

# Assembly and operating instructions Duodos 20 PPS/PVT Air-driven double diaphragm pump



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. The document is always aimed equally at women, men and gender-neutral persons. We kindly ask 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.

#### Warning information

Warning information includes detailed descriptions of the hazardous situation, see  $\Leftrightarrow$  *Chapter 2.1 'Labelling of Warning Information' on page 6.* 

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

#### Tab. 1: More symbols

Symbol	Description		
1.	Action, step by step.		
⇔	Outcome of an action.		
Ŕ	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



Fig. 1: Duodos: Air-driven double diaphragm pump.

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 suitable for the transport of liquid chemicals (media).

The Duodos double diaphragm pump transports media up to a delivery height of 7 metres. It is essential that you note the pump characteristic curve  $\bigotimes$  *Chapter 13 'Performance curves' on page 36*, as the pump capacity is seriously dependent on the back pressure.

Check the material tolerability when selecting your double diaphragm pump. Also consider the density, viscosity, solids content and temperature of the medium being pumped.

Tab. 2: Permissible values for the medium

Design	Temperature of the medium	
PP version (PPS):	10 80 °C	
PVDF version (PVT):	-13 93 °C	
Viscosity of the medium: max. 200 mPas		
Solids: < 2 mm		

## 1.2 Nameplate and identification

#### Nameplate





- 1 Check number
- 2 CE mark
- 3 Designation of origin
- 4 Serial number
- 5 Month and year of manufacture
- 6 Order number
- 7 Model designation (type)
- 8 Place and country of manufacture
- 9 Manufacturer





- 1 Manufacturer's website
- 2 Permissible air pressure
- 3 Maximum feed pressure
- 4 Liquid inlet and outlet
- 5 Dimensions/ thread, [/NT] = input / [Ext.] = output

#### Identification and material

Туре	Pump capacity	Seals	Slide rod	Part no.
Duodos 20 PPS	0 20 l/min	EPDM	Corrosion-proof steel	1103381
Duodos 20 PVT	0 20 l/min	PTFE	Hastelloy <sup>®</sup> C	1103378

Туре	Housing	Diaphragm	Valve balls	Valve seats	Part no.
Duodos 20 PPS	PP	Santoprene®	PTFE	Corrosion-proof steel	1103381
Duodos 20 PVT	PVDF	PTFE	PTFE	PVDF	1103378

# 2 Safety and responsibility

## 2.1 Labelling of Warning Information

Introduction

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

The warning 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.

Description of hazard

 Denotes an immediate threatening danger. If the situation 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.

 Denotes a possibly hazardous situation. If the situation 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.

 Denotes a possibly hazardous situation. If the situation 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.

 Denotes a possibly damaging situation. If the situation 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.

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

## 2.2 User qualification



#### WARNING!

Danger of injury with inadequately qualified personnel

The operator of the system / equipment is responsible for ensuring that the qualifications are ful-filled.

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.

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

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 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 the manufacturer or another authorised distribution partner.
Trained, qualified per- sonnel	A trained, 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 training, knowledge and experience, as well as knowledge of pertinent regula- tions. A trained, qualified employee must be able to perform the tasks assigned to him independently with the assistance of drawing documentation and parts lists. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrical technician	An electrical technician is able to complete work on electrical systems and rec- ognise and avoid possible dangers independently based on his technical training and experience as well as knowledge of pertinent standards and regu- lations. An electrical technician must be able to perform the tasks assigned to him independently with the assistance of drawing documentation, parts lists, terminal and circuit diagrams. The electrical technician must be specifically trained for the working environment in which the electrical technician is employed and be conversant with the relevant standards and regulations.
Service	The Service department refers to service technicians, who have received proven training and have been authorised by the manufacturer to work on the system.

## 2.3 Intended use

Correct and proper use:

- The pump is intended for the transport of liquids.
- Only use the pump in accordance with the technical data and specifications set out in these operating instructions.

## 2.4 General safety information on the Duodos

## 2.4.1 Safety information on the medium to be pumped and the diaphragm

Danger from hazardous substances!



Please ensure when handling hazardous substances that you have read the latest material safety data sheets provided by the manufacturer of the hazardous substances. The measures required are described in the material safety data sheet. Check the material 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 the material safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workplaces affected.

Fig. 4: Handling hazardous substances

#### Service life of the diaphragm



The service life of the diaphragm cannot be precisely specified. You therefore need to assume that the diaphragm will rupture and that liquid will then escape.

