

# EC-12RT Resting ECG Machine Technical Specification



ECG input	
Input impedance	$\geq 10 \text{ MOhm}$
Input bias current	$\geq 0,1\mu\text{A}$
Input dynamic range	from 0,03mV up to 10mV (peak-to-peak amplitude)
Nonlinearity	$\leq \pm 2\%$
Electrode offset tolerance	$\pm 300\text{mV}$
Common-mode rejection	$\geq 100\text{dB}$
Internal noise voltage	$\leq 20\mu\text{V}$ (driven to input)
Crosstalk	$\leq 1\%$
Frequency range of ECG amplifier	from 0,05 up to 150Hz; nonlinearity $\leq 3\text{dB}$
Time constant Pacemaker detection	$\geq 3,2\text{s}$ amplitude from $\pm 2$ up $\pm 700\text{mB}$ duration from $\pm 0,1$ up $\pm 2\text{ms}$
Input unit proof	fully isolated amplifier, defibrillation protected when used patient's cable supplied with EC-12RT

ECG processing	
AD converter resolution	12 bit
AD resolution (LSB voltage)	$4,79\mu\text{V}$ (refer to input)
AD sampling frequency	3200 Hz for each lead
Time constant	$\geq 3,2\text{s}$
Filters:	antitremor 35Hz (switchable)
	antidrift: automatic baseline offset compensation (switchable)
	AC mains filter 50Hz
Baseline drift	no more than 1,5mm within registration time
ECG auto centering	switchable
Voltage measurement	from $\pm 0,1$ up to $\pm 0,5\text{mV}$ , inaccuracy $\leq \pm 15\%$ from $\pm 0,5$ up to $\pm 4\text{mV}$ , inaccuracy $\leq 7\%$
Heart rate measurement range	from 15 up to 300 BPM, inaccuracy $\pm 1\text{BPM}$
Heart rate averaging method	moving averaging for 8 last heart beats
ECG analysis	Peaks amplitude measurement (in all leads): P, Q, R, S, ST, T with inaccuracy: $\pm 15\%$ for voltage range from $\pm 0,058$ up to $\pm 0,5\text{mV}$ $\pm 10\%$ for voltage range from $\pm 0,5$ up to $\pm 4\text{mV}$
	Intervals measurement (in all leads): RR, PQ (PR), QT, QRS, duration of peaks P, Q, R and S with inaccuracy $\pm 7\%$ within duration range from 12 up to 1333ms.
	Heart electrical axis angle measurement ( $\alpha\text{QRS}$ ) within range from $-180^\circ$ up to $180^\circ$ with inaccuracy $\pm 1^\circ$ .

**ECG processing**

	conclusion making: <ul style="list-style-type: none"> <li>- on rhythm regularity;</li> <li>- on heart electrical axis location (HEA);</li> <li>- on ST segment level displacement;</li> <li>- on amplitude-time parameters of QRS complex.</li> </ul>
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**ECG Registration**

<b>Print method</b>	high resolution thermal print
<b>Printer resolution</b>	along paper – 64 dots per mm at the speed 25mm/s across paper – 8 dots per mm
<b>Thermal paper width</b> <b>Line thickness</b>	110mm narrow, normal and wide
<b>Type of thermal paper</b>	roll paper: width 110mm, length $\leq 30m$ , inside diameter 12mm, winding: temperature-sensitive layer outside. Z-fold paper: width 110mm, page length 100mm, 200 pages in pack Availability of paper without grid usage – “print grid” mode.
<b>Printing width</b>	104mm
<b>Sweep speed</b>	5, 10, 12,5, 25 and 50 mm/s, sweep speed inaccuracy $\leq \pm 5\%$
<b>Sensitivity</b>	2,5; 5; 10; 20 or 40 mm/mV, error no more than 5%
<b>ECG registration method</b>	It is chosen it in EC menu simultaneous registration of 12 ECG leads contiguous registration during the print
<b>Leads systems</b>	Standard, Cabrera, Nehb, Frank and user defined leads set.
<b>ECG registration modes</b>	manual, automatic, auto start mode with noise level assessment, waiting for arrhythmia mode, rhythm registration, extend if arrhythmia mode, periodic ECG print, print of the latest ECG copy, ECG print out from memory
<b>ECG registration formats</b> <b>Forms of rhythm registration</b>	<ul style="list-style-type: none"> <li>3 leads, 3 leads + rhythm, 6 leads, 12 leads across paper</li> <li>- print of one selected ECG lead for 36 seconds in 3 lines with sweep speed 25 mm/s;</li> <li>print of one selected ECG lead for 72 seconds in 6 lines with sweep speed 25 mm/s;</li> <li>print of one selected ECG lead for 90 seconds in 3 lines with sweep speed 10 mm/s;</li> <li>print of one selected ECG lead for 3 minutes in 6 lines with sweep speed 10 mm/s;</li> <li>print of one selected ECG lead for 3 minutes in 3 lines with sweep speed 5 mm/s;</li> <li>- print of three selected ECG lead for 24 seconds in 6 lines with sweep speed 25 mm/s;</li> <li>- print of three selected ECG lead for 1 minute in 6 lines with sweep speed 10 mm/s.</li> </ul>
<b>Length of ECG print in automatic mode</b>	3, 5, 10, 15, 25 seconds per each leads group; or 100, 200 or 400 mm per each leads group.
<b>Printed data</b>	ECG, heart rate value, analysis results (full, short or off), sweep speed, sensitivity, filters condition, date and time, patient information (may be turned off), name of patient care institution, doctor's name
<b>Acoustic noise level upon print</b>	no more than 58dB

