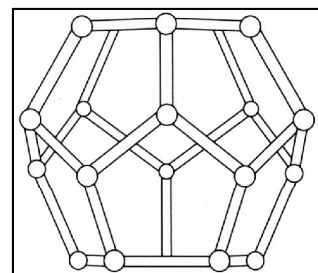


Technical Information Sheet – TIS 01 (previously T7) Product Specification



The information in this document relates specifically to product expanded in the Zotefoams plc plant at Croydon, UK. Products expanded in the Zotefoams Inc plant at Walton, USA, are covered in document TIS 01A.

ZOTEFOAMS AZOTE 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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1. GENERAL INFORMATION

The Azote brand products comprise a range of crosslinked, closed cell foams, physically blown using pure nitrogen gas, and sold under the trade marks Plastazote[®], Evazote[®], Propozote[®] and Supazote[®]. All grades are thermoformable, though the degree of detail and complexity of moulding possible will vary between grades.

The Azote 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.

2. PRODUCT DESCRIPTIVE CODES

Each Azote brand foam product is identified by an individual grade descriptive code based on a system that distinguishes the polymer, nominal density, variant type (if applicable) and colour in that order.

i) **Polymer Code:** (first two letters)

Plastazote Foam	Evazote or Supazote Foam
Polyethylene	Polyethylene copolymers
LD, MP, HL, HD, PK	EV, VA, EM

ii) **Density Code:** 2 or 3 digits describing the nominal density (in kg/m³)

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

Electrically Conductive	Static Dissipative	Flame Retardant
CN	SD	FR, FM, FB

iv) **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. LD33 - Base product coding (no code suggests standard cell size)
LD33 LC - Large cell variant

Cell size codes:	Large Cell	-	LC
	Intermediate Cell	-	IC
	Medium Cell	-	MC
	Standard Cell	-	SC
	Fine Cell	-	FC
	Superfine Cell	-	SF

Cell size has no implication for density. In the example above the density of both LD33 and LD33 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.

v) Crosslinking Code: Some special grades are produced at greater or lesser crosslink levels than standard. Where the degree of crosslinking is considered standard, then no reference will be made in the grade code. The additional coding descriptions for crosslinking variants are designated as follows:

SV		- more lightly crosslinked product
SM		
No code		- standard level
TM		
TV		- more highly crosslinked product

vi) Colour Code: Full colour name in English.

vii) As an example of all of the above:

Plastazote® LD45 FR Charcoal = Azote branded LDPE foam with a nominal foam density of 45 kg/m³, flame-retardant and charcoal in colour.

3. PRODUCT TYPES

i) 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.

ii) 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 Table 7.

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 Table 7.

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.

4. PRODUCT SIZE

i) Sheets [Test method : 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.

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 of nominal/minimum dimensions and thickness 3 mm less than the nominal/minimum sheet thickness 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).

ii) Fabricated Items [Test method : ISO 1923:1995]

Fabrication tolerances are shown in Tables 5, 6 & 7.

5. PRODUCT PROPERTIES

i) Density [Test method : BS ISO 7214:1998]

Foam densities are measured with process skins intact unless otherwise stated. Density ranges by product are given in Table 1. The density range applies irrespective of foam sheet size or colour.

ii) Mechanical Properties [Test method : Table 4 &/or Technical Data Sheets]

Technical data sheets are published listing a range of property values relating to Zotefoams Azote brand foam products. The data sheet property values are typical of the material and are intended to provide guidance to customers; they do **not constitute a specification** and should not be used for specification development. The data sheet property values however, in combination with details given in Table 4 do give the expected range of product properties.

Certain grades are produced with crosslink levels significantly different from standard, in order to provide special properties (such as enhanced



thermoformability or enhanced resilience). Such grades may deviate more substantially from data sheet indications - all necessary specification requirements for these products should be made and agreed in writing with Zotefoams plc Quality Assurance Department.

iii) Thermoformability [Test method : Zotefoams Internal]

The test involves compression moulding of a 28 mm thick piece of foam into a test mould having areas of different depth/width moulding (draw) ratios. Details of the test mould can be provided on request.

