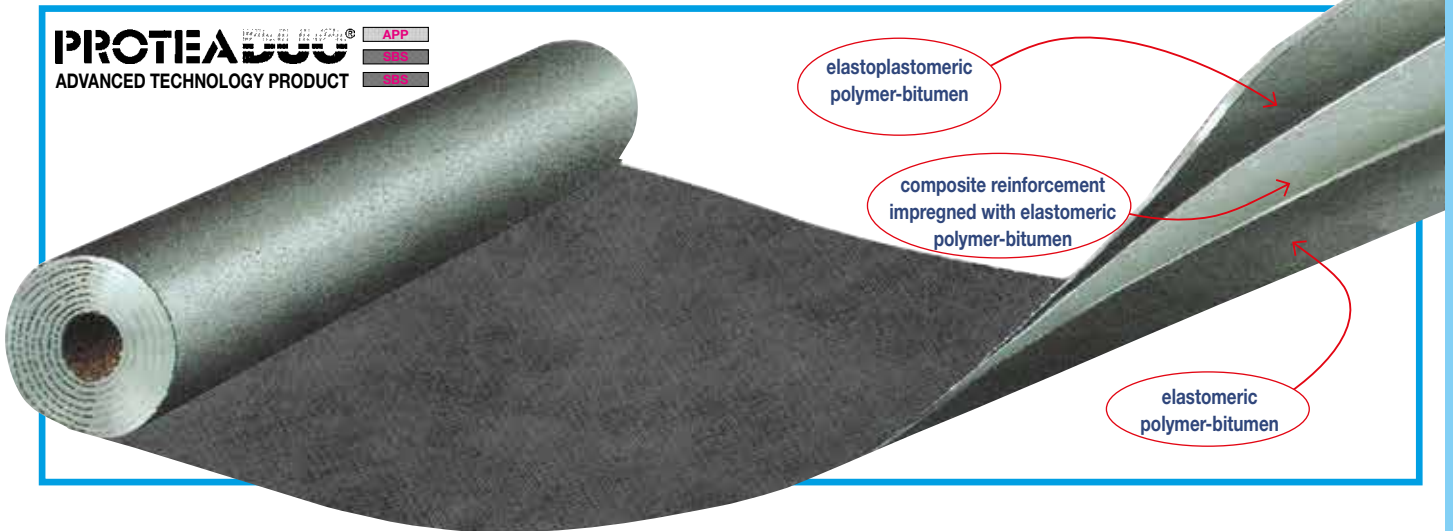


# PROTEADUO TRIARMATO MINERAL PROTEADUO TRIARMATO PROTEADUO POLYESTER MINERAL PROTEADUO POLYESTER

WATERPROOFING MEMBRANES MADE OF MULTILAYER  
COMPOSITE DISTILLED POLYMER-BITUMEN  
AND COMPOSITE REINFORCEMENT

GRANTS *LEED* CREDITS



## 1

## PROBLEM

Polymer-bitumen membranes are manufactured using a reinforcement which is usually "non-woven" polyester fabric and/or fibreglass mat, impregnated and covered with a compound of distilled bitumen with added polymers.

The nature of the polymer mixed with the bitumen divides the membranes into two consistent groups:

- APP bitumen membranes (atactic polypropylene)
- SBS bitumen membranes (styrene butadiene copolymer)

Due to the physical characteristics of the polymer used, the APP type is also called plastomeric polymer-bitumen membrane, while the SBS type is called elastomeric polymer-bitumen membrane.

APP bitumen membranes are characterised by a high heat resistance and may be directly exposed to the sun's rays, while SBS bitumen membranes, noticeably more elastic and flexible even at low temperatures, soften at a lower temperature.

Due to the fact that SBS is sensitive to U.V. rays, for use on surfaces which will remain visible, it is necessary to produce these membranes with a protective layer of slate flakes or mineral granules.

The areas of use of the two membrane groups overlap in many cases, except for a preference for SBS bitumen membranes where the climate is particularly cold or where a high level of elasticity is required, such as for metal

deck coverings on light weight structures. The use of APP membranes has become indispensable in hot climates and for waterproofing road structures where tarmac is applied hot onto the membrane, or when covering waterworks where a smooth top face without a mineral finish is required.

