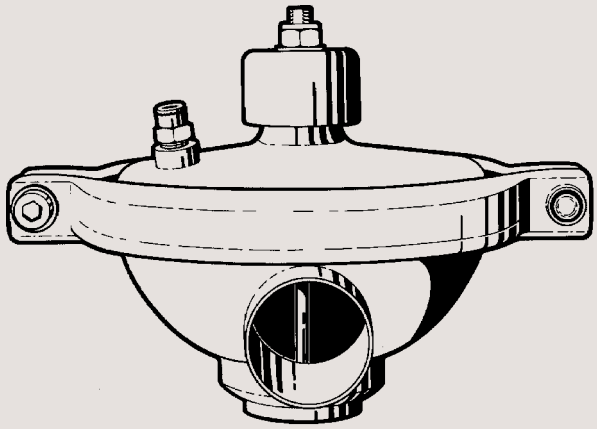
Instruction Manual

CPM-2 Constant-Pressure Modulating Valve



IM70775-GB3 2001-06

Declaration of Conformity

The designating company

Alfa Laval
Company Name

6000 Kolding
Address

+45 79 32 22 00
Phone No.

hereby declare that

Constant-Pressure Modulating Valve	**CPM-2**	
Denomination	Type	Year

Was manufactured in conformity with the provisions in the COUNCIL DIRECTIVE of 14 June 1989 on mutual approximation of the laws of the Member States on the safety of machines (89/392/EEC as amended by directives 91/368/EEC and 93/44/EEC) with special reference to Annex 1 of the directive on essential safety and health requirements in relation to the construction and manufacture of machines.

Bjarne Søndergaard	**Vice President, R & D**
Name	Title
Alfa Laval	B. Søndergaard
Company	Signature

Designation

CE

Table of contents

This manual is divided into main sections. - See below.

Safety

Unsafe practices and other important information are emphasized in this manual.

Warnings are emphasized by means of special signs.

1. Important information

Always read the manual before using the valve!

WARNING! : Indicates that special procedures **must** be followed to avoid severe personal injury.

CAUTION! : Indicates that special procedures **must** be followed to avoid damage to the valve.

NOTE! : Indicates important information to simplify practices or to make them clearer.

2. Warning signs

: General warning.

: Caustic agents.

All warnings in the manual are summarized on this page.

Pay special attention to the instructions below so that severe personal injury or damage to the valve are avoided.

3. Safety precautions

Installation:

: - **Always** observe the technical data (see page 16).
- **Always** release compressed air after use.
- **Never** touch the valve top if compressed air is supplied to the valve.
- The valve and the pipelines must **never** be pressurised when dismantling the valve.

Operation:

: - **Always** observe the technical data (see page 16).
- **Always** release compressed air after use.

: **Never** touch the valve or the pipelines when processing hot liquids or when sterilizing.

: **Never** touch the valve top if compressed air is supplied to the valve.

: **Always** handle lye and acid with great care.

Maintenance:

: - **Always** observe the technical data (see page 16).
- **Always** disconnect compressed air before service.

: - The valve must **never** be hot when servicing it.
- The valve and the pipelines must **never** be pressurised when servicing the valve.

Installation

The instruction manual is part of the delivery.

Study the instructions carefully.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

1. Unpacking/Delivery

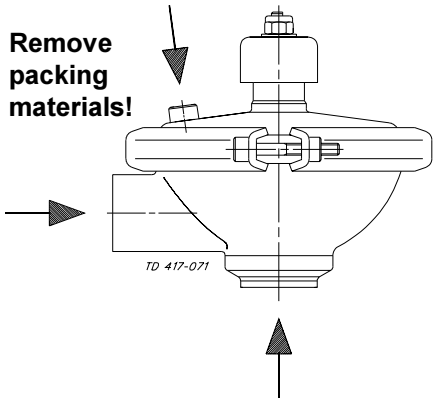
1

NOTE!
We cannot be held responsible for incorrect unpacking.

2

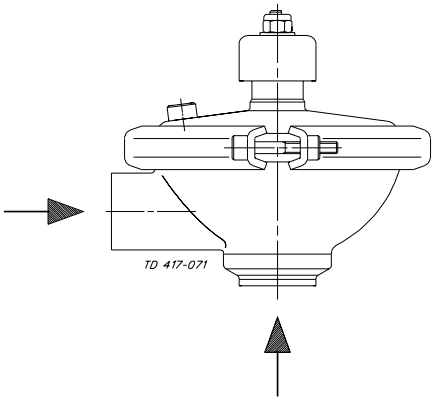
Check the delivery:
1. Complete valve, CPMI-2 or CPMO-2.
2. Delivery note.
3. Instruction manual.

3



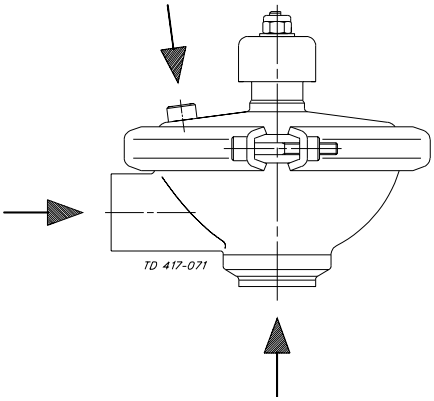
Clean the valve ports for possible packing materials.

4



Inspect the valve for visible transport damages.

5



Avoid damaging the air connection and the valve ports.

Study the instructions carefully and pay special attention to the warnings!
The valve has welding ends as standard but can also be supplied with fittings.

2. General installation

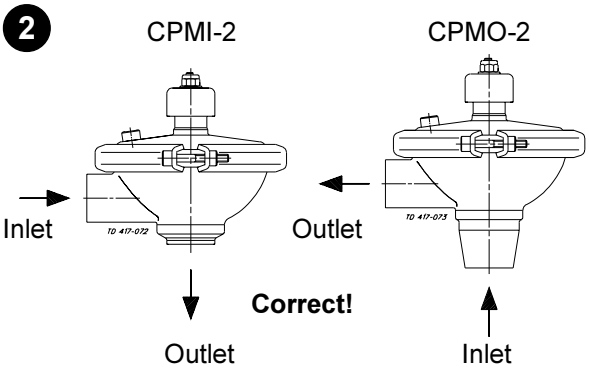
1

⚠
- **Always** observe the technical data (see page 16).
- **Always** release compressed air after use.
- **Never** touch the valve top if compressed air is supplied to the valve.

NOTE!
We cannot be held responsible for incorrect installation.

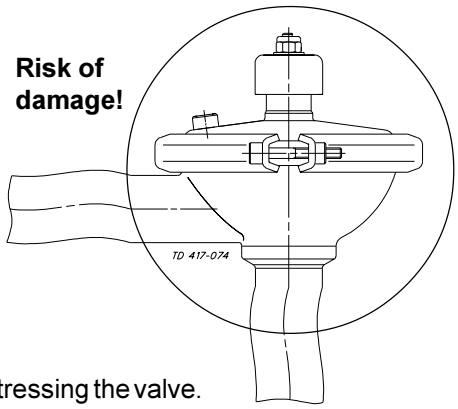
2

CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.
The required product pressure is preset by means of an air pressure regulating valve (optional extra).



Ensure that the flow direction is correct.

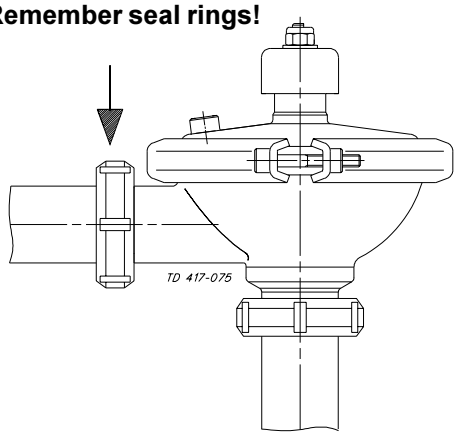
3



Avoid stressing the valve.
Pay special attention to:
- Vibrations.
- Thermal expansion of the tubes.
- Excessive welding.
- Overloading of the pipelines.

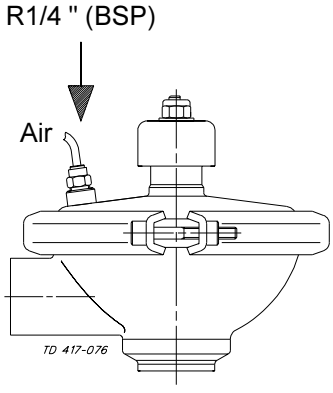
4

Remember seal rings!



