

**Maintenance Instructions
Demaco VI Valve
DN15 and DN25**

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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):



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



Points out possible problems to the operator.



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



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



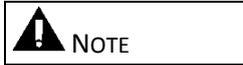
The life of the operator is directly threatened.

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



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.

II. SAFETY AND HEALTH CONCERNS



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 on Demaco Holland bv products*

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 safe working environment for your operator(s), additional copies can be requested from Demaco Holland bv. Contact our sales department.

Maintenance Instructions Demaco VI Valve DN15 and DN25

1 STAINLESS STEEL CRYOGENIC GLOBE VALVE DN15 (Ø18X1) AND DN25 (Ø28X1)

Manual or pneumatic operated vacuum jacketed cryogenic valve DN25 (Ø28x1) for liquid nitrogen or liquid argon use, maintainable valve and seat, straight (Y) or angled.

Specifications:

Design Pressure	PN16
Operating Pressure	PN16 (manual drive) PN12 (standard pneumatic drive).
Operating temperature	-196 °C – +65 °C
Opening/closing Cycles	30.000 over lifetime under normal conditions.
Cooling down cycles	10.000 over lifetime
Condensation	Up to 60% RH no moist in static conditions.
Leak tightness	
- Valve to vacuum	$< 1 \times 10^{-9}$ mbar.l/s
- Process over seat	$< 1 \times 10^{-3}$ mbar.l/s (equivalent to Rate B ISO-5208)

Connections:

Weld Ends	DN25: Ø28 x 1,5 DN15: Ø18 x 1,5
Jacket	Ø63,5 x 1,5

Materials:

Body	1.4301
Stem	1.4301
Gland	CW614N / PTFE
Seal	PTFE (PCTFE optional)
Seat	1.4301
Cone	1.4404
Handwheel	Aluminum

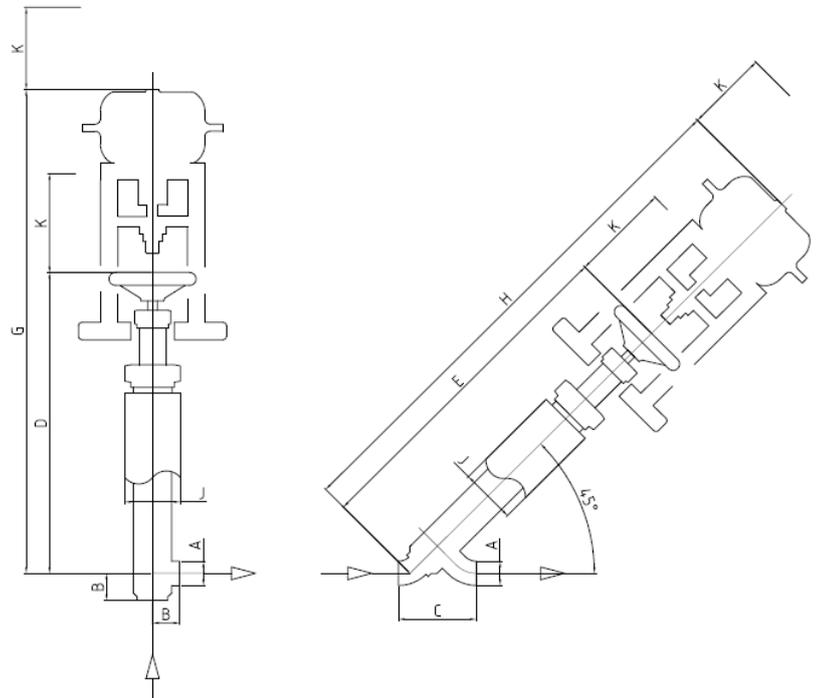
Valve Drive

Manual Drive	Handwheel Ø100mm
Pneumatic Drive	120 cm ² , Normally Closed
Air Supply	3-5 bar, 6 bar max.
Power supply	230VAC, (24VAC or 24VDC optional); 30VA
Protection type	IP65 (DIN 40050)
Valve acc. to PED 97/23/EC.	
Solenoid acc. to LVD 06/95/EC	

	DN15	DN25
A	Ø18 x 1,5	Ø28 x 1,5
B	32	31
C	88	89
D	350	350
E	395	395
G	560	560
H	605	605
J	Ø63,5 x 1,5	Ø63,5 x 1,5

Clearance for maintenance:

K	260	260



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2 PREVENTIVE MAINTENANCE

- Periodically (at least once every three months) check the valve for damage or signs of wear or leakage. Moist may be normal, but may also be an indication that something is damaged or leaking.
- Periodically (at least once every three months) check proper functioning of the valve by opening and closing of the valve. Check that the valve can be opened and closed properly. Check there is no flow when the valve is closed.

