

Protan SE, EX and EXG roofing membranes

is approved by SINTEF Building and Infrastructure with properties, fields of application and conditions as stated in this document

1. Holder of the approval

Protan AS
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2. Manufacturer

Protan AS, Drammen.

3. Product description

Protan SE, EX and EXG are roofing membranes made of pliable PVC with a core of woven polyester. Stabilizers have been added to make the roofing resistant to high and low temperatures, ultra violet radiation, and to limit spread of flames. Installation is carried out by using hot air welding.

Protan SE, EX and EXG are available in several thicknesses, and with specifications as shown in Table 1. Protan EX has a layer of polyester felt, and Protan EXG a layer of glass felt, fixed to the underside.

Standard widths are 1 m and 2 m. Standard length is 20 m per roll. Other dimensions are available on request.

The membranes are manufactured with several standard surface colours. The underside is dark grey.

4. Field of application

Protan SE, EX and EXG are used as exposed, mechanically fastened roofing membranes on flat and sloping roofs, see Fig. 1.

Protan SE can be used as roofing on all types of underlay, but needs a separate migration barrier/levelling layer on polystyrene underlay and for re-roofing applications.

Protan EX has a laminated felt, and can be laid directly on old roofing underlay of bitumen. The membrane may also be used under turf roofing. An additional loose felt must be used on liquid applied asphalt roofing.

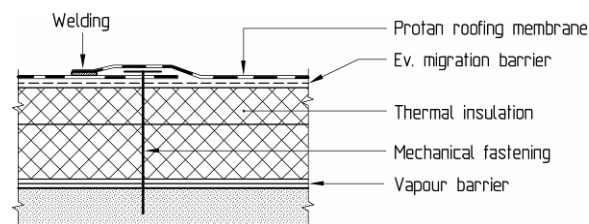


Fig. 1
Protan SE, EX and EXG roofing, mechanically fastened at the edge

Protan EXG is laminated with glass felt and can be laid directly on polystyrene.

Roofs must have adequate slope to drain water from rain and melting snow. SINTEF Building and Infrastructure recommends that all roofs have an inclination of minimum 1:40.

5. Properties

Material properties

Product properties for fresh material are shown in Table 2.

Safety in case of fire

Protan SE fulfils the requirements of class B_{ROOF} (t2) according to EN 13501-5 for all underlay except EPS/XPS-insulation. When using a migration barrier of at least 120 g/m² and 50 g/m² glass felt respectively, Protan SE fulfils class B_{ROOF} (t1) and (t2) also on EPS/XPS-insulation.

Protan EX satisfies the requirements of class B_{ROOF} (t2) on underlay of old roofing membranes.

Protan EXG fulfils class B_{ROOF} (t2) according to EN 13501-5 for all underlay.

Durability

Some properties after artificial ageing are given in Table 3. The products have shown satisfying properties after artificial ageing in connection with type-testing and audit testing performed by SINTEF Building and Infrastructure.

Table 1

Measures and tolerances for Protan SE, EX and EXG roofing membranes

Property	Protan SE			Protan EXG		Protan EX		
Thickness (mm)	1.2 +0.2/-0.1	1.6 +0.2/-0.15	1.8 +0.2/-0.15	1.2 +0.2/-0.10	1.6 +0.2/-0.15	1.2 +0.2/-0.1	1.6 +0.2/-0.15	1.8 +0.2/-0.15
Weight (kg/m ²)	1.4 +0.2/-0.1	1.75 +0.2/-0.1	2.1 +0.2/-0.1	1.4 +0.2/-0.1	1.75 +0.2/-0.1	1.4 +0.2/-0.1	1.75 +0.2/-0.1	2.1 +0.2/-0.1
Width	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %	1 m / 2 m ± 2 %
Roll length	20 m + 2 %/-0 %	20 m + 2 %/-0 %	20 m + 2 %/-0 %	20 m + 2 %/-0 %	20 m + 2 %/-0 %	20 m + 2 %/-0 %	20 m + 2 %/-0 %	20 m + 2 %/-0 %
Weight. Polyester core (impr.)	80 g/m ²	80 g/m ²	80 g/m ²	80 g/m ²	80 g/m ²	80 g/m ²	80 g/m ²	80 g/m ²
Weight. Polyester felt						180 g/m ²	180 g/m ²	180 g/m ²
Weight. Glass felt				55 g/m ²	55 g/m ²			

