ZOTEFOAMS

Technical Information Sheet TIS01F

Specification

ZOTEFOAMS ZOTEK® F BRAND FOAM PRODUCTS

The information below is the Zotefoams plc general specification for each of the products identified, unless otherwise agreed between Zotefoams and the customer. Normally, the foam attributes and properties would be expected to fall well within the limits given in this document, but occasionally properties may approach these limits.

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This specification may be amended periodically in line with our policy of continual improvement. For critical applications or significant new projects, we would recommend that customers contact the Zotefoams Sales department before ordering.

GENERAL INFORMATION

The ZOTEK® F brand products comprise a range of crosslinked, closed cell foams, physically blown using pure nitrogen gas and based on the polymer PVDF. All grades are thermoformable, though the degree of detail and complexity of moulding possible will vary between grades.

The ZOTEK® F brand products are manufactured and sold as essentially rectangular sheets (sometimes known as buns or blocks) in a range of sizes, all having process skin surfaces. Talc residues or other processing aids may be present on the skin surfaces.

All information within this specification refers to the products in the form of sheets with process skins unless otherwise stated.

PRODUCT DESCRIPTIVE CODES

All ZOTEK F® foam products are identified by a descriptive code based on a system that distinguishes the polymer category, nominal density, variant type (if applicable) and colour in that order.

Density Code: Two or three digits describing the nominal Skin/Skin density (in kg/m³)

Variant Code: Where special properties have been imparted to foam, a variant code is used to identify these:

Lower Smoke Emission	High Temperature	Flexible	Rigid	Semi Rigid	Extra Rigid
LSS	HT	F	R	SR	XR

***Cell Size Code*:** Where grades are made available in more than one cell size range [see Table 1 for product cell size ranges], then an additional description code is used to identify the cell size of the product:

e.g. *ZOTEK F30 – Base product coding (no code suggests standard cell size)*

ZOTEK F30 LC – Large cell variant

Cell size has no implication on density. In the example above the density of both ZOTEK F30 and ZOTEK F30 LC products should be equivalent (accepting normal density distribution) and only the cell dimensions will have changed.

It is important to recognise that as foam density increases then product cell size, as a rule, will increase. This is more clearly shown in Table 1

Colour Code: Full colour name in English.

As an example of all the above:

ZOTEK® F42 HT LSS White – *ZOTEK branded PVDF foam with a nominal foam density of 42 kg/m³, higher temperature variant polymer with lower smoke performance and white in colour.*

PRODUCT TYPES

Sheets, rolls and laminated sheets are classified as:

Skin/Skin (S/S)	Skin/Cell (S/C)	Cell/Cell (C/C)
Product retains both process skin surfaces.	Product has one process skin removed.	Product has both process skins removed.

Note: *Any product may have had one or more edge skins removed.*

Fabricated products may then be further subdivided into:

- ***Untrimmed*** - Produced from full size sheets but supplied with untrimmed edges. The useable size will be subject to the tolerances in Tables 5 & 6.

Note: *Due to sheet alignment some loss on overall size will occur.*

- ***Trimmed:*** Fabrications have edges trimmed to size and will be useable over the whole size supplied subject to the tolerances in Tables 5 & 6.

Note: *When ordering fabricated sheets and rolls it is necessary to specify the finish required using a combination of the above, e.g. untrimmed c/c, trimmed s/s, etc.*

PRODUCT SIZE

Sheets [Test method: BS EN ISO 1923:1995]

Sheet sizes are defined by length, width and thickness. Nominal dimensions are the dimensions specified on the acknowledgement of order. For skin/skin sheets nominal dimensions (process skins are considered an integral part of the sheet) are the minimum dimensions and will always be met or exceeded. For cell/cell and skin/cell tolerances see “Fabricated Items” below.

