TECHNICAL MEMO

A collection of basic technical information.

UNION FOAM

advanced elastomeric thermal and acoustic insulation materials

T E C H N I C A L M E M O

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Insulation materials.
Our world.
For a better world.

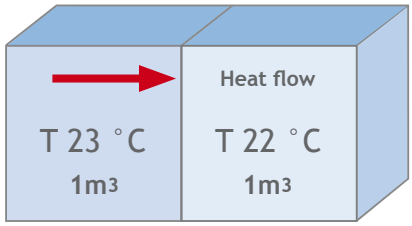
UNION FOAM

advanced elastomeric thermal and acoustic insulation materials

Thermal conductivity λ and insulation materials

- **Defined by the symbol λ (lambda), thermal conductivity is technically the quantity of heat passing through the contacting surfaces of two materials, both of which have a volume of 1 m³ and a difference in temperature of 1 °C.**
  It measures the ability of a substance to conduct heat. Given two surfaces on either side of the material with a temperature difference between them, the thermal conductivity is the heat energy transferred per unit time and per unit surface area, divided by the temperature difference, and is measured in watts per degree Kelvin.

Diagram of heat flow between two surfaces



(Heat always flows from a surface with a higher temperature to one with a lower temperature)

Thermal conductivity is measured in **W/m·K** and only materials with a thermal conductivity value (**λ**) lower than **0,100 W/m·K** are considered as having insulating properties.

The insulating property of a material is determined by its thermal conductivity value (**λ**); those with low values are considered as being more effective.

Determining factors that affect the thermal conductivity value (**λ**) are:

- **The chemical composition of materials.**
- **Density (which leads to a higher thermal conductivity value (λ) and therefore an inferior insulating property.**
- **The characteristics of a material's cell structure.**

The ability of the material to simulate and stabilize the quantity of air in its structure will ensure a lower **λ value.**

Black closed-cell flexible elastomeric foam Insulation material (FEF), due to its characteristics (low density, compact cell structure and a high amount of closed cells) ensures low thermal conductivity values and conforms to the recent European Standard EN 14304:2009 +A1:2013 standards which stipulate that products should not have a value higher than 0,050 W/m·K (at a mean working temperature of 10 °C).

The following table shows the thermal conductivity values of the EUROBATEX elastomeric insulation material at different mean temperatures as specified on the certificates issued by specialized laboratories.

MEAN TEMPERATURE OF TEST (°C)	-30	-10	0	+20	+40	+70
THERMAL CONDUCTIVITY (W/m•K)	0,033	0,034	0,035	0,037	0,038	0,040

The thermal conductivity values of various insulation material

Material	λ (W/m·K)	Density Kg/m³
ELASTOMERIC FOAM (FEF)	**0,040**	**50**
MINERAL WOOL (MV)	0,045	30-100
POLYURETHANE FOAM (PU)	0,032-0,034	25-50
POLYETHYLENE FOAM (PEF)	0,040	< 30
CELLULAR GLASS (CG)	0,045	100-125
CALCIUM SILICATE	0,060	250

The thermal conductivity of the materials in the table is evaluated at a mean temperature of 40 °C.

Water vapour diffusion resistance factor μ

The water vapour diffusion resistance factor is defined by the symbol **μ (MU)** and is a measured value which determines the effectiveness of an insulating material to act as a barrier against water vapour transmission.

It is a fundamental parameter to assess the suitability of the insulating material for applications through which cold fluids flow: refigeration and air-conditioning systems.

A high μ value will guarantee the effectiveness of the insulation material over a long period of time.

Usually, as regards thermal insulation materials and in particular elastomeric foam, resistance to water vapour tramsmission is linked to the following properties:

- **A molecular structure with a high amount of closed cells (>90/95%)**
- **Small cell dimensions**
- **An excellent cohesion of the cell walls**
- **Consistent material thickness**

To prevent the risk of condensation, the external surface temperature of the insulation material should be equal to or higher than the dew point temperature in the environment in which it is applied.

μ conversion factor in equivalent air thickness

The following formula illustrates how to determine the equivalent air layer thickness for a specific insulation material, taking into consideration that air, with a thermal conductivity **λ value** of approximately **0,020 W/m·K** in normal conditions, is by far the most effective thermal insulator:

SA = (μ x s) where the different parameters represent:

- **SA** = Equivalent air layer thickness (metres)
- **μ** = The water vapour diffusion resistance factor of the chosen insulation material
- **s** = Thickness (metres) of the chosen insulation material

Assuming that EUROBATEX elastomeric insulation material (with a water vapour diffusion resistance factor of μ ≥ 7000) is used, the equivalent air layer thicknesses obtained using the above formula are:

EUROBATEX insulation thk	6 mm	SA=7.000x 0,006 =	42 meters of equivalent air layer thickness
EUROBATEX insulation thk	9 mm	SA=7.000x 0,009 =	63 meters of equivalent air layer thickness
EUROBATEX insulation thk	13 mm	SA=7.000x 0,013 =	91 meters of equivalent air layer thickness
EUROBATEX insulation thk	19 mm	SA=7.000x 0,019 =	133 meters of equivalent air layer thickness
EUROBATEX insulation thk	25 mm	SA=7.000x 0,025 =	175 meters of equivalent air layer thickness
EUROBATEX insulation thk	32 mm	SA=7.000x 0,032 =	224 meters of equivalent air layer thickness
EUROBATEX insulation thk	40 mm	SA=7.000x 0,040 =	280 meters of equivalent air layer thickness
EUROBATEX insulation thk	50 mm	SA=7.000x 0,050 =	350 meters of equivalent air layer thickness
EUROBATEX insulation thk	60 mm	SA=7.000x 0,060 =	420 meters of equivalent air layer thickness

N.B.
It is useful to remember that water vapour diffusion resistance factor μ is purely a numeric parameter used to make calculations. Its value is not taken into consideration in formulas used to calculate thermal dispersions, vital for calculating the correct insulation material thicknesses to use in the various applications.

Rules for calculating insulation material thicknesses to avoid the formation of condensation on piping carrying low temperature fluids.

thickness calculations

In specific cases where fluids carried in the piping have temperatures lower than those of the external environment, together with the likely presence of ambient air humidity, the risk of condensation formation increases, harmful to energy saving and causing corrosion on the piping itself.

Therefore the insulation material has two purposes: to maintain energy saving and preserve and protect piping (exposed to the air and its humidity), ensuring that the external surface temperature is never lower than the dew point temperature of the environment.

To calculate the required insulation thickness, the following information is vital to be able to proceed with the necessary calculation, following the formula described below.

1. The temperature of the fluid in the system's piping.
2. The external ambient temperature
3. Ambient relative humidity

The correct thickness of the insulation material needs to be calculated to avoid condensation formation (basically, this calculation helps to obtain the value relative to the insulation applications on flat surfaces which however represent the maximum dispersed surfaces, and therefore the most difficult situations).

$$S = \frac{\lambda}{\alpha a} \times \left(\frac{ta - ti}{ta - tr} - 1 \right)$$

Where:

- **S** = Thickness of the insulation material (expressed in metres).
- λ = Thermal conductivity of the specific insulation material expressed as **W/m·K** (the value obtained at the mean functioning temperature should be inserted).
- αa = External surface coefficient expressed as **W/m²·K** (data obtained from the following table).
- **ta** = Ambient temperature °C.
- **ti** = Temperature of the fluid inside the piping °C.
- **tr** = Air dew point temperature °C.

α_a reference values for the calculation

Value	Type of ventilation
5 W/m²·K	Poor
9 W/m²·K	Normal (internal environment)
15 W/m²·K	High (external environment)

The value of (ta-tr) can be obtained from the first table, while the second table indicates the correct thickness of EUROBATEX insulation material required to avoid the formation of condensation.

