The background of the entire page is a photograph of an industrial facility. It features several tall, cylindrical chimneys with alternating red and white horizontal stripes. A complex network of white metal scaffolding and walkways surrounds the chimneys. In the foreground, there are several large, dark green evergreen trees. Two red cranes are visible, one on the left and one on the right, positioned near the base of the chimneys. The sky is a pale, overcast grey.

**GUIDE TO THE INSTALLATION  
AND MAINTENENCE  
OF MINERAL INSULATED  
HEATING CABLE**

### III. TEST OF THE HEATING PACKED WIRES

a) At the exit of the factory

- Insulation at 20° C. Under 500V DC :> 10<sup>3</sup> Mega Ohm
- Immersion: 6 hours after insulation measurement
- Ohmic resistance: +/- 10% of the theoretic one
- Dielectric:
  - . Diam. Element ≥ 3.00 mm: 1200 V/1'
  - . Diam. Element < 3.00 mm: 1000 V/1'

Dimensional features:

Tolerances on the lengths:

- Circuits inferior to 5 m: +/- 8% with min. limit of +/- 100 mm
- Circuits superior to 5 m and inferior to 50 m: +/- 5%
- Circuits superior to 50 m: +/- 3%

Tolerances on diametres: +/- 0,05 mm

b) On the place of installation

- Insulation at 20° C under 500 V DC: > 10 Mega Ohm
- Ohmic resistance: +/- 10% of the theoretic one

Dielectric

- . Element of diam. ≥ 3.0 mm: 1000 V/1'
- . Element of diam. < 3 mm: 800 V/1'

The test is not carried out at  $2U + 1000$  V, as the heating wires are not wires for energy conveying, for those this standard is foreseen.

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## V. CONTROLS BEFORE CIRCUIT ASSEMBLING

- Visual control of the good shape of the sheathes of the heating wires, of the cool wires and of all terminations and junctions.
- Control of the insulating resistance (it must be superior to  $10^3$  Mega Ohm under 500V DC at 20° C).
- Probable control of the Ohmic resistance.
- Be sure that the feeding tension is in compliance with the one foreseen during the project phase.

## VI. CIRCUIT SET-UP AND INSTALLATION

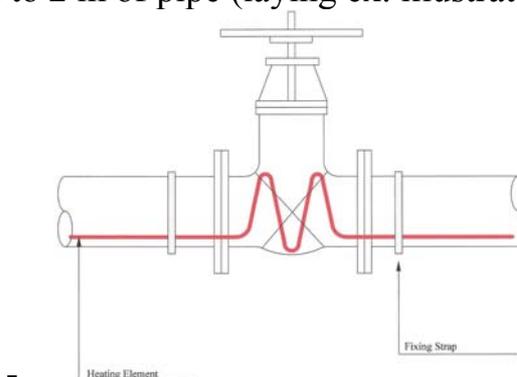
- Temperature limit during the element laying: - 30°C
- Refer to the installation or isometric plans of the surfaces to be heated
- Control the state of the surface to be heated (be sure that no dressing-off, corrosion point and welding peaks are available). Foresee a protection for sharp edges.

### 1. Marking of piping

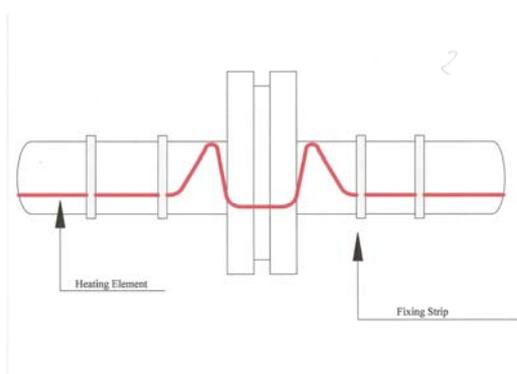
#### a) Valves, supports and flanges

With the exception of specific cases (valves that require a great heating power, for those a separate element will be installed) the following parameters are generally to be considered:

