

>> **MATTRESS MAT**

White Paper

Confidential
Version 1.0



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1. Introduction Mattress Mat

The Mattress Mat Development Kit by Sensing Tex is a product system developed for multiple applications for body pressure in bedding.

It can be used for product in health, wellness for bedding applications such as measure and monitor patient position, evaluate patient comfort, identify pressure on risk areas, measure position for wellness purposes among other applications.

The main application of this *Mattress Mat* is for ulcer prevention for individuals with reduced mobility. The sensor mat provided allows the detection of non-uniform pressures in a certain surface on a mattress, which in the long run could result to skin ulcers.

An accurate monitoring of the pressure will allow to generate alarms or other way of interacting with the monitored person (or personal taking care of him/her) to reduce the risk due to large period of time with pressure in certain parts of the body. All bed-bound persons or those whose ability to reposition easily is impaired have high risk of pressure ulcers.

The Mattress Mat system will improve monitoring of special pressure points sensible to ulcers as sacrum, ischium, trochanters, heels, elbows and the back of the head.



Figure 1. Transportation Bag



Figure 2. Mattress Mat



Figure 3. Mattress Mat Installed

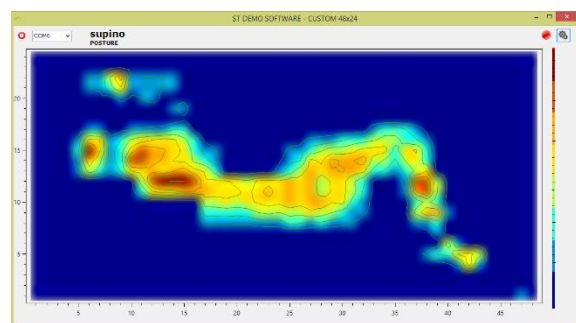


Figure 4. App Screenshot

About Mattress Mat Development Kit

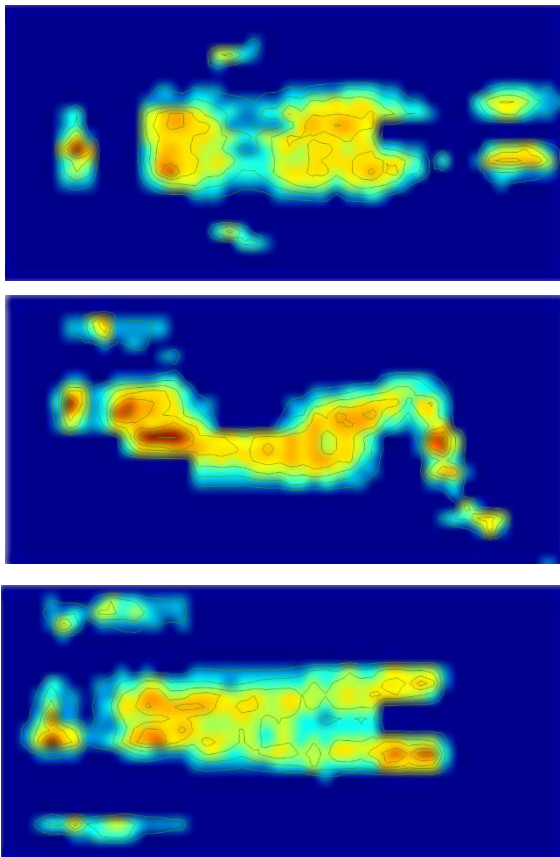


Figure 5. Mattress Mat. Pressure Maps of different Decubitus Positions

A non intrusive system

The sensor Mat is integrated on top of the mattress in a cover. The sensor area will be packaged accordingly to requirements.

Easy Installation

No installation work is required; simply place the Mattress Mat on a Mattress. Ensure it covers the mattress.

Easy Maintenance

It is unlikely that the system will become damaged. However, the cost is feasible to provide a replacement. No installation work is necessary.

Modular System

To monitor larger areas (e.g. mattress), six Pressure Sensor Tex systems may be needed.

Flexibility

The system can be used in articulated beds. Smooth pressure will be notice due to articulation

Precision

Since the systems compares pressures in several points through an extensive sensor matrix, further development could lead to advanced algorithms considering person's weight to distinguish between normal and risky body positions.