Products with nominal densities of 29 kg/m³ or less and conductive/static dissipative grades are typically thermoformable to a draw ratio 1:1.5 without losing structural integrity, e.g. by surface tearing. All other grades are typically thermoformable to a draw ratio of 1:2.5 and above.

Note: *Thermoformability is affected by many variables and under optimum moulding conditions thermoformability beyond these draw (depth:width) ratios may be achieved by specialists in the foam moulding field.*

6. PRODUCT APPEARANCE

i) Voids [Test Method : Zotefoams Internal]

The method takes into account the perceived seriousness of the void in so much as small voids (1 mm to 2 mm diameter) are assessed by physical count of an area of a square metre, medium sized voids (2 mm to 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 m² = 27). Large voids (4+ mm in diameter) are physically counted over an extended area of 15m².

The above are arranged into void categories and these categories are quoted for the different grades in Tables 1 and 2. The category description and the void levels these represent are given in Table 3.

ii) Cell Size [Test method : Zotefoams Internal]

Cell size ranges by product are given in Table 1.

iii) 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. 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.

iv) 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.

v) 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.

vi) Sheet Flatness [Test method : Zotefoams Internal]

When sheets are split some waviness may occur at the edges of the sheet. The amplitude and frequency is 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.

vii) Distortion [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, except HD and HL grades, shall be no more than 20 mm. For HD and HL grades the maximum distortion shall be no more than 30 mm.

TABLE 1 : SPECIFICATION FOR DENSITY, CELL SIZE AND VOIDS

PRODUCT REFERENCE		SHEET DENSITY ^a		CELL SIZE		VOID CATEGORY ^b
GRADE	VARIAN	MIN (kg/m ³)	MAX (kg/m ³)	MIN (mm)	MAX (mm)	A – K (see Table 3)
LD14	IC	14	18	0.6	1.2	C
LD15		14	18	0.2	0.6	C
LD15	IC	14	18	0.6	1.2	C
LD15	FM	14	19	0.2	0.6	C
LD15	FMSV	14	19	0.2	0.6	C
LD18		18	24	0.5	1.0	C
LD18	SC	18	24	0.25	0.8	C
LD23		19	25	0.15	0.45	B
LD24		19	25	0.15	0.45	C
LD24	MC	19	25	0.3	0.7	C
LD24	LC	19	25	0.9	1.6	C
LD24	FR	21	28	0.15	0.45	C

^a Cell/cell densities are lower than the densities quoted. The difference will vary depending on grade and sheet thickness.

^b Void categories refer to all current products at the date of issue that do not appear in Table 2.



PRODUCT REFERENCE		SHEET DENSITY ^a		CELL SIZE		VOID CATEGORY ^b
GRADE	VARIAN	MIN (kg/m ³)	MAX (kg/m ³)	MIN (mm)	MAX (mm)	A – K (see Table 3)
LD24	FM	19	26	0.15	0.45	C
LD24	FMSV	19	26	0.15	0.45	C
LD28		25	33	0.4	0.9	C
LD29		25	33	0.4	0.9	C
LD30		26	34	0.3	0.6	C
LD30	SD	25	35	0.2	0.6	F
LD32	CN	27	37	0.6	1.3	F
LD33		27	35	0.25	0.55	C
LD33	LC	27	35	0.9	1.6	C
LD33	FM	27	36	0.25	0.6	D
LD34		27	35	0.25	0.55	B
LD38		34	44	0.25	0.55	B
LD45		37	47	0.25	0.6	C
LD45	FR	39	49	0.25	0.6	F
LD45	IC	37	47	0.5	1.0	C
LD50	CN	43	58	0.6	1.1	E
LD52		43	55	0.4	0.8	C
LD60		51	66	0.35	0.9	C
LD70		60	76	0.35	0.9	B
VA25	MC	20	28	0.4	0.8	C
VA25		20	28	0.2	0.6	C
VA35	FC	29	39	0.2	0.5	C
VA35		29	39	0.3	0.7	C
VA44 ^c		39	49	0.3	0.7	B
VA65		57	74	0.5	0.9	C
VA80		63	85	0.5	1.0	C
EV30		28	38	0.3	0.7	C
EV45	CN	37	49	0.2	0.6	E
EV50		41	54	0.25	0.6	C
EV70	CN	61	81	0.4	0.9	F
EV120	CN	92	148	0.6	1.2	F
EM26		20	27	0.2	0.4	C
HD30		23	33	0.25	0.7	K
HD60		43	63	0.4	0.85	K
HD80		58	87	0.4	0.85	K
HD110		85	130	0.7	1.6	K
HD115		90	125	0.7	1.6	K
HL34		30	39	0.4	1.1	H
HL47		39	53	0.5	1.2	H
HL79		64	86	0.6	1.3	H
MP15 ^c		14	18	0.2	0.6	B
MP15 ^c	FR	13	18	0.6	1.2	F
MP24 ^c		17	29	0.1	0.3	B
MP33 ^c		28	40	0.15	0.5	B
MP34 ^c		28	40	0.15	0.5	B
MP45 ^c		38	49	0.15	0.5	B
PK24 ^c		18	26	0.2	0.5	H
PK33 ^c		27	37	0.2	0.45	H
PK45 ^c		43	54	0.25	0.55	H

