SILICON MEDITECH
WE DELIVER QUALITY

GE Healthcare

Engström Carestation
Refurbihsed

Breathing life into critical care

Features

- Simplified user interface
- Paramagnetic O_2 sensing
- Non-Invasive ventilation (Optional)
- Secure access to central stations
- Sophisticated power management control with battery backup
- Auxiliary pressure sensor
- Airway Resistance Compensation

Integrated Ventilation and Monitoring

- Advanced ventilation
- INview™ Suite: SpiroDynamics™ and FRC INview
- Plug and play modules
- Patient Spirometry
- Gas monitoring with metabolics and energy expenditure
- Optional use of proximal Neo Flow Sensor with Neonatal ventilation

Exceptional Design

- Adaptable to your environment
- Flexible and moveable display
- Transferable module bay
- Quick-release expiratory valve
- Multiple trolley configurations

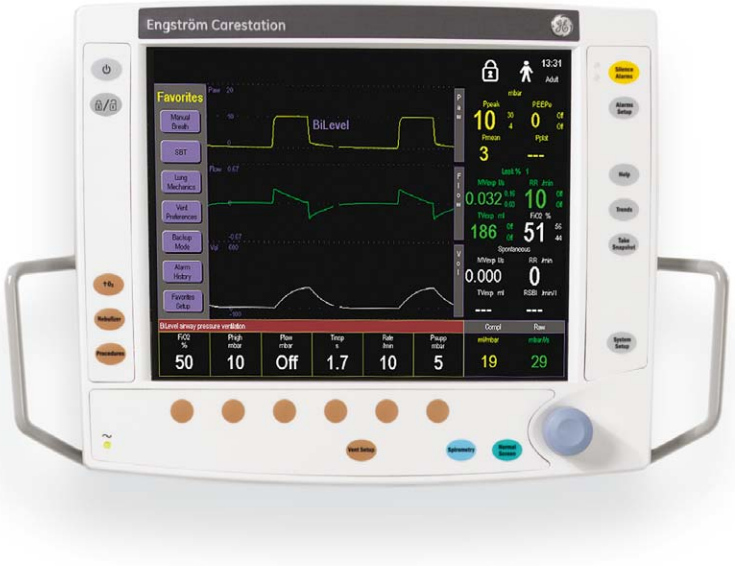
Physical Specifications

Dimensions

Height:	44.5 cm/17.5 in (Display down) 67.5 cm/26.6 in (Display up)
Height including cart:	122 cm/48 in (Display down) 145 cm/57.1 in (Display up)
Width:	38 cm/15 in
Depth:	36 cm/14 in
Weight:	31 kg/68.3 lb (not including cart); 76 kg/167.6 lb (including cart)

Display motion

Vertical tilt:	160° in raised position 60° in lowered position
Height adjustment:	23 cm/9.1 in



Key:

Available only when Adult patient type is selected

Available only when Pediatric patient type is selected

Available only when Neonatal patient type is selected

Note: Neonatal software is an optional feature. If not specified with the icon, features listed in this specifications sheet apply to Adult/Pediatric units and patient population selections.

Note: Ranges and Settings without an icon pertain to both Adult and Pediatric patient types.

Modes of Ventilation

Volume Controlled (VCV)

Pressure Controlled (PCV)

Pressure Controlled, Volume Guaranteed (PCV-VG)

Synchronized Intermittent Mandatory Ventilation, Volume Controlled (SIMV-VC)

Synchronized Intermittent Mandatory Ventilation, Pressure Controlled (SIMV-PC)

Synchronized Intermittent Mandatory Ventilation, Pressure Controlled, Volume Guaranteed (SIMV-PCVG) (optional)

BiLevel Airway Pressure Ventilation (APRV capable)

BiLevel with Volume Guaranteed (BiLevel-VG) (optional)

Non-Invasive Ventilation (NIV) (optional); nCPAP available with Neonatal option

Constant Positive Airway Pressure/Pressure Support Ventilation (CPAP/PSV)