thickness calculations

Table 1 - ta-tr values

Air Temperature °C	Maximum Humidity g/m³	Permitted air cooling °C until the formation of condensation for relative humidity														Maximum Humidity g/m³	Air Temperature °C
		30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%		
-20	0.90	-	10.4	9.1	8.0	7.0	6.0	5.2	4.5	3.7	2.9	2.3	1.7	1.1	0.5	0.90	-20
-15	1.40	12.3	10.8	9.6	8.3	7.3	6.4	5.4	4.6	3.8	3.1	2.4	1.8	1.2	0.6	1.40	-15
-10	2.17	12.9	11.3	9.9	8.7	7.6	6.6	5.7	4.8	3.9	3.2	2.5	1.8	1.2	0.6	2.17	-10
-5	3.27	13.4	11.7	10.3	9.0	7.9	6.8	5.8	5.0	4.1	3.3	2.6	1.9	1.2	0.6	3.27	-5
0	4.8	13.9	12.2	10.7	9.3	8.1	7.1	6.0	5.1	4.2	3.5	2.7	1.9	1.3	0.7	4.8	0
2	5.6	14.3	12.6	11.0	9.7	8.5	7.4	6.4	5.4	4.6	3.8	3.0	2.2	1.5	0.7	5.6	2
4	6.4	14.7	13.0	11.4	10.1	8.9	7.7	6.7	5.8	4.9	4.0	3.1	2.3	1.5	0.7	6.4	4
6	7.3	15.1	13.4	11.8	10.4	9.2	8.1	7.0	6.1	5.1	4.1	3.2	2.3	1.5	0.7	7.3	6
8	8.3	15.6	13.8	12.2	10.8	9.6	8.4	7.3	6.2	5.1	4.2	3.2	2.3	1.5	0.8	8.3	8
10	9.4	16.0	14.2	12.6	11.2	10.0	8.6	7.4	6.3	5.2	4.2	3.3	2.4	1.6	0.8	9.4	10
12	10.7	16.5	14.6	13.0	11.6	10.1	8.8	7.5	6.3	5.3	4.3	3.3	2.4	1.6	0.8	10.7	12
14	12.1	16.9	15.1	13.4	11.7	10.3	8.9	7.6	6.5	5.4	4.3	3.4	2.5	1.6	0.8	12.1	14
16	13.6	17.4	15.5	13.6	11.9	10.4	9.0	7.8	6.6	5.5	4.4	3.5	2.5	1.7	0.8	13.6	16
18	15.4	17.8	15.7	13.8	12.1	10.6	9.2	7.9	6.7	5.6	4.5	3.5	2.6	1.7	0.8	15.4	18
20	17.3	18.1	15.9	14.0	12.3	10.7	9.3	8.0	6.8	5.6	4.6	3.6	2.6	1.7	0.8	17.3	20
22	19.4	18.4	16.1	14.2	12.5	10.9	9.5	8.1	6.9	5.7	4.7	3.6	2.6	1.7	0.8	19.4	22
24	21.8	18.6	16.4	14.4	12.6	11.1	9.6	8.2	7.0	5.8	4.7	3.7	2.7	1.8	0.8	21.8	24
26	24.4	18.9	16.6	14.7	12.8	11.2	9.7	8.4	7.1	5.9	4.8	3.7	2.7	1.8	0.9	24.4	26
28	27.2	19.2	16.6	14.9	13.0	11.4	9.9	8.5	7.2	6.0	4.9	3.8	2.8	1.8	0.9	27.2	28
30	30.3	19.5	17.1	15.1	13.2	11.6	10.1	8.6	7.3	6.1	5.0	3.8	2.8	1.8	0.9	30.3	30
35	39.4	20.2	17.7	15.7	13.7	12.0	10.4	9.0	7.6	6.3	5.1	4.0	2.9	1.9	0.9	39.4	35
40	50.7	20.9	18.4	16.1	14.2	12.4	10.8	9.3	7.9	6.5	5.3	4.1	3.0	2.0	1.0	50.7	40
45	64.5	21.6	19.0	16.7	14.7	12.8	11.2	9.6	8.1	6.8	5.5	4.3	3.1	2.1	1.0	64.5	45
50	82,3	22.3	19.7	17.3	15.2	13.3	11.6	9.9	8.4	7.0	5.7	4.4	3.2	2.2	1.0	82.3	50

Table 2 - Thicknesses of EUROBATEX in mm required to avoid condensation formation on flat surfaces.

ta Ambient Temperature		+ 15 °C					+ 20 °C					+ 25 °C					+ 30 °C					+ 35 °C				
U.R.%		60	70	80	85	90	60	70	80	85	90	60	70	80	85	90	60	70	80	85	90	60	70	80	85	90
Temperature of the fluid °C	+15	—	—	—	—	—	—	—	—	4	8	—	—	7	11	19	—	6	12	18	31	5	10	17	25	41
	+10	—	—	—	4	8	—	—	7	12	20	—	6	13	19	31	6	10	18	26	42	7	12	22	32	51
	+5	—	—	8	12	19	—	7	13	19	31	6	10	18	26	41	8	13	23	33	54	10	16	27	39	62
	0	4	7	13	20	31	6	10	18	27	43	8	13	23	33	52	10	16	28	40	64	12	19	33	46	73
	-5	6	10	18	27	41	9	14	24	34	55	10	16	28	40	63	12	19	33	46	74	14	22	37	52	82
	-10	8	13	23	33	51	11	17	28	41	64	13	20	34	48	74	15	22	38	53	85	16	25	41	58	91
	-20	13	20	33	48	72	15	23	37	53	83	16	25	41	58	89	19	28	47	66	104	20	31	51	72	112
	-30	17	26	43	61	92	19	29	48	67	105	21	31	51	72	109	22	33	55	76	120	23	34	56	79	123

The CE marking of elastomeric insulation materials and the normative references.

Introduction

The plan to reduce polluting emissions into the atmosphere on a world wide scale detailed during the KYOTO Conference in 1990 and was aimed at encouraging the Member Countries to adopt an adequate energy policy which, without penalizing environmental comfort could boost a sustainable growth, especially for developed countries.

The EU Member Countries (at that time actively involved in creating a more united "future") had already begun to introduce regulations and standards in various specific sectors with the aim to put into effect the decisions taken during the Kyoto Conference as quickly as possible.

Between the sectors identified as being those that could contribute both to energy saving and a reduction of emissions into the atmosphere, the construction industry, which consumes approximately 30% of the total energy, was targeted as being in need of swift intervention.

The 89/106/EEC Directive and the Regulation

The European Directive regarding construction products (89/106/EEC) was promulgated by the boards of experts who imposed fundamental parameters for materials used in this sector with the aim to guarantee safety and to possess efficient energy saving qualities.

In March 2011 the European Community approved the No. 305 Regulation published on April 4th 2011 in the official European Journal, which abrogated the above mentioned Directive, substituting it with the Regulation which became operational from 1 July 2013. The main aim was to guarantee, define all the conditions related to the commercialization of goods (free circulation in the EU) and to unify the administrative regulations in one single document, valid for all EU Member Countries.

NB.

The Regulation (CPR-Construction Product Regulation) is a law that came into force in all EU Member Countries without the necessity of a specific national transposition.

Also all main requirements of construction materials (together with those of insulation materials) have been included in the CPR and are stated in the table below:

List of requirements specified by the 305/2011 Regulation

Construction material	Insulation material
Mechanical resistance and stability	Thermal conductivity
Safety in the event of fire	Fire performance
Hygiene, health and environment	Water vapour diffusion
Safety and ease of use	Working temperature
Noise protection	Type of installation (installability)
Energy saving and heat retention	Health and safety
Sustainable use of natural resources	

The CE marking of elastomeric insulation materials and the normative references.

The 89/106/EEC European Directive regarding construction products categorically states that specific standards should be harmonized for each type of product, in order to guarantee its proper use based on its technical properties, some of which are not comparable between different types already on the market.

The competent Technical Commision approved the European Standard EN 14304:2009+A1:2013 for elastomeric insulation material; the standard was published in the Official Journal of the European Union and is compulsory in order to gain a CE Marking.

The following tables have the purpose of suppling those who work in this sector with useful information regarding its contents and required conditions.

EUROPEAN STANDARD - EN 14304:2009 + A1:2013
Thermal insulation products for building equipment and industrial installations. Factory made flexible elastomeric foam (FEF) products.

Regulations and compliances

The main characteristics of elastomeric products for thermal insulation taken into consideration by the Standard are:

- **Thermal conductivity**
- **The dimensions and the Dimensional tolerances**
- **Dimensional stability**
- **Fire behaviour**
- The minimum and maximum working temperatures
- Water absorption
- Resistance to water vapour
- **Solubility and pH value**
- Sound absorption
- **Release of harmful substances**

The CE marking of elastomeric insulation materials and the normative references.

The characteristics highlighted in the previous table are analysed in greater depth on the following pages since they are considered to be both important and useful for those who work in this sector.

Thermal conductivity

This is considered as being the distinguishing characteristic of insulation material and is defined by the symbol **λ (lambda)**, and is measured in **W/m•K**; the product with the lowest value will have the highest insulating capacity.

Usually a material with a thermal conductivity value lower than **0,100 W/m•K** is defined as an "insulating" material;

The European Standard states that the thermal conductivity value for elastomeric insulation material should not be greater than **0,050 W/m•K**; at a mean working temperature of **10 °C**.

This value is determined by tests specified by the regulations:

- **EN 12667 for flat surfaces (sheets) and EN 12939 (for thickness)**
- **EN ISO 8497 for cylindrical products (pipes)**

It is defined for the complete application temperature range of the product (with a minimum limit of **- 170 °C**). Tests on pipes are normally carried out on those with diameters ranging from **22** and **42** mm, taking into consideration the minimum and maximum thicknessess produced.
If different thicknesses are produced, the manufacturer is given the possibility to declare a single thermal conductivity value which should be the highest after having carried out the specific tests. This value will characterize the entire range.

Dimensional tolerances

These are determined by the Standards: EN 822 and EN 823 for sheets, rolls and tapes and EN 13467 for tubes.

A summary of the limitations is stated in the following table:

Dimensions in mm.

Form of delivery	Length	Width	Thickness		Squareness	Inside diameter	
			Declared	Tolerance		$D_i \leq 100$	$D_i > 100$
Tubes	± 1,5%	-	$d_D \leq 8$	± 1	3,0 mm	$D_{iD} + 1 \leq D_i \leq D_{iD} + 4$	$D_{iD} + 1 \leq D_i \leq D_{iD} + 6$
			$8 < d_D \leq 18$	± 1,5	-		
			$18 < d_D \leq 31$	± 2,5	-	-	-
			$d_D > 31$	± 3	-		
Sheets	± 1,5%	± 2%	$d_D \leq 6$	± 1	3,0 mm/m (length/width)	-	-
			$6 < d_D \leq 19$	± 1,5	-		
			$d_D > 19$	± 2	3,0 mm (thickness)		
Rolls	+ 5% - 1.5%	± 2%	$d_D \leq 6$	± 1	3,0 mm/m (length/width)	-	-
			$6 < d_D \leq 19$	± 1,5	-		
			$d_D > 19$	± 2	3,0 mm (thickness)		
Tapes	+ 5% - 1.5%	± 2%	$d_D = 3$	- 0.1 + 1,5	-	-	-

Key: D_i = inside Ø | D_{id} = nominal inside Ø (Ref. Tubes) | d_D = Nominal thickness

The CE marking of elastomeric insulation materials and the normative references.

