



Datasheet  
**Servo-s**  
**System version 8.0**

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# Servo-s

## Technical specifications


### General

Instructions for use	Please carefully read the user's manual
Legal manufacturer	Maquet Critical Care AB
Other products	See separate data sheets. Contact your local Getinge supplier for more information.

### The ventilator – general

Dimensions:	(See dimensional drawings page 9)
• User interface and patient unit	W 380 x D 300 x H 520 mm (W 15" x D 11.8" x H 20.5")
• User interface	W 355 x D 53 x H 295 mm (W 14" x D 2.1" x H 11.6")
• Patient unit	W 380 x D 300 x H 210 mm (W 15" x D 11.8" x H 8.3")
Weight	Approximately 20 kg (44 lbs)
Method of triggering	Flow and pressure
Max. airway pressure	Approximately 115 cmH <sub>2</sub> O
Bias flow	2 l/min

### The system – general

	The device complies with requirements and classification IIb of Medical Device Directive 93/42/EEC. CE Mark Notified Body number: 0123.
Classification	Class I equipment. According to IEC/EN 60 601-1
Standards	<ul style="list-style-type: none"><li>• IEC 60601-1: 2005</li><li>• ISO 80601-2-12:2011</li><li>• ISO 80601-2-55: 2011</li></ul>
A-weighted sound pressure level (L <sub>PA</sub> )	<41 dB, measured at a distance of 1 m (3.3 ft)
IP classification	IP 21
Electromagnetic compatibility (EMC)	According to limits specified in IEC 60601-1-2:2007
The ' <b>EMC Declaration, Information to the Responsible Organization</b> ' is available from Getinge.	
Patient range	Patient weight 10–250 kg (22–551 lbs)

### Screen

Type	TFT-LCD module
Size	31 cm (12.1") diagonal
Viewing area	246.0 x 184.5 mm (9.7" x 7.3")

## Power supply

Power supply, automatic range selection	100–120 V AC $\pm 10\%$ , 50–60 Hz, or 220–240 V AC $\pm 10\%$ , 50–60 Hz
External 12 V DC	12.0 V–15.0 V DC, 10 A
Battery capacity	2 rechargeable battery modules 12 V, 5 A, 3.5 Ah each
Battery backup time	At least 1 h with 2 fully charged batteries
Battery recharge time	Approximately 3h/battery
Max power consumption	At 100–120 V: 2 A, 190 VA, 140 W At 220–240 V: 1 A, 190 VA, 140 W

## Gas supply

Inlet gas pressure air/O <sub>2</sub>	200–600 kPa / 2.0–6.0 bar / 29–87 PSI
Connection standards available	AGA, DISS, NIST, or French standard available
Unavailable gas/loss of gas pressure	The flow from an unavailable gas (air or O <sub>2</sub> ) 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

## Patient system gas connectors

Conical fittings	Male 22 mm / female 15 mm. In accordance with ISO 5356-1
Gas exhaust port	Male 30 mm cone

## Inspiratory channel

Pressure drop	Max. 6 cmH <sub>2</sub> O at a flow of 1 l/s
Internal compressible factor	Max. 0.1 ml/cmH <sub>2</sub> O
Gas delivery system	Microprocessor controlled valve
Inspiratory flow range	0 to 3.3 l/s

## Expiratory channel

Pressure drop	Max. 3 cmH <sub>2</sub> O at a flow of 1 l/s
Internal compressible factor	Max. 0.1 ml/cmH <sub>2</sub> O
PEEP regulation	Microprocessor controlled valve
Rise time, expiratory flow measurement	<12 ms for 10–90 % response at flow of 0.05–3.2 l/s
Expiratory flow range	0 to 3.2 l/s

## Operating conditions

Operating temperature	+10 to +40°C (+50 to +104°F)
Relative humidity	15 to 95% non-condensing
Atmospheric pressure	660 to 1060 hPa
Lowest pressure in breathing system	-400 cmH <sub>2</sub> O

