

User's Manual

High Vacuum Diaphragm-type Dry Teflon Vacuum Pump

Model : DTC-41 (Special) , 41K (Special)



D T C - 4 1 (Special)



D T C - 4 1 K (Special)

Request to Users

Please read this manual thoroughly to ensure safe and effective use of the equipment.

Keep this manual in a safe place.

Due to periodic improvements in performance, the equipment described in this manual is subject to changes in dimensions and specifications without prior notice.

ULVAC KIKO, Inc.

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Pages with a shaded background are those which contain items related to safety.

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Before Using the Equipment

Thank you for purchasing this product. Your custom is very much appreciated. This pump is designed solely for vacuum discharge, and may malfunction or cause accidents if not handled appropriately. Read the manual thoroughly, and pay due attention to inspections, maintenance, and safety.

Personnel Handling the Equipment

Only persons who have read this manual thoroughly, and have sufficient understanding of safety, pump specifications, and method of operation, may operate this pump.

Read the Manual Thoroughly

Read the manual thoroughly in order to use the equipment correctly. Read the section on Safe Use particularly closely.

Keep This Manual in a Safe Place

After reading this manual, be sure to keep it in a safe place which is readily accessible to others needing to use it.

Copying This Manual Is Prohibited

No part of this manual may be copied for use by a third party without the express permission of the manufacturer.

Statutory Requirements for Disposal

Follow all statutory and local authority regulations when disposing of this pump.

Safety During Repair

Please provide a full description of the circumstances of use (particularly the use of dangerous materials) for the safety of repair personnel when requesting the manufacturer for repairs to the pump. Your request for repair of may be refused if these circumstances are unclear.

Checks When Opening Packaging

Check the following after opening the packaging.

- (1) Is the product as you requested?
- (2) Are the accessories and necessary parts included?

Standard accessories

User's manual ----- x 1
Inlet and outlet caps (fitted to inlet and outlet) ----- x 2

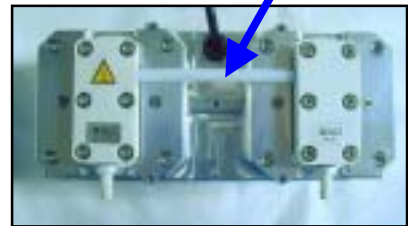
- (3) Is the pump damaged in any way?
- (4) Are any external screws or inlet and outlet pipes loose? Are any components missing?

Contact your agent or the sales division of the manufacturer if there are any problems with the pump.

Note

Customers purchasing the DTC- 41K(Special)

Do not grip or pull the tube on the top of the pump when removing it from the packing.
Damage to the tube may affect performance of the Pump.



Using the Pump Safely

To ensure that the pump is handled correctly, read this section thoroughly before use.

This manual and the warning labels on the pump include safety icons as an aid to understanding safety requirements.

These safety icons warn the operator and others of possible dangers and damage and should always be followed.

Safety icons

The meanings of the safety icons are as follows.

Danger

Incorrect handling of the equipment is very likely to result in death or serious injury to the operator.

Warning

Incorrect handling of the equipment may result in death or serious injury to the operator.

Caution

Incorrect handling of the equipment may result in light or medium injuries to the operator or damage to the equipment.

Note

Incorrect handling of the equipment may result in damage to the equipment and hinder its correct operation.

High Temperatures

Some components reach surface temperatures in excess of 60°C during pump operation. Burns may result if these components are touched during operation.

Electric Shock

To prevent electric shock, always shut-off the primary power supply before working on electrical wiring, or engaging in any electrical work.

Cautions for Safety in Use

Danger

Applications

- (1) This pump is not designed to be explosion-proof, and should therefore not be used to discharge explosive gases.
- (2) In addition to discharge of gas via the outlet, gas may also leak from other parts of the pump, and it should therefore not be used with toxic gases. If toxic gas is discharged for any reason it is important to note that the interior of the pump will be contaminated by the gas, requiring appropriate caution during maintenance.

