

## VT PLUS HF Gas-Flow Analyzer

### Technical Data



The VT PLUS HF is Fluke Biomedical's premier general-purpose gas-flow analyzer. In addition, special display modes and bi-directional flow make it perfect for fully and efficiently testing both conventional mechanical ventilators and high-frequency ventilators. EC.6.20 now requires 100 % completion of scheduled life-support device preventive maintenance every year, and VT PLUS HF can help meet those requirements. Multiple special-function tests make troubleshooting quick and efficient.

VT PLUS HF has the capability to measure either high- or low-flow and pressure, replacing the need for gauges and flow meters. It measures 21 ventilator parameters and can display all of them on one screen. Results can be printed directly from the unit or from a PC with included Windows-compatible software. VT PLUS HF also has onboard graphing capability and shows the minimum, maximum, average, and absolute measurement for all parameters.

Learning to use the VT PLUS HF is simple. Technicians control the unit using the VT PLUS HF user-friendly command system, or, if they're familiar with the RT-200, they can switch to a special control mode that uses RT-200-style commands.

VT PLUS HF can be operated with a variety of precision test lungs to ensure that ventilators are tested to manufacturers' specifications and clinical expectations with a fully NIST-traceable testing system.

### Key features

- Bi-directional flow, pressure, volume, and oxygen concentration, and pressure measurements
- Low- and high-pressure, and flow measurement capability
- Special HF mode—up to 900 BPM (15 Hz)
- RS-232 and printer ports
- Included Windows-compatible graphics software
- All 21 ventilator parameters displayed at once on one screen
- Operation by user-friendly VT PLUS HF command mode or special RT-200 command mode
- Minimum, maximum, average, absolute, and graph for all parameters
- Multiple special-function tests for efficient troubleshooting

### Optional features

- Operation with a variety of precision test lungs available from Fluke Biomedical to complete a fully NIST-traceable ventilator testing system

## Specifications

<b>Power</b>	100 V ac to 240 V ac, 50/60 Hz	
<b>Maximum over-voltage</b>	264 V ac	
<b>Power consumption</b>	< 132 V A	
<b>Fuse rating</b>	0.5 A, slow blow	
<b>Display</b>	320 x 240 LCD with CFL backlight	
<b>Viewing area</b>	10.1 cm x 8.2 cm (3 in x 4 in), blue on white background	
<b>Operational modes</b>	Manual mode for simple tests or troubleshooting; computer-control mode, using RS-232 serial port for special applications; use of VT PLUS HF with VT for Windows software for recording graphs and logging data to a computer	
<b>Output ports</b>	RS-232 serial port, and parallel-printer port	
<b>Oxygen measurement</b>		
<b>Range</b>	0 % to 100 %	
<b>Accuracy</b>	± 2 % FSO	
<b>Resolution</b>	0.1 % O <sub>2</sub>	
<b>Transducer location</b>	Internal	
<b>Gas</b>		
<b>Compatibility</b>	Air, O <sub>2</sub> , CO <sub>2</sub> , N <sub>2</sub> , N <sub>2</sub> O, He, mixtures, or user-defined	
<b>Reference units</b>	ATP, STPDO, STPD21 and BTPS	
<b>Test parameters</b>		
<b>Continuous flow</b>	Low flow	± (2 % of reading and 1 % of range)
	High flow	± (2 % of reading and 1 % of range)
<b>Volumetric flow</b>	<b>Low-flow</b>	
	Flow range	-25 lpm to 25 lpm
	Accuracy	± 2 % of reading or ± 1 % of range, whichever is greater
	Frequency response	> 25 Hz or t <sub>10-90</sub> < 40 ms, whichever is greater
	Low-flow dropout	0.01 lpm
	Breath-detect threshold	0.5 lpm
	Maximum-flow rate	50 lpm
	Volume range	> ± 60 l
	Sample rate	100 Hz
	Resolution	0.01 lpm flow > 1 lpm; 0.001 lpm flow < 1 lpm
	Dynamic resistance	< 2.5 cmH <sub>2</sub> O @ 5 lpm
	Fittings	15 mm OD, 1:40 conical male; 0.25 in NPT ID per ASTM F-1054 aluminum with black anodized finish
	<b>Notes:</b>	
	<ul style="list-style-type: none"> <li>• Tidal-volume accuracy: ± 3 % of reading or ± 2 ml, whichever is greater</li> <li>• Volume accuracy tested to 1 liter</li> <li>• Flow accuracy is specified for dry air or oxygen</li> <li>• Below 3.0 lpm, measurement accuracy is obtained by allowing the VT PLUS HF to fully warm up or manually zeroing before reading or documenting measurement</li> </ul>	
	<b>High-flow</b>	
Flow range	-300 lpm to 300 lpm	
Accuracy	± 2 % of reading or ± 2 % of range, whichever is greater	

