

**Technical characteristics:**

No	Technical and functional characteristics (consumer properties) and other indicators of goods	Description
<b>1</b>	<b>General requirements</b>	
1.1	Purpose	The expert-class ventilator for artificial lung ventilation for adults and children from three years of age
1.2	Registration certificate of the Ministry of Health of Russia	Is present
1.3	Certificate of conformity	Is present
1.4	Year of manufacture	No earlier than 2020
1.5	Equipment must be new, not previously used	Conformity
<b>2</b>	<b>Technical characteristics</b>	
2.1	Pneumatic drive, from a source of compressed air or compressor	Pneumatic
2.2	Electrical network characteristics	Built-in power supply 220 V +/- 10 %
2.3	Autonomous power supply	180 minutes with a fully discharged battery
2.4	Power consumption	150 W
2.5	High pressure oxygen supply in the range of at least	From 2.8 up to 6.5 kPa
2.6	High pressure air supply in the range of at least	From 2.8 up to 6.5 kPa
<b>3</b>	<b>Lung ventilation modes</b>	
3.1	Controlled ventilation with adjustable volume	Is present
3.2	Controlled ventilation with adjustable pressure	Is present
3.3	Controlled ventilation with adjustable pressure and target volume	Is present
3.4	Synchronized intermittent forced lung ventilation with adjustable volume	Is present
3.5	Synchronized intermittent forced lung ventilation with adjustable pressure	Is present
3.6	Synchronized ventilation with control of two pressure levels and the possibility of independent breathing with pressure support in the phases of high and low pressure	Is present
3.7	Synchronized ventilation with control of two pressure levels and the possibility of independent breathing throughout the entire respiratory cycle with inversion I:E	Is present
3.8	Ventilation with continuous positive pressure in airways / ventilation with pressure support	Is present
3.9	Standby ventilation during apnea with the possibility of	Is present

	choosing any mode with the presence of controlled ventilation cycles	
<b>4</b>	<b>Additional features</b>	
4.1	Automatically proposed ventilation parameters based on the ideal patient weight from 5 kg and pulmonary system pathologies	Is present
4.2	Automatically suggested ventilation parameters based on patient gender	Is present
4.3	Automatically suggested ventilation parameters based on impaired respiratory system: obstruction	Is present
4.4	The ability to return to the previous settings of the ventilator from standby mode	Is present
4.5	The ability to start the ventilator with preset settings	Is present
4.6	Automatic quick self-test of the device when turned on for no more than 30 seconds	Is present
4.7	Automatic sanitation mode	Is present
4.8	Automatic sanitation mode provides 3 step procedure	<ol style="list-style-type: none"> <li>1. Delivery of 100% O<sub>2</sub> to the patient circuit within 60 seconds with indication of the countdown on the screen.</li> <li>2. Sanitation period with disconnection of the patient from the device without alarm about disconnection.</li> <li>3. Post-oxygenation -100% oxygenation of the patient for 60 seconds with indication of the countdown on the screen.</li> </ol>
4.9	Manual inhale	Is present
4.10	Time-controlled manual holding of inhale	40 seconds
4.11	Time-controlled manual activation of expiration delay	60 seconds
4.12	A metabolograph integrated into the device with a CO <sub>2</sub> , O <sub>2</sub> monitoring and analysis system, patient spirometry, metabolism	Is present
4.13	Automatic compensation of the tracheostomy tube resistance to reduce patient respiration	Range: from 0 up to 100 %
4.14	The ability to choose the diameter of the tracheostomy tube	Range: from 3 up to 9 mm
4.15	Automatic compensation of endotracheal tube resistance to reduce patient respiration	Range: from 0 up to 100 %
4.16	The ability to choose the diameter of the endotracheal tube	Range: from 2 up to 10 mm
4.17	Non-invasive mask ventilation with leak detection and compensation: NIV in all ventilation modes	Is present

4.18	Function for detecting and compensating for leaks in the breathing circuit during ventilation	Is present
4.19	Proximal flow sensor located between the Y-shaped connector of the breathing circuit and the patient	Is present
4.20	Socket for connecting a flow sensor integrated into the expiratory valve	Is present
4.21	Lines for connecting a differential pressure flow sensor	Is present
4.22	Function of conducting an automatic breathing maneuver with the construction and analysis of inspiratory and expiratory tensile curves (volume-pressure loop)	Is present
4.23	Calculation of static (true) lung extensibility	Is present
4.24	Determination of the optimal PEEP level and maximum airway pressure	Is present
4.25	Conducting a recruitment maneuver (opening of the alveoli) with setting the airway pressure from 25 to 60 cm of water column and adjusting the speed of inflation from 2 to 5 cm of water column/sec, breath holding on inspiration from 0 to 30 seconds with a final PEEP from 1 to 20 cm of water column	Is present
4.26	Function of holding the breath in and out to determine the mechanics of breathing by occlusion of the lungs for no more than 30 seconds	Is present
4.27	The ability to determine the volume of alveolar ventilation	Is present
4.28	The presence of at least 4 pneumatic lines with pressure sensors	Is present
4.29	The possibility to connect a proximal flow sensor. The use of a proximal flow sensor reduces dead space in the breathing circuit and provides increased sensitivity of the device to changes in volumetric characteristics, which is necessary for ventilation of children.	Is present
4.30	The presence of a port for connecting an additional pressure measuring line with an integrated pressure and flow sensor and a patient display system with the possibility of low-flow oxygen supply for breath maintaining in the cuffs of the tracheal and tracheostomy tubes or the presence of a port for connecting an additional pressure measuring line with an integrated pressure and flow sensor and a patient display system with the possibility of supplying low-flow oxygen for intestinal oxygenation.	Is present
4.31	The presence of a port for connecting a SpO <sub>2</sub> sensor	Is present
4.32	The presence of a connector for connecting a distal flow sensor. The use of a distal flow sensor in the exhalation valve provides accurate delivery of tidal volume for adult patients and in some cases protects against sputum and	Is present

