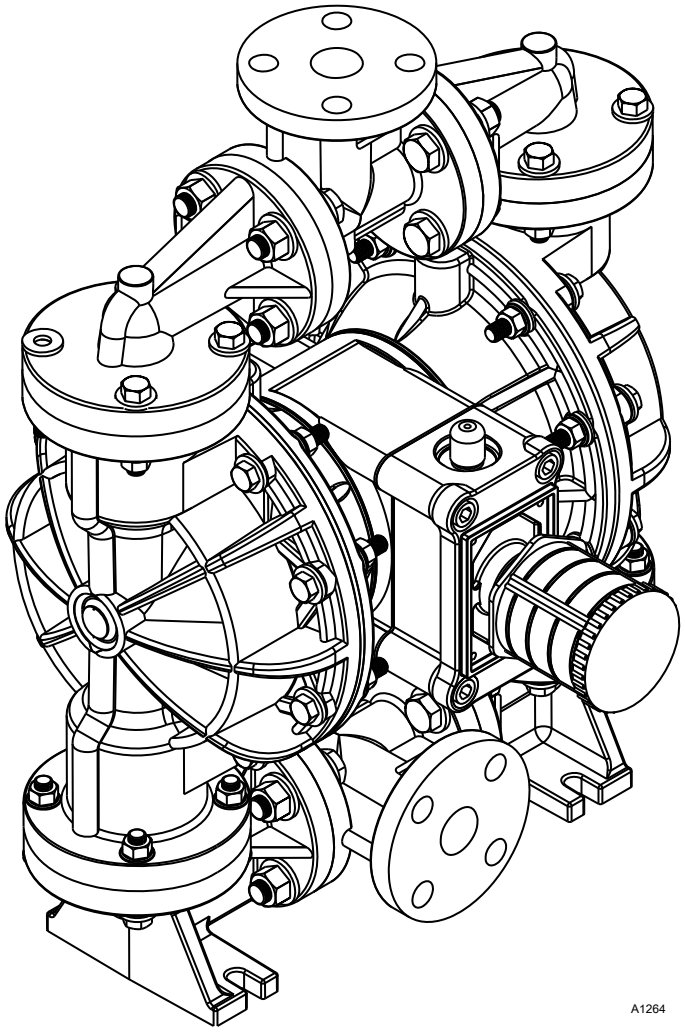
Assembly and operating instructions

Duodos 25

Air-driven double diaphragm pump

EN



Please carefully read these operating instructions before use. · Do not discard.
The operator shall be liable for any damage caused by installation or operating errors.
The latest version of the operating instructions are available on our homepage.

General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

Please read the supplementary information in its entirety.

Information

This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Safety Information

The safety information includes detailed descriptions of the hazardous situation, see *Chapter 2.1 'Explanation of the safety information' on page 5*

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

More symbols

Symbol	Description
1.	Action, step by step
⇨	Outcome of an action
	Links to elements or sections of these instructions or other applicable documents
■	List without set order
[Button]	Display element (e.g. indicators) Operating element (e.g. button, switch)
'Display /GUI'	Screen elements (e.g. buttons, assignment of function keys)
CODE	Presentation of software elements and/or texts

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1 Function and Identification

1.1 Function

The Duodos is an air-driven double diaphragm pump.

The Duodos is run-dry safe and self-priming.

The pump capacity of the double diaphragm pump can be controlled by changing the pressure in the air supply. The air control is designed for oil-free operation. The Duodos is optimally suited to the transport of liquid chemicals.

The Duodos double diaphragm pump transports liquids to a discharge lift of 70 m. As the pump capacity depends greatly on the back pressure, the performance curve must always be observed. At the same time, the differential pressure between the hydraulic and pneumatic sides must not exceed 2 bar. Higher values reduce the service life of the double diaphragm pump.

When selecting the double diaphragm pump you must check its material compatibility. In addition, the density, viscosity, solids content and temperature of the liquid being transported must be considered.

Permissible values for the medium

Temperature of the medium

- *PP version: 5 ... 65 °C*
- *PVDF version: -13 ... 93 °C*

Viscosity of the medium max. 200 mPas

Solids content: none

1.2 Identification

Type	Housing	Diaphragm	Feed rate l/h	Order number
Duodos 25	PP	Santoprene®	0 ... 6700	1010796
Duodos 25	PVDF	Teflon®	0 ... 6700	1010800

2 Safety and Responsibility

2.1 Explanation of the safety information

Introduction

These operating instructions provide information on the technical data and functions of the product. These operating instructions provide detailed safety information and are provided as clear step-by-step instructions.

The safety information and notes are categorised according to the following scheme. A number of different symbols are used to denote different situations. The symbols shown here serve only as examples.

DANGER!

Nature and source of the danger

Consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger

Danger!

– Denotes an immediate threatening danger. If this is disregarded, it will result in fatal or very serious injuries.

WARNING!

Nature and source of the danger

Possible consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger

Warning!

– Denotes a possibly hazardous situation. If this is disregarded, it could result in fatal or very serious injuries.

CAUTION!

Nature and source of the danger

Possible consequence: Slight or minor injuries, material damage.

Measure to be taken to avoid this danger

Caution!

– Denotes a possibly hazardous situation. If this is disregarded, it could result in slight or minor injuries. May also be used as a warning about material damage.

NOTICE!

Nature and source of the danger

Damage to the product or its surroundings

Measure to be taken to avoid this danger

Note!

– Denotes a possibly damaging situation. If this is disregarded, the product or an object in its vicinity could be damaged.

Type of information

Hints on use and additional information

Source of the information, additional measures

Information!

– *Denotes hints on use and other useful information. It does not indicate a hazardous or damaging situation.*

2.2 Users' qualifications

WARNING!

Danger of injury with inadequately qualified personnel!

The operator of the plant / device is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

– All work on the unit should therefore only be conducted by qualified personnel.
– Unqualified personnel should be kept away from the hazard zone

Training	Definition
Instructed personnel	An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/her and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfils the requirements made of an instructed person and who has also received additional training specific to the system from ProMinent or another authorised distribution partner.
Trained qualified personnel	A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.

Training	Definition
Electrician	Electricians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which the are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent to work on the system.

Note for the system operator

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to!

2.3 Intended use

CAUTION!

Intended use

Possible consequences if the instructions are not observed: Minor injuries and material damage

- The pump is intended for liquids transport
- The pump is not intended for the transport of gaseous or solid media
- Only use the pump in accordance with the technical data and specifications outlined in the operating instructions.
- The pump is not designed for use in areas at risk from explosion
- Only switch the device on if it has been properly fastened to the ground or its holding fixture.

2.4 Duodos general safety notes

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

WARNING!

Hazardous media / contamination of persons and equipment

Possible consequence: Fatal or very serious injuries. material damage

- Ensure the device is resistant to the media being conveyed
- Always observe the safety data sheets for the media to be conveyed. The system operator must ensure that these safety data sheets are available and that they are kept up-to-date
- The safety data sheets for the media being conveyed are always decisive for initiating counter measures in the event of leakage to the media being conveyed
- Observe the general restrictions in relation to viscosity limits, chemical resistance and density

WARNING!

Service life of the diaphragm

Possible consequence: Fatal or very serious injuries

The service life of the diaphragm cannot be precisely specified. For this reason, the possibility of fracture and subsequent leakage of liquids must be taken into account.

In addition, you must prevent particles from the defective diaphragm reaching the media being conveyed. This can be achieved e.g. by filtration, a hose rupture alarm or other means suitable for the respective process.

CAUTION!

Compressed air

Before working on the double diaphragm pump, close the compressed air lines and vent the double diaphragm pump.

Before undertaking any maintenance and repair work, close off the compressed air supply, discharge the compressed air and detach the air supply line from the double diaphragm pump. The line to the discharge side of the double diaphragm pump may be under pressure and must likewise be vented.

CAUTION!

Hot surface

When conveying hot liquids, the pump can likewise become hot. Hot surfaces may then be present on the pump. Bear this in mind and take suitable measures to reduce any hazards.

Maximum pump sound pressure level 91 dB

Depending on the operating conditions, the maximum sound pressure level of the device can reach 88 dB ± 3 dB. Bear this in mind and take suitable measures to reduce any impact caused by this sound pressure level. The type and implementation of suitable measures depends on the local circumstances and is the responsibility of the system operator.

Check the fastening elements are correctly seated.

Before commissioning the double diaphragm pump, you must check that all fastening elements with sealing rings are correctly seated. The seals may 'creep', so that the fastening elements come loose over time.

In the event of a diaphragm rupture

In the event of a diaphragm rupture, the pumped medium can enter the air system of the double diaphragm pump and from there into the atmosphere. If the pumped medium is a dangerous, harmful or toxic substance, the air outlet must be routed to a suitable area where safe disposal is possible.

Operation in the open air and outdoors

- *Take suitable measures to protect the device from environmental influences when operating outside such as:*
  - *UV rays*
  - *Humidity*
  - *Frost, etc.*

3 Transport and storage

- **User qualification, transport and storage:** trained user, see ↳ *Chapter 2.2 'Users' qualifications' on page 6*

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

3.1 Transport

Transport

- The pump is protected by means of cardboard packaging
- The packaging materials can be recycled
- Consider the ambient conditions

3.2 Storage

The device must be completely drained before storage.

