EDITION: INT. ENGLISH - PUBLICATION: 11/2014

ProRox

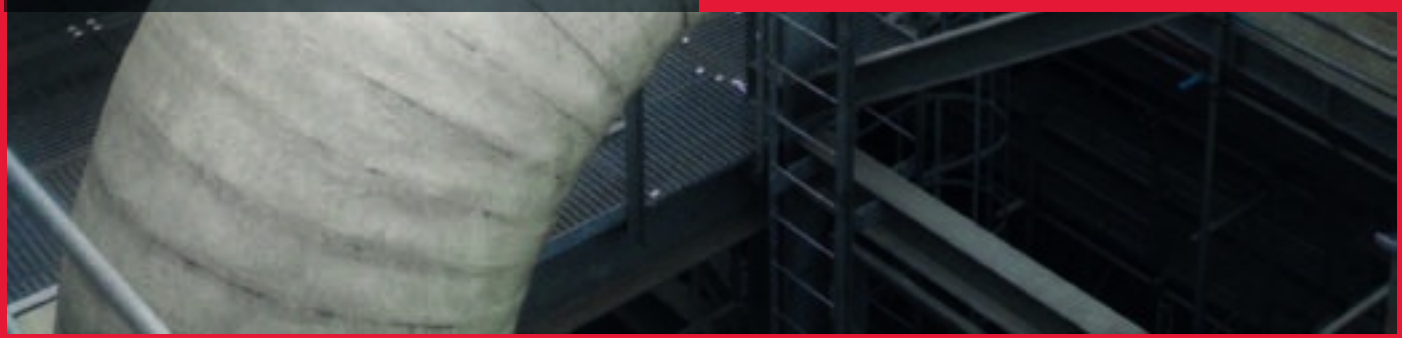
Industrial insulation

ProRox GRP 1000

The watertight insulation system

PNK
Engineering Co.,Ltd

ROCKWOOL®
TECHNICAL INSULATION



We share our knowledge to your advantage

ROCKWOOL© Technical Insulation – a subsidiary of the ROCKWOOL Group – develops innovative technical insulation solutions for the process industry and the shipbuilding & offshore market. Through our comprehensive product lines ProRox and SeaRox we offer a full spread of sustainable products and systems guaranteeing the highest possible thermal and firesafe insulation of all technical installations. Our +75 years of experience are reflected in a complete set of high-grade products and expert advice. Today, our dedicated and technically experienced people remain fully committed to providing the very best service and tools in the market and a total range of cutting-edge insulation solutions.

Excellent insulation products, outstanding people

All ROCKWOOL Technical Insulation solutions meet the most stringent quality and safety standards. All ProRox and SeaRox products and constructions have been tested according to the latest regulations and approved by all major classification societies. As an innovation-driven company we demand excellence. In every segment we keep searching for new systems, methods and solutions. We endeavour to develop ever more efficient products and to constantly optimise production processes and processing technologies. And we deliver! Our people know your market down to the smallest detail and provide continual knowledge and service for the benefit of the client. Besides excellent insulation products, they are the real key to our success. Thanks to their expertise and extensive experience, we can offer you exceptional stone wool solutions, expert tools and an impeccable service.

The best solutions, built on solid expertise

Our people's in-depth expertise is the best guarantee that end users in the petrochemicals, power generation, shipbuilding, offshore and the process industries are given the best and most advanced insulation solution. Both in the process industry and in the marine & offshore industry, our stone wool

products offer the highest possible protection against heat and energy loss, fire, noise and other unwanted influences. Our experts will be delighted to share their knowledge and advise you in drawing up technical and project specifications.

Up-to-date information and expert tools

As a highly skilled professional you are always looking for the best possible end result. The quickest way to achieve that is with ROCKWOOL Technical Insulation premium products, and the detailed information and expert tools that come with them, which always incorporate the latest technical findings. That's why you should always check that the information and tools you have are up-to-date. If you have any questions about specific application issues, working methods or product properties, please visit our website at www.rockwool-rti.com or contact one of our local sales organisations (see the ☎ on the back of this brochure).

