



Mounting Instructions Welded Coupling

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I. STRUCTURE OF THE MANUAL / CLARIFICATION

The various aspects of this manual are clearly listed here. Points of attention are marked throughout the entire manual in the following way (the interpretation is also given):



HINT

Offers suggestions/advice to the operator in order to perform certain tasks more easily.



NOTE

Points out possible problems to the operator.



CAREFUL

Indicates damage to the system or directly linked equipment when the operator does not carefully adhere to the procedures.



WARNING

Warns the operator of possible injuries if the procedures are not adhered to properly.



PERIL TO LIFE

The life of the operator is directly threatened.

**Demaco Holland bv considers the operator to be:
the one who operates the machine or equipment supplied by Demaco Holland bv.**



WARNING

The operator is responsible for the safety of any assisting employee. The operator must ensure, before starting the machine or application, that no dangerous situation can occur for the assisting employee.

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II. SAFETY AND HEALTH CONCERNS



NOTE

This user manual must be read by the operator as soon as possible in order for him to become familiar with the operation of this equipment.

From the point of view of injuries to the operator, specific attention is given to the dangers that can occur when using liquid nitrogen. On Demaco Holland bv equipment, where the operator may come into contact with liquid nitrogen, you can find the label as shown below. It warns the operator of the presence of coldness and it is indicated that safety glasses and gloves with wrist protection should be worn.



figure 1; *Safety label*

This user manual should at least be available for consultation at the head of the department. We recommend that a copy be made of this manual inserted in plastic folders, or bound, and put on view at location with the control cabinet.

We also recommend to carefully read the Demaco safety instruction "Safety guidelines for working with cold media". Extensive information is provided in this manual about working with cryogenic media. A copy of the "safety instruction" is shipped with this delivery. Should you require more copies of this instruction in order to create a save working environment for your operator(s), additional copies can be requested from Demaco Holland bv. Contact our sales department.

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1 INTRODUCTION

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

2 GENERAL INSTRUCTIONS

Before mounting check the pipe sections using the isometric drawing. On each section, the project number and section number are engraved at the pump valve by Demaco Holland B.V. This corresponds with the project and section as can be found on the isometrics.

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.

If all sections are identified and sorted check the parts necessary to complete the welded couplings. Part items can be found on the drawings of the weld connections. But you should have at least per welded coupling:

2x Sections with heat bridge (Fig2, pos.1) and weld ring (Fig2, pos.2)

1x Vacuum jacket (Fig2, pos.3)

1x Pump valve complete (Fig2, pos.6)

- Pump valve plastic cover cap
- Pump valve housing
- Pump valve plug
- Quad ring
- Shaft Ø2mm

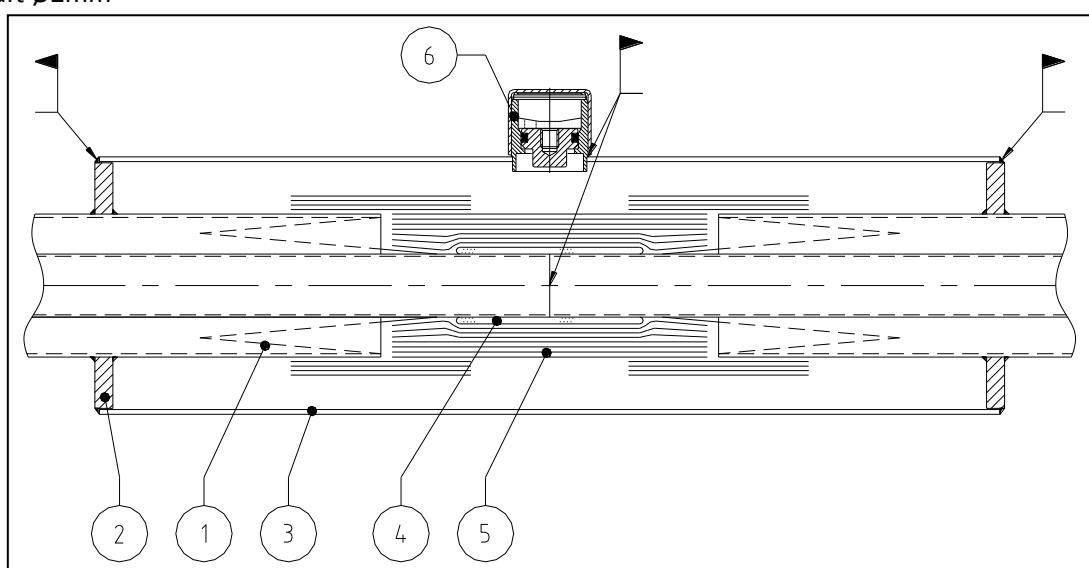


figure 2; *Straight welded coupling*

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The jackets do not have a section number. Also the diameter of the jacket is such that it fits exactly over the welding rings. The pump valves are delivered separately, and are all identical.



