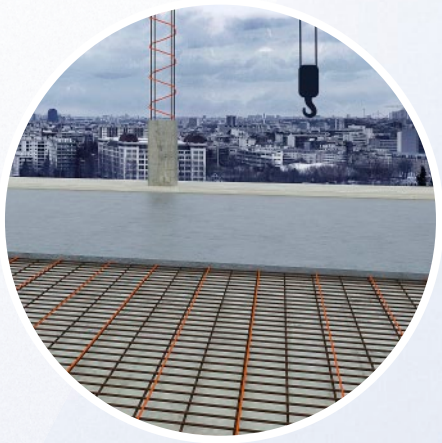
FENIX



GUTTERS AND DOWNPIPES DE-ICING
HEATING OF OUTDOOR SURFACES
FROST PROTECTION OF PIPES AND TECHNOLOGICAL HEATING
CONCRETE CURING
HEATING SYSTEMS IN AGRICULTURE AND INDUSTRY
HEATING OF GRASS PLAYING SURFACES

OUTDOOR APPLICATIONS

ONLY THE SUN DOES IT BETTER...

Benefits

- safe entrance and exit from the building
- maintenance-free operation
- load relief on the roof structure
- prevention of deformation of gutters and downpipes
- energy efficient operation

GUTTERS AND DOWNPIPES DE-ICING

Heating cables prevent the accumulation of snow on the roof in places where it is undesirable – at snow barriers, in roof gutters, eaves troughs etc. They provide protection against possible costly damage. Particularly, the heating cables are suitable to roof gutters and downspouts for roofs with insufficient thermal insulation, where even in severe frosts, snow melts, water flows into the gutter, freezes and forms an ice barrier. Subsequently, it begins to overflow and creates icicles, a romantic, yet undesirable and dangerous for pedestrians, "decoration" of roofs. MAPSV (single-core) and ADPSV (double-core) cables with full screen protection and jacket with protection against UV radiation, or self-regulating ELSR cables are intended for these applications.

DIMENSIONING

For typical eaves troughs and downpipes (up to a diameter of 150 mm), a heating wattage of 30–40 W/m is installed; at higher altitudes approaching 1,000 m above sea level 60 W/m and more is used (after the assessment of local conditions). It is more advantageous to use a cable with a lower wattage and install it into the eaves trough or downpipe twice or even three times (a larger surface is thus covered) rather than use a higher output cable and install only one core. Plastic grips or steel cables with grips are used for the attachment of the cable in eaves troughs and downpipes. The distance between the clips should not be more than 25 cm. The spacing between the cables in the gutters and downspouts should be 50–80 mm. On the roofs the cable is layed in a saw-toothed pattern (see fig.) at such spacing that the surface power input is about 200 W/m^2, at altitudes close to 1,000 m then at least 250 W/m^2.

INSTALLATION

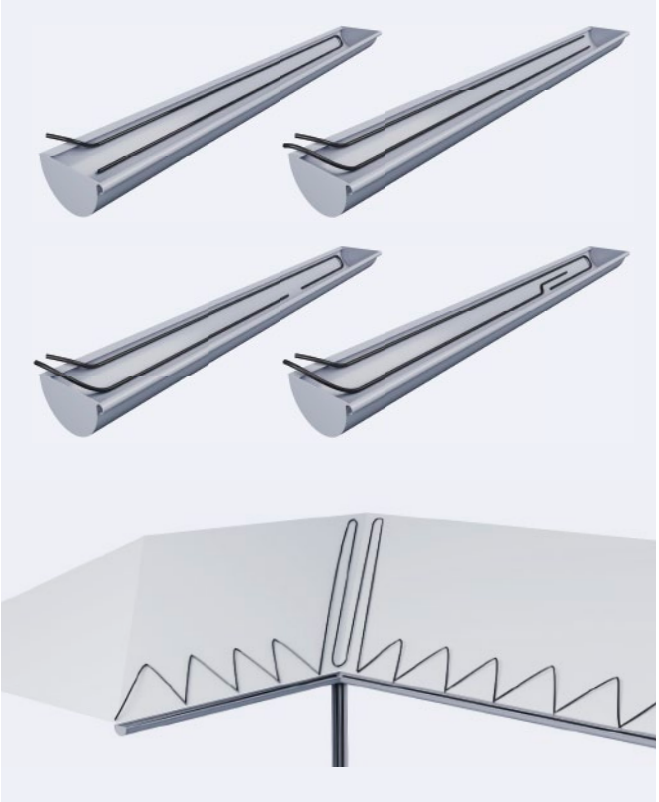
Before and after installation, it is necessary to measure the resistance of the heating circuits. The measured values must match and must be recorded in the warranty card. The tolerance of the measured values is ±5–10 %. Before and after installation, the insulation resistance between the heating conductor and the screen protection must also be measured – the value must not be lower than 0.5 MΩ. Also this value must be recorded in the warranty card.

To attach the heating cable into a standard gutter or downspout (Ø 150 mm), use a “gutter clip” or a “downspout clip” (clips to the downspouts are to be fixed by a chain). The distance between the clips should not be more than 25 cm.

To attach the heating cable in atypical gutters, valleys, and on roofs, use a “C” roof clip or a special clipping method according to local conditions. The heating cable is fixed using four clips per meter of cable length.

The heating part of the cable heating circuit must not be shortened or otherwise modified. Only cold leads can be shortened as required.

Examples of two-core cable installation:



All important information and further details can be found in the product manual: https://www.fenixgroup.cz/sites/default/files/n201.pdf

MANUAL/PDF

SELF-REGULATING CABLES

A special category of heating cables, which are used mainly for frost protection of gutters and roof gutters, or also for protection of pipes and for technological heating of various industrial vessels, storage tanks, etc., consists of so-called self-regulating cables.

The cable consists of two copper conductors, between which a semiconducting heating core is placed. As the ambient temperature increases, the resistance of the heating core increases and thus its output decreases. Conversely, as the temperature drops, the cable's performance increases. This occurs at any point of its length, the cables thus might touch each other, intersect or pass through different temperatures without danger of overheating or burning.

An indisputable advantage and argument for buying this product is the fact that the self-regulating cable can be shortened to any length. Installation kit KIT No. 4 (5030124) is supplied to terminate the cable and connect the cold lead end. Although self-regulating heating cables automatically change their output depending on the ambient temperature, they never switch off completely. A thermostat is therefore required for economical operation.

REGULATION

For frost protection applications, it is important that the control senses not only the temperature but also the presence of moisture (water, snow, ice). This is the only way to ensure not only reliable and economical operation, but also to avoid exceeding the upper limit of the temperature resistance of the cable, which can occur if used incorrectly (f.ex. operation in the summer months).

HEATING CABLES

ADPSV heating cable

- dual-core
- easy installation
- full protection screen
- UV protection

ADPSV 30 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
195	30195	7	2253505
340	30340	11	2253510
420	30420	14	2253515
560	30560	18	2253520
670	30670	22	2253525
800	30800	26	2253530
970	30970	32	2253535
1060	301060	36	2253540
1300	301300	44	2253545
1600	301600	52	2253550
1940	301940	65	2253555
2250	302250	76	2253560
2800	302800	96	2253565
3400	303400	114	2253570

ADPSV 30 W/m – 400 V

Output [W]	TYPE	Length [m]	Cat. No.
350	30350	12	2253605
580	30580	20	2253610
730	30730	24	2253615
950	30950	32	2253620
1150	301150	39	2253625
1360	301360	46	2253630
1670	301670	56	2253635
1850	301850	63	2253640
2250	302250	76	2253645
2720	302720	92	2253650
3350	303350	114	2253655
3900	303900	132	2253660
5000	305000	163	2253665
6000	306000	196	2253670

MAPSV heating cable

- single-core
- industrial use
- full protection screen
- UV protection

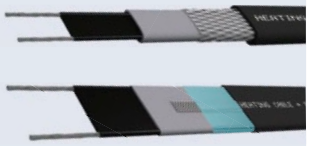
MAPSV 30 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
420	30420	14.0	2322600
500	30500	16.3	2322602
700	30700	23.6	2322604
1100	301100	35.6	2322606
1250	301250	42.3	2322608
1600	301600	55.1	2322610
2100	302100	70.0	2322612
2500	302500	84.6	2322614
2950	302950	98.0	2322616
3200	303200	106.7	2322618
4000	304000	134.9	2322620
4800	304800	162.1	2322622
6300	306300	209.9	2322624

MAPSV 30 W/m – 400 V

Output [W]	TYPE	Length [m]	Cat. No.
730	30730	24.4	2322700
850	30850	29.0	2322702
1230	301230	40.7	2322704
1900	301900	62.4	2322706
2200	302200	72.7	2322708
2800	302800	95.2	2322710
3700	303700	120.1	2322712
4400	304400	145.5	2322714
5100	305100	171.4	2322716
5600	305600	184.3	2322718
7000	307000	233.2	2322720
8500	308500	276.8	2322722
11000	3011000	363.6	2322724

ELSR self-regulating cable



- semi-conductive heating core
- can be shortened to any length
- UV protection

MARKING	Output [W/m] at 10 °C	Thermal resistance [°C]	Limitation for installation		Max. length at the switch. temperature 0 °C and installed circuit braker			Cat. No.
			Min. temp.	Min. radius	10 A	16 A	20 A	
ELSR-M – Frost protection of pipes								
ELSR-M – 10 BO	10	65	–30 °C	25 mm	115.5	115.5	115.5	2330310
ELSR-M – 15 BO	15	65	–30 °C	25 mm	83	97.5	97.5	2330315
ELSR-N – Frost protection of trays, gutters, roofs, technological heating					16 A	20 A	25 A	
ELSR-N – 20 BO	20	80	–10 °C	25 mm	92	115	119	2330320
ELSR-N – 30 BO	30	80	–10 °C	25 mm	71	89	105	2330330
KIT No. 4	For connection and termination of self-limiting cables							5030124
Cold lead (SK) for self-regulating cables								
SK 1.5	Limitation: 12 A / 20 m							2000790
SK 2.5	Limitation: 20 A / 20 m							2000795

