vyaire™
MEDICAL

AVEA™ ventilator

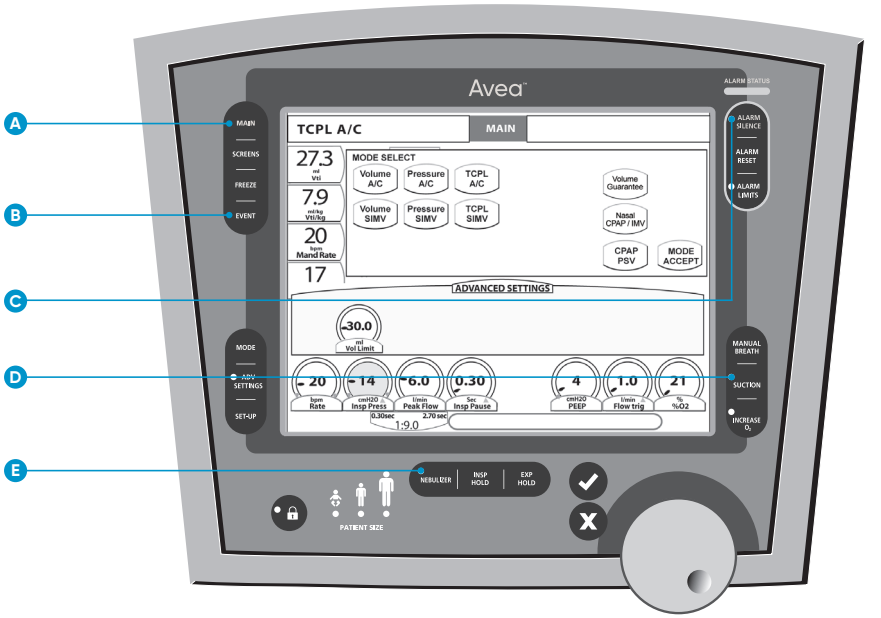
Critical care ventilation

QUICK TIPS

NOTE: The AVEA™ ventilator's quick tips card is not intended to replace the operator manual.

You must become completely familiar with the operator manual before using the AVEA ventilator.

User interface



A. **Main:** Returns the user to the main screen.

B. **Event:** Selects the event to record in the trends screen.

C. **Alarm silence:** Starts a two-minute silence period.

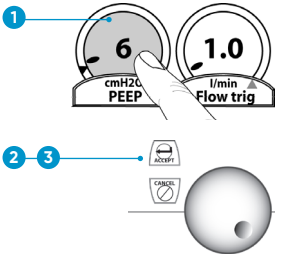
D. **Suction:** Three functions:
   1. Run ↑O_2 maneuver for two minutes.
   2. Disable demand flow on loss of PEEP.
   3. Silence alarms for two minutes.

E. **Nebulizer:** Flows air for 20 minutes, synchronized with inspiration.

User interface *(continued)*

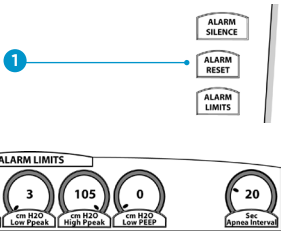
Touch-Turn-Touch™ and Touch-Turn-Accept™ method

1. Touch the control to select. The control changes color, indicating that it is active.
2. Turn the data dial to reach the selected value.
3. Touch the control again, or press **ACCEPT** to confirm the change.



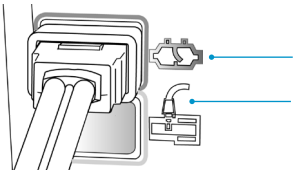
Setting alarm limits

1. Press **ALARM LIMITS** to open or close the window.
2. Use the Touch-Turn-Touch or Touch-Turn-Accept method to modify alarms.



Proximal flow sensors

The AVEA ventilator accepts either hot wire or variable orifice proximal low sensors. These are in addition to the internal inspiratory flow sensor and heated expiratory flow sensor.



The variable orifice sensor attaches to the receptacle circled in dark blue.

The hot wire flow sensor attaches to the receptacle circled in light blue, directly below the variable orifice flow sensor connection.

To attach the flow sensor, pull back the locking collar. Push firmly onto the receptacle. Push the collar forward to lock the sensor in place.

To disconnect, retract the collar and pull the connector straight away from the ventilator.

