Patient Simulator

Psi 300

Instruction Manual

CE

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Contents

1. Purpose and Application

The PSI 300 is a patient simulator. It generates signals that simulate predetermined sequences in a corresponding recording apparatus, such as a patient monitor, and thereby to interpret and display the patient's vital parameter.

The PSI 300 simulates the following vital parameter:

- Electrocardiogram **[ECG]**
- Respiration **[RESP]**
- Invasive blood pressure **[BP]**
- Temperature **[TEMP]**
- Cardiac output **[C.O.]** *with PSI 300 only – Extended version*

2. Models

The PSI 300 is available in 4 models that differ in function according to the respective software (firmware).

- **PSI 300 – Basic Model**

  The basic model of the PSI 300 with the firmware "V 1.xx" comprises the simulation of 4 vital parameter:
  - *Electrocardiogram, 12 channels*
  - *Respiration*
  - *Invasive blood pressure*
  - *Temperature*

- **PSI 300 – Basic Model With RS-232 Interface**

  The basic model of the PSI 300 with the firmware version "RS 1.xx" offers the above-mentioned 4 basic vital parameter simulation, but also includes the RS-232 interface for connection to a PC.

- **PSI 300 – Extended Model "C.O."**

  The extended version of the PSI 300 with firmware "V 1.xx-CO" allows the simulation of 5 vital parameter:
  - *Electrocardiogram, 12 channels*
  - *Respiration*

- *Invasive blood pressure*
- *Temperature*
- *Cardiac output*

- **PSI 300 – Extended Model "C.O." With RS-232 Interface**

  The extended model of the PSI 300 with the firmware version "RS 1.xx-CO" offers not only the above-mentioned 5 basic vital parameter simulation, but also the RS-232 interface for connection to a PC as well.

Note:

After turning on the PSI 300, during the initialization, the respective version and firmware revision (xx) numbers are shown in the display for approximately 2 seconds.

3. Delivery

The shipment of the PSI 300 includes the following:

- 1 Patient simulator PSI 300, Item No. 8210 0014
- 4 Batteries 1.5V (AA)
- 1 Nullmodem-cable RS 232
  (only with firmware versions "RS 1.xx" / "RS 1.xx-CO")
- 1 Instruction manual
- 1 Manufacturer's Factory Calibration Certificate
  Please deposit this certificate in a safe place, together with your future calibration protocols.

4. Optional Accessories

The following optional accessories are available for the PSI 300

Item	Description
Battery charger	Charger for NiCd or NiMH rechargeable batteries (15 minutes)

5. Important Security Notice

Please read the instructions in this manual carefully before using the Patient Simulator PSI 300 the first time. The manufacturer does not assume liability or a warranty for mistakes or damages resulting from incorrect operation or use.

- Never use the PSI 300 directly on a patient or on an instrument that is currently being used with a patient.
- Place the PSI 300 so that the LCD display is clearly visible. Avoid direct sunlight.
- Do not press on the LCD display.
- Avoid short circuting the signals on the output jacks. Never use damaged cables.
- Make sure no liquids penetrate the inside of the PSI 300.
- In case of a defect, remove the batteries and contact your Customer Service. Only trained and qualified personnel are authorized to repair the PSI 300. If an unauthorized person opens the apparatus, the warranty and any liability claims automatically expire.
- Keep this Instruction Manual handy for future reference.

6. Power Supply

The PSI 300 can be operated with commercial alkaline batteries or rechargable storage batteries.

- **Batteries**

  4 Batteries á 1.5V (AA or LR6), Alkaline
  The average operating time with one set of batteries is ca. 70 hours.

- **Rechargable Storage Batteries**

  4 Storage Batteries á 1.2V (AA or LR6), NiCd or NiMH
  The average operating time with one set of NiMH, 1800mAh storage batteries is ca. 50 hours.
  The storage batteries must be recharged in an appropriate external charger. A charger with a loading time of only 15 minutes is available as an optional accessory.

Caution!

Change the batteries as described in Section 10, if the any of the following occurs:

the LCD display has become weak and doesn't have a clear contrast,
the PSI 300 shuts off automatically,
the PSI 300 cannot be turned on.

In these cases, immediately remove the weak batteries!

Note:

Never dispose of used batteries and storage batteries in ordinary household trash. Adhere to your local regulations and laws for disposal. Always recycle used batteries.

