

## FIELD INSTALLATION OF INSULATING JOINTS

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| N°<br>Rev | DESCRIPTION OF REVISION                                 | ISSUED QA |           | CHECKED PGT |           | APPROVED PGT |           |
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|           |   | Date      | Signature | Date        | Signature | Date         | Signature |
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| 2         | High voltage Protection                                 | 04.06.02  |           | 04.06.02    |           | 04.06.02     |           |
| 3         | Joint protection during PWHT                            | 04.06.03  |           | 04.06.03    |           | 04.06.03     |           |
| 4         | Shotblasting operations                                 | 09.12.03  |           | 09.12.03    |           | 09.12.03     |           |
| 5         | Other recommendations                                   | 01.10.05  | S.A       | 01.10.05    | I.C.      | 01.10.05     | I.C.      |
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| 7         | Reccomendations about testing conditions                | 21.09.15  | I.C.      | 21.09.15    | L.P.      | 21.09.15     | G.V.      |
|           |   |           |           |             |           |              |           |
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1. **SCOPE** : Handling and installation of joints on site
2. **FIELD OF APPLICATION** : Every insulating joint
3. **REFERENCES** : Zunt Quality Assurance Manual ; NACE RP0286
4. **RESPONSIBILITY**: Users
5. **INSTRUCTIONS**

#### 5.1 ELECTRIC MEASUREMENT BEFORE INSTALLATION

Before the joint is installed , the Inspector or Company Representative shall measure the electrical insulation resistance of the joint in upright position with a 1000 DC volt megger in dry and clean conditions. The result shall be at least 25 MOhm. This test can not be performed once the joint is already installed.

#### 5.2 INSTALLATION

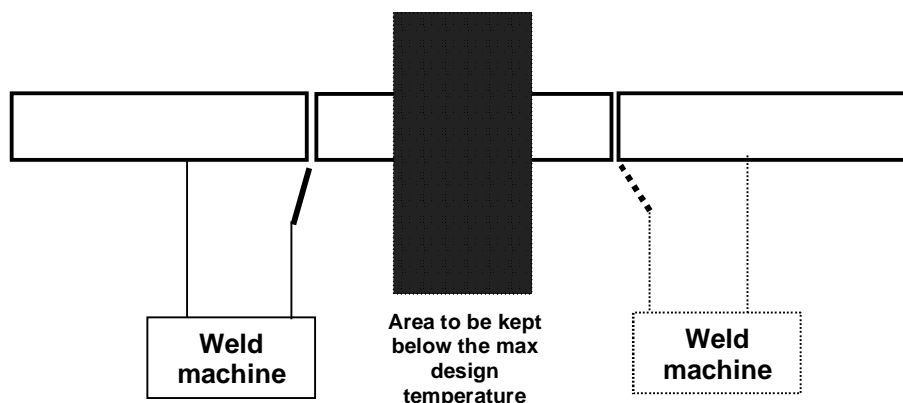
Handling and transportation of the joints in the various site areas shall be done very carefully, so as to prevent any mechanical damage or permanent deformation.

A particular care shall be taken not to damage the internal and external coating in any way.

On a distance of 25 - 30 mm, any protection or foreign material shall be removed, both internally and externally from all weld ends, which shall then be ground or repaired to recondition, if necessary, all weld bevels. The latter shall be free from oil, grease or any other contaminating material that would affect the subsequent welding.

**Hammering, hitting or heating the ends of dielectric joints shall be absolutely avoided.**

**The union welding between the dielectric joint and the adjacent line pipe shall be done very accurately, making sure that the weld can shrink freely, with no obstacle and in any case that, at the end of that operation, no stresses are grieving on the joint (both longitudinally and transversally). During field welding, be sure to move the earthing electrical terminal to the same side of the weld to be made (see the sketch here below). This will avoid any damage to the dielectric properties due to the welding current.**



