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# Intensive Care and Transport Ventilator Solutions

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# LYRA x1 **Best performing and versatile ventilation for hospital applications**

A compact turbine driven ventilator with multi-function, covers the non-invasive and invasive ventilation, and is suitable for treatment of most patient type. LYRA x1 is versatile throughout hospital and transport. Comprehensive ventilating modes, including APRV, PRVC, NIV are available for all your demands and for all type of patients from neonatal to adult.

A collapsible high-resolution touch-screen display makes LYRA x1 mounted on a trolley your choice for ICU applications, as well as a high performance ventilator throughout hospital and transport.

The innovative expiration valve disassembling concept brings more ease and efficiency for the sterilization process. As your versatile assistant, LYRA x1 is configured with O2 therapy, P-V tool, a lung titrating gold standard, etc.

# LYRA x1

## Technical Specifications

### Physical Specification

Dimensions: 336 mm x 330 mm x 345 mm
(L x W x H): 664 mm x 600 mm x 1370 mm (with trolley)
Weight: Approximately 9.5 kg,
Approximately 31.0 kg (with trolley)

### Screen

Display Size: 12.1  Color active matrix TFT touch
Display Resolution (H) x (V): 1280 x 800 pixels
Brightness: Adjustable

### Ventilation Specifications

Patient Type: Adult, Pediatric, Neonate

**Invasive Ventilation Mode:**

**VCV** (Volume Control Ventilation)
**PCV** (Pressure Control Ventilation)
**VSIMV** (Volume Synchronized Intermittent Mandatory Ventilation)
**PSIMV** (Pressure Synchronized Intermittent Mandatory Ventilation)
**CPAP/PSV** (Continuous Positive Airway Pressure/Pressure Support Ventilation)
**PRVC** (Pressure Regulated Volume Control)
**V + SIMV** (PRVC + SIMV)
**BPAP** (Bilevel Positive Airway Pressure)
**APRV** (Airway Pressure Release Ventilation)
Apnea Ventilation

**Non-invasive Ventilation Mode:**

**PCV** (Pressure Control Ventilation)
**PSIMV** (Pressure Synchronized Intermittent Mandatory Ventilation)
**CPAP/PSV** (Continuous Positive Airway Pressure/Pressure Support Ventilation)
**BPAP** (Bilevel Positive Airway Pressure)
**APRV** (Airway Pressure Release Ventilation)

### Controlled Parameters

$O_2$%: 21-100% (increments of 1%)
VT (Tidal Volume): Adult: 100-2000 mL (increments of 10 mL) / Pediatric: 20-300 mL / Neonate: 2-300 mL (increments of 1 mL)
f (Ventilation frequency): 1-80 bpm / Neonate: 1-150 bpm (increments of 1 bpm)
fSIMV (Ventilation frequency in SIMV mode): 1-80 bpm / Neonate: 1-150 bpm (increments of 1 bpm)
I:E range: 4:1-1:10 (increments of 0.5)
Tinsp (Inspiratory time): 0.20-10 s (increments of 0.05 s)
Tslope (Time of Pressure Rising): 0-2.00 s (increments of 0.05 s)
Thigh: 0.2-30 s (increments of 0.1 s)
Tlow: 0.2-30 s (increments of 0.1 s)
Tpause: 5%-60% (increments of 1%), Off
ΔPinsp: 5-80 cm $H_2O$ (increments of 1 cm $H_2O$)
ΔPsupp: 0-80 cm $H_2O$ (increments of 1 cm $H_2O$)
Phigh: 0-80 cm $H_2O$ (increments of 1 cm $H_2O$)
Plow: 0-45 cm $H_2O$ (increments of 1 cm $H_2O$)
PEEP: 1-45 cm $H_2O$ (increments of 1 cm $H_2O$), Off
Flow trigger: 0.5-15 L/min (increments of 0.1 L/min)
Pressure trigger: -10 to -0.5 cm $H_2O$ (increments of 0.5 cm $H_2O$)
Exp% (Expiration termination level): 10-85% (increments of 5%), Auto

