LÖWENSTEIN
medical

HOME CARE

HOSPITAL

LM Flow / LM Flow 100

Instructions for Use and Technical Description

Hifent HUMID BM / BH

High-flow device with heatable humidifier

HOSPITAL HOME CARE DIAGNOSTICS

Table of Contents

Symbols

°C	Degrees Celsius	L/min	Litre per minute
	Protection class II against electric shock	IPX1	Protection class against vertical water drips (dripping water)
	Alarm condition		Electrical level of protection, BF
	Acoustic alarm switched OFF	SN	Serial number
	According to RoHS		Pay attention to the User Manual
CE 0197	According to EC directive 93/42 / EEC		Pay attentiion to the safety information
	Caution – hot surfaces		Menu open; parameter changes possible
	Heated tube		Menu blocked; Parameter-changes not possible

Warnings

- Before using this high-flow device, please read this user manual carefully.
- Do not use this high-flow device for life support.
- The high-flow device generates a positive airway pressure during operation. If the high-flow shows side effects in patients, please discontinue therapy immediately and call a physician.
- This high-flow device may only be used and adjusted on the instructions of a physician.
- Do not replace the advice of the physician with recommendations in the user manual.
- This high-flow device may only be used with humidifiers, heated breathing tubes, nasal cannulas and other accessories approved by Löwenstein Medical. The use of unapproved accessories can impair the functionality of the high-flow device or cause danger.
- In the event of a power failure or malfunction of the high-flow device, remove the nasal cannulas and shut off the oxygen supply.
- To ensure electromagnetic compatibility, this high-flow

device must be installed, tested and used in accordance with the provisions in the accompanying documents.

- Portable and mobile RF communications equipment can impair the electromagnetic compatibility of this high-flow device. Should this happen, please contact Löwenstein Medical to resolve the problem.
- This high-flow device can only be connected with the power cords specified in this document. The use of unapproved accessories and power cords to connect the high-flow device can lead to increased electromagnetic emissions or reduce immunity to electromagnetic radiation.
- Do not place this high-flow device near other devices.
  If this high-flow device is to be installed in the vicinity of other devices, inspections and observations must be made to ensure that this high-flow device can function normally in such a location. The high-flow device should be placed in a well-ventilated area and not on a soft surface.
- Do not use the high-flow device if it is surrounded by flammable and / or narcotic gases.
- Do not continue to use the high-flow device if there is obvious damage, liquid has penetrated the high-flow device, the therapy gas is too hot, or if unusual noises can be heard.
- If the high-flow device is used in accordance with the specified ambient and humidity conditions, the therapy gas temperature is below 43°C.
- The temperature and humidity of the therapy gas will be affected if the high-flow device is operated outside of the specified ambient temperature and humidity conditions.
- If the high-flow device is used outside the specified environmental conditions (temperature, humidity, etc.), the performance of the high-flow device may be affected.
- The AC input voltage should be within ± 10% of the rated voltage. AC input voltages outside of this range can damage the high-flow device.
- The high-flow device can be disturbed if it is operated in the vicinity of electrocautery, electrosurgery, defibrillation, X-rays (y-rays), infrared radiation and transient electromagnetic fields including magnetic resonance (MRI) and radio interference.
- If the high-flow device is blocked by closing the therapy tube or the

air inlet, the high-flow device may overheat or be damaged.

- If the high-flow device is connected to oxygen and the therapy tube is blocked, this can lead to an increased oxygen concentration.
- The ventilation openings are in the bottom of the humidification chamber. To avoid burns, do not touch the underside when moving the device.
- Do not carry the high-flow device during operation, do not turn it upside down or tilt it when there is water in the water chamber. This will prevent water from flowing back into the high-flow device and damaging it.
- When the high-flow device is not in use, remove the plug from the socket.
- Do not open the inside of the high-flow device. Repairs may only be carried out by authorised maintenance personnel.
- For proper disposal of the high-flow device, please contact Löwenstein Medical.
- Note: Above are general warnings and precautions. Refer to this User Manual for more detailed warnings, notes to the reader, and remarks.

Foreword

The high-flow devices of the LM Flow series are heatable high-flow devices with an integrated respiratory humidifier. In order to use this high-flow device safely and effectively, please read this user manual carefully before use.

Intended use

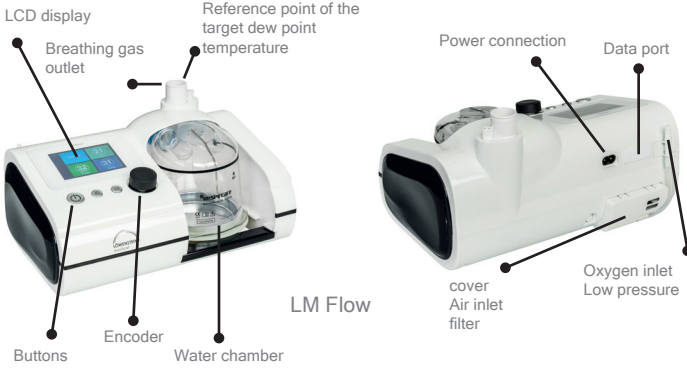
This high-flow device is suitable for patients with spontaneous breathing. For treatment, heated and humidified breathing gas with a specific flow is provided. This high-flow device is suitable for humidification treatment and oxygen therapy via nasal cannula, endotracheal intubation and tracheostomy. This product is not for life support.

