Pre-insulated Pipe System
Featuring Ecoflex® Potable plus
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Ecoflex® Potable plus Pre-insulated Pipe

Ecoflex® Potable plus is a versatile insulated water pipe containing a self-regulating heating cable that keeps it from freezing. It is suitable for use as a water pipe or pressure sewage system for resort villages, holiday homes, residential areas, industry, ski centers and other locations susceptible to freezing.

**Structure**

**Flow Pipe** — The flow pipe, made of crosslinked polyethylene (PEX-a), distributes potable water.

**Heating Cable** — The self-regulating heating cable has a nominal output of 23W/m (watts per meter) or 7W/ft. (watts per feet) and supply voltage of 230V (see Table 1-4 on page 2).

**Aluminium Foil** — Aluminium foil intensifies power transmission from the cable to the flow pipe.

**Insulation (PEX foam)** — The insulation is made of PEX foam. The closed-cell structure of the insulation prevents water absorption and provides good insulation. The foamed plastic density is 30kg/m³ (1.87lb/ft³) and thermal conductivity is 0.038W/m·K (0.22 BTU ft/h/ft²/°F).

**PE Casing** — The PE casings are made of corrugated high-density polyethylene (HDPE). Corrugation makes the casing stiff, but flexible.

Ecoflex Potable plus pipe comes in a maximum 100m- (328 ft.) coil completely ready for installation. The unique features of the self-regulating heating cable allows installers to cut Ecoflex Potable plus pipe at the required length, without compromising quality. The flow pipe size is 1¼”. The maximum pressure for the PEX-a pipe is 10 bar (145 psi). Connect the flow pipe using commonly used water pipe connectors. We recommend using the ProPEX® fittings connection system for fast and reliable installations and long-term peace of mind.

<table>
<thead>
<tr>
<th>Flow Pipe Size</th>
<th>Casing External Diameter</th>
<th>Insulation Thickness</th>
<th>Weight</th>
<th>Bending Radius</th>
<th>Max. Coil Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1¼”</td>
<td>140mm (5.5”)</td>
<td>39mm (1.54”)</td>
<td>0.435kg/mm (0.96 lbs.)</td>
<td>406mm (16”)</td>
<td>100m (328 ft.)</td>
</tr>
</tbody>
</table>

Table 1-1: Uponor Ecoflex Potable plus - Technical Pipe Specifications
Cable
The self-regulating heating cable (FSLe .. CF) is designed specifically to prevent pipes from freezing. The heating part of the self-regulating heating cable is a conductive polymer extruded between two copper wires (hot and neutral). In cold parts of the cable, a large current travels from one wire to another, creating heat in the core material. In the warmer parts of the cable, the resistance of the material increases, the current slows down and the output is reduced. The heat production of the cable remains balanced and the heating capacity is regulated according to ambient conditions separately in each part of the pipe (see Table 1-4). In low temperatures, the Ecoflex Potable plus pipe provides adequate power to prevent freezing. As the temperature increases, the power is reduced. The self-regulating nature of the Ecoflex Potable plus means it is safe to use (e.g., won’t overheat; no short circuit).

**FSLe .. CF:** Fluoropolymer outer jacket over tinned copper braid provides protection where corrosive chemical solutions or vapors may be present.

<table>
<thead>
<tr>
<th>Type Ref</th>
<th>Nominal Dimensions (mm)</th>
<th>Weight</th>
<th>Min. Bending Radius</th>
<th>Gland Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSLe .. CF</td>
<td>10.5 x 5.9 (4.1 x .23&quot;)</td>
<td>9.9kg (22 lbs.)</td>
<td>35mm (1.4&quot;)</td>
<td>m20</td>
</tr>
</tbody>
</table>

Table 1-2: Weight and Dimensions

<table>
<thead>
<tr>
<th>Cat Ref</th>
<th>Start-up Temperature</th>
<th>230V 6A</th>
<th>10A</th>
<th>16A</th>
<th>20A</th>
</tr>
</thead>
<tbody>
<tr>
<td>23FSLe</td>
<td>5°C (41°F)</td>
<td>46 (50)</td>
<td>76 (250)</td>
<td>124 (407)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>0°C (32°F)</td>
<td>42 (138)</td>
<td>70 (230)</td>
<td>114 (374)</td>
<td>124 (407)</td>
</tr>
<tr>
<td></td>
<td>-20°C (-4°F)</td>
<td>34 (112)</td>
<td>56 (184)</td>
<td>88 (289)</td>
<td>110 (361)</td>
</tr>
<tr>
<td></td>
<td>-40°C (-40°F)</td>
<td>28 (92)</td>
<td>46 (151)</td>
<td>72 (236)</td>
<td>90 (295)</td>
</tr>
</tbody>
</table>

Table 1-3: Maximum Length m (ft.) vs. Circuit Breaker Size

Table 1-4: Thermal Ratings
Nominal output at 115V or 230V when FSLe is installed on insulated metal pipes.
## Section 2

### Planning

#### Determining Thermal Loss

Table 2-1 shows the Ecoflex Potable plus pipe element thermal losses in different outdoor temperatures, with an assumed pipe temperature of 2°C (35°F).