2. Mattress Mat Technical Features

The Mattress Mat is based in the following parts:

Component	Description
1	Mattress Cover
2	Electronic Control Unit
3	Transportation Bag

Table 1. Components of the Mattress Mat Dev Kit



Figure 6. Components of the Mattress Mat Dev Kit: Transportation Bag, Electronic Module and Mattress Mat

The software could be delivered to you, so you can customize it to check specific features you want to test using our Ulcer Prevention system/product. Engineering service is available to support you and to define your final product.

3. Sensor & Mat Features

Technical Features: Size and Topology Features

Mattress Cover Size [cm]	90 x 200
Sensing Area [cm]	85 x 190
Number of Sensor Points	1152
Topology	48x24
Horizontal & Vertical Resolution [cm]	3.75
Sensor Shape and Size [cm]	Round 2.26 diameter
#Sensor Set	06
Sensor Module Matrix	12x16
Sensor Module Size	49.8 x 58.7

Table 2. Mattress Mat Features

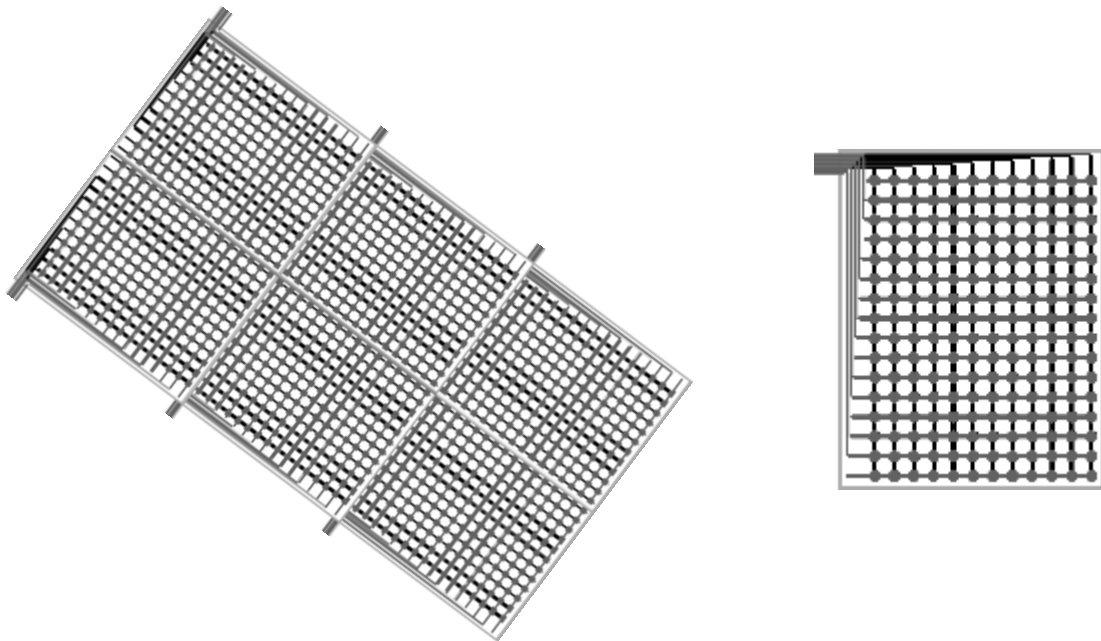


Figure 7. Technical Scheme of the Modular Sensor Mat

Technical Features: Pressure Sensing Features

Linearity	Yes Conductance vs Pressure (2 curves)
Hysteresis	12%
Repeatability	<8%
Raising Time	<5%
Precision	8%
Drift	<12% Model for Correction
Pressure Range	5-350 mmHg

Table 3. Pressure Sensing Features

4. Electronic Module Features

Individual control unit for the Sensor Module

Element	Value
Microcontroller	ATmega328
Voltage [V]	5
Flash Memory [Kb]	32
SRAM Memory[Kb]	2
EEPROM [Kb]	1
Clock Speed [MHz]	16
Communication between Electronic Modules	I2C
Connector	USB BUS