Fire behaviour

In order to harmonise and regulate one of the most important aspects regarding environmental safety on a european level (the fire behaviour of building products, including insulation material), the regulations specified in the table have been introduced to analyse and measure the parameters of: flammability, the production of smoke, heat development and dripping.

Test regulation and european classification

EN 13501-1	Fire classification of building products. Part 1 Fire behaviour
EN 13238	Conditioning procedures
EN ISO 1182	Non-combustibility test
EN ISO 1716	Calculation of calorific values
EN ISO 11925-2	Flammability of construction products in direct contact with flame
EN 13823	Fire behaviour test for construction products excluding floors (S.B.I. test)
EN ISO 9239-1	Fire behaviour test for floors (radiant panel)

Table of the tests and designations required for behaviour to fire classes for construction products

Construction products				Floors		Linear products	
Class	Test method	Classification criteria	Additional classification	Class	Test method	Class	Test method
A1	EN ISO 1182 +	$\Delta T \leq 30\ ^{\circ}C$ $\Delta m \leq 50\ \%$ $t_t \leq 0$ (non-persistent fire)		$A1_{FL}$	EN ISO 1182 +	$A1_L$	EN ISO 1182 +
	EN ISO 1716	PCS ≤ 2,0 MJ. Kg^{-1} PCS ≤ 2,0 MJ. Kg^{-1} PCS ≤ 2,0 MJ. m^{-2} PCS ≤ 2,0 MJ. Kg^{-1}			EN ISO 1716		EN ISO 1716
A2	EN ISO 1182	$\Delta T \leq 50\ ^{\circ}C$ $\Delta m \leq 50\ \%$ $t_t \leq 20s$		$A2_{FL}$	EN ISO 1182 +	$A2_L$	EN ISO 1182 +
	EN ISO 1716 +	PCS ≤ 3,0 MJ. Kg^{-1} PCS ≤ 4,0 MJ. Kg^{-2} PCS ≤ 4,0 MJ. m^{-2} PCS ≤ 3,0 MJ. Kg^{-1}			EN ISO 1716		EN ISO 1716
	EN 13823 (SBI)	FIGRA ≤ 120 W. s^{-1} LSF < sample margin $THR_{600s} \leq 7,5$ MJ	Smoke production and burning particles		EN ISO 9239-1		UNI EN 13823 (SBI)
B	EN 13823 (SBI) +	FIGRA ≤ 120 W. s^{-1} LSF < sample margin $THR_{600s} \leq 7,5$ MJ	Smoke production and burning particles	B_{FL}	EN 13823 (SBI) +	B_L	UNI EN 13823 (SBI) +
	EN ISO 11925-2 exposure =30s	Fs ≤ 150 mm within 60s			EN ISO 11925-2 exposure =30s		UNI EN ISO 11925-2 exposure =30s
C	EN 13823 (SBI) +	FIGRA ≤ 250 W. s^{-1} LSF < sample margin $THR_{600s} \leq 15$ MJ	Smoke production and burning particles	C_{FL}	EN 13823 (SBI) +	C_L	UNI EN 13823 (SBI) +
	EN ISO 11925-2 exposure =30s	Fs ≤ 150 mm within 60s			EN ISO 11925-2 exposure =30s		UNI EN ISO 11925-2 exposure =30s
D	EN 13823 (SBI) +	FIGRA ≤ 750 W. s^{-1}	Smoke production and burning particles	D_{FL}	EN 13823 (SBI) +	D_L	UNI EN 13823 (SBI) +
	EN ISO 11925-2 exposure =30s	Fs ≤ 150 mm within 60s			EN ISO 11925-2 exposure =15s		UNI EN ISO 11925-2 exposure =30s
E	EN ISO 11925-2 exposure =15s	Fs ≤ 150 mm within 60s	Smoke production and burning particles	E_{FL}	EN ISO 11925-2 exposure =15s	E_L	UNI EN ISO 11925-2 exposure =15s
F	Reaction not determined			F_{FL}	Reaction not determined	F_L	Reaction not determined

The CE marking of elastomeric insulation materials and the normative references.

Fire behaviour

Euroclass - application table

Fire behaviour classes			Smoke classes		Dripping classes	
A1	Incombustible		No test required		No test required	
A2		Non-combustible	s1	Limited or absent	d0	Absent for the first 10 minutes
B		Level of combustion increasing from class B to class E	s2	Present	d1	Low dripping of flaming material for less than 10 seconds during the first ten minutes
C			s3	Significant	d2	Significant
D			No test		No indications or d2	
E						
F	No test required					

The CE marking of elastomeric insulation materials and the normative references.

In the specific case of elastomeric foam products (usually belonging to the organic material family) the best fire behaviour classification obtained is class B.

N.B:

In the new european classification for classes from A2 to E, additional characteristics are requested that are marked by the letters:

s = smoke

d =dripping

and should be added to the initial classification.

If tests are carried out separately on linear piping or floors, the initial classification will have a subscript L or FL as indicated below:

B_L (tubes)

B_{FL} (floors)

Resistance to water vapour diffusion

Characterized by the symbol **μ (mu)** with its property determined by the European Standards:

EN 12086 - For flat products

EN 13469 - For cylindrical products

Alternatively it can be determined by the European Standard **EN ISO 10456**

The value should be indicated at intervals of 1000 to a maximum of 15000 and should never be less than the declared value, (this value should always be preceded by the symbol ≥ greater or identical), as shown in the following table:

Level (μ)	Declared value (μ)
1000	≥ 1000
2000	≥ 2000
3000	≥ 3000
4000	≥ 4000
↓	↓
15000	≥ 15000

Traces of soluble ions in the water, PH value, release of harmful substances (halogens)

The traces of CHLORIDE- FLUORIDE - SILICATE - SODIUM ions (that can cause possible corrosion of metal piping) together with the product's **PH** value, are evaluated based on the European Standard **EN 13458**.

Traces of halogens (chlorine, fluorine, bromine, iodine) are determined based on the European Standard **DIN/VDE 472-815**. An elastomeric product can only be defined as being halogen free (halogen free) if its content percentages based on weight are:

- **less than 0,2% (the total of its chlorine, bromine and iodine content)**
- **less than 0,1% for fluorine**

The CE marking of elastomeric insulation materials and the normative references.

Examples of CE labelling

CE	CE conformity marking, consisting of the "CE" - symbol given in Directive 93/68/EEC.
01234	Identification number of the certification body (for products under system 1).
AnyCO Ltd, PO Box 21 B-1050	Name or identifying mark and registered address of the producer.
13	Two last digits of the year for affixing CE marking (ITT).
01234-CPD-00234	Certificate number (for products under system 1).
EN 14304:2009+A1:2013	No. of dated version of European Standard.
Flexible Elastomeric Foam, intended to be used as thermal insulation product for building equipment and industrial installations. Reaction to fire - Class B Thermal conductivity see Manufacturer's Literature.	Description of the product and Information on regulated characteristics.
FEF - EN - 14304 - ST(+) 115 - ST(-) 200 - MU 7000 - CL 1	Designation code (in accordance with Clause 6 for the relevant characteristics according to Table ZA.1).

CE Marking (explanation of references are supplied on the product's labelling)

FEF - EN-14304: reference to the product standard regarding elastomers.	**ST (+)-ST (-):** maximum and minimum working temperatures.	**MU 7000:** Diffusion coefficient of water vapour value	**CL1:** quantity of chloride ions soluble in water

Type of products applicable to CE Markings

(Ref. attached IV-Table 1 - European regulation 305/2011

As for the CPR concerning building products, the specific references regarding the application of insulation materials are summarized below.

Area code	Type of ptoduct
4	Products for thermal insulation Composite insulation kits/systems
27	Heating appliances
28	Ducts, tanks and accessories that do not come into contact with water for human consumption.
34	Kits for buildings, units, prefabricated structures

The CE marking of elastomeric insulation materials and the normative references.

Documentation relevant to CE Markings

Apart from the labelling previously illustrated, the documents accompanying the CE Trademark (updated when the European Regulation came into force) are as follows:

The product's Certificate of Constancy of Performance (substituting the Certificate of Conformity) released by the notified Body.

Declaration of Performance (DoP) released by the manufacturer, accompanied by the safety data sheet in accordance with the EU Regulation No.1907/2006 (Reach).
NB: according to Reach regulation, the Safety Data Sheet is not mandatory for FEF/PEF products.

Summary of the european standards for materials used for the insulation of systems.

In order to supply adequate information, the following table lists the standards for each type of insulation product. Those which concern the UNION FOAM S.p.A. products are highlighted.

EN 14303 Thermal insulation material for applications in buildings and industrial installations. Factory made mineral wool (MW) products.

EN 14304 Thermal insulation products for building equipment and industrial installations. Factory made flexible elastomeric foam (FEF) products.

EN 14305 Thermal insulation material for applications in buildings and industrial installations. Factory made cellular glass (CG) products.

EN 14306 Thermal insulation material for applications in buildings and industrial installations. Factory made calcium silicate (CS) products.

EN 14307 Thermal insulation material for applications in buildings and industrial installations. Factory made extruded polystyrene foam (XPS) products.

EN 14308 Thermal insulation products for building equipment and industrial installations. Factory made rigid polyurethane foam (PUR) and polyisocyanurate foam (PIR) products.

EN 14309 Thermal insulation material for applications in buildings and industrial installations. Factory made polystyrene foam (EPS) products.

EN 14313 Thermal insulation products for building equipment and industrial installations - Factory made polyethylene foam (PEF) products.

