Metran

Humming Vue

Piston HFO/IMV Ventilator for Neonates and Infants

Precise and powerful
HFO piston technology
from Japan to the world

Fighting Disease with Electronics

NIHON KOHDEN

HFO ventilation can reduce premature baby and neonate

Child mortality is a major problem

15 million premature babies/ year in the world

There is more than 1 premature birth in every 10 births

Total death under 5 years of age

Premature babies deaths account for 40%

Born too early, the world's biggest cause of newborn deaths

More than 1 million deaths/year

Born too soon

UN and leading international organizations* are working hand in hand

UN Millennium Development Goals (MDGs)

1. To eradicate extreme poverty and hunger
2. To achieve universal primary education
3. To promote gender equality and empowering women
4. **To reduce child mortality rates**
5. To improve maternal health
6. To combat HIV/AIDS, malaria, and other diseases
7. To ensure environmental sustainability
8. To develop a global partnership for development

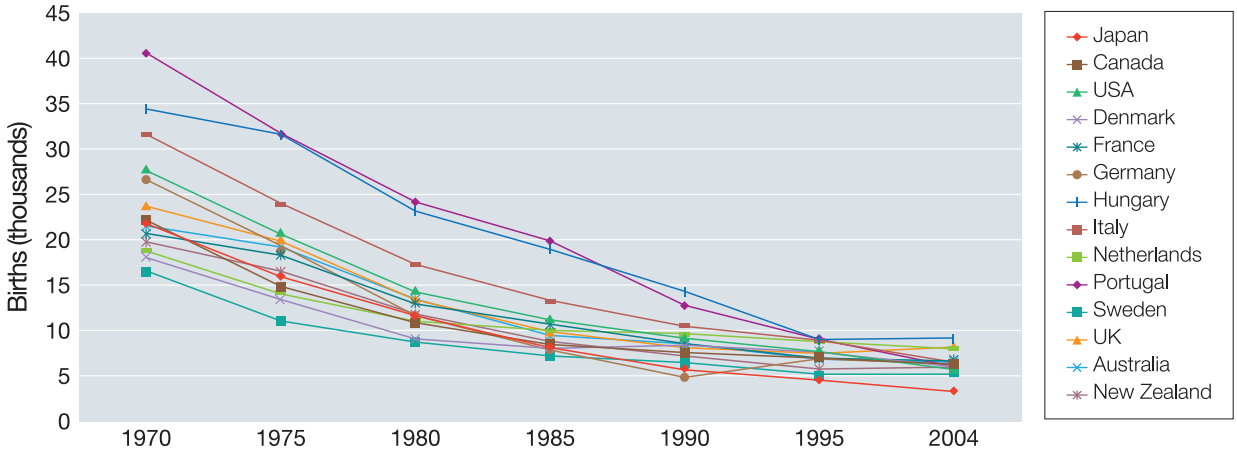
* The Millennium Development Goals (MDGs) are eight international development goals that were established following the Millennium Summit of the United Nations in 2000, following the adoption of the United Nations Millennium Declaration. All 189 United Nations member states at the time (there are 193 currently) and at least 23 international organizations committed to help achieve the Millennium Development Goals by 2015.
http://en.wikipedia.org/wiki/Millennium_Development_Goals

e mortality

HFO ventilation is recognized worldwide as an effective treatment for neonates and premature babies

Perinatal mortality is affected by many things but ventilation plays a major factor in the hospital treatment. HFO (high frequency ventilation) is a gentle ventilation method that is especially effective for neonates and premature babies.

Japan has one of the world's lowest perinatal mortality rates. One reason is adoption of the latest technology. Metran HFO ventilators are used in nearly 90% of NICUs in Japan and we are glad to be able to contribute to the high level of neonatal care in Japan.



Perinatal mortality of various countries

Source: Japanese Public Welfare Statistical Outline Table 1-24 [Perinatal Mortality (1,000s births) of other countries, by year]

BW, g	n (%)		
	Born Alive	Died Before 28 d of Postnatal Life	Died During NICU Stay
<400	62	33 (53.3)	42 (67.7)
400–499	159	67 (42.1)	85 (53.5)
500–599	387	86 (22.2)	107 (27.7)
600–699	537	90 (16.8)	119 (22.2)
700–799	574	54 (9.4)	73 (12.7)
800–899	649	41 (6.3)	59 (9.1)
900–999	697	27 (3.9)	37 (5.3)
Total	3065	398 (13.0)	522 (17.0)