REFERENCE

Public library, Czech Republic

Sport hall, Czech Republic

Industrial hall, Romania

REGULATION

	TYPE / Description	Cat. No.
01	**EBERLE EM 524 89;** Regulator (230 V, 1× switching contact 16 A) for heating roof gutters, downpipes and outdoor areas – pavements and drives. Set of sensors to be ordered separately. IP 20.	4600015
02	**EBERLE EM 524 90;** A two-zone regulator (230 V, 2× switching contact 16 A). Both zones require connection of their own set of sensors (to be ordered separately). IP 20.	4600016
03	**SET OF EBERLE SENSORS FOR EAVES TROUGHS;** Humidity (ESD 524 003) and temperature (TFD 524 004) sensors for EM 524 89, 90 regulators. IP 65.	4600051
04	**EBERLE DTR-E 3102;** Differential thermostat (230 V,1× switching contact 16 A). 20–35 °C, IP 65.	4066038
05	**EB-THERM 800;** Digital thermostat (230 V, 1× switching contact 16 A) with LCD display, 1 low temperature cable sensor (3 m, range –15 °C to +75 °C) included in packing. Possible to connect second sensor.	4200170
06	**ETO2;** Two-zone controller, 120–240 V, 50–60 Hz, 3×16 A, IP 20.	4200020
07	**ETR2;** One-zone controller for smaller applictions, 230 V, 50–60 Hz, 16 A, IP 20.	4200022
08	**ETF-744;** Outdoor temperature sensor for ETO2 or ETR2, IP 54, –50/+70 °C.	4200030
09	**ETOR-55;** Outdoor moisture sensor for ETO2 or ETR2 for gutters and downpipes, IP 68, –50/+70 °C.	4200028


01


02


03


04


05

06


07


08


09

ACCESSORIES

	TYPE / Description		Quantity	Cat. No.
10	**GUTTER CLIP 100;** Material: frost-resistant plastic; intended for standard 100 mm semicircular gutters – install approx. 4 pcs / 1 m (spacing 25 cm), 1 package = 25 pcs.		1 package	2350000
11	**GUTTER CLIP 150;** Material: frost-resistant plastic, suitable for selfregulating cable, 1 package = 25 pcs.		1 package	2350007
12	**DOWNPIPE CABLE CLIP;** Material: frost-resistant plastic; for the attachment of a cable on a chain in the downspout – install approx. 4 pcs / 1 m (spacing 25 cm), 1 package = 25 pcs.		1 package	2350003
13	**CHAIN;** Material: frost-resistant plastic.	5 m	1 package	2350015
14	**SYFOK-P;** Material: frost-resistant plastic; fixation of cables in nonstandard eaves, gutters and valleys.	P/20 (20 m)	1 package	2350012
		P/10 (10 m)	1 package	2350013
15	**SPACING GRIP;** Material: frost-resistant plastic; it maintains the spacing 4.5 cm of cables running in parallel; 1 package = 25 pcs.		1 package	2350007
16	**ROOF GRIP "C";** for the attachment of cables in roof valleys, atypical eaves, flat roofs – attachment via soldering/riveting, gluing using 3M 4611F acrylic tape; 1 package = 25 pcs.	Cu	1 package	2350005
		TiZn	1 package	2350006
17	**SELF-ADHESIVE ALUMINIUM TAPE;** designed for fixation of heating cables to pipes (temperature resistance 150 °C); width 50 mm, length 50 m.		1 pc	2832515


10


13


11

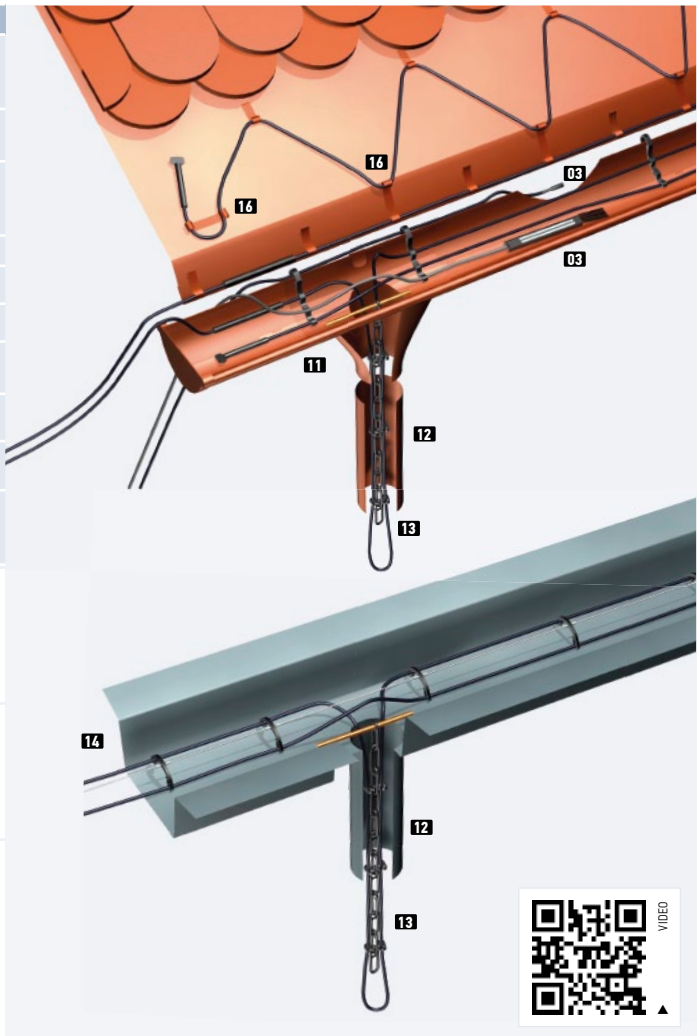

12


16


14


15


17



Benefits

- prevention of falling on ice
- preventing the forming of icy surfaces
- end with manual snow removal
- energy efficient operation
- maintenance-free operation
- aesthetic (invisible) solution

HEATING OF OUTDOOR SURFACES

It is possible to protect any area used for passage with the help of heating cables – pavements, paths, drive-up ramps, staircases etc. Special heating cables are used for these applications – robust structures with stranded resistance and wattages of 20–30 W/m. The heating can be provided by a heating circuit as well as a heating mat. For thoroughfares which are walked on, the heating element is placed in a sand bed or into a concrete slab, while in the case of stairs, terraces and similar areas the element is embedded into bonding cement. In thoroughfares used for driving, we unambiguously recommend that the heating element is placed into a concrete slab which will protect the heating cable from damage when the thoroughfare is used by a car.

DIMENSIONING

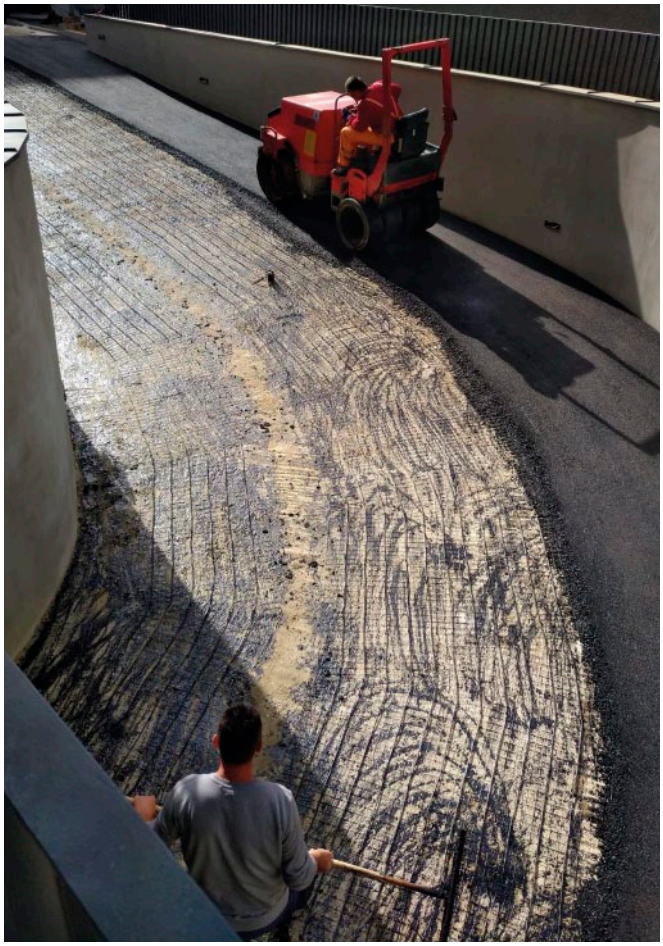
Select the surface power output in open spaces with a base surface of soil and on thermally insulated surfaces with an output of 250–300 W/m^2. For installations on thermally non-insulated surfaces with an output of 300–400 W/m^2. The value of the power depends, among other things, on the installation depth. The closer to the surface, the lower the power from the recommended interval. In the case of installation in fine washed sand, the installed surface output must not exceed 300 W/m^2.

High output is necessary for the system to work properly even at temperatures deep below 0 °C. Proper regulation is also very important, it will put the heating system into operation at a time when the danger of icing arises. That is, a regulation that senses not only the temperature, but also the presence of

moisture in the monitored area. If the system is operated manually and is put into operation by the user only when the area is covered by a layer of snow, its defrosting may take more than 12 hours (depending on the height of the snow layer). It is necessary to realize that the heating cable is located in the ground, which has a huge ability to absorb heat, and also requires a large amount of energy to convert snow into water – the so-called latent heat. The installation of additional thermal insulation in the composition is (with some exceptions) ineffective.