## Non operating conditions

Impact	<ul style="list-style-type: none"> <li>• Peak acceleration: 15 g</li> <li>• Pulse duration: 6 ms</li> <li>• Number of impacts: 1000</li> </ul>
Storage temperature	-25 to +60°C (-13 to +140°F)
Storage relative humidity	<95% condensing
Storage atmospheric pressure	470 to 1060 hPa

## Waveform and loop presentations

Real time waveforms: <ul style="list-style-type: none"> <li>• Up to 3 waveforms can be displayed simultaneously.</li> </ul>	<ul style="list-style-type: none"> <li>• Pressure</li> <li>• Flow</li> <li>• Volume</li> </ul>
Loops	<ul style="list-style-type: none"> <li>• Volume / Pressure</li> <li>• Flow / Volume</li> </ul>

## Ventilation modes – Invasive ventilation

<p>Controlled ventilation:</p> <ul style="list-style-type: none"> <li>• PC (Pressure Control)</li> <li>• VC (Volume Control)</li> </ul>	<p>Can be configured with alternative flow patterns:</p> <ul style="list-style-type: none"> <li>- VC with flow adaptation,</li> <li>- VC without flow adaptation,</li> <li>- VC with decelerating flow</li> </ul>
<ul style="list-style-type: none"> <li>• PRVC (Pressure Regulated Volume Control)</li> </ul>	
<p>Supported ventilation:</p> <ul style="list-style-type: none"> <li>• PS/CPAP (Pressure Support / Continuous Positive Airway Pressure)</li> </ul>	
<p>Combined ventilation:</p> <ul style="list-style-type: none"> <li>• SIMV (PC) + PS (Synchronized Intermittent Mandatory Ventilation)</li> <li>• SIMV (VC) + PS</li> <li>• SIMV (PRVC) + PS</li> <li>• Bi-Vent/APRV (Airway Pressure Release Ventilation)</li> </ul>	<p>Optional, pressure controlled ventilation on two independently adjustable levels, allowing unrestricted spontaneous breathing on both levels.</p>

## Non invasive ventilation (optional)

Leakage compensation level	Inspiratory, up to 200 l/min Expiratory, up to 65 l/min
Leakage overrange detection	Automatic
Disconnect detection	Automatic
Disconnect flow:	<ul style="list-style-type: none"> <li>• Low</li> <li>• High</li> <li>• Disabled</li> </ul>
	<ul style="list-style-type: none"> <li>• Configurable 7.5 l/min</li> <li>• 40 l/min</li> <li>• Deactivates disconnect detection</li> </ul>
Connect detection	Manual, or automatic via bias flow

## Ventilation modes – Non invasive ventilation (optional)

NIV PC
NIV PS

## Parameter settings

Parameter	Setting range
Inspiratory tidal volume (ml)	100–2000
Inspiratory minute volume (l/min)	0.5–60
Apnea, time to alarm (s)	15–45
PC/PS above PEEP (cmH <sub>2</sub> O)	0–(120 - PEEP)
PC/PS above PEEP in NIV (cmH <sub>2</sub> O)	0–(62 - PEEP)
PEEP (cmH <sub>2</sub> O)	0–50
PEEP in NIV (cmH <sub>2</sub> O)	2–20
CMV frequency (breaths/min)	4–100
SIMV frequency (breaths/min)	1–60
Breath cycle time, SIMV (s)	1–15
P <sub>High</sub> (cmH <sub>2</sub> O)	(PEEP + 1)–50
T <sub>High</sub> (s)	0.2–30
T <sub>PEEP</sub> (s)	0.1–10
O <sub>2</sub> concentration (%)	21–100
I:E ratio	1:10–4:1
T <sub>Insp</sub> (s)	0.1–5
T <sub>Pause</sub> (% of breath cycle time)	0–30
Flow trigger sensitivity level	0–10
Press. trigg sensitivity (cmH <sub>2</sub> O)	-20–0
Insp. rise time (% of breath cycle time)	0–20
Insp. rise time (s)	0–0.4
End inspiration (% of peak flow)	1–70
End inspiration in NIV (% of peak flow)	10–70
Oxygen breaths	100% for 1 minute
Start breath	Initiation of 1 breath (In SIMV mode initiation of 1 mandatory breath)
Pause hold	Insp. or exp (0–30 seconds)
Alarm silence/reset	2 minute silence and reset of latched alarms
Compliance compensation	On/Off
Backup ventilation	Backup On/Off