When thermal loss is less than 23W/m (7w/ft.), the cable output is enough to keep the element from freezing (see Table 2-1).

#### Electrical Planning

The self-regulating cable used in Uponor Ecoflex Potable plus is approved by CSA. Installer must install and protect Ecoflex Potable plus Pipe according to CSA regulations.

Due to the structure of parallel connections, the self-regulating heating cable also functions as a possible feed cable for branches. Therefore, the pipe network can consist of several branches.

**Note:** The total length of the pipe network supplied from one point must not exceed the longest permitted installation length for the heating cable. The longest permitted installation length is outlined in Table 1-4 on page 2.

It is often best to group various short pipes into one circuit. Each circuit must have its own shielding.

![Figure 2-1: Supply Cable Lengths](image)

### Table 2-1: Ambient Temperature and Heat Demand

<table>
<thead>
<tr>
<th>Ambient Temperature</th>
<th>1 1/4&quot; Pipe o.d./5.5&quot; Jacket o.d.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1°C</td>
<td>1 W/m</td>
</tr>
<tr>
<td>-2</td>
<td>1</td>
</tr>
<tr>
<td>-3</td>
<td>1</td>
</tr>
<tr>
<td>-4</td>
<td>1</td>
</tr>
<tr>
<td>-5</td>
<td>1</td>
</tr>
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<tr>
<td>-49</td>
<td>10</td>
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<tr>
<td>-50</td>
<td>10</td>
</tr>
</tbody>
</table>

**Note:** L1 + L2 + L3 < Longest permitted length (see Table 1-4)
Circuit Length
The lengths of the pipes are summed up with 0.5 meters (2 ft.) added for connection and termination. Add 1.5m (5 ft.) per branch. Also reserve enough cable to wrap around additional sources of thermal loss (valves, feed-throughs, etc.).

Protection
The total length of the heating cable determines the number and size of safety devices and the number of independent pipe circuits.

If the power supply cannot be organized from two directions, install a direct burial supply cable in the trench for the second supply point from different fuse boxes.

Ecoflex Potable plus Connection Parts
The Heat Trace Accessory Kit contains:
- One Strip-free Power Termination Kit End Seal
- One Strip-free Power Termination Kit
- 2 End Caps (EPDM rubber) with O-ring (EPDM) and stainless steel pipe clamps
- Detailed installation instructions

Kit contains detailed installation instructions for the plumber and electrician. Read the instructions carefully prior to the installation. The kit does not contain fittings for the flow pipe.

Equipment Used for Installing the Safety Devices
- Plug fuse 10A, 16A or 20A slow
- Line protection switches (automatic), G or K curve
- Ground fault interrupter

A final circuit leading to the heating cable must be protected with a ground fault interrupter with a release current of 30mA.

Sizing the Supply Cable
Supply cables connected to the Ecoflex Potable Plus pipe elements must be determined, taking into account general regulations, the sizing of the safety devices and possible voltage drops. The selection and installation of the cable size and structure must be carried out according to regulations as with all other electrical equipment. Select the cable size according to the rated value of the safety device.

Power Consumption
Depending on the surrounding temperature, the Heat Trace cable will consume a greater or lesser amount of electrical power. If the cable is buried in the ground, you can possibly reduce power consumption by installing a timer. The lower the ambient temperature, the shorter intervals on the timer. The timer is not supplied by Uponor.
Section 3
Installation

1. Install Ecoflex Potable plus pipe underground, and cover at least 10 to 30 cm (4 to 12”) with soil.

Note: If warranted, install Ecoflex Potable plus pipe directly on ground surface or on the snow. Ecoflex Potable plus pipe can withstand constant freezing temperatures.

2. When installing Ecoflex Potable Plus above ground, ensure adequate mechanical protection is in place.

3. Protect the pipe from direct contact with sharp stones and tree stumps. If vehicles travel over Ecoflex Potable plus Pipe, adequately protect it using a casing pipe that can withstand such occurrences.

4. Ecoflex Potable plus pipe can also be installed as an overhead line. Support with adequate holders (e.g., mounting rail clamp) according to the manufacturer’s instructions. Take into account the thermal expansion of the flow pipe according to the prevailing installation conditions, for example \( \Delta t = 10 ^\circ C, l = 100 m \Rightarrow \Delta l = 18 cm \) (\( \Delta t = 18 ^\circ F, l = 328 ft \Rightarrow \Delta l = 6 ^\circ \)).