Permissible storage conditions:

All versions:	+ 5 °C ... 60 °C
All versions:	< 95% relative air humidity (non-condensing)

Permissible operating conditions:

All versions:	- 10 °C ... 40 °C
All versions:	< 95% relative air humidity (non-condensing)

4 Assembly

- **User qualification, installation:** trained qualified personnel, see *Chapter 2.2 'Users' qualifications' on page 6*

CAUTION!
Possible consequence: Slight or minor injuries. Material damage.

Observe the permissible ambient conditions.

4.1 Installation surroundings

Upright installation
Install the double diaphragm pump upright and plumb. The valves of the double diaphragm pump operate when loaded by gravity. The valve balls are pressed by gravity into the valve seat and seal it off. Installation outside the vertical axis impairs the function of the valves.

Nominal width of the pipework
The threaded connectors must not reduce the nominal width of the pipework or the double diaphragm pump. The hydraulic connectors have internal and external threads. Do not screw threaded fittings on to the internal thread as this would lead to a reduction of the nominal width.

Keep the suction line short and the number of pipe valves small. Do not reduce the diameter of the suction line. If a rigid pipework system is used, short flexible hose pieces should be inserted between the double diaphragm pump and pipework to protect the double diaphragm pump against vibration and tensile and compressive forces. The installation of a pulsation damper is recommended to reduce pulsations in the pumped medium.

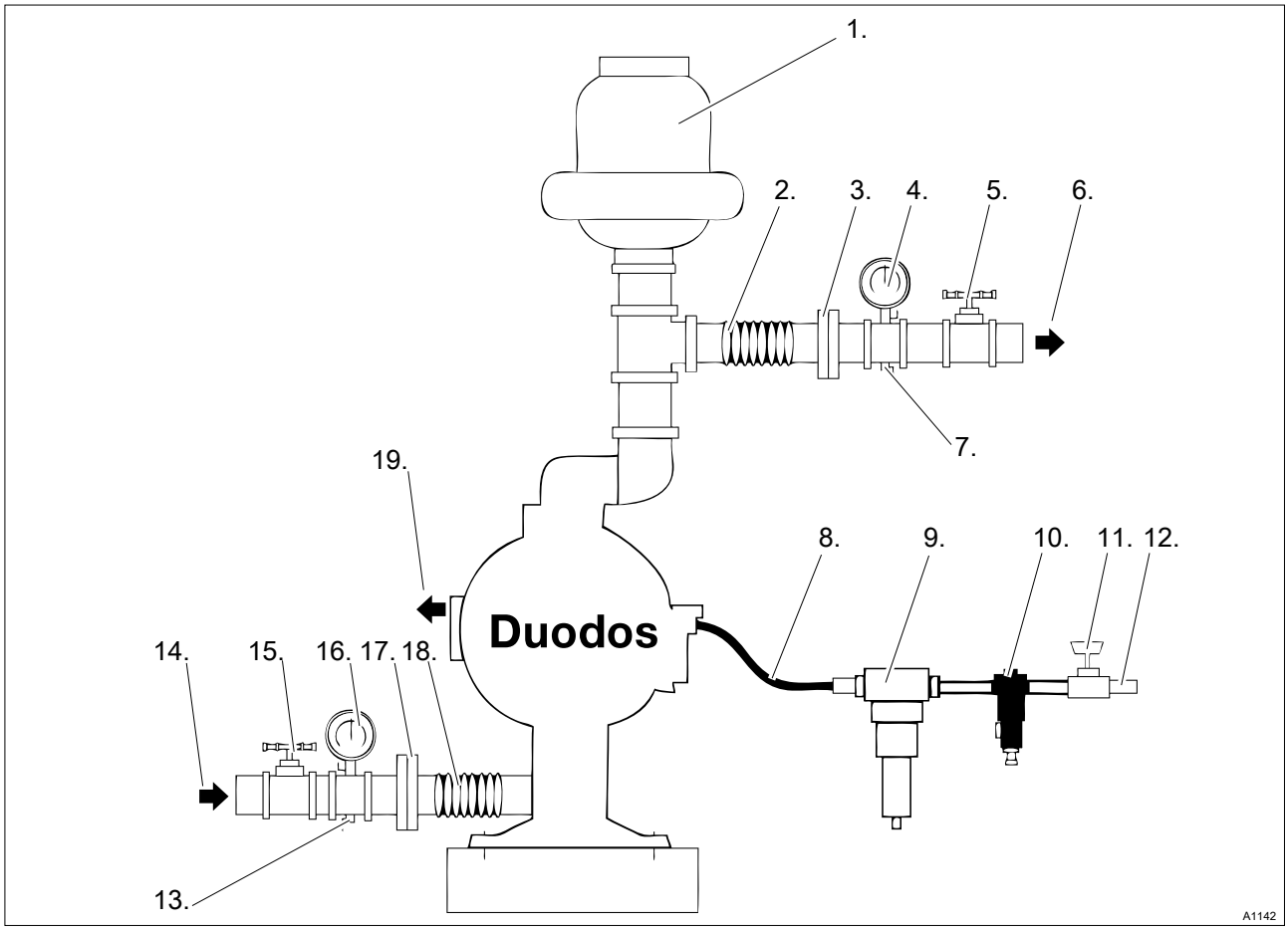

Fig. 1: Installation surroundings

1. Pulsation damper
2. Flexible connection
3. Pipe connection
4. Manometer
5. Shut-off valve
6. Discharge side
7. Outlet valve
8. Flexible connection
9. Filter/controller module
10. Air dryer (option)
11. Shut-off valve
12. Compressed air connection
13. Outlet valve
14. Suction side
15. Shut-off valve
16. Manometer
17. Pipe connection
18. Flexible connection
19. Air outlet

4.1.1 Securing the double diaphragm pump

Correct securing of the device

Only switch the device on if it has been properly fastened to the ground or its holding fixture. The system operator is responsible for ensuring that the ground and the fittings can hold the device safely and under all operating conditions.

4.2 Ambient conditions

NOTICE!

Ambient conditions

Possible consequence: Property damage and increased wear and tear

Assembly is to be carried out in the following order. If the pump has to be installed outdoors, then it is to be equipped with protection against sunlight and weather influences.

When positioning the pump, ensure that sufficient room for access is provided for all types of maintenance work.

4.3 Layout of the suction side

Nominal width of the pipework

The threaded connectors must not reduce the nominal width of the pipework or the double diaphragm pump. The hydraulic connectors have internal and external threads. Do not screw threaded fittings on to the internal thread as this would lead to a reduction of the nominal width.

Dimensioning of the suction side

Layout the suction side with generous dimensions. The supply of the double diaphragm pump with the liquid to be pumped must be ensured under all load and operating statutes. Ensure that the inside diameters of the suction lines are generously sized.

To ensure a maximum service life of the diaphragm, the double diaphragm pump should be installed as close as possible to the pumped medium. If there is a positive priming pressure on the suction side of more than 3.0 m water column, the fitting of a back pressure valve in the air outlet of the double diaphragm pump is recommended in order to protect the diaphragm. The minimum air pressure to operate the double diaphragm pump is approximately 1 bar.

4.4 Compressed air supply

Compressed air supply

The double diaphragm pump must be connected to a compressed air supply in accordance with the current state of the art (ISO 8573-1). We require unoiled, residual oil-free (residual oil from the compressors of maximum 0.1 mg/m³ for HEES-liquids, bio-oils or max. 5mg/m³ permitted for mineral oils) and appropriately dried compressed air (ISO 8573-1, class 4 with 3 °C PDP).

Our recommendation is that the pressure dew point must be at least 10 °C below the ambient temperature.

Suitable compressed air supply

The system operator is responsible for the provision of a suitable compressed air supply. In doing so, observe ISO 8573.

Layout the compressed air supply with generous dimensions. Your compressed air supply must be able to supply the double diaphragm pump with sufficient compressed air at any time and under all operating statutes. In this respect also consider the air consumption of other devices and machinery connected to the same compressed air supply. Considerable pressure fluctuations can occur in the compressed air supply when switching compressed air consumers on and off.

The air pressure of the supplied air must not exceed 7 bar (100 psi). Connect the air inlet of the double diaphragm pump to a compressed air supply, which is designed to provide the required pump capacity in terms of air quantity and pressure. To guarantee the supply pressure remains within the specified values, a control valve should be connected upstream of the double diaphragm pump.

In there is a rigid air supply line insert a short piece of flexible hose between the double diaphragm pump and the pipework.

The weight of the air supply line, control valve, and filters must not weigh upon the air connection fitting of the double diaphragm pump, rather it must be supported in a suitable manner. Otherwise the double diaphragm pump can be damaged.

Lubrication of the air valves

Based on their design, the air valve and the pilot valve do not require any lubrication and indeed must not be lubricated.

Moisture in the air line

Water in the compressed air can lead to the exhaust air freezing or the double diaphragm pump icing up. The possible consequences are malfunctions or failure of the double diaphragm pump. It is recommended that an air dryer is fitted. This extracts the water from the compressed air and protects against icing up.

5 Operation of the double diaphragm pump

- **User qualification: operation** instructed personnel, see
  ↳ *Chapter 2.2 'Users' qualifications' on page 6*

The double diaphragm pump is fully integrated into the customer provided system and is then controlled from this system. It is not possible to operate the double diaphragm pump directly.

6 Commissioning

- **User qualification, commissioning:** trained user, see *Chapter 2.2 'Users' qualifications' on page 6*

Check the fastening elements are correctly seated.
Before commissioning the double diaphragm pump, you must check that all fastening elements with sealing rings are correctly seated. The seals may 'creep', so that the fastening elements come loose over time.

