

SINCE 1889



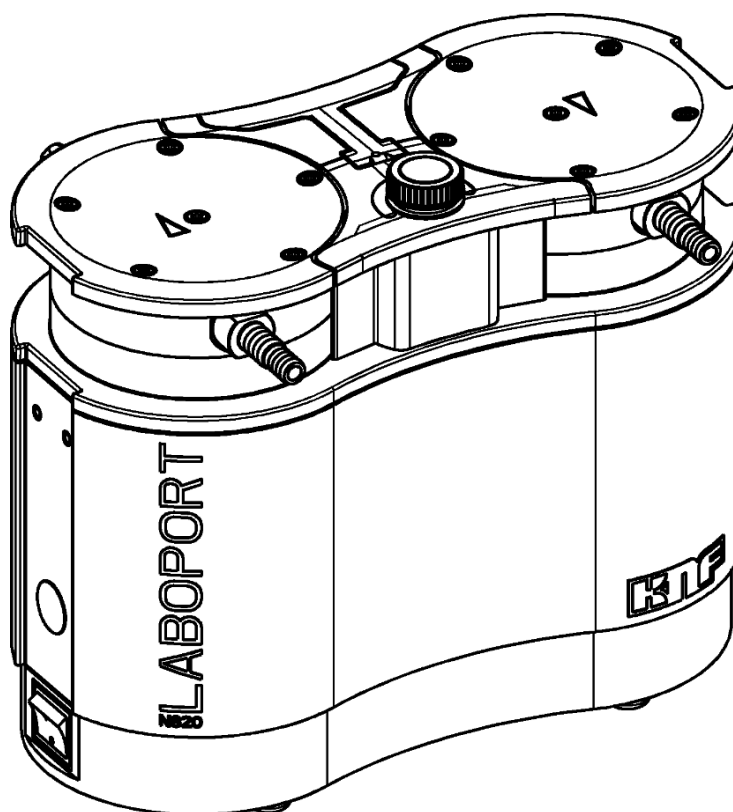
LABOPORT®



Diaphragm Vacuum Pump

model **N820G**

Instruction Manual



Note!

Before operating the pump and the accessories, please read the operating instructions and pay attention to the safety precautions!

YAMATO SCIENTIFIC CO., LTD.

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1. About this document

1.1. Using the Operating Instructions

The Operating Instructions are part of the pump.

- ➔ Carefully study the Operating Instructions before operating the pump.
- ➔ Always keep the Operating Instructions handy in the work area.
- ➔ Pass on the Operating Instructions to the next owner.

1.2. Symbols and markings

Warning



A danger is located here.

Possible consequences of a failure to observe the warning are specified here. The signal word, e.g. Warning, indicates the danger level.

- ➔ Measures for avoiding the danger and its consequences are specified here.

Danger levels

Signal word	Meaning	Consequences if not observed
DANGER	warns of immediate danger	Death or serious injuries and/or serious damage are the consequence.
WARNING	warns of possible danger	Death or serious injuries and/or serious damage are possible.
CAUTION	warns of a possibly dangerous situation	Minor injuries or damage are possible.

Tab. 1

Other information and symbols

- ➔ An activity to be carried out (a step) is specified here.
- 1. The first step of an activity to be carried out is specified here. Additional, consecutively numbered steps follow.



This symbol refers to important information.

2. Use

2.1. Proper use

The pumps are exclusively intended for transferring gases and vapors.

Owner's responsibility

Operating parameter and conditions

Only install and operate the pumps under the operating parameters and conditions described in Chapter 5. Technical Data.

Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water as well as other pollutions.

The pump is suitable for transferring explosive atmospheres in explosion group IIB+H2.

The pump must not be operated in potentially explosive areas. The Ex marking applies only to the working chamber (area in contact with medium).

The gas-tightness of the connections between the application pipes and the pump (or the pump connection) must be checked regularly; with leaky connections, there is a danger that hazardous gases or vapors may escape from the pump system.

Requirements for transferred medium

Before using a medium, check whether the medium can be transferred danger-free in the specific application case.

Before using a medium, check the compatibility of the materials of the pump head, diaphragm and valves with the medium.

Ensure that the system is not subject to any risks of explosion, also in extreme operating situations (temperature, pressure) or in case of malfunctions.

Only transfer gases which remain stable under the pressures and temperatures occurring in the pump.

Accessories

Laboratory equipment or additional components connected to the pump must be designed for the pneumatic data of the pump (see Chapter 5. Technical Data).

2.2. Improper use

The pumps may not be operated in an explosive area.

The pumps are not suitable for use underground.

The pumps are not suitable for transferring:

- Dusts
- Liquids
- Aerosol
- Biological and microbiological substances
- Fuel
- Explosive materials
- Fibers
- Oxidizing agent
- Foodstuffs.

The pumps must not be used to create vacuum and overpressure simultaneously.

Never apply positive pressure to the suction side of the pump.

The pump may not be used if, when the gas ballast valve is open, reactive, explosive or otherwise hazardous mixtures (e.g. with the medium) could occur.

2.3. Use to transfer explosive atmospheres

To transfer explosive atmospheres, use only pumps in the corresponding device category and temperature class.

These pumps have the following explosion protection markings:

Marking	Description
	Symbol for explosion-proof pumps
II	Device group (see 2.4.1)
2/-G	Device category (see 2.4.2)
IIB+ H2	Explosion groups (see 2.4.3)
T3	Temperature class (see 2.4.4)
X internal atmosphere only	Special conditions (see 2.4.5)

Tab. 2

The explosion protection marking can also be found at the following location:

- Pump type plate

2.4. Explanations of the explosion protection marking

2.4.1. Device groups

Device group I	Device group I applies to devices used in the underground and above-ground operations of mines where there is a risk of methane and/or flammable dusts.
Device group II	Device group II applies to devices used in other areas where there is a risk of explosive atmospheres.