The ROCKWOOL Group

ROCKWOOL Technical Insulation is a subsidiary of the ROCKWOOL Group, the world's largest and most experienced producer of stone wool products. ROCKWOOL International A/S is based in Hedehusene, Denmark. The parent company has net turnover of around € 2 billion in 2013. ROCKWOOL International has 27 factories in Europe, North America and Asia, and has around 10,500 employees.

ROCKWOOL has a melting point above 1000°C

ROCKWOOL products withstand temperatures up to 1000°C, making them exceptionally resistant to fire. This resistance can slow a fire's progress and buy precious time for rescue operations while helping to protect the building's structure from unnecessary damage. Yet while heat and flames are bad enough in a fire, smoke is the serious danger. It can suffocate occupants, and it can incapacitate people who might otherwise have been able to escape. ROCKWOOL insulation keeps toxic smoke from insulation to a minimum for even greater safety.

Stone wool protects people and the environment

ROCKWOOL products offer effective protection and optimal performance for the entire life cycle of the installation. According to independent research ROCKWOOL is one of the most durable products available with an unequalled combination in the field of environmental improvement, energy savings, CO_2 reduction, acoustic insulation and fire safety. A positive 'carbon footprint': During its entire life cycle, ROCKWOOL insulation will save more than 20,000 times the carbon emissions caused by its production. The fire retardant and fire insulating characteristics of our stone wool products deliver superior protection to people, property and the environment.

Founding Partner of EIIF

- ROCKWOOL Technical Insulation was one of the founding partners of the European Industrial Insulation Foundation (EIIF), which has established itself as a resource for industries that need to reduce CO_2 emissions.

Table of contents

1. ProRox GRP 1000, the watertight cladding

Achieving the best insulation system for your application is not easy. Besides the right choice and implementation of the insulation, the insulation protection system also plays an important role. Specific uses call for specific solutions. Certain processes require a fully watertight and closed finish. Strong and easy to clean, with great durability and chemical resistance. An insulation protection that results in a high amount of operational safety, low maintenance costs and limited energy costs. ROCKWOOL Technical Insulation offers an innovative protection system for ROCKWOOL ProRox insulation: ProRox GRP 1000.

ProRox GRP 1000: for a durable insulation protection

ProRox GRP 1000 is a fiberglass reinforced polyester mat positioned between two sheets of film. The material contains resins, fiberglass and special fillers and is ready to use. Unprocessed it is soft and malleable. In this state, ProRox GRP 1000 can be cut or trimmed into any shape which makes it easy to apply to the insulation. The polyester subsequently cures under the influence of ultraviolet (UV) light. After curing, ProRox GRP 1000 is absolutely watertight and is able to give optimal mechanical protection.

The advantages

The ProRox GRP 1000 system has important advantages that enhances the quality of your work.

- **Great durability:** ProRox GRP 1000 forms a seamless connection that offers a watertight protection to the ROCKWOOL insulation. It minimizes the damaging effects of the weather (wind, rain, seawater, etc.) or general wear and tear. It is chemical-resistant and withstands mechanical stresses (i.e. can be walked upon).
- **Easy to clean:** ProRox GRP 1000 can withstand spray-cleaning. Cleaning with water is possible without damaging the insulation.
- **Low start-up costs:** processing and installation takes place on location. This makes investments for the pre-fabrication of the insulation protection unnecessary.
- **Flexible use:** cold and hot insulation, underground and above ground cables and pipes, on and offshore. ProRox GRP 1000 molds itself to every technical application.

Reinforced polyester mat positioned between two sheets of film.

ProRox GRP 1000 can be cut or trimmed into any shape.

The polyester cures ultraviolet (UV) light.

Optimal mechanical protection and absolutely watertight.

2. Multi-use

Food & Pharmaceutical

The food industry and the pharmaceutical sector also adhere to very rigorous standards and rules as far as insulation is concerned. Those strict rules and regulations must prevent dirt, bacteria or moisture from accumulating in the (damaged) insulation.

- ProRox GRP 1000 is the **ideal solution** for making insulation around pipes, cables, storage tanks, installations, etc. **sealed, watertight and damage-resistant.**
- In addition, ProRox GRP 1000 can **withstand spray-cleaning**. The insulation material can be cleaned with water without causing any damage.
- Thanks to the low permeability of ProRox GRP 1000 as well as the thermal resistance of ROCKWOOL insulation, a **durable insulation of dual temperature systems** is possible.

