PHILIPS

Remote Diagnostic Technologies

Tempus ALS, US

Monitor/defibrillator system

Modular form-factor

Tempus ALS, US specifications

Introduction

Tempus ALS is an advanced monitor/defibrillator system, designed to enable prehospital caregivers to deliver care more efficiently.[1]

Key features

Full range of vital signs monitoring parameters with manual, synchronized cardioversion and pacing in a small, highly robust package[2]
Utilizes the widely used, low energy 200 J biphasic BTE waveform
Small enough to enable new choices in transport and deployment
Long battery life - 10 3/4 hour of monitoring with display at 60% brightness (Tempus Pro) and 300 shocks with maximum energy (Tempus LS)
Water and solid object ingress protection for austere environments with rating of IP66 for monitor (dust and water protection with rating of IP65 for defibrillator)
Plug-in sensor allows real-time CPR measurement and feedback[3]
Enables the capture of all vital signs, images and electronic records in an easy to use format that can be easily transmitted or shared with other devices and systems
Fully integrated communications capability enables the transmission of allmedical and vital signs data in real-time[4]
Large color display with multiple waveform configurations and large numeric view
Displays ultrasound and video laryngoscopy images on the large color display utilizing third party ultrasound probes and video laryngoscopy accessories[5]

Control Interface
Defibrillator interface is via clearly labelled buttons
Monitor 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 on monitor

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

Display
Defibrillator – color 145 mm (5.7"), 640x480 pixels
Monitor - color 165 mm (6.5") 640x480 pixels, 130 klux daylight readable display
Multiple user-selectable display formats
High-contrast mode, NVG compatible

Printer[5]
High resolution 4.3" integrated thermal printer

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

Tempus LS-Manual[6]

Manual Defibrillation
Biphasic Truncated Exponential (BTE) waveform for defibrillation and synchronized cardioversion
1-200 J user configurable energy levels (1-10, 15, 20, 30, 50, 70, 90, 100, 120, 150, 170 & 200 J)
Adult and pediatric modes available
Charge time: 9 seconds to 200 J from first charge
Time to shock from cold start-up: <15 seconds to 200 J
Disposable adult and child pads

Defibrillator ECG Monitoring
ECG monitoring using pads or 3-Lead via Tempus Pro-compatible ECG cable
Speed: 12.5 mm/sec, 25 mm/sec, 50 mm/sec
Heart rate range: 15-300 beats per minute (bpm) ±5, Accuracy: ±10%
50/60 Hz mains filter

Pacer
Fixed and demand modes provided
0-200 mA ±10% or ±5 mA (higher value applies)
40-180 ppm ±1.5% range
20 ms pulse width ±5%

Synchronized Cardioversion
Synchronizes to R wave markers displayed on-screen
<60 ms from R wave peak
Automatically reverts to asynchronous delivery after shock has been provided

CPR Feedback
Optional plug-in-sensor provides on-screen feedback of compressions,rate, depth and quality
Audible feedback and on-screen messaging is provided to ensure compliance to AHA/ERC guidelines
AHA/ERC guideline settings can be updated through USB with a manufacturer provided software update

Tempus Pro

ECG Monitoring
3-, 4-, 5- and 12-Lead monitoring via standard snap-on electrodes with automatic leadset detection
Heart rate range: 30-300 bpm
12-Lead acquisition[5] and 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
Acquisition 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 and depression and QT segment measurement with alarms[5]

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

Pulse Oximetry

SpO_2
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 rainbow SET technology
Uses comfortable, waterproof soft-tip sensor
Pleth Variability Index (PVI)[5]

Pulse Rate
Range: 25 – 239 bpm
Accuracy (all ages): no motion ≤3 digits, motion ≤5 digits

Total hemoglobin (SpHb g/dl)[5]
Range 0 - 25 g/dl
Accuracy (adults/infants/pediatrics) 8 - 17 g/dL ± 1 g/dl

Methemoglobin (SpMet)[5]
Range 0 - 99%
Accuracy (adults/infants/pediatrics/neonates) 1 - 15% ± 1%

Carboxyhemoglobin (SpCO)[5]
Range 0 - 99.9%
Accuracy (adults/infants/pediatrics) 1 - 40% ± 3%

Total Oxygen Content (SpOC)[5]
Range 0 – 35ml of O_2/dL of blood

Non-Invasive Blood Pressure
Accuracy: ±3 mmHg
Adult range: 20 – 260 mmHg
Pediatric range: 20 – 230 mmHg
Neonate range: 20-130 mmHg
Cuffs: neonate disposable sizes 1-5, infant, child, adult, large adult, thigh, cuff kit

Capnometry

Respiration Rate
Range: 1 - 149 Breaths Per Minute (BPM)
Accuracy: 0-70 BPM ±1 BPM, 71-120 BPM ±2 BPM, 121-149 BPM ±3 BPM

Microstream $EtCO_2$
Range: 0 – 150 mmHg
Flow rate: 50 (42.5 ≤ flow ≤ 65) ml/min, flow measured by volume
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 YSI 400 series compatible[10]
Measurement range: 20 - 45 °C/68 - 113 °F
Resolution: ±0.1 °C/±0.2 °F, Accuracy: ±0.1 °C

Invasive Pressure[5]
2 channels, 5 µV/V/mmHg, Response: 0-20 Hz (-3 dB)
Filters: 50-60 Hz notch, Range: -99 – 310 mmHg
Expandable up to 4 channels via USB module[5]

Trauma Record - Summary Record of Care
Unique, automatically-updating electronic trauma record
User-friendly interface and completely configurable through separate PC application
Semi-automatic patient record completion
Operable with a gloved hand
Record can be emailed or shared with any ePCR system through an easy to implement software development kit
Record can be passed from device to device to accompany the patient through the echelons of care
Data can be output as a PDF report
Record can be streamed for real-time decision support