Device description

Device components

The LM Flow series high-flow devices consist of the following components:

Components and functions



LCD display	Parameter display, parameter setting (only LMFlow100)
Buttons / encoders	Start/stop, parameter setting
Oxygen inlet	Connection to an external oxygen source
Power connection	Connection to the power supply
Cover, air inlet, filter	Inlet and filtering of the therapy air
Data port	Extends the functions of the device; please contact Löwenstein Medical for details
Breathing gas outlet	Connection to the heated therapy tube
Water chamber	Water supply and heating
Reference point of the target dew point temperature	Reference point of the target dew point temperature
O_2-control module	Auto FiO2 control

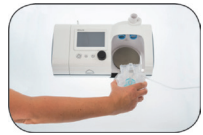
Warning: Only connect storage media approved by Löwenstein Medical to the data port.

System preparation

Warning: If the water chamber and heated therapy tube are not properly installed, please do not start the high-flow device. To avoid burns, do not touch the underside of the water chamber.

Installation ***LM Flow***

Connect the nozzle fitting to the water chamber.



To insert the water chamber, press the lock with the bottom of the water chamber and slide the water chamber onto the heating plate until the lock engages.

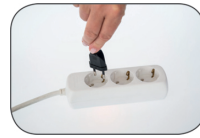
Connect the water bag / water bottle (only when using the auto-fill water chamber).

Check the water level in the water chamber.

Connect the heated tube system.

Connect the oxygen source to the oxygen tank (not necessary if no additional oxygen is required).

Connect the oxygen source to the high-flow device (not necessary if no additional oxygen is required).



Connect the LM flow to power.

*Installation **LM Flow 100***

Connect the nozzle fitting to the water chamber.

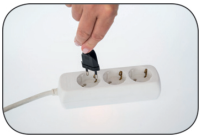
To insert the water chamber, press the lock with the bottom of the water chamber and slide the water chamber onto the heating plate until the lock engages.

Connect the water bag / water bottle.

Check the water level in the water chamber.

Connect the heated tube system.

Connect the oxygen source (not necessary if no additional oxygen is required).



Connect the LM flow 100 to power.

Notes to the reader / Warnings

→ Home care water chamber

When using the Home care water chamber, fill clean water or medical sterile water (e.g. ALLEGRA sterile water) into the water chamber. By heating the water to 100°C before use, you reduce limescale deposits in the water chamber. Do not fill the water chamber above the mark for the maximum water level.

Note to the reader: The water chamber is heated during operation. Please avoid touching the metal base of the water chamber and the heating plate of the high-flow device.

→ Clinic water chamber (Auto-Fill)

When using the Clinic AutoFill water chamber, hang a sterile water bag in a high position. Insert the inlet needle into the rubber stopper of the water bag and open the ventilation opening of the bag. The Clinic AutoFill water chamber is automatically filled with water to the intended level.

Please use sterilised water suitable for medical purposes and not more than 2000 ml.

After connecting the water bag, check that the water flows into the Clinic AutoFill water chamber and is below the marking line. Replace the clinic AutoFill water chamber in the event of problems.
Make sure that water does not leak from the Clinic AutoFill water chamber and water bag during use. Otherwise the Clinic AutoFill water chamber will run dry and impair the humidification effect.

To avoid damage to the Clinic AutoFill water chamber, avoid running empty.

→ Therapy tube

Check the therapy tube and nasal cannula before connecting them and replace them if a breakage or other damage is visible.

Do not expose uncovered skin to the heated therapy tube for a long time to avoid skin irritation caused by the heat.

Do not run the therapy tube near a heat source (e.g. heater). Do not cover large areas of the therapy tube. Otherwise the temperature may rise.

To avoid interference, the therapy tube should be kept away from all objects with electronic radiation and from electrical wires and conductors.

→ Connecting the oxygen source

LM Flow (Fig.III a)

The LM Flow high-flow device can be connected to a low-pressure oxygen source (e.g. oxygen concentrator). To do this, plug the oxygen supply hose onto the oxygen connector on the high-flow device (see Figure IIIa).

III a) Oxygen connection (Low pressure)

LM Flow 100 (Fig.III b)

The LM Flow 100 high-flow device can be connected to both a low-pressure oxygen source (e.g. oxygen concentrator) and a high-pressure oxygen source.

For connection to a low-pressure oxygen source, please proceed as described under LM Flow and Figure IIIa.