ProRox GRP 1000 is used in various sectors where it continuously satisfies the highest standards.

(주)피엔케이엔지니어링 경남 거제시 아주1로 58 Tel : 055-632-3114/055-681-7993 Fax : 055-681-7998 Email : pnkeng@pnkeng.co.kr

Offshore & Marine

Because of the extreme weather conditions (rain, wind, temperature fluctuations,...) and the action of sea salt and chemicals, the insulation of (upper deck) ship's pipe and cable lines, storage tanks and offshore installations sometimes have to endure a lot of punishment.

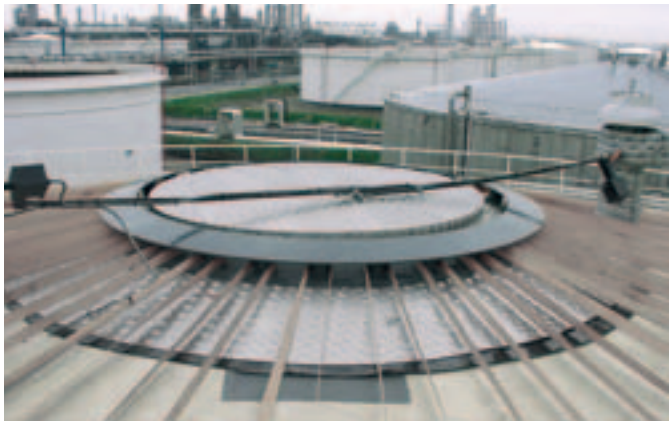
- ProRox GRP 1000 prevents the problems which can compromise safety. **The watertightness, high chemical resistance, mechanical strength and seamless finish guarantee** that.
- **Moisture penetration leading to corrosion under insulation** is virtually impossible.
- ProRox GRP 1000 can be installed **on site** around pipes, cables and equipment. Missing or complicated prefabricated parts of the cladding now are a thing of the past.
- The **unique fire properties** of ProRox GRP 1000 in comparison with conventional polyester finishes, and **the non-combustibility of ROCKWOOL insulation**, ensures an extremely high level of fire performance.
- ProRox GRP 1000 is MED certified: Low Surface Flame Spread in accordance with IMOA653.

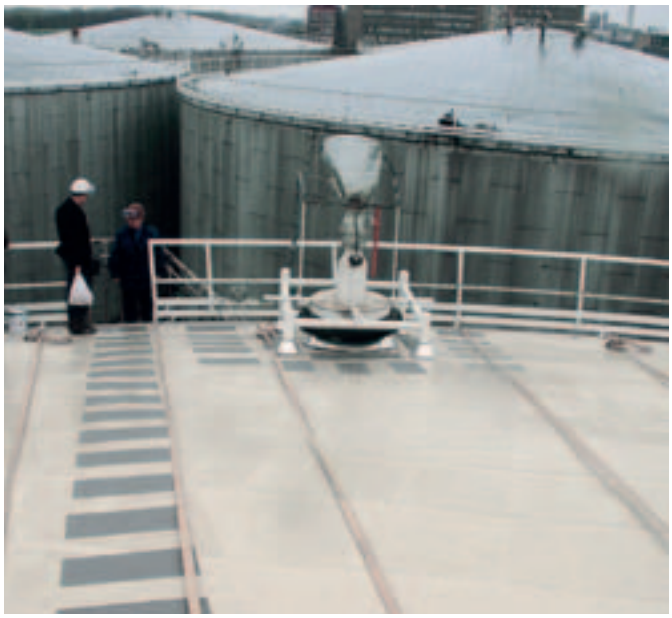
(주)피엔케이엔지니어링 경남 거제시 아주1로 58 Tel : 055-632-3114/055-681-7993 Fax : 055-681-7998 Email : pnkeng@pnkeng.co.kr

Tank roof insulation

Conventional systems for tank roof insulation are often sensitive to damage from the weather (water, wind, etc.) and the effect of chemicals. The costs of maintenance and the consequent lowered operational safety resulting from this are often higher than the (energy) cost-savings that are realized by the insulation. For this reason many tank roofs, especially in the lower temperature ranges, are not insulated.

