# SERVO-U<sup>®</sup> Ventilation

DATASHEET





### **General Specifications**

Specifications	
Intended use	The SERVO-U <sup>®</sup> Ventilator system is:
	<ul> <li>Intended for respiratory support, monitoring and treatment of neonatal, pediatric and adult patients</li> </ul>
	<ul> <li>To be used only by healthcare providers</li> </ul>
	<ul> <li>To be used only in professional healthcare facilities and for transport within these facilities</li> </ul>
	For NAVA <sup>®</sup> and Edi monitoring, it is in addition intended: <ul> <li>To provide monitoring of the patient's breathing drive</li> </ul>
	<ul> <li>To improve synchrony between the ventilator system and patient when the electrical signal from the brain to the diaphragm is active</li> </ul>
	<ul> <li>For use on all patients with no contraindication for insertion/exchange of a nasogastric tube</li> </ul>
Instructions for use	(See user's manual)
Legal manufacturer	Maquet Critical Care AB
Other products	(See separate data sheets — contact your Maquet Sales Representative for more information)

# General Ventilator Specifications

Specifications	SERVO-U	SERVO-U on mobile cart
Base system weight	<ul> <li>Approx. 50 lb 11 oz (23 kg)</li> <li>Patient unit 33 lb 1 oz (15 kg</li> <li>User interface 8 lb 13 oz (4 kg)</li> <li>Handle 7 lb (3 kg)</li> <li>Cable holder and cable 2 lb 3 oz (1 kg)</li> </ul>	<ul> <li>Approximately 77 lb 3 oz (35 kg)</li> <li>Base system approx. 50 lb 11 oz (23 kg)</li> <li>Mobile cart 27 lb 9 oz (12.5 kg)</li> </ul>
Dimensions of base (See Technical Drawings on page 13)	14.5 W x 8.1 D in (368 W x 205 D mm)	25.5 W x 21.5 D in (incl. wheels) (647 W x 547 D mm) (incl. wheels)
Height (includes user interface)	32.5 in (826 mm)	53.9 in (1368 mm)
Wheels	N/A	4 wheels with separate brakes
A-weighted sound pressure level (LpA)	<40 dB, measured at a distance of	of 3 ft 3 in (1 m)
A-weighted sound power level (LWA)	<51 dB	

#### General Ventilation Specifications

Specifications	
Patient range	<ul> <li>Standard configuration: 7 lb to 551 lb 2 oz (3 to 250 kg)</li> </ul>
	<ul> <li>Neonatal option: 11 oz to 17 lb 10 oz (0.3 to 8 kg)</li> </ul>
Bias flow	Adult: 2 I/min
	<ul> <li>Pediatric and neonatal: 0.5 l/min</li> </ul>
Internal compressible factor	Max. 0.2 ml/cmH <sub>2</sub> O
Gas delivery system	Microprocessor controlled valves
Maximum airway pressure	125 cmH₂O
Method of triggering	Flow, pressure and Edi (with Edi module and Edi catheter)
Inspiratory flow range	<ul> <li>Adult: 0 to 200 l/min</li> </ul>
	<ul> <li>Pediatric and neonatal: 0 to 33 I/min</li> </ul>
Pressure drop	<ul> <li>Max. 6 cmH<sub>2</sub>O at a flow of 60 l/s (insp. channel)</li> </ul>
	<ul> <li>Max. 3 cmH<sub>2</sub>O at a flow of 60 l/s (exp. channel)</li> </ul>
PEEP regulation	Microprocessor controlled valve
Rise time, expiratory flow measurement	<12 ms for 10% to 90% response at flow of 3 to 192 l/min
Expiratory flow range	0 to 192 l/min
User interface	
Туре	TFT-LCD touchscreen
Size	14.4 x 11.8 in (366 x 300 mm)
Viewing area	15 in XGA, 1024 x 768 pixels with a 24-bit color palette
Weight	Approximately 8 lb 13 oz (4 kg)

### Power Supply Specifications

Specifications	
Power supply, automatic range selection:	<ul> <li>100V to 120V AC, 2.5 A, 50 to 60 Hz</li> </ul>
	<ul> <li>220V to 240V AC, 1.5 A, 50 to 60 Hz</li> </ul>
Plug-in battery module:	
Battery backup (nickel-metal hydride, NiMH)	Six battery module slots - two batteries are delivered with the ventilator
Battery capacity	Rechargeable, 12V, 3.5 Ah each
Battery backup time	Ranging from 50 minutes (2 batteries) to 150 minutes (6 batteries)
Recharge time	Approximately 3 hr/battery
External 12V DC	12.0V to 15.0V DC, 10 A
Typical min. power consumption (no optional modules, no ongoing battery charging, normal panel backlight)	110 VA, 40 W
Typical max. power consumption (with CO <sub>2</sub> , Edi and Y sensor modules, ongoing battery charging, max. panel backlight)	210 VA, 85 W

