

# TEMPUS **PRO**

More Than Just a Monitor



The **21st Century Approach** to  
Pre-Hospital Vital Signs Monitoring



# More Than Just A Monitor™



**Tempus Pro™ is a new concept in vital signs monitoring that places the needs of the pre-hospital care professional at the heart of its design.**

Ground breaking in functionality, the monitor is light enough to carry with you to the patient, small enough to hold in one hand and rugged enough to deploy in any situation. It uniquely offers 5 distinct capability sets:

## **Monitoring**

**Patient record data collecting and sharing**

**Real-time reach back**

**Modular feature selection**

**Scalability**

Tempus Pro provides all the integrated features and capabilities expected in a market-leading vital signs monitor with unmatched durability, daylight readable display, long battery life, intuitive interface and a glove-friendly touch screen that enables ease of use for both advanced and basic life support paramedics and emergency practitioners.

The additional ability to easily document and share all patient data electronically ensures that all care givers have accurate information on patient injuries, therapies, trended vital signs, drugs and fluids that can be handed over, or sent ahead via ReachBak™, ahead of the patient arriving at hospital.

With the ability to add advanced capabilities post purchase, the platform is designed to be scalable to accommodate immediate and evolving budgets. This way Tempus Pro enables users to perform whole new diagnostic process on patients using the same battery and display already being carried. This flexibility and scalability enables you to leverage the most from your pre-hospital monitor investment.



**RDT specialises in compact and highly integrated vital signs monitors that enable civilian and military pre-hospital care users to carry less, but do much more.**

RDT's products push the boundaries within the market by offering whole new features that other monitors can not, do not and will not provide. This includes data capture and sharing and real time telemedicine capabilities.

RDT has civilian and military customers across the globe and has established a reputation for reliability and excellent customer service over 17 years, whilst continuing to push boundaries with its state of the art engineering and design capabilities.



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# Monitoring and Functionality

**TEMPUS PRO**  
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**Tempus Pro™** is an advanced vital signs monitor that is ground-breaking in size, weight, ruggedness, functionality, ease of use, flexibility and scalability.

**Tempus Pro** incorporates all the integrated features and capabilities expected in a market-leading vital signs monitor whilst being smaller and lighter than similar transport monitors, with a longer battery life and a market-leading water and solid object ingress protection rating of IP66.

The monitor is operated through an intuitive and easy to use and navigate touch-screen interface; this means display configurations and alarm settings are easy to use and configure.





# Monitoring and Functionality

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## Features include:

- + Masimo SpO<sub>2</sub> and pulse
- + Full set of Masimo rainbow® parameters (PVI®, PI, SpCO®, SpMet®, SpHb®, SpOC™)
- + Real-time arrhythmia detection
- + 3/5 & Optional 12 lead electrocardiogram (ECG)
- + ST elevation & QT segment monitoring & alarming
- + 12 Lead ECG interpretation
- + Impedance respiration
- + Non-invasive blood pressure
- + Up to 4 channels of invasive pressure
- + Up to 2 channels of contact temperature (YSI Series 400)
- + Optional Oridion® Microstream® capnography
- + Optional integrated video laryngoscopy
- + Optional integrated point-of-care ultrasound
- + Water & sand resistant to IP66
- + Lithium-ion battery with a 10¾ -14 hour battery life\*
- + Multiple ways of reviewing patient data, including 4 waveform colour display
- + The facility to easily & quickly switch between patients
- + A truly daylight readable, glove-operable touch-driven display
- + Integral 3.2MP camera for recording images of the patient
- + Optional unique real-time data, voice & video communications
- + Wide operating & storage temperature range

\* subject to storage and conditions of use



Your life With care Anywhere  
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Unique to **Tempus Pro**™ is the optional integrated secure real-time reach back capability. This allows communications of voice, data and video for telemedicine and tlementoring purposes over a wide range of civilian communications links.

This **ReachBak** capability enables users to share all medical data, including 12 Lead ECG recordings, waveforms, still images and the patient encounter record with colleagues in real-time.

**Tempus Pro** is compatible with a range of military and civilian sea, air and both mounted and dismounted land communication systems, including 3G. Tempus can transmit two-way real time voice (using VoIP) via either wired or wireless (Bluetooth® - optional) headsets over civilian communications networks and military IP radios - such as Trellisware, Harris Falcon III, ITT Rifleman and Thales - EPLRS, SRW and ANW-2 waveforms and satellite communications such as Ku/Ka (VSAT), X Band and B-GAN.







