

Infinity[®] M540 monitor Infinity M500 docking station

Now you can hold your patient in the palm of your hand with the Infinity M540 monitor, the portable monitoring component of the Infinity Acute Care System. This innovative hand-held monitor is designed to accompany the patient on transport from the bedside and throughout the hospital campus*.



FEATURES

- Continuously captures and displays hemodynamic monitoring data at the bedside and on transport in the hospital and in a land ambulance
- Transmits vital signs data via the hospital's wireless network while on transport
- Automatically backfills vital signs data collected on transport into the Dräger Medical Cockpit[®] upon docking
- Has 180° flip-screen, for proper visual orientation and docking on left or right

INFINITY M540 PATIENT MONITOR

The M540's built-in touch screen displays real-time monitoring information, allowing you to be vigilant while you 'carry your patient in your hand'. During transport, the monitor also stores trends and events for viewing at the Dräger Medical Cockpit when returned to the docking station. Depending on the acuity of your patient, you can add or remove patient cables or modules – giving you the flexibility to address the changing acuity levels of your patient.

Optimized for intra-hospital transport, the handheld M540 is lightweight, sturdy and waterproof – making transport less disruptive to the patient, reducing the risks of undetected events, and improving clinician efficiency. The innovative design allows for quick undocking, thereby reducing preparation time for transport. Simply undock the M540 and go – without having to disconnect or reconnect the patient. The monitor provides seamless information whether docked or on transport and broadcasts patient data wirelessly while on transport. Once re-docked, the M540 automatically backfills trends, events and patient demographics into the Medical Cockpit – thus supporting a more complete, accurate patient record and reducing the risk of missed events.

INFINITY M500 DOCKING STATION

In addition to charging the M540's built-in battery, the Infinity M500 docking station makes the M540's data accessible to the Medical Cockpit at the bedside.

*The M540 monitor is intended for use in any hospital care environment with the exception of hyperbaric chambers and environments containing MRI equipment.



Infinity M540 monitor and M500 docking station

Designed for quick, one-handed docking/undocking



The M540 has an 180° auto-flip screen, for proper visual orientation and docking on left or right

TECHNICAL DATA

MONITORING CAPABILITIES

Adult, pediatric, and neonatal applications¹

ECG

Acquires up to 12 leads²

Available leads:	3-lead wire set: I, II, III (user-selectable) 5-lead wire set: I, II, III, aVR, aVL, aVF, V 6-lead wire set: I, II, III, aVR, aVL, aVF, V, V+ 10-lead wire set: I, II, III, aVR, aVL, aVF, V1-V6 TruST [®] derived 12-lead on: I, II, III, aVR, aVL, aVF, dV1, V2, dV3, dV4, V5, dV6
Measurement range	15 to 300 beats per minute (bpm)
Accuracy	±2 bpm or ±1 % (whichever is greater)
Resolution	1 bpm
Frequency ranges	Monitoring filter: 0.5 - 40 Hz OR Mode/ESU filter: 0.5 to 20 Hz (pacer detection disabled) Diagnostic ECG Bandwidth: 0.05 to 150 Hz OFF filter: 0.05 to 150 Hz (M540 display limited to 40 Hz)

QRS detection range

Amplitude	0.5 to 5 mV p-p RTI (peak to peak with respect to input)
Duration	Adult: 70 to 120 ms Pediatric/Neonatal: 40 to 120 ms
Alarms	User selectable upper and lower limits

Pacer detection (adult/pediatric)

Sensing leads:	Leads: I, II or III
Amplitude (a_p)	±2 to ±900 mV
Width (d_p)	0.2 to 2.0 ms
Rise/Fall times (min)	0.1 d_p , ≤100 μs
Overshoot (min)	0.025 to 0.25 a_p , <2 mV
Recharge time constant	4 to 100 ms

ST (adult/pediatric)

Sensing leads	Any ECG lead available based on lead set used
ST complex length	828 ms (-260 ms to 568 ms from fiducial point)
Sample rate	250 samples/s
Isoelectric measurement point	Adjustment range: -260 ms to 40 ms Default: QRS onset -28 ms
ST measurement point	Adjustment range: -28 ms to 568 ms Default: QRS offset +80 ms
Update interval	15 s ±1 s, 1 normal beat required
Measuring range	-15.0 mm to 15.0 mm (-1.50 to 1.50 mV)
Measuring accuracy	±0.1 mm (±0.01 mV) RTI (with respect to input)
Resolution	±0.1mm (0.01 mV)
Alarms	User selectable upper and lower limits
Event duration	Off, 15, 30, 45, 60 s (default 60 s)

Arrhythmia

Basic arrhythmia	Asystole, Ventricular Fibrillation, Ventricular Tachycardia, Artifact
Note: Bradycardia is available as a low heart rate alarm for neonates.	
Full arrhythmia	Basic plus Ventricular Run, Accelerated Idioventricular Rhythm, Supra-Ventricular Tachycardia, Couplet, Bigeminy, Tachycardia, Bradycardia, Pause, PVC/min.