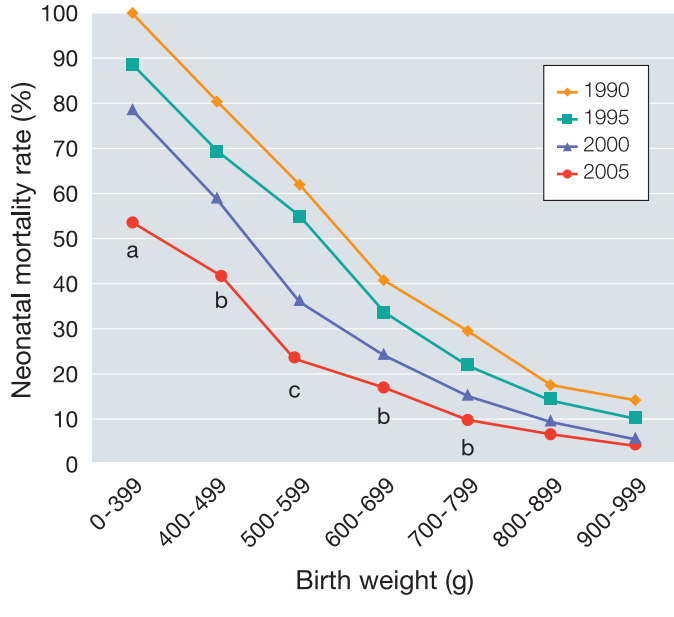
Numbers of births and mortality rates according to BW

Source: PEDIATRICS Volume 123, Number 2, February 2009: 446

Gestational Age, wk	n (%)		
	Born Alive	Died Before 28 d of Postnatal Life	Died During NICU Stay
22	97	57 (58.8)	64 (66.0)
23	282	112 (39.7)	129 (45.8)
24	423	77 (18.2)	99 (23.4)
25	501	56 (11.2)	73 (14.6)
26	542	35 (6.5)	56 (10.3)
27	408	22 (5.4)	32 (7.8)
≥28	809	37 (3.9)	67 (8.3)
Unknown	3	2 (66.7)	2 (66.7)
Total	3065	398 (13.0)	522 (17.0)

Numbers of births and mortality rates according to gestational age

Source: PEDIATRICS Volume 123, Number 2, February 2009: 446



Comparison of neonatal mortality rates according to BW.

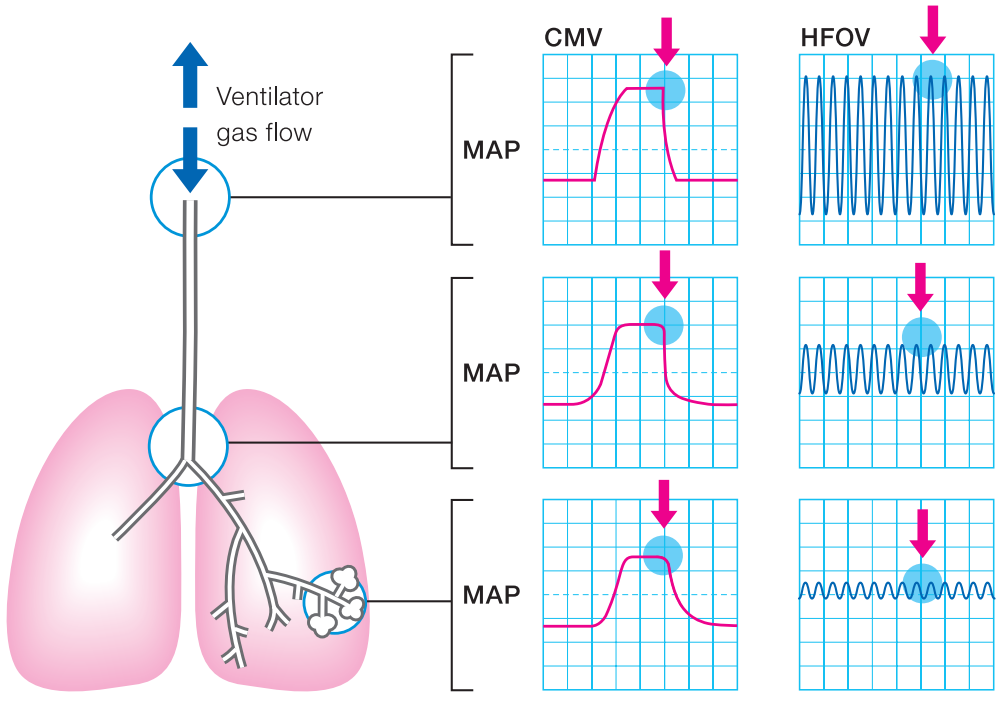
[a]P < .05, [b]P < .01, and [c]P < .001 for comparisons between 2005 and 2000
Source: PEDIATRICS Volume 123, Number 2, February 2009: 447

