HAMILTON-MR1

Technical specifications

The HAMILTON-MR1 guarantees uncompromised continuous ventilation care from the ICU to the MRI scanner and back. Its reliability and high performance, with advanced lung-protective strategies and patient-adaptive modes, make the HAMILTON-MR1 the ideal choice for any critical care department that needs to transport ventilated patients to the MRI department.

- MRI Conditional (up to 50 mT)
- Integrated TeslaSpy gaussmeter
- Adult, pediatric, and neonatal ventilation
- More than 9 h of battery operating time
- Independent air supply
- Advanced ventilation modes including ASV®

For more information, visit our website: **www.hamilton-medical.com/MR1**

Swiss Quality

HAMILTON MEDICAL

Intelligent Ventilation since 1983

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, 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 30 monitoring parameters
Real-time waveforms	Paw, Flow, Volume
Others [1)]	Loops: P-V, V-Flow, P-Flow, Trends: 1, 6, 12, 24, and 72 hours

Alarms

Operator adjustable	Low/high minute volume, low/high pressure, low/high tidal volume, low/high rate, apnea time, low/high oxygen, high flow[1)]
Special alarms	O_2 cell, disconnection, exhalation obstructed, loss of PEEP, pressure not released, flow sensor, expiratory valve, pressure limitation, performance limited, battery, power supply, gas supply, oxygen concentration
Loudness	Adjustable (1 – 10)

Ventilation Modes

Type	Mode	Description	Adult/Ped.	Neonatal[1)]
Closed-loop control	ASV	Adaptive Support Ventilation. Guaranteed minute volume based on user settings 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[1)]	Airway pressure release ventilation	✓	✓
	DuoPAP[1)]	Duo positive airway pressure	✓	✓
Volume	(S)CMV+/APVcmv	(Synchronized) controlled mandatory ventilation	✓	✓
	SIMV+/APVsimv	Synchronized intermittent mandatory ventilation	✓	✓
Noninvasive	NIV[1)]	Noninvasive ventilation: optional	✓	✓
	NIV-ST[1)]	Spontaneous / timed noninvasive ventilation	✓	✓
	nCPAP[1)]	Nasal continuous positive airway pressure		✓
	nCPAP-PC[1)]	Nasal continuous positive airway pressure - pressure control		✓

Maintenance

Blower lifetime	Dynamic lifetime surveillance; typically 8 years. 5 year warranty.

[1)] optional - not available in all markets

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Standards	IEC 60601-1, IEC 60601-1-2, ISO 80601-2-12, CAN/CSA-C22.2 No. 60601-1, UL 60601-1
Configurations	
Trolley accessories	Cylinder holder, auto-lock brake
Options [1]	DuoPAP/APRV, NIV/NIV-ST, Trends/Loops, Neonatal application, nCPAP/nCPAP-PC
Electrical and gas supplies	
Input voltage	100 to 240 V AC -15%/+10%, 50/60 Hz
Power consumption	50 W typical, 120 W maximum
Backup battery time	Typical 8 h, maximum 9 h 25 min[2] with two internal batteries
Oxygen supply	280 to 600 kPa (41 to 87 psi), V´max 200 l/min
Air supply	Integrated blower
Degree of protection	IP21
Environment	
Temperature	Operating: 5°C to 40°C Storage: -20°C to 60°C
Humidity	10% to 95%, noncondensing (operating and storage)
Altitude	Up to approx. 3,000 m (9842 ft), 1,100 to 700 hPa
Interface connectors	USB
Event log	Storage and display of up to 1,000 events with date and time stamp
IntelliTrig	
Leak compensation	Automatic response to varying leaks and configurable trigger sensitivity in all modes Inspiratory leakage up to 85 l/min, expiratory leakage up to 40 l/min

[1] Optional - not available in all markets

[2] Reduced display brightness

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Controls

Type	Adult / Pediatric	Neonatal [1)]
Special functions	Manual breath, O_2 enrichment, standby, sigh, screen lock, apnea backup ventilation, inspiratory hold, print screen, suctioning tool, dimmable screen, configurable quick-start settings, start up settings based on patient height and gender, integrated pneumatic nebulizer, O_2 consumption display	Manual breath, O_2 enrichment, standby, screen lock, apnea backup ventilation, inspiratory hold, print screen, dimmable screen, configurable quick-start settings, start up settings based on body weight, O_2 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	15 to 80 b/min (without IntelliSync 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_2O	3 to 25 cmH_2O
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_2O, added to PEEP/CPAP	0 to 45 cmH_2O, added to PEEP/CPAP
Pressure support	0 to 60 cmH_2O, added to PEEP/CPAP	0 to 45 cmH_2O, added to PEEP/CPAP
Pressure ramp	0 to 2,000 ms	0 to 600 ms
P high (APRV/DuoPAP)	0 to 60 cmH_2O	0 to 45 cmH_2O
P low (APRV)	0 to 35 cmH_2O	0 to 25 cmH_2O
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

[1)] Optional - not available in all markets

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Monitoring parameters

Type	Parameter	Unit	Description	Numeric monitoring	Wave-forms	Vent Status	Dynamic Lung
Pressure	Paw	cmH_2O;mbar;hPa	Real-time airway pressure		✓		
	Ppeak	cmH_2O;mbar;hPa	Peak airway pressure	✓			
	Pmean	cmH_2O;mbar;hPa	Mean airway pressure	✓			
	Pinsp	cmH_2O;mbar;hPa	Inspiratory pressure			✓	
	PEEP/CPAP	cmH_2O;mbar;hPa	Positive end expiratory pressure/ continuous positive airway pressure	✓		✓	
	Pplateau	cmH_2O;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	✓			
	I:E		Inspiratory-expiratory ratio	✓			✓
Time	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	✓		✓	
	Cstat	ml/cmH_2O	Static compliance	✓			✓
Lung mechanics	AutoPEEP	cmH_2O;mbar;hPa	AutoPEEP or intrinsic PEEP	✓			
	RCexp	s	Expiratory time constant	✓			
	Rinsp	cmH_2O*s/l	Inspiratory flow resistance	✓			✓
	RSB	1/l*min	Rapid shallow breathing index	✓		✓	
	PTP	cmH_2O*s;mbar*s	Pressure-time product	✓			
	P0.1	cmH_2O;mbar;hPa	Airway occlusion pressure	✓			
Oxygen	O_2	%	Airway oxygen concentration (FiO_2)	✓		✓	

[1] Optional - not available in all markets

Technical specifications

MR clearance

MRI Conditional	1.5 and 3.0 T static magnetic flield
Proximity to MRI scanner	50 mT
Gaussmeter	TeslaSpy

Physical dimensions

Size	See illustrations below
Weight	6.8 kg (15 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

[1] Optional - not available in all markets

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