

Advanced Neuromonitoring Solutions

Intracranial Pressure,
Brain Temperature
and Oxygen
Partial Pressure
Measurement



RAUMEDIC®
— Lifeline to Health —



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References:

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Microchip catheters with maximum precision NEUROVENT®

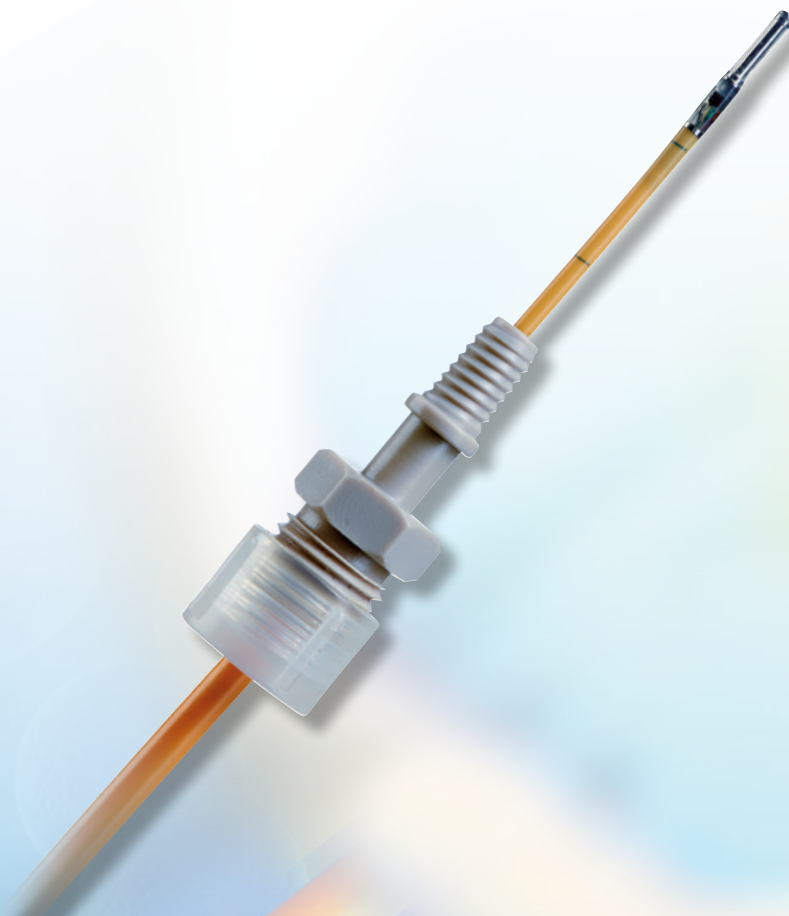
NEUROVENT microchip catheters are used for the reliable measurement of:

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

ICP is measured using semiconductor pressure sensors and brain temperature is measured by a micro thermistor. 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 measurement.

NEUROVENT-PTO:
Pressure (ICP), Brain Temperature, Oxygen Partial Pressure ($p_{ti}O_2$)



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

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

- Parenchymal monitoring of ICP with **NEUROVENT-P**; with integrated brain temperature measurement using **NEUROVENT-P-TEMP**
- Ventricular monitoring of ICP and CSF drainage with **NEUROVENT**; with integrated brain temperature measurement using **NEUROVENT-TEMP**
- Parenchymal monitoring of ICP and ventricular drainage using **NEUROVENT-Sleeve Housing**

ICP Catheters

Product	Description	Diameter	Article No.
Parenchymal			
NEUROVENT-P	ICP	5F	092946-002
NEUROVENT-P-TEMP	ICP + brain temperature	5F	094268-002
Ventricular			
NEUROVENT	ICP + drainage, stylet	9F	092956-002
NEUROVENT-IFD-S	ICP + drainage, inset guide wire soft	9F	091678-002
NEUROVENT-IFD-R	ICP + drainage, inset guide wire rigid	9F	095317-002
NEUROVENT-TEMP	ICP + drainage + brain temperature, stylet	9F	094278-002
NEUROVENT-TEMP-IFD-S	ICP + drainage + brain temperature, inset guide wire soft	9F	094288-002
NEUROVENT-TEMP-IFD-R	ICP + drainage + brain temperature, inset guide wire rigid	9F	095327-002
NEUROVENT-Sleeve Housing	ICP in parenchyma + ventricular drainage	9F	091576-002