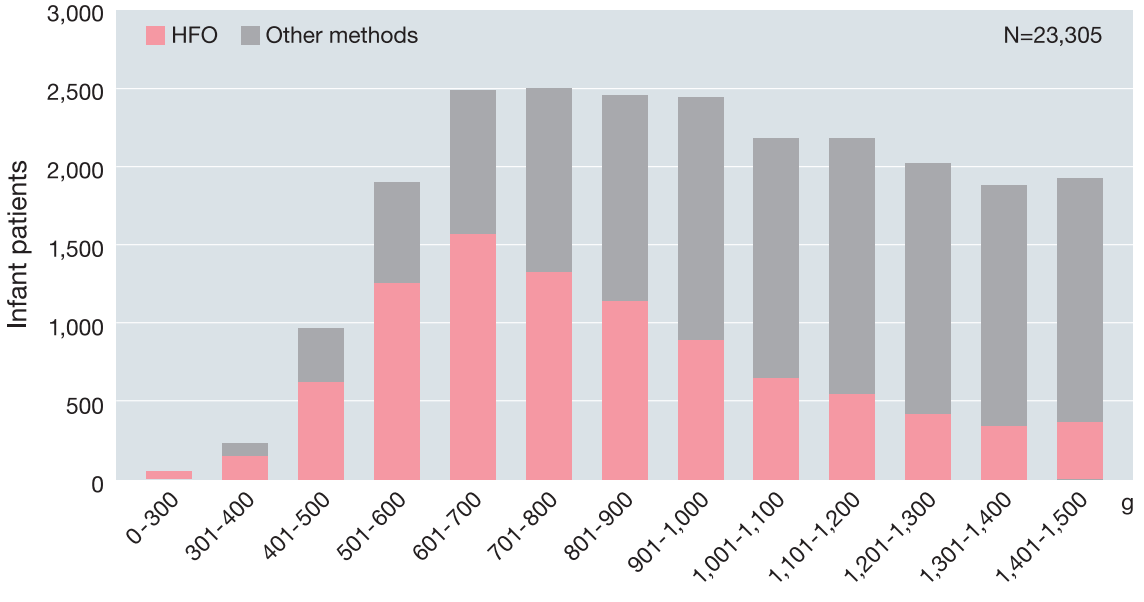
HFO ventilation is gentler to the lungs

HFO ventilation provides sufficient and sustained exchange of gas when the stroke volume is smaller than the anatomical dead space.

HFO pressure waves are sinusoidal and symmetrical with respect to the mean airway pressure (MAP) axis. After passing through the endotracheal tube, the amplitude of the HFO pressure wave falls drastically upon entering the trachea so there is minimal pressure variation at the airway periphery near the pulmonary alveoli.

Compared with continuous mandatory ventilation (CMV), HFO ventilation has much less pressure swing at any MAP and this greatly reduces physical injury to the pulmonary alveoli.

