Flow-c Anesthesia Machine System version 4.7

Datasheet

GETINGE

Contents

Flow-c Anesthesia Machine

Technical specifications

Gas volumes, flows and leakages associated with the breathing system are stated in the technical specifications and adhere to BTPS reference conditions. (Body Temperature, Ambient Pressure, Saturated).

All gas concentration readings are normally referenced to dry gas conditions, ambient room temperature and atmospheric pressure (ATPD).

The condition for measured inlet gas pressures and flows is STPD (Standard Temperature and Pressure Dry); 20°C, standard pressure at 101.3 kPa and 0 % relative humidity (dry).

Weight and dimensions

Base system weight (out of the box weight)	249 lbs. (20 kg)
System nominal weight*	1295 lbs. (34 kg)

* Equipped with control panel, patient cassette, one full vaporizer, one CO_2 absorber.

System max weight including maximum load	595 lbs. (270 kg)
Dimensions of base plate	27.4" x 34.0" (697 x 863 mm)
Drawers	1
Vertical rail	4
Wheels	Four wheels (diameter 4.9"/125 mm)
Working surface/writing table	15.0" x 18.9" (380 x 480 mm)
Reading lamp	Adjustable LED light integrated into the shelf tower.

Display

Type	LED touch screen, complete with 11 membrane switches and one rotary knob
Size	17.0" x 11.6" (432 x 295 mm)
Placement	Attached to display arm
Viewing area	15"
Waveforms	Up to 6 waveforms, user configurable
Trends	• Graphic display, 1 to 24 hour resolution • Numeric display, 1 to 60 minute resolution

Essential performance (term defined in IEC 60601-1)

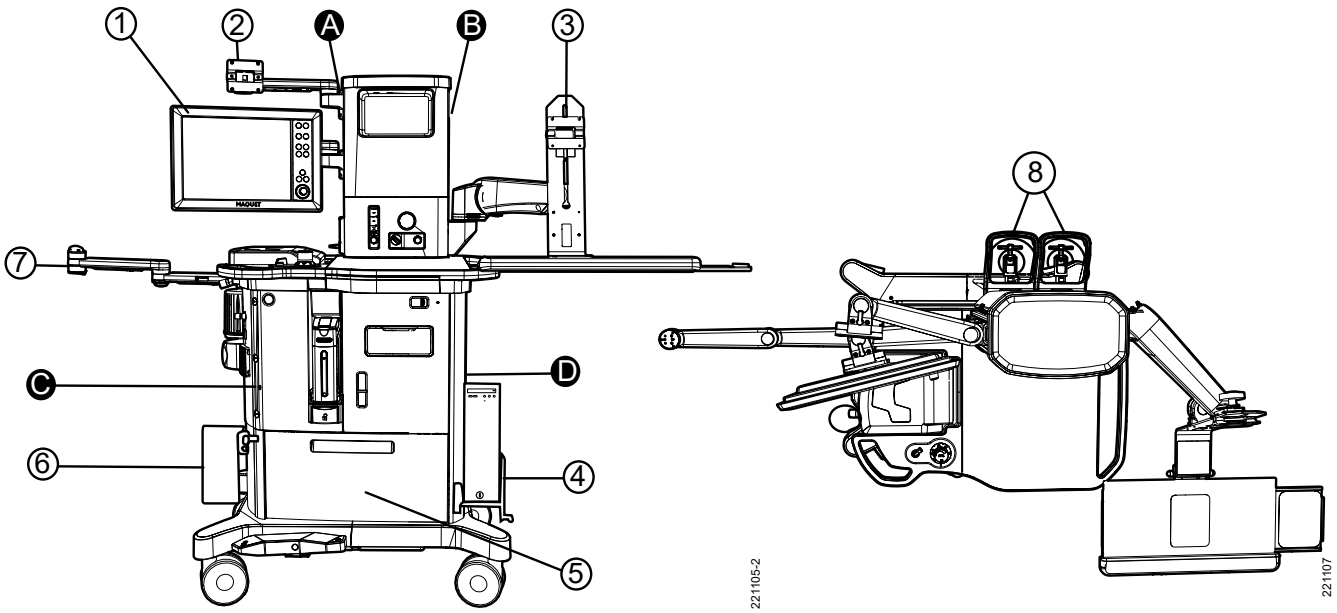
- Oxygen flow under all conditions except the failure of the oxygen supply or generation of a clinical and/or technical alarm.
- Delivery of a non-hypoxic gas mixture to the patient or generation of a clinical and/or technical alarm.
- Non-delivery of excessive concentrations of a volatile anesthetic agent or generation of a clinical alarm.
- Airway pressure monitoring and associated clinical alarms (Ppeak, PEEP).
- Gas measurement accuracy (for Isoflurane, Desflurane, Sevoflurane, CO_2, N_2O, O_2) and generation of gas measurement associated clinical alarms or generation of a technical alarm.
- Delivery of ventilation at the patient connection port within the alarm limits set by the operator or generation of a clinical or technical alarm.

