

# HAMILTON-C1

## Technical specifications

The HAMILTON-C1 is unique in providing outstanding noninvasive performance in a full-featured intensive care ventilator. Due to its very compact design, it offers maximum flexibility in various user environments, be it long term care, intensive care, emergency, or respiratory care. The HAMILTON-C1 ventilator's compact, powerful design also increases the availability of appropriate modes of therapy for ventilated hospital patients.

The HAMILTON-C1 is:

- A universal ventilator for all patients from adult to neonates
- Highly mobile with integrated turbine and more than 4 hours battery life
- Small, light weight, and ideal for all intraclinical transports
- Offers an outstanding value for money

For more information, visit our website: [www.hamilton-medical.com/C1](http://www.hamilton-medical.com/C1)



# Technical specifications

## Ventilation Cockpit

Dynamic Lung	Real-time visualization of the lungs with representations of tidal volume, lung compliance, resistance and patient activity
Vent Status	Visual representation of ventilator dependency, grouped into oxygenation, CO <sub>2</sub> elimination, patient activity
ASV target graphics	Graphic display of target and actual parameters for tidal volume, frequency, pressure, patient activity and minute ventilation
Monitoring	Display of more than 50 monitoring parameters
Real-time waveforms	Paw, Flow, Volume, Plethysmogram, Capnograph
Others <sup>1)</sup>	SpO <sub>2</sub> , volumetric CO <sub>2</sub> , sidestream CO <sub>2</sub> , Loops: P-V, V-Flow, P-Flow, V-CO <sub>2</sub> , Trends: 1h, 6h, 12h, 24h, 72h

## Alarms

Operator-adjustable	Low/high minute volume, low/high pressure, low/high tidal volume, low/high rate, apnea time, low/high oxygen, low/high PetCO <sub>2</sub> <sup>1)</sup> , low/high SpO <sub>2</sub> <sup>1)</sup> , low/high pulse <sup>1)</sup> , low/high perfusion index <sup>1)</sup> , high flow <sup>1)</sup> ,
Special alarms	O <sub>2</sub> cell, disconnection, exhalation obstructed, loss of PEEP, pressure not released, flow sensor, expiratory valve, pressure limitation, performance limited, CO <sub>2</sub> <sup>1)</sup> and SpO <sub>2</sub> <sup>1)</sup> , battery, power supply, gas supply, oxygen concentration
Loudness	Adjustable (1 – 10)

## Ventilation Modes

Type	Mode	Description	Adult/Ped.	Neonatal <sup>1)</sup>
Closed-loop control	ASV	Adaptive Support Ventilation. Guaranteed minute volume based on user setting and application of lung-protective rules.	✓	
Pressure	PCV+	Pressure-controlled ventilation. Biphasic breathing	✓	✓
	PSIMV+	Pressure-controlled synchronized intermittent mandatory ventilation	✓	✓
	SPONT	Pressure support ventilation	✓	✓
	APRV <sup>1)</sup>	Airway pressure release ventilation	✓	✓
Volume	DuoPAP <sup>1)</sup>	Duo positive airway pressure	✓	✓
	(S)CMV+/APVcmv	(Synchronized) controlled mandatory ventilation	✓	✓
Noninvasive	SIMV+/APVsimv	Synchronized intermittent mandatory ventilation	✓	✓
	NIV <sup>1)</sup>	Noninvasive ventilation: optional	✓	✓
	NIV-ST <sup>1)</sup>	Spontaneous / timed noninvasive ventilation	✓	✓
	nCPAP <sup>1)</sup>	Nasal Continuous Positive Airway Pressure		✓
	nCPAP-PC <sup>1)</sup>	Nasal Continuous Positive Airway Pressure - pressure control		✓

## Maintenance

Blower lifetime	Dynamic lifetime surveillance; typically 8 years. 5 years warranty.
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<sup>1)</sup> optional - not available in all markets

# Technical specifications

**Standards** IEC 60601-1, IEC 60601-1-2, ISO 80601-2-12, CAN/CSA-C22.2 No. 60601-1, UL 60601-1

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## Configurations

Trolley Accessories	Humidifier support, cylinder holder, tubing support arm
Options <sup>1)</sup>	Volumetric mainstream capnography, sidestream capnography, DuoPAP/APRV, NIV/NIV-ST, Trends/Loops, Neonatal application, nCPAP/nCPAP-PC; SpO <sub>2</sub>

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## Electrical and gas supplies