6.1 Checks prior to commissioning

WARNING!
Danger from hazardous substances!
Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

The following checks are to be carried out:

- Ensure that the device has not been damaged during transportation or storage. Immediately report any damage to the supplier
- Check that the air pressure is suitable for the device.
- Ensure that the device is suitable for the liquid to be conveyed and that it will not be attacked.
- Make sure that the temperature of the liquid does not exceed the recommended temperature range
- Install a manometer in the discharge line if the back pressure value is unknown
- Under the operating conditions, check the values for flow, pressure, etc.
- Install a pressure relief valve in the discharge line in order to protect the pump in the event that a valve is unintentionally closed off or the line is blocked in another way.

6.2 Priming

1. To start the double diaphragm pump, open the air value by approximately 1/2 to 3/4 of a turn

2. 

Cavitation

If opening of the air valve causes the stroke rate of the double diaphragm pump to increase, but not however the flow volume passing through the double diaphragm pump, then cavitation is the cause. Slightly turn back the air valve so that the air consumption and feed rate of the double diaphragm pump are set in an optimum ratio.

Once the double diaphragm pump is filled with water, open the air valve further to set the required air flow.

6.3 Interrupting operation

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

Rinse through the double diaphragm pump after every use if liquids are used which when stationary have a tendency to form deposits or to solidify. This avoids damage to the double diaphragm pump. Liquid residues remaining in the double diaphragm pump may dry out and form deposits. When restarting the double diaphragm pump, this can lead to problems at the diaphragms and the ball valves. At temperatures below 0 °C the double diaphragm pump must always be completely drained.

7 Checking Tightening Torque Prior to Commissioning

Lasting tightness

Check that the threaded connectors have the correct torque during commissioning.

We also recommend checking these threaded connectors for correct torque at least once a year because the pump material yields and the tightening torque is then reduced.

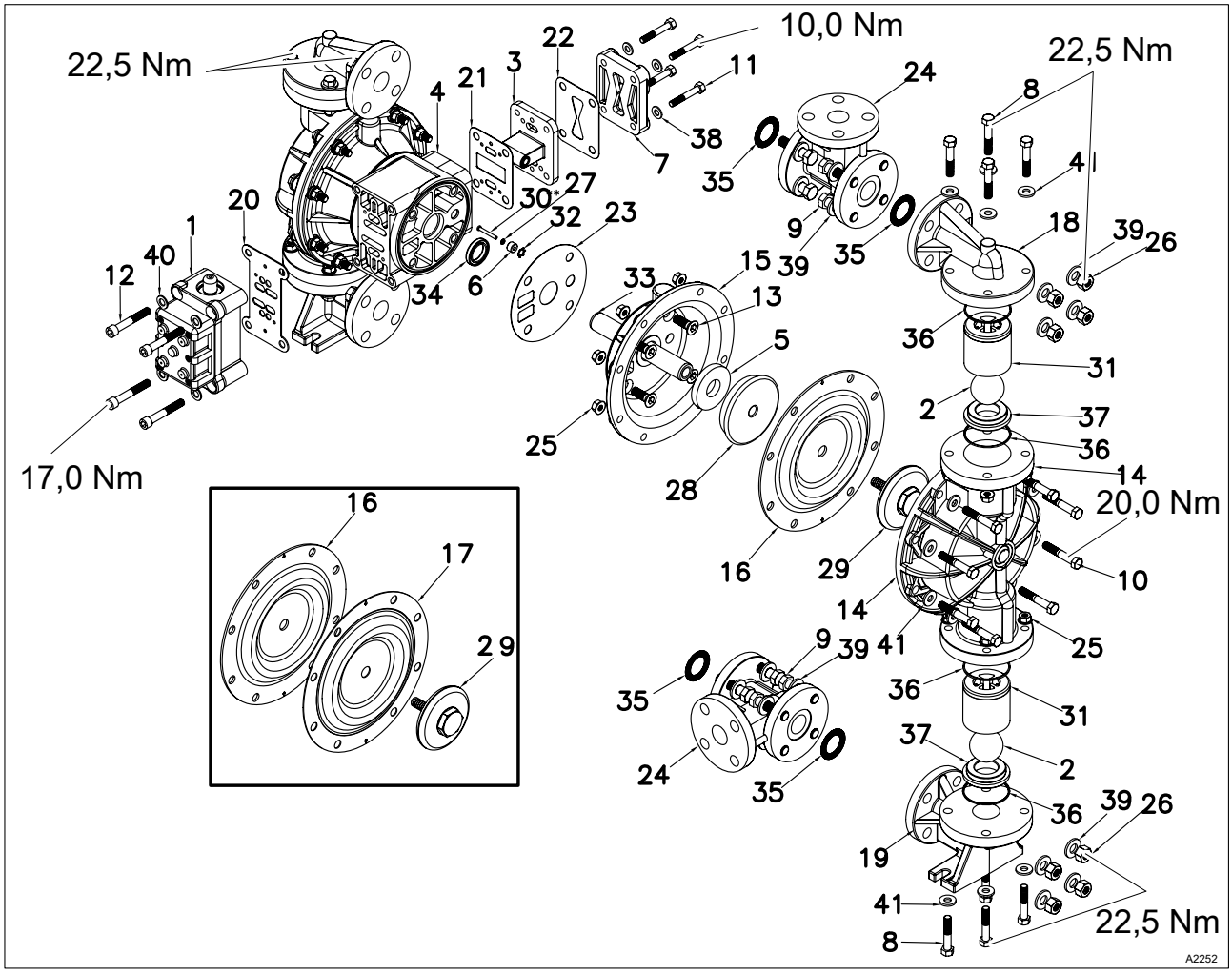

Fig. 2: Checking tightening torque prior to commissioning.

1. Tighten all screws (8) to 22.5 Nm.
2. Tighten all screws (10) to 20.0 Nm.
3. Tighten all screws (11) to 8.0 Nm.
4. Tighten all screws (12) to 17.0 Nm.
5. Tighten all nuts (26) to 22.5 Nm.

8 Maintenance of the double diaphragm pump

- **User qualification, Maintenance:** instructed personnel, see *Chapter 2.2 'Users' qualifications' on page 6*

WARNING!
Danger from hazardous substances!
Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

Before all work
Before all work on the double diaphragm pump, disconnect the double diaphragm pump from the compressed air supply and the feed and discharge lines, vent and decontaminate. Always observe the safety data sheet for the chemicals to be conveyed.

8.1 Troubleshooting

Possible symptoms

- Double diaphragm pump does not cycle
- Double diaphragm pump cycles, but does not pump
- Double diaphragm pump cycles, but insufficient feed rate
- Double diaphragm pump cycles irregularly
- Double diaphragm pump vibrates strongly

Cause:	Measure:
Suction lift of the system too high	For suction lifts above 6 metres, priming of the pump can in most cases be induced by pre-filling the pump chambers
Too high priming pressure on the suction side of the system	If there is a priming pressure of more than 3 metres water column, provide a back pressure valve in the air outlet of the double diaphragm pump
Back pressure of the medium higher than the air pressure	Increase the air inlet pressure to the double diaphragm pump
Compressed air pressure higher than the back pressure of the medium	Adjust the feed air pressure according to the performance curve of the double diaphragm pump. At high stroke rates, cavitation in the medium may occur
Suction line of too small nominal width	Observe the recommendations of the dimensioned drawing for the cross-section of the suction line

Cause:	Measure:
Air line of too small nominal width	Observe the recommendations for dimensioning of the air inlet line in the operating instructions of the double diaphragm pump
Air distribution system of the double diaphragm pump	Dismantle and examine the air valve, pilot valve and control pins
Rigid pipe connections at the pump	Use flexible connections and a pulsation damper
Exhaust air silencer blocked	Remove the silencer. Then clean or de-ice and refit.
Pumped medium in the exhaust air silencer	Dismantle pump chambers and determine whether a diaphragm is broken or a diaphragm flange is loose
Ball valve blocked	Dismantle the liquid end of the double diaphragm pump and clear the blockage
Ball valve or valve seat worn or distorted	Check the ball valves and valve seats for wear and correct seating Replace as necessary
Suction line blocked	Clear blockage or check and clean suction line
Discharge line blocked	Check for blockage. Valves in the discharge line may be closed
Pump chamber blocked	Dismantle the liquid end and inspect the diaphragm chambers of the double diaphragm pump

8.2 Maintenance of the air valve

To carry out maintenance on the air valve, first disconnect the compressed air supply, vent the double diaphragm pump and remove the air supply line from the double diaphragm pump.