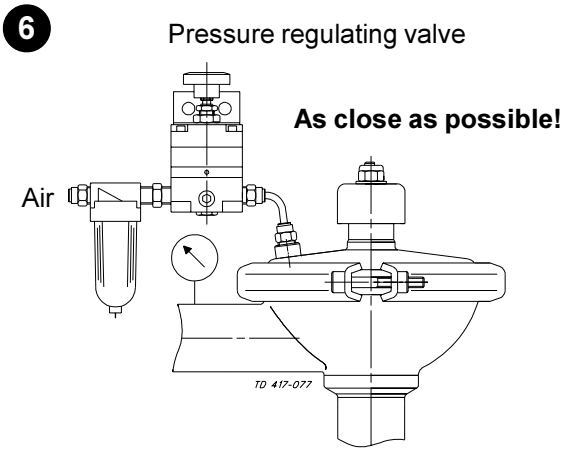
Fittings:
Ensure that the connections are tight.

5



Air connection:

6



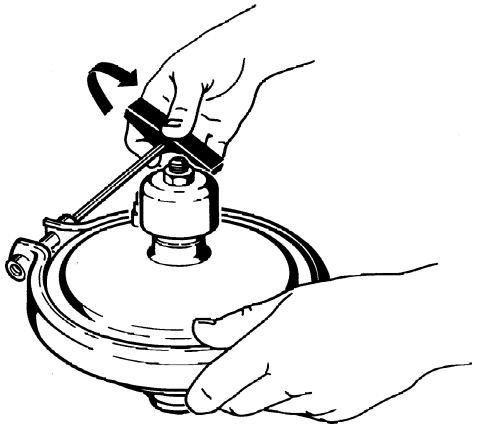
Air pressure regulating valve: (optional extra)
It is recommended to install the air pressure regulating valve as close as possible to the valve.

Study the instructions carefully
The valve has welding ends as standard.
Weld carefully.

CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

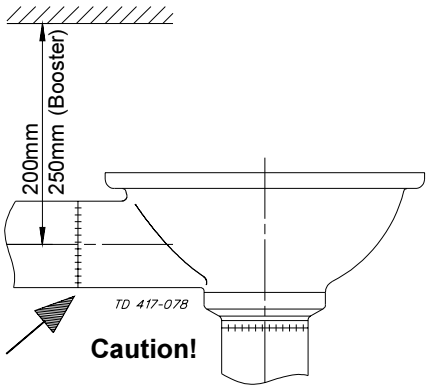
3. Welding

1



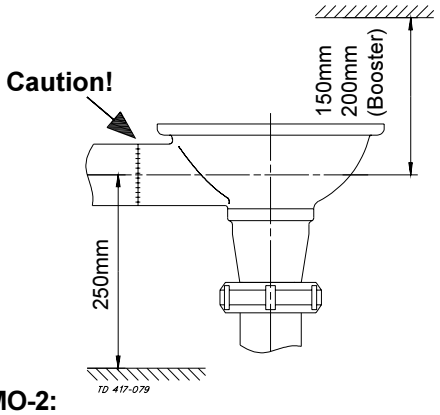
Dismantle the valve in accordance with the instructions 1-4 on page 12.
Pay special attention to the warning!

2



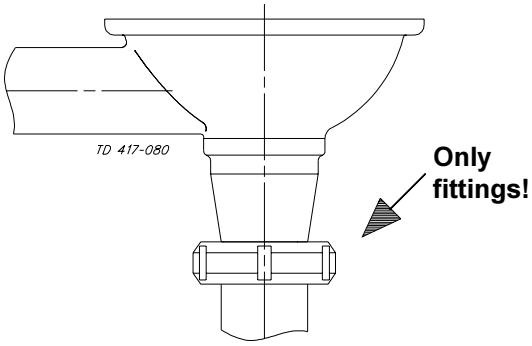
CPMI-2:
1. Weld the valve body into the pipelines.
2. Maintain the minimum clearance so that the internal valve parts can be removed.

3



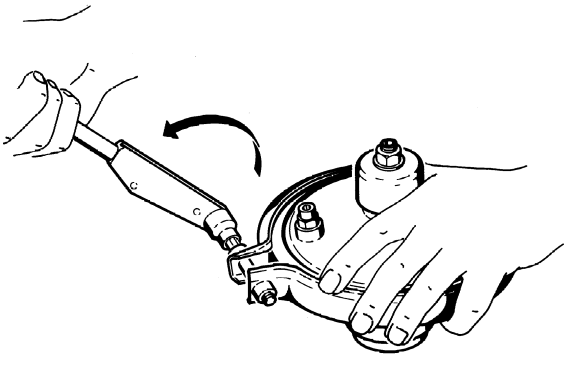
CPMO-2:
1. Weld the valve body into the pipelines (see also 4).
2. Maintain the minimum clearance so that the valve plug can be removed.

4



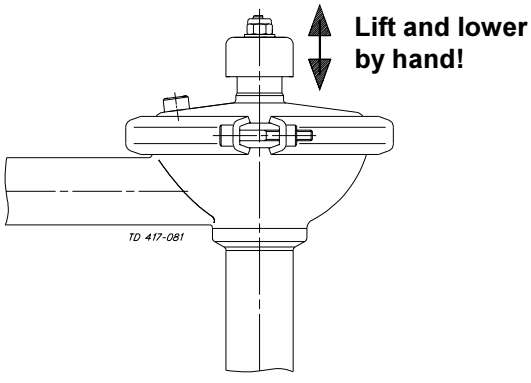
CPMO-2:
Never weld the bottom connection as this will make it impossible to dismantle the valve.

5



Assemble the valve in accordance with the instructions 6-10 on page 14-15.

6



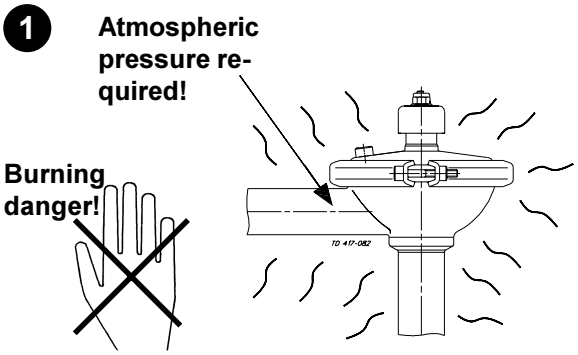
Pre-use check:
Lift and lower the valve top several times to ensure that the valve operates smoothly.
Pay special attention to the warning!

Study the instructions carefully and pay special attention to the warnings!
The items refer to the drawings and the parts list on the pages 22-25.

The valve can be supplied with a Booster to increase the permitted product pressure.

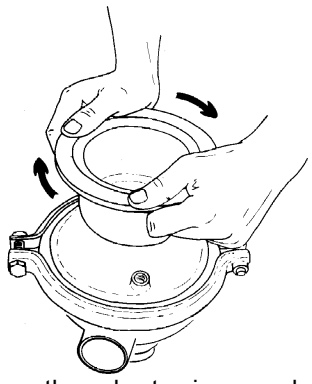
4. Fitting of Booster (optional extra)

1



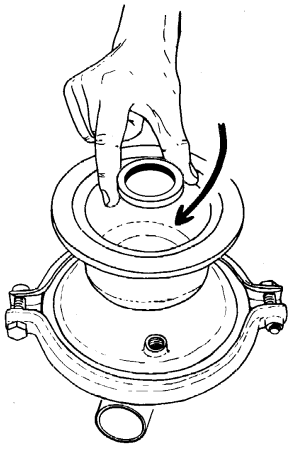
- **Never** touch the valve or the pipelines when processing hot liquids or when sterilizing.
- The valve and the pipelines must **never** be pressurised when dismantling the valve.

2



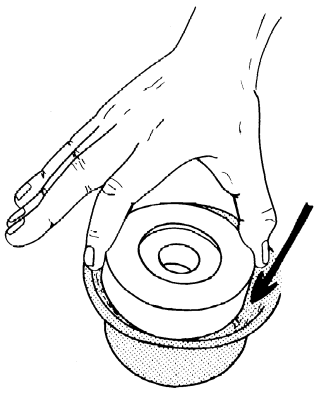
1. Remove the valve top in accordance with instruction 3 on page 12.
   Pay special attention to the warnings!
2. Fit Booster housing (1) on the cover.
3. Fit and tighten lock nut (2).

3



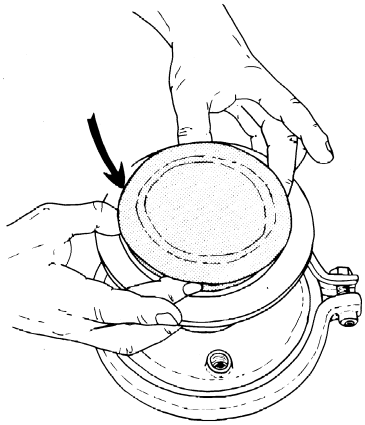
1. Fit washer (3).
2. Refit the washer and the top nut on the valve plug.

