

CORROSION PROTECTION AND WATERPROOFING OF PIPELINES

HEAT-SHRINKABLE COATINGS





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# RUSSIAN ENERGY RESOURCES





- **More proven natural gas reserves than any other country**
- **Among top ten in proven oil reserves**
- **The largest exporter of natural gas**
- **Second largest oil exporter**
- **Third largest energy consumer**

## ABOUT THE COMPANY

TIAL is a developer and manufacturer of heat-shrinkable coatings for corrosion protection and waterproofing of steel and pre-insulated pipes and pipe components. The enterprise based in Russia started its activities in 2001. Since then TIAL operations have led to the leading position in the domestic market of heat-shrinkable materials and to impressive track record of export sales.

TIAL primary manufacturing facility is located 30 km southwest of Moscow. The city is a major junction of Eurasian commercial transport routes. Position of manufacturing premises near Moscow enables the company to highly optimize its logistic schemes. It is the ideal location for commodity flows when raw materials are supplied from Europe and finished products are delivered to Eurasia and Middle East.

The factory initially is removed from the city itself to minimize production costs.

TIAL secondary facility is located in Aqtobe, Republic of Kazakhstan.

TIAL products are specifically designed to be used in construction and repairing of oil, gas, water and heat transmission systems.

TIAL manufacture relies on the latest achievements in polymer industry and irradiation cross-linking. Advanced equipment together with multilevel product quality control provide extremely long lifetime of products.

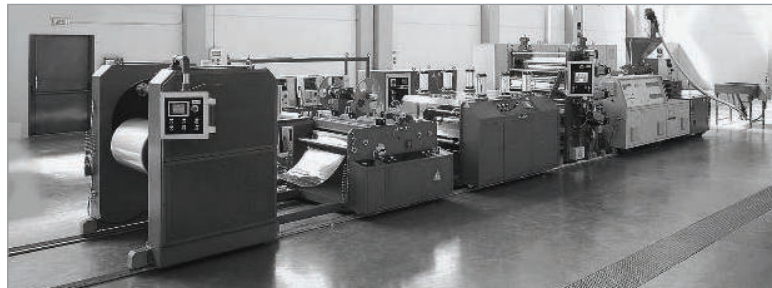
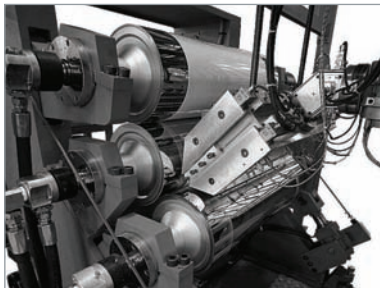
## TIAL STRUCTURE

**Name of TIAL manufacturer in Russia: IFC Techprocomplex LLC**

**Name of TIAL manufacturer in Kazakhstan: TIAL Production Central Asia LLP**

**Name of TIAL official domestic sales structure in Russia: Trading Company TIM LLC**

Name of TIAL official export sales structure in Russia: Anticor Technologies LLC



## PRODUCTION OUTPUT

Maximum productivity of Moscow based plant is 300 MT per month. Hence annual quantities are enough to cover field joints of:



56" pipeline with 7500 km length  
(680 000 field joints)



12" pipeline with length equal to the  
Earth equator  
(3 600 000 field joints)



2" pipeline with length exceeding  
the Earth circumference by 4,7 times  
(16 400 000 field joints)

## QMS, HSE, TRAINING AND CERTIFYING OF APPLICATION CREW

### QMS

TIAL Quality Management System has been certified to meet DIN EN ISO 9001:2008 standard by Bureau Veritas, a world leading QMS registrar accredited by UKAS. Integrated quality management system ensures high performance to meet the planned objectives in most efficient and cost effective manner.

TIAL QMS provides comprehensive evidence to all partners that the operations are conducted to documented procedures subject to continuous improvement in a specific controlled manner. Successfully managed company has a positive effect on employee motivation and boosts TIAL image.



The standards are applied at every stage of TIAL activities starting from the choice of our suppliers to post-sale support during pipeline construction.

Both manufacturing process at all stages of the producer IFC Techprocomplex LLC and also commercial activities of official sales structures have been certified.



### HSE

TIAL considers health, safety and environmental problems of top priority. Existing TIAL manufacturing facilities allow to cause no impact of production operations on the environment. TIAL constantly seeks to completely eliminate any incidents and unsafe operations from its activities. The company manages all products and processes in a manner that preserves a stable environment, keeps workplaces safe and ensures that TIAL employees and customers are healthy and secure.



### TRAINING AND CERTIFYING OF APPLICATION CREW

In addition to production and delivery of products TIAL provides training of insulation workers on site. TIAL field service engineers conduct comprehensive training of your application technicians on how to install TIAL products most effectively. Upon successful completion of the training the client's crew obtain special certificates which allow to install TIAL products.





## GLOBAL TRENDS

Today pipeline construction increasingly demands pipeline factory coatings based on various materials, such as polyethylene, polypropylene, epoxy resins and polyurethane. However, regardless of mill coating type, protection of weld joints remains a critical issue since this protection has to be at least as good as factory pipeline coating.

TIAL experts have developed a wide range of TIAL heat-shrinkable coatings for overall protection of pipelines. The range of our products allows you to choose the right material for any mill coating type and meet any specified objectives.

The key criteria used in TIAL production include reaching maximum compatibility with main pipeline coating and meeting high requirements to avoid chemical corrosion, cathodic disbondment and negative influences of impact and shear forces and UV irradiation.

By using TIAL materials you will obtain maximum protection and guaranteed high quality coating for various applications in different climatic zones.

**Regardless of mill coating type, protection of weld joints remains a critical issue since this protection has to be at least as good as factory pipeline coating.**





## DESIGN OF TIAL MATERIALS

TIAL heat-shrinkable coatings are two-layer structures consisting of preliminarily irradiation treated polyolefin backing and a layer of hot-melt adhesive. This combination creates a two-layer coating for protected area.

If a three-layer corrosion protection coating is required the materials are applied jointly with TIAL two-component solvent free wet epoxy primer. The primer is applied directly onto the coated surface during application procedure and serves as an additional barrier to corrosion process.

### BACKING

Backing is produced from HDPE via extrusion process followed by specifically oriented stretching. This stretching procedure ensures required heat-shrinkable effect, i.e. enables the material to maintain initial dimensions when heated. The backing ensures high indentation resistance, impact strength, electrical resistance and low moisture absorption of the coating. To maintain special mechanical strength and ultraviolet radiation stability the backing is treated with irradiation cross-linking process.

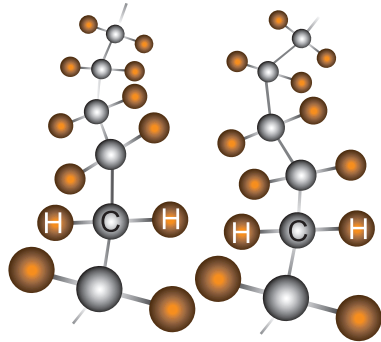
Polymer materials in general consist of randomly oriented long chain molecules. Intermolecular spacing and crystal lattice pattern play the predominant role, i.e. the less intermolecular spacing is and the stronger the crystal lattice is, the stronger is the polymer.

Of special importance in TIAL protection systems is the polyolefin backing which provides waterproofing and protects the adhesive layer from mechanical damage. The hot-melt adhesive is definitely as important as the backing. When heated during installation the adhesive melts and fills in all irregularities of insulated surface. This ensures excellent bond of backing with the pipe surface. The adhesive layer guarantees the required peel strength and high resistance to shear forces, while remaining elastic within range of temperatures from  $-60^{\circ}\text{C}$  up to  $+80^{\circ}\text{C}$ , thus compensating stresses caused by pipeline expansion and compression because of change of temperatures during operation.

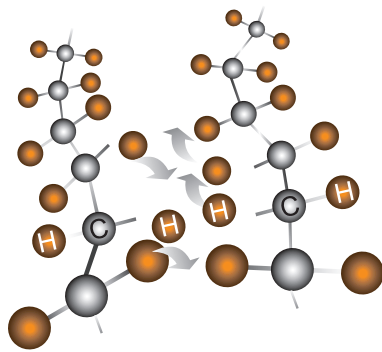
Heating of these molecular structures to above  $120^{\circ}\text{C}$  destroys the crystal lattice, which results in the molecules moving freely relative to one another without any mutual bonding. This causes buckling and unpredictable shaping of the polymer. Irradiation cross-linking process serves to modify properties of polymer materials. When treated with accelerated particles delivered by irradiation, polymer molecules produce permanent transverse cross-links, i.e. become cross-linked.

This treatment results in the so-called 'elastic shape memory' - effect of the materials that 'remember' their initial shape and 'recall' it after heat treatment. The 'memory' degree or the material shrinkage degree, can be adjusted during production process.

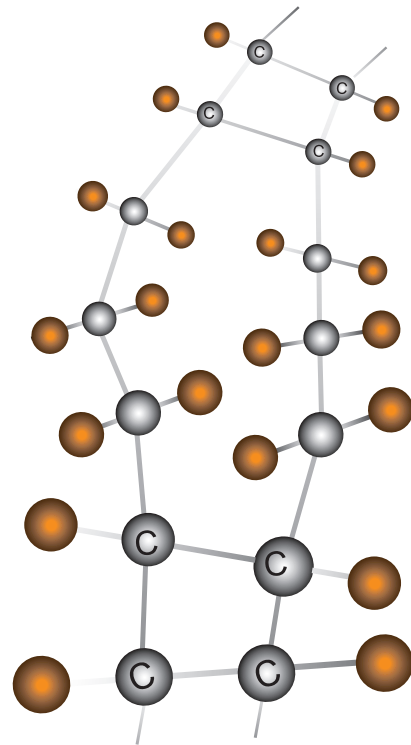
**The backing ensures high indentation resistance, impact strength, electrical resistance and low moisture absorption of the coating.**



Before irradiation cross-linking



Irradiation cross-linking process



After irradiation cross-linking

## ADHESIVE

During elaboration of adhesive layer TIAL focused on the maximum performance characteristics of pipeline factory polyethylene coating. Fundamental of them are peel strength, resistance to cathodic disbondment and shear forces. Another basic objective is the capability to use TIAL materials as three-layer systems with use of epoxy primer and two-layer systems without the primer.

This unique TIAL hot-melt adhesive possesses high properties at low preheat temperatures of the coated surface, which helps win time and preserve resources during installation.

When heated, the adhesive layer spreads over the surface and fills in the irregularities of field joint and mill coating microcracks. After cooling the adhesive provides with excellent adhesion over entire insulated surface - preliminarily cleaned steel surface and factory pipeline coating. Obtained values of cathodic disbondment resistance tests indicate that TIAL materials can be applied without epoxy primer thus saving your time and costs.

**TIAL focused on the maximum performance characteristics of pipeline factory polyethylene coating. Fundamental of them are peel strength, resistance to cathodic disbondment and shear forces.**



## DESIGN OF TIAL MATERIALS

### EPOXY PRIMER

If pipeline is designed with three-layer factory coating, a similar three-layer structure has to be provided for the joint area to be coated. This is achieved by using TIAL-P two component solvent free wet epoxy primer which is one of the most important components in three-layer protection systems.