^c Table 1 products in *italics* have provisional limits and may be subject to amendment as more data becomes available.

TABLE 2 : EXCEPTIONAL VOID CATEGORIES

PRODUCT REFERENCE		VOID
GRADE & VARIANT	COLOUR	CATEGORY
LD45	PINK	A
NOTE : For densities and cell sizes on this product see Table 1 above.		

TABLE 3 : MAXIMUM VOID LEVELS BY CATEGORY

	1mm < D < 2mm [No./m ²]	2mm < D < 4mm [Σ(D) ³ /m ²] ^d	4mm < D < 5mm ^e [No./15m ²]
Category A	16	80	1
Category B	50	80	1
Category C	80	80	1
Category D	170	80	1
Category E	120	80	1
Category F	50	200	1
Category G	80	200	1
Category H	80	200	3 ^f
Category J	500	200	1
Category K	300	120	3 ^f

D = Void diameter in mm on any split surface.

TABLE 4 – PROPERTY RANGE SPECIFICATIONS

Property	Sample	Test Method	Property Value Range
Compression Stress / Strain	cell/cell skin/skin	BS ISO 7214 : 1998 (1 st cycle) EN ISO 3386/1 : 1997 (4 th cycle)	85% to 115% of quoted data sheet value
Compression Set	cell/cell	BS ISO 7214 : 1998	≤ 120% of quoted data sheet value
Tear Strength	cell/cell	BS EN ISO 8067 : 1995	≥ 80% of quoted data sheet value
Tensile Strength	cell/cell	BS ISO 7214 : 1998	≥ 80% of quoted data sheet value
Elongation at Break	cell/cell	BS ISO 7214 : 1998	≥ 80% of quoted data sheet value

^d Sum of the cube of the void diameters (in mm) per unit area of foam.

^e Voids greater than 5 mm are not expected to be found except in categories H and K (see note (f) below). Any sheets in other categories found containing such voids are rejected.

^f Holes >5 mm are allowed provided they do not affect service performance and are included in the 4-5 mm count. Single sheets cannot be checked against this standard.



TABLE 5 - FABRICATION TOLERANCES – SPLITTING

<u>SPLITTING FROM UNLAMINATED SKIN/SKIN SHEETS^g</u>				
Nominal Split Thickness (mm)	<u>HD, HL & SD Grades</u>		<u>All Other Grades</u>	
	Tolerance (mm)		Tolerance (mm)	
	Cell/cell	Skin/cell	Cell/cell	Skin/cell
≤ 5mm	± 0.4	N/A	± 0.3	N/A
>5 to ≤ 10mm	± 0.5	± 1.0	± 0.4	± 1.0
>10 to ≤ 15mm	± 0.8	± 1.5	± 0.6	± 1.0
>15 to ≤ 20mm	± 1.0	± 1.5	± 0.8	± 1.5
>20 to ≤ 30mm	± 1.0	± 2.0	± 1.0	± 2.0
>30 to ≤ 55mm	± 1.5	± 2.0	± 1.5	± 2.0