To connect to a high-pressure oxygen source, screw the connecting nut of the oxygen supply hose onto the thread of the oxygen connection of the high-flow device (see Fig. IIIb) and tighten the connecting nut firmly (hand-tight).

III b) Oxygen connection (Low pressure)

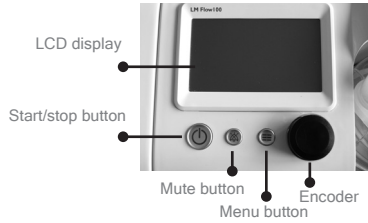
Oxygen connection (High pressure)

→ How to connect to the power supply

Connect the power cord to the power connector on the back of the high-flow device and insert the power plug into the socket. The high-flow device screen will light up indicating that the high-flow device is being properly supplied with power.

Control panel

The control panel consists of buttons and an LCD display.

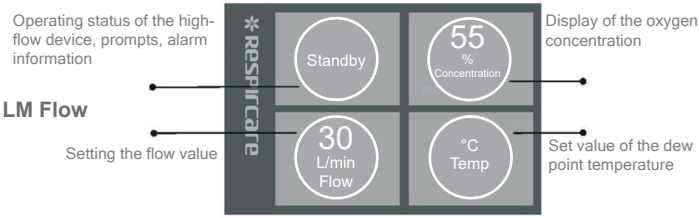


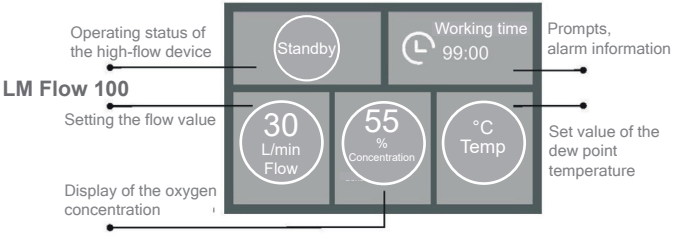
→ Buttons

Start/Stop	• Press this button in standby mode to start therapy. Press this button during the therapy to end therapy.
Mute	• Press this button to enable or disable the acoustic alarm.
Menu	• Press this button to enter the setup menu or to exit and confirm the set menu parameters.
Encoder	• The encoder has three basic functions: confirm (press), turn left, turn right.
	• In the setup menu, press the encoder to select or exit the displayed function. By turning left or right you select the different functions and can then change the values or data. The data or values are applied by pressing the encoder again.

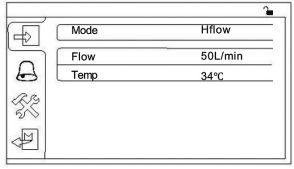
→ LCD display

- The LCD display can be operated in Monitoring mode or Setup Menu Mode.
- Monitoring mode : Displays the operating mode and monitors the oxygen concentration, flow rate and temperature.
- If no input is made for approx. 5 minutes during therapy, the high-flow device darkens the LCD display. When you press any button, the LCD display lights up again.





* Setup menu: Mode setting, Alarm setting, System configuration



→ How to connect the high-flow device

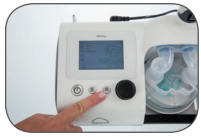
Connect the high-flow device to the mains.

→ Set parameters

Do not change the parameters without the doctor's instruction and supervision. You can skip this chapter if the high-flow device is to continue to operate with the last settings.
You cannot change the parameters if 🔒 is displayed in the upper right corner of the settings interface.

Only if 🔓 is displayed, can you change the parameters and make changes to the system configuration.

*Parameter setting **LM Flow***



Press the menu button to select the flow and temperature via the encoder.

Set the parameters with the encoder.

Set the desired oxygen concentration at the oxygen source. (Not applicable if no additional oxygen is required)

Press the Start/Stop button for 3 seconds to start therapy.

Adjust the nasal cannula.

*Parameter setting **LM Flow 100***

Select the parameters using the touchscreen.

Set the required parameters(O_2, flow, temperature) using the touchscreen / encoder.

Press the Start/Stop button for 3 seconds to start therapy.

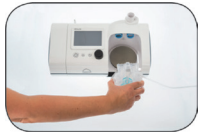
Adjust the nasal cannula.

End of therapy

LM Flow:
Disconnect/shut off the oxygen source.

LM Flow 100:
Disconnect/shut off the oxygen source.

Press the Start/Stop button for 3 seconds to end the therapy and start or end the drying mode.



Remove the tube system and disconnect the power.