Table 2

Product properties for fresh material of Protan SE, EX and EXG roofing membranes

Property	Test method EN	Control limit ¹⁾								Unit
		Protan SE			Protan EXG		Protan EX			
		1.2 mm	1.6 mm	1.8 mm	1.2 mm w/felt	1.6 mm w/felt	1.2 mm w/felt	1.6 mm w/felt	1.8 mm w/felt	
Foldability at low temperature	495-5:2001	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	°C
Dimensional stability	1107-2:2001	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5	± 0,5	%
Water tightness (10 kPa)	1928:2000 (A)	Tett	Tett	Tett	Tett	Tett	Tett	Tett	Tett	-
Tear resistance	12310-2:2000	≥ 210	≥ 210	≥ 210	≥ 210	≥ 210	≥ 300	≥ 300	≥ 300	N
Tensile strength	12311-2:2000 (A)	≥ 1050	≥ 1050	≥ 1050	≥ 1050	≥ 1050	≥ 1100	≥ 1100	≥ 1100	N/50 mm
Elongation	12311-2:2000 (A)	≥ 15	≥ 15	≥ 15	≥ 15	≥ 15	≥ 15	≥ 15	≥ 15	%
Average peel resistance of joints	12316-2:2000	≥ 150	≥ 150	≥ 150	≥ 150	≥ 150	≥ 150	≥ 150	≥ 150	N/50 mm
Shear resistance of joints	12317-2:2000	≥ 1000	≥ 1000	≥ 1000	≥ 1000	≥ 1000	≥ 1000	≥ 1000	≥ 1000	N/50 mm
Resistance to puncture - by impact at +23°C	12691:2006 (A)	≥ 400	≥ 400	≥ 400	≥ 400	≥ 400	≥ 400	≥ 400	≥ 400	mm
- by impact at -10°C	12691:2001	≤ 8	≤ 8	≤ 8	≤ 10	≤ 10	≤ 8	≤ 8	≤ 8	mm diam
- by static loading	12730:2001(A)	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	≥ 20	kg
Water vapour permeability	ISO 12572:2001	12·10 ⁻¹²	9·10 ⁻¹²	8·10 ⁻¹²	12·10 ⁻¹²	9·10 ⁻¹²	12·10 ⁻¹²	9·10 ⁻¹²	8·10 ⁻¹²	kg/m²sPa
Water vapour resistance as equivalent air layer thickness	ISO 12572:2001	16	22	24,5	16	22	16	22	24,5	m

¹⁾ The stated values are existing control limits for internal control at the producer and supervising control

Table 3

Product properties for aged material of Protan SE, EX and EXG roofing membranes

Property	Test method EN	Measured value									Unit
		Protan SE			Protan EXG		Protan EX				
		1.2	1.6	1.8	1.2	1.6	1.2	1.6	1.8	mm	
Foldability at low temperature - Aged in hot water ¹⁾ - Artificial ageing ²⁾	495-5:2001	≤ -30			≤ -30		≤ -30			°C	
		≤ -25			≤ -25		≤ -25			°C	

¹⁾ Aged according to method NS-EN 1847 (NS 3531) for 8 weeks at 60 °C²⁾ Aged according to method NS-EN 1297 with specimen exposed to UV light, heat radiation, water and laboratory climate

Calculation of fasteners

Load capacities for fastening the roofing membrane with various types of fasteners are shown in Table 5. The capacities relate to the fastening of the membrane itself. The strength of the hold to weak underlay may limit the overall capacity of the fixing points.

Calculation of fastener spacing is carried out according to SINTEF Building Research Design Sheet 544.206 and "TPF Informs No. 5". The capacities apply to Norwegian conditions, with load coefficient 0.9×1.5 according to NS 3490. Factor 0.9 is reduction factor k_L regarding reliability class 1, and factor 1.5 is load factor.

Environmental declaration

Specific environmental declaration has been worked out for Protan SE. Environmental indicators are given in Table 4. For complete documentation see environmental declaration document NEPD No. 0032 on <http://www.nho.no> (search for "PCR"). No environmental declarations have been worked out for the other membranes. The products contain no chemical substances listed on the Norwegian authorities' observation list of compounds being harmful to human health or the environment.

Table 4
Environmental declaration for Protan SE, 1,2 mm

Environmental indicators	
Global warming	6,1 kg CO ₂ ekv.
Energy use	29,55 kWh
Recycled materials	0 %
Indoor air classification (Classification according to CR 1752:1999)	Not relevant

Waste treatment/recycling

The materials in Protan SE, EX and EXG can be recycled, and a system for recycling has been established. Energy can be retrieved by delivering the membranes to a waste combustion plant.

6. Special conditions for use and installation

Storage

Protan roofing membranes should be stored in a dry place, with the rolls placed on pallets at the building site and protected by a covering.

Installation

The joints of Protan SE, EX and EXG are welded by the use of hot air, and the membranes shall be installed in accordance with the manufacturer's instructions. The products shall otherwise be used in accordance with the principles shown in SINTEF Building Research Design Sheet 544.202, 544.204 and 544.206, as well as in "TPF Informs No. 5".

Widths over 1 m should only be used at the mid-section of the roof, and where the dimensioning peak velocity pressure is ≤ 40 m/s. Maximum spacing between fasteners shall be 1 m.

