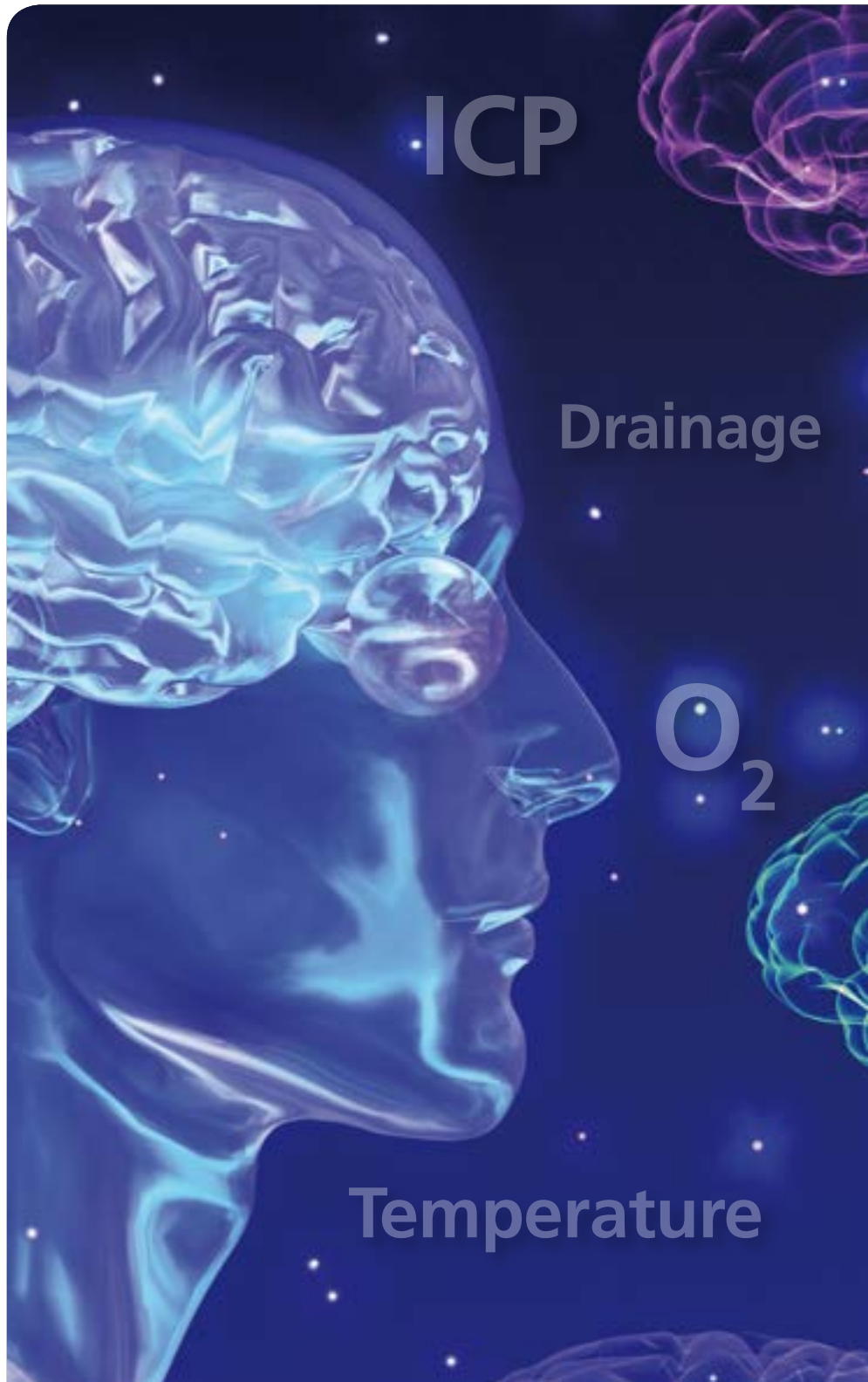


# Advanced Neuromonitoring Solutions



Oxygen Partial  
Pressure, Intracranial  
Pressure and  
Temperature  
Measurement



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## Microchip catheters with maximum precision NEUROVENT®

NEUROVENT microchip catheters are used for the reliable measurement of:

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

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 parenchyma as well as ventricular measurement.

