

Engström Pro

When does efficiency meet functionality in a ventilator?



Today.

The Engström Pro™, built on the proven platform of the Engström Carestation™, provides you with all the features you expect from a critical care ventilator, while helping clinicians redefine cost savings.

We developed the Engström Pro to be user friendly, help control costs and further improve efficiencies in your ICU and Step-down units.

Features

- Simplified user interface
- Advanced ventilation, including optional BiLevel-VG and SIMV-PCVG
- Patient Spirometry, measured at the ventilator
- Intuitive user interface that is flexible and adaptable, with the ability to quickly switch to your facility's standards
- Flexible and movable display allows for each repositioning of the display to keep respiratory parameters and controls in view and in reach at all times
- Helping to increase patient comfort, through optional non-invasive ventilation
- Secure access to our Central stations, web viewers and wireless connections, providing seamless flow of information
- Airway Resistance Compensation

Low cost of ownership

- Maintenance-free Paramagnetic (O₂) Sensor comes standard and never needs to be replaced
- Easy to clean quick-release expiratory valve and flow sensor, fully autoclavable to 134°C
- Only one Preventative Maintenance (PM) check required annually, no PM recommended replacement parts or PM kits needed

Aerogen Aeroneb®

- Built-in advanced nebulization system
- Operated inline or independently for pediatric through adults



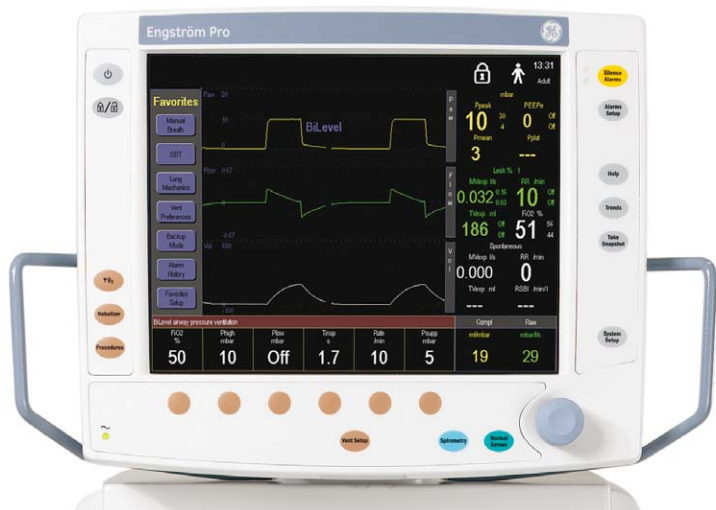
Physical Specifications

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); 72 kg/158.7 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

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)
- Constant Positive Airway Pressure/Pressure Support Ventilation (CPAP/PSV)
- Apnea backup available in SIMV-VC, SIMV-PC, BiLevel, SIMV-PCVG, BiLevel-VG, and CPAP/PSV (institutionally selectable defaults)

Control and Ranges

- Maximum peak flow: 200 L/min
- Flow: 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: 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) 
- FiO₂: 21 to 100% O₂
- Rate: 3 to 120 breaths per minute for VCV, PCV, PCV-VG and BiLevel (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)
- Minimum rate: 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: 1:9 to 4:1 (ventilator setting)
1:79 to 60:1 in BiLevel
- Tidal volume range: 20 to 2000 mL

Control and Ranges (continued)

Incremental settings:	20 to 50 mL (increments of .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	selected. Active in VCV, PCV, PCV-VG, SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel-VG, NIV and BiLevel (increments of 50 ms)
Patient weight:	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 1 lb) 220 to 440 lb (increments of 5 lb)	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 and CPAP/PSV (increments of 50 ms)
Inspiratory pressure (P_{insp}) range:	1 to 98 cm H ₂ O (increments of 1 cm H ₂ O)	Trigger window: 0 to 80% of expiration time (increments of 5%)
P_{high} :	1 to 98 cm H ₂ O (increments of 1 cm H ₂ O)	Flow trigger: 1 to 9 L/min (increments of 0.5 L/min) 1 to 3 L/min (increments of 0.1 L/min) 3 to 9 L/min (increments of 0.5 L/min)
P_{low} :	Off, 1 to 50 cm H ₂ O (increments of 1 cm H ₂ O)	Pressure trigger: -10 to -3 cm H ₂ O (increments of 0.5 cm H ₂ O) -3 to -0.25 cm H ₂ O (increments of 0.25 cm H ₂ O)
Pressure limit (P_{limit}) range:	7 to 100 cm H ₂ O for VCV and SIMV-VC (increments of 1 cm H ₂ O)	Bias flow rate: 2 to 10 L/min (increments of 0.5 L/min) 8 to 20 L/min for NIV (increments of 0.5 L/min)
Max. inspiratory pressure		Insp. pause: 0 to 75% of inspiration time (increments of 5%)
(P_{max}) limit:	7 to 100 cm H ₂ O (increments of 1 cm H ₂ O) 9-100 cm H ₂ O (increments of 1 cm H ₂ O) in NIV	T_{pause} : 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)
PEEP:	Off, 1 to 50 cm H ₂ O (increments of 1 cm H ₂ O) 2-20 cm H ₂ O (increments of 1 cm H ₂ O) in NIV	Pressure support from PEEP level: 0 to 60 cm H ₂ O for SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel, BiLevel-VG and CPAP/PSV (increments of 1 cm H ₂ O) 0 to 30 cm H ₂ O for NIV (increments of 1 cm H ₂ O)
Inspiratory time:	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)	End flow level: 5 to 80% of peak flow for NIV, SIMV-VC, SIMV-PC, SIMV-PCVG, BiLevel, BiLevel-VG and CPAP/PSV (increments of 5%)
T_{high} :	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 0.05) 1 to 4 sec (increments of 0.1) 4 to 18 sec (increments of 0.25)	
T_{supp} :	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 0.5 to 59.75 sec in NIV	
Rise time:	0 to 500 ms of inspiratory period for either flow or pressure depending on the mode	