<b>Volumetric flow</b> cont.	Frequency response	> 25 Hz
	High-flow dropout	25 lpm
	Breath-detect threshold	2 lpm
	Maximum-flow rate	500 lpm
	Volume range	> ± 60 l
	Dynamic resistance	< 2 cmH <sub>2</sub> O @ 60 lpm
	Sample rate	100 Hz
	Resolution	0.01 lpm
	Fittings	22 mm OD, 1:40 conical male; 15 mm ID, 1:40 conical female per ASTM F-1054 aluminum with black anodized finish
	<b>Notes:</b>	
	<ul style="list-style-type: none"> <li>• Tidal-volume accuracy: ± 3 % of reading or ± 10 ml, whichever is greater</li> <li>• Volume accuracy tested to 7 liters</li> <li>• Flow accuracy is specified for dry air or oxygen</li> </ul>	
	<b>Low-pressure</b>	
	Range	± 500 mmHg (10 psi)
	Accuracy	± 0.8 % of reading or ± 1.5 mmHg, whichever is greater
	Frequency response	> 10 Hz
	Resolution	0.1 mmHg
	Fittings	Luer lock, stainless steel
	Maximum applied pressure	60 psi
	Sample rate	100 Hz
	Operating pressure	30 psi
	<b>Note:</b> Fluid pressure may be applied to the positive port; however, fluids should be kept from entering the pressure port by using a suitable length of connection tubing	
	<b>High-pressure</b>	
	Maximum applied pressure	150 psi
	Range	± 100 psi
	Accuracy	± 1 % of reading or ± 0.3 psig, whichever is greater
	Frequency response	> 10 Hz
	Resolution	0.1 psi
	Sample rate	100 Hz
	Fittings	DISS connector, stainless steel
	<b>Airway-pressure</b>	
	Maximum applied pressure	20 psi
	Range	± 120 cmH <sub>2</sub> O
Accuracy	± 0.75 % of reading or ± 0.5 cmH <sub>2</sub> O, whichever is greater	
Frequency response	> 25 Hz or t10-90 < 40 ms, whichever is greater	
Resolution	0.1 cmH <sub>2</sub> O	
Sample rate	100 Hz	
Fittings	Internally connected at the transducer distal end	
<b>Note:</b> Airway pressure is internally tapped off the proximal-flow sensor port, which is the port closest to the exhaust port on the VT PLUS HF		

