DeMaCo

SPECIAL MACHINERY - CRYOGENICS - VACUUM TECHNOLOGY - ENGINEERING - ISO 9001 / VCA**

Mounting instructions
Welded coupling

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Introduction

These mounting instructions apply to vacuum insulated piping, connected by means of welded couplings. You must read these instructions before starting the mounting.

Mounting instructions

Check the piping sections using the isometric drawing. On each section, the project number, piping number and section number are engraved at the pump valve location (Fig.1, pos.6) by DeMaCo Holland bv. The engraved section numbers on the piping correspond with the section numbers on the isometric drawing. The piping and section numbers can be read even when the packaging is still applied. Do not remove the packaging until the moment of final fitting.This prevents dirt and moisture from entering the piping sections.
In case of several pipelines, we recommend that you first sort the sections by pipe line number, before proceeding with mounting.
Each section ends with a welding ring (Fig.1, pos.2) on the outside jacket. At the connection of the sections, the jacket (Fig.1, pos.3) is welded on these welding rings. The jackets do not have a section number.The diameter of the jacket is such that it fits exactly over the welding rings.The pump valves (Fig.1, pos.6) are supplied separately, and are all identical.Also refer to figure 2.

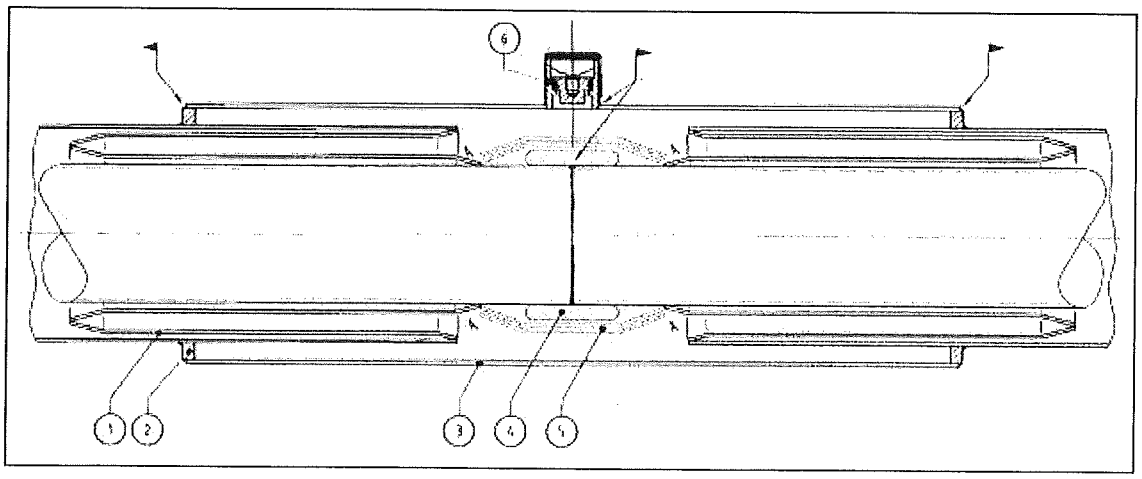

Figure 1: Cross section of a DeMaCo Holland bv welded coupling (straight version)

Note

Do not weld the pump valve onto the jackets before the jackets are in their final positions between two sections. Once the pump valves are welded onto the jackets, the jackets can no longer be slid over the welding rings.

Depending on the routing of the piping a starting point for the fitting process can be selected. This does not necessarily need to be at section number 1.

Place the chosen starting section on the supports, and position the following section with an interim distance of 600 mm onto the supports too. Remove the packaging from the ends of the sections. Check for possible contamination at the section ends. In case of doubt, clean the ends with a clean piece of paper or cloth. In heavily contaminated environments and during rain, we recommend that you perform the fitting in a tent, or to shield of the environment using screens.
Position the jacket on one of the two sections past the welding ring. Now slide the two sections with the inner piping against one another. Before starting welding the inner piping, the inner piping must be filled with backing gas. This gas prevents the burning of the material of the inner piping. Ensure that a constant flow of backing gas flows from the welding seam during welding. Once this is ensured, the inner piping can be welded all around. The weld can, after it has cooled down, be tested for leakage using X-ray and/or helium.

Brush the weld clean, using a stainless steal wire brush. De-grease the outside of the inner piping next to the weld, using a cloth soaked in alcohol.