EN 14314 Thermal insulation material for applications in buildings and industrial installations. Factory made phenolic resin foam (PF) products.

Comparison between CPD (Directive) and CPR (Regulation)

Evaluation systems for performance consistency

The EU No. **305/2011 Regulation (CPR)** abrogated, substituted and integrated the **89/106/EEC (CPD)** Directive from 01/07/2013 with the following differences.

Characteristics	
89/106/EEC (CPD) Directive	**EU No. 305/2011 (CPR) Regulation**
Application: **OPTIONAL** Systems: **1+, 1,2, 2+, 3, 4**	Application: **COMPULSORY** Systems: **1+, 1,2+, 3, 4**
Document Type	
Declaration of Conformity CE Certificate of Conformity	Declaration of performance Certificate of Constancy of Performances
European Technical approval (ETA)	European Technical evaluation (ETA)
6 essential requisites of the works	7 essential requisites of the works

a) Basic requirements for construction work, according to the EU No.305/2011 (CPR) Regulation

1. Mechanical resistance and stability
2. Safety in case of fire
3. Hygiene, health and the environment
4. Safety and accessibility in use
5. Protection against noise
6. Energy economy and heat retention
7. Sustainable use of natural resources

Compared to the 89/106 CEE (CPD) Directive, point No. 7 has been added.

b) Assessment and verification of constancy of performance (AVCP)

Defined by the **EU No. 305/2011 (CPR)** Regulation for construction products, these specify the tests to be carried out by the manufacturer on finished products.

The assessment of the characteristics and the process of measuring its performance is defined by the specific product standard.

There are 5 evaluation systems stipulated by the EU Regulation which are described in the Product Standards in order to obtain the CE Marking:

(4) - (3) - (2+) - (1) - (1+)

From system 4 to system 1+
Greater guarantee of quality

System 1+

The System 1+, in accordance with the EU Regulation, makes further verifications compared to those for system 1, and also requires tests to be carried out by the Notified Bodies on samples taken from the manufacturing plant.

It is currently optional since it has not been included in the product regulations.

UNION FOAM S.p.A. chose GSH - CELLE D-29227 as its Notified body and thanks to the RAL Quality Mark guarantees and meets the requirements outlined in system (1+), ensuring its clients a higher degree of product quality.

Summary of the regulations

ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCR - AVCP SYSTEMS (EU REGULATION No. 305/2011 - CPR)

TRADEMARK	TYPE	DOCUMENT	TASKS	
			MANUFACTURER	NOTIFIED BODY
RAL GÜTEZEICHEN FEF / PEF	1+	RAL certificate of quality	Control of facory production. Complementory tests on samples taken from the production plant of the manufacturer following a specific control programme.	Initial product tests. Initial inspection of the factory and its production control procedures. Monitoring, evalutation and permanent approval of the factory's production control. Tests carried out by the Notified Body on samples taken from the factory.
CE	1	Certificate of performance consistency. Declaration of product's performance (DOP)	As system 1+	As system 1+ but without tests carried out by the Notified Body on samples taken from the factory.
	2+	Declaration of product's performance (DOP)	Initial product tests. Production control in the factory. Possible tests of samples taken from the factory following a specific control programme.	Certification of factory production control depending on the initial inspection of the factory and its production control. Monitoring, evalutation and permanent approval of the factory's production control.
	3	Declaration of product's performance (DOP)	Production control in the factory.	Initial product tests.
	4	Declaration of product's performance (DOP)	Initial product tests. Production control in the factory.	

environmental sustainability of buildings

Introduction

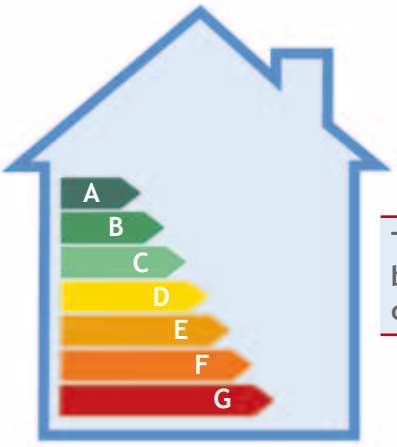
In an era of renewed politics to safeguard the environment and its natural resources, strongly linked to construction and protection of buildings and as well as the need to continuously finalize Energy Performance Certificates, it is possible to study and promote the environmental sustainability of the buildings themselves through the following protocols.
The table illustrates the main features of the two types of certificates, aimed, as well as an improved management of traditional energy sources, at guaranteeing adequate personal and environmental protection.

Comparison of the 2 systems

ENVIRONMENTAL CERTIFICATION	ENERGY PERFORMANCE CERTIFICATE
Declares the performance (and environmental impacts on health) of the building, including energy consumption.	Declares, through a class of attributed energy consumption (**in KWh/mq year**) in order to evaluate performance. Energy consumption increases starting from cat. A up until cat. G (see diagram)
IT IS VOLUNTARY (It could become obligatory if required) • Needed to take advantage of tax incentives • For public buildings • For ERP buildings • For new public tenders	IT IS OBLIGATORY • For new buildings (Public and/or Private) • To take advantage of tax incentives • For deeds of sale

Diagram of the energy efficiency class attributions of buildings

Low energy consumption



High energy consumption

The "energy quality" of a building decreases from category A to category G.

Protocols for the certification of the environmental sustainability of buildings

List of world wide protocols:

● **BREEM** - ENGLAND	**INBAR** - ITALY
BLUE ANGEL - GERMANY	**ITACA** - ITALY
CASACLIMA - ITALY	● **LEED GBC** - UNITED STATES
● **CASBEE** - JAPAN	**MINERGIE ECO** - SWITZERLAND
ECOLABEL - EUROPE	**QUALITEL** - FRANCE
GREEN STAR - AUSTRALIA	**SB100 ANAB** - ITALY
HQE - FRANCE	**SWAN ECOLABELLING** - NORTH EUROPE

● The most widespread on a world wide scale are **LEED GBC**, **BREEM** and **CASBEE**.

The diffusion of the protocols in Italy is carried out by:

ITACA - the most widespred on a national level
LEED (GBC Italia) - in the Lombardy Trentino A.A. regions
CASACLIMA - Trentino A.A.

The environmental sustainability of buildings

Features of the ITACA and LEED protocols: analysis and differences

a) ITACA protocol

The ITACA Protocol is a system for the certification of the level of environmental sustainability of buildings of different uses. It is promoted by the Italian Regions and managed by a specific committee with representatives of the regions with the participation of the iiSBE Italy and ITC-CNR associations. The protocol is based on the SBMethod, chosen in 2002 as a reference by the Italian regions.

• Homes • Offices • Shopping centres • Industrial buildings

The analysis and evaluation was made based on specific tables based on predetermined criteria necessary to give buildings a score (see following table) which will identify the respected requirement.

Analysing and evaluating with the appropriate tables:

- **CONSUMPTION OF RESOURCES** (Referring to energy and material consumption and the performance of its envelope)
- **THE QUALITY OF THE INTERNAL ENVIRONMENT** (Thermo-hygrometric and acoustic comfort)
- **THE QUALITY OF THE SERVICE** (The maintenance of performances during the operational phase)

Increasing "environmental quality" ↓

SCORE	THE BUILDING'S REQUIREMENT
-1	Inferior performance of the standard practice
0	Minimum acceptable performance (see current regulations)
1	Minor improvement compared to point 0
2	Significant improvement compared to point 0
3	Major improvement compared to point 0 (best practice)
4	Substantial increase of the best practice of point 3
5	Notable performance and of an advanced level compared to the best practice of point 3

b) LEED Protocol

This is the most widespread system on a world wide scale for the verification and certification of the environmental sustainability of buildings; in Italy it is promoted by **GBC ITALIA** and adapted to the national situation.
It consists of a rating system which allocates points in 7 specific areas and identifies both the obligatory prerequisites needed to obtain the certification of buildings and those which are optional which are necessary to obtain a higher classification level.

The reference areas are as follows:

- Sustainability of the site
- Water
- Energy and atmosphere
- Materials and resources
- Quality of the internal environment
- Innovation
- Regional and/or local peculiarities (these are necessary to increase the score obtained in the previous areas)

The scores and relative certifications are decribed in the following diagram:

CERTIFICATE	from 40 to 49 points
SILVER CERTIFICATE	from 50 to 59 points
GOLD CERTIFICATE	from 60 to 79 points
PLATINUM CERTIFICATE	> 80 points

"Environmental quality" based on the total score

c) Table of the differences between the two protocols:

ITACA Protocol	LEED Protocol
Greater importance is given to :	Construction phase with points-based, allocation system for:
• consumption • CO2 emissions • management and maintenance of the building	• impact on environmental repercussions • waste production • emission of harmful substances

N.B.: In the evaluation and quantification of the environmental sustainability of a building, insulation material can play an important role in improving energy efficiency and acoustic performance, contributing to a higher score and therefore a higher certification, even if they are not taken into consideration in the points-based allocation system of the protocols.

Railway applications

Fire safety in railway rolling stock (amendment to the european standard)

railway applications

The aim of this report is to supply some information regarding the **EN 45545** Regulation which, in the May 2013 edition, defined the technical specifications related to fire safety in railway rolling stock. It needed to be accepted and published by the Member States within September 2013 with the obligation to revoke the present norms within March 2016.