Apnea backup available in SIMV-VC, SIMV-PC, BiLevel, SIMV-PCVG, BiLevel-VG, CPAP/PSV and VG-PS (institutionally selectable defaults)

Volume Guarantee Pressure Support (VG-PS) available with Neonatal option

Control and Ranges

Maximum peak flow:	200 L/min
Flow:	0.2 to 30 L/min (0.004 to 0.5 L/sec) 2 to 90 L/min (0.04 to 1.5 L/sec) 2 to 160 L/min (0.04 to 2.6 L/sec)
Incremental settings:	0.2 to 5 L/min (increments of 0.1 L/min) 5 to 30 L/min (increments of 0.5 L/min) 2 to 40 L/min (increments of 1 L/min) 40 to 90 L/min (increments of 5 L/min) 40 to 160 L/min (increments of 5 L/min)
FiO_2:	21 to 100% O_2
Rate:	3 to 150 breaths per minute for VCV, PCV, PCV-VG and BiLevel (increments of 1 breath per minute) 3 to 120 breaths per minute for VCV, PCV, PCV-VG and BiLevel (increments of 1 breath per minute) 2 to 60 breaths per minute for SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel-VG (increments of 1 breath per minute) 1 to 60 breaths per minute for SIMV-VC, SIMV-PC, SIMV-PCVG and BiLevel-VG (increments of 1 breath per minute)

Control and Ranges (continued)

Minimum rate:
2 to 60 breaths per minute for VG-PS (increments of 1 breath per minute)
0 to 60 breaths per minute for CPAP/PSV and 0 to 40 breaths per minute for NIV (increments of 1 breath per minute)

Inspiratory/ expiratory ratio:
1:199 to 40:1 in BiLevel
1:9 to 4:1 (ventilator setting)
1:79 to 60:1 in BiLevel

Tidal volume range:
2 to 350 mL
20 to 2000 mL

Incremental settings:
2 to 50 mL (increments of 0.5 mL)
50 to 100 mL (increments of 1 mL)
100 to 350 mL (increments of 5 mL)
For VCV, PCV-VG, SIMV-VC, SIMV-PCVG, VG-PS and BiLevel-VG
20 to 50 ml (increments of 0.5 ml)
50 to 100 ml (increments of 1 ml)
100 to 300 ml (increments of 5 ml)
300 to 1000 mL (increments of 25 mL)
1000 to 2000 mL (increments of 50 mL)
For VCV, PCV-VG, SIMV-VC, SIMV-PCVG and BiLevel-VG

Patient weight:
0.25 to 1 kg (increments of 0.01 kg)
1 to 7 kg (increments of 0.1 kg)
0.5 to 2 lb (increments of 0.02 lb)
2 to 15 lb (increments of 0.2 lb)
5 to 15 kg (increments of 0.5 kg)
15 to 100 kg (increments of 1 kg)
100 to 200 kg (increments of 2 kg)
10 to 34 lb (increments of 1 lb)
34 to 220 lb (increments of 2 lb)
220 to 440 lb (increments of 5 lb)

Inspiratory pressure (P_{insp}) range:
1 to 98 cm H_2O (increments of 1 cm H_2O)

P_{high}:
1 to 98 cm H_2O (increments of 1 cm H_2O)

P_{low}:
Off, 1 to 50 cm H_2O (increments of 1 cm H_2O)

Pressure limit (P_{limit}) range:
7 to 100 cm H_2O for VCV and SIMV-VC (increments of 1 cm H_2O)

Max. inspiratory pressure (P_{max}) limit:
7 to 100 cm H_2O (increments of 1 cm H_2O)
9-100 cm H_2O (increments of 1 cm H_2O) in NIV and nCPAP

PEEP:
Off, 1 to 50 cm H_2O (increments of 1 cm H_2O)
2-15 cm H_2O (increments of 1 cm H_2O) in nCPAP
2-20 cm H_2O (increments of 1 cm H_2O) in NIV