THERMAL INSULATION OF OUTDOOR APPLICATIONS

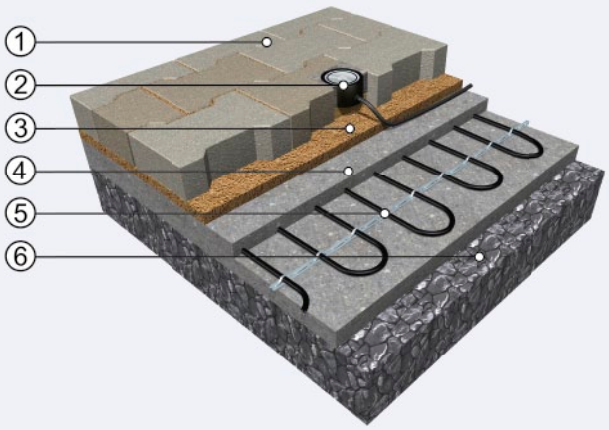
Users often enquire as to whether the efficiency of outdoor applications – the heating of thoroughfares – could be increased by the placement of suitable thermal insulation into the composition of their structure. Unfortunately, while in winter this insulation could speed up the warming of the upper layer and thus the melting of snow, in the transitional period it would insulate the heat accumulated in the earth and thus cause ice formation also in the spring and in the autumn when the ground isn't generally frozen. Thermal insulation has its value only in applications in which the heated surface is exposed to ambient conditions from all sides. For example, in the case of an outdoor staircase where the stair carriage is above the ground, it is possible to carry out thermal insulation of the steps from the bottom side so that undesired leakage of warmth via that side is avoided.



INSTALLATION

Installing to concrete

- Firstly a compact underlaying layer of gravel (150–300 mm) is created. It can be considered as a thermal insulation. Importance and effect of high quality thermal insulation (e.g. on the basis of extruded polystyrene) shall be consulted with FENIX technician prior to its use.
- In the case of a mat, most often a layer of concrete of about 40 mm is poured onto the gravel layer and it's allowed to fully set. After cleaning and removing sharp objects, a penetrating coating is applied and then the heating mat is developed according to the required heated surface.
- In the case of a heating cable, most often the cable is unwound directly onto the reinforcement mesh in an open-looping pattern and fixed with Grufast strips. The heating cable must not be overtightened to prevent damage to the cable due to the thermal expansion of the concrete. The reinforcement mesh is ideally placed in the middle, but not more than ⅔ of the height of the concrete layer.
- There is more possibilities of placing heating cables/mats, a suitable composition needs to be discussed with the designer depending on the type of surface and requirements for static load-bearing capacity of the structure.
- Subsequently, it is necessary to measure the resistance of the heating circuit / heating mat and the insulation resistance, the values are recorded in the certificate of warranty, where it is necessary to draw the cable layout, too. It is also suitable to make photo documentation.
- Then the heating cable or mat is covered with a concrete layer. The concrete layer must be monolithic so that the individual layers do not separate due to thermal stress. The resistance of the heating circuit / heating mat and the insulation resistance are measured again and the values are marked in the warranty card.
- Put the heating system into full operation at the earliest after 28 days (after the concrete has completely cured). Concrete mixtures must contain ingrediences protecting it against external effects.

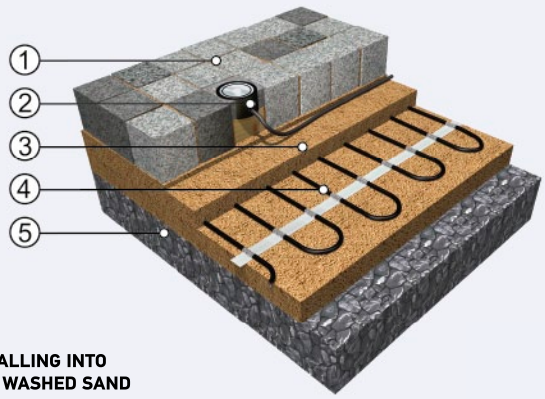


INSTALLING TO CONCRETE

1 Tiles (concrete)
2 Sensor (f.ex. EBERLE ESF 524 001 + TFF 524 002)
3 Fine washed sand
4 Concrete layer
5 Ceating cable/mat ECOFLOOR®
6 Base (gravel 150–300 mm)

Installing into fine washed sand

- This procedure is suitable only for use under pedestrian sidewalks. As in the case of installation in concrete, the basis here is a 150–300 mm layer of gravel, on which a layer of fine sand of about 50 mm is subsequently compacted. Then the heating cable / mat is unrolled according to the required heated surface, the resistance values are measured and the layout diagram is drawn in the warranty card. An additional 50 mm layer of sand is then created on the heating cables and the tiles are laid. A control measurement of resistances follows.

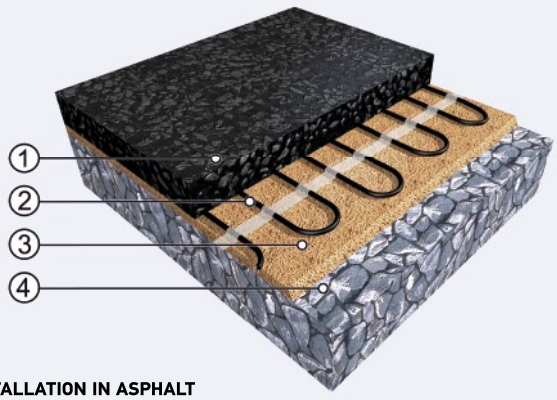


INSTALLING INTO FINE WASHED SAND

1 Interlocking (granite) pavement
2 Sensor (f.ex. EBERLE ESF 524 001 + TFF 524 002)
3 Fine washed sand, min. 100 mm
4 Heating cable/mat ECOFLOOR®
5 Base (gravel 150–300 mm)

Installation in asphalt

- Only MADPSP cables can be placed directly into asphalt providing that the pattern shown in figure below is complied with. The temperature of the asphalt which is in contact with the cable must not exceed 240 °C for period of 30 mins. The asphalt layer shall be placed on the cable manually. Layer compaction shall be carried out by a manual vibrating plate or by a road roller. In case of installation over a large area, it is necessary to lay the first layer onto the cable manually and to compact the layer manually, too. Only the next layer may be laid by heavy machinery. If you intend to heat just the drive-strips of the total asphalt surface, we recommend placing a gravel base layer in the places intended for heating (stone grading 0–4 mm), or place a geo-textile fabric underneath. However, we do not recommend this procedure for larger applications.

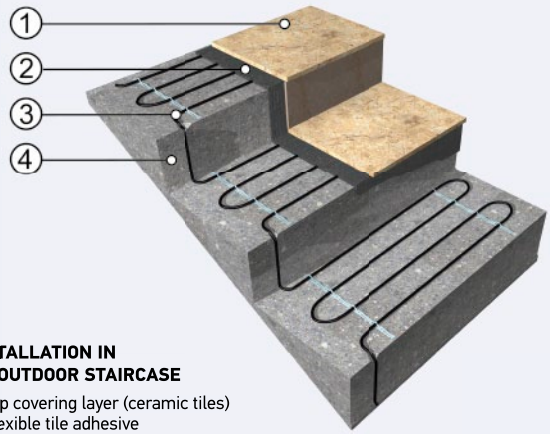


INSTALLATION IN ASPHALT

1 Asphalt layer 50–100 mm
2 MADPSP heating cable
3 Fine gravel or sand 20–30 mm
4 Compacted base layer

Installation in an outdoor staircase

- A frequent application of heating outdoor surfaces is the installation of heating cables in outdoor stairs. For reasons of practicality, the use of heating circuits is preferred for this application rather than mats. The cables can be wound on the surface of the stairs and between the individual steps as needed.
- For attachment to a cured concrete base the Grufast fixing strips are used. When installing, extra care must be taken to keep the surface clean, to remove sharp objects from the substrate, and also to drill the grooves for placing the cable when going from step to step (see figure below) to avoid damaging it (cutting / breaking by an edge). Here, too, it is necessary to verify the specified resistance and insulation resistance of the cable before and after laying the top layer. This can be both – another layer of concrete and, for example, ceramic tiles, while the cables are covered with a flexible tile adhesive. With regard to the thickness of the final layer, it is necessary to pre-arrange the place for mounting the set of ground sensors so that the upper edge of the sensors aligns with the surface of the step.



INSTALLATION IN AN OUTDOOR STAIRCASE

1 Top covering layer (ceramic tiles)
2 Flexible tile adhesive
3 Heating cable ECOFLOOR®
4 Concrete step

Installation in heliport

- Heliports are a specific category of installation of heating cables in concrete. These are often located on the roofs of hospitals or high-rise office buildings, and therefore the thermal expansion of the load-bearing structure must be taken into account here. The most frequently chosen output is 300 W/m^2, the most durable MADPSP heating cables are used. It is suitable to supplement the heating system with heating of drainage channels, for example by ADPSV heating circuits or ELSR self-regulating cables.

REGULATION

For frost protection applications, it is important that the control senses not only the temperature but also the presence of moisture (water, snow, ice). This is the only way to ensure not only reliable and economical operation, but also to avoid exceeding the upper limit of the temperature resistance of the cable, which can occur if used incorrectly (f.ex. operation in the summer months).

