The designating company

Alfa Laval
Company Name

6000 Kolding
Address

+45 79 32 22 00
Phone No.

hereby declare that

Constant-Pressure Modulating Valve
Denomination

CPM-2
Type

is in conformity with the following directives:

- Machinery Directive 2006/42/EC

Bjarne Søndergaard
Name

Manager, Product Centres, Compact Heat Exchangers & Fluid Handling
Title

Alfa Laval
Company

Signature

Designation

CE CE
## Table of contents

The information contained herein is correct at the time of issue but may be subject to change without prior notice.

1. **Safety** ........................................................................................................ 6  
   1.1 Important information ........................................................................ 6  
   1.2 Warning signs .................................................................................. 6  
   1.3 Safety precautions ........................................................................... 6  

2. **Installation** ................................................................................................ 7  
   2.1 Unpacking/Delivery ........................................................................ 7  
   2.2 General installation ......................................................................... 8  
   2.3 Welding ............................................................................................ 9  
   2.4 Fitting of Booster (optional extra) ................................................... 10  

3. **Operation** .................................................................................................. 12  
   3.1 Operation ....................................................................................... 12  
   3.2 Fault finding ................................................................................... 13  
   3.3 Recommended cleaning ................................................................ 14  

4. **Maintenance** ............................................................................................. 15  
   4.1 General maintenance ..................................................................... 15  
   4.2 Dismantling .................................................................................... 16  
   4.3 Assembly ....................................................................................... 18  

5. **Technical Data** .......................................................................................... 20  
   5.1 Technical Data................................................................................ 20  
   5.2 Selection / Pressure drop - capacity diagram ............................... 21  

6. **Parts lists and service kits** .......................................................................... 22  
   6.1 CPM-2 ........................................................................................... 22  
   6.2 Booster .......................................................................................... 24  

1. Important information

1.1 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 or clarify practices.

1.2 Warning signs

**General warning:**

**Caustic agents:**

1.3 Safety precautions

**Installation:**
- **Always** observe the technical data (see chapter 5).
- **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 chapter 5).
- **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 chapter 5).
- **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.

**Transportation:**
- **Always** secure that compressed air is released.
- **Always** secure that all connections is disconnected before attempt to remove the valve from the installation.
- **Always** drain liquid out of valves before transportation.
- **Always** used predesigned lifting points if defined.
- **Always** secure sufficient fixing of the valve during transportation - if special designed packaging material is available it must be used.
2. 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.

2.1 Unpacking/Delivery

Step 1
NOTE!
Alfa Laval cannot be held responsible for incorrect unpacking.

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

Step 3
Clean the valve ports for possible packing materials.
Avoid damaging the air connection and the valve ports.

Step 4
Inspect the valve for visible transport damages.

Recycling information.
- Unpacking
  - Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.
  - Wood and cardboard boxes can be reused, recycled or used for energy recovery.
  - Plastics should be recycled or burnt at a licensed waste incineration plant.
  - Metal straps should be sent for material recycling.

- Maintenance
  - During maintenance oil and wear parts in the machine are replaced.
  - All metal parts should be sent for material recycling.
  - Worn out or defective electronic parts should be sent to a licensed handler for material recycling.
  - Oil and all non metal wear parts must be taken care of in agreement with local regulations.

- Scrapping
  - At end of use, the equipment shall be recycled according to relevant, local regulations. Beside the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt, or in the absence of local regulations, please contact the local Alfa Laval sales company.
2.2 General installation

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.
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).

Step 1
- Always observe the technical data (see chapter 5)
- Always release compressed air after use.
- Never touch the valve top if compressed air is supplied to the valve.

NOTE!
Alfa Laval cannot be held responsible for incorrect installation.

Step 2
Ensure that the flow direction is correct.

Step 3
Avoid stressing the valve.
Pay special attention to:
- Vibrations.
- Thermal expansion of the tubes.
- Excessive welding.
- Overloading of the pipelines.

Step 4
Fittings:
Ensure that the connections are tight.

Step 5
Air connection:

Step 6
Air pressure regulating valve: (optional extra)
An air pressure regulating valve must be used and should be installed with min. clearance to the Booster/CPM-2 valve.
2. Installation

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.

Step 1
Dismantle the valve in accordance with steps 1-4 in section 4.2.
Pay special attention to the warning!

Step 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.

Step 3
CPMO-2:
1. Weld the valve body into the pipelines (see also step 4).
2. Maintain the minimum clearance so that the valve plug can be removed.

Step 4
CPMO-2:
Never weld the bottom connection as this will make it impossible to dismantle the valve.

Step 5
Assemble the valve in accordance with the steps 6-10 in section 4.3.
Tighten clamp 10-15 Nm (7.5-11 lbf-ft)

Step 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!
2.4 Fitting of Booster (optional extra)

Study the instructions carefully and pay special attention to the warnings!
The items refer to the parts list and service kits section.
The valve can be fitted with a Booster to allow for a product pressure higher than available air pressure.