Integral Digital Camera
Color 3.2M pixel camera
Streams video using the H264 algorithm (bandwidth dependent)[12]
Images are included in the patient record

Ultrasound and Video Laryngoscopy[5]
Optional Interson ultrasound probes general purpose 3.5 MHz and line placement 7.5 MHz
Optional Karl Storz C-MAC video laryngoscope imager and single use blades

Battery and Power

Operating Time – Tempus LS-Manual
At least 300 shocks at 200 J from a fully charged battery
>12 hours ECG monitoring from a fully charged battery

Operating Time – Tempus Pro[11]
At least 10 $^3/_4$ hours (display brightness at 60%, ECG, SpO_2, $EtCO_2$, temp x 2 and NIBP every 15 minutes)
At least 11 $^1/_2$ hours (display brightness at 30%, ECG, SpO_2, $EtCO_2$, temp x 2 and NIBP every 15 minutes)
Up to 14 hours with battery saving mode activated[7]

Battery – Tempus LS-Manual and Tempus Pro
Rechargeable, user replaceable lithium-ion battery
Charge time: 3 hours to 90% [8, 9]

Power Supply – Tempus LS-Manual and Tempus Pro
Small size: 133 x 60.7 x 41 mm (5.24" x 2.39" x 1.62")
Rated 90 – 264 Vac, 47 – 440 Hz, maximum 0.6 A
Vehicle adaptor 11-27 V dc available[5]

External Charger[5]
Optional external battery chargers

Physical Dimensions

Tempus LS-Manual
Physical Dimensions
Standalone size: 200 mm (7.9") wide x 164 (6.5") high x 72 (2.8") deep, cube 142" (excluding rear clip)
Standalone weight: 4.3 lbs. with battery (without accessories)

Tempus Pro
Standalone size (printer model): 263 mm (10.3") wide x 216 mm (8.5") high x 102 mm (3.9") deep, cube 346"
Standalone weight: 7 lbs. nominal including battery and printer, excluding IP module and accessories (without printer 6.4 lbs.)

Environment - Tempus LS-Manual and Tempus Pro
Operating temperature range: 0 °C to 50 °C
Relative humidity: 15%-95% (non-condensing) operating and storage
Altitude: -200 m to +5486 m (-656' to +18000')
Storage temperature range: -37 °C to +73.3 °C
Water and solid object ingress protection for austere environments with rating of IP66 for monitor (dust and water protection with rating of IP65 for defibrillator

Tempus LS-Manual and Tempus Pro
Medical Electrical Equipment: IEC 60601-1-12
Airborne equipment: RTCA DO-160G, 2010 section 21 cat. M
Exceeds requirements of MIL-STD 810G 1.22 m (4') 26 drops all corners, edges and faces
Crash Safety: 20 g per DO160E Sec 7 Cat B
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: 40 g per MIL-STD 810G, 6 g per RTCA DO-160E

Mounts and Bags
Hard transit cases and saddle bags available[5]
Mechanical and electromechanical mounts compliant with ground and air (fixed and rotary wing) vehicles available[5]

IntelliSpace Corsium licence options

IntelliSpace Corsium ReachBak licence[5]
All medical monitoring data, vital signs, ECGs, Summary Record of Care and images are transmitted in real-time
Transmits 12-Lead ECG in real-time and acquires 10 seconds of all 12-Leads
Provides 12-Lead ECG analysis and measurement tools on the transmitted ECG
ECG review results can be sent back to the Tempus Pro
Tempus Pro operator can acknowledge ECG results and provide estimated time of arrival

IntelliSpace Corsium ECG licence[5]
Tempus Pro user can transmit 12-Lead ECGs
Provides 12-Lead ECG analysis and measurement tools on the transmitted ECG
Also transmits basic vitals recorded at the time of the transmitted ECG

Communications

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

Voice Communications
Compatible with military headsets (Peltor, Liberator etc.)
Voice communications provided by an optional wired or wireless Bluetooth headset[4]
Voice channel is full duplex with low bandwidth utilization (12 kbps)
Voice transmitted in real-time[12]

Image Communications
Images received from the Tempus can be annotated with text, colors, shapes and graphics which can be sent back to the Tempus Pro[12]
Video transmitted in real-time[12]

Integral Ethernet
Compatible with Inmarsat, BGAN, V-SAT and other broadband communications systems[4]
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 sockets
USB 1.0 & 2.0
For use with plug-in invasive pressure modules, CPR sensor, USB sticks, video laryngoscope, ultrasound probes etc[5]

Integral Wi-Fi
802.11b/g
Uses 128-bit encryption, WPA2 and WEP standards to ensure security
Smart Wi-Fi management allows the user to scan and connect to available networks

Integral GPS Positioning
Provides position via ReachBak and allows automatic geo-tagging of drugs and therapies in the patient record/ Accuracy ±10 m[13]

Integral 3G/GSM Cell Phone[14]
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)

1. Tempus ALS is a system comprised by Tempus Pro monitor and Tempus LS-Manual professional defibrillator
2. Tempus LS-Manual for manual defibrillation only
3. Depending on network availability there may be a 2-3 second delay between display of the data on the Tempus Pro and display of the same data on IntelliSpace Corsium
4. Limitations apply and contract required with relevant service provider
5. Optional, additional feature
6. Tempus LS-Manual is 510(k) approved
7. Display active 50% of the time.
8. Subject to conditions of storage and use, times are approximate.
9. Tempus switched off while charging, charging takes longer when the device is active.
10. One channel fitted as standard second channel is optional.
11. Test done without printing.
12. i2i ReachBak only
13. GPS accuracy depends on the number of satellites visible to the device
14. If enabled

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