2.4.2. Device categories for gas

The device category describes the frequency and duration of the occurrence of an explosive atmosphere in the operations.

Device category	Description*
1 G	Devices for areas in which it is expected that dangerous, explosive atmospheres (gases and vapors) occur constantly, over long periods, or frequently.
1 D	Devices for areas in which it is expected that dangerous, explosive atmospheres (dusts) occur constantly, over long periods, or frequently.
2 G 2/-G	Devices for areas in which it is expected that dangerous, explosive atmospheres (gases and vapors) occur occasionally. The pump may suck gas from zone 1 but must not be installed in a potentially explosive atmosphere (zone).
2 D	Devices for areas in which it is expected that dangerous, explosive atmospheres (dusts) occur occasionally.
3 G	Devices for areas in which it is not expected that dangerous, explosive atmospheres (gases and vapors) will occur. If, however, they do occur, then only rarely and for short periods.
3 D	Devices for areas in which it is not expected that dangerous, explosive atmospheres (dusts) will occur. If, however, they do occur, then only rarely and for short periods.

Tab. 3

**according to DIN EN 13463-1*

2.4.3. Explosion groups

Flammable gases and vapors are classified according to explosion groups (I, IIA, IIB, and IIC) and temperature classes. Tab. 4 shows the classification of the most common flammable gases and vapors.

	T1	T2	T3	T4	T5	T6
I	Methane	–	–	–	–	–
IIA	Acetone Ethane Ethyl acetate Ammonia Ethyl chloride Benzene Acetic acid Carbon monoxide Methane Methanol Methyl chloride Naphthalene Phenol Propane Toluene	i-Amyl acetate n-Butane n-Butanol Cyclohexanone 1,2-dichloroethane Acetic anhydride	Gasoline Diesel fuel Jet fuel Fuel oils n-Hexane	Acetaldehyde	–	–
IIB	Town gas	Ethylene Ethyl alcohol	Hydrogen sul- fide	Diethyl ether	–	–
IIC	Hydrogen	Acetylene	–	–	–	Carbon disul- fide

Tab. 4

The classification of gases and vapors into explosion groups and temperature classes applies to the transferred medium.

Transferred medium	The pump may be used only to transfer gases and vapors in explosion groups IIA or IIB+ H ₂ and temperature class T3 (and lower) (marked area in Tab. 4) or that are not flammable.
Pump environment	The pump must not be installed in potentially explosive areas. It is suitable only to transfer explosive atmospheres.

2.4.4. Temperature classes

Maximum surface temperature	The maximum surface temperature is the highest temperature that the surface of a pump reaches under the least favorable conditions.
Ignition temperature	The maximum surface temperature of the pump must always be lower than the lowest ignition temperature of the gas or vapor/air mixture in which it is used.
Temperature class	The maximum surface temperature is based on the design of the pump and is specified as temperature class.

Temperature class	Max. surface temperature [°C]	Ignition temperature [°C]
T1	450	> 450
T2	300	> 300
T3	200	> 200
T4	135	> 135
T5	100	> 100
T6	85	> 85

Tab. 5

2.4.5. Additional conditions

Marking	Description
X internal atmosphere only	Special additional conditions

Tab. 6

Additional conditions for the diaphragm pump:

- The pump must not be installed outdoors. It may be started up only with suitable weatherproof and corrosion protection cladding.
- The pump must not be installed in potentially explosive areas. It is suitable only to transfer explosive atmospheres.
- The pump must be installed so that it cannot be damaged externally.

3. Information about EX marking

This KNF pump has the following device marking according to the latest explosion prevention and protection directive. The marking applies only to the working chamber of the pump (area in contact with medium).