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# LYRA x1

## Technical Specifications

### Apnea Ventilation

Vtapnea: Adult: 100-2000 mL (increments of 10 mL) / Pediatric: 20-300 mL / Neonate: 2-300 mL (increments of 1 mL)
ΔPapnea: 5-80 cm $H_2O$ (increments of 1 cm $H_2O$)
Fapnea: 1-80 bpm (increments of 1 bpm)
Apnea Tinsp: 0.20-10 s (increments of 0.05 s)

### Sigh

Sigh Switch: On, Off
Interval: 20 s-180 min (increments of 1 s from 20 to 59 s, increments of 1 min from 1 to 180 min)
Cycles Sigh: 1-20 (increments of 1 )
Δint.PEEP: 1-45 cm $H_2O$ (increments of 1 cm $H_2O$), Off

### Synchronized Tube Resistance Compliance

Tube Type: ET Tube, Trach Tube, Disable STRC
Tube I.D.: Adult: 5.0 -12.0 mm (increments of 0.5 mm) / Pediatric: 2.5 - 8.0 mm (increments of 0.5 mm)
Compensate: 0-100% (increments of 1%)
Expiration Compliance Switch: On, Off

### Monitored parameters

Numeric:

| | | |
|---|---|---|
| Paw | Vte | Cdyn |
| Ppeak | VTi | Cstat |
| Pplat | Oxygen concentration | Rcexp |
| Pmean | VTe spn | WOB |
| PEEP | VTe/IBW | RSBI |
| Insp Flow | ftotal | NIF |
| Exp Flow | fmand | P0.1 |
| MV | fspn | PEEPi |
| MV leak | Re | |
| MV spn | Ri | |

Continuous Flow ($O_2$ Therapy)

Real time Graphics:
Pressure-time waveforms: Paw-Volume Loop
Flow-time waveforms: Flow-time Loop
Volume-time waveforms: Paw-Flow Loop

### Control Accuracy

$O_2$%: ±(3 vol.% +1% of setting)
TV: ±(10 mL +10% of setting) (BTPS)
Tinsp: ±0.1 s or ±10% of setting, whichever is greater
I: E 2:1 to 1:4: ±10% of setting, other range: ±15% of setting
f: ±1 bpm
fSIMV: ±1 bpm
Tslope: ±(0.2 s + 20% of setting)
PEEP: ±(2.0 cm $H_2O$ + 5% of setting)
ΔPinsp: ±(2.0 cm $H_2O$ + 5% of setting)
ΔPsupp: ±(2.0 cm $H_2O$ + 5% of setting)
Phigh: ±(2.0 cm $H_2O$ + 5% of setting)
Plow: ±(2.0 cm $H_2O$ + 5% of setting)
Thigh: ±0.2 s or ±10% of setting, whichever is greater
Tlow: ±0.2 s or ±10% of setting, whichever is greater
Pressure Trigger: ±(1.0 cm $H_2O$ + 10% of setting)
Flow Trigger: ±(1.0 L/min + 10% of setting)
Δint.PEEP: ±(2.0 cm $H_2O$ + 5% of setting)
Exp%: ±10%
fapnea: ±1 bpm
ΔPapnea: ±(2.0 cm $H_2O$ + 5% of setting)
Tvapnea: ±(10 mL + 10% of setting) (BTPS)
Apnea Tinsp: ±0.1 s or ±10% of setting, whichever is greater