Environment

Environment	Operating conditions	Non-operating conditions
Ambient temperature	+60°F to +95°F (+15°C to +35°C) (Desflurane: +60°F to +85°F, +15°C to +30°C)	-15°F to +140°F (-25°C to +60°C)
CO_2 absorber	60°F to 95°F (15 °C to 35 °C)	32°F to 95°F (0 C to 35°C)
Storage at higher temperatures can result in reduced efficiency and service life due to moisture loss. When correctly stored, canisters will maintain absorption capacity for a period of two years.		
Battery	+60°F to +95°F (+15°C to +35°C)	+40°F to +104°F (+5°C to +40°C)
When the system is disconnected from a mains power supply, a fully charged battery can be stored in the anesthesia system for up to six weeks at temperatures between +40°F and +105 °F (+5°C and +40°C). At temperatures between +125°F and +140°F (+50°C and +60°C) storage time is one week. If these limits are exceeded, battery performance can no longer be guaranteed.		
Relative humidity (non-condensing)	15% to 95%	<95%
Atmospheric pressure	700 hPa–1060 hPa	470 hPa–1060 hPa

Maximum weight, number, and position of accessories

- Accessories must be installed according to any installation and safety guidelines given in the accessories installation instruction. Additional local, regional, and/or national guidelines related to occupational safety may apply.
- The following illustrations show a typical configuration. The setup given in the table has been verified by the manufacturer. The manufacturer assumes no responsibility for other configurations.
- The functionality of the system is extended by installing accessory carriers with appropriate accessories using the vertical rails.



Ref.no	Accessory carrier	Accessory	Rail	Max. load
1	Control panel arm	Control panel	A, B	
2	• GCX arm with VESA interface • Monitor arm slide-in plate • Monitor arm 2 pin	Patient monitor	A, B	27.5 lbs. (12.5 kg)
3	Height adjustable arm VESA Remark: Installed in lowest rail position. Requires Extra mains power outlet option.	PDMS system	B	30.0 lbs. (13.6 kg)
4	• CPU mounting small* • CPU mounting large† * CPU width/max.height/ max. depth: 3.0-4.9/14.0/14.0" (76-114/356/356 mm) † CPU width/max.height/ max. depth: 4.9-7.0/18.0/18.0" (114-178/457/457 mm)	• CPU • CPU	• D • D	24.9 lbs. (11.3 kg) 40.1 lbs. (18.2 kg)
5	N/A Remark: Incl. vaporizer, etc.	Drawer with load	N/A	22.0 lbs. (10 kg)
6	• Horizontal short rail DIN • Horizontal short rail Duoflex	Suction container	C, D	6.6 lbs. (3 kg)
7	Equipment arm	• Downward pole short • Upward pole short • Quad hook for cable management • Parameter box	C	16.5 lbs. (7.5 kg)
8	• Backup gas rack O_2 Pin index • Backup gas rack Air Pin index • Backup gas rack N_2O Pin index	Backup gas cylinders	N/A	15.4 lbs. (7 kg)/cylinder

Accessory	Equipment weight	Max load
Additional writing table	9.9 lbs. (4.5 kg)	11.0 lbs. (5 kg)
GCX arm with VESA interface Monitor arm slide-in plate Monitor arm 2 pin	4.4 lbs. (2 kg)	27.5 lbs. (12.5 kg)
Equipment arm	6.6 lbs. (3 kg)	16.5 lbs. (7.5 kg)
CPU mounting	5.5 lbs. (2.5 kg)	40.1 lbs. (18.2 kg)
Height adjustable arm VESA	22.0 lbs. (10 kg)	30.0 lbs. (13.6 kg)

