

**Parameters and Technical Specifications**

| Input parameters                                                                        |                                         |                        |                                    |                                                    |                                                                      |
|-----------------------------------------------------------------------------------------|-----------------------------------------|------------------------|------------------------------------|----------------------------------------------------|----------------------------------------------------------------------|
| Parameter name                                                                          | Type (numeric, alphanumeric, character) | Range                  | Unit of measurement                | Tolerances                                         | Measured/set by the operator                                         |
| Flow                                                                                    | Numerical                               | -100, +250             | slm <sup>1</sup>                   | 7 % m.v. <sup>2</sup> asl (on full range)          | Measured                                                             |
| Differential pressure                                                                   | Numerical                               | -50, +50               | mbar                               | ± 1 % (on full scale) <sup>3</sup>                 | Measured                                                             |
| Respiratory frequency (mod.: forced)                                                    | Numerical                               | 8-30                   | Breathing acts/minute              | ± 1 act/min                                        | Set                                                                  |
| Target patient input volume (mod.: forced)                                              | Numerical                               | 50-1300                | ml                                 | ± 15% (compared to the set value)                  | Set                                                                  |
| Desired Plateau pressure (mod.: forced)                                                 | Numerical                               | 1-50                   | cmH <sub>2</sub> O                 | ± 1 cmH <sub>2</sub> O (compared to the set one)   | Set                                                                  |
| Ratio between desired inhalation and exhalation time (mod.: forced)                     | Numerical                               | 1:1, 1:1.5, 1:2, 1:2.5 | Dimensional (being a relationship) | ± 5% (compared to the set value)                   | Set                                                                  |
| Maximum allowed loss percentage (or Leak percentage) (mod.: forced)                     | Numerical                               | 5-90                   | % <sup>4</sup>                     | ± 1% (compared to the set value)                   | Set                                                                  |
| PEEP desired                                                                            | Numerical                               | 0-25                   | cmH <sub>2</sub> O                 | ± 1 cmH <sub>2</sub> O (compared to the set one)   | Set                                                                  |
| Desired support pressure (mod.: assisted)                                               | Numerical                               | 0-30                   | cmH <sub>2</sub> O                 | ± 1 cmH <sub>2</sub> O (compared to the set one)   | Set                                                                  |
| Support pressure acceleration (mod.: assisted)                                          | Numerical                               | 1-15                   | Dimensional                        | Irrelevant                                         | Set (Only serves to adjust the acceleration of the support pressure) |
| Trigger to start inhalation under pressure (mod.: assisted)                             | Numerical                               | -1 a -15               | cmH <sub>2</sub> O                 | ± 0.5 cmH <sub>2</sub> O (compared to the set one) | Set                                                                  |
| Flow start inhalation trigger (mod.: assisted)                                          | Numerical                               | 5 a 500                | ml/min                             | ± 15% (compared to the set value)                  | Set                                                                  |
| End of inhalation assisted trigger in percentage threshold on the flow (mod.: assisted) | Numerical                               | 0 a 99                 | %                                  | ± 5% (compared to the set value)                   | Set                                                                  |
| Backup forced breathing time (mod.: assisted)                                           | Numerical                               | 2 a 20                 | S [sec]                            | ± 5% (compared to the set value)                   | Set                                                                  |

<sup>1</sup> slm: mass flow measured in liters per minute at standard conditions (T = 20 °C, p = 1013.25 mbar)

<sup>2</sup> % m.v. = % measured value = % of reading

<sup>3</sup> Total accuracy is the combined error from offset and span calibration, linearity, pressure hysteresis, and temperature effects. Linearity is the measured deviation based on a straight line. Hysteresis is the maximum output difference at any point within the operating pressure range for increasing and decreasing pressure. Calibration errors include the deviation of offset and full scale from nominal values.

