HAMILTON-HF90

Technical Specifications for SW version 1.0.x

Standard configuration and options (in alphabetical order)

Standard: ✓ Option: O

Functions	Standard: ✓ Option: O
Aerogen Nebulizer support	O
Battery	O
Event log (maximum 1000 events with date and time stamp)	✓
Hamilton Block protocol	O
Languages: Chinese, Croatian, Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Indonesian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Serbian, Slovak, Spanish, Swedish, Turkish	✓
Nurse call	O
O2 assist	O
O2 enrichment	✓
On-screen help	✓
Patient group: Adult/Ped, Neo/Ped	✓
RS-232 COM1 port	O
Screen lock (automatically after 2 minutes)	✓
SpO2 monitoring	O
Trends	✓
USB port	✓

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HAMILTON MEDICAL

Technical performance

Description		Specification
Flow range		*Adult/Ped*: 4 to 80 l/min[1] *Neo/Ped*: 2 to 30 l/min
Flow accuracy		±10% or ±300 ml/min, whichever is greater
Oxygen mixer range		21% to 100%
Oxygen mixer accuracy		± (volume fraction of 2.5% + 2.5% of actual reading)
Temperature range		31°C to 39°C
Temperature accuracy		±2°C
Warm-up time (including specified humidity output)		Less than 30 minutes with a Temperature setting of 38°C and Flow setting of 40 l/min (at an ambient temperature of 23°C and ambient relative humidity of 40%)
Humidity	Temperature setting 38°C to 39°C and Flow 10 to 60 l/min	Minimum humidity: 33 mg H2O/l
	Temperature setting < 38°C and Flow < 60 l/min	Minimum humidity: 16 mg H2O/l
	Flow > 60 l/min	
	Flow < 10 l/min with temperature setting > 37°C	
Display on device		*Type:* Color TFT touch screen *Size:* 800 x 480 pixels, 5 inches (127 mm) diagonal
Brightness setting for display		The range is 10% to 100% brightness. By default, Day = 80%; Night = 40%. When set to Automatic, the brightness switches between the Day and Night setting at 6 am and 6 pm.
Alarm volume (loudness)[2]		The range is 1 to 5. The default for the *Adult/Ped* patient group is 3; for *Neo/Ped*, 2.
Sound power level[3]		54.5 dB(A)
Sound pressure level[3]		46.5 dB(A)

[1] In some markets, the maximum possible Flow setting may be limited. In the USA, the maximum Flow is 60 l/min.
[2] The volume of the alarms at one (1) meter distance is between 50 dB(A) and 80 dB(A), depending on the (alarm) Loudness setting.
[3] Per ISO 80601-2-90.

Pneumatic performance

Component	Specification	
High-pressure oxygen inlet	Pressure:	2.8 to 6 bar / 41 to 87 psi
	Flow:	≤ 100 l/min
	Connector:	DISS (CGA 1240) or NIST
Low-pressure oxygen inlet	Pressure:	≤ 6 bar / 87 psi
	Flow:	≤ 60 l/min
	Connector:	Quick-coupling system, compatible with Colder Products Company (CPC) PMC series
Gas mixing system	High pressure oxygen:	21% to 100% ± (volume fraction of 2.5% + 2.5% gas level)
	Peak flow:	80 l/min ± 10%
Inspiratory outlet (*To patient* port)	Connector:	Proprietary connection between the device and the breathing circuit

Electrical specifications

Element	Specifications	
Input power	100 to 240 VAC, 50/60 Hz	
Power consumption	< 350 VA	
Battery	Supplier:	Hamilton Medical (offers optional battery)
	Electrical specifications:	10 Ah, 252 Wh
	Type:	Lithium-ion
	Recharge time:	≤ 8 hours
	Storage:	-20°C to 60°C (-4°F to 140°F)
	Normal operating time:	Typically 2 hours. Operating time is measured with a fully charged battery, with the following settings: *Adult/Ped* patient group, Flow = 40 l/min, Oxygen = 30%, Temperature = 37°C, SpO2 sensor connected. This operating time applies to a new, fully charged Li-ion battery not exposed to extreme temperatures. The actual operating time depends on battery age and on how the battery is used and recharged.

Graphical patient data

Graphic type	Options
Tren\ds	1-, 6-, 12-, 24-, or 72-h trend data for the following parameter or combination of parameters: Flow/Oxygen, SpO2/Oxygen[4], SpO2/FiO2 ratio[4], RRp[5], ROX Index[5]

[4] Only available if the SpO2 option is installed.
[5] Only if the SpO2 option is installed on the device and the RRp option is activated on the Masimo adapter.