It included the following seven points:

- **General description.**
- **Requirements for fire behaviour of material and components.**
- **Fire resistance requirements of fittings.**
- **Fire resistance requirements for railway rolling stock material (planning).**
- **Fire resistance requirements for electrical equipment, including those installed on board trolleybuses, buses and magnetic-levitation vehicles.**
- **Fire control and suppression systems.**
- **Safety requirements for gas and flammable liquid installations.**

We will analyse Point 1 (general description) and point 2 (relating to the fire behaviour characteristics of material and components that are installed in railway vehicles) in greater detail.

In general, there are 3 specific topics that represent the basis of the regulation, and are as follows:

1- The operational categories and their risk levels.

2- The test methods (still predominantly related to the standards already applicable to the shipbuilding and civil sectors).

3- The evaluation of essential parameters for a correct definition of results.

1. The operational categories and risk levels

Table of details

Type of service	Risk Level	Operative Categories	Type of evacuation
National lines, regional, urban	HL 1	OC 1	Immediate stopping/fast evacuation.
Urban and suburban lines Stretches in tunnels and underground	HL 2	OC 2	Stopping at the nearest station. Slower evacuation.
National and regional lines Stretches in tunnels and underground	HL 3	OC 3	Stopping at the nearest station or in available lateral platforms.
National, regional and urban lines	HL 4	OC 4	Extremely difficult evacuation due to lack of lateral platforms.

Fire safety in railway rolling stock (amendment to the european standard)

2. Test Methods

Taking into consideration the following parameters it is possible to determine the **FCE** (Fire Critical Effect):

Flammability - Fire diffusion - Heat emission - Opacity of smoke - Smoke toxicity

Through the tests shown below it is possible to define a value for a specific time in which evacuation is impossible if no other assistance is available. Naturally each above-mentioned parameter has its own reference value.

SPECIFICATIONS OF THE TESTING SYSTEMS

Parameter	Type of control	Reference standards
Non-combustibility	Fire persistence and mass loss (through an increase in temperature of the furnace from 750 °C)	EN ISO 1182
Lateral fire spread	Critical heat flux at which the flame extinguishes	ISO 5658-2
Cone calorimeter (heat release)	Determination of MAHRE value in kW/m^2 (with radiation of 25/50 in kW/m^2)	ISO 5660-1
Smoke development (opacity)	Determination of Dm, Ds4, VOF4 values (for different radiations in the absence or presence of flame)	ISO 5659-2
Gas Toxicity	Sample of gas taken in dynamic conditions in the smoke room. FTIR analysis and determination of time for CIT=1. Alternatively the AFNOR NF X 70-100 can be used (Tube furnace at 600 °C and discontinued analysis of combustion gases)	ISO 5659-2+FTIR ISO CD 21489 ISO 19702
Heat release for seats	Determination of MAHRE by means of a 3 minutes exposure to the flame of a burner with a power of 7 kW	NT FIRE 032 ISO 9705
Limiting Oxygen Index (LOI)	Measurement of the percentage of oxygen that when mixed could activate combustion	EN 4589-2

Explanation of symbols:
MAHRE = heat release rate
Dm = maximum value of the optical density of smoke
Ds4 = value of optical density after 4 minutes from the beginning of the test
VOF4 = expressed in minutes, this is the value of smoke opacity (at 4 minutes) in the area represented by the Ds-time curve (from 0 to 4 minutes)
CIT = conventional Toxicity Index (determined by the relationship Ci/IDHL where Ci is the medium concentration of each gas and IDHL represents the concentration which correspond to 30 minutes to determine human incapacity.

Table of IDHL values for gas types in mg/mc.

Gas type		Value	
CO_2	72000 mg/mc	SO_2	262 mg/m^3
CO	1380 mg/mc	HF	25 mg/m^3
HCN	55 mg/mc	HBr	99 mg/m^3
NOx	38 mg/mc	HCl	75 mg/m^3

List of the elements to be tested

1. **Structural - Internal - External - Furnishings - Electrical and mechanical equipment**
2. **Electrical material, electronic and mechanical (Situated inside the vehicles)**

The requirements for mechanical material are: LOI, Dm and CIT as shown in the table below

RISK LEVEL	LOI value		Dm value		CIT value	
	Internal	External	Internal	External	Internal	External
1	28	28	600	-	4	-
2	28	28	300	600	2	4
3	28	28	300	600	2	4
4	32	32	150	300	1	2

Railway applications

Fire safety in railway rolling stock (amendment to the european standard)

The following tables illustrate:

A) The risk level assessment for each type of vehicle. Level HL 4 is not included as it is not considered valid in terms of safety.

Fire risk classification

Operational Category	Type of vehicle			
	N: Standard vehicles	**A:** Vehicles belonging to an automatic train without trained staff on board.	**D:** Double-deck vehicles	**S:** Vehicles equiped with sleeping facilities.
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

B) Regarding risk levels, the standard defines the values of single parameters based both on application and the specific required tests.

Material requirements

Material requirements (No. relevant to the product)	Test method	Parameter and unit	Level	HL1	HL2	HL3
R1 (IN1A; IN1B; IN1D; IN1E; IN4; IN5; IN6; IN7; IN8; IN9B; IN11; IN12A; IN12B; IN14; F5)	T02 ISO 5658-2	CFE kWm^{-2}	Minimum	20 (a)	20 (a)	20 (a)
	T03.01 ISO 5660-1: 50 kWm^{-2}	MARHE kWm^{-2}	Maximum	- (a)	90	60
	T10.01 EN ISO 5659-2: 50 kWm^{-2}	$D_S(4)$ non-dimensional	Maximum	600	300	150
	T10.02 EN ISO 5659-2: 50 kWm^{-2}	VOF_S min	Maximum	1200	600	300
	T11.01 EN ISO 5659-2: 50 kWm^{-2}	CIT_G non-dimensional	Maximum	1,2	0,9	0,75

(a): If drops or particles are reported during the **ISO 5658-2** test or in cases where the material does not catch fire and are therefore non-classifiable, the following requisites are added:

-The **EN ISO 11925-2** test (subjected to direct flame for 30 seconds)
the material is considered acceptable if: flame spread < 150 mm within 60 seconds, no dripping and/or incandescent particles.

The codes in the first column of the table correspond (for internal applications) to:

IN 1A - vertical internal surfaces (insulation material and internal surface of the body)

IN 1B - horizontal internal surfaces facing the floor (insulation material and internal surface of the body)

IN 1D - internal surfaces with cavities

IN 1E - external covered surfaces containing technical equipment

IN 4 - areas for luggage storage

IN 5 - driver's area

IN 6 - internal surfaces of the gangways

IN 7 - doors and windows

IN 8 - curtains and parasols

IN 9B - tables and folding tables

IN 11 - bins and ashtrays

IN 12A and IN 12B - internal and external surfaces of air ducts

IN 14 - passenger information devices

F 5 - lower surfaces of sleeping wagons and beds

Railway applications

Fire safety in railway rolling stock (amendment to the european standard)

Shown below an example of classification report for railway applications according to EN 45545.

RAPPORTO DI CLASSIFICAZIONE
CLASSIFICATION REPORT
0753\DC\REA\13_2

Rapporto di classificazione di reazione al fuoco del prodotto: / *Reaction to fire classification report of product*: **Eurobutex HF**

Descrizione / *Description*: **Vedi pagina 2** / *See page 2*

Per conto di/ *On behalf of*: **UNION FOAM S.p.A.**

Indirizzo / *Address*: **Via Dell'Industria, 11 20040 Bellusco (MI)**

Norma tecnica / *Technical standard*: **EN 45545-2:2013 - Applicazioni ferroviarie - Protezione al fuoco per i rotabili ferroviari - Parte 2: Requisiti per il comportamento al fuoco di materiali e componenti** / ***EN 45545-2:2013 - Railway applications. Fire protection on railway vehicles. Requirements for fire behaviour of materials and components***

Data / *Date*: 05/06/2013

1. DATI GENERALI / *GENERAL DATA*

Identificazione della norma di riferimento / *Standard reference identification*

- **EN 45545-2:2013 - Applicazioni ferroviarie - Protezione al fuoco per i rotabili ferroviari - Parte 2: Requisiti per il comportamento al fuoco di materiali e componenti** / ***EN 45545-2:2013 - Railway applications. Fire protection on railway vehicles. Requirements for fire behaviour of materials and components***
- **ISO 5660-1:2002 - Reaction-to-fire tests -- Heat release, smoke production and mass loss rate Heat release rate (cone calorimeter method)**
- **ISO 5659-2:2006/Amd 1:2011 - Reaction to fire tests -- Spread of flame Guidance on flame spread**
- **ISO 5659-2:2012 - Plastics - Smoke generation - Part 2: Determination of optical density by a single-chamber test**

2. IDENTIFICAZIONE DELLE PROCEDURE / *PROCEDURES IDENTIFICATION*

- Procedura normalizzata / *Standard procedure*: **SI / Yes**
- Controllo calcoli / *Calculation check*: **SI / Yes**

3. DETTAGLI DEL PRODOTTO CLASSIFICATO / *DETAILS OF CLASSIFIED PRODUCT*

3.1. Natura e impiego / *Nature and end use application*:

Il prodotto **Eurobutex HF** è definito come un materiale isolante – INIA / INIB / INIC superfici interne, verticali/orizzontali con faccia vista/ il bancale/orizzontali con faccia vista/ l'alto. La sua classificazione è valida per le seguenti condizioni di impiego:

The product **Eurobutex HF** *is defined as a insulation material – INIA / INIB / INIC Interior surfaces, vertical/horizontal downwards facing / horizontal upwards facing. Its classification is valid for the following end use applications:*

- Lista dei requisiti R1 – Incollato su supporto incombustibile
  Requirement set R1 – Glued on non-combustible substrate