Input voltage	100 to 240 V AC -15%/+10%, 50/60 Hz
Power consumption	50 VA typical, 150 VA maximum
Backup battery time	Typical 4 h, maximum 4 h 30 min <sup>2)</sup>
Oxygen supply	280 to 600 kPa (41 to 87 psi), V <sub>max</sub> 200 l/min
Low pressure oxygen	≤15 l/min, max. 600 kPa (87 psi) for low pressure
Air supply	Integrated turbine
Degree of protection	IP21

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## Environment

Temperature	Operating: 5°C to 40°C Storage: -20°C to 60°C
Humidity	10% to 95% non condensing (operating and storage)
Altitude	Up to approx. 4,000 m (13,120 ft) 1,100 to 600 hPa

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**Interface connectors** USB, COM1 (RS-232)<sup>1)</sup>, nurse call <sup>1)</sup>, CO<sub>2</sub> <sup>1)</sup>, SpO<sub>2</sub> <sup>1)</sup>

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**Event log** Storage and display of up to 1,000 events with date and time stamp

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**IntelliTrig** Automatic response to varying leaks and adaption of trigger sensitivity in all modes

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<sup>1)</sup> Optional - not available in all markets

<sup>2)</sup> Reduced display brightness

# Technical specifications

## Controls

Type	Adult / Pediatric	Neonatal <sup>1)</sup>
Special functions	Manual breath, O <sub>2</sub> enrichment, standby, sigh, screen lock, apnea backup ventilation, inspiratory hold, print screen, suctioning tool, dimmable screen, configurable quick-start settings, start-up over patient height and gender, integrated pneumatic nebulizer, O <sub>2</sub> consumption display	Manual breath, O <sub>2</sub> enrichment, standby, screen-lock, apnea backup ventilation, inspiratory hold, print screen, suctioning tool, dimmable screen, configurable quick-start settings, start-up over body weight, O <sub>2</sub> consumption display
Ventilation modes	See page 2, Ventilation modes	See page 2, Ventilation modes
Patient groups	adult / pediatric	neonatal
Patient height	30 to 250 cm	-
Patient gender	male / female	-
Patient weight	-	0.2 to 30 kg
(S)CMV+/APVcmv	4 to 80 b/min	15 to 80 b/min
SIMV+/APVsimv+	1 to 80 b/min	1 to 80 b/min
PCV+	4 to 80 b/min	15 to 80 b/min
NIV-ST	5 to 80 b/min	15 to 80 b/min
PSIMV+	5 to 80 b/min	5 to 80 b/min
DuoPAP	1 to 80 b/min	1 to 80 b/min
APRV	1 to 80 b/min	1 to 80 b/min
nCPAP-PC	-	10 to 80 b/min
Tidal volume	20 to 2,000 ml	2 to 300 ml
PEEP/CPAP	0 to 35 cmH <sub>2</sub> O	3 to 25 cmH <sub>2</sub> O
Oxygen	21% to 100%	21% to 100%
I:E ratio	1:9 to 4:1 (DuoPAP 1:599 to 149:1)	1:9 to 4:1 (DuoPAP 1:599 to 149:1)
%MinVol (ASV)	25% to 350%	-
Inspiratory time (TI)	0.1 to 12 s	0.1 to 12 s
Flow trigger	off, 1 to 20 l/min	off, 0.1 to 5 l/min
Pressure control	5 to 60 cmH <sub>2</sub> O, added to PEEP/CPAP	0 to 45 cmH <sub>2</sub> O, added to PEEP/CPAP
Pressure support	5 to 60 cmH <sub>2</sub> O, added to PEEP/CPAP	0 to 45 cmH <sub>2</sub> O, added to PEEP/CPAP
Pressure ramp	0 to 2,000 ms	0 to 600 ms
P high (APRV/DuoPAP)	0 to 60 cmH <sub>2</sub> O	0 to 45 cmH <sub>2</sub> O
P low (APRV)	0 to 35 cmH <sub>2</sub> O	0 to 25 cmH <sub>2</sub> O
T high (APRV/DuoPAP)	0.1 to 40 s	0.1 to 40 s
T low (APRV)	0.2 to 40 s	0.2 to 40 s
Expiratory trigger sensitivity (ETS)	5% to 80% of peak inspiratory flow	5% to 80% of peak inspiratory flow
Peak flow	up to 260 l/min	up to 40 l/min