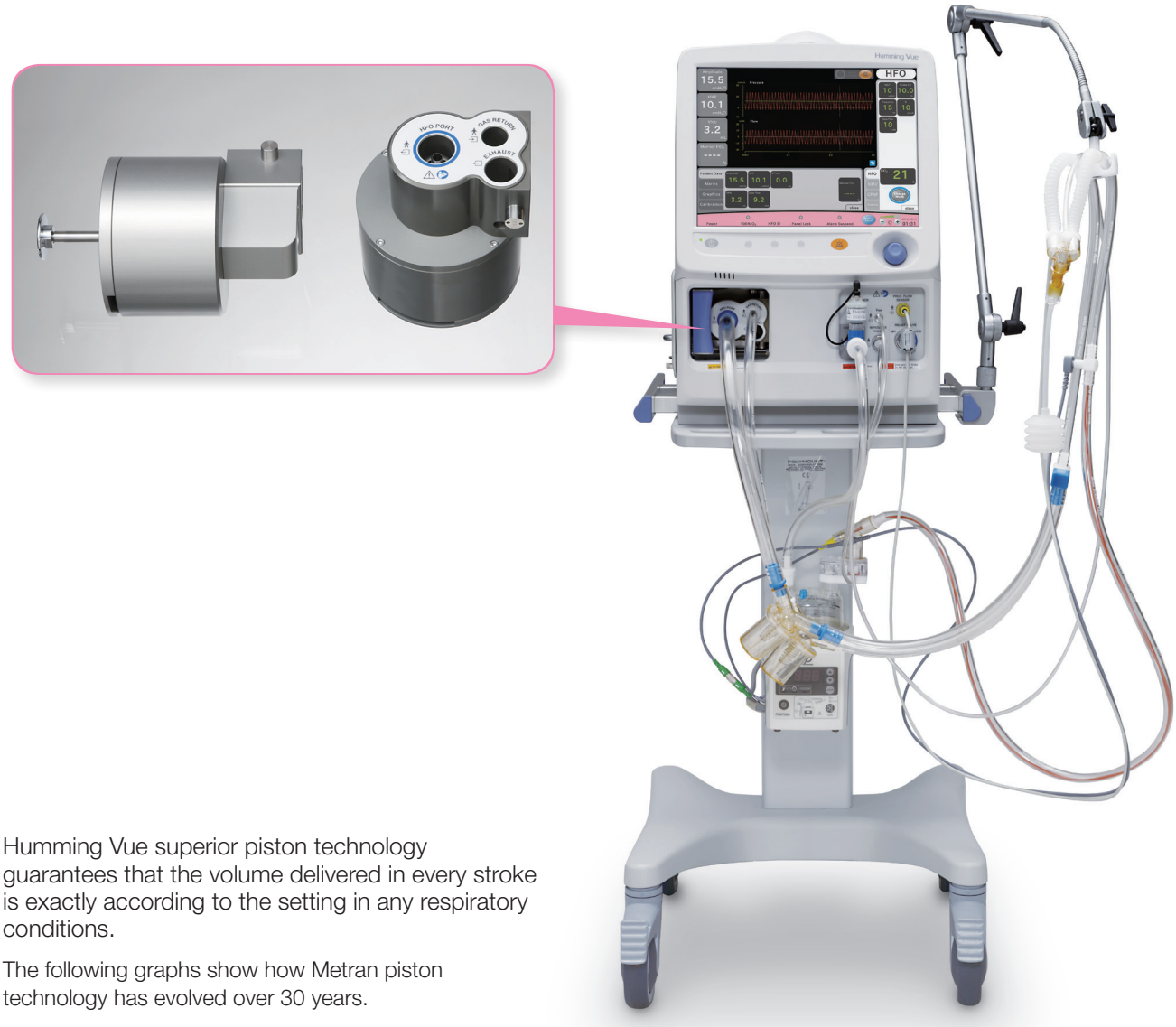




Usage of HFO ventilation by birthweight (2003–2012)

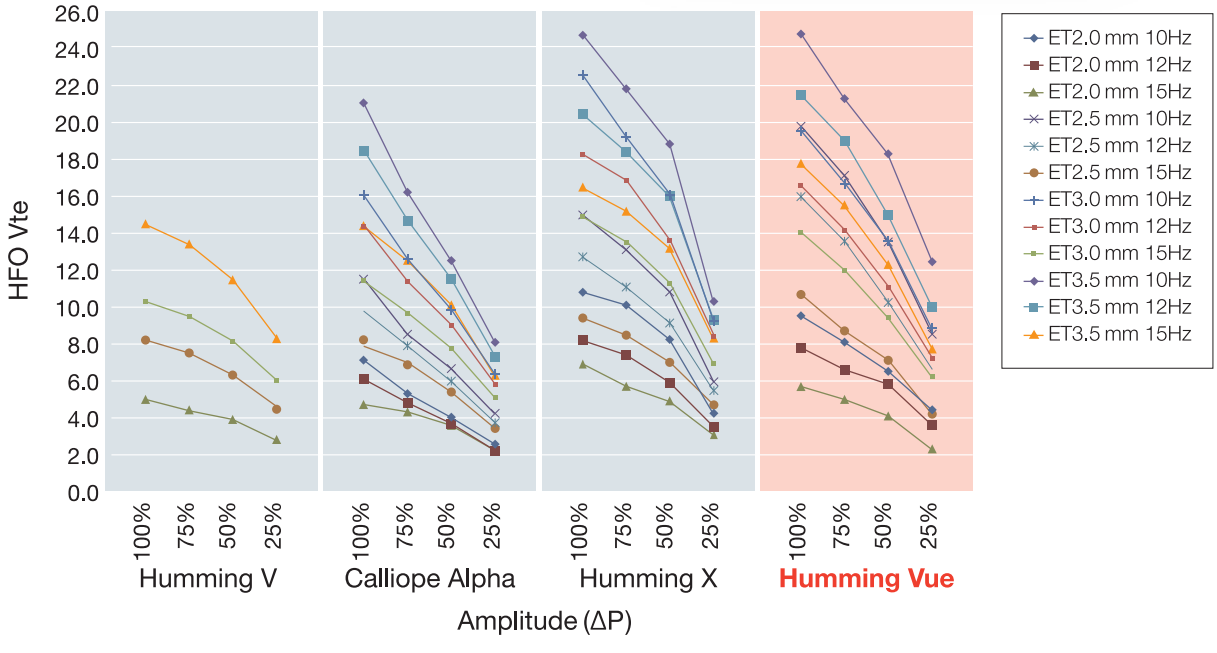
Source: Among infants with live birth, remained and mechanical ventilation
Satoshi Kusuda, M.D.
Maternal and Perinatal Center, Tokyo Women's Medical University

Quest for perfection



Humming Vue superior piston technology guarantees that the volume delivered in every stroke is exactly according to the setting in any respiratory conditions.

The following graphs show how Metran piston technology has evolved over 30 years.