Standards — safety and functionality

Safety	IEC 60601-1:2005 + A1:2012 IEC 60601-1-2:2014 IEC 60601-1-8:2006 + A1:2012 ISO 80601-2-13:2011 + A1:2015 IEC 62304:2006 + Cor1:2008 + A1:2015 ISO 5360:2016	
Electromagnetic compatibility	IEC 60601-1-2:2014 Refer to **Electromagnetic Compatibility, Flow-c Anesthesia System**	
Respiratory gas monitoring	ISO 80601-2-55:2011	
Anesthetic gas delivery	ISO 80601-2-13:2011 + A1:2015	
Usability	IEC 62366-1:2015	
Cleaning	IEC 60601-1:2005 + A1:2012 ISO 80601-2-13:2011 + A1:2015	
Classification according to IEC 60601-1:		
Class I equipment	According to the type of protection against electrical shock	
Type B equipment	According to the degree of protection against lectrical shock	
Continuous operation	According to the mode of operation	
Classification according to EU Medical Directive 93/42/EEC:		
The anesthesia system is classified as IIb		
Classification according to IEC 60529:		
Ingress Protection	IP21 Valid when the patient cassette is in place and the patient cassette lid s closed. Make sure any fluid has been wiped from the connections in the vaporizer slots before connecting a vaporizer.	
IP number	First digit — Solids	Second digit — Liquids
IP21	Protected against solid foreign objects of 12.5 mm diameter and greater	Protected against vertically falling water drops

Power supply

Mains power

Mains power	100–240 V, AC 50–60 Hz (without auxiliary power outlets) 100–120 V, 220–240 V, AC 50–60 Hz (with auxiliary power outlets)
Power consumption	300 VA (auxiliary power outlets not included) 1500 VA (maximum auxiliary configuration)

Battery

Type	Sealed acid-lead rechargeable
Capacity	18 Ah
Operating time	Approx. 90 minutes
Charging time	Approx. 6 hours

Auxiliary power outlets

All auxiliary power outlets are connected to an isolation transformer.
Voltage depends on mains power supply.

Voltage	Type of electrical outlet	Max load total	Max load from each outlet
220–240 V	4 x IEC	• 5 A	• 5 A
	• 4 x CEE 7/3 (EU)	• 5 A	• 2 A
	• 4 x BS 1363 (UK)	• 5 A	• 2 A
100–120 V	• 4 x IEC	• 10 A	• 10 A
	• 4 x CEE 7/3 (EU)	• 10 A	• 4 A
	• 4 x BS 1363 (UK)	• 10 A	• 4 A
	• 4 x NEMA 5-15R (US)	• 10 A	• 4 A

Gas supply

All gases and anesthetic agents must conform to the European and American Pharmacopeia.

Central gas

Supply pressure: • O_2 • Air • N_2O	 • 250–600 kPa (2.5–6.0 bar, 36–87 psi)* • 250–600 kPa (2.5–6.0 bar, 36–87 psi)† • 250–600 kPa (2.5–6.0 bar, 36–87 psi)	
Hospital central gas supply must be able to deliver a flow of at least 60 l/min at a supply pressure of 280 kPa (2.8 bar, 41 psi).		
Connection standards	AGA DISS NIST French standard British standard	
Maximum levels	Air • H_2O <7 g/m^3 • Oil <0.5 mg/m^3 • Chlorine must not be detectable	O_2 • H_2O <20 mg/m^3
If the compressed air is generated by a liquid ring compressor there is a potential risk of chlorine in the supplied air.		
Maximum inlet gas temperature	<95°F (<35°C)	
External vacuum source pressure	-0.9 to -0.6 bar (-90 to -60 kPa)	

Backup gas

Cylinder connection standards	• Pin index safety system (PISS) • DIN
DIN connections	6, 9, 12, 13
Backup gas rack, excluding valves Size Weight	 25.8" x 5.5" (655 x 140 mm) (H x Ø) Max 7 kg per cylinder, including gas
Cylinder configuration	Max. two cylinders and only one of each • O_2 • Air • N_2O
Cylinder pressure • O_2 • Air • N_2O	 Max. 20,000 kPa (200 bar, 2900 psi) Max. 20,000 kPa (200 bar, 2900 psi) Max. 8,000 kPa (80 bar, 1160 psi)
Pressure measurement	Electronically measured cylinder pressure.
Cylinder safety valve opening pressure • O_2 • Air • N_2O	 650 kPa (6.5 bar, 94 psi) 650 kPa (6.5 bar, 94 psi) 650 kPa (6.5 bar, 94 psi)

* The auxiliary O_2 device will not meet specified performance if the supply pressure is less than 300 kPa (3 bar, 44 psi).

† The Venturi vacuum ejector pump will not meet specified performance if the supply pressure is less than 300 kPa (3 bar, 44 psi).