¹ Arrhythmia and ST Analysis are for adult and pediatric patients only.

² All 12-leads can be viewed via two screens with 6-leads each; 12-lead monitoring is an option

PVC/min

Measurement range	0 to 300 bpm
Resolution	1 bpm
Accuracy	± 5 bpm or $\pm 10\%$ of the rate, whichever is greater
Response time	<4 seconds

Diagnostic ECG³

Diagnostic program	Glasgow Interpretive ECG
Interpretation base	Age, gender, race, medication, clinical classification
Report formats	13 different report formats available
Report languages	English, French, German, Italian, Portuguese, Spanish, Swedish
Export	Infinity CentralStation can be configured to automatically export 12-lead reports
Reports provided by	Infinity CentralStation with Rest ECG Option enabled

Note: Printed Rest-ECG reports on the Infinity CentralStation meet diagnostic bandwidth requirements.

Respiration rate

Sensing leads	I, II (user-selectable)
Measuring method	Impedance pneumography
Auxiliary current	<10 μ A for any active electrode
Bandwidth (-3 dB)	0.25 to 3.5 Hz
Detection threshold	0.2 Ω - 4.0 Ω in manual mode (user adjustment) 0.3 Ω - 1.5 Ω in auto mode (automatic adjustment)
Measuring range	0 to 155 breaths per minute
Resolution	1 breath per minute
Measuring accuracy	± 1 breath per minute, or $\pm 2\%$ of the rate value, whichever is greater
Apnea detection interval times	Off, 10, 15, 20, 25, and 30 s
Alarms	User-selectable upper and lower respiration rate

Pulse Oximetry (SpO₂)

Displayed parameters	Saturation (fraction of oxyhemoglobin to functional hemoglobin) and pulse (rate and curve), perfusion index (Masimo SET [®] only)
Measuring method	Absorption spectrophotometry
Measuring range	SpO ₂ : 1 to 100 % Pulse rate: 26 to 239 bpm

SpO₂ Algorithm (Infinity MCable[®]-Masimo rainbow[®] SET)

Masimo rainbow[®] SET (Signal Extraction Technology[®])

Masimo provides the industry gold-standard for motion tolerant pulse oximetry* and is known for accuracy during low perfusion. See additional product datasheet for complete and more detailed specifications.

*As documented in Masimo's peer reviewed studies located on www.masimo.com.

SpO₂ Algorithm (Infinity MCable-Nellcor[™] OxiMax[™])

Nellcor OxiMax

See product datasheet for complete and more detailed specifications.

Non-Invasive Blood Pressure (NIBP)

Parameter display	Systolic, Diastolic, Mean
Measuring method	Oscillometric via step deflation
Modes of operation	Manual (single measurement), Interval, Continuous, or Venous Stasis
Interval times	Off, 1, 2, 2.5, 3, 5, 10, 15, 20, 25, 30, 45, 60, 120, and 240 min
Static cuff accuracy	± 3 mmHg (± 0.4 kPa)
Resolution	1 mmHg (0.1 kPa)

³ Diagnostic ECG requires the presence of an Infinity Medical Cockpit running IACS software connected to the M540 and also the presence of an Infinity CentralStation for analysis and reports.

CONTINUING TECHNICAL DATA**Measuring range (default)**

Heart rate	30 to 240 bpm
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Adult

Systolic	30 to 250 mmHg (4 to 33.3 kPa)
Mean	30 to 230 mmHg (4 to 30.6 kPa)
Diastolic	10 to 210 mmHg (1.3 to 28 kPa)

Pediatric

Systolic	30 to 170 mmHg (4 to 22.6 kPa)
Mean	30 to 150 mmHg (4 to 20 kPa)
Diastolic	10 to 130 mmHg (1.3 to 17.3 kPa)

Neonatal

Systolic	30 to 130 mmHg (4 to 17.3 kPa)
Mean	30 to 110 mmHg (4 to 14.7 kPa)
Diastolic	10 to 100 mmHg (1.3 to 13.3 kPa)