Table 4. Single Electronic Module

Electronic Concentrator

Elemento	Valor
Microcontroller	ATmega2560
Voltage [V]	5
Flash Memory [Kb]	256
SRAM Memory[Kb]	8
EEPROM [Kb]	4
Clock Speed [MHz]	16
Communication between Electronic Modules	Serial/Bluetooth
Connector	USB BUS

Table 5. Concentrator Features

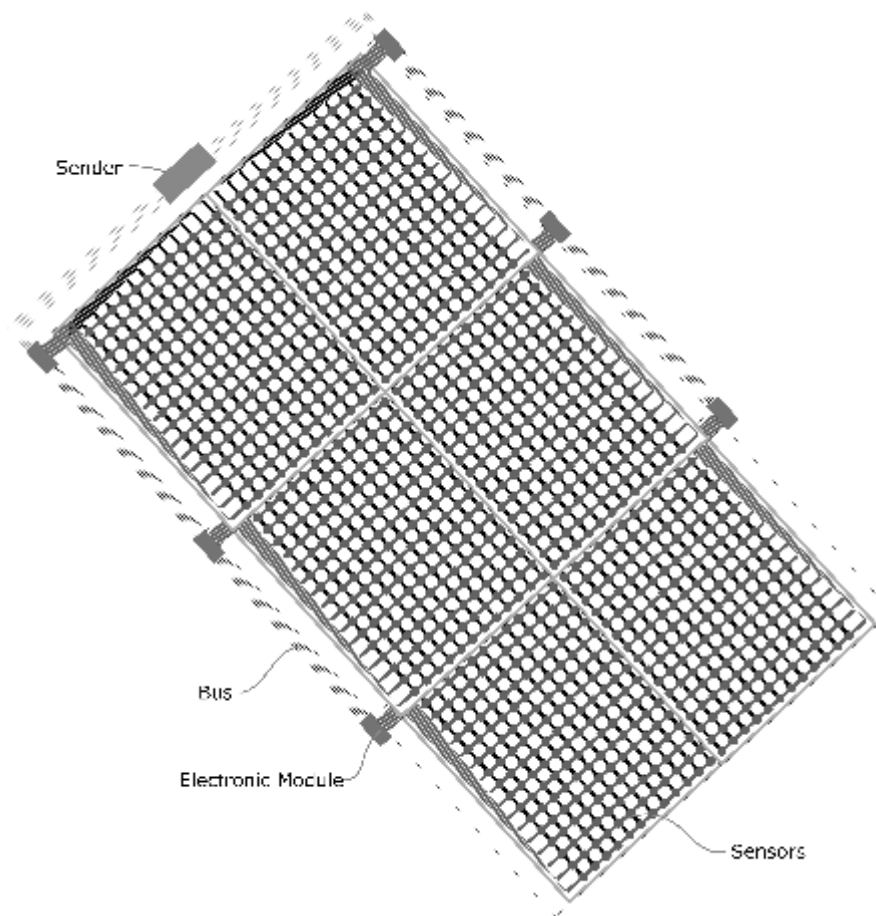


Figure 8. Technical Scheme of the modular system

5. Software Features – Windows App

Mattress Mat App allows you to discover the capabilities of the Mattress Mat system. You can see the Pressure Maps and recognize human patterns in real-time and set alarms to prevent ulcers.

The App implements a basic algorithm showing the basics of an Ulcer Prevention monitoring system. It sets a timer when at least one sensor is above a threshold set and sets an alarm when this body position is kept for more than certain pre-programmed seconds.

The final system has many other features like USB and BT communication to your alarm system, sound alarm, and communication with nurse mobile through Android or iOS mobile, Bluetooth communication to any other device or even warning voice messages to patient when the alarm set conditions happens.

Windows App has been developed. Using interpolation and isobars, it generates not only realistic images but precise information of every measurement point. The different sensors allow you to get different resolution images.