Traditional production technology makes it possible to produce membranes with a single waterproofing mass. In other words, the compound which is used to impregnate the reinforcement is the same as that which covers both the top face and the underside of the sheet. Apart from the mechanical characteristics, the other characteristics of the membrane are determined solely by the type of polymer used in the mix.

Many attempts have been made to combine the qualities of APP with those of SBS by mixing them together with bitumen but the results to date have been disappointing as the SBS loses a consistent amount of its elasticity once it is mixed with a plastomer.

Index S.p.A. research is now being directed towards the concept of membranes in which both polymers are present but not mixed together.

Several membranes have been developed: it is possible to find different types of layers positioned in various ways depending on the specific use for which the membrane is designed.

In order to produce these membranes it was necessary to devise and manufacture a new

prototype line which allows differential build-up and it was also necessary to find new innovative bonding systems which guarantees a long-lasting and optimal adhesion between the layers of the membrane.

Index S.p.A. is now in a position to propose an innovative range of products called composite membranes, due to the fact that they are made up of several different layers which are synergetic and specialised because they have been designed to display specific characteristics.

CATEGORY		CHARACTERISTICS			ENVIRONMENTAL						METHOD OF USE				
COMPOSITE ELASTOPLATOMERIC		WATERPROOF	REACTION TO FIRE	ECO GREEN	ASBESTOS FREE	TAR FREE	CHLORINE FREE	RECYCLABLE	NON DANGEROUS WASTE	EXHAUSTED OIL FREE	TORCH APPLICATION	HOT AIR APPLICATION	NAILING	COLD ADHESIVE BONDING	APPLICATION WITH MOLTEN BLOWN BITUMEN

\* For waterproofing membranes with TEXFLAMINA underface finish only

## 2 SOLUTION

**PROTEADUO** is a multi-layer composite polymer-bitumen waterproofing membrane with a reinforcement impregnated with SBS-modified bitumen. Even the lower layer in contact with the laying surface is made of SBS-modified bitumen, while the upper layer is made of APP-modified bitumen.

The elastomeric mix of the lower face is based on distilled bitumen and thermoplastic rubber made up of a copolymer with blocks of radial styrene-butadiene. It offers an ultimate elongation of 2000%, cold flexibility of up to -25°C, and very high resistance to thermo-oxidative ageing. The base of the elastoplastomeric mix making up the protective layer of the upper face of the sheet is distilled bitumen, atactic and isotactic polypropylene and UV-resistant polyolefin elastomers, supplemented with thermal shock stabilisers. Its melting point is above 150°C. The reinforcement is also the result of thorough research into the strengthening of waterproofing membranes. As is well known, "non-woven" polyester fabric, while being resistant and elastic, is more sensitive to temperature than mineral fibre reinforcement and can cause the membranes to deform. The traditional coupling with fibreglass solves the problem of stability but even during application the bending of the membrane causes tiny breakages in the fibreglass that can damage the bituminous mass covering it. **PROTEADUO TRIARMATO** has a special composite prefabricated three-layer reinforcement, where the fibreglass mat is compressed between two layers of "non-woven" Spunbond polyester fabric and so cannot damage the bituminous mass.

Stability is guaranteed by the fibreglass mat which limits the movements of the membrane both at high and low temperatures. The mix is protected and reinforced with a "non-woven" polyester fabric.

The composite material is more resistant to nail tearing than normal reinforcements, therefore **PROTEADUO** can also be mechanically fastened. The fibres are completely impregnated and coated with an elastomeric mix using an exclusive procedure which guarantees absolute waterproofing, high resistance to tearing and impact, and excellent elasticity even at low temperatures.

**PROTEADUO POLYESTER** is also reinforced with composite "non-woven" polyester fabric which is stabilized with fibreglass mat to guarantee stability in hot conditions, while at low temperatures it behaves like a pure polyester reinforced membrane.

The lower face of **PROTEADUO** is coated with a Flamina hot-melt film with high shrinkage in contact with the flame.

The elastomeric layer ensures excellent adhesion to conventional building materials, to polymer-bitumen membranes and also to oxidised bitumen coatings and old bituminous coverings. The upper face is coated with a new multifunctional surface finish called Texflamina, which can be painted immediately after application and guarantees optimal adhesion of SOLARIS aluminium and INDECOLOR SV paints and INDECOLOR water-based paint. It is also compatible with ALLUMASOL, ELASTOLIQUID and ELASTOLIQUID PUR coatings.