With all data, voice and video designed to provide a minimum bandwidth footprint, data can be transmitted over as low as 2k4 baud. All patient identifiers (name, age etc.) are AES256 encrypted; this is the level of encryption required for inter-governmental data transfer.

This ability to share all vital signs and patient care record in real time increases situational awareness and allows for better informed treatment and transport decisions to be made.

**ReachBak** is further augmented by the monitor's built-in GPS positioning receiver which allows the patient record to be geo-tagged to record where drugs and therapies were given. This also allows the **i2i™** user to identify the patient's location\*.

**i2i** software, used to receive calls from Tempus, is easy to install and configure.



\*Internet connection required



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# Patient Record Collection and Sharing (SRoC™)

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The Tempus monitoring platform is uniquely designed to allow the simple and fast collection, viewing and sharing of key patient encounter data; at the point of care, on the monitor, without the need for a second device or computer. This is done on the Tempus using a sophisticated, configurable set of features called the **Summary Record of Care™ (SRoC™)**, supplied as standard on every monitor.



The **SRoC** automatically collects and stores all vital signs, graphical and tabular trends, 12 lead ECG recordings, arrhythmias, intubation images, ultrasound FAST exam reports, photographs from the integral camera and waveforms.



Other data, such as drugs and fluids administered, GCS scores or patient interventions and observations can be quickly and simply collected and stored into the **SRoC** via a dedicated "Event Capture" button while patient demographics are quickly and easily entered via the large onscreen touch keyboard.

The **SRoC** data collection, viewing and sharing features give users, a fast, flexible and easy way to record, view and share patient information. With the patient encounter record building automatically from point of encounter to the hospital, this means that all care givers have accurate information as the patient moves through the levels of care.







# Patient Record Collection and Sharing (SRoC™)

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**Tempus Pro™** can transfer patient data over wired (Ethernet and USB connections) and wireless (WiFi and a built in cell phone) connections.

The AES 256 encrypted data can be transferred securely from:

- Tempus to Tempus (for patient handover);
- Tempus to a computer;
- Tempus to a third party patient record;
- Tempus to email;
- Tempus to a printer.

The **SRoC** reports are viewable on PC's, smart devices and laptops with no special software needed. This powerful feature enables encrypted pdf 12 lead ECGs and detailed patient encounter reports to be emailed to other clinicians for advice, support or review. Additionally the record of care can be transmitted and viewed in real-time via optional **ReachBak™** technology.

The patient data produced by the **Tempus Pro** includes the following information for up to 72 hours of monitoring on any given patient.

- Patient details including name, age, sex, allergies and other patient demographic information
- Detailed event list including Drugs, Fluids, Interventions, Images, Arrhythmias, GCS Scores, AVPU Scores, Notes, and Body Maps such as tourniquet map etc.
- Any 12 lead ECG recordings including interpretation statements and measurement reports
- Patient waveforms
- Colour-coded trended vital signs graphs and tables for all parameters used on the patient
- Any pictures taken with the internal camera
- TCCC Card information including: Injury Map, Burns Map, Battle Roster Information, Treatments, Fluids, Drugs and Notes etc.



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# Flexible and Scalable

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**Tempus Pro™** is designed to be scalable, enabling you to select the most appropriate configuration for your immediate budget requirements, with the ability to add feature sets, such as 12 Lead ECG and **ReachBak™**, after initial purchase and without the need to return the unit to RDT.



Additionally, the platform is designed for easy integration with external modules, using either wired (USB) or wireless interfaces to add whole new monitoring and diagnostic capabilities to the Tempus. This not only enables your monitor to evolve as your needs change, but also allows users to perform whole new diagnostic processes on patients in pre-hospital care settings using the same battery and display already being carried. This allows you to leverage even more from your investment in the future.







# Flexible and Scalable

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## Examples include:

### Ultrasound for point-of-injury line placement and vascular examinations

- Small, compact, Tempus-powered 3.5 MHz ultrasound probe for FAST exam or general abdominal examinations
- 7.5 MHz ultrasound probe for Extended-FAST exams, line placement & vascular examinations
- Structured process to remind user of the elements of the exam\*
- Automatic creation of a FAST exam report\* for automatic inclusion in the record of care
- FAST exam report\* can be transmitted to colleagues real time or post event using optional integrated **ReachBak™** technology
- No need to carry a separate ultrasound device, display & battery



- A range of disposable Macintosh, Miller & D-blades are available to enable video laryngoscope images to be visualised on the **Tempus Pro™** display
- View vitals, including capnography & ECG, while intubating the patient
- Particularly useful with difficult intubations e.g. patients wearing neck braces in the confined space of an EMS vehicle
- Still images can be captured & automatically included in the record of care
- Still images can be transmitted via the optional integrated **ReachBak** technology
- This removes the need to carry a separate video laryngoscope, display & battery



In response to user-driven requirements, RDT will be continuing to expand **Tempus Pro** with new software features and external peripherals that will be field upgradeable.