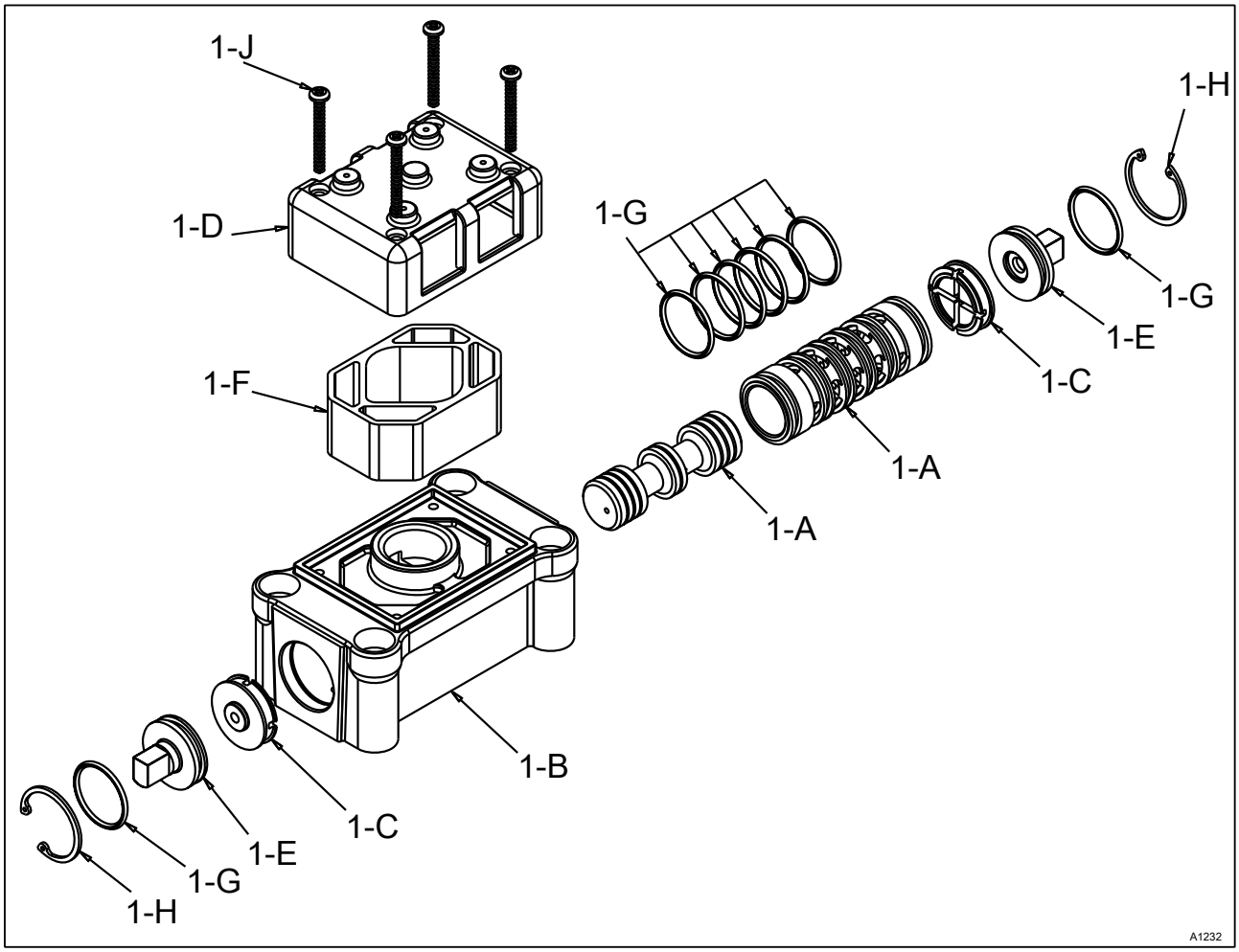

Fig. 3: Maintenance of the air valve

1. Remove the 4 hexagonal head screws
2. Dismantle the air filter housing
3. Remove the seal
   ⇨ Check the seal and replace as necessary.

Dismantle the air valve

4. Using pliers, remove the two safety collars (1-H) of the air valve and the two end stops (1-E)
   ⇨ Replace the O-rings (1-G) as necessary.
5. Remove the two shock absorbers (1-C) and check them for scratches, wear and abrasion
   ⇨ Replace the shock absorbers (1-C) as necessary.
6. Pull the piston (1-A) out of the control cylinder. Ensure that the piston is not scratched or damaged
7. Clean the piston with a soft cloth
8. Check the piston for scratches and signs of wear
   ⇨ Replace the piston as necessary.
9. Check whether the control cylinder (one part of 1-A) is dirty on the inside or scratched
   ⇨ Replace the control cylinder and piston as necessary.

Reassemble the air valve

10. Insert the end stop (1-E) with an O-ring (1-G) and the shock absorber (1-C) into the air valve housing (1-B)
    ⇨ Secure with a safety collar (1-H).

11. Remove the new control cylinder and piston (1-A) from the plastic bag and pull the piston out of the control cylinder
12. Push the six O-rings (1-G) onto the control cylinder and press the O-rings into the recesses
13. Coat the O-rings thinly with grease prior to fitting the control cylinder in the air valve housing
14. Push the piston into the control cylinder up to the end cover already mounted. Ensure that this does not cause any scratches.
15. Fit the second end stop complete with O-ring and the shock absorber (1-C)
16. Fit the remaining safety collar (1-H)
17. Now you can refit the air valve housing (1-B) to the pump
18. Place the cover and the seal onto the double diaphragm pump with the four hexagonal head screws
19. Tighten the four hexagonal head screws to 3.4 Nm
20. Switch the compressed air supply back on

    ⇨ The double diaphragm pump is now ready for use.

8.3 Maintenance of the pilot valve

Before all work

Before all work on the double diaphragm pump, disconnect the double diaphragm pump from the compressed air supply and the feed and discharge lines, vent and decontaminate. Always observe the safety data sheet for the chemicals to be conveyed.

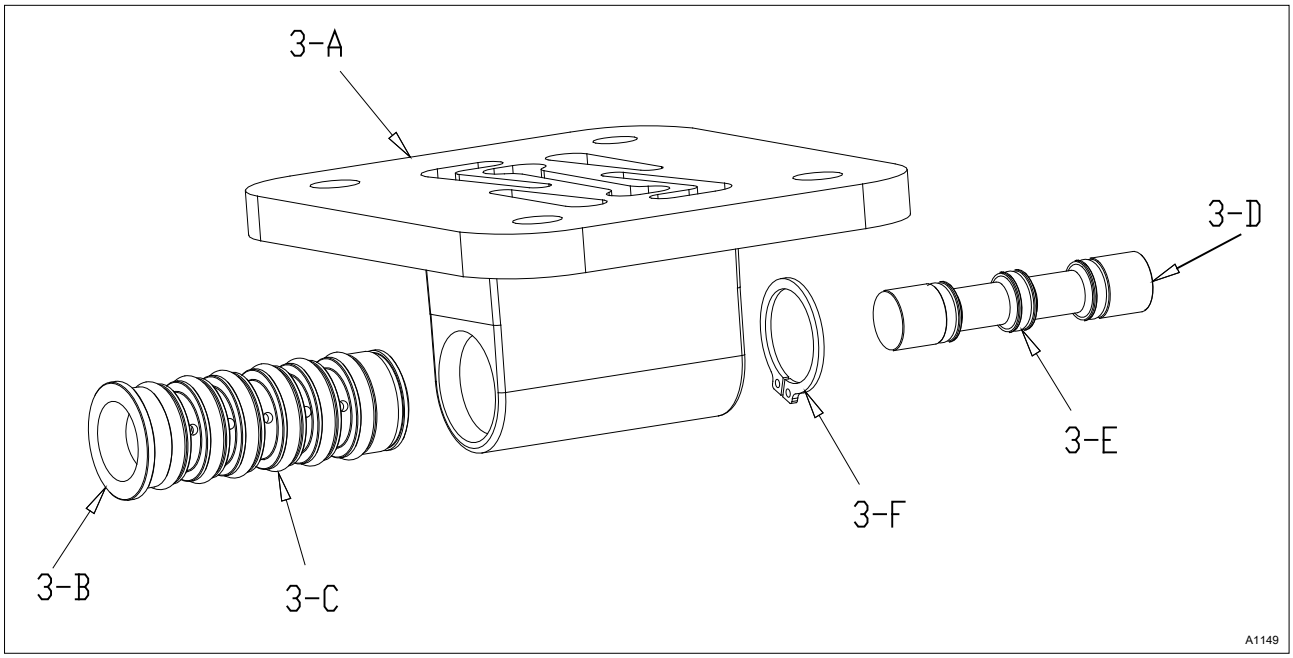

Fig. 4: Maintenance of the pilot valve

1. Remove the 4 hexagonal head screws
2. Remove the air inlet cover
3. Remove the seal
   ⇨ Check the seal and replace as necessary.

   You can now remove the pilot valve.

Dismantle the pilot valve

4. Remove the pilot valve piston (3D) and the O-rings
5. Clean all parts with a soft cloth
6. Check all parts for scratches and signs of wear and tear
   ⇨ Replace the parts as necessary.
7. Remove the safety collar from the end of the control cylinder
8. Clean all parts with a soft cloth
9. Check all parts for scratches and signs of wear and tear
   ⇨ Replace the parts as necessary.

Reassembling the pilot valve

10. Thinly apply grease to the outside of the control cylinder and the O-rings
11. *Do not squeeze the O-rings when doing so.*

    Insert the control cylinder into the valve housing

12. Insert the safety collars into the control cylinder
13. Thinly apply grease to the control piston and O-rings
14. Insert the control piston into the control cylinder

Insert the pilot valve into the pump housing

15. Place the seal on the pilot valve housing
16. Carefully insert the pilot valve into the recess on the pump housing
17. The control pins must align correctly with the pilot valve control piston
18. Fit the seal, the air inlet cover and the hexagonal screws
19. Switch the compressed air supply back on

    ⇨ The double diaphragm pump is now ready for use.

8.4 Maintenance of the ball valves

An inspection or maintenance is normally indicated if upon starting the double diaphragm pump:

- *primes badly*
- *provides less capacity*
- *cycles irregularly*
- *cycles, but does not pump*

Before maintenance work

1. First close the suction line of the double diaphragm pump
2. Close the discharge line of the double diaphragm pump
3. Shut-off the compressed air supply
4. Vent the double diaphragm pump
5. Remove the air supply line from the double diaphragm pump
6. If necessary remove any liquid which may remain in the double diaphragm pump

   ⇨ Now the double diaphragm pump can be removed for maintenance.

