Pipe protection, Installation principles

The anti-freeze protection of pipes

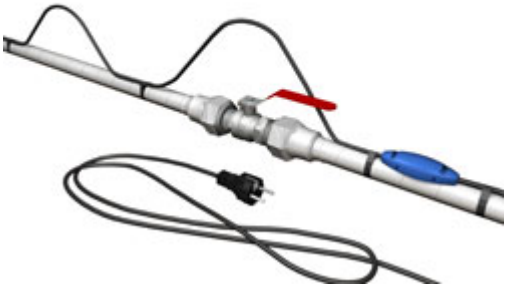
Sometimes situations arise in which water distribution pipes freeze up even though they are equipped with thermal insulation. Not only pipes which lead through outdoor environments are affected but also distribution networks which lead through non-heated areas – cellars or basements, agricultural buildings etc. This problem can be solved with the help of heating cables. It is necessary to point out that when a heating cable is used, the pipes always need to be fitted with thermal insulation (over the heating cables). The cable isn't meant as a substitute for thermal insulation - it only compensates for the heat losses which cannot be prevented completely by any insulation. Cables can be used not only for the protection of pipes against freezing but also for preventing other transported liquids from dropping under a certain temperature – known as the technical heating of pipes. However, in these cases we recommend consultation regarding the solution with a specialized company so that heating cables used have not only sufficient output but also suitable thermal endurance.

Installation principles

Both plastic and metal pipes can be protected against icing. The cable is attached to metal pipes directly, while plastic pipes need to be covered by a metal, ideally self-adhesive aluminium tape or foil. After installation, the heating cable is attached with self-adhesive aluminium tape along its whole length concurrently. Self-adhesive aluminium foil helps to transfer the heat from the jacket of the cable to the protected pipes. With the exception of self-regulating cables, the heating cables must not touch or cross one another. Finally, the pipes are fitted with suitable thermal insulation. Heating cables can be wound around the pipes or they can run concurrently. As with the winding it is difficult to estimate the degree of twist needed, we recommend that the heating cable is divided into even sections – attach the beginning and the end of the cable, and again, attach the middle of the created sag to the pipe. By continuing with this procedure several even sags are created which are then wound around the pipe in opposing directions.

Cover the plastic pipe with aluminium foil along its whole length

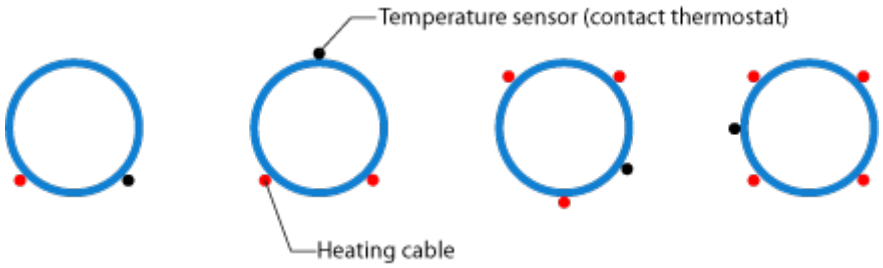
Create even sags



Wind the sags in opposite directions to each other

Attach the cable to the pipe along its whole length with aluminium tape and furnish the pipe with thermal insulation.

Where the heating cable follows the length of the pipe, we recommend that the cable is placed onto the bottom part of the pipe so that the heat warms the jacket better due to the natural conduction of heat in the upward direction. Place the device for reading the temperature of the pipe's surface in such a way that it isn't affected by the heating cable. If the heating cable is attached along the length of the pipe in more loops, it is advantageous to place them so that they best cover the cross-section of the pipe – see the picture.



Selecting the cable wattage

The wattage of the cable is dependent on the ambient temperature, the thickness and type of thermal insulation and on the required temperature of the transported medium. For pipe protection, cables with a wattage of 10-15 W/m are usually used. The required wattage of the cable per 1m of length can be roughly estimated from the following table; the stated values are valid for the maintenance of the temperature of the transported medium at 5 °C.