Note
After the inner piping has been de-greased, you must avoid touching the inner pipe with your hands. Wear nylon gloves during fitting of the molecular sieves and the super insulation.

The molecular sieves are packaged in a fibre bag (Fig.1, pos.4). In turn this fibre bag is packaged again in a plastic bag. This being to prevent adsorption of humidity during storage. Remove the plastic bag and position the sieves including the fibre bag on the inner piping at the position of the weld. Now wrap 20 layers of super insulation (Fig.1, pos.5) around the visible part of the inner piping. Ensure that the aluminium foil does not come into contact with the heat bridges (Fig.1, pos.1). Wrap up to the points "A" in figure 1.

Now the jacket can be slid over the inner piping, until the jacket rests on both welding rings. Ensure that the jacket is rotated in such a way, that the opening for fitting the pump valve is at the top, as shown in figure 1. Check, with respect to obstacles in the surroundings of the jacket, whether it is possible in this position to place a pump-out tool on the pump valve. When this is not possible, the jacket must be rotated. Ensure that the opening for the pump valve remains within the top 180 degrees of the jacket.

Note
Each section is vacumised ex-works. Welds on the outside jacket of a section will lead to breaking the vacuum. As a result of the vacuum, the meltage will be drawn to the inside, and a hole in the outside jacket is created. Only weld on the welding rings at the location where the jacket rests on the welding rings.This is clearly shown in figure 1.

Weld, using tack-welding, the jacket on the welding rings.

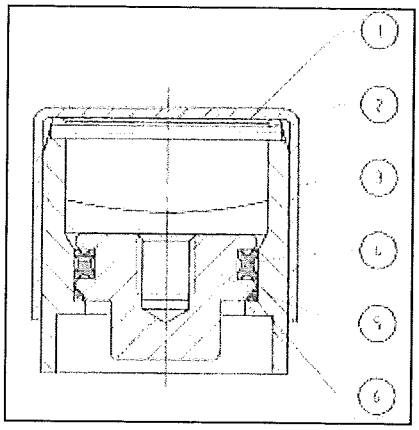

Figure 2: Cross section pump valve

Position the pump valve house (Fig. 2, pos. 3) in the opening in the jacket. Check whether the opening is properly covered by the pump valve house. Do not insert the house too far in the jacket. This can lead to problems when connecting the pump-out tool. Now weld the pump valve house fixed in the jacket.

Position an industrial hot air gun, with inlet filter, in the pump valve house. Heat the inside space of the welded coupling up to 200 °C and maintain this temperature for one hour. Remove the hot air gun and fill the internal space of the welded coupling with backing gas. Now weld, with a light flow of backing gas, the circumference of the jacket to the welding rings. Then let the jacket cool down to room temperature.
Check whether the pump valve house has cooled down completely, before the following activities are performed.

Now the welded coupling can be vacumised. To this end you need a pump-out tool and the remaining parts of the pump valve. Lightly grease the Quad-ring (Fig. 2, pos. 4) with silicone grease. In case of oxygen applications, you must use e.g. Fomblin grease. Position the Quad-ring in the groove in the plug (Fig. 2, pos. 5). Then fit the plug, with Quad-ring on the spindle of the pump-out tool (M8 thread). Screw the plug lightly onto the spindle. Do not use any tools. Remove the spindle from the pump-out tool in the top position, and turn the spindle in such a way that it locks in the highest lock. Check whether the outside of the pump valve is actually clean. Now lightly grease the O-ring (Fig. 2, pos. 6) and place it in the pump valve house on the position shown in figure 2.
Now place the pump-out tool on the pump valve.

Connect a helium leakage tester to the pump-out tool and check whether all welds are leak tight (approval criterium: $1x10^{-9}$ mbarl/sec).
Remove only the leakage tester, and connect a vacuum pump to the pump-out tool. Now vacumise the space in the welded coupling up to a vacuum level of $1x10^{-4}$ mbar. Once this vacuum level has been reached, the pump valve can be closed. Turn the spindle of the pump-out tool out of the height locking, and slowly push the spindle downwards. When the plug comes into contact with the house of the pump out tool, you must push the plug in the pump valve house using a certain amount of force, until you feel that the plug touches an end stop. Also refer to figure 2.
Now break the vacuum at the vacuum pump side. Now the plug can be removed from the pump out tool spindle.Turn the spindle anti clockwise (min. 10 turns) until the spindle can be freely moved up and down. Now the plug is separated from the spindle. Remove the pump-out tool from the pump valve.