## Backup parameter settings

Parameter	Setting range
Inspiratory tidal volume (ml)	100–2000
PC above PEEP (cmH <sub>2</sub> O)	5–(120 - PEEP)
PC above PEEP in NIV (cmH <sub>2</sub> O)	5–(62 - PEEP)
CMV frequency (breaths/min)	4–100
I:E ratio	1:10–4:1
T <sub>Insp</sub> (s)	0.1–5

## Suction support

Pre oxygenation time	Max. 2 min
Post oxygenation time	Max. 1 min
Suction phase time	No maximum level
Adjustable oxygen level	21–100 %

## Monitoring

	Displayed value	Trended value*
Breathing frequency	Yes	Yes
Spontaneous breaths per minute (RRsp)	No	Yes
Peak airway pressure	Yes	Yes
Mean airway pressure	Yes	Yes
Pause airway pressure	Yes	Yes
Positive end expiratory pressure	Yes	Yes
Inspired tidal volume	Yes	Yes
Expired tidal volume	Yes	Yes
Inspired minute volume	Yes	Yes
Expired minute volume	Yes	Yes
Leakage fraction in NIV (%)	Yes	Yes
Ti/Ttot	Yes	No
I:E ratio	Yes	No
Total PEEP**	Yes	No
Switch to backup (b/min)	No	Yes
Backup (%/min)	No	Yes
O <sub>2</sub> concentration (measured)	Yes	Yes
MV <sub>e</sub> sp / MV <sub>e</sub>	Yes	No
Spontaneous exp. minute volume (MV <sub>e</sub> sp):	Yes	Yes
End expiratory flow	Yes	Yes
Static compliance **	Yes	Yes
Dynamic compliance **	Yes	Yes
Inspiratory resistance **	Yes	Yes
Expiratory resistance **	Yes	Yes
Elastance **	Yes	Yes
Time constant **	Yes	No
P0.1 measurement **	Yes	Yes
Work of breathing patient **	Yes	Yes
Work of breathing ventilator **	Yes	Yes
Shallow Breathing Index (SBI) **	Yes	Yes
Supply pressure (O <sub>2</sub> and air) **	Yes	No
Battery remaining time	Yes	No
Barometric pressure	Yes	No

\* Stored trend values for up to 24 hours

\*\* Optional

## Alarms

Airway pressure (upper):	16–120 cmH <sub>2</sub> O
• Invasive ventilation	16–70 cmH <sub>2</sub> O
• Non-invasive ventilation	
Expired minute volume (upper alarm limit)	0.5–60 l/min
Expired minute volume (lower alarm limit)	0.5–40 l/min
No patient effort (Apnea) alarm	15–45 s Automatic return to support mode on patient triggering
No consistent patient effort	Yes, described in User's manual
Respiratory frequency	1–160 breaths/min
High end expiratory pressure	0–55 cmH <sub>2</sub> O
Low end expiratory pressure	0–47 cmH <sub>2</sub> O Note. Setting the alarm to 0 (zero) is equal to alarm off
High continuous pressure	Obstruction leading to constant high airway pressure (>PEEP +15 cmH <sub>2</sub> O) during: <ul style="list-style-type: none"> <li>• &gt;2 breaths or 5 seconds, whichever is greater,</li> <li>• 15 ±1.5 s if less than 2 breaths are triggered</li> </ul>
O <sub>2</sub> concentration:	Set value ±5 vol% or ≤18 vol%
Gas supply	Below 200 kPa / 2.0 bar / 29 PSI and above 600 kPa / 6.0 bar / 87 PSI
Battery	<ul style="list-style-type: none"> <li>• Limited battery capacity: 10 min</li> <li>• No battery capacity: less than 3 min</li> <li>• Low battery voltage</li> </ul>
Leakage out of range in NIV	Yes, described in User's manual
Technical	Yes, described in User's manual