4



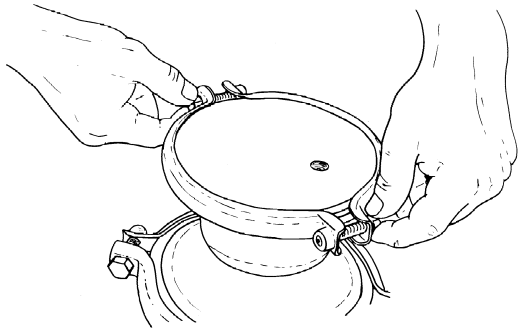
1. Turn diaphragm (7) inside out.
2. Place piston (6) in the diaphragm so that the hole is visible.

5



1. Roll diaphragm (7) down half it's lenght.
2. Fit the diaphragm with piston (6) in Booster housing (1).

6



1. Fit cover (8) on Booster housing (1).
2. Fit and tighten clamp (9).
3. The valve and the Booster are now ready for operation.

The valve is lubricated, adjusted and tested before delivery.
Study the instructions carefully and pay special attention to the warnings!

The items refer to the drawings and the parts list on the pages 18-21.

1. Operation

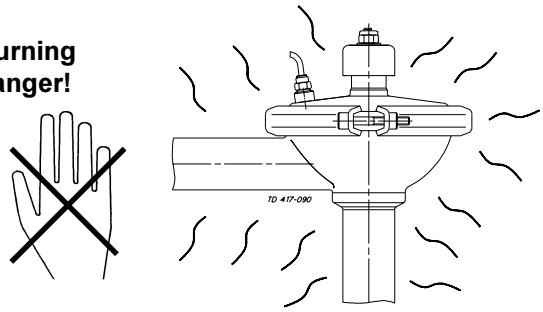
1

⚠ - **Always** observe the technical data (see page 16).
- **Always** release compressed air after use.

NOTE!
We cannot be held responsible for incorrect installation.

2

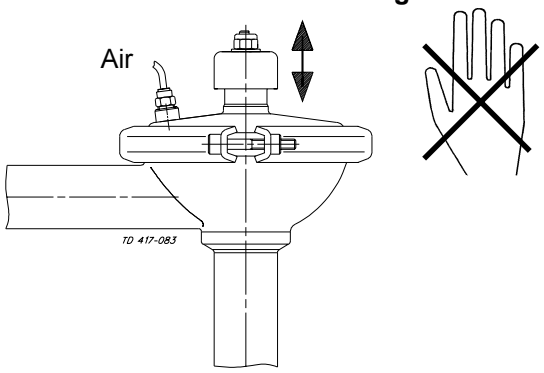
Burning danger!



⚠ **Never** touch the valve or the pipelines when processing hot liquids or when sterilizing.

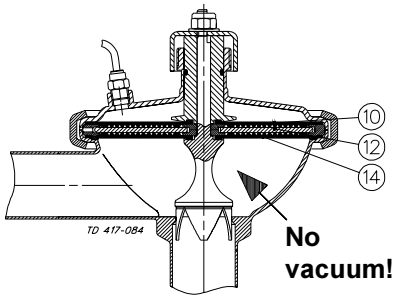
3

Cutting danger!



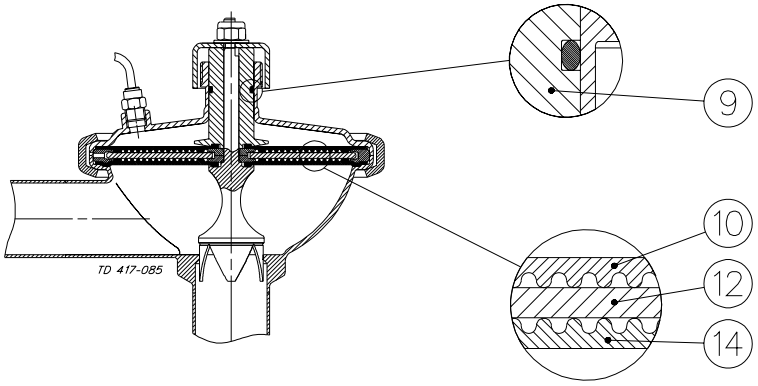
⚠ Never touch the valve top if compressed air is supplied to the valve.

4



CAUTION!
There must not be vacuum in the valve as air can be drawn into the product and diaphragms (14) can then be pulled out from support sectors (12).

5



Lubricate if necessary!
(See page11).

Lubrication:
1. Ensure smooth movement between diaphragms (10,14) and support sectors (12).
2. Ensure smooth movement of guide (9).

Pay attention to possible break-down.
Study the instructions carefully.

The items refer to the drawings and the parts list on the pages 18-21.

2. Fault finding

NOTE!
Study the maintenance instructions carefully before replacing worn parts. - See page 11!

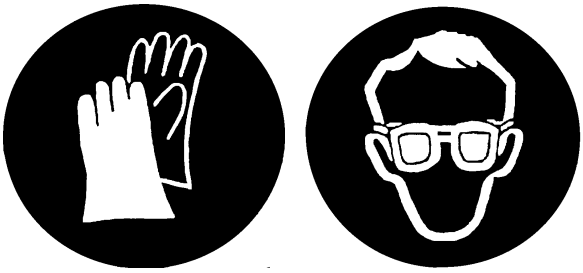
Problem	Cause/result	Repair
The valve does not maintain the preset pressure	- Faulty diaphragm - Guide (9) seizes - Incorrect operating range - The available air pressure is lower than the product pressure - The air pressure is not correctly adjusted - Faulty air pressure regulating valve or incorrect type	- Replace the diaphragm - Lubricate the guide (see page 8) - Check the pressure drop over the valve and check the flow rate (see page 17) - Increase the air pressure eg. by using a Booster (see page 7). - Readjust the air pressure - Repair the valve or check that it is pressure compensating
Product leakage	- Worn diaphragm - Product affected diaphragm	Replace the diaphragm
Air leakage	- Worn O-ring - Worn diaphragm (10) - Worn and hard diaphragm (10)	- Replace the O-ring - Replace the diaphragm - Replace by a diaphragm of a different grade for higher temperature (see page 16)
Valve plug moving too fast up and down (unstable)	Pressure pulsations because of fast changes in process conditions	Use an air throttling valve (optional extra) between the air pressure regulating valve and the CPM-2 valve.

The valve is designed for cleaning in place (CIP).
CIP = Cleaning In Place.

Study the instructions carefully and pay special attention to the warnings!
NaOH = Caustic Soda.
HNO_3 = Nitric acid.

3. Recommended cleaning

1 **Caustic danger!**



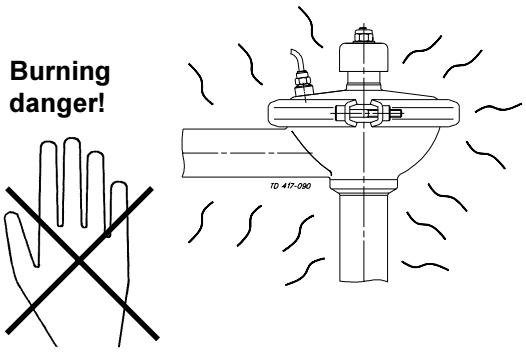
Always use rubber gloves!

Always use protective goggles!

Always handle lye and acid with great care.

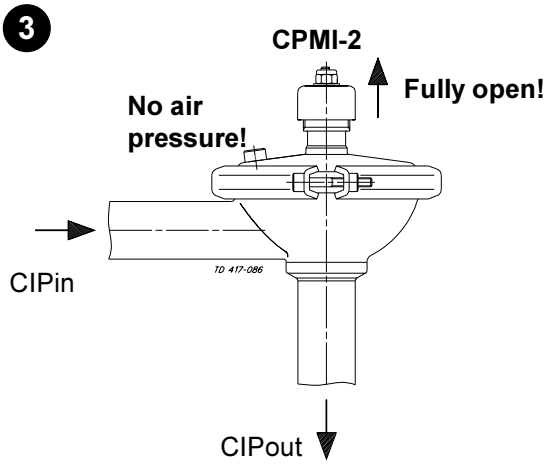
2

Burning danger!

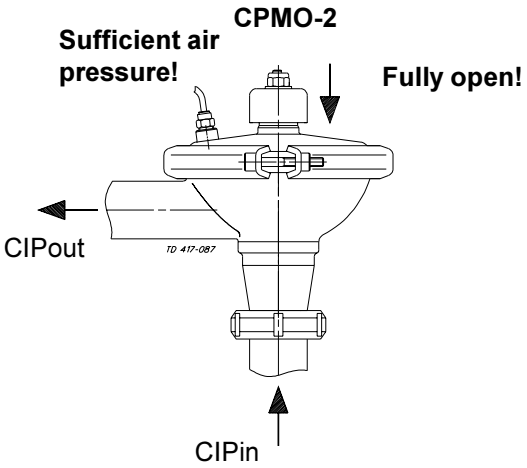


Never touch the valve or the pipelines when sterilizing.