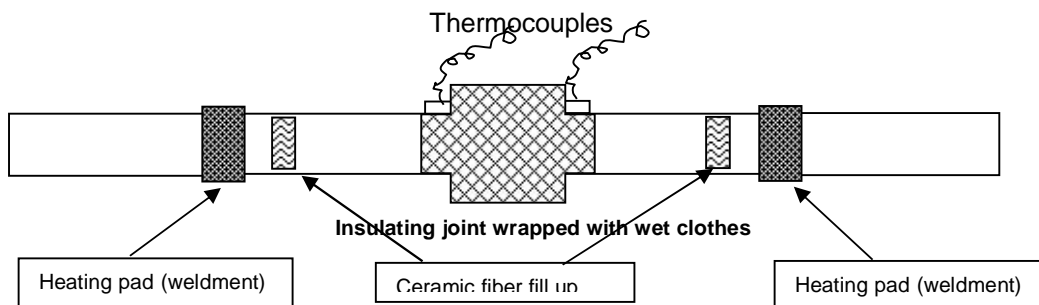
Assembly and welding operations shall be carried out by skilled personnel (qualified welders ), using approved Welding Procedure Specifications.

**Welding and post weld heat treatment shall be carried out in such a manner that the heat generated does not damage the insulating materials, the interpass temperature shall be maintained within limits allowing the temperature of the insulating joint central body not to exceed THE MAX DESIGN TEMPERATURE.**

There is no preferential direction as regards the fluid conveyed. When insulating joints are installed in vertical position, the closure weld "F" of the insulating joint (visible weld on joint central body) shall be preferably installed **upwards**.

### PWHT PERFORMANCE

**When PWHT has to be carried out after installation, care shall be taken to protect the joint body parts from overheating. The internal bore of the joint shall be filled with ceramic-fiber blanket or refractory material immediately after the area to be heat treated, in order to prevent internal heat convection towards the joint body parts. Suitable cooling methods shall be employed (wet clothes wrapping, compressed air, etc.) and the joint body parts temperature shall be monitored for the whole duration of the PWHT in order not to overcome the maximum design temperature reported by the identification label..**



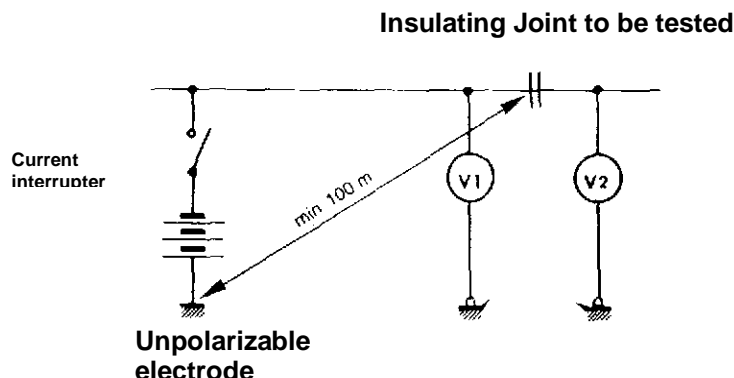
### 5.3 TESTING AFTER INSTALLATION

Reliability of all electrical integrity checks is strongly influenced by the conditions in which the joint is tested. Insulating joint electrical integrity must be assessed with the joint dry and clean.

In particular ZUNT recommend to perform this check before any pressure test in order to avoid the need of complicated drying operation of the pipeline to remove completely any traces of water across the joint, that would affect the reliability of the measurements.

Testing method - Alternative 1 – Voltage variation method

The sketch n°1 shows the scheme of the circuit to be made .



### SKETCH N°1

The integrity of the joint can be tested by the tension variation method.

The tension variation shall be high enough to allow a good evaluation of the joint (about 1.35V).

A chopper shall be installed in the circuit of the closest impressed current station .

If the tension difference  $\Delta V$  is not high enough , a temporary impressed current station with a current interrupter shall be installed close to the joint to be tested.