The two-component primer forms the first insulation layer. It acts as an additional corrosion inhibitor, fills in microscopic defects of the surface and largely improves the material adhesion to the surface. Additionally if the epoxy primer is used, the cathodic disbondment resistance of TIAL coatings increases considerably.

Advanced 'wet primer' technology allows to preheat the pipe surface only once to the unusually low temperature with further primer application and non-stop installation of TIAL materials

without drying the primer to complete hardening. This is an important advantage which largely reduces coating installation time and considerably saves resources.

By using TIAL coatings with TIAL-P primer, you will maintain three-layer coating as easy as two-layer structure due to the self-sufficient primer sets and simplicity of primer application. One TIAL-P primer set includes containers of component A (resin) and component B (hardener) to be used for insulation of one field joint or a branch. Size of each A or B component depends on size of area to be coated (pipe diameter, pipe portion length etc.) and is calculated by our experts to suit your specific needs. You will never need to waste your time calculating mixing ratio of primer component or buying expensive pumps for extraction of components from bulk packages.

**If pipeline is designed with three-layer factory coating, a similar three-layer structure has to be provided for the joint area to be coated. This is achieved by using TIAL-P two component solvent free wet epoxy primer .**

## CERTIFICATION AND INDEPENDENT TESTING

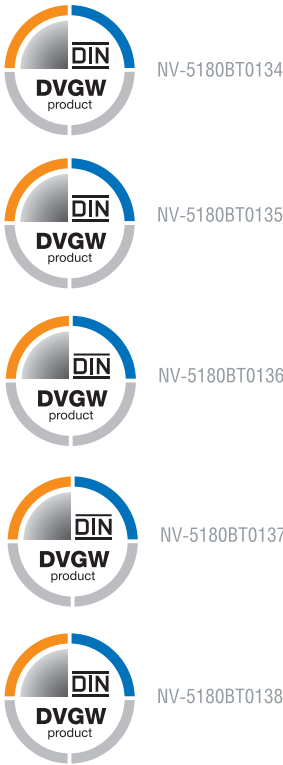
All major TIAL products are certified according to the latest version of DIN EN 12068 standard, class C UV.

EN 12068 is a European standard edited by CEN (European Committee for Standardization). Full name of the standard reads: 'External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection – tapes and shrinkable materials.'

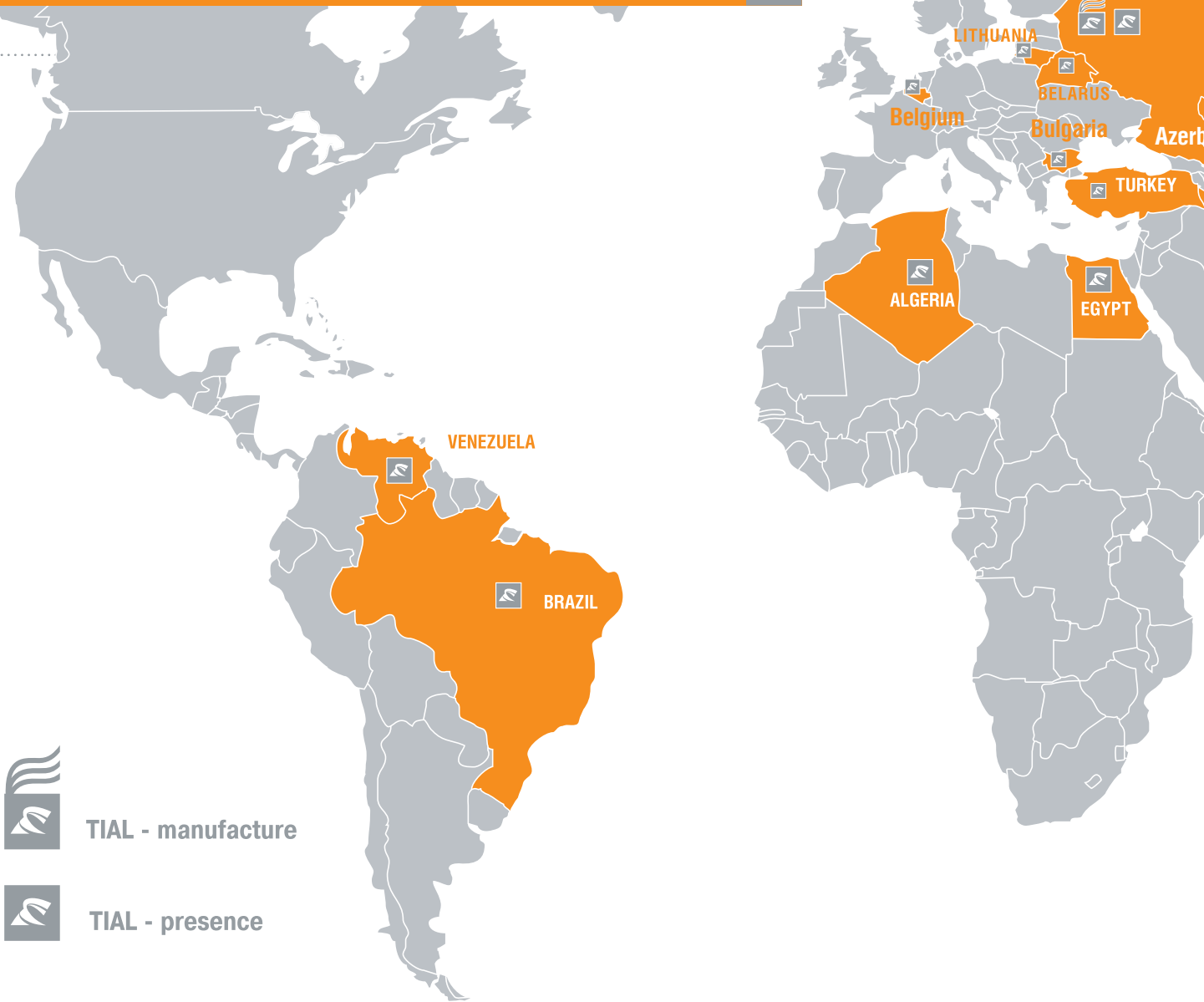
Type examination certificates according to DIN EN 12068 ensure the highest product quality according to international standards. Certification body is DVGW (Deutsche Vereinigung des Gas- und Wasserfaches e.V.), located in Bonn, Germany.

Additionally TIAL-M and TIAL-M80 wraparound sleeves have been tested according ASTM standards (American Society for Testing and Materials) and AFNOR standards (L'Association Francaise de Normalisation) in world famous independent laboratories BODYCOTE, Manchester, UK and GTI (Gas Technology Institute), Illinois, USA. The results obtained during testing are excellent.

TIAL is also proud to declare that after being deeply involved in technical contents of ASTM standard test methods relative to polymer coatings the company optionally has become an organizational member of ASTM.



## TIAL IN THE WORLD



Please, apply to TIAL headquarters directly to obtain contact information of an agent / distributor in your region.

List of TIAL major partners



First-rate transnational oil & gas companies apply TIAL heat-shrinkable coatings during strategic pipeline construction.



**FOR WHAT PURPOSE CAN YOU USE TIAL ?**

- Corrosion protection
- Corrosion protection in conjunction with cathodic protection
- Waterproofing

**IN WHAT FIELDS CAN YOU USE TIAL ?**

- Oil
- Gas
- Petrochemical products
- Water supply
- Heat supply

**ON WHAT KIND OF PIPES CAN YOU USE TIAL ?**

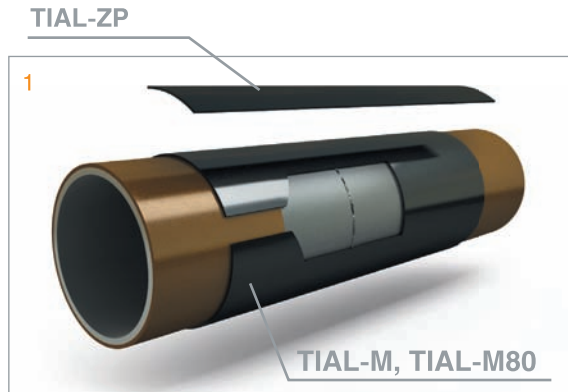
- Buried pipelines
- Exposed pipelines

**AT WHAT STAGE CAN YOU USE TIAL ?**

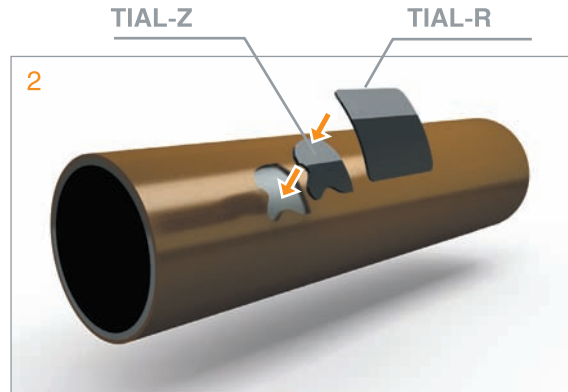
- Construction of new pipelines
- Repair of existing pipelines

## APPLICATION OF TIAL PRODUCTS

### CORROSION PROTECTION



TIAL-M and TIAL-M80 – heat-shrinkable wraparound sleeves for corrosion protection of field joints in conjunction with cathodic protection. Designed for pipelines with diameters ranging from 2 to 88 inches. Operation temperatures up to +60° C (for TIAL-M) and up to +80° C (for TIAL-M80).



TIAL-R and TIAL-Z – repair materials for restoration of damaged pipeline factory polyethylene coatings and PE sleeves. Operation temperatures up to +80° C.



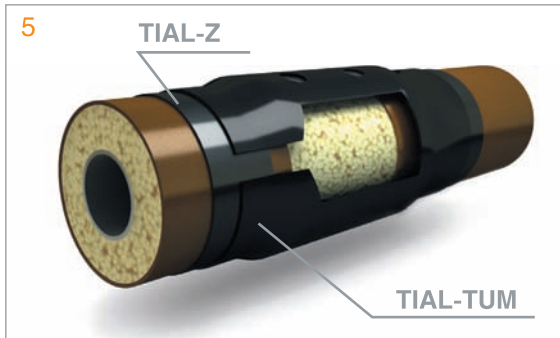
TIAL-L – heat-shrinkable tape for spiral coating of straight pipes, pipe bends, passages, T-joints and other pipeline fittings. Operation temperatures up to +60° C.



TIAL-P – two-component solvent free wet epoxy primer for protection of welded joints and straight pipes. To be used jointly with TIAL sleeves or TIAL tapes. Operation temperatures up to +80° C.

