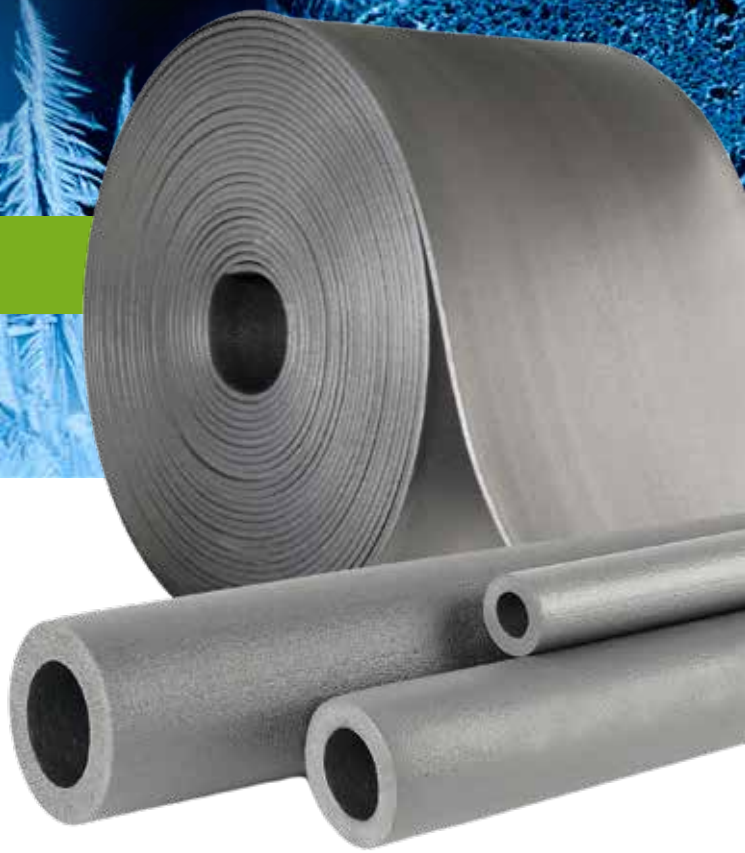
THERMAFLEX ®

FROST PROTECTION

Insulation Brochure | EN 2025



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The problem of ground freezing

All geographical regions are differently influenced by winter, especially frost. It is not always obvious that what we should be looking at is not on the ground, like snow, or rime but underneath it – the **frost line**, also called ground freezing depth. It is the maximum depth at which the ground freezes each year in a given area.

Although the frost line and dynamic strength provide a good estimation of how deep the pipeline should be installed, many water authorities recommend placing the pipe even **several dozen centimetres deeper**. Pipe planning always requires customised expert advice, as everything may vary based on the microclimate of the given city or region.

Recently, more and more shallow pipeline placements pose greater risks of leakage and therefore increase the need for applying thermal insulation.

The risk of frozen pipes

Frost protection is crucial if we want to prevent pipe damage and avoid repairs. Many factors can influence in-pipe frost, such as:

The diameter and material of the pipe (metal pipes have a significantly lower insulating capacity than plastic pipes).

Yearly temperature range should be taken into account during the planning stage. Otherwise, the harsh low temperatures pose a risk of pipe damage.

Flow/fill in the pipe and its environment, e.g. temperature and type of soil (as humidity increases, insulation effectiveness decreases).

Wind speed or sunshine for overhead pipelines.

How to choose the right insulation material for frost protection?

When selecting insulation material for frost protection, consider these key factors:

- **Thermal conductivity:** Choose materials with low thermal conductivity, like ThermaSmart® PRO (λ 0.035 W/mK at 10°C), to effectively prevent heat loss.
- **Moisture resistance:** Opt for insulation with high vapor diffusion resistance (μ ≥ 10,000) and minimal water absorption to maintain performance in damp conditions.
- **Temperature range:** Ensure the material can withstand both extreme cold and potential heat, such as ThermaSmart® PRO's -80°C to +95°C range.
- **Fire safety:** Select insulation with appropriate fire classifications (e.g., B_L-s1, d0) to meet safety standards.
- **Durability and longevity:** Choose materials that can withstand environmental stresses and maintain performance over time.

By prioritising these characteristics, you can select an insulation material that provides reliable frost protection while meeting specific project requirements and industry standards.