Maintenance and Repair

- (3) When requesting the manufacturer's service division to dismantle and repair the pump, always note the gas which the pump has been used with on the Usage Check Sheet. Note that if it has been used to discharge toxic gas for any reason it will be contaminated. **Please be aware that use with some gases will preclude dismantling and repair.**

Warning

Installation

- (1) Do not use the pump in an explosive atmosphere. Such use may result in injury and fire.
- (2) Ensure that there are no inflammable materials such as solvents in the vicinity when using the pump.
- (3) Ensure that the motor is freely ventilated to prevent overheating which may result in fire or burns.

Power Supply

- (4) Always remove the power cord from the wall socket before checking or repairing the pump. Failure to do so may result in electric shock, or the pump suddenly starting and causing injury.
- (5) Ensure that the relevant wiring is in accordance with technical standards for electrical equipment and wiring regulations. Incorrect wiring may result in fire.
- (6) Remove the power cord from the wall socket before connecting any wiring. Connecting wiring with the power on may result in electric shock.
- (7) Always ensure that the pump is correctly earthed. A dedicated earth leakage breaker is recommended. Failure to earth the pump correctly may result in electric shock if a fault or earth leakage occurs.
- (8) Use the pump only at the rated voltage. Use at other than the rated voltage will interfere with operation of the overload protection device, and this may result in the motor burning out, or fire.
- (9) Do not damage, modify, pull the power cord, or place objects on it. Damage to the cord may result in electric shock or fire.
- (10) Touching the power cord with wet hands may result in electric shock.
- (11) Touching electrical wiring etc while inserting the power plug may result in electric shock.

Warning

Operation

- (12) This pump is not designed to be explosion-proof. When using the pump, ensure that there are no inflammable materials such as solvents, or explosive gases, in the vicinity. Use under such conditions may result in injury or fire.
- (13) Inserting fingers or objects into the motor inlet may result in electric shock, injury, or fire.
- (14) Operating the pump with the discharge outlet blocked, or with a device which prevents passage of gas to the discharge outlet, may result in rupture of the pump. The internal pressure of the pump rises and the pump body may rupture and the motor become overloaded.
This pump is not designed to be pressure-resistant. The internal pressure of the pump is limited to 0.03 MPa (gauge pressure).

Maintenance and Repair

- (15) The pump should be dismantled or repaired only by a repair technician trained by the manufacturer.
- (16) To prevent ingestion of microscopic particles resulting from wear of components, **use a dust mask and gloves during repair work.**

Caution

Installation

- (1) The fine clearances used in this pump require that the following conditions be satisfied during storage, installation, and operation.
 - 1. Ambient temperature of 0~40°C and maximum relative humidity of 85% during operation.
 - 2. Other conditions for storage and operation.
 - a) Level floor of sufficient strength.
 - b) No condensation
 - c) Dust-free environment
 - d) Well ventilated
 - e) Environment free of corrosive or explosive gas.
 - f) Not subject to direct sunlight.
 - g) No danger of fire.
 - h) Maximum ambient temperature of 40°C during assembly of pump.
- (2) To prevent back injury, **always use both hands to lift pumps.**
- (3) Microscopic particles resulting from wear of components are discharged from the outlet and contaminate the room. If necessary, connect a pipe from the discharge outlet to the outside of the building.

Operation

- (4) **Do not use in applications involving organ transplants, or contact with body fluids or living tissue.**
- (5) Touching rotating components (eg motor, main shaft, axial joints, cooling fan) while the pump is in operation may result in injury.
- (6) The overload protector operates when the pump becomes excessively hot. Touching it in this condition may result in burns.
- (7) Touching the motor while the pump is in operation or while it is still hot immediately after having been switched off may result in burns.
- (8) Do not insert fingers or objects into, or peer into, the inlet or outlet during operation.

Caution

Maintenance and Repair

- (9) Dispose in accordance with legislation for disposal and cleaning of waste products, handle as industrial waste, and do not incinerate. Toxic fluorine gas is generated by incineration of fluorine-based plastics.
- (10) If the pump ceases operation, turn power OFF (set switch to O) immediately to prevent accidents, remove the power cord from the wall outlet, and contact your dealer or the manufacturer for inspection and repair.
- (11) Leave the pump for at least 30 minutes until it has cooled, and begin operation again. Touching the pump immediately after it has stopped may result in burns.