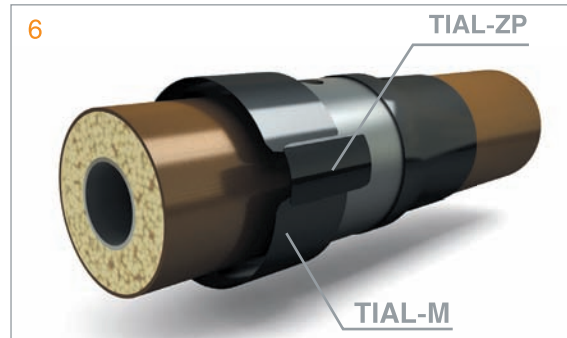


## WATERPROOFING

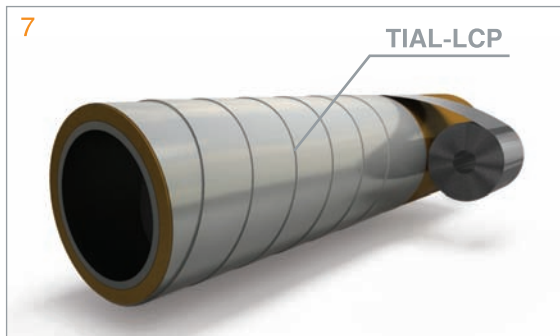


TIAL-TUM – one-piece heat-shrinkable casing for complete joint protection of pre-insulated pipelines.

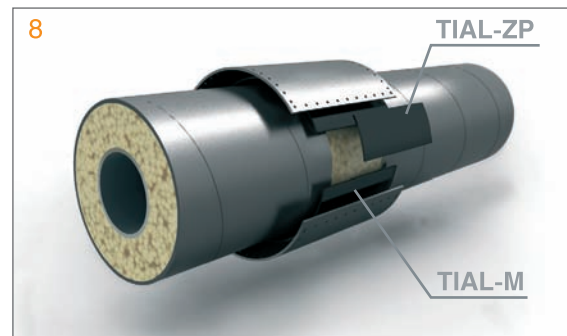
TIAL-Z - adhesive tape for additional sealing of one-piece heat-shrinkable casings.



TIAL-M – heat-shrinkable wraparound sleeves can be used for joint protection of pre-insulated pipelines together with protective jackets. Applied for underground construction.



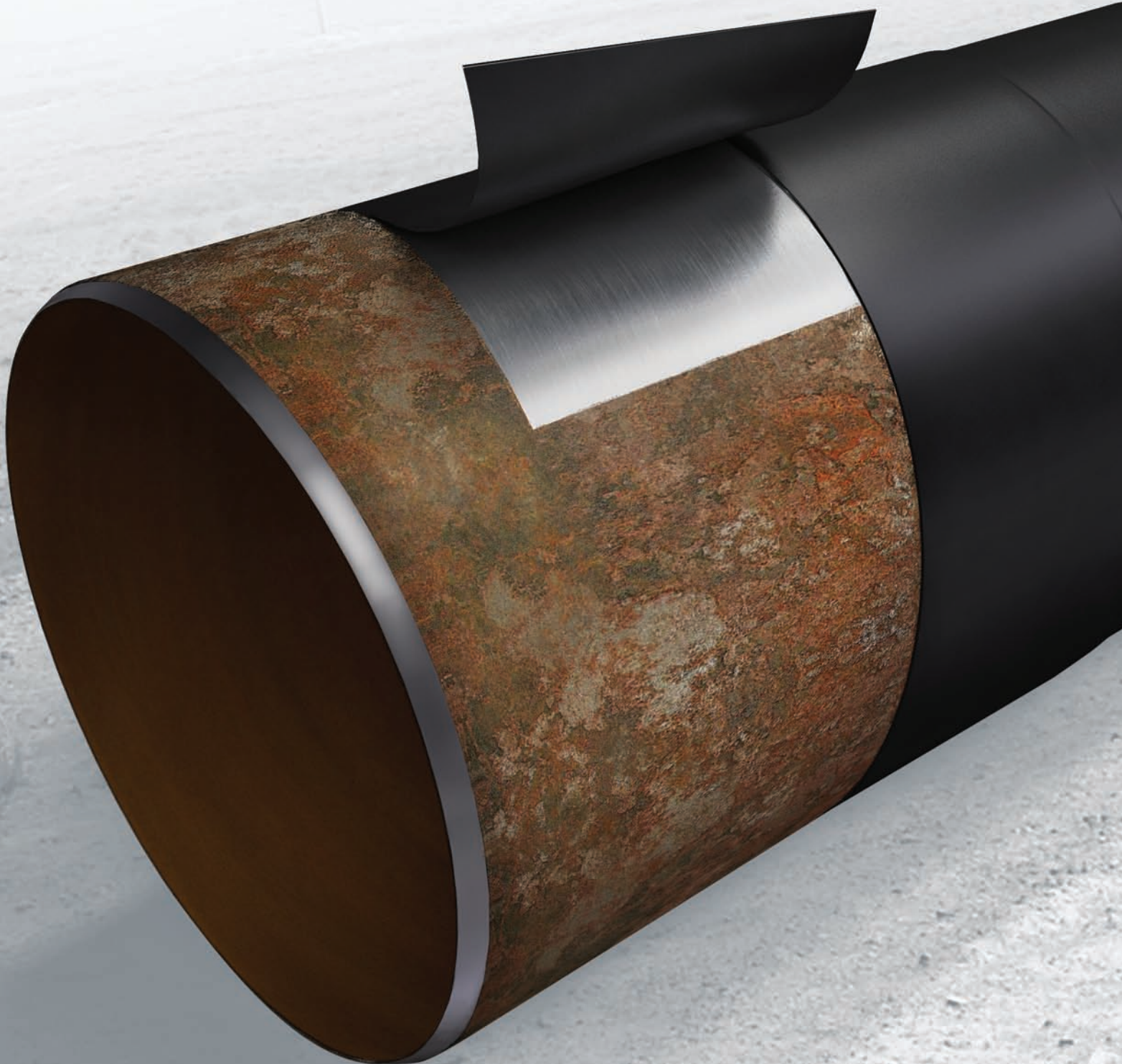
TIAL-LCP – fire-resistant heat-shrinkable colored tape for spiral coating of pre-insulated pipes.



TIAL-M – heat-shrinkable wraparound sleeves can be used for joint protection of pre-insulated pipelines when main body of pipe is covered with zinc-galvanized steel. Applied for aboveground construction.



- **protection of welded joints**
- **protection of straight pipes, pipe bends and fittings**
- **repair of mill coatings**
- **repair of heat-shrinkable coatings**





## GIRTH WELD PROTECTION WITH TIAL-M AND TIAL-M80 SLEEVES

TIAL-M and TIAL-M80 are heat-shrinkable wraparound sleeves for corrosion protection of pipeline welded joints in conjunction with cathodic protection. The sleeves are elaborated for the easiest installation in field conditions.

TIAL-M sleeve is specifically designed for pipelines with operation temperatures up to 60°C.

TIAL-M80 sleeve is specifically designed for pipelines with operation temperatures up to 80°C.

TIAL-M and TIAL-M80 sleeves are certified according EN 12068 standard, class C UV.

The sleeves have two-layer structure (polyethylene backing and hot-melt adhesive). They can form three-layer corrosion protection system when used together with TIAL-P two-component solvent free wet epoxy primer. The choice between two- or three-layer coating system depends on requirements of a project.

TIAL-M or TIAL-M80 sleeves are fixed on the pipe surface with the help of TIAL-ZP closure patches. The closure patch is a non-shrinkable fiberglass reinforced polyolefin tape with adhesive layer which has high resistance to shear forces.

The delivery set of either TIAL-M or TIAL-M80 sleeve includes one two-layer sleeve, one TIAL-ZP closure patch and one TIAL-P epoxy primer set. Components of the primer are packed in the amount sufficient to coat one field joint of specified diameter.

To ensure mobility of operations and to simplify logistics TIAL-M or TIAL-M80 sleeves can be delivered in 30 running meter rolls. The rolls are cut to the required length by installation crew on site.

Lifetime of TIAL-M sleeve is minimum 45 years.

**TABLE 1. LENGTH OF TIAL-M AND TIAL-M80 SLEEVES AND WIDTH OF TIAL-ZP CLOSURE PATCHES**

| Diameter Nominal<br>- DN - (mm) | Nominal Pipe Size<br>- NPS - (inches) | Outside<br>Pipe Diameter (inches) | Outside<br>Pipe Diameter (mm) | TIAL<br>Sleeve Length (m) | Recommended TIAL<br>Closure Patch Width (mm) |
|---------------------------------|---------------------------------------|-----------------------------------|-------------------------------|---------------------------|--|
| 50                              | 2                                     | 2.375                             | 60.3                          | 0.30                      | 50   |
| 65                              | 2 1/2                                 | 2.875                             | 73                            | 0.35                      | 50   |
| 80                              | 3                                     | 3.5                               | 88.9                          | 0.40                      | 50   |
| 90                              | 3 1/2                                 | 4                                 | 101.6                         | 0.45                      | 80   |
| 100                             | 4                                     | 4.5                               | 114.3                         | 0.50                      | 80   |
| 125                             | 5                                     | 5.563                             | 141.3                         | 0.55                      | 80   |
| 150                             | 6                                     | 6.625                             | 168.3                         | 0.65                      | 80   |
| 200                             | 8                                     | 8.625                             | 219.1                         | 0.85                      | 100  |
| 250                             | 10                                    | 10.75                             | 273.1                         | 1.00                      | 100  |
| 300                             | 12                                    | 12.75                             | 323.9                         | 1.20                      | 100  |
| 350                             | 14                                    | 14                                | 355.6                         | 1.30                      | 100  |
| 400                             | 16                                    | 16                                | 406.4                         | 1.45                      | 100  |
| 450                             | 18                                    | 18                                | 457.2                         | 1.62                      | 100  |
| 500                             | 20                                    | 20                                | 508                           | 1.80                      | 100  |
| 550                             | 22                                    | 22                                | 558.8                         | 2.00                      | 125  |
| 600                             | 24                                    | 24                                | 609.6                         | 2.15                      | 125  |
| 650                             | 26                                    | 26                                | 660.4                         | 2.35                      | 125  |
| 700                             | 28                                    | 28                                | 711.2                         | 2.50                      | 125  |
| 750                             | 30                                    | 30                                | 762                           | 2.65                      | 125  |
| 800                             | 32                                    | 32                                | 812.8                         | 2.85                      | 125  |
| 850                             | 34                                    | 34                                | 863.6                         | 3.00                      | 150  |
| 900                             | 36                                    | 36                                | 914.4                         | 3.20                      | 150  |
| 950                             | 38                                    | 38                                | 965.2                         | 3.35                      | 150  |
| 1000                            | 40                                    | 40                                | 1016                          | 3.50                      | 150  |
| 1050                            | 42                                    | 42                                | 1066.8                        | 3.70                      | 150  |
| 1100                            | 44                                    | 44                                | 1117.6                        | 3.85                      | 150  |
| 1150                            | 46                                    | 46                                | 1168.4                        | 4.00                      | 150  |

|      |    |    |        |      |     |
|------|----|----|--------|------|-----|
| 1200 | 48 | 48 | 1219.2 | 4.20 | 150 |
| 1250 | 50 | 50 | 1270   | 4.35 | 150 |
| 1300 | 52 | 52 | 1320.8 | 4.52 | 150 |
| 1350 | 54 | 54 | 1371.6 | 4.70 | 150 |
| 1400 | 56 | 56 | 1422.4 | 4.85 | 150 |
| 1450 | 58 | 58 | 1473.2 | 5.00 | 150 |
| 1500 | 60 | 60 | 1524   | 5.20 | 150 |
| 1550 | 62 | 62 | 1574.8 | 5.35 | 150 |
| 1600 | 64 | 64 | 1625.6 | 5.55 | 150 |
| 1650 | 66 | 66 | 1676.4 | 5.70 | 150 |
| 1700 | 68 | 68 | 1727.2 | 5.85 | 150 |
| 1800 | 72 | 72 | 1828.8 | 6.20 | 150 |
| 1900 | 76 | 76 | 1930.4 | 6.52 | 150 |
| 2000 | 80 | 80 | 2032   | 6.90 | 200 |
| 2200 | 88 | 88 | 2235.2 | 7.60 | 200 |

Note! When pipe diameter in the order is stated in DN or NPS the sleeve length is calculated according to the exact outside pipe diameter listed in Table 1.

