymal measurements

Product	Version	Dimension	Article number
NEUROVENT-P	ICP	5F	092 946-001
NEUROVENT-PX	ICP	5F	091 580-001
NEUROVENT-P-TEMP	ICP + temperature	5F	094 268-001
NEUROVENT-PX-TEMP	ICP + temperature	5F	091 431-001
NEUROVENT-PTO Treatment KIT	Catheter + BOLT KIT PTO + DRILL KIT CH5	5F	096 274-001
NEUROVENT-PTO	ICP + temperature + p _i O ₂ delivered with BOLT-DRILL KIT PTO	5F	095 008-001 092 380-001
NEUROVENT-PTO 2L	ICP + temperature + p _i O ₂	5F	095 108-001
NEUROVENT-PTO 2L BOLT	ICP + temperature + p _i O ₂ delivered with BOLT KIT PTO 2L and DRILL KIT CH9	5F	095 308-001 096 076-001 091 668-002
NEUROVENT-TO	Temperature + p _i O ₂ delivered with BOLT-DRILL KIT PTO	3F	095 908-001 092 380-001
NEUROVENT-TO Treatment KIT	Catheter + BOLT KIT PTO + DRILL KIT CH5	3F	096 284-001

Ventricular measurements

Product	Version	Dimension	Article number
NEUROVENT	ICP + drainage, with stylet	9F	092 956-001
NEUROVENT 6F	ICP + drainage	6F	094 678-001
NEUROVENT-IFD-S	ICP + drainage rigid internal guide wire	9F	091 678-001
NEUROVENT-IFD-R	ICP + drainage rigid internal guide wire	9F	095 317-001
NEUROVENT-Sleeve Housing (ventricular + parenchymal)	ICP + drainage, with sleeve housing Ventricle drainage, ICP in the parenchyma	9F	091 576-001
NEUROVENT VP 16 (ventricular + parenchymal)	ICP drainage, neuro navigable Ventricle drainage, ICP in the parenchyma	9F	096 704-001
NEUROVENT-TEMP	ICP + drainage + temperature, with stylet	9F	094 278-001
NEUROVENT-TEMP-IFD-S	ICP + drainage + temperature soft internal guide wire	9F	094 288-001
NEUROVENT-TEMP-IFD-R	ICP + drainage + temperature rigid internal guide wire	9F	095 327-001

Epidural measurements

Product	Version	Dimension	Article number
NEURODUR	ICP	5,8 x 2,1 mm (measurement head)	092 976-001
NEURODUR-TEMP	ICP + temperature	5,8 x 2,1 mm (measurement head)	094 298-001

Technical data

Pressure measurement range	-40 bis +400 mmHg (-5,3 bis 53 kPa)
Upper cut-off frequency	20,000 Hz (-3 dB)
Catheter material	Polyurethane
Measurement range temperature sensor	+25 °C bis +45 °C
Pressure sensitivity	5 µV/V/mmHg
Measurement* range p _i O ₂	0-200 mmHg
Electrical catheter length (tip to connector)	
– Parenchymal	approx. 55 cm
– Ventricular	approx. 55 cm
– Epidural	approx. 55 cm

* Measurement accuracy ± 2,5 mm; Hg p_iO₂ (for < 120 mmHg p_iO₂)

Zero Drift Pressure

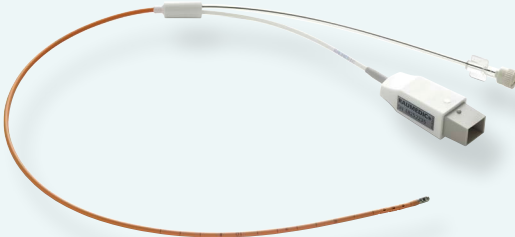
Ø Deviation 0,6 mmHg after 5 days*

* 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., Contant C., and Chambers I., BrainIT Group Acta Neurochirurgica (Wien). 2004, Aug; DOI: 10.1007/s00701-004-0351-z