Note

Installation

- (1) The pump may malfunction if it is subjected to shocks or tipped over on its side.
- (2) Do not hold or push the tube at the top of the pump (see below). Damage to the tube may affect performance of the pump.



Applications

- (3) This pump is not designed to be corrosion-proof. Use it only with clean air at normal temperature, or with gases of equivalent characteristics.
- (4) This pump is designed for general corrosion resistance, however it is not resistant to molten alkali metals such as molten sodium, to fluorine at high temperatures, and to some oxides of fluorine.
- (5) Corrosion-resistant plastic is used in the external covering of the DTC-41(Special), however it is not resistant to all chemicals.

Ensure that the following chemicals do not come in contact with the pump. Any chemical, including the following, which comes into contact with the pump should be wiped off immediately.

- Acetone
- Ethyl ether
- Ethyl acetate
- Animal fats

Note

Installation

- (5) Ingestion of liquids into the pump will result in damage and prevent proper operation.
- (6) Ingestion of rubbish and dust in the air entering the pump will interfere with its proper function. If the air is likely to contain rubbish or dust, a filter should be fitted to the inlet to protect the pump.
- (7) Ducting should always be fitted to the pump outlet if toxic corrosive gases, or steam, enters the pump.

Operation

- (8) Use the pump within an ambient temperature range of 40°C. Use at high ambient temperatures will dramatically reduce the life of the pump.
- (9) Back pressure at the outlet while the pump is starting may overload the motor.
- (10) The thermal protection relay operates when the pump reaches a very high temperature. Touching the pump in this condition may result in burns.
- (11) **To maintain the performance of the pump, always ensure that it is cleaned internally after use. Clean by ingesting clean air for 3-5 minutes under no-load conditions.**

Maintenance and Repair

- (12) The fine clearances used in this pump require skill in its assembly. If a repair technician is unavailable, replacement of all consumables should be left to the manufacturer's service division.



1. Product Outline

1.1 Purpose of Use and Prohibitions

This product is a dry vacuum pump which employs reciprocating motion of a rubber diaphragm for vacuum discharge.

PTFE is a highly corrosion-resistant plastic and is used in components which come in contact with gas.

Observe the following prohibitions to ensure normal operation of the pump.

< Prohibitions >	
 Warning	(1) This pump employs only vacuum operation, and must not be pressurized. (2) Do not re-sell, repair, or modify this pump without the approval of the manufacturer.
 Note	(3) This pump is designed for general corrosion resistance, however it is not resistant to molten alkali metals such as molten sodium, to fluorine at high temperatures, and to some oxides of fluorine. (4) Corrosion-resistant plastic is used in the external covering of the DTC – 41(Special) however it is not resistant to all chemicals. Ensure that the following chemicals do not come in contact with the pump. Any chemical, including the following, which comes into contact with the pump should be wiped off immediately. • Acetone • Ethyl ether • Ethyl acetate • Animal fats (5) Ensure that the gas entering the pump does not contain rubbish, dust, or water (except steam). (6) Do not operate the pump for long periods at near-atmospheric pressure.