Suction unit

Type	High vacuum/high flow rate
Vacuum ejector pump – Venturi	
Compressed air consumption (Suction unit)	50–90 Nl/min* at a supply pressure equivalent to patient suction supply pressure (Air)
Max free flow (suction flow)	28 Nl/min
Max. vacuum (suction)†	-0.9 to -0.6 bar (-90 to -60 kPa), at a supply pressure equivalent to patient suction supply pressure (Air)
External vacuum source – Medical vacuum system	
External vacuum source pressure	-0.9 to -0.6 bar (-90 to -60 kPa)

* Normal liter (Nl) — volume of gas given ambient conditions, for example current atmospheric pressure.
† Max. vacuum varies as a function of atmospheric pressure and supply pressure. Highest performance is obtained at sea level when the supply pressure is approx. 4 bar. Performance decreases with increased altitude.

Anesthetic Gas Scavenging System (AGSS)

Type	Passive system (including a flow indicator) integrated into the system
Scavenging flow	Minimum 25 l/min (STPD), or 10 l/min (STPD) over the set minute volume, whichever is greater
Outlet connections	• 30 mm ISO taper • DISS EVAC • 0.5"/12.7 mm in-hose barb • 1"/25 mm barb • AGA EVAC • WAGD-to-Vacuum connector • 22 mm out. diam. connector and 22 mm int. diam. connection tube

Fresh gas flow

Gas mix	Air/O_2 O_2/N_2O	Electronic Servo controlled Electronic Servo controlled
Fresh gas flow range	• MAN = 0.1–20 l/min • AUTO = 0.1–20 l/min (FGF delivery depending on set MV) • AFGO = 1.0–20 l/min	
Fresh gas O_2/Air Flow (numerical/bargraph)	Selectable	
Fresh gas O_2/N_2O Flow (numerical/bargraph)	Selectable	
O_2 concentration accuracy in the fresh gas:		
• Air/O_2 (21%–100%) • O_2/N_2O (28%–100%)	• Fresh gas flow 0.3–20 l/min: ±5% • Fresh gas flow 0.3–20 l/min: ±5%	• Fresh gas flow <0.3 l/min: ±20%* • Fresh gas flow <0.3 l/min: ±20%†
Setting resolution, O_2	1%	
Setting resolution, flow	0.1 l/min	
O_2 Flush	• Approximately 56 l/min • 2 cmH_2O expiratory resistance when APL is set to SP	
Auxiliary O_2		
Auxiliary O_2 flow range	0–15 l/min‡	

* Specification valid in typical clinical range for minimal flow anesthesia: Respiratory Rate 5–35 breaths/min, Tidal Volume 100–700 ml, Minute Volume <10 l/min, Pressure 5–40 cmH_2O, Set O_2 50–100%.
† Specification valid in typical clinical range for minimal flow anesthesia: Respiratory Rate 5–35 breaths/min, Tidal Volume 100–700 ml, Minute Volume <10 l/min, Pressure 5–40 cmH_2O, Set O_2 50–100%.
‡ The apparent gas flow will increase if the ambient pressure decreases.

Breathing system

Type	Circle system with Volume Reflector
System volume (incl. absorber, without patient tubings and manual breathing bag)	Approx. 2.8 l
Maximum volume allowed for patient tubings and optional equipment forming part of the circle system	3000 ml
The patient circuit configurations are intended to provide the following range of inspired tidal volumes	• Adult: 22 mm tubing, Tidal Volumes 100–2000 ml • Infant: 15 mm tubing, Tidal Volumes 25–350 ml • Infant: 10–12 mm tubing, Tidal Volumes 5–100 ml* * VC: 20–100 ml, PC: 5–100 ml
Drive gas	O_2
CO_2 absorber	Volume disposable Approx. 0.8 l Volume reusable Approx. 0.7 l Absorbent material Sofnolime®
Patient tube connections	22/15 mm ISO cone
Type of material (breathing circuit system)	• PPSU (Polyphenylsulphone) • SBC (Styrene-butadiene copolymer) • PP (Polypropylene)
System compliance (volume of gas lost due to internal compliance — manual mode only)	Approx. 3 ml/cmH_2O , i.e. 90 ml at a pressure of 30 cmH_2O
Inspiratory/expiratory flow resistance of the system (the figures here apply to the breathing tubes recommended by the manufacturer)	• 10 mm breathing circuits (including Y-piece): – <2.8 cmH_2O at a flow of 2.5 l/min – <5.5 cmH_2O at a flow of 15 l/min • 15 mm breathing circuits (including Y-piece): – <1.3 cmH_2O at a flow of 2.5 l/min – <2.1 cmH_2O at a flow of 15 l/min – <4.4 cmH_2O at a flow of 30 l/min • 22 mm breathing circuits (including Y-piece): – <1.1 cmH_2O at a flow of 2.5 l/min – <2.0 cmH_2O at a flow of 15 l/min – <3.7 cmH_2O at a flow of 30 l/min – <6.0 cmH_2O at a flow of 60 l/min