Insulation thickness (mm)	Minimum ambient temperature °C	Pipe diameter (G/m)										
		½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	6"	8"
		15	20	25	32	40	50	65	80	100	150	200
		Heating cable wattage per 1 standard metre (W)										
10	-15	7	9	11	13	15	19	23	28	34	50	66
	-25	11	14	16	19	23	28	35	42	52	75	99
20	-15	5	6	7	8	9	11	13	15	19	27	34
	-25	7	9	10	12	14	16	20	23	28	40	52
30	-15	4	5	5	6	7	8	10	11	13	19	24
	-25	6	7	8	9	10	12	14	17	20	28	36
The table is valid for insulation types with a thermal conductivity coefficient of λ=0,05 W/mK												

Example:

Pipe diameter G 1" (DN 25), length of pipe 48 m, ambient temperature -25 °C, pipe insulation 20 mm thick. The temperature of the transported medium mustn't drop below 5 °C (non-freeze temperature). Result from the table: You'll find the required wattage per 1m = 10 W in the table. The needed total output will thus be approx. 480 W (48 m x 10 W/m). Therefore, use a heating cable with a total output of at least 480W. The cable has to be installed in such a way that it will evenly cover the whole length of the pipe. ATTENTION – the length of the cable shouldn't be shorter than the pipe – this situation may occur if a cable is chosen with a higher specific wattage per 1 m.

Cables with an integrated thermostat

Cables with an integrated thermostat and plug are specially produced for the protection of pipes. The contact thermostat switches on the heating cable automatically when the temperature of the pipe drops below 3°C. The cable is produced in lengths of up to 50 m. Thanks to the plug and the integrated thermostat, installation is very simple and doesn't require any specialized connection to the electrical system. Because of this the cable is suitable particularly for do-it-yourself installations in non-commercial or residential buildings.

PFP - heating cable with a thermostat

Connection to a socket; the thermostat switches at +3°C; 1.5 m connection lead with a plug; IP 66 coverage.		
Type PFP 12W/m	**Wattage (W)**	**Length of cable (m)**

PFP 1m/12W	12	1.0
PFP 2m/25W	25	2.0
PFP 3m/36W	36	3.0
PFP 4m/48W	48	4.0
PFP 6m/72W	72	6.0
PFP 10m/136W	136	10.0
PFP 14m/152W	152	14.0
PFP 21m/281W	281	21.0
PFP 30m/337W	337	30.0
PFP 42m/490W	490	42.0

Heating circuits

Heating circuits made from resistance heating cables are produced in lengths of up to 200 m. As the thermostat isn't part of the circuit for these cables, suitable regulation is necessary, for example an industrial **thermostat with a separate sensor**. Due to the greater lengths involved, the necessity of combination with an external thermostat and connection to a wiring box, such cables are more suitable for industrial applications which are installed by a specialized firm.

Heating cables for the protection of pipes – ADPSV

Cold tail 1×5 m, Ø of cable 5.0–5.9 mm

Type ADPSV 10W/m	Wattage (W)	Lenght of cable (m)
ADPSV 10120	120	11.4
ADPSV 10200	200	18.9
ADPSV 10250	250	23.6
ADPSV 10320	320	31.6

ADPSV 10400	400	36.9
ADPSV 10450	450	45.9
ADPSV 10550	550	56.1
ADPSV 10600	600	63.9
ADPSV 10750	750	75.8
ADPSV 10950	950	87.0
ADPSV 101100	1100	114.5
ADPSV 101300	1300	131.3
ADPSV 101700	1700	158.5
ADPSV 102000	2000	194.5

Self-regulating cables

As with outdoor surfaces, self-regulating cables can also be used for the heating of pipes. The disadvantage in the form of a higher price is compensated for by the option of shortening the cable to any length. The self-regulation of the cable is also advantageous in situations when the pipes pass through environments with different temperatures. However, even self-regulating cables require the installation of suitable regulation – see **Regulation of ECOFLOOR heating systems**. More detailed information about self-regulating cables **can be found here…**