In this case, to prevent detachment and/or non-uniformity of the paint applied in the central part of the membrane over time, where the Texflamina remains intact, and the paint applied close to the overlaps, where the Texflamina is affected by the reflection of the flame, care must be taken to limit the extension of the reflection, possibly using a welding torch with a flat nozzle that can be placed under the overlap.

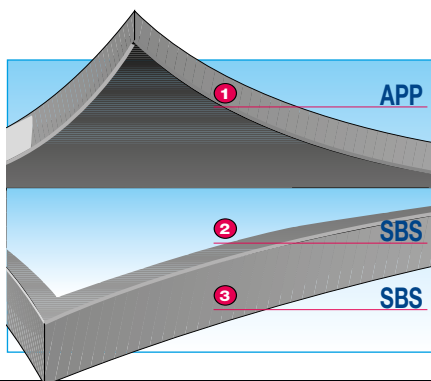
Thanks to the high heat resistance of the top polymeric layer, **PROTEADUO** can be covered with hot-laid bituminous conglomerate. **PROTEADUO** withstands exposure to the sun's rays without heavy protection, but a coat of light coloured paint is always recommended, especially when applying on insulation. This will help to reduce the effects of thermal shock and also help to insulate the roof.

Both types of membrane are also produced in a version with the upper face coated with slate granules, either natural or coloured, called **MINERAL PROTEADUO**, designed both to meet specific aesthetic requirements and to protect the membrane from the impact of hailstones with sharp edges.

The slate coating is hot-bonded to the external layer in APP-modified bitumen, ensuring strong and lasting adhesion.

To be able to seal the membrane overlaps, the sheets are produced with a side strip of 8 cm approximately without slate granules on the upper face.

**MINERAL PROTEADUO** is used as a final visible layer where it is possible to appreciate its



## CE INTENDED USE OF "CE" MARKING SPECIFIED ACCORDING TO THE AISPEC-MBP GUIDELINES

### EN 13707 - REINFORCED BITUMEN SHEETS FOR ROOF WATERPROOFING

• Sub-layer or intermediate layer in multi-layer systems without permanent heavy upper protection (visible)

- PROTEADUO TRIARMATO
- PROTEADUO POLYESTER

• Upper layer in multi-layer systems without permanent heavy surface protection (visible)

- PROTEADUO TRIARMATO
- MINERAL PROTEADUO TRIARMATO
- PROTEADUO POLYESTER
- MINERAL PROTEADUO POLYESTER

• Exposed single-layer

- PROTEADUO TRIARMATO
- MINERAL PROTEADUO TRIARMATO

• Single-layer under heavy protection

- PROTEADUO TRIARMATO

• Under heavy protection in multi-layer systems

- PROTEADUO TRIARMATO
- PROTEADUO POLYESTER

### EN 13969 - BITUMEN DAMP PROOF SHEET INCLUDING BITUMEN BASEMENT TANKING SHEETS

• Membranes for foundations

- PROTEADUO TRIARMATO
- PROTEADUO POLYESTER

decorative effect and where it can offer a contribution to the waterproof covering's resistance to hailstones.

**PROTEADUO** in the **PROTEADUO TRIARMATO 4 mm** and **MINERAL PROTEADUO TRIARMATO 4 mm** versions is certified by the DVT (technical assessment document) issued by the ITC - CNR certification institute (formerly ICITE).

## ADVANTAGES

- It combines the advantages of APP bitumen with those of SBS bitumen.
- It lasts longer than both APP bitumen membranes and SBS bitumen membranes.
- It can be painted immediately.
- The only SBS bitumen membrane that is smooth (not slated) that can be directly asphalted.