Example: When DN50 is stated in the order the sleeve length is offered for 60.3 mm outside pipe diameter. The length is calculated according to the following formula  $L = 3,14 \times D \times 1,05 + K$

Where:

D – outside pipe diameter

1,05 – coefficient reference shrinkage degree

K – sleeve ends overlap (110 mm for  $\leq \text{Ø}20''$  and 160 mm for  $\geq \text{Ø}22''$ ).

### PRIMER WEIGHT

Table 2 indicates TIAL-P wet epoxy primer weight corresponding to pipe diameter and sleeve width. This table is presented for information purposes. The primer is supplied in accordance with the table. Weights are calculated for most frequently applied sleeve width. In case width of sleeve is different from stated in the table please contact TIAL to obtain required primer weights.

**TABLE 2. NET WEIGHTS OF TIAL-P (A+B) SETS**

| Nominal Pipe Size<br>- NPS - (inches) | TIAL-P (A+B) Set Net Weight (g) |                     |                     |
|---------------------------------------|---------------------------------|---------------------|---------------------|
|                                       | Sleeve Width 400 mm             | Sleeve Width 450 mm | Sleeve Width 500 mm |
| 2                                     | 12                              | 12                  | 12                  |
| 2 1/2                                 | 12                              | 12                  | 12                  |
| 3                                     | 18                              | 18                  | 18                  |
| 3 1/2                                 | 18                              | 18                  | 18                  |
| 4                                     | 18                              | 18                  | 18                  |
| 5                                     | 24                              | 24                  | 30                  |
| 6                                     | 30                              | 30                  | 36                  |
| 8                                     | 36                              | 42                  | 48                  |
| 10                                    | 42                              | 48                  | 54                  |
| 12                                    | 54                              | 60                  | 66                  |
| 14                                    | 60                              | 66                  | 72                  |
| 16                                    | 66                              | 72                  | 78                  |
| 18                                    | 78                              | 84                  | 96                  |
| 20                                    | 84                              | 90                  | 102                 |
| 22                                    | 90                              | 102                 | 114                 |
| 24                                    | 96                              | 108                 | 120                 |

## GIRTH WELD PROTECTION WITH TIAL-M AND TIAL-M80 SLEEVES

|    |     |     |     |
|----|-----|-----|-----|
| 26 | 102 | 114 | 126 |
| 28 | 108 | 120 | 132 |
| 30 | 114 | 126 | 144 |
| 32 | 126 | 138 | 156 |
| 34 | 132 | 144 | 162 |
| 36 | 138 | 156 | 174 |
| 38 | 144 | 162 | 180 |
| 40 | 150 | 168 | 186 |
| 42 | 156 | 174 | 192 |
| 44 | 168 | 186 | 210 |
| 46 | 174 | 198 | 222 |
| 48 | 180 | 204 | 228 |
| 50 | 186 | 210 | 234 |
| 52 | 192 | 216 | 240 |
| 54 | 204 | 228 | 252 |
| 56 | 216 | 240 | 264 |
| 58 | 222 | 246 | 276 |
| 60 | 228 | 258 | 288 |
| 62 | 240 | 270 | 300 |
| 64 | 252 | 282 | 312 |
| 66 | 258 | 288 | 318 |
| 68 | 270 | 300 | 336 |
| 72 | 282 | 318 | 354 |
| 76 | 300 | 336 | 372 |
| 80 | 312 | 354 | 396 |
| 88 | 348 | 390 | 432 |

### PRIMER APPLICATION KITS

For the easiest installation TIAL-M and TIAL-M80 sleeves are supplied with primer application kits.

One kit contains:

- 50 foam rollers
- 1 handle for rollers
- 1 stick for mixing primer components

TIAL recommends that one installation engineer performs sleeve installation on a pipe of diameter less than or equal to 20" and two engineers perform installation on a pipe of diameter greater than or equal to 22".

### ORDERING INFORMATION:

| SLEEVE        |                    | TIAL- M80 40" / 450x2.5 |
|---------------|--------------------|-------------------------|
| Product group | Sleeve M or M80    |                         |
| Pipe Ø        | from 2" to 88"     |                         |
| Width         | from 250 to 900 mm |                         |
| Thickness     | from 1.2 to 3.0 mm |                         |

In case of order 30 m rolls for more economical calculation it is recommended to state pipe diameter.

One application kit is enough for 50 welded joints of a pipe with diameter of  $\leq 20''$  and two kits suffice for 50 welded joints of a pipe with diameter of  $\geq 22''$ .

### BENEFITS

- corrosion protection in conjunction with cathodic protection
- complete replication of two or three layer mill coating
- superior level of sleeve adhesion to steel
- highest level of sleeve adhesion to polyethylene mill coating
- excellent resistance to cathodic disbondment
- excellent resistance to soil shear forces
- minimum installation time to accelerate pipeline construction process and minimize labour costs

| CLOSURE PATCH |                        | TIAL- ZP 450x150 |
|---------------|------------------------|------------------|
| Product group | Closure Patch          |                  |
| Pipe Ø        | According sleeve width |                  |
| Width         | from 80 to 200 mm      |                  |

\* Standard width 80, 100, 125, 150 and 200 mm.

Can be changed upon request.

## INSTALLATION PROCEDURE

1

Prepare the steel surface to be coated to minimum Sa 2 ½ degree as per ISO 8501-1. Treat the polyethylene coating with abrasive paper to provide sufficient surface roughness.



2

Preheat the steel surface and the adjacent factory coating to 80°C (for TIAL-M) or 100°C (for TIAL-M80). Apply preliminarily prepared epoxy primer onto the steel surface and the adjacent factory coating over the entire area to be coated.



3

Wrap the sleeve around the weld joint so that the overlap with the factory coating is at least 75 mm at each side and the overlap of the sleeve ends is at least 100 mm.

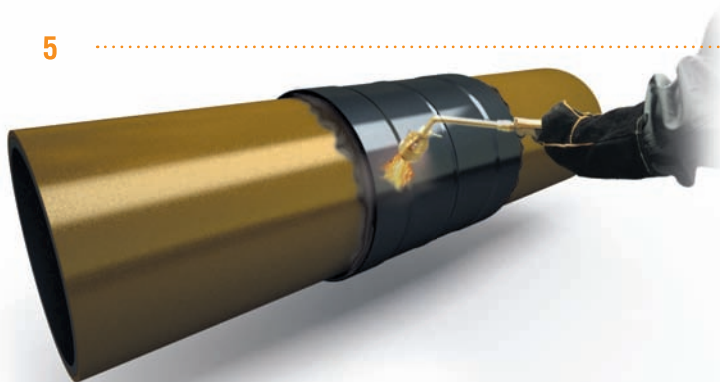


4

Heat the adhesive layer of the closure patch with a soft flame and install the patch in the central position onto the sleeve end in place of overlap. Smooth the patch down with hand and roll with silicon roller. The closure patch has to be located on the pipe circumference near 2 or 10 o'clock position.



5



Heat the sleeve with a soft flame from center to edges starting from bottom part of the joint to remove air from under the sleeve surface.

### NOTE:

This installation procedure is indicative and incomplete. Please follow installation guide supplied together with product.

### Indications of Appropriate Installation:

- the sleeve wraps weld joint area tightly and reproduces the weld seam relief
- the adhesive layer is evident from under sleeve edges to at least 3-4 mm around entire perimeter of circle
- the sleeve has no folds, buckling or bubbles

## PROTECTION OF STRAIGHT PIPES, PIPE BENDS AND FITTINGS WITH TIAL-L TAPES

TIAL-L is a heat-shrinkable tape for corrosion protection of straight pipes, bends and fittings in conjunction with cathodic protection. The tape is elaborated for installation in field or factory conditions. Operation temperatures up to +60°C.

TIAL-L is certified according EN 12068 standard, class C UV.

The tape is applied onto the pipe surface by spiral wrapping with overlap on adjacent tape turns.

TIAL-L has a two-layer structure (polyethylene backing and hot-melt adhesive) and can be used jointly with TIAL-P two-component solvent free wet epoxy primer to form three-layer corrosion protection system.

When the tape is being heated, the backing of the tape shrinks, the adhesive layer softens and fills in all the irregularities to

constitute a uniform coating and provide with excellent peel and dielectric strength of the coating.

TIAL-L tape is delivered in 30, 40 or 50 running meter rolls.

The primer is supplied in containers sufficient for coating of 1, 3 or 5 square meters of pipe surface. This packing is cost-effective for insulation of long bends or straight pipeline portions.

Recommended dimensions of TIAL-L tape and consumption of the product depending on pipe diameter are listed in Table 3. If different diameters are used please contact TIAL to obtain specific figures. Dimensions of the tape can be changed according to customer request.

Lifetime of TIAL-L tapes is minimum 45 years

**TABLE 3. TIAL-L DIMENSIONS AND CONSUMPTION**

| Nominal Pipe Size - NPS - (inches) | Tape Thickness (mm) | Tape Width (mm) | Tape Overlap (mm) | Tape Consumption for 1 Running Meter of Pipe (tape running m) |
|------------------------------------|---------------------|-----------------|-------------------|---|
| 4                                  | 1,4                 | 100             | 15                | 4,3   |
| 6                                  | 1,4                 | 150             | 15                | 4,0   |
| 8                                  | 1,4                 | 225             | 25                | 3,5   |
| 10                                 | 1,8                 | 225             | 25                | 4,3   |
| 12                                 | 1,8                 | 225             | 25                | 5,1   |
| 18                                 | 1,8                 | 225             | 40                | 7,8   |
| 20                                 | 1,8                 | 300             | 40                | 6,2   |
| 28                                 | 2                   | 300             | 50                | 9,0   |
| 32                                 | 2                   | 350             | 50                | 8,5   |
| 40                                 | 2,4                 | 350             | 50                | 10,1  |

For coating of bends or straight pipes of large diameters it is possible to install TIAL-M heat-shrinkable sleeves. In case of TIAL-M choice the overlap to be at least 75 mm.