\* CE marked but subject to 510k regulatory clearance



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# Specifications

**TEMPUS PRO**  
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**Tempus Pro™**  
The most advanced  
prehospital care vital  
signs monitor



## Overview

**Tempus Pro** is an advanced vital signs monitor with multiple and emerging capabilities. Providing:

- Full range of vital signs monitoring parameters in a small, highly robust package
- 2.2 lbs lighter and smaller than similar transport monitors
- 10 <sup>3</sup>/<sub>4</sub> hour battery life, longer than similar transport monitors
- Market-leading water and solid object ingress protection with rating of IP66
- Enables the capture of all vital signs, images and electronic records such as the TCCC card in an easy to use format that can be transmitted or shared with other Tempus monitors or computers
- Fully integrated communications capability enables the transmission of all medical and vital signs data, voice and video transmission in real time using military radios <sup>vi</sup>
- Large colour display with multiple waveform configurations and large numeric view
- Operated through an intuitive and easy to use touch-screen interface which can be used with a gloved hand

## Control Interface

- Displays ultrasound and video laryngoscopy images on the large colour display utilizing third party ultrasound probes and video laryngoscopy accessories <sup>v</sup>
- User interface is provided by a touch screen and simple graphically labelled buttons
- Drugs, fluids, therapies and interventions quickly added to the patient record through the Event button

## Alarms

- User configurable visual and audible alarms
- Adult, paediatric and neonate settings
- Adjustable alarms ≤85 dBA at 1m
- 360° alarm visible indicator lights

## Display

- Colour 6.5 " VGA screen
- 130 klux daylight readable display
- Multiple user-selectable display formats
- High-contrast mode
- NVG compatible
- Device can be set to an appropriate viewing angle with the integral foot
- Rear of the **Tempus Pro** houses the **RapidPak™** clip which enables easy deployment and storage of sensors and cables

## On-Screen Trends & Events

- Graphical and tabular format for all vital signs parameters
- Summary record of care of drugs, fluids, therapies and interventions provided

## ECG Monitor

- 3, 5 and 12 lead monitoring via standard snap-on electrodes
- Automatic leadset detection
- Heart rate range: 30-300 BPM
- 12 lead acquisition <sup>v</sup>
- 12 lead interpretation
- Input impedance: >100 MΩ
- Dynamic range: ±5 mV ac
- Accuracy: ±3%
- DC offset: ±300 mV dc
- Frequency response: 0.05 Hz to 175 Hz ±3dB
- Sample rate: 500 Hz
- Common mode rejection: 95 dB minimum, additional filters include mains, muscle and low and high pass
- Arrhythmia monitoring & alarms
- ST elevation measurement with alarms <sup>v</sup>
- QT duration measurement with alarms <sup>v</sup>

## Impedance Respiration

- Range: 3 - 150 RPM
- Accuracy: ±2 RPM or ±2% whichever is greater

## Pulse Oximetry

### SpO<sub>2</sub>

- Range: 1 – 100%
- Accuracy (adults/child): no motion or low perfusion ±2 digits 70-100%, motion ±3 digits 70-100%,
- Accuracy (neonate): motion, no motion and low perfusion ±3 digits 70-100%
- Signal strength indicator
- Perfusion index: 0.02-20%
- Response: <1 second delay
- Employs patented Masimo SET Rainbow® technology
- Uses comfortable, waterproof soft-tip sensor
- Pleth Variability Index (PVI®) <sup>v</sup>

## Pulse Rate

- Range: 25 – 239 BPM
- Accuracy (all ages): no motion ≤3 digits, motion ≤5 digits