Table 5
Design capacities at ultimate limit state for mechanical fasteners in Protan SE, EX and EXG 1.2 mm and 1.6 mm

Fastening system/Fastener	Capacity, N per fastener
Placed at lane edge, Protan SE, EXG	
Roofing nail 2,8–25	100
Staples (2 x 20 mm)	130
ECOTEK 40 washer	650
Teleskop 40 washer	650
Iso-Tak 40 washer	650
Teleskop 42 fastener	700
ECOTEK 45 fastener	700
Iso-Tak 45 fastener	700
SK Isofest Y40 fastener	700
SK Isofest Ø 50 Croco without studs	750
SFS IT-C 40 x 82 washer	1000
Iso-Tak Plus 48-3N fastener	1000
Teleskop Dracula TPD 50 fastener	1000
Iso-Tak Twin Peak Plus fastener	1100
SK Isofest Ø 50 Croco with studs	1100
Placed at the edge, Protan EX	
Teleskop 42 fastener	850
Teleskop 40 washer	900
Iso-Tak 40 washer	900
Teleskop Dracula TPD 50 fastener	1100
SFS IT-C 40 x 82 washer	1100
SK Isofest Ø 50 Croco with studs	1100
Placed in roll flip X-335	
Teleskop 42 fastener	1000
SFS IT-C 40 x 82 washer	1100
Teleskop Dracula TPD 50 fastener	1100
Iso-Tak Twin Peak Plus fastener	1100
SK Isofest Ø 50 Croco with studs	1100
Pull through resistance	
Teleskop 40 washer	1100
Iso-Tak 40 washer	1100
Iso-Tak 45 washer	1000
Teleskop 42 fastener	1000
SFS IT-C 40 x 82 washer	1200

Fasteners

Fastening with normal steel washers can be used in longitudinal overlap joints on stiff underlay, i.e. on wood-based roof sheathing or on concrete.

On underlay of insulation material with good compression strength, such as EPS 20 kg/m³ or similar, plastic fasteners with integrated sleeve are preferably used. When roofing membranes are installed on insulation material with lower compression strength, the tightening of the fasteners must be controlled and fasteners with good telescopic action must be used.

Fasteners with studs must always be used on the roll width of 2 m for Protan SE and EXG. Some suitable fasteners are:

- a) Teleskop Dracula TPD 50
- b) Iso-Tak Twin Peak Plus
- c) Iso-Tak Plus 48-3N
- d) Croco Ø 50 mm with studs

Underlay

When a fire classification is required the underlay must be in accordance with the provisions stated in section 5 "Safety in case of fire".

To avoid migration, Protan EXG or a separate migration barrier must be used when the roofing is installed directly on old, aged PVC, or on EPS or XPS insulation.

When the membrane is installed on old asphalt roofing without additional insulation, Protan SE with a separate barrier or Protan EX shall be used.

Protan EX is recommended for installation on wood-based roof sheathing.

Inspections and maintenance

The roofing membranes must be cleaned locally before starting any welding of joints as a part of repair work.

Roof traffic

When it should be expected that roof traffic may exceed what is required for normal inspection visits and maintenance, special measures should be taken to protect the roofing membrane.

7. Factory production control

Protan SE, EX and EXG are subject to supervisory factory production control and product control according to contract between SINTEF Building and Infrastructure and Protan AS concerning SINTEF Technical Approval.

The manufacturer Protan AS has a quality system which is certified by Det Norske Veritas according to ISO 9001:2000, certificate no. 95-OSL-AQ-6343.

8. Basis for the approval

Material- and design data have been verified by type testing and audit testing performed by SINTEF Building and Infrastructure during the years 1975–2006.

Resistance against spread of flames have been verified by type testing and audit testing performed by the Norwegian Fire Research Laboratory during the years 1975–2006.

The data in Table 5 is based on system tests in accordance with the test methods NT Build 307 and NBI 162/90, supplemented by comparable results from simplified tests in accordance with NBI 163/91.

The durability of Protan PVC roofing membranes against humus attacks from roots in the turf roofing has been verified according to DIN 16734 par. 5.16, see report 31224/96 and 33354/97 from Süddeutsches Kunststoff-Zentrum, and in accordance with FLL-Verfahren (1999), see report dated 12.10.1999 from Institut für Bodenkunde und Pflanzenernährung.

9. Marking

All rolls/packages shall be marked with the manufacturer's product code, product name and date of production. The approval mark for SINTEF Technical Approval No. 2010 may also be used.



Approval mark

10. Liability

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402.

11. Technical management

Project manager for this approval is Knut Noreng, SINTEF Building and Infrastructure, Trondheim.

for SINTEF Building and Infrastructure

Steinar K. Nilsen

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Approval manager