#### Gas Supply Specifications

Specifications	
Inlet gas pressure air/O <sub>2</sub>	200 to 600 kPa / 2.0 to 6.0 bar / 29 to 87 PSI
Connection standards available	AGA, DISS, NIST, or French standard
Unavailable gas/loss of gas pressure	The flow from an unavailable gas (air or $O_2$ ) is automatically compensated for so that the patient gets the preset volume and pressure
Patient system gas connectors	Male 22 mm / female 15 mm — in accordance with ISO 5356-1
Gas exhaust port	Male 30 mm cone

#### **Operating Conditions Specifications**

Specifications	
Temperature	50° to 104°F (10° to 40°C)
Relative humidity	15% to 95% non-condensing
Atmospheric pressure	660 to 1060 hPa
Lowest pressure in patient circuit	-400 cmH <sub>2</sub> O

#### Non-operating Conditions Specifications

Specifications	
Temperature	-13° to 140° F (-25° to 60°C)
Relative humidity	<95% condensing
Atmospheric pressure	470 to 1060 hPa
Lowest pressure in patient circuit	N/A

#### Standards-Safety and Functionality Specifications

Specifications	
<b>CE</b> 0123	The device complies with requirements and classification IIb of Medical Device Directive $93/42/EEC - CE$ Mark Notified Body number: 0123
Classification	IEC 60601-1: 2005, Class I, continuous operation
Standards	<ul> <li>ISO 80601-2-12:2011, ISO 80601-2-55:2011, EN 13544-1:2007+A1:2009</li> </ul>
	<ul> <li>IEC 60601-1, Type B (equipment making physical contact with the patient and the gas pathways)</li> </ul>
	<ul> <li>IEC 60601-1, Type BF (CO<sub>2</sub> analyzer, Y sensor, nebulizer patient unit and cable)</li> </ul>
	<ul> <li>IEC 60601-1, Type CF — defibrillation proof (Edi catheter and cable)</li> </ul>
Ingress protection	IP 21
Electromagnetic compatibility (EMC)	<ul> <li>According to limits specified in IEC 60601-1-2: 2007</li> <li>The 'EMC Declaration, Information to the Responsible Organization' is available from Maquet</li> </ul>

#### **Display Specifications**

Specifications	
Views	BASIC View
	ADVANCED View
	LOOPS View
	DISTANCE View
	FAMILY View
	Each of the screen layout views offers a specific combination of displayed waveforms, loops and presented values
Real time waveforms	Pressure
	• Flow
	Volume
	<ul> <li>CO<sub>2</sub> (with CO<sub>2</sub> analyzer option)</li> </ul>
	<ul> <li>Edi (with Edi module and Edi catheter)</li> </ul>
Loops	Pressure — Volume
	Pressure — Flow
	Volume — Flow
	A reference loop and three overlaying loops can be displayed

#### Ventilation Modes Specifications

Invasive Ventilation Modes Specifications	
Controlled ventilation	<ul> <li>PC (Pressure Control)</li> <li>VC (Volume Control)</li> <li>PRVC (Pressure Regulated Volume Control)</li> </ul>
Supported ventilation	<ul> <li>PS/CPAP (Pressure Support / Continuous Positive Airway Pressure)</li> <li>VS (Volume Support)</li> </ul>
Automode (option)	<ul> <li>Control mode: VC &lt;&gt; Support mode: VS</li> <li>Control mode: PC &lt;&gt; Support mode: PS</li> <li>Control mode: PRVC &lt;&gt; Support mode: VS</li> </ul>
Combined ventilation	<ul> <li>SIMV (VC) + PS (Synchronized Intermittent Mandatory Ventilation)</li> <li>SIMV (PC) + PS</li> <li>SIMV (PRVC) + PS</li> <li>Bi-Vent/APRV (Airway Pressure Release Ventilation)</li> </ul>
NAVA®	<ul> <li>Neurally Adjusted Ventilatory Assist via endotracheal tube or tracheostomy</li> </ul>

NOTE: VC and SIMV (VC) + PS and Automode VC <-> VS are not available in the neonatal patient category.

Non-invasive Ventilation Modes Specifications	
Controlled ventilation	NIV PC (option)
Supported ventilation	<ul><li>NIV PS (option)</li><li>Nasal CPAP (option)</li></ul>
NIV NAVA	<ul> <li>Neurally Adjusted Ventilatory Assist via non-invasive patient interfaces (option)</li> </ul>
NOTE: Nasal CPAP is not available in the adult patient category.	

NOTE: Nasal CPAP is not available in the adult patient category. NOTE: NIV PS is not available in the neonatal patient category.