- ProRox GRP 1000 is applied directly on ROCKWOOL tank roof insulation **on site**. Since direct cladding supports are no longer needed, it fits to all parts of the tank **seamlessly** and has an **unequalled hardness and mechanical strength** (e.g. can be walked upon).
- Where there are **high wind stresses**, a special cable construction can be applied that will keep the insulation in its place under the most extreme weather conditions.
- An **anti-slip coating** is available that can easily be installed to ProRox GRP 1000.
- The absence of cladding supports virtually **eliminates any risk of corrosion under insulation**.
- This ensures **perfect protection** to the insulation and storage tank which guarantees the **durability** of the insulation.





ProRox GRP 1000, the watertight insulation system.

(주)피엔케이엔지니어링 경남 거제시 아주1로 58 Tel : 055-632-3114/055-681-7993 Fax : 055-681-7998 Email : pnkeng@pnkeng.co.kr

Petrochemical industry

The footprint of a petrochemical plant is considerable. For example, a medium sized oil refinery contains 222 km of insulated piping and more than 26 football pitches (130,000 m²) of insulated equipment, vessels and tanks. The temperature inside can easily go up to 600°C or more. Insulation is therefore essential to keep the heat inside.

	Heat loss (W/m)	Reduction heat loss
Uninsulated pipe	6400	-
50 mm ROCKWOOL ProRox pipe sections	350	95%
Damaged insulation	2800	56%
Repairing the damaged insulation will save 260 euro/yr.m		

Design conditions: T 320°C, pipe diameter DN200, ambient temperature 10°C, wind speed 5 m/s, energy costs 0.03euro/kWh

Source: National Insulation Association

In many cases the insulation gets damaged by mechanical impact, the ingress of water and/or potentially corrosive media. The effect of these damages is substantial. In many cases the reduction in heat loss is up to 40% less than expected, the annual maintenance costs for corrosion can be overwhelming.

	Mid-Size Chemical plant	Refinery (150.000 barrels per day)
Insulation damage	19.2%	21.3%
Corrosion	182,000 euro annually	365,000 euro annually
Additional energy loss (0.012 euro/kWh)	1,335,036 euro annually	7,783,942 euro annually

Source: US steam digest, insulation management and its value to industry

In order to meet the technical requirements of today's stringent operational environments, ProRox GRP 1000 has undergone a rigorous programme of extensive testing to provide the reassurance needed to give the user confidence in the effectiveness and protection provided by ProRox GRP 1000.

