JYSK STANDARD

Flexible foam

Scope

This standard describes requirements for flexible foam used in JYSK products.

Change-log

Section	Changes
All	General revision: • New standard format. • Updated wording (Substance and requirements remain the same). • Updated tables and references. • Descriptive texts stated as notes. Significant changes in wording is highlighted in red.
3	Indentation factor requirements moved to chapter 3.3.
6	Updated requirements on tensile strength and elongation at break.

Contents

1 Resilience

The nominal resilience of foam must be specified according to ***ISO 8307***.

Notes:

If resilience is not specified by the supplier JYSK will assume the resilience according to *Table 1*.

The specified/assumed nominal resilience is used to determine several other requirements.

Resilience is an indicator of the surface elasticity and springiness.

Testing is performed by dropping a steel ball onto the foam sample from a specified drop height and measuring rebound.

The resilience is expressed as the rebound height in percent of the initial drop height.

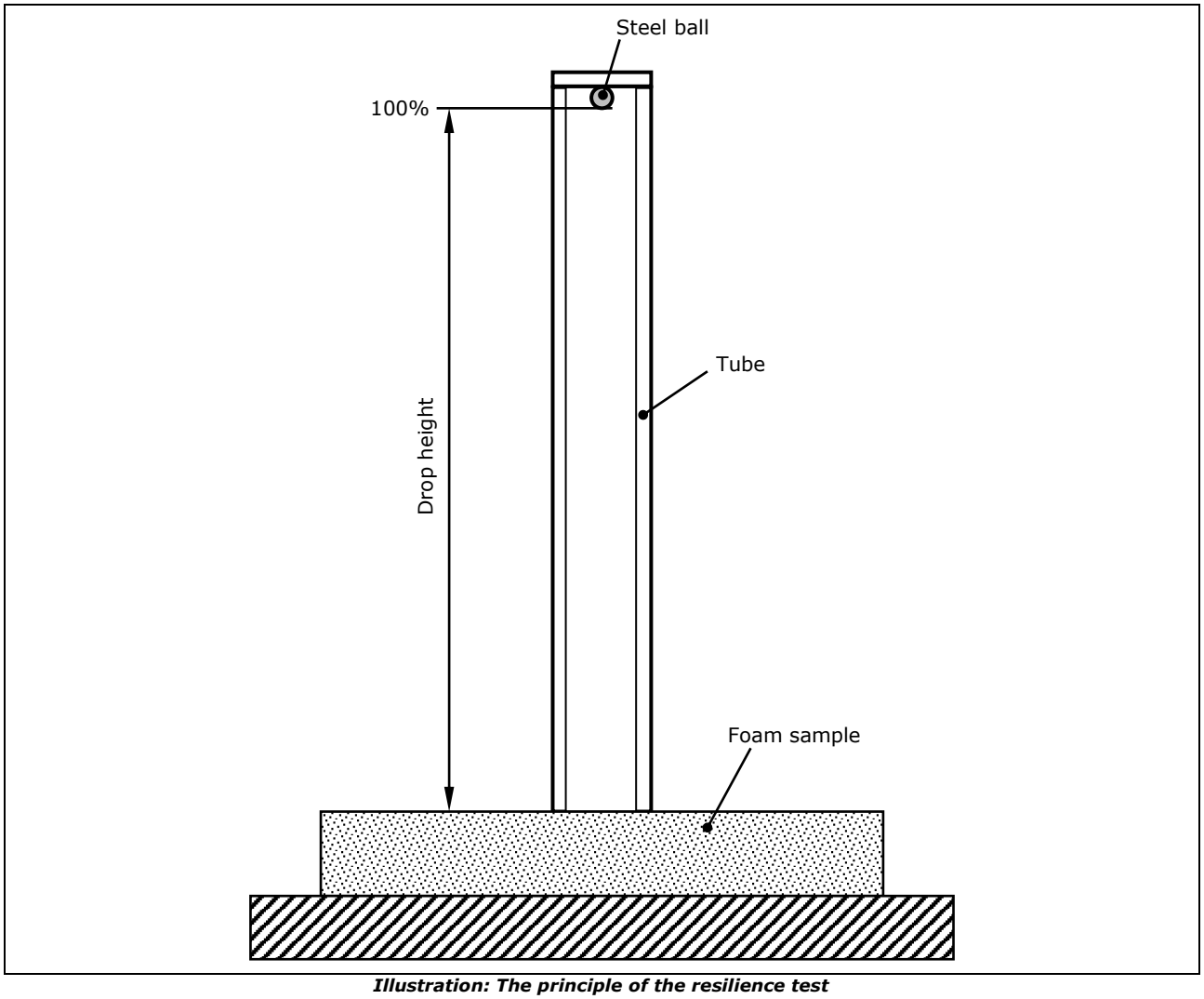

Illustration: The principle of the resilience test

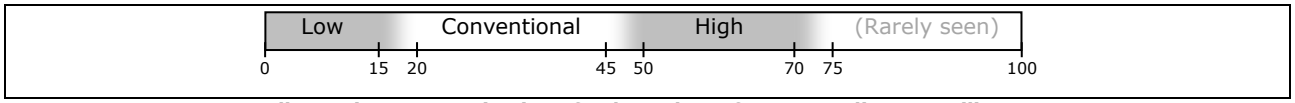

Illustration: Categorization of polyurethane foam according to resilience

Polyurethane			Latex
Low-resilient • Memory foam • Viscoelastic foam	Conventional • Standard polyether	High-resilient • Cold foam	
R≤20	20<R<45	R≥45	R≥50

Table 1 - Assumed nominal resilience (R) of foams if not specified by supplier

2 Density

The nominal density of foam must be specified in kilograms per cubic metre [kg/m3] according to ***ISO 845*** using "standard atmosphere – a".

Notes:

Density is mass per volume and can be defined by the following formula:

$\rho = \frac{m}{V}$

Where:

ρ is the density

m is the mass

V is the volume

The density measured on foam is technically an 'apparent density' as foams are inherently not solid materials.

'Apparent density' means cellular mass per unit volume of a sample such as a foam block.

An approximated test based on similar principles is simple to recreate using a suitable weighing scale.

Specified foam densities must comply with the minimum densities stated in *Table 2*.

Polyurethane			Latex
Low-resilient	*Conventional*	*High-resilient*	
≥30	≥18	≥23	≥55

Table 2 – Minimum (nominal) densities of foam [kg/m³]

Delivered foam must comply with the specified nominal density ±10% unless otherwise agreed upon with *CAM* and *JYSK C&Q*.