## CERTIFICATIONS



Technical Assessment for Use Document  
DVT-0009

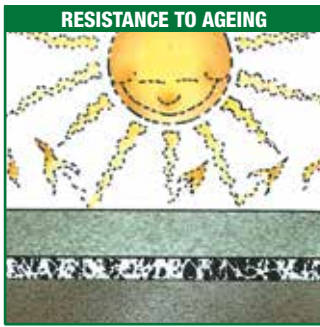


(for PROTEADUO TRIARMATO 4 mm and MINERAL PROTEADUO TRIARMATO 4 mm only)

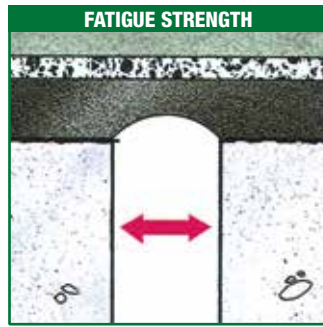


AGREEMENT  
BBA

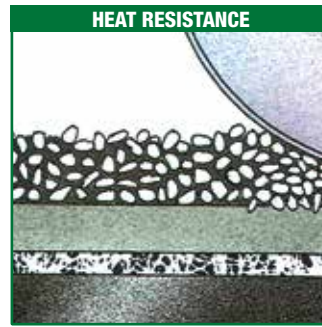




**RESISTANCE TO AGEING**  
**PROTEADUO's** resistance to ageing is guaranteed by the upper APP-bitumen layer



**FATIGUE STRENGTH**  
 The underside in SBS-bitumen and the continuously extruded polyester fibre reinforcement guarantee **PROTEADUO's** excellent fatigue strength



**HEAT RESISTANCE**  
 The high softening point of the upper face guarantees **PROTEADUO TRIARMATO's** heat resistant properties. Hot road asphalt can be mastic straight on both **PROTEADUO TRIARMATO** and **PROTEADUO POLYESTER 25**, whereas mastic asphalt straight on **PROTEADUO POLYESTER 25** only



**CAMPATIBILITY**  
 The SBS-bitumen of the underside of **PROTEADUO** membranes is also compatible with oxidized bitumen coatings

## APPLICATION FIELDS

**PROTEADUO** is applied in single layers or as a finishing layer in a multi-layer system. The high mechanical strength, flexibility, thermal stability and durability of **PROTEADUO** mean it can be used on roofs subject to considerable dimensional variations in both hot and cold climates.

The strong welds obtained on the smooth upper face, both for the side and end joints, guarantees perfect bonding even on flat areas and in the presence of ponding. **PROTEADUO** is therefore also used for hydraulic work coverings. When used in direct contact with the ground it will be necessary to add Phenoxy-Fatty Acid Ester additive, a special anti-root agent.

The **MINERAL** versions were designed to

be applied as a finishing layer of a visible waterproof covering where as well as providing a pleasant aesthetic effect, they improve resistance to hailstones both due to the high elasticity of the mix of the lower layer and the mechanical protection of the slate granules.

Thanks to the excellent fatigue strength of elastomeric membranes, even when they are fully bonded, **PROTEADUO** is resistant to dimensional variations and active cracks which appear on cement surfaces. The good compatibility of the lower face of the membrane with bitumen surfaces in general, including oxidised bitumen even if recently applied, guarantees the long-lasting adhesion of **PROTEADUO** both on more difficult repairs and on new layers of bitumen.

Furthermore, in the **TRIARMATO** versions, it

can be used with hot asphalt and the adhesion between membrane and conglomerate is much stronger and lasts longer than that obtained on the self-protected mineral coatings of normal SBS-bitumen membranes currently used on bridges. Therefore, **PROTEADUO TRIARMATO** is used to waterproof decks and car parks also in mountainous areas.

The technical data can be found in the specific technical data sheet.



## DURABILITÀ

Both the SBS-bitumen and the APP-bitumen compounds pass the thermo-oxidizing ageing test in accordance with UEAtc Directives for waterproofing membranes of January 1984.

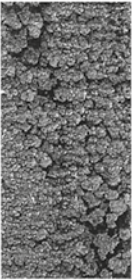
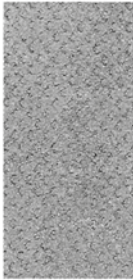
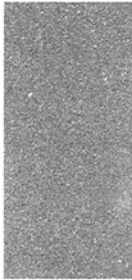

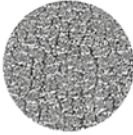
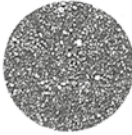
Even though the membranes are mainly made from SBS-bitumen, **PROTEADUO** resists ageing caused by U.V. rays (2000 hours Xenotest) provided for by the same Directives valid for APP membranes. It also resists the combined action of sunlight and rainwater UNI 8629 (800 hours Q.U.V. test). When subjected to 1500 cycles of thermal shock of the Thermal Hydra Shock test, **PROTEADUO** shows no signs of visible deterioration.