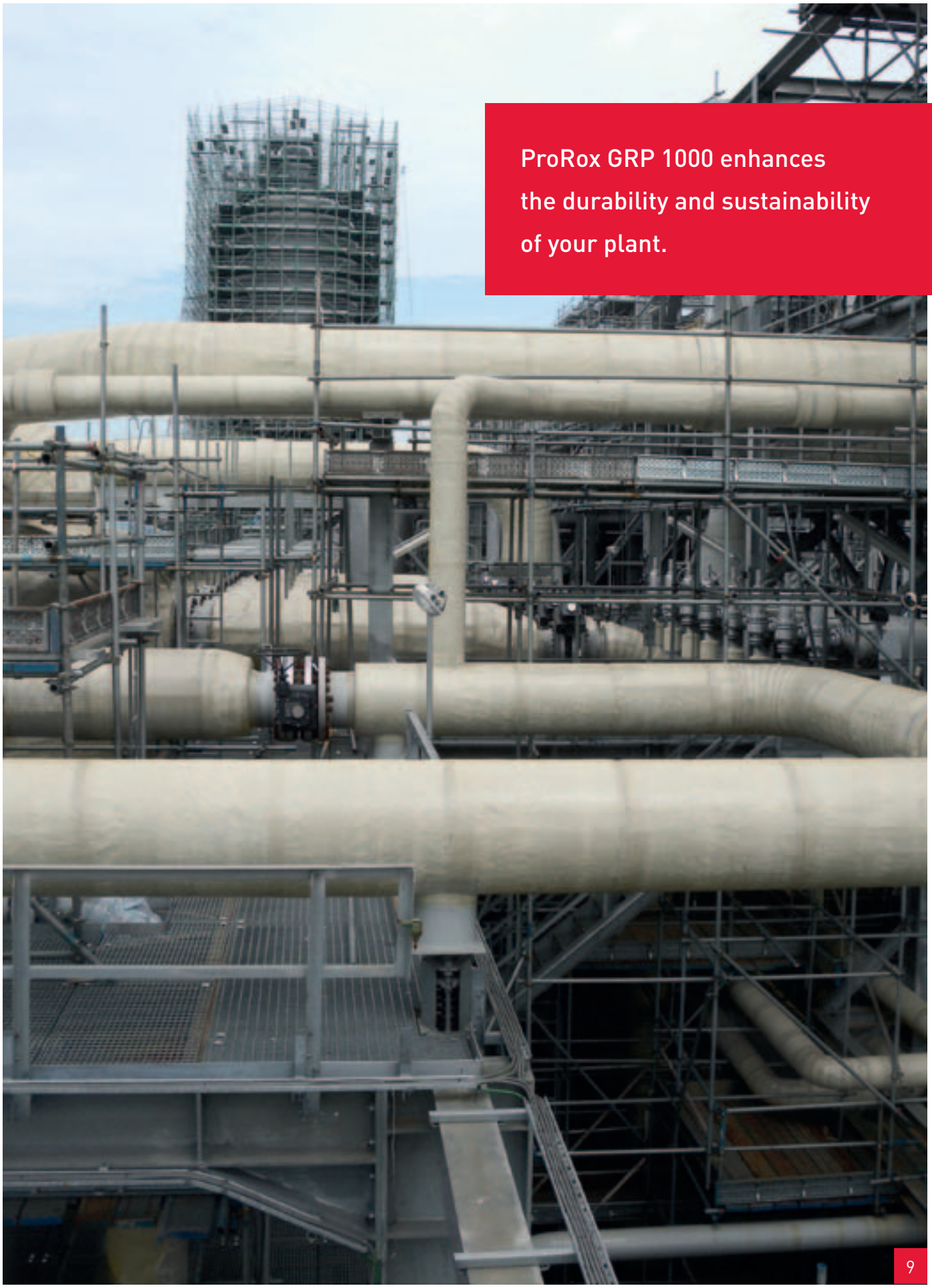
ProRox GRP 1000 has been extensively developed to be used across a broad range of applications in the petrochemical industry typically and many other installations in land based or offshore environments. Even in environments where aggressive chemicals are exposed to the insulation surface ProRox GRP 1000 gives excellent protection for:

- Pipework
- Vessels
- Tanks
- Valves

The advantages

Applying ProRox GRP 1000 offers you the opportunity to enhance the quality of your insulation work and thus reduces the energy costs and sustainability of your plant.

- **No water ingress:** ProRox GRP 1000 is a seamless protection, which provides a watertight insulation system which reduces the risk of corrosion under insulation.
- ProRox GRP 1000 is the ideal solution for making insulation around pipes, on top of storage tanks, column heads watertight and **damage-resistant**.
- Thanks to its **great resistance to many corrosive chemicals** the life of the insulation is significantly prolonged.



ProRox GRP 1000 enhances
the durability and sustainability
of your plant.

(주)피엔케이엔지니어링 경남 거제시 아주1로 58 Tel : 055-632-3114/055-681-7993 Fax : 055-681-7998 Email : pnkeng@pnkeng.co.kr

3. Installation

ProRox GRP 1000 is a material that is very easily installed. Because of its great malleability, it allows itself to be shaped without difficulty, after which it acquires its unique properties by the curing process.
Because of its almost endless applications, it is impossible to give a working description for each situation. The most essential information is stated in the processing instruction below. More information is available upon request.

The right tools

The only tool required are a tape measure and knife. Use your X-acto knife to cut on the cutting table. Clean the tools thoroughly after use. The transparent tape is perfectly suitable for evening out the seams and surfaces.

ROCKWOOL ProRox insulation

For a simpler installation and better adhesion, ROCKWOOL ProRox insulation should be coated with an aluminum foil. An overview of the appropriate insulation is mentioned below.