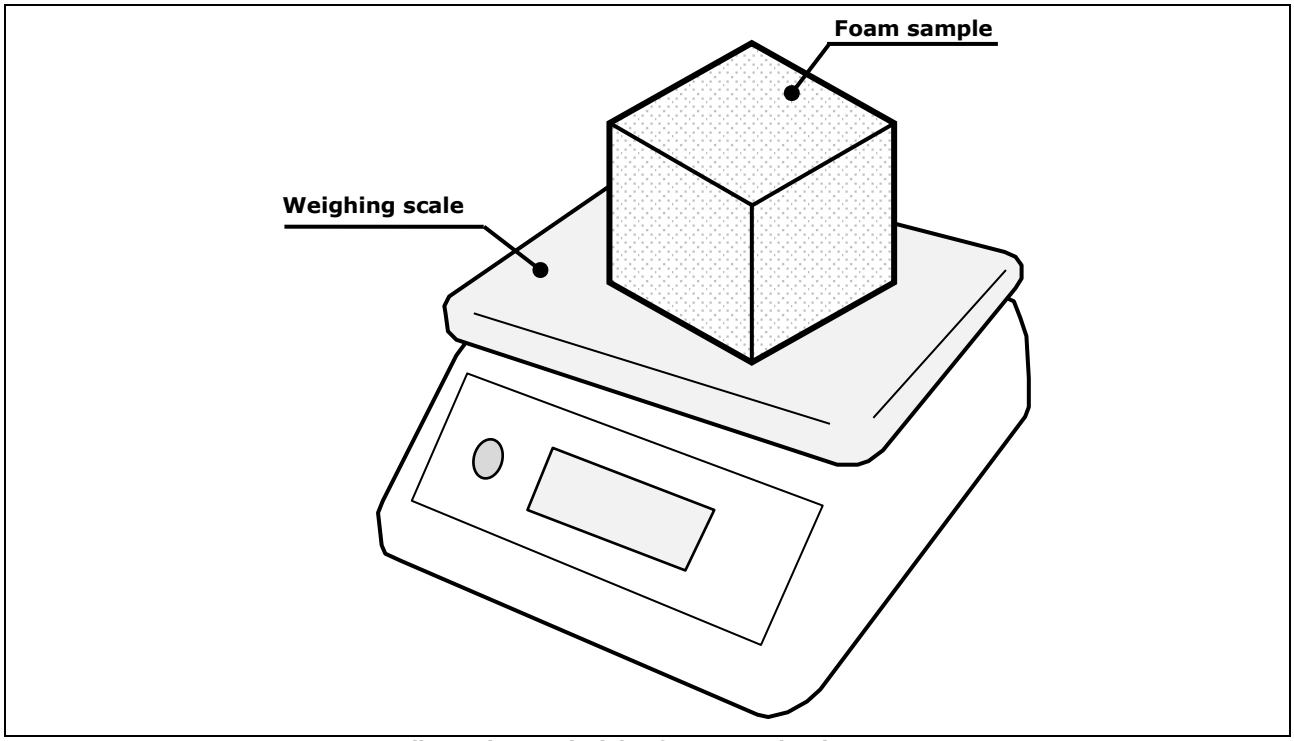

Illustration – Principle of apparent density test

3 Hardness

The nominal hardness of foam must be specified as *indentation hardness* according to *3.1* and/or *compression hardness* according to *3.2*.

Notes:
Hardness indicates the load-bearing properties of a foam and how it will feel for the end user.
Indentation hardness and *compression hardness* are not to be directly converted!

Delivered foam must comply with applicable requirements in *Table 3* and *3.3* unless otherwise agreed upon with *CAM* and *JYSK C&Q*.

General foam requirement	±20%
Foam in mattresses and beds	±15%

Table 3 - Maximum tolerance on specified hardness

3.1 Indentation hardness

Indentation hardness must be specified in Newton [N] according to ***ISO 2439*** - *Method B* (40% indentation / 30 second hold period).

Notes:
Indentation hardness is a measure of the load bearing properties of a foam when pressure is applied on an area smaller than the full sample surface.
Other common names for *indentation hardness* are:

- *Indentation Force Deflection* (IFD)
- *Indentation Load Deflection* (ILD)