Control settings and ranges

Parameter (units)	Range: Adult/Ped	Default: Adult/Ped	Range: Neo/Ped	Default: Neo/Ped
Flow (l/min)	4 to 80[6]	40	2 to 30	2
Oxygen (%)	21 to 100	21	21 to 100	21
Temperature (at tube exit) (°C)	31 to 39	37	31 to 39	37

Monitored parameters

Parameter (units)		Description
Standard	Flow (l/min)	The continuous and constant flow of medical gas to the patient.
	Oxygen (%)	Oxygen concentration to be delivered to the patient.
	Oxygen consumption (l/min)	The current oxygen consumption rate. Displayed when the device is running on battery power.
	Temperature (°C)	Temperature of the delivered gas at the patient end of the breathing circuit.
	Therapy duration (hours, minutes)	The length of time the patient has received therapy.
SpO2	SpO2 (%)	Arterial oxygen saturation in blood.
	Pulse rate (bpm)	Pulse.
	SpO2/FiO2 (%)	Calculated approximation of PaO2/FiO2 when SpO2 is 97% or lower[7]. Calculated as: *100*SpO2 / Oxygen*
	PI (%)	Perfusion index; pulse strength.
	PVI (%)	Pleth variability index; measure of peripheral perfusion changes.
	RRp (bpm)	Respiratory rate measured from the plethysmogram.
	ROX Index[8]	Respiratory rate oxygenation index. Calculated as: *(100*SpO2 / Oxygen) / RRp*

[6] In some markets, the maximum possible Flow setting may be limited. In the USA, the maximum Flow is 60 l/min.
[7] When SpO2 exceeds 97%, the SpO2/FiO2 ratio is not calculated.
[8] The parameter is only displayed as a Trend.

Alarms

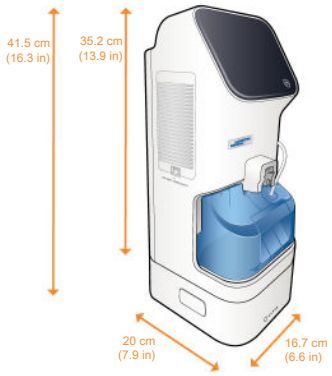
Priority	Alarm
Technical fault	Battery totally discharged, Blower fault, Total power loss
High priority	Battery communication error, Battery defective, Battery low, Battery power line error, Battery temperature high, Buzzer defective, Cannot reach target flow, Check for blockage, Device temperature high, Device tilted, Exchange tube, High gas temperature, High oxygen, High water level, Loudspeaker defective, Low oxygen, Oxygen supply failed *SpO2-related*:[9] Low SpO2
Medium priority	Battery low, Battery replacement required, Check chamber, Check tube, Confirm start-up message, Cooling fan failure, Could not resume therapy, Device tilted, Humidity low, Low gas temperature, Low water level, Maintain device, Nebulizer disconnected, Patient group changed, Touch not functional *SpO2-related*:[9] SpO2: Adapter error, SpO2: Adapter missing, SpO2: Light interference, SpO2: Low perfusion index, SpO2: Patient disconnected, SpO2: Poor signal, SpO2: Probe missing, SpO2: Sensor error, low/high PI, low/high Pulse, low/high PVI, low/high RRp, Low SpO2
Low priority	Battery low, Blower service required, Chamber type mismatching, Check ambient temperature, Check settings, Consider battery replacement, External connections disabled, Loss of external power, O2 sensor calibration needed, Service required (gold cap), Set date and time, Trial license expired *SpO2-related*:[9] High SpO2

Approvals

Description	Specification
Classification	Class I (trolley) Class IIb (HAMILTON-HF90) In accordance with Medical Device Regulation (EU) 2017/745
Declaration	The HAMILTON-HF90 was developed in accordance with pertinent international standards and FDA guidelines. The device is manufactured within an EN ISO 13485, certified quality management system. The device meets the General Safety and Performance Requirements of Medical Device Regulation (EU) 2017/745.
Electromagnetic compatibility	According to IEC 60601-1-2:2014/AMD1:2020
Ingress protection	IP22
Safety class	Class IIb, Type BF applied part (heated breathing limbs, SpO2 sensor including adapter, nebulizer (integrated or standalone)); continuous operation according to IEC 60601-1

[9] Only available if the SpO2 option is installed.

Physical characteristics



Dimension	Specification
Weight	Device (without options and trolley): ≤ 4.5 kg Device with battery (without options and trolley): ≤ 7 kg Maximum loading weight of water bag pole: 1 kg (a 1 liter water bag weighs approx. 1 kg)
Dimensions	See figure above
Trolley including accessories	Trolley and device mounting kit, device mounting kit, O2 switch connect, oxygen cylinder holder set (for one, or up to three cylinders), blue-white support arm, basket

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