Monitors and definitions

Volume monitors	
Vte	Exhaled tidal volume.
Vte/kg	Exhaled tidal volume adjusted for patient weight.
Vti	Inspired tidal volume.
Vti/kg	Inspired tidal volume adjusted for patient weight.
Spon Vt	Spontaneous tidal volume.
Spon Vt/kg	Spontaneous tidal volume adjusted for patient weight.
Mand Vt	Mandatory tidal volume: displayed as a rolling average of either eight breaths or one minute, whichever occurs first.
Mand Vt/kg	Mandatory tidal volume adjusted for patient weight.
Vdel	Delivered machine volume measured by the ventilator's inspiratory flow sensor.
% leak	Percent leakage: the difference between the inspired and exhaled tidal volumes in terms of the percent difference.
Ve	Minute volume. Volume of gas exhaled by the patient during the last minute.
Ve/kg	Minute volume adjusted for patient weight.
Spon Ve	Spontaneous minute volume.
Spon Ve/kg	Spontaneous minute volume adjusted for patient weight.
Rate/time monitors	
Rate	Breath rate.
Spon rate	Spontaneous breath rate.
Ti	Inspiratory time.
Te	Exhalation time.
I:E	Inspiratory/expiratory ratio. **Note:** Not active for demand breaths.
f/Vt	Rapid shallow breathing index.
Pressure monitors	
Ppeak	Peak inspiratory pressure. **Note:** Not active with spontaneous breaths.
Pmean	Mean airway pressure.
Pplat	Plateau pressure. If no plateau occurs, then the monitor displays.***
PEEP	Positive end expiratory pressure.
Air inlet	Air inlet gas supply pressure.
O_2 inlet	Oxygen inlet gas supply pressure.
Gas composition monitors	
FiO_2	Delivered percent O_2.

Monitors and definitions *(continued)*

Mechanics	
CDYN CDYN/kg	Dynamic compliance (CDYN and CDYN/kg), absolute and normalized to patient weight.
Cstat Cstat/kg	Respiratory system compliance (C_{RS}), *(i.e., static compliance Cstat)*, absolute and normalized to patient weight. **Note:** This requires an Inspiratory Hold maneuver.
PIFR	Peak inspiratory flow rate.
PEFR	Peak expiratory flow rate.
Ccw	The ratio of the tidal volume *(exhaled)* to the delta esophageal pressure (dP_{ES}). Requires an esophageal balloon.
CLUNG	The ratio of the tidal volume *(exhaled)* to the delta transpulmonary pressure. The delta transpulmonary pressure is the difference between the airway plateau pressure *(during an inspiratory pause)* and esophageal pressure *(at the time the airway plateau pressure is measured)* minus the difference between the airway and esophageal baseline pressures. Requires an inspiratory hold and esophageal balloon.
C_{20}/C	The ratio of the dynamic compliance during the last 20% of inspiration (C_{20}) to the total dynamic compliance (C).
RRS	The total resistance during the inspiratory phase of a breath. Respiratory system resistance is the ratio of the airway pressure differential *(peak–plateau)* to the inspiratory flow 12 ms prior to the end of inspiration. Requires an inspiratory hold.
R_{PEAK}	The peak expiratory resistance (R_{PEAK}) is defined as the resistance at the time of the peak expiratory flow (PEFR).
R_{IMP}	The airway resistance between the wye of the patient circuit and the tracheal sensor. Requires an inspiratory hold and tracheal catheter.
R_{LUNG}	The ratio of the tracheal pressure differential *(peak–plateau)* to the inspiratory flow 12 ms prior to the end of inspiration. Requires an inspiratory hold and tracheal catheter.
dP_{AW}	The difference between peak airway pressure ($P_{PEAK\ AW}$) and baseline airway pressure ($PEEP_{AW}$).
dP_{ES}	The difference between peak esophageal pressure ($PPEAK_{ES}$) and baseline esophageal pressure ($PEEP_{ES}$).
AutoPEEP	The airway pressure at the end of an expiratory hold maneuver. Requires a passive patient.
dAutoPEEP	The difference between airway pressure at the end of an expiratory hold maneuver and the airway pressure at the start of the next scheduled breath after the expiratory hold maneuver. Requires a passive patient.
$AutoPEEP_{ES}$	The difference between esophageal pressure measured at the end of exhalation ($PEEP_{ES}$) minus the esophageal pressure measured at the start of a patient-initiated breath ($P_{ES\ start}$) and the sensitivity of the ventilator's demand system. The sensitivity of the ventilator's demand system is the difference between the baseline airway pressure ($PEEP_{AW}$) and the airway pressure when the patient initiates a breath (PAW start). Requires an esophageal balloon.
P_{tp} Plat	Transpulmonary pressure during an inspiratory hold, which is the difference between the airway plateau pressure ($P_{PLAT\ AW}$) and the corresponding esophageal pressure. Requires an inspiratory hold and esophageal balloon.