### Non-invasive Ventilation Specifications

Specifications	
Maximum leakage compensation level	<ul> <li>Neonatal/pediatric: 25 l/min (20 l/min Nasal CPAP)</li> <li>Adult: 65 l/min</li> </ul>
Disconnection flow (configurable)	<ul> <li>Low: 7.5 l/min</li> <li>High: Adult — 40 l/min Neonatal/pediatric — 15 l/min</li> <li>Disabled: Deactivates disconnection detection</li> </ul>
Connection detection	Manual or automatic via bias flow

#### Parameter Settings

Settings	Neonatal Range	Pediatric Range	Adult Range
Tidal volume	2 to 50 ml	10 to 350 ml	100 to 4000 ml
Minute volume	0.1 to 7.5 l/min	0.3 to 20 l/min	0.5 to 60 l/min
Apnea, time to alarm	2 to 45 s	2 to 45 s	15 to 45 s
Maximum apnea time in Automode	3 to 15 s	3 to 15 s	7 to 12 s
Pressure level above PEEP	0 to 80 cmH <sub>2</sub> O	0 to 80 cmH <sub>2</sub> O	0 to 120 cmH <sub>2</sub> O
Pressure level above PEEP in NIV	0 to 30 cmH <sub>2</sub> O	0 to 30 cmH <sub>2</sub> O	0 to 30 cmH <sub>2</sub> O
PEEP	1 to 50 cmH <sub>2</sub> O	1 to 50 cmH <sub>2</sub> O	1 to 50 cmH <sub>2</sub> O
PEEP in NIV	2 to 20 cmH <sub>2</sub> O	2 to 20 cmH <sub>2</sub> O	2 to 20 cmH <sub>2</sub> O
CPAP pressure	2 to 20 cmH <sub>2</sub> O	2 to 20 cmH <sub>2</sub> O	-
Respiratory rate	4 to 150 breaths/min	4 to 150 breaths/min	4 to 100 breaths/min
SIMV rate	1 to 60 breaths/min	1 to 60 breaths/min	1 to 60 breaths/min
Breath cycle time, SIMV	0.5 to 15 s	0.5 to 15 s	1 to 15 s
P <sub>High</sub>	2 to 50 cmH <sub>2</sub> O	2 to 50 cmH <sub>2</sub> O	2 to 50 cmH <sub>2</sub> O
T <sub>High</sub>	0.2 to 30 s	0.2 to 30 s	0.2 to 30 s
T <sub>PEEP</sub>	0.1 to 10 s	0.1 to 10 s	0.1 to 10 s
PS above P <sub>High</sub>	0 to 79 cmH <sub>2</sub> O	0 to 79 cmH <sub>2</sub> O	0 to 119 cmH <sub>2</sub> O
O <sub>2</sub> concentration	21% to 100%	21% to 100%	21% to 100%
I:E ratio	1:10 to 4:1	1:10 to 4:1	1:10 to 4:1
Ti	0.1 to 5 s	0.1 to 5 s	0.1 to 5 s
NAVA level	0 to 15 cmH <sub>2</sub> O/μV	0 to 15 cmH <sub>2</sub> O/µV	0 to 15 cmH <sub>2</sub> O/ $\mu$ V
Edi trigger	0.1 to 2.0 μV	0.1 to 2.0 µV	0.1 to 2.0 µV
T <sub>Pause</sub>	-	0 to 1.5 s	0 to 1.5 s
T <sub>Pause</sub> (% of breath cycle time)	_	0% to 30%	0% to 30%
Flow trigger	0 to 0.5 l/min	0 to 0.5 l/min	0 to 2.0 l/min
Pressure trigger	-1 to -20 cmH <sub>2</sub> O	-1 to -20 cmH <sub>2</sub> O	-1 to -20 cmH <sub>2</sub> O
Insp. rise time (% of breath cycle time)	0% to 20%	0% to 20%	0% to 20%
Insp. rise time	0 to 0.2 s	0 to 0.2 s	0 to 0.4 s
End inspiration (% of peak flow)	1% to 70%	1% to 70%	1% to 70%
End inspiration (% of peak flow) in NIV	10% to 70%	10% to 70%	10% to 70%

#### Back-up Parameter Settings

Settings	Neonatal Range	Pediatric Range	Adult Range
Inspiratory tidal volume	2 to 50 ml	10 to 350 ml	100 to 4000 ml
Pressure level above PEEP in back-up	5 to 80 cmH <sub>2</sub> O	5 to 80 cmH <sub>2</sub> O	5 to 120 cmH <sub>2</sub> O
Pressure level above PEEP in NIV back-up	5 to 30 cmH <sub>2</sub> O	5 to 30 cmH <sub>2</sub> O	5 to 30 cmH <sub>2</sub> O
Respiratory rate in back-up	4 to 150 breaths/min	4 to 150 breaths/min	4 to 100 breaths/min
I:E ratio	1:10 to 4:1	1:10 to 4:1	1:10 to 4:1
Ti	0.1 to 5 s	0.1 to 5 s	0.1 to 5 s