3



Ensure that the valve is fully open to allow for maximum CIP flow.



4

Examples of cleaning agents:
Use clean water, free from clorides.

1. 1% by weight NaOH at 70°C.

1 kg NaOH	+	100 l water	= Cleaning agent.
2.2 l 33% NaOH	+	100 l water	= Cleaning agent.

2. 0.5% by weight HNO_3 at 70°C.

0.7 l 53% HNO_3	+	100 l water	= Cleaning agent.

5

1. Avoid excessive concentration of the cleaning agent

   ⇒ **Dose gradually!**
2. Adjust the cleaning flow to the process

   ⇒ **Milk sterilization/viscous liquids**

   ⇒ **Increase the cleaning flow!**
3. **Always** rinse well with clean water after the cleaning.

NOTE!
The cleaning agents must be stored/discharged in accordance with current rules/directives.

Maintain the valve carefully.
Study the instructions carefully and pay special attention to the warnings!

Always keep spare diaphrams and o-rings in stock.

1. General maintenance

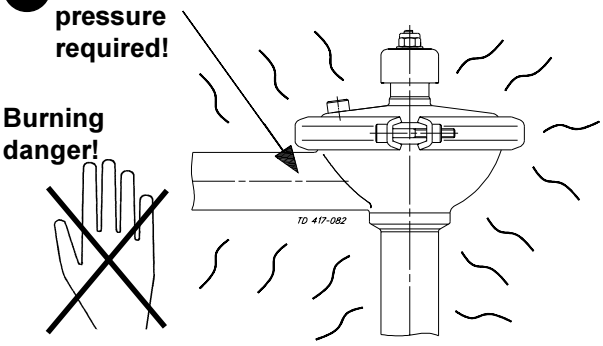
1

- **Always** observe the technical data (see page 16).
- **Always** disconnect the compressed air before service.

NOTE!
All scrap must be stored/discharged in accordance with current rules/directives.

2 **Atmospheric pressure required!**

Burning danger!



- The valve must **never** be hot when servicing it.
- The valve and the pipelines must **never** be pressurised when servicing the valve.

Ordering spare parts

- Contact the Sales Department.
- Order from the Spare Parts List.

Recommended spare parts: Service kits (see Spare Parts List).

	Diaphragms	**O-ring**
Preventive maintenance	**Replace after 12 months**	Replace when replacing the diaphragms
Maintenance after leakage (leakage normally starts slowly)	**Replace by the end of the day**	Replace when replacing the diaphragms
Planned maintenance	- Regular inspection for leakage and smooth operation - Keep a record of the valve - Use the statistics for planning of inspections **Replace after leakage**	Replace when replacing the diaphragms

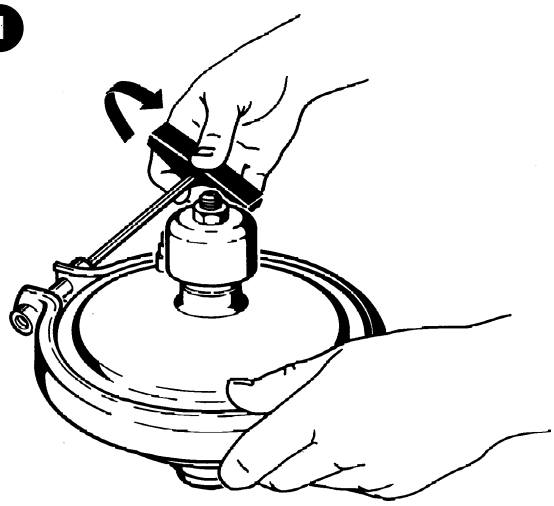
Lubrication : (Before assembly)
- Guide: Molycote longterm 2 Plus.
- Sectors: Molycote 111.
- Threads: Molycote TP42.

Study the instructions carefully.
The items refer to the drawings and the parts list on the pages 18-21.

Handle scrap correctly.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

2. Dismantling

1

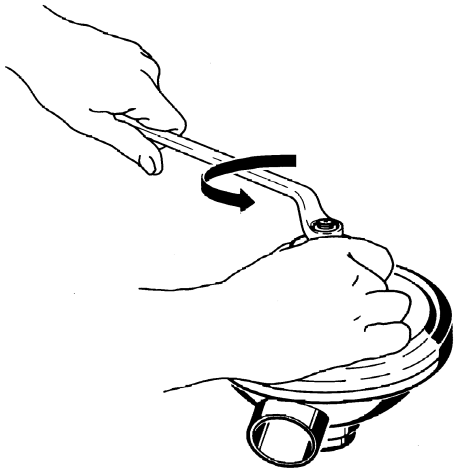


Loosen and remove clamp (6).

2

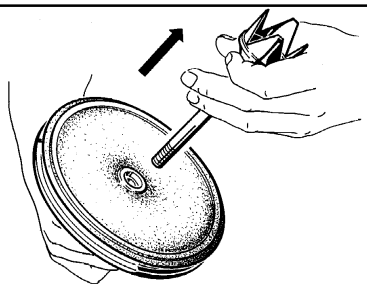
CPMI-2:
Remove cover (7) together with the internal parts of the valve from valve body (16).

3



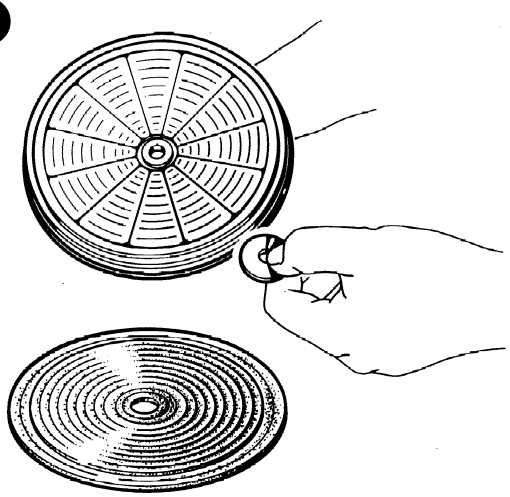
CPMI-2 and CPMO-2 valves:
Remove top nut (1), washer (2) and top (3) from plug 15a or 15b).

4



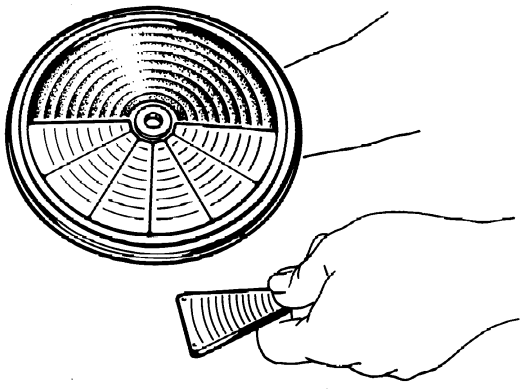
Remove plug (15a) from the diaphragm unit and guide (9), or for **CPMO-2** remove plug (15b) from valve body (16) and remove cover (7) and the internal parts of the valve.
CAUTION!
Ensure that cover (7) is turned downwards and plug (15a) is pulled upwards so that sectors (12) are not separated from diaphragms (10, 14).

5



Remove lower inner ring (11) and lower diaphragm (14).

6



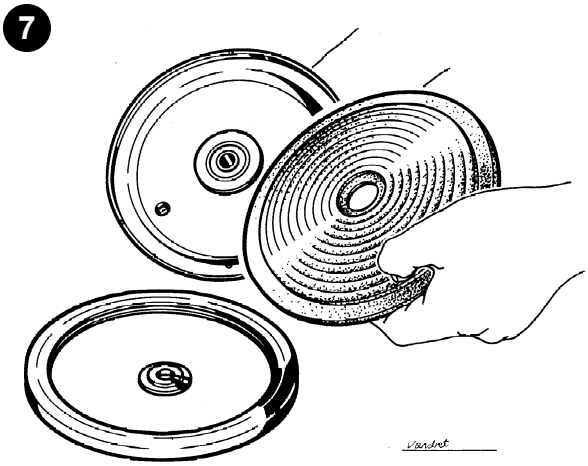
Remove sectors (12).

Study the instructions carefully.
The items refer to the drawings and the parts list on the pages 18-21.

Handle scrap correctly.