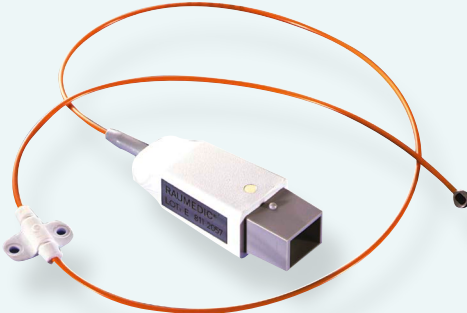
NEUROVENT-P



NEUROVENT-IFD-S



NEURODUR



Accessories for transferring measurement values to the patient monitor

Accessories overview

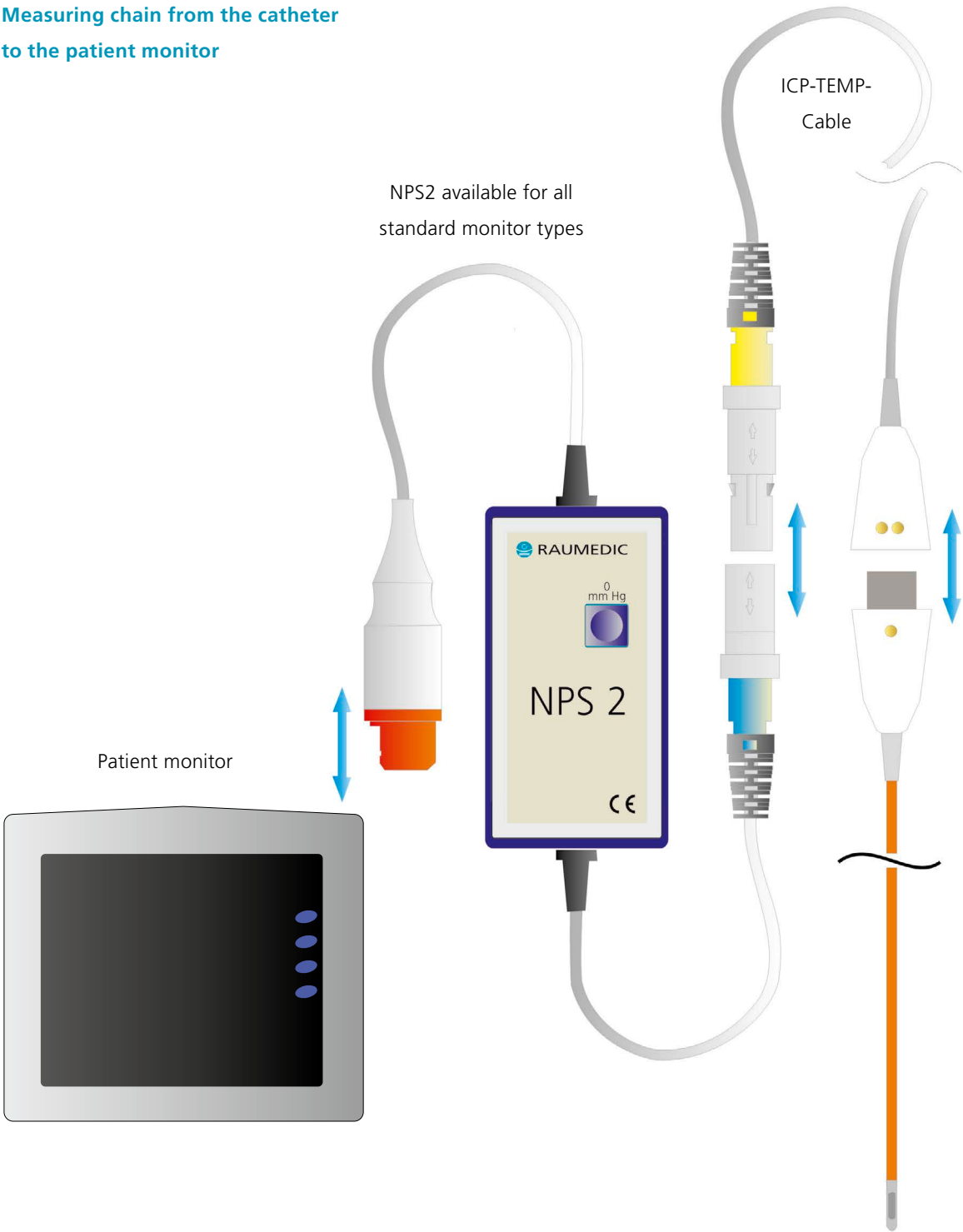
Product	Description	Article number
ICP-TEMP-Cable	Connecting cable between ICP catheter and zero point simulator NPS2	094 328-001
ICP-TEMP-Adapter	Adapter between zero point simulator NPS2 and patient monitor	094 323-001
ICP-TEMP-Adapter Philips/HP	Adapter between zero point simulator NPS2 and patient monitor Philips/HP	094 047-001
NPS2 Siemens/Dräger Infinity	Adapter cable to Siemens/Dräger Infinity patient monitor	092 627-001
NPS2 Philips/HP	Adapter cable to Philips/HP patient monitor	092 637-001
NPS2 Nihon Kohden BSM 41xx	Adapter cable to Nihon Kohden BSM 41xx patient monitor	094 716-001
NPS2 GE/MARQUETTE	Adapter cable to GE/MARQUETTE patient monitor	093 807-001
NPS2 SpaceLabs	Adapter cable to SpaceLabs patient monitor	091 715-001
NPS2 Fukuda Denshi	Adapter cable to Fukuda Denshi patient monitor	096 003-001