Clinical benefits:

- No ICP monitor: ICP cable transfers measured values to patient monitor
- Plug & Play system – no catheter calibration required
- Continuous ICP measurement, CSF drainage and brain temperature measurement
- 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 (NPS2) allows for easy replacement of patient monitor without losing measured values



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 sensitivity	5 μ V/mmHg

Zero Point Stability of Pressure Measurement

Less than 1 mmHg during the first 24 hours at 37°C (98.6°F)

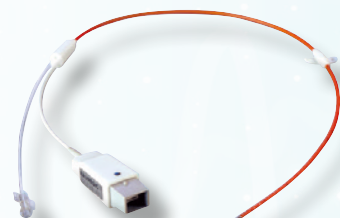
Less than 2 mmHg during the first week at 37°C (98.6°F)

Average deviation 0.6 mmHg after 5 days*

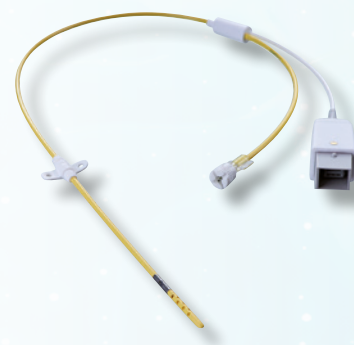
NEUROVENT-P



NEUROVENT

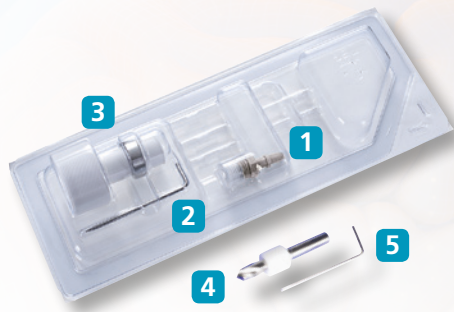


NEUROVENT- Sleeve Housing



* 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

BOLT and DRILL KITS



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

ICP Implantation Accessories

Product	Article No.
Parenchymal	
BOLT KIT CH5	091868-002
DRILL KIT CH5	091878-002
Spliceable Tunneling Sleeve CH8 (for use with DRILL KIT CH9)	090506-002
Ventricular	
BOLT KIT CH9	091688-002
DRILL KIT CH9	091668-002
Spliceable Tunneling Sleeve CH12	090717-001

ICP Cables and Adapters for Transferring Measured values to patient monitor

Product	Article No.
ICP-TEMP-Cable	094328-001
ICP-TEMP-Adapter	094323-001
ICP-TEMP-Adapter Philips/HP	094047-001
NPS2 Philips/HP	092637-001
NPS2 GE/MARQUETTE	093807-001
NPS2 Siemens/Dräger Infinity	092627-001
NPS2 Nihon Kohden BSM 8800	091676-001
NPS2 Nihon Kohden BSM 41xx	094716-001
NPS2 Datex Ohmeda	090924-001
NPS2 SpaceLabs	091715-001
NPS2 Fukuda Denshi	096003-001
NPS2 Hellige	092617-001