Inspiratory time:
0.1 to 10 sec
0.1 to 1 sec (increments of 0.01)
1 to 4 sec (increments of 0.1)
4 to 10 sec (increments of 0.25)
0.25 to 15 sec
0.25 to 1 sec (increments of 0.05)
1 to 4 sec (increments of 0.10)
4 to 15 sec (increments of 0.25)

T_{high}:
0.1 to 10 sec
0.1 to 1 sec (increments of 0.01)
1 to 4 sec (increments of 0.1)
4 to 10 sec (increments of 0.25)
0.25 to 15 sec
0.25 to 1 sec (increments of 0.05)
1 to 4 sec (increments of 0.1)
4 to 15 sec (increments of 0.25)

T_{low}:
0.25 to 18 sec
0.25 to 1 sec (increments of 0.01)
1 to 4 sec (increments of 0.1)
4 to 18 sec (increments of 0.25)
0.25 to 18 sec
0.25 to 1 sec (increments of 0.05)
1 to 4 sec (increments of 0.1)
4 to 18 sec (increments of 0.25)

T_{supp}:
0.1 to 0.8 sec (increments of 0.01)
0.25 to 4 sec for NIV
0.25 to 1 sec (increments of 0.05)
1 to 4 sec (increments of 0.1)

Expiratory time:
0.25 to 59.75 sec
0.25 to 29.9 sec Invasive vent modes
0.5 to 59.75 sec for NIV

Rise time:
0 to 500 ms of inspiratory period for either flow or pressure depending on the mode selected. Active in VCV, PCV, PCV-VG, SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel-VG, NIV and BiLevel (increments of 50 ms)

PSV rise time:
0 to 500 ms of inspiratory period for pressure supported breaths only. Active in SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel, BiLevel-VG, CPAP/PSV and VG-PS (increments of 50 ms)

Trigger window:
0 to 80% of expiration time (increments of 5%)

Flow trigger:
0.2 to 1 L/min (increments of 0.05 L/min)
1 to 3 L/min (increments of 0.1 L/min)
3 to 9 L/min (increments of 0.5 L/min)

Pressure trigger:
–10 to –3 cm H_2O (increments of 0.5 cm H_2O)
–3 to –0.25 cm H_2O (increments of 0.25 cm H_2O)

Bias flow rate:
2 to 15 L/min (increments of 0.5 L/min) for nCPAP
2 to 10 L/min (increments of 0.5 L/min)
8 to 20 L/min for NIV (increments of 0.5 L/min)

Control and Ranges (continued)

Insp. pause:	0 to 75% of inspiration time (increments of 5%)
T_{pause}:	0 to 7.5 sec 0 to 1 sec (increments of 0.05) 1 to 4 sec (increments of 0.1) 4 to 7.5 (increments of 0.25) 0 to 11 sec 0 to 1 sec (increments of 0.05) 1 to 4 sec (increments of 0.1) 4 to 11 (increments of 0.25)
Pressure support from PEEP level:	0 to 60 cm H_2O for SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel, BiLevel-VG and CPAP/PSV (increments of 1 cm H_2O) 0 to 30 cm H_2O for NIV (increments of 1 cm H_2O)
End flow level:	5 to 80% of peak flow for NIV, SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel, BiLevel-VG, VG-PS and CPAP/PSV (increments of 5%)

