

# Pressure Care and Support Surfaces

Understanding Clinical and Technical Terms



# Understanding Clinical and Technical Terms

The world of clinical support surfaces can be bewildering at times. There are a lot of different clinical and technical terms to understand, and technologies from which to select. This guide is intended to help demystify these terms and technologies so clinical staff and organizations can select product solutions that best suit their patients and their organisation.





# References

European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel, Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers/Injuries: Clinical Practice Guidelines. The International Guideline. Emily Haesler (Ed.). EPUAP/NPIAP/PPPIA. 2019.





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# I. Clinical Terminology

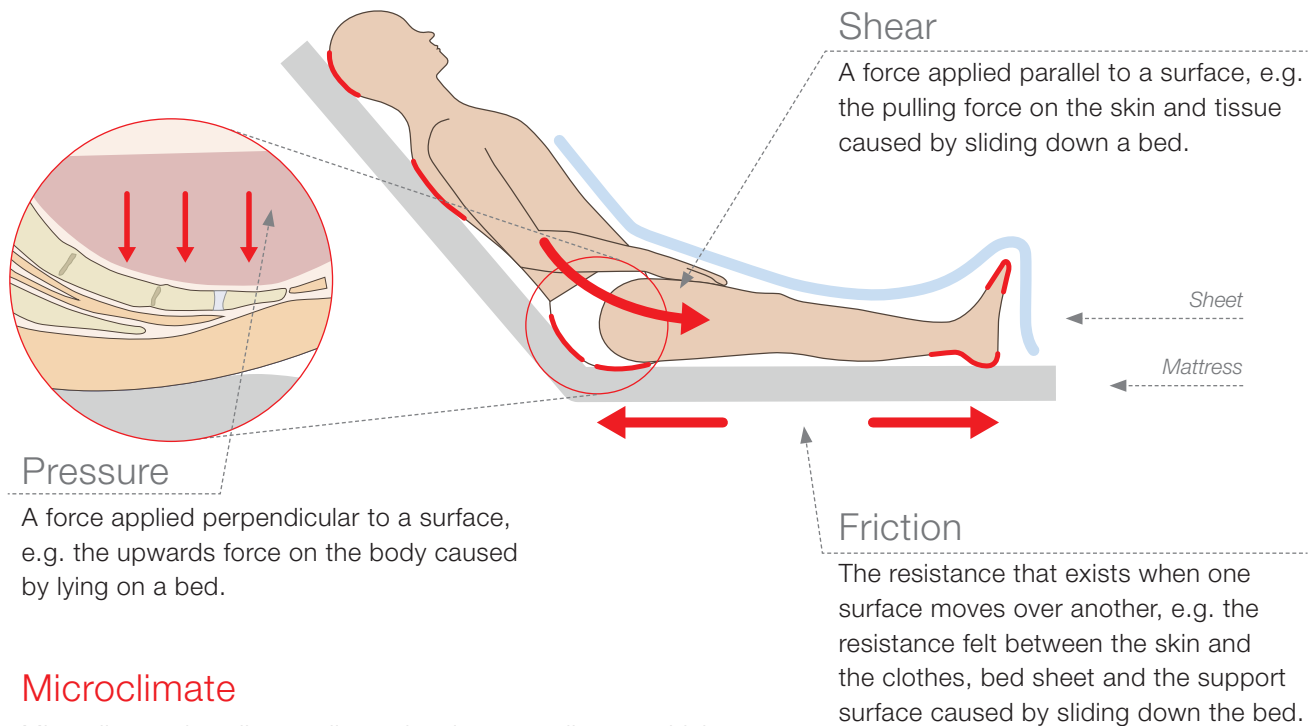
Basic terminology to describe pressure injuries, their stages and the risk factors that lead to their development.

## Pressure Injury/Pressure Ulcer

EPUAP and NPUAP define a pressure injury/ulcer as “localized damage to the skin and/or underlying tissue, as a result of pressure, or pressure in combination with shear. Pressure injuries usually occur over a bony prominence but may also be related to a medical device or other object.”

For the purposes of this guide, the term “pressure injury” is used.

Note: Other localized definitions may apply in some countries.



## Microclimate

Microclimate describes a climate local to a small area, which differs from the wider climate. In the context of pressure injuries, microclimate relates to the heat and moisture levels next to the skin. However the term can also be used to describe the local climate below the mattress cover.

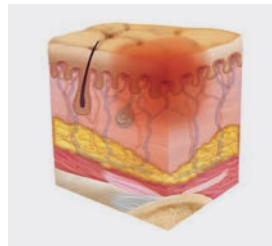
2.5 million	patients per year develop a pressure injury <sup>(1)</sup>
60,000	patients die every year as a direct result of pressure injuries <sup>(2)</sup>
2.5x more	expensive to treat pressure injuries than to prevent them <sup>(3)</sup>

## Pressure Injury Classification System

A system devised by EPUAP and NPUAP to classify different types of pressure injuries into Category I, Category II, Category III, Category IV, Unstageable Pressure Injury, Suspected Deep Tissue Injury.\*

### Category I Pressure Injury

"Intact skin with non-blanchable redness of a localized area usually over a bony prominence".\* Non/blanchable means that when pressured, e.g. with a glass, the red colour does not dissipate.<sup>(4)</sup>



