

MPS450

Patient Simulator

Technical Data



The portable MPS450 is Fluke Biomedical's next-generation multiparameter patient simulator. Designed to evaluate the simplest ECG monitor to the most complex arrhythmia detection system, the MPS450 provides a broad range of physiological waveforms for comprehensive equipment testing and training.

The MPS450 features multiple simulations for ECG, blood pressure, respiration, temperature, pacemaker, artifact, and arrhythmia conditions. Optional features include cardiac-output and fetal/maternal ECG simulation.

Microprocessor control, combined with extensive digital memory, makes testing quick and convenient. A menu-driven interface provides an intuitive method to get around the multitude of tests and functions, and the tool's large, bright display makes reading test results easy. Compact and portable, the MPS450 is ideal for mobile technicians, whether they need to do a quick check on a bedside monitor or perform a complete PM on the latest patient-monitoring system.

The MPS450 is also an excellent training tool that teaches techniques for recognizing normal and abnormal conditions in the heart, lungs, and circulatory system, as well as techniques for CPR, defibrillation, and cardioversion. Cardiac physiologists learn how to interpret ECG waveforms, and respiratory physiologists learn pulmonary and respiratory analysis techniques.

Key features

- 12-lead ECG simulation
- 36 arrhythmia selections
- Pacemaker simulation
- 4 invasive blood-pressure channels, including Swan-Ganz
- Respiration and temperature simulation
- Blood pressure synchronization with ECG
- Large, bright 4-line by 20-character super-twist display
- Compact and portable
- Battery operated
- High-level ECG output
- Intuitive interface
- R-wave detection test
- RS-232 port for computer control

Optional features

- Cardiac-output simulation
- Fetal/maternal ECG, direct simulations with intrauterine-pressure waveform
- Remote controller HHC3 (Handheld Controller)

Technical Specifications

Normal-sinus-rhythm waveform

ECG reference

ECG amplitudes specified for lead II (calibration), from baseline to peak of R-wave; other leads proportional

Normal sinus rhythm

12-lead configuration with independent outputs referenced to right leg (RL); output to 10 universal ECG jacks, color-coded to AHA and IEC standards

Low-level amplitude

0.05 mV to 0.50 mV (0.05-mV steps); 0.5 mV to 5.5 mV (0.5-mV steps; power-on default: 1 mV)

Amplitude accuracy

± 2 % of setting lead II

High-level output (available on BP3 connector)

0.2 V/mV ± 5 % of the ECG-amplitude setting

ECG rate

30, 40, 45, 60, 80, 90, 100, 120, 140, 160, 180, 200, 220, 240, 260, 280 and 300 BPM (power-on default: 80 BPM)

Rate accuracy

± 1 % of setting

ECG-waveform selection

Adult (80 ms) or pediatric (40 ms) QRS duration (power-on default: adult QR/P-R interval of 0.16 s)

Superimposed artifact

50 Hz and 60 Hz, muscle, baseline wander, respiration

ST-segment elevation/depression

Adult mode only: -0.8 mV to 0.8 mV, in 0.1-mV steps; additional steps: 0.05 mV and -0.05 mV (power-on default: elevation 0 mV)

Pacemaker waveform

Pacer-pulse amplitude

1 mV, 2 mV, 5 mV, 10 mV, ± 10 % (power-on default: 5 mV)

Pacer-pulse width

0.1 ms, 0.5 ms, 1 ms, 1.5 ms, 2 ms, ± 5 % (power-on default: 1 ms)

Pacing rate

75 BPM

Waveforms

(Power-on default: atrial waveform), atrial, asynchronous 75 BPM, demand with frequent sinus beats, demand with occasional sinus beats, AV sequential, non-capture (one time), nonfunction

Arrhythmias

Baseline NSR

80 BPM

PVC focus

Left focus, standard timing (except where specified)

Supraventricular arrhythmias

(Power-on default: atrial fibrillation, coarse); atrial fibrillation, coarse; atrial fibrillation, fine; atrial flutter; sinus arrhythmia; missed beat (one time); atrial tachycardia; paroxysmal atrial tachycardia (PAT); nodal rhythm; supraventricular tachycardia