1.2 Specifications

Table 1.1 Product Specifications

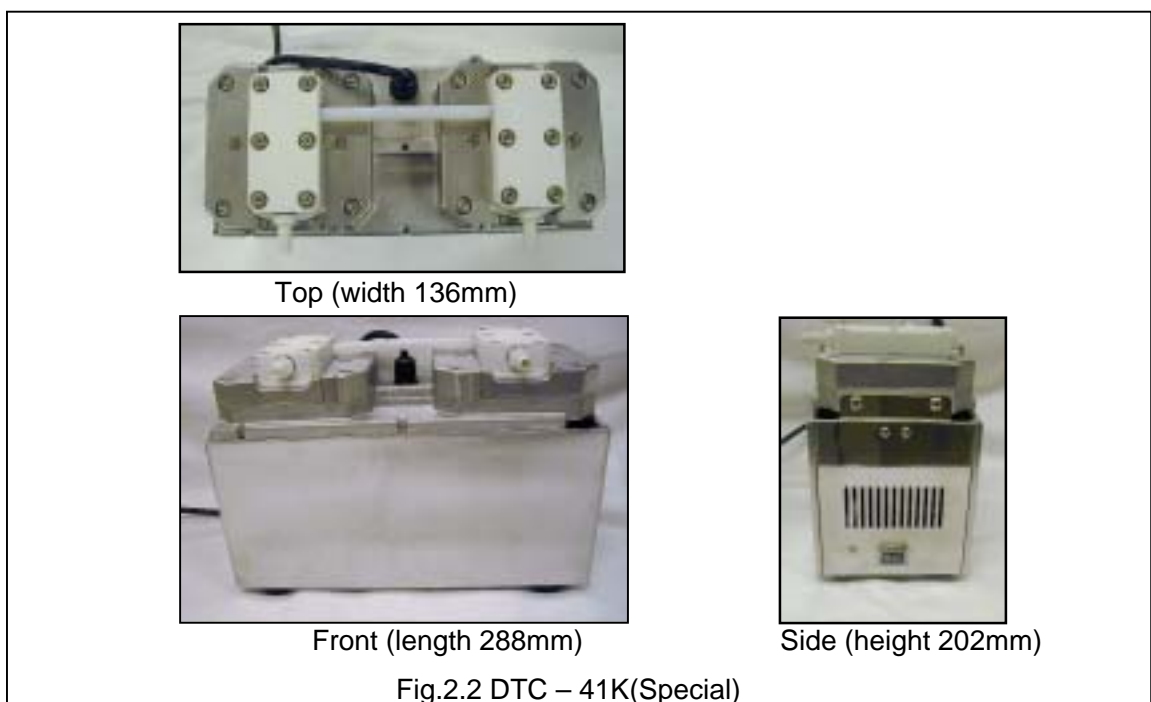
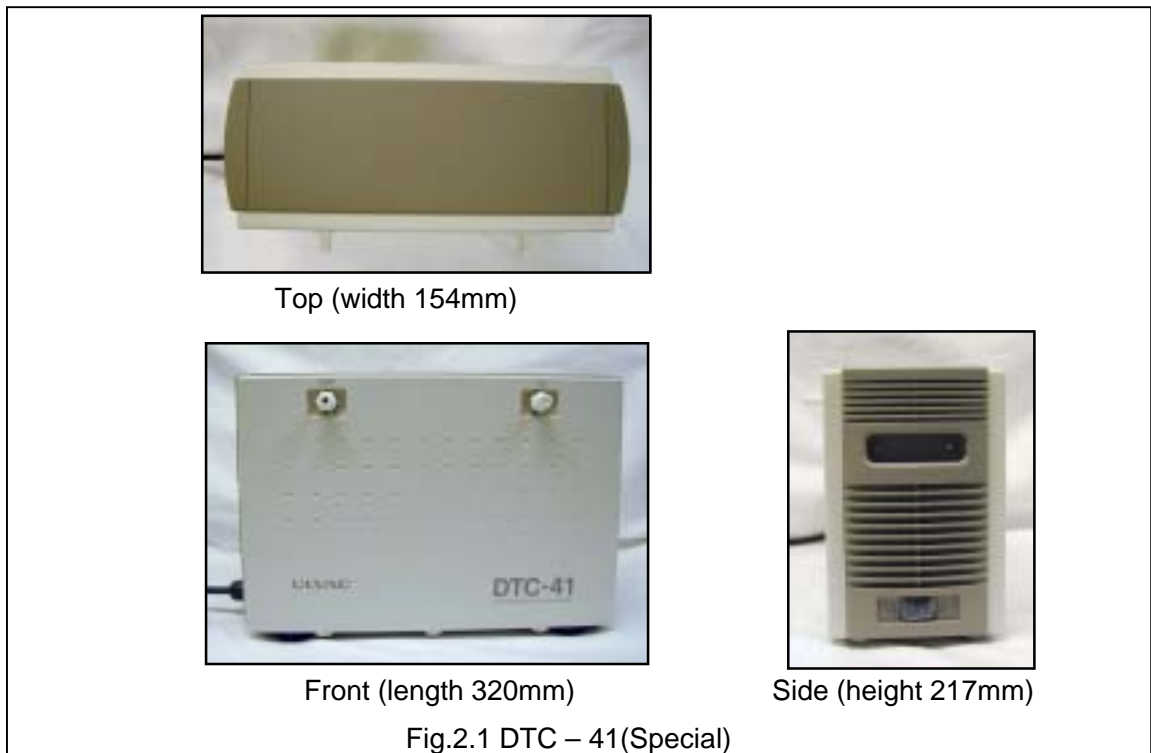
Model		DTC-41(Special)		DTC-41K(Special)	
Discharge rate	50Hz	40L/min			
	60Hz	46L/min			
Pressure achieved		1.0kPa			
Motor	Single phase, AC 115 V (±10%) (60Hz)	Single phase, AC 200 V (±10%) (50/60Hz)	Single phase, AC 220 V (±10%) (50/60Hz)	Single phase, AC 230 V (±10%) (50Hz)	
	100 W, 4P, with condenser-run thermal protection relay (automatic reset)				
Rated current		2.1 A (60Hz)	1.3/1.3 A (50/60Hz)	1.1/1.1 A (50/60Hz)	1.0A(50Hz)
Speed		1615rpm (50Hz)	1320/1610rpm (50/60Hz)	1321/1605rpm (50/60Hz)	1370rpm (50Hz)
Inlet and outlet piping		O.D. Φ 9X I.D. Φ 6(PF1/4)			
Weight		10.3kg		10.2kg	
Air temperature		0~40°C			
Dimensions		155 (W)X320 (L)X217 (H) mm		136 (W)X288 (L)X202 (H) mm	