Zero point simulator NPS2 for further monitor types upon request

Clinical advantages:

- Direct connection to the patient monitor without ICP monitor
- Easy handling via Plug & Play system – no calibration required
- Easy monitor change without measurement loss of ICP is possible using zero point simulator (NPS2)

Measuring chain from the catheter to the patient monitor



Clinical advantages:

- Wireless communication with the completely implanted telemetric catheter
- Data acquisition using RAUMED Home ICP, MPR 1 DATALOGGER or RAUMED NeuroSmart
- Continuous intracranial pressure measurement (ICP) over the entire application period
- USB data transfer to PC /laptop possible
- Use of the telemetric catheter for up to 3 months



Product	Description	Article number
NEUROVENT-P-tel	Parenchymal telemetry catheter	096 504-001
DRILL KIT CH5	Drill bit for NEUROVENT-P-tel	091 878-002
RAUMED Home ICP	Data recording and storage (outpatient sector)	096 804-001
Reader TDT1 readP	RFID reader for communication with the telemetry catheter	096 524-001
MPR 1 DATALOGGER	Data recording and storage (inpatient sector)	094 474-002
RAUMED NeuroSmart	Data recording and storage (inpatient sector)	095 284-001



World’s unique telemetric ICP measurement NEUROVENT®-P-tel

For parenchymal ICP-Measurement, RAUMEDIC offers the transdermal telemetry system. The telemetric pressure catheter, **NEUROVENT-P-tel**, is completely implanted below the scalp onto the cranial bone, where it measures the ICP and wirelessly transmits the data through the closed scalp.

Together with the **RAUMED Home ICP**, the data can be continuously collected at the patient’s home and daily routine. In the clinical setting, the **MPR 1 DATALOGGER** or **RAUMED NeuroSmart** is still available in combination with the reader **TDT1 readP**.

NEUROVENT-P-tel

Parenchymal telemetry catheter

- 5F catheter tube
- Overall length of the implant: 30 mm
- Ceramic housing
- MR conditional at 1,5 T and 3,0 T¹

¹ Indicated within non-clinical laboratory tests

Reader TDT1 readP

RFID reader for communication with the telemetry catheters

- Telemetric capture of pressure measurement values
- Connection to the MPR 1 DATALOGGER or NeuroSmart

MPR 1 DATALOGGER

Data recording and storage of pressure measurement for the **inpatient** sector

- Simple and safe operating interface
- Display of curve and trend graphs
- Analog output and USB interface
- Mains/battery operation

RAUMED Home ICP

Data recording and storage of pressure measurement for the **outpatient** sector

- Mobile acquisition and continuous recording of ICP values
- Storage of the data over the application period
- Identification of the individual activities
- Easy handling
- USB interface
- Battery operation