### BENEFITS

- corrosion protection in conjunction with cathodic protection
- complete replication of two or three layer mill coating
- superior level of sleeve adhesion to steel
- excellent resistance to cathodic disbondment
- excellent resistance to soil shear forces

### ORDERING INFORMATION:

| TAPE          |                         | TIAL-L 20" / 300x1,8 |
|---------------|-------------------------|----------------------|
| Product group | Tape                    |                      |
| Pipe Ø        | from 2" to 48"          |                      |
| Width         | from 50 to 450 mm       |                      |
| Thickness*    | 1,2, 1,4, 1,8, 2,0, 2,4 |                      |

| CLOSURE PATCH |                      | TIAL-ZP 300x100 |
|---------------|----------------------|-----------------|
| Product group | Closure Patch        |                 |
| Length        | According tape width |                 |
| Width**       | from 80 to 200 mm    |                 |

\* Standard thickness can be changed upon request.

\*\* Standard width 80, 100, 125, 150 and 200 mm. Can be changed upon request.



## INSTALLATION PROCEDURE

1

Prepare the steel surface to be coated to minimum Sa 2 ½ degree as per ISO 8501-1.



2

Preheat the steel surface to be coated up to 80°C. Apply preliminary prepared epoxy primer onto the steel surface over the needed pipe length. Area to be small enough to retain the required temperature during installation (usually within one running meter of pipe).



3

Make the first turn with TIAL-L tape and continue wrapping spirally with a slight tension and minding overlap of the turns depending on pipe diameter. Before applying next turn, preheat the previous turn over the entire surface to ensure shrinkage of tape and softening of adhesive layer. Remove air bubbles with hand or silicon roller.



4

After the whole roll is used, fasten the beginning of next roll with TIAL-ZP closure patch.



5

The last turn of TIAL-L tape has to be complete. Fasten end of the tape with closure patch. Heat adhesive layer with a soft flame on the closure patch and install the patch in the central position onto the tape end. Smooth the patch down with hand and roll with silicon roller.



### NOTE:

This installation procedure is indicative and incomplete. Please follow installation guide supplied together with product.

### Indications of Appropriate Installation:

- adjacent tape turns are installed tightly and cover the entire insulated surface with overlap according to recommendations in Table 3 (Column 4)
- the adhesive layer is evident from under the tape edges to at least 3-4 mm to indicate coating tightness and even tape adhesion over the entire length
- the tape has no folds, buckling or bubbles.

## REPAIR OF FACTORY COATINGS WITH TIAL-R AND TIAL-Z

TIAL-R repair patch is a two-layer system consisting of irradiated high-strength polyethylene with low shrinkage degree and fiber-glass reinforced adhesive layer. The adhesive possesses high properties of shear resistance and peel strength to all types of factory polyethylene coatings. Reinforced structure adds extra resistance to shear forces.

TIAL-Z defect filler is an adhesive composition with high softening point. During heating the material fills in all the surface irregularities and attains excellent adhesion to steel surface and TIAL-R repair material.

TIAL-R and TIAL-Z are applied jointly for restoration of damaged factory polyethylene coatings.

TIAL-R repair patch and TIAL-Z defect filler are certified according to EN 12068 standard, class C UV.

Repair materials are supplied in rolls of 30, 40 and 50 running meters.

Table 4 contains information for easiest choice of repair materials quantities. If there is no strict requirements in a project reference quantity of repair materials you can choose the following data. These figures are advisory and based on TIAL wide experience to ship heat-shrinkable coatings for different projects.

**TABLE 4. TIAL-R AND TIAL-Z REPAIR MATERIALS CONSUMPTION**

| Nominal Pipe Size - NPS - (inches) | TIAL-R Repair Patch<br>for 10 km pipe length (or 1000 weld joints) |                | TIAL-Z Defect Filler<br>for 10 km pipe length (or 1000 weld joints) |                |
|------------------------------------|--|----------------|---|----------------|
|                                    | kg   | m <sup>2</sup> | kg  | m <sup>2</sup> |
| 2 – 6                              | 10   | 6              | 10  | 5              |
| 8 – 12                             | 15   | 9              | 15  | 7,5            |
| 14 – 18                            | 20   | 12             | 20  | 10             |
| 20 – 28                            | 30   | 18             | 30  | 15             |
| 30 – 40                            | 40   | 24             | 40  | 20             |
| 42 – 52                            | 50   | 30             | 50  | 25             |
| 54 – 64                            | 60   | 36             | 60  | 30             |
| 66 – 76                            | 70   | 42             | 70  | 35             |
| 78 – 88                            | 80   | 48             | 80  | 40             |

**TABLE 5. TIAL-R AND TIAL-Z STANDARD DIMENSIONS**

| Material | Width* (mm) | Thickness (mm) | Roll Length* (running meters) |
|----------|-------------|----------------|-------------------------------|
| TIAL-R   | 225         | 1,6            | 30, 40 or 50                  |
|          | 450         |                |                               |
| TIAL-Z   | 50          | 2,0            |                               |
|          | 80          |                |                               |
|          | 100         |                |                               |
|          | 450         |                |                               |

\*Can be changed upon customer request.

### BENEFITS

- corrosion protection in conjunction with cathodic protection
- requires no primer
- fiber glass reinforcement and unique adhesive ensure high resistance to shear forces

### ORDERING INFORMATION:

| REPAIR PATCH  |                 | TIAL-R 225 / 30 |
|---------------|-----------------|-----------------|
| Product group | Repair Patch    |                 |
| Width*        | 225 or 450 mm   |                 |
| Roll length*  | 30, 40 and 50 m |                 |

\* Standard dimensions can be changed upon request.

| DEFECT FILLER |                        | TIAL-Z 100 / 30 |
|---------------|------------------------|-----------------|
| Product group | Defect Filler          |                 |
| Width*        | 50, 80, 100 and 450 mm |                 |
| Roll length*  | 30, 40 and 50 m        |                 |

\* Standard dimensions can be changed upon request.

Quantity of each product can be stated in kg or m<sup>2</sup> according to Table 4 or according to project requirements.

## INSTALLATION PROCEDURE

1

Preheat the repaired polyethylene coating area up to 100°C and remove the damaged factory coating with spatula or knife. Smooth the sharp edges of the mill coating and make the coating rougher with abrasive paper 75 mm more around the removed coating area. Remove rust from the repaired steel pipe surface portion with abrasive paper.



2

Preheat the steel surface up to 60°C and the polyethylene surface of the repaired area up to 100°C (100 mm more around the damaged area). Apply preliminary cut to size TIAL-Z repair filler onto the steel and polyethylene pipe surfaces. Heat the filler with a gas torch, fill in the damaged area with the help of a spatula and evenly distribute the filler with the spatula over the polyethylene surface (75 mm more around the damaged area).



3

Cut TIAL-R repair patch to ensure 40-45 mm overlap on factory coating. Heat the adhesive layer until it becomes lustrous.

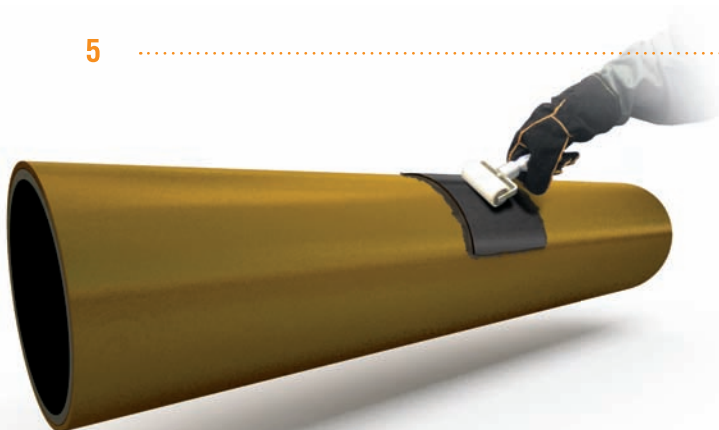


4

Install TIAL-R piece onto the repaired pipe area to ensure that the adhesive layer extends from under the tape to at least 20 mm.



5



Heat the piece with a gas torch and roll down with a roller to remove adhesive blobs and air bubbles.

### Indications of Appropriate Installation:

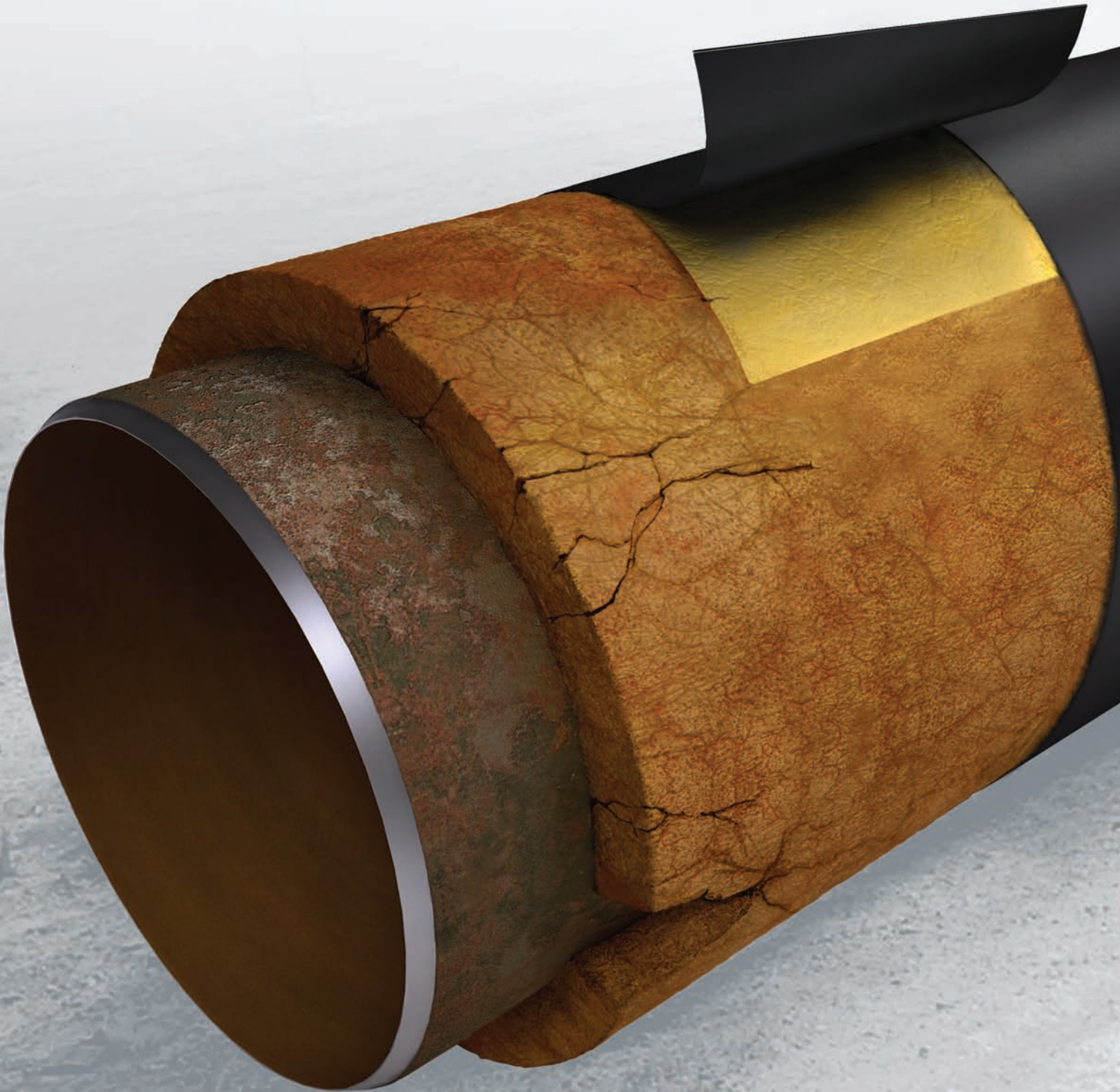
- no bubbles under TIAL-R tape
- the surface is smooth, without folds or creases.