7. Operating Keys

All operating elements of the PSI 300 are located on the keyboard:

"ON"

"OFF"

Cursor key "UP"

Cursor key "DOWN"

Cursor key "LEFT"

Cursor key "RIGHT"

"EXECUTE" the setting using the cursor keys

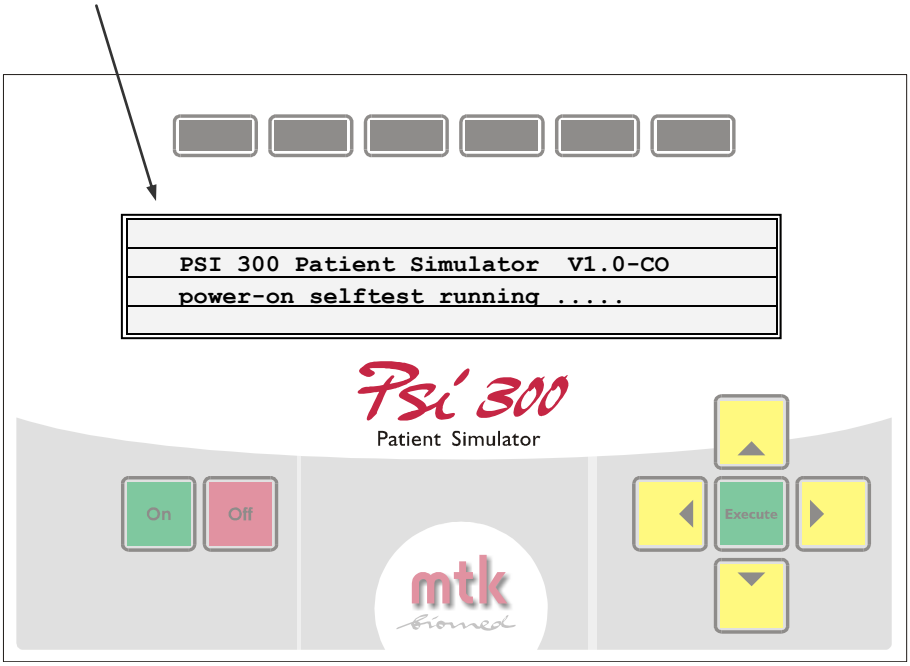
Function key for choosing main functions:

ECG **RESP** **BP** **TEMP** **C.O.** **NS**

8. Display Elements

The current operating conditions and all settings are shown in the four-line **LCD-Monitor** à 40 characters.

Using the cursor keys, the contents of the window can be shifted up or down as well as to the left or right, according to the main function.

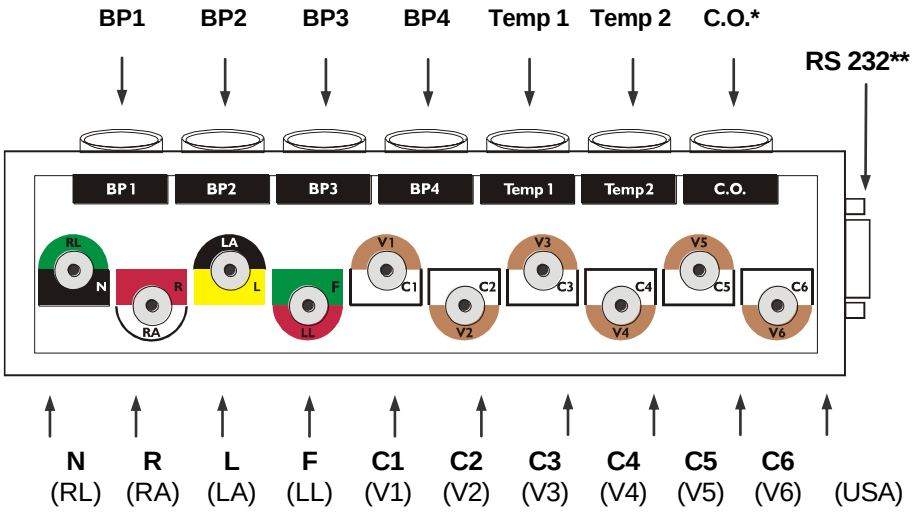


9. Connections

The DIN jacks for connecting the cables for:

invasive blood pressure,
temperature, and
cardiac output

are located on the back of the PSI 300.



The snap fasteners for connecting the

ECG signal and
respiration

are located on the upper part of the front of the PSI 300.

***Note:**

Cardiac output can only be simulated with the:
PSI 300 – Extended version "C.O." or
PSI 300 – Extended version "C.O." with RS-232 interface
together with the firmware "V 1.xx-CO"or "RS 1.xx-CO," respectively.