Operating mode:

Parameter settings mode	
Children	• Flow: 2-25 L/min; • Temperature: 34 °C • O_2: 21-100%
Adults	• Flow: 10-80 L/min • Temperature : 31 °C, 34°C, 37°C • O_2: 21-100%

Alarm settings:

Alarm	Parameter settings	Default value
O_2 too high!	OFF, 30% - 100%	90%
O_2 too low!	OFF, 21% - 25%	21%
System alarm!	OFF, ON	OFF
System blocked!!	OFF, ON	OFF
Reset alarms	Resets the default values of the alarm parameters	

System configuration:

Clinical menu	OFF: High-flow device can only be switched ON and OFF. All other settings are blocked On: All settings can be changed.
Language	German/English

Caution:
If the high-flow device sends an alarm because the set flow value is not reached, this may be because the nasal cannula model is not suitable. In this case, it must be replaced with a larger nasal cannula. It is recommended that the NAS-1 S model be used when the flow is less than 50 L / min or the NAC-1 M model when the flow is less than 60 L / min.

Do not set the parameters without the instruction of your attending physician and use this high-flow device only under the supervision of a physician.

Incorrect alarm threshold settings can lead to false alarms.

→ Preheating

Press the Start/Stop button for 3 seconds to start the high-flow device. The screen shows “Preheating” and the high-flow device begins to warm up. Immediately afterwards the displayed flow and dew point values increase. When the set values are reached, the display value remains unchanged. The word "Active" then appears after warm up.

Warning:
Make sure that the high-flow device is already started when you connect oxygen.

Oxygen may only be connected to the oxygen inlet of the high-flow device itself. Make sure that the oxygen hose, air inlet cover, filter, and power plug are properly installed. Before ending the therapy, first shut off the oxygen source, then disconnect the oxygen hose and only switch the high-flow device to standby mode when the oxygen concentration in the high-flow device has returned to the ambient level (21 vol%).

When the high-flow device is not in use, make sure that the oxygen source is shut off to prevent oxygen accumulation in the device.

To avoid the risk of fire, special precautions must be taken during oxygen therapy. The high-flow device must not be located near sources of fire or smoke.

The high-flow device should be installed in a well-ventilated place.

For safety reasons all ignition materials should be kept away from oxygen and should not be stored in the same room with oxygen. “No

smoking, no fire", signs should be visibly hung.

Near medical oxygen equipment and accessories avoid sparks generated by static electricity (through friction).

→ Adjust the oxygen flow

Adjust the flow of the oxygen source and ensure that the oxygen concentration shown on the display of the high-flow device corresponds to the required values. The FiO2 can be controlled automatically when using the LM Flow 100.

The oxygen concentration must be within the preset range of the alarm parameters for the oxygen concentration, otherwise an alarm will sound.

Note to the reader:
The gas inhaled by the patient may be below the monitored value due to dilution by air.

→ Use

Put on the nasal cannula correctly and start the treatment.

If the external power supply is interrupted during treatment, an alarm sounds (press the mute button to switch off the alarm). In this case, the user must immediately shut off the oxygen source, remove the nasal cannula, check the power supply, and do not continue to use the high-flow device until the fault has been rectified.

→ Transport-Mode

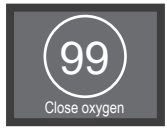
Press and hold the mute button for 3 seconds in standby, warm up or active mode so that the high-flow device switches to transport mode and the hoses and water chamber are no longer in warm up mode. The high-flow device switches back to warm up mode 20 minutes later. The device flow remains unchanged during transport mode.

→ End of therapy

When you end therapy with the high-flow device, remove the nasal cannula, shut off the oxygen source first, then disconnect the oxygen hose from the high-flow device. Press the Start/Stop button for 3 seconds.

The high-flow unit then switches to the drying mode, in which the hoses are dried. The drying mode runs for 99 minutes. The high-flow device then switches to standby mode. If the drying mode is to be switched off earlier, press the Start/Stop button for at least 3 seconds.

Warning:
If drying phases are too short, the tubes can be damaged by the remaining moisture, which can prevent reuse.

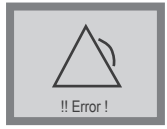


Caution:
At the end of the therapy, the oxygen must always be switched off in order to avoid an accumulation of oxygen in the high-flow device.

Warning:
To avoid possible damage to health, do not wear a nasal cannula during the drying mode.

Alarms

The high-flow devices of the LM Flow series are equipped with visual and acoustic alarm signals. The visual alarm signal appears if an alarm is triggered while using the high-flow device. The causes of alarm signals should be eliminated as soon as possible in order to avoid risks.



The visual alarm signal is shown in the figure on the right. The alarm type is explained under the symbol.

The mute button can mute the acoustic alarm for 2 minutes.

The acoustic alarm is reactivated by pressing the mute button again.