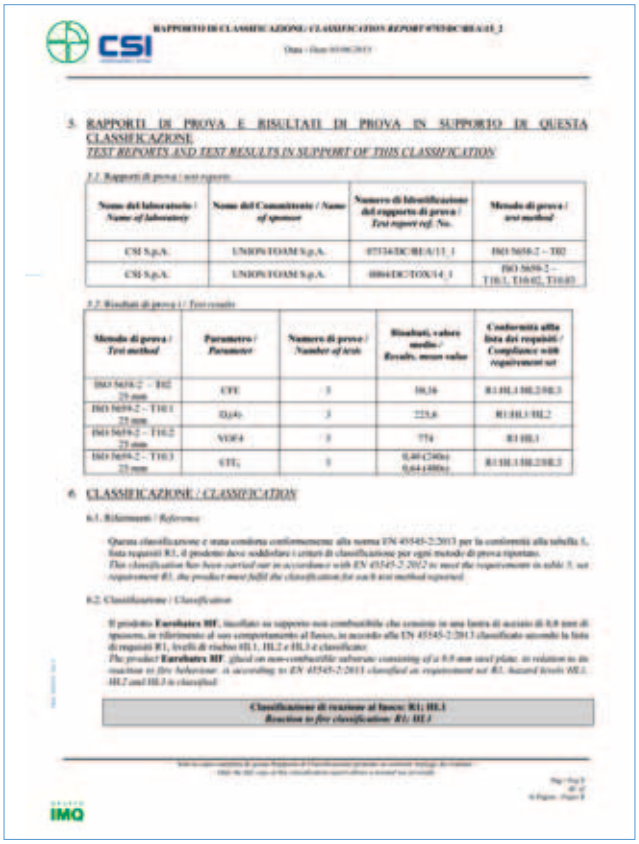
3.2. Descrizione / *Description*:

Il prodotto **Eurobutex HF** è compiutamente descritto nei rapporti di prova in sussidio della classificazione elencati in 3.1

The product **Eurobutex HF** *is fully described in the test reports in support of the classification listed in 3.1.*

4. DICHIARAZIONI / *STATEMENTS*

- I risultati di prova contenuti nel presente rapporto di classificazione si riferiscono esclusivamente al campione provato. *Test results contained in this classification report relate only to the specimens tested.*
- Il presente rapporto di prova non può essere riprodotto parzialmente senza l'autorizzazione del Responsabile di Laboratorio. *test report shall not be reproduced except in full without the written approval of the Managing Director.*



5. RAPPORTI DI PROVA E RISULTATI DI PROVA IN SUPPORTO DI QUESTA CLASSIFICAZIONE / *TEST REPORTS AND TEST RESULTS IN SUPPORT OF THIS CLASSIFICATION*

5.1. Rapporti di prova / *test reports*

Nome del laboratorio / *Name of laboratory*	Nome del Committente / *Name of sponsor*	Numero di Identificazione del rapporto di prova / *Test report ref. No.*	Metodo di prova / *test method*
CSI S.p.A.	UNION FOAM S.p.A.	0753-DC/REA/11_1	ISO 5659-2 – T02
CSI S.p.A.	UNION FOAM S.p.A.	0804/DC/TOX/14_1	ISO 5659-2 – T10.1, T10.02, T10.03

5.2. Risultati di prova / *Test results*

Metodo di prova / *Test method*	Parametro / *Parameter*	Numero di prove / *Number of tests*	Risultati, valore medio / *Results, mean value*	Conformità alla lista dei requisiti / *Compliance with requirement set*
ISO 5659-2 – T02 25 mm	CFE	3	30,16	R1:HL1:HL2:HL3
ISO 5659-2 – T10.1 25 mm	$D_s(4)$	3	725,8	R1:HL1:HL2
ISO 5659-2 – T10.2 25 mm	VOF4	3	774	R1:HL1
ISO 5659-2 – T10.3 25 mm	ST_1	3	0,40 (240s) 0,64 (480s)	R1:HL1:HL2:HL3

6. CLASSIFICAZIONE / *CLASSIFICATION*

6.1. Riferimenti / *Reference*

Questa classificazione è stata condotta conformemente alla norma EN 45545-2:2013 per la conformità alla tabella 3, lista requisiti R1, il prodotto deve soddisfare i criteri di classificazione per ogni metodo di prova riportato. *This classification has been carried out in accordance with EN 45545-2:2013 to meet the requirement in table 3, set requirement R1, the product must fulfil the classification for each test method reported.*

6.2. Classificazione / *Classification*

Il prodotto **Eurobutex HF**, incollato su supporto non combustibile che consiste in una lastra di acciaio di 0,8 mm di spessore, in riferimento al suo comportamento al fuoco, in accordo alla EN 45545-2:2013 classificato secondo la lista di requisiti R1, livelli di rischio HL1, HL2 e HL3 è classificato:

The product **Eurobutex HF**, *glued on non-combustible substrate consisting of a 0.8 mm steel plate, in relation to its reaction to fire behaviour, is according to EN 45545-2:2013 classified as requirement set R1, hazard levels HL1, HL2 and HL3 is classified:*

Classificazione di reazione al fuoco: R1; HL1 / *Reaction to fire classification: R1; HL1*

7. LIMITAZIONI / *LIMITATIONS*

7.1. Avvertimento / *Warning*

Questo documento non rappresenta un'approvazione di tipo od una certificazione del prodotto. *This document does not represent type approval or certification of the product.*

DATA / *Date*	Resp. Costruzioni / *Construction Head*	A.D. Divisione Certificazione e Testing / *Testing and Certification Division CEO*
05/06/2013	Paolo Famagalli	Raoul Gatti

MED 96/98 EC Directive - Requisites and conditions to obtain the conformity marking

Shipbuilding sector - passenger transport

shipbuilding sector

Fire safety

As regards the revision of the fire protection code, IMO (International Maritime Organisation) has updated the FTP Code to IMO RES MSC 307(88) Ed. 2010, completing and describing in greater detail the various test methods.

It came into force from 1st July 2012 and its use became obligatory (with regard to carrying out tests) from 1st July 2013.

Compared to the previous edition of the code, one of the new features introduced regards tests carried out for the new certificates which should be dated within the previous five years. Tests carried out before a five year period can be validated only if released by authorised institutes.

Ten points of the Code have been updated (point 6 has been completely eliminated) and a summary is shown in the table below where parameters relevant to fire behaviour have been labelled with the following sign (▲) and those relevant to fire resistance with the sign (■).

1) Incombustibility test ▲
2) Smoke and toxicity test (in accordance with ISO 5659-2) ▲
3) Class A, B and F division test ■
4) Fire door control systems test ■
5) Surface flammability tests (according to ISO 5658-2 + heat release rate measurement) ▲
6) ELIMINATED POINT
7) Vertically supported materials and film ▲
8) Padded furniture tests ▲
9) Bed components tests ▲
10) Fire-restricting material tests ▲
11) Test for fire resistant partitions for fast embarkation ■

The optical density and the concentration of substances present in combustion gases are also measured.
The number of items to be tested are now 6 instead of 3, as stipulated by the previous edition of the Code.

The requisites for insulation material have been compared to wall and floor cladding and are regulated by SOLAS 74, by the FTP Code 61 (67) and by the IMO MSC Circular No. 916 (determination of toxic gases, No. 1004-1008 for reference purposes.

Specifically, the FTP Code (Annex 1 Parts 2 and 5) requires carrying out tests from which the methodological conformity is required as shown in the table below:

FLAME SPREAD WITH RADIANT HEAT PANEL METHOD (IMO A 653 (16) FOR USE AS WALL CLADDING (EVALUATION PARAMETERS)		
CFC	=	Critical flow >20 kW/m^2
Qsb	=	Heat of combustion >1,5 MJ/m^2
Qt	=	Total heat <0,7 MJ
Qp	=	Heat release peak <4,0 kW

Determination of smoke and gas according to ISO 5659-2 (NBS Chamber) with irradiation of 25 kW (with or without flame) and of 50 kW (without flame).

MED 96/98 EC Directive - Requisites and conditions to obtain the conformity marking

Shipbuilding sector - passenger transport

shipbuilding sector

Fire safety

The maximum optical density of smoke (Dm) must not exceed a value of 200 in a period of 4 minutes. As regards gases, the acceptable values (parts per million) are specified in the following table and a comparison is made with the results obtained by the **EUROBATEX HF insulation material**:

Acceptable limits			EUROBATEX HF values
-CO	1450	ppm	870
-HCL	600	ppm	16,5
-HF	600	ppm	<0,1
-NOx	350	ppm	61,0
-HBr	600	ppm	<0,1
-HCN	140	ppm	22,8
-SO2	120	ppm	22,5

For cladding material in the areas near stairs, corridors and escape routes, the Determination of Calorific Value is required if relevant, according to ISO 1716, the maximum reference value being 45MJ/m2.

UNION FOAM S.p.A., along with the Management System Certificate according to ISO 9001 and the relevant CE Marking has obtained the MED Mark of Conformity as underlined in the above table and in the following certificates regarding both Module B (EC Certificate of type examination) and Module D (EC quality system certificate for production) in accordance with the Directive.

Quality Management Certificate ISO 9001

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificato No./Certificate No.: CERT-02587-96-AQ-MIL-SINCERT

Data prima emissione/Initial date: 13 febbraio 1998

Validità/Valid: 25 novembre 2015 - 15 settembre 2018

Si certifica che il sistema di gestione di/This is to certify that the management system of

UNION FOAM S.p.A.