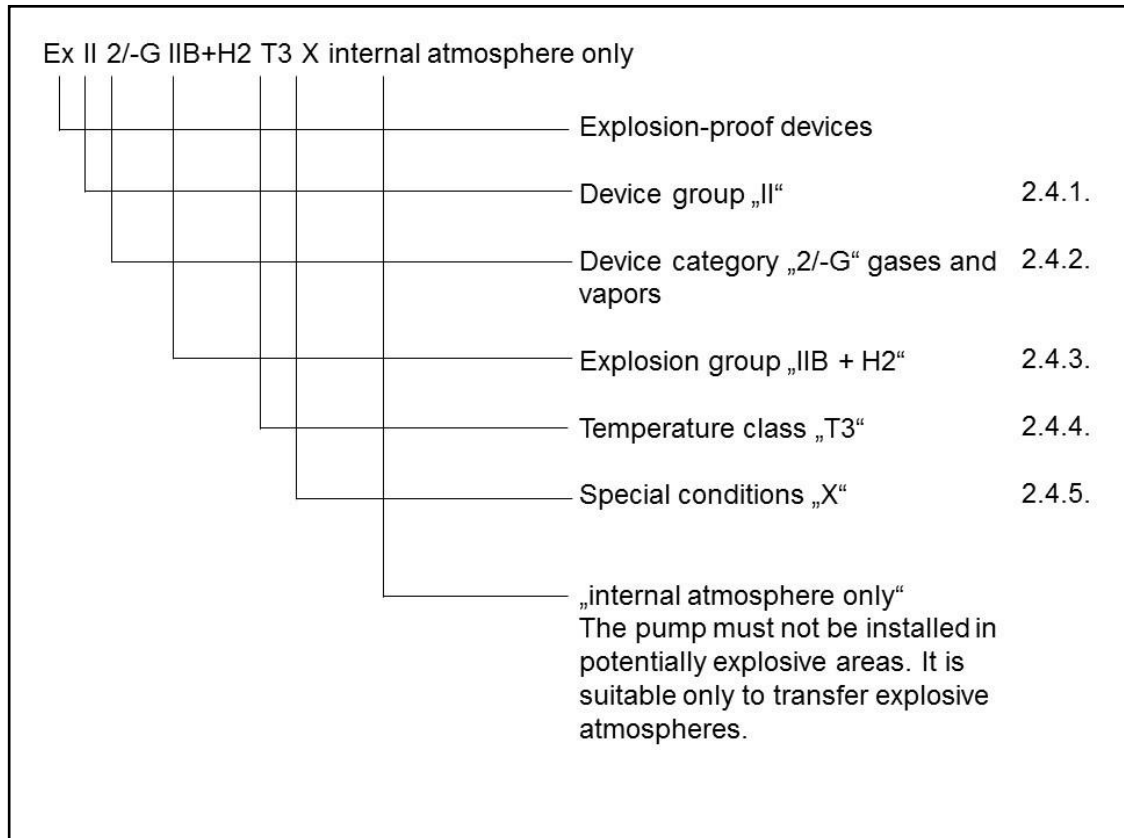


Fig. 1: EX marking of the pumps

Vacuum pumps in category 2/-G are designed to transfer gases, vapors, or aerosols where it is expected that an explosive atmosphere will form occasionally.

The devices must be installed so that they cannot suffer external mechanical damage.

The pumps must not be modified. If a wearing part is replaced, the original function of the pump must be checked by reaching the specified ultimate vacuum (see Operating Instructions, Servicing section).

4. Safety

i Note the safety precautions in Chapter 8. Setup, installation and connection and 9. Operation.

The pumps are built according to the generally recognized rules of the technology and in accordance with the occupational safety and accident prevention regulations. Nevertheless, dangers can result during their use which lead to injuries to the user or others, or to damage to the pump or other property.

Only use the pumps when they are in a good technical and proper working order, in accordance with their intended use, observing the safety advice within the Operating Instructions, at all times.

Components connected to the pump must be designed to withstand the pneumatic performance of the pump.

Take care that safety regulations are observed when connecting the pump to the electricity supply.

Personnel	Make sure that only trained and instructed personnel or specially trained personnel work on the pumps. This especially applies to assembly, connection and servicing work. Make sure that the personnel has read and understood the Operating Instructions, and in particular the “Safety” chapter.
Working in a safety conscious manner	Observe the accident prevention and safety regulations when performing any work on the pump and during operation. Do not subject parts of the body to vacuum. Make sure that there are no hazards due to flow with open gas connections, noises or hot gases.
Handling dangerous media	When transferring dangerous media, observe the safety regulations when handling these media.
Handling combustible media and explosive atmospheres	Remember that the pumps are suitable only for transferring explosive atmospheres and may not be installed in potentially explosive areas. Make sure the temperature of the medium is always sufficiently below the ignition temperature of the medium, to avoid ignition or explosion. This also applies for unusual operational situations. Note that the temperature of the medium increases when the pump compresses the medium. Hence, make sure the temperature of the medium is sufficiently below the ignition temperature of the medium, even when it is compressed to the maximum permissible operating pressure of the pump. The maximum permissible operating pressure of the pump is stated in the technical specifications (Chapter 5). If necessary, consider any external sources of energy, such as radiation, that may add heat to the medium. In case of doubt, consult the Yamato customer service.
Environmental protection	Store all replacement parts in a protected manner and dispose of them properly in accordance with the applicable environmental

	protection regulations. Observe the respective national and international regulations. This especially applies to parts contaminated with toxic substances.
EU/EC Directives / Standards	The part of the pumps that comes into contact with medium corresponds to Directive 2014/34/EU (ATEX). The pumps comply with the following directives: ▪ 2011/65/EU (RoHS2) ▪ 2014/30/EU (EMC) ▪ 2006/42/EC. The following harmonized standards are met: ▪ DIN EN 61326-1 (Class B) ▪ DIN EN 61010-1 ▪ DIN EN 1012-2 ▪ DIN EN 12100 The part of the pumps that comes into contact with media meets the following harmonized standards: ▪ DIN EN 13463-1 ▪ DIN EN 1127-1 In accordance with IEC 664 the pumps conform to: ▪ Overvoltage category II ▪ Pollution degree 2
Customer service and repairs	The pump is maintenance-free. But we recommends, checking the pump regularly with regard to conspicuous changes in noise and vibrations. Housing with voltage-caring parts may be opened by technical personnel only. Use only genuine parts from Yamato for servicing work.

5. Technical Data

Pump materials

Assembly	Material
Pump head	Modified PTFE
Diaphragm	PTFE-coated
Valve	FFPM
Interconnection	PTFE/FFPM
Hose connector	PTFE/FFPM
Gas ballast	PTFE/FFPM

Tab. 7

Pneumatic values

N 820G

Parameter	Value
Ultimate vacuum [Pa.]	
Min. speed:	
Gas ballast closed	≤ 600
Gas ballast open	≤ 1700
Max. speed:	
Gas ballast closed	≤ 800
Gas ballast open	≤ 1500
Flow rate at atm. pressure [l/min]**	
Min speed	9
Max. speed	20

Tab. 8

**liters in standard state (1013 hPa, 20°C)

Pneumatic Connections

Pump type	Value
Hose connection [mm]	OD 10.6mm / 9mm

Tab. 9

Electrical data

Parameter	Value
Voltage [V]	100 - 240
Frequency [Hz]	50/60
Power consumption of the pump [W]	66
Max. operating current [A]	0.66
Max. permissible power supply voltage fluctuations	± 10 %