HEATING CABLES AND MATS

▶ MAPSV heating cable

- single-core
- industrial use
- full protection screen
- UV protection

MAPSV 20 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
340	20340	17.3	2322500
400	20400	20.3	2322502
570	20570	29.0	2322504
880	20880	44.5	2322506
1030	201030	51.4	2322508
1350	201350	65.3	2322510
1750	201750	84.0	2322512
2100	202100	100.8	2322514
2400	202400	120.4	2322516
2600	202600	131.3	2322518
3300	203300	163.6	2322520
4000	204000	194.5	2322522
5100	205100	259.3	2322524

MAPSV 30 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
420	30420	14.0	2322600
500	30500	16.3	2322602
700	30700	23.6	2322604
1100	301100	35.6	2322606
1250	301250	42.3	2322608
1600	301600	55.1	2322610
2100	302100	70.0	2322612
2500	302500	84.6	2322614
2950	302950	98.0	2322616
3200	303200	106.7	2322618
4000	304000	134.9	2322620
4800	304800	162.1	2322622
6300	306300	209.9	2322624

MAPSV 30 W/m – 400 V

Output [W]	TYPE	Length [m]	Cat. No.
730	30730	24.4	2322700
850	30850	29.0	2322702
1230	301230	40.7	2322704
1900	301900	62.4	2322706
2200	302200	72.7	2322708
2800	302800	95.2	2322710
3700	303700	120.1	2322712
4400	304400	145.5	2322714
5100	305100	171.4	2322716
5600	305600	184.3	2322718
7000	307000	233.2	2322720
8500	308500	276.8	2322722
11000	3011000	363.6	2322724

▶ MADPSP heating cable / MDT heating mat (width 75 cm)

- dual-core
- the most powerfull type
- full protection screen
- UV protection

MADPSP 40 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
340	40340	8.5	2323505
570	40570	14.5	2323510
880	40880	22	2323515
1030	401030	26	2323520
1320	401320	33	2323525
1700	401700	43	2323530
1880	401880	47	2323535
2450	402450	60	2323540
2900	402900	73	2323545
3400	403400	85	2323550
5200	405200	127	2323555
7350	407350	180	2323560

MADPSP 40 W/m – 400 V

600	40600	15	2323605
1000	401000	25	2323610
1520	401520	39	2323615
1800	401800	45	2323620
2300	402300	58	2323625
2970	402970	75	2323630
3300	403300	81	2323635
4250	404250	105	2323640
5100	405100	126	2323645
5900	405900	148	2323650
9000	409000	222	2323655

MDT mat 400 W/m² – 230 V

Output [W]	TYPE	Surface [m²]	Length [m]	Cat. No.
340	23MDT400/0,9	0.9	1.1	5510005
570	23MDT400/1,4	1.4	1.9	5510010
880	23MDT400/2,3	2.2	2.9	5510015
1030	23MDT400/2,6	2.6	3.4	5510020
1320	23MDT400/3,3	3.3	4.4	5510025
1700	23MDT400/4,3	4.3	5.7	5510030
1880	23MDT400/4,7	4.7	6.3	5510035
2450	23MDT400/6,1	6.1	8.2	5510040
2900	23MDT400/7,3	7.3	9.7	5510045
3400	23MDT400/8,5	8.5	11.3	5510050
5200	23MDT400/13	13.0	17.3	5510055
7350	23MDT400/18,4	18.4	24.5	5510060

MDT mat 400 W/m² – 400 V

600	40MDT400/1,5	1.5	2.0	5510105
1000	40MDT400/2,5	2.5	3.3	5510110
1520	40MDT400/3,8	3.8	5.1	5510115
1800	40MDT400/4,5	4.5	6.0	5510120
2300	40MDT400/5,8	5.8	7.7	5510125
2970	40MDT400/7,4	7.4	9.9	5510130
3300	40MDT400/8,3	8.3	11.0	5510135
4250	40MDT400/10,6	10.6	14.2	5510140
5100	40MDT400/12,8	12.8	17.0	5510145
5900	40MDT400/14,8	14.8	19.7	5510150
9000	40MDT400/22,5	22.5	30.0	5510155

▶ ADPSV heating cable / ADPSV heating mat

- dual-core
- easy installation
- full protection screen
- UV protection

ADPSV 10 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
120	10120	11.4	2256010
200	10200	18.9	2256015
250	10250	23.6	2256020
320	10320	31.6	2256025
400	10400	36.9	2256030
450	10450	45.9	2256035
550	10550	56.1	2256040
600	10600	63.9	2256045
750	10750	75.8	2256050
950	10950	87.0	2256055
1100	101100	114.5	2256060
1300	101300	131.3	2256065
1700	101700	158.5	2256070
2000	102000	194.5	2256075

ADPSV 20 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
160	20160	8.3	2252800
270	20270	14.0	2252805
340	20340	17.2	2252810
450	20450	22.5	2252815
540	20540	27.4	2252820
640	20640	32.1	2252825
780	20780	39.3	2252830
870	20870	43.8	2252835
1070	201070	53.5	2252840
1290	201290	64.4	2252845
1580	201580	79.0	2252850
1850	201850	92.4	2252855
2300	202300	117.3	2252865
2750	202750	141.4	2252870

ADPSV 30 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
195	30195	7	2253505
340	30340	11	2253510
420	30420	14	2253515
560	30560	18	2253520
670	30670	22	2253525
800	30800	26	2253530
970	30970	32	2253535
1060	301060	36	2253540
1300	301300	44	2253545
1600	301600	52	2253550
1940	301940	65	2253555
2250	302250	76	2253560
2800	302800	96	2253565
3400	303400	114	2253570

ADPSV 30 W/m – 400 V

Output [W]	TYPE	Length [m]	Cat. No.
350	30350	12	2253605
580	30580	20	2253610
730	30730	24	2253615
950	30950	32	2253620
1150	301150	39	2253625
1360	301360	46	2253630
1670	301670	56	2253635
1850	301850	63	2253640
2250	302250	76	2253645
2720	302720	92	2253650
3350	303350	114	2253655
3900	303900	132	2253660
5000	305000	163	2253665
6000	306000	196	2253670

ADPSV mat 300 W/m² – 230 V

Output [W]	TYPE	Surface [m²]	Length [m]	Cat. No.
300	23ADPSV 300/1-0,5	1.0	2.0	5510505
450	23ADPSV 300/1,5-0,5	1.5	3.0	5510510
600	23ADPSV 300/2-0,5	2.0	4.0	5510515
750	23ADPSV 300/2,5-0,5	2.5	5.0	5510520
900	23ADPSV 300/3-0,5	3.0	6.0	5510525
1050	23ADPSV 300/3,5-0,5	3.5	7.0	5510530
1200	23ADPSV 300/4-0,5	4.0	8.0	5510535
1500	23ADPSV 300/5-0,5	5.0	10.0	5510540
1800	23ADPSV 300/6-0,5	6.0	12.0	5510545
2100	23ADPSV 300/7-0,5	7.0	14.0	5510550
2700	23ADPSV 300/9-0,5	9.0	18.0	5510555
3000	23ADPSV 300/10-0,5	10.0	20.0	5510560

REGULATION AND ACCESSORIES

	TYPE / Description	Cat. No.
01	**EBERLE EM 524 89;** Regulator (230 V, 1× switching contact 16 A) for heating roof gutters, downpipes and outdoor areas – pavements and drives. Set of sensors to be ordered separately. IP 20.	4600015
02	**EBERLE EM 524 90;** A two-zone regulator (230 V, 2× switching contact 16 A). Both zones require connection of their own set of sensors (to be ordered separately). IP 20.	4600016
	SET OF EBERLE GROUND SENSORS; Humidity (ESF 524 001) and temperature (TFF 524 002) sensors for EM 524 89, 90 regulators. IP 65.	4600050
04	**EBERLE DTR-E 3102;** Differential thermostat (230 V, 1× switching contact 16 A). 20–35 °C, IP 65.	4066038
05	**EB-THERM 800;** Digital thermostat (230 V, 1× switching contact 16 A) with LCD display, 1 low temperature cable sensor (3 m, range –15 °C to +75 °C) included in packing. Possible to connect second sensor.	4200170
06	**ETO2;** Two-zone controller, 120–240 V, 50–60 Hz, 3×16 A, IP 20.	4200020
07	**ETR2;** One-zone controller for smaller applictions, 230 V, 50–60 Hz, 16 A, IP 20.	4200022
08	**ETF-744;** Outdoor temperature sensor for ETO2 or ETR2, IP 54, –50/+70 °C.	4200030
09	**ETOG-55;** Ground sensor for ETO2 or ETR2 for temperature and moisture, 10 m cable.	4200026
10	**GRUFAST;** Universal fixing tape for fixation of heating cables. Spacing of grips: 3.5 cm, consumption: 1 unit (= 10 m) / 4 m².	4200013


01


02


03


04


05


06

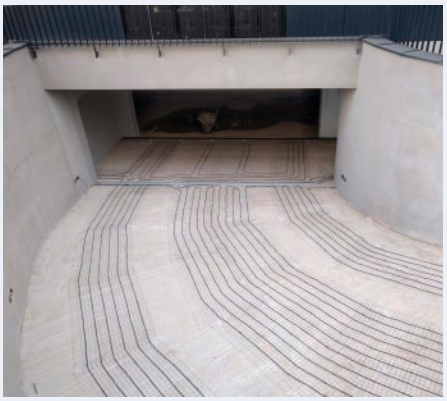

07


08


09

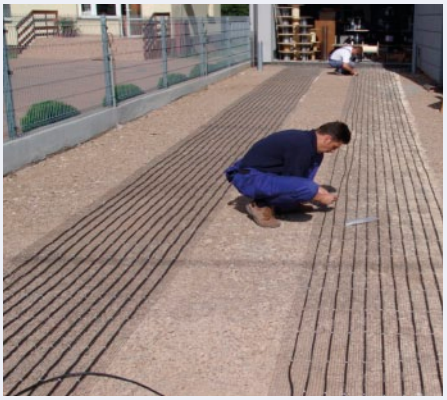

10

Mercedes Showroom, Dublin, Republic of Ireland



Underground parking entrance, Zagreb, Croatia

HELIPORT, GRUDZIĄDZ, POLAND – The heliport is located on the roof of the hospital in Grudziądz. For this installation, a MADPSP 30 W/m heating cable with a total output of 170 kW was chosen as the heating element. The heating circuits were distributed in several fields at the base of the platform with regard to thermal expansion in the supporting roof structure. The circuits were attached to the reinforcement grid with tapes at a spacing of approx. 10 cm = 300 W/m². An additional 300 m of self-regulating cable was used in the drainage channels around the perimeter of the landing area. A two-zone ETO2 controller with two ETOG-55 ground sensors were used to control the entire system.