5. When feeding the pipe through structures, protect Ecoflex Potable plus pipe, (e.g., a plastic casing pipe sealed into the structure).

6. When joining flow pipe, reserve approximately 0.5 meters (2 ft.) of free heating cable at the end of each pipe for connections.

7. In locations with extra thermal loss (flanges, valves, etc.), wrap some heating cables around the part in question to compensate for the larger thermal loss (cables may intersect).

Note: The installation and assembly of Ecoflex Potable plus pipe is not recommended in temperatures below \(-15 ^\circ C \) \((-5 ^\circ F)\). Before installing in cold conditions, preheat the coil. For example, you could preheat the coil by first storing it in a room-temperature environment.

Caution: Install with care as a pipe placed against the ground can easily freeze.

8. Fill the pressure pipe with water before turning on power to prevent damage to the flow pipe.

9. If assembling the pipe in extremely cold temperatures, first defrost and bend on a larger coil. When the pipe warms to room temperature, wrap on a smaller coil.

10. Unwind the coil by first cutting the binders inside the coil.

11. Tie the inner end of the pipe to the terrain and unwind the coil by rolling it. The plastic wrapper prevents the reel from unwinding uncontrollably.

12. When storing the reel in conditions where the open end of the heating cable is susceptible to moisture, protect the end of the cable.

Heating Cable
The heating cable of the Ecoflex Potable plus non-freeze water pipe is self-regulating and cannot overheat. When there is no risk of freezing, switch off the power supply to the heating cable.

If the pipeline is used infrequently, use the cable to defrost a frozen pipeline.

Note: The heating cable does not require regular maintenance and must be switched off and protected from mechanical damage during any repairs to the pipeline. After repairs, measure the insulation resistance and record it on the technical drawing (see page 6).
General Electrical Installation Instructions

Installation
Comply with general safety regulations during installation. Only a qualified electrician should connect the heating cable. Take care to avoid damaging the heating cable during installation.

Connections
Note: Other than the heating cable, no other power consumption is permitted on the final circuit which is protected with a ground fault interrupter. It must be possible to separate the heating cable installation from the network either with a common or circuit-specific switch that can also connect to the control circuit. The switch must include position indicator markings and a label explaining the installation (e.g., non-freeze water pipe).

1. The network connection is provided through the control unit. Do not use the protective ground metal cord on the heating cable as a neutral conductor. Always equip the supply cable with a separate shielded wire in the neutral conductor.

2. Measure the insulation resistance of the heating cable before covering and commissioning the pipes. The measurement is conducted using direct-current voltage 500 VAC - 2.5 kV D/C. The insulation resistance should be $R > 20 \text{ M}\Omega$. Make the connection so the insulation resistance of the heating cable can be easily measured later in an accessible location.

3. Use approved termination kits for the extension, tee branching and connection of the heating cable to the supply cable. The cables can touch in the joints because the self-regulating heating cable cannot overheat.

Important: In temperatures below 0°C (32°F), the resistance of the cable is very small. When switching the cable on in low temperatures, the protection (fuse) may switch off. Alter the protection temporarily in order to increase the cable temperature and resistance and to keep the cable switched on.

Technical Drawings
The technical drawings are used to reference the location of the cable for future use, replacement or additions. The drawings should be kept at the installation and must include:

- Type of heating cable
- Number of heating cables
- Placement of heating cables
- Maximum permissible operating temperature for the cable

Technical Drawings
The technical drawings are used to reference the location of the cable for future use, replacement or additions. The drawings should be kept at the installation and must include:

- Type of heating cable
- Number of heating cables
- Placement of heating cables
- Maximum permissible operating temperature for the cable
End Cap Mounting Instructions

Required Tools
- Saw for cutting the tube (if required)
- Sharp knife
- Screwdriver to tighten the clamp on the End Cap
- Snipe nose pliers
- Crimping tool
- Nipper pliers

Bring Heat Trace Cable Out of End Cap
1. Cut the output for the flow pipe on the End Cap (1¼”). Cut the cable output.

2. Peel off the casing pipe and remove the insulation, taking into account the length of the End Cap. Reserve 0.5 meters (2 ft.) of cable for the electrician. Cut the flow pipe at the required length. Do not damage the cable or the flow pipe. Clean thoroughly, including the casing pipe.

3. Carry out the termination of the heating cable using the supplies in the installation kit.
4. Place the seal in the second groove of the pipe.

5. Ensure the seal is pressed into the grooves.

6. Apply lubricant on the inside of the End Cap (lubricant is not sold by Uponor).

7. Pull the End Cap on top of the pipe element and pull the cable through. Place the clamp on the End Cap seal and tighten.

Note: If installing the product into an insulation kit, do not use the clamps.