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

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Acta Neurochir (Wien). 2010 Apr;152(4):681-8.



## 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

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

#### 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



#### 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/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*

#### 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 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

Product	Article No.
BOLT KIT CH5 (parenchyma)	091868-002
DRILL KIT CH5 (parenchyma)	091878-002
BOLT KIT CH9 (ventricular)	091688-002
DRILL KIT CH9 (ventricular)	091668-002
Tunneling Sleeve CH8 (parenchyma)	090506-002
Tunneling Sleeve CH12 (ventricular)	090717-001

### BOLT KIT Advantages:

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

## Cables and Adapters

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 Datex Ohmeda	090924-001
NPS2 SpaceLabs	091715-001
NPS2 Fukuda Denshi	096003-001
NPS2 Schiller	094527-001
NPS2 Hellige	092617-001

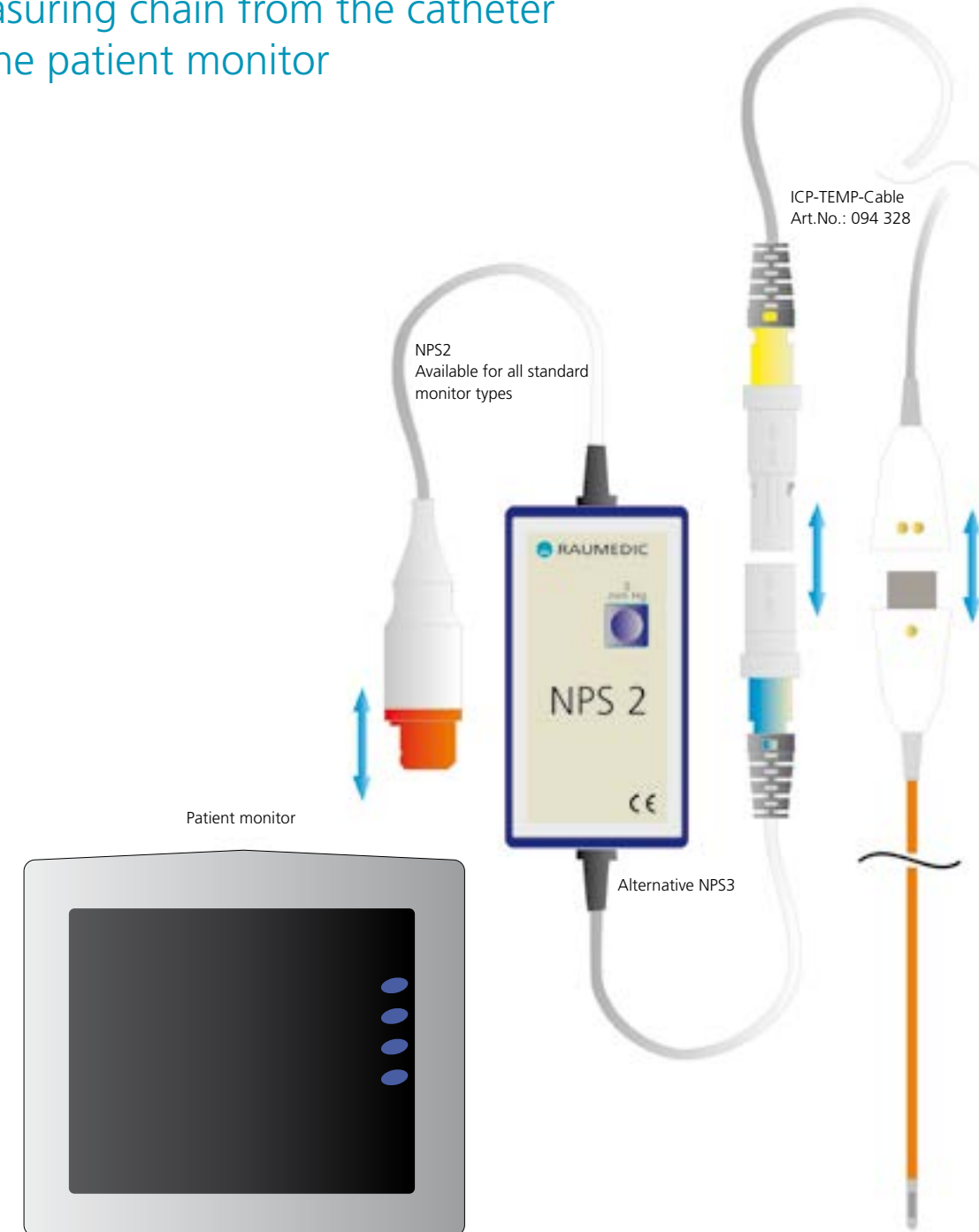
NPS2 for additional monitor types upon request