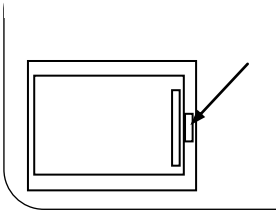
****Note:**

The Interface RS-232 for connecting the PSI 300 to a PC is supported only with the firmware "RS 1.xx" or "RS 1.xx-CO," respectively.

10. Getting Started

Before you start, insert new batteries or fully charged storage batteries. See the instructions in Section 6.

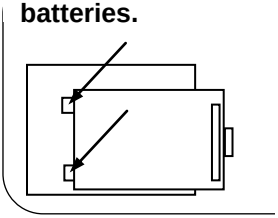
- In order to insert the batteries, open the cover of the battery compartment on the bottom of the PSI 300.



Put the tip of a small screwdriver into the smaller slot of the cover and gently push the cover up. The cover will open easily.

Caution!
Pay strict attention to the right position of the batteries (poles!)!

- **Close the cover of the battery compartment after inserting the batteries.**



Insert the two pegs of the cover into the holes of the battery compartment and gently push the cover down until it clicks into place.

Caution!
The cover can only be inserted in one direction.

- **Turn on the PSI 300 as described in Section 11 below.**

11. Operating Instructions

All operations of the PSI 300 are managed by menus and are executed using 13 menu keys on the keyboard.
Operating the PSI 300 via the interface is only possible with those models that run under the firmware "RS 1.xx" or "RS 1.xx-CO."

- **Starting the PSI 300**

  Switch on the PSI 300 by pressing the **"On" button**.
  After starting, during the initialization process, the model and the firmware version of the PSI 300 are shown in the display for about 2 seconds.

```
PSI 300 Patient Simulator  V1.0-CO
power-on selftest running .....
```

When the Start menu appears in the display, the PSI 300 is ready for use.

```
  [ECG]  RESP   BP   TEMP  C.O.   NS
ECG form   [IEC 601]  others
type       [calibration]  analytical
heart rate [60] 120
```

Note:

Every time the PSI 300 is switched on, it will start with the main functions default. The next menu to appear is the Start menu for the main function "ECG."

- **Turning Off the PSI 300**

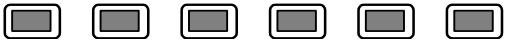
  Turn off the PSI 300 by pressing the **"Off" key.** Switch i off when you are not going to use it any longer period of time.

  Note:

  Any changes in the main functions are not stored and need to be set up again each time you switch on the PSI 300.

- **Choosing the Main Function**

In order to change to another function shown in the Main Menu (display Line 1), press the **Function Key** that is located above the respective function.



[ECG]	RESP	BP	TEMP	C.O.	NS
ECG form	[IEC 601]	others			
type	[calibration]	analytical			
heart rate	[60]	120			

Line 1

Main function chosen in this example: **[ECG]**

Note:

The main menu in Line 1 always appears in the monitor.

Subfunctions and Parameter

The subfunctions and parameter of the selected main function are shown in Lines 2 to 4.

[ECG]	RESP	BP	TEMP	C.O.	NS
ECG form	[IEC 601]	others			
type	[calibration]	analytical			
heart rate	[60]	120			

Line 1
Line 2
Line 3
Line 4

Active subfunction in this example: **[artificial], [calibration]**
Active parameter: **[60]**

Cursor Key s"Down" and "Up"

For the main functions "ECG" and "RESP," further lines can be shown by pressing the cursor key "Down." The display shifts down one line each time the key is pressed:

[ECG]	RESP	BP	TEMP	C.O.	NS
type	[calibration]	analytical			
heart rate	[60]	120			
QRS form	[RS]	R	QS	smallRS	

Line 1
Line 3
Line 4
Line 5

Press the cursor key "Up" in order to return to a line further up the list. The display will move up one line each time the key is pressed, until Lines 2 to 4 reappear under Line 1.

Note: The Main Menu in Line 1 is always shown in the display.

Cursor Keys "Right" and "Left"

For the main functions "TEMP" and "C.O.," further paramater can be selected by pressing the cursor key "Right" if the symbol ">“ appears at the end of the line. The display shifts one field further to the right each time the cursor key "Right" is pressed.

ECG RESP BP TEMP [C.O.] NS
Blood temp (°C) 36 [37] 38
min vol (l/min) < 4.5 [5.0] 5.5 6.0 7.>

Field 41... →

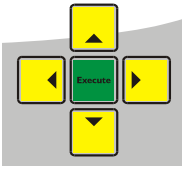
Press the cursor key "Left" in order to return to the previous paramater fields that are no longer visible. The display will shift back one field further to the left each time the cursor key "Left" is pressed, until the first paramater field is back in the first position.