The joints are also strong and long lasting. Both new joints or those which have been subjected to ageing are up to the standards of UEAtc Directives.

**Q.U.V. TEST**

Test of resistance to the combined action of water and U.V. rays



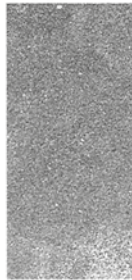
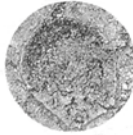
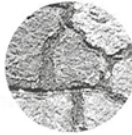
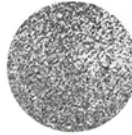
1 Cycle:  
 4 hours U.V. rays at 60°C  
 4 hours condensed water at 40°C

		
SBS-bitumen membrane after 800 cycles	APP-bitumen membrane after 800 cycles	PROTEADUO composite membrane after 800 cycles
		

**THERMAL SHOCK**

Test of resistance to rapid temperature changes

1 Cycle:  
 55' I.R. rays at 80°C  
 5' water at 15°C

		
SBS-bitumen membrane after 500 cycles	APP-bitumen membrane after 1.500 cycles	PROTEADUO composite membrane after 1.500 cycles
		

## TECHNICAL CHARACTERISTICS

	Standard	T	PROTEADUO TRIARMATO	MINERAL PROTEADUO TRIARMATO	PROTEADUO POLYESTER	MIN. PROTEADUO POLYESTER
Reinforcement			Composite Three-layer Non-woven Spunbond and fibreglass	Composite Three-layer Non-woven Spunbond and fibreglass	"Non-woven" composite polyester stabilized with fibreglass	"Non-woven" composite polyester stabilized with fibreglass
Thickness	EN 1849-1	±0,2	4 mm	4 mm	4 mm	5 mm
Weight MINERAL	EN 1849-1	±15%	-	-	4.5 kg/m <sup>2</sup>	-
Roll size	EN 1848-1	-1%	1x10 m	1x10 m	1x10 m	1x10 m
Watertightness • after ageing	EN 1928 - B EN 1926-1928	≥	60 kPa 60 kPa	60 kPa 60 kPa	60 kPa 60 kPa	60 kPa -
Peel resistance L/T	EN 12316-1	-20 N	100 N/50 mm	100 N/50 mm	-	-
Shear resistance L/T	EN 12317-1	-20%	650/550 N/50 mm	650/550	-	600/400 N/50 mm
Maximum tensile force L/T	EN 12311-1	-20%	750/650 N/50 mm	750/650	750/600	700/500 N/50 mm
Elongation L/T	EN 12311-1	-15% V.A.	50/50%	50/50%	50/50%	40/45%
Resistance to impact	EN 12691 - A		1 250 mm	1 250 mm	-	1 250 mm
Resistance to static loading	EN 12730 - A		20 kg	20 kg	-	15 kg
Resistance to tearing (nail shank) L/T	EN 12310-1	-30%	250/250 N	250/250 N	250/250 N	160/200 N
Dimensional stability L/T	EN 1107-1	≤	-0.20/+0.10%	-0.20/+0.10%	-0.20/+0.10%	-0.30/+0.10%
Flexibility to low temp. • after ageing	EN 1109 EN 1296-1109	≤ +15°C	-15°C/-25°C -20°C	-15°C/-25°C -20°C	-15°C/-25°C -20°C	-15°C/-25°C -20°C
Flow resist. at high temp. • after ageing	EN 1110 EN 1296-1110	≥ -10°C	100°C 90°C	100°C 90°C	100°C 90°C	100°C 90°C
UV ageing	EN 1297		Test passed	-	-	Test passed
Reaction to fire Euroclass	EN 13501-1		E	E	E	E
External fire performance	EN 13501-5		F roof	F roof	F roof	F roof

### Thermal specifications

Thermal conductivity			0.2 W/mK	0.2 W/mK	0.2 W/mK	0.2 W/mK	0.2 W/mK
Heat capacity			5.20 KJ/K-m <sup>2</sup>	4.80 KJ/K-m <sup>2</sup>	5.40 KJ/K-m <sup>2</sup>	5.20 KJ/K-m <sup>2</sup>	6.50 KJ/K-m <sup>2</sup>

Compliant with EN 13707 in terms of the resistance factor to steam penetration for reinforced polymer-bitumen membranes, the value of  $\mu = 20\ 000$  may be considered, unless declared otherwise.