## Total Haemoglobin (SpHb® g/dl) <sup>v</sup>

- Range 0 - 25 g/dl
- Accuracy (adults/infants/paediatrics) 8 - 17 g/dL ± 1 g/dl

## Methaemoglobin (SpMet®) <sup>v</sup>

- Range 0 - 99.9%
- Accuracy (adults/infants/paediatrics/neonates) 1 - 15% ± 1%

## Carboxyhaemoglobin (SpCO®) <sup>v</sup>

- Range 0 - 99.9%
- Accuracy (adults/infants/paediatrics) 1 - 40% ± 3%

## Total Oxygen Content (SpOC®) <sup>v</sup>

- Range 0 – 35ml of O<sub>2</sub>/dl of blood

## Non-Invasive Blood Pressure

- Accuracy: ±3 mmHg or ±2% (whichever is greater)
- Adult range: 20 – 260 mmHg
- Child range: 20 – 250 mmHg
- Neonate range: 20-140 mmHg
- Cuffs: neonate disposable 1-5, infant, child, adult, large adult, thigh, cuff kit

## Capnometry <sup>v</sup>

### Respiration Rate

- Range: 1 - 149 BPM
- Accuracy: 0-70 BPM ±1 BPM, 71-121 BPM ±2 BPM, 122-149 BPM ±3 BPM

### Microstream® ETCO<sub>2</sub>

- Range: 0 – 150 mmHg
- Flow rate: 50 ml/min -7.5 + 15 ml/min
- Uses Oridion® Microstream® technology
- Accuracy: 0-38 mmHg ±2 mmHg, 39-150 mmHg ±5% of reading +0.08% per 1 mmHg over 38 mmHg

## Contact Temperature

- 2 channel <sup>vii</sup>, YSI 400 series compatible
- Measurement range: 20-45 °C
- Resolution: 0.1 °C (0.2 °F)
- Accuracy: ±0.1 °C

## Invasive Pressure <sup>v</sup>

- 2 channels, 5 µV/V/mmHg
- Response: 0-20 Hz (-3 dB)
- Filters: 50-60 Hz notch
- Range: -99 – 310 mmHg
- Accuracy: ±2% or ±2 mmHg
- Bridge: 180 Ω minimum
- Expandable up to 4 channels via USB module <sup>v</sup>

## Trauma Record

- Electronic trauma record (TCCC, summary record of care)
- User-friendly interface
- Semi-automatic patient record completion
- Operable with a gloved hand
- Patient reports can be emailed to physicians
- Record can be passed from device to device to accompany the patient through the echelons of care
- Data can be output as .PDF for attachment into electronic patient record systems
- Record can be transmitted over military radios for real-time decision support

## Integral Digital Camera

- Colour 3.2M pixel camera
- Takes still pictures or video using the H264 algorithm (bandwidth dependent)
- Images are included in the patient record

## Ultrasound <sup>v</sup>

- Optional Interson ultrasound probes general purpose 3.5 MHz and line placement 7.5 MHz

## Video Laryngoscopy <sup>v</sup>

- Optional Karl Storz C-MAC® video laryngoscope imager and single use blades





# Specifications

**TEMPUS PRO**  
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## Battery & Power

### Operating Time

- Over 10<sup>3</sup>/<sub>4</sub> hours (display brightness at 60%, ECG, SpO<sub>2</sub>, ETCO<sub>2</sub>, IP x 2, temp x 2 and NIBP every 15 minutes)
- 11<sup>1</sup>/<sub>2</sub> hours (display brightness at 30%, ECG, SpO<sub>2</sub>, ETCO<sub>2</sub>, IP x 2, temp x 2 and NIBP every 15 minutes)
- Up to 14 hours with battery saving mode activated (typically 12.5 hours <sup>ii</sup>)

### Battery

- Rechargeable, user replaceable lithium-ion battery
- 5 state battery gas gauge
- Nominal 7.4 V 10.2 Ah / 75.5 Wh
- Charge time: 3 hours to 90% and apx 4 hours to 100% <sup>iii</sup>, <sup>iv</sup>

### Power Supply

- External power supply provided
- Small size: 133 x 60.7 x 41 mm (5.24 " x 2.39 " x 1.62 ")
- Rated 100-250 V, 50-60Hz & 115 V 400 Hz 0.5 A apx
- Battery may optionally be charged by the **Tempus Pro**<sup>TM</sup> when running on mains power
- Alternate vehicle adaptor 9-24 V dc available <sup>v</sup>

### External Charger

- Optional external single bay battery charger
- Charger PSU 100-240 V 50-60 Hz <0.9 A
- Charge time: 4.5 hours to 97% <sup>iv</sup>

## Environmental and Storage

- Operating temperature range: 0 °C to 50 °C
- Relative humidity: 15%-95% (non-condensing) operating and storage
- Altitude: -170 m - 4500 m (-557 - 14763 ft)
- Storage temperature range: -37 °C to +73.3 °C
- Soft bag or hard transit case available