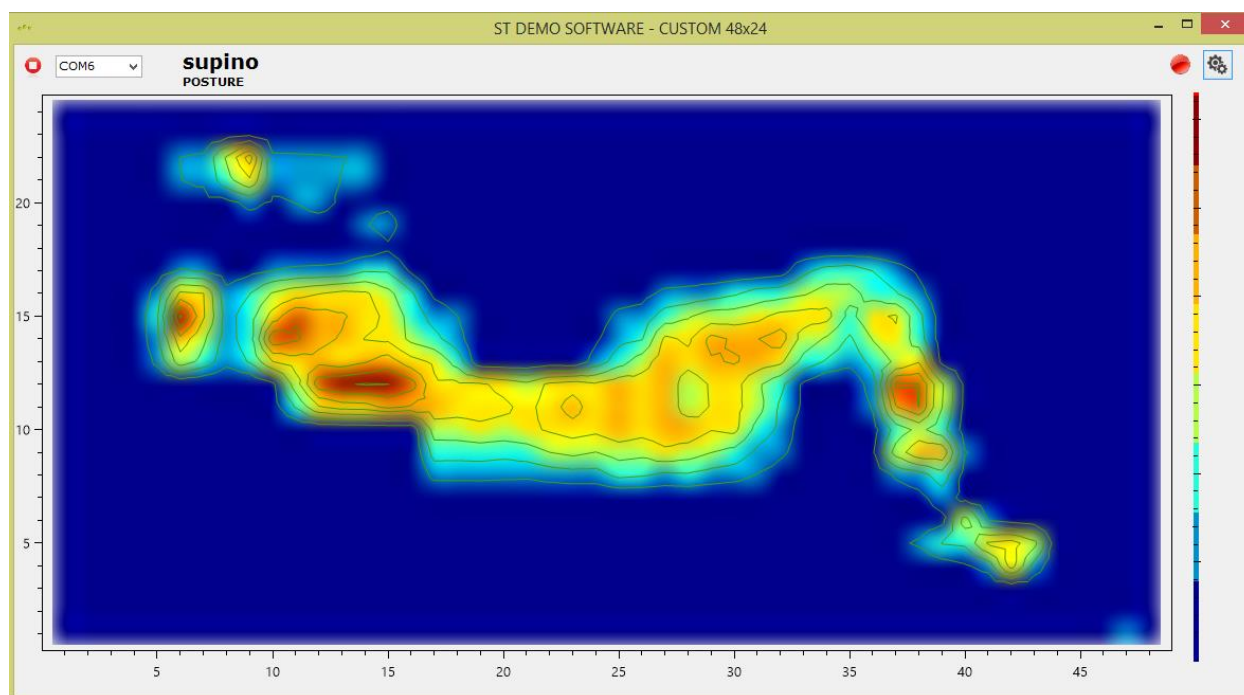


Figure 9. Screen Shoot Windows App

Pattern Recognition

Mattress Mat Development Kit allows you to recognize human patterns. In Sensing Tex we offer mats, sensors and systems with higher resolution, and we can also make a personal design to match your needs. **This specific Mattress Mat integrates 1152 sensor points.**

The following images show the pattern recognition of some different patient positions.