Tab. 10

Weight

Pump type	Value [kg]
N 820G	8.8

Tab. 11

Other parameters

Parameter	Value
Permissible ambient temperature	+ 10 °C to + 40°C
Permissible media temperature	+ 5°C to + 40°C
Dimensions L x H x W [mm] N 820.3FT.18G	259 x 220 x 163
Maximum permissible ambient relative humidity	80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.
Max. altitude of site: [m above sea level]	2000
Device protection	➔ Overcurrent protection ➔ Overtemperature protection (drive) ➔ Blocking protection (drive)

Tab. 12

6. Design and function

6.1. Design

- 1 Pneumatic pump inlet
- 2 Handle
- 3 Rotary/push knob for:
 - Switching the pump on and off
 - Adjusting the speed of the pump
- 4 Pneumatic pump outlet
- 5 Power switch
- 6 Signal cable connection port with cap
- 7 Control knob for gas ballast

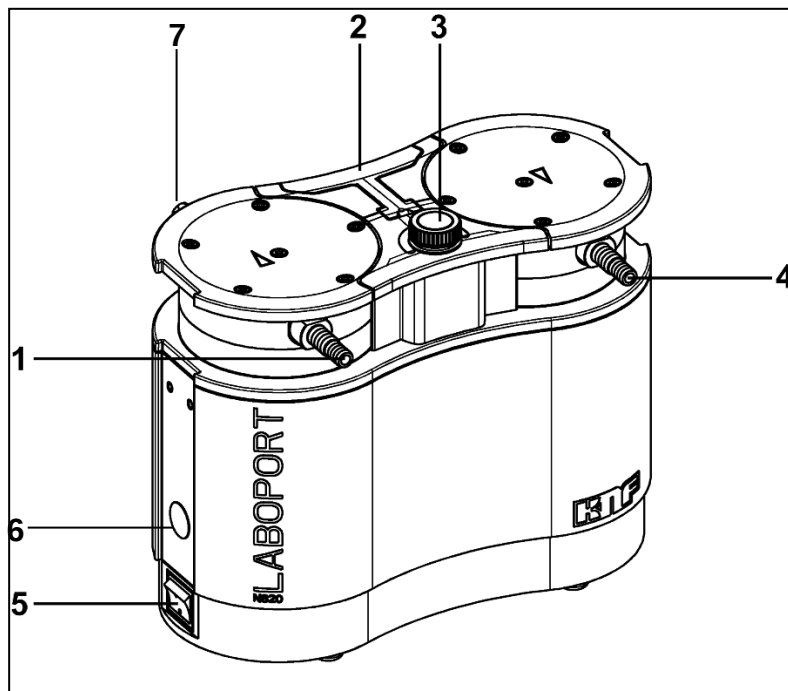


Fig. 2: Diaphragm pump (N 820G)

Function Diaphragm Pump

- 1 Outlet valve
- 2 Inlet valve
- 3 Transfer chamber
- 4 Diaphragm
- 5 Eccentric
- 6 Connection rod
- 7 Pump drive

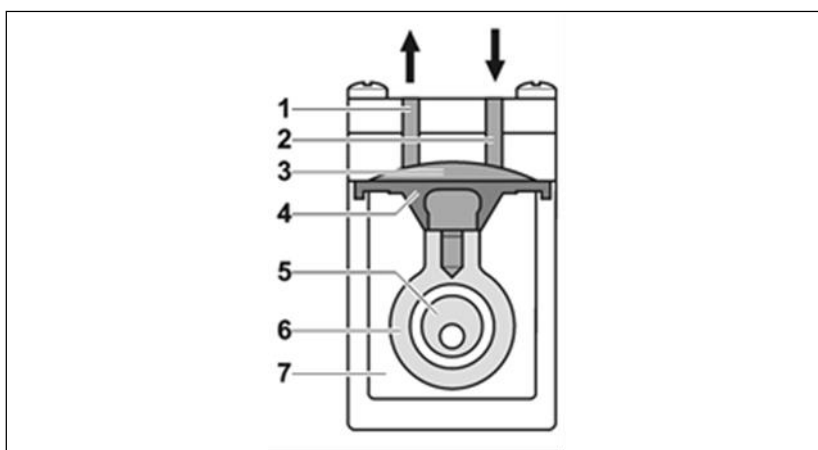


Fig. 3: Pump head

Diaphragm pumps transfer, compress (depending on pump version) and evacuate gases and vapors.

The elastic diaphragm (4) is moved up and down by the eccentric (5) and the connection rod (6). In the downward stroke it aspirates the gas to be transferred via the inlet valve (2). In the upward stroke, the diaphragm presses the medium out of the pump head via the outlet valve (1). The transfer chamber (3) is hermetically separated from the pump drive (7) by the diaphragm.

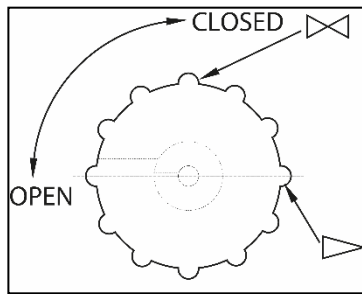


Fig. 4: Control knob for gas ballast

6.2. Gas ballast



DANGER

Personal injury caused by poisoning or explosion and damage to the pump

- ➔ Make sure that no reactive or explosive mixtures will be produced when the gas ballast valve is open.
- ➔ If necessary, close the gas ballast valve.
- ➔ If inert gas is required, contact Yamato Service.



When transferring vaporous media, opening the gas ballast valve can minimize the formation of condensation in the pump heads.



Opening the gas ballast valve deteriorates ultimate vacuum performance.

