FLUKE®

Biomedical

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 oscillatory 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
- Very high-frequency measurement capability – up to 900 BPM (15 Hz)
- RS232 and printer ports
- Included Windows-compatible graphics software
- All 21ventilator 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 VAC to 240 VAC, 50/60 Hz
Maximum Over-Voltage: 264 VAC
Power Consumption: < 132 V A
Fuse Rating: 0.5 A, Slow Blow
Display: 320 x 240 LCD with CFL backlight
Viewing Area: 3 in x 4 in (10.1 cm x 8.2 cm)
Blue on white background
Operational Modes: Manual mode for simple tests or troubleshooting; computer-control mode, using RS232 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: RS232 serial port, and parallel-printer port

Oxygen Measurement
Range: 0 % to 100 %
Accuracy: + 2 % FSO
Resolution: 0.1 % O2
Transducer Location: Internal

Gas
Compatibility: Air, O_2, CO_2, N_2, N_2O, He, mixtures, or user-defined
Reference Units: ATP, STPDO, STPD21 and BTPS

Test Parameters
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 cmH_2O @ 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 cmH_2O @ 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: ± 0.5 % 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

Note: 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 ± 0.1 psig, whichever is greater
Frequency Response: > 10 Hz
Resolution: 0.1 psi
Sample Rate: 100 Hz
Fittings: DISS connector, stainless steel

Airway-Pressure
Maximum Applied Pressure: 20 psi
Range: ± 120 cmH_2O
Accuracy: ± 0.75 % of reading or ± 0.5 cmH_2O, whichever is greater
Frequency Response: > 25 Hz or t10-90 < 40 ms, whichever is greater
Resolution: 0.1 cmH_2O
Sample Rate: 100 Hz
Fittings: Internally connected at the transducer distal end

Note: 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 cmH_2O
Range: ± 120 cmH_2O
Accuracy: ± 3 % or ± 1 cmH_2O

Inspiratory Pause Pressure
Resolution: 0.1 cmH_2O
Range: ± 120 cmH_2O
Accuracy: ± 3 % or ± 1 cmH_2O

Mean Airway Pressure
Resolution: 0.1 cmH_2O
Range: ± 80 cmH_2O
Accuracy: ± 3 % or ± 0.5 cmH_2O

Positive End-Expiratory Pressure (PEEP)
Resolution: 0.1 cmH_2O
Range: -5 cmH_2O to 40 cmH_2O
Accuracy: ± 3 % or ± 0.5 cmH_2O

Lung Compliance
Resolution: 0.1 ml/cmH_2O
Range: 0 ml/cmH_2O to 150 ml/cmH_2O
Accuracy: ± 5 % or ± 5 ml/cmH_2O
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

Model

2128272: VT PLUS HF-US120
2399376: VT PLUS HF-AUS250V
2399383: VT PLUS HF-SHK250V
2399390: VT PLUS HF-UK250V

Premium Precision Ventilator Test Kit:
(VT PLUS HF Gas Flow Analyzer; and ACCU LUNG portable precision test lung)
2387329: VT PLUS HF/ACCU LUNG-US
2425682: VT PLUS HF/ACCU LUNG-AUS
2425694: VT PLUS HF/ACCU LUNG-SHK
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
XXXXXXX: Power cord (country specific)
2131367: Accessory kit (includes 16 accessories)

Optional Accessories
2222822: Soft vinyl carrying case for VT PLUS HF
2248587: Hard-sided protective carrying case for VT PLUS HF (limited to stock on hand)
2397628: Soft-sided carrying case for ACCU LUNG

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

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
2719653: 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
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
2213679: Barb (luer lock – male to 1/89 in ID tubing), 2 each
2133240: Tubing adapter (1/4 " NPT male to 1/8 " ID tubing barb fitting), 2 each
2133202: Tubing adapter (luer lock 1/16 " to bulkhead connection), 2 each
2133932: Fuse (500 mA)
2391848: Tubing 1/8 in 4 ft long, 2 each

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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

Fluke Biomedical.

Better products. More choices. One company.

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