In case of malfunction see chapter 6 of this manual.

3 REPAIR INSTRUCTIONS

3.1 Preparations and Warnings

- Before commencing any maintenance, make sure the Demaco safety guidelines are read and understood. Make sure any technician working on the valve is familiar with cryogenic equipment.
- During maintenance the pneumatic drive may require operation. Beware of risk of injury (jamming or crushing of fingers).
- Before commencing any maintenance, make sure the pressure in the system is released.
- Before commencing any maintenance, make sure the system is warm. This may take a day or more.
 - When the system is cold, parts are stuck rock solid, and cannot be removed.
 - Moist from ambient air will enter a cold system, and forms hard, solid particles in cryogenic circumstances. This may lead to leakage of, or damage to, valves and equipment. This is the major cause for malfunctioning of a cryogenic valve.

3.2 Repair Procedures Manual Operated Valve

A. Gland, tightening

1. Open the valve at least 1 turn.
2. Tighten Gland Nut (Pos. 1) $\frac{1}{4}$ turn at a time.
3. Pressurise the system using warm gas.
4. Test the gland using water/soap.
5. Release the pressure.
6. If leak still occurs, repeat from step 1.
7. Close the valve.

B. Valve Stem assembly, removing

1. Open the valve at least one turn.
2. Hint: If the Gland Packing needs maintenance, loosen the Gland Nut (Pos. 1) before the next step.
3. Unscrew Headpiece Nut (Pos. 5).
4. Remove the valve stem assembly.
5. Cover the valve housing to prevent moist entering the valve.

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C. Gland, replacing

1. Remove the Valve Stem Assembly (**B**),
2. Remove the handwheel.
3. Remove the spindle from the Headpiece.
4. Remove the Gland Nut (Pos. 1), the Compression Ring (Pos. 2), the PTFE gland packing (Pos. 3, set of 7 rings) and packing rings (Pos. 4, 2 off).
5. Check the headpiece and the spindle for signs of wear. Replace if necessary.
6. Clean and reinstall the packing ring (Pos. 4).
7. Install a new PTFE gland packing set (Pos. 3). The middle packings must be installed pointing upwards (^). Make sure the top and bottom ring are positioned correctly.
8. Install Packing Ring (Pos. 4) and Gland Compression Ring (Pos.2).
9. Position the Gland Nut (Pos. 1) but don't tighten.
10. Insert the spindle. Be careful not to damage the gland packing.
11. Tighten the Gland Nut (Pos. 1) firmly by hand.
12. Check aligning of the spindle by rolling the spindle on the edge of a flat surface. The headpiece may not wobble.
13. Reinstall the handwheel.
14. After reinstalling the headpiece (**D**) tighten the gland nut ½ stroke. Continue with (**A**).

D. Valve Stem installation

1. Make sure the valve and the valve stem are clean and dry. In case of doubt: dry the valve (**M**).
2. Open the valve (turn the spindle in the headpiece until the valve head is in the 'open' position).
3. install the valve stem assembly using the headpiece (Pos. 5). Tighten firmly.
4. Pressurise the system using warm gas.
5. Test the Valve housing/headpiece connection using water/soap.
6. Release the pressure.
7. If leak occurs, Clean and tighten the housing/headpiece parts, and repeat from step 2.
8. Close the valve.

E. Valve, Inspect

1. Remove the valve stem assembly (**B**).
2. If in doubt: Check the spindle top side for wear or scratches that may cause damage to the Gland. (**C2-5**). If required polish surface, replace spindle or replace Gland (**C**). Reinstall Spindle (**C9-12**).
3. Check the PTFE guiding ring (Pos. 6) at the bottom side of the spindle for wear. Replace if necessary.
4. Check the PTFE or PCTFE valve head seal ring (Pos. 7a/b) for wear, damage or foreign objects. Replace if necessary (**G**).
5. Check the Valve Cone (Pos. 7a/b) for wear. Visible wear may be caused by improper alignment of spindle. Replace if necessary.
6. Check the valve seat (Pos. 7a/b) for wear by removing the valve seat from the valve (**F**) or by checking inside the valve housing using a bright light. In case of doubt: Replace (**F**).
7. Reinstall valve stem assembly (**D**).