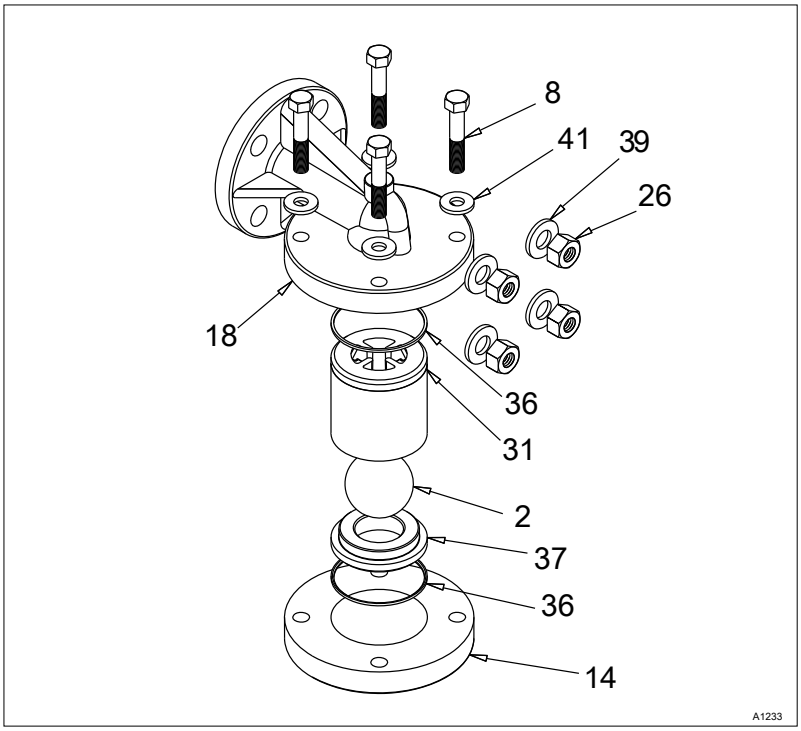

Fig. 5: Maintenance of the ball valves

1. Remove the fixings for the angle fittings (18) to gain access to the ball valves
2. Now remove and dismantle the seal (39) and the complete ball valve
3. Check the valve balls (2) for wear, abrasion and scratches
4. Examine the valve ball cage (33), the valve ball (2), the valve seat (40) and the seals (39) for scratches, abrasion and material that has eaten into the surface. It is important that the curve of the ball aligns perfectly with the profile of the bevelled edges for the seal to sit correctly.

   ⇨ Replace worn or damaged parts.

Reassembling the ball valve

5. Place the valve seal (39) and the valve seat (40) into the hollow interior of the external chamber (14) with the chamfered sides pointing upwards.
6. Place the valve ball (2) on the valve seat and put the valve ball cage (33) with its open side pointing downwards over the ball and the valve seat
7. Place on a further valve seal (39) so that the chamfered side of the seal is pointing towards the valve ball cage.

   ⇨ You can now reassemble the pump.

After maintenance work

1. Attach the air supply line to the double diaphragm pump
2. Open the compressed air supply
3. Open the discharge line of the double diaphragm pump

4. Open the suction line of the double diaphragm pump
   ⇨ Now the double diaphragm pump can pump again

Check all connectors for leak-tightness

8.5 Maintenance of the diaphragms

Before maintenance work

1. First close the suction line of the double diaphragm pump
2. Close the discharge line of the double diaphragm pump
3. Shut-off the compressed air supply
4. Vent the double diaphragm pump
5. Remove the air supply line from the double diaphragm pump
6. If necessary remove any liquid which may remain in the double diaphragm pump
   ⇨ Now the double diaphragm pump can be removed for maintenance.

Duodos 25 PP

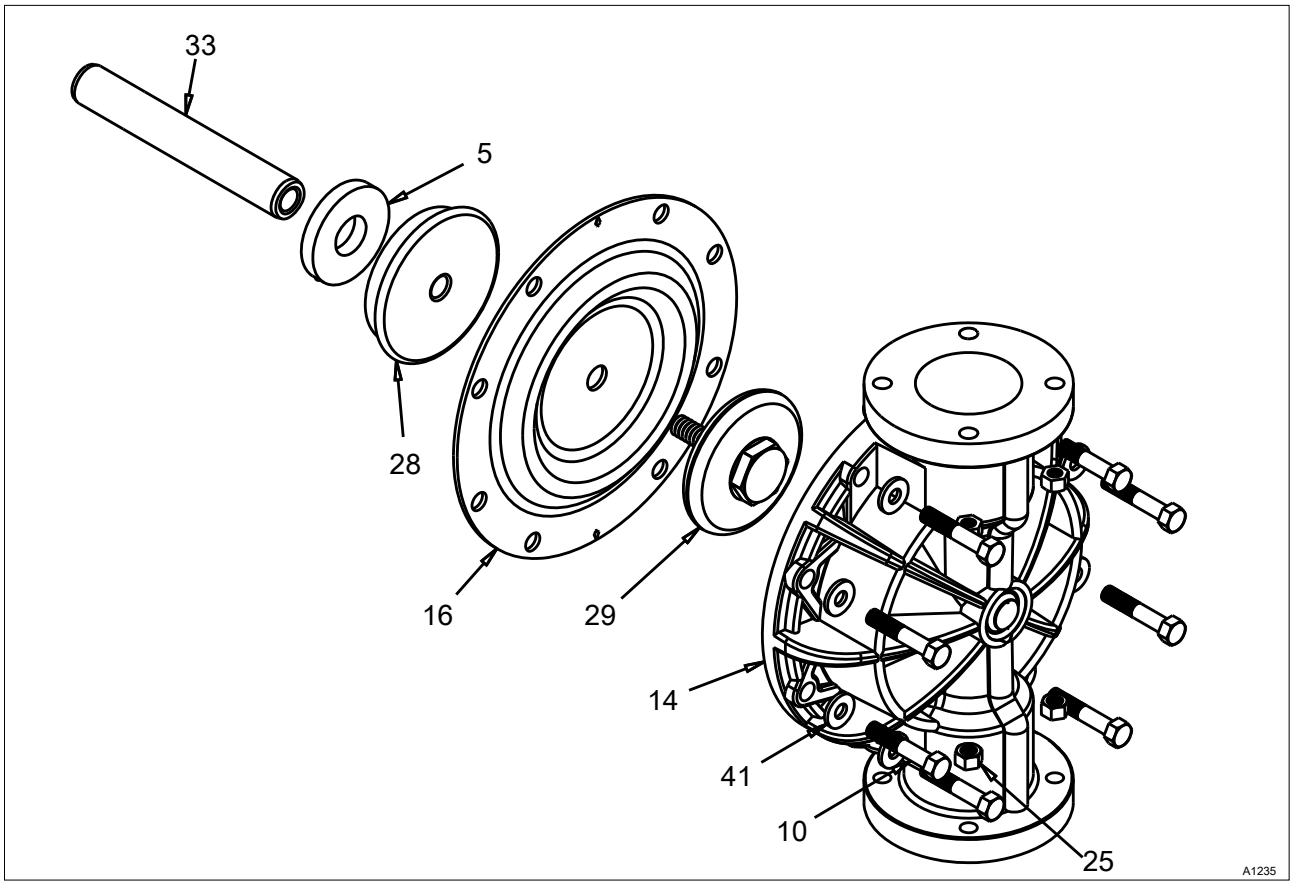

Fig. 6: Maintenance of the diaphragms

1. Unscrew the 16 screws that fix the pipe elbows to the pumping housings (14)

   ⇨ Remove the brackets including the associated distributor fittings.

Remove the liquid ends.

2. Unscrew the 16 screws that hold together the pumping housing, diaphragms and the pump housing

Removing and dismantling the diaphragm assembly.

3. Remove the diaphragm assembly (consisting of the outer diaphragm flange, the diaphragms and inner diaphragm flange) in a counterclockwise direction from the piston rod (33)
4. Clamp the inner diaphragm flange loosely into a vice
5. Rotate an adjustment screw into the threaded hole of the inner diaphragm flange
6. Remove the outer diaphragm flange (29) in a counterclockwise direction
7. Examine the diaphragm (16) for scratches, tiny holes and wear. Examine the diaphragms for signs that the diaphragms have been attacked by the pump medium

   ⇨ Use new diaphragms as necessary.

Assembling the diaphragm assembly

8. Insert the threaded bolt of the outer diaphragm flange though the hole into the centre of the diaphragm
9. Screw the inner diaphragm flange clockwise onto the threaded bolt
10. Clamp the loosely assembled group with the adjustment screw used above into a vice

11. Tighten the loosely assembled group using a torque wrench to 27 Nm

    ⇨ Wait a minimum of 15 minutes until the components have settled and repeat the tightening procedure to 27 Nm.

Fitting the liquid end.