The following alarms are arranged according to internal priority:

Alarm	Problem description	Modus operandi
Internal alarm	Problem description After commissioning, an error alarm displays errors in internal parts such as the engine, and after 5 seconds an acoustic alarm sounds.	Turn off and turn on again. If this does not solve the problem, please contact Löwenstein Medical.
Check tube	The alarm appears if the high-flow device does not detect a heatable respiratory tube after starting therapy. An acoustic alarm tone sounds after 5 seconds.	Make sure the respiratory tube is not damaged and has been connected properly. If this does not solve the problem, replace the tube.
Check for leakage	If the high-flow device detects a leak, a leak alarm is displayed and an acoustic alarm tone sounds after 5 seconds.	Verify that the water chamber is installed. Check whether the therapy tube is intact and properly connected.
System blocked	If the device detects a blockage, an alarm is displayed and after 10 seconds an acoustic alarm tone sounds.	Check to see if the water chamber, therapy tube, or nasal cannula are blocked. Check whether the air inlet of the device or the filter are clogged.
Oxygen too low	If it is detected that the oxygen concentration is below the limit value, an alarm is displayed and an acoustic alarm tone sounds after 20s. The alarm setting range of the low FiO2 is between 21 to 25 vol% and OFF (setting levels: 1 vol%). The default setting is 21 vol%.	Check that the device's oxygen inlet is properly connected to the oxygen source. Adjust the flow of the oxygen source as needed.
Oxygen too high	If it is recognised that the oxygen concentration has exceeded the limit value of the high FiO2 alarm, an alarm is displayed and an acoustic alarm sounds after 20s. The range is adjustable from 30 to 100 vol% and OFF. The default setting is 100vol% (setting levels: 1vol%).	Adjust the flow of the oxygen source as needed.
Target flow	If the high-flow device does not reach the preset flow within 10 minutes (± 1 minute), an alarm is displayed. In addition, an acoustic alarm tone sounds.	Check whether the water chamber, the therapy tube or the nasal cannula are clogged. Check if the fan air inlet cover or filter are clogged.

		Check if the preset flow value is too high.
Check water level	If there is not enough water in the water chamber, an alarm is displayed and an acoustic alarm tone sounds after 20 minutes for a flow> 20l / min or after 40 min for a flow <20l / min.	Check whether the water in the water chamber has evaporated and the chamber has been damaged as a result. Make sure there is always water in the water chamber.
Target temperature	If the device does not reach the preset temperature within 30 minutes (± 3 minutes), an alarm is displayed. In addition, an acoustic alarm tone sounds.	Decrease the flow value or the target temperature if the flow of the device is too high and / or the ambient temperature is too low.
Check system	If the ambient temperature is outside the range of 16-30°C when the device is started, an alarm is displayed to check the operating condition. In addition, an acoustic alarm tone sounds after 60s (± 6s).	Do not use the device if the ambient temperature is not in the range of 16-30°C, as the preset temperature will probably not be reached. A sudden change in ambient conditions can trigger an alarm. Start the device at ambient temperature and let it run for 30 minutes. Then restart the device.
Power failure	In the operating status, after the failure of the external power supply, an acoustic alarm tone sounds after 1s and lasts longer than 120s.	Check that the power supply is properly connected and working.

The selected alarm settings remain saved in the device, even when it is switched off. After switching on the device, check whether the alarm system is working properly: Remove the heatable therapy tube. You should now see the “Check tube” alarm on the display and hear an alarm tone. Otherwise, stop using the device and contact Löwenstein Medical.

Cleaning and maintenance

The high-flow devices of the LM Flow series humidify the respiratory therapy gas with water vapor. If the regular cleaning, disinfection and replacement of parts are not carried out in accordance with these instructions, there is a risk that bacteria will settle on and in the high-flow device, which can infect the patient. The high-flow device must therefore be cleaned thoroughly before and after each use. It must be cleaned and disinfected when used on multiple patients.

→ Cleaning

Daily cleaning: Hoses, nasal cannula, water chamber. Connect the entire tube system with nasal cannula and activate the drying mode. Once dry, remove the water chamber and rinse with clean water.

Warning:
The water chamber and the therapy tube must not be cleaned with cleaning agents. Use a clean, lint-free, disposable cloth (moistened with a neutral detergent) to wipe the connector between the auto-fill water chamber and the high-flow device.

Also check that all impurities have been removed.

The power supply of the high-flow device must be disconnected before cleaning. Do not place the device in liquids.

LM Flow disinfection instructions

Installation

Press the Start/Stop button for 3 seconds to end the therapy and start or end the drying mode. Remove the tube system and disconnect the device from the power source.

Remove the tube system with the water chamber and insert the filter and the green cap as shown in the figure.

Connect the red hose to the breathing gas outlet and the ozone disinfection device to the open connection.

Press the ozone disinfection device button to start disinfection. The disinfection ends automatically after 35 minutes.

To complete disinfection, remove the filter and disconnect the therapy tube and the ozone disinfection device from the high-flow device. Do not use the device for at least one hour after disinfection.

Warning:

Disconnect the oxygen supply from the high-flow device during the disinfection process.

Before connecting the ozone disinfection device, the high-flow device must be disconnected from the mains. When the ozone disinfection device is in operation, no one should be in the same room for a long time.