NPS2 for additional monitor types upon request

Mobile Pressure Measurement

Product	Article No.
NPS3	091656-001

BOLT CH9



BOLT CH5

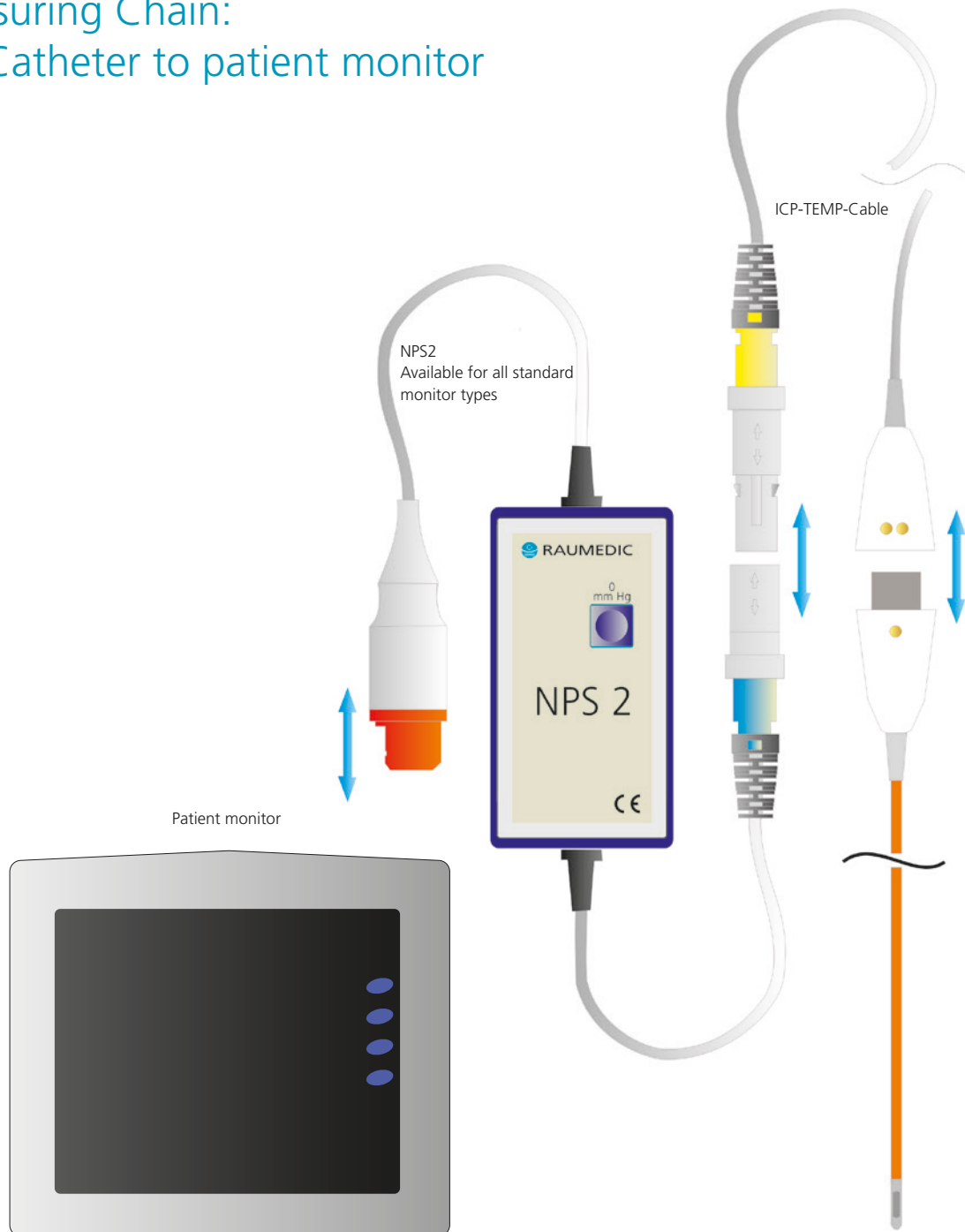


BOLT KIT Advantages:

- Low profile
- Self-cutting conical thread with sealing function



Measuring Chain: ICP Catheter to patient monitor



Oxygen partial pressure measurement NEUROVENT®-PTO

Measurement of oxygen partial pressure ($p_{i}O_2$) 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 $p_{i}O_2$.

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

Clinical advantages:

- Parenchymal pressure, brain temperature and $p_{i}O_2$ measurement in one catheter
- Plug & Play system – no catheter calibration required
- No oxygen consumption by the O_2 sensor
- No refrigeration of catheter required
- Excellent long-term stability and linearity of measuring values
- Compatible with standard patient monitors



NEUROVENT®-PTO Catheters

Product	Description	Dimension	Article No.
NEUROVENT-PTO	ICP + brain temperature + p _t iO ₂	5F	095008-002
NEUROVENT-PTO 2L	ICP + brain temperature + p _t iO ₂ (for use with BOLT KIT PTO 2L)	5F	095108-002
NEUROVENT-TO	Temperature + p _t iO ₂	3F	095908-002

NEUROVENT®-PTO Implantation Accessories

Product	Description	Dimension	Article No.
BOLT KIT PTO	Set for NEUROVENT-PTO/-TO	CH5	096026-001
DRILL KIT CH5	Drill bit and allen key	CH5	091878-002
BOLT KIT PTO 2L	BOLT with two lumens, only for NEUROVENT-PTO 2L	CH9	096076-001
DRILL KIT CH9	Drill bit and allen key	CH9	091668-002
Spliceable Tunneling Sleeve CH8	Parenchymal Spliceable Tunneling Sleeve (for use with NEUROVENT-PTO 2L and DRILL KIT CH9)	CH8	090506-002