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.

3 MOUNTING INSTRUCTIONS

3.1 Straight coupling

Step 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.

Step 2:

Position the jacket on one of the two sections past the welding ring.

Step 3:

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.

Step 4:

The weld can, after it has cooled down, be tested for leakage by means of a helium leakage tester (acceptance criteria: 1×10^{-9} mbar·l/sec).

Step 5:

De-grease the inside of the vacuum chamber using a cloth soaked in alcohol. The vacuum chamber contains the outside of the inner piping, the outside of the vacuum jacket of the process pipe and the inner side of the vacuum jacket of the weld connection.



NOTE

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

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Step 6:

The molecular sieves are packaged in a fibre bag (Fig.2, 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 underneath the pump valve. Fasten the molecular sieves including the fibre bag to the process pipe with Silver tape (for example: 3M type 850). Wrap super insulation (Fig2, pos.5) loosely from the opening in the heat bridge at one end, around the visible part of the inner piping until the opening in the heat bridge at the other end. The glass paper of the super insulation may come in contact with the heat bridges, but ensure that the aluminium foil does not come into contact with the heat bridges. Fasten the super insulation with stainless steel wire or Silver tape. Now wrap 10 layers super insulation over the gap between the heat bridges and the already applied super insulation. Make sure the super insulation does not come in contact with the vacuum jacket of the weld connection and fasten the super insulation with stainless steel wire or tape.

Step 7:

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 2. 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.



CAREFUL

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 2.

Step 8:

Place, at both ends of the welded coupling, preferably at the bottom side of the vacuum jacket a slotted screwdriver and create a gap. Weld the jacket on the welding rings except for a gap of approximately 5mm at the bottom side of the vacuum jacket.

Step 9:

Position the pump valve house (Fig 3, pos.3) in the opening in the jacket. Check whether the opening is properly covered by the pump valve house. Now weld the pump valve house fixed in the jacket.

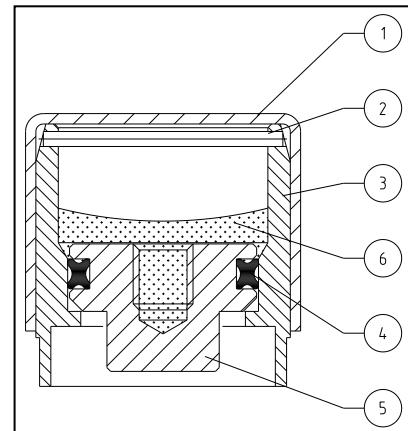


figure 3; *Pump valve*

Step 10

Prior to the next steps the pump-out tool needs to be prepared. You need a pump-out tool and the remaining parts of the pump valve. Lightly grease the Quad-ring (Fig.3, pos.4) with vacuum grease (For example: Dow Corning, type: High Vacuum Grease). 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. Store the valve pump-out tool during step 11 and 12 in a clean and dry environment.

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Step 11:

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 at least one hour. Remove the hot air gun.

Step 12:

Now weld the remaining circumference of the jacket to the welding rings.

Step 13:

Now the welded coupling can be vacumised. Check whether the outside of the pump valve is actually clean. Now place the pump-out tool on the pump valve.

Step 14:

Connect a vacuum pump to the pump-out tool. Now vacumise the space in the welded coupling up to a vacuum level

$< 1 \times 10^{-3}$ 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 valve, 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 3. Now break the vacuum at the vacuum pump side.

Step 15:

If necessary, the welded coupling can be checked on leakage by a helium leakage tester. Connect the helium leakage tester onto the pump-out tool. Vacumise the space in the pump-out tool to a vacuum level $< 1 \times 10^{-3}$ mbar.

