Function Tester **TBH-400**



Test system for function tests of clinical thermometer (DIN EN ISO 80601-2-56), cardiac output-, invasive (IEC 60601-2-34) and non-invasive blood pressure devices (IEC 80601-2-30)



- ☑ temperature simulation from 0 – 70 °C
- ☑ simulation of multiple NIBP signals
- ☑ suitable for calibration of medical thermometer
- ☑ user specific language setting
- ☑ accumulator operated device in a carrying case
- ☑ dynamic and static IBP signal simulation
- ☑ 4 different cardiac outputs selectable
- ☑ Versions available: NE, NT, E, N

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Tel. +49 33232 39915, www.spl-elektronik.com
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TÜVRheinland ZERTIFIZIERT
Management System ISO 9001:2015
www.tuv.com ID 0910095181

Technical Data

Mains voltage:	83 – 264 V ac, 50 / 60 Hz or internal accumulator operation
Nominal power:	max. 25 VA
Protection class:	internal power supply
Environmental temperature:	+ 5 - + 40 °C
Storage temperature:	- 10 - + 50 °C
Timer:	10 – 60 min in 10 min steps, ± 1 sec
Interface:	1 x RS-232 for PC connection
Digital display:	4 x 16 char display
Keyboard:	8 key foil keyboard
Accessories:	1 x RS-232 interface cable, charger or power supply
Mechanical data:	light weight metal case IP20
Dimensions:	138 x 230 x 37 mm (W x H x D)
Weight:	approx. 6,5 kg (incl. suitcase and accessories)
Temperature:	0 - 70 °C in 1 °C steps, ± 0,03 °C 20 - 50 °C in 0,1 °C steps, ± 0,03 °C YSI 400 / 700 compatible
Temperature [°C]:	20,40 / 21,70 / 23,00 / 24,30 / 25,60 / 26,90 28,20 / 29,50 / 30,80 / 32,10 / 33,40 / 34,70 36,00 / 37,30 / 38,60 / 39,90 / 41,20 / 42,50 43,80 / 45,10 / 46,40 / 47,70 / 49,00 ± 0,03 °C
Cardiac output:	3, 5, 7, 9 l/min, ± 0,3 l/min
Blood temperature:	37 °C, ± 0,1 °C
Injectate temperatur:	1, 4, 12, 20 °C, ± 0,2 °C
Injectate volume:	10 ml
Invasive blood pressure:	5 or 40 µV/ V/ mmHg [V(monitor)]
Output impedance:	178, 345 Ohm, ± 2 Ohm

Static signals:	0 - 400 mmHg in 1 mmHg steps
Dynamic signals:	± 1 mmHg
ARP 120 / 80 mmHg	aorta radial pressure
AFP 130 / 70 mmHg	aorta femoral pressure
ZVP 10 / 0 mmHg	central vein pressure
PAP 25 / 10 mmHg	pulmonary aorta pressure
PAWP 10 / 0 mmHg	pulmonary-ast-wedge-position
LVP 10 / 0 mmHg	left ventricle pressure
LAP 5 / 0 mmHg	left atrium pressure
RVP 25 / 0 mmHg	right ventricle pressure
RAP 5 / 0 mmHg	right atrium pressure
Arrhythmia:	aorta damped 110 / 80 mmHg aorta disturbed 170 / 20 mmHg
Puls rates:	30 - 150 bpm in 10 bpm steps ± 2 bpm
Non-invasive blood pressure:	0,1 mmHg steps
Manometer function:	0 - 300 mmHg. ± 0.8 mmHg
Leakage rate measurement:	1 - 15 min in 1 min steps, ± 1 sec
Simulation mode:	oscillometric
Puls rate:	80 bpm, ± 2 bpm
Reference volume:	100 / 500 ml
Systole / Diastole:	120/80, 180/120, 90/50 mmHg ± 3 mmHg
Time Measurement	1 – 1000 sec, ± 0,1 sec, ± 1 %
Accessories:	hand calibration pump adapter block with connection set reference pressure volume 100 / 400 ml
Selectable languages:	german, english, french, polish spanish, italian, portuguese, turkish

Temperature – simulator

The simulation of temperature levels is based on precision resistances with fixed output values, that can be adjusted in 1°C steps (0-70°C) and 0,1°C steps (20-50°C). Accurate resistance values, like for the thermistorprobe series YSI 400/ 700, are implemented for simulation.