Alarm Settings

Tidal volume:	Low:	Off, 1 to 345 mL Off, 5 to 1950 mL
	High:	3 to 350 mL, Off 10 to 2000 mL, Off
Minute volume:	Low:	0.01 to 10 L/min 0.01 to 40 L/min
	High:	0.02 to 40 L/min 0.4 to 99 L/min
Respiratory rate:	Low:	Off, 1 to 99/min
	High:	2 to 150/min, Off 2 to 120/min, Off
Inspired oxygen (FiO_2):	Low:	18 to 99%
	High:	24 to 100%, Off
P_{max}:	High:	7 to 100 cm H_2O 9-100 cm H_2O (increments of 1 cm H_2O) in NIV and nCPAP
P_{peak}:	Low:	1 to 97 cm H_2O
$PEEP_e$:	Low:	Off, 1 to 20 cm H_2O
	High:	5 to 50 cm H_2O, Off
$PEEP_i$:	High:	1 to 20 cm H_2O, Off
P_{limit}:	7 to 100 cm H_2O	
Apnea alarm:	User adjustable:	5 to 20 sec 10 to 60 sec
Circuit leak:	10 to 90%, Off	
EtO_2:	Low:	Off, 10 to 99%
	High:	11 to 100%, Off
$EtCO_2$:	Low:	Off, 0.1 to 14.9% or Off, 0 to 114.5 mmHg
	High:	0.2 to 15%, off or 0.5 to 115 mmHg, Off
Ventilation soft limit indicators:	When adjusting selected ventilator parameters, color indicators show when parameters are approaching their setting limits.	
Parameters with soft limits:	P_{max}, PEEP, P_{insp}, P_{supp}, T_{insp}, RR, I:E, P_{high}, P_{low}, T_{high} and T_{low}	

Alarm System

Escalating alarms:	High priority alarms escalate to a higher pitch if unattended for specified time
Adjustable to:	0, 10, 20 and 30 sec, Off
Auto limits:	Alarm limits calculated on the current measured values for selected parameters

Procedures

Suction

Program routine: Automatic

Pre-oxygenation:	≤ 2 minutes with 100% O_2 with automatic disconnection detection*
Standby pause:	≤ 2 minutes with automatic patient (re-connection) detection
Post-oxygenation:	≤ 2 minutes with 100% O_2*

Note: FIO_2 can be set to level other than 100%

*Note: 5 to 75% above current FiO2 setting

Manual breath

Intrinsic PEEP (includes $PEEP_i$ Volume)

Lung Mechanics: PØ.1
NIF
Vital Capacity

Inspiratory hold: 2 to 15 sec (increments of 1 sec)

Expiratory hold: 2 to 20 sec (increments of 1 sec)

Spontaneous Breathing Trial (SBT)
(Adjustable range: 2 to 120 minutes)

Non-Invasive Ventilation (NIV) (optional)

Mask ventilation: Yes

Integrated unique leak recognition algorithm

Automatic Patient Detection (APD)

Patient re-connection:	Automatic detection in standby
Detection by:	Back pressure to Bias-flow

100% O_2 ($\uparrow O_2$)

Delivers 5 to 75% above current FiO_2 setting for ≤ 2 minutes

Delivers 100% O_2 for ≤ 2 minutes

Can be adjusted to other O_2%

Take Snapshot

Immediate capture and storage of critical data currently on the Engström's display

Stored data:	3 waveform segments Alarm messages (up to 5, currently active) All measured parameters All set ventilator parameters
Maximum stored Snapshots:	10 most recent
Cursor:	Ability to cursor across waveforms for specific measured values

Ventilator Preferences

Back-up Mode:	Establishes the specific ventilator mode and parameters used in the event that the ventilator switches to Back-up ventilation
ARC:	Allows control and setting of the airway resistance compensation
Assist Control:	Allows the user to turn the Assist Control capability On or Off
Leak Compensation:	Allows the user to turn the Leak Compensation capability On or Off
Trigger Compensation:	Allows the user to turn On or Off compensation for flow triggering
TV Based Conditions:	Allows setting between ATPD (Ambient Temperature Pressure Dry) or BTPS (Body Temperature Pressure Saturated)

Airway Resistance Compensation (ARC)

Note: Not available in Neonatal option

Type of compensation:	Electronic tube compensation
Compensation for:	Endotracheal and tracheostomy tubes
Tube diameter:	5 to 10 mm
Level of compensation:	25 to 100%