1.3 Thermal Protection Relay

- 1) This pump is fitted with an automatic reset thermal protection relay for overload protection. This device shuts off the motor power supply circuit automatically to prevent burn-out if the motor temperature rises due to a pump fault which prevents rotation, or if load becomes excessive.
- 2) It is recommended that additional protective devices (eg. earth leakage breaker, motor breaker) be fitted.




 Warning	See Warning (8), P04
 Caution	See Caution (6), P05

2. Dimensions



3. Installation and Storage

3.1 Cautions for Installation and Storage

 Warning	See Warning (1)(2)(3)(5)(6)(7)(8)(9)(10)(11), P04
 Caution	See Caution (1)(2)(3), P05
 Note	See Note (1)(2)(7), P06

3.2 Environmental Conditions for Installation, Storage, and Operation

The fine clearances used in this pump require that the following conditions be satisfied during storage, installation, and operation.

1. Ambient temperature of 0~40°C and maximum relative humidity of 85% during operation.
2. Other conditions (during storage and operation).
 - a) Level floor of sufficient strength.
 - b) No condensation
 - c) Dust-free environment
 - d) Well ventilated
 - e) Environment free of corrosive or explosive gas.
 - f) Not subject to direct sunlight.
 - g) No danger of fire.
 - h) Maximum ambient temperature of 40°C during assembly of pump.

3.3 Location

The pump should be installed level in a location with minimal dust and humidity. This location should be selected in consideration of ease of installation and removal, inspection, and cleaning. Particular attention should be paid to ambient temperature when fitting the pump to equipment. Use anti-vibration rubbers to isolate the pump from vibrations in the equipment. See 3.2 Environmental Conditions for Installation, Storage, and Operation for details.

3.4 Checking Operation After Installation

- 1) Remove the rubber caps from the inlet and outlet.
- 2) Check that the pump switch is OFF (set to O), and insert the plug into the power supply.
Note: Ensure that the power plug is sufficient for the rated voltage and current.
- 3) Turn the switch ON (set to I) and check that gas is being drawn into the inlet.
- 4) When this check is complete, turn the power switch OFF (set to O) to stop the pump.