Alarm Settings

Tidal volume:	Low: Off, 5 to 1950 mL High: 10 to 2000 mL, Off
Minute volume:	Low: 0.01 to 40 L/min High: 0.4 to 99 L/min
Respiratory rate:	Low: Off, 1 to 99/min High: 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 ₂ O 9-100 cm H ₂ O (increments of 1 cm H ₂ O) in NIV

Alarm Settings (continued)

P_{peak} :	Low:	1 to 97 cm H ₂ O
$PEEP_e$:	Low:	Off, 1 to 20 cm H ₂ O
	High:	5 to 50 cm H ₂ O, Off
P_{limit} :		7 to 100 cm H ₂ O
Apnea alarm:	User adjustable:	10 to 60 sec
Circuit leak:		10 to 90%, 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%

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)

Spirometry

Data source:	Ventilator
Loop types:	Pressure-Volume, Pressure-Flow and Flow-Volume
Saved loop:	Up to six loops can be saved
Reference loop:	A saved loop can be selected as the reference loop to compare with the current loop being displayed
Cursor:	Freezes current loops and provides numeric display of X and Y axis as cursor moves across loops
Pulmonary mechanics:	P_{peak} , P_{plat} , P_{mean} , $PEEP_e$, $PEEP_i$, TV_{insp} , TV_{exp} , MV_{insp} , MV_{exp} , Compliance and Resistance

Auxiliary Pressure

Auxiliary pressure (P_{aux}):	Measured range: -20 to +120 cm H ₂ O Alarm range: 12 to 100 cm H ₂ O
Purge flow:	Low flow to clear the P_{aux} line, can be turned Off

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% O₂ (↑O₂)

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)

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

Mode Families

Allows user adjustment to specify certain parameters that align with the hospital's current ventilator usage.

Adjustable parameters:	Flow and Inspiratory timing
Family 1:	Flow control is On/Insp. Timing is I:E
Family 2:	Flow control is Off/Insp. Timing is I:E
Family 3:	Flow control is On/Insp. Timing is T_{insp}
Family 4:	Flow control is Off/Insp. Timing is T_{insp}
Family 5:	Flow control is On/Insp. Timing is T_{pause}

Help

Help screens are available for any recent or active alarm. Help will provide the cause of the alarm and the action to resolve the alarm conditions.

Ventilator Monitoring

Airway pressure:	-20 to +120 cm H ₂ O
Patient flow:	1 to 200 L/min
Tidal volume:	5 to 2,500 mL
Minute volume:	0 to 99.9 L/min
Compliance:	0.1 to 150 mL/cm H ₂ O
Resistance:	1 to 500 cm H ₂ O/L/s
Rate:	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

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 ₂ O
Volume readings:	$\pm 10\%$ or ± 15 mL, whichever is greater
O ₂ concentration monitor:	$\pm 3\%$

Delivery Accuracy*

Inspired pressure control:	± 2 cm H ₂ O
Oxygen – Air mixing:	$\pm 3\%$ V/V of setting
Tidal volume delivery:	$\pm 10\%$ of setting or ± 5 mL, whichever is greater

Nebulization

Nebulizer:	Aeroneb Nebulizer System built-in
Nebulizer technology:	Electronic micro pump
Nebulizer run time:	10, 15, 20 or 30 minutes
Auto-repeat capability:	Cycles: 1 to 10 Pause Time: 30 sec to 8 hr 1 to 5 minutes (increments of 1 minute) 5 to 55 minutes (increments of 5 minutes) 1 to 8 hours (increments of 0.5 hour)
Nebulizer volume setting:	2.5, 3, 5 or 6 mL
Particle size:	Aeroneb Pro: average 2.1 microns MMAD (Mean Mass Aerodynamic Diameter) Aeroneb Solo: 3.4 microns MMAD
Residual volume:	Aeroneb Pro: average 0.3 mL Aeroneb Solo: average < 0.1 mL

Performance may vary depending upon the type of drug used. For additional information contact Aerogen or drug supplier.

* Ventilation delivery specifications requirements:

- Operating at EN794 and ASTM F1100 patient conditions
- Operating at 21°C and at 1000 mbar ambient pressure
- All volumes are at ambient temperature and pressure, dry (ATPD)

Pneumatic nebulizer

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

Trend data:	All 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
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})

External Communications

Communication ports:	Serial port (RS-232), RS-485 port, RS-422 port, 1 USB port, Ethernet port, Compact flash card socket, nurse call
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EView (optional)

Data Available:	10 snapshots 7 days of vent data Optional breath to breath waveform data
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Electrical Specifications

Line supply

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

Electrical Specifications (continued)

Battery supply

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

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

Environmental Specifications

Thermal

Operating range:	10° to 40°C
Storage range:	-20° to 65°C

Humidity

Operating range:	15 to 95% RH Non-condensing
Storage range:	15 to 95% RH Non-condensing In accordance with IEC 68-2-3

Vibration and shock

Random vibration:	9.5 grms @ 30 min unpacked 2 to 5000 Hz
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Altitude

Operating range:	-440 to 3565 m/500 to 800 mmHg
Storage range:	-440 to 5860 m/375 to 800 mmHg

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GE imagination at work

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