NEUROVENT-P-tel



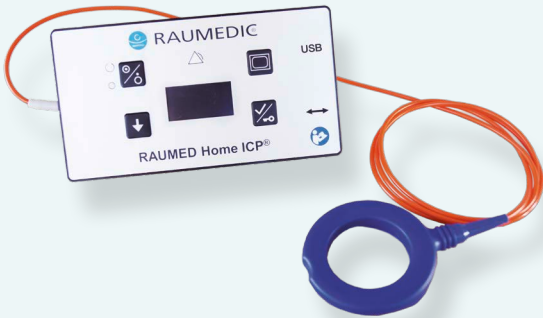
Reader TDT1 readP



MPR 1 DATALOGGER



RAUMED Home ICP



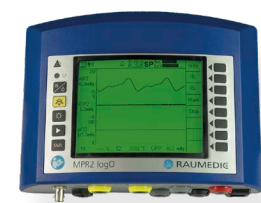
Oxygen partial pressure measurement

NEUROVENT®-PTO

Oxygen partial pressure measurement records the available oxygen in the brain tissue. This ensures possible cerebral damage is quickly detected and appropriate measures for the avoidance of cerebral ischaemia can be taken.

Clinical advantages:

- Parenchymal pressure, temperature and $p_{ti}O_2$ measurement in one catheter
- Easy handling via Plug & Play system – no calibration required
- No oxygen consumption by the O_2 sensor
- No refrigeration required
- Data recording and storage using MPR2 logO DATALOGGER or NeuroSmart logO
- Data display using EASY logO



MPR2 logO DATALOGGER



EASY logO

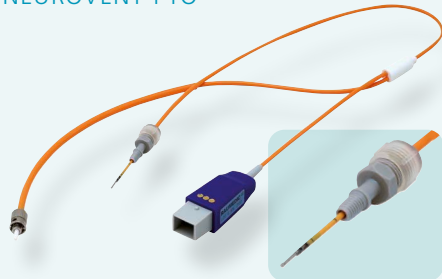
→ Mains operation	yes	yes
→ Rechargeable battery	yes	no
→ 2 x Analog output (Transfer of pressure value)	yes	yes
→ USB interface	yes	no
→ Data storage	yes	no
→ Curves	yes	no
→ Possible display of		
– ICP	yes	yes
– $p_{ti}O_2$	yes	yes
– Temperature	yes	yes
– ICPA	yes	yes
– ART	yes	no
– CPP	yes	no

NEUROVENT-PTO

One catheter – Three measurement functions

- ICP
- Temperature
- $p_{ti}O_2$

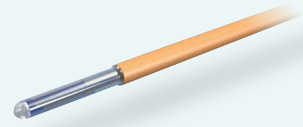
NEUROVENT-PTO



NEUROVENT-TO

Catheter for measuring temperature and $p_{ti}O_2$

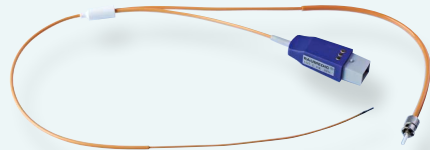
NEUROVENT-TO



NEUROVENT-PTO 2L

Unique catheter for craniotomies which measures ICP, temperature and $p_{ti}O_2$

NEUROVENT-PTO 2L BOLT



NEUROVENT-PTO 2L BOLT

Similar measuring catheter with application of BOLT KIT PTO 2L and a microdialysis catheter

BOLT KIT PTO 2L

Two lumen BOLT for safe and functional implantation of the NEUROVENT-PTO 2L BOLT and a microdialysis catheter

BOLT KIT PTO 2L



Product	Version	Dimension	Article number
NEUROVENT-PTO	ICP + temperature + $p_{ti}O_2$ delivered with BOLT-DRILL KIT PTO	5F	095 008-001 092 380-001
NEUROVENT-PTO Treatment KIT	Catheter + BOLT KIT PTO + DRILL KIT CH5	5F	096 274-001
NEUROVENT-TO	Temperature + $p_{ti}O_2$ delivered with BOLT-DRILL KIT PTO	3F	095 908-001 092 380-001
NEUROVENT-TO Treatment KIT	Catheter + BOLT KIT PTO + DRILL KIT CH5	3F	096 284-001
NEUROVENT-PTO 2L	ICP + temperature + $p_{ti}O_2$	5F	095 108-001
NEUROVENT-PTO 2L BOLT	ICP + temperature + $p_{ti}O_2$	5F	095 308-001
BOLT KIT PTO 2L	Only for NEUROVENT-PTO 2L BOLT	CH9	096 076-001
DRILL KIT CH9	Drill bit for NEUROVENT-PTO 2L BOLT	CH9	091 668-002
EASY logO	Data display		095 264-002
MPR2 logO DATALOGGER	Data recording and storage		095 254-002
RAUMED NeuroSmart logO	Data recording and storage		095 294-001

RAUMED® NeuroSmart and RAUMED® NeuroSmart logO

The RAUMED NeuroSmart is available for the visualization and storage of ICP and ICPT measurement data. In another version, the RAUMED NeuroSmart logO, the oxygen partial pressure p_{iO_2} can also be recorded and visualized.

