HEINEN + LÖWENSTEIN
Lebenserhaltende Medizintechnik

Heinen & Löwenstein GmbH
Servicecenter

LEONI baby ventilator service manual

Test report :

Intervals

Spare parts

Changing the sintered filters

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Hex key : 4mm
Sintered filter : 0207157

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The NIST connectors are at the rear of the device. Using the hex key, the fixing screws can be removed in order to take out the filters (or, in newer versions, the filters can be removed directly with the hex key).

Software version check:

In the onscreen menu „settings“, press the keys “menu” and “alarm limits” in parallel and keep pressed for 5 seconds. The onscreen menu “system diagnosis” is opened and here you take the readings of the following parameters in the left column:

CHK PO
DAT PO
CHK P1
Ver P1
CHK P2
Ver P2

Check whether the latest version is installed.

Sensor adjustment:

Flow sensor:

Before each adjustment, the device must warm up for 15 min.

Assemble LEONI with its sensors, tubing system and test lung. Use the calibration key to choose the onscreen menu "sensor check". With the tubing system connected, press soft key "flow" and keep pressed until "sensor check" and then "ADJUSTMENT" shows up. With the message „sensor adjusted", adjustment of the flow sensor has been effected successfully.

O_2 Sensor:

Oxygen calibration must always be done almost pressureless, so first disconnect the expiration tube in order to reach a minimum constant positive pressure.

In the same onscreen menu now press the „21% O_2" key and keep pressed until the hourglass starts on the monitor.
21% adjustment has been successful when the hourglass disappears without error message and you see the message „sensor adjusted".

Finally, press the "100%" key and keep pressed until the hourglass starts.
100% adjustment has been successful when the hourglass disappears without error message and you see the message „sensor adjusted".

Flow adjustment : AIR

Screwdriver : slot-head 3,5 x 75

For flow adjustment, disconnect the expiration tube and kink it. As soon as the system alarm starts, acknowledge and mute the system alarms by pressing the keyswitch and the alarm suppression key in parallel. In the lower left corner of the monitor a message shows up. Enter the setup screen via keyswitch and adjust the following parameters:

Insp.-Flow 20	**Basic flow 10**	**PEEP 10**	**P.-Insp. 50**
	Frequency 30	**Insp.-Time 1**	**Oxygen 21%**

Re-connect the expiration tube but remove the test lung.
Now switch the screen to the graphical mode by means of the menu key and then set to 20 litres compressed air. Check by displaying the flow graph in the 20 l setting. (Switch from pressure to flow by repeatedly pressing the „graphs“ key).

Do adjust the flow sensor first !

Pressure reducing valves for adjustment are at the rear of the device. Pressure adjustment is achieved by turning the pressure reducer set screw. Compressed air is controlled by the pressure-reducer next to the NIST-AIR screwing. Turn until the pressure shown in the screen display corresponds to 20 or 10 litres respectively.

Flow adjustment : O_2

Screwdriver : slot-head 3,5 x 75

For flow adjustment, disconnect the expiration tube and kink it. As soon as the system alarm starts, acknowledge and mute the system alarms by pressing the keyswitch and the alarm suppression key in parallel. In the lower left corner of the monitor a message shows up. Enter the setup screen via keyswitch and adjust the following parameters:

Insp.-Flow 20	**Basic Flow 10**	**PEEP 10**	**P.-Insp. 50**
	Frequency 30	**Insp.-Time 1**	**Oxygen 100%**

Re-connect the expiration tube but remove the test lung.
Now switch the screen to the graphical mode by means of the menu key and then set to 20 litres O_2. Check by displaying the flow graph in the 20 l setting. (Switch from pressure to flow by repeatedly pressing the „graphs“ key).

Do adjust the flow sensor first !

Pressure reducing valves for adjustment are at the rear of the device. Pressure adjustment is achieved by turning the pressure reducer set screw. Oxygen is controlled by the pressure-reducer next to the NIST-O_2 screwing. Turn until the pressure shown in the screen display corresponds to 20 or 10 litres respectively.

Pressure sensor adjustment:

Pressure source
Pressure monitor

0 cm H_2O :

In the onscreen menu „settings“ press „menu“ and „alarm limits“ keys in parallel and keep pressed for 5 seconds. This leads to the screen “System diagnosis“.
Now leave the proximal pressure input without pressure (disconnect the tube) and keep softkey “0cm H_2O” pressed for approximately 5 seconds until a dot shows up above the key.