Cardiac output – simulator

By changing the temperature / resistance ratio send to the monitor, the cardiac output can be simulated. You can choose between four different output values and four injectate temperatures. The blood temperature is fixed at 37°C and the injectate volume to 10ml.

Invasive – blood pressure – simulator

Static and dynamic signals can be simulated by changing the values send from the IBP modules to the transducer. You can choose between various signal styles and arrhythmia. In addition to that, the pulse rate can be adjusted in 10bpm steps from 30 to 150 bpm.

Non-invasive – blood pressure – simulator

The blood pressure simulator comes with a precision hand pump, an adapter block, hoses and two reference pressure volumes. Static pressures can be generated via the hand pump and are simultaneously displayed in the simulator. Three different systole / diastole combinations can be simulated via an oscillometric method. The pulse rate is fixed at 80bpm. There is a leakage rate measurement and a manometer function included.

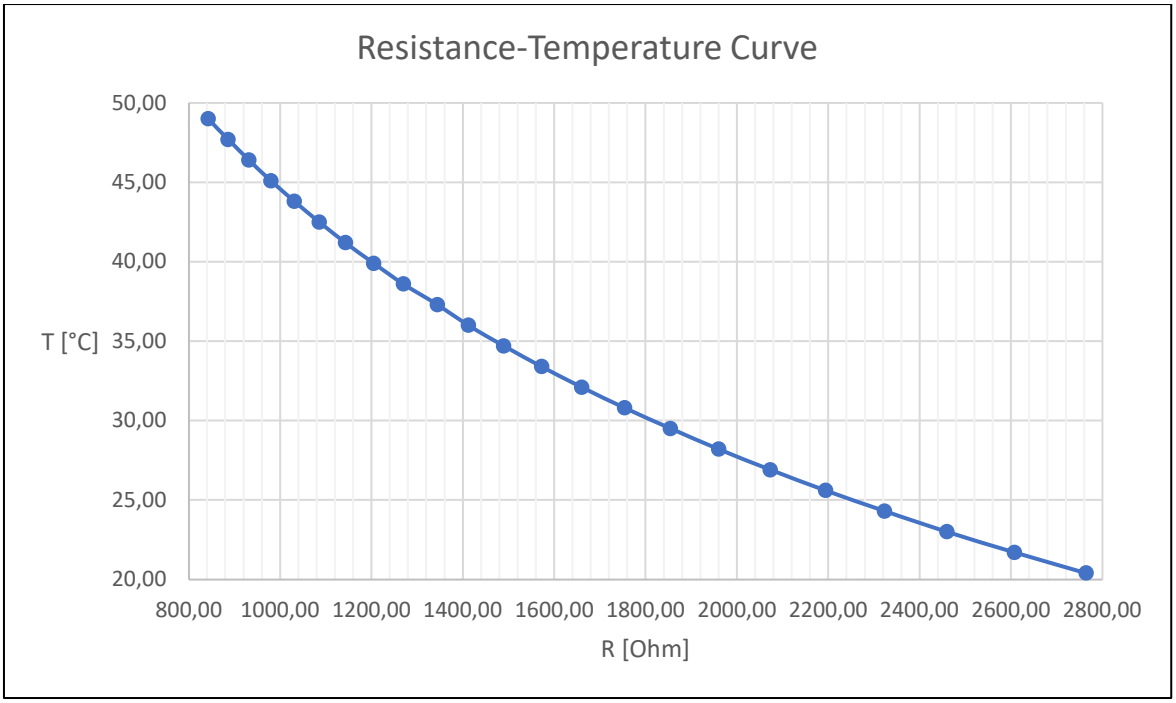
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Technical Data



R [Ohm]	T [°C]
2764,40	20,40
2607,40	21,70
2460,00	23,00
2323,40	24,30
2194,40	25,60
2073,20	26,90
1960,40	28,20
1854,50	29,50

R [Ohm]	T [°C]
1754,20	30,80
1660,20	32,10
1572,60	33,40
1489,60	34,70
1412,00	36,00
1344,20	37,30
1269,80	38,60
1204,90	39,90

R [Ohm]	T [°C]
1143,00	41,20
1085,50	42,50
1031,20	43,80
979,59	45,10
931,80	46,40
886,12	47,70
842,80	49,00