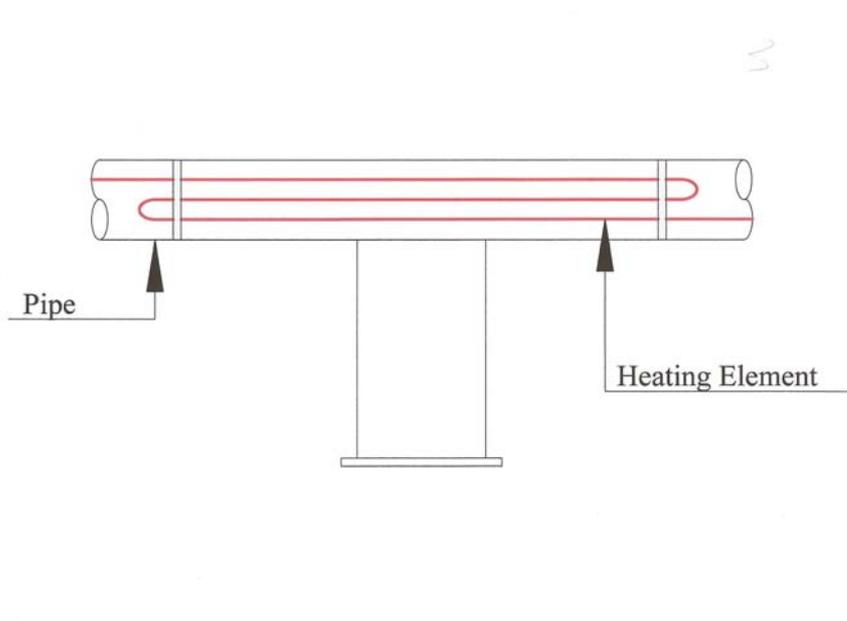
- a valve is equivalent to 2 m of pipe (laying ex. illustrated in drawing Nr. 1)



- on a flange, the heating wire must make at least a pipe circle on one end and on the other end of the flange itself, by checking that the wires never come close (laying ex. illustrated in drawing Nr. 2)



- a pipe support is equivalent to 0.50 m of piping (laying ex. illustrated in drawing Nr. 3)

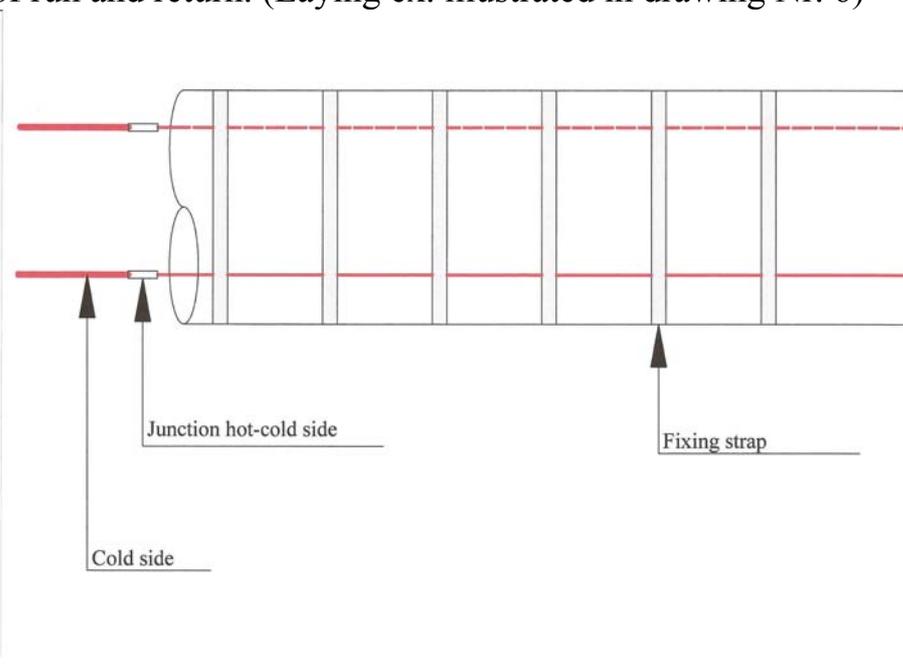


### b) Pipe

- For safety reason, we suggest to feed the heating circuit just by one side.