You should also prevent particles of the faulty diaphragm entering the medium being pumped. You can prevent contamination, for example by filtration, installation of a hose rupture indicator or other measures appropriate for the respective process.

Fig. 5: The service life of the diaphragm

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 feed chemical is a dangerous, harmful or toxic substance, the air outlet must be routed to a suitable area where safe disposal is possible.

# 2.4.2 Safety information on ambient conditions



Fig. 6: Ambient conditions

Compressed air	Before working on the double diaphragm pump, check whether it is necessary to 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. These meas- ures depend on the configuration of your compressed air supply. The line to the discharge side of the double diaphragm pump may be under pressure and must likewise be vented if required.
Hot surfaces	The pump can also become hot when conveying hot liquids. There can then be hot surfaces 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 pres- sure level of the device can reach 88 dB $\pm$ 3 dB. Bear this in mind and take appropriate 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 responsi- bility of the system operator.
Operation in the open air and out- doors	<ul> <li>Take suitable measures to protect the device from environmental influences when operating outside such as:</li> <li>UV radiation</li> <li>Humidity</li> <li>Frost, etc.</li> </ul>
Check the fastening elements are cor- rectly seated	Check that all fastening elements with sealing rings are correctly seated before commissioning the double diaphragm pump. The seals may "creep" so that the fastening elements may come loose over time.

## 3 Transport and storage

User qualification, transport and storage: trained user & Chapter 2.2 'User qualification' on page 8.



#### 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:

- Use cardboard packaging to protect the pump.
- You can reuse the packaging material.
- Observe the ambient conditions.

#### 3.2 Storage

Store the unit fully drained.

Tab. 3: Permissible storage conditions

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

#### Assembly of the pump 4

Permissible ambient conditions	User qualification, installation: trained and qualified personnel Chapter 2.2 'User qualification' on page 8.	
	Observe the permissible ambient conditions.	
Tab. 4: Permissible ambient conditio	ns for operation	

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

## 4.1 Installation environment



#### 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 then seal it off. Installation outside the vertical axis impairs the function of the valves.

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#### 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 fittings minimal. Do not reduce the diameter of the suction line.

If a rigid pipework system is used, it is essential that short flexible sections of hose are inserted between the double diaphragm pump and pipework to protect the double diaphragm pump against vibration and from tensile and compressive forces.

We recommend installing a pulsation damper to reduce pulsation in the medium to be pumped.

#### **Recommended installation**



Fig. 7: Recommended installation

▶ ▲ WARNING! Protect the pump from overload: Install a relief valve in the discharge line. The relief valve protects the pump from overload if a valve is closed or the line is blocked in another way.

Compressed air remote outlet with silencer

An optional kit is needed for the compressed air remote outlet.



Fig. 8: Compressed air remote outlet with silencer

- **1.** Loosen the 4 screws and remove the air cap.
  - $\Rightarrow$  An outlet opening is visible.
- 2. Connect a hose to the new outlet opening and install the silencer on the end of the hose.

**NOTE:** Use a hose with the same diameter as the outlet opening 3/8" NPT.

## 4.1.1 Fastening the double diaphragm pump



**NOTE:** The operator of the system must ensure that they have appropriate installation material available (rawlplugs, screws etc.).

■ Use appropriate installation material to fasten the double diaphragm pump in place. Tightening torque 20 Nm.

## 4.2 Outdoor installation



#### Tab. 5: Permissible operating conditions:

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

#### 4.3 Design of the suction side

Nominal width of the pipework	1.	Configure the threaded connectors to ensure that they do not reduce the nominal width of the pipework and the double diaphragm pump.
Dimensioning of the suction side	2.	Design the suction side to be generously sized. Ensure that the supply to the double diaphragm pump with the medium to be pumped is ensured under all load and operating statuses. Ensure that the inside diameters of the suction lines are gen- erously sized.
	3.	Install the double diaphragm pump as close as possible to the medium to be pumped to ensure the maximum service life of the diaphragm. The minimum air pressure to operate the double diaphragm pump is approximately 1.5 bar.

## 4.4 Compressed air supply

#### Compressed air supply

**INFO: Suitable compressed air supply.** The system operator is responsible for the provision of a suitable compressed air supply. When doing so, observe ISO 8573.

Connect the double diaphragm pump to a compressed air supply in accordance with the current state of the art (ISO 8573-1).