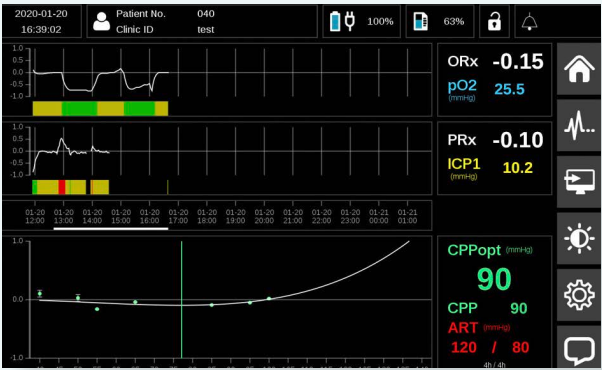
RAUMED NeuroSmart logO



Clinical advantages:

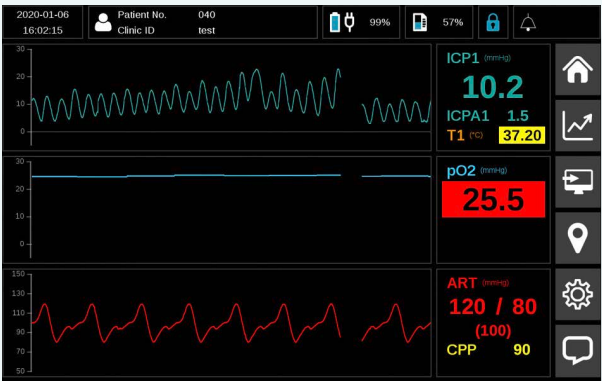
- ICP measurement wired and telemetrically possible
- Display of ICP, temperature, p_{iO_2} , ART, CVP, amplitudes
- Integrated data storage for up to 10 days
- Audible and visual alarms
- Battery/mains operation possible
- Mobile use
- Connection to the patient monitor possible
- Attachment to the pole

Display of OR_x , PR_x and CPP_{opt}



Regression curve CPP_{opt}

Live data



Live Graph View

Connections RAUMED NeuroSmart logO



Features

- Colored touch-screen display
- Colors can be set individually
- Calculation of PR_x , OR_x and CPP_{opt}
- Various scaling options
- Display of the curves and trend data
- 2 USB interfaces
(USB stick and PC connection)
- Screenshots can be saved directly on a USB stick



General information

Display	LCD, color, 10-inch
Trend display	Selectable via menu
Alarm limits	Selectable via menu
Dimensions	Approx. 310 x 225 x 150 mm (W x L x D)
Mass	Approx. 2,86 kg with battery and stand holder*
Power supply	Internal battery with power adapter
Service life	≥ 4h (charged, battery as new, all channels occupied)

Device features

→ Invasive pressure (2 x)
→ Telemetry pressure (1 x)
→ Oxygen partial pressure (1 x) (only RAUMED NeuroSmart logO)
→ Temperature (2 x ICT)
→ Analogue outputs (2 x)
→ USB interfaces (2 x)
→ Analogue Rec output (1 x)

Product	Product	Article number
RAUMED NeuroSmart	Data recording and storage	095 284-001
RAUMED NeuroSmart logO	Data recording and storage	095 294-001

Accessories

NeuroSmart	Article number
ICP-TEMP-Cable	094 328-001
RAUMED DataView*	296 900-001
USB-Cable*	283 949-001
Power adapter NeuroSmart	284 037-001
REC-BNC-Cable NeuroSmart*	096 096-001