60 cm H_2O :

Now connect a pressure source with a constant pressure of 60cm H_2O and keep softkey “60cm H_2O” pressed until a dot shows up there as well.

Then leave the program by pressing the menu key.

Expiration valve adjustment

Enter the setting screen via keyswitch and set the following parameters:

Insp.-Flow **8**	**Basic Flow** **8**	**PEEP** **10**	**P.-Insp.** **50**
	Frequency **30**	**Insp.-Time**	**Oxygen** **21%**

Then press the keyswitch repeatedly until all parameters are de-framed.

Finally press the „menu“ and „limits“ softkeys in parallel for approximately 5 seconds until the screen displays the message „AV adjustment”. Wait until Pmax = 50 cm H_2O / Pmedium = 29 cm H_2O / PEEP = 10 cm H_2O.

Finish adjustment by pressing the „mode“ key.

Test report: Serial number:

Set complete device running including a double-lobe test lung (LEONI test lung).

Set the following values: Mode: IMV

Insp.-Flow 10	Basic Flow 5	PEEP 10	P.-Insp. 30
	Frequency 60	Insp.-Time 0,5	Oxygen 21%

		NOK	OK
1 Test LED's, Display and Signaller			
1.1	**Switch on unit** **LCD screen backlighting**		
	Red alarm LED		
	Yellow alarm LED (Alarm muted)		
	Alarm generator (Alarm sound)		

		NOK	OK
1.2	**Switch off unit** **Alarm generator (power failure)**		
	Red power failure LED flashes		
	Press mute key, alarm signal stops		
	Red LED goes out		

NOK OK

2 Patient alarms

Assemble device completely, including test lung, and switch on.
Switch to screen "alarm limits", place cursor in topmost line, select "all limits auto" and set limits via "autoset" softkey. Wait until auto limits have been set.
Stop each alarm after having been activated and acknowledge error message by pressing the second softkey from the left.

2.1 MV , click upper limit and set below the actual „real volume".
Alarm message: „MV too high."
Re-set limit.

2.2 MV , click lower limit and set above the actual „real volume".
Alarm message: „MV too low."
Re-set limit.

2.3 Set the blue cock of the test lung so that the airway is open to both lung lobes and to one white plug.
Alarm message „ tube leakage too high"
Re-set blue cock.

2.4 Set breath rate limit below „real frequency".
Alarm message „ breath rate too high".
Re-set limit.

2.5 Kink the test lung connection tube.
Alarm message „Apnea"
Release connection tube.

3 System alarms

Stop each alarm after having been activated.
Only after all alarms had been activated acknowledge the error message by pressing the right softkey.

3.1	**Seal expiration tube by kinking it.** **Alarm message : „System alarm expiration tube“** **Release tube.**	**NOK**	**OK**
3.2	**Seal inspiration tube by kinking it.** **Alarm message : „System alarm inspiration tube“** **Release tube.**		
3.3	**Remove the AIR supply plug from the wall supply.** **Alarm message: „inlet pressure air supply“** **Re-insert supply plug.**		
3.4	**Remove the O_2 supply plug from the wall supply.** **Alarm message: „inlet pressure O_2“** **Re-insert supply plug.**		
3.5	**Remove test lung** **Alarm message „pressure too low“,** **then „Disconnection“** **Re-connect test lung.**		

4 Flow sensor alarm		**NOK**	**OK**
4.1	**Disconnect flow sensor, sensor alarm is activated immediately.** **Alarm message „check sensors“** **Re-connect sensor.**		
4.2	**Connect a defective flow sensor** **Alarm message “Sensor defective “** **Re-connect the intact sensor.**		

5 Pressure measurements:

Set he following values Mode: IMV

Press calibration key and switch off flow sensor

Set the given parameters and enter into table.