	exudate entering the sensor.	
4.33	The possibility to select a distal or proximal flow sensor for operation.	Is present
<b>5</b>	<b>Ventilation parameters</b>	
5.1	Tidal volume	Range: from 50 up to 3000 ml.
5.2	Adjustable respiration rate	Range: from 1 up to 100 breath/min.
5.3	Inspiratory / expiratory ratio (I:E)	Range: from 1:400 up to 400:1.
5.4	Inspiratory / expiratory ratio (I:E) for ventilation with two-level positive pressure	Range: from 1:400 up to 400:1.
5.5	Setting inspiratory pressure ( $P_{\text{insp}}$ )	Range: from 1 up to 100 cm of water column with a step of 1 cm of water column.
5.6	Restriction on inspiratory pressure limit in controlled volumetric ventilation mode	Range: from 1 up to 100 cm of water column with a step of 1 cm of water column.
5.7	PEEP setting	Range: from 1 up to 50 cm of water column with a step of 1 cm of water column or turn off.
5.8	Inspiratory time	Range: from 0.1 up to 40 sec.
5.9	Expiratory time	Range: from 0.1 up to 40 sec.
5.10	Flow trigger sensitivity adjustment	Range: from 0.1 up to 20 l/min with a step of 0.5 l/min.
5.11	Pressure trigger sensitivity adjustment	Range: from 1 up to 80 cm of water column with a step of 1 cm of water column.
5.12	Expiratory trigger sensitivity setting	Range: from 0 up to 80 % with a step of 1 %.
5.13	Maximum inspiratory flow	245 l/min.
5.14	O <sub>2</sub> concentration adjustment	Range: 21 – 100 %.
5.15	Pressure support adjustment	Range: from 0 up to 100 cm of water column with a step of 1 cm of water column.
5.16	Display at the bottom of the screen the basic settings of ventilation parameters on the main screen without using additional pop-up windows in an amount of at least:	11
5.17	Trigger system for 4 types of triggers	Is present
<b>6</b>	<b>Monitored indicators</b>	
6.1	Airway pressure $P_{\text{insp}}$	Is present
6.2	Breathing rate 1/min	Is present
6.3	Spontaneous breathing rate in pressure support mode 1/min	Is present

6.4	Inspiratory / expiratory ratio (I:E)	Is present
6.5	Positive End-Expiratory Pressure (PEEP)	Is present
6.6	Average airway pressure (P mean)	Is present
6.7	Inspiratory tidal volume V <sub>t</sub>	Is present
6.8	Minute volume of breath MV	Is present
6.9	O <sub>2</sub> concentration on inspiration and expiration using the integrated oxygen sensor	Is present
6.10	Inspiratory time T <sub>i</sub>	Is present
6.11	Expiratory time T <sub>e</sub>	Is present
6.12	Plateau time T <sub>pl</sub>	Is present
6.13	Plateau pressure P <sub>pl</sub>	Is present
6.14	Resistance R	Is present
6.15	Static compliance C <sub>stat</sub>	Is present
6.16	Dynamic compliance C <sub>dyn</sub>	Is present
6.17	Pressure rise rate	Is present
6.18	Expiratory flow rate	Is present
6.19	Inspiratory flow rate	Is present
6.20	CO <sub>2</sub> concentration in exhaled gas etCO <sub>2</sub>	Is present
6.21	Oxygen consumption VO <sub>2</sub>	Is present
6.22	CO <sub>2</sub> production VCO <sub>2</sub>	Is present
6.23	Respiratory coefficient	Is present
6.24	T-constant	Is present
6.25	Respiratory work, J/l	Is present
6.26	Loop leakage percentage	Is present
6.27	Display of pressure P in an additional pressure line	Is present
6.28	Display of oxygen supply through an additional line	Is present
6.29	Display of oxygen flow rate through an additional line	Is present
6.30	Display of current energy intake by the patient EE <sub>cur</sub>	Is present
6.31	Display of daily energy intake by the patient EE <sub>day</sub>	Is present
6.32	SpO <sub>2</sub>	Possible
6.33	Heart rate 1/min	Possible
6.34	<b>Graphs displayed:</b>	4 simultaneously
6.35	Pressure graph	Is present
6.36	Flow graph	Is present
6.37	Volume graph	Is present
6.38	Capnogram CO	Is present
6.39	Button for selecting the number of graphs displayed on the home screen	Is present