NeuroSmart logO	Article number
Cable PTO	095 624-001
Cable LWL	095 657-001
ICP-TEMP-Cable	094 328-001
RAUMED DataView*	296 900-001
USB-Cable*	283 949-001
Power adapter NeuroSmart	284 037-001
REC-BNC-Cable NeuroSmart*	096 096-001

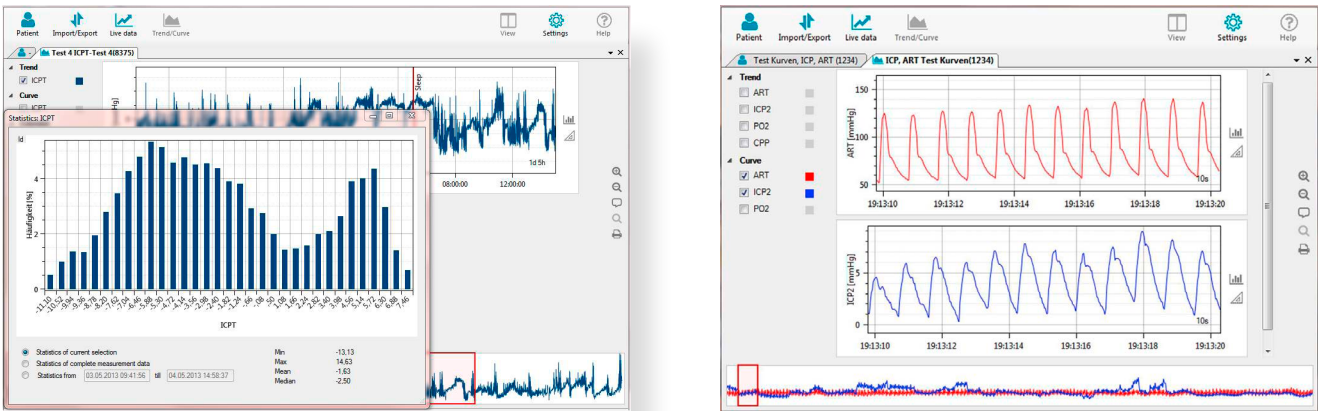
*No medical product according to MPG and EU-VO 2017/745.

RAUMED® DataView

Using the PC software RAUMED DataView*, the recorded and saved [data](#) on the RAUMEDIC devices according to the table on the right, can be transferred to a desktop/ laptop [for visualization](#).

Requirements for installation:

- Windows 7, 8, 8.1 or 10 operating system
- PC Internet connection not necessary
- Installation via license code
- Installation via download link or USB stick



Benefits

- Display of ICP, temperature, p_{iO_2} and ART on the PC
- Extended display of PR_x , OR_x und CPP_{opt}
- Representation of the curves, the trend and the live data
- Comparison of several curve data
- Data export to CSV, EDF, datalogger format and .pdf
- A detailed management system of the measured values
- Extensive filter functions for data search
- Creation of histograms of the data transferred
- Entering comments for special events

Product	Description	Article number
RAUMED DataView	Software for visualization of measurement data on PC	296 900-001

Accessories for all devices

Product	Article number	MPR 1 DATA- LOGGER	MPR 2 logO DATA- LOGGER	Easy logO	Neuro Smart	Neuro Smart logO	RAUMED Home ICP
Cable PTO	095 624-001		x	x		x	
Cable LWL	095 657-001		x	x		x	
ICP-TEMP-Cable	094 328-001	x	x		x	x	
ICP-TEMP-Adapter	094 323-001	x	x				
Main power adapter EASY logO	284 017-001			x			
Wide range power adapter MPR 1/2	284 027-001	x	x				
Stand holder DATALOGGER	283 957-002	x	x	x			
Table stand DATALOGGER	283 959-002	x	x	x			
RAUMED DataView*	296 900-001	x	x		x	x	x
USB-Cable*	283 949-001	x	x		x	x	
Power adapter NeuroSmart	284 037-001				x	x	
Rec-BNC-Cable NeuroSmart	096 096-001				x	x	
Wide range power adapter RAUMED Home ICP	096 814-001						x
Device bag RAUMED Home ICP	096 824-001						x
USB-Cable RAUMED Home ICP	096 834-001						x