7. Transport

General



Physical injury and/or property damage due to incorrect or improper transport of the pump

Incorrect or improper transport may cause the pump to fall, be damaged or injure persons.

- If necessary, use suitable aids (carrying strap, lifting device, etc.).
- If necessary, wear suitable personal protective equipment (e.g. safety shoes, safety gloves).



Risk of injury due to sharp edges on the packaging

There is a risk of injury due to getting cut by sharp edges while gripping on edges or when opening the packaging.

- If necessary, wear suitable personal protective equipment (e.g. safety shoes, safety gloves).

- Transport the pump in its original packaging to the installation location.
- Store the original packaging of the pump (for example, for future storage).
- Check the pump for transport damage upon receipt.
- Document damage that has occurred during transport in writing.
- If necessary, remove the transport safety devices before commissioning the pump.

Parameter

Parameter	Value
Storage temperature	+ 5°C to + 40°C
Transport temperature	- 10°C to + 60°C
Permiss. humidity (non-condensing)	30% to 85%

Tab. 13



Before starting the pump, make sure that it has reached ambient temperature (see Chapter 5. Technical Data).

8. Setup, installation and connection

Only install and operate the pumps under the pneumatic operating parameters and conditions described in Chapter 5, Technical Data.

Observe the safety precautions (see Chapter 4).

- Before installation, store the pump at the installation location to bring it up to ambient temperature.
- Mounting dimensions → Pump dimensions, see Chapter 5. Technical Data.
- Installation location → Make sure that the installation location is dry and the pump is protected against rain, splash, hose and drip water as well as other pollutions.
- Choose a safe location (level surface) for the pump.
- Protect the pump from dust.
- Protect the pump from vibrations, jolts and external damage.

8.1. Connecting the pump

- Connected components → Only connect components to the pump which are designed for the pneumatic data of the pump (see Chapter 5, Technical Data).
- Pump exhaust → If the pump is used as a vacuum pump, safely discharge the pump exhaust at the pump's pneumatic outlet.
 1. Remove the protective plugs from the hose connection threads.
 2. Connect the suction line and pressure line.
 3. Orient the suction and pressure lines at a downward angle to prevent condensate from running into the pump.
 4. Insert the power cable plug into a properly installed grounded socket.

9. Operation

9.1. Pump

9.1.1. Preparing for start-up

	Prerequisites for start-up
Pump	▪ All hoses are attached properly
Pump	▪ Specifications of the power supply correspond with the data on the pump's type plate ▪ Pump outlet not closed or restricted ▪ When operating with gas ballast: If the pump is ventilated through the air inlet, no explosive or toxic mixtures can form.

Tab. 14

9.1.2. Initial start-up

- Only operate the pumps under the operating parameters and conditions described in Chapter 5. Technical Data.
- Make sure the pumps are used properly (see Chapter 2.1).
- Make sure the pumps are not used improperly (see Chapter 2.2).
- Observe the safety precautions (see Chapter 4).



Hazard of the pump head bursting due to excessive pressure increase

- Do not exceed max. permissible operating pressure (see Chapter 5. Technical Data).
- Monitor pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure, immediately switch off pump and eliminate fault (see Chapter 11. Troubleshooting).
- Only throttle or regulate the air or gas quantity in the suction line to prevent the maximum permissible operating pressure from being exceeded.
- If the air or gas quantity in the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure is not exceeded.
- Ensure that the pump outlet is not closed or constricted.

9.2. Information about switching the pump on and off

Switching the pump on

- i** Do not allow the pump to start against overpressure. This also applies during operation after a brief power cut. If a pump starts against pressure, it may block; this activates the blocking protection (drive) and the pump switches off.
- ➔ Make sure that there is no pressure in the hoses before switching on the pump.
 - ➔ Switch the pump on at the power switch (see Fig. 2/5).

Adjusting the flow rate

The speed of the pump can be varied by using the rotary/push knob. This allows the flow rate to be set.

- ➔ The speed setting of the rotary/push knob is not reset when the pump is switched off with the power switch.

Switching off pump/decommission

- ➔ If aggressive media are being transferred, rinse the pump before switching it off to extend the service life of the diaphragm (see Chapter 10).
- ➔ Switch the pump off with the rotary/push knob.(see Fig. 2/3)
- ➔ Switch the pump off at the power switch (see Fig. 2/5).
- ➔ Restore the system to normal atmospheric pressure (release pneumatic pressure in pump).
- ➔ Unplug the pump.

Status display

- ➔ Is green when the pump is switched on at the power switch. (see Fig. 2/5).
- ➔ Is blue when the pump is also switched on with the rotary/push knob. (see Fig. 2/3)
Pump is running:
The status display becomes brighter as the speed is set higher.
- ➔ Is red when a fault exists:

Signal duration	Type of fault
100% ON (continuously lit)	Drive blocked
50% ON; 50% OFF	Temperature too high (drive)
90% ON; 10% OFF	Other fault

Tab. 15: Fault signal via status display

More information see Chapter 11. Troubleshooting.

10. Servicing

10.1. Servicing schedule



WARNING

Risk of explosion resulting from the formation of an explosive atmosphere

Leaking connections can cause dangerous, explosive atmospheres.

- Ensure that diaphragms, valve plates/seals are not damaged and are clean and correctly installed.
- Check pneumatic connections on the pump for leaks.
- Take care during servicing work.
- Immediately replace defective parts.

Component	Servicing interval
Pump	- Inspect regularly for external damage or leaks - Inspect regularly for noticeable changes in noise and vibration
Diaphragm and valve plates/seals	- Change as soon as pumping capacity decreases, preferably sooner

Tab. 16

10.2. Cleaning



When cleaning, make sure that no liquids enter the housing.