Solution

Insulating water pipes is a proactive measure to protect plumbing infrastructure against freezing conditions. Effective insulation helps to reduce the risk of bursts, leaks, mould growth, and structural damage. Implementing reliable frost protection for water service pipes is a key preventative step in safeguarding buildings from the harmful effects of severe cold.

In order to keep the infrastructure in full working order during the winter period, it is necessary to effectively protect water and sewage pipelines from freezing.

Drinking water installations:
With a pipe diameter of 25 mm and over.

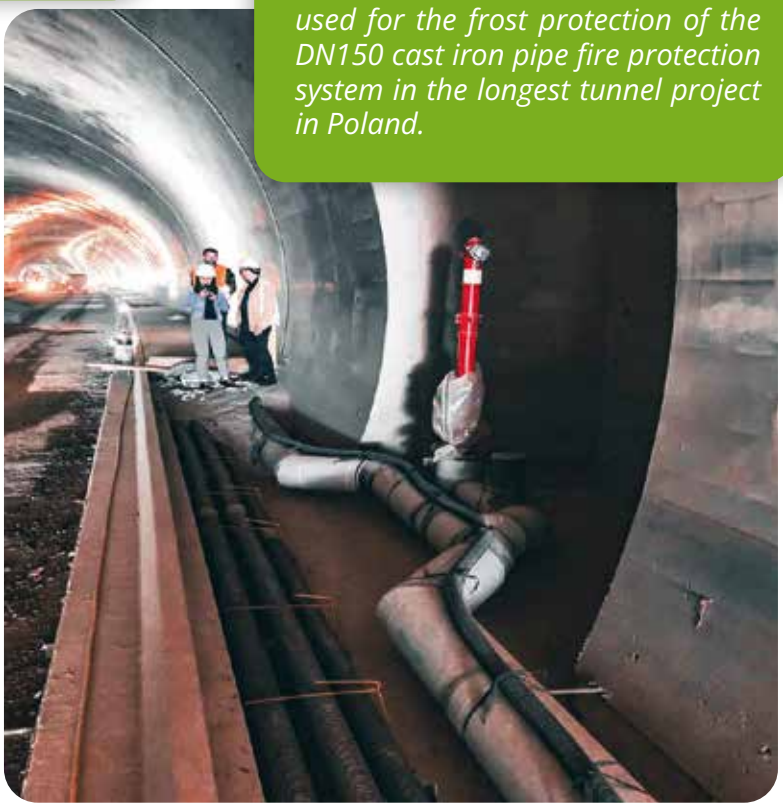
Wastewater systems:
Typically use pipes from 110 mm in diameter.

Olefins complex in Płock

ThermaSmart® PRO 10mm sheet and Alu coating were used when insulating large diameter pipelines at the Olefins Complex construction site in Płock. ThermaTape was also used ThermaSmart® PRO and ThermaGlue.

Tunnel on the S3 express road

More than 4,200 m(2) of ThermaSmart® PRO mats were used for the frost protection of the DN150 cast iron pipe fire protection system in the longest tunnel project in Poland.



Zwierzyniecki Bridge in Wrocław

For the frost insulation of water pipes DN 300 and DN 350, ThermaSmart® PRO solutions were used. Products from Thermaflex were also used to insulate the district heating network.

ThermaSmart® PRO

Will help ensure that expected temperature parameters are maintained and the risk of failure is minimised.

Installations over ground level

In the case of outdoor installations, such as bridge crossings and flyovers, where pipelines are exposed to extreme weather conditions, insulation solutions are required to guarantee the uninterrupted function of the water supply systems.

Networks and installations underground

Protecting underground pipelines from freezing affects the functionality of the water supply infrastructure. A key element is the correct selection of thermal insulation materials. In underground conditions, where ground temperature and lack of flow can affect freezing processes, the use of additional external protective layers is important. They extend the service life and prevent damage to the insulation material.