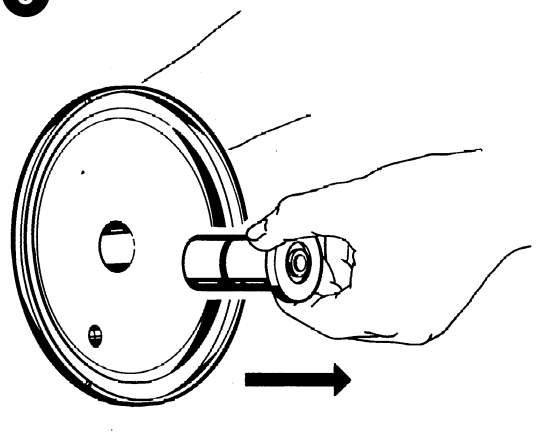
2. Dismanthing

7



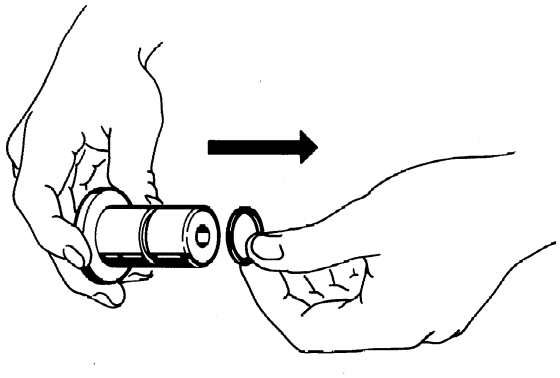
Remove outer ring (13), upper inner ring (11) and upper diaphragm (10).

8



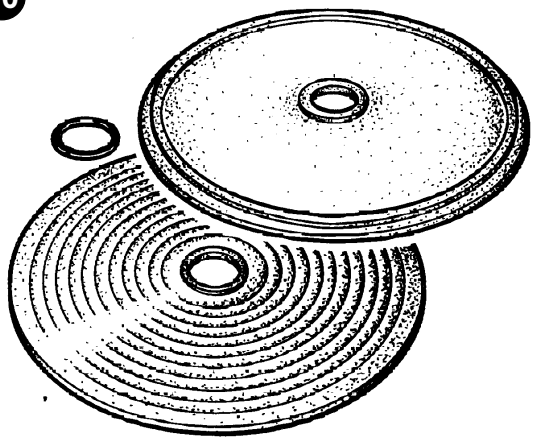
Remove guide (9) from cover (7).

9



Remove O-ring (8) from guide (9).

10



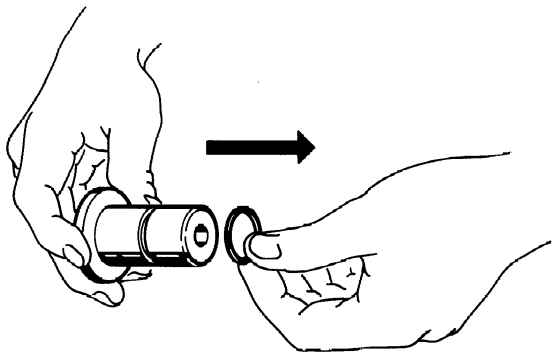
Replace the O-ring and the diaphragms.

Study the instructions carefully.
The items refer to the drawings and the parts list on the pages 18-21.

Lubricate the guide, the sectors and the threads before assembly.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

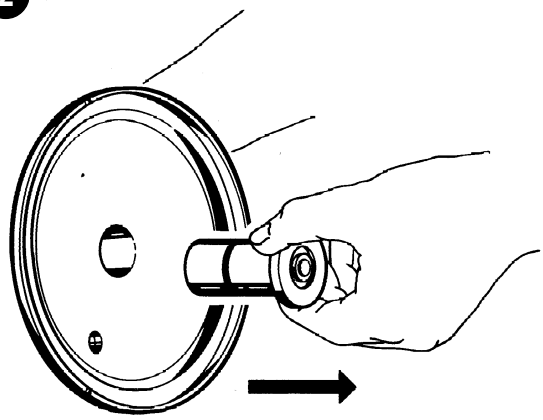
3. Assembly

1



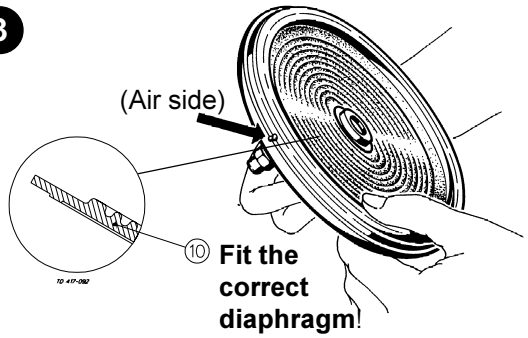
Fit O-ring (8)

2



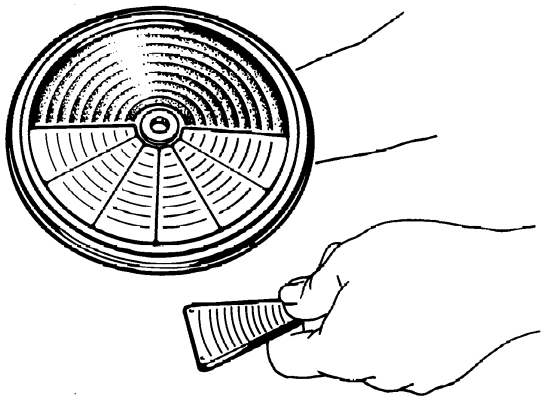
Lubricate guide (9) and fit it into cover (7).
NOTE!
Turn cover (7) downwards before continuing.

3



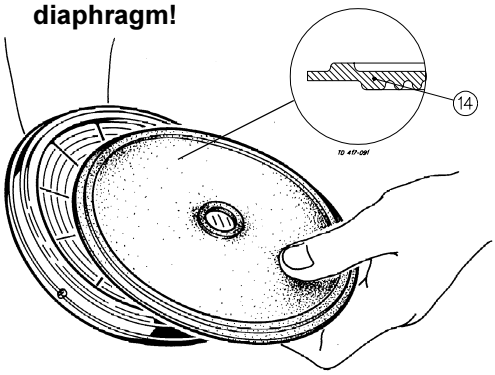
Fit upper diaphragm (10), upper inner ring (11) and outer ring (13) on guide (9) and cover (7).
NOTE!
The upper diaphragm has a small recess.The outer ring must be fitted with the recess turned uppermost so that the indication hole is fixed opposite the indication hole in the cover.

4



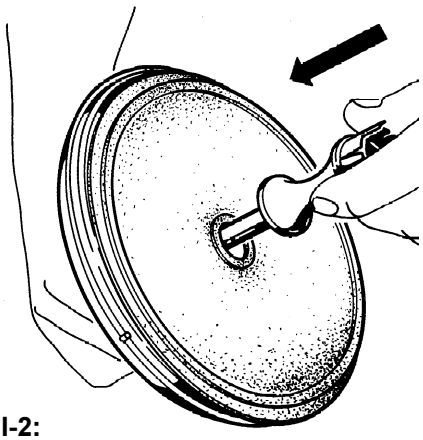
Fit sectors (12) between upper inner ring (11) and outer ring (13).

5 **Fit the correct diaphragm!**



Fit lower inner ring (11) and lower diaphragm (14).

6



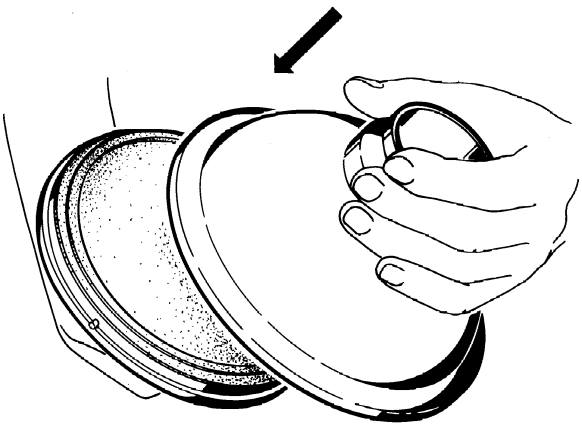
CPMI-2:
Fit plug (15a) in the diaphragm unit and guide (9) until the flange of the plug contacts lower diaphragm (14).

Study the instructions carefully.
The items refer to the drawings and the parts list on the pages 18-21.