10.2.1. Flushing pump



WARNING

Risk of explosion when flushing the pump with air

- If the pump is used with potentially explosive media, have the pump flushed with an inert gas only by an expert.



WARNING

Personal injury caused by poisoning or explosion and damage to the pump

- When flushing the pump with inert gas, make sure that the gas ballast valve is closed so no reactive or explosive mixtures form.

- Before switching off the pump, flush it with air (or with inert gas if required for safety reasons) under atmospheric conditions (ambient pressure) for about five minutes.

10.2.2. Cleaning pump

- ➔ Clean the pump only with a moist cloth. Do not use flammable cleaning agents.
- ➔ If compressed air is available, blow out the parts.

10.3. Replacing diaphragm and reed valves/seals and O-rings

Requirements

- Pump switched off and unplugged
- Pump clean and free of hazardous materials.
- Hoses removed from pump's pneumatic inlet and outlet.

Material and tools

Quantity	Material
1	TORX ® screwdriver T20
1	Spare parts kit (see Chapter 12)
1	Felt-tip pen

Tab. 17

Information on procedure

- ➔ Always replace the diaphragm, valve plates/seals and O-rings together in order to preserve the pump's performance.
- ➔ Replace the membrane and valve plates/seals of the individual pump heads in sequence.



WARNING

Health hazard due to dangerous substances in the pump

Depending on the medium transferred, caustic burns or poisoning are possible.

- ➔ If necessary, wear protective equipment (e.g. safety gloves, safety glasses).
- ➔ Take the proper steps to clean the pump.

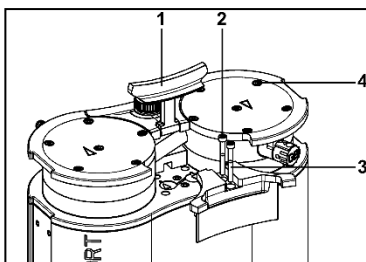


Fig. 5: Dismantle the cover

Preparatory steps

1. Place the handle (Fig. 5/1) in a vertical position.
2. Undo the screws (Fig. 5/2) of the cover (Fig. 5/3).
3. Remove the cover (Fig. 5/3).
4. Undo the head screws (Fig. 5/4).

Dismantling the pump head

- 1 Screw
- 2 Pressure plate
- 3 Head plate
- 4 Valve plates/seals
- 5 Intermediate plate
- 6 Diaphragm
- 7 Shim rings

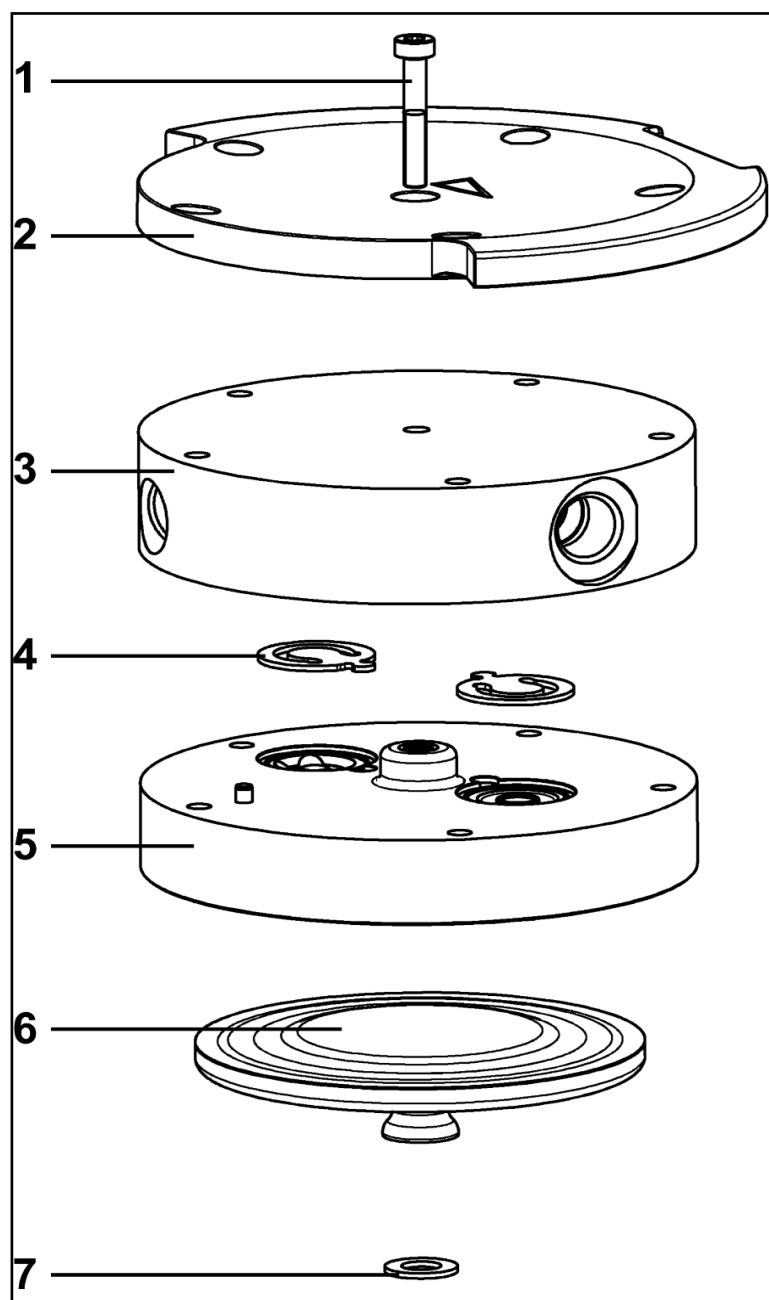


Fig. 6: Pump head

i If not specified otherwise, the following part numbers relate to Fig. 6.