### Category II Pressure Injury

"Partial thickness loss of dermis presenting as a shallow open injury with a red pink bed, without slough".\* The dermis is the visible protective top layer of the skin. Slough is dead tissue surrounded by living tissue typically soft, hydrated and yellow brown in colour.<sup>(5)</sup>



### Category III Pressure Injury

"Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss."<sup>(6)</sup>



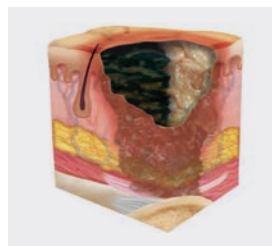
### Category IV Pressure Injury

"Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present. Often includes undermining and tunnelling."\* Eschar is dry dead tissue which is not a scab. Slough is wet dead tissue.<sup>(7)</sup>



### Unstageable Pressure Injury

"Full thickness tissue loss in which the base of the injury is covered by slough (yellow, tan gray, green or brown) and/or eschar (tan, brown, or black)".<sup>(8)</sup>



### Suspected Deep Tissue Injury

"Purple or maroon localized area of discoloured intact skin or a blood-filled blister due to damage of underlying soft tissue from pressure and/or shear".<sup>(9)</sup>



\* For a full definition of each category, see EPUAP/NPUAP Guidelines.



## Risk Factor

A risk factor is something that places an individual at risk of developing a pressure injury. There are many known risk factors. However, a critical risk factor is a lack of mobility. This is because healthy people change positions regularly as they become uncomfortable, thus avoiding the damaging effects of pressure and shear. When individuals are unable to move in this way, they become at risk of developing pressure injuries.

PREVALENCE OF PRESSURE INJURIES BY DEPARTMENTS <sup>(10)</sup>	
9.7%	Acute Care
25.2%	Long Term Acute Care
11.8%	Long Term Care (Nursing Home)
12.0%	Rehabilitation Centers



## Two Types of Risk Factors

### INTRINSIC RISK FACTORS

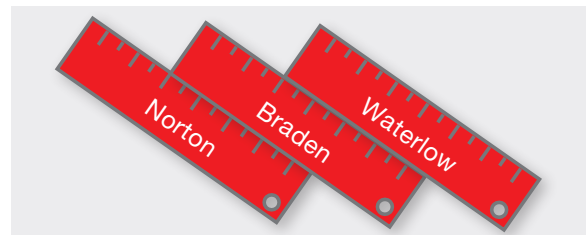
Risk factors that relate to the individual, such as medication, age and incontinence.

### EXTRINSIC RISK FACTORS

Risk factors that relate to the immediate environment, such as pressure, shear, friction and moisture. External risk factors can be influenced by changing the features of the support surface.

## Risk Assessments

A structured approach to identifying individuals who may be at risk of developing a pressure injury, and the factors that place them at increased risk, e.g. nutritional status. Common risk assessments scales used are Waterlow, Norton, and Braden. Risk Assessments are useful tools that should complement, rather than replace, good clinical reasoning.



## Risk Levels

Risk assessment scales tend to categorize individuals based on a score achieved on the risk assessment scale. For example, Norton categorizes individuals as low risk, medium risk, high risk, and very high risk.



### Note:

It is important to remember that these categories relate to the individual and not a support surface. Manufacturers may indicate that a support surface is suitable for use with individuals at a risk level, often as a requirement of insurance companies or tenders. However, it is important to remember that this is a guide only. The most suitable support surface is selected based on clinical reasoning and understanding why an individual is at risk.



# II. Support Surface Related Terminology

Basic terms concerning mattress types and their key aspects

## Support Surfaces

A term used to describe any surface supporting the patient's mass, e.g. mattress or seat cushion

### PRIMARY SUPPORT SURFACE

The main patient support surface, e.g. mattress or seat cushion

### SECONDARY SUPPORT SURFACE

Other support surfaces which may also support body parts, e.g. arm supports on a chair, foot supports on a wheelchair.

## Zones on Surface



### Torso Zone

The section of the mattress that sits under the torso.

### Head Zone

The section of the mattress that is under the head. Many active mattresses keep this section static to prevent dizziness, discomfort or motion sickness. See Active Mattresses.

### Heel Zone

The section of the mattress that sits under the patients heels. In some passive mattresses this zone uses different types of foam, or cuts, to reduce pressure to the heels. Additionally a slope can be used to reduce pressure to the heels. For example, some LINET® mattresses use a 7 degree slope.

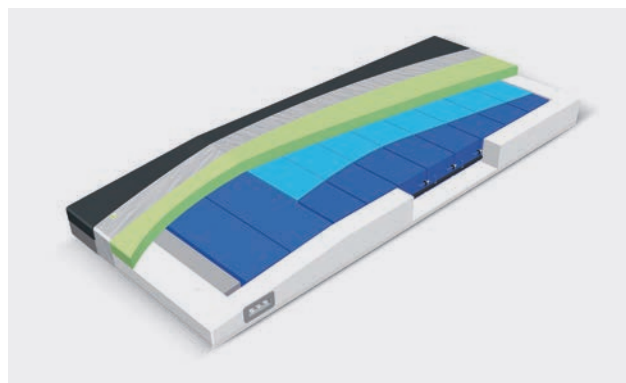
In an active mattress this zone may have smaller cells or be collapsible to remove pressure from this area. See Active Mattresses.