3.5 Piping

- 1) Install piping carefully to prevent leaks.
- 2) Piping connected to the inlet should be at least 6 mm inside diameter.
- 3) Ensure that piping connected to the outlet does not cause back pressure. Maximum back pressure is 0.03 MPa (gauge pressure).
- 4) When evacuating a vessel, ensure that a shut-off valve is placed between the pump inlet pipe and the vessel (see Fig.3.1).

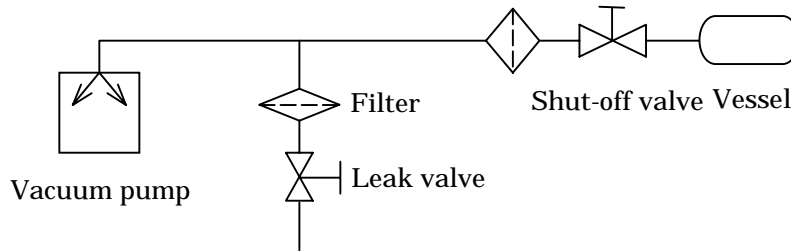


Fig.3.1 Example of Piping Used When Evacuating a Vessel

3.6 Storage

Turn the switch OFF (set to O), remove the power plug from the outlet, place the rubber caps over the inlet and outlet, and store the pump in an area of low humidity.

4. Cautions for Operation

4.1 Cautions for Operation

Danger	See Danger (1)(2), P04
Warning	See Warning (8)(12)(13)(14), P04
Caution	See Caution (4)(5)(6)(7)(8), P05
Note	See Note (3)(4)(5)(6)(7)(8)(9)(10)(11)(12), P06

- 1) To maintain the performance of the pump, always ensure that it is cleaned internally after use. Clean by ingesting clean air for 3~5 minutes under no-load conditions.
- 2) Consult the manufacturer if the pump is to be used in a special application.

4.2 Operation of the Thermal Protection Relay

- 1) When the thermal protection relay operates, switch the pump power supply OFF (set to O), remove the power cord from the outlet, and contact the manufacturer. Note that the pump will be very hot and should not be touched.
- 2) The pump operates automatically when temperature drops. Shut-off the power supply, and determine the cause of operation of the thermal protection relay.
- 3) Once the cause of the fault has been removed, wait until the motor cools and restart operation.

Caution	See Caution (6), P05
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4.3 Starting in Cold Weather

Cold weather will increase the viscosity of bearing grease and harden diaphragms, resulting in the pump being difficult to start. Follow the procedure below in such conditions.

- 1) Turn the switch ON/OFF 2~3 times with the inlet open to atmosphere until the pump starts. If the pump still does not start, raise the ambient temperature to beyond 0°C.
- 2) With the inlet open to atmosphere, run the pump for a few minutes to warm it.
- 3) Commence normal operation once the pump has warmed.

5. Pump Performance

5.1 Pressure Achieved

The term “pressure achieved” as employed in the catalogue and in this manual is defined as “the minimum pressure obtained by the pump without introduction of gas from the pump inlet (ie the no-load condition)”.

Note that the indicator values for pressure may differ between types of vacuum gauges.

The pressure achieved in practice is higher than that noted in the catalogue for the following reasons.

- (1) The fact that the vacuum gauge is mounted a distance from the pump, the steam generated by water droplets and rust etc on the inside walls of the pump and piping, and a variety of gases present in the system result in increased pressure.
- (2) Leaks into the vacuum system introduce other gases, resulting in increased pressure.

5.2 Evacuation Rate

The maximum rate of evacuation is reached when air is introduced, and decreases slightly as pressure is reduced.

The resistance of the piping system increases with small bore piping which extends over long distances, and this reduces the rate of evacuation.





The declared rate of evacuation for this pump is the maximum value achieved with dry air.