<sup>4</sup> Leak percentage calculated as: (Air Volume Inhaled – Air Volume exhaled)/ Air Volume Inhaled\* 100

| Output parameters                       |                                         |                 |                       |                                         |                               |
|-----------------------------------------|-----------------------------------------|-----------------|-----------------------|-----------------------------------------|-------------------------------|
| Parameter name                          | Type (numeric, alphanumeric, character) | Range           | Unit of measurement   | Tolerances (compared to expected value) | Direct/Calculated Measurement |
| Plateau Pressure (mod.: forced)         | Numerical                               | 0 a 50          | cmH2O                 | ± 1 cmH2O                               | Direct                        |
| PIP Pressure                            | Numerical                               | 0 a 50          | cmH2O                 | ± 1 cmH2O                               | Direct                        |
| Inhaled Volume                          | Numerical                               | ND <sup>5</sup> | ml                    | ± 15%                                   | Calculated <sup>6</sup>       |
| Exhaled Volume                          | Numerical                               | ND              | ml                    | ± 15%                                   | Calculated <sup>6</sup>       |
| Respiratory frequency                   | Numerical                               | ND              | Breathing acts/minute | ± 1 act/min                             | Calculated <sup>7</sup>       |
| PEEP Pressure                           | Numerical                               | 0 a 50          | cmH2O                 | ± 1 cmH2O                               | Direct                        |
| Driving Pressure (mod.: forced)         | Numerical                               | ND              | cmH2O                 | ± 1 cmH2O                               | Calculated <sup>8</sup>       |
| Compliance (mod.: forced)               | Numerical                               | ND              | ml/cmH2O              | ± 5%                                    | Calculated <sup>9</sup>       |
| Leak Percentage (or percentage of loss) | Numerical                               | ND              | %4                    | ± 1%                                    |                               |
| Support Pressure (mod.: assisted)       | Numerical                               | 0 a 35          | cmH2O                 | ± 1 cmH2O                               | Direct                        |

<sup>5</sup> DN means that the parameter is a dependent variables so its range depends on the values of the indirect parameters related to it.

<sup>6</sup> Volume calculated as integral flow over time:  $V = \int_{-T/2}^{+T/2} F dt$ , where T corresponds to the period of a respiratory act.

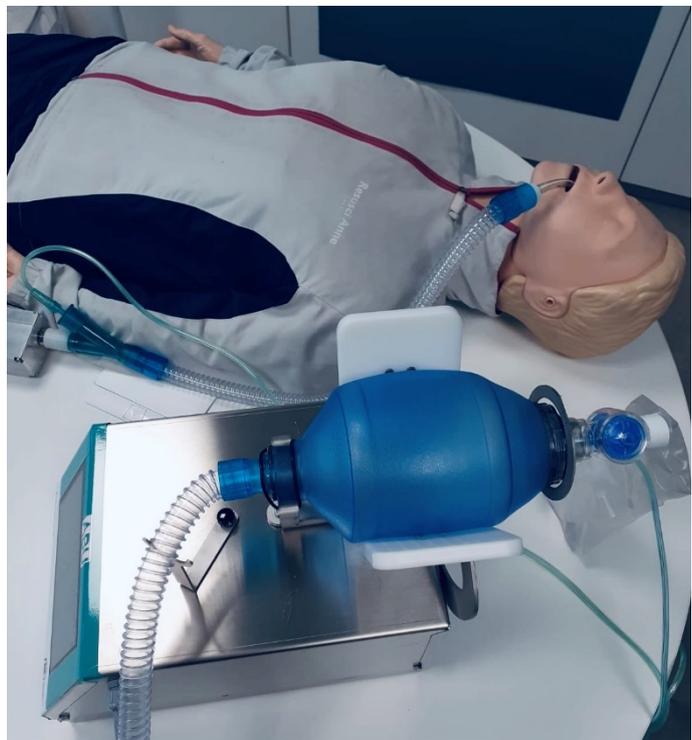
<sup>7</sup> Breathing frequency calculated as:  $1/T$ .