## Types of Mattresses for Use in Bed Frames

Based on the individual needs of the patients and according to the technical requirements of the existing equipment, we recognize 3 types of the mattresses.

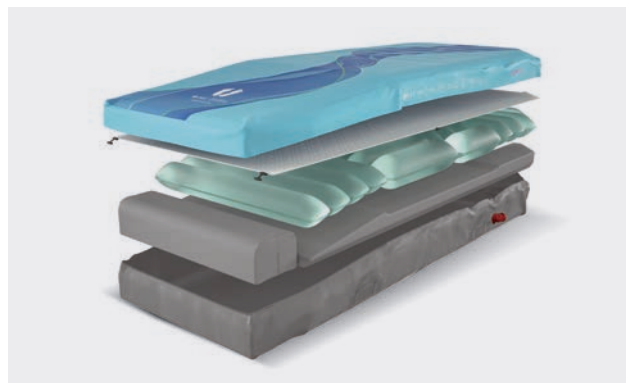
### Overlay Mattress

A support surface, typically thinner than a replacement mattress, that is designed to be fitted on top of an existing support surface. The performance will vary depending upon the quality and type of support surface used beneath.



### Mattress Replacement

A replacement mattress is a support surface design to fit directly onto any bed frame.

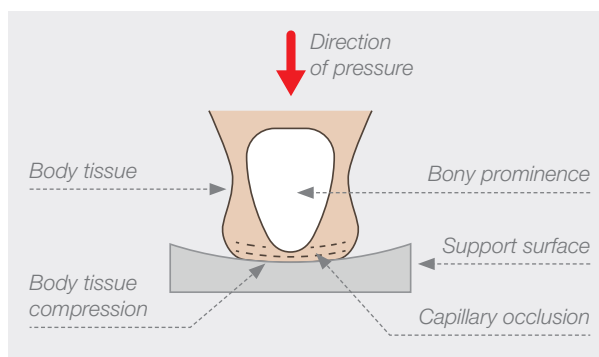


### Integrated Mattress

A mattress that is integrated into the bed frame including the pump and controls. The advantage of integration is that the pump of an active mattress is away from the end of the bed.

### Bottoming Out

A support surface is considered to have bottomed out when the material within is unable to compress any further given a greater load/force. In an air mattress, this is the point at which the patient is no longer supported by the air cells and comes into contact with the surface platform below. This is generally considered to be a negative effect. This could result in a build-up of localized pressure where the system has bottomed out.



## Passive Mattress/Systems

Support surfaces which do not rely on an electrical air pump to continuously inflate, deflate or create movement of air flow through the support surfaces. Passive support surface assist the prevention of pressure injury development through immersion and envelopment. Together, immersion and envelopment enable the pressure to be redistributed over the largest possible surface area, thus reducing damaging peak pressures.



### Pressure Redistribution

The redistribution of pressure, usually over a larger surface area with the aim of reducing potentially damaging peak pressures. Sometimes passive surfaces are described as pressure reducing. However, this is not technically correct. However, peak pressures can be reduced by spreading the pressure over a larger surface area, sometimes referred to as pressure reduction.



### Immersion

The ability to sink into a support surface.