ThermaSmart® PRO

Available solutions

Tubes,
for diameters ≤ 114 mm

Sheets,
for diameters ≤ 114 mm

Tape and/or ThermaGlue,
for sealing seams to prevent thermal bridges

Insulation tailored to individual customer needs

		Tube		Sheet	
Properties	**SI unit**	**Value**	**Test method**	**Value**	**Test method**
Density	kg/m³	18-40		18-40	
Operating temperature range	°C	-80 to +95		-80 to +95	
Maximum operating temperature	°C	+95	EN 14707	+95	EN 14706
Heat transfer coefficient (λ)	W/mK	0.035 at 10 °C 0.038 at 40 °C	EN ISO 8497	0.036 at 20 °C 0.038 at 40 °C	EN 12667
SBI classification	-	B_L-s1,d0* D_L-s2, d0**	EN 13501-1	B-s2,d0	EN 13501-1
Flammability standard	-	HF-1	UL94	HF-1	UL94
Water vapour diffusion	μ	≥10,000	EN 13469	≥5,300	EN 12086
Water absorption	kg/m²	0.02	EN 13472	0.03	EN 1609
Availability		Standard length 2 m, wall thickness 6 - 30 mm		Standard rolls width 1000 mm, mat thickness 7.5 - 25 mm	

* for wall thickness: 6 - 25 mm,
** for wall thickness: 30 mm

Classification
SBI B, s2, d0 (sheets)
Degree NRO (non-proliferation)

Excellent insulation
λ 0.038 W/mK at 40°C
λ 0.035 W/mK at 10°C

Operating temperature
from -80° to +95°

Protection against condensation and condensation
through closed cellular structure

Suitable for projects
LEED & BREEAM

100% recyclable

Example calculations for selecting the right insulation

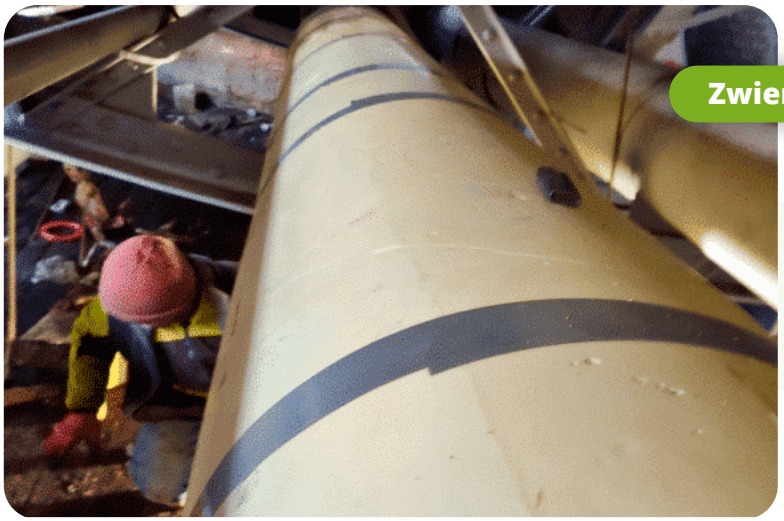
When selecting the right solution, parameters such as heat transfer coefficient, pipe material, ambient temperature and medium must be taken into account.

External installation

Installation conditions taken into account:

- Pipeline installed outdoors, e.g. under a bridge
- Heat transfer coefficient insulation – environment (air) 25 W/mK
- Pipe material; plastic or metal
- Medium: water, no flow, temperature 5°C
- Ambient temperature -20°C

Insulation thickness	25 mm		30/32 mm		38 mm		50 mm	
Layers	1x25 mm		1x30mm 13 mm + 19 mm		13mm+25 mm		2x25 mm	
Outer diameter Ø	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***
[mm]	[W/m]	[h]	[W/m]	[h]	[W/m]	[h]	[W/m]	[h]
50	8	0.8	6	0.9	6	1.0	5	1.2
100	13	1.9	11	2.3	9	2.5	8	3.1
150	18	3.0	15	3.7	13	4.2	11	5.1
200	23	4.2	19	5.1	16	5.9	13	7.3



Zwierzyniecki Bridge in Wrocław

Underground installation

Installation conditions taken into account:

- Pipeline installed underground in the frost zone, located at a depth of 1.4 m and above
- Thermal conductivity of soil 1 W/mK
- Pipe material: plastic or metal
- Medium: water, no flow, temperature 5°C
- Soil temperature -3°C