<b>Ventilator parameter</b>		
<b>Inspiratory and expiratory tidal volume</b>	Resolution	0.1 ml
	Range	As specified in high-flow/low-flow specification
	Accuracy	As specified in high-flow/low-flow specification
<b>Expiratory minute volume</b>	Resolution	0.001 lpm
	Range	0 L to 60 L
	Accuracy	± 3 %
<b>Breath rate</b>	Resolution	0.1 BPM
	Range	0.5 BPM to 150 BPM
	Accuracy	± 1 %
<b>Inspiratory-to-expiratory time ratio (I:E ratio)</b>	Resolution	0.01
	Range	1:200 to 200:1
	Accuracy	± 2 % or ± 0.1 s
<b>Inspiratory time</b>	Resolution	0.01 s
	Range	0 s to 60 s
	Accuracy	± 1 % or ± 0.02 s
<b>Expiratory time</b>	Resolution	0.01 s
	Range	0 s to 90 s
	Accuracy	± 1 % or ± 0.01 s
<b>Peak inspiratory pressure</b>	Resolution	0.1 cmH <sub>2</sub> O
	Range	± 120 cmH <sub>2</sub> O
	Accuracy	± 3 % or ± 1 cmH <sub>2</sub> O
<b>Inspiratory pause pressure</b>	Resolution	0.1 cmH <sub>2</sub> O
	Range	± 120 cmH <sub>2</sub> O
	Accuracy	± 3 % or ± 1 cmH <sub>2</sub> O
<b>Mean airway pressure</b>	Resolution	0.1 cmH <sub>2</sub> O
	Range	± 80 cmH <sub>2</sub> O
	Accuracy	± 3 % or ± 0.5 cmH <sub>2</sub> O
<b>Positive end-expiratory pressure (PEEP)</b>	Resolution	0.1 cmH <sub>2</sub> O
	Range	-5 cmH <sub>2</sub> O to 40 cmH <sub>2</sub> O
	Accuracy	± 3 % or ± 0.5 cmH <sub>2</sub> O
<b>Lung compliance</b>	Resolution	0.1 ml/cmH <sub>2</sub> O
	Range	0 ml/cmH <sub>2</sub> O to 150 ml/cmH <sub>2</sub> O
	Accuracy	± 5 % or ± 5 ml/cmH <sub>2</sub> O
	Inspiratory pause time	> 0.5 s
<b>Inspiratory hold time</b>	Resolution	0.01 s
	Range	0 s to 60 s
	Accuracy	± 1 % or ± 0.1 s
<b>Expiratory hold time</b>	Resolution	0.01 s
	Range	0 s to 90 s
	Accuracy	± 1 % or ± 0.1 s

<b>Peak expiratory flow</b>	Resolution	0.01 lpm
	Range	0 lpm to 300 lpm
	Accuracy	± 3 % or ± 2 lpm
<b>Peak inspiratory flow</b>	Resolution	0.01 lpm
	Range	0 lpm to 300 lpm
	Accuracy	± 3 % or ± 2 lpm
<b>Flow bias</b>	Resolution	0.01 lpm
	Range	0 lpm to 30 lpm
	Accuracy	± 2 % or ± 0.5 lpm
	Expiratory pause time	> 0.5 s
<b>Operating environment conditions</b>		
<b>Temperature range</b>	10 °C to 40 °C	
<b>Ambient humidity</b>	0 % to 80 % non-condensing to 31 °C, decreasing to 50 % at 40 °C	
<b>Barometric pressure</b>	8 psig to 18 psig	
<b>Storage environment conditions</b>		
<b>Temperature range</b>	-25 °C to -50 °C	
<b>Humidity</b>	0 to 95 % non-condensing	
<b>Dimensions (WxDxH)</b>	25.4 cm x 25.4 cm x 12.7 cm (10 in x 10 in x 5 in)	
<b>Weight</b>	4.53 kg (10 lb)	

## Ordering information

### Models

**VT+HF-US120** United States, 120 V  
**VT+HF-AUS250V** Australia, 250 V  
**VT+HF-SHK250V** Schuko, 250 V  
**VT+HF-BRAZ250** Brazil, 250 V  
**VT+HF-UK250V** United Kingdom, 250 V

### Premium precision ventilator test kits

(VT PLUS HF Gas-Flow Analyzer; and ACCU LUNG portable precision test lung)

**VT+HF/ACCULUNG-US** United States  
**VT+HF/ACCULUNG-AUS** Australia  
**VT+HF/ACCULUNG-SHK** Schuko  
**VT+HF/ACCULUNG-BRAZ** Brazil  
**VT+HF/ACCULUNG-UK** United Kingdom

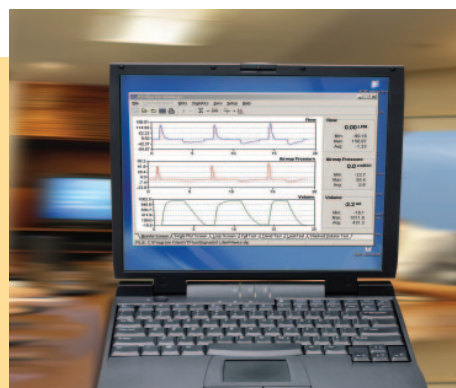
### VT-Plus upgrades

(adds HF capability and RT-200 mode)