<sup>8</sup> Driving Pressure (dP) calculated as:  $dP = P_{plateau} - PEEP$

<sup>9</sup> Compliance is calculated as:  $C = \text{Air Volume Inhaled} / dP$



| Monitoring                     |                                                        |                               |                             |
|--------------------------------|--------------------------------------------------------|-------------------------------|-----------------------------|
| <b>Pressure Value</b>          | <i>Ppeak, Pplat, Pmean, Pmin, PEEP</i>                 |                               |                             |
| <b>Volume/Flow Value</b>       | <i>MV, MVSpont</i>                                     |                               |                             |
| <b>Time/Value</b>              | <i>I:E</i>                                             |                               |                             |
| <b>Real Time Curves</b>        | <i>Pressure-Time, Flow-Time, Volume-Time waveforms</i> |                               |                             |
| <b>Calculated Values</b>       | <i>Compliance (C)</i>                                  |                               |                             |
|                                | <i>MVleak</i>                                          |                               |                             |
|                                | <i>RSBI</i>                                            |                               |                             |
|                                | <i>WOB</i>                                             |                               |                             |
|                                | <i>PEEPi</i>                                           |                               |                             |
| Alarms                         |                                                        |                               |                             |
|                                | <i>Paw high/Low</i>                                    | <i>Circuit disconnect</i>     | <i>High respiration low</i> |
|                                | <i>Apnea AC Failure</i>                                | <i>Inspiration/Expiration</i> | <i>Tidal volume low</i>     |
|                                | <i>Low Battery</i>                                     | <i>High/Low PEEP</i>          | <i>Leakage out of range</i> |
|                                | <i>Occlusion</i>                                       |                               |                             |
| Further Technical Data         |                                                        |                               |                             |
| <b>Screen</b>                  | <i>7" TFT Color Touch Screen</i>                       |                               |                             |
| <b>Power Supply</b>            | <i>AC100-240 V, 50 Hz/60Hz</i>                         |                               |                             |
| <b>Communication Interface</b> | <i>RS-232 Port, Nurse call Port, Usa Port</i>          |                               |                             |
| <b>Dimension (WxDxH)</b>       | <i>350 mm x 220 mm x 350 mm (main unit)</i>            |                               |                             |
| <b>Weight</b>                  | <i>12 Kg (main unit)</i>                               |                               |                             |



**VENTILATION MODE FOR ABU MEDICAL DEVICE**

Volumetric Mode

- **Assist Control (AC):** the ventilator provides a respiratory act every time the patient begins to breathe. In fact, the ventilator perceives a negative pressure given by the inspiratory effort and delivers a respiratory act according to the set tidal volume;
- **Synchronized Intermittent Mandatory Ventilation (SIMV):** is the ventilation mode used during the weaning phase by the fan. The acts delivered by the respirator synchronize with the patient's inspiration. If the patient does not start a spontaneous respiratory act, the ventilator intervenes by delivering a respiratory act. The tidal volume varies according to the patient's efforts, but the ventilator ensures that the patient performs a pre-established minimum number of acts per minute.
- **Non Invasive Mechanical Ventilation (NIMV), otherwise indicated as NIV (Non Invasive Ventilation) or NPPV (Non Invasive Positive Pressure Ventilation)** guarantees positive pressure mechanical ventilation support that uses different ventilation strategies.

Pressure Mode

- **Continuous Positive Airway Pressure (CPAP):** the ventilator gives the patient a continuous high pressure that overlaps the patient's spontaneous ventilation, improving oxygenation and reducing ventilation and cardiac work.

Variable Flow Mode

- **Pressure Regulated Volume Control (PRVC)** This implies that instead of delivering an exact tidal volume to each respiratory act, a target volume is set and the ventilator will vary the inspiratory flow at each act to reach the target volume at the lowest possible peak pressure. The inspiratory time (Ti) limits the duration of the inspiratory cycle and therefore the value of the ratio between inspiratory time and expiratory time (I / E ratio). Pressure-regulated mode such as PRVC or Auto-flow (Draeger) can be imagined as the transition from a volume-controlled mode to a pressure-controlled one with the advantage of maintaining greater control over the tidal volume compared to a purely mode pressure.

|                           |                                            |                                                        |                                                                                     |
|---------------------------|--------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Volumetric Mode</b>    | Assist Control (AC)                        | Synchronized Intermittent Mandatory Ventilation (SIMV) | NIV (Non Invasive Ventilation) or NPPV (Non Invasive Positive Pressure Ventilation) |
| <b>Pressure Mode</b>      | Continuous Positive Airway Pressure (CPAP) |                                                        |                                                                                     |
| <b>Variable Flow Mode</b> | Pressure Regulated Volume Control (PRVC)   |                                                        |                                                                                     |





**ABU - Automatic Breathing Unit**

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