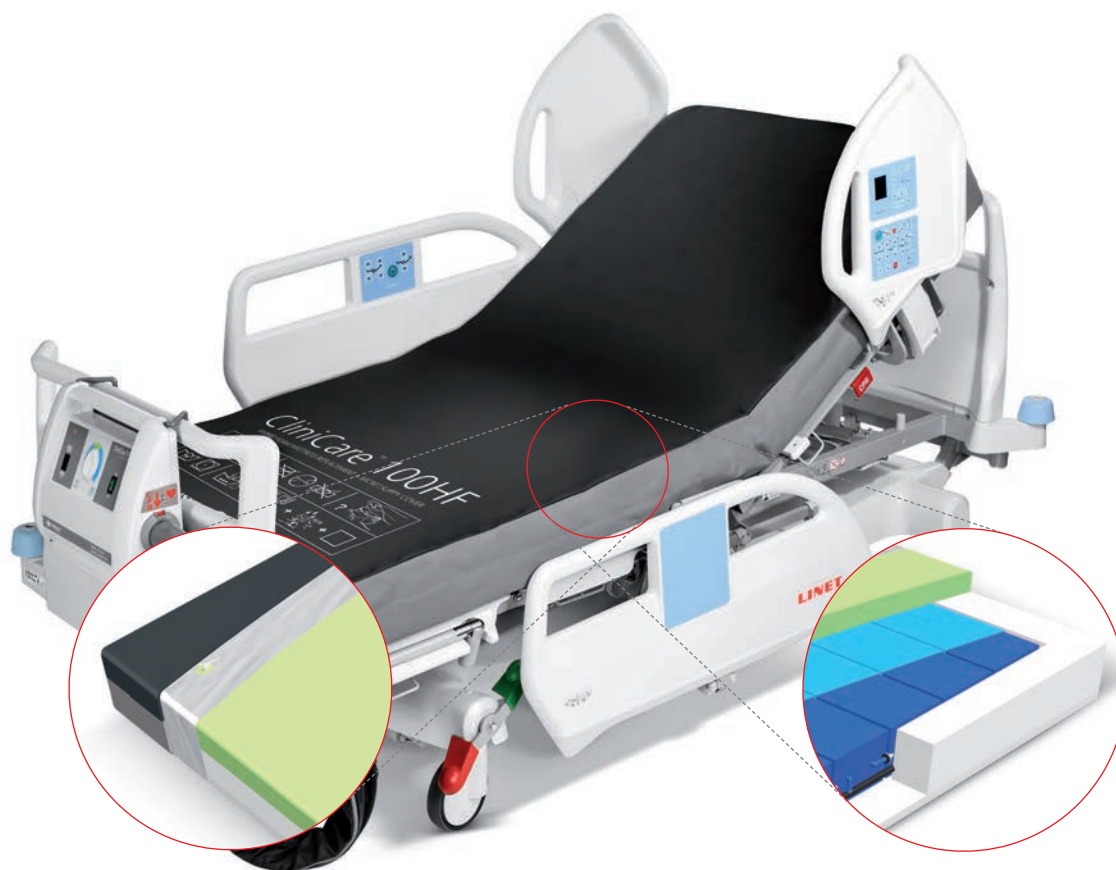
### Envelopment

The ability of a support surface to wrap around the shape of the body.



## Hybrid Mattress/Systems

Support surfaces which contain elements of both a passive and an active system, enabling the permanent use as either a passive or active system. Hybrids function as a passive mattress when there is no active power source but can be converted into an active system by the addition of power. An advantage of this type of system is the quick ability to convert between an passive and active surface without having to move the patient.



### Open Hybrid System

Refers to a hybrid mattress/system when used without a pump. This includes the flow of air in and out of the mattress, e.g. through a valve. The connection of a pump that bypasses the valve would convert this into a closed.

### Close Hybrid System

Refers to a hybrid mattress/system where there is no free flow of air in and out of the mattress. This can either be without a pump and no valves or with a pump attached. This type of hybrid system may also be referred to as a reactive system, along with other passive surfaces.



## Controlled Release Hybrid System

An open hybrid system that includes a valve that limits the free flow of air in and out of the mattress.

## Step Up

A hybrid system is said to be "stepped up" when an air pump is used to convert it from a passive to an active system. The term 'Step Up' is also sometimes used to describe moving from a passive to an active support surface.

## Step Down

A hybrid system is said to be "stepped down" when an air pump is removed to convert an active system to a passive system. The term 'Step Down' is also sometimes used to describe moving from an active to a passive support surface.

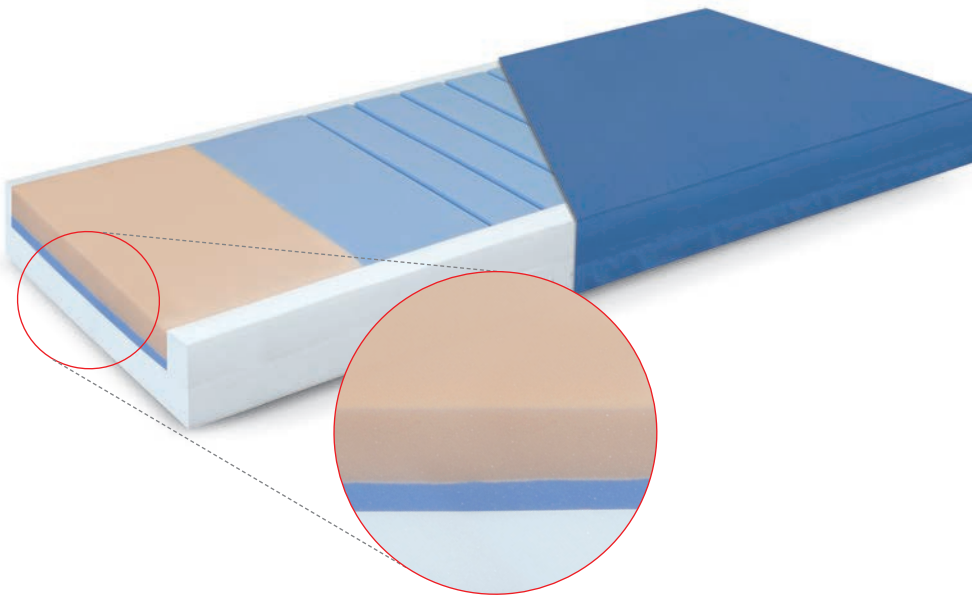
## Active Mattress/Systems

Support surfaces that use an air pump to continuously inflate or deflate cells, or to create movement of air through the system. Active systems assist in the prevention and management of pressure injuries through several mechanisms including alternating pressure therapy, constant low pressure and microclimate management.



# Passive Pressure Care Technologies

The material, technology, and manufacturing process determine the characteristics of the mattress.



## Foams

Foam is a flexible material formed with pockets of air. High specification foams (HSF) is a term commonly used to describe high quality foams.