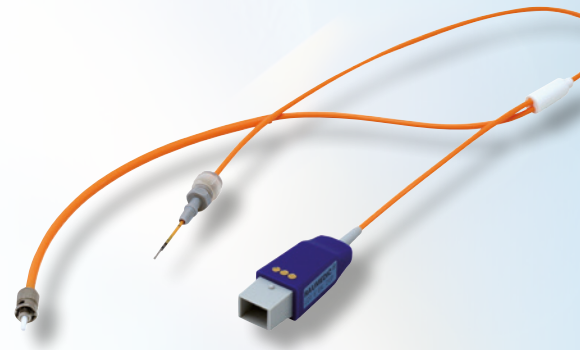
Technical Data

Pressure measurement range	-50 to + 250 mmHg (-6.7 to 33.3 kPa)
Bandwidth	> 100 Hz
Measurement range of 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/mmHg
Measurement process p _t iO ₂	Fiber optic
p _t iO ₂ measuring surface	22 mm ²
Measurement* range p _t iO ₂	0-150 mmHg

Zero Point Stability of Pressure Measurement

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**

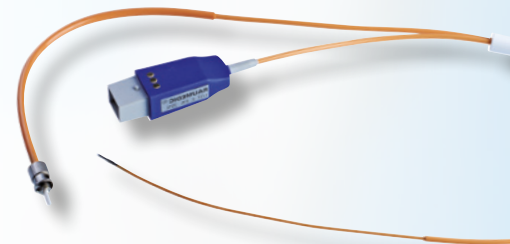
*Measurement accuracy ± 3 % of the measured value or ± 2.50 mmHg ptiO₂ (for < 120 mmHg ptiO₂)
 **Bench test assessment of the new Raumedic Neurovent-P ICP sensor: a technical report by the BrainIT group Citerio G., Piper I., Cormio M., Galli D., Cazzaniga S., Enblad P., Nilsson P., Contant C., and Chambers I., BrainIT Group Acta Neurochirurgica (Wien). 2004, Aug; DOI: 10.1007/s00701-004-0351-z



NEUROVENT-PTO

One catheter;
three measurement functions

- ICP
- Brain temperature
- p_tiO₂



NEUROVENT-PTO 2L

Application with BOLT KIT
PTO 2L or Spliceable
Tunneling Sleeve CH8.

BOLT KIT PTO 2L

BOLT with two lumens
for safe and functional
implantation of the
NEUROVENT-PTO 2L
and a microdialysis
catheter





Data Acquisition

	EASY logO	MPR2 logO DATALOGGER
Rechargeable battery	no	yes
2 assigned outputs (Transfer of pressure values to patient monitor)	yes	yes
Data storage	no	yes
Curves	no	yes

EASY logO

Product	Description	Article No.
EASY logO	Acquisition of ICP + brain temperature + p_{iO_2} measurement values	095264-001
Main power adapter EASY logO	EASY logO to main power supply	283997-002

MPR2 logO DATALOGGER

Product	Description	Article No.
MPR2 logO DATALOGGER	Acquisition, display, data recording and storage ICP + brain temperature + p_{iO_2}	095274-001
Wide range power adapter MPR1/2	MPR1/2 logO DATALOGGER to main power supply	284007-002

EASY logO and MPR2 logO DATALOGGER Accessories

Product	Description	Article No.
Cable LWL	Fiber optic connecting cable for p_{iO_2}	095657-001
Cable PTO	Connecting cable for pressure and temperature	095624-001
Stand Holder DATALOGGER	Pole mounting device	283957-002
Table Stand DATALOGGER	Table mounting device	283959-002

Connecting Cables (EASY logO and MPR2 logO to patient monitor)

Product	Article No.
Cable DATALOGGER GE/MARQUETTE	094858-001
Cable DATALOGGER Philips/HP	094868-002
Cable DATALOGGER Siemens/Dräger Infnitiv	094878-002
Cable DATALOGGER Datex Ohmeda	094888-001
Cable DATALOGGER SpaceLabs	094967-001
Cable DATALOGGER Nihon Kohden	096006-001
Cable DATALOGGER Nihon Kohden 41xx	095017-001

EASY logO



MPR2 logO DATALOGGER



Service Worldwide!

RAUMEDIC Brain Competence



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