1. Use a felt-tip pen to mark the pressure plate (2), head plate (3), intermediate plate (5) with a continuous line. This prevents the parts being assembled incorrectly later.
2. Undo the outer screws (Fig. 5/4) from the pump heads.
3. Carefully remove the pump heads.

Replacing the diaphragm

i With this pump, the diaphragms (6) are replaced in sequence to make sure that the same number of shim rings (7) as before is used.

1. Press one diaphragm (6) down until the other diaphragm is at the upper dead center.
2. Carefully unscrew the top diaphragm (6) by hand in an anti-clockwise direction.

i Use caution to prevent the shim rings located between the diaphragm and the connecting rod from falling into the pump housing.

Remove any shim rings sticking to the diaphragms and place them on the associated thread of the connecting rod. The same number of shim rings as before must be installed in order to ensure the pump's pneumatic performance.

3. Manually screw in the new membrane (6) hand-tight.
4. Carry out steps 1 to 4 for the second pump head.

Replacing O-rings

- 8 Gas ballast valve
- 9 Interconnection tube
- 10 Hose connections

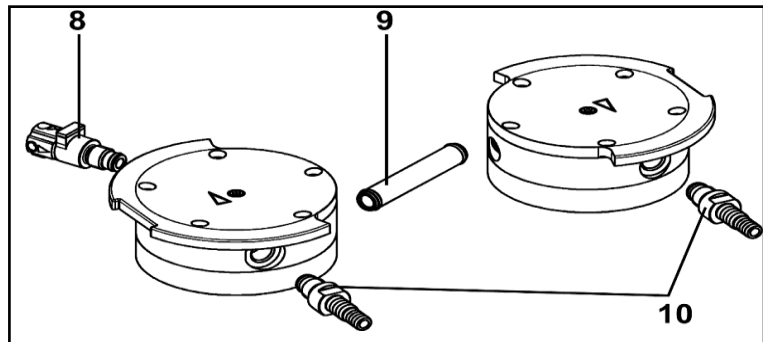


Fig. 7: Replacing O-rings

1. Unscrew the hose connections (10) and gas ballast valve (8) from the head plate (3).
2. Remove the interconnection tube (9) from the head plate (3).
3. Replacing O-rings.

Replacing valve plates/sealings

i With this pump, the valve plates/seals (4) are replaced in sequence.

1. Undo the screw (1) from just one pump head.
2. Remove the pressure plate (2) and head plate (3) from the intermediate plate (5). Remove the valve plates/seals (4).
3. Remove the old valve plates/seals (4).

4. Carefully clean the intermediate plate (5) (if there are deposits).
5. Insert new valve plates/seals (4) into the seats of the intermediate plate (5).
6. Carry out steps 1 to 5 for the second pump head.
7. Dispose of the old diaphragm (6), valve plates/seals (4) properly.
8. Insert the interconnection tube (9) in the head plate (3).
9. Screw the gas ballast (8) into the corresponding head plate (3) so that the surface faces upward.

Assembling the pump head

1. Press down all around the edge of the diaphragm (6). Press the diaphragm (6) down only on one pump head.
2. Place the intermediate plate (5) with valve plates/seals (4) on the holder in accordance with the felt-tip pen line.
3. Place the head plate (3) on the intermediate plate (5) in accordance with the felt-tip pen line.
4. Place the pressure plate (2) on the head plate in accordance with the felt-tip pen line.
5. Tighten the screws (Fig. 5/4) in a crosswise sequence (tightening torque: 5 Nm).
6. Screw (1) in the middle of the pressure plate.
7. Tighten screw (1) (tightening torque: 2 Nm).
8. Carry out steps 1 to 7 for the second pump head.
9. Screw in the hose connections (10) hand-tight using the supplied tool.

Final steps



WARNING

Risk of explosion from leaks

→ Before restarting the pump, check the pump heads and pneumatic connections for leaks. Leaks may cause an explosion.

1. Functional check
 - Connect the suction and pressure sides to the pump
 - Connect the pump to the power supply
 - Check the functions of the pump (including ultimate vacuum)
 - Disconnect electrical and pneumatic connections from the pump again

2. Pump integrated into the application

- Connect the suction and pressure sides to the pump
- Connect the pump to the power supply
- Check the functions of the pump

11. Troubleshooting



DANGER

Extreme danger from electrical shock!

- All work on the pump must only be carried out by authorized specialists.
- Disconnect the pump power supply before working on the pump.
- Make sure the pump is de-energized and secure.

→ Check the pump (see Tab. 18 and Tab. 19).

Pump does not transfer	
Cause	Fault remedy
No voltage in the power supply.	→ Connect the pump to the power supply.
Pump's overtemperature protection triggered.	→ Disconnect pump from the power supply. → Allow pump to cool. → Identify and eliminate cause of overheating.
Connections or hoses are blocked.	→ Check connections and hoses. → Remove blockage.
External valve is closed or filter is clogged.	→ Check external valves and filters.
Condensate has collected in the pump head.	→ Disconnect the condensate source from the pump. → Flush the pump with air (or with inert gas if required for safety reasons) under atmospheric pressure for a few minutes.
Diaphragm or valve plates/seals are worn	→ Membrane und Ventilplatten/Dichtungen wechseln (siehe Kapitel 10.3. Membrane, Ventilplatten/Dichtungen und O-Ringe wechseln)