A characteristic of ZOTEK® F and other closed cell foams is the fact that they will reversibly change dimensions with varying temperatures and pressures (climatic conditions). The nominal dimensions acknowledged on the order will be met or exceeded when sheets are equilibrated at standard conditions. (23°C +/- 2°C, standard pressure at sea level).

Relating to Sections 4 and 6 the following applies; A skin/skin sheet showing any surface fault or defect is considered to be in specification providing that a specification cell/cell sheet can be obtained (e.g. a 2000 mm x 1000 mm x 27 mm specification cell/cell sheet shall be obtainable from nominal 2000 mm x 1000 mm x 30 mm skin/skin sheet).

Fabricated Items [Test method: BS EN ISO 1923:1995]

Fabricated items will be delivered in line with the dimensions and tolerances agreed prior to order. For information on general thickness tolerances for split (skived) sheets and how this is assessed in our process please see TIS01 – Annex A.

Tolerances for laminated blocks are provided in TIS01 – Annex B

PRODUCT CHARACTERISTICS

Quality Control

- Zotefoams quality control procedures cover testing of a random sample from every batch manufactured for the following properties:

  - ***Density Skin/Skin*** *[Test method: BS EN ISO 7214:2012]*

  Foam densities are measured with process skins intact unless otherwise stated. The density range applies irrespective of foam sheet size or colour.

  - ***Cell Size*** *[Test method: Zotefoams Internal]*

- Cell size is determined by measuring the diameter of ten representative cells of a sample and reporting the average value.

  - ***Voids*** *[Test Method: Zotefoams Internal]*

  The method takes into account the perceived seriousness of the void in so much as small voids (≥1 - ≤ 2 mm diameter) are assessed by physical count of an area of a square metre, medium sized voids (>2 - ≤ 4 mm diameter) are counted and then the sum of the cube of all the diameters is quoted per square metre (i.e. one 3 mm diameter void in 1 m^2 = 27). Large voids (>4 - ≤ 5 mm & >5 mm in diameter) are physically counted over an extended area of 15m^2.

- Void levels are summarised in categories. The category description and the void levels these represent are given in Table 2. Specifications for these properties for our standard products can be found in Table 1

General Information

- Typical values for other product characteristics such as compression and tensile properties are published on our Product Information documents with corresponding test methods utilised to measure them. These typical values represent the average values of test results carried out on random batches samples from our process. Where appropriate special properties such as flammability or electrical conductivity will also be provided on our Product Information documents.
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- These documents are intended to enable comparison of the performance of our products to judge the most suitable grade and range when selecting a foam for an application.

Specification Agreements

- Mechanical properties for foam are not solely defined by the density and polymer used, therefore our Product Information documents quote typical values not a specification. For technical applications where customers have specific requirements and require mechanical properties to meet a specification Zotefoams will negotiate a customer agreement with limits. These limits are set to ensure the customer needs are achieved within the product design stage and within the manufacturing process.

Test reports

- Zotefoams provides a statement of compliance that material has been manufactured in line with the specification laid out in this document on every delivery note. Where customers require batch release testing to their specific requirements provision of a Manufacturers Test Report can be included in a customer agreement.

PRODUCT APPEARANCE

- ***Voids*** *[Test Method: Zotefoams Internal]*

  Void measurements are performed as described in section 5i above and void categories are given in Table 1. Zotefoams categorises products into by void type and level. All ZOTEK F products are category C. A description of this void level is given in Table 2.

- ***Cell Size*** *[Test method: Zotefoams Internal]*

  Cell size ranges by product are given in Table 1.

- ***Colour*** *[Test method: Zotefoams Internal]*

The colour shall be essentially visually uniform within the foam structure of a sheet. However, variation may be found between production Lots and/or individual sheets. A characteristic of PVDF polymer is the presence of occasional brown specs, a minor effect from the manufacturing process. They manifest themselves as brown spots in the foam. Zotefoams reject raw material with excessive brown spots but a small number should be expected. The average area of brown spots per sheet per batch shall not exceed those in Table 1. No single brown spot shall exceed 30mm in diameter.