## Mobile Pressure Measurement

Product	Article No.
NPS3	091656-001



## Measuring chain from the catheter to the patient monitor



## Oxygen partial pressure measurement NEUROVENT®-PTO

Measurement of oxygen partial pressure ( $p_{iO_2}$ ) 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  $p_{iO_2}$ .

- **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



### Clinical advantages:

- Parenchyma pressure, temperature and  $p_{iO_2}$  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

## Catheters

Product	Description	Dimension	Article No.
NEUROVENT-PTO	ICP + temperature + $p_{iO_2}$	5F	095008-002
NEUROVENT-PTO 2L	ICP + temperature + $p_{iO_2}$ for use with BOLT KIT PTO 2L	5F	095108-002
NEUROVENT-TO	Temperature + $p_{iO_2}$	3F	095908-002

### Technical Data

Pressure measurement range	-50 to + 250 mmHg (-6.7 to 33.3 kPa)
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 $\mu$ V/V/mmHg
Measurement process $p_{iO_2}$	Fiber optic
$p_{iO_2}$ measuring surface	22 mm <sup>2</sup>
Measurement* range $p_{iO_2}$	0-150 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**



### NEUROVENT-PTO

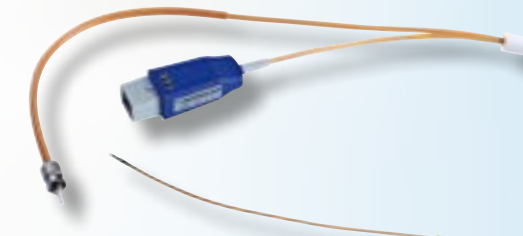
One catheter;  
three measurement functions