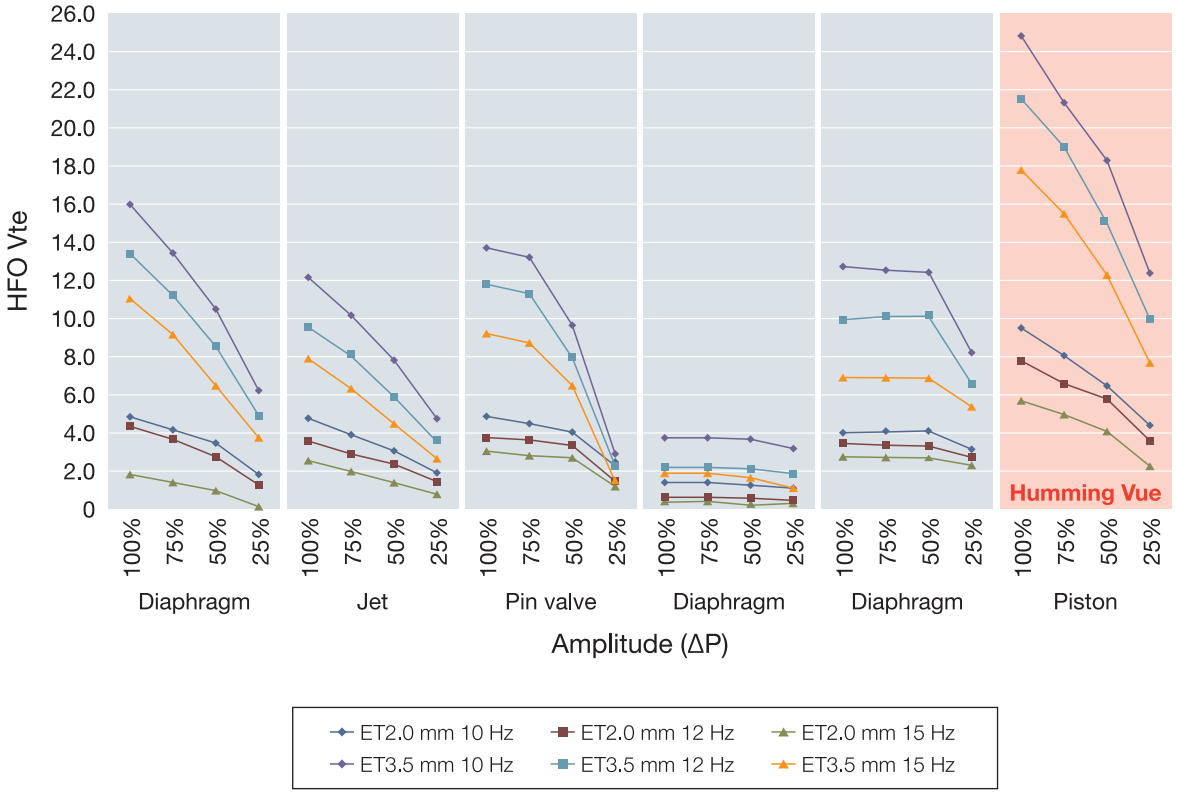
MAP10 stroke volume per amplitude (ΔP)

A powerful and precise piston generating oscillation

Power

Humming Vue is a high value, full-featured, flexible pediatric HFO ventilator. Like previous Metran models, Humming Vue is a volume generator ventilator. It produces the precise stroke volume (SV) to obtain a specified amplitude pressure (ΔP). SV is similar to tidal volume in conventional ventilation. A fixed SV is guaranteed no matter how the lung compliance changes.

The tidal volume which is delivered by the stroke volume of other ventilators becomes flat after the ventilator reaches a certain power or doesn't have the power to provide higher tidal volume.



HFO tidal volume per increase in amplitude

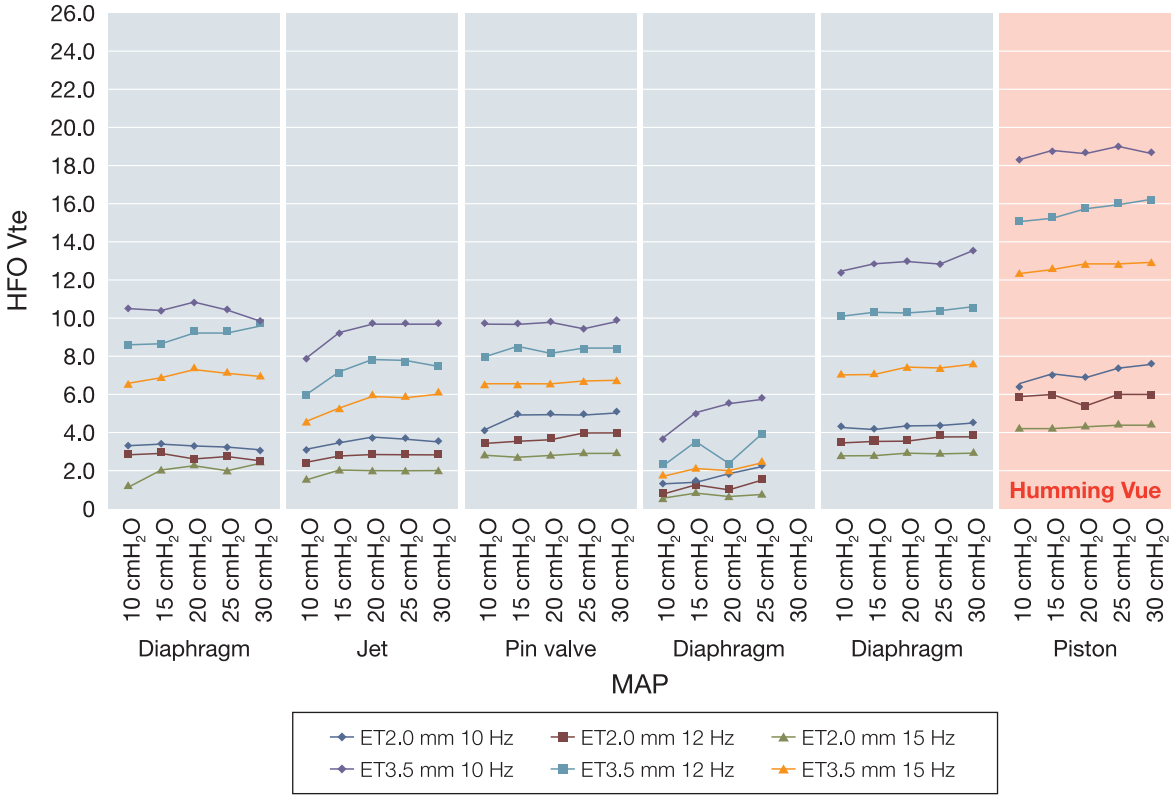
Vertical axis
HFO Vte: HFO tidal volume
Horizontal axis
Amplitude (ΔP): Stroke volume