5.3 Power Requirements

The power required to drive the pump is the total of the work required to overcome the rotational resistance of the pump (mechanical work), and the work required to compress the air (compression work), and is at a maximum at an inlet pressure of $2.7 \times 10^4 \sim 4 \times 10^4$ Pa. At pressures below this range the compression work is considerably reduced and power is expended in mechanical work.

6. Maintenance, Inspection, and Repair

6.1. Cautions for Maintenance, Inspection, and Repair

 Danger	See Danger (3), P04
 Warning	See Warning (4)(15)(16), P04
 Caution	See Caution (9)(10)(11), P05
 Note	See Note (12), P06

Maintenance and repair by the customer's repair technician is limited to the following procedures. Do not undertake other repairs, or make modifications other than the standard options supplied by the manufacturer.

- 1) Replacing diaphragms
- 2) Replacing inlet and outlet valves
- 3) Replacing O rings

6.2 Maintenance

The following checks are required at least once every three days during operation.

- (1) Check for abnormal noises.
- (2) Check for abnormal heating of the pump.
- (3) Check that gas is discharged normally.

If a problem is found, take the measures described in 6.5 Troubleshooting List.

6.3 Regular Inspections

Inspect consumables after the first 3000 hours of operation, and replace and clean in accordance with the Replacement and Cleaning Guide on the following page. Refer to 6.4 Replacing and Cleaning Consumables for procedures.

Request replacement by the manufacturer's service division if a repair technician is not available.

Table 6.1 Consumables List

Components	Quantity	Material	Average life
Diaphragms	2	Synthetic rubber (EPDM) In contact with gas: Teflon	6,000hr
Inlet and outlet valves	4	Teflon	6,000hr
O rings (P-10A)	2	Synthetic rubber (FPM)	6,000hr
O rings (S-24)	4	Synthetic rubber (FPM)	6,000hr
O rings (AS568-110)	4	Synthetic rubber (FPM)	6,000hr
Bearings	1 set		15,000hr

Note that the average life for a component varies with the conditions of use.

Always follow 4.1 Cautions for Operation, and remember that life is extended by running the pump at minimal load (running the pump at minimal load is operation at the achieved pressure (inlet closed)).

Bearings are replaced by the manufacturer's service division.

<Replacement Guide>

Replace or clean components if performance is reduced or the following symptoms become apparent.

- Diaphragms : Replace if teflon components are worn or peeling, or if rubber components are deformed, hard or cracked.
Inlet and outlet valves : Replace if deformed, hard, or cracked.
O rings : Replace if hard, cracked, or stretched.
Bearings : Request manufacturer for repair if abnormal noises, or abnormal motor vibration, is noted.

Table 6.2 Locations for Maintenance and Inspection

Period of operation	Inspection item	Replacement guidelines	Method of inspection
3,000 hours	Diaphragms	Wear of Teflon components, deformation, hardening, or cracking of rubber components	Visual inspection
	Inlet and outlet valves	Deformed, hard, or cracked	Visual inspection
	O rings	Hard, cracked, or stretched	Visual inspection
	Bearings	Abnormal noises	Listen

6.4 Replacing and Cleaning Consumables



Always use a mask and gloves when replacing components to prevent ingestion of microscopic particles resulting from wear of components.

Use the following tools, and refer to the photographs, when replacing cleaning components. Contact the manufacturer's service division for this work if the necessary tools are not available.

1. Phillips screwdriver : No.2
2. Hex socket wrench : (1) 4mm (2) 5mm
3. Torque wrench : (1) With 4 mm socket. Ensure that it is capable of being set to 0.5 N.m torque.
(2) With 5 mm socket. Ensure that it is capable of being set to 12 N.m torque.
4. Spanners : 14mm or equivalent adjustable spanner
5. Vacuum grease : For replacing O rings.
6. Solvent : Use a solvent such as ethylalcohol which has no effect on rubber components.
7. Paper towels etc

1) Replacing diaphragms (simultaneous replacement of both diaphragms is recommended)

Note: To prevent injury, always wear gloves when fitting or removing diaphragms. Use tools No.1, 2, 3, 4, 5, 6 and 7.