Lubricate the guide, the sectors and the threads before assembly.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

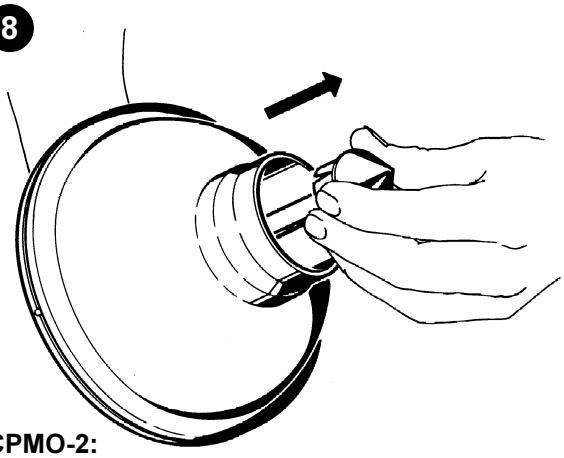
3. Assembly

7



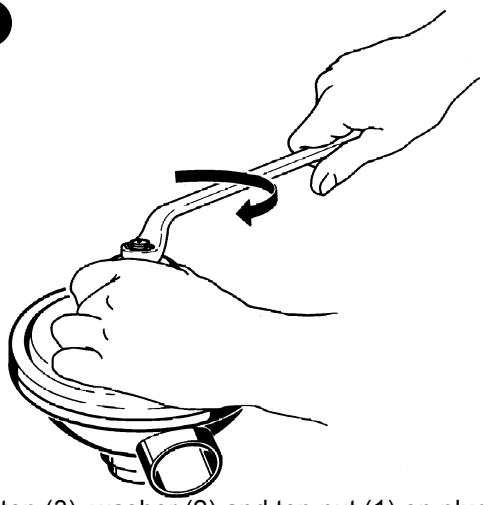
Fit valve body (16) in cover (7).

8



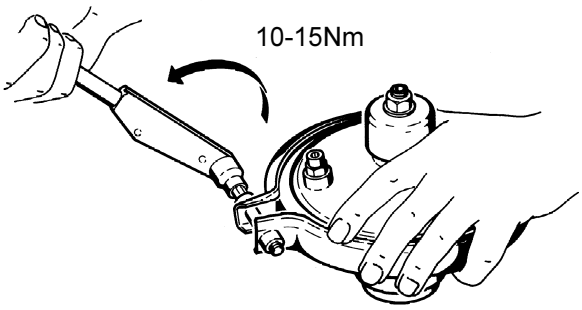
CPMO-2:
Fit plug (15b) through valve body (16) and in the diaphragm unit and guide (9) until the flange of the plug contacts lower diaphragm (14).

9



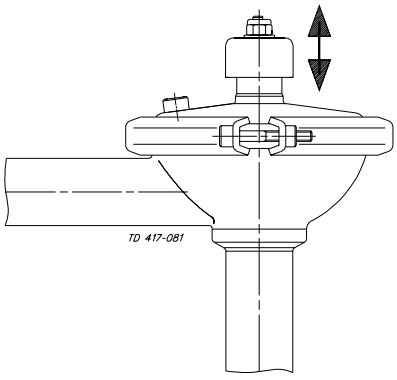
Fit top (3), washer (2) and top nut (1) on plug (15a or 15b).

10



Fit and torque tighten clamp (6) to 10-15Nm.

11



Pre-use check:
Lift and lower the valve top several times to ensure that the valve operates smoothly.
Pay special attention to the warning!

Technical data

It is important to observe the technical data during installation, operation and maintenance.

Inform the personnel about the technical data.

1. Technical Data

Data

Max. product pressure	1000 kPa (10 bar)
Min. product pressure	0 kPa (0 bar) = Atmospheric
Temperature range	-10°C to +95°C
Temperature range (with upper diaphragm inPTFE/EPDM)	-10°C to +140°C (higher on request)
Air pressure	0 to 600 kPa (0 to 6 bar)
Flow range Kv, fully open (Δ p = 1bar)	Approx. 23m³/h
Flow range Kv, low capacity (Δ p = 1bar)	Approx. 2m³/h
(Alternative size)	(regulating area) Approx. 15m³/h (CIP area)

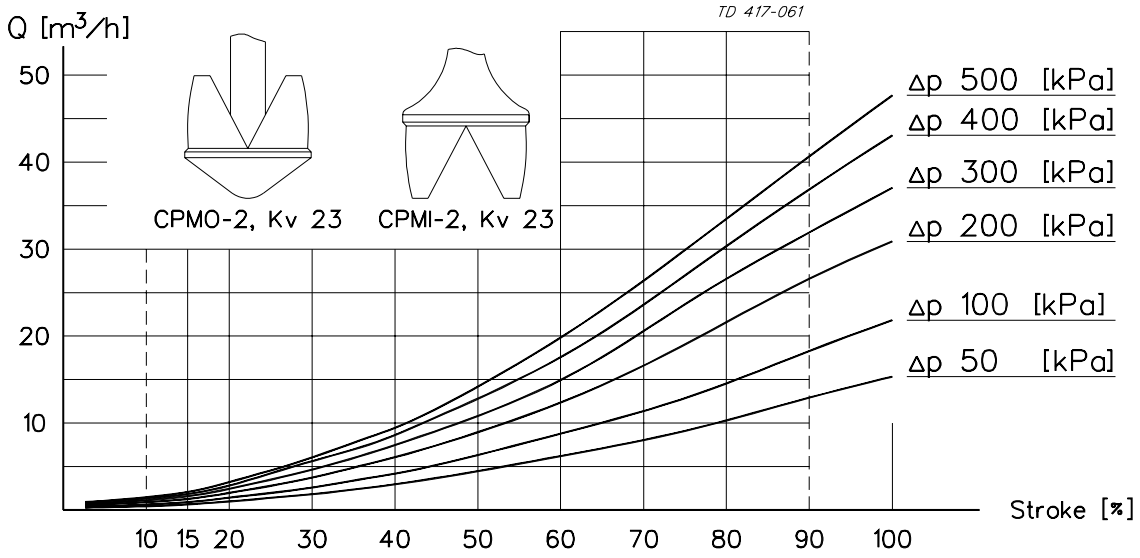
Materials

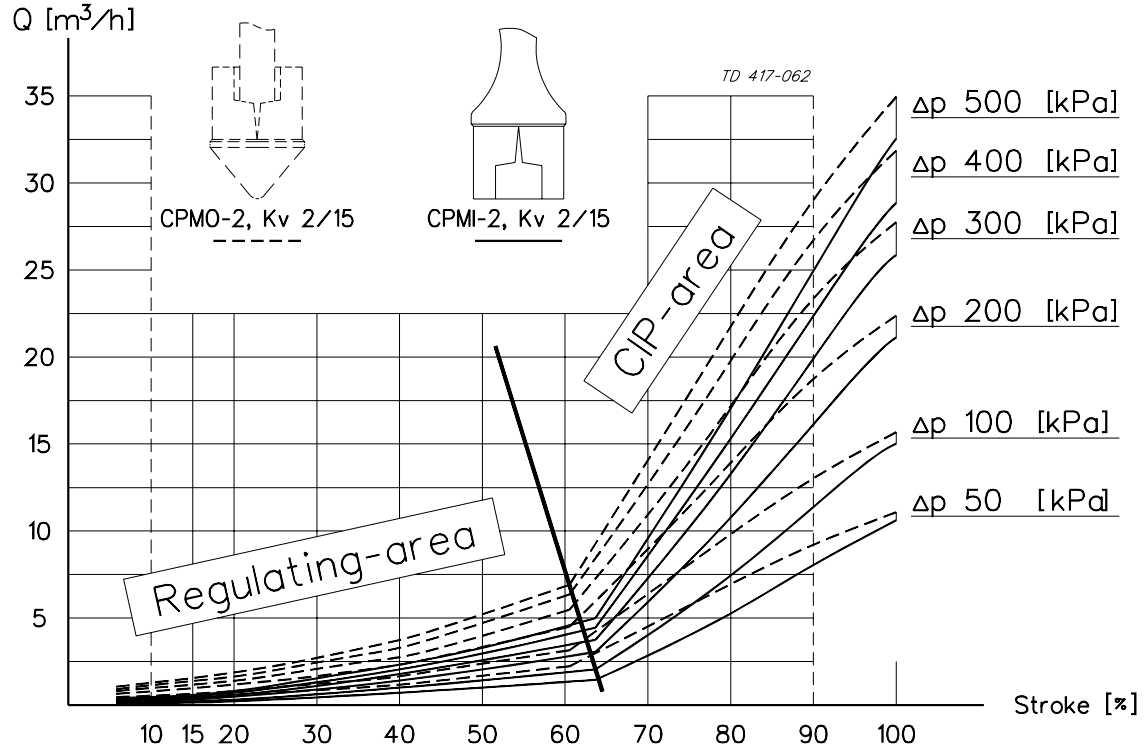
Product wetted steel parts	AISI 316 L
Other steel parts	AISI 304
Upper diaphragm	Nitrile (NBR), (standard)
Lower diaphragm	PTFE covered EPDM rubber, (standard)
Alternative upper diaphragm	EPDM/PTFE (for temperatures 95-140° C)
Alternative upper diaphragm	Solid Teflon (PTFE) (for temperatures above 140° C)
Alternative lower diaphragm	Solid Teflon (PTFE) (for temperatures above 140° C)
O-ring	Nitrile (NBR), (standard)
Alternative O-ring	Viton (FPM) (for temperatures above 95°C)
Finish	Semi bright

It is important to observe the technical data during installation, operation and maintenance.