Requirements:

- Compressed air free of residual oil: Compressor residual oil:
  - maximum 0.1 mg/m<sup>3</sup> for HEES liquids and bio-oils,
  - or maximum 5 mg/m<sup>3</sup> for mineral oils.
- Dried compressed air: ISO 8573-1, Class 4 with 3 °C pressure dew point.

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

- 1. Design the compressed air supply to have generous dimensions. Your compressed air supply must be capable of supplying the double diaphragm pump with sufficient compressed air at any time and under all operating statuses. In this respect, consider the air consumption of other equipment and machines operated by the same compressed air supply. Considerable pressure fluctuations can occur in the compressed air supply when switching compressed air consumers on and off.
- 2. Do not allow the air pressure of the supplied air to 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 volume and pressure. Connect a control valve upstream of the double diaphragm pump to guarantee the supply pressure remains within the specified values.
- **3.** If there is a rigid air supply line, insert a short section of flexible hose between the double diaphragm pump and the pipework.
- **4.** Make sure that the weight of the air supply line, control valve, and filters does not weigh down on the air connection fitting of the double diaphragm pump, instead support it in a suitable manner. Otherwise the double diaphragm pump can be damaged.

Do not lubricate the air valves	<b>INFO: Do not lubricate the air valves.</b> Due to their design, the air valves do not require any lubrication and must not be lubricated.
Moisture in the air line	<b>INFO: Moisture in the air line.</b> Water in the compressed air can lead to the exhaust air freezing or the double diaphragm pump icing up. Possible consequences include malfunctions or failure of the double diaphragm pump. We recommend installing an air dryer in the compressed air supply. The air dryer extracts water from the compressed air and protects it from icing up.

# 5 Operation of the double diaphragm pump

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

# 6 Checking tightening torque prior to commissioning

■ User qualification, pre-commissioning checks: trained qualified personnel & *Chapter 2.2 'User qualification' on page 8*.



*Fig. 9: Permanent tightness: Check the tightening torque prior to commissioning, in the sequence shown in* Fig. 9.

1. Check the tightening torque of the screws 1 ... 8 prior to commissioning. Tighten all screws to 5 Nm, in the sequence shown in Fig. 9.

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

Prior to commissioning, check that the threaded connectors have the correct torque.

# 7 Commissioning

Check the fastening elements are correctly seated

- User qualification, commissioning: trained user ♦ Chapter 2.2 'User qualification' on page 8.
  - Check that all fastening elements with sealing rings are correctly seated before commissioning the double diaphragm pump.

The seals may "creep/move" so that the fastening elements may loosen over time.

## 7.1 Pre-commissioning checks



## 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.

Perform the following tests:

- **1.** Ensure that the unit has not been damaged during transport or storage. Immediately report any damage to the supplier.
- **2.** Check that the air pressure is suitable for the unit  $\bigotimes$  *Chapter 14 'Technical data' on page 37*.
- **3.** Ensure that the unit is suitable for the liquid to be conveyed and that it will not be attacked. To do so, refer to the Resistance List on the manufacturer's website.
- **4.** Make sure that the temperature of the liquid does not exceed or fall below the recommended temperature. Schapter 14 *'Technical data' on page 37*
- **5.** INFO: Pressure gauge. Install a pressure gauge into the discharge line if the back pressure value is unknown.
- **6.** Check the values for flow, pressure etc. under operation conditions  $\Leftrightarrow$  *Chapter 14 'Technical data' on page 37*.

## 7.2 Priming

- **1.** To start the double diaphragm pump, open the air valve by approximately a 1/2 ... 3/4 turn.
- 2. INFO: Cavitation. Cavitation has occurred if opening the air valve causes the stroke rate of the double diaphragm pump to increase, but not the flow volume passing through the double diaphragm pump. Close the air valve slightly so that the air consumption and the feed rate of the double diaphragm pump are at an optimum ratio to each other.

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

## 7.3 Interruption to operation



#### WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

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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.

- **1.** Flush through the double diaphragm pump after every use if liquids are used which have a tendency to form deposits or solidify when stationary.
  - $\Rightarrow$  This will avoid damage to the double diaphragm pump.

**INFO: Deposits.** Liquid residue in the double diaphragm pump may dry out and form deposits. When restarting the double diaphragm pump, these deposits can lead to problems at the diaphragms and the ball valves.

**2.** At temperatures below 0 °C, make sure that the double diaphragm pump is always completely drained after use.

# 8 Troubleshooting and fault elimination

User qualification, troubleshooting and fault elimination: trained qualified personnel & Chapter 2.2 'User qualification' on page 8.