<sup>1)</sup> Optional - not available in all markets

# Technical specifications

## Monitoring parameters

Type	Parameter	Unit	Description	Numeric monitoring	Wave-forms	Vent Status	Dynamic Lung
Pressure	Paw	cmH <sub>2</sub> O;mbar;hPa	Real-time airway pressure		✓		
	Ppeak	cmH <sub>2</sub> O;mbar;hPa	Peak airway pressure	✓			
	Pmean	cmH <sub>2</sub> O;mbar;hPa	Mean airway pressure	✓			
	Pinsp	cmH <sub>2</sub> O;mbar;hPa	Inspiratory pressure			✓	
	PEEP/CPAP	cmH <sub>2</sub> O;mbar;hPa	Positive end expiratory pressure/ continuous positive airway pressure	✓		✓	
	Pplateau	cmH <sub>2</sub> O;mbar;hPa	Plateau or end inspiratory pressure	✓			
Flow	Flow	l/min	Real-time inspiratory flow		✓		
	Insp Flow	l/min	Peak inspiratory flow	✓			
	Exp Flow	l/min	Peak expiratory flow	✓			
Volume	Volume	ml	Real-time tidal volume		✓		✓
	VTE	ml	Expiratory tidal volume	✓			
	VTI/VTI NIV	ml	Inspiratory tidal volume	✓			
	ExpMinVol/MinVol NIV	l/min	Expiratory minute volume	✓		✓	
	MVSpont/MVSpont NIV	l/min	Spontaneous expiratory minute volume,	✓			
	Leak/MV Leak	%;l/min	Leakage minute volume Leakage percentage at the airway	✓			
Time	I:E		Inspiratory-expiratory ratio	✓			✓
	fTotal	b/min	Total breathing frequency	✓			✓
	fSpont	b/min	Spontaneous breathing frequency	✓			
	TI	s	Inspiratory time	✓			✓
	TE	s	Expiratory time	✓			✓
	%fSpont	%	Percentage of spontaneous breathing rate	✓		✓	
Lung mechanics	Cstat	ml/cmH <sub>2</sub> O	Static compliance	✓			✓
	AutoPEEP	cmH <sub>2</sub> O;mbar;hPa	AutoPEEP or intrinsic PEEP	✓			
	RCexp	s	Expiratory time constant	✓			
	Rinsp	cmH <sub>2</sub> O*s/l	Inspiratory flow resistance	✓			✓
	RSB	1/l*min	Rapid shallow breathing index	✓		✓	
	PTP	cmH <sub>2</sub> O*s;mbar*s	Pressure-time product	✓			
Oxygen	PO.1	cmH <sub>2</sub> O;mbar;hPa	Airway occlusion pressure	✓			
	O <sub>2</sub>	%	Airway oxygen concentration (FiO <sub>2</sub> )	✓		✓	
Carbon dioxide <sup>1)</sup>	CO <sub>2</sub>	mmHg;%;kPa	Real-time CO <sub>2</sub> measurement		✓		
	FetCO <sub>2</sub>	%	Fractional end-tidal CO <sub>2</sub> concentration	✓	✓		
	PetCO <sub>2</sub>	mmHg;Torr;kPa	End-tidal CO <sub>2</sub> partial pressure	✓	✓		✓
	SlopeCO <sub>2</sub>	%CO <sub>2</sub> /l	V/Q status of the lung	✓			
	VTalv	ml	Alveolar tidal ventilation	✓			
	VTalv/min	ml	Alveolar minute ventilation	✓			
	V'CO <sub>2</sub> /min	ml/min	CO <sub>2</sub> elimination	✓			
	VDaw	ml	Airway dead space	✓			
	VDaw/VTE	%	Dead space fraction measured at the airway opening	✓			
	VeCO <sub>2</sub>	ml	Exhaled volume of CO <sub>2</sub>	✓			
VICO <sub>2</sub>	ml	Inspired volume of CO <sub>2</sub>	✓				

<sup>1)</sup> Optional - not available in all markets

# Technical specifications

## Monitoring parameters

Type	Parameter	Unit	Description	Numeric monitoring	Wave-forms	Vent Status	Dynamic Lung
SpO <sub>2</sub> <sup>1)</sup>	Plethysmogram	-	Real-time Plethysmogram		✓		
	SpO <sub>2</sub>	%	Arterial oxygen saturation in blood	✓			✓
	Pulse	1/min	Heart rate	✓			✓
	Perfusion index	ml/dl	calculation of the oxygen content	✓			
	SpO <sub>2</sub> /FiO <sub>2</sub>	-	Calculated approximation of PaO <sub>2</sub> /FiO <sub>2</sub>	✓			

## Physical dimensions

Size	See illustrations below
Weight	4.9 kg (10.8 lb) without trolley
Display	8.4 in, TFT color, backlit, touch screen
Main patient outlet	ISO 5356-1; 22M/15F
Oxygen inlet	DISS or NIST male
Low oxygen inlet	CPC quick coupling, 3.2 mm ID



<sup>1)</sup> Optional - not available in all markets