12. Check that the shock absorber (6) is attached to the piston rod
13. Screw the threaded bolt of one of the diaphragm assemblies clockwise into the threaded hole at the end of the piston rod until the end of the piston rod is aligned correctly with the inner diaphragm flange.
14. Insert the piston rod into the pump
15. Align the screw holes in the diaphragm with the screw holes in the pump housing

    ⇨ The directional arrows moulded into the diaphragms should point upwards.
16. Screw the pumping housing (14) to the pump housing with the screws and nuts, at the same time pulling out the piston rod on the opposite side of the pump as far as possible.
17. Check that the shock absorber (5) is attached to the piston rod

    Screw the threaded bolt of the second diaphragm assembly clockwise into the threaded hole at the end of the piston rod (35) just far enough to align the screw holes in the diaphragm to the holes in the pump housing
18. Fit the diaphragms, as shown in the cross-section, with the folds pointing to the centre of the pump
19. Fix the second external chamber to the pump housing (14) with the screws and nuts.
20. Screw the angle fitting including the distributor using the screws and nuts

    ⇨ The pump can now be reinstalled, connected to the compressed air supply and started up.

After maintenance work

1. Attach the air supply line to the double diaphragm pump
2. Open the compressed air supply
3. Open the discharge line of the double diaphragm pump
4. Open the suction line of the double diaphragm pump

    ⇨ Now the double diaphragm pump can pump again

Check all connectors for leak-tightness

Maintenance of the Overlay Diaphragms - Duodos 25 PVDF

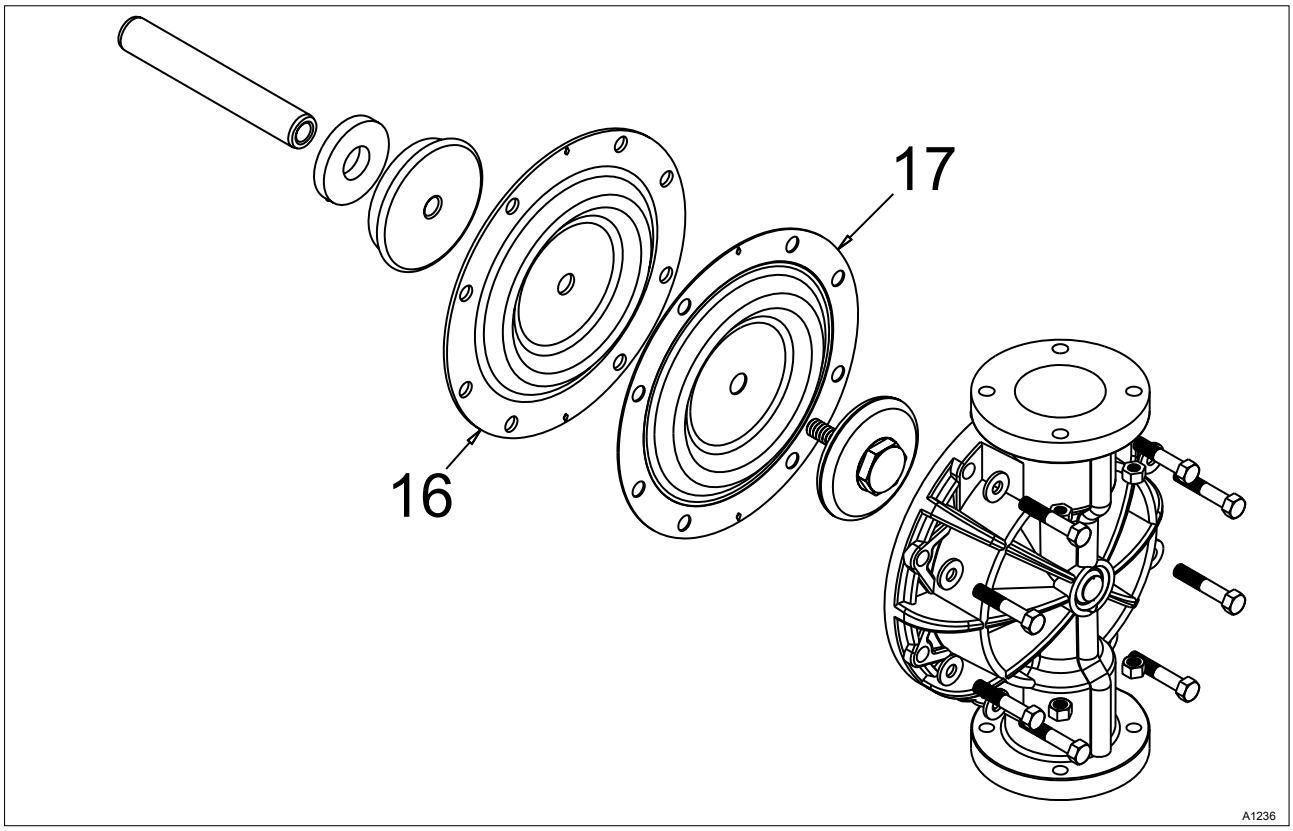

Fig. 7: Maintenance of the Overlay Diaphragms - Duodos 25 PVDF

16. Santoprene® diaphragm

17. PTFE overlay diaphragm

The PTFE overlay diaphragm (17) lies tightly on the outside of the normal Santoprene® diaphragm (16). Remove and fit as described for standard diaphragms.

9 Technical drawing

9.1 Technical Drawing – Duodos 25

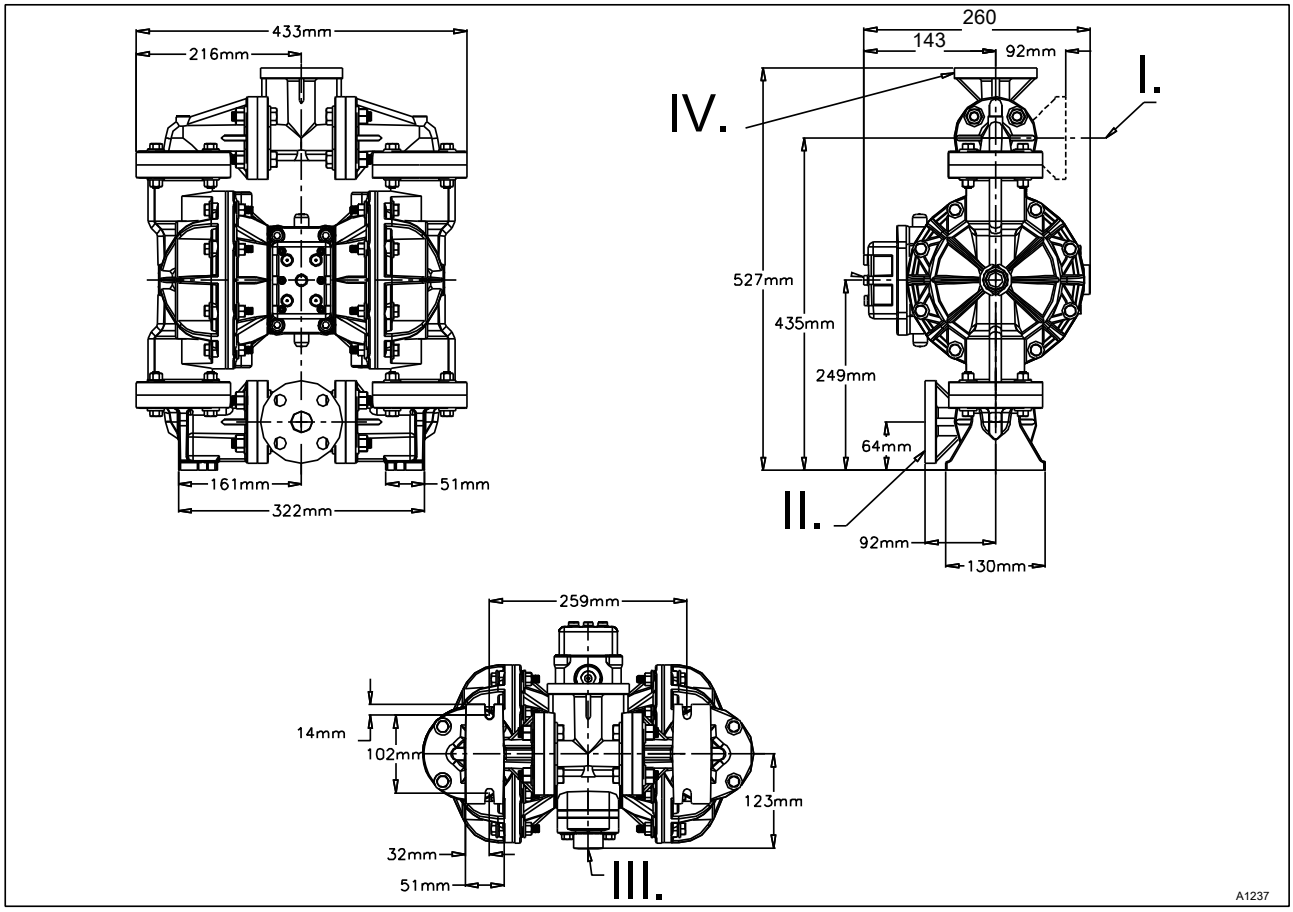

Fig. 8: Technical drawing – Duodos 25 / All dimensions in "mm" ± 3 mm

I. Connector rotatable by ± 90°
II. Suction connector 1" ANSI
III. Compressed air connector 1/2" NPT
IV. Discharge connector 1" ANSI