- This graph shows the change of HFO tidal volume (HFO Vte) for various models with MAP fixed at 10 cmH_2O and amplitude (stroke volume) at maximum power according to each device. HFO Vte was measured during 100%, 75%, 50% and 25% of full power during HFO.
- Test lung compliance = 2.0 mL/cmH_2O

Precision

Our technology allows us to precisely control piston movement to within 13 microns. Humming Vue allows fine setting of stroke volume with resolution as fine as 0.2 mL. This is critical when treating very small babies.

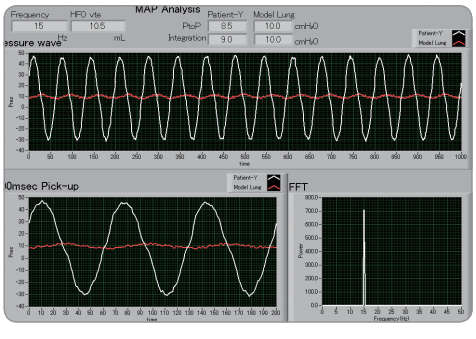
Due to constant feedback, our system can maintain the same HFO Vte even after changing the MAP setting.



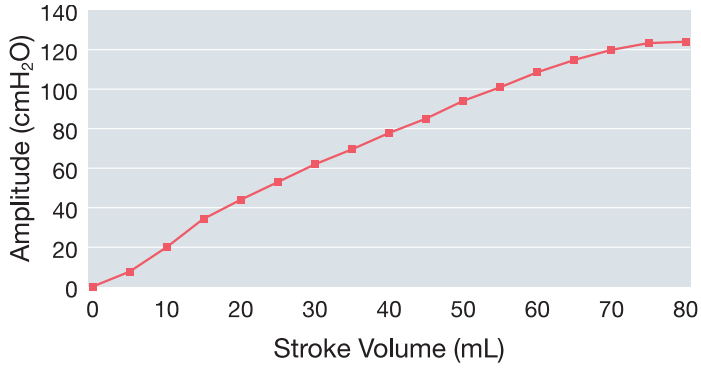
Tidal volume per change in MAP

Vertical axis
HFO Vte: HFO tidal volume
Horizontal axis
MAP: Mean airway pressure

- This graph shows HFO Vte when changing MAP setting with the ventilator at 50% of its maximum amplitude.
- Test lung compliance = 2.0 mL/cmH$_2$O



MAP analysis of HFOV with model lung



Amplitude in relation to Stroke Volume

Source: Keiichi Kanno[1], Masaki Shimizu[1], Kouichi Takeda[2]
(1) Department of Neonatology, Saitama Children's Medical Center, Saitama, Japan
(2) Metran Co., Ltd., Saitama, Japan

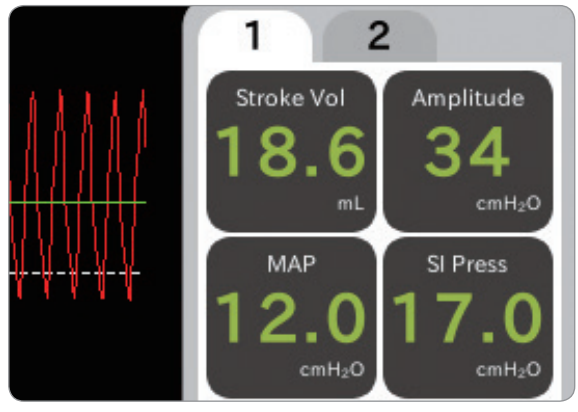
Safety with a variety of settings

Appropriate amplitude and SV

If amplitude is set, the SV is automatically adjusted to maintain that amplitude.

If SV is set, the amplitude changes according to the SV setting. You can confirm the lung condition by changing the amplitude or flow.

Even if ventilation is started or after changing the circuit, safe ventilation is assured with appropriate amplitude and SV.



Auto SI

Lung recruitment can be performed periodically from 0.5–10 s (1 to 120 times/hour).

Enhanced conventional modes

In addition to HFO, some of the Humming Vue models have enhanced conventional ventilation modes such as APRV and NIV. All modes support treatment of any case.

A new feature VA (Volume Assured) can support respiration control by prioritizing ventilation volume.