6.40	Button for selecting the displayed parameter in the form of a graph on the home screen	Is present
6.41	Graph scaling	Automatic scaling for optimal dimensions and independent scaling of each graph
6.42	<b>Displayed loops:</b>	3 simultaneously
6.43	Button for selecting the number of loops on the home screen	Is present
6.44	Button for setting the type of loops on the home screen	Is present
6.45	Pressure-volume	Is present
6.46	Pressure-flow	Is present
6.47	Flow-volume	Is present
6.48	Display curves and loops in bright colors on a dark background	Is present
6.49	Event and alarm log with display of patient settings, selected ventilation parameters, number of records not less:	10 000
7	<b>Trends</b>	Is present
7.1	Stored data	All settable parameters and measured values
7.2	Trend display formats	Tabular, graphic
7.3	Trend recording duration	14 days
7.4	Trend scale selection	In the range from 1 min to 24 hours
7.5	Display of at least 20 rows in a table on one screen	Is present
7.6	Trend chart display	4
8	<b>Display</b>	LCD, color with touch control (touch screen), integrated
8.1	Screen diagonal	19 inches
8.2	Control, data viewing by touch and by means of a key-manipulator (touch-turn-touch) without additional mechanical buttons	Is present
8.3	Simultaneous display in different fields of the screen of at least 4 breathing curves, at least 3 loops, monitoring parameters and ventilator settings available for modification	Is present
8.4	Russified software	Is present
9	<b>Alarm and signaling system</b>	Is present
9.1	Alarms preset and user-configurable	Is present
9.2	Number of levels and light gradations of alarms	3
9.3	Indicative and sound accompaniment	Is present
9.4	Alarms	Is present

9.5	Low oxygen pressure supplied to the device	Is present
9.6	Low air pressure supplied to the device	Is present
9.7	High / low inspiratory pressure	Is present
9.8	High / low PEEP	Is present
9.9	Low tidal volume	Is present
9.10	High / low minute ventilation	Is present
9.11	High respiration rate	Is present
9.12	Apnea	Is present
9.13	Battery mode	Is present
9.14	High / low percentage of O <sub>2</sub> on inspiration	Is present
9.15	High / low percentage of CO <sub>2</sub> on inspiration	Is present
9.16	Circuit depressurization	Is present
9.17	Low battery	Is present
9.18	<b>User-defined alarm limits</b>	Is present
9.19	Apnea time	Range: from 5 up to 60 sec.
9.20	O <sub>2</sub> concentration on inspiration	Range: from 18 up to 100 %.
9.21	PEEP	Range: from 0 up to 55 mm of water column.
9.22	Inspiratory pressure	Range: from 0 up to 105 cm of water column.
9.23	Support pressure	Range: from 0 up to 100 cm of water column.
9.24	Breathing rate	Range: from 0 up to 105 breath/min.
9.25	Inspiratory time	Range: from 0.05 up to 59.9 sec.
9.26	Expiratory time	Range: from 0.05 up to 59.9 sec.
9.27	Supply volume	Range: from 0.01 up to 6.5 l.
9.28	CO <sub>2</sub> partial pressure on the exhale ETCO <sub>2</sub>	Range: from 0 up to 120 mmHg.
10	<b>Complete set (for 1 device)</b>	
10.1	Artificial lung ventilator with integrated display	1 pc.
10.2	Transport trolley or rack for moving inside the hospital	1 pc.
10.3	Humidifier with camera for adults	1 pc.
10.4	CO <sub>2</sub> adapter for adults, reusable	1 pc.
10.5	Gas module (metabolograph)	1 pc.
10.6	Disposable breathing circuit with two moisture collectors and a pressure measurement line	2 sets
10.7	Swivel breathing hose holder	1 pc.

10.8	Reusable distal flow sensor with cable for connection	1 pc.
10.9	Proximal differential pressure flow sensor, reusable, pluggable into ports with additional pressure sensors	1 pc.
10.10	Water trap at the inlet of compressed air into the device	1 pc.
10.11	Water trap at the inlet of oxygen into the device	1 pc.
10.12	Oxygen supply hoses of at least 5 meters with a connector compatible with customer's pneumatic outlets	1 pc.
10.13	Air supply hoses of at least 5 meters with a connector compatible with customer's pneumatic outlets	1 pc.
10.14	Pressure sensor tube	2 pc.
10.15	Line with optional pressure sensor	1 pc.
10.16	Connection kit for additional pressure line	1 pc.
10.17	Bacterial filters	4 pc.
10.18	Reusable autoclavable expiratory valve	1 pc.