R [Ohm] / T [°C]
6989 / 1,0
3886 / 13,0
2252 / 25,0
1355 / 37,0
842,8 / 49,0

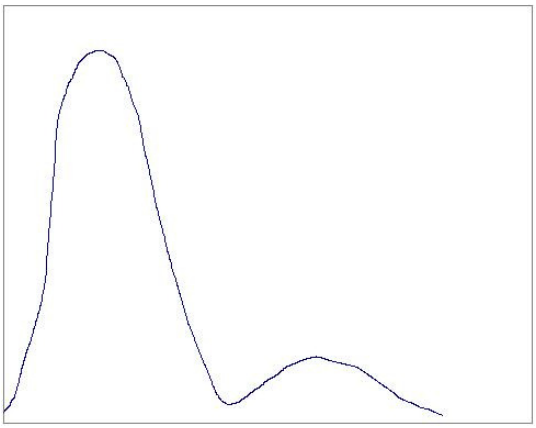
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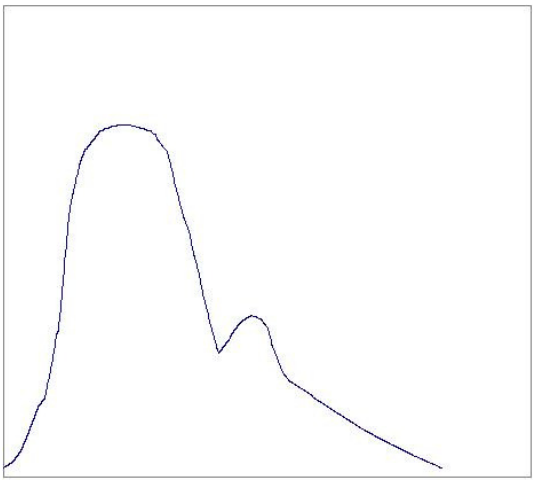
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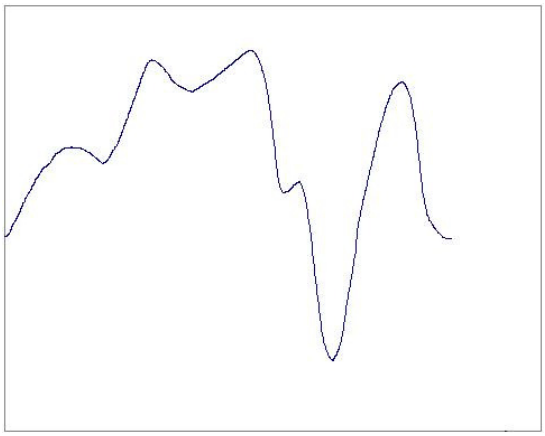
Technical Data



aortafemoral pressure
130 / 70 mmHg (AFP)



aortaradial pressure
120 / 70 mmHg (ARP)



central venous pressure
10 / 0 mmHg (ZVP)

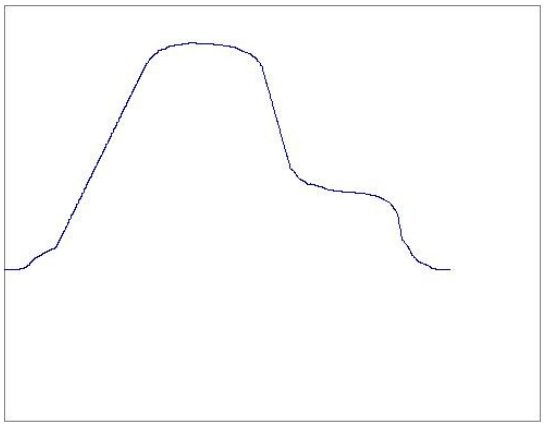
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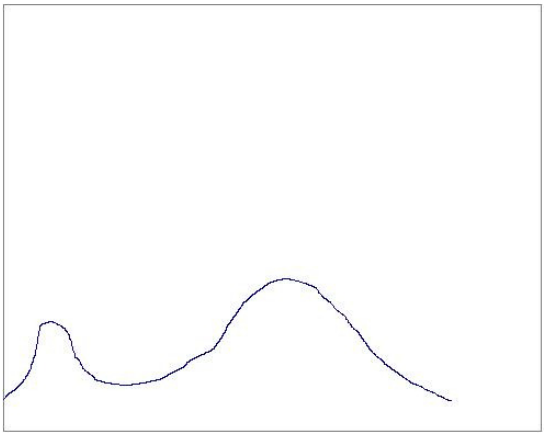
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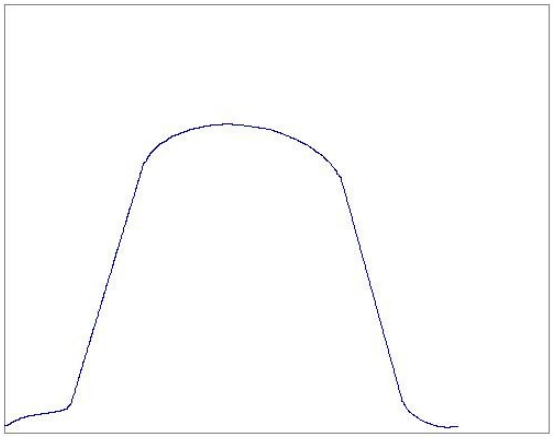
Technical Data