## Physical Dimensions

- Standalone size: 263 (10.35") wide x 216 (8.5") high x 98 (3.85") deep, cube 339"
- Standalone weight: 2.8 kg (6.2 lb) nominal including battery and **RapidPak**<sup>TM</sup>

## ReachBak<sup>TM</sup> <sup>v</sup>

- All medical monitoring data, vital signs, ECGs, TCCC card, photos, and voice and video are transmitted in real time
- Compatible with military IP-radios and satcoms
- Low bandwidth system providing real-time medical data
- Transmits 12 Leads in real time and acquires 10 seconds of all 12 leads
- Provides 12 Lead ECG analysis and measurement tools on the transmitted ECG
- Images received from the Tempus can be annotated with text, colours, shapes and graphics which can be sent back to the **Tempus Pro**
- All wireless devices (and GPS) can be disabled by the factory and enabled by the user when required using a software update
- All voice, data and video communications are transmitted and stored using AES256 encryption

## Integral Bluetooth<sup>®</sup>

- Used for communication with the device's accessories
- Version: V2 EDR class 2

## Voice Communications

- Compatible with military headsets (Peltor<sup>®</sup>, Liberator<sup>®</sup> etc.)
- Voice communication provided by an optional wired or wireless Bluetooth<sup>®</sup> headset <sup>vi</sup>
- Voice channel is full duplex with low bandwidth utilisation (12 kbps)

## Integral Ethernet

- Compatible with Inmarsat, BGAN, V-SAT and other broadband communications systems <sup>vi</sup>
- Low bandwidth compatible (3 kbps)
- LAN interface: 100Base-TX
- Connected via an RJ-45 connection
- Tempus can connect direct to a radio or via an access point or router

## Integral USB

- 2 latched USB sockets
- USB 1.0 & 2.0
- For use with plug-in invasive pressure modules

## Integral WiFi

- 802.11b/g
- Uses 128 bit encryption, WPA2 and WEP standards to ensure security

## Integral GPS Positioning

- Provides position via **ReachBak** and allows automatic geo-tagging of drugs and therapies in the patient record
- Accuracy ±10 m

## Integral 3G/GSM Cell Phone

- Able to connect over 2G GPRS networks (GSM 850, EGSM 900, DCS 1800 & PCS 1900)
- Able to connect over 3G GPRS networks (UMTS 850/ Band V, UMTS 900/ Band VIII, UMTS 1900/ Band II & UMTS 2100/ Band I)

## Compliance

### EMC

- EMC emissions: RTCA DO160G Section 21 Cat Q
- EMC emissions and immunity: IEC60601-1-2 Class B, 20 V/m radiated immunity
- FCC Part 15 B & C compliant

## Environmental Standards

- Exceeds requirements of MIL-STD 810G 1.22 m (4') 26 drops all corners, edges and faces
- Enclosure withstands a 500 g (1.1 lb) steel ball dropped from 1.3 m (4' 3")
- Solid and liquid ingress protected to IP66 according IEC60529
- All connectors provided with dust covers for increased protection
- Temperature: DO160G Sec 4, Para 4.5.1 – 4.5.4
- Altitude: DO160G Sec 4, Para 4.6.1 and 4.6.2
- Rapid Decompression DO160G Sec 4.6.2, 8000-51000 ft in 1 second
- Temperature Variation: DO160G Sec 5 Cat C: 2° C/min
- Humidity: DO160G Sec 6 Cat A
- Crash Safety: 20 g per DO160G Sec 7.2 Type F
- Vibration: MIL-STD 810G rotary wing (UH-60 & CH-47), fixed wing (jet profile), fixed wing (turboprop profile), composite wheeled vehicle; Ground Vehicle per EN1789
- Operational shock: 45 g per MIL-STD 810G, 6 g per RTCA DO-160G
- Bump: 15 g per EN1789

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Patents Pending US No.2006/0287586, EP 1734458A & other areas

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C-MAC<sup>®</sup> is the property of Karl Storz.

RDT is an ISO9001:2008 and an ISO13485:2012 approved company.

ECR Authorization: 15-0089

Issue Ref: 44-2001US-04

Date of Issue: Oct 09, 2015

i **Tempus Pro** is 510k cleared and is CE marked in Europe.

ii Display active 50% of the time.

iii Subject to conditions of storage and use, times are approximate.

iv Tempus switched off while charging, charging takes longer when the device is active.

v Optional, additional feature.

vi Limitations apply and contract required with relevant service provider.

vii 1 channel fitted as standard second channel is optional.



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