Driveway, Warsaw, Poland

Outdoor surfaces, complex Barin, Iran

Entrance to the underground garage, Ljubljana, Slovenia

Heliport, Hospital Bory, Bratislava, Slovakia

Outside surfaces, Hilton Garden Inn, Kazakhstan

Sidewalks, Warsaw, Poland

Benefits

- antifrost protection of pipes
- maintenance-free efficient operation
- end with expensive piping repairs
- plug-in solution

FROST PROTECTION OF PIPES AND TECHNOLOGICAL HEATING

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 technological heating. 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.

DIMENSIONING

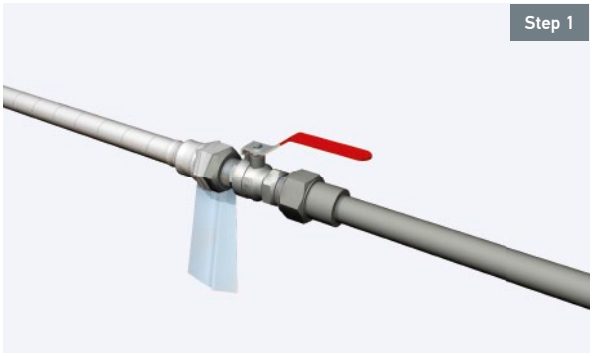
The wattage of the cable is dependent on the ambient temperature, the thickness and type of thermal insulation and on the required temperature of the transported medium. For pipe protection, cables with a wattage of 10–15 W/m are usually used. The required wattage of the cable per 1 m of length can be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

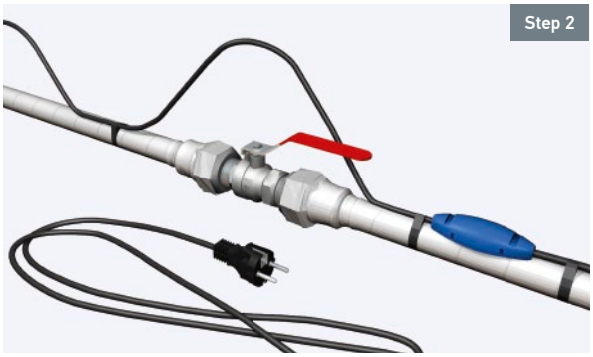
Insulation thickness [mm]	Minimum ambient temp. [°C]	Pipe diameter [G/m]										
		½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	6"	8"
		15	20	25	32	40	50	65	80	100	150	200
		Heating cable wattage per 1 standard metre [W]										
10	–15	7	9	11	13	15	19	23	28	34	50	66
	–25	11	14	16	19	23	28	35	42	52	75	99
20	–15	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												

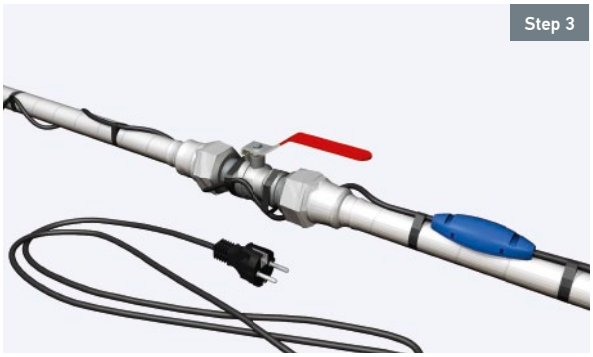
EXAMPLE
Pipe diameter **G 1"** (DN 25), length of pipe 48 m, ambient temperature **–25 °C**, pipe insulation **20 mm** thick. The temperature of the transported medium mustn't drop below 5 °C (non-freeze temperature). Result from the table: You'll find the required wattage per 1 m = 10 W in the table. The needed total output will thus be approx. 480 W (48 m × 10 W/m). Therefore, use a heating cable with a total output of at least 480 W. 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.

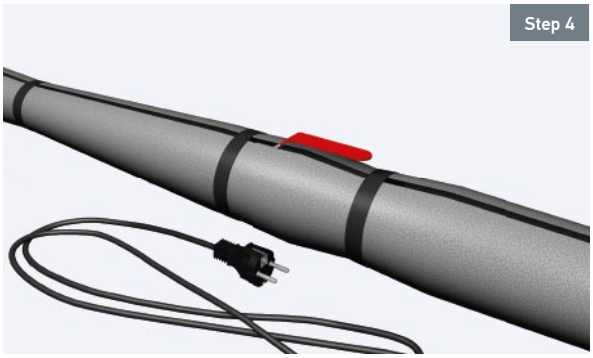
INSTALLATION

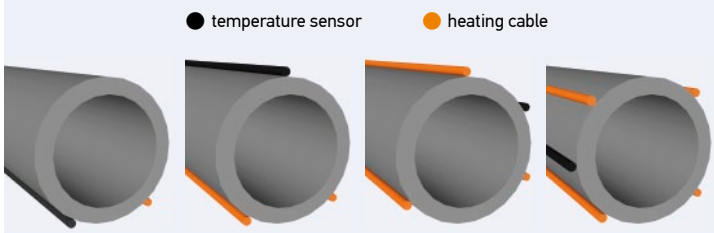
Both plastic and metal pipes can be protected against icing. The cable is attached to metal pipes directly, while plastic pipes need to be covered by a metal, ideally self-adhesive aluminium tape or foil (Step 1). After installation, the heating cable is attached with selfadhesive aluminium tape along 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 (Step 2) are created which are then wound around the pipe in opposing directions (Step 3). At the end the pip eis furnished with suitable thermal insulation (Step 4).











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 fig. above.

HEATING CABLES

ADPSV heating cable

- dual-core
- easy installation
- full protection screen
- UV protection

ADPSV 10 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
120	10120	11.4	2256010
200	10200	18.9	2256015
250	10250	23.6	2256020
320	10320	31.6	2256025
400	10400	36.9	2256030
450	10450	45.9	2256035
550	10550	56.1	2256040
600	10600	63.9	2256045
750	10750	75.8	2256050
950	10950	87.0	2256055
1100	101100	114.5	2256060
1300	101300	131.3	2256065
1700	101700	158.5	2256070
2000	102000	194.5	2256075

ADSV+ heating cable

- dual-core
- easy installation
- full protection screen
- UV protection

ADSV+ 10 W/m – 230 V

Output [W]	TYPE	Length [m]	Cat. No.
120	10120	11.4	2253000
200	10200	18.9	2253005
250	10250	23.6	2253010
320	10320	31.6	2253015
400	10400	36.9	2253020
450	10450	45.9	2253025
520	10520	49.6	2253030
600	10600	63.9	2253035
750	10750	75.8	2253040
950	10950	87.0	2253045
1100	101100	114.5	2253050
1300	101300	131.3	2253055
1700	101700	158.5	2253060
2000	102000	194.5	2253065

PFP heating cable

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 100 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

Output [W]	TYPE	Length [m]	Cat. No.
12	PFP 1m/12W	1	2330150
25	PFP 2m/25W	2	2330152
36	PFP 3m/36W	3	2330154
48	PFP 4m/48W	4	2330156
72	PFP 6m/72W	6	2330158
136	PFP 10m/136W	10	2330160
152	PFP 14m/152W	14	2330162
281	PFP 21m/281W	21	2330164
337	PFP 30m/337W	30	2330166
490	PFP 42m/490W	42	2330168
620	PFP 50m/620W	50	2330169
660	PFP 58m/660W	58	2330170
810	PFP 70m/810W	70	2330171
1030	PFP 80m/1030W	80	2330172
1260	PFP 100m/1260W	100	2330173

REGULATION AND ACCESSORIES

	TYPE / Description	Cat. No.
01	**EB-THERM 800;** Digital thermostat (230 V, 1× switching contact 16 A) with LCD display, 1 low temperature cable sensor (3 m, range –15 °C to +75 °C) included in packing. Possible to connect second sensor.	4200170
02	**EBERLE UTR/60;** Exterior/interior control, 0–60 °C, 1×16 A, 230 V, IP 65.	4066037
03	**EBERLE F 891 000;** Standard sensor, 4 m, PVC, IP 64.	4066137
04	**BMR DTR01;** Dvoukanálový termostat, 2 ks kabelové sondy BMR RT-P (3 m) součástí balení. Lze použít i jako jednokanálový (druhý kanál nezapojen).	4200052
05	**SELF-ADHESIVE ALUMINIUM TAPE;** designed for fixation of heating cables to pipes (temperature resistance 150 °C); width 50 mm, length 50 m.	2832515


01


02


03


04


05

SELF-REGULATING CABLES

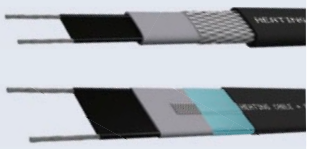
A special category of heating cables, which are used mainly for frost protection of gutters and roof gutters, or also for protection of pipes and for technological heating of various industrial vessels, storage tanks, etc., consists of so-called self-regulating cables.

The cable consists of two copper conductors, between which a semiconducting heating core is placed. As the ambient temperature increases, the resistance of the heating core increases and thus its output decreases. Conversely, as the temperature drops, the cable's performance increases. This occurs at any point of its length, the cables thus might touch each other, intersect or pass through different temperatures without danger of overheating or burning.