Selecting the Subfunctions and Changing the Parameter

The active subfunctions and parameter are shown in brackets.

[ECG] RESP BP TEMP C.O. NS	Line 1
ECG form [IEC 601] others	Line 2
type [calibration] analytical	Line 3
heart rate [60] 120	Line 4

Active subfunctions in this example: **[artificial], [calibration]**
Active parameter: **[60]**



Using the yellow **direction keys** (up, down, left, right), move the cursor in the display field over the first letter of the desired subfunction or the parameter.
Complete your choice by pressing the green **"Execute"** key.

CAUTION!

In the main functions "ECG" and "RESP," more lines are available in order to change the functions or the parameter by pressing the “Down” cursor key.
The display moves one line lower each time the "Down" cursor key is pressed. The main menu in Line 1 always remains in view.

Press the "Up" cursor key in order to return to the upper lines. The display moves one line higher each time the "Up" cursor key is pressed, until Lines 1, 2, 3, and 4 are shown in the display.

Note:

After turning on the PSI 300, or after making changes, the functions and parameter are still active when a different menu appears on the display after pressing a function selection key. They remain active until a new function is implemented by pressing the “Execute” key.

12. Operational Sequences and Definitions

Main Menu

The main menu is always shown in the **first (top) line** of the display when the PSI 300 is in operation.

```
  [ECG]  RESP   BP   TEMP  C.O.   NS
ECG form   [IEC 601]  others
type       [calibration] analytical
heart rate [60] 120
```

The meanings and explanations of the abbreviations shown in the main menu are the following:

Display	Meaning	Selection (Function Key)
[ECG]	Electrocardiogram	Main function "ECG"
RESP	Respiration	Main function "RESP"
BP	Blood Pressure	Main function "BP"
TEMP	Temperature	Main function "TEMP"
C.O.	Cardiac Output	Main function "C.O."
NS	Noise	Main function "NS"

Main Function "ECG"

In the default setting after turning on the PSI 300, the main function "ECG“ appears in the top line of the display, together with the following settings in Lines 2, 3 and 4:

```
  [ECG]  RESP   BP   TEMP  C.O.   NS
ECG form   [IEC 601]  others
type       [calibration] analytical
heart rate [60] 120
```

Line 1 (Main Menu)
Line 2
Line 3
Line 4

Note:

The settings and parameter in Line 5 to Line 8 can be shown and changed by pressing the “down“ cursor key.

The basic settings of the main function "ECG" can be changed according to the following table:

Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8
ECG form: [IEC 601]	type: [calibrat]	heart rate [60]	QRS form: [RS]	QRS(mV): ±0.5 ±1.0 ±1.5 [±2.0] ±3.0 ±5.0	STdev(µV): [0]	-
			QRS form: [R] QS	QRS(mV): [±2.0]	STdev(µV): -200 [0] +200	-
			QRS form: [smallRS]	QRS(mV): [±2.0]	STdev(µV): [0]	-
		heart rate [120]	QRS form: [RS]	QRS(mV): [±2.0]	STdev(µV): [0]	-
	type: analytical	heart rate 40 [60] 120	QRS form: [RS]	QRS(mV): ±2.0	STdev(µV): [0]	-
ECG form: others	[sinusrh]	heart rate 30 [60] 80 120 160 200 240	Axis: [INT] HOR VERT	QRS(mV): 0.05 0.1 0.2 0.5 0.7 [1.0] 1.5 2.0 2.5 3.0 4.0 5.0	STdev(µV): -800 –600 –400 –200 –100 –50 [0] +50 +100 +200 +400 +600 +800	NEO: [OFF] ON
	arrhyth	category [suprve]	type [af1] af2 aflt sa mb80 mb120 pat nodal svt	-	-	-
		category [prem]	type [pac] pnc pvc mf1 mf2 mf3	-	-	-
		category [vntar]	type [big] trig pair run5 run11 vent vtac vfib emd asys	-	-	-

		category [suprve] condar	**type [1-bk] 2-b2 2-b2 3-bk rbbb lbbb**	**-**	**-**	**-**

Note:

The parameter in the lines that are adjacent to one another can be combined at will. For example, this allows for the function "sinus rhythm“ alone more than 3,500 different options.