Note: Allow 13mm (0.5”) spacing between Ecoflex Potable plus pipe and all combustible surfaces.
Terminating Inside End Cap

Heat Trace Accessory Kit Contents

- One Strip-free Power Termination Kit End Seal
- One Strip-free Power Termination Kit
- Tee Insulation Kit
- Detailed installation instructions

Required Tools

- Saw for cutting the pipe (if required)
- Sharp knife
- Snipe nose pliers
- Hammer
- Screwdriver

1. Peel off the casing pipe and remove the insulation, taking into account the size of the branch tee. Only peel off what is absolutely required in order to connect the flow pipe. Reserve approximately 0.5 meters (2 ft.) of cable for the electrician. Cut the flow pipe at the required length.

   **Important:** Do not damage the cable or the flow pipe. Cut the flow pipes so the total length of uninsulated pipe ends and fasteners is as small as possible. Thoroughly clean the pipe ends of all debris (including the casing pipe).

   **Note:** Save at least 0.5 m (2 ft.) for the electrician.

2. Cut the output for the flow pipe on the end cap (1¼”). Cut the cable output.

3. Peel off the casing pipe and remove the insulation, taking into account the length of the End Cap. Cut the flow pipe at the required length. Do not damage the cable or the flow pipe. Clean thoroughly including the casing pipe.

4. Place the seal in the second groove.

5. Ensure the seal is pressed into the grooves securely.

6. Apply lubricant on the inside of the End Cap (lubricant is not sold by Uponor).

7. Place the clamp on the seal on the End Cap and tighten.

   **Note:** If installing the product into an insulation kit, do not use the clamps.
8. The End Caps are installed in place before joining the flow pipes. Be careful not to damage the heating cable. Use the insulation that was peeled off as an additional insulation for the joint.

Installing a Branch Tee

1. Join the pipes with pipe fittings (not included in the kit).

2. Pressure test the connections (i.e., the system).

3. Terminate the ends of the heating cables with the installation kit equipment (End Seal), and wrap the heating cables on the branch with heat-proof tape. Bring the cable out of the end cap (see page 7).

4. Apply sealant compound in the bottom of the T-insulation shell.

5. Place the pipes in the T-insulation shell.

6. Apply sealant compound as shown in the following illustration.

7. Place top part of T-insulation shell in place.

8. Tighten all bolts and screws, and hammer in all rivets.
Strip-free Power Installation

Note: Before performing this installation, consider that the enclosure and terminal block are manufactured from plastic materials and are at risk of breaking down in aggressive soil.

This can be solved by making the termination inside an insulation kit, under the end cap or above ground in a non-aggressive environment.

1. Sequentially push the clamping nut, cable stopper and the red seal onto the one end of cable. Ensure the cable end is cut straight. Leave the seal 120mm (4.7”) from the cut end.

2. Remove 80mm (3.2”) of outer jacket from the cut end, and push the braiding wires back. To secure the ground connection, wrap aluminum tape around braiding wires in order to make it a minimum 6.5mm (0.25”) long. Position the red seal 90mm (3.5”) from the end of the cable.

3. Insert the stripped cable into the strip-free terminal. Note: Observe the cable passing into the jaws of the cutting blades in the Figure 3b. The braid wires should be in close contact with the metallic ground frame at the point of entry into the Strip-free connector.

The following illustration provides an example of how straight and deep the cable should insert into the terminal block.

When inserting the cable, ensure the terminal set remains in the enclosure.

4. Fasten the seal and clamping nut onto the strip-free connector (hold the cable in place prior to fastening the screws).

Ensure the far side terminal blade doesn’t touch the near side bus wire.

5. Tighten the terminal screws until the cutting blades touch the wires with a minimum torque of 2.5Nm (1.84 lb f-ft).

6. Check for convection by verifying a circuit is present with conventional multimeter. Once a circuit is verified, close the lid and tighten all the screws to securely waterproof.

For Power Terminations

1. Slide gland and seal over cable, strip back 80mm (3.2”) of jacket and push into strip-free unit.

2. Complete electrical connection by securing terminals with screws as shown in Figure 8.

Warning: Select a power cable suitable for temperatures in which the equipment is used.
**Strip-free End Seal Installation**

*Note:* Before performing this installation, consider that the enclosure and terminal block are manufactured from plastic materials and are at risk of breaking down in aggressive soil.

This can be solved by making the termination inside an insulation kit, under the end cap or above ground in a non-aggressive environment.

1. Remove the outer jacket 20mm (0.79") from the end.
2. Trim the braiding wires.
3. Cut one of the bus wires back in order to maintain a minimum 5mm (0.20") clearance distance between the bus wires.
4. Push the heat cable into the kit and ensure the cable contacts the inner wall.