An indisputable advantage and argument for buying this product is the fact that the self-regulating cable can be shortened to any length. Installation kit KIT No. 4 (5030124) is supplied to terminate the cable and connect the cold lead end.

Although self-regulating heating cables automatically change their output depending on the ambient temperature, they never switch off completely. A thermostat is therefore required for economical operation.

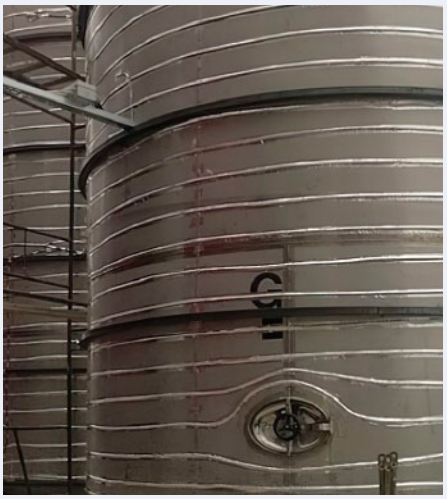
ELSR self-regulating cable



- semi-conductive heating core
- can be shortened to any length
- UV protection

MARKING	Output [W/m] at 10 °C	Thermal resistance [°C]	Limitation for installation		Max. length at the switch. temperature 0 °C and installed circuit braker			Cat. No.
			Min. temp.	Min. radius				
ELSR-M – Frost protection of pipes					**10 A**	**16 A**	**20 A**	
ELSR-M – 10 BO	10	65	–30 °C	25 mm	115.5	115.5	115.5	2330310
ELSR-M – 15 BO	15	65	–30 °C	25 mm	83	97.5	97.5	2330315
ELSR-N – Frost protection of trays, gutters, roofs, technological heating					**16 A**	**20 A**	**25 A**	
ELSR-N – 20 BO	20	80	–10 °C	25 mm	92	115	119	2330320
ELSR-N – 30 BO	30	80	–10 °C	25 mm	71	89	105	2330330
KIT No. 4	For connection and termination of self-limiting cables							5030124
Cold lead (SK) for self-regulating cables								
SK 1.5	Limitation: 12 A / 20 m							2000790
SK 2.5	Limitation: 20 A / 20 m							2000795

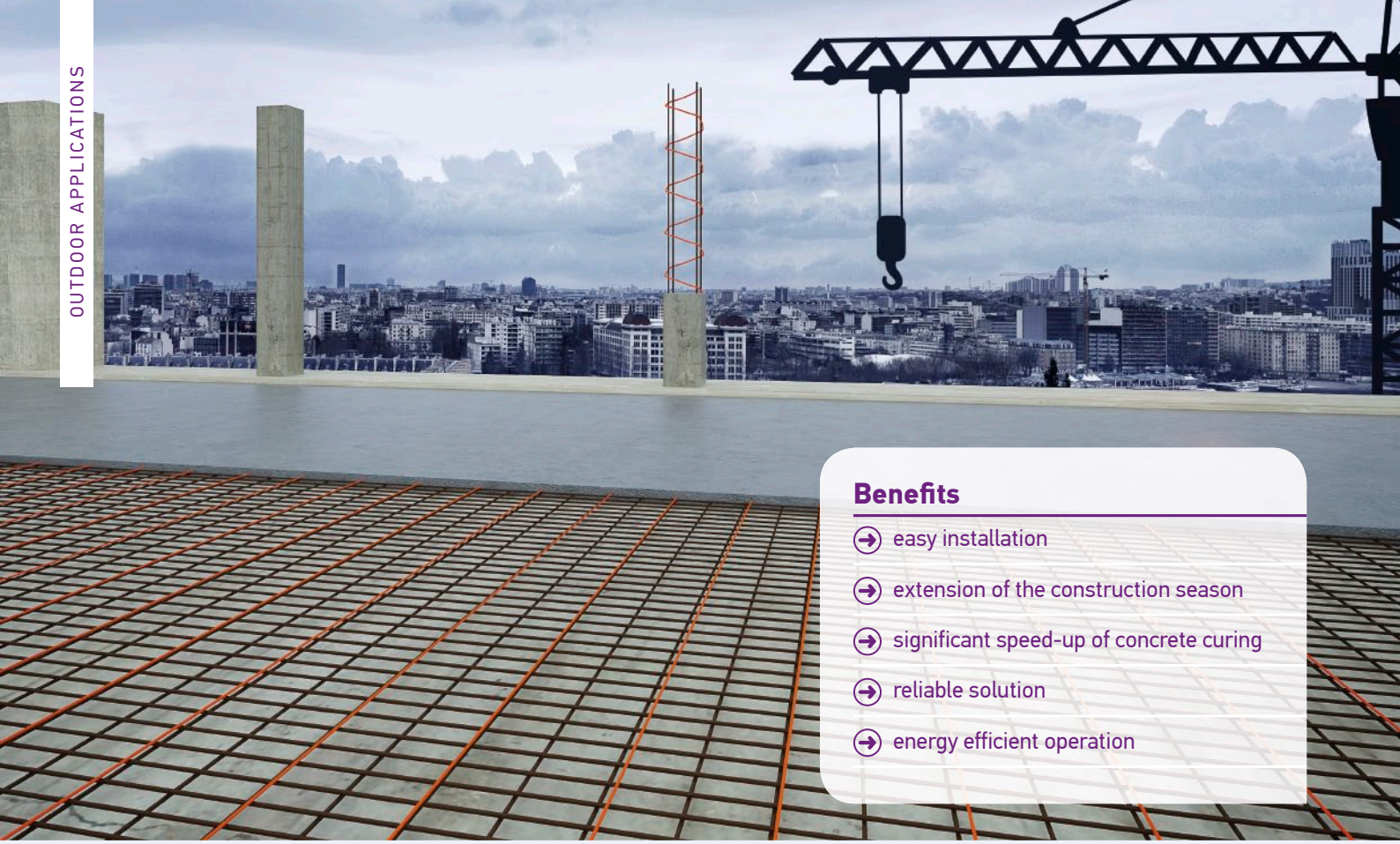
REFERENCE



Technological fluid heating, Romania

Piping protection, Poland

Tank anti-freeze protection, Bulgaria



Benefits

- easy installation
- extension of the construction season
- significant speed-up of concrete curing
- reliable solution
- energy efficient operation

CONCRETE CURING

PDS1P heating cables are products for special applications. These cables are designed to short-term single use in the winter period to accelerate the curing and hardening of concrete. Installation and use of heating cables is possible up to temperatures of –10 °C. After the curing process is completed, the cables are disconnected (cut off) and remain in the concrete block. The cables are intended exclusively for industrial use and are manufactured in accordance with IEC 60800. The heating circuit (IP 67) is terminated by a 2 m long cold lead with a plug connection (IP 20). It is connected to a voltage of 230 V. The diameter of the heating cable is 7 mm.

DIMENSIONING

Power consumption must be chosen depending on the thickness of the concrete and ambient conditions (800–1 200 W/m³). After determining the required area input (W/m²), the required circuit loop spacing must be calculated. Recommended loop spacings for selected area inputs for concrete curing are given in the following table

INSTALLATION

The heating cable is fixed to the reinforcement steel grid using plastic cable ties or self-adhesive tape (it is forbidden to use wire for fixing). Care must be taken during installation to avoid damaging the heating cable. The heating cable and the cold lead must not be shortened or adjusted. The heating cable must be surrounded on all sides by concrete in min. 5 cm thickness.

HEATING CIRCUIT

PDS1P heating circuit

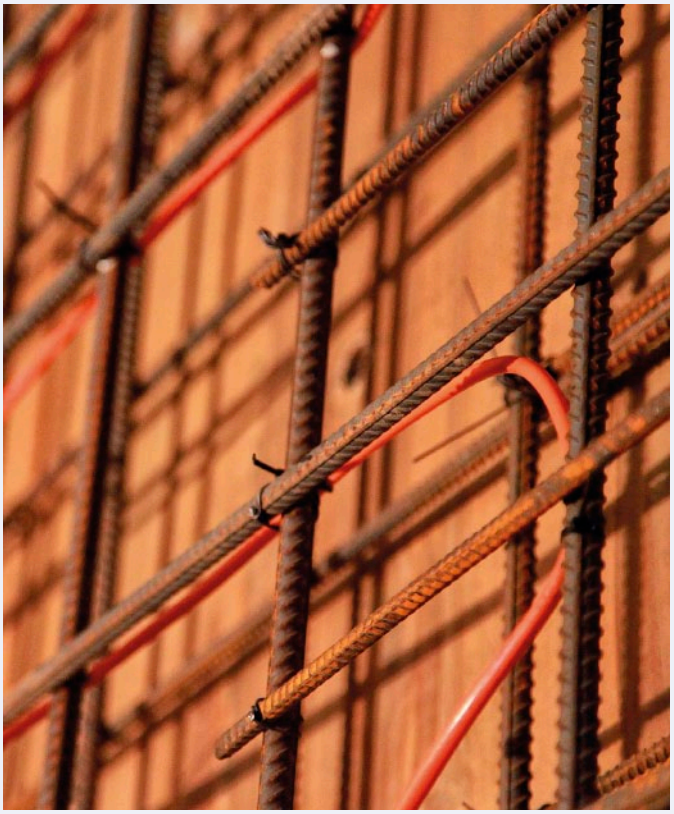
- dual-core
- easy installation
- full protection screen
- plug