The abbreviations found under the main function "ECG” are listed and explained in alphabetical order in the following table:

Display	Meaning
arrhyth	Arrhythmia
condar	Conduction Arrhythmia
ECG form: IEC 601	Calibrating and analytical ECGs according to DIN EN 60601:2:51
ECG form: others	Other ECG forms (sinus rhythm ECGs and arrhythmia)
HOR	horizontal heart position
INT	intermediate heart position
prem	premature arrhythmia
QRS (mV)	QRS Amplitude; for the norm ECGs calculated from zero, for all others as peak-peak values
QRS form	QRS form, e.g., RS, R, QS
sinusrh	sinus rhythm
STdev	ST deviation
suprve	supraventricular arrhythmia
type analytical	analytical ECGs, derivations are different
type calibration	Calibrating ECGs; derivations are the same. Derivation III is a zero line.

VERT	vertical heart position
vntar	ventricular arrhythmia

List of Arrhythmia

Display	Meaning
category suprve	
af1	atrial fibrillation, coarse
af2	atrial fibrillation, fine
aflt	atrial flutter
mb120	missed beat at 120 bpm
mb80	missed beat at 80 bpm
nodal	nodal rhythm
pat	paroxymal atrial tachycardia
sa	sinus arrhythmia
svt	supraventricular tachycardia
category prem	
mf1-3	multifocal PVCs
pac	premature atrial contraction
pnc	premature nodal contraction
pvc	premature ventricular contraction
category [vntar]	
asys	asystole
big	bigeminy
emd	electromotive disassociation
pair	couplet (2 PVCs)
run11	11 PVCs, 8 normal beats
run5	5 PVCs, 8 normal beats
trig	trigeminy
vent	ventricular rhythm
vfib	ventricular fibrillation
vtac	ventricular tachycardia
category suprve	
1-bk	First degree A-V block
2-b2	Second degree A-V block, Wenckebach
2-b2	Second degree A-V block
3-bk	Third degree A-V block
lbbb	left bundle branch block
rbbb	right bundle branch block

Main Function "RESP" - Respiration

In the basic setting after turning on the PSI 300, after pressing the main function key "RESP," the following settings in Lines 2 to 4 are shown in the display:

ECG [RESP] BP TEMP C.O. NS
Wave [Norm]
Rate 15 20 [30] 40 60 120
R delt 0.0 0.1 0.2 0.5 [1.0] 3.0

Line 1 (Main Menu)
Line 2
Line 3
Line 4

Note:

The settings and parameter in Line 5 to Line 7 can be shown and changed by pressing the “down“ cursor key.

The basic settings of the main function "ECG” can be altered according to the following table. Each setting can be comined with all other settings.

Line 2	Line 3	Line 4	Line 5	Line 6	Line 7
Wave [Norm]	Rate 15 20 [30] 40 60 120	R delt 0.0 0.1 0.2 0.5 [1.0] 3.0	Ratio 1/1 2/1 [3/1] 4/1 5/1	Lead I [II]	Basel 500 [1000] 1500 2000

The abbreviations used in the main function "RESP” are shown and explained in alphabetical order in the following table:

Display	Meaning
Wave	Wave progression
Norm	Normal (spontaneous breathing)
Rate	Breathing frequency [pro minute]
R delt	Delta resistance (breath amplitude, resistance change [Ohm])
Ratio	Inspiration/Expiration Ratio
Lead	ECG Connection with which respiration can be measured
Basel	Baseline (simulated basic resistance of the thorax [Ohm])

Main Function "BP" – Invasive Blood Pressure

In the basic setting after turning on the PSI 300, after pressing the main function key "BP," the following settings in Lines 2 to 4 are shown in the display:

ECG RESP [BP] TEMP C.O. NS	Line 1 (Main Menu)
Chan [IBP1] IBP2 IBP3 IBP4	Line 2
Type [Wave] Stat Swan-Ganz	Line 3
Wave ART LV [CVP] RV PA PAW	Line 4

Note:

Further lines in this main function **cannot** be shown and changed by pressing the "down" cursor key.

The basic settings of the main function "BP" can be altered according to the following table.