## Memory

<b>Type</b>	internal nonvolatile Flash memory – 128MB or external memory
<b>ECG fragment duration written to memory</b>	10 or 45 seconds depending on user's choice
<b>Number of saved ECGs</b>	in internal memory – around 500
Memorization up to 10 profiles: doctor's name and settings fixed by him.	
Internal memory	USB flash memory

## Display

<b>Type</b>	color TFT display with LED backlight
<b>Screen size</b>	116X88mm, diagonal size 5,6 inch (142mm)
<b>Resolution</b>	640 X 480 dots
<b>Brightness control</b>	5 levels
<b>Displayed data</b>	In the main screen there displayed: 1, 3, 4, 6 or 12 ECG leads simultaneously, heart rate, date and time, doctor's name, patients name and ID, battery condition, electrode break, noise level detection, selected filters, values of sensitivity and sweep speed, printing format, leads system, kind of ECG analysis, duration of memory-written ECG fragment. Patient's data: name, sex, height, weight, birthday and BP are displayed in the patient's data screen.

## Audible signal

Patient pulse audible signal	
Button push confirmation tone	
<b>Volume control</b>	11 levels: from 0 (signal off) up to 10

## Miscellaneous

Availability of electrode cable testing: test of cable open-circuit fault and fault contact with cable braided shield.

## Interface (option)

<b>Type</b>	COM-port/USB-port
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## Power

<b>AC mains voltage</b>	from 85 up to 264V
<b>Mains frequency</b>	50 or 60Hz
<b>DC mains voltage</b>	from 12 up to 16V (on-board power system of emergency car)

Power	
<b>Power consumption</b>	AC mains operation: when printing: $\leq 30$ VA without printing: $\leq 15$ VA DC mains operation: when printing: $\leq 30$ VA without printing: $\leq 9$ VA
<b>Internal battery</b>	LiIon, 7,4V, 2Ah
<b>Operating from battery time</b>	about 3 hours with new, full charged battery
<b>Battery charging time</b>	6-7 hours, if battery was fully discharged
EC-12RT may operate during battery charging.	
EC-12RT recorder may operate from mains power upon battery lack (or its fault).	

Dimensions and weight	
<b>Dimensions</b>	width 250mm depth 174mm height 63mm
<b>Weight (with battery)</b>	$\leq 1,2$ kg
<b>EC-12RT weight in bag with complete set of accessories</b>	$\leq 4,0$ kg

Safety and electromagnetic compatibility	
EC-12RT meets safety standards requirements: IEC 601-1, IEC 601-2-25 class II, internally powered product, type CF.	
EC-12RT connected to computer meets IEC 601-1-1 standards requirements. Computer must be located at a distance no less than 1,5 m from patient.	
EC-12RT meets electromagnetic compatibility standard requirements: IEC 60601-1-2: 2007	

Environment	
<b>Operating temperature</b>	from +10 up to +40°C
<b>Humidity</b>	up to 80% at temperature +25°C and at lower temperatures without condensation.
<b>Atmospheric pressure</b>	from 84 up to 106,7kPa (630-800mmHg)

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