## Autoset (alarm limits) specification

Autoset alarm limits specification	Invasive ventilation, controlled modes only
High airway pressure	Mean peak pressure +10 cmH <sub>2</sub> O or at least 35 cmH <sub>2</sub> O
Upper minute volume	Expiratory minute volume +50%
Lower minute volume	Expiratory minute volume -50%
Upper respiratory frequency	Breathing frequency +40%
Lower respiratory frequency	Breathing frequency -40%
High end expiratory pressure	Mean end expiratory pressure +5 cmH <sub>2</sub> O
Low end expiratory pressure	Mean end expiratory pressure -3 cmH <sub>2</sub> O

## Communication/interface

Serial port	RS-232C - isolated. For data communication via the Communication Interface Emulator (CIE).
Alarm output connector (optional):	<ul style="list-style-type: none"> <li>• Connector</li> <li>• Ratings</li> </ul>
	<ul style="list-style-type: none"> <li>• 4-pole Modular connector</li> <li>• Max 40 V DC, Max 500 mA, Max 20 W</li> </ul>

## Log function

Event log	<ul style="list-style-type: none"> <li>• Alarms</li> <li>• Ventilator settings</li> <li>• Apnea periods</li> <li>• Immediate functions</li> </ul>
Service log	<ul style="list-style-type: none"> <li>• Technical alarms</li> <li>• Test results</li> <li>• Preventive maintenance</li> <li>• Service history</li> <li>• Configuration log</li> </ul>

## Servo-s Mobile Cart (optional)

Weight	25 kg (55 lbs)
Dimensions	H 830 mm (with handles 1.030 mm) x L 650 mm x W 500 mm (H 32.7" (with handles 40.6") x L 25.6" x W 19.7") (see dimensional drawing page 10)

## Servo-s Shelf base (optional)

Weight	0,1 kg (0.2 lbs)
Dimensions	H 8 mm x L 160 mm x W 80 mm (H 0.3" x L 6.3" x W 2.4") (see dimensional drawing page 10)

## Gas cylinder restrainer (optional)

Max load	2 x 5-liter bottles
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## Compressor Mini (optional)

See separate datasheet	• Order number 66 84 417
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## Aerogen nebulizer systems (optional)

See separate datasheet	<ul style="list-style-type: none"> <li>• Order number MX-7156 for Aerogen Pro</li> <li>• Order number MX-7154 for Aerogen Solo</li> </ul>
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## Service

Regular maintenance	Once every 12 months or at least after 5000 operating hours
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### Note

For inaccuracies and more detailed technical specifications please refer to the User's manual.