1) -1. DTC-41(Special)

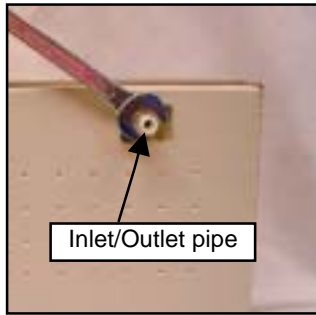


Photo 1

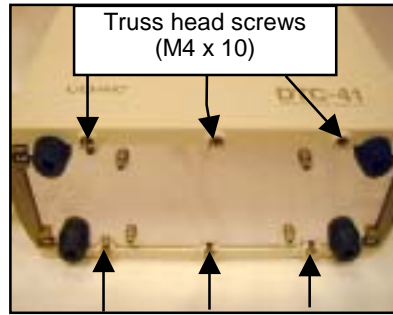


Photo 2

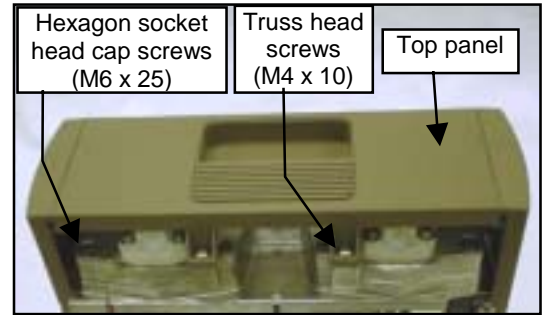


Photo 3

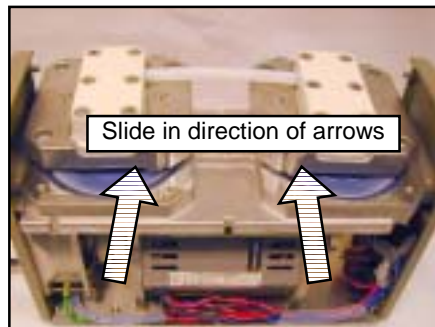


Photo 4

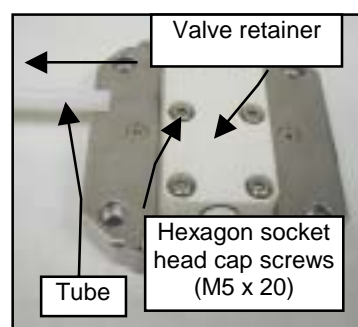


Photo 5

- (1) Remove the inlet and outlet pipes, and lay the pump horizontally on a soft cloth (Photo 1).
- (2) Remove the six truss head screws (M4 x 10) in the pump base, and remove the front panel (white) (Photo 2).
- (3) Stand the pump upright and remove the four truss head screws (M4 x 10), and remove the top panel (Photo 3).
- (4) Remove the eight hexagon socket head cap screws (M6 x 25) and remove the pump head as shown in Photo 4.

Note: Gripping, pushing, or bending the connecting tube will damage it and reduce the performance of the pump.

Note: Lay the removed pump head on a soft cloth.
- (5) Remove the connecting tube from the valve retainer and separate the left and right pump heads (Photo 5).

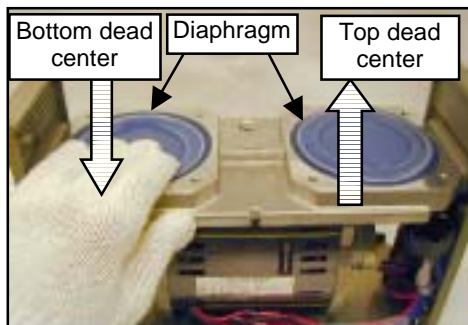


Photo 6

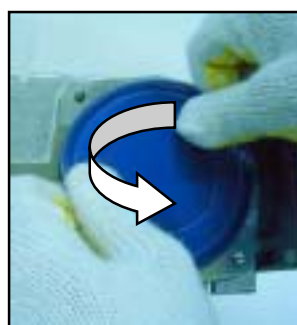


Photo 7

