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
Technical specifications

**Power**
100 V ac to 240 V ac, 50/60 H

**Maximum over-voltage**
264 V ac

**Power consumption**
< 132 V A

**Fuse rating**
0.5 A, slow blow

**Display**
320 x 240 LCD with CFL backlight

**Viewing area**
10.1 cm x 8.2 cm (3 in x 4 in) Blue on white background

**Operational modes**
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

**Output ports**
RS-232 serial port, and parallel-printer port

**Oxygen measurement**

<table>
<thead>
<tr>
<th>Range</th>
<th>Accuracy</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 % to 100 %</td>
<td>+ 2 % FSO</td>
<td>0.1 % O₂</td>
</tr>
</tbody>
</table>

**Transducer location**
Internal

**Gas**

<table>
<thead>
<tr>
<th>Compatibility</th>
<th>Reference units</th>
</tr>
</thead>
</table>
| Air, O₂, CO₂, N₂, N₂O, He, mixtures, or user-defined | ATP, STPDO, STPD21 and BTPS

**Test parameters**

**Continuous flow**
Low flow: ± (2 % of reading and 1 % of range)
High flow: ± (2 % of reading and 1 % of range)

**Volumetric flow**

**Low-flow**
Flow range: -25 lpm to 25 lpm
Accuracy: ± 2 % of reading or ± 1 % of range, whichever is greater
Frequency response: > 25 Hz or t₁₀⁻⁹₀ < 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 cmH₂O @ 5 lpm
Fittings: 15 mm OD, 1:40 conical male; 0.25 in NPT ID per ASTM F-1054 aluminum with black anodized finish

**Notes:**
- Tidal-volume accuracy: ± 3 % of reading or ± 2 ml, whichever is greater
- Volume accuracy tested to 1 liter
- Flow accuracy is specified for dry air or oxygen
- 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

**High-flow**
Flow range: -300 lpm to 300 lpm
Accuracy: ± 2 % of reading or ± 2 % of range, whichever is greater
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 cmH₂O @ 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

**Notes:**
- Tidal-volume accuracy: ± 3 % of reading or ± 10 ml, whichever is greater
- Volume accuracy tested to 7 liters
- Flow accuracy is specified for dry air or oxygen

**Low-pressure**
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

**Notes:**
- 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

**High-pressure**
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
Fittings: DISS connector, stainless steel

**Airway-pressure**
Maximum applied pressure: 20 psi
Range: ± 120 cmH₂O
Accuracy: ± 0.75 % of reading or ± 0.5 cmH₂O, whichever is greater
Frequency response: > 25 Hz or t₁₀⁻⁹₀ < 40 ms, whichever is greater
Resolution: 0.1 cmH₂O
Sample rate: 100 Hz
Fittings: Internally connected at the transducer distal end

**Notes:** 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
**Ventilator parameter**

**Inspiratory and expiratory tidal volume**
- Resolution: 0.1 ml
- Range: As specified in high-flow/low-flow specification
- Accuracy: As specified in high-flow/low-flow specification

**Expiratory minute volume**
- Resolution: 0.001 lpm
- Range: 0 L to 60 L
- Accuracy: ± 3 %

**Breath rate**
- Resolution: 0.1 BPM
- Range: 0.5 BPM to 150 BPM
- Accuracy: ± 1 %

**Inspiratory-to-expiratory time ratio (I:E ratio)**
- Resolution: 0.01
- Range: 1:200 to 200:1
- Accuracy: ± 2 % or ± 0.1 s

**Inspiratory time**
- Resolution: 0.01 s
- Range: 0 s to 60 s
- Accuracy: ± 1 % or ± 0.02 s

**Expiratory time**
- Resolution: 0.01 s
- Range: 0 s to 90 s
- Accuracy: ± 1 % or ± 0.01 s

**Peak inspiratory pressure**
- Resolution: 0.1 cmH₂O
- Range: ± 120 cmH₂O
- Accuracy: ± 3 % or ± 1 cmH₂O

**Inspiratory pause pressure**
- Resolution: 0.1 cmH₂O
- Range: ± 120 cmH₂O
- Accuracy: ± 3 % or ± 1 cmH₂O

**Mean airway pressure**
- Resolution: 0.1 cmH₂O
- Range: ± 80 cmH₂O
- Accuracy: ± 3 % or ± 0.5 cmH₂O

**Positive end-expiratory pressure (PEEP)**
- Resolution: 0.1 cmH₂O
- Range: -5 cmH₂O to 40 cmH₂O
- Accuracy: ± 3 % or ± 0.5 cmH₂O

**Lung compliance**
- Resolution: 0.1 ml/cmH₂O
- Range: 0 ml/cmH₂O to 150 ml/cmH₂O
- Accuracy: ± 5 % or ± 5 ml/cmH₂O
- Inspiratory pause time: > 0.5 s

**Inspiratory hold time**
- Resolution: 0.01 s
- Range: 0 s to 60 s
- Accuracy: ± 1 % or ± 0.1 s

**Expiratory hold time**
- Resolution: 0.01 s
- Range: 0 s to 90 s
- Accuracy: ± 1 % or ± 0.1 s

**Peak expiratory flow**
- Resolution: 0.01 lpm
- Range: 0 lpm to 300 lpm
- Accuracy: ± 3 % or ± 2 lpm

**Peak inspiratory flow**
- Resolution: 0.01 lpm
- Range: 0 lpm to 300 lpm
- Accuracy: ± 3 % or ± 2 lpm

**Flow bias**
- Resolution: 0.01 lpm
- Range: 0 lpm to 30 lpm
- Accuracy: ± 2 % or ± 0.5 lpm
- Expiratory pause time: > 0.5 s
Ordering information