Pull the spindle slowly upwards so the plug will come out of the pump valve housing. Turn the spindle of the pump-out tool in the height locking. Check whether all welds are leak tight (acceptance criteria 1×10^{-9} mbar·l/sec).

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 valve, 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 3. Now break the vacuum at the vacuum pump side.

Step 16:

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.

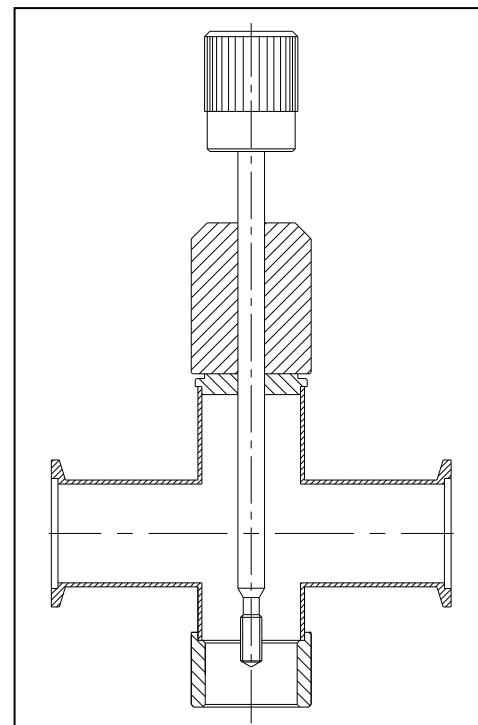


figure 4: *Pump-out tool*

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Step 17:

Finally the pump valve must be further finished. Apply vacuum grease 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 3, pos 6. Insert the supplied small shaft ø 2 mm (Fig.3, pos.2) through the holes at the top of the pump valve house. Finally place the plastic protection cover (Fig.3, pos.1) over the pump valve. Now the welded coupling is completely fitted.

3.2 Corner welded coupling

Apart from the above described straight welded coupling, Demaco Holland B.V also supplies a corner 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.5, pos.1), 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 5 shows a cross section of the Demaco corner welded coupling.

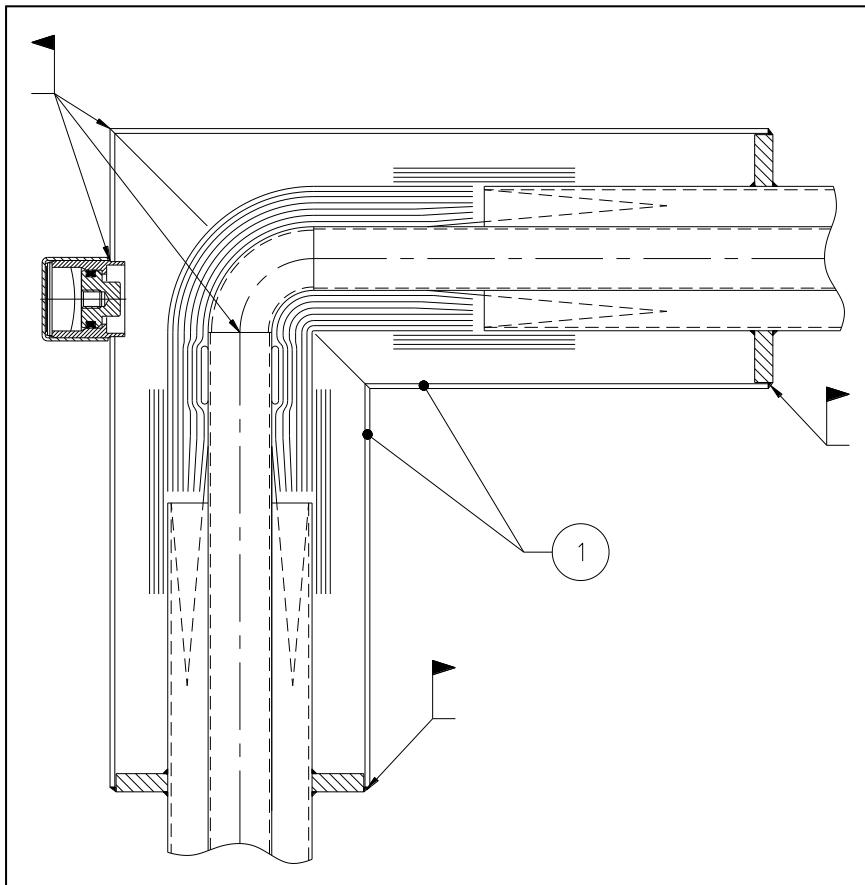


figure 5; *Corner welded coupling*

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3.3 Welded T-coupling

A combination of a straight and corner coupling is a welded T-coupling. Working procedure is equal to the above mentioned couplings (straight and corner).