## Monitoring Accuracy

Airway pressure (Ppeak, Pplat, Pmean, PEEP, PAP, EPAP): ±(2 cm $H_2O$ + 4% of the actual reading)
Tidal Volume: (Tvi, Tve, TVe/IBW, TVe spn):
0 ml-100 ml: ±(10 ml + 3% of the actual reading) (BTPS)
100 ml-4000 ml: ±(3 ml +10% of the actual reading) (BTPS)
Minute Volume (MV, MVspn, Mvleak):
±0.3 L/min or ±8% of the actual reading, whichever is greater (BTPS)
Frequency (ftotal, fmand, fspn): ±5% of reading or ±1bpm, whichever is greater
Inspired Oxygen ($FiO_2$): ±(2.5 vol.% + 2.5% of the actual reading)
Resistance: 0 to 50: ±10 cm $H_2O$/L/s
Other range: 50% of the actual reading
Compliance: 25% of the actual reading or ±10 ml/cm $H_2O$, whichever is greater
RSBI: 0 to 999 1/(min*L): ± (3 1/(min*L)
± 15% of the actual reading)
WOB: -
NIF: ±(2 cm $H_2O$ + 4% of the actual reading)
P0.1: ±(2 cm $H_2O$ + 4% of the actual reading)
PEEPi: -
Rcexp: -

## Alarm settings

Tidal Volume: High / Low
Minute Volume: High / Low
Airway pressure: High / Low
Frequency: High / Low
Inspired Oxygen (FiO2): High / Low
etCO2: High / Low
Apnea alarm time: 5-60 s

## Trend

Type: Tabular, Graphic
Length: 72 hours
Content: Monitor Parameters, Setting Parameters (Setting Ventilation mode and Parameters)


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# LYRA x1

## Technical Specifications

### High Flow Oxygen Therapy

Controlled Parameters
$O_2$%: 21-100% (increments of 1%)
Flow: 4-60 L/min
Controlled Accuracy
$O_2$%: ±(3 vol.% +1% of setting)
Flow: ±(2 L/min +10% of setting) (BTPS)

### Environmental specifications

Temperature: 5-40 °C (operating); -20 to 60 °C (storage and transport, $O_2$sensor: -20 to 50 °C )
Relative Humidity: 10-95% (operating);
10-95% (storage and transport)
Barometric Pressure: 62-106 kPa (operating);
50-106 kPa (storage and transport)

### Power Battery Backup

External AC power supply
Input voltage: 100-240 V
Input frequency: 50/60 Hz
Input current: 2.5 A Max
Fuse: T2.5 AH/250 V
Internal battery
Number of batteries: One or Two (Optional)
Battery type: Build-in Lithium-ion battery, 11.25 VDC, 6400 mAh
Battery run time: 3 hours (Powered by one new fully-charged battery in standard working condition), 6 hours (powered by two new fully-charged batteries in standard working condition).

### Others

Communication interface: RS-232, Ethernet, USB port, CO2 analyzer connector, HDMI
Gas supply: O2
(HPO) Oxygen connector: NIST (DISS optional)
Gas supply pressure: 280-600 kPa
(LPO) Oxygen connector: CPC quick connector
Gas supply pressure: <100 kPa
Flow: ≤ 15L/min (STPD)
Nebulizer: connector for pneumatic nebulizer (Oxygen driven)


# LYRA x2 **Top notch performance of Non-Invasive and Invasive Ventilation**

LYRA x2 is a premium non-invasive turbine driven ventilator with no compromise on the performance in invasive ventilation.

User can easily switch between NIV- and IV-modes by UI operation only.

Comprehensive parameter monitoring describes the full scenario of patient's status to the care giver.

In a busy ICU it is imperative to give the desired mechanical ventilation to the patient.

An 18.5 inch vertical layout touchscreen display makes operating of the ventilator smooth & easy.

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# LYRA x2

## Technical Specifications

### Physical Specification

Dimensions: 327 mm x 310 mm x 493 mm
(L x W x H): 664 mm x 600 mm x 1520 mm (with trolley)
Weight: Approximately 12.0 kg, Approximately 33.0 kg (with trolley)

### Screen

Display Size: 18.5" Color active matrix TFT touch
Display Resolution (H) x (V): 1080 x 1980 pixels
Brightness: Adjustable