	Pipework		Vessels, tank walls, columns	Tank roofs
	Ø<356	Ø>356 Short pieces, bends		
ProRox PS 970 ALU	■■■	■		
ProRox MA 520 ALU		■■■	■■■	
ProRox SL 960 ALU			■■■	■ [1]
ProRox SL 580 ALU				■■■

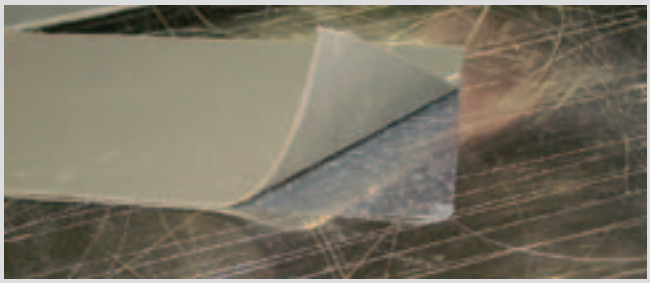
[1] Limited resistance to foot traffic

Always apply the insulation as tight as possible around or on top of the object. Unfaced areas should be covered with alu-foil. At temperatures below 200°C a support construction is in general not necessary. For flat surface where high wind stresses can occur the insulation should be mechanically fixed by a special support construction.

Getting started:

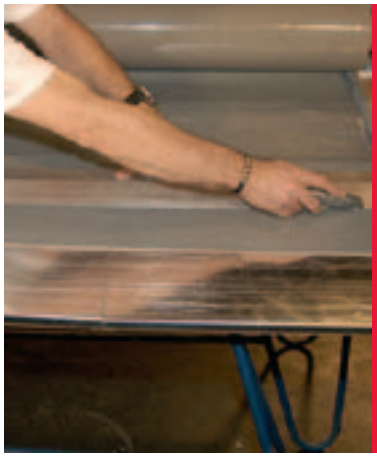
ProRox GRP 1000 has two distinct faces. The underside is equipped with a dark foil and has a slightly rougher surface. The upper surface has a transparent film and has a smoother surface. When the bottom film is removed, ProRox GRP 1000 is tacky to aid application. The top film should be removed after curing. The upper surface (with film) of the material is located on the outside of the roll. Cut or trim the necessary amount of ProRox GRP 1000.

Make sure that the roll always remains hanging in the box. Close the box after use. This will prevent curing of the roll by incoming daylight or UV-light. Cut or trim the pieces of ProRox GRP 1000 needed on a flat table.



To ensure the highest level of quality and safety always apply ProRox GRP 1000 under dry conditions within a well ventilated environment.

1. Open the box and make sure that the roll remains hanging in the box.



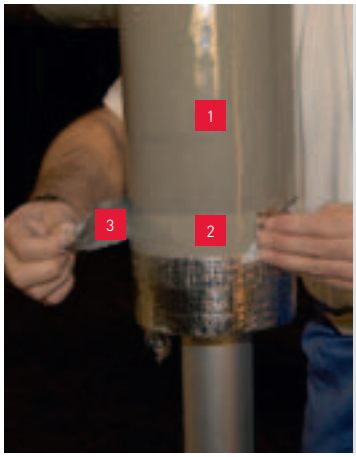
2. Use a flat table for the cutting and trimming of ProRox GRP 1000. Avoid direct contact with sunlight during use.

3. Cut or trim the pieces ProRox GRP 1000 needed on a flat table.

4. Close the box after use. Always store ProRox GRP 1000 horizontally in the original packaging in an ambient temperature of a maximum of 25°C.

Important!

Always apply an overlap of at least 3 cm to secure a good adhesion. At seams where distorting stresses may occur (bends, etc.) a supplementary adhesive strip should be used. During the installation, it may be necessary to allow certain sections to cure and other sections not to cure. Parts, on which later connections with ProRox GRP 1000 must be made, should not yet be allowed to cure. Make sure that these sections are covered up with a UV-blocking tape (e.g. alu-tape).