Premature arrhythmias (all one-time events)

(Power-on default: premature atrial contraction); premature atrial contraction (PAC); premature nodal contraction (PNC); PVC1 left ventricular; PVC1 left ventricular, R on T; PVC2 right ventricular; PVC2 right ventricular, early; PVC2 right ventricular, R on T; multifocal PVCs

Ventricular arrhythmias

(Power-on default: PVCs 6/min); PVCs 6/min (power-on default); PVCs 12/min; PVCs 24/min; frequent multifocal PVCs; bigeminy; trigeminy; multiple PVCs (one-time run of 2PVCs); multiple PVCs (one-time run of 5 PVCs); multiple PVCs (one-time run of 11 PVCs); ventricular tachycardia; ventricular fibrillation, coarse; ventricular fibrillation, fine; asystole

Conduction defects

(Power-on default: first-degree heart block), first-degree heart block, second-degree heart block, third-degree heart block, right-bundle-branch block, left-bundle-branch block

ECG-performance testing

Amplitude

0.05 mV to 0.5 mV (0.05-mV steps); 0.5 mV to 5.5 mV (0.5-mV steps) (power-on default: 1 mV)

Pulse wave

30 BPM, 60 BPM, with 60 ms pulse width

Square wave

2 Hz, 0.125 Hz (power-on default: 2 Hz)

Triangle wave

2 Hz, 2.5 Hz

Sine wave

0.5 Hz, 5 Hz, 10 Hz, 40 Hz, 50 Hz, 60 Hz, and 100 Hz

R-wave-detection waveform

Haver-triangle R-wave rate: 30 BPM, 60 BPM, 80 BPM, 120 BPM, 200 BPM, and 250 BPM (power-on default: 60 BPM) R-wave width: 20 ms to 200 ms (10-ms steps); additional steps: 8 ms, 10 ms, and 12 ms (power-on default: 10 ms)

Rate Accuracy

1 %

Amplitude accuracy

± 2 %, lead II (exception: ± 5 % for R-waves ≤ 20 ms)

Respiration

Rate

0 (OFF), 15 BrPM, 20 BrPM, 30 BrPM, 40 BrPM, 60 BrPM, 80 BrPM, 100 BrPM, and 120 BrPM (power-on default: 20 BrPM)

Impedance variations ($\Delta\Omega$)

0.2 Ω , 0.5 Ω , 1 Ω , or 3 Ω (power-on default: Δ 1 Ω)

Accuracy delta

\pm 10 %

Baseline

500 Ω , 1000 Ω , 1500 Ω , and 2000 Ω , leads I, II, III (power-on default: 1000 Ω)

Accuracy baseline

\pm 5 %

Respiration lead

LA or LL (power-on default: LA)

Apnea selection

12 s, 22 s, or 32 s (one-time events), or continuous (apnea ON = respiration OFF; power-on default: 12 s apnea)

Blood pressure

Input/output impedance

300 Ω \pm 10 %

Exciter-input range

2 V RMS to 16 V RMS

Exciter-input-frequency range

DC to 5000 Hz

Transducer sensitivity

5 μ V/V/mmHg or 40 μ V/V/mmHg (power-on default: 5 μ V/V/mmHg)

Pressure accuracy

\pm (2 % reading + 2 mmHg)

Static levels, P1

-10 mmHg, 0 mmHg, 80 mmHg, 160 mmHg, 240 mmHg, 320 mmHg, and 400 mmHg (power-on default: 0 mmHg)

Static levels, P2

-10 mmHg, 0 mmHg, 50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, and 240 mmHg (power-on default: 0 mmHg)

Static levels, P3

-5 mmHg, 0 mmHg, 20 mmHg, 40 mmHg, 60 mmHg, 80 mmHg, and 100 mmHg (power-on default: 0 mmHg)

Static levels, P4

-5 mmHg, 0 mmHg, 20 mmHg, 40 mmHg, 60 mmHg, 80 mmHg, and 100 mmHg (power-on default: 0 mmHg)

Dynamic waveforms, P1

Arterial: 120/80
Radial artery: 120/80
Left ventricle: 120/00
Right ventricle: 25/00