9.1.1 Exploded drawings and parts lists

Exploded drawing – Duodos 25

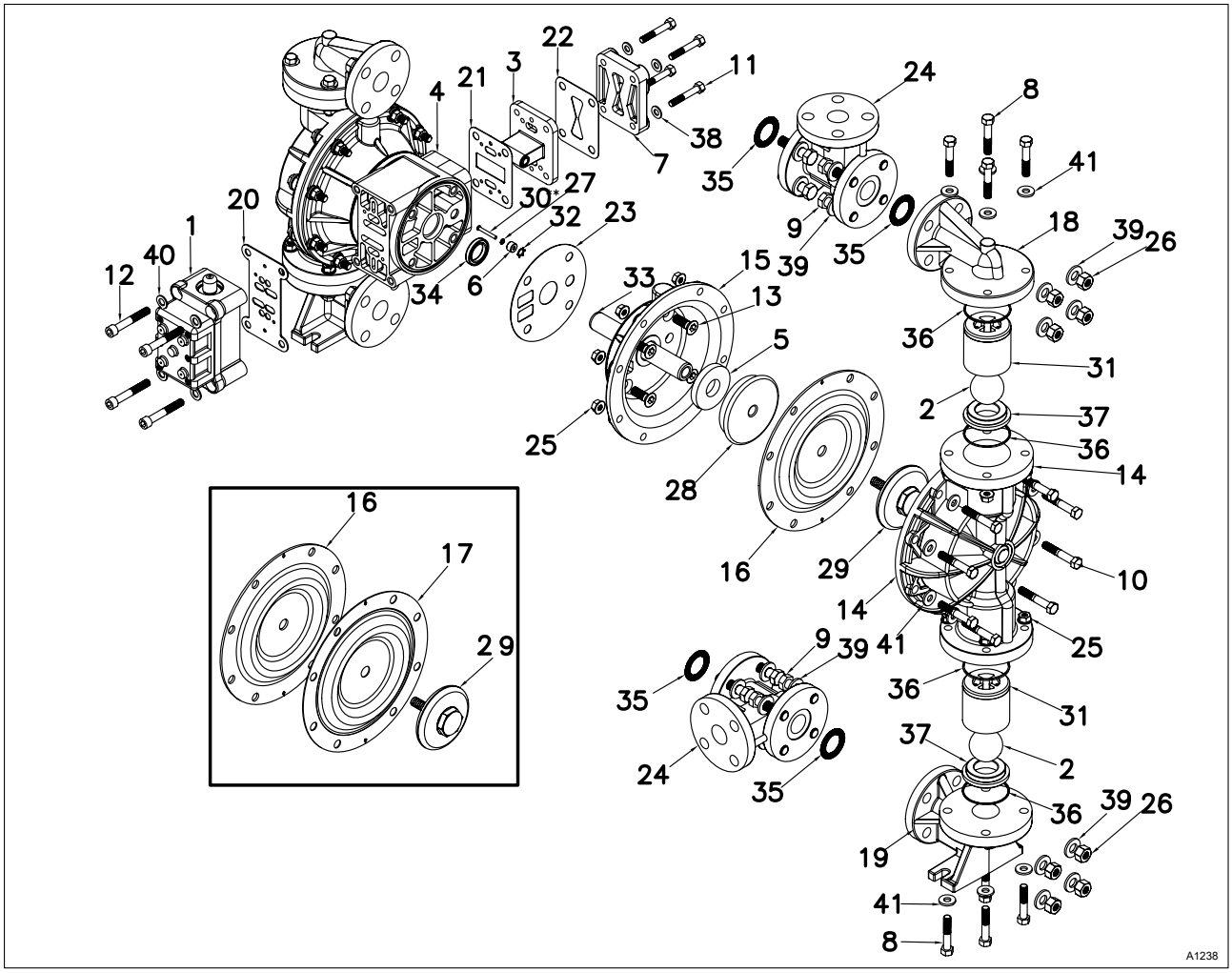

Fig. 9: Exploded drawing – Duodos 25

Parts list for Duodos 25 PP

Item	Quan-tity	Article no.	Description	Material
1	1	031-140-000	Air valve, complete	Sub-assembly
2	4	050-042-354	Valve ball	Santoprene®
3	1	095-110-558	Pilot valve, complete	Sub-assembly
4	1	114-024-551	Pump housing	Aluminium, coated with epoxy resin
5	2	132-035-360	Shock absorber, piston rod	Buna-N®
6	2	135-034-506	Guide sleeve	Delrin®
7	1	165-125-551	Cover, air inlet	Aluminium, coated with epoxy resin
8	16	170-020-115	Hexagonal head screw HD 3/8-16 x 2.00	Stainless steel 302/304
9	16	170-030-115	Hexagonal head screw HD 1/2-13	Stainless steel 302/304
10	16	170-052-115	Hexagonal head screw HD 5/16-18 x 1 3/4	Stainless steel 302/304
11	4	171-069-115	Hexagonal head screw HD 3/8-16 x 0.88	Stainless steel 302/304
12	4	171-053-115	Hexagonal head screw HD 3/8-16 x 2.5	Stainless steel 302/304
13	8	171-015-115	Hexagonal head screw HD 3/8-16 x 7/8	Stainless steel 302/304
14	2	196-157-552	Pumping housing/pump head	Polypropylene
15	2	196-177-551	Pump housing	Aluminium, coated with epoxy resin
16	2	286-107-354	Diaphragm	Santoprene®
18	2	312-104-552	Pipe elbow	Polypropylene
19	2	312-113-552	Elbow, suction side	Polypropylene
20	1	360-093-360	Seal, air inlet	Buna-N®
21	1	360-103-360	Seal, pilot valve	Buna-N®
22	1	360-104-360	Seal, air valve	Buna-N®
23	2	360-107-360	Seal, pump housing	Buna-N®
24	2	518-179-552	Distributor fitting	Polypropylene
25	32	544-002-115	Flange nut 3/8-16	Stainless steel 302/304
26	16	545-008-115	Hexagonal head screw 1/2-13	Stainless steel 302/304
27	2	560-001-360	O-ring	Buna-N®
28	2	612-200-157	Inner diaphragm flange	Polypropylene
29	2	612-204-552	Outer diaphragm flange	Stainless steel 316
30	2	620-020-115	Control pin	Stainless steel 302/304
31	4	670-048-552	Valve ball cage	Polypropylene
32	2	675-042-115	Safety collar	Stainless steel 302/304
33	1	685-058-120	Diaphragm piston rod	Stainless steel 416
34	2	720-004-360	Seal, piston rod	Buna-N®
35	4	720-044-600	Seal, distributor fitting	PTFE

Item	Quantity	Article no.	Description	Material
36	8	720-047-600	Valve seal	PTFE
37	4	722-079-552	Valve seat	Polypropylene
38	4	901-038-115	Washer 5/16"	Stainless steel 302/304
39	32	901-046-115	Washer 1/2"	Stainless steel 302/304
40	4	901-048-115	Washer 1, 3/8"	Stainless steel 302/304
41	32	901-049-115	Washer 2, 3/8"	Stainless steel 302/304

Parts list for Duodos 25 PVDF

Item	Quantity	Article no.	Description	Material
1	1	031-140-000	Air valve, complete	Sub-assembly
2	4	050-042-600	Valve ball	PTFE
3	1	095-110-558	Pilot valve, complete	Sub-assembly
4	1	114-024-551	Pump housing	Aluminium, coated with epoxy resin
5	2	132-035-360	Shock absorber, piston rod	Buna-N®
6	2	135-034-506	Guide sleeve	Delrin®
7	1	165-125-551	Cover, air inlet	Aluminium, coated with epoxy resin
8	16	170-020-115	Hexagonal head screw HD 3/8-16 x 2.00	Stainless steel 302/304
9	16	170-030-115	Hexagonal head screw HD 1/2-13	Stainless steel 302/304
10	16	170-052-115	Hexagonal head screw HD 5/16-18 x 1 3/4	Stainless steel 302/304
11	4	171-069-115	Hexagonal head screw HD 3/8-16 x 0.88	Stainless steel 302/304
12	4	171-053-115	Hexagonal head screw HD 3/8-16 x 2.5	Stainless steel 302/304
13	8	171-015-115	Hexagonal head screw HD 3/8-16 x 7/8	Stainless steel 302/304
14	2	196-157-552	Pumping housing/pump head	Polypropylene
15	2	196-177-551	Pump housing	Aluminium, coated with epoxy resin
16	2	286-107-354	Diaphragm	Santoprene®
17	2	286-108-600	Diaphragm	PTFE
18	2	312-104-552	Pipe elbow	Polypropylene
19	2	312-113-552	Elbow, suction side	Polypropylene
20	1	360-093-360	Seal, air inlet	Buna-N®
21	1	360-103-360	Seal, pilot valve	Buna-N®
22	1	360-104-360	Seal, air valve	Buna-N®
23	2	360-107-360	Seal, pump housing	Buna-N®
24	2	518-179-520	Distributor fitting	Polypropylene
25	32	544-002-115	Flange nut 3/8-16	Stainless steel 302/304
26	16	545-008-115	Hexagonal head screw 1/2-13	Stainless steel 302/304
27	2	560-001-360	O-ring	Buna-N®
28	2	612-200-157	Inner diaphragm flange	Polypropylene
29	2	612-204-520	Outer diaphragm flange	PVDF
30	2	620-020-115	Control pin	Stainless steel 302/304
31	4	670-048-520	Valve ball cage	PVDF
32	2	675-042-115	Safety collar	Stainless steel 302/304
33	1	685-058-120	Diaphragm piston rod	Stainless steel 416
34	2	720-004-360	Seal, piston rod	Buna-N®