PDS1P 40 W/m				OUTPUT (W/m²)			
Output [W]	TYPE	Length [m]	Cat. No.	150	120	100	90
				Area [m²] / Loop spacing [cm]			
130	40130	3.3	2325000	0.9 / 30	1.08 / 35	1.3 / 45	1.44 / 50
380	40380	10.0	2325005	2.5 / 27	3.2 / 35	3.8 / 40	4.2 / 45
735	40735	20.0	2325008	5.0 / 25	6.0 / 30	7.3 / 36	8.0 / 40
760	40760	19.0	2325010	5.0 / 27	6.5 / 35	7.5 / 40	8.5 / 45
1400	401400	35.0	2325018	9.0 / 27	12.0 / 34	14.0 / 40	16.0 / 46
1500	401500	38.0	2325020	10.0 / 27	12.5 / 35	15.0 / 40	16.5 / 45
2200	402200	55.0	2325025	14.0 / 25	18.0 / 32	22.0 / 40	24.5 / 45
3200	403200	85.0	2325028	21.0 / 25	26.5 / 31	32.0 / 38	35.5 / 42

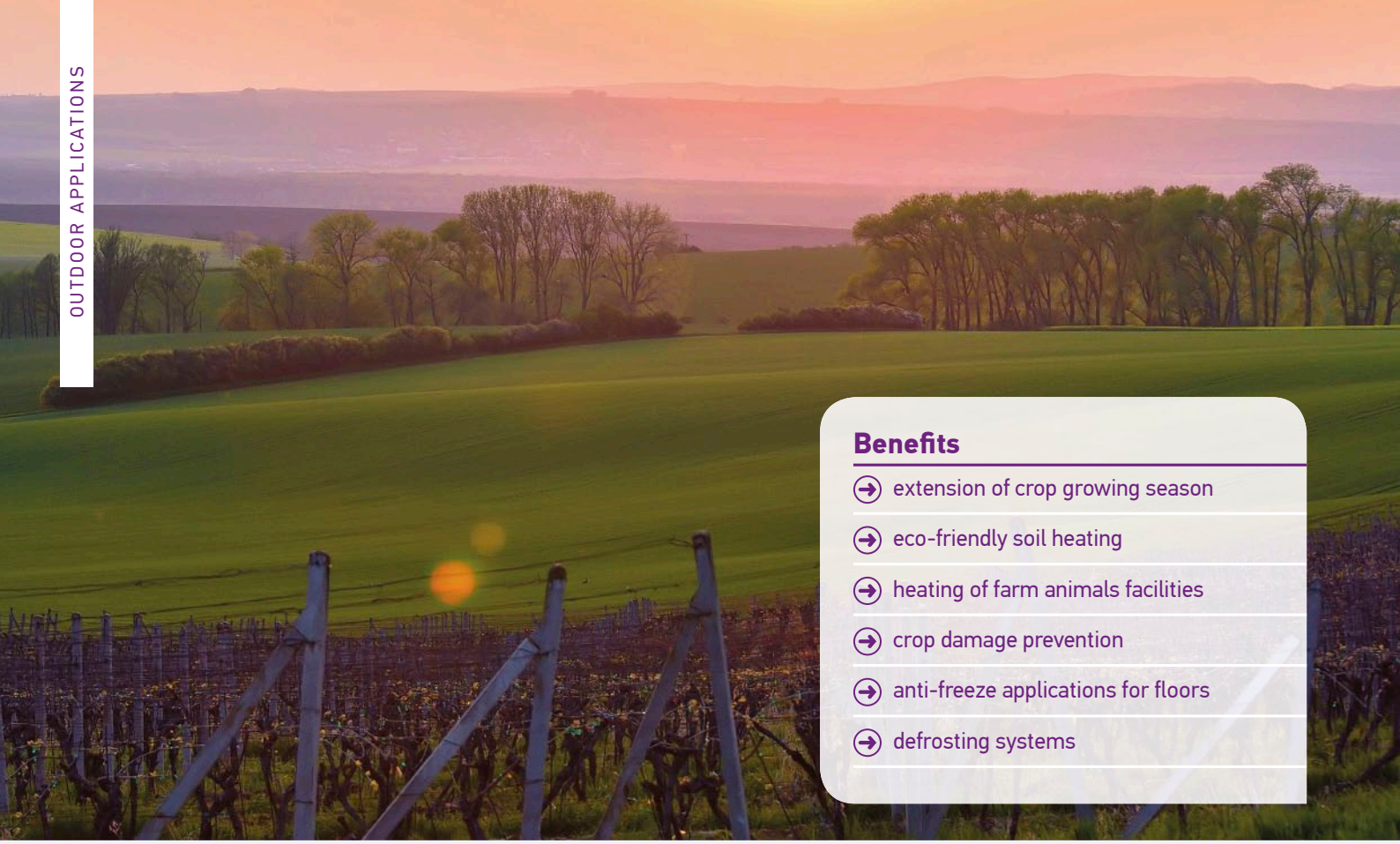
REFERENCE

Installation, Finland

Installation, Finland



Installation, Finland



Benefits

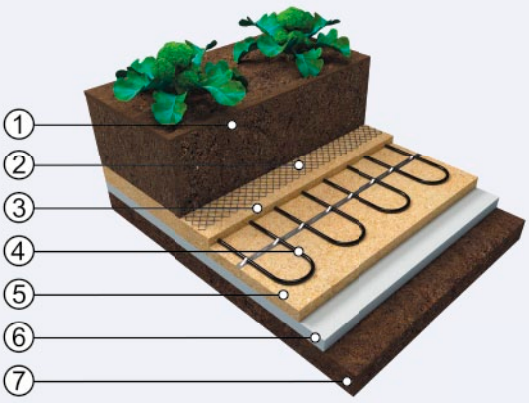
- extension of crop growing season
- eco-friendly soil heating
- heating of farm animals facilities
- crop damage prevention
- anti-freeze applications for floors
- defrosting systems

HEATING SYSTEMS IN AGRICULTURE AND INDUSTRY

FENIX heating systems are also used in various applications of plant cultivation and livestock breeding. They help to optimize plant production, protect crops from adverse weather conditions and provide thermal comfort for both the animals themselves and the operators of breeding facilities.

SOIL HEATING IN GREENHOUSES

The use of ECOFLOOR® heating cables in the soil for growing fruit and vegetables in greenhouses promotes faster and earlier germination of seedlings. The harvest season itself can also last longer.



1 Soil
2 Protective grid
3 Sand 20–30 mm
4 ECOFLOOR® heating cable
5 Sand bed 20–30 mm
6 Insulation 20–30 mm
7 Soil bed

Proven output for this method of heating is 100 W/m^2, higher powers are already undesirable. The heating cable is placed so deep into the ground that it cannot be damaged in any way during planting or harvesting. The cables in the sand bed must not cross in any way and the sand or soil in close proximity to the cable should not contain any stone chips, etc., which could damage the protective jacket of the cable. Even garden peat must not be in contact with the cable, which could easily become an insulating element and cause the cable to overheat.

▶ **Recommended heating circuit:**
ADPSV heating cable – 10 W/m

PROTECTION OF VINEYARDS FROM SPRING FROST

Every year in the spring months, wineries across Europe fear the arrival of frosts, which cause considerable damage in many places. Freshly sprouted buds and already growing young twigs are primarily endangered by spring frosts.

Therefore, on incriminated days, the winemakers have so far placed paraffin candles in the vineyards, or burned straw to heat the air around them and, with a little luck, save what they can. In recent years, however, the installation of heating cables has proved to be an effective solution. Unlike

other methods of protection, this is a one-time investment that will reliably serve for many years. The heating cable is installed directly on the supporting wires of the vineyard near the sprouted buds. A heating cable with an output of 15–20 W per meter of length is installed (depending on the density and length of the individual wine rows). The operation can be controlled by a controller with an external temperature probe, which switches the system on when the temperature falls below the set limit, or the entire system can be set to simple ON/OFF switching. The selection of a suitable cable type and the method of regulation is always adapted to local conditions and designed according to customer requirements.

▶ **Recommended heating circuit:**
ADPSV heating cable

REFERENCE

Protective vineyards heating, Champagne, France

ADPSV HEATING CABLE

- dual-core
- easy installation
- full protection screen
- UV protection

HEATING OF FACILITIES FOR LIVESTOCK

Livestock facilities are often too large and poorly (or not at all) insulated, often the temperatures inside are not very different from those outside. Full-area heating would therefore be very expensive from an economic point of view.

However, if the spaces in which the animals are located most of the time can be heated only locally, **ECOSUN® radiant heating panels** can advantageously be used as heat sources. Their advantage is undoubtedly the heat transfer by radiation, i.e. electromagnetic radiation of a certain wavelength, which is largely absorbed by objects and the surface of the body. It is therefore possible to induce a pleasant feeling of warmth with suitably oriented sources of radiant heating at lower air temperatures in the room in the same time.

Compared to conventional convection heating, zone heating can achieve more than 50 % savings in heating costs. Due to the reduced flow (circulation of the air in the room), the swirling of dust is also limited.

Radiant panels are manufactured in two basic designs:

- **High-temperature panels**
- **Low temperature panels**

HIGH-TEMPERATURE PANELS

High-temperature panels are equipped with a flat radiating surface, which provides radiation at an angle of up to 180° (so-called hemispherical radiation). The temperature on the surface of the radiant lamellas is approx. 350 °C. This high temperature ensures a relatively high radiant flux density. Therefore, these panels are designed for hanging to greater heights 5–8 m above the ground.

LOW TEMPERATURE PANELS

Low temperature panels also have a flat radiating surface. Unlike high-temperature panels, the surface area of the radiating surface is max. 110 °C. The radiant flux density is lower. The recommended height of the panels is 2.5–3 m above the ground.

Both versions are available in different power variants and different color variants are also possible for low-temperature panels. The technical department of FENIX will help with the selection of suitable heaters and the corresponding regulation for a specific application.