#### Special Functions Settings

Special Functions	Setting Range
Manual breath	Initiation of 1 breath (In SIMV mode initiation of 1 mandatory breath)
Static measurements	Insp. or exp. hold (0 to 30 seconds)
Nebulization	5 to 30 min/Continuous/Off
O <sub>2</sub> boost level	Off, 1% to 79%
O <sub>2</sub> boost function	Activate O <sub>2</sub> boost up to 1 minute
Leakage compensation	On/Off
Circuit compensation	On/Off
Edi monitoring	In all ventilation modes and in Standby (with Edi module and Edi catheter)
Previous mode	Activates previously used mode
Backup ventilation	Back-up On/Off
Apnea management	Several parameters

### Disconnection / Suction Specifications

. .. ..

Specifications	
Pre-oxygenation time	Maximum 2 minutes
Post-oxygenation time	Maximum 1 minute
Patient disconnected	High priority alarm activated after 1 minute
Adjustable oxygen level	21% to 100%

# Monitoring and Trends Specifications

Peak airway pressurePpeakPause airway pressurePheanPause airway pressurePEPPositive end expiratory pressurePEPContinuous positive airway pressureCPAPSpontaneous breaths per minuteRR spRespiratory rateRRSpontaneous expiratory minute volumeMVsSpontaneous expiratory minute volumeMVeLeakage fraction (%)LeakageInspired minute volumeVTiLeakage fraction (%)Conc.Leakage fraction (%)VTiEndexpiratory momentationQc conc.Og end tidal concentrationetCO2CO2 minute eliminationVTCO2CO2 minute eliminationCdVaOg end tidal concentrationEdstaceSpriatory resistanceRiStatic complianceCdynStatic complianceParticeSpriatory resistanceRiSubitor of breathing, ventilatorWOBepatVork of breathing, patientWOBepatPol1Pol1Shallow Breathing IndexSBIPeak Edi valueEdipeakResult valueEdipeakResult valueEdipeakPol of expired tidal volume to predicted body weightVTPBWSwitch to backup (/minute)Trended value only	Specifications	
Mean airway pressurePmeanPositive end expiratory pressurePEEPContinuous positive airway pressureCPAPSpontaneous breaths per minuteRR spRespiratory rateRRSpontaneous expiratory minute volumeMVe spInspired minute volumeMViExpired minute volumeMVeLeakage fraction (%)LeakageLeakage fraction (%)VTiExpired tidal volumeVTeEnd expiratory flowFloweeMesured oxygen concentrationQ2 conc.CO2 minute eliminationVCO2CO2 minute eliminationVCO2Static complianceGdynStatic orphianceRiExpiratory resistanceRiExpiratory resistanceRiExpiratory resistanceRiStatic complianceVOBentWork of breathing, patientWOBentVork of breathing, nettiatorSBIPo.1SBIPo.1SIShallow Breathing IndexSBIPake Edi valueEdipeakMinium Edi valueEdipeakSutich to backup (minute)Tredevalue only	Peak airway pressure	Ppeak
Positive en expiratory pressurePEEPContinuous positive airway pressureCPAPSpontaneous breaths per minuteRR spRespiratory rateRRSpontaneous expiratory minute volumeMVe spInspired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpiratory flowVTeEnd expiratory flowQ conc.CO2 end tidal concentrationQ2 conc.CO2 initute eliminationVCO2CO2 minute eliminationVCO2CO2 minute eliminationVCO2CO2 minute eliminationVCO2CO2 minute eliminationCdynStatic complianceReKork of breathing, ventilatorWOBventWork of breathing, patientWOBventWork of breathing, patientP 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakMinimum Edi valueEdipeakSynten to backup (/minute)TriPBWSwitch to backup (/minute)TriPdevalue only	Pause airway pressure	Pplat
Continuous positive airway pressureCPAPSpontaneous breaths per minuteRR spRespiratory rateRRSpontaneous expiratory minute volumeMVe spInspired minute volumeMViExpired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTiEnd expiratory flowRespiratory didal concentrationMeasured oxygen concentrationog conc.CO2 end tidal concentrationetCO2CO2 tidal eliminationVTCO2Spriatory resistanceRiExpiratory resistanceRiExpiratory resistanceRiExpiratory resistanceRiExpiratory resistanceRiSpriatory resistanceSBIPo.1SDIShallow Breathing IndexSBIPeak Edi valueEdipeakMinum Edi valueEdiminationVT/PBWStute outpressing	Mean airway pressure	Pmean
Spontaneous breaths per minuteRR spRespiratory rateRRSpontaneous expiratory minute volumeMVeInspired minute volumeMViExpired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationVCO2CO2 end tidal eliminationVTCO2Dynamic complianceCdynStatic complianceRestExpiratory resistanceReWork of breathing, patientWOBpatWork of breathing, patientWOBpatBoatomePo.1Shallow Breathing IndexSBIPeak Edi valueEdipeakaMinum Edi valueEdipeakaMinum Edi valueEdipeakaMinum Edi valueEdipeakaSwitch to backup (/minute)Trended value only	Positive end expiratory pressure	PEEP
Respiratory rateRRSpontaneous expiratory minute volumeMVe spInspired minute volumeMViExpired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVCO2Static complianceCdynInspiredry resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, ventilatorWOBuentPo.1Po.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakWinimum Edi valueFloweatSwitch to backup (/minute)Trended value only	Continuous positive airway pressure	CPAP
Sportaneous expiratory minute volumeMVe spInspired minute volumeMViExpired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationVCO2CO2 tidal eliminationVCO2CO2 tidal eliminationVCO2Static complianceCdynInspiratory resistanceReExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientWOBventWork of breathing IndexSBIPaal Edi valueEdipeakMinum Edi valueEdipeakMinum Edi valueEdipeakMinum Edi valueEdipeakMinum Edi valueForder value only	Spontaneous breaths per minute	RR sp