**Connecting cables from device
to patient monitor**

Cable DATALOGGER GE/MARQUETTE	094 858-001	x	x	x	x	x
Cable DATALOGGER Philips/HP	094 868-002	x	x	x	x	x
Cable DATALOGGER Siemens/Dräger Infinity	094 878-002	x	x	x	x	x
Cable DATALOGGER SpaceLabs	094 967-001	x	x	x	x	x
Cable DATALOGGER Nihon Kohden 41xx	095 017-001	x	x	x	x	x

**Transducercables between device
and disposable transducer**

Transducercable DATALOGGER Smiths Medical	094 908-001	x	x		x	x
Transducercable DATALOGGER Medex MX 960	095 974-001	x	x		x	x
Transducercable DATALOGGER Edwards TRUWAVE	096 036-001	x	x		x	x
Transducercable DATALOGGER Becton Dickinson	096 046-001	x	x		x	x
Transducercable DATALOGGER Combitrans	096 664-001	x	x		x	x

* No medical product according to MPG and EU-VO 2017/745.

BOLT KIT advantages:

- Suitable for all imaging methods
- Low BOLT height
- Self-cutting thread with sealing function

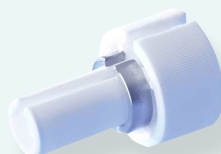
BOLT CH9



BOLT CH5



Screw-in tool



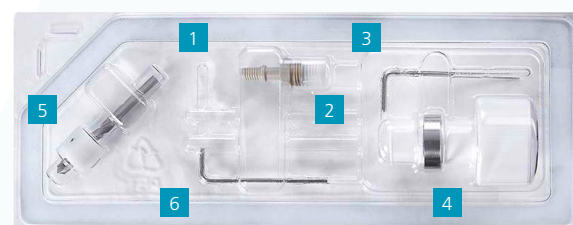
RALK-Hand Drill, autoclavable



RAUMEDIC – BOLT KIT and DRILL KIT

Safe and functional fastening of the catheter is achieved using the **BOLT KIT**. Other accessories for catheter application are the **RALK-Hand Drill** and the **DRILL KIT**.

BOLT-DRILL KIT components



BOLT KIT components:

- 1 Polymer screw with seal
- 2 Fixing cap
- 3 Dura opener
- 4 Screw-in tool

DRILL KIT components:

- 5 Drill bit with stopper
- 6 Allen key

Product	Description	Article number
BOLT KIT CH5	For parenchymal catheters	091 868-002
DRILL KIT CH5	For BOLT KIT CH5	091 878-002
BOLT-DRILL KIT CH5	Set for parenchymal catheters	091 888-001
BOLT KIT CH9	For ventricular catheters	091 688-002
DRILL KIT CH9	For BOLT KIT CH9	091 668-002
BOLT-DRILL KIT CH9	Set for ventricular catheters	091 898-001
BOLT KIT PTO	Only for NEUROVENT-PTO/-TO	096 026-001
BOLT-DRILL KIT PTO	Set for NEUROVENT-PTO/-TO	092 380-001
BOLT-DRILL KIT VP 16	Only for NEUROVENT VP 16 and NEUROVENT-Sleeve Housing	092 969-001
RALK-Hand Drill	Autoclavable drill	231 584-002

RAUMEDIC – Tunneling Sleeve

The Spliceable Tunneling Sleeve and the Tunneling KIT are application accessories for the subcutaneous tunneling of the RAUMEDIC catheters and are intended for single use.

Spliceable Tunneling Sleeve

- Chamfered sleeve for low resistance application
- Coloured tear-off strip for easy removal of the Tunneling Sleeve

Product	Article number
Spliceable Tunneling Sleeve CH8 (for parenchymal catheters)	090 506-002
Spliceable Tunneling Sleeve CH12 (for ventricular catheters and the NEUROVENT-PTO 2L)	090 717-001

Tunneling KIT

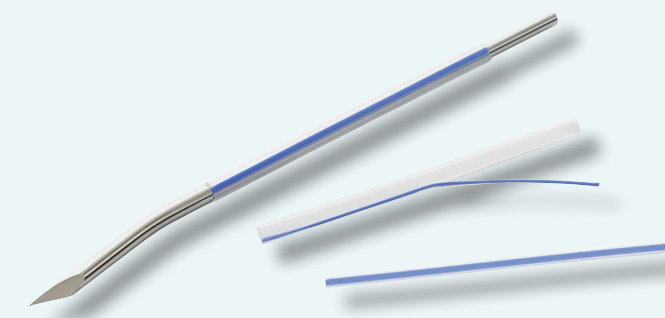
- Fir tree connection for a secure hold of the Tunneling Sleeve