Inform the personnel about the technical data.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

2. Selection / Pressure drop - capacity diagram





NOTE! For the diagrams the following applies:
Medium: Water (20°C).
Measurement: In accordance with VDI 2173.

Example 1:
CPMI-2:
Pressure drop Δ p = 200 kPa.
Flow Q = 8 m³/h.
Select: CPMI-2, Kv 23 which at working point will be 48% open.

Example 2:
CPMI-2:
Pressure drop Δ p = 300 kPa.
Flow Q = 1 m³/h.
Select: CPMI-2, Kv 2/15 which at working point will be approx. 35% open equal to about 50% of the regulating area.

The drawing and the parts list include all items.

The items are identical with the items in the Spare Parts List.
When ordering spare parts, please use the Spare Parts List!

Parts list
CPM-2

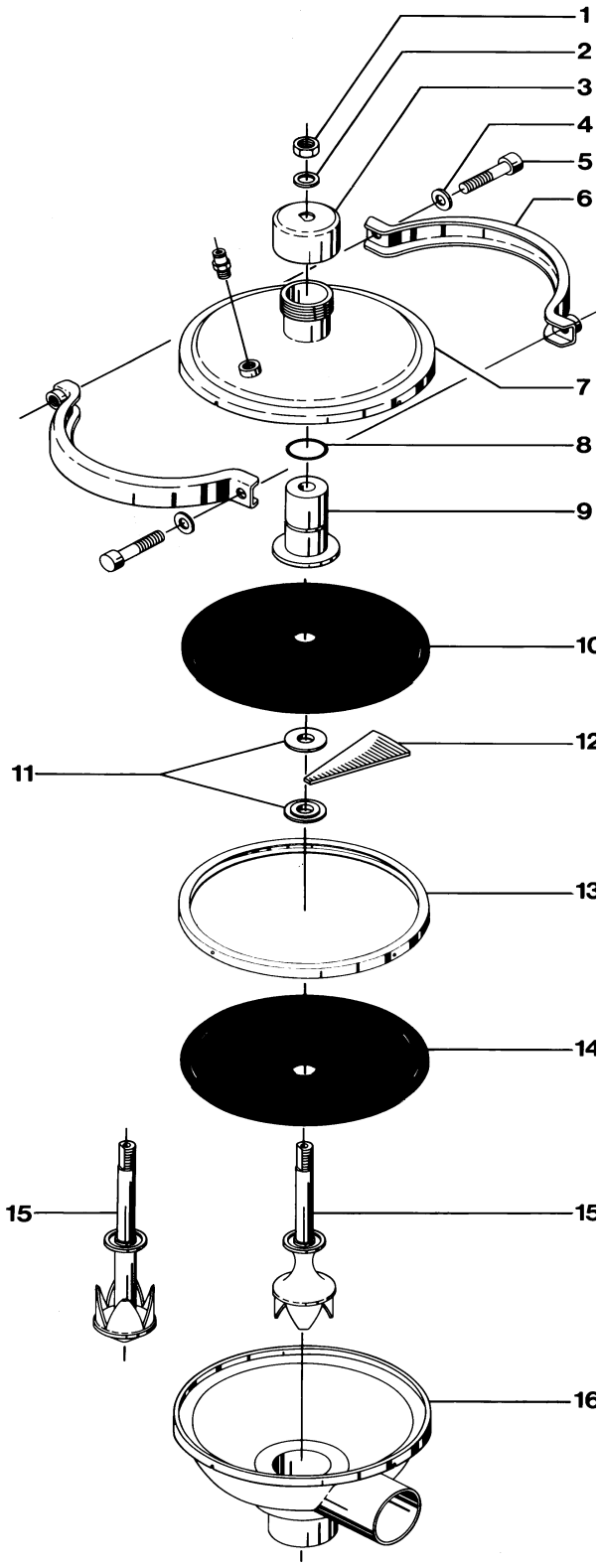
Item	Qty.	Denomination
1	1	Nut
2	1	Washer
3	1	Top
4	2	Washer
5	2	Screw
6	2	Clamp
7	1	Cover
8Δ	1	O-ring
9	1	Guide
10Δ	1	Upper diaphragm
11	2	Inner ring
12	12	Support sector
13	1	Outer ring
14Δ	1	Lower diaphragm
15	1	Valve plug
16	1	Valve body

Δ : Service kit
(See Spare Parts List)

This page shows an exploded drawing of CPM-2.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

The drawing includes all items of the valve.
They are identical with the items in the Spare Parts List

Exploded drawing



The drawing and the parts list include all items.

The items are identical with the items in the Spare Parts List.
When ordering spare parts, please use the Spare Parts List!

Parts list
CPM-2

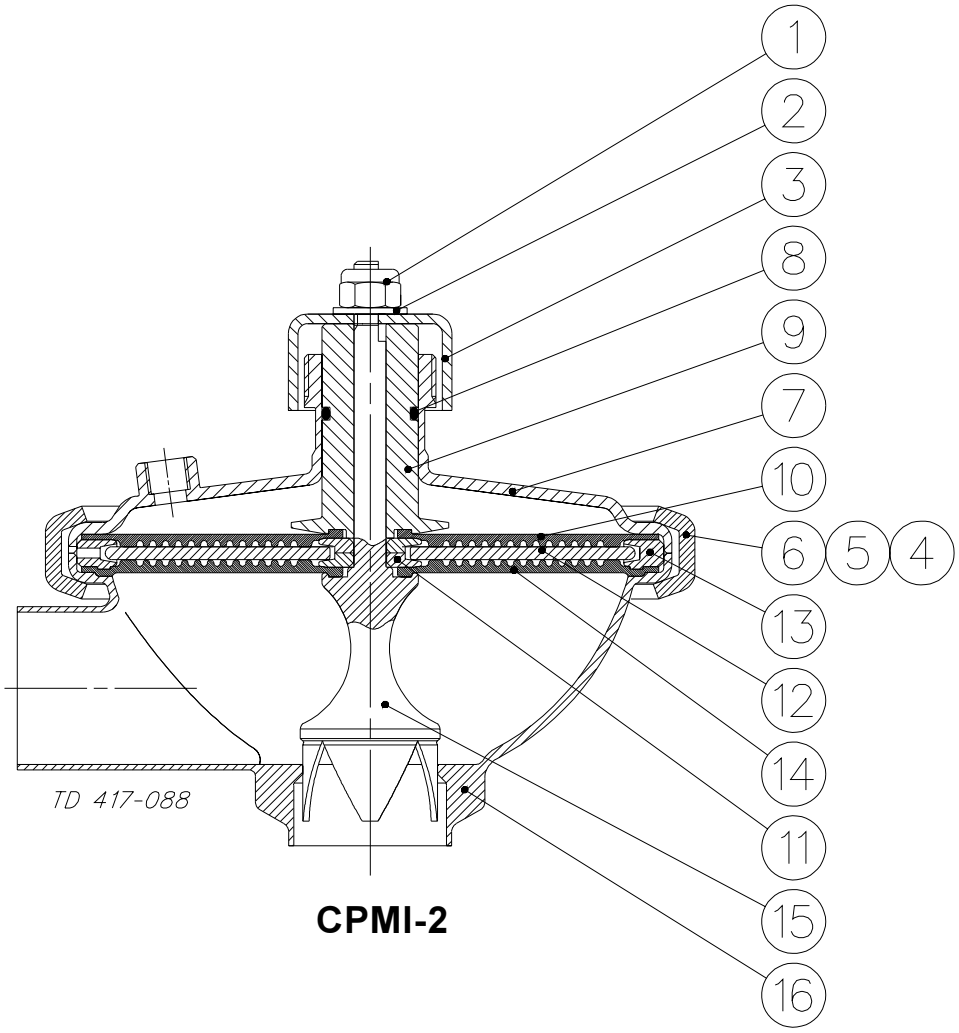
Item	Qty.	Denomination
1	1	Nut
2	1	Washer
3	1	Top
4	2	Washer
5	2	Screw
6	2	Clamp
7	1	Cover
8Δ	1	O-ring
9	1	Guide
10Δ	1	Upper diaphragm
11	2	Inner ring
12	12	Support sector
13	1	Outer ring
14Δ	1	Lower diaphragm
15	1	Valve plug
16	1	Valve body

Δ : Service kit
(See Spare Parts List)

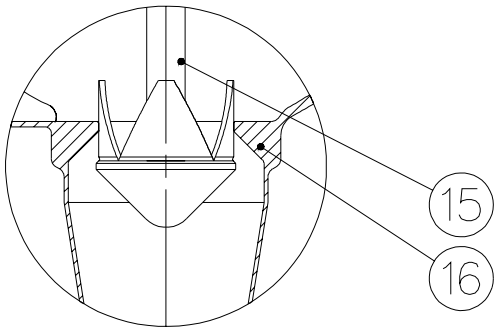
The drawing below shows CPM-2.
CPMI-2: Constant-Pressure Modulating Inlet.
CPMO-2: Constant-Pressure Modulating Outlet.