---

### Step 1

**WARNING:**
- 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.

### Step 2

1. Remove the valve top in accordance with step 3 in section 4.2
   - Pay special attention to the warnings!
2. Fit Booster housing (1) on the cover.
3. Fit and tighten lock nut (2).

### Step 3

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

### Step 4

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

### Step 5

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

### Step 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.
2. Installation

2.4 Fitting of Booster (optional extra)

---

Step 7
Compressed air:
An air pressure compensating regulating valve must be used and should be installed with min. clearance to the Booster/CPM-2 valve.

The pressure regulating valve (PR) and the pressure gauge (PG) are optional extras.

Alfa Laval recommends using the air pressure regulating valve from Alfa Laval.

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Dimensions:

Revised 5.2.2022

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3.1 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 parts list and service kits section.

Step 1

⚠️ Always observe the technical data (see chapter 5)
- Always release compressed air after use.

NOTE!
Alfa Laval cannot be held responsible for incorrect installation.

Step 2

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

Step 3

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

Step 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).

Step 5

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

Lubricate if necessary! (See page 11).
### 3. Operation

#### 3.2 Fault finding

*Pay attention to possible break-down.*  
*Study the instructions carefully.*  
*The items refer to the parts list and service kits section.*

**NOTE!**  
Study the maintenance instructions carefully before replacing worn parts - see section 4.1

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause/result</th>
<th>Repair</th>
</tr>
</thead>
</table>
| 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 section 3.1)  
- Check the pressure drop over the valve and check the flow rate (see section 5.2)  
- Increase the air pressure e.g. by using a Booster (see section 2.4).  
- 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 section 5.1) |
| 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). |
3.3 Recommended cleaning

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. HNO₃ = Nitric acid.

3. Operation

Step 1

⚠️ Always handle lye and acid with great care.

Step 2

⚠️ Never touch the valve or the pipelines when sterilizing.

Step 3

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

Step 4

CPMI-2
No air pressure!
CPM0-2
Sufficient air pressure!

Step 5

Examples of cleaning agents:

1. 1% by weight NaOH at 70°C (158°F).
   1 kg (2.2 lb) NaOH + 100 l (26.4 gl) water = Cleaning agent.
   33% NaOH + 100 l (26.4 gl) water = Cleaning agent.

2. 0.5% by weight HNO₃ at 70°C (158°F).
   0.7 l (0.2 gl) 53% HNO₃ + 100 l (26.4 gl) water = Cleaning agent.

Step 6

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.
4. Maintenance

Maintain the valve carefully.
Study the instructions carefully and pay special attention to the warnings!
Always keep spare diaphragms and o-rings in stock.

4.1 General maintenance

Step 1

⚠️
- Always observe the technical data (see chapter 5).
- Always disconnect the compressed air before service.

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

Step 2

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

Recommended spare parts: Service kits (see chapter 6)
Order service kits from the service kits list (see chapter 6)
Ordering spare parts: contact the Sales Department

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

Lubrication: (Before assembly)
- Sectors: Molykote 111.
- Threads: Molykote TP42.
4.2 Dismantling

Study the instructions carefully.
The items refer to the parts list and service kits section.
Handle scrap correctly.

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

Step 1
Loosen and remove clamp (6).

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

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

Step 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).

Step 5
Remove lower inner ring (11) and lower diaphragm (14).

Step 6
Remove sectors (12).
4. Maintenance

4.2 Dismantling

Step 7
Remove outer ring (13), upper inner ring (11) and upper diaphragm (10).

Step 8
Remove guide (9) from cover (7).

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

Step 10
Replace the O-ring and the diaphragms.
Study the instructions carefully. The items refer to the parts list and service kits section. Lubricate the guide, the sectors and the threads before assembly. 

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

Step 1
Fit O-ring (8)

Step 2
Lubricate guide (9) and fit it into cover (7).
NOTE!
Turn cover (7) downwards before continuing.

Step 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.

Step 4
Fit sectors (12) between upper inner ring (11) and outer ring (13).

Step 5
Fit lower inner ring (11) and lower diaphragm (14).
Concentric grooves should point towards the steel segments.

Step 6
CPMI-2:
Fit plug (15a) in the diaphragm unit and guide (9) until the flange of the plug contacts lower diaphragm (14).
4. Maintenance

4.3 Assembly

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

Step 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).

Step 9
Fit top (3), washer (2) and top nut (1) on plug (15a or 15b).

Step 10
Fit and torque tighten clamp (6) to 10-15Nm (7.5-11 lbf-ft).