1. Cured ProRox GRP 1000
2. Un cured ProRox GRP 1000
3. Aluminum foil

UV-light safety

Since ProRox GRP 1000 is a material that cures under the influence of ultraviolet light (UV-A), it is necessary to supply artificial lighting when there is insufficient daylight (sunlight). For the best results, keep the following information in mind. When using artificial lighting, different forms of UV-light can be released, depending on the type of light source: UV-A-, UV-B- and UV-C-light. Looking at the lamps at a short distance is not good for the eyes, regardless of the type of UV-radiation (see actinic conjunctivitis, snow-blindness). Because of the high intensity of the light, you must especially be careful of UV-C-radiation. Is direct contact with the UV-light not avoidable? In that case, use protective clothing (UV-glasses, etc.). Also, maintain your distance. At a distance of more than 4 meters, the danger is almost negligible. The UV-400 W HPA Power lamp is recommended as a standard. This is a UV-lamp with a very high UV-A capacity. ROCKWOOL Technical Insulation offers UV lamps and bulbs as a service for our customers. More information is available upon request.

Installation example

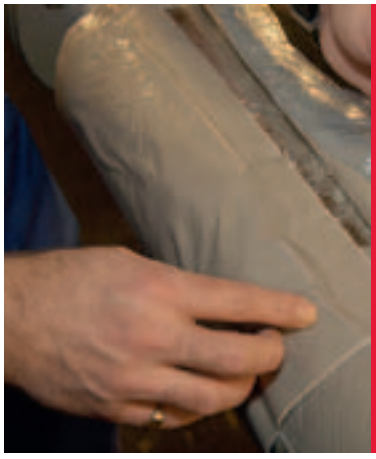
The installation demonstrated below shows an example of pipework with a temperature less than 90°C.

Step 1

Cut the ProRox GRP 1000 into the pieces/sizes needed and loosen the bottom foil.

Step 2

Remove the bottom foil while applying the strip directly on top of the alu-faced ProRox insulation.



Step 3

Remove the top foil to create an overlap of at least 3 cm.

Step 4

Curing with UV-light.

Step 5

Remove the top foil.

Step 6

Resistant to mechanical impact and water!

(주)피엔케이엔지니어링 경남 거제시 아주1로 58 Tel : 055-632-3114/055-681-7993 Fax : 055-681-7998 Email : pnkeng@pnkeng.co.kr

4. Technical information

Definition

ProRox GRP 1000 is a fiberglass-reinforced 1-component polyester (GRP) that in un-processed state is soft and malleable. The material contains resins, fiberglass and special fillers and is ready to use. ProRox GRP 1000 can be cut or trimmed into any shape which makes it easy to apply to the insulation. The material cures under the influence of ultraviolet light. Once cured, ProRox GRP 1000 has an extremely high level of hardness and mechanical strength compared to conventional polyester. In addition, ProRox GRP 1000 is impermeable and resistant to a large number of chemicals. The fire properties are unique in its class.

Ancilliaries

ProRox GRP 1000 HMO is used for the most common applications. Besides special versions (e.g. higher chemical resistance), related products, such as UV-curing ProRox GRP 1000 Primer and Gel, UV-lamps and safety-goggles are available upon request.

Curing

The curing will depend upon the ambient temperature and the intensity of the UV-light. Under the influence of sunlight or 400 W UV-lamps, placed at a distance of 0.5 meters, ProRox GRP 1000 cures in 30 minutes (T 20°C / RV 50%).

Packaging and storage

ProRox GRP 1000 is supplied in rolls of 10 m in length and 1 m in width, packed in boxes. Each roll (including packaging) weighs approx. 37 kg. The storage life is 6 months (after date of delivery). The contents measure 10 m² per roll. Always store ProRox GRP 1000 in the original packaging in an ambient temperature of a maximum of 25°C. Avoid direct contact with sunlight during use.