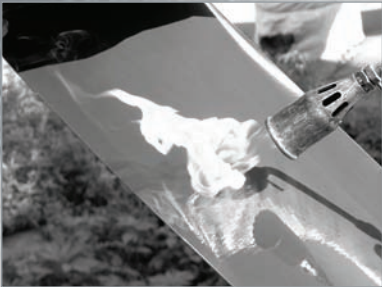
### NOTE:

This installation procedure is indicative and incomplete. Please follow installation guide supplied together with product.



- joint protection of pre-insulated pipelines
- sealing of joints protected with jackets
- protection of pre-insulated aboveground pipelines





## JOINT PROTECTION WITH TIAL-TUM ONE-PIECE CASING

TIAL-TUM one-piece heat-shrinkable casing is specifically designed for complete joint protection of pre-insulated pipelines for underground laying.

One-piece structure of the casing allows to execute waterproofing that meets the highest requirements, though the installation is carried out in a simple way which does not require high qualification of field crew. This one-piece structure eliminates the need of additional end seals.

TIAL-TUM is manufactured of LDPE and HDPE mix via extrusion process followed by specifically oriented stretching to obtain shrinkage. The casing is cross-linked to prevent buckling and to impart excellent mechanical strength due to high impact, indentation and abrasive resistance.

The inner non-shrinkable HDPE layer is built into the middle section of TIAL-TUM system to prevent deformation. This extremely solid layer structure additionally reinforces the construction to provide full resistance to soil stress.

TIAL-TUM is used together with TIAL-Z unique hotmelt adhesive. TIAL-Z serves for complete and long-term sealing of casing ends thanks to its high peel and lap shear strength. TIAL-Z is supplied as part of TIAL-TUM set preliminary cut for specific diameter. As an option TIAL-Z can be supplied in 30 m rolls.

TIAL-TUM operates at environmental temperatures from – 60 to + 60 °C.

Lifetime of TIAL-TUM casing is minimum 45 years.

**TABLE 6. RECOMMENDED CASING LENGTH**

| Diameter of PE Jacket, mm | Casing Length, mm |
|---------------------------|-------------------|
| 110                       | 500/600/700       |
| 125                       |                   |
| 140                       |                   |
| 160                       |                   |
| 180                       |                   |
| 200                       |                   |
| 225                       |                   |
| 250                       |                   |
| 280                       |                   |
| 315                       |                   |
| 355                       | 700               |
| 400                       |                   |
| 450                       |                   |
| 500                       |                   |
| 560                       |                   |
| 630                       |                   |
| 710                       |                   |
| 800                       |                   |
| 900                       |                   |
| 1000                      |                   |
| 1100                      |                   |
| 1200                      |                   |

### ORDERING INFORMATION:

| ONE-PIECE CASING |                     | TIAL-TUM 500/ 700 |
|------------------|---------------------|-------------------|
| Product group    | One-Piece Casing    |                   |
| Ø of PE jacket   | from 110 to 1200 mm |                   |
| Length*          | 500, 600 and 700 mm |                   |

\*Standard length can be changed upon customer request.

### BENEFITS

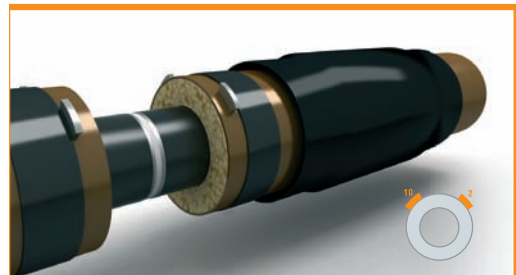
- complete sealing
- comprehensive weld joint area protection against underground, flood and other waste waters
- no deformation due to hardness of middle section layer
- no additional end seals
- excellent resistance to soil stresses
- complete set of component parts
- over 30% shrinkage

## INSTALLATION PROCEDURE

**1** Slide the casing onto the pipe before welding. Mark installation area of the casing. Clean and degrease PE jacket to be covered with TIAL-TUM up to a distance of 200 mm from the edge of the jacket. Preheat the prepared surface up to +40°C.



**2** Cut TIAL-Z adhesive tape according to perimeter of circle (if supplied in 30 meter rolls). Wrap adhesive tape over PE jacket within marked edges. Place spacers at 10 and 2 o'clock position at the edge of the jacket.



**3** Drill a hole of 25 mm in diameter at a distance of 150 mm from casing end. Install the casing according to marking. Shrink casing ends with gas torch flame. Allow the casing to cool down up to 40°C. To check quality of the sealing perform air pressure test. Degree of internal pressure to be maintained in compliance with project requirements. Drill a second hole of 25 mm in diameter.



**4** Perform foaming of the joint with the help of filling machine, foam kit or other method which ensures qualitative mixing of PUF components. Mixing is carried out according to requirements of PU foam components manufacturer.



**5**



After PU foam has hardened, weld up holes in the casing with PE plugs and install PE patches onto the welded plugs.

### NOTE:

This installation procedure is indicative and incomplete. Please follow installation guide supplied together with product.

### Indications of Appropriate Installation:

- the adhesive layer is evident from under casing ends around entire perimeter of circle
- no foam evident from under casing ends
- full contact of casing ends with PE jacket

## JOINT PROTECTION WITH TIAL-M SLEEVES

TIAL-M heat-shrinkable wrap-around sleeve is used for sealing of weld joint areas of pre-insulated pipelines.

The sleeve has two-layer structure (PE backing and hotmelt adhesive).

The backing provides with high indentation resistance, impact strength and extremely low moisture absorption. The backing is cross-linked to prevent tape from buckling and to impart specific mechanical strength and resistance to UV-radiation.

Adhesive layer of the sleeve possesses high peel and shear strength.

TIAL-M sleeve is fixed on the pipe surface with the help of TIAL-ZP fiberglass reinforced closure patch.

The closure patch is delivered in set together with the sleeve.

To ensure mobility of the works and to simplify logistic schemes TIAL-M sleeves can be delivered in 30 running meter rolls. The rolls are cut to the required length by installation crew on site.

Lifetime of TIAL-M sleeve is minimum 45 years.

**TABLE 7. SEALING OF PRE-INSULATED JOINTS WITH TIAL-M SLEEVE**

| Pipeline Type | Type of Joint Pre-Insulation        |
|---------------|-------------------------------------|
| Buried        | PUF shells                          |
|               | PE non-shrinkable protective jacket |
|               | Galvanized steel protective jacket  |
| Exposed       | Galvanized steel protective jacket  |

### BENEFITS

- complete sealing
- comprehensive weld joint area protection against underground, flood and other waste waters
- high peel and shear strength
- excellent resistance to soil shear forces

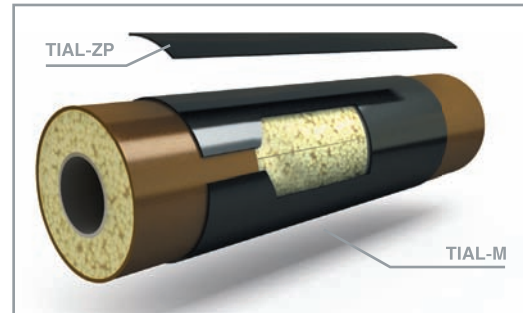


### UNDERGROUND PIPELINES PRE-INSULATED WITH POLYURETHANE FOAM (PUF) SHELLS

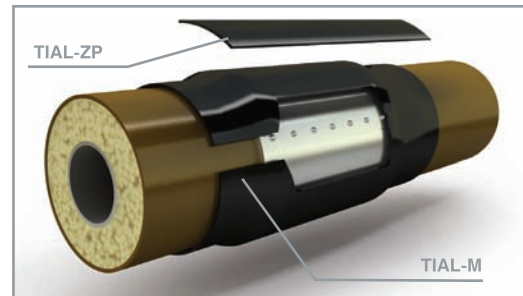
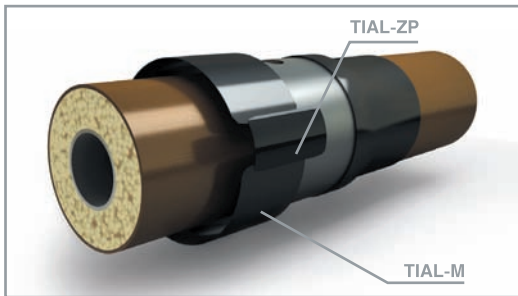
Nowadays heat-shrinkable all-in-one casings for sealing of pre-insulated pipeline joints are preferable. However when the carrier pipe sections has been already welded the tubular casing can not be installed. In this case TIAL-M wraparound sleeve is an indispensable product for coating of joints of pre-insulated pipes.

Taking into account economical aspect, application of the sleeve is more preferable due to lower cost of the sleeve in comparison with one-piece casing. Additionally, time for installation process is greatly minimized. These both factors significantly reduce the cost of pipeline construction.

When there are no strict requirements to hardness of the coating, TIAL-M sleeve is the ideal decision.



### UNDERGROUND PIPELINES PRE-INSULATED WITH PE OR STEEL PROTECTIVE JACKETS

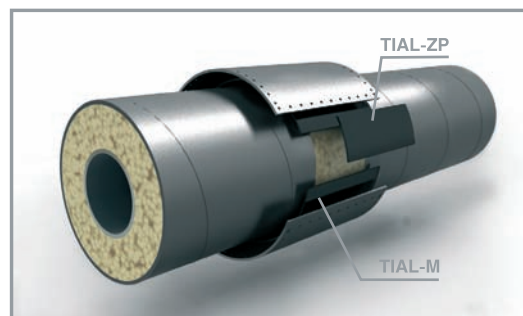


Another means to replace all-in-one casing for sealing of joint areas of buried pre-insulated pipelines is PE or zinc-galvanized steel jacket application. The jackets impart additional hardness to the whole coating system for a joint. In this case TIAL-M sleeve is the ideal decision for waterproofing of the whole system protecting joint area.

### ABOVEGROUND PIPELINES PRE-INSULATED WITH GALVANIZED STEEL PROTECTIVE JACKETS

Qualitative sealing of joint areas is always an important goal during exposed pre-insulated pipeline construction. TIAL-M sleeve is optimal decision when the main coating of the pipeline is zinc-galvanized steel.