Via dell'Industria, 8/11 - 20882 Bellusco (MB) - Italy

È conforme ai requisiti della norma per il Sistema di Gestione Qualità/ has been found to conform to the Quality Management System standard:

UNI EN ISO 9001:2008 (ISO 9001:2008)

Questa certificazione è valida per il seguente campo applicativo:

Progettazione, produzione e commercio di tubi e lastre in elastomero espanso

(Settore EA: 14)

This certificate is valid for the following scope:

Design, manufacture and trade of pipes and sheets in elastomeric foam

(EA Sector: 14)

Luogo e Data/Place and date: **Vimercate, 28 ottobre 2015**

ACCREDIA

Per l'Organismo di Certificazione/ For the Certification Body

Vittore Marangon
Management Representative

MED 96/98 EC Directive - Requisites and conditions to obtain the conformity marking

Shipbuilding sector - passenger transport

shipbuilding sector

Fire safety

EC certificate of type examination according to the procedures required by Module B (Attachment - Directive 96/98/EC)

CSI CERT

CERTIFICATO CE DEL TIPO (MODULO B)

EC CERTIFICATE (MODULE B) OF TYPE EXAMINATION

UNION FOAM S.p.A.

Via dell'Industria, 11 - 20040 BELLUSCO (MI) - ITALY

MED/3.18d

EUROBATEX HF

CSI CERT

CERTIFICATO CE DEL TIPO (MODULO B)

EC CERTIFICATE (MODULE B) OF TYPE EXAMINATION

ALLEGATO A/ ANNEX A

UNION FOAM S.p.A.

Via dell'Industria, 11 - 20040 BELLUSCO (MI) - ITALY

EC quality system certificate for production, with the required requisites according to the procedure of form D.

CSI CERT

CERTIFICATO CE GARANZIA DI QUALITA' DELLA PRODUZIONE (MODULO D)

EC QUALITY SYSTEM (MODULE D) CERTIFICATE

UNION FOAM S.p.A.

Via dell'Industria, 11 - 20040 BELLUSCO (MI) - ITALY

A.1/3.18d

Materiali di copertura e rivestimenti per pavimenti a limitata capacità di propagazione della fiamma:
d) rivestimenti per la coibentazione di tubature

CSI CERT

CERTIFICATO CE GARANZIA DI QUALITA' DELLA PRODUZIONE (MODULO D)

EC QUALITY SYSTEM (MODULE D) CERTIFICATE

0497/yy

MED 96/98 EC Directive - Requisites and conditions to obtain the conformity marking

Shipbuilding sector - passenger transport

shipbuilding sector

Fire safety

Lloyd's Register

CERTIFICATE OF FIRE APPROVAL

This is to certify that

The product detailed below will be accepted for compliance with the applicable Lloyd's Register Rules and Regulations and with the International Convention for the Safety of Life at Sea, (SOLAS), 1974, as amended, for use on ships and offshore installations classed with Lloyd's Register, and for use on ships and offshore installations when authorised by contracting governments to issue the relevant certificates, licences, permits etc.

Manufacturer Union Foam S.p.A.

Address Via dell'Industria 11
20822 Bellusco (MB)
Italy

Type MATERIAL HAVING LOW FLAME SPREAD CHARACTERISTICS & NOT CAPABLE OF PRODUCING EXCESSIVE SMOKE & TOXIC PRODUCTS OF COMBUSTION

Description Fire-Resisting Material - Type "**Eurobatex HF**"

Specified Standard IMO Res. MSC.307(88) - (2010 FTP Code) Annex 1 Part 5 and Annex 2

The attached Design Appraisal Document forms part of this certificate.
This certificate remains valid unless cancelled or revoked, provided the conditions in the attached Design Appraisal Document are complied with and the equipment remains satisfactory in service.

Date of issue 31 August 2017 Expiry date 30 August 2022

Certificate No. SAS FI70204 Signed

Sheet No 1 of 2 Name J.M. Evans
Surveyor to Lloyd's Register EMEA
A Member of the Lloyd's Register Group

Note:

This certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested. The manufacturer should notify Lloyd's Register of any modification or changes to the equipment in order to obtain a valid Certificate.

Lloyd's Register

Lloyd's Register EMEA
71 Fenchurch Street, London, EC3M 4BS
Telephone 020 7423 2456 Fax 020 7423 2031
Email: ...@lr.org

Page 2 of 2
Our reference SAS FI70204
Issue number 1

DESIGN APPRAISAL DOCUMENT

Date 31 August 2017 Quote the reference on all future communications SOL/TSO/SFS/TA/IE/W729620974

ATTACHMENT TO CERTIFICATE OF TYPE APPROVAL No. SAS FI70204

This Design Appraisal Document forms part of the Certificate.

APPROVAL DOCUMENTATION

CSI S.p.A., Viale Lombardia 20, 20021 Bollarate (MI), Italy, Fire Test Reports No. 0826/DC/REA/15 dated 9th October 2015 and No. 0270/DC/REA/17 dated 3rd April 2017.

CONDITIONS OF CERTIFICATION

1. **Restricted Application:** Restricted to cold service pipework / fittings on refrigerated systems listed in SOLAS II-2, Reg.5.5.1.1 everywhere on-board, or to spaces exempt from this requirement in the same regulation, i.e. cargo spaces, mail rooms, baggage room and refrigerated compartments of service spaces
2. Consisting of: halogen free elastomer foam (thickness 4mm to 32mm, density 55 +/- 5 kg/m³)
3. Smoke and toxicity criteria is satisfied by meeting the total heat release (Q) and peak heat release rate (q) as stated in IMO Fire Test Procedures Code, Annex 2, Section 2.2
4. Composition of individual components, including any flame retardants, to be maintained in production in accordance with originally tested composition formula
5. Production items are to be manufactured in accordance with a quality control system which shall be maintained to ensure that items are of the same standard as the approved prototype

PLACE OF PRODUCTION

Union Foam S.p.A.
Via dell'Industria 11
20822 Bellusco (MB)
Italy

Jessica Evans
Senior Specialist
Statutory Fire & Safety
Southampton Technical Support Office, Marine & Offshore
Lloyd's Register EMEA

Supplementary Type Approval Terms and Conditions

This certificate and Design Appraisal Document relates to type approval, it certifies that the prototype(s) of the product(s) referred to herein has/have been found to meet the applicable design criteria for the use specified herein, it does not waive or imply approval for any other use, nor approval of any products designed or manufactured otherwise than in strict conformity with the said prototype(s).

TYPE APPROVAL CERTIFICATE
No. **LAB185117CS/001**

This is to certify that the product identified below is in compliance with the regulations herewith specified.

Description	**Materials with low flame spread characteristic and with low smoke specific optical density and toxicity of the combustion products**
Type	**Eurobatex HF**
Applicant	**UNION FOAM SPA** **VIA DELL'INDUSTRIA 11** **20040 Bellusco (MB)** **ITALY**
Manufacturer *Place of manufacture*	**UNION FOAM SPA** **VIA DELL'INDUSTRIA 11** **20040 Bellusco (MB)** **ITALY**
Reference standards	**IMO Res. MSC.307(88)-(2010 FTP Code)**
Reference documents	**Chap. II-2 of SOLAS 74 Convention, as amended, RINA Rules for the Testing and Certification of Marine Materials and Equipment**

Issued in **Genoa** *on* **August 28, 2017**. *This Certificate is valid until* **August 27, 2022**

RINA Services S.p.A.
Enrico Cabella

This certificate consists of this page and 1 enclosure

TYPE APPROVAL CERTIFICATE
No. **LAB185117CS/001**
Enclosure - Page 1 of 1
Eurobatex HF

Product description

Halogen free elastomeric foam.

- Density (kg/m³): 55 ± 5
- Thickness range (mm): 4 to 32

Field of application

As pipe insulation covers.

On the basis of the value of the total heat release (Q) and on the basis of the value of the peak heat release (q) the material is deemed not generating excessive quantities of smoke nor toxic products in fire according to Annex 2 IMO 2010 FTP Code.

Tests carried out

Tests as per CSI Test Laboratory reports No. 0826/DC/REA/15 dated 9 October 2015 and No. 0270/DC/REA/17 dated 3 April 2017 issued according to IMO 2010 FTP Code Part 5.

General conditions for the approval

a) The initial conditions verified by RINA at the time of the approval are to be maintained

b) Any changes to the initial conditions are to be promptly communicated to RINA, which reserves the right to repeat the relevant assessment

c) This certificate will not be valid if the manufacturer makes any changes or modifications to the approved equipment, which have not been notified to, and agreed with RINA

d) RINA personnel are to allowed to witness during the performances of activities, upon their request

e) The activities are to be carried out in compliance with the RINA Rules and/or other applicable Rules

f) Should the specified regulations or standards be amended during the validity of this certificate, the product is to be reapproved prior to it being placed on board vessels to which the amended regulations or standards apply.

Genoa 28/08/2017

Having obtained the MED certifications, the official approval documents of the products used for on-board insulation as foreseen by the normative are available on request, especially useful since they were issued by official bodies (RINA e LLOYD) which normally carry out the supervision of the products and their suitability for specific uses.
Union Foam is therefore now able to provide customers with all necessary documents required by the Shipbuilding sector.

EUROBATEX

CHEMICAL RESISTANCE

INORGANIC Substances

Resistant. | Resistant to limited resistance. | Limited Resistance. | Limited resistance to not resistant | Not resistant.