### Ventilation Specifications

Patient Type: Adult, Pediatric, Neonate
**Invasive Ventilation Modes:**
**VCV** (Volume Control Ventilation)
**PCV** (Pressure Control Ventilation)
**VSIMV** (Volume Synchronized Intermittent Mandatory Ventilation)
**PSIMV** (Pressure Synchronized Intermittent Mandatory Ventilation)
**CPAP/PSV** (Continuous Positive Airway Pressure/Pressure Support Ventilation)
**PRVC** (Pressure Regulated Volume Control)
**V + SIMV** (PRVC + SIMV)
**BPAP** (Bilevel Positive Airway Pressure)
**APRV** (Airway Pressure Release Ventilation)
Apnea Ventilation
**Non-invasive Ventilation Modes:**
**CPAP** (Continuous Positive Airway Pressure)
**PCV** (Pressure Control Ventilator)
**PPS** (Proportional Pressure Support)
**S/T** (Spontaneous and Timed)
**VS** (Volume Support)

### Controlled Parameters

$O_2$%: 21-100% (increments of 1%)
VT (Tidal Volume): Adult: 100-2000 mL (increments of 10 mL) / Pediatric: 20-300 mL / Neonate: 2-300 mL (increments of 1 mL)
f (Ventilation frequency): 1-80 bpm / Neonate: 1-150 bpm (increments of 1 bpm)
fSIMV (Ventilation frequency in SIMV mode): 1-80 bpm / Neonate: 1-150 bpm (increments of 1 bpm)
I:E range: 4:1-1:10 (increments of 0.5)
Tinsp (Inspiratory time): 0.20-10 s (increments of 0.05 s)
Tslope (Time of Pressure Rising): Thigh0-2.00 s (increments of 0.05 s)
Tlow: 0.2-30 s (increments of 0.1 s)
Tpause: 0.2-30 s (increments of 0.1 s)
ΔPinsp: 5%-80 cm $H_2O$ (increments of 1 cm H2O), Off
ΔPsupp: 0-80 cm $H_2O$ (increments of 1 cm $H_2O$)
Phigh: 0-80 cm $H_2O$ (increments of 1 cm $H_2O$)
Plow: 0-45 cm $H_2O$ (increments of 1 cm $H_2O$)
PEEP: 1-45 cm $H_2O$
(increments of 1 cm $H_2O$), Off
Flow trigger: 0.5-15 L/min
(increments of 0.1 L/min)
Pressure trigger: -10 to -0.5 cm $H_2O$
(increments of 0.5 cm $H_2O$)
Exp% (Expiration termination level): 10-85% (increments of 5%), Auto
CPAP: 4-25 cm $H_2O$ (increments of 1 cm $H_2O$)
EPAP: 4-25 cm $H_2O$ (increments of 1 cm $H_2O$)
IPAP: 4-20 cm $H_2O$ (increments of 1 cm $H_2O$)
Rise time: 1-5 (increments of 1)

Ramp time: 5-45 min (increments of 5 min), Off
Min P (VS minimum IPAP): 5-30 cm $H_2O$ (increments of 1 cm $H_2O$)
Max P (VS maximum IPAP): 6-40 cm $H_2O$ (increments of 1 cm $H_2O$)
Max P (PPV maximum pressure limit): 5-40 cm $H_2O$ (increments of 1 cm $H_2O$)
Max V (PPV maximum volume limit): 200-3500 mL (increments of 5 ml)
Max E: 0-100 cm $H_2O$/L (increments of 1 cm $H_2O$/L)
Max R: 0-50 cm $H_2O$/L (increments of 1 cm $H_2O$/L)
PPV%: 0%-100% (increments of 1%)

## Apnea Ventilation

Vtvapnea: Adult: 100-2000 mL (increments of 10 mL) / Pediatric: 20-300 mL / Neonate: 2-300 mL (increments of 1 mL)
ΔPapnea: 5-80 cm $H_2O$ (increments of 1 cm $H_2O$)
Fapnea: 1-80 bpm (increments of 1 bpm)
Apnea Tinsp: 0.20-10 s (increments of 0.05 s)

## Sigh

Sigh Switch: On, Off
Interval: 20 s-180 min (increments of 1 s from 20 to 59 s, increments of 1 min from 1 to 180 min)
Cycles Sigh: 1-20 (increments of 1)
Δint.PEEP: 1-45 cm $H_2O$ (increments of 1 cm $H_2O$), Off