REFERENCE

Piglet breeding facility, Szczepankowo, Poland

Horse stables heating, Germany

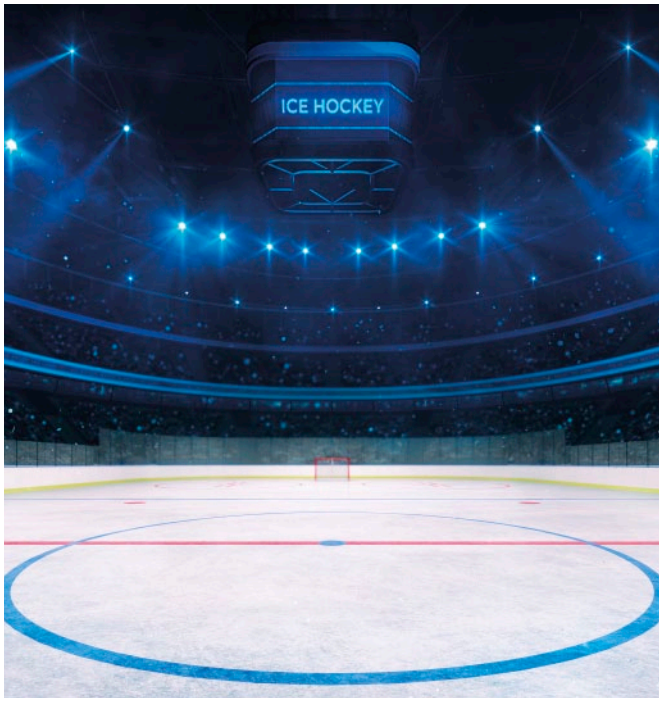
Dairy farm, Větřkovice, Czech Republic

APPLICATION AGAINST FREEZING OF FLOORS AND DOOR SILLS

Heating cables can also be used in the construction of foundation blocks and floors of cold stores or winter stadiums, where it is necessary to temper the floors and door sills to a certain temperature.

For refrigerated boxes, the area output under the floor is most often chosen 20 to 25 W/m², below the door sill of the entrance door to the room then 100 to 120 W/m².

▶ **Recommended heating circuit:**
ADPSV heating cable – 10 W/m
ADPSV heating cable – 20 W/m



The spacing of the heating cables must not exceed 40 cm, for safety reasons it is advisable to install a second (backup) circuit, which will continue to heat the floors in the event of a fault in the primary circuit. In practice, this means that both circuits are regulated separately by means of their own floor temperature probe, the backup circuit being set to switch at 4 °C, while the primary circuit already switches at 5 °C.

DEFROST TUNNELS

Many thermal power plants use train sets to supply coal. In the winter months, however, the brown coal on the wagons freezes during transport and the set needs to be thawed before it can be unloaded. Defrost tunnels are used for this purpose. As standard, the coal is thawed by blowing hot air from the operation of the power plant units, where the temperature reached 120 °C. However, at the moment of block shutdown, this system cannot work and it is necessary to look for an alternative that will ensure efficient and continuous defrosting in the current tunnel areas at the same time at advantageous investment and operating costs.

▶ **The assembly of high-temperature radiant panels ECOSUN S +** proved to be a suitable technology for full-area defrosting.

REFERENCE

Defrost tunnel, power plant Nováky, Slovakia
(594 panels ECOSUN S+ installed)

ADPSV HEATING CABLE

- dual-core
- easy installation
- full protection screen
- UV protection

HIGH-TEMPERATURE RADIANT PANELS ECOSUN S+

- flat radiating surface providing radiation at an angle of 180°
- high radiant flux density
- quality design
- high reliability

Benefits

- solution for both natural and artificial grass playing surfaces
- electricity as the only power source
- maintenance-free and ecological heating without antifreezing mix (Glycol)
- precise and very quick regulation, intuitive control system
- easy installation into existing natural grass football pitches
- extension of the playing season, accelerating the regeneration of the pitch

HEATING OF GRASS PLAYING SURFACES

Although hot water heating systems have dominated in our conditions so far, in recent years the position of electrically heated grass surfaces has been demonstrably strengthened. Electric heating is gaining ground even more strongly in Europe in the segment of heating playing fields with artificial grass. Heated playing fields are especially popular in the Nordic countries of Europe or in places with higher altitudes, both in training centers and in major stadiums.

Electric heating has a number of advantages compared to hot water heating. The only source is electricity, so there is no need to worry about the source that heats the hot water heating (gas, boiler room, etc.). Water consumption is completely zero, and antifreeze mixtures that protect hot water distribution systems from freezing are eliminated. Thanks to the absence of pipework filled with Glycol, electric heating is also significantly safer and more environmentally friendly. Electric heating does not require regular maintenance and service. However, precise and very fast regulation of electric heating is a key advantage. Long-term experience from operation shows that in terms of the speed of response to changes in outdoor temperature, electric heating is very fast and thus more energy efficient. Hot water systems are not able to provide this flexibility and accuracy in supplying the small amount of heat required.

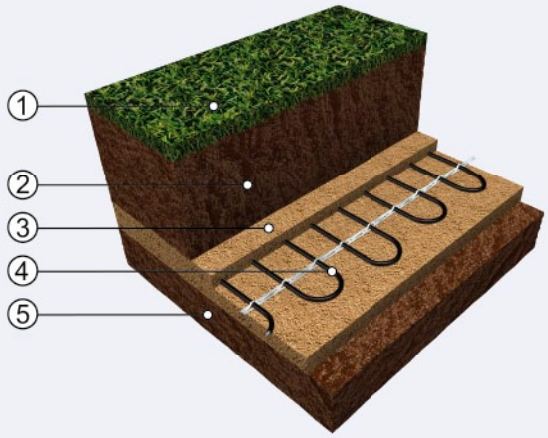
DIMENSIONING

The installed capacity of the electric heating system varies from installation to installation, depending on the geographical location, the type of subsoil and the seasonal conditions. Usually the required power of heating cables / mats is in the range of 50–100 W/m². The standard size of the pitch according to the UEFA association is 105×68 m, the typical total installed heating power is 400–750 kW. The spacing of the heating cable loops (18 to 40 cm) also depends on the determination of the required system output. It is also necessary to heat the drainage channels around the perimeter of the playing area. According to the investor's request, other parts of the playing area behind the side line are often heated (e.g. space in front of the benches, areas behind the goals, athletic track, etc.).

INSTALLATION

Natural grass fields

- **Application of the system to the substrate during the lawn renovation phase**
  Heating cables are laid directly on the sand bed after removing the old lawn. Subsequently, it is covered with soil, the thickness of the layer depends on both the local conditions of grass maintenance (e.g. the length of the aeration roller spike) and the purpose for which the pitch is used (sports such as javelin throw, hammer throw, etc.).



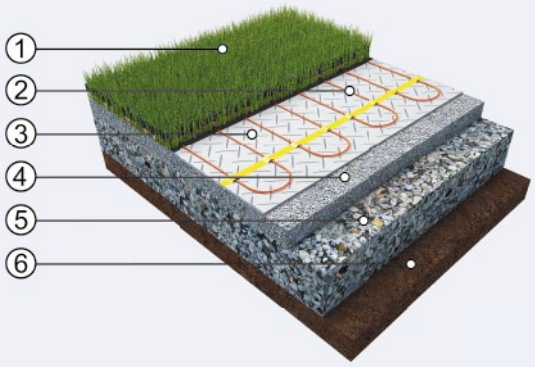
1 Grass
2 Soil (200–250 mm)
3 Sand bed (cca. 70 mm compacted + 30 mm to cover the cables
4 ECOFLOOR® heating cable / heating mat
5 Existing hard soil

The technical department of FENIX offers a free consultation of grass playing surface heating project and will help to find a tailor-made solution in the conditions of the given location.

- **Application of the system to an existing pitch**
  The cable is laid in the grass field by means of a specially adapted trolley with a plow for making the furrow and unwinding the heating cable from the spool.

Artificial grass fields

- We produce special ultra-thin fluoropolymer heating cables for playgrounds with an artificial surface. They have excellent mechanical, chemical and weather resistance. Thanks to their diameter of up to 4 mm, they can be placed directly between the mat and the carpet of artificial turf and there is no danger of drawing of cable loops through the carpet. We customize heating circuits and mats directly to order so that the installation is as simple and as fast as possible.



1 Artificial grass carpet with sand and rubber granulate
2 ECOFLOOR® heating mat
3 Water permeable pad
4 Fine crushed gravel (40 mm)
5 Coarse crushed gravel (150–200 mm)
6 Solid compacted soil

REGULATION

The standard regulation of the heating system consists of:

- Control unit
- Units of sensors input information sensing the temperatures in the playground area
- Output units switching heating circuits according to sections
- Display for local visualization and control

REFERENCE

Training ground with artificial grass, Fossum, Norway

CZECH REPUBLIC – 1990

FENIX

REPUBLIC OF SERBIA – 2021

Elmark d.o.o.

SLOVAK REPUBLIC – 1993

FENIX Slovensko s.r.o.

POLAND – 2019

FENIX Polska Sp. z o.o.

UNITED KINGDOM – 2003

FLEXEL UNDERFLOOR HEATING SYSTEMS

FENIX GROUP

GERMANY – 2018

FENIX Deutschland GmbH

UNITED KINGDOM – 2008

demista™ Clearly Perfect

CZECH REPUBLIC – 2016

AERS

FRANCE – 2010

ACSO

NORWAY – 2014

ELFLEX -et smartere valg

SPAIN – 2010

CEILHIT SLU

FENIX TRADING s.r.o.

Slezská 2, 790 01 Jeseník, Czech Republic
Tel.: +420 584 495 111, Fax: +420 584 495 441
E-mail: fenix@fenixgroup.cz

SPECIALISTS IN RADIANT HEATING

www.fenixgroup.eu