Line 2	Line 3	Line 4	Note
Chan: [IBP1] IBP2 IBP3 IBP4	Type: [Wave]	Wave: ART LV [CVP] RV PA PAW	
	Type: Stat	Stat: -10 –5 0 20 40 [80] 100	
	Type: Swan-Ganz	Current Wave: [ATM] insert remove	Selection with Insert: ⇒ CVP ⇒ RV ⇒ PA ⇒ PAW, Selection with Remove: Back to [ATM]
		Current Wave: [PAW] deflate ⇔ [PA] inflate remove	Selection with Deflate: Tp [PA] and selection: inflate / remove

The abbreviations used in the main function "BP" are shown and explained in alphabetical order in the following table:

Display	Meaning
Chan:	Blood pressure channel for the current choice of setting
Chan: **IBP1..4**	Channels 1 to 4 (Jacks BP1 to BP4)
CuWa:	Current Wave (current curve of the Swan-Ganz catheter function)
CuWa: **ATM**	Atmospheric Pressure (zero line, catheter outside of the patient)
CuWa: **CVP**	Central Venous Pressure
CuWa: **RV**	Right Ventricular Pressure
CuWa: **PA**	Pulmonary Artery Pressure
CuWa: **PAW**	Pulmonary Artery Wedge Pressure
insert	Swan-Ganz Catheter, continue to insert
remove	Swan-Ganz Catheter, remove
inflate	Swan-Ganz Balloon, inflate
deflate	Swan-Ganz Balloon, deflate
Type	Type of Blood Pressure
Type: **Stat**	Static (static pressure)
Type: **Wave**	Dynamic Pressure Courses
Type: **Swan-Ganz**	Swan-Ganz Procedure
Wave: **ART**	Arterial Pressure
Wave: **ATM**	Atmospheric Pressure (zero line)
Wave: **CVP**	Central Venous Pressure
Wave: **LV**	Left Ventricular Pressure
Wave: **PA**	Pulmonary Artery Pressure
Wave: **PAW**	Pulmonary Artery Wedge Pressure
Wave: **RV**	Right Ventricular Presssure

Main Function "TEMP" - Temperature

In the basic setting after turning on the PSI 300, after pressing the main function key "TEMP," the following settings in Lines 2 and 3 are shown in the display:

	ECG		RESP		BP	[TEMP]	C.O.		NS
FIX	34	35	36	[37]	38	39	40	41	42>
VAR	34	[37]	40		Hypo	Hypr	Spike		

Line 1 (Main Menu)
Line 2
Line 3
Line 4

Note:

Further lines in this main function **cannot** be shown and changed by pressing the “down” cursor key.

The basic settings of the main function "TEMP” can be altered according to the following table:

- **FIX (Channel Temp1)**
  Channel Temp 1 should be used for more exact measurements because it is more precise (deviation of 0.1K).
- **VAR (Channel Temp2)**
  Channel Temp2 should be used for sequences with lower precision (deviation of 0.4K):
  - **Hypo** (Hypotrophy change of temperature)
    Decreases temperature from 37°C to 34°C in 20 minutes, holds constant at 34°C for 60 minutes, then returns to 37°C in 20 minutes, holding at 37°C for 60 minutes
    Continuous repetition of this interval.
  - **Hypr** (Hypertrophy change of temperature)
    Increases temperature from 37°C to 40°C in 20 minutes, holds at 40°C for 60 minutes, then decreases temperature from 40°C to 37°C in 20 minutes, holding at 37°C for 60 minutes.
    Continuous repetition of this interval.
  - **Spike** (Spike temperature changes)
    Increases temperature from 37°C to 40°C in 20 minutes, then decreases back to 37°C in 20 minutes, holding at 37°C for 60 minutes.
    Continuous repetition of this interval.

Line 2	Line 3	Line 4	Line 5
FIX **34 35 36 [37] 38 39 40 41 42 43**	**VAR** **34 [37] 40 Hypo Hypr Spike**	**-**	**-**

The abbreviations used in the main function "TEMP" are shown and explained in alphabetical order in the following table:

Display	Meaning
FIX	Adjust Channel Temp1
VAR	Adjust Channel Temp2
Hypo	Hypotrophy Change of Temperature
Hypr	Hypertrophy Change of Temperature
Spike	Spike Temperature Changes

Main Function "C.O." – Cardiac Output

In the basic setting after turning on the PSI 300, after pressing the main function key "CO," the following settings in Lines 2 and 3 are shown in the display:

ECG RESP BP TEMP [C.O.] NS	Line 1 (Main Menu)
Blood temp (°C) 36 [37] 38	Line 2
min vol (l/min) 3.0 4.0 4.5 [5.0] 5.>	Line 3
	Line 4

Note:

Further lines in this main function **cannot** be shown and changed by pressing the "down" cursor key.

