



## Factsheet n° 22

# Closed- and Open-Cell Spray Polyurethane (PU) Foam

## DIFFERENCES BETWEEN CLOSED-CELL AND OPEN-CELL SPRAY POLYURETHANE (PU) FOAM

Spray Polyurethane (PU) Foam is a cellular product. The cell structure and more particularly the open (closed) cell content will have significant influence on the product performance and the final applications.

Whilst a closed-cell foam should contain more than 90% closed cells, there is no official definition in Europe for open-cell foam. A typical system would have less than 20% of closed cell-content. However, higher ratios may also be possible.

Class	Content of closed cells (%)
<b>CCC1</b>	<b>&lt; 20 %</b>
CCC2	20 % to 80 %
CCC3	> 80 % to 89 %
<b>CCC4</b>	<b>≥ 90 %</b>

**Closed-cell content classification according to EN 14315-1**

This factsheet outlines the properties of the two most commonly used types of SPF in Europe: closed-cell foam (CCC4) with a density of 35-60 kg/m<sup>3</sup>, and open-cell foam (CCC1) with a density of 8-15 kg/m<sup>3</sup>. Other systems with intermediate densities or closed-cell contents (CCC2, CCC3) are outside the scope of this document.

The manufacturer and the installer have the obligation to properly inform their customers about the properties of their product and its suitability for different construction methods and end-use applications.

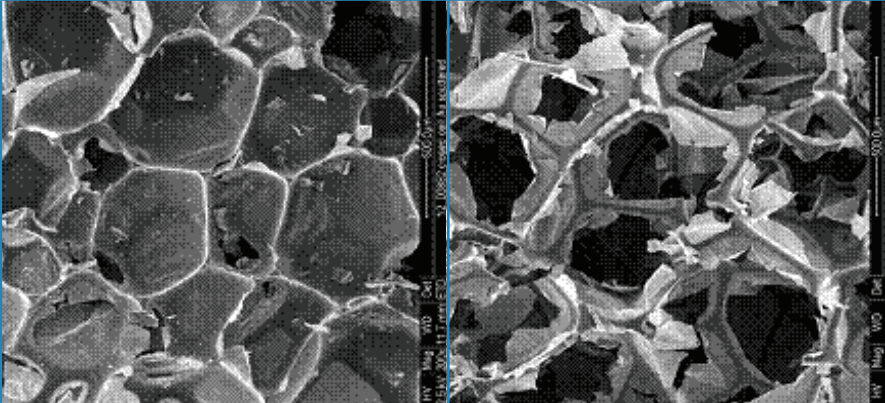
It is important to note that both types of foam are covered by the scope of EN 14315-1 **[1]**. All performance claims must therefore result from test methods referred to in that standard. As of November 2014, all PU spray foam systems must bear a CE mark according to EN 14315-1.

All declared thermal conductivity values (lambda values) should be aged values determined by using the statistical rules laid down in EN 14315-1 and SG19 position paper NB-CPR/SG19-22/213r1.

The table below summarises the main characteristics of closed- and open-cell foams.

Property	Closed-cell [CCC4]	Open-cell [CCC1]
Closed-cell content (according to ISO 4590)	≥ 90 %	< 20 %
Density (according to EN 1602)	35-60 kg/m <sup>3</sup>	8-15 kg/m <sup>3</sup>
Thermal conductivity (aged value according to EN 12667 and for thick products EN 12939)	0.023-0.028 W/m·K	0.035-0.042 W/m·K



Short-term water absorption (according to EN 1609, method B)	$< 0.3 \text{ kg/m}^2$	Limit values depend on open-cell composition <b>[2]</b>
Water vapour resistance factor ( $\mu$ ) (according to EN 12086)	Medium permeability $50 < \mu < 150$	High permeability $\mu < 15$
Air flow resistance	Closed-cell foam acts as an air barrier and ensures airtightness (with minimum thickness applied)	Open-cell foam acts as an air barrier and ensures airtightness
Compressive strength (according to EN 826)	170-500 kPa	5-30 kPa
Strength and rigidity	Higher strength and rigidity. Depending on density, may add structural strength to certain load-bearing building elements (in particular timber constructions)	Lower strength and rigidity (will not add structural strength to load-bearing elements)
Acoustic absorption coefficient (according to EN ISO 11654)	Medium sound absorption 0.3	High sound absorption 0.5
Reaction to Fire Classification <b>[3]</b> (according to EN 13501-1)	EuroClass E or F	EuroClass E or F
Blowing agent	Physical and reactive blowing agents	Reactive blowing agents
Picture of the cell structure		

## Notes

- [1] Thermal insulating products for buildings – In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products – Part 1: Specification for the rigid foam spray system before installation
- [2] Specific open-cell products can reach water absorption values as low as  $< 0,3 \text{ kg/m}^2$
- [3] Classifications for naked foam only. Classifications for end-use application may reach up to B,s1-d0