Dynamic waveforms, P2

Arterial: 120/80
Radial artery: 120/80
Left ventricle: 120/00
Right atrium (central venous or CVP): 15/10
Right ventricle: 25/00 Pulmonary artery: 25/10
Pulmonary-artery wedge: 10/2
Left atrium: 14/4

Dynamic waveforms, P3

Arterial: 120/80
Radial artery: 120/80
Left ventricle: 120/00
Right atrium (central venous or CVP): 15/10
Right ventricle: 25/00
Pulmonary artery: 25/10
Pulmonary-artery wedge: 10/2
Left atrium: 14/4

Dynamic waveforms, P4 (Swan-Ganz sequence)

Right atrium (CVP)
Right ventricle (RV)
Pulmonary artery (PA)
Pulmonary-artery wedge (PAW)

Respiration artifact

BP delta change from 3 mmHg to 16 mmHg

BP output

Mini DIN 7-pin

Temperature

0 $^{\circ}$ C (32 $^{\circ}$ F), 24 $^{\circ}$ C (75.2 $^{\circ}$ F), 37 $^{\circ}$ C (98.6 $^{\circ}$ F), and 40 $^{\circ}$ C (104 $^{\circ}$ F) (power-on default: 32 $^{\circ}$ F/0 $^{\circ}$ C)

Accuracy

\pm 0.1 $^{\circ}$ C

Compatibility

Yellow Springs, Inc. (YSI) Series 400 and 700

Output

Mini DIN 7-pin

Cardiac output (optional)

Catheter type

Baxter Edwards, 93a-131-7f

Calibration coefficient

0.542 (0 $^{\circ}$ C injectate), 0.595 (24 $^{\circ}$ C injectate)

Blood temperature

37 $^{\circ}$ C (98.6 $^{\circ}$ F) \pm 2 %

Injectate volume

10 cc

Injectate temperature

0 $^{\circ}$ C or 24 $^{\circ}$ C \pm 2 % value (power-on default: 0 $^{\circ}$ C injectate)

Cardiac output

2.5 lpm, 5 lpm, 10 lpm \pm 5 % (power-on default: 2.5 lpm)

Faulty-injection curve

(Waveform for simulation available)

Left-to-right-shunt curve

(Waveform for simulation available)

Calibrated pulse

1.5 $^{\circ}$ for 1 s (37 $^{\circ}$ * 35.5 $^{\circ}$) (waveform for simulation available)

Repeatability

\pm 1 %

Fetal/maternal ECG (optional)

Maternal heart rate (fixed)

80 BPM

Fetal heart rate (selectable)

60 BPM, 90 BPM, 120 BPM, 140 BPM, 150 BPM, 210 BPM, and 240 BPM (power-on default: 120 BPM)

Fetal heart rate (IUP)

140 BPM at beginning, then varying with pressure

Intrauterine-pressure waveforms

Uniform acceleration (140 BPM to 175 BPM to 140 BPM; rate change lagging IUP contraction by 30 s); uniform deceleration (140 BPM to 100 BPM to 140 BPM; rate change lagging IUP contraction by 30 s) (power-on default); early deceleration (140 BPM to 100 BPM to 140 BPM; no IUP lag time); late deceleration (140 BPM to 100 BPM to 140 BPM, starting at IUP peak);

Wave duration

90 s, bell-shaped pressure curve, from 0 mmHg to 90 mmHg and returning to 0 mmHg, ± 4 mmHg (max)

IUP period

2 min, 3 min, or 5 min; and manual (power-on default: manual)

Computer setup

Port

Bidirectional (data communications equipment)
RS-232

Baud rate

9600

Parity

None

Stop bits

1

Data bits

8

Temperature

Operating

10 °C to 40 °C (50 °F to 104 °F)

Storage

-25 °C to 50 °C (13 °F to 122 °F)

Humidity

80 % max relative humidity

General information

Battery replacement

Warning for low-battery condition (batteries to be replaced at this time)

Power

Two 9 V alkaline batteries (8 hours min continuous power); optional battery eliminator

Dimensions (WxDxH)

15.2 cm x 19 cm x 5 cm
(6 in x 7.5 in x 2 in)