Position the three pipe section on the supports. Slide the three jackets (Fig.6, pos.1) around each section of the pipe and check the length of each part. Shorten the inner pipe and jacket if necessary and weld the inner pipe together.

When the inner pipe is fitted, clean the pipe and wrap 20 layers of super insulation around the inner pipes, as described in step 6 of the straight welded coupling.

The remaining vacuum jacket (Fig.6, Pos.2) is carried out as two half shells. These shells are mounted and welded when the vacuum jackets at the welding rings are welded according step 8 of the straight welded coupling

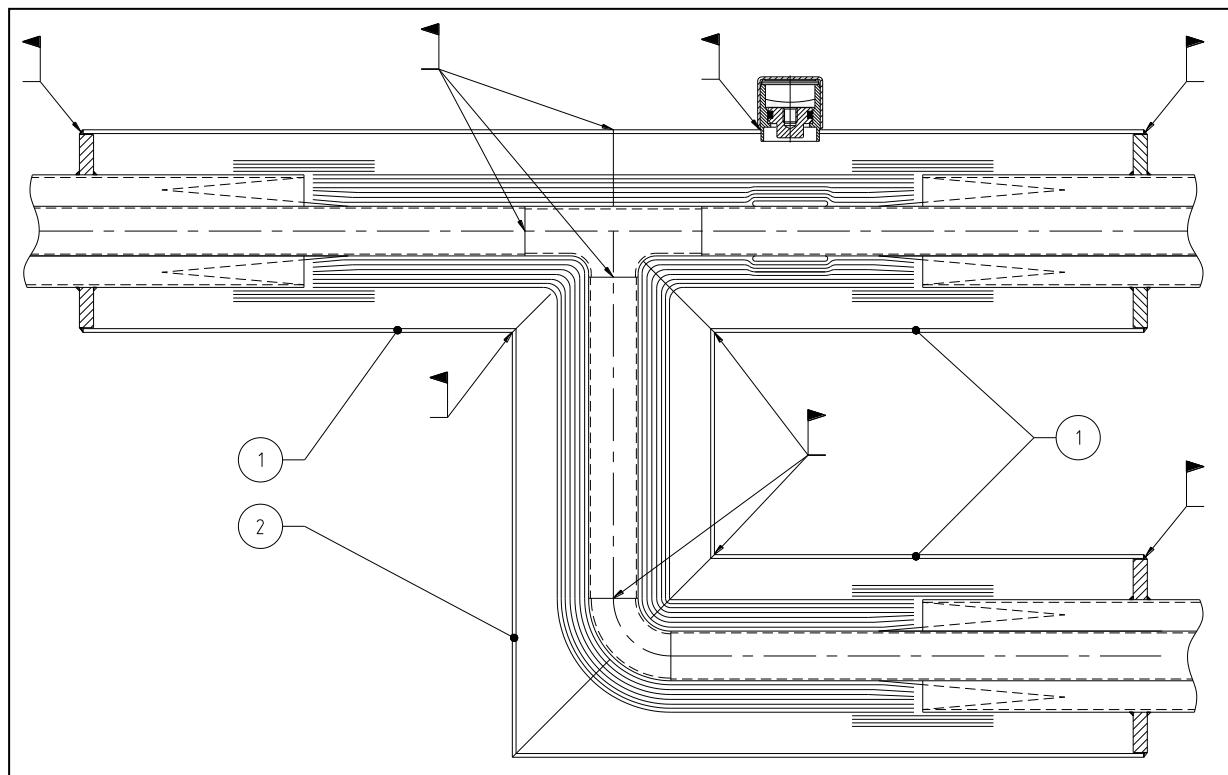


figure 6; **Welded T-coupling**

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5 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.



CAREFUL

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

6 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 B.V. 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.