

SINTEF confirms that

Protan G, GG and GT roofing and waterproofing membranes

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document

1. Holder of the approval

Protan AS
 Postbox 420
 NO 3002 DRAMMEN
www.protan.com

2. Product description

Protan G, GG and GT are three types of roofing and waterproofing membranes, all made of plasticized PVC with a core of glass felt. Stabilizer and plasticizer are added to the products to make them resistant to high temperatures, and to provide crack resistance at low temperatures.

Protan G is made resistant to ultra violet radiation. The top-side of the roofing membranes can be supplied in different colours. The underside is dark grey.

Protan GG has a yellow top-side and a dark grey underside.

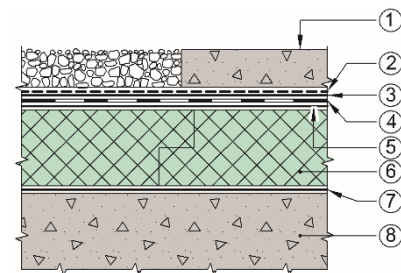
Protan GT is made resistant to ultra violet radiation. GT is also stabilized to resist external fire. The top-side of the roofing membranes can be supplied in different colours. The underside is dark grey.

Table 1 is presenting standard-measures and tolerances for the three mentioned products. Other thicknesses, lengths and widths can be supplied if required.

Table 1
 Measurements and tolerances for Protan G, GG og GT
 roofing and waterproofing membranes

Property	Protan G	Protan GG	Protan GT	Unit	Tolerance
Thickness	1,5	2,0	2,4	mm	+10%/-5%
Area weight	1,65	2,2	2,7	kg/m ²	+10%/-5%
Width	2,0	2,0	2,0	m	+1%/-0,5%
Length of roll	15	10	10	m	+5%/-0%
Weight of glass fiber core	50	80	80	g/m ²	-

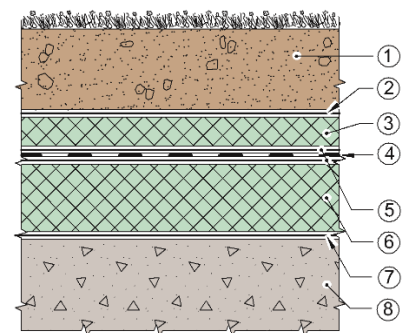
Measured according EN 1848-2 and EN 1849



1	Gravel, slabs of lightweight aggregate or concrete etc.	5	Optional migration layer if insulation of EPS/XPS
2	Optional separation layer	6	Insulation
3	Protection layer of geotextile	7	Vapour barrier
4	Protan G	8	Structural deck

Fig. 1

Examples of use of Protan G in ballasted roofs, with the roofing membrane installed over the insulation. For new roofs or refurbishing. Durable covering of e.g. wooden decking, concrete tiles on pads, tilework on concrete, extensive or intensive green roofs.



1	Soil	5	Optional migration layer if insulation of EPS/XPS
2	Protection layer of geotextile	6	XPS / EPS
3	XPS	7	Vapour barrier
4	Protan GG	8	Structural deck

Fig. 2

Examples of use of Protan GG in ballasted, insulated roofs with intensive roofs or culverts.

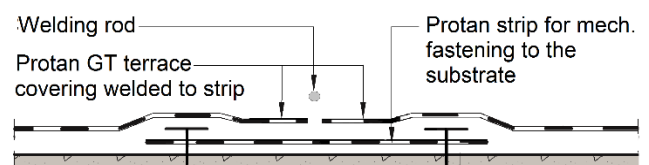


Fig. 3

Fastening system of Protan GT.

Table 2

Product properties for fresh material of Protan G, GG and GT roofing and waterproofing membranes

Property	Test method EN	Protan G		Protan GG		Protan GT		SINTEFs recom. minimum values	Unit
		DoP ¹⁾	Control limit ²⁾	DoP ¹⁾	Control limit ²⁾	DoP ¹⁾	Control limit ²⁾		
Foldability at low temperature	495-5:2013	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	≤ -30	°C
Dimensional stability	1107-2:2001	-	± 0,1	-	± 0,1	-	± 0,1	± 0,5	%
Water tightness (10 kPa)	1928:2000 (A)	Tight	Tight	Tight	Tight	Tight	Tight	Tight	-
Water tightness (150 kPa)	1928:2000 (B)	-	Tight	-	Tight	-	Tight	-	-
Tear resistance	12310-2:2000	≥ 110	≥ 110	≥ 130	≥ 130	≥ 130	≥ 130	≥ 80	N
Tensile strength	12311-2:2013(A)	≥ 500	≥ 500	≥ 600	≥ 600	≥ 600	≥ 600	≥ 380	N/50 mm
Elongation	12311-2:2013(A)	≥ 200	≥ 200	≥ 180	≥ 180	≥ 200	≥ 200	≥ 180	%
Peel resistance joints Average	12316-2:2013	-	-	-	-	≥ 200	≥ 200	≥ 150	N/50 mm
Peel resistance joints Maximum						-	≥ 200	≥ 200	
Shear resistance of joints	12317-2:2010	≥ 450	≥ 450	≥ 600	≥ 600	≥ 550 ³⁾	≥ 550 ³⁾	≥ 380	N/50 mm
Puncturing -by impact at +23°C	12691:2006 (A)	≥ 600	≥ 600	≥ 900	≥ 900	≥ 900	≥ 900	≥ 400	mm mm diam. kg kg kg kg
-by impact at -10°C	12691:2001	-	≤ 20	-	≤ 20	≤ 20	≤ 20	≤ 20	
-by static loading	12730:2015 (A)	-	-	-	-	≥ 20	≥ 20	≥ 20	
-by static loading ⁴⁾	12730:2015 (A)	-	≥ 20	-	≥ 20	-	-	≥ 20	
-by static loading ⁵⁾	12730:2015 (A)	-	≥ 20	-	≥ 20	-	-	≥ 20	
-by static loading	12730:2015 (C)	≥ 20	-	≥ 20	-	≥ 20	-	-	
Water vapour permeability	ISO 12572:2016	-	9,5 10 ⁻¹²	-	7 10 ⁻¹²	-	6 10 ⁻¹²	-	kg/m ² sPa
Water vapour resistance as equivalent air layer thickness	ISO 12572:2016	-	20	-	28	-	33	-	m