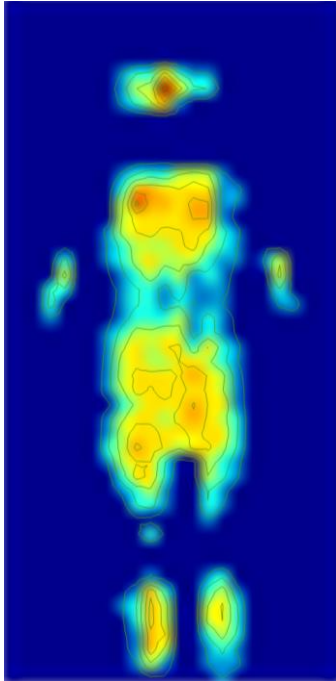


Figure 10. Decubitus Supine

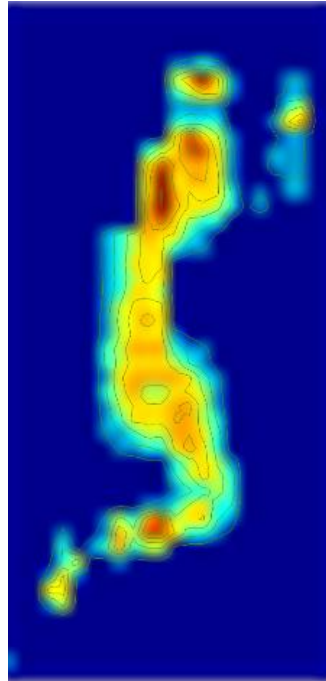


Figure 11. Decubitus Lateral

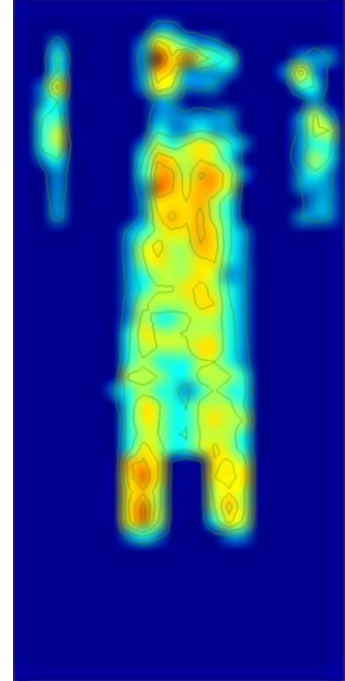


Figure 12. Decubitus Prone

6. FAQs

Which part number we should order if we want to test a mattress size solution?

Mattress Mat Product System as stated above

The available size of the Pressure Tex does not fit exactly with our needs. What can we do?

The Mattress Mat is based on standard customer requirements. A customized solution is normally the expected outcome for your industrial order. Do not hesitate to contact our engineer team.

Is it possible to receive more resolution in my measurements?

We can design almost anything you can imagine, from big area sensor mats to high resolution small area pressure sensors. Contact us and you will have the solution you need.

7. Maintenance and Operating Instructions

Cover Material.

Washability	Yes, Alcohol 30%, 5000 ppm Clor, Hydrogen Peroxide 15%
Air/Vapour Permeability	N/A
Material	PU

Table 6. Cover Material

Coating Cover Material

Description	Value	Certification
Mass PES [g/m²]	180 [+/-10]	ISO 3801/5 1977
Coating Mass PU [g/cm²]	75[+/-5]	ISO 3801/5 1977
Warp Breaking Strength Force [N/cm]	>130	ISO 13934 1999
Weft Breaking Strength Force [N/cm]	>30	ISO 13934 1999
Warp Breaking Elongation [%]	>50	ISO 13934 1999
Weft Breaking Elongation [%]	>300	ISO 13934 1999
Warp Tear Resistance [N]	>45	ISO 4674A1 1977
Weft Tear Resistance [N]	>30	ISO 4674A1 1977
Warp Adherence [N/mm]	>0.82	DIN 53357 1982
Weft Adherence [N/mm]	>0.82	DIN 53357 1982
Water Resistance before washability	Ok: 2000 mm	ISO 811 1981
Water Resistance after washability	Ok: 2000 mm	ISO 811 1981
Warp Shrinkage after washability [95°C] [%]	+/-3	ISO 5077 1984
Weft Shrinkage after washability [95°C] [%]	+/-2	ISO 5077 1984
Inflammability [Crib 5]	OK	BS 7175 1989
Breathability [g/m²]	400 g/m ² /24h 37°C / 65% HR	
Mold and Mildew Resistance	OK	

Table 7. Cover Material Features

- Mattress Mat has to be rolled up with care.
- Perform a correct battery charge in each use to achieve better long life battery.
- Mattress Mat can be cleaned with some soap and water with a tissue or with any other cleaning system indicated in table.
- Specific finishes on the Sensor Mat for end product applications allow to wash the Mat in standard washing machines.

8. Legal Note

Sensing Tex commercialized products require a careful handling according to the provided instructions. Therefore, any manipulation, modification or transformation applied to Sensing Tex commercialized materials which do not match the standard existing protocols also given to the clients, or which are not strictly authorized by Sensing Tex, will cause an invalid existing product operation warranty, and Sensing Tex will not be responsible for any damage to the product or malfunction.

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