→ Replacement of the accessories

In clinical use:

Replace the nasal cannula, the heated therapy tube and the autofill water chamber every 2 weeks or whenever you change patients. Replace the air inlet filter every 2 months or after 1000 hours of operation.

In non-clinical use:

Replace the nasal cannula, the heated therapy tube and the autofill water chamber every 8 weeks or whenever you change patients. The home care water chamber can be reused for up to one year. Before each use, however, check whether damage and / or leaks are visible and replace the water chamber in the event of damage or after 1 year at the latest. Replace the air inlet filter every 2 months or after 1000 hours of operation.

Service and repair

- If the high-flow device fails, contact Löwenstein Medical.
- To ensure long-term use of the high-flow device, the user must follow its safety, cleaning and disinfection guidelines.
- For proper disposal of the high-flow device, please contact Löwenstein Medical.
- The service life of the high-flow device is 10 years.
- See the label for production date information.
- For more about the guarantee: see the guarantee card.

Troubleshooting

Error	Root cause analysis	Troubleshooting
Insufficient flow	• Air inlet filter or outlet port blocked. • Respiratory tube leaking or damaged. • Water chamber not installed or damaged. • Respiratory tube connection defective. • Tube used not compatible.	• Replace the air inlet filter, clear the outlet opening from the blockage. • Replace the nasal cannula or the respiratory tube. • Wear the nasal cannula according to the manufacturer's instructions. • Check that the connection is correct and reliable. • Only use devices recommended and provided by Löwenstein Medical. • Contact Löwenstein Medical.
Excessive noise	• Incorrect installation.	• Check that the hoses are properly connected • Check whether the respiratory tube is leaking. • Check that the connection between the water chamber and the high-flow device is working correctly. • Contact Löwenstein Medical.
Internal error or device does not work	• Tubes not or incorrectly connected. • Nasal cannula or respiratory tube leaking. • The motor of the high-flow device has failed or there is another internal technical problem.	• Check that the connection between the high-flow device and the power supply is correct. • Contact Löwenstein Medical.
Dry and / or irritated upper and / or lower airways	• Inflammation • Dry air	• If necessary, adjust the temperature setting to your needs or consult a physician. • Check the water level in the water chamber.
Redness or inflammation in the contact area of the nasal cannula	• Headband too tight. • The nasal cannula model is not suitable for the patient. • The patient is allergic to the material of the nasal cannula model.	• Loosen the headband. • Consult a physician if necessary.

Water in the high-flow device	• The high-flow device has fallen into water or water has penetrated the interior of the high-flow device.	• End the therapy immediately and contact Löwenstein Medical to have the high-flow device repaired

Technical data

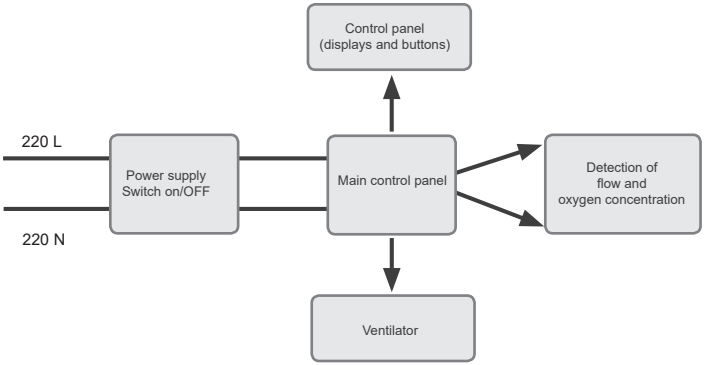
Target condensation temperature	31°C, 34°C, 37°C
Flow	10-80 L/min, (Mode: adults), 31°C, 34°C, 37°C 2-25 L/min, (Mode: children), 34°C
Max. oxygen supply	80L/min
Noise level	<20dBA at 10 L/min
Dimensions	300x197x165mm (LM Flow) 358x197x165mm (LM Flow 100)
Weight	2.0Kg(LM Flow), 2.5Kg(LM Flow 100)
High-flow device outlet	> 33 mg/L (2-60L/min, 37°C) > 10 mg/L (2~80L/min, 34°C) > 10 mg/L (2~60L/min, 31°C)
Maximum temperature of the transported gas	43°C
Preheating time	10 minutes to 31°C, 30 minutes to 37°C, (Auto-Fill-water chamber (clinic), flow 35 L/min, Initial temperature 23±2°C)
Max. capacity of the water chamber	≤ 90ml Auto-Fill-water chamber (clinic) ≤ 500ml Home care water chamber
Noise level of the acoustic alarm	45dB (A) (1 m distance)
Power supply	220VAC±22V, 50Hz±1 Hz
Fuse	F1 : 0451 005.(5N125V fast fracture) LAC1, LAC2: MEF F3.15A250V