¹⁾ The manufacturer's Declaration of performance, DoP²⁾ Control limit shows values, product has to satisfy during internal factory production control and audit testing³⁾ Welded joint according fig. 3⁴⁾ Result with 180 g/m² polyester felt underlay, according fig. 1 and fig 4-5⁵⁾ Result with 50 g/m² glass felt underlay + 1,0 mm migration layer according fig. 1 and fig 5

3. Fields of application

Protan G

Protan G can be used as roofing on pitched or flat roofs, with or without pedestrian traffic. The membrane shall be installed ballasted either with wooden decking, concrete tiles on pads, tilework on concrete or used in extensive or intensive green roofs. In insulated constructions, the roofing can be installed over the insulation, below the insulation (inverted construction) or between two layers of insulation (duo construction).

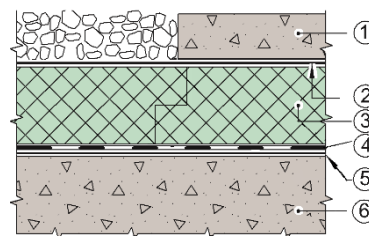
Protan G shall not be mechanically fastened except to parapets where linear edge fastenings shall be used. Examples for roofing constructions with Protan G are shown in fig. 1 and fig. 4-5.

Protan GG

Protan GG is a waterproofing membrane primarily intended for use in parking decks, on intensive green roofs, in culverts and in-ground structures. Examples of applications are shown in fig. 2 and 7. Protan GG is laid loosely, with ballast.

Protan GT

Protan GT is a waterproofing membrane primarily intended for use on terraces with pedestrian traffic. Protan GT is mechanically fastened as shown in fig. 3.



1	Gravel, slabs of lightweight aggregate or concrete etc.	4	Protan G, optional migration layer over
2	Optional separation layer	5	Slide- / protection layer
3	Insulation	6	Structural deck

Fig. 4

Example of use of Protan G in a construction of a ballasted, insulated, inverted roof construction. Durable covering of e.g. wooden decking, concrete tiles on pads, tilework on concrete, extensive or intensive green roofs.

General

Roofs must have adequate slope to drain water from rain and melting snow. SINTEF recommends that all roofs have an inclination of minimum 1:40. On normal terraces as shown, see fig. 1 and 2, the membrane can be laid with a minimum slope 1:100.

Other structures, such as parking decks and terraces, must have adequate slope to drain water from rain and melted snow. For inverted constructions or duo constructions the membrane can be laid horizontally when integrally casted wear layers have a slope towards gutter and drain of at least 1:100.

4. Properties

Material properties

Product properties for fresh material are shown in Table 2.

Safety in case of fire

Protan GT has fire classification B_{ROOF} (t2) according EN 13501-5 on substrates, shown in table 3. Testing is performed according CEN/TS 1187 Test 2.

Protan G and GG is not classified according to EN 13501-5.

Table 3

Protan GT has fire classification B_{ROOF} (t2) on following substrates

Type substrate	Protan GT
EPS	No
Stone wool	No
Particle boards	No
Concrete / silicate plates	Yes
Old roofing membrane on EPS	No
Old roofing membrane on stone wool	No
Old roofing membrane on particle board	No
Old roofing membrane on concrete or silicate plates	Yes

Durability

The products are assessed to have satisfying durability based on type testing and audit testing performed by SINTEF.

Protan G og GG are assessed to have satisfying durability against root penetration in green roofs.

5. Environmental aspects

Substances hazardous to health and environment

Protan G, GG and GT contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

Effect on soil, surface water and ground water

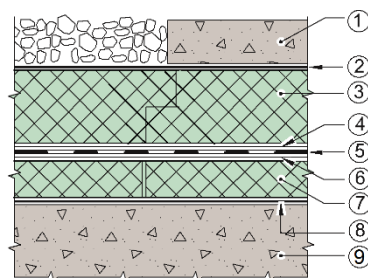
The leaching properties of the product are evaluated to have no negative effects on soil and water.