Cuff Pressure

Default inflation pressure	Adult: 160 ±5 mmHg (21.3 ±0.66 kPa) Pediatric: 130 ±5 mmHg (17.3 ±0.66 kPa) Neonatal: 110 ±5 mmHg (14.7 ±0.66 kPa)
Inflation pressure after a valid measurement (Accurate within ±5 mmHg or ±0.66 kPa)	Adult: Previous NBP Systolic 25 mmHg (3.3 kPa) Pediatric: Previous NBP Systolic 25 mmHg (3.3 kPa) Neonatal: Previous NBP Systolic 30 mmHg (4 kPa)
Maximum inflation pressure	Adult: 265 ±5 mmHg (35.3 ±0.66 kPa) Pediatric: 180 ±5 mmHg (24 ±0.66 kPa) Neonatal: 140 ±5 mmHg (18.6 ±0.66 kPa)
Minimum inflation pressure	Adult: 110 ±5 mmHg (14.7 ±0.66 kPa) Pediatric: 90 ±5 mmHg (12 ±0.66 kPa) Neonatal: 80 ±5 mmHg (10.6 ±0.66 kPa)
Connector	Quick-release connector with single airway

Invasive Blood Pressure

Measuring method	Resistive strain gauge transducer
Resolution	1 mmHg (0.1 kPa)
Measuring range	-50 to 400 mmHg (-6.6 to 53.3 kPa)
Dynamic range	-250 to 600 mmHg (-33.3 to 80 kPa)
Frequency ranges	User selectable DC to 8 Hz, DC to 16 Hz
Accuracy	±1 mmHg or ±3% (whichever is greater) exclusive of transducer
IBP Update interval	4 s
Response time (at 90% of pressure change)	14 beats + 2 s (ART, LV, GP1, GP2, GP3, GP4) 8 beats + 2 s (PA, RV) 16 s (CVP, RA, LA, ICP)
Transducer specifications	Transducers with a resistance of 200 to 3000 Ω and an equivalent pressure sensitivity of 5μV/V/mmHg ±10%

Carbon dioxide

Displayed parameters	End-tidal CO ₂ (etCO ₂), inspired CO ₂ (inCO ₂), respiration rate (RRc)
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Measurement range

CO ₂	0 – 100 mmHg (0-13.3 kPa or 0-13.2 vol % at sea level) CO ₂ , partial pressure
RRc	0 to 150 bpm

For further details, please see datasheet for Infinity MCable-Mainstream CO₂

Temperature

Parameter display	Temperatures: Ta, Tb, ΔT , T1a, T1b, $\Delta T1$
Measurement range	Ta, Tb, T1a, T1b: 0 °C to 50 °C (32 °F to 122 °F) ΔT , $\Delta T1$: 0 °C to 39 °C (0 °F to 102.2 °F)
Resolution	0.1 °C (0.1 °F)
Absolute temperature Accuracy ⁴	± 0.1 °C (± 0.2 °F)
Delta temperature Accuracy ⁵	± 0.2 °C (± 0.4 °F)
Probe accuracy	± 0.1 °C (± 0.2 °F)
Average update time	< 2.5 s
Response time	23 to 44 °C (73.4 to 111.2 °F), ± 0.2 °C (± 0.4 °F) within 150 s

DISPLAY PRODUCT SPECIFICATIONS

Display type	Color Liquid Crystal Display (LCD), Advanced Touch Screen
Size	158 mm (6.2 in) diagonal
Viewing area	149 mm x 54 mm (5.9 in. x 2.1 in)
Resolution	640 x 240 (1/2 VGA)
Brightness	80 cd/m ² minimum during battery operation; 120 cd/m ² minimum when powered via M500

User Interface

Controls	Touch screen plus 3 fixed push-button keys, 8 control keys
Alarms	Audible ⁵ & visible alarm indication Alarm levels: High, Medium, Low 45 dB(A); full volume is > 70 dB(A)
Alarm bar	High (Life Threatening): Flashes red Medium (Serious): Flashes yellow Low: Does not light or flash

Information Management Capabilities

Trend storage	Up to 72 hours of parameter information
Trend data resolution	Up to 30 s

PHYSICAL SPECIFICATIONS

Infinity M540 Monitor

Dimensions (H x W x D)	89 x 259 x 43 mm (3.5 x 10.2 x 1.7 in)
Weight	Less than 920 grams (2.0 lbs)
Cooling	Conduction when docked, convection when undocked
Connections	ECG, CO ₂ , Hemo, Temperature/Auxiliary, SpO ₂ , NIBP-input