Inspired minute volumeMViExpired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVTCO2CO2 minute eliminationVTCO2CO2 minute eliminationCdynStatic complianceCdynStatic complianceCdynStatic oxplianceRiExpiratory resistanceReWork of breathing, ventilatorWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakMinimum Edi valueCt/TPBWSwitch to backup (minute)Trendet value only	Respiratory rate	RR
Expired minute volumeMVeLeakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVCO2CO2 tidal eliminationCdynStatic complianceCdynStatic complianceReExpiratory resistanceReVork of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakMinimum Edi valueEdiminSwitch to backup (/minute)Trended value only	Spontaneous expiratory minute volume	MVe sp
Leakage fraction (%)LeakageInspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 mitute eliminationVCO2CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceStaticInspiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientBPo.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdimainKatic da volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Inspired minute volume	MVi
Inspired tidal volumeVTiExpired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceCotatticInspiratory resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientP0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakMinimum Edi valueEdipeakMinimum Edi value furtidatorVT/PBW	Expired minute volume	MVe
Expired tidal volumeVTeEnd expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVCO2Dynamic complianceCdynStatic complianceCstaticInspiratory resistanceReExpiratory resistanceWOBventWork of breathing, ventilatorWOBpatElastanceEP 0.1P0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakMinimum Edi valueEdiminSwitch to backup (/minute)Trended value only	Leakage fraction (%)	Leakage
End expiratory flowFloweeMeasured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceStaticInspiratory resistanceReVork of breathing, ventilatorWOBventWork of breathing, patientWOBpatElastanceEP 0.1StalShallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Inspired tidal volume	VTi
Measured oxygen concentrationO2 conc.CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceStaticInspiratory resistanceReExpiratory resistanceWOBventWork of breathing, patientWOBpatElastancePP 0.1StaliShallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Expired tidal volume	VTe
CO2 end tidal concentrationetCO2CO2 minute eliminationVCO2CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceCstaticInspiratory resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientP 0.1ElastanceFP 0.1SBIShallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	End expiratory flow	Flowee
CO2 minute eliminationVCO2CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceCstaticInspiratory resistanceReExpiratory resistanceWOBventWork of breathing, ventilatorWOBpatWork of breathing, patientP 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Measured oxygen concentration	O <sub>2</sub> conc.
CO2 tidal eliminationVTCO2Dynamic complianceCdynStatic complianceCstaticInspiratory resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientEElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	CO <sub>2</sub> end tidal concentration	etCO <sub>2</sub>
Dynamic complianceCdynStatic complianceCstaticInspiratory resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	CO <sub>2</sub> minute elimination	VCO <sub>2</sub>
Static complianceCstaticInspiratory resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Tended value only	CO <sub>2</sub> tidal elimination	VTCO <sub>2</sub>
Inspiratory resistanceRiExpiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdipeakRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Tended value only	Dynamic compliance	Cdyn
Expiratory resistanceReWork of breathing, ventilatorWOBventWork of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueE diminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Static compliance	Cstatic
Work of breathing, ventilatorWOBventWork of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Inspiratory resistance	Ri
Work of breathing, patientWOBpatElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Expiratory resistance	Re
ElastanceEP 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Work of breathing, ventilator	WOBvent
P 0.1P 0.1Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Work of breathing, patient	WOBpat
Shallow Breathing IndexSBIPeak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	Elastance	E
Peak Edi valueEdipeakMinimum Edi valueEdiminRatio of expired tidal volume to predicted body weightVT/PBWSwitch to backup (/minute)Trended value only	P 0.1	P 0.1
Minimum Edi value     Edimin       Ratio of expired tidal volume to predicted body weight     VT/PBW       Switch to backup (/minute)     Trended value only	Shallow Breathing Index	SBI
Ratio of expired tidal volume to predicted body weight     VT/PBW       Switch to backup (/minute)     Trended value only	Peak Edi value	Edipeak
Switch to backup (/minute) Trended value only	Minimum Edi value	Edimin
	Ratio of expired tidal volume to predicted body weight	VT/PBW
Backup (%/min) Trended value only	Switch to backup (/minute)	Trended value only
	Backup (%/min)	Trended value only