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F. Valve Seat Removal and installation

1. Remove the valve stem assembly **(B)**.
2. Use Demaco Valve Seat Removal Tool (pos. 14a/b) for removing the seat (Pos. 7a/b) from the housing. Make sure the tool is positioned properly to prevent damage to the seat.
3. Inspect the seat for damage such as chafing or scratches. If in doubt: replace the seat.
4. Put the seat in the Demaco tool.
5. Put flowtite "PTFE sealing joint" around the underside of the seat. For DN15 instead of sealing joint an annealed copper ring DIN7603A (M18x22) can be used.
6. Tighten the seat (DN15) with 20Nm torque or tighten the seat (DN25) with 30Nm torque.
7. Reinstall the valve stem assembly **(D)**.

G. Valve sealing ring, valve Cone, valve head Removal and installation

1. Remove the valve stem assembly **(B)**.
2. Remove the valve head from the spindle by loosening the top nut of the valve head (this is the nut where the spindle enters the valve head). The valve head is attached to the spindle by two half-moon shaped plates in the slot of the spindle.
3. Remove the Valve Cone (Pos. 7a/b). If the cone doesn't come loose, heat the valve head using a hot air gun to 70°C. Remove Valve Cone, be careful not to damage the screwdriver slot.
4. Inspect the PTFE or PCTFE sealing ring (Pos. 7a/b). Replace if necessary.
5. Inspect the Valve Cone for scratches or wear. Replace if necessary. Use one drop of Loctite 577 on the threads to secure the Cone to the valve.
6. Tighten the cone, be careful not to damage the screwdriver slot.
7. Put the valve head top nut over the spindle, put the half-moon shaped plates in the slot of the spindle, and screw the top nut into the valve head. Make sure the valve head can rotate slightly in all directions.
8. Reinstall the Valve Stem Assembly **(D)**.

3.3 Repair and Maintenance Procedures Pneumatic Operated Valve

Ref Manual Valve. Instead of opening the valve by turning the handwheel, open the valve by energizing the solenoid. Make sure to de-energize the valve when opening of the valve is not required. Be careful: Risk of injury caused by crushing of fingers or body parts.

H. Adjustment of pneumatic drive

1. Actuate the drive with 3-5 bar instrument air connected and solenoid energised.
2. De-actuate the drive.
3. Make sure the limit in (closed) travel is caused by the valve and not by the drive. If the travel is limited by the drive: open the valve (energize the drive), adjust the ball connection attachments (Pos. 8) to change the travel of the drive and close the valve (de-energize the drive). Repeat until satisfactory.

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J. Removal of pneumatic drive

Be careful when the valve is spring closed. When the valve is not energized the springs put a significant load on the valve drive and on the drive posts. Make sure the valve is actuated before loosening the bolts of the posts or the ball joint. A spring-opened valve needs no energising.

1. Open the valve (actuate the drive with 3-5 bar instrument air connected and solenoid energised).
2. Remove the two rings and nuts securing the drive posts.
3. Disconnect the ball joint (Pos. 8).
4. The drive can now be removed.
5. De-actuate the drive.

K. Changing Springs or membrane of pneumatic drive

1. Remove the pneumatic drive (**J**).
2. The springs and compressed air contain a lot of energy. Always make sure the valve is not actuated when opening the pneumatic drive. Disconnect the instrument air connection.
3. Open the actuator screws carefully, and open the actuator cap.
4. Add, Remove or Replace springs (Pos. 9) as necessary. The springs must be positioned symmetrically to prevent a bending force on the spindle. 2, 3, 4 or 6 springs can be used. The amount of springs influences the closing (process) pressure of the valve and the opening (instrument air) pressure of the valve drive.
5. Remove or Replace the Membrane (Pos. 10) if necessary.
6. Re-install springs, close the actuator and tighten the screws crosswise. Leaktest with water/soap (a small leak is acceptable).
7. Re-install the Pneumatic Drive (**L**).