The colour appearance of product will be affected by cell size; for the same colour product, larger cell size appears darker, smaller cell size appears lighter. Perceived colour will therefore be affected by the cell size ranges in Table 1.

ZOTEK® F White foam is based on the natural colour of the PVDF resin purchased. This varies from a white through off white to a cream/pink colour. The colour tends to be consistent through a single batch purchased, but can vary from batch to batch, where sheets placed next to each other from two batches can have an apparent difference.

- ***Surface Condition*** *[Test method: Zotefoams Internal]*

The products as manufactured will normally show an embossed pattern on one process skin surface. All process skins may occasionally have slight surface marks, indentations or discolouration. Talc residues, water, other processing aids or paint marks used by Zotefoams plc during manufacture may be present on the skin surfaces and/or edges. No guarantee is offered in relation to the skin surface.

- ***Internal Condition*** *[Test method: Zotefoams Internal]*

The products as manufactured may show internal patterns and markings within the cellular structure. Such appearance faults may be very subtle and would not normally affect foam performance.

- ***Sheet Flatness (Cell/ Cell)*** *[Test method: Zotefoams Internal]*

When sheets are split some waviness may occur at the edges of the sheet. The amplitude and frequency are dependent on the thickness of the split sheet, the original sheet thickness, the product density and the process history of the sheet. Typically, a 6 mm thick split from a 30 mm flat sheet would be expected to have 1.5 to 2.5 waves along its length. These would be more frequent with a 50mm thick sheet and less frequent with 15 mm splits or for trimmed sheets. This waviness would not normally affect the sheet performance and may be further alleviated by trimming of the product prior to splitting through the thickness – note that minimum size specifications detailed earlier (sections 4, 5 & 6) will apply.

- ***Distortion / Bowing (skin/ skin)*** *[Test method: Zotefoams Internal]*

Distortion is the maximum curvature of a sheet and is the measured difference between the apparent thickness over the curvature and the actual thickness of the sheet. Distortion is measured using a standard measuring table and for all skin/skin sheets shall be no more than 20 mm.

Table 1 - Specifications for Density; Cell Size; Void Category; & Brown Spots for each ZOTEK F Product

Product Reference		Sheet Density[1] (kg/m³)		Cell size (mm)		Void Category (See Table 2)	Average Area of Brown Spots (mm²)
Grade	Variant	Min	Max	Min	Max	A – K	Max
F30		30	38	0.15	0.37	C	500
F35		28	38	0.15	0.4	C	500
FOSU	F	29	36	0.15	0.37	C	500
FOSU	SR	32	40	0.05	0.37	C	500
FOSU	R	49	92	0.1	0.7	C	500
FOSU	XR120	105	150	0.1	0.7	C	500
FOSU	XR150	120	165	0.1	0.8	C	500
F38HT		36	44	0.2	0.3	C	500
F40HT		35	44	0.1	0.6	C	500
F41HT		36	44	0.05	0.6	C	500
F42HT	LSS	31.5	44	0.05	0.35	C	1000
F74HT		51	94	0.1	0.7	C	500
F75HT		51	94	0.1	0.7	C	500
F120HT		105	150	0.1	0.7	C	500
F150HT		120	165	0.1	0.8	C	500

Table 2 - Maximum Void Levels by Category

	≥1 - ≤ 2 mm [No./m²]	>2 - ≤ 4 mm [(D)³/m²][2]	>4 mm,[3] [No./15m²]
Category C	80	80	1

D= *Void diameter in mm on any split surface.*

[1] Cell/cell densities are lower than the densities quoted. The difference will vary depending on grade and sheet thickness.
[2] Sum of the cube of the void diameters (in mm) per unit area of foam.
[3] Holes >5 mm are allowed provided they do not affect service performance and are included in the >4 mm count. Single sheets cannot be checked against this standard.

Exclusion of Liability

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