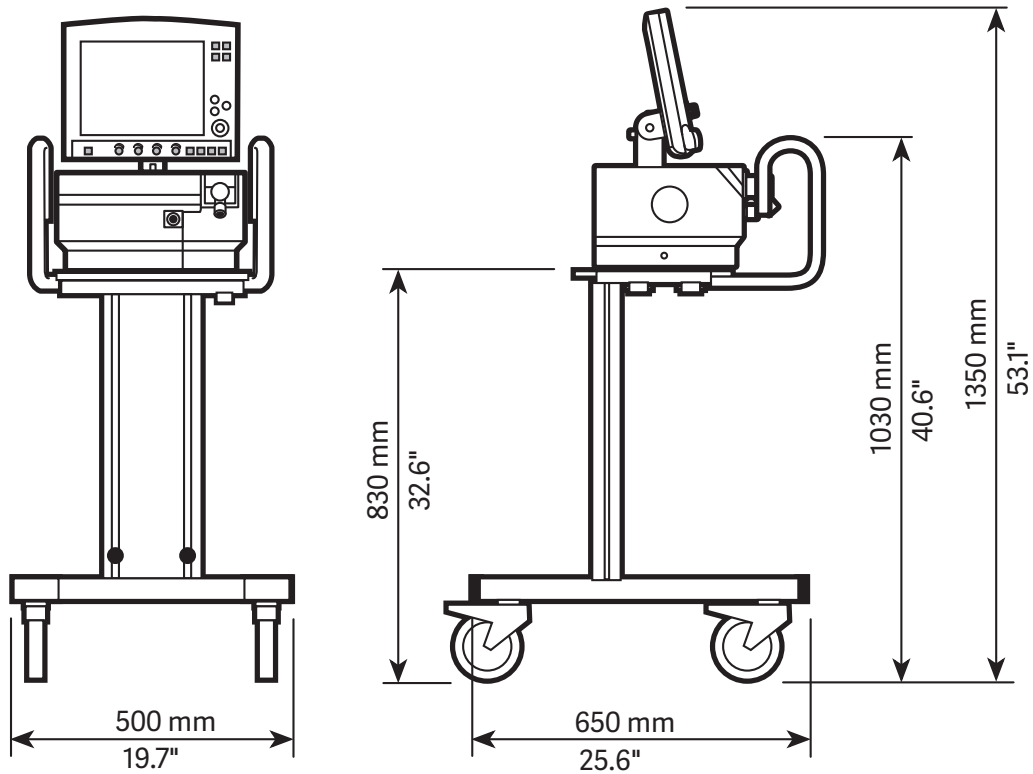


# Ordering information

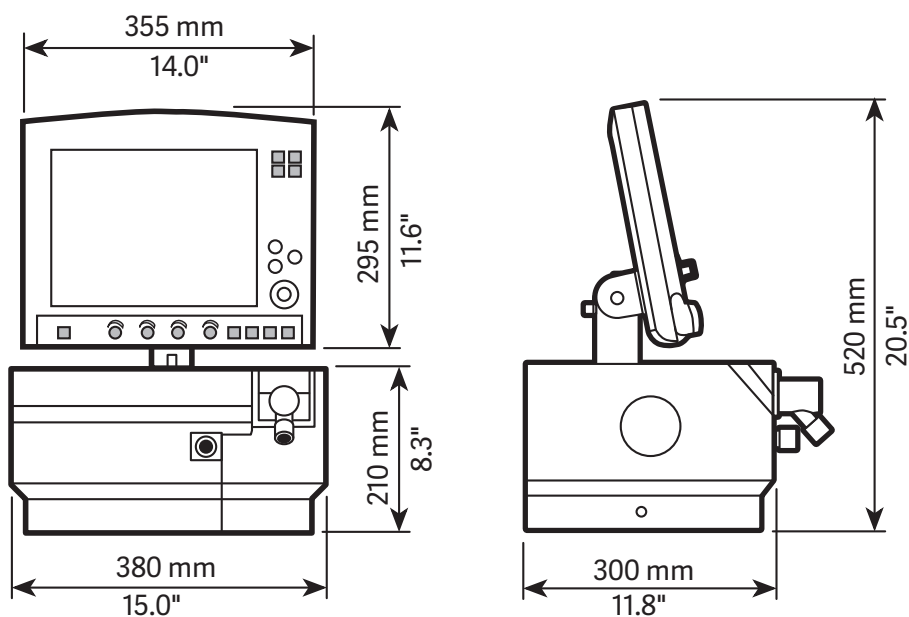
See separate information • System flowchart, Servo-s,  
Order no: 66 70 112