pulmonary pressure
25 / 10 mmHg (PAP)



pulmonalis branch, wedge-position
10 / 0 mmHg (PAWP)



left ventricle pressure
10 / 0 mmHg (LVP)

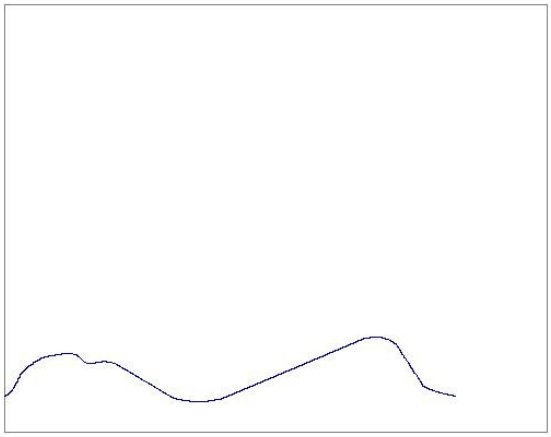
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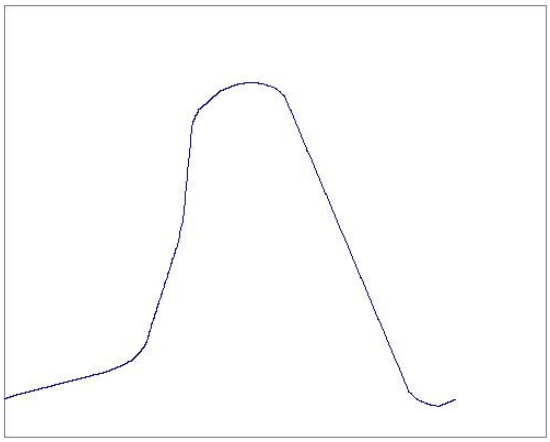
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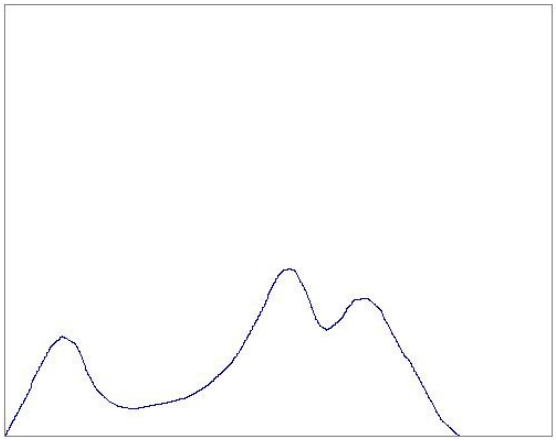
Technical Data



left intraarterial pressure
5 / 0 mmHg (LAP)



right intraventricular pressure
25 / 0 mmHg (RVP)



right intraarterial pressure
5 / 0 mmHg (RAP)

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Example of use

Versions:

	Version			
	NE	**NT**	**E**	**N**
T	☑	☑	☑	
NIBP	☑	☑		☑
IBP	☑		☑	
CO	☑		☑	

T: Temperature
NIBP: Non-invasive blood pressure
IBP: Invasive blood pressure
CO: Cardiac Output

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