## High Specification Foams (HSF)

The 2019 EPUAP/NPUAP guidelines include a detailed specification on what can be considered a high specification foam mattress.

### FOAM DENSITY

Foam density is the weight of the foam per unit volume. Higher weight foams tend to be made from greater volumes of chemicals. Density is often an indicator of durability, as there is more material supporting the patient. However, the greater the density, the lower the air content and breathability of the foam. Therefore, it is important to select the right density for the right application.

### FOAM HARDNESS/FIRMNESS

Depending on the country the feel of a foam is referred to as hardness or firmness. It is the amount of force required to compress the foam to a given reduced height. The greater the hardness/firmness, the harder it is to compress the foam. Foam hardness is often perceived as an indicator of comfort. However, a foam that is too soft may bottom out. A foam that is too hard may not conform enough to the patients body shape and does not provide adequate immersion or envelopment. Therefore, it is important to select the correct hardness/firmness for the right application.

## High Resilience Polyurethane (HR PU) Foams

Foam made from a polyurethane (PU) material. They are used for their support, comfort, and resilience.

### RESILIENCE

The ability of a foam to spring back after a foam has been squashed out of shape.

## Modified Polyurethane (PU) Foams

A PU foam cut to alter the deformation properties of the foam. Typically, this is in the form of castellations (cubed), convolutions or other cuts in the top surface of the foam. These types of modifications break the surface tension of the foam increasing its ability to conform to the body shape.

### CASTELLATIONS (CUBED)

A grid shaped cut made to the top surface of a foam.

### CONVOLUTIONS (E.G. EGGBOX)

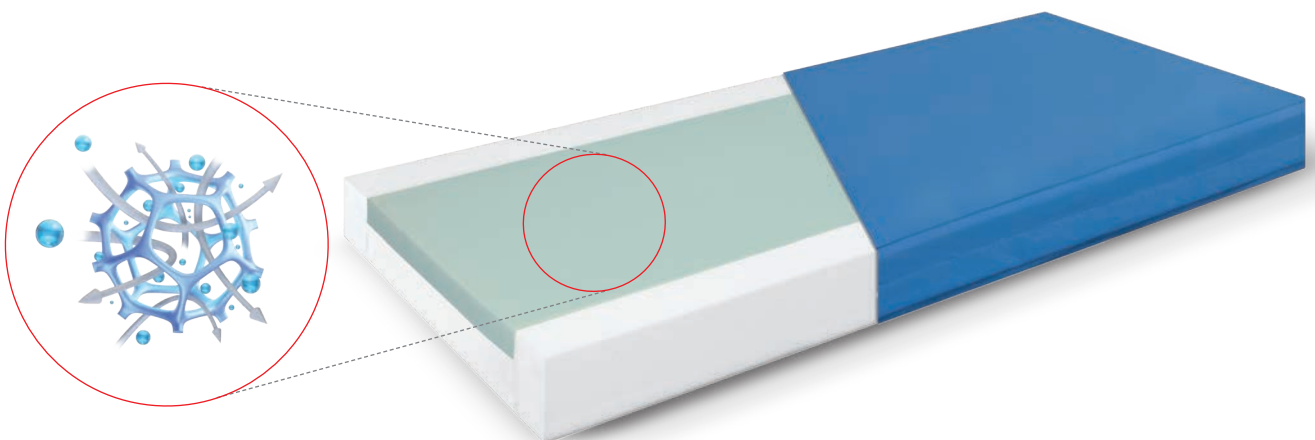
An egg box shaped cut made to the top surface of a foam.

## Viscoelastic Foams (Memory Foams)

A foam which is pressure and temperature sensitive enabling the individual to sink into the material. Some perceive viscoelastic foams as warmer than HR Foams, this may be because of the different chemical composition and because viscoelastic foams tend to be used in higher densities than HR PU foams. Viscoelastic foams have a tendency to continue stretching and deforming under pressure. For this reason, viscoelastic is often best used as the top layer in a support surface, with the support of a high resilience foam underneath.

## Gel Infused Foams

Polyurethane foam that contains gel particles. This is often used to improve comfort and provide a 'cooler' feeling surface. Some gel infused foams also include a phase change material (PCM).



## Gels

A semi-rigid viscoelastic polymer used to provide envelopment over bony prominences. This type of material is generally shock-absorbing, x-ray translucent, and reduces heat and shear. As gels have a high load-bearing capacity they work well where the thickness of the support surface is restricted, for example on operating tables.

## Static Air

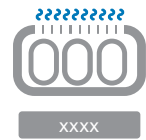
A static air support surface is filled with air that does not actively move through the system. It can be manually filled using a hand pump or via a powered pump.

## Phase Change Material (PCM)

A material which changes phase at a give temperature in order to maintain a constant temperature. This is typically in the form of gel or small micro beads which change to a liquid when subjected to body heat. Generally, the more phase change material that is used, the more time it takes for the material to change phase – this provides longer benefits to the patient on the mattress.

### Passive Microclimate Management (Passive MCM)

In a passive support system, microclimate management is generally managed by phase change material (PCM) or a highly moisture vapor permeable cover material (see Cover Technologies).