## Synchronized Tube Resistance Compliance

Tube Type: ET Tube, Trach Tube, Disable STRC
Tube I.D.: Adult: 5.0-12.0 mm (increments of 0.5 mm) / Pediatric: 2.5-8.0 mm (increments of 0.5 mm)
Compensate: 0-100% (increments of 1%)
Expiration Compliance Switch: On, Off

## Monitored parameters

Numeric:

| | | |
|---|---|---|
| Paw | Oxygen concentration | WOB |
| Ppeak | VTe spn | RSBI |
| Pplat | VTe/IBW | NIF |
| Pmean | f | P0.1 |
| PEEP | ftotal | PEEPi |
| Insp Flow | fmand | PIP |
| Exp Flow | fspn | EPAP |
| MV | Re | Pt.Trig |
| MV leak | Ri | Pt.leak |
| MV spn | Cdyn | Tot.leak |
| Vte | Cstat | Continuous Flow ($O_2$ Therapy) |
| VTi | Rcexp | |

Real time Graphics:
Pressure-time waveforms: Paw-Volume Loop
Flow-time waveforms: Flow-time Loop
Volume-time waveforms: Paw-Flow Loop

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# LYRA x2

## Technical Specifications

### Control Accuracy

$O_2$%: ±(3 vol.% + 1% of setting)
TV: ±(10 mL + 10% of setting) (BTPS)
Tinsp: ±0.1 s or ±10% of setting, whichever is greater
I: E: 2:1 to 1:4: ±10% of setting, other range: ±15% of setting
f: ±1 bpm
fSIMV: ±1 bpm
Tslope: ±(0.2 s + 20% of setting)
PEEP: ±(2.0 cm $H_2O$ + 5% of setting)
ΔPinsp: ±(2.0 cm $H_2O$ + 5% of setting)
ΔPsupp: ±(2.0 cm $H_2O$ + 5% of setting)
Phigh: ±(2.0 cm $H_2O$ + 5% of setting)
Plow: ±(2.0 cm $H_2O$ + 5% of setting)
Thigh: ±0.2 s or ±10% of setting, whichever is greater
Tlow: ± 0.2 s or ±10% of setting, whichever is greater
Pressure Trigger: ±(1.0 cm $H_2O$ + 10% of setting)
Flow Trigger: ±(1.0 L/min + 10% of setting)
Δint.PEEP: ±(2.0 cm $H_2O$ + 5% of setting)
Exp%: ±10%
CPAP: ±(2.0 cm $H_2O$ + 5% of setting)
EPAP: ±(2.0 cm $H_2O$ + 5% of setting)
IPAP: ±(2.0 cm $H_2O$ + 5% of setting)
Rise time: -
Ramp time: ±1 s
Min P (VS minimum IPAP): ±(2.0 cm $H_2O$ + 5% of setting)
Max P (VS maximum IPAP): ±(2.0 cm $H_2O$ + 5% of setting)
Max P (PPV maximum pressure limit): ±(2.0 cm $H_2O$ + 5% of setting)
Max V (PPV maximum volume limit): ±15% of setting
Max E: -
Max R: -
Fapnea: ±1 bpm
ΔPapnea: ±(2.0 cm $H_2O$ + 5% of setting)
Tvapnea: ±(10 mL + 10% of setting) (BTPS)
Apnea Tinsp: ±0.1 s or ± 10% of setting, whichever is greater