The pump is not working.	
Cause:	Recommended measure:
The outlet valve on the discharge side is not open.	Open the discharge valve on the discharge side.
No air supply.	Switch on the compressor and open the air valve and the air regulator.
The air pressure is too low.	Check the compressor and the configuration of the air line.
Air is escaping from the connecting elements.	Check the connecting elements and the torque of the screws.
The air lines or additional equipment are blocked with foreign bodies.	Check and clean the air line and the auxiliary equipment.
The outlet opening (silencer) of the pump is blocked with foreign bodies.	Check and clean the outlet opening and the silencer.
The liquid line is blocked with foreign bodies.	Check and clean the liquid line.
The pump is blocked with foreign bodies.	Remove, check and clean the pump housing.

The pump is working but no liquid is being pumped.		
Cause:	Recommended measure:	
The valve on the suction side is not open.	Open the valve on the suction side.	
Too high a suction or discharge lift.	Check the configuration of the installation and reduce the height of the installation.	
The outlet opening of the liquid line (including the filter) is blocked with foreign bodies.	Check and clean the liquid line.	
The pump is blocked.	Dismantle the pump, then check and clean the pump.	
The ball and the ball seat are worn or damaged.	Check the components and replace if necessary.	

The flow volume is reducing.		
Cause:	Recommended measure:	
The air pressure is low.	Check the compressor and the configuration of the air line.	
The air lines or additional equipment are blocked with foreign bodies.	Check and clean the air line and the auxiliary equipment.	
The outlet valve on the discharge side is not opening normally.	Adjust the outlet valve on the discharge side.	
The liquid is mixing with air.	Top up liquid if necessary. Check and adjust the configu- ration of the line on the suction side if necessary.	
Cavitation will be caused.	Adjust the air supply pressure and the outlet pressure and reduce the suction capacity.	
There are vibrations.	Adjust the air pressure and the outlet pressure. Reduce the flow of the inlet valve to adjust the pressure and volume of the fluid.	
Ice is forming in the air outlet.	Remove ice from the air bypass valve and check and clean the air filter. Use a longer intermediate pipe in the exhaust air to prevent ice from forming in the silencer.	
The liquid line, including the filter, is blocked with foreign bodies.	Check and clean the liquid line and the filter mesh.	
The outlet opening and/or the silencer of the pump is blocked with foreign bodies.	Check and clean the outlet opening and the silencer.	
The pump is blocked with foreign bodies, e.g. sludge.	Remove, check and clean the pump housing.	

Escape of liquid through the open compressed air outlet (silencer).		
Cause:	Recommended measure:	
The diaphragm is faulty.	Replace the diaphragm.	

Unusual noises.	
Cause:	Recommended measure:
The air pressure is too high.	Adjust the air pressure.
The pump is blocked with foreign bodies, which are larger than the permitted diameter (< 2 mm).	Dismantle, check and clean the pump housing.

Unusual vibrations.		
Cause:	Recommended measure:	
The connection elements and the fastening of the pump are loose.	Check each connecting element and tighten the screws.	
The air pressure is too high.	Adjust the air pressure.	
The different valves are vibrating or fluttering.	Adjust the air pressure. Adjust the feed pressure.	

## Troubleshooting and fault elimination

Air bubbles in the feed chemical.		
Cause:	Recommended measure:	
The diaphragm is faulty.	Remove and check the pump and replace the dia- phragm.	
The suction hose is loose or broken.	Fasten or replace the suction hose.	

Leaks or air pressure fluctuating between 3 8 bar.		
Cause:	Recommended measure:	
The directional valve is closed or faulty.	Replace the components of the directional valve.	

Pump does not start. No regulated air pressure.		
Cause:	Recommended measure:	
Immovable air pressure sensor.	Replace the air pressure sensor.	
Close directional valve.	Replace the components of the directional valve.	

# 9 Maintenance of the double diaphragm pump

User qualification, maintenance: trained and qualified personnel & Chapter 2.2 'User qualification' on page 8.



#### 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 commencing all work

- **1.** Disconnect the double diaphragm pump from the compressed air supply and all supply and discharge lines.
- 2. Vent and decontaminate the double diaphragm pump. Always observe the safety data sheet for the chemicals to be conveyed.