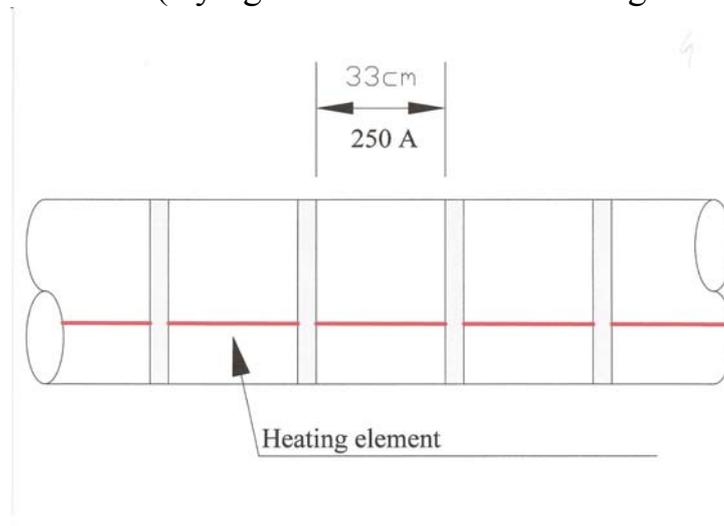
#### 1. Elements fed separately:

- The element is positioned rectilinear respect the pipe by effecting one or more sections of run and return. (Laying ex. illustrated in drawing Nr. 6)



The pipe fixing is made by means of stainless steel straps of about 10 mm width and with a thickness from 0.7 to 0.9 mm.

Warning: the strap edges must not have any dressing-off. The strap closure must not be excessive and must allow the heating wire expansion – distance between two fixing: about 250 – 300 mm (laying ex. illustrated in drawing Nr. 4)

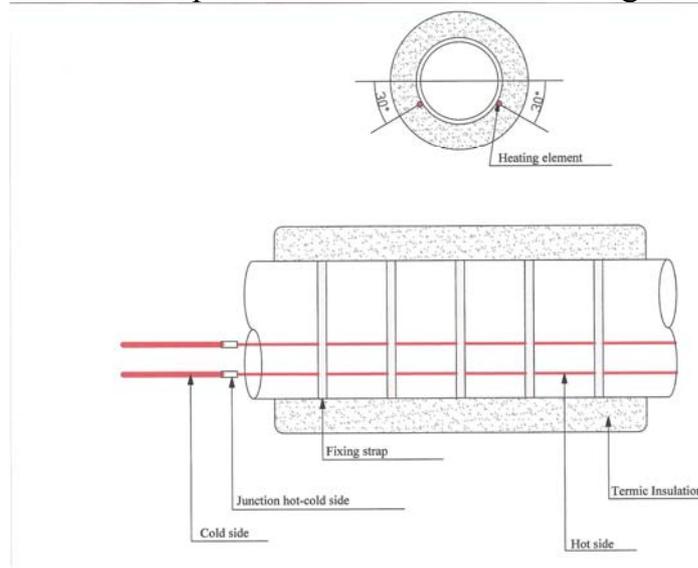


- The heating circuit can have a spiral laying with pitch determined during the project phase.  
In any case, you must pay attention that the curvature radius is NEVER inferior to 6 time the diameter of the heating wire.

## 2. Elements fed by three-phase tensions and star (Y) coupling:

This solution eases the installation of the pipe elements for the following reasons:

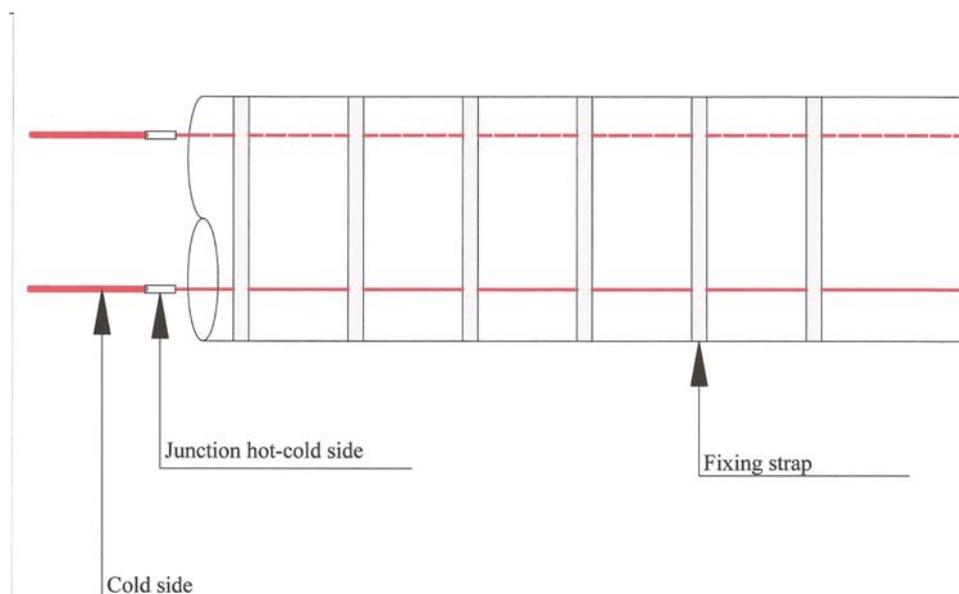
- A better distribution of heat on the pipe (min. 3 wires long the pipe on 3 generators in the inferior part of the wire – see drawing N. 5)