## Alarms Specifications

Alarms	Neonatal Range	Pediatric Range	Adult Range
Airway pressure (upper alarm limit)	16 to 90 cmH <sub>2</sub> O	16 to 90 cmH₂O	16 to 120 cmH₂O
Airway pressure NIV (upper alarm limit)	16 to 40 cmH <sub>2</sub> O	16 to 40 cmH <sub>2</sub> O	16 to 40 cmH <sub>2</sub> O
Respiratory rate (upper and lower alarm limits)	1 to 160 breaths/min	1 to 160 breaths/min	1 to 160 breaths/min
Expired minute volume (upper alarm limit)	0.02 to 30 l/min	0.02 to 30 l/min	1 to 60 l/min
Expired minute volume (lower alarm limit)	0.01 to 20 l/min	0.01 to 20 l/min	0.5 to 40 l/min
End expiratory pressure (upper alarm limit)	1 to 55 cmH₂O	1 to 55 cmH <sub>2</sub> O	1 to 55 cmH <sub>2</sub> O
End expiratory pressure (lower alarm limit)	Off, 1 to 47 cmH <sub>2</sub> O	Off, 1 to 47 cmH₂O	Off, 1 to 47 cmH₂O
No patient effort (Apnea) alarm	2 to 45 s	2 to 45 s	15 to 45 s
	Automatic return to sup	oport mode on patient tri	ggering
No consistent patient effort	Yes (See User's manua	l)	
High continuous pressure	Yes (See User's manua	<i>l</i> )	
O <sub>2</sub> concentration	Set value ±5 vol% or ≤18 vol%		
Gas supply	Below 200 kPa (2.0 bar/29 PSI), above 600 kPa (6.0 bar/87 PSI)		
Battery	<ul> <li>Limited battery capacity: 10 minutes</li> </ul>		
	<ul> <li>No battery capacity:</li> </ul>	less than 3 minutes	
	<ul> <li>Low battery voltage</li> </ul>		
End tidal CO <sub>2</sub> (upper and lower limit)	0.5% to 20%, 4 to 100 mmHg, 0.5 to 14 kPa		
Leakage too high	Yes (See User's manual)		
Technical	Yes (See User's manual)		
Autoset (Alarm Limits) Specifications	Invasive Ventilation — Controlled Modes Only		1
High airway pressure	Mean peak pressure +10 cmH <sub>2</sub> O or at least 35 cmH <sub>2</sub> O		cmH <sub>2</sub> O
Inspiratory tidal volume too high	The greater of VTi + 30	% or VTi + 2 ml	
Expiratory minute volume (upper alarm limit)	Mean expiratory minut	e volume + 50%	
Expiratory minute volume (lower alarm limit)	Mean expiratory minute volume - 50%		
Respiratory rate (upper alarm limit)	Mean respiratory rate + 40%		
Respiratory rate (lower alarm limit)	Mean respiratory rate - 40%		
End expiratory pressure (upper alarm limit)	Mean end expiratory pressure + 5 cmH <sub>2</sub> O		
	Mean end expiratory pressure - 3 cmH <sub>2</sub> O		
End expiratory pressure (lower alarm limit)	wean end expiratory p		
End expiratory pressure (lower alarm limit) End tidal CO <sub>2</sub> concentration (upper alarm limit) End tidal CO <sub>2</sub> concentration (lower alarm limit)	Mean end tidal CO <sub>2</sub> co Mean end tidal CO <sub>2</sub> co	ncentration +25%	