TABLE 6 - FABRICATION TOLERANCES – BUTT WELDING

<u>ALL PRODUCTS^h</u>			
Dimension	Finish	Untrimmed	Trimmed
Nominal Thickness ⁱ	Skin/skin (s/s) & Skin/cell (s/c)	Sheets will be nominal minimum	Sheets will be nominal minimum, but there may be steps up to 1 mm maximum at the each weld.
	Cell/cell (c/c)	Thickness of the rolls is as s/c split sheet tolerances (see Table 5).	Thickness of the rolls is as s/c split sheet tolerances (see Table 5).
Nominal Width ⁱ	Skin/skin (s/s), Skin/cell (s/c) & Cell/cell (c/c)	Sheet widths will be nominal minimum, but each weld will be lined up on one side with a maximum error of 6 mm.	Sheet width will be greater than the (nominal trimmed width – 5 mm), but each weld will be lined up on one side with a maximum error of 6 mm.
Nominal Length ⁱ	Sheets [up to 3m]	Nominal length will be met or exceeded ^g .	
	Rolls [up to 15m]		

Note : Customer should specify Trimmed or Untrimmed, skin/skin, cell/cell or skin/cell when ordering, e.g. Trimmed s/s, Untrimmed s/c. For sizes and tolerances outside those specified please consult the Zotefoams Sales Team.

^g Different or tighter tolerances (including maximum dimensions) may be achieved, provided they are agreed before the time of the initial order.

^h Some local variations in the sheet may be experienced in the vicinity of the welds.

ⁱ For standard tolerances, no maximum size specified.



TABLE 7 - FABRICATION TOLERANCES – LAMINATION

LAMINATION ^g – THICKNESS SPECIFICATION							
Nominal Thickness ^j (mm)	LD18 AND LD29		HD, HL & SD Grades			All Other Grades	
	Min (mm)	Max (mm)	Nominal Thickness (mm)	Min (mm)	Max (mm)	Min (mm)	Max (mm)
skin/skin (s/s) and skin/cell (s/c)							
50	- 1	+ 4	< 50	- 1	+ 8	- 2	N/A
70	- 1	+ 4.5	< 70	- 1	+ 8	- 3	N/A
100	- 2	+ 9	< 100	- 2	+ 10	- 3	N/A
140	- 2	+ 10	< 140	- 3	+ 12	- 4	N/A
170	- 2	+ 10	< 170	- 3	+ 12	- 5	N/A
200	-5	+10	< 200	- 5	+ 12	- 10	N/A
cell/cell (c/c)							
50	- 1	+ 3.5	< 50	- 1	+ 5	- 4	N/A
70	- 2	+ 3.5	< 70	- 1	+ 5	- 5.5	N/A
100	- 3	+ 5.5	< 100	- 2	+ 6	- 5.5	N/A
140	- 4	+ 6	< 140	- 3	+ 7	- 6.5	N/A
170	- 5	+ 6	< 170	- 3	+ 8	- 8	N/A
200	- 5	+ 10	< 200	- 5	+ 10	- 10	N/A
LAMINATION – LENGTH & WIDTH SPECIFICATION							
Block Finish	LD18, LD29, HD, HL, & SD Grades		All Other Grades				
	Length & Width Tolerance ⁱ (minimum)		Nominal thickness (mm)		Length & Width Tolerance ⁱ (minimum)		
Trimmed	Nominal – 0 mm		0 mm< t <100 mm		nominal – 50 mm		
			100 mm< t <200 mm		nominal – 100 mm		
			t >200 mm		nominal – 150 mm		
Untrimmed	Nominal – 0 mm		All thicknesses up to 200 mm		nominal – 100 mm		

Note : Customer should specify Trimmed or Untrimmed, skin/skin, cell/cell or skin/cell when ordering, e.g. Trimmed s/s, Untrimmed s/c, along with length, width and nominal thickness requirements. For sizes and tolerances outside those specified please consult the Zotefoams Sales Team.

^j Other nominal thicknesses of LD18 and LD29 products will be as for HD, HL and SD products.



This standard 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.

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Zotefoams plc
675 Mitcham Road
Croydon
CR9 3AL
United Kingdom
Telephone: +44 (0) 20 8664 1600
Telefax: +44 (0) 20 8664 1616

Zotefoams Inc.
55 Precision Drive
Walton, Kentucky,
41094
USA
Telephone: +1 859 371 4046
Freephone: (800) 362-8358 (US Only)
Telefax: +1 859 371 4734



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