The items refer to the parts list on the opposite part of the page.

Drawings



CPMI-2



CPMO-2

The drawing and the parts list include all items.

The items are identical with the items in the Spare Parts List.
When ordering spare parts, please use the Spare Parts List!

Parts list
Booster

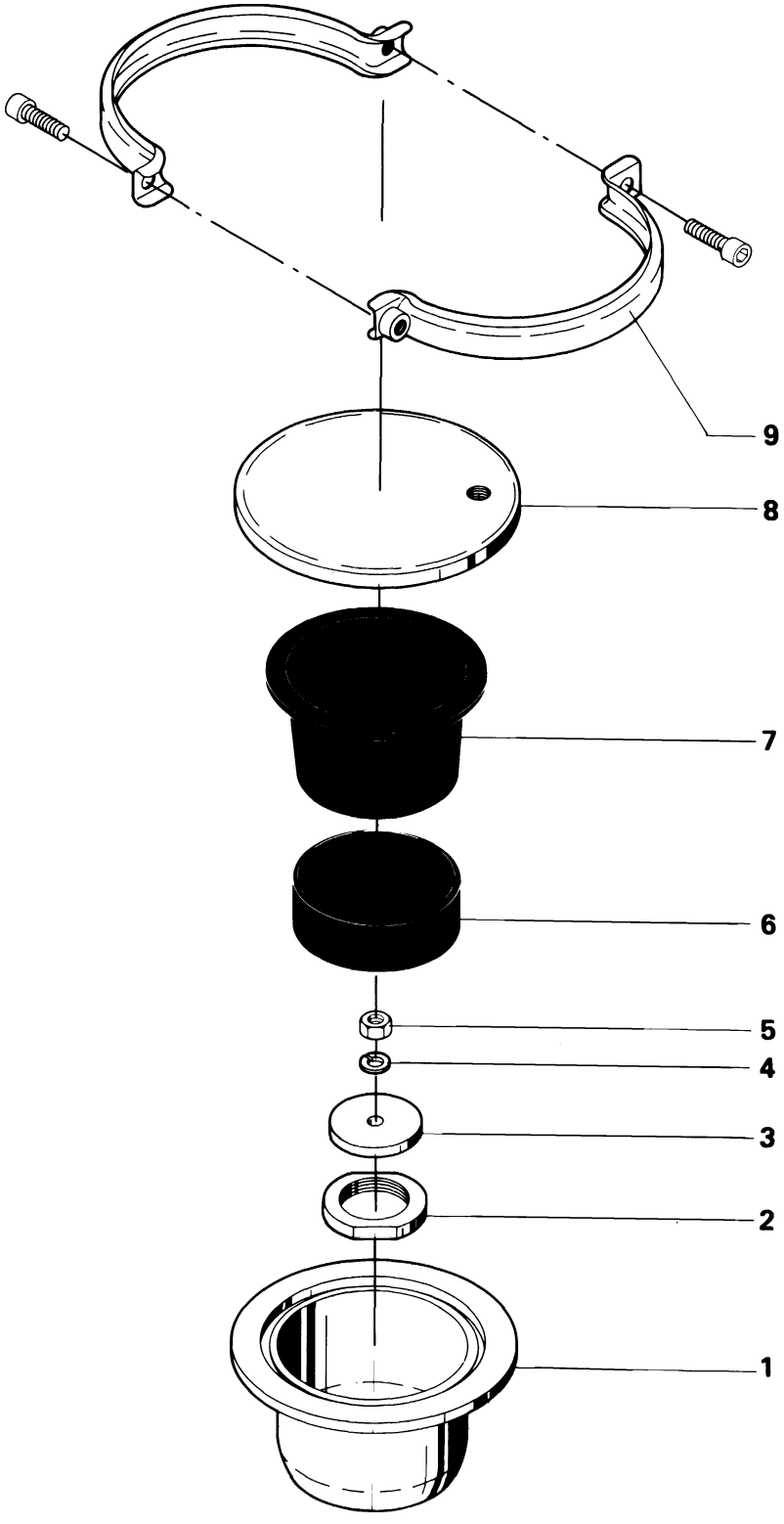
Pos.	Qty.	Denomination
1	1	Booster housing
2	1	Lock nut
3	1	Washer
4	1	Spring washer
5	1	Nut
6	1	Booster piston
7Δ	1	Diaphragm
8	1	Booster cover
9	1	Clamps and screws

Δ : Service kit
(See Spare Parts List)

This page shows an exploded drawing of the Booster.

The drawing includes all items of the valve. They are identical with the items in the Spare Parts List.

Exploded drawing



The drawing and the parts list include all items.

The items are identical with the items in the Spare Parts List.
When ordering spare parts, please use the Spare Parts List!

Parts list
Booster

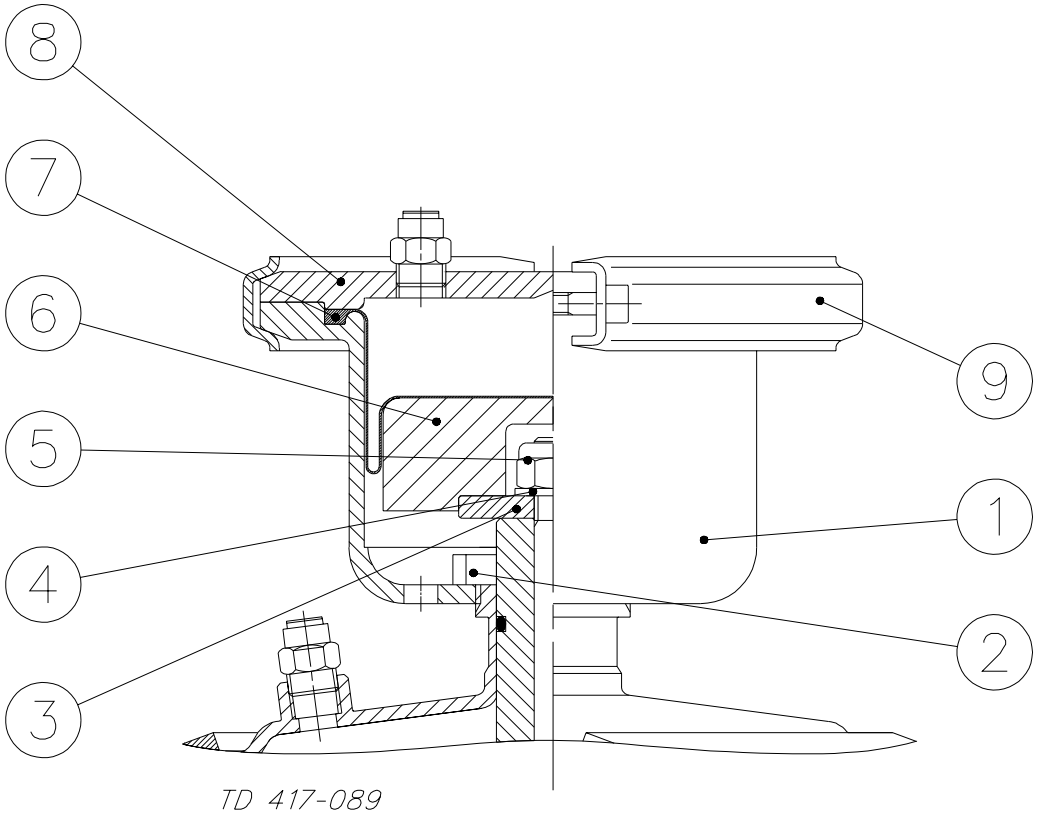
Pos.	Qty.	Denomination
1	1	Booster housing
2	1	Lock nut
3	1	Washer
4	1	Spring washer
5	1	Nut
6	1	Booster piston
7Δ	1	Diaphragm
8	1	Booster cover
9	1	Clamps and screws

Δ : Service kit
(See Spare Parts List)

The drawing below shows the Booster.

The items refer to the parts list on the opposite part of the page.

Drawing



TD 417-089

How to contact Alfa Laval

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