## Dimensional drawings

### Servo-s on Mobile cart



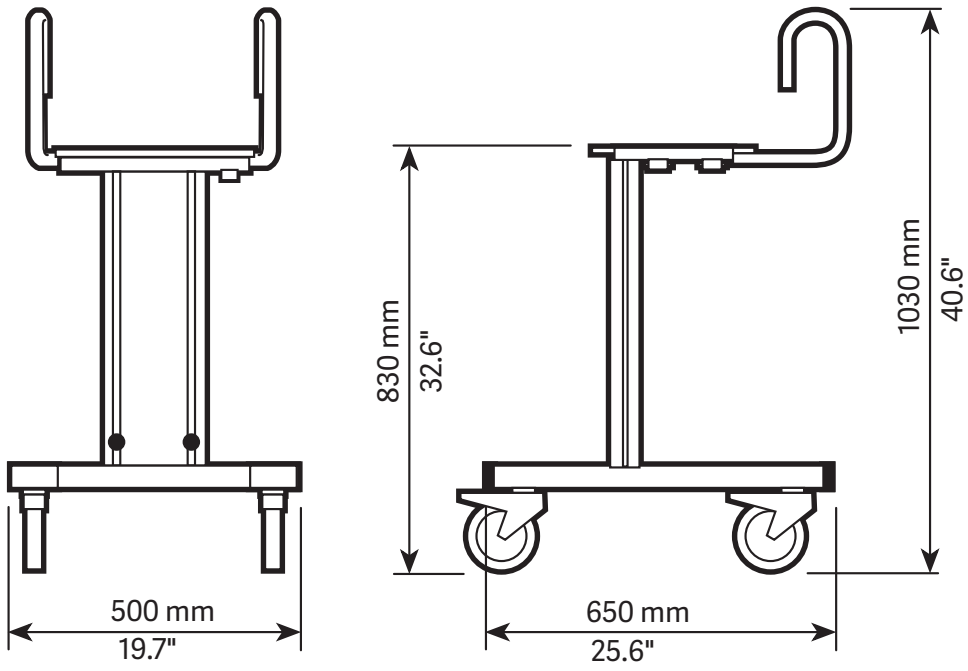
### Servo-s on Shelf base



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## Mobile cart Servo-s

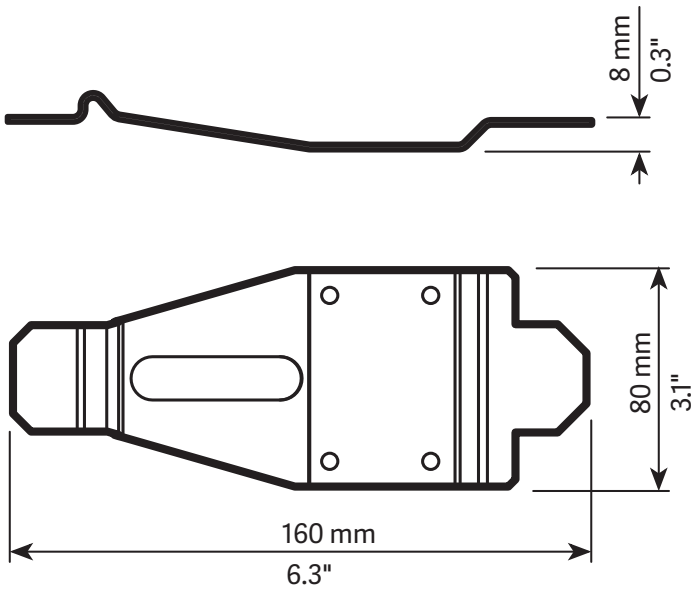
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## Shelf base Servo-s

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Getinge is a global provider of innovative solutions for operating rooms, intensive care units, sterilization departments and for life science companies and institutions. Based on our firsthand experience and close partnerships with clinical experts, healthcare professionals and medtech specialists, we are improving the everyday life for people, today and tomorrow.

Servo-s may be pending regulatory approvals to be marketed in your country. Contact your Getinge representative for more information. This document is intended to provide information to an international audience outside of the US.

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