#### Tool

Tab. 6: Tool

Component	Screw type	Required tool
Directional valve	Hexagonal head with flange	Socket wrench, metric: 8 mm
Inlet and outlet connector (valve, seat and seals)		
Diaphragm cover (diaphragms and central slide rod)		

A Torx screwdriver T20 is needed for additional maintenance work (air sensors and spool valve).

Maintenance of the double diaphragm pump

## 9.1 Maintenance of the diaphragm



Fig. 10: Maintenance of the diaphragm

- 1
- Cover with 4 screws Directional valve with 4 screws
- 2 3 4
- O-rings Cover of the diaphragm

- Screws (8 no.) Diaphragm O-rings
- 5 6 7



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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.

- **1.** First disconnect the compressed air supply before undertaking maintenance work on the air valve.
- 2. Bleed the pump.
- **3.** Disconnect the air supply line from the pump.
- **4.** Close the liquid valves.
- **5.** Drain the liquid from the pump. Collect the liquid and dispose of it in line with the provisions of the material safety data sheet.
- 6. Remove the 4 screws and remove the cover (1).
- **7.** Remove the 4 screws and remove the directional valve (2). Make sure that the directional valve is not damaged.

Replace the O-rings (3 and 7).

- 8. Remove the 8 screws (5) of the diaphragm cover.
- 9. Remove the cover (4) by carefully removing it.



- Fig. 11: Replacing the diaphragm.
- **10.** Remove the worn diaphragm (6), drawing the diaphragm off the slide rod (8) to the side.

Clean the seating surfaces in the housing.

Push the recess (9) of the new diaphragm into the correct position on the slide rod (8).

- $\Rightarrow$  The diaphragm is now fixed precisely in the pump.
- **11.** Fit the diaphragm cover.
- **12. INFO: Torque wrench.** Use a torque wrench, set to 5 Nm, to tighten the screws (5).

Tighten the screws (5) with a maximum torque of 5 Nm (44 lbf).

- **13.** Repeat this process with the second diaphragm.
- **14.** Fit the diaphragm cover.
- **15. INFO: Torque wrench.** Use a torque wrench, set to 5 Nm, to tighten the screws (5).

Install the directional valve with new O-rings and a torque of 5 Nm (44 lbf). Check whether all O-rings are tight.

**16.** Install the upper cover (1) and tighten the 4 screws until hand-tight.

Using a torque wrench

Using a torque wrench

## 9.2 Maintenance of the slide rod



Fig. 12: Maintenance of the slide rod

- 1 Rectangular O-ring
- 2 Sleeve
- 3 Holes for installation tool
- 4 O-ring
- 5 Slide rod



#### WARNING!

#### Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

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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.

- **1.** Close all compressed air and feed chemical shut-off valves.
- 2. Bleed the compressed air lines.
- **3.** Disconnect the pump from the compressed air supply and all supply and discharge lines.

- **4.** Decontaminate the pump. Refer to the material safety data sheet for the feed chemical.
- **5.** Dismantle the pump, as described in  $\bigotimes$  *Chapter 9.1 'Maintenance of the diaphragm' on page 24.*
- Proceed as follows as soon as the slide rod is visible:
- **6.** Remove the slide rod (5) from its housing by pulling on one end of the slide rod.
  - **7.** Use a pair of snap ring pliers in the two openings (3) shown in the drawing to remove the sleeve (2).
  - **8.** Once the sleeve has been removed, remove the O-ring (4) and the rectangular O-ring (1) on the inside of the pump body.
  - **9.** Clean and check all components.
  - **10.** Replace all parts shown in the installation drawing.
  - **11.** Re-assemble the pump, as described in  $\bigotimes$  *Chapter 9.1 'Maintenance of the diaphragm' on page 24*.

#### 9.3 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. 13: Maintenance of the ball valves

- **1.** Remove the screws (1 ... 6) to remove the directional valve. Mark the alignment of the directional valve.
- **2.** Remove the inlet and outlet connectors. Note the alignment of the connecting pieces.
- **3.** Check the surfaces of the valve balls and valve seats for wear and damage.
  - ⇒ Replace worn or damaged parts.
- 4. Install a new set of valve balls and/or valve seats.
- 5. Once the valve seats and seals have been installed, then the seals must be evenly visible.
- **6.** Tighten the 6 screws in the sequence 1 ... 6, as shown in Fig. 13.
  - 1st stage: Sequence 1 ... 6, manually tighten.
  - 2nd stage: Sequence 1 ... 6, tighten to 5 Nm.
- **7.** Check all seals and O-rings for consistent and undamaged installation.

