

Integrated Multi-Parameter Module

Zug integrated Multi-Parameter module, referred herein after as MMP module is used for adult, children and neonate clinical monitoring in ICUs and hospital care. It should be integrated as whole or part of a patient monitoring system.

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*Integrated
Multi-Parameter
Module*



FEATURES

- SpO₂, PR monitoring
SBP, MAP, DBP and PR monitoring
- Support 3/5 leads ECG (3 independent channels), 1 respiration, 2 temperature
- Compact structure with a 2.5mm thickness
- Real time transmission of pulse wave signal
- Real time transmission of module states: hardware state, software state and sensor state
- High accuracy SpO₂ measurement and reliability when blood perfusion is as low as 0.075%, which meets the application for OR and ICU
- Support OEM available
- Advanced anti-motion interference algorithm for SpO₂ and NIBP
- NIBP 3 measurement modes: manual, auto and continuous
- NIBP double protection mode: hardware and software over-pressure protection
- NIBP 4 measurement modes: diagnose, monitor, HARDEST and operation measurement
- ECG arrhythmia diagnostic
- Compatible with ZUGMED protocol
- Special function of ECG analysis, verified by MIT database
- SpO₂ accuracy matching the requirements of ISO80601

OVERVIEW

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The Integrated Multi-Parameters module can measure ECG, Respiratory Rate, Temperature, NIBP, SpO₂, and PR.

ECG measurement method: the heart generates electrical stimulation, biological electricity and transmits these signals to the body surface. Different parts of the body will generate different electric potentials and form potential differences on body surface. The recording of potential differences will form a dynamic curve, which is the ECG signal.

Respiratory Rate signal measurement: based on the principle of impedance method, the system measures the changes of thoracic impedance when the patient

breathes and the thorax fluctuates.

Temperature measurement method: based on thermostat.

SpO₂ measurement method: based on arterial blood absorption of the infrared and red light during an impulse, the photoelectric sensor receives red spectrum and infrared light which are transmitted through finger. It transmits the signal to a photocurrent signal amplifier, before the signal is processed as follow: voltage amplification, filtering, digitizing, feature recognition and algorithm. The result allows determining the SPO₂ and PR values.

NIBP measurement method: using the oscillometric method, the pressure sensor gets pulse wave signal during stepwise deflation, and then processes the pressure information by a complex algorithm to determine the Systolic BP, Mean Arterial Pressure, Diastolic BP and Pulse Rate.

APPLICATIONS

- SpO₂, NIBP, ECG, Temperature, Respiration rate, PR functions of Patient Monitor

FUNCTIONS

ECG MEASUREMENT

- The ECG measurement results include PR, temperature, respiratory, the ST offset value of III, VI channel and arrhythmia.
- There are four kinds of measurement mode: diagnose, monitor, HARDEST and operation mode.

Mode	Filter Range
<i>Diagnose</i>	<i>0.05HZ-130HZ</i>
<i>Monitor</i>	<i>0.05HZ-40HZ</i>
<i>HARDEST</i>	<i>5HZ-20HZ</i>
<i>Operation</i>	<i>1HZ-25HZ</i>

- Patient type: Adult, Children, Neonate.
- ECG calibration by recording the amplitude of wave by inputting a standard voltage 1mv.
- Heart rate calculation/arrhythmia analysis channel: I, II, VI channel can be used as analysis channel or you can choose any other channel by yourself.
- The trapped wave mode: 50HZ, 60HZ, 50/60HZ are available and you can turn off the trapped wave mode.

SpO₂ MEASUREMENT

- Real-time SpO₂, PR, PI measurements.
- Real-time transmission of pulse wave signal.
- Real-time transmission of module status: hardware status, software status and sensor status. The host can give an alarm according to the above status.
- Patient type: Adult, Children, Neonate.
- Average time setting of calculation parameters is to get different response time.
- With great performance of anti-movement and weak signal measurement.

NIBP MEASUREMENT

- SBP, MAP, DBP and PR measurements
- 3 kinds of measurement modes: manual, automatic, continuous.
- Patient type: Adult, Children, Neonate.
- Pressure calibration: the module provides continuous real time pressure to calibrate the pressure accuracy.
- Gas path Leakage detection.

Manual mode..... Measurement is "manually" started by a command

Automatic modeA timing automatically starts the measurement. Cycle time can be selected: 1 minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes, 10 minutes, 15 minutes, 30 minutes, 60 minutes, 90 minutes, 2 hours, 3 hours, 4 hours and 8 hours.

Continuous mode.....Continuous measurement of blood pressure, with 5 minutes interval between each measurement.