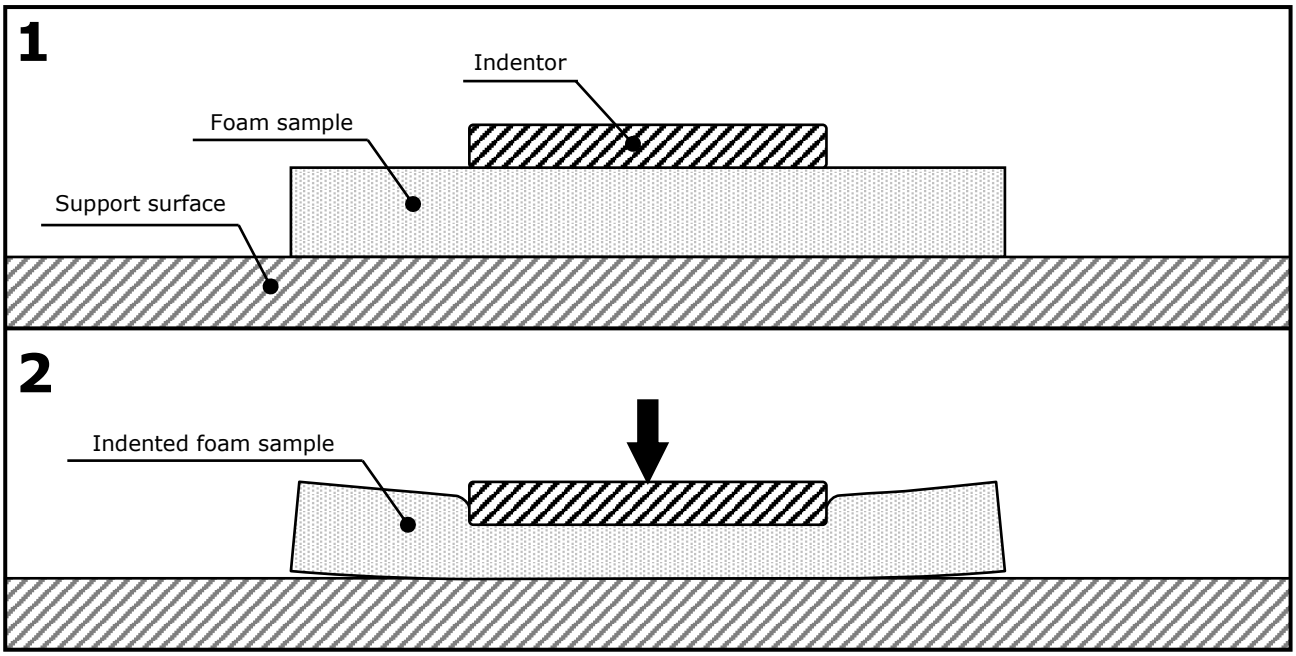

Illustration: The principle of indentation hardness testing.

3.2 Compression hardness

Compression hardness must be specified using the *compression stress value* (CV_{40}) measured in kilopascal [kPa] according to ***ISO 3386-1***.

Notes:

Compression hardness is a measure of the load bearing properties of a foam when pressure is applied on the complete area of the sample.

Other common names for *compression hardness* are:

- *Compression Load Deflection* (CLD)
- *Compression Force Deflection* (CFD)