Oxygen measuring range	21%-100%, with an accuracy of ±3%
Classification	Product class according to EC Directive 93/42/ EEC: IIa; device class Type II BF Model Pro- tection against water IPX1 Dripping water Operating mode: continuous operation. Do not use the device in an environment with air, oxygen or nitrous oxide, or other gases mixed with flammable anaesthetic gases. Air pressure: 700 - 1060 kPa. Operating temperature: 16°C - 28°C
Environmental conditions	Operating humidity: 10 - 95%, without condensation Temperature during storage and transport: -20°C - 60°C Humidity during storage and transport: 10 - 95% without condensation

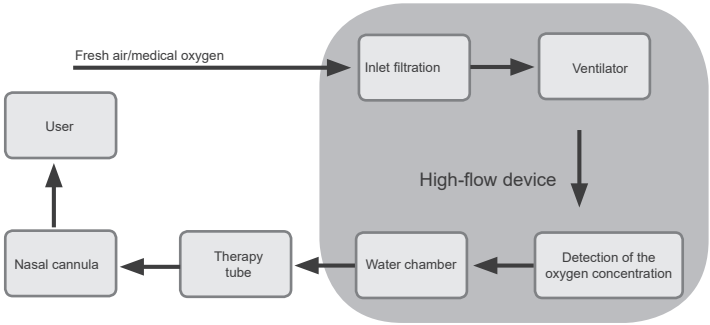
FiO2 [%], Tabelle LM-FLOW / Hifent

Gesamt Flow (L/min)	O2-Flow (L/min)																
	0	**5**	**10**	**15**	**20**	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**
5	21	100															
10	21	61	100														
15	21	47	74	100													
20	21	41	61	80	100												
25	21	37	53	68	84	100											
30	21	34	47	61	74	87	100										
35	21	32	44	55	66	77	89	100									
40	21	31	41	51	61	70	80	90	100								
45	21	30	39	47	56	65	74	82	91	100							
50	21	29	37	45	53	61	68	76	84	92	100						
55	21	28	35	43	50	57	64	71	78	86	93	100					
60	21	28	34	41	47	54	61	67	74	80	87	93	100				
65	21	27	33	39	45	51	57	64	70	76	82	88	94	100			
70	21	27	32	38	44	49	55	61	66	72	77	83	89	94	100		
75	21	26	32	37	42	47	53	58	63	68	74	79	84	89	95	100	
80	21	26	31	36	41	46	51	56	61	65	70	75	80	85	90	95	100

Electrical block diagram



Flow Block Diagram



Packing list

Item	Description	Units	Quantity
01	High-flow device	Piece	1
02	Water chamber	Set	1
03	Heatable therapy tube	Piece	1
04	Nasal cannula	Piece	1
05	Power cord	Piece	1
06	Oxygen hose set (optional)	Set	1
07	Oxygen hose	Piece	1
08	Mounting screw (optional)	Piece	3
09	filter	Piece	5
10	Guarantee card	Piece	1
11	Quality card	Set	1
12	Operating Instructions	Piece	1
13	User manual	Piece	1
14	Carrier bag	Piece	1
15	Device stand (optional)	Set	1

Appendix A Electromagnetic Compatibility

Guidelines and manufacturer's declaration on electromagnetic emissions: The high-flow device is intended for use in the electromagnetic environment described below. The buyer and the user should ensure that the high-flow device is in the electromagnetic environment described.

Immunity test	Conformity	Electromagnetic environment - guidelines
RF emission GB 4824	Group I	The high-flow device used RF energy only for its internal function. Therefore, the high-flow device has very low RF emissions and other electronic devices in the vicinity are very unlikely to be disturbed.
RF emission GB 4824	Type B	
Harmonious emission	Type A	The high-flow device is suitable for use in all facilities, including in residential buildings with a direct connection to a public low-voltage network for residential buildings.
Flow variation / Flash emission GB17625.2 OK		

Guidelines and manufacturer's declaration on electromagnetic emissions:

The high-flow device is intended for use in the electromagnetic environment described below. The buyer and the user should ensure that the high-flow device is in such an electromagnetic environment.

Immunity test	IEC60601 Test level	Compliance level	Electromagnetic Environment - Guidelines
Electrostatic discharge GB/T17626.2	±6kV contact discharge ±8kV air discharge	±6kV contact discharge ±8kV air discharge	The floor should be made of wood, concrete or ceramic tiles. If the floor is covered with synthetic material, the relative humidity should be at least 30%
Fast electrical transient disturbances GB/T17626	±2kV for power line ±1 kV for inlet / outlet line	±2kV to power line Not applicable	The power supply should be suitable for use in typical business or hospital environments.
Overvoltage GB/T17626.5	±1 kV, conductor to conductor ±2kV, conductor to ground	±1 kV conductor to conductor Not applicable	The power supply should be suitable for use in typical business or hospital environments.