## Optional Equipment Specifications

Optional Equipment	Weight	Dimensions	Maximum load
Mobile cart	27 lb 9 oz (12.5 kg)	25.5 W x 21.5 L x 21.9 H in (647 W X 547 L x 557 H mm)	_
Drawer for mobile cart	1 lb 5 oz (0.6 kg)	9.7 W x 4.6 L x 11.9 H in (247 W x 118 L x 302 H mm)	-
Shelf base	5 lb 8 oz (2.5 kg)	8.1 W x 11.9 L x 1.7 H in (207 W x 302 L x 43 H mm	_
Pendant/bed holder	7 lb (3.2 kg)	11.9 W x 11.9 L x 15.5 H in (302 W x 302 L x 393 H mm)	-
Humidifier holder	1 lb 2 oz (0.5 kg)	9.6 W x 1.5 L x 7.3 H in (243 W x 38 L x 185 H mm)	26 lb 7 oz (12 kg)
Support arm 178	5 lb 8 oz (2.5 kg)	35.4 L in (900 L mm)	2 lb 3 oz to 7 lb (1 to 3 kg) depending on angle
User interface holder	1 lb 5 oz (0.6 kg)	1.8 W x 3.5 L x 4.8 H in (46 W x 90 L x 123 H mm)	_
Cable holder for handle	4 oz (0.1 kg)	5.4 W x 3.6 L x 6.1 H in (138 W x 92 L x 155 H mm)	22 lb 1 oz (10 kg)
Waterbag/IV pole	14 oz (0.4 kg)	5.8 W x 1.0 L x 39.6 H in (148 W x 26 L x 1007 H mm)	3 lb 5 oz (1.5 kg)
Gas cylinder restrainer kit	1 lb 2 oz (0.5 kg)	Upper: 4.1 W x 2.6 L x 1.9 H in (104 W x 65 L x 48 H mm) Lower: 4.2 W x 6.4 L x 3.0 H in (106 W x 162 L x 76 H mm)	Two 4.5 liter bottles
Y piece holder		1.0 W x 2.0 L x 1.8 H in (26 W x 52 L x 46 H mm)	

#### Y Sensor (option) Specifications

Specificiations	Size	Weight
Y sensor module	6.1 W x 3.5 L x 0.8 H in (154 W x 90 L x 21 H mm)	10 oz (280 g)
Y sensor	0.7 W x 2.0 L x 1.1 H in (18 W x 50 L x 27 H mm)	0.4 oz (11 g)
Connectors and cables	<ul> <li>15 mm male and female conical c to ISO 5356-1</li> <li>Pressure port on module, pressure</li> <li>Flow sensor cable, 6 ft 6.7 in (2.0</li> </ul>	e line, 2.0 m, phthalate free PVC
Sensor material	<ul> <li>Single use: PC, Polycarbonate</li> </ul>	
Power source	Powered by the ventilator system, 4.5 W during normal operation.	
Measuring method	Hot Wire Anemometer (HWA)	
Parameters	<ul> <li>Airway pressure</li> <li>Airway flow</li> <li>Inspiratory and expiratory volume</li> <li>Trigger and End inspiration</li> </ul>	S
Measuring range	<ul> <li>Flow: 0.12 to 32 l/min</li> <li>Pressure: -40 to 120 cmH<sub>2</sub>O</li> </ul>	
Y sensor resistance	10 cmH <sub>2</sub> O/I/s at 30 I/min	
Dead space	≤1 ml	
Pressure line connector	Gable mounted bulk head connector of 0.1 to 0.16 in (3 to 4 mm)	or to fit tubing with an inner diameter

### CO<sub>2</sub> Analyzer (option) Specifications

Specifications	Size	Weight	
•			
CO <sub>2</sub> analyzer module	6.1 W x 3.5 L x 1.7 H in (154 W x 90 L x 43 H mm)	16 oz (0.45 kg)	
Sensor (Capnostat 5)	1.3 x 1.9 x 0.9 in	0.7 oz	
	(32 x 47 x 21.6 mm)	(20 g)	
Operating temperature	50°F to 91°F (10°C to 33°C)	-	
Airway adapter	-	0.4 oz (10 g)	
Power source	Powered by the ventilator		
Connectors and cables	<ul> <li>CO<sub>2</sub> analyzer module: 15-pole D-s</li> <li>Sensor: 9 ft 2 in (2.8 m) cable</li> </ul>	sub female connector	
Measuring method	Mainstream, dual-wavelength, non-dispersive infrared		
Parameters	<ul> <li>CO<sub>2</sub> end tidal concentration (etCO<sub>2</sub>)</li> </ul>		
	• CO <sub>2</sub> minute elimination (VCO <sub>2</sub> )		
	<ul> <li>CO<sub>2</sub> tidal elimination (VTCO<sub>2</sub>)</li> </ul>		
Measuring range	• 0 to 150 mmHg CO <sub>2</sub> partial press	ıre	
	<ul> <li>0 to 20 kPa CO<sub>2</sub> partial pressure</li> </ul>		
	<ul> <li>0 to 19.7% CO<sub>2</sub> volume (at a baro</li> </ul>	metric pressure of 1013 hPa)	
System response time CO <sub>2</sub>	The total system response time of t	he CO <sub>2</sub> monitor when exposed first	
	to air and then to a gas mix with 5.0	0% CO₂ is <250 ms	
Warm-up time	15 s to initial $CO_2$ indication		
	maximum 2 minutes to full specifica		
Oxygen concentration compensation	Automatic — values supplied from the ventilator system		
Barometric pressure compensation	Automatic – values supplied from	the ventilator system	
Digitizing rate	100 Hz		
Airway adapter dead space	• Neonatal/pediatric: <1 cm <sup>3</sup>		
	• Adult: <5 cm <sup>3</sup>		