INORGANIC substances	Concentration level	Resistance in time				
		Resistant	Resistant to limited resistance.	Limited Resistance.	Limited resistance to not resistant.	Not resistant.
Salts (aquesous solutions)						
Ammonium Nitrate	saturated solution	■				
Ammonium Phosphate	solution 30%	■				
Ammonium Sulphate	solution 30%	■				
Potassium Nitrate	30% or gas	■				
Rocksalt	melting mixture	■				
Sodium Carbonate	saturated solution	■				
Sodium Chloride	saturated solution	■				
Sodium Nitrateo	saturated solution	■				
Sodium Sulphate	saturated solution	■				
Zinc Chloride	saturated solution	■				
Electroplating Solutions of the Metals						
Sulphur dioxide	gas				■	
Chlorine	gas and liquid					■
Bases						
Ammonia	30% or gas	■				
Calcium Hydrate	saturated solution	■				
Acids						
Hydrochloric Acid	20%	■				
Hydrochloric Acid	concentrated		■			
Hydrofluoric Acid	48%	■				
Nitric Acid	20%		■			
Nitric Acid	concentrated			■		
Phosphoric Acid	concentrated	■				
Others/Altro						
Hydrogen Peroxide	30%					■
Hydrogen Peroxide	3%				■	
Hydrogen Sulphide	gas					■
Sugared Water	30%	■				
Caustic Soda	concentrated	■				

EUROBATEX

CHEMICAL RESISTANCE

ORGANIC Substances

Resistant. | Resistant to limited resistance. | Limited Resistance. | Limited resistance to not resistant. | Not resistant.

ORGANIC substances	Concentration level	Resistance in time				
		Resistant.	Resistant to limited resistance.	Limited Resistance.	Limited resistance to not resistant.	Not resistant.
Alcohols						
Ethyl Alcohol	–					
Ethylene Glycol	–					
Glycerine	–					
Methyl Alcohol	–					
Acids						
Acetic Acid	20%					
Concentrated Acetic Acid	99-100%					
Esters						
Tricresyl Phosphate	–					
Aldehydes, Ketones	–					
Acetaldehyde	solution 40%					
Acetone						
Formalin (water sol. -40% of Formaldheyde)	–					
Ethers						
Ethyl Ether						
Saturated Aliphatics Hydrocarbons						
Hexane	gas or liquid					
Methane	gas					
Aliphatic Halogenated Hydrocarbons						
Carbon Tetrachloride	–					
Chloroform	–					
Freon 11 (boiling point 74 F)	liquid and gas					
Freon 113 (boiling point 114 F)	liquid and gas					
Trichloroethylene	–					
Aromatic Hydrocarbons						
Benzene	–					
Hydrocarbon Blends						
Gas Oil	–					
Hydraulic Oil	–					
Motor Fuel FAM	liquid					
Oils ASTM specifications 1, 2, 3	–					
Petroleum/Petrolio, Crude Petroleum	–					
Animal and Vegetable Oils and Fats						
Castor Oil	–					
Linseed Oil	–					
Soyabean Oil						
Others						
Carbon Disulphide	gas					
Carbon Disulphide	liquid					
Detergents and Surfactants						
Molasses						

EUROBATEX AT

CHEMICAL RESISTANCE

ORGANIC Substances

Resistant. | Resistant to limited resistance. | Limited Resistance. | Limited resistance to not resistant. | Not resistant.

ORGANIC substances	Concentration level	Resistance in time				
		Resistant.	Resistant to limited resistance.	Limited Resistance.	Limited resistance to not resistant.	Not resistant.
Alcohols						
Ethyl Glycol, Glycerine	–					
Methanol, Ethanol Propanol, Butanol	–					
Acids						
Acetic Acid	50%					
Acetic Anhydride	–					
Chloroacetic and Tricloroacetic Acid	–					
Adipic, Butyric, Caproic, Lactic, Maeic and Oxalic Acid	–					
Formic, Stearic, Plmmitic Oleic and Chlorosulphonic Acid	–					
Amines						
Ethanolamine Triethanolamine	–					
Trimethylamine Triethylamine, Propylamine	–					
Esters/						
Methyl Acetate, Ethyl Acetate Amyl Acetate	–					
Ethyl Acrylate	–					
Dioctylphthalate	–					
Tributyl Phosphate, Tricresyl Phosphate	–					
Butyl Stearate	–					
Aldehydes, Ketones						
Acetaldehyde	–					
Acetone, Methyl Ethyl Ketone	–					
Acrolein	–					
Acrylonitrile	–					
Cyclohexanone	–					
Ethers						
Diethyl Ether Tetrahydrofuran	–					
Saturated Aliphatics Hydrocarbons						
Methane, Propane, Hexane, Isooctane, Kerosene	–					

EUROBATEX AT

CHEMICAL RESISTANCE

ORGANIC Substances

Resistant. | Resistant to limited resistance. | Limited Resistance. | Limited resistance to not resistant. | Not resistant.

ORGANIC substances	Concentration level	Resistance in time				
		Resistant.	Resistant to limited resistance.	Limited Resistance.	Limited resistance to not resistant.	Not resistant.
Unsaturated Aliphatics Hydrocarbons						
Ethane, Propene, Butadiene Acetylene	–					
Aliphatic Halogenated Hydrocarbons						
Methylene Chloride, Ethylene Chloride Chloride	–					
Ethylene Dichloride	–					
Trichloroethylene, Chloroform, Perchloroethylene	–					
Carbon Tetrachloride, Ethylene Bromide, Allyl Chloride	–					
Vinyl Chloride, Freon	–					
Aromatic Hydrocarbons						
Benzene, Toluene, Xylene Tetralin, Decalin	–					
Aniline, Nitrobenzene	–					
Naphtalene, Styrene, Phenol, Vinylpyridine	–					
Chlorobenzene, Bromobenzene, Benzyl Chloride	–					
Benzaldehyde	–					
Mineral Oils	–					
Animal and Vegetable Oils and Fats						
Olive Oil, Butter	–					
Coconut Oil, Castor Oil, Soyabean Oil	–					

UNION FOAM

advanced elastomeric thermal and acoustic insulation materials

EUROBATEX AT

CHEMICAL RESISTANCE

INORGANIC Substances

Resistant. | Resistant to limited resistance. | Limited Resistance. | Limited resistance to not resistant. | Not resistant.

INORGANIC substances	Concentration level	Resistance in time				
		Resistant.	Resistant to limited resistance.	Limited Resistance.	Limited resistance to not resistant.	Not resistant.
Salts (aqueous solutions)						
Ammonium, Alkali Metals, Alkaline Earth Metals	–					
Cadmium, Zinc, Aluminium, Iron, Chromium	–					
Antimony, Arsenic, Tin, Siver	–					
Mercury and Uranium Salts	–					
Bases						
Ammonia, Alkali Metal Hydroxides	–					
Alkali Earth Metal Hydroxides	–					
Acids						
Hydrochloric Acid	37%					
Nitric Acid	30%					
Phosphoric Acid	–					
Sulphuric Acid	75%					
Sulphurous Acid	–					
Others						
Copper, Gold, Nickel, Rhodium	–					
Bromine, Iodine	–					
Chorine	dry					
Chorine	moist					
Platinum, Silver, Tin, Zinc and Brass	–					
Sulpher Dioxide	dry, moist					
Water, Hot Water, Water Vapour, Sea Water	–					

European Regulation 1907/2006 . REACH

(European law No. 396 of 30/12/2006)

REACH

Substances of Very High Concern (SVHC)			
Substance Name (REACH SVHC)	**Name IUPAC**	**EC No.**	**CAS No.**
Trirthyl arsenate	Trietil arseniato	427-700-2	15606-95-8
Anthracene	—	204-371-1	120-12-7
4,4[3]-Diaminodiphenylmethane (MDA)	—	202-974-4	101-77-9
Dibutyl Phthalate (DBP)	—	201-557-4	84-74-2
Cobalt dichloride	—	231-589-4	7646-79-9
Diarsenic pentaoxide	1,3 - Dioxodiarsoxane 1,3 - Dioddido	215-116-9	1303-28-2
Diarsenic trioxide	Dioxodiarsoxane	215-481-4	1327-53-3
Sodium dichromate	Bicromato di sodio	234-190-3	10588-01-9 7789-12-0
Musk xylene 5 - tert - butyl - 2,4,6 - trinitro-m-xylene	1-tert-butil, 5-dimetil, 2, 4, 6 trinitrobenzene	201-394-4	81-15-2
Bis (2-ethylhexyl) phthalate (DEHP)	—	204-211-0	117-81-7
Hexabromocyclododecane (HBCDD) and all major diastereoisomers identified	—	247-148-4 221-695-9	25637-99-4 3194-55-6
Alpha-Hexabromocyclododecane	—	221-695-9 247-148-4	134237-50-6
Beta-Hexabromocyclododecane	—	221-695-9 247-148-4	134237-51-7
Gamma-Hexabromocyclododecane	—	221-695-9 247-148-4	134237-52-7
Alkanes, C10-13, chloro (short chain chlorinated paraffins)	—	287-476-5	85535-84-8
Bis (tributyltin) oxide (TBTO)	Hexa-n-Butyldistannoxan	200-268-0	56-35-9
Lead hydrogen arsenate	Piombo arseniato idrogeno	232-064-2	7784-40-9
Benzyl butylphthalate (BBP)	—	201-622-7	85-68-7

Union Foam S.p.A confirms that their products comply with the REACH regulations according to EU Guideline 1907/06. Union Foam S.p.A as a manufacturer of products is in the sense of the REACH Regulation a "downstream user" ; due to this fact the company is not subject to the registration duty under REACH. Union Foam also declares that their suppliers comply with REACH regulations and that the whole range of Union Foam product items is SVHC free.

Insulation materials.
Our world.
For a better world.

UNION FOAM

advanced elastomeric thermal and acoustic insulation materials

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