Item	Quan-tity	Article no.	Description	Material
35	4	720-044-600	Seal, distributor fitting	PTFE
36	8	720-047-600	Valve seal	PTFE
37	4	722-079-520	Valve seat	PVDF
38	4	901-038-115	Washer 5/16"	Stainless steel 302/304
39	32	901-046-115	Washer 1/2"	Stainless steel 302/304
40	4	901-048-115	Washer 1, 3/8"	Stainless steel 302/304
41	32	901-049-115	Washer 2, 3/8"	Stainless steel 302/304

10 Spare Parts kits

Spare parts kit	Part no.
Spare parts kit for air drive for Duodos 25	1010813
Spare parts kit for liquid end for Duodos 25 PP	1010804
Spare parts kit for liquid end for Duodos 25 PVDF	1010809

Parts list for spare parts kit - Duodos 25

Spare parts kit for air drive - Duodos 25 (order no. 1010813):

Item	Quantity	Article no.	Description	Material
1	1	031-139-000	Control cylinder and piston	Sub-assembly
3	1	095-110-558	Pilot valve, complete	Sub-assembly
5	2	132-035-360	Shock absorber	Polypropylene
6	2	135-034-506	Guide sleeve	Delrin®
20	1	360-093-360	Seal, air inlet	Buna-N®
21	1	360-103-360	Seal, pilot valve	Buna-N®
22	1	360-104-360	Seal, air valve	Buna-N®
23	2	360-107-360	Seal, pump housing	Buna-N®
27	2	560-001-360	O-ring	Buna-N®
1-G	8	560-020-360	O-ring	Buna-N®
30	2	620-020-115	Control pin	Stainless steel 302/304
32	2	675-042-115	Safety collar	Stainless steel 302/304
34	2	720-004-360	Seal, piston rod	Buna-N®

Spare parts kit for liquid end for Duodos 25 PP (order no. 1010804):

Pos.	Quantity	Article no.	Description	Material
2	4	050-042-354	Valve ball	Santoprene®
16	2	286-107-354	Diaphragm	Santoprene®
35	4	720-044-600	Seal, distributor fitting	PTFE
36	8	720-047-600	Valve seal	PTFE

Spare parts kit for liquid end for Duodos 25 PVDF (order no. 1010809):

Item	Quantity	Article no.	Description	Material
2	4	050-042-600	Valve ball	PTFE
16	2	286-107-354	Diaphragm	Santoprene®

Item	Quan-tity	Article no.	Description	Material
17	2	286-108-600	Overlay diaphragms	PTFE
35	4	720-044-600	Seal, distributor fitting	PTFE
36	8	720-047-600	Valve seal	PTFE

11 Technical data

Technical data – Duodos 25 PP/PVDF

Part no.	1010796	1010800
Pump type	Duodos 25 PP	Duodos 25 PVDF
Capacity (max.)	10 200 l/h	10 200 l/h
Back pressure (max.)	70 m water column	70 m water column
Feed rate/stroke	0.64 l	0.64 l
Temperature of medium	5 ... 65 °C	-13 ... 93 °C
Max. solids Ø	6 mm	6 mm
Suction lift moist	8.2 m	8.2 m
Suction connector	1" ANSI flange	1" ANSI flange
Discharge connector	1" ANSI flange	1" ANSI flange
Compressed air connection	1/2" NPT inside	1/2" NPT inside
Air consumption	8.5 ... 77 Nm^3/h	8.5 ... 77 Nm^3/h
Max. air pressure	7 bar	7 bar
Minimum air pressure approx.	1 bar	1 bar
Pumping housing	PP	PVDF
Diaphragm	Santoprene®	Santoprene®
Overlay diaphragms	none	PTFE
Valve balls	Santoprene®	PTFE
Valve seat	PP	PVDF
Seals	PTFE	PTFE
Pump housing	Aluminium, coated with epoxy resin	Aluminium, coated with epoxy resin
Assembly bracket	Steel, coated with epoxy resin	Steel, coated with epoxy resin
Weight	24 kg	29 kg
Dimensions L x W x H	446 x 260 x 530 mm	446 x 260 x 530 mm

Operating temperatures

Material	Min. op. temperature	Max. op. temperature
Santoprene®	-23 °C	100 °C
Thermoplastic elastomers produced in the injection moulding process without a mesh layer. Flexible with high durability. Excellent abrasion hardness.		
PTFE	-37 °C	100 °C
Chemically inactive and effectively impermeable. Only a very few chemicals are know to react with Teflon®.		
PVDF	-13 °C	93 °C
Polypropylene	5 °C	65 °C

Repair tools

Tool	Size (mm)	Duodos 25
1/4" Allen key	6.35 mm	x
Spanner 1/2"	12.7 mm	x
Spanner 9/16"	14.28 mm	x
Spanner 3/4"	19.05 mm	x
Spanner 1 3/8"	34.92 mm	x

11.1 Performance curves

Performance curves

The performance curves are based on the pumping of water at ambient temperature (approx. 20 °C).

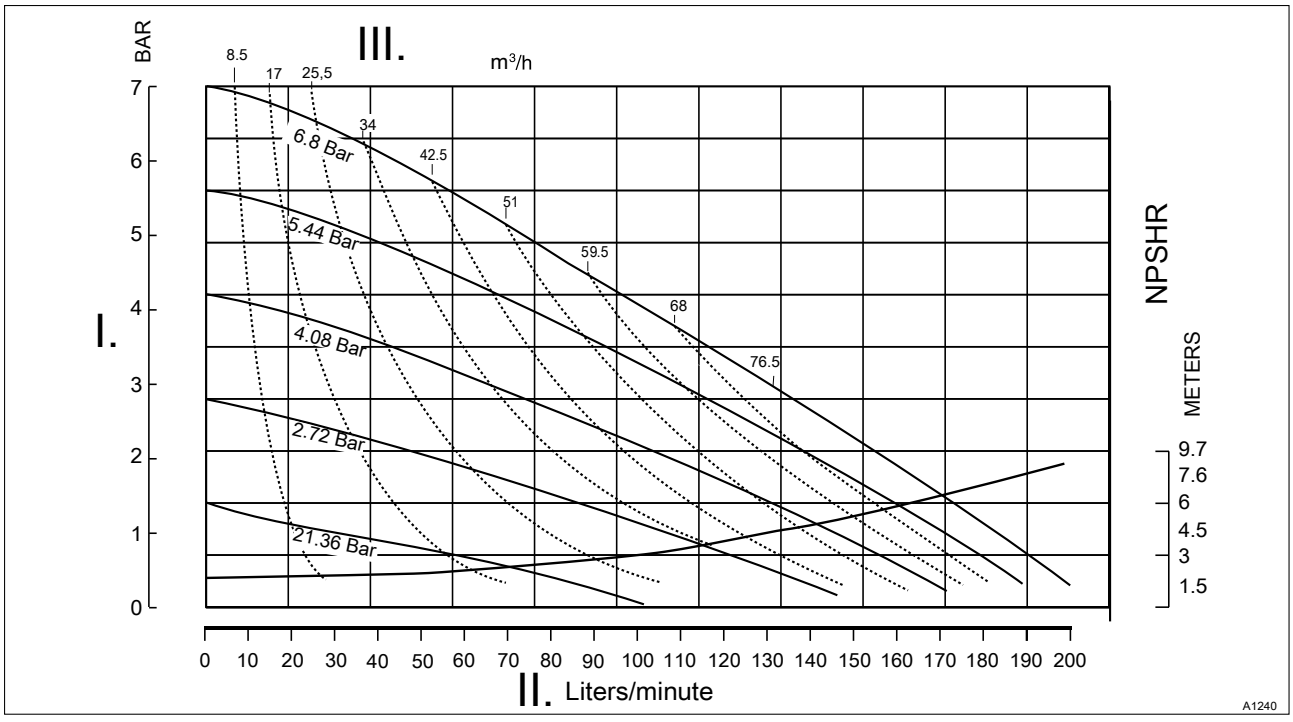

Fig. 10: Performance curves – Duodos 25

I. Back pressure in bar
II. Pump capacity in l/min
III. Air consumption in m^3/h
NPSHR = Pump Net Positive Suction Head (according to DIN EN ISO 12723)

12 Disposal of Used Parts

- **User qualification:** instructed user, see *Chapter 2.2 'Users' qualifications' on page 6*

NOTICE!

Regulations governing the disposal of used parts

– Note the current national regulations and legal standards which apply in your country

The manufacturer will take back decontaminated used units providing they are covered by adequate postage.

Decontaminate the unit before returning it for repair. To do so, remove all traces of hazardous substances. Refer to the Material Safety Data Sheet for your feed chemical.

A current Declaration of Decontamination is available to download on the ProMinent website.

13 Declaration of Conformity

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

We,

- ProMinent GmbH
- Im Schuhmachergewann 5 - 11
- D - 69123 Heidelberg, Germany,

hereby declare that the product specified in the following, complies with the relevant basic health and safety requirements of the EC Directive, on the basis of its functional concept and design and in the version distributed by us. Any modification to the product not approved by us will invalidate this declaration.

Extract from the EC Declaration of Conformity

Designation of the product:	Pneumatic double diaphragm pump
Product type:	Duodos
Serial number:	see nameplate on the device
Relevant EC directives:	EC Machinery Directive (2006/42/EC)
Harmonised standards applied, in particular:	EN ISO 12100 / 2010 EN 809
Date:	01.03.2012

The EC Declaration of Conformity is available to download on our homepage.

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ProMinent GmbH
Im Schuhmachergewann 5 - 11
69123 Heidelberg, Germany
Telephone: +49 6221 842-0
Fax: +49 6221 842-419
Email: info@prominent.com
Internet: www.prominent.com

985413, 2, en_GB