Product	Article number
Tunneling KIT CH8 (for parenchymal catheters)	090 516-001
Tunneling KIT CH12 (for ventricular catheters and the NEUROVENT-PTO 2L)	090 727-001

Advantages:

- Sharpened trocar tip
- Tunneling Sleeves made of biocompatible, polymer material – in-vitro tested according to DIN EN ISO 10993-1

Spliceable Tunneling Sleeve



Tunneling KIT



VENTRICULAR CATHETER
1-lumen tunneling version



CSF-Drainage



RAUMEDIC – disposable ventricular catheters

The catheters are used for external ventricular drainage (EVD).

VENTRICULAR CATHETER, 1-lumen tunneling version

- Including trocar, stylet, Luer connector, butterfly and clamp
- Compatible with all standard pressure transducers
- Polyurethane catheter 30 cm long
- Length scale provided

CSF-Drainage

- System for draining and collecting CSF
- Accessories:
Replacement bag and filter for CSF-Drainage

Comparison of material properties of the disposable ventricular catheter



SEM* image of the RAUMEDIC PU ventricular catheters**:

Smooth surface structure of the RAUMEDIC catheter made of polyurethane



SEM* image of a standard ventricular catheter, typically of silicone

* SEM: scanning electron microscope
** PU: Polyurethane

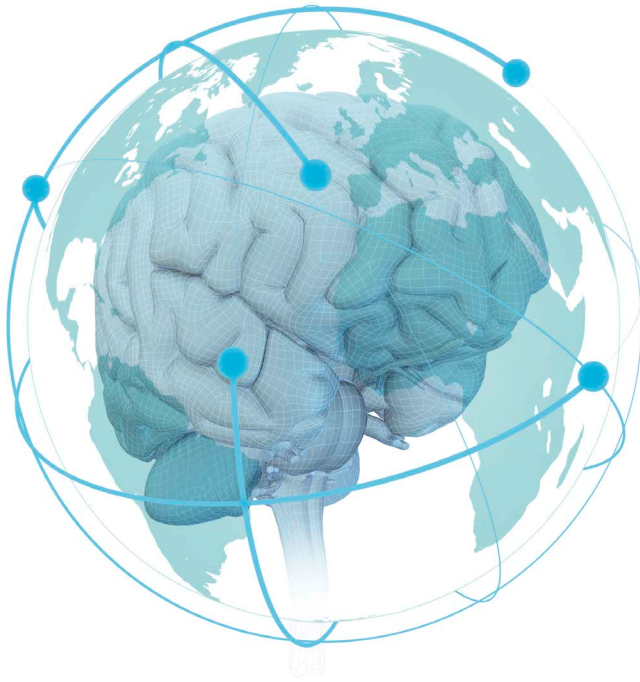
Product	Version	Packaging	Article number
Ventricular catheter	CH9 / 300 mm tunneling version	10 pcs / pack	870 772-001
CSF-Drainage		15 pcs / pack	095 377-002
Spare bag for CSF-Drainage		10 pcs / pack	095 424-001
Spare filter for CSF-Drainage		10 pcs / pack	095 568-001
Ventricular catheter	1-Lumen CH9 / 300 mm (long)	5 pcs / pack	871 621-002
Ventricular catheter	1-Lumen CH9 / 200 mm (short)	5 pcs / pack	871 871-002
Ventricular catheter	2-Lumen CH9 / 300 mm (long)	5 pcs / pack	871 631-001
Ventricular catheter	2-Lumen CH9 / 200 mm (short)	5 pcs / pack	871 881-001

Clinical advantages:

- User-friendly application
- Easy application using BOLT or Tunneling Sleeve
- Immediate liquor checking through transparent catheter tube
- Reliable location identification due to titanium ball or X-ray contrast strips
- Compatible with all standard pressure transducers
- Kink-resistant
- 1- and 2-lumen catheters also available

Service Worldwide!

RAUMEDIC Brain Competence



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