L. Reinstall the pneumatic Drive

Be careful: the valve is spring closed. When the valve is not energised the springs put a significant load on the valve drive.

1. Actuate the drive (3-5 bar instrument air connected and solenoid energized).
2. Connect the drive to the spindle by reconnecting the ball joint (Pos. 8).
3. Reinstall the two rings and two nuts securing the drive posts.
4. De-actuate the drive. Adjust the pneumatic drive (**H**) if necessary.

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3.4 Drying of the valve

Water may enter the valve when there is an opening to ambient air. When the valve is cold this water will certainly and very quickly build-up ice. Therefore it is important to:

- Only service the valve when the valve is warm.
- If the valve is cold, keep all openings covered at all times to diminish the ingress of moist.
- Keep the valve at a steady slight overpressure with warm gas. This will reduce the ingress of moist.
- Clean and dry valve parts before installation at all times.

M Bake-out of Valve without removing seals.

1. Make sure the system is warm and not pressurized.
2. Disconnect the tubing, for instance at a Johnston Coupling, upstream and downstream of the valve.
3. Open the valve at least 50%.
4. Use a hot air gun to blow hot nitrogen gas or air (130°C max) through the process line for at least one hour.
5. Reconnect the tubing and close the valve.

N Bake-out of valve with removing seals.

In case there is a lot of moist, it is more effective to bake out at a higher temperature. The soft seals must be removed before heating:

1. Remove valve stem assembly (**B**), Gland packing (**C**) and Valve Seal (**G**).
2. Remove the sealing joint under the valve seat (**F**).
3. Reposition the valve stem without gland packing and seal. Leave the headpiece nut slightly open, so hot air blows through the shaft.
4. Bake-out the valve (**M**) while increasing the temperature to 230°C max. for at least one hour.
5. Reinstall the valve seal (**G**) the valve seat (**F**) and the valve stem (**C, D**).

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4 TROUBLE SHOOTING

Symptom	Diagnosis	Procedure
Leakage over valve, (Valve does not close completely)	Dirt or Ice Wear Gland packing damaged or too tight Pneumatic Drive, not enough travel Pneumatic Drive, not enough springs Pneumatic Drive, Membrane damaged	Clean and dry parts (E) Bake out the valve (N, M) Inspect and replace parts (E) Adjust Gland Packing (C) Adjust Pneumatic Drive (H) Add springs (K) Replace membrane (K)
Leakage over gland packing	Wear Spindle not straight in Gland Packing	Gland Tightening (A) Gland Replacing (C) Gland Replacing (C)
Moist on Top side of Valve	Humidity (RH) > 60% Lots of pressure fluctuations Valve only slightly opened Leakage over Gland or Headpiece (Check with water and soap)	- Stabilise process Open valve completely Readjust pneumatic drive (H) Tighten Gland (A) or Replace Gland (C) Tighten Headpiece (D)
Pneumatic Drive not functioning	Wear of gland packing Instrument Air pressure too low Solenoid malfunction Leaking or damaged Membrane	Adjust or Replace Gland Packing (A)(C) Adjust Instrument Air to 5 bar(g) Check or replace Solenoid Check voltage (230 VAC, 24 VAC/VDC) Check or Replace Membrane (K)

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5 ANNEX

Item	Description	Part No.	Quantity	Comments
1	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts
2	Valve Seat Assembly, DN25	418 100 000	1	Set containing 3 parts
3	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts
4	Valve Seat Assembly, DN25	418 100 000	1	Set containing 3 parts
5	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts
6	Valve Seat Assembly, DN25	418 100 000	1	Set containing 3 parts
7	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts
8	Valve Seat Assembly, DN25	418 100 000	1	Set containing 3 parts
9	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts
10	Valve Seat Assembly, DN25	418 100 000	1	Set containing 3 parts
11	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts
12	Valve Seat Assembly, DN25	418 100 000	1	Set containing 3 parts
13	Valve Seat Assembly, DN15	418 100 000	1	Set containing 3 parts

Remark:
 - Valid from 01-01-2009
 - When ordering spare parts specify diameter of valve

VALVE DN15-DN25 MAN / PNEU
 Spare parts list

DEMACO
 43715 C1219