$1\ kPa = 1000 \frac{N}{mm^2}$

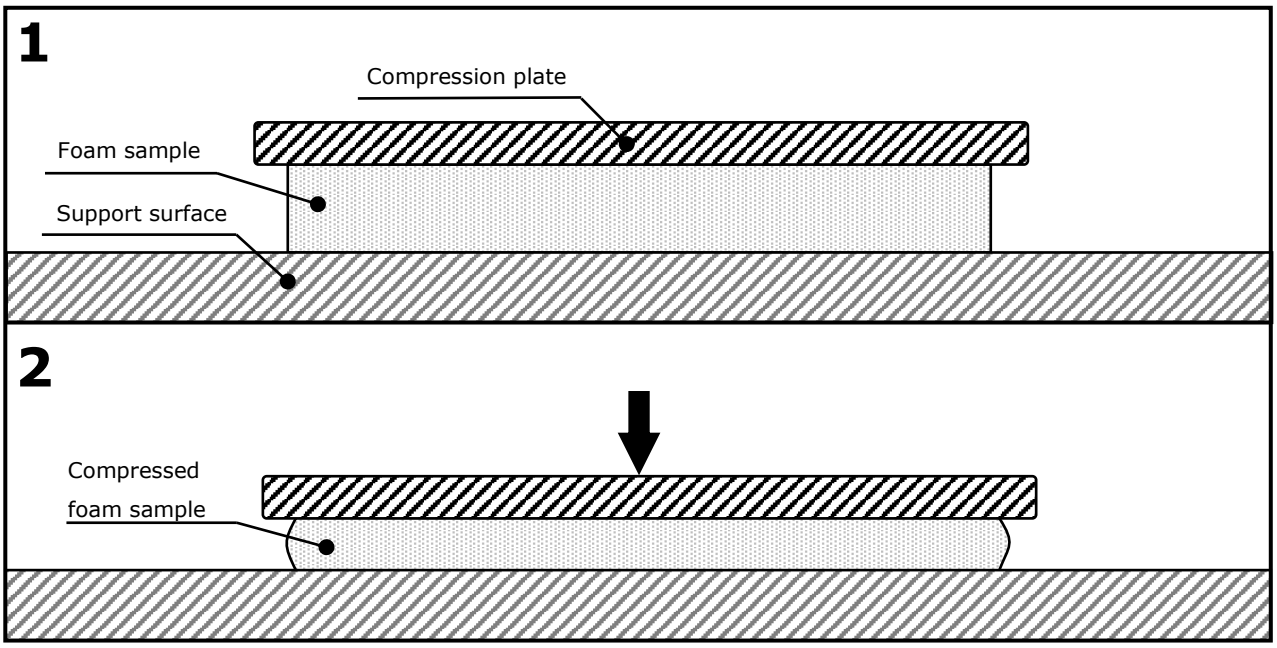

Illustration: The principle of compression hardness testing.

3.3 Indentation factor

Delivered foam must comply with applicable requirements in *Table 4* when tested according to ***ISO 2439*** – *Method B*.

Notes:

The indentation factor is an indicator of how a foam "cushions" and "supports".

Definition: $Indentation\ factor = \frac{HB_{(65\%/30s)}}{HB_{(25\%/30s)}}$

Where:

$HB_{(65\%/30s)}$ is the hardness recorded at 65% indentation and 30 second hold period

$HB_{(25\%/30s)}$ is the hardness recorded at 25% indentation and 30 second hold period

Other common names for indentation factor are:

- Support factor
- Compression modulus
- Deflection factor

Polyurethane			*Latex*
Low-resilient	*Conventional*	*High-resilient*	
n/a	≥1,8	≥2,2	≥2,4