In place where PU foam and galvanized steel contact each other there is often a problem to resist different speed of PUF and steel cooling down. TIAL-M sleeve eliminates this specific problem due to its high durability.



## PROTECTION OF PRE-INSULATED EXPOSED PIPES WITH TIAL-LCP

TIAL - LCP is a heat-shrinkable tape designed for protection of pre-insulated exposed pipes.

Coating of straight pipes, bends and fittings is performed by spiral winding in field conditions.

Pre-insulation of pipes can be provided with PU foam, mineral cotton and other heat-insulating materials and then with TIAL-LCP tapes for waterproofing.

TIAL-LCP provides long lasting and effective protection of heat-insulation layer against water, UV-radiation, and other external factors. Unique property of TIAL-LCP is fire-resistance. This property allows to greatly minimize damage caused by burning dried grass or in case of incendiary crime.

For good-looking appearance of above-ground district heating pipes TIAL provides customers with TIAL-LCP of various colors (silver, green, blue, red and yellow).

Coating works can be performed by application crews of 2 or 3 workers depending on the pipeline diameter.

Protective properties of TIAL-LCP are preserved at temperatures from - 60 °C to +60 °C.

Lifetime of TIAL-LCP is minimum 30 years.

### BENEFITS

- fire-resistant
- good-looking exterior appearance
- long-lasting protection
- opportunity to preserve and restore existing heat insulated layer
- can not be used twice (excludes stealing)

| FIRE-RESISTANT TAPE |                     | TIAL-LCP 1140 / 450 |
|---------------------|---------------------|---------------------|
| Product group       | Fire-Resistant Tape |                     |
| Ø of pre-insulation | from 140 to 1540 mm |                     |
| Width               | from 150 to 450 mm  |                     |

| CLOSURE PATCH |                      | TIAL- ZP 450x150 |
|---------------|----------------------|------------------|
| Product group | Closure Patch        |                  |
| Length        | According tape width |                  |
| Width         | from 80 to 150 mm    |                  |

## INSTALLATION PROCEDURE

**1** Take in hands TIAL-LCP roll and reel out minimum 1 meter. Heat the adhesive layer of the reeled out part of tape with a gas torch until the adhesive layer glitters. Install the heated tape on the pipe with adhesive layer down at a certain angle to provide required overlap.



**2** Press the tape edge to heat-insulation surface until tape adhesive layer sticks to the heat-insulation. After the first complete turn the further winding is performed with overlap on previous turns.



**3** Wrap a pipe section with the tape by spiral winding (2-3 turns) providing minimum 20-30 mm overlap.



**4** Perform shrinkage of the tape with gas torches avoiding heat-insulation burning. Shrinkage to be carried out for the whole length of the tape. Roll down every turn with silicon roller or manually with heat-resistant gloves. Overlap of turns after application procedure has to be at least 20 mm.



**5** Permanently control tape temperature during shrinkage to avoid bubbles or tape burning. In case of bubble forming roll down the coating with silicon roller or manually with heat-resistant gloves. Accomplish the installation procedure with wide moves of gas torches along the whole surface of the covered area.



### NOTE:

This installation procedure is indicative and incomplete. Please follow installation guide supplied together with product.

### Indications of Appropriate Installation:

- the adhesive layer is evident from under casing ends around entire perimeter of circle.
- no foam evident from under casing ends.
- full contact of casing ends with PE jacket.

# SAMPLES OF TIAL CERTIFICATES AND TEST REPORTS

**BUREAU VERITAS**  
Certification

**Certification**  
Awarded to

**IFC "TECHPROCOMPLEKT" LLC**  
1, 62, Starokauluzhskoye Shosse, Moscow, Russia, 117630  
including:  
"TRADING COMPANY TIM" LLC  
1, 62, Starokauluzhskoye Shosse, Moscow, Russia, 117630  
"ANTICOR TECHNOLOGIES" LLC  
24, Chocerny skly, Moscow, Russia, 117042

Bureau Veritas Certification certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standard detailed below

Standard  
**ISO 9001:2008**

Scope of supply  
**DEVELOPMENT, MANUFACTURE AND SALES  
OF INSULATION MATERIALS; INSTALLATION SERVICES**

Digital Signed Date: **29 April 2005**

Valid to: **27 April 2014**

For each non-qualified activity please call: +7 495 527 5777

Further clarifications regarding the scope of the certificate and the applicability of the management system requirements may be obtained by consulting the registration.

15 April 2011  
Certificate Number: **RU227910-U**

**BUREAU VERITAS**  
15, rue de la Woluwe, 1200 Brussels, Belgium  
15, rue de la Woluwe, 1200 Brussels, Belgium  
15, rue de la Woluwe, 1200 Brussels, Belgium

**DVGW**  
CERT GMBH

**DIN-DVGW-Baumusterprüfzertifikat**  
*DIN-DVGW type examination certificate*

NV-5180BT0138  
Registration number

Anwendungsbereich: Produkte der Gas- und Wasserversorgung  
field of application: products of gas and water supply

Zertifikatinhaber: IFC Techprocomplekt LLC  
owner of certificate: 1,62 Starokauluzhskoye Shosse, RUS-117630 Moskau

Vertreiber: IFC Techprocomplekt LLC  
distributor: 1,62 Starokauluzhskoye Shosse, RUS-117630 Moskau

Produktart: greasing and sealing materials: Protection tape against corrosion (S160)  
product category

Produktbezeichnung: Heat-shrinkable wraparound sleeve TIAL-M80 with TIAL-ZP and primer  
product description: TIAL-P

Modell: TIAL-M80  
model

Prüfberichte: type testing: 07/290/5180/2 from 24.04.2008 (EBI)  
test reports

Prüfgrundlagen: DIN EN 12068 (01.03.1999)  
basis of type examination

Ablaufdatum / AZ: 24.04.2013 / 06-0173-GNE  
date of expiry / file no.

15. April 2013  
DIN-DVGW-Zertifikat - vom der Deutschen Akkreditierungsstelle Technischer Sachverständigen für die Konformitätsbewertung von Produkten der Gas- und Wasser-Versorgung  
DIN-DVGW-Zertifikat - accredited by Deutsche Akkreditierungsstelle Technischer Sachverständigen für die Konformitätsbewertung von Produkten der Gas- und Wasser-Versorgung

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Josef-Möhrle-Strasse 1-8  
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**DVGW**  
CERT GMBH

**DIN-DVGW-Baumusterprüfzertifikat**  
*DIN-DVGW type examination certificate*

NV-5180BT0134  
Registration number

Anwendungsbereich: Produkte der Gas- und Wasserversorgung  
field of application: products of gas and water supply

Zertifikatinhaber: IFC Techprocomplekt LLC  
owner of certificate: 1,62 Starokauluzhskoye Shosse, RUS-117630 Moskau

Vertreiber: IFC Techprocomplekt LLC  
distributor: 1,62 Starokauluzhskoye Shosse, RUS-117630 Moskau

Produktart: greasing and sealing materials: Protection tape against corrosion (S160)  
product category

Produktbezeichnung: Heat-shrinkable wraparound sleeve TIAL-M with TIAL-ZP and primer  
product description: TIAL-P

Modell: TIAL-M  
model

Prüfberichte: type testing: 07/290/5180/1 from 24.04.2008 (EBI)  
test reports

Prüfgrundlagen: DIN EN 12068 (01.03.1999)  
basis of type examination

Ablaufdatum / AZ: 24.04.2013 / 05-0173-GNE  
date of expiry / file no.

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DIN-DVGW-Zertifikat - accredited by Deutsche Akkreditierungsstelle Technischer Sachverständigen für die Konformitätsbewertung von Produkten der Gas- und Wasser-Versorgung

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**Bodycote**

Materials Testing  
www.bodycote.com

Bodycote Materials Testing Ltd Coatings Division  
8 Coronet Way, Cranbury Park, Epsom, Middlesex, M20 1RL, UK  
Tel: +44 (0) 181 787 33 80, Fax: +44 (0) 181 787 3351

**TEST CERTIFICATE**

IFC Techprocomplekt LLC  
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Moscow  
117261

REF No: N7077059-10 Issue 1  
Ord No: Cash account  
Date Tested: 07/11/07  
Date Reported: 27/11/07

Test product: TIAL-M80 sleeve installed on PVC steel pipe with TIAL-P primer prior to application

Specification: NFA 49 718-06 (NF EN 10329-06) Annex D Figure D.1 External Field Joint Coatings

Description of product tested  
TIAL-M80 heat-shrinkable wrap-around sleeve operating at temperature up to 80°C with TIAL-P wet epoxy primer.

| NFA 49 718-06 (NF EN 10329-06) Annex D Figure D.1     |                      |                       |               |                        |                        |
|---|----------------------|-----------------------|---------------|------------------------|------------------------|
| Ring Section Peel                                     |                      |                       |               |                        |                        |
| TIAL-M80 Sleeve with TIAL-P Primer on steel substrate |                      |                       |               |                        |                        |
| Item number   | Dimension Width (mm) | Test Temperature (°C) | Test Load (N) | Mean Peel Force (N/mm) | Mean Peel Force (N/mm) |
| 1   | 45.61                | 23                    | 613.88        | 13.48                  | 13.48                  |
| 2   | 47.41                | 23                    | 710.88        | 14.99                  | 14.99                  |
| 3   | 46.95                | 23                    | 617.43        | 13.28                  | 13.28                  |
| 4   | 47.71                | 23                    | 643.71        | 13.49                  | 13.49                  |
| 5   | 44.84                | 23                    | 793.97        | 17.70                  | 17.70                  |

Test equipment used:  
Hounsfield H80KS serial number 0243 Calibration due 04/2008  
10kN load cell serial number 0178280 Calibration due 04/2008  
Digital caliper serial number 06991593 (NW 223) Calibration due 02/2008

The test specimens were conditioned for 24 hours at 23 ± 2°C and 50 ± 5% relative humidity.

The peel test was carried out at a constant speed of 10mm/minute.

The test specimens were peeled over a 200mm length. The first and last 20mm were discounted and the mean load was calculated using the remaining values at 20mm intervals.

The test temperature was maintained within a 2°C of the required temperature throughout the test.

The above testing has been carried out in accordance with the requirements of the governing specification and/or clients requirements, and controlled within the laboratories ISO/IEC 17025 UKAS accredited quality system. However, the testing is not covered under the laboratories UKAS testing schedule.