Manual ventilation

Electronic APL valve	Spontaneous breathing (SP) and adjustable pressure up to 80 cmH_2O

AFGO — Additional Fresh Gas Outlet (option)

Type	• 22 mm coaxial/15 mm conical outlet connections • Pneumatic powered SW controlled (from control panel)

Emergency backup ventilation

Emergency APL valve	SP–80 cmH_2O , SP = 2 cmH_2O
O_2 emergency flow	0–10 l/min

Breathing circuits and accessories

Note that the table applies to the breathing circuits recommended by the manufacturer.

Compliance	• 10 mm breathing circuits: <0.4 ml/cmH_2O • 15 mm breathing circuits: <0.7 ml/cmH_2O • 22 mm breathing circuits: <1.8 ml/cmH_2O
Internal volume	• 10 mm breathing circuits: 0.4 l • 15 mm breathing circuits: 0.7 l • 22 mm breathing circuits: 1.8 l
Flow resistance in each limb including Y-piece	• 10 mm breathing circuits: – At 2.5 l/min: <3.0 cmH_2O/(l/s) – At 15 l/min: <6.0 cmH_2O/(l/s) – At 30 l/min: <10 cmH_2O/(l/s) (30 l/min not applicable for intended patient tidal volume range) • 15 mm breathing circuits: – At 2.5 l/min: <1.5 cmH_2O/(l/s) – At 15 l/min: <1.5 cmH_2O/(l/s) – At 30 l/min: <2 cmH_2O/(l/s) • 22 mm breathing circuits: – At 2.5 l/min: <0.5 cmH_2O/(l/s) – At 15 l/min: <0.7 cmH_2O/(l/s) – At 30 l/min: <1.0 cmH_2O/(l/s)
Flow resistance for angled adapter	• At 2.5 l/min: <0.2 cmH_2O/(l/s) • At 15 l/min: <0.6 cmH_2O/(l/s) • At 30 l/min: <1.0 cmH_2O/(l/s)
• Flow resistance for 22 mm joint adapter	• At 2.5 l/min: <0.2 cmH_2O/(l/s) • At 15 l/min: <0.2 cmH_2O/(l/s) • At 30 l/min: <0.2 cmH_2O/(l/s)

Ventilator

Type	Pneumatic powered Servo controlled
Patient range	Neonatal to adult
Ventilation modes	• Manual/Bag • Additional Fresh Gas Outlet (AFGO, option) • Volume Control (VC) • Pressure Control (PC, option) • Pressure Support (PS, option) • Pressure Regulated Volume Control (PRVC, option) • Synchronized Intermittent Mandatory Ventilation (SIMV, option) • Low VT ventilation (option) • High performance ventilation (option)
Tidal volume range (volume controlled modes)	20–350 ml, ±10% or 10 ml, whichever is greater* 50–1600 ml, ±10% or 10 ml, whichever is greater 50–2000 ml, ±10% or 10 ml, whichever is greater† Note that the Flow-c delivers tidal volumes down to 5 ml when using Pressure Control
Tidal volume setting range	Infant range: • 20–350 ml, resolution 1 ml* • 50–350 ml, resolution 1 ml Adult range: • 100–1600 ml, resolution 10 ml • 100–2000 ml, resolution 10 ml†
Minute volume setting range	Infant range: 0.3–20 l/min Adult range: 0.5–60 l/min
Inspiratory pressure (pressure-controlled modes)	• 0–80 cmH_2O ±15% or ±2 cmH_2O, whichever is greater • 0–120 cmH_2O ±15% or ±2 cmH_2O, whichever is greater†
Inspiratory pressure setting range	Infant range: • 0–80 cmH_2O, resolution 1 cmH_2O Adult range: • 0–80 cmH_2O, resolution 1 cmH_2O • 0–120 cmH_2O, resolution 1 cmH_2O†
Compressible volume compensation	Yes
Inspiratory flow	200 l/min (3.3 l/s)
Breathing frequency	4–100 ±1 breaths/minute
I:E (VC, PC)	1:8.3–4:1
PEEP	0–50 cmH_2O
Trigger	Flow/Pressure
Inspiratory pause (VC)	0 to 30% or 0–1.5 s

***** Option low VT ventilation is required.

† Option high performance ventilation is required.