Table 4 - Foam specific indentation factor requirements

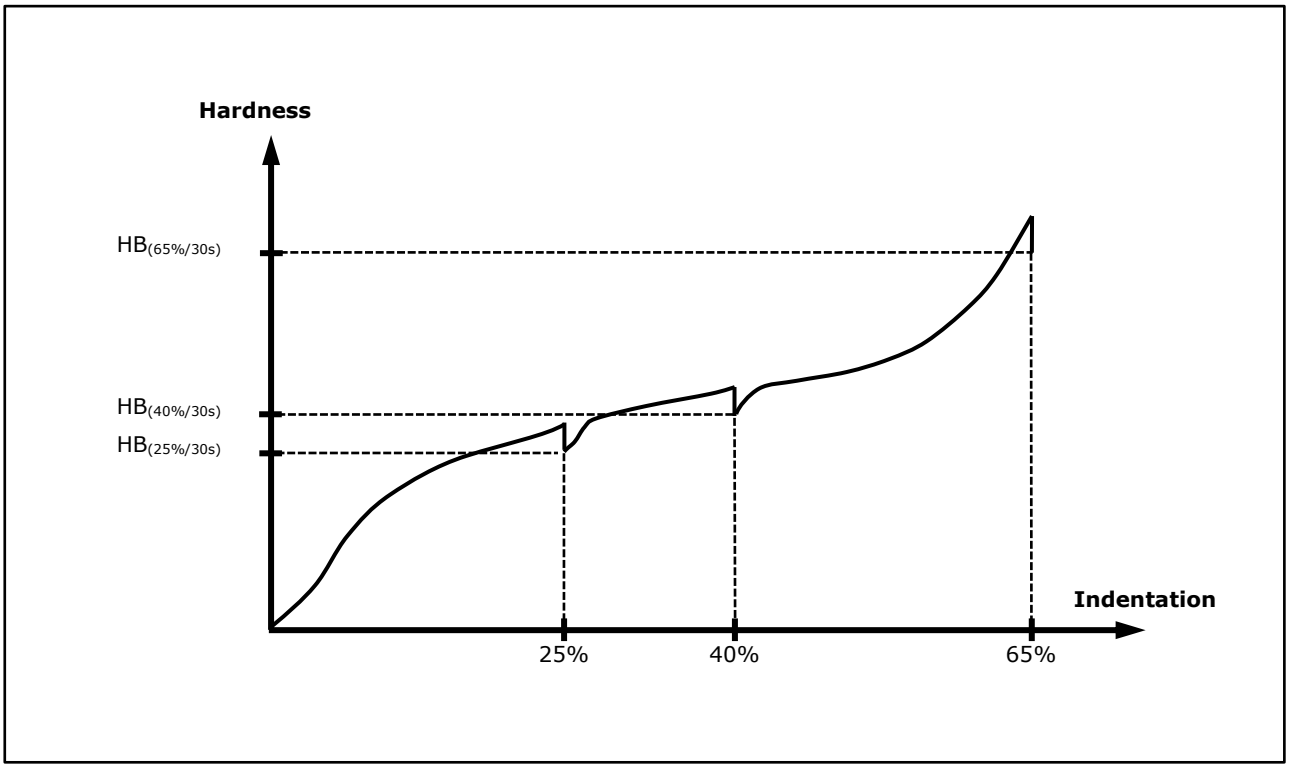

Illustration: Typical measurement characteristics

4 Compression set (Dry conditions)

Delivered foam must comply with applicable requirements in *Table 6* and *Table 7* when tested according to ***ISO 1856*** - *Method A* using the configuration stated in *Table 5*.

Notes:

Compression set is the difference between initial and final thickness of a foam sample after compressed storage in a clamping device under certain conditions.

Definition: $Compression\ set = \frac{d_o - d_r}{d_o}$

Where:

d_o is the initial thickness of the sample in millimetres [mm]

d_r is the thickness of the foam sample after recovery in millimetres [mm]

JYSK uses compression set as an indicator of a foam's ability to withstand compressive forces applied during daily use.

Requirements apply in the compression direction of the foam in the actual product.

Time	22 hours
Temperature	70°C
Compression	50%

Table 5 – Test configuration for compression set (Dry conditions)