Insulation thickness	19mm		25 mm		30/32 mm		38 mm		50 mm	
Layers	1x19 mm		1x25 mm		1x30mm 13 mm + 19 mm		13mm+25 mm		2x25 mm	
Outer diameter Ø	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***	**Heat loss**	**Time to freeze***
[mm]	[W/m]	[h]	[W/m]	[h]	[W/m]	[h]	[W/m]	[h]	[W/m]	[h]
50	3.2	1.9	2.8	2.2	2.4	2.5	2.1	2.8	1.8	3.3
100	4.7	5.1	4.1	5.9	3.6	6.7	3.3	7.4	2.8	8.7
150	6.3	8.7	5.5	9.9	4.8	11.2	4.4	12.4	3.7	14.6
200	7.1	13.6	3.6	15.3	5.6	17.2	5.2	18.7	4.4	21.8

**calculations based on no flow and complete filling; partially filled pipelines freeze faster. THE ABOVE CALCULATIONS ARE FOR EXAMPLE VALUES. UPON REQUEST, THERMAFLEX EXPERTS WILL PREPARE INDIVIDUAL HEAT LOSS CALCULATIONS FOR SPECIFIC CONDITIONS.*

Tunnel on the S3 express road

Installation recommendations

(Detailed installation and connection instructions (depending on the pipe diameter and the ThermaSmart® PRO product used) are available at www.thermaflex.com)

- Before starting installation, the surfaces to be connected and insulation should be dry and free of contaminants e.g. dust or grease.
- If you are preparing the insulation yourself insulation from a mat, you can determine the required circumference using a strip of insulation material of the same thickness.
- To obtain maximum bonding (adhesion) surface, cut the mat at an angle. Make the butt joint at a standard angle of 90°.
- Installation will be faster at higher temperatures . In the case of layered insulation, it is recommended that the edges of the joints of successive layers do not overlap.

Additional equipment

We offer a comprehensive frost protection solution by combining its **ThermaLint and TracingSet heating cables** with ThermaSmart® PRO insulation. This synergistic approach provides superior protection against freezing in pipes and other applications, even in extreme cold conditions down to -45°C. The heating cables prevent water from freezing inside pipes, while ThermaSmart® PRO's closed-cell polyolefin foam structure offers excellent **thermal insulation and moisture resistance.** This combination not only prevents frost damage but also enhances energy efficiency by reducing heat loss. The system is versatile, suitable for both indoor and outdoor use, and can be applied to various installations including water pipes, condensate drains, sprinkler systems, and more. With easy installation and CE mark certification, this integrated solution from Thermaflex ensures reliable, safe, and efficient frost protection for industrial and commercial applications.

How to choose the right cable?

If you would like to receive design recommendations, please contact our local sales engineers, who will do it for you!

Outer Protective Layer

For underground installations, it is recommended to use an additional protective layer to extend the service life and prevent damage to the foam insulation material. We recommend placing the entire pipe system with insulation in a protective pipe (concrete, PVC, PE, GRP) or adding a bituminous layer, PE jacket or other durable protective layer, depending on the situation.

1. 7506-600030-001 Aluminium coating 600 mm x 50 m silver SA
2. 7506-100050-001 Aluminium coating 100 mm x 50 m silver SA

Other available solutions

In certain situations, it may be necessary to select other insulation materials, e.g.:

ThermaPUR

ThermaWool

ThermaCompact IS

Protectube

Design and installation recommendations

We recommend a minimum system coverage (service pipe plus insulation) of 0.5 m. In case of excessive traffic load, please contact our experts.

For greater installation depths, please contact our experts.

The above recommendations do not take into account the location of the pipeline at depths greater than 1.5 m

To avoid damage and achieve optimal thermal insulation of the pipeline and prevent deformation of the pipe+insulation system, we recommend the following steps:

1. Min. 100 mm of fine-grained sand 0-3 mm (in accordance with PN EN13941 2) around the pipe system. Manual compaction required, without the use of machines
2. Add a 200 mm layer of excavated material; without machine compaction in this layer, we recommend warning tape to avoid damage during future earthworks.
3. Continue backfilling with excavated material and, depending on the situation, with a top layer of soil as the final layer. For these layers, we recommend a vibratory rammer.

Contact

Our insulation experts are ready to support your next project with tailored solutions and reliable technical support.
Contact us today at **international@thermaflex.com** to connect with our team.
Let's stay warm together!

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Ready to explore tailored solutions?
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