Voltage dips, short interruptions and voltage fluctuations GB/T17626.11	<5% of the mains voltage Lasts 0.5 cycles at 40% of the mains voltage. Lasts 5 cycles at 70% of the mains voltage and voltage fluctuations Lasts 25 cycles <5% Ute Lasts 5S cycles	<5% of the mains voltage, Lasts 0.5 cycle 40% of the mains voltage Lasts 5 cycles 70% of the mains voltage Lasts 25 cycles <5% of the mains voltage Lasts 5S cycles	The power supply of the networks should be suitable for use in typical business or hospital environments. It is recommended to use an uninterruptible power supply or batteries if the user requires continuous operation of the high-flow device during a power interruption.
GB/T17626.8	3A/m	3A/m	The power frequency magnetic field should exhibit typical characteristics of the power frequency magnetic field in a typical business or hospital environment..

Note to the reader: Ute refers to the mains voltage before the test voltage is applied.

Guidelines and manufacturer's declaration on electromagnetic emissions:

The high-flow device is intended for use in the electromagnetic environment specified below. The buyer and user should ensure that it is used in such an electromagnetic environment.

Immunity test	IEC60601 Test level	Compliance level	Electromagnetic Environment - Guidelines
RF line GB/T17626.6	3V (effective value) 150kHz-80M Hz	3V 150kHz-80MHz	The distance for the use of portable and mobile RF communications equipment should be no less than the recommended distance from any part of the high-flow device, including power cords. This distance should be calculated using the following formula: d = 1.2 P, which corresponds to the transmitter frequency.
RF line GB/T17626.3	3V/m 80MHz-2.5GHz	3V/m 80MHz-2.5GHz	d=1.2 80MHz-800MHz d=1.2 800MHz-2.5GHz

RF line
GB/T17626.3: 3V/m
80MHz-2.5GHz: 3V/m
80MHz-800MHz: d= 1.2P
80MHz-2.5GHz: d= 1.2 P

With the following meaning:

P - the maximum output power of the transmitter specified by the manufacturer, unit: W;

d - recommended distance, unit: m;

The field strength of fixed RF transmitters must be determined by measuring "a" of the electromagnetic field and should be lower than the compliance level for each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol.

Note 1: For the frequencies 80 MHz and 800 MHz, the formula of the higher frequency band is used.

Note 2: These guidelines do not apply in all cases. Electromagnetic propagation is adversely affected by absorption and reflection from buildings, objects and human bodies.

(a) For fixed transmitters, such as base stations of mobile phones (cellular/cordless phones) and ground mobile radio, amateur radio, AM and FM radio and television broadcasting, the field strength can theoretically not be predicted accurately. In order to correctly assess the electromagnetic environment of fixed RF transmitters, the measurement of the electromagnetic field should be considered. If the measured field strength of the high-flow device is greater than the RF compliance level specified above, the therapeutic device should be observed to verify normal operation. If normal operation is not possible, additional measures may be required, e.g. readjusting the direction or location of the high-flow device.

(b) Within the entire frequency range from 150 kHz to 80 MHz, the field strengths should be less than 3 V/ m 1 .

Recommended distance between portable and mobile RF communications equipment and high-flow equipment:

The high-flow device is intended for use in an electromagnetic environment with controlled radio frequency interference. Depending on the maximum output power rating of communications equipment, the buyer or user can help prevent electromagnetic interference by maintaining the

following minimum recommended distance between portable and mobile RF communications equipment (transmitters) and the high-flow device.

Max. output power in Watt (W)	Distance of the transmission frequency in meters (m)		
	150kHz-80MHz d = 1.2	80 MHz-800MHz d = 1.2	80MHz-2.5GHz d = 2.3
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.79	3.79	7.27
100	12	12	23

For the maximum output power of transmitters not listed in the table above, the recommended distance d in meters (m) can be determined using the formula in the corresponding column for the transmitter frequency. Thereby, P is the maximum output power in watts (w) of the transmitter as specified by the manufacturer.

Note 1: For the frequencies 80 MHz and 800 MHz, the formula of the higher frequency band is used.

Note 2: These guidelines do not apply in all cases. Electromagnetic propagation is adversely affected by absorption and reflection from buildings, objects and human bodies.

Appendix B Order numbers

Figure	Name	Item no.
	LM Flow	302010004
	LM Flow 100	302010003
	Löwenstein Medical high-flow Cannulas	lmhfc2001 lmhfc2002 lmhfc2003 lmhfc2004 lmhfc2005 lmhfc2006
	Tracheostoma Adapter	303030007
	Disinfection device	303030010
	Disinfection kit	303030011

	Heated therapy tube	313030017
	Set of heated therapy tube & Autofill water chamber	303030017
	Home care water chamber	303040002
	Handle water chamber	501010141
	Air inlet filter (5 pieces per pack)	5011500017
	Trolley	402300020
	LM Flow / LM Flow 100 Instructions for use and technical description	gba10440de2005

LÖWENSTEIN
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