Authorized by: T.S.Haynes  
AMM MScEng, TME, Eng Tech  
O.M.I.CORR

For and on behalf of:  
Bodycote Materials Testing Ltd

Witnessed by: [Signature]

24. 11. 07  
Mr S Davernport International Accrediting Engineer  
Vise Europe Limited, UK

The contents of this report are prepared to the terms and conditions quoted

Page 1 of 1

**Bodycote**

Bodycote Materials Testing Ltd Coatings Division  
8 Canal Way, Coneybury Park Eccles, Manchester M50 1RE UK  
Tel +44 (0)161 787 3250 Fax +44 (0)161 787 3251

**TEST CERTIFICATE**

IFC Techprocomplect LLC  
1, 62 Starokaluzhskoye Shosse  
Moscow  
Russia  
117630

REF No N7077057-8 Issue 2  
Ord No Cash account

Date Tested 01/12/2007  
Date Reported 12/11/2008

**Test Product:** TIAL-M80 sleeve installed on Ø 4" steel pipe with TIAL-P primer prior to application

**Specification - ASTM G42 - 03**

**Description of product tested:**  
TIAL-M80 heat-shrinkable wrap-around sleeve operating at temperature up to 81°C with TIAL-P wet epoxy primer.

| Item number | Test Duration (Days) | Test Temperature (°C) | Cathodic Disbondment (mm) |
|-------------|----------------------|-----------------------|---------------------------|
| 1           | 30                   | 80                    | 3.77                      |
| 2           | 90                   | 80                    | 10.77                     |

Note: The mean radius values of air reading were measured from the outer edge of the holiday and reported as the cathodic disbondment result.

| Item number | Test Duration (Days) | Test Temperature (°C) | Disbondment Reference Vapour Zone (mm) | Comments  |
|-------------|----------------------|-----------------------|--|---|
| 1           | 30                   | 80                    | 0.00                                   | The coating system exhibited no disbondment at the test area. |
| 2           | 30                   | 80                    | 0.00                                   | The coating system exhibited no disbondment at the test area. |

**Bodycote TESTING**

**Test Product:** TIAL-M80 sleeve installed on Ø 4" steel pipe with TIAL-P primer prior to application  
REF No N7077057-8 Issue 2

**ASTM G15 - 07**  
Coating Thickness  
TIAL-M80 with TIAL-P Primer on steel substrate.

| Item number | Number of measurements | Maximum (mm) | Minimum (mm) | Mean (mm) | Coating thickness at holiday site (mm) |
|-------------|------------------------|--------------|--------------|-----------|--|
| 1           | 12                     | 2.82         | 2.28         | 2.29      | 2.27                                   |
| 2           | 12                     | 2.53         | 2.40         | 2.63      | 2.36                                   |

**Test equipment used:**  
Ecometer 206F+3 serial number GC899-40 Calibration on use against reference foil.  
Ecometer reference foil serial number PCD787-796 Calibration due 07/2008  
RS Megger BMM60 Insulation Multimeter serial number 8111-4170300031280 Calibration due 08/2008  
Glenkamp OMT 150 x2.0 fan oven serial number 599600251 Calibration due 04/2008  
C.D. unit TR638-ASBY serial number 002 Calibration due 11/2006  
Thermo reference electrode  
Platinum wire 99.9% pure  
Digital calliper serial number 06891063 (NW 225) Calibration due 02/2008

The end of the pipe was sealed with a plastic cap and Dew Corning 732 silicone sealant

The resistance measurements in accordance with section 8.1.1 at 500 volts are item 1 before = 3.29 GD after = 3.29 GD and item 2 before = 3.43 GD and after = 3.44 GD

One Ø 7.5mm artificial holiday was used and had an impressed current of -1.50 ± 0.01 volts through a pure platinum wire anode (99.9%).

Immersed surface areas of the coating system are item 1 = 82936 mm<sup>2</sup> and item 2 = 82938 mm<sup>2</sup>

The electrolyte solution was made in accordance with ASTM G42 section 8.1.

The test specimens were conditioned for 24 hours at 23 ± 2°C and 50 ± 5% relative humidity.

The test specimens were maintained within ± 2°C of the required temperature throughout the test.

The above testing has been carried out in accordance with the requirements of the governing specification and/or clients requirements, and controlled within the laboratories BB/EHS/0/IEC 17025 UKAS accredited quality system. However, the testing is not covered under the laboratories UKAS testing schedule.

The results have been reported in accordance with the client's instructions.  
The report has been re-issued due the clients address change.

Authorized by: Mr T S Haynes  
AMM Member, TMIE, Eng Tech  
O.M.I.CORR

Witnessed by: Mr S. Davenport Inspection/Expediting Engineer  
Veloxi Europe Limited

Page 2 of 2

**TEST REPORT**

GTI TESTING LABORATORIES  
1700 South Mount Prospect Road | Des Plaines, Illinois | 60018

Brian K. Spillar  
Manager, Industrial Testing Services  
T: 847 768 0558 F: 847 768 0569  
Brian.Spillar@gstechnology.org

IFC Techprocomplect LLC  
1, 62, Starokaluzhskoye Shosse  
Moscow, 117630, Russia  
Ph. +7 495 974 7008

10/29/2008

Reference: Test results for TIAL-M80 backing : Our Report 081659.

We have completed testing on the following materials submitted to our laboratory.

Material Name: Backing layer of TIAL-M80 heat shrinkable wrap-around sleeve.  
Test Method: ASTM D638-2008  
Test Speed: 20.0in/min  
Specimens: Die Cut Type IV.  
Quantity of specimens: 11  
Test Temperature: 25°C

When tested in accordance with ASTM D638-2008 the following results were obtained:

**Tensile strength = 3288psi; standard deviation 135psi.**  
**Elongation at break = 599%; standard deviation 60%**

Brian K. Spillar  
Manager, Industrial Testing Services

Neither GTI nor any person acting on behalf of GTI assumes any liability with respect to the use of, or for damages resulting from the use of, any information presented in this report.

**TEST REPORT**

GTI TESTING LABORATORIES  
1700 South Mount Prospect Road | Des Plaines, Illinois | 60018

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1, 62, Starokaluzhskoye Shosse  
Moscow, 117630, Russia  
Ph. +7 495 974 7008

10/28/2008

Reference: Test results for TIAL-M adhesive: Our Report 081659.

We have completed testing on the following materials submitted to our laboratory.

Material Name: Adhesive layer of TIAL-M heat shrinkable wrap-around sleeve.  
Test Method: ASTM D1002-2005  
Test Speed: 0.05in/min  
Specimens: Grit blasted steel 0.5" overlap, prepared by client.  
Quantity of specimens: 10  
Test Temperature 21°C

When tested in accordance with ASTM D1002-2005 the following results were obtained:

**Lap shear strength = 447psi; standard deviation 53psi.**

Brian K. Spillar  
Manager, Industrial Testing Services

This laboratory maintains A2LA accreditation to ISO/IEC 17025 for specific tests listed in A2LA Certificate 2139-01 and meets the relevant quality system requirements of ISO 9000:2000. The test results included in this report however are not covered by this accreditation.

Neither GTI nor any person acting on behalf of GTI assumes any liability with respect to the use of, or for damages resulting from the use of, any information presented in this report.

## WELCOME TO RUSSIA

**Full country name:** Russian Federation  
**Head of state:** President  
**Government type:** Federative Republic

**Area:** 17 075 400 square kilometers  
**Climate:** varies from sub-polar in north to sub-tropical in south-west; average temperatures vary from - 45°C to +5°C in winter, from +10°C to +25°C in summer. Absolute temperatures: - 71°C and +45°C.  
**Land boundaries:** total: 19,917 km  
**Coastline:** 37,653 km  
**Natural resources:** crude oil, natural gas, coal, strategic minerals, timber, metals

**Population:** 143 899 200 (source: United Nations - 2004)  
**Capital:** Moscow (pop. 9 million)  
**Language:** Russian, many minority languages  
**Religion:** Russian Orthodox, Islam, Buddhism, Judaism

**Daylight saving time:** +1hr, begins last Sunday in March; ends last Sunday in October.

**Exports:** USD 355 billion (2007)  
**Imports:** USD 223 billion (2007)

**Currency:** Rouble

**Business Hours:**  
 Offices 9.00 a.m. - 6.00 p.m. Monday-Friday  
 Banks 9.00 a.m. - 6.00 p.m. Monday-Friday

**Museums:**  
 10.00 a.m. - 7.00 p.m. Tuesday-Sunday

**Electricity:** 220 Volts AC, 50 Hertz

### USEFUL LINKS:

**Oil & Gas Main Companies:**  
 Gazprom – <http://www.gazprom.com>  
 Transneft – <http://www.transneft.ru>  
 Rosneft – <http://www.rosneft.ru>

**Russian Oil and Gas Web-Sites:**  
 Argus (ru-en-jp-chn) – <http://www.argus.ru>  
 Central Dispatching Department of Fuel and Energy Complex (ru-en) – <http://www.riatec.ru>  
 Neftegaz (ru-en) - <http://neftegaz.ru>  
 Oil Capital (ru-en) – <http://www.oilcapital.ru>  
 Oil & Gas Vertical (ru-en) - <http://www.ngv.ru>  
 Rusenergy (ru-en) - <http://www.rusenergy.com>

**Ministries/Authorities:**  
 President of the Russian Federation (ru-en) – <http://www.kremlin.ru>  
 Ministry of Foreign Affairs (ru-de-fr-en-es) – <http://www.mid.ru>  
 Ministry for Economic Development (ru-en) – <http://www.economy.gov.ru>  
 Ministry of Industry and Trade (ru-en-chn-ara) – <http://www.minprom.gov.ru>  
 Ministry of Finance (ru-en) – <http://www.minfin.ru>  
 Federal Customs Service (ru-en) – <http://www.customs.ru>

| City                      | Time       |
|---------------------------|------------|
| London                    | Noon       |
| In Russia                 |            |
| Kaliningrad               | 2.00 p.m.  |
| Moscow                    | 3.00 p.m.  |
| Samara                    | 4.00 p.m.  |
| Yekaterinburg             | 5.00 p.m.  |
| Novosibirsk               | 6.00 p.m.  |
| Krasnoyarsk               | 7.00 p.m.  |
| Irkutsk                   | 8.00 p.m.  |
| Yakutsk                   | 9.00 p.m.  |
| Khabarovsk                | 10.00 p.m. |
| Magadan                   | 11.00 p.m. |
| Petropavlovsk-Kamchatskiy | Midnight   |
| Anadyr                    | 1.00 a.m.  |

### NATIONAL HOLIDAYS:

The New Year's Holidays - January 1-5,  
 Orthodox Christmas - January 7,  
 Day of Fatherland Defender - February 23,  
 International Women's Day - March 8,  
 Holiday of Spring and Labour - May 1,  
 Victory Day - May 9,  
 Independence Day - June 12,  
 National Unity Day - November 4.

### HOW TO CALL RUSSIA FROM OUTSIDE:

00 + 7 + area code + telephone number (total 10 digits after 00)  
 Where:  
 7 – country code of the Russian Federation  
 Area code: from 3 to 5 digits depending on area  
 Telephone number: from 5 to 7 digits

### TO CALL TIAL HEADQUARTERS FROM OUTSIDE RUSSIA:

00 7 495 9747008  
 Where:  
 7 – country code  
 495 – area code for Moscow  
 9747008 – TIAL reception

### TO CALL TIAL HEADQUARTERS FROM A RUSSIAN

**REGION:** (instead country code 7 dial 8)  
 Example: 8 495 9747008

**TO CALL TIAL HEADQUARTERS FROM MOSCOW:** (just dial 7 digits) 9747008

**EMERGENCY CALLS INSIDE RUSSIA:** 911





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