Models
2128272 VT PLUS HF—USA, 120 V
2399376 VT PLUS HF—Australia, 250 V
2399383 VT PLUS HF—Schuko, 250 V
2399390 VT PLUS HF—UK, 250 V

Premium precision ventilator test kits
(VT PLUS HF Gas-Flow Analyzer; and ACCU LUNG portable precision test lung)
2387329 VT PLUS HF/ACCU LUNG—USA
2425682 VT PLUS HF/ACCU LUNG—Australia
2425694 VT PLUS HF/ACCU LUNG—Schuko
2425701 VT PLUS HF/ACCU LUNG—UK

VT-Plus upgrades
(adds HF capability and RT-200 mode)
2240945 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
2137275 Operator’s Manual
2392054 VT for Windows PC Software
2238659 Serial Cable
2133387 Tilt Stand
2131367 Power Cord (country specific)
2133310 Tubing Adapter, Directional 15 mm OD x 15 mm OD, 2 each
2133305 Tubing Adapter (22 mm OD x 22 mm ID), 2 each
2133291 Tubing Adapter (22 mm OD x 22 mm OD), 2 each
2133269 Tubing Adapter (15 mm OD x 22 mm OD), 2 each
2133278 Tubing Adapter (15 mm OD x 15 mm OD), 2 each
2133284 Tubing Adapter (15 mm ID x 15 mm OD), 2 each
2133322 Tubing Adapter, Narrow Bore, 2 each
2133777 Adapter, DISS 02 Nut and Nipple with 1/4 in I.D. Hose Barb, 1 each
2133230 Barb (Luer Lock – Male to 1/8 in ID tubing), 2 each
2133240 Tubing Adapter (1/4 “ NPT Male to 1/8 in ID Tubing Barb Fitting), 2 each
2133202 Tubing Adapter (Luer Lock 1/16 in to Bulkhead Connection), 2 each
2391848 Tubing 1/8 in 4 ft long, 2 each
2397628 Soft-Sided Carrying Case for ACCU LUNG

Optional accessories
2222822 Soft Vinyl Carrying Case for VT PLUS HF
2248597 Hard-Sided Protective Carrying Case for VT PLUS HF (limited to stock on hand)
2397628 Soft-Sided Carrying Case for ACCU LUNG

Parabolic airway resistors
(for use with Michigan Instruments test lungs)
2212830 Parabolic Airway Resistor: RP5
2212934 Parabolic Airway Resistor: RP10
2212848 Parabolic Airway Resistor: RP20
2212853 Parabolic Airway Resistor: RP50
2212918 Parabolic Airway Resistor: RP200
2213140 Parabolic Airway Resistor: RP500

Printers
2248762 Printer 110 V, Citizen IDP 3110
22719653 Printer 220 V, Citizen IDP 3110
2238072 Parallel Printer Cable, D25M-C36M

Accessory kit parts
2133712 Filter, External (Bacterial), 1 each
2391777 Adapter, DISS 02 Nut and Nipple with 1/4 in I.D. Hose Barb, 1 each
213310 Tubing Adapter, Directional 15 mm OD x 15 mm OD, 2 each
213305 Tubing Adapter (22 mm OD x 22 mm ID), 2 each
2133291 Tubing Adapter (22 mm OD x 22 mm OD), 2 each
2133269 Tubing Adapter (15 mm OD x 22 mm OD), 2 each
2133278 Tubing Adapter (15 mm OD x 15 mm OD), 2 each
2133284 Tubing Adapter (15 mm ID x 15 mm OD), 2 each
2133322 Tubing Adapter, Narrow Bore, 2 each
2133777 Adapter, DISS 02 Nut and Nipple with 1/4 in I.D. Hose Barb, 1 each
2133230 Barb (Luer Lock – Male to 1/8 in ID tubing), 2 each
2133240 Tubing Adapter (1/4 “ NPT Male to 1/8 in ID Tubing Barb Fitting), 2 each
2133202 Tubing Adapter (Luer Lock 1/16 in to Bulkhead Connection), 2 each
2391848 Tubing 1/8 in 4 ft long, 2 each

Test lungs
2387318 ACCU LUNG Portable Precision Test Lung (with Soft-Sided Carrying Case for ACCU LUNG, Model 2397628)
2251049 Michigan Instruments Non-Instrumented Single-Adult Test Lung
2251008 Michigan Instruments Non-Instrumented Dual-Adult Test Lung
2251013 Michigan Instruments Non-Instrumented Adult/Infant Test Lung
2213774 Siemens 190 Test Lung

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. 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 device manufacturer, we recognize and follow certain quality standards and certifications when developing our products. We are ISO 9001 certified and our products are:
• FDA Compliant
• CE Certified, where required
• NIST Traceable and Calibrated
• UL, CSA, ETL Certified, where required
• NRC Compliant, where required

Fluke Biomedical
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More choices.
One company.

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2/2008 2817925 D-EN-N Rev B