The basic settings of the main function "CO" can be altered according to the following table:

Line 2	Line 3	Line 4	Line 5
Blood temp(°C) **36 [37] 38**	**min vol (l/min)** **3.0 4.0 4.5 [5.0] 5.5** **6.0 7.0 intr lvs slow**	**-**	**-**

The abbreviations used in the main function "CO" are shown and explained in alphabetical order in the following table:

Display	Meaning
Blood temp (°C)	Blood Temperature
min vol (l/min):	Cardiac output per minute [l/min]
min vol (l/min): **intr**	Interrupted Injectate Waveform
min vol (l/min): **lvs**	Left Vetricular Shunt
min vol (l/min): **slow**	Slow Injetate Waveform

Main Function "NS" - Noise

In the basic setting after turning on the PSI 300, after pressing the main function key "NS," the following settings in Line 2 are shown in the display:

ECG	RESP	BP	TEMP	C.O.	[NS]
Noise	[off]	50Hz	60Hz	HF	Bas	B+HF

Line 1 (Main Menu)
Line 2
Line 3
Line 4

Note:

Further lines of the main function "NS" **cannot** be shown and changed by pressing the “down” cursor key.

The basic settings of the main function "NS” can be altered according to the following table:

Line 2	Line 3	Line 4
Noise: **[off] 50Hz 60Hz HF Bas B+HF**	-	-

The various disturbances are those that are inherent in DIN EN 60601-2-51. Thus, the filters of the ECG monitors can be verified.

The abbreviations used in the main function "NS” are shown and explained in alphabetical order in the following table:

Display	Meaning
off	No interferences
50Hz	50 Hz disturbance on the ECG
60Hz	60 Hz disturbance on the ECG
HF	High frequency disturbances
Bas	Baseline digression (Frequency: 0.3 Hz)
B+HF	Baseline digression and high frequency disturbances

13. Environmental Factors

Please always adhere to the operating and storage conditions of the PSI 300 in order to ensure that it functions without flaws:

- **Operating Conditions**
  The PSI 300 should be operated only between the temperatures +5°C and +40°C and at a relative humidity between 50% and 80% (noncondensing).

- **Storage Conditions**
  Store the PSI 300 only at temperatures between -20°C and +70°C at a relative humidity between 35% and 90% (noncondensing).
  When not in use over a longer period of time, remove the batteries.

14. Cleaning and Disinfection

- **Cleaning**
  The surfaces can be cleaned with any mild commercial plastic cleanser and a damp cloth.

  Caution!
  Do not allow any liquids to leak through the openings or jacks to the inside of the apparatus.

- **Desinfection**
  Use any commercial desinfectants.

  Caution!
  Before using any cleansers and disinfectants, always test that they do not damage the plastic surfaces.

Caution!
The PSI 300 is not suited to sterilization!

15. Errors, Defects and Customer Service

Error Codes

The PSI 300 is equipped with internal monitoring of the timing for the microcontroller and an internal voltage test. If the system detects an error, an error code appears on the display:

- Code 22 – "Timing Error"
- Code 25 – "Error ECG Voltage"

If the error code is still displayed after a cold start, there is presumably another defect in the apparatus. In this case, please contact mtk biomed.

Trouble-Shooting

- **The PSI 300 cannot be switched on.**
  - Check whether the batteries are inserted correctly (position and polarity).
  - Check whether the batteries are sufficiently loaded.
- **The PSI 300 shuts itself off after a short time.**
  - Check whether the batteries are sufficiently loaded.
- **It's hard to read the display of the PSI 300.**
  - Check whether the batteries are sufficiently loaded.
- **The display shows a menu segment, but the keys don't react.**
  - An internal security shutdown has taken place. Switch off the PSI 300 for about 60 seconds and then switch it on again.
- **The display shows the menu segments, but no signals reach the jacks.**
  - An internal security shutdown has taken place. Switch off the PSI 300 for about 60 seconds and then switch it on again.

If none of the above are able to remedy the problem, presumably there is another defect in the apparatus. In this case, please contact mtk biomed.

16. Maintenance

The PSI 300 is maintenance-free. The output signals and parameter are

regulated by a microcontroller in the operating software (firmware). There is no adjustment hardware for alignment inside the PSI 300.

Updating the Operating Software (Firmware Update)

A firmware update can be necessary if you want to expand the system of your PSI 300. In this case, please contact mtk biomed about a firmware update.

Determining the Current Software

The version and the firmware revision (xx) of the PSI 300 are shown in the display for about 2 seconds during the initialization process, immediately after switching it on.

17. Intervals for Calibration

The manufacturer recommends to calibrate the **PSI 300** every 12 months. Keep your calibration protocols handy.