**8831007** VT PLUS HF hardware and firmware factory service upgrade (for units lower than hardware v1.01.01; additional flat-rate charge required for factory service/calibration)

### Standard accessories

**9VT0015** Users Manual  
**8830200FG** VT for Windows PC Software  
**75034** Serial Cable  
**1HD0011** Tilt Stand  
 Power Cord (country specific)  
**VT-PLUS-7001** Accessory Kit (includes 16 accessories)



VT for Windows PC Software



VT PLUS HF standard accessories

**Optional accessories**

**5022010** Soft Vinyl Carrying Case for VT PLUS HF

**9530-0066** Hard-Sided Protective Carrying Case for VT PLUS HF (limited to stock on hand)

**Test lungs**

**ACCU LUNG** ACCU LUNG Portable Precision Test Lung (with Soft-Sided Carrying Case)

**MI-14900** Michigan Instruments Non-Instrumented Single-Adult Test Lung

**MI-11000** Michigan Instruments Non-Instrumented Dual-Adult Test Lung

**MI-12952** Michigan Instruments Non-Instrumented Adult/Infant Test Lung

**48499** Siemens 190 Test Lung

**Parabolic airway resistors** (for use with Michigan Instruments test lungs)

**48129** Parabolic Airway Resistor ring

**Printers**

**PRINTR/CTZ-US120V** Printer 110 V, Citizen IDP 3110

**PRINTR/CTZ-US220V** Printer 220 V, Citizen IDP 3110

**71072** Parallel Printer Cable, D25M-C36M

**61096** Printer 120 V Power Supply

**61097** Printer 220 V Power Supply

**97116** DPU-414 and DPU-411 Printer Paper (minimum 7 rolls - price is per roll)

**Accessory kit parts**

**1XX0015** Filter, External (Bacterial), 1 each

**49343FG** Adapter, DISS O2 Nut and Nipple with 1/4 in I.D. Hose Barb, 1 each

**1FT0050** Tubing Adapter, Directional 15 mm OD x 15 mm OD), 2 each

**1FT0049** Tubing Adapter (22 mm OD x 22 mm ID), 2 each

**1FT0048** Tubing Adapter (22 mm OD x 22 mm OD), 2 each

**1FT0045** Tubing Adapter (15 mm OD x 22 mm OD), 2 each

**1FT0046** Tubing Adapter (15 mm OD x 15 mm OD), 2 each

**1FT0047** Tubing Adapter (15 mm ID x 15 mm OD), 2 each

**1FT0051** Tubing Adapter, Narrow Bore, 2 each

**48478** Barb (Luer Lock - Male to 1/89 in ID tubing), 2 each

**1FT0043** Tubing Adapter (1/4 in NPT Male to 1/8 in ID Tubing Barb Fitting), 2 each

**1FT0005** Tubing Adapter (Luer Lock 1/16 in to Bulk-head Connection), 2 each

**2FU0005** Fuse (500 mA)

**67535** Tubing 1/8 in 4 ft long, 2 each

**About Fluke Biomedical**

Fluke Biomedical is the world's leading manufacturer of quality biomedical test and simulation products. In addition, Fluke Biomedical provides the latest medical imaging and oncology quality-assurance solutions for regulatory compliance. Highly credentialed and equipped with a NVLAP Lab Code 200566-0 accredited laboratory, Fluke Biomedical also offers the best in quality and customer service for all your equipment calibration needs.

Today, biomedical personnel must meet the increasing regulatory pressures, higher quality standards, and rapid technological growth, while performing their work faster and more efficiently than ever. Fluke Biomedical provides a diverse range of software and hardware tools to meet today's challenges.

**Fluke Biomedical Regulatory Commitment**

As a medical test device manufacturer, we recognize and follow certain quality standards and certifications when developing our products. We are ISO 9001 and ISO 13485 medical device certified and our products are:

- CE Certified, where required
- NIST Traceable and Calibrated
- UL, CSA, ETL Certified, where required
- NRC Compliant, where required

**Fluke Biomedical.**

*Better products. More choices. One company.*

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