- This solution allows the marking of long pipes without intermediate feedings.
- It allows foreseeing the installation of a reserve element.  
In case of fault of one of the three elements, you can use this reserve element.
- The element fixing is equal to the above described ones for the elements with separately feeding.
- The star (Y) closure of the three heating wires is made at an end of the pipe by means of a connection box suitably chosen.

### 3. General notes

- In case of pipe curving, whatever is the chosen installation, you must consider a certain over-length of the wires to compensate the effects of the elbow expansion.
- We suggest to foresee a thermostat for each feeding point. The bulb of this thermostat is fixed at the pipe by means of 2 identical straps used for the element fixing. The bulb will be placed at the same distance between 2 loops of the element.
- The junctions warm wire/cold wire will be fixed at the pipe by means of identical straps used for the fixing of the heating wire. (See drawing Nr. 6).



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## **2. Marking on tanks, non (spherical) basins and hoppers**

### First solution

Supply of the elements equipped with cool exits realized at the factory (without shape)

It is installer's duty to supply the supports and the put in shape of the elements on these supports.

- Assembling of these elements on the wall to be heated:

This assembling can be made by use of straps with cut fins with 30/50 mm pitch and of stainless steel straps with 30 mm width and thickness of 0.8 mm for binding the heating wire.

The assembling of these bands will be made by means of hooping or welding points on the wall to be heated.

We foresee a band for each end of the area to be heated, moreover one band for each 0.5 mt. of height.

The installation of the elements must be carried out with run and return on the height of the basin to be marked. The pitch between any run and turn will be defined during the planning phase. (In any case the curving radius must be superior to 6 times the wire diameter).

- Closure of the elements on the wall to be heated:

a) This closure can be made by means of a small stainless steel strap of 10 mm width and a thickness from about 0.7 to 0.9 with rings, by using a suitable device.

The distance between every straps varies from 250 and to 350 mm.

## **3. Marking on tanks with spherical walls:**

The elements can be prepared at the factory, but the put in shape must be carried out on the place of installation.

The fixing of the heating units can be made as follows:

### First solution

By means of small staples welded on the walls to be heated; if this is possible, we suggest to foresee 3 or 4 small staples for every meter of heating wire.