# Active Pressure Care Technologies

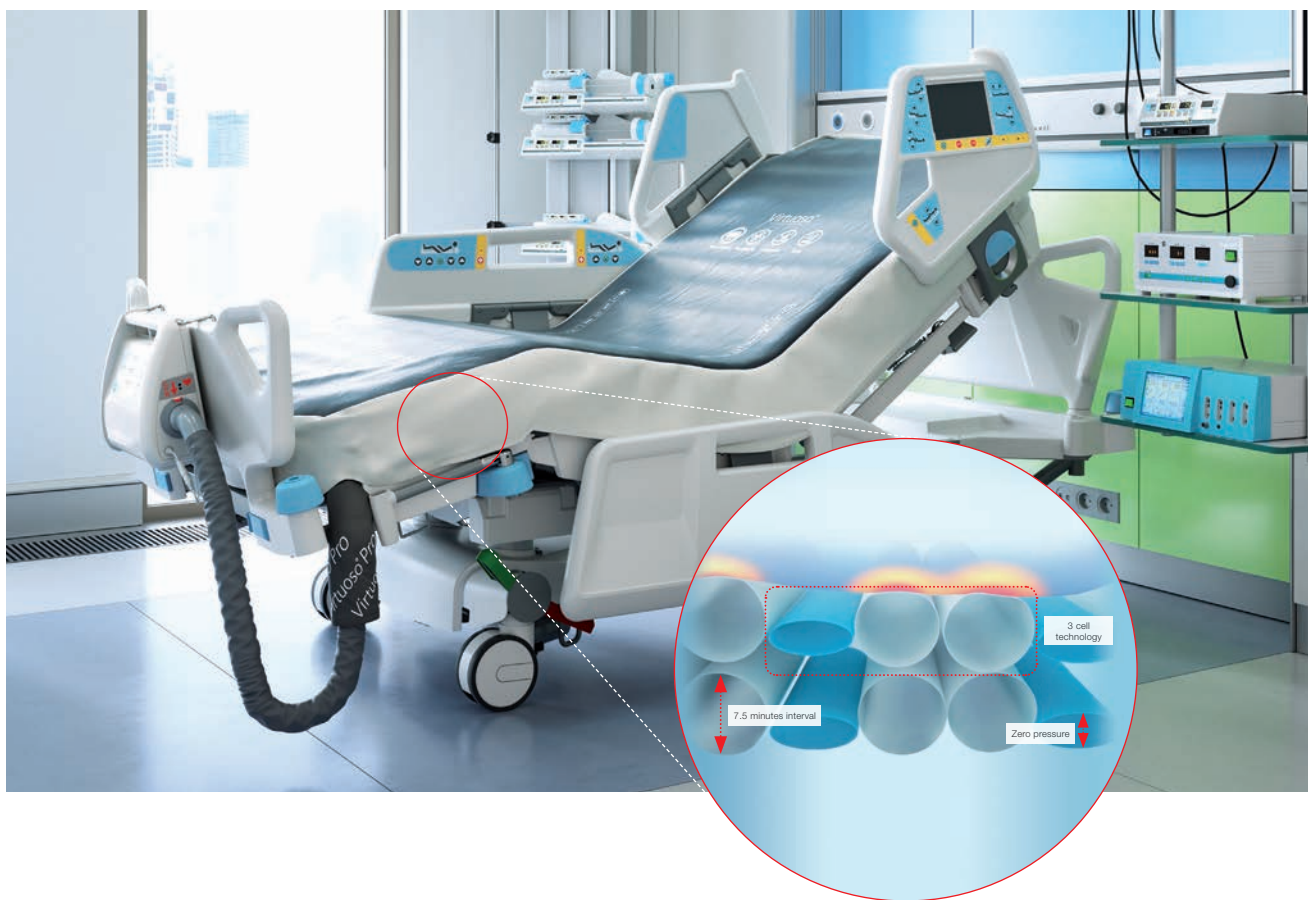
Various active air mattress systems are available to prevent and support the treatment of pressure injuries.

## Alternating Pressure Therapy (APT)

A system containing several sealed air cells that alternate between inflation and deflation for relieving pressure.

### Pressure Relief/Removal

The process of removing pressure from a localized area of tissue by moving the load to an adjacent body area. When the pressure is totally removed from a localized area, it is referred to as Zero Pressure.



### Cell Configuration

In an alternating pressure therapy system, cells are configured in groups. Each group has a total cycle time during which each cell is deflated once.

## 2 Cell

A system that is made up of multiples of 2 cell groups, which alternate between one inflated and one deflated cell. A two-cell system ensures  $\frac{1}{2}$  of the body is supported at any one time.



## 3 Cell

A system that is made up of multiples of 3 cell groups which alternate between two inflated and one deflated. A three-cell system ensures that  $\frac{2}{3}$ rd of the body is supported at any one time.