- With great performance of anti-movement and weak signal measurement.
 - Excellent reliability:
1. Real-time transmission of module status: hardware status, software status and sensor status. The host can give an alarm according to these statuses.
 2. Double protection of over-pressure: over-pressure protections of hardware and software.
 3. Double protection of overtime: module overtime protection provides the host timing trigger port.

TEMP MEASUREMENT

- Double port of temperature measurement, using standard TEMP probe

PERFORMANCES

ECG

Range 0.15 mv – 5.5 mv

Accuracy 2.36uV/LSB

Resolution 1%

RESPIRATORY

Range 15-120 rpm

Base resistance value..... 500-2000 Ω

Variable resistance value..... 0.2-3.0 Ω

HEART RATE

Range 15-300bpm

Accuracy ± 1 bpm

Resolution 1bpm

TEMPERATURE

Range 0-50°C

Accuracy /

Resolution 0.1°C

SpO2

Range 0 – 100 %

Accuracy 70 – 100 %, $\pm 2\%$ <70%, Undefined

Resolution 1%

PI

Range 0 – 20%

Resolution 0.001%

PVI

Range 0 – 100 %

Base resistance value..... Undefined

Variable resistance value..... 1%

CUFF PRESSURE

Range 0 – 300 mmHg

Accuracy ± 2 mmHg or $\pm 1\%$ of the reading
(whichever is greater)

Resolution 1mmHg

BLOOD PRESSURE

Adult..... SBP: 40-270, MAP: 20-230, DBP: 10-210 mmHg

Children... SBP: 40-200, MAP: 20-175, DBP: 10-162 mmHg

Neonate... SBP: 40-130, MAP: 20-100, DBP: 10-90 mmHg

Accuracy Mean deviation < ± 5 mmHg,
Standard deviation < 8 mmHg

Resolution 1mmHg

PULSE RATE

Adult..... 30-240 bpm

Children 30-240 bpm

Neonate..... 40-240 bpm

Accuracy ± 2 bpm or $\pm 2\%$
of the reading (whichever is greater)

Resolution 1 bpm

PSI (Notice: In blood pressure simulator mode)

Range 10% – 120%

Accuracy Inapplicability

Resolution 1%

OVER PRESSURE PROTECTION

Adult	< 297 ±3 mmHg
Children	< 250 ±3 mmHg
Neonate	< 150 ±3 mmHg

THE MAXIMUM TIME OF MEASUREMENT

Adult	< 120 s
Children	< 120 s
Neonate	< 90 s

STANDARDS COMPLIANCE

Standard NO.	Number of standard	Version
ANSI/AAMI SP-10	Electronic or automated Sphygmomanometers	1992 A1:1996
IEC60601-2-30	Medical Electrical Equipment – Part 2: Particular requirements for safety of automatic cycling indirect blood pressure monitoring equipment	1996 A1:1999
EN1060-1	Non-invasive sphygmomanometers – Part 1: General requirements	1995
EN1060-3	Non-invasive sphygmomanometers – Part 3: Supplementary requirements for electro- mechanical blood pressure measuring systems	1997
IEC60601-1-2	Medical Electrical Equipment – Part 1: General Requirements for Safety - 2. Collateral Standard – Electromagnetic compatibility – Requirements and tests	2001
ISO80601-2-61:2011	Medical electrical equipment – Part 2-25: particular requirements for the basic safety and essential performance of pulse oximeter	2011
IEC60601-2-25	Medical electrical equipment – Part 2-25: particular requirements for the basic safety and essential performance of electrocardiographs	2011