Respiratory monitoring

Administered breaths	1–100 ±1 breaths/minute
Loops	Flow – Volume Volume – Pressure
Lung characteristics	Airway resistance (Rdyn) Compliance (Cdyn) Elastance (Edyn)
Inspiratory minute volume	0.3–60 l/min
Accuracy insp. minute volume	±15% or ±15 ml multiplied by the breathing frequency, whichever is greater
Expiratory minute volume	0.3–60 l/min
Accuracy exp. minute volume	±15% or ±10 ml multiplied by the breathing frequency, whichever is greater
Inspiratory tidal volume	5–2000 ml
Accuracy insp. tidal volume	±4 ml (5–20 ml range)* ±15% or 15 ml, whichever is greater (20–2000 ml range) * Accuracy valid for O_2/Air gas mix, O_2 concentration at 60%, RR at 30 and I:E ≥1:2.
Expiratory tidal volume	5–2000 ml
Accuracy exp. tidal volume	+7/-4 ml (5–20 ml range) * ±15% or 10 ml, whichever is greater (20–2000 ml range) * Accuracy valid for O_2/Air gas mix, O_2 concentration at 60%, RR at 30 and I:E ≥1:2.
Mean airway pressure	0–100 cmH_2O
Peak airway pressure	0–140 cmH_2O
End expiratory airway pressure	-40–100 cmH_2O
Airway pressure	-30–140 cmH_2O
Airway pressure accuracy (applicable to all pressure measurements)	±5% or ±2 cmH_2O, whichever is greater

Alarms

Expiratory minute volume: high	0.5–60 l/min
Expiratory Minute Volume: low	0.01–40 l/min
Excessive leakage	The difference between the maximum and minimum pressures during inspiration is too low
Airway pressure: high	10–120 cmH_2O
Continuous APL pressure (manual mode only)	Activated when the measured airway pressure exceeds predefined values for more than 15 seconds. Predefined values depend on current APL setting.
High continuous pressure (automatic mode only)	Airway pressure is constant above set PEEP level +15 cmH_2O more than 15 seconds
Negative airway pressure	Measured airway pressure is below -10 cmH_2O for more than one second
Regulated Pressure Limited (PRVC mode only)	Permissible pressure limits pre-set tidal volume
PEEP: high	0–55 cmH_2O
PEEP: low	0–47 cmH_2O
Respiratory Rate: high	1–140 B/min and OFF
Respiratory rate: low	1–140 B/min and OFF
Apnea	5–45 s and OFF
Long apnea (manual mode only)	Infant: No breath detection for up to 60 s Adult: No breath detection for up to 120 s
Check breathing circuit	Activated when inspiratory and expiratory pressures fail to meet preset requirements because of blocked or disconnected tubing
Limited battery capacity	Less than 18 minutes left of battery operation
No battery capacity	Less than 3 minutes left of battery operation
Water trap missing/Replace water trap	The gas analyzer has detected that a water trap replacement is needed
Gas alarms	
FiO_2: high	23–99% and OFF
FiO_2: low	18–99%
EtO_2: high	13–99% and OFF
EtO_2: low	10–99% and OFF
$FiCO_2$: high	0.1–10%
$EtCO_2$: high	0.1–10%
$EtCO_2$: low	0.1–9.9% and OFF
FiAA: high	• 0.1–5.0% and OFF (ISO) • 0.1–8.0% and OFF (SEV) • 0.1–18% and OFF (DES)
FiAA: low	• 0.1–5.0% and OFF (ISO) • 0.1–8.0% and OFF (SEV) • 0.1–18% and OFF (DES)
EtAA: high	• 0.1–5.0% and OFF (ISO) • 0.1–8.0% and OFF (SEV) • 0.1–18% and OFF (DES)