Monitors and definitions *(continued)*

Mechanics *(continued)*	
P_{tp} PEEP	The difference between the corresponding airway and esophageal pressures at the end of the expiratory hold during an AutoPEEP maneuver. Requires an inspiratory hold and esophageal catheter.
MIP	The maximum negative airway pressure that is achieved by the patient during an expiratory hold maneuver.
P_{100}	The negative pressure that occurs 100 ms after an inspiratory effort has been detected.
WOB_V	Ventilator work of breathing (WOB_V) is defined as the summation of airway pressure (PAW) minus the baseline airway pressure (PEEPAW) times the change in tidal volume to the patient (-V) during inspiration, and normalized to the total inspiratory tidal volume (Vti).
WOB_P	Patient work of breathing (WOB_P), normalized to the total inspiratory tidal volume. Patient work of breathing is defined as the summation of two work components: Work of the lung and work of the chest wall. Requires an esophageal balloon.
WOB_I	Imposed work of breathing (WOB_I) is defined as the work performed by the patient to breathe spontaneously through the breathing apparatus, *(i.e., the ET tube)*, the breathing circuit and the demand flow system. Requires a tracheal catheter. **Note:** Monitored values are displayed as BTPS.
Capnography	
$EtCO_2$	The patient's peak expired CO_2 as measured and reported by the CO_2 sensor in the airway, calculated for each breath then averaged as specified by set $ETCO_2$ averaging time.
VCO_2	Minute volume of exhaled CO_2 measured continuously and averaged over a user-selectable time. Requires flow measurement at the wye or circuit compliance active.
$VtCO_2$	Tidal volume of exhaled CO_2, measured for each breath and then averaged over the set VCO_2 averaging time. Requires flow measurement at the wye or circuit compliance active.
Vd ana	The volume of dead space in the patient's conducting airways from the nose to the level of the terminal bronchioles measured for each breath, then averaged over the set CO_2 averaging time. Also includes any mechanical dead spaces added to the ventilator circuit between the CO_2 sensor and the patient. Requires flow measurement at the wye or circuit compliance active.
Vd/Vt ana	Anatomic Vd/Vt is averaged over the set VCO_2 averaging time. Requires flow measurement at the wye or circuit compliance active.
Vd phy	Comprises Vd ana as well as the volume of the respiratory zone *(respiratory bronchioles, alveolar ducts and alveoli)* not participating in gas exchange. Requires an arterial blood gas sample.
Vd/Vt phy	Physiologic Vd/Vt is averaged over the set VCO_2 averaging time. Requires an arterial blood gas sample.
Vd alv	Alveolar dead space is the difference between physiological dead space and anatomical dead space. It represents the volume of the respiratory zone that is from ventilation of relative under-perfused or non-perfused alveoli. Requires an arterial blood gas sample.

Monitors and definitions *(continued)*

Capnography *(continued)*	
VA	Alveolar ventilation is the volume of gas participating in gas exchange per minute. Requires an arterial blood gas sample.
P/F	The PaO_2/FIO_2 ratio is a simple assessment of gas exchange calculated from the FiO_2 monitor value and an arterial blood oxygen measurement *(required)* entered by the clinician.
OI	Oxygenation index is a dimensionless number often used to assess the "pressure cost" of oxygenation calculated from the FiO_2 mean airway pressure and an arterial blood oxygen measurement *(required)* entered by the clinician.

Available modes

Mode	Adult	Pediatric	Neonatal
Volume A/C	•	•	•
Volume SIMV	•	•	•
Pressure A/C*	•	•	•
Pressure SIMV*	•	•	•
TCPL A/C*			•
TCPL SIMV*			•
PRVC A/C	•	•	
PRVC SIMV	•	•	
APRV/BiPhasic	•	•	
CPAP/ PSV	•	•	
Nasal CPAP/IMV			•

* Volume guarantee breaths available for neonates

Normal values and indications for weaning *(adults)*

Parameter	Normal range	Indications for weaning
Respiratory rate	10 to 20 breaths/min	< 30 B/min△
Esophageal pressure	5 to 10 cmH_2O	< 15 cmH_2O
Tidal volume	7 to 10 mL/kg	> 5 mL/kg△
Minute ventilation	5 to 10 L/min	< 10 L/min
WOB_P	3 to 0.6 J/L	< 0.75 J/L △
Pressure time index	0.05 to 0.12	< 0.15 △
Airway resistance	2 to 5 cmH_2O/L/s	< 15 cmH_2O/L/s
Lung compliance	50 to 100 mL/cmH_2O	> 25 mL/cmH_2O
Maximum inspiratory	-30 cmH_2O low effort	> -20 cmH_2O△
Pressure (MIP)	-140 cmH_2O high effort	
Auto PEEP	0	< 3 cmH_2O
Respiratory drive P0.1	2 to 4 cmH_2O	< 6 cmH_2O△
f/VT	60 to 90	< 105
Pressure time	200 to 300 cmH_2O sec/min	
Product (PTP)		
Ti/TTOT	0.3 to 0.4	
Parameter	Acceptable range	
SaO_2	> 90% on FiO_2 of < 40%	
P(A - a) O_2 on FIO_2 of 100%	< 350 mmHg	
PaO_2/FIO_2	> 200 mmHg	
Qs/Qt	< 20%	
Vd/Vt	< 0.6	
Heart rate	> 70 and < 120 BPM	
Mean blood pressure	> 70 and < 110 mmHg	

NOTE: Research indicates these pulmonary parameters may aid qualified medical personnel in evaluating weaning potential. If measured values exceed acceptable range, successful weaning may be less likely. Ranges from these parameters are not intended to substitute clinical assessment by qualified medical personnel, and Vyaire assumes no liability for their use in patient care. A list of references is available upon request.

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