## Cell Size

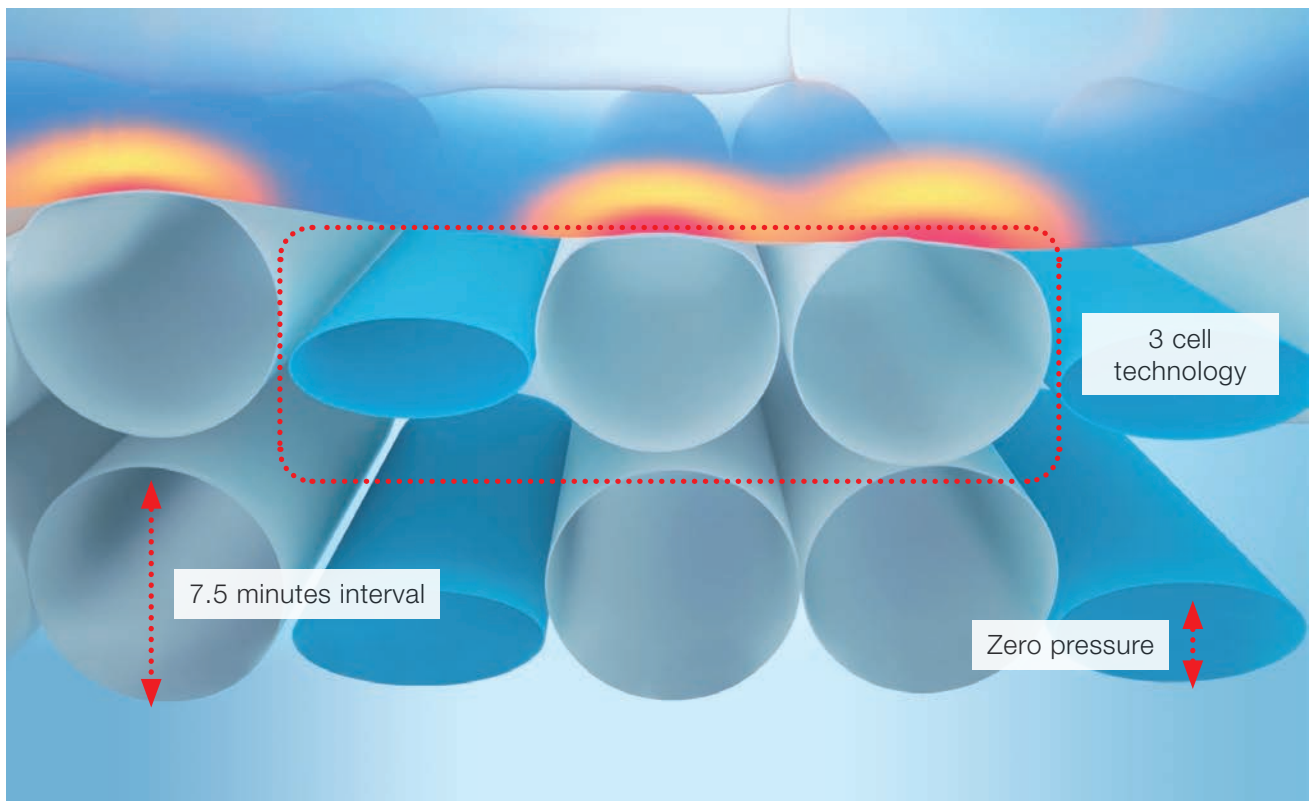
Cell size refers to the diameter of the air cell. Cell size can be different between the different zones of a mattress, e.g. cells can be smaller in the head and heel sections.

## Cycle Time

The time it takes an alternating pressure mattress to run through a full cycle.

## 7.5 Minute Cycle Time

LINET® 3 cell support surfaces are designed to take 7.5 minutes to complete a full cycle. Each of the three cells in a cell group are inflated for 5 minutes and deflated for 2.5 mins, ensuring that pressure is relieved from the whole body every 7.5 minutes. This is based on research by Exton-Smith and Sherwin that demonstrated patients who moved every 7–8 minutes did not go on to develop pressure injuries, while patients who moved much less did.

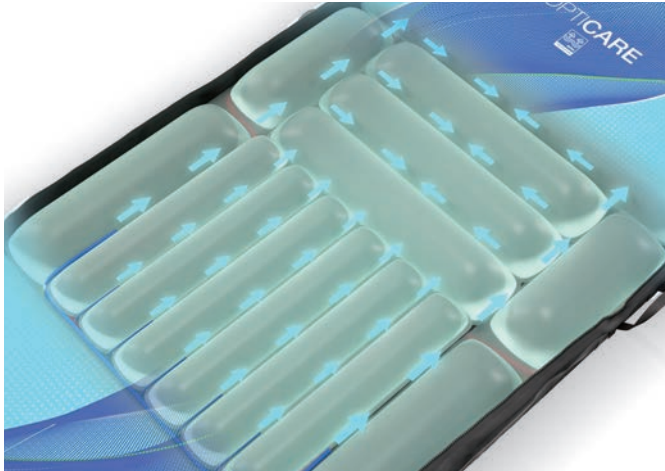


### Microclimate Management

The management of localized heat and moisture on the patient support interface. This uses airflow and a permeable cover which enables microclimate management through moisture vapor transfer.



Active Microclimate is generally measured in terms of litres per minute. The systems effectiveness is determined by the volume of air, the route of airflow, and the number of free air holes.