Alarms *(continued)*

EtAA: Low	• 0.1–4.0% and OFF (ISO) • 0.1–6.0% and OFF (SEV) • 0.1–12% and OFF (DES)
Agent mixture: MAC >3	The MAC_{40} of the secondary agent is ≥0.6 and the total MAC_{40} value is ≥3
Agent mixture	The second agent is MAC ≥0.6 and the total MAC value is <3
High continuous MAC	Measured MAC exceeds time limit: • MAC >2.2; from starting a new case, until 15 minutes after the first vaporizer activation. • MAC >1.8 otherwise
FiN_2O: high	Inspiratory N_2O gas supply >80%
Occlusion in sampling line	Detected occlusion reported from Y-piece gas analyzer

Vaporizer

Active vaporizers slots	1	
Agents	Isoflurane, Sevoflurane and Desflurane	
Type	Electronic injector	
Weight (full)	Approx. 7.1 lbs. (3.2 kg)	
Dimensions	2.8" x 8.5" x 7.0" (70 x 215 x 178 mm)	
Agent capacity	300 ml	
Residual capacity	30 ml (triggering the low level alarm)	
Setting range	Isoflurane Sevoflurane Desflurane	0, 0.3–5%, OFF 0, 0.3–8%, OFF 0, 1.0–18%, OFF
Accuracy	±15% of set value or ±5% of maximum possible user setting (whichever is greater)	
Filling system	Isoflurane Sevoflurane Desflurane	• Maquet filling adapter • Quik Fil, Maquet filling adapter and SAFE-T-SEAL filling adapter attached to anesthetic agent bottle • SAFE-FIL
Emptying system	Maquet drain adapter for SAFE-T-SEAL vaporizer	
Vaporizer filling speed	Approx. 4 ml/s	
Tank liquid level	Optical and electronic	

Gas analyzer

Measuring technology	O_2 Agents, CO_2, N_2O	Paramagnetic sensor IR sensor
Warm-up time	ISO standard accuracy Full accuracy	Within 60 s Within 10 minutes
Sampling flow and tolerance	225 ml/min ±10% (Return to circuit), BTPS condition	
Sampling line	Length: 2.0 m 2.5 m 3.5 m 4.5 m	Inner diameter: 1.3 mm 1.5 mm 1.5 mm 1.5 mm

Measured parameters

Resp. rate	2–100 breaths/minute	
Respiration rate measurement accuracy	<60 breaths/minute >60 breaths/minute	±1 breath/minute Unspecified
Inspiratory and End-Tidal O_2 Concentration	Yes	
Inspiratory and End-Tidal CO_2 concentration	Yes	
Inspiratory and End-Tidal N_2O concentration	Yes	
MAC Y (age dependent)	Yes	
MAC Brain (age dependent)	Yes	
Inspiratory and End-Tidal agent concentration	Yes	

Gas measurement accuracy	Gas conc.	Accuracy [%ABS]	Interference	[%ABS]
O_2	0–25% 25–80% 80–100%	±1 ±2 ±3	N_2O CO_2 Any agent	0.2 0.2 1.0
N_2O	0–20% 0–40% 40–80%	±2 ±3 ±5	CO_2 O_2 Any agent	0.1 0.1 0.1
CO_2	0–1% 1–5% 5–7% 7–10% >10%	±0.3 ±0.2 ±0.3 ±0.5 Unspecified	N_2O O_2 Any agent	0.1 0.1 0.3
Isoflurane	0–1% 1–5% >5%	±0.15 ±0.2 Unspecified	CO_2 N_2O O_2 2nd agent	0 0.1 0.1 0.2
Sevoflurane	0–1% 1–5% 5–8% >8%	±0.15 ±0.2 ±0.4 Unspecified	CO_2 N_2O O_2 2nd agent	0 0.1 0.1 0.2
Desflurane	0–1% 1–5% 5–10% 10–15% 15–18% >18%	±0.15 ±0.2 ±0.4 ±0.6 ±1.0 Unspecified	CO_2 N_2O O_2 2nd agent	0 0.1 0.1 0.2

Gas analyzer *(continued)*

Drift of measurement accuracy	The accuracy includes stability and effects of device drift during operation between calibrations.

- The respiration rate limit for accurately measured end-tidal values is <60 breaths/minute for I:E = 1:1, <40 breaths/minute for I:E = 1:2 and <30 breaths/minute for I:E = 1:3.
- The accuracy of the gas measurements may be affected if the Ethanol concentration is higher than 0.1%, the Methane concentration is higher than 1% or the Acetone concentration is higher than 1%.
- The partial pressure and the percentage volume of CO_2, N_2O, O_2 and anesthetic agent depend on the amount of water vapor in the breathing gas. A partial H_2O pressure of 11 cmH_2O is automatically compensated for by the analyzer. Higher H2O partial pressures will further dilute the gas sample; at 30 cmH_2O the general error of all measured gases is -2%.