Product performance ProRox GRP 1000

Property	Performance	Standard
Color	Grey	-
Handling / Application temperature	min. 5°C - max. 45°C	-
Service temperature	min. -150°C - max. 90°C	-
Emissions (styrene)	< 20 ppm (MAC-value 25 ppm), safety data sheet upon request	-
Flashpoint (non-cured)	125°C	-
Reaction to fire	C_L-s1, d0 round	EN 13501-1
	C-s2, d0 flat	
	Surface burning characteristics; Flame spread = passed. Smoke development=passed	ASTM E84
	Low Surface flame Spread	IMO A.653
Density	1,840 kg/m³	ISO 1183
Thickness (after curing)	1.5mm - 2.0 mm	-
Weight	2.8 kg/m² - 3.7 kg/m²	-
Linear expansion coefficient	$25*10^{-6}$ K^{-1}	ISO 11359-2
Hardness	> 60 Barcol	ASTM D2583
Impact strength	57 kJ/m²	EN ISO 179
Tensile strength	65 Mpa	EN ISO 527-4
Tensile Modus	9 Gpa	EN ISO 527-4
Strain at break	1.7%	EN ISO 527-4
Flexural strength	150 MPA	EN ISO 14125
Flexural modus	9 Pa	EN ISO 14125
Compressive strength	150 MPa	EN ISO 14126
Compressive modulus	14 Gpa	EN ISO 14126
Bending straing / Elongation at break	3.5%	-
Water absorption	0.2 mg/100hr.	EN ISO 62
Water vapour permeability	0.001 metric perms	ASTM E96
Chemical resistance	available upon request	-
Compliance	ProRox GRP 1000 conforms to CINI 3.2.11 "Weather resistant UV-curing fiberglass reinforced polyester (GRP)"	-

(Small divergencies from the declared values are not fully precluded)

ROCKWOOL Technical Insulation

ROCKWOOL© Technical Insulation, a subsidiary of the international ROCKWOOL Group, is the worldwide market leader in technical insulation. With our comprehensive product lines ProRox and SeaRox we cover the whole industrial market and marine & offshore industry, providing a full range of products and systems for the thermal and firesafe insulation of technical applications. Besides sustainable products we offer reliable expert advice, from documentation to delivery and after sales service. Throughout the whole chain from specifier, through dealer to contractor and installer we aim to add value. We don't just sell products, we supply solutions. It's this total approach that makes us the ideal choice for professionalism, innovation and trust.

All explanations correspond to our current range of knowledge and are therefore up-to-date. The examples of use outlined in this document serve only to provide a better description and do not take special circumstances of specific cases into account. ROCKWOOL Technical Insulation places great value upon continuous development of products, to the extent that we too continuously work to improve our products without prior notice. We therefore recommend that you use the most recent issue of our publications, as our wealth of experience and knowledge is always growing. Should you require related information for your specific application or have any technical queries, please contact our sales department or visit our website www.rockwool-rti.com

RTI/11.14/3.0k/Eng Int 401

The ROCKWOOL Group

The ROCKWOOL Group is the world's leading supplier of innovative products and systems based on stone wool, improving the environment and the quality of life for millions of people. The Group is amongst the global leaders within the insulation industry. Together with other building-related products such as acoustic ceilings, cladding boards and our consultancy business, the Group ensures energy efficient and firesafe buildings with good acoustics and a comfortable indoor climate. We create green solutions for the horticultural industry, inventive special fibres for industrial use, effective insulation for the process industry and marine & offshore as well as noise and vibration systems for modern infrastructure.

Our more than 10,500 employees in more than 40 countries cater for customers all over the world. The Group's head office is located close to Copenhagen. In 2013 the Group generated sales of EUR 2 billion. The company is listed on the NASDAQ OMX Nordic Exchange Copenhagen. The Group's operations have a main presence in Europe and we are expanding production, sales and service activities in North and South America and Asia. Together with a broad network of business partners, this ensures that the Group's products and systems reach almost every corner of the globe. For more information, please visit www.rockwool.com

ROCKWOOL Technical Insulation

Delfstoffenweg 2
NL-6045 JH Roermond
Tel. +31 (0) 475 35 36 18
Fax +31 (0) 475 35 36 01
E-mail info-rti@rockwool.nl
www.rockwool-rti.com

ROCKWOOL Technical Insulation
is part of ROCKWOOL International A/S

for Belgium: +32 (0) 2 715 68 20
for Germany: +49 (0) 2043 408 389
for France: +33 (0) 1 40 77 82 11
for UK: +44 (0) 871 222 1780
for Italy: +39 02 34 61 32 40
for Export (Africa, Middle East, India):
+31 (0) 475 35 38 35
for Poland: +48 683 850 126

for Czech Republic: +420 725 741 008
for Slovakia: +421 903 235 027
for Baltics: +370 69 94 33 92
for Denmark: +45 29 25 21 71
for Sweden: +46 705 710 815
for Norway: +47 91 13 62 49
for Finland: +358 400 824 260

ROCKWOOL®
TECHNICAL INSULATION