18. Packaging Materials and Disposal

Dispose of the packaging materials according to your local laws and regulations. When the PSI 300 has reached the end of its lifespan, do not dispose of it with the regular household waste.

Clean and disinfect the PSI 300 before disposing of it. For information on environmentally safe disposal, contact your customer service.

19. Pictographs

For the meaning of the pictographs on the identification plate of the PSI 300, see the following table:

- "Observe the Instruction Manual"

Before starting the PSI 300 the first time, read this instruction manual. Comply with the safety regulations.

- "Not Household Waste"

Do not dispose in the regular household waste.

- "CE Symbol"

The CE symbol of the manufacturer assures that the PSI 300 conforms to EU Regulations 73/23/EWG.

20. Technical Specifications

Measurements and Weight ca. 22.5 cm x 22 cm x 9 cm, 1.1 kg (without batteries)

Power

- Rated Voltage: Batteries: 4 x 1.5V or Storage Batteries: 4 x 1.2V
- Operating Voltage: 3.8 V= ... 6.8 V=
- Power Input: 28 mA .... 46 mA, 38 mA typically

Interface: Serial Interface RS-232,
for external steering via PC

Environmental Conditions

- In Use
Temperature, relative humidity: +0°C ... +40 C, 35% ... 80% noncondensing

- Transport and Storage
Temperature, relative humidity: -20°C ... +70°C, 35% ... 90% noncondensing

Performance Features

ECG:
12-Channel ECG with individual jacks for electrodes (10 electrodes R, L, F, N, C1 to C6)
Bipolar Extremity Output according to Einthoven: I, II, III;
Unipolar Extremity Output according to Goldberger: aVR, aVL, aVF

Generater lead according to Wilson: V1 - V6

Respiration:
Impedance Pneumograph, Output via ECG – Electrodes (choice of L or F)

Invasive Blood Pressure:
4 Blood pressure channels, able to be programmed individually
Pneumograph Sensitivity 5µV/V/mmHg, utilizing the monitor reference voltage

Temperature
Simulation of the standard temperature sensor YSI400 via 2 channels
Fixed adjustment (Temp1) and temperature sequences (Temp2)

Cardiac output
1 channel, measurement according to the thermo dilution principle

Output Signals and Parameter

ECG

- Calibrating and analytical ECG:	DIN EN 60601-2-51:2004
- Sinus rhythm ECGs:	Choice of 7 frequencies: 30, 60, 80, 120, 160, 200, 240 3 different types of positions: intermediate, horizontal,vertical 12 different amplitudes: 0.05, 0.1, 0.2, 0.5, 0.7, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0 mV ST Elevation and Sinking in 13 variations: +/- 800, +/- 600, +/- 400, +/- 200, +/- 100, +/- 50, 0 µV All parameter can be chosen independently and can be combined freely with one another. Additional neonatal ECG, with frequencies, type of position, and amplitudes freely interchangeable .
- Arrhythmia:	auricular fibrillation, auricular flutter, extrasystole, bigeminy, ventricular tachycardia, AV blocks of varying degrees, right bundle branch block (Rechtsschenkelblock)
- Supraventricular arrhythmia:	9 varieties
- Premature beats:	6 varieties
- Ventricular arrhythmia:	10 varieties
- Impulse lead error:	6 varieties

Respiration

6 various frequencies,
6 various amplitudes,
5 various inhale/exhale ratios

All parameter can be chosen independently and can be combined freely with one another,
choice of Output I or Output II lying down, with 4 different baselines, also independent choice

Invasive Blood Pressure

- static pressures (per channel):	7 various pressures (-10, 5, 0, 20, 40, 80, 100 mmHg)
- dynamic blood pressure sequences:	artery presure (ART) left ventricular pressure (LVP), central venous Pressure (CVP), right ventricular pressure (RVP), pulmonary pressure (PAP), pulmonary artery closing pressure (PCWP)
-Swan-Ganz Procedure:	Swan-Ganz Procedure with different stations

Temperature

Starting temperatures:	34°C to 43 °C, adjustable in 1K steps
Continual temperature sequences:	hypertroph or hypotroph, on different channels

Cardiac Output

- Flow sequence curve:	after choosing the blood reference temperature

Precision

- ECG:	Frequency ±1%, Amplitude ±5%
- Respiration:	Frequency ±1%, Amplitude ±10%
- Invasive blood pressure:	Frequency ±1%, Amplitude ±5%
- Temperature:	Temp1 (1K-Schritte): ±0.1K, Temp2: ±0.4K, Fr: ±1%
- Cardiac output:	Frequency ±1%, Amplitude ±5%