Modes and breath types

SIMV: PC, VC, VA
A/C: PC, VC, VA
APRV

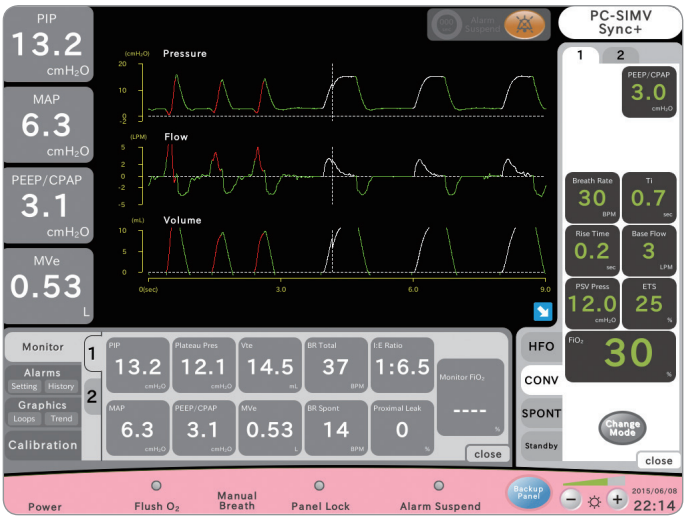
VA (Volume Assured)

In addition to VC or PC, Humming Vue also has VA mode which is volume control ventilation with pressure correction. VA supports respiration control especially when CO_2 control is prioritized.

Sync+ (Sync Plus)

Sync+ is available for PC-SIMV. When the patient has spontaneous breathing, Sync+ uses PS to support those efforts.

When the patient experiences apnea, mandatory ventilation automatically starts after the respiration rate falls below the setting. Sync+ gives you flexible respiration control, especially in neonatal patients with sudden apnea.



Enhanced non-invasive modes

Humming Vue has improved non-invasive modes to support optimum ventilation, like CPAP, NIV and N-CPAP. Popular high-flow therapy is available with cannulas. Humming Vue provides a variety of respiration control to support optimum patient care.

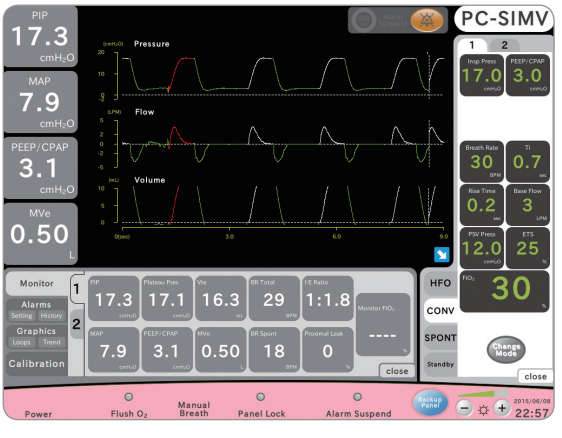
Monitoring

Color touch screen

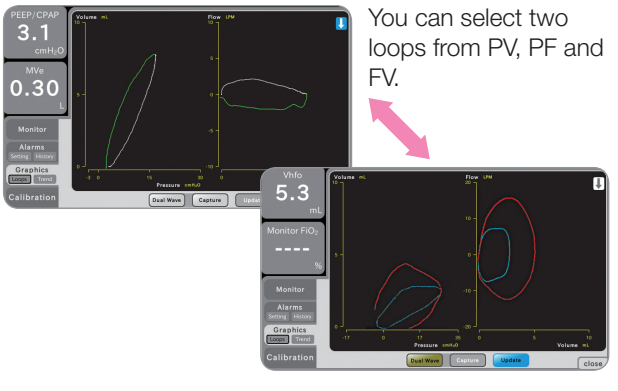
The easy-to-see 15-inch color touchscreen and operation knob provide intuitive operation.

Flexible setting

The monitoring parameters can be customized to match the ventilation mode.



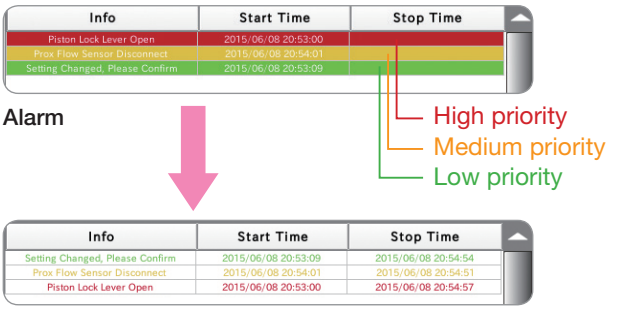
PV, PF and FV loops



You can select two loops from PV, PF and FV.