ELECTRICAL CHARACTERISTICS

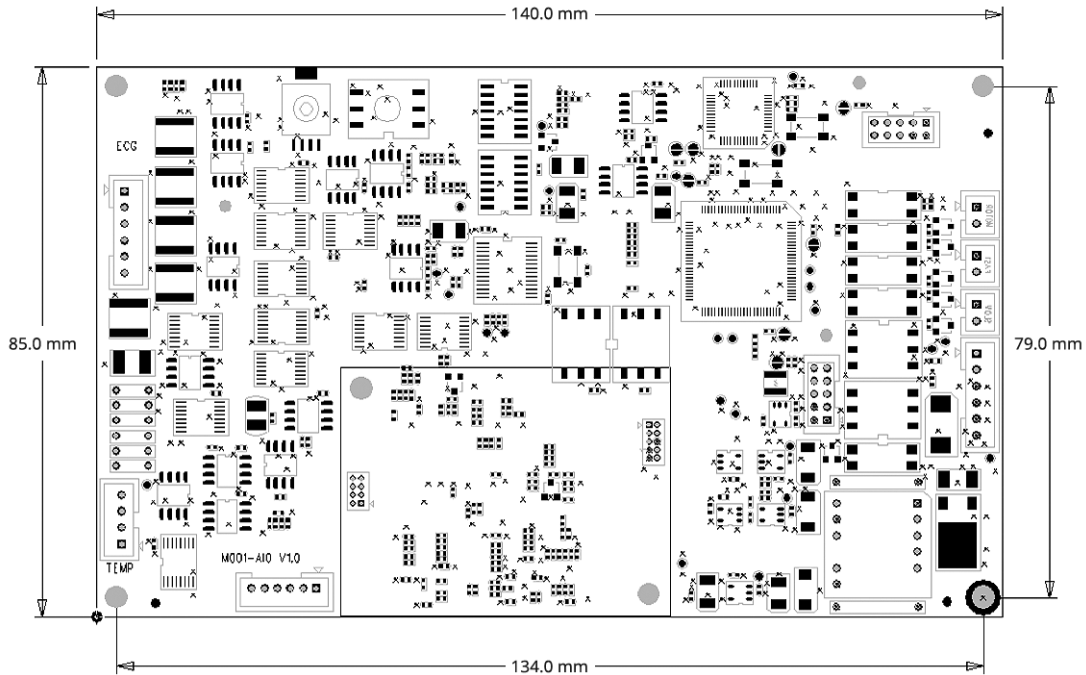
Input Voltage	External power supply should provide +12V DC Voltage offset range should between ±10% of voltage full range
Power Consumption	≤ 3W

ENVIRONMENT CHARACTERISTICS

	Operating environment	Storage environment
Temperature	10°C to 40°C (50°F to 140°F)	-20°C to +70°C (4°F to 158°F)
Humidity	15%-90% non-condensing	15%-90% non-condensing
Altitude	-170 m to +1700 m	-170 m to +1700 m

DIMENSIONS

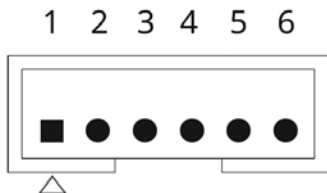
The board dimensions are given in millimeters.



INTERFACES

POWER AND COMMUNICATION CONNECTOR

The connector J4 shown below is used for the purpose of communication and power supply. The pin 1 is actually indicated by an arrow on the PCB.



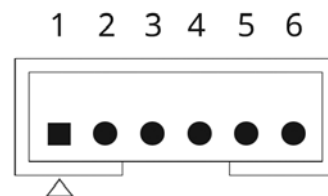
The table shows the pin assignment of this connector.

Pin No	Signal	Description
1	TXD	UART Sending data from module to host
2	RXD	UART Receiving data from host to the module
3	GND	Ground
4	+12V	Power Supply input 12V DC
5	GND	Ground
6	+12V	Power Supply input 12V DC

Note: 4 and 6 pins are the same input, 3 and 5 pins are the same input.

ECG LEADS INPUT CONNECTOR

The connector J10 shown below is used for the purpose of ECG signals transmission. The pin 1 is actually indicated by an arrow on the PCB.

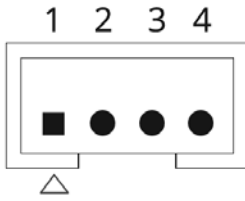


The table shows the pin assignment of this connector.

Pin No	Signal	Description
1	RA	Right arm
2	LA	Left arm
3	LL	Left leg
4	V1	Chest lead, in No.4 ribs stick to sternum
5	ECG SHIELD	Signal shielding wire
6	RL	Right leg

TEMPERATURE SENSOR CONNECTOR

The connector J8 shown below is used for the purpose of temperature signals transmission. The pin 1 is actually indicated by an arrow on the PCB.

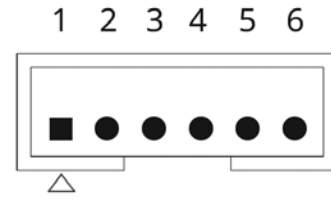


The table shows the pin assignment of this connector.

Pin No	Signal	Description
1	TEMP1	Temperature sensor 1, positive input
2	TGND	Temperature sensor 1, negative input
3	TEMP2	Temperature sensor 2, positive input
4	TGND	Temperature sensor 2, negative input

SPO2 SENSOR CONNECTOR

The connector J5 shown below is used for the purpose of SpO2 signal transmission. The pin 1 is actually indicated by an arrow on the PCB.



The table shows the pin assignment of this connector.

Pin No	Signal	Description
1	1_WIRE	Sensor detection signal
2	GND	Ground
3	IR	IR LED positive electrode
4	RED	RED LED positive electrode
5	SPO2-	Light signal-
6	SPO2+	Light signal+

ORDERING

Our integrated Multi-Parameter module part number is **MMP**.

For ordering our module, please contact directly our sales team by email at sales@zugmed.com or refer to our website www.zugmed.com for further information.

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