#### Edi Module (option) Specifications

Specifications	Size	Weight
Edi module	3.5 W x 6.1 L x 0.8 H in (90 W x 154 L x 21 H mm)	8.8 oz (0.25 kg)
Edi catheter cable	6 ft 6.7 in (2.0 m)	-
Power source	Powered by the ventilator	
Power consumption	<3 W during normal operation	
Parameters	Edi waveform     ECG leads waveforms	

ECG leads waveforms
 NAVA<sup>®</sup> estimated pressure waveform (Pest)

#### Aeroneb Nebulizers Specifications

Specifications	Pro	Solo	
Size	2.0 W x 2.0 L x 1.8 H in (50 W x 50 L x 45 H mm)	(1.9 W x 1.0 L x 2.6 H in (48 W x 25 L x 67 H mm)	
Weight	Approx. 0.9 oz (25 g)	Approx. 0.5 oz (14 g)	
Particle size	1 to 5 µm mass median aerod	1 to 5 µm mass median aerodynamic diameter (MMAD)	
Flow rate	>0.2 (average: ~0.4) ml/min		
Maximum volume	10 ml	6 ml	
Residual volume	<0.1 ml for 3 ml dose		
Control cable	5 ft 10.9 in (1.8 m)		

#### Communication/Interface Specifications

Communication/Interface		
Serial ports	Isolated	
	<ul> <li>Two RS-232C ports. For data communication via the SERVO Communication Interface (SCI)</li> </ul>	
Servo Communication Interface (SCI)	A protocol for data communication with external devices	
Alarm output connection (option)	<ul> <li>Isolated</li> </ul>	
	<ul> <li>4-pin modular connector for communication of all active alarms</li> </ul>	
	<ul> <li>Switching capability: Max. 40 V DC, max. 500 mA, max. 20 W</li> </ul>	
Data transfer via USB port	Non-isolated	
	<ul> <li>For transfer of trends, logs, screenshots and recordings to a</li> </ul>	
	USB memory stick	
VGA port	Non-isolated	
	<ul> <li>External monitors should be isolated from the ventilator system — this can be achieved if the connected monitor is powered via a medical grade transformer</li> </ul>	
Eth sup studies with	Isolated	
Ethernet port	<ul> <li>The network connection (LAN) port is for service use</li> </ul>	

#### Log Function

Specifications	
Event log	• Alarms
	<ul> <li>Ventilator settings</li> </ul>
	<ul> <li>Apnea periods</li> </ul>
	<ul> <li>Immediate functions</li> </ul>
Diagnostic log	Technical information
	Test results
	Service records
	Software installation
	<ul> <li>Configuration information</li> </ul>

#### Saving of Data

Specifications		
Recording of current waveform and parameter values	30 seconds of data will be recorded (15 seconds before and 15 seconds after activation) — up to 40 recordings can be stored	
Saving screenshots	Up to 40 screenshots can be stored	
Export files	Recordings, screenshots and the event log can be saved together in an export file and transferred to a USB memory stick	

#### Compressor Mini (option)

Specifications

See separate data sheet

#### Service

Specifications

Regular maintenance

Once every 12 months or at least after 5000 operating hours

#### Ordering Information

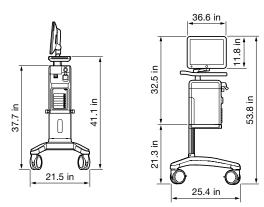
Specifications

SERVO-U, ventilator system and accessories

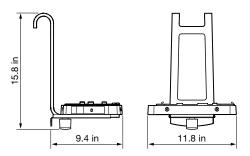
Contact your local Maquet representative

# Technical drawings

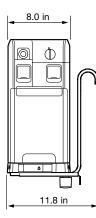
#### SERVO-U® on Mobile Cart

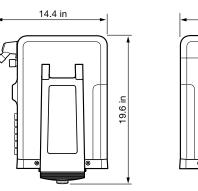


#### SERVO-U Holder

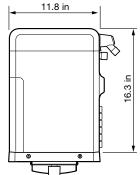


SERVO-U (patient unit) on SERVO-U Holder

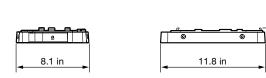




1.6 in



#### SERVO-U Shelf Base



#### MAQUET GETINGE GROUP

### **GETINGE GROUP**

Maquet Medical Systems USA 45 Barbour Pond Drive Wayne, NJ 07470

www.maquetusa.com

Getinge Group is a leading global provider of products and systems that contribute to quality enhancement and cost efficiency within healthcare and life sciences. We operate under the three brands of ArjoHuntleigh, Getinge and Maquet. ArjoHuntleigh focuses on patient mobility and wound management solutions. Getinge provides solutions for infection control within healthcare and contamination prevention within life sciences. Maquet specializes in solutions, therapies and products for surgical interventions, interventional cardiology and intensive care.