Insp.-Flow 10	Basic Flow 5	PEEP 5	P.-Insp. 10
	Frequency 30	Insp.-Time 1	Oxygen 21%

5 Pressure measurement

	Settings		Readings				
	P_{insp}	PEEP	P_{max}	P_{med}	PEEP	NOK	OK
5.1	10	0	9.....11	4.....6	0.....1		
5.2	20	0	19.....21	9.....11	0.....1		
	30	0	28.....32	14.....16	0.....1		
	40	0	38.....42	19.....21	0.....1		
	50	0	47.....53	23.....27	0.....1		
	60	0	57.....63	28.....32	0.....1		
	30	5	28.....32	16.....18	4.....5		
	30	10	28.....32	19.....21	9.....11		
	30	15	28.....32	21.....23	14.....16		
	30	20	28.....32	23.....27	19.....21		

6 Volume measurement:
Connect calibrated 1 l bottle instead of test lung.

Set the following values Mode: IMV

Press calibration key and switch on flow sensor.

Set the given parameters and enter into table.
Display : Graphical + Numerical values

Insp.-Flow 10	Basic Flow 5	PEEP 5	P.-Insp. 10
	Frequency 30	Insp.-Time 1	Oxygen 21%

6 Volume measurement

	Settings		Readings				
	P_{insp}	PEEP	MV	Vte	Compliance	NOK	OK
6.1	10	0	0,28…0,32	9,5…10,5	0,7…1,3		
6.2	20	0	0,57…0,63	19,0…21,0	0,7…1,3		
	30	0	0,86…0,95	28,5…31,5	0,7…1,3		
	40	0	1,14…1,26	38,0…42,0	0,7…1,3		
	50	0	1,43…1,58	47,5…52,5	0,7…1,3		
	60	0	1,71…1,89	57,0…63,0	0,7…1,3		
	30	5	0,71…0,79	23,7…26,3	0,7…1,3		
	30	10	0,57…0,63	19,0…21,0	0,7…1,3		
	30	15	0,42…0,47	14,2…15,8	0,7…1,3		
	30	20	0,28…0,32	9,5…10,5	0,7…1,3		

7 Oxygen measurement:

Connect O_2 monitor to inspiration tube.

7	Oxygen measurement					
	Settings	Tolerance		Measuring device	Nok	OK
7.1	21%	21%-21%		%		
	40%	39%-41%		%		
	60%	58%-62%		%		
	80%	76%-84%		%		
	100%	100%-100%		%		

S/N O_2 cell ……

8 Checking the electrical safety according to VDE 0751 / 1 . Documentation on separate original H&L test report.

Intervals for service and safety check

Every 6 months:

-optical check and cleaning of the device housing and accessories

-open and clean the casing interior

-optically check all tubes, electrical cables, adapters and connectors, all electrical and pneumatic couplings, screws and casing components

-optically check all internal components

-check completely according to test report

-Generate a test report and perform the electrical safety check

Every 12 months:

-Change AIR and O2 sintered filters (Art.-Nr.0217028)

-Change O_2 measuring cell (Art.-Nr.0217028)

-Perform calibration

Every 3 years:

-Replace internal tubing

Every 10 000 hrs. :

-Replace air/oxygen blender (Art.-Nr.0217032)
incl. fine dust filter

-Replace inlet pressure reducer

Spare parts:

Item	Part number	Description
1	0217000	LEONI baby ventilator
2	0217010	Trolley without drawer
3	0217010-1	Trolley XS
4	0217013	Drawer set
5	0217020	LEONI infusion rack
6	0217021	Tube support bracket with rail suspension
7	0217022	Nut for water boom
8	0217500	LEONI M portable baby ventilator
9	0217015	Heated primary tube system, autoclav.
10	0217015-1	Heated secondary tube system, autoclav.
11	0217015-2	LEONI tube system, autoclaveable, *without heating*
12	0217015-3	LEONI disposable tube system, 10 pcs
13	0217025	Neonatology Y-connector, autoclaveable
14	0217011	LEONI sensor
15	0217012	LEONI sensor cable
16	0217026	LEONI expiration valve
17	0217027	LEONI test lung
18	8409742	Draeger baby test lung
19	0217028	Sintered filter
20	0217029	Internal fine dust filter
21	0217030	External bacterial filter
22	0217031	LEONI O_2 measuring cell
23	0217032	Air / Oxygen blender
24	0217033	Pressure reducer, O_2 inlet
25	0217034	Pressure reducer, Air inlet
26		
27		
28		
29		
30		
31		
32		
33		