Tab. 18

Flow rate, pressure or vacuum too low	
The pump does not achieve the output specified in the Technical data or the data sheet.	
Cause	Fault remedy
Condensate has collected in the pump head.	→ Disconnect the condensate source from the pump. → Flush the pump (see Chapter 10.2.1). → Open the gas ballast and rinse the pump head.
At the pressure side there is positive pressure and at the suction side vacuum or pressure from the atmosphere at the same time.	→ Change pneumatic conditions.
Cross-section of pneumatic hoses or connectors too narrow or restricted.	→ Disconnect the pump from the system and determine output values. → Remove restriction (e.g. valve) if necessary. → If applicable, use larger-diameter hoses or connectors.
Leaks in connections, hoses or pump head.	→ Make sure the hoses are properly seated on the hose connectors. → Replace leaking hoses. → Repair leaks.
Connections or hoses completely or partially obstructed.	→ Check connections and hoses. → Remove any parts or particles causing obstructions.
Pump head components are soiled.	→ Clean head components.

Flow rate, pressure or vacuum too low	
The pump does not achieve the output specified in the Technical data or the data sheet.	
Diaphragm or valve plates/seal are worn.	➔ Replace diaphragm and reed valves (see Chapter 10.3).
Replaced diaphragm and valve plates/seals	➔ Ensure that the shim rings were placed on the diaphragm screw thread. ➔ Check hoses for leaks. ➔ If necessary, carefully tighten the outer screws of the pressure plate in a crosswise sequence.
Gas ballast still open.	➔ Close gas ballast.
Rotary/push knob is not set to max. speed.	➔ Set rotary/push knob to max. speed.

Tab. 19

Pump is switched on but does not run, status display not lit	
Cause	Remedy
Pump not connected to the power supply.	➔ Connect pump to the power supply.
No voltage in the power supply.	➔ Check room fuse and switch on if necessary.

Tab. 20

Pump is switched on but does not run, status display flashes red (50% ON, 50% OFF)	
Cause	Remedy
Pump overheated, overtemperature protection triggered.	➔ Unplug the pump. ➔ Allow pump to cool. ➔ Identify and eliminate cause of overheating.

Tab. 21

Pump is switched on but does not run, status display is red (100% ON)	
Cause	Remedy
Pump drive is blocked.	➔ Unplug the pump. ➔ Allow pump to cool. ➔ Identify and eliminate the cause of the blockage.

Tab. 22

Pump is switched on but does not run, status display flashes red (90% ON, 10% OFF)	
Cause	Remedy
Other fault.	➔ Unplug the pump. ➔ Allow pump to cool. ➔ Contact Yamato Customer Service.

Tab. 23

Fault cannot be rectified

If you are unable to determine any of the specified causes, send the pump to Yamato.

1. Flush the pump under atmospheric conditions some minutes with air (if necessary for safety reasons: with an inert gas) to free the pump head of dangerous or aggressive gases (see Chapter 10.2.1).
2. Dismantle the pump.
3. Clean the pump (see Chapter 10.2.2).
4. Send the pump, together with completed Health and Safety Clearance and Decontamination Form (Chapter 14), to Yamato stating the nature of the transferred medium.

12. Spare parts

Spare parts set

Parts	Quantity
Diaphragm	2
Valve plates/seals	4
O-ring interconnection tube (Ø 10 x 1.8)	2
O-ring hose connection and gas ballast valve (Ø 8 x 1.8)	3

Tab. 24 * see Chapter 10.3. Replacing diaphragm and reed valves/seals and O-rings

Spare parts set	Order No.
N 820G	317435

Tab. 25

13. Returns

Pumps and systems used in laboratories and process-based industries are exposed to a wide variety of conditions. This means that the components contacting pumped media could become contaminated by toxic, radioactive, or otherwise hazardous substances.

For this reason, customers who send any pumps or systems back to Yamato must submit a Health and safety clearance and decontamination form in order to avoid a hazardous situation for Yamato employees. This Health and safety clearance and decontamination form provides the following information, among other things:

- physiological safety
- whether medium-contacting parts have been cleaned
- whether the equipment has been decontaminated
- media that have been pumped or used

To ensure worker safety, work may not be started on pumps or systems without a signed Health and safety clearance and decontamination form.

For optimal processing of a return, a copy of this declaration should be sent in advance via e-mail, regular mail, or fax to Yamato.

14. Health and safety clearance and decontamination form

Health and safety clearance and decontamination form

This declaration must be present and complete (the original must accompany the shipment's delivery receipt) before the returned device can be examined.

Device type:

Serial number(s):

.....

.....

Reason for returning the device (please describe in detail):

(The device(s) was(were) in operation ☐ yes ☐ no)

.....

.....

.....

.....

.....

We confirm that the above device(s)

- ☐ has(have) pumped exclusively **physiologically unobjectionable** media and that it(they) are free of hazardous materials and any materials that are harmful to health.

Pumped media:

The device(s) was(were) cleaned ☐ yes ☐ no

- ☐ has(have) pumped media of the following category(categories) which are not physiologically unobjectionable and that cleaning of the device(s) (potentially only media-contacting parts) is required.

Name, chemical formula, Material Safety Data Sheet

☐ aggressive

☐ biological

☐ radioactive

☐ toxic

☐ other

The device(s) was(were) decontaminated and work can proceed without special measures ☐ yes

Method / proof:

.....

The device(s) was(were) not decontaminated and special measures are required before starting work ☐ yes

Measures:

.....

Legally binding declaration

We herewith affirm that the information provided in this form is correct and complete. Shipment of the devices and components is in compliance with statutory regulations.

.....
Company (stamp)

.....
Date

.....
Name

.....
Authorized signature

.....
Position

Yamato Scientific Co.,Ltd.

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Chuo-ku, Tokyo 104-6136, Japan