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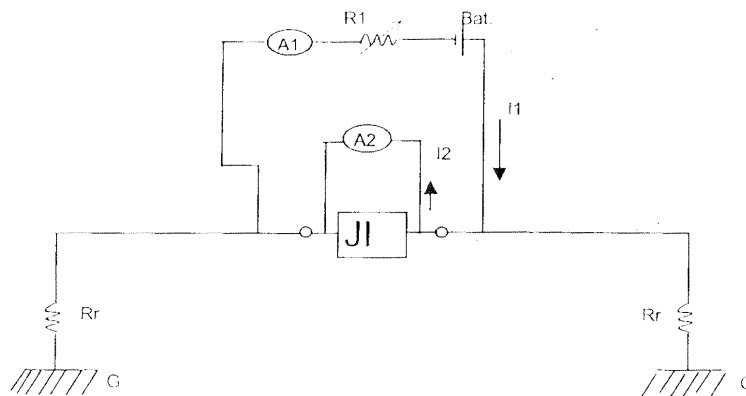
After having applied the tension  $\Delta V$ , tensions  $V1$  and  $V2$  shall be measured by means of two voltmeters:

- The joint is in good conditions if, when  $\Delta V$  is applied, either  $V2$  does not change or it changes in the opposite way than  $V1$ .
- The joint is faulty if  $V2$  is either equal or almost equal to  $V1$ .

**PRECAUTIONS: In order to perform a reliable test, it is important to observe the following precautions:**

- 1) Any connecting cable employed to short-circuit the joint during weld operations in site shall be removed.
- 2) Any metallic support short-circuiting the insulating joint shall be removed or suitably isolated.
- 3) The inside internal surfaces of the pipeline in correspondence of the joint shall be dry and free from any conductive material.

#### TESTING AFTER INSTALLATION – Alternative 2



The following method of checking insulating joints consists in measuring the current  $I2$  by means of an amperometer  $A2$  in dry conditions.

A 12 V battery is connected in parallel with the Joint with an amperometer  $A1$  and a variable resistance  $R1$  as per above sketch.

The joint is not damaged if the measurement obtained from  $A1$  is the same of  $A2$ .

If the joint is not damaged any current variation  $I1$  generated by the variation of resistance  $R1$  will change the  $I2$  current approximately in the same proportions.

The joint is damaged if the  $I2$  current is near zero or the variation is too small for any variation of  $I1$ .

If any discrepancies on electrical test value will arise and test were carried out in a reliable way, the only reason of this fault is that the installation was not carried out following our previously described recommendations. As a heat damaged installed joint can't be repaired, it must be replaced with a new monoblock insulating joint.

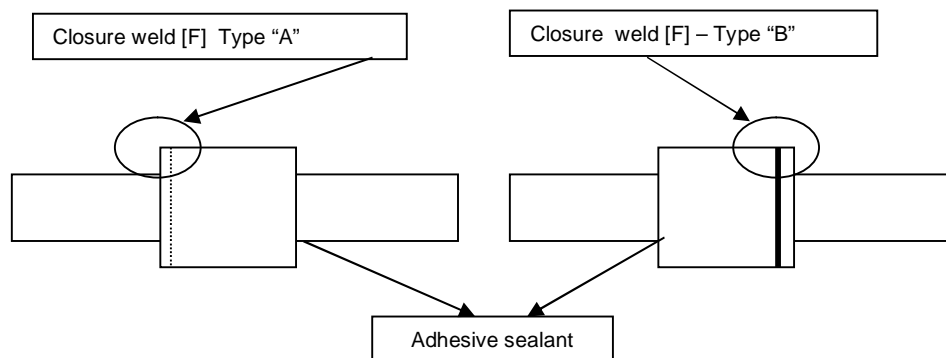
#### 5.4 HIGH VOLTAGE PROTECTION

Insulating joints dielectric properties may be damaged by lightning and high voltage surges generated by fault conditions, switching surges, induced AC from adjacent high voltage cables. Therefore it is advisable, according to the particular application in which the joint is employed, to protect the joint with devices like capacitors, polarisation cells, spark gaps, or any equivalent solid-state product. Lightning arrestors and other protective devices shall be located to prevent the collection of dirt and moisture that could lead to an external flashover at a relatively low surge voltage.

#### 5.5 SHOTBLASTING OPERATIONS

In case it is necessary to carry out shotblasting operations on installed joints, care must be taken to avoid removal of the adhesive sealant on the epoxy filler area. The area of application of the adhesive sealant is easily identifiable because it is the side that is opposite to the side where the joint body closure weld is present.

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6. **DOCUMENTATION:** Results of any electrical test shall be written in a report by the appointed personnel dated and signed.