Waste treatment/recycling

Protan G, GG and GT shall be sorted as residual waste. The product shall be delivered to an authorized waste treatment plant for energy recovery. The product can by ended service life be delivered to material recycling in recycling system.

Environmental declaration

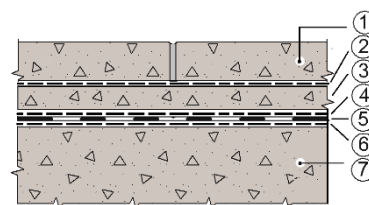
No environmental declaration (EPD) has been worked out for Protan G, GG and GT.



1	Gravel, slabs of lightweight aggregate or concrete etc.	6	Optional migration layer if insulation of EPS/XPS
2	Optional separation layer	7	Insulation
3	Insulation	8	Vapour barrier
4	Optional migration layer if insulation of EPS/XPS	9	Structural deck
5	Protan GG		

Fig. 5

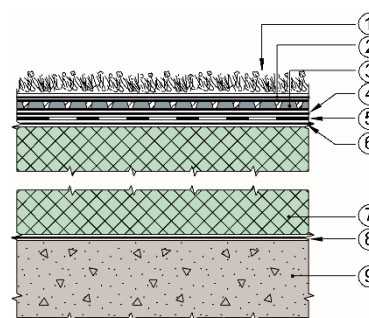
Example of use of Protan G in a construction of a ballasted, insulated, duo-roof construction. Durable covering of e.g. wooden decking, concrete tiles on pads, tilework on concrete, extensive or intensive green roofs.



1	Wearing course of reinforced concrete	5	Protan GG
2	Optional barrier / sliding layer of 0.2 mm PE	6	Fibre felt of min 300 g/m2
3	Protective mortar of non-reinforced concrete	7	Structural deck
4	Sliding- / protection layer 1,2 – 2.0 mm		

Fig. 6

Parking deck with concrete surface



1	Sedum vegetation	6	Optional migration layer if insulation of EPS/XPS
2	Optional filtering layer of geotextile	7	Insulation
3	Drainage layer	8	Vapour barrier
4	Optional protection layer of fibre	9	Structural deck
5	Protan G		

Fig. 7

Protan G used in extensive green solution

6. Special conditions for use and installation

Installation in general

Joints of Protan G, GG and GT are welded with hot air. The membranes shall be installed by an authorised contractor in accordance with the manufacturer's instructions.

Protan G and Protan GG should only be used together with one of the layers mentioned in table 2, footnote 4 or 5.

Roofs, terraces and parking decks

On roofs, terraces and parking decks Protan G, GG and GT should be used in accordance to principles mentioned in "TPF informs no. 5" and SINTEF Building Research Design Guides no.:

- 525.207 *Kompakte tak*
- 525.304 *Terrasse på etasjeskiller av betong for lett eller moderat trafikk*
- 525.306 *Terrasser med beplantning på bærende betongdekker*
- 525.307 *Tak for biltrafikk og parkering*
- 544.202 *Takfolie. Egenskaper og tekking*
- 544.204. *Tekking med asfalttakbelegg eller takfolie. Detaljløsninger*

Fastening/ballast

Necessary ballast is calculated according to SINTEF Building Research Design Guide no. 544.202 and "TPF Informs No. 5". Protan GT shall be mechanically fastened as shown in fig. 3, or may, under certain conditions, be glued to the underlay.

Substrate

Where fire classification of the substrate is required, the products can be placed on the substrate as defined in item 4 concerning "Safety in case of fire".

When the membranes are installed on old asphalt roofing without additional insulation or directly on EPS or XPS insulation, a separate migration barrier/separation layer as instructed by the producer shall be used.

When the membranes are applied directly on rough underlay without additional insulation, a protection layer of polyester felt or similar shall be used. SINTEF recommends use of ca. 250 g/m² felt when applied directly on concrete underlay and minimum 300 g/m² felt on concrete underlay in constructions with heavy traffic.

7. Factory production control

The products are produced by Protan AS, Postbox 420, 3002 Drammen, Norway.

The holder of the approval is responsible for the factory production control in order to ensure that the product is produced in accordance with the preconditions applying to this approval.

The manufacturing of the product is subject to continuous surveillance of the factory production control in accordance with the contract regarding SINTEF Technical Approval.

The quality management system used of Protan AS also for factory production control is certified by Det Norske Veritas according to EN ISO 9001, 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 during the years 1975–2017.

Durability of Protan G og GG roofing membranes against root penetration in green roof is documented according to EN 13948 and FLL method (2008).

- Institut für Gartenbau, Hochschule Weihenstephan-Triesdorf, report 27/10, dated 12.10.2010.

9. Marking

All rolls/packages shall be marked with the manufacturers name, product name and date of production. All rolls are marked with the manufacturer's production code.

Protan G, GG and GT are CE marked in accordance with EN 13956.

The approval mark for SINTEF Technical Approval No. 2008 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

for SINTEF

Hans Boye Skogstad
Approval Manager