Weight

0.7 kg (1.5 lb)



MPS450 optional accessories

Optional temperature cables

- 2391678 Hewlett Packard Temperature Cable Adapter
- 2391976 Temperature Cable 400 Series (1/4 in phone plug)
- 2391983 Temperature Cable 700 Series (1/4 in phone plug)

Optional blood pressure cables

- 2392031 Burdick (10 socket)
- 2226935 Care (5 pin)
- 2226947 Carometrics (3 pin/3 socket)
- 2226986 Carometrics (12 pin)
- 2226856 Criticare (6 pin)
- 2226856 Critikon (6 pin)
- 2226842 Datascope (6 socket)
- 2392031 Datex (10 socket)
- 2226935 Gould/Statham (5 pin)
- 2226888 Hewlett Packard (5 socket)
- 2226874 Hewlett Packard/Merlin (12 pin)
- 2226856 Invivo Research (6 pin)
- 2226856 Ivy Biomedical (6 pin)
- 2226842 Kontron/Roche (6 socket)
- 2392022 Marquette 7000 (8 pin)
- 2392297 GE Medical/Marquette Eagle (11 pin)
- 2226839 Marquette Twin (6 pin)
- 2226856 Medical Data Electronics (MDE) (6 pin)
- 2226863 Mennen Medical (6 pin)
- 2392005 MPS-1 Cable to LH-3 adapter, (6 pin)
- 2226895 Nihon Khoden (5 pin)
- 2226856 North American Drager (6 pin)
- 2226947 Novamatrix (3 pin/3 socket)
- 2226856 Ohmeda (6 pin)
- 2226856 Physio Control (6 pin)
- 2226856 Protocol (6 pin)
- 2392031 Puritan Bennett (10 socket)
- 2226901 Siemens (10 pin) (used with Siemens Medical transducer adapter (3368-383-E530U) to run a single invasive BP channel on Siemens Medical SC6000 and SC9000 series Monitors)
- 2226842 SMEC (6 socket)
- 2226856 SpaceLabs (6 pin) (used with SpaceLabs adapters 700-0028-00 and 0120-0551-00 when testing UltraView command module)
- 2226912 SpaceLabs/Squibb (5 pin)
- 2226856 Tektronix/Squibb (6 pin)
- 2392010 Universal BP adapter (pigtail/unterminated)
- 2226912 Vitastat (5 pin)
- 2226856 Vitatek/Squibb (6 pin)

Ordering information

Model

2251364 MPS450 (ECG 12-lead simulation; invasive BP; respiration; temperature; BP in sync with ECG; large, bright 4-line x 20-character display; R-wave-detection test; RS-232 port for computer control; soft-key navigation; universal ECG connectors; and flash memory for easy program upgrade)

2251373 MPS450-CO (base model plus cardiac-output simulation)

2251399 MPS450-FET (base model plus direct fetal/maternal ECG simulations with maternal heart rate, selectable fetal heart rate, and dynamic intrauterine pressure waveform [IUP])

2251386 MPS450-CO/FET (base model plus cardiac-output simulation and direct fetal/maternal ECG simulations with maternal heart rate, selectable fetal heart rate, and dynamic intrauterine pressure waveform [IUP])

Standard accessories MPS450

- 2243350 User Manual
- 2646537 AC Battery Eliminator

Optional accessories

- 2248623 Soft-Sided Vinyl Carrying Case
- 2238659 Serial Cable D9M-D9F
- 2645641 HHC3 Handheld Controller

Cardiac output adapters

- 2392285 GE Medical/Marquette Cardiac Output Cable (interface cable for GE Medical/Marquette plus monitors, including in-line switch box to select injectate temperature)
- 2227016 Gould/Spectramed 1445 Injectate Temperature Adapter (4 pin)
- 2227025 Gould/Spectramed 1465 Injectate Temperature Adapter (phone jack)
- 2226973 HP Injectate Temperature Adapter (1/4 in phone plug)
- 2391990 Universal Injectate Temperature Adapter Pigtail (unterminated)
- 2392158 General Purpose Connector

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.

*Better products.
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One company.*

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