Infinity M500 Docking station

Dimensions (H x W x D)	195 x 101 x 107 mm (7.7 x 4.0 x 4.2 in)
Weight	1200 grams (2.6 lbs)
Cooling	Convection
Connections	System Cable, Nurse Call
Mount interface	VESA 75

ELECTRICAL SPECIFICATIONS

Monitor

Power source	Internal lithium ion battery or external power from docking station
Battery pack	Li-ion: 3.75 VDC, 4400 mAh
Protection class	Internally powered (per IEC 60601-1)
Mode of operation	Continuous (with power coupling via docking station).
Patient leakage current	<10 μ A (at both 110 V/60 Hz and 220 V/50 Hz)

⁴ Accuracy exclusive of probe

⁵ Audible indication only when not docked

CONTINUING TECHNICAL DATA

Infinity M540 Battery Specifications

Battery operating time	Normal operation: approximately 3 hours Power save mode: approximately 4 hours
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Note: Battery operating time varies with device configuration. The battery time specified above is under the following load conditions: 12-lead ECG, SpO₂, 2 Temperature probes, NIBP in 15-minute Interval Mode, LCD at Transport (Battery operation), Brightness for normal mode. Power Save mode temporarily disables the LCD.

Battery Recharging Time	100% capacity: approximately 6.5 hours for completely discharged battery 70% capacity: approximately 4 hours for completely discharged battery
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Communications

Network	802.3 100 BaseT Ethernet when connected to docking station. Optically isolated connection between monitor and docking station 10 Mbps
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Note: M540 hardware includes 802.11b/g Wireless Ethernet radio

Infinity M500 Docking station

DC input	+24 VDC nominal, 1.5A (+18 to +30VDC)
Protection class	For use with specified Class I power supply
Mode of operation	Continuous
Power output	Provides power to Infinity M540 via direct contact charging

Environmental Requirements

Infinity M540 Monitor and Infinity M500 docking station

Atmospheric pressure

Operating	485 to 795 mmHg (64.7 to 106.0 kPa)
Storage	375 to 795 mmHg (50.0 to 106.0 kPa)
Protection against ingress of water**	IPX4 (per IEC 60529, splash-proof) for Infinity M540 IPX1 (per IEC 60529) for Infinity M500

Temperature

Operating	0 to 40 °C* (32 to 104 °F)
Storage	-20 to 60 °C (-4 to 140 °F)

Humidity (non-condensing)

Operating	20 to 95 %
Storage	20 to 95 %

Standards

The M540 monitor and M500 docking station comply with Medical Devices Directive (MDD) 93/42/EEC and bear the CE mark.

IEC 60601-1 (2nd edition) and applicable particular and collateral standards with applicable regional and national deviations

IEC 60601-1-2:2004, Electromagnetic compatibility

CISPR 11, Class B and EN55011 Class B

IEC 60601-2-27:2005, Electrocardiographic Monitoring Equipment

IEC 60601-2-25:2001, Electrocardiographs

IEC 60601-2-30:1999, Automatic non-invasive blood pressure monitoring equipment

IEC 60601-2-34:2000, Invasive blood pressure monitoring equipment

IEC 60601-2-49:2001, Multifunction patient monitoring equipment

IEC 60601-2-51:2003, Recording and analyzing single channel and multichannel electrocardiographs

ISO 9919:2005, Pulse oximeter equipment

ISO 21647:2004/TC1:2005, Respiratory gas monitors

* At ambient temperatures above 35 °C (95 °F) the battery may not be charging even while docked in the Infinity M500 Docking Station

** The M540 is protected against the ingress of water when submersed to 30 cm (11.8 inches), of water, for 10 minutes.

D-19899-2009

Infinity MCable-Mainstream
CO₂

D-6565-2011

Infinity MCable-
Masimo rainbow® SET

D-19897-2009



Infinity MCable-Dual Hemo

D-19899-2009



Infinity MPod-Quad Hemo

EN1060-3:1997, Non-invasive sphygmomanometers, Supplementary Requirements for electro-mechanical blood pressure measuring systems

EN 12470-4:2001, Clinical thermometers for continuous measurement

IEC 60601-1-8:2006 (Alarms)

Drop per IEC 60068-2-32: 1975 +A1:1982, +A2:1990, Procedure 1

– Drop once on each of six surfaces from a height of 1 m (3.2 feet)