- ICP
- ICT
- $p_{iO_2}$



### NEUROVENT-TO

Catheter for measuring  
temperature and  $p_{iO_2}$

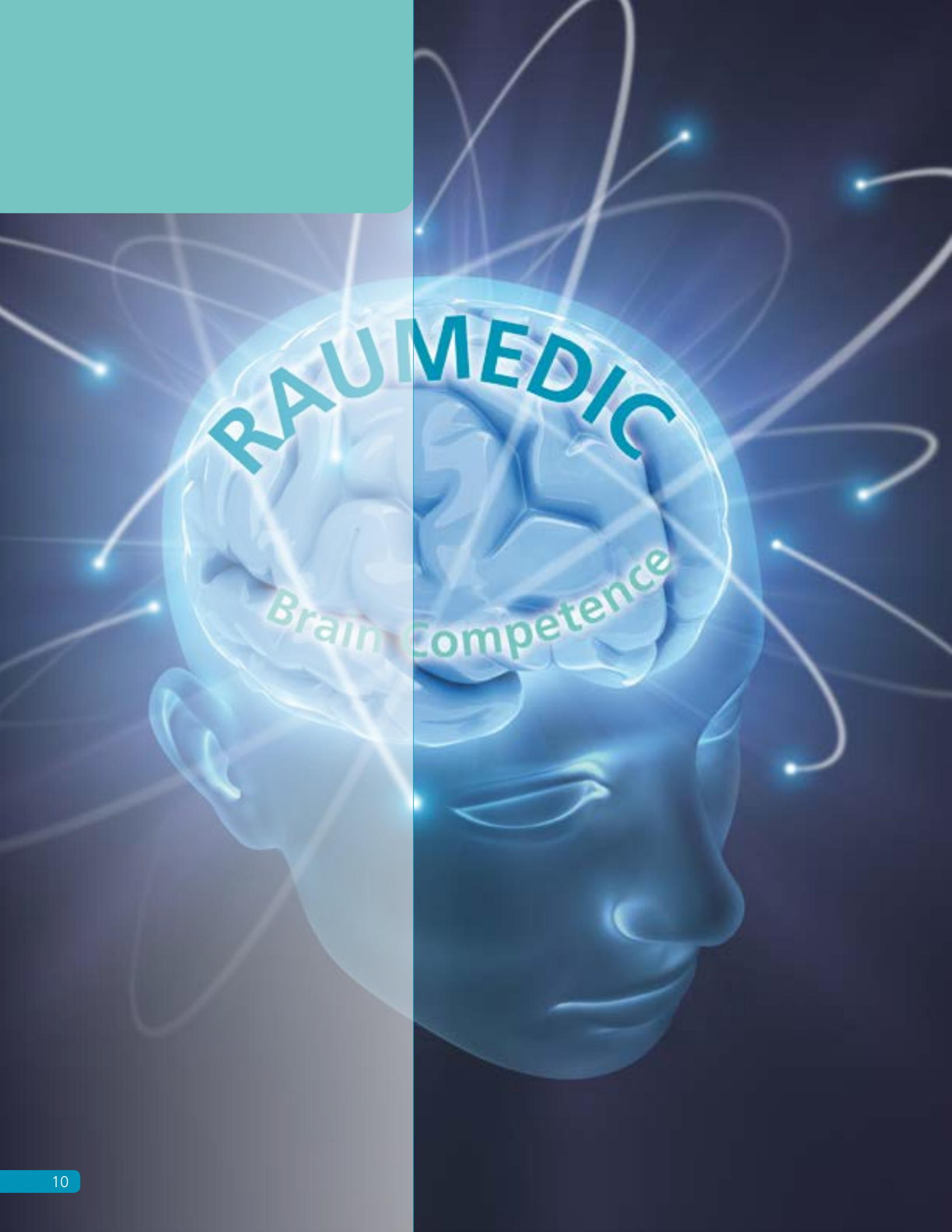


### NEUROVENT-PTO 2L

Application with BOLT KIT  
PTO 2L and Tunneling Sleeve.

\*Measurement accuracy ± 2.5 mmHg  $p_{iO_2}$  (for < 120 mmHg  $p_{iO_2}$ )

\*\*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



## Implantation Accessories

Product	Description	Dimension	Article No.
BOLT KIT PTO	BOLT with single lumen, only 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	Parenchyma Tunneling Sleeve for NEUROVENT-PTO 2L	CH8	090506-002

## Data Acquisition and Accessories

Product	Description	Article No.
EASY logO	Acquisition of ICP + ICT + $p_{ti}O_2$ measurement values	095264-001
Cable LWL	Fiber optic connecting cable for $p_{ti}O_2$ to EASY logO	095657-001
Cable PTO	Connecting cable for pressure and temperature to EASY logO	095624-001
Stand Holder	Pole mounting device for EASY logO	283957-001
Table Stand	Table mounting device for EASY logO	283959-001

## Connecting Cables (EASY logO to patient monitor)

Product	Article No.
Cable DATALOGGER GE/MARQUETTE	094858-001
Cable DATALOGGER Philips/HP	094868-001
Cable DATALOGGER Siemens/Dräger Infnitiv	094878-001
Cable DATALOGGER Datex Ohmeda	094888-001
Cable DATALOGGER Hellige	094898-001
Cable DATALOGGER SpaceLabs	094967-002
Cable DATALOGGER Nihon Kohden	096006-001

### BOLT KIT PTO 2L

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



### EASY logO

Acquisition of ICP, ICT and  $p_{ti}O_2$  measurement values using a single device

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

# Service Worldwide! RAUMEDIC Brain Competence



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