Ventilator Monitoring

Airway pressure	−20 to +120 cm H_2O
Patient flow	0.1 to 32 L/min 1 to 200 L/min
Tidal volume	0.5 to 1,000 mL with Neonatal Flow Sensor 1 to 1,000 mL without the Neonatal Flow Sensor 5 to 2,500 mL
Minute volume	0 to 99.9 L/min
CO_2	0 to 30%/0 to 225 mmHg
Compliance	0.1 to 150 mL/cm H_2O
Resistance	1 to 500 cm H2O/L/s
RQ	0.6 to 1.3
VO_2	50 to 1000 mL/min
VCO_2	50 to 1000 mL/min
Rate	0 to 150 breaths per minute (increments of 1 breath per minute) 0 to 120 breaths per minute (increments of 1 breath per minute)
FiO_2	10 to 100%
Rapid Shallow Breathing Index (RSBI)	1 to 999 bpm/L

Note: Not available in Neonatal option

Pnuematic nebulizer

Flow compensation:	1 to 4 L/min (increments of 0.5 L/min) 1 to 12 L/min (increments of 0.5 L/min)

Oxygen Monitoring

Technology:	Dynamic Paramagnetic Oxygen monitoring system
Life span:	Unlimited operating life due to the use of non-depleting technology

Screen

Display type:	30.5 cm/12 inch touch screen full color LCD adjustable viewing angle
Waveforms in screen:	Three at a time
Waveform parameters:	Pressure, flow, volume, CO_2, O_2 and auxiliary pressure
Graphic scaling:	Automatic scaling for optimal size or independent scaling
Data:	Control parameters, patient data, alarm settings and messages
Status indicator:	Ventilation mode, battery level, clock
Favorites:	23 Hyperlink shortcuts to choose from 7 selectable at one time

Monitoring Accuracy**

Pressure readings:	±2 cm H_20
Volume readings:	±10% or ±1 mL, whichever is greater (with proximal neonatal flow sensor) ±10% or ±5 mL, whichever is greater (nCPAP) ±10% or ±15 mL, whichever is greater
O_2 concentration monitor:	±3%

Delivery Accuracy**

Inspired pressure control:	±2 cm H_2O
Oxygen – Air mixing:	±3% V/V of setting
Tidal volume delivery:	±10% of setting or ±1 mL, whichever is greater (with proximal neonatal flow sensor) ±10% of setting or ±5 mL, whichever is greater

Trends

Trend data:	Set parameters and measured data
Trend styles:	Measured and graphic
Maximum trending:	14 days (336 hours)
Trend scaling:	12 min, 1h, 2h, 4h, 6h, 8h, 10h, 12h, 24h, 36h, 48h and 72h
Resolution:	1 minute intervals for most recent 12 hours, 5 minute intervals for 12 to 48 hours, 30 minute intervals after 48 hours
Mini-Trends:	Waveform values can be displayed as a trend in a split screen view

Trends (continued)

Mini-Trends parameters are based on the waveform displayed:	Paw (P_{peak}, P_{plat} or Leak) Flow (MV_{exp}, RR) Volume (Spont MV or Mech MV, Spont RR or Mech RR) P_{aux} (P_{peak}) CO_2 ($EtCO_2$) O_2 (EtO_2, FiO_2)

Gas supply

Single gas operation:	Yes
Emergency air valve:	Built-in

Oxygen supply

Pressure range:	240 to 641 kPa/35 to 94 psi
Flow:	160 L/min

Air supply

Pressure range:	240 to 641 kPa/35 to 94 psi
Flow:	160 L/min

Electrical Specifications

Line supply

Line voltage:	85 to 132 Vac, 47/63 Hz 190 to 264 Vac, 47/63 Hz
Power consumption:	< 200 W

Battery supply

Back-up battery:	Built-in
Type:	Lead acid gel
Battery back-up time:	120 minutes typical, 30 minute minimum, battery fully charged