Step 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!
5.1 Technical Data

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

<table>
<thead>
<tr>
<th>Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. product pressure</td>
<td>1000 kPa (10 bar) (145 psi)</td>
</tr>
<tr>
<td>Min. product pressure</td>
<td>No vacuum</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-10°C to +95°C (14°F to 203°F)</td>
</tr>
<tr>
<td>(with upper diaphragm in PTFE/EPDM)</td>
<td>-10°C to +140°C (14°F to 284°F) (higher on request)</td>
</tr>
<tr>
<td>Air pressure</td>
<td>0 to 600 kPa (0 to 6 bar) (0 to 87 psi)</td>
</tr>
<tr>
<td>Flow range Kv (Lv), fully open (Δp = 1 bar) (14.5 psi)</td>
<td>Approx. 23 m³/h (101 gal/m)</td>
</tr>
<tr>
<td>Flow range Kv (Lv), low capacity (Δp = 1 bar) (14.5 psi)</td>
<td>Approx. 2 m³/h (8.8 gal/m)</td>
</tr>
<tr>
<td>(Alternative size)</td>
<td>(regulating area)</td>
</tr>
<tr>
<td>(CIP area)</td>
<td>Approx. 15 m³/h (66 gal/m)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Product wetted steel parts</td>
<td>AISI 316 L</td>
</tr>
<tr>
<td>Other steel parts</td>
<td>AISI 304</td>
</tr>
<tr>
<td>Upper diaphragm</td>
<td>Nitrile (NBR), (standard)</td>
</tr>
<tr>
<td>Lower diaphragm</td>
<td>PTFE covered EPDM rubber, (standard)</td>
</tr>
<tr>
<td>Alternative upper diaphragm</td>
<td>EPDM/PTFE, (for temperatures 95-140°C) (203°F to 284°F)</td>
</tr>
<tr>
<td>Alternative upper diaphragm</td>
<td>Solid Teflon (PTFE), (for temperatures above 140°C) (284°F)</td>
</tr>
<tr>
<td>Alternative lower diaphragm</td>
<td>Solid Teflon (PTFE), (for temperatures above 140°C) (284°F)</td>
</tr>
<tr>
<td>Alternative O-ring</td>
<td>O-ring Nitrile (NBR), (standard)</td>
</tr>
<tr>
<td>Finish</td>
<td>Viton (FPM), (for temperatures above 95°C) (203°F)</td>
</tr>
<tr>
<td></td>
<td>Semi bright</td>
</tr>
</tbody>
</table>

Noise
One meter away from - and 1.6 meter above the exhaust the noise level of a valve actuator will be approximately 77 db(A) without noise damper and approximately 72 db(A) with damper - Measured at 7 bars air-pressure.
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.

NOTE! For the diagrams the following applies:
Medium: Water (20°C) (68°F).
Measurement: In accordance with VDI 2173.

Example 1:
CPMI-2:
Pressure drop $\Delta p = 200$ kPa. (29 psi)
Flow $Q = 8$ m$^3$/h. (35 gal/min)
Select: CPMI-2, Kv 23 which at working point will be 48% open.

Example 2:
CPMI-2:
Pressure drop $\Delta p = 300$ kPa. (43.5 psi)
Flow $Q = 1$ m$^3$/h. (4.4 gal/min)
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.

### Parts list

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

Δ: Service kits - product wetted parts

### Service Kits

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Item number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product wetted parts</td>
<td></td>
</tr>
<tr>
<td>NBR/EPDM-PTFE</td>
<td>9611-92-0218</td>
</tr>
<tr>
<td>FPM/PTFE</td>
<td>9611-92-0515</td>
</tr>
<tr>
<td>FPM/EPDM-PTFE</td>
<td>9611-92-0516</td>
</tr>
<tr>
<td>FPM/PTFE/EPDM-PTFE</td>
<td>9611-92-0517</td>
</tr>
</tbody>
</table>
The drawing below shows CPM-2.
CPMI-2: Constant-Pressure Modulating Inlet. CPMO-2: Constant-Pressure Modulating Outlet.
The drawing includes all items of the valve. The items refer to the parts list on the opposite part of the page.
The drawings and the parts list include all items.

### Parts list

<table>
<thead>
<tr>
<th>Pos.</th>
<th>Qty.</th>
<th>Denomination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Booster housing</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Lock nut</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>Washer</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Spring washer</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Nut</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>Booster piston</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Diaphragm</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Booster cover</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>Clamps and screws</td>
</tr>
</tbody>
</table>

> : Service kit

### Service Kits

<table>
<thead>
<tr>
<th>Denomination</th>
<th>Item number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td>31356-0094-1</td>
</tr>
</tbody>
</table>

---

*TD 417-089*
6. Parts lists and service kits

6.2 Booster

The drawing below shows the Booster. The items refer to the parts list on the opposite part of the page. The drawing includes all items of the valve.
How to contact Alfa Laval

Contact details for all countries are continually updated on our website. Please visit www.alfalaval.com to access the information direct.