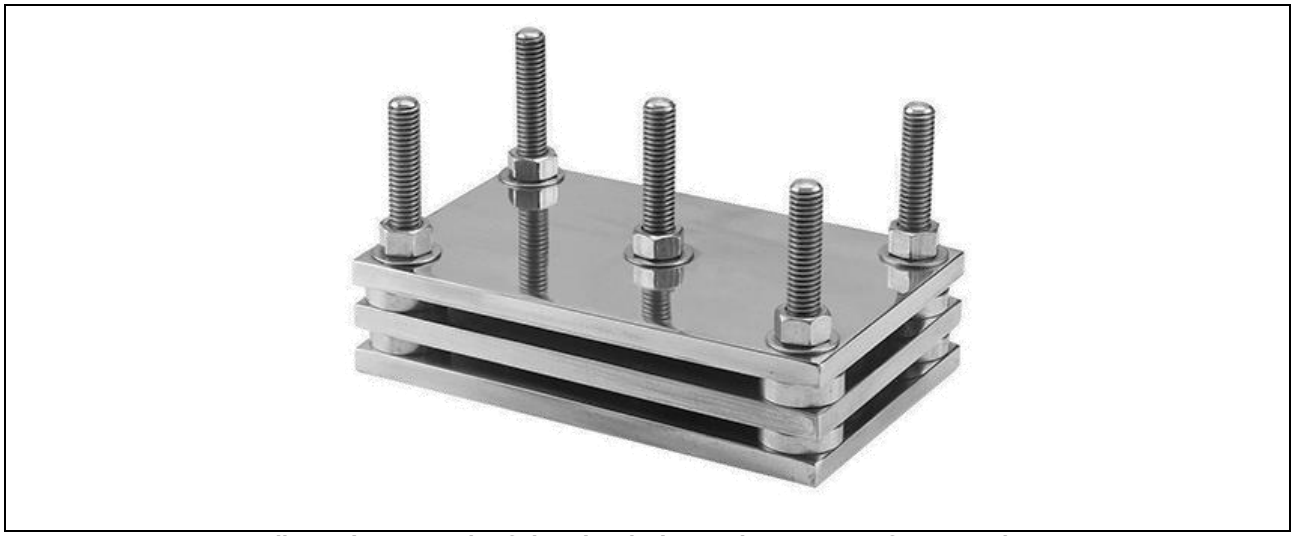

Illustration: Example of clamping device used to compress foam samples

Density (D) - (See *2*)	**Resilience** (R) - (See *1*)	
	R>20	R≤20
D<20	≤9%	≤12%
20≤D<25	≤8%	
25≤D<30	≤7%	
30≤D<35	≤6%	
D≥35	≤5%	

Table 6 - Maximum compression set (Dry conditions) according to specified density and resilience

Product type	**Compression set (Dry conditions)**
Mattresses and beds (When R>20 - See *1*) • Foam cores • Foam on lying surfaces	≤7%

Table 7 - Product-specific requirements

5 Dynamic fatigue

Delivered foam must comply with the requirements stated in *Table 8* and *Table 9* when tested according to ***ISO 3385***.

Notes:

Dynamic fatigue is the ability of a foam to withstand dynamic loads.

Foams with a resilience ≤20 are not subject to dynamic fatigue requirements as slow rebound conflicts with the test method.

Density (D) - (see *2*)	**Resilience** (R) - (see *1*)		
	R≥45	45>R>20	R≤20
D≤25	≤6%	≤7%	n/a
25<D≤30	≤5%	≤6%	
D>30	≤4%	≤5%	

Table 8 - Maximum loss of thickness of foam according to specified density and resilience

Density (D) - (see *2*)	**Resilience** (R) - (see *1*)		
	R≥45	45>R>20	R≤20
D≤25	≤35%	≤45%	n/a
25<D≤28	≤30%	≤40%	
28<D≤35	≤25%	≤35%	
D>35	≤20%	≤30%	

Table 9 - Maximum loss of hardness of foam according to specified density and resilience

6 Tensile strength and elongation at break

Delivered foam must comply with the requirements stated in *Table 10* when tested according to ***ISO 1798*** using *test piece – Type 1*.

Notes:

Tensile strength and elongation at break are two parameters used to describe the tensile characteristics of foam.

Tensile characteristics are mainly used as indicators of other related qualities and properties of the foam.

Tensile strength (TS) is measured in kilopascal [kPa] ($1\ kPa = 1000 \frac{N}{mm^2}$)

Elongation at break (E_b) is measured in % of original gauge length ($E_b = \frac{L-L_0}{L_0} \cdot 100\%$)

Minimum tensile strength (TS) according to specified density and resilience	**Density** (D) - (see *2*)	**Resilience** (R) - (see *1*)		
		R≥45	45>R>20	R≤20
	D≤30	≥70	≥80 (≥55)	≥50 (≥40)
	D>30	≥80 (≥70)	≥90 (≥60)	
	Note: The numbers in paragraphs apply only to combustion-modified foam for the UK/IE markets.			
Minimum elongation at break (E_b)	≥80%			

Table 10 – Requirements for tensile strength and elongation

7 Determination of ash

Delivered foam must show a mass of ash residue after incineration in accordance with *Table 11* when tested according to ***ISO 3451-1 -*** *method A* using a calcining temperature of 700±25°C.

Polyurethane foam	≤5%
Latex foam	≤8%

Table 11 – Maximum residue after incineration

8 Additional foam specifications

Additional foam specifications can be agreed upon according to *Table 12*.

Parameter:	**Standard:**	
Tear strength	***ISO 8067***	
Air permeability	***ISO 7231***	
Compression set (Humid conditions)	***ISO 13362***	Time: 22 hours Temperature: 40°C Compression: 70% Relative humidity: 95% to 100%

Table 12 – Additional specifications