### Moisture Vapor Transfer

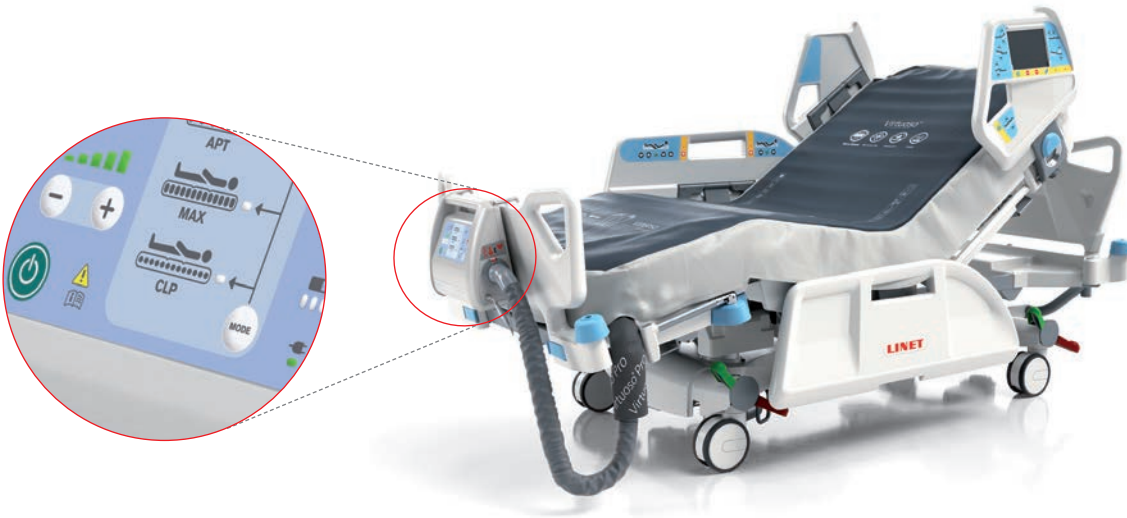
The movement of vapor through a substance, in the context of support surfaces, is usually provided by a moisture vapor permeable cover. When such a cover is combined with active MCM it can help to prevent a rise in interface temperature, maintaining skin temperature and preventing sweating.

### Low Air Loss (LAL)

A mode on active mattresses and cushions that enables air to be constantly blown into the mattress. Airflow under the top cover helps to maintain skin temperature and prevent sweating through moisture vapor transfer.

### Constant Low Pressure (CLP)

A mode on active mattresses that enables low internal cell pressures so that the support surface immerses and envelopes the patient to ensure lower peak pressures.



### Pressure Optimization System (POS)

A patented LINET® system that regularly monitor's the support surface and adjusts the mattress accordingly to ensure maximum safe immersion.

### Max Inflate (MAX)

A mode on active mattresses that inflates the support surface for certain types of nursing care to be carried out on a firm base.



### Fowler Boost

A manual or automatic system designed to increase internal cell pressure when the backrest of the frame is raised. This ensures the patient remains supported.

On some systems the Fowler boost is activated when the back reaches 30 degrees, while on others there is a gradual increase in-line with the back angle.



### Individual Cell Control

An active mattress system that includes a cell or cells that can be individually deflated.



# Cover Technologies

Covers are an important part of the mattresses and they determine functionality and effectiveness.



## Stretch Fabric

A fabric which has some level of stretch, usually in either width or length only. Stretch enables some immersion into the support surface. A fabric that can be stretched only in length or width is usually referred to as 2 way stretch.

## Multi-Stretch Fabric

Multi-stretch fabrics stretch in both length and width directions, thus enabling greater immersion into the support surface. This is also called a 4-way stretch.

## Moisture Vapor Permeable (MVP) Cover

The ability of a material (usually PU coated fabrics) to allow moisture vapor from the skin to pass through the fabric and away from the patient, helping to keep the patient cool and dry.

## Moisture Vapor Transmission Rate (MVTR)

The rate at which a vapor can transfer through a material, usually a cover material. Different materials have different MVTR's. The higher the MVTR, the more effective it is at allowing vapor to move away from the individual.

## Microclimate Cover

A microclimate cover is a PU coated fabric that provides higher than standard rates of MVTR. For example. LINET®'s Microclimate cover allows up to 10 times higher MVPR rates than standard polyurethane-coated fabrics.

## Bacteriostatic Cover

Contains a special additive that protects the polyurethane coating from the growth of bacteria. This is used in LINET®'s Microclimate cover.

## Fungistatic Cover

Incorporates a special additive that protects the polyurethane coating from the growth of fungus. This is used for LINET®'s Microclimate cover and it can also be applied to foams.

# Portfolio of Mattresses

## Active and Hybrid Mattresses

## Passive Mattresses



Virtuoso®



OptiCare®



Symbioso



Air2Care



ProphyCair



CliniCare® 100 HF



CliniCare® 30



CliniCare® 20



CliniCare® 10



PrimaCare® 20



PrimaCare® 10



EffectaCare® 20



EffectaCare® 10

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# Pressure Care and Support Surfaces



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- (1–3) Pressure Injury Fact Sheet, NPIAP, [www.npiap.com](http://www.npiap.com)
- (4–9) National Pressure Injury Advisory Panel September 2016, [www.npiap.com](http://www.npiap.com)
- (10) Pressure Injury Fact Sheet, NPIAP, [www.npiap.com](http://www.npiap.com)



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