Finally the pump valve must be further finished. Apply vacuum grease (428 of Rhodorsil, manuf. Rône-Poulenc) to the top of the plug which is visible in the pump valve house. In particular the transition zone between the plug and the pump valve house must be properly greased.The grease is clearly shown in figure 2.
Insert the supplied small shaft ø 2 mm (Fig.2, pos. 2) through the holes at the top of the pump valve house. Finally place the plastic protection cover (Fig.2, pos.1) over the pump valve. Now the welded coupling is completely fitted.

Apart from the above described straight welded coupling, DeMaCo Holland bv also supplies a 90° welded coupling. This coupling is used when two sections have to be connected at an angle of 90°. For this coupling the same fitting procedure applies as for the straight welded coupling. The only difference is the jacket (Fig.3, pos.3), which is, for this version, composed of two sections instead of one pipe section. These two sections must, before the inner piping is welded, be slid around both sections. Figure 3 shows a cross section of the DeMaCo angle welded coupling.

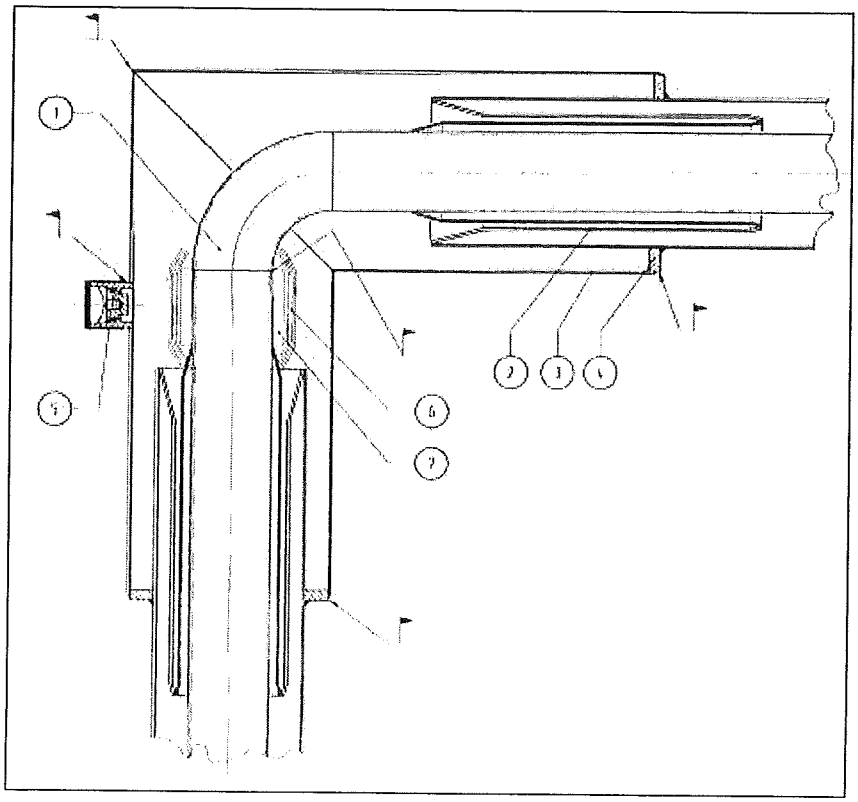

Figure 3: 90° welded coupling DeMaCo Holland bv

Storage of the vacuum-insulated piping

Vacuum-insulated piping must be stored dry and packaged. Ensure that moisture and dirt are not able to enter the piping.The minimum storage temperature of the piping is 18 °C.

Note

Ensure that the packaging and protection of the ends of the piping sections remains undamaged during transport and storage.

Maintenance

The maintenance of a vacuum-insulated piping is limited to a visual inspection, once a month. Ice deposits on the outside jacket, or on flanges of the couplings can indicate a decrease in the vacuum level in the vacuum space. Under normal circumstances this occurs after some years. As a result of the decrease of the vacuum level, the insulation value also decreases.Thus ice becomes visible.The insulation is restored by re-vacumisation of the piping or section. DeMaCo Holland bv has all relevant equipment and expertise to perform this re-vacumisation.
For a proper re-vacumisation, the piping must be empty, and should be brought up to at least room temperature.