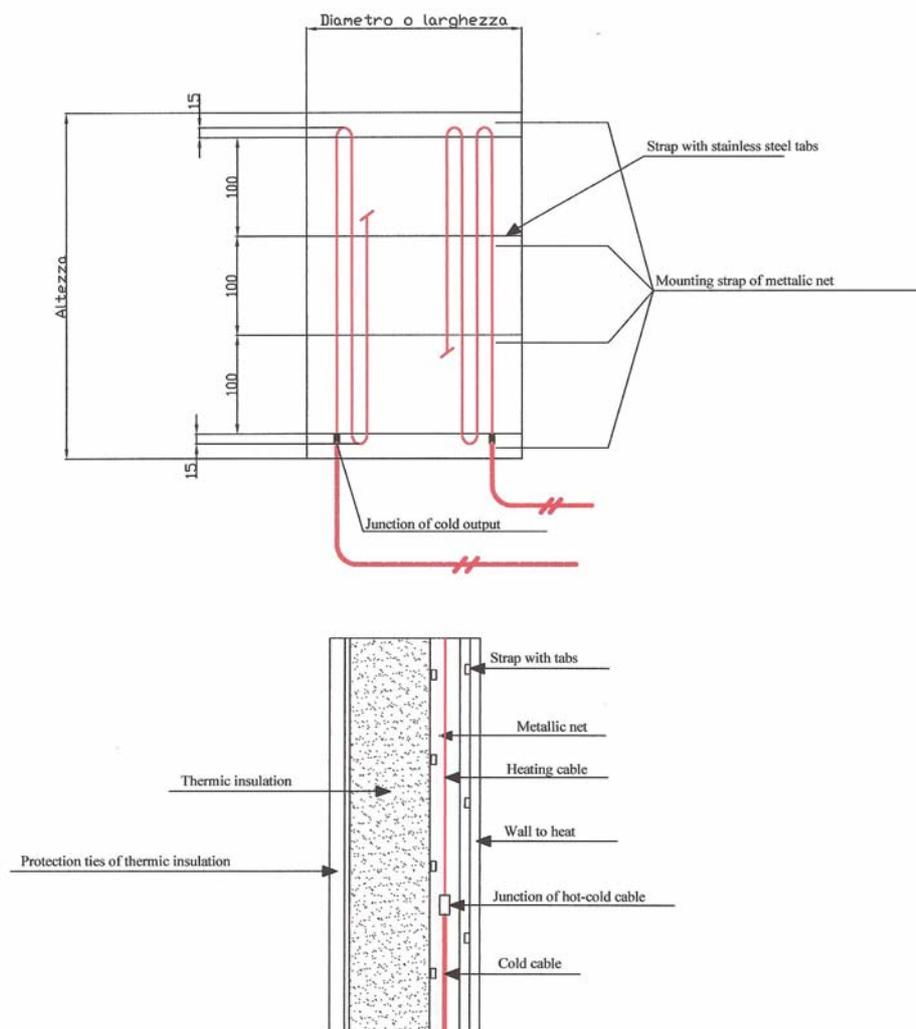
## Second solution

Fixing of a metal wire with medium mesh on the wall to be heated.

After fixing the metal wire, install the elements by means of copper or stainless steel wire (foresee 4 or 5 fixing for every meter of wire). The shaping will be carried out according to the project (curving radius of at least 5 diameters of wire).

In both suggested solutions, a metal wire as protection of the elements must be foreseen, which protects the heating parts against the penetration of these in the thermal insulation.

(See drawing Nr. 11, for the installation principle)



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#### **4. Control of the elements before the installation and of the thermal insulation:**

- a. Check the electric continuity of each element.
- b. Check the insulation of each element.
- c. Check that the wire in no place comes in touch with the other, the min. distance between two sections of heating wire must be of about 10/15 mm.
- d. Check that the min. curving radius is equal to 6 times the diameter of the wire, and that this value is respected.

#### **5. Installation of the thermal insulation**

- a. Be sure that the thermal insulation does not completely surround the heating wire.
- b. Pay attention do not damage the installed wire during the installation phase for the assembling of the protective sheets of the thermal insulation.
- c. After the installation of the thermal insulation, please proceed to check a) and b) of the previous paragraph.

#### **6. General precautions before use**

- a. Check that the section and type of the feeding wire are in compliance with the marking requirements and with the installed power.
- b. Check that each circuit is equipped with the foreseen electric protective systems (intensity and insulation).
- c. Check that the electric plant is realized in compliance with the ruling standards and the particular specifications foreseen by the installation country.

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## VII. POSSIBLE FAILURES AND REPAIRS

### **1. Insulation defect**

Find the defect: in order to do this, connect a megaohmmeter and slightly heat one after the other the ends of the extremities; if the needle swings, disassemble the affected termination and install it again according to our procedure Nr. 1 “Preparation of a termination on the site”.

If the terminations are not affected, check the junctions one after the other after the thermal insulation removal, by following the same procedure used for the terminations.

In case of bad functioning of a junction, disassemble and assemble again by following the procedure “preparation of a junction”; in case of junctions originally “TIG welded”, please contact us before any reparation.

### **2. Continuity defect**

Completely cut one after the other the cool exits and check the continuity after each cut.

The cool exits can be re-used after the damage reparation, by means of a junction or/and a termination.

If the defect does not involve the cool parts, try to find it by means of visual detection of the critical installation points (valves, supports, flanges, curvatures). If the damage does not either involve this area, please contact us.

If you detect that the damage involves the warm part, a connecting junction can be prepared following the procedure “junction preparation”, by limiting the use of the elements at a temperature inferior to 350° C. Over this temperature and for circuits in execution Ex made and certificated by Cableries de Lens, please contact us.