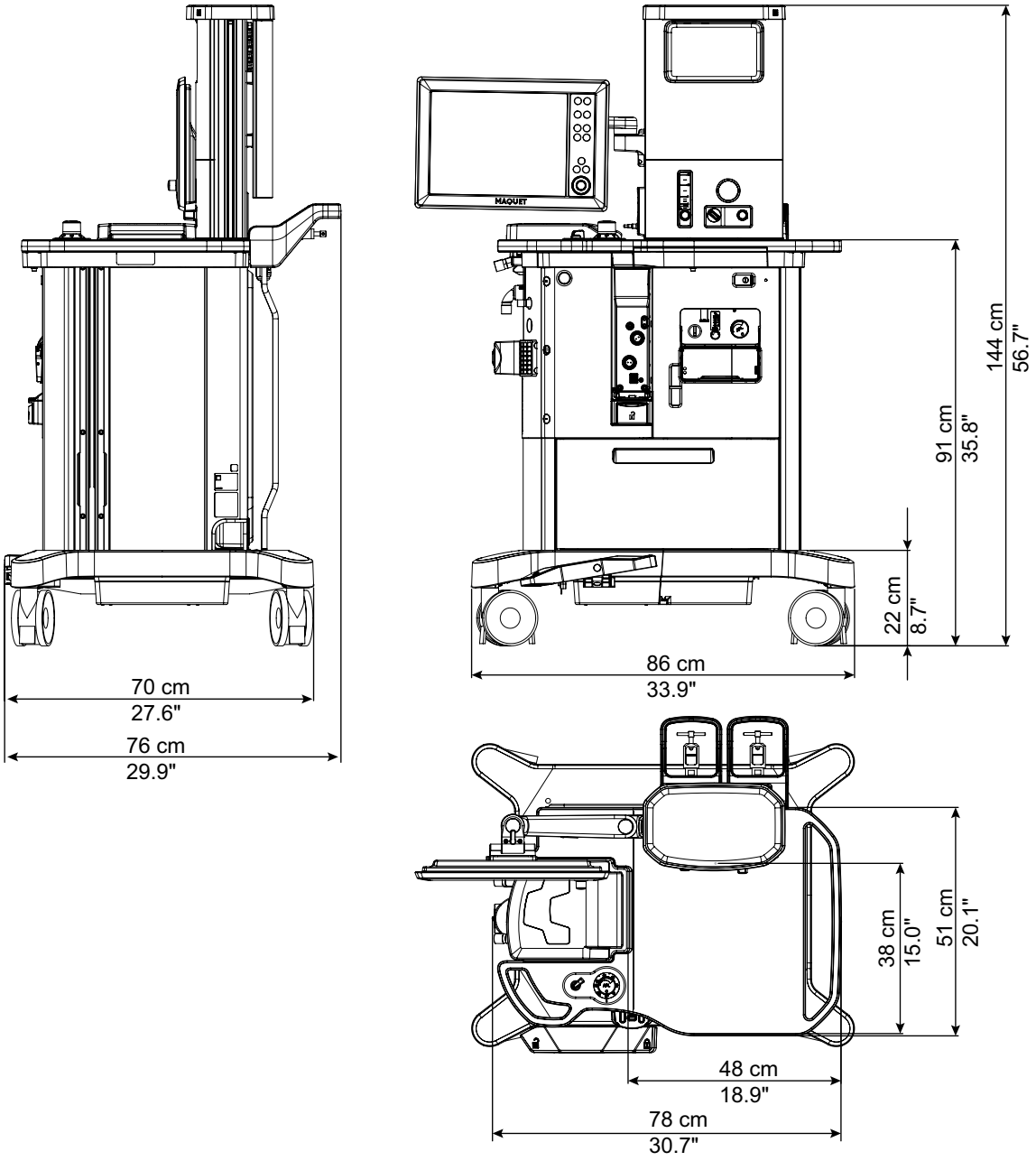
External communication

	Quantity	Type	Description
Serial ports	2	RS232	FCI (Flow Communication Interface) protocol
USB	2	USB 1.1	• One port for communication • One port for power supply
Video out	1	VGA	Interface for slave monitor
Ethernet	1	RJ45	Network connection for use with remote service

Ordering information

Flow-c Anesthesia Machine and accessories:
See separate information in “System flowchart, Flow-c”.

Dimensional drawings



Notes

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