Power Supply Specifications

Infinity PS50

Input voltage	85 to 264 VAC
Input frequency	47 to 63 Hz
Maximum output power	50 W
Dimensions (H x W x D)	146 x 76 x 43 mm (5.75 x 2.99 x 1.69 in)
Weight	465 g (1.03 lb)

Humidity (non-condensing)

Operating	5 to 95 %
Storage	5 to 95 %

Temperature

Operating	0 to 70 °C (32 to 158 °F)
Storage	-40 to 85 °C (-40 to 185 °F)

Atmospheric pressure

Operating	485 to 795 mmHg (64.7 to 106 kPa)
Storage	375 to 795 mmHg (50 to 106 kPa)

ORDERING INFORMATION

Infinity M540 patient monitor with companion Infinity M500 Docking Station as part of:

IACS Monitoring with C500	MS25510
IACS Monitoring with C700	MS25520

Language Support: English, German, French, Spanish, Italian, Dutch, Swedish, Portuguese (Brazilian), Danish, Norwegian, Japanese (Katakana), Russian, Turkish, Polish, Greek, Hungarian, Chinese (Simplified), Czech, Finnish, UK English

Note: language availability may vary. Please see your Dräger representative for more information.

Infinity M540 options

SpO₂ Masimo rainbow® SET or Nellcor OxiMax

Factory-enabled

Additional locked option capability: 12-lead monitoring, Multiple IBPs (greater than two); full arrhythmia, wireless may or may not be available based on connectivity to the Infinity Medical Cockpit.

Optional pods, modules and hardware accessories

Note: Refer to individual module or pod data sheet for details concerning connection cables and adapters, transducers and mounting accessories

SpO ₂ Pod Holder (Fits Masimo SET Pod, and Nellcor OxiMax Pod)	MS26266
Infinity M500 Transport Dock + Clamp	MS28144

Infinity MPod® - Quad Hemo

The Infinity MPod - Quad Hemo provides up to four continuous, invasive blood pressures, temperature and thermodilution cardiac output measurements. A Dräger Medical Cockpit is required for the display of cardiac output parameters.

CONTINUING ORDERING INFORMATION

Infinity MCable-Dual Hemo

The Infinity MCable-Dual Hemo provides a consolidated place for management of up to two invasive blood pressures.

Infinity MCable-Masimo rainbow® SET

The Infinity MCable-Masimo rainbow® SET enables Masimo's gold-standard* SET SpO₂ algorithm. The Masimo rainbow® SET MCable connects the Infinity M540 multi-parameter patient monitor to Masimo rainbow® SET SpO₂ sensors and provides continuous, noninvasive monitoring of functional oxygen saturation of arterial hemoglobin (SpO₂), pulse and perfusion index. Additional options are available to measure blood constituents and fluid responsiveness (SpHb™, SpOC™, SpCO®, SpMet®, PVI®)

*As documented in Masimo's peer-reviewed studies found at www.masimo.com.

Infinity MCable-Nellcor OxiMax

The Infinity MCable-Nellcor OxiMax enables Nellcor's OxiMax SpO₂ algorithm. The Nellcor OxiMax MCable connects the Infinity M540 multi-parameter patient monitor to Nellcor OxiMax SpO₂ sensors and provides continuous, noninvasive monitoring of functional oxygen saturation of arterial hemoglobin (SpO₂) and pulse.

Infinity MCable-Mainstream CO₂

The Infinity MCable-Mainstream CO₂ provides measurements of CO₂ in mainstream.

Infinity MCable-Analog/Sync

The Infinity MCable-Analog/Sync provides Analog Output of ECG and arterial pressure (ART) and/or QRS Synchronization signals from ECG to an external device.

Infinity MCable-Nurse Call

The Infinity MCable-Nurse Call allows connection of either the M540 or the IACS to a hospital alarm output system. Active life-threatening or serious alarms at the bedside are then sent out to the hospital's alarm output system.

Accessories

For further information and for accessories information, please refer to the Dräger IACS Accessories IFU for detailed information on compatibility.

To order pods, cables, MCables and MPods, please see individual product datasheets.

Infinity, Hemo2, Hemo4, MCable, Medical Cockpit and MPod are registered trademarks of Dräger.

Masimo, Masimo rainbow SET and Signal Extraction Technology are registered trademarks of Masimo Corporation. Nellcor and OxiMax are trademarks of Covidien AG.

This product may not be approved for Market Release in all countries.

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The quality management system at Dräger Medical GmbH is certified according to ISO 13485, ISO 9001 and Annex II.3 of Directive 93/42/EEC (Medical devices).