### Monitoring Accuracy

Airway pressure (Ppeak, Pplat, Pmean, PEEP, PAP, EPAP): ±(2 cm $H_2O$ + 4% of the actual reading)
Tidal Volume (Tvi, Tve, TVe/IBW,TVe spn):
0 ml -100 ml: ± (10 ml+3% of the actual reading) (BTPS) / 100 ml - 4000 ml:
±(3 ml + 10% of the actual reading) (BTPS)
Minute Volume (MV, MVspn, Mvleak): ±0.3 L/min or ±8% of the actual reading, whichever is greater (BTPS)
Frequency (ftotal, fmand, fspn): ±5% of reading or ±1 bpm, whichever is greater
Inspired Oxygen ($FiO_2$): ±(2.5 vol.% + 2.5% of the actual reading)
Resistance: 0 to 50: ±10 cm $H_2O$/L/s Other range: 50% of the actual reading
Compliance: 25% of the actual reading or ±10 ml/cm $H_2O$, whichever is greater
RSBI: 0 to 999 1/(min*L): ± (3 1/(min*L) ± 15% of the actual reading)
WOB: -
NIF: ± (2 cm $H_2O$ + 4% of the actual reading)
P0.1: ± (2 cm $H_2O$ + 4% of the actual reading)
PEEPi: -
Rcexp: -

## Alarm settings

Tidal Volume: High / Low
Minute Volume: High / Low
Airway pressure: High / Low
Frequency: High / Low
Inspired Oxygen (FiO2): High / Low
etCO2: High / Low
Apnea alarm time: 5-60 s

## Trend

Type: Tabular, Graphic
Length: 72 hours
Content: Monitor Parameters,
Setting Parameters (Setting Ventilation mode and Parameters)

## High Flow Oxygen Therapy

Controlled Parameters
$O_2$%: 21-100% (increments of 1%)
Flow: 4-60 L/min
Controlled Accuracy
$O_2$%: ±(3 vol.% +1% of setting)
Flow: ±(2 L/min +10% of setting) (BTPS)

## Environmental specifications

Temperature: 5-40°C (operating); -20 to 60 °C (storage and transport, $O_2$ sensor: -20 to 50 °C)
Relative Humidity: 10-95% (operating); 10-95% (storage and transport)
Barometric Pressure: 62-106 kPa (operating); 50-106 kPa (storage and transport)

## Power Battery Backup

External AC power supply
Input voltage: 100-240 V
Input frequency: 50/60 Hz
Input current: 2.5 A Max
Fuse: T2.5 AH/250 V
Internal battery
Number of batteries: One or Two (Optional)
Battery type: Build-in Lithium-ion battery, 11.25 VDC, 6400 mAh
Battery run time: 3 hours (Powered by one new fully-charged battery in standard working condition) / 6 hours (Powered by two new fully-charged battery in standard working condition)


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# LYRA x2

## Technical Specifications

### Others

Communication interface: RS-232, Ethernet, USB port, CO2 analyzer connector, HDMI
Gas supply: $O^2$
(HPO) Oxygen connector: NIST (DISS optional)
Gas supply pressure: 280-600 kPa
(LPO) Oxygen connector: CPC quick connector
Gas supply pressure: <100 kPa
Flow: ≤ 15L/min (STPD)
Nebulizer: connector for pneumatic nebulizer (Oxygen driven)


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# MUSCA x1

## Portable Ventilator

### Features

- Portable and easy operation
- Innovative voice-guided direction
- Tidal volume range: 100~1500 ml
- Air Mix option for 60% $O_2$
- 3 knobs for flexible parameters adjustment
- TFT display of airway pressure and ventilation mode
- 3 ventilation modes. IPPV, Assisted control and Manual control
- Li-ion rechargeable battery with more than 10 hours of working time


# MUSCA x2

## Emergency & Transport Ventilator

### Features

- Compact design with weight 3.4 kg
- 7”color touch screen with screen lock function
- Airway pressure and EtCO2 real-time waveforms
- Smart CPR mode according to AHA guideline
- I:E ratio range: 1:9 to 9:1; and tidal volume range: 50-2500 ml
- 9 ventilation modes: IPPV, V-AC, V-SIMV, P-AC, P-SIMV, CPAP, PCV, Manual, CPR
- Internal PEEP valve
- 40% or 100% for FiO2
- Rechargeable Li-ion battery with 6 hours working time
- Optional Mainstream EtCO2 analyzer
- Audible and visual alarm for multi-parameters
- IPX4 waterproof

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# Intensive Care and Transport Ventilator Solutions

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