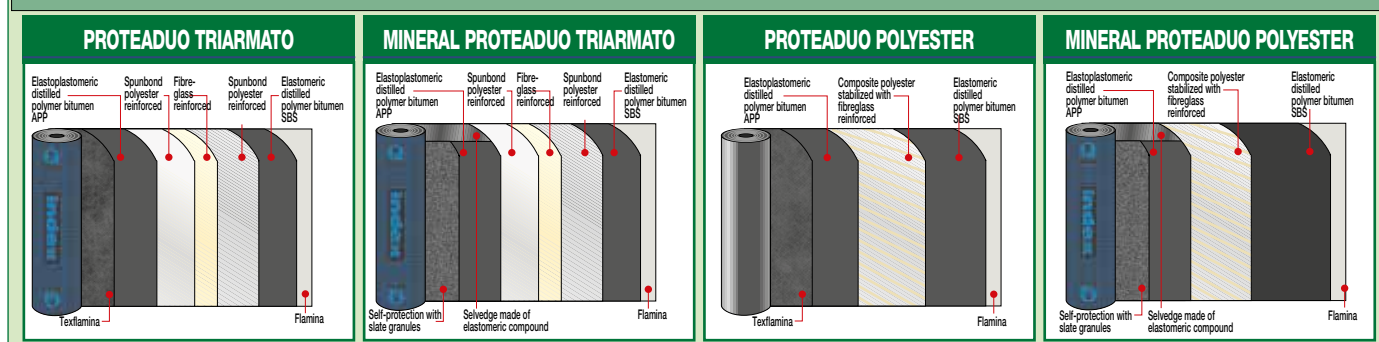
(†) Thickness measured on the selvage according to EN 1849-1, tolerance  $\pm 10\%$ .

Slated membranes may change colour depending on the storage periods. The colour may vary within 2-3 months for the colour to be corrected to their original colour. The colour change is not an aspect of this type of membrane and cannot be the basis for a complaint. The same is true regarding the maintenance of colour and the different colourings that can occur among the various exposed areas of the covering based on the types of artificial colouring.


The numerous possible uses and the possible interference of conditions or elements beyond our control, we assume no responsibility regarding the results which are obtained. The purchasers, of their own accord and under their own responsibility, must establish the suitability of the product for the envisaged use.

The figures shown are average indicative figures relevant to current production and may be changed or updated by INDEX at any time without previous warning. The advice and technical information provided, is what results from our best knowledge regarding the properties and the use of the product. Considering


## COMPOSITION OF THE MEMBRANE




## PRODUCT FINISHING



**EMBOSSING FLAMINA.** The embossing on the lower surfaces of the membranes finished with Flamina film makes it possible to lay the product precisely and quickly, forming a smooth surface when melted with the torch. It indicates the correct melting temperature and lets the film retract faster. The embossing also enables optimal vapour diffusion; in spot bonded and loose laid installation, in the points where it remains intact, preventing blisters and swelling.



**"TEXTLAMINA" PP NON-WOVEN.** Multifunction, protection finishing material made up of a non-woven flame-melting synthetic-fibre fabric, coupled to the upper face of the membrane. It prevents coils from sticking to the roll, improves foot traffic resistance during installation, enhances the adhesion of paints, glues and extends their life.



**SELF-PROTECTION WITH SLATE GRANULES.** On the visible face of the membrane, a protective coating made up of slate granules of various colours is hot bonded. This mineral shield protects the membrane from ageing caused by UV rays.

• FOR ANY FURTHER INFORMATION OR ADVICE ON PARTICULAR APPLICATIONS, CONTACT OUR TECHNICAL OFFICE • IN ORDER TO CORRECTLY USE OUR PRODUCTS, REFER TO INDEX TECHNICAL SPECIFICATIONS •

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