High visibility alarms

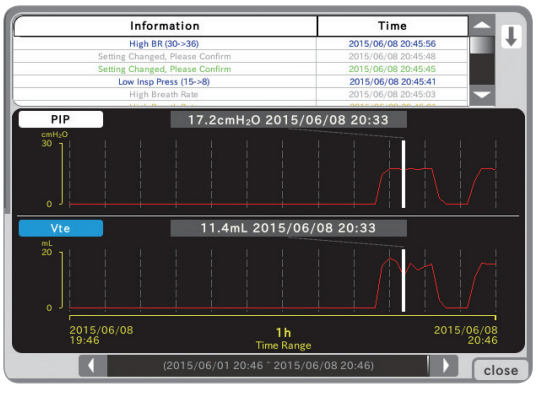
Humming vue has different colors and patterns to make it easy to check the alarm status. The alarm history and operation history are also color coded according to priority.



Alarm canceled

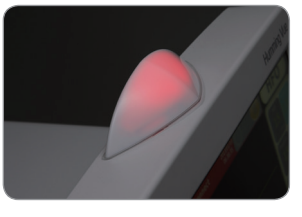
Time-linked

Trend graphs and logs are time-linked. This enables you to easily access any necessary information. When you switch screens, the same event is clearly displayed in both trend graphs.



360° alarm indicator

An alarm indicator on top of the ventilator can be seen from all directions.



Remote SI

Even if you are not near Humming Vue, manual breath/ HFO SI can be provided by a remote control.

Specifications

Ventilation modes	SIMV, A/C, APRV*, CPAP, N-CPAP*, NIV*, HFO, Standby
Breath types	PC, VC*, VA*, HFO

**Options of Humming Vue Plus and Humming Vue Advanced. APRV, VC and VA are available for Humming Vue Advanced only.*

Settings and Range

Inspiration pressure	5–80 cmH_2O
Inspiration time	0.1–3.0 s
Tidal volume	2–300 mL
Inspiration flow	3–30 Lpm
Flow pattern	⌐¬ Square, ⌐\ Decelerating
Plateau time	0–2.0 s
PEEP/CPAP	0–30 cmH_2O
Breath rate	1–150 bpm
Breath rate (NIV)	0–150 bpm
Backup rate	1–150 bpm
PSV (above PEEP)	0–50 cmH_2O
PSV (above P-high)	0–15 cmH_2O
Exhalation trigger	10–90%
Trigger type	Pressure, Flow
Trigger sensitivity	Press: Off, -0.1 to -10.0 cmH_2O Flow: Off, 0.2–10.0 Lpm
P-high	1–80 cmH_2O
P-low	0–30 cmH_2O
T-high	0.1–30 s
T-low	0.1–2.0 s
Rise tme	0.1–0.9 s

IMV base flow	3–20 Lpm
Sync+	On, Off
Tube diameter	2.0–8.0 mm
Tube length	30–300 mm
Tube compensation	Off, 0–100%
N-CPAP flow	3–30 Lpm
Amplitude	0–200 cmH_2O
Stroke volume	0–160 mL

Maximum stroke volume according to frequency

Freq (Hz):	<9	10	11	12	13	14	15	16	17
Max SV (mL):	160	154	148	130	120	112	106	99	89

MAP	3–40 cmH_2O
Frequency	5–17 Hz
SI pressure	3–50 cmH_2O
SI time	Off, 0.5–10 s
SI cycles	1–120 cph
HFO base flow	10–30 Lpm
Amplitude control	On, Off
Auto SI	On, Off
Oxygen saturation	21–100%
Flush iO_2	21–100%

Alarms

Types	High priority	5 consecutive beeps	Lamp: red	Message: red	Blinks two times per second
	Medium priority	3 consecutive beeps	Lamp: yellow	Message: yellow	Blinks once every 2 seconds
	Low priority	2 consecutive beeps	Lamp: yellow	Message: green	Lit continuously in yellow
	Power failure	Continuous buzzer sound	Lamp: red		Blinks two times per second
Alarm suspend	Audio alarm can be silenced for 30, 60, 90 or 120 seconds by pressing the alarm suspend button				

Monitoring Data and Waveforms

Data	Peak inspiratory pressure, Mean airway pressure, PEEP/CPAP, Plateau, IE ratio, Overall breath rate, Spontaneous breath rate, Tidal volume, Minute volume, Proximal leak, Dynamic compliance, FiO_2, P-high*, P-low*, N-CPAP**, Amplitude***, MAP***, SI pressure***, HFO base flow***, Vhfo***, SI time***
Waveforms	Pressure, Flow, Volume (excluding HFO), Pressure-volume loop, Pressure-flow loop, Flow-volume loop

**APRV mode, **N-CPAP mode, ***HFO mode*

Operating Conditions

Gas supply input	Pressure: 0.3–0.5 MPa, Minimum flow: 100 Lpm
Protection level against electric shock	Class 1 equipment
Degree of protection against electric shock	Type B applied part
Water resistance	IPX0
Dimensions (W) × (D) × (H)	517 × 691 × 1,350 mm including stand 517 × 489 × 568 mm main unit only
Weight	Main unit: 38 kg, Main unit and stand: 55 kg
Power	AC 100–240 V 50/60 Hz, 200 VA
Environmental operating temperature	10–40 °C
Humidity	10–95% RH (non condensing)
Altitude	-300–3,000 m

This brochure may be revised or replaced by Nihon Kohden at any time without notice.

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