After maintenance work	<b>1.</b> Attach the air supply line to the double diaphragm pump
	<b>2.</b> 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
  - $\Rightarrow$  Now the double diaphragm pump can pump again



Check all connectors for leak-tightness

# 10 Disposal of used parts

User qualification: instructed user Chapter 2.2 User qualification' on page 8.



Regulations governing the disposal of used parts
 Note the national regulations and legal standards that currently apply in your country

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

Decontaminate the device before returning it for repair. To do so, remove all traces of hazardous substances. Always observe the material safety data sheets for the medium being pumped.

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

#### 11 **Technical drawing**



Fig. 14: Dimensions, inlets and outlets.

- I. Medium, 1/4" BSP/ NPT (F), 3/4" NPT (M).
  II. Compressed air, outlet
  III. Compressed air, inlet, (3/8" NPSM)
  IV. Medium, inlet, 1/4" BSP/ NPT (F), 3/4" NPT (M).

	Α	A1	A2	В	С	D	E	F	F1	G	G1	Н
mm	142	67	75	142	173	142	29	108	79	96	86	9
Inch	5.59"	2.64"	2.95"	5.59"	6.81"	5.59"	1.14"	4.25"	3.11"	3.78"	3.38"	0.35"

# 11.1 Exploded drawing of the pump



## Exploded drawing – Duodos 20



# 12 Spare parts

**INFO: Ordering address for spare parts and accessories:** The current address for ordering spare parts and accessories can be found on the manufacturer's homepage ProMinent GmbH.

# <text>

## 12.1 Repair set, air valve with sensor

Fig. 16: Repair set, air valve (1) with sensor (2)

Tab. 7: Parts lisi	, repair set,	air valve	(1) with	sensor (2)
--------------------	---------------	-----------	----------	------------

Description	Quantity	Material	Repair set part number
Air valve	1	PP	1103386
Sensor	1	PP	
Air valve	1	PP	1103398
Sensor	1	PVDF	

## 12.2 Repair set, diaphragm with valves



Fig. 17: Repair set, diaphragm (3) with valve balls (4) and valve seats (1) with O-rings (2)

Description	Quantity	Material	Repair set part number					
Valve seats with O-rings, repair	1	PP	1103391					
Set		EPDM						
Valve balls, repair kit	1	PTFE						
Diaphragm	1	Santoprene®						
Valve seats with O-rings, repair	1	PTFE	1103394					
set		PVDF						
Valve balls, repair kit	1	PTFE						
Diaphragm	1	PTFE						

Tab. 8: Parts list, repair set, diaphragm (3) with valve balls (4) and valve seats (1) with O-rings (2)

# 13 Performance curves



The performance curves are based on the pumping of water. Pump is filled. 80 mm suction head.

Fig. 18: Performance curves

- I. Air consumption
- II. Pump capacity
- III. Feed chemical pressure

# 14 Technical data

Parameter	Value
Gear ratio:	1:1
Maximum free flow:	20 l/min
	5.28 US gal/min
Air pressure, operating range:	1.5 7 bar
	22 115 psi
Solids in the feed chemical:	< 2 mm
	< 3/32"
Maximum suction lift:	Dry: 2 m or 6 1/2" ft
	Wet: 7 m or 23 ft
Weight:	1.2 kg
	2.65 lb
Feed chemical, inlet and outlet connectors:	1/4" BSP (F) or NPT (F)
	3/4" NPT (M)
Air inlet:	3/8" NPSM (F)
Temperature range:	0 70 °C
	32 158 °F

# 15 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 below 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 marketed by us. Any modification to the product not approved by us invalidates this declaration.

Tab. 9: Extract from the EC Declaration of Conformity

on of the product: Air-driven doub	le diaphragm pump						
ype: Duodos							
nber: see nameplate	on the device						
EC Directives: EC Machinery	EC Machinery Directive (2006/42/EC)						
EU RoHS Direc	EU RoHS Directive (2011/65/EU)						
ed standards applied, EN ISO 12100:	2010						
ar: EN 809:1998 +	A1:2009 + AC:2010						
EN 50581:2012	2						
e: Heidelberg, 01.	10.2019						
nber: see nameplate EC Directives: EC Machinery EU RoHS Directives: EN ISO 12100: ar: EN 809:1998 + EN 50581:2012 e: Heidelberg, 01.	on the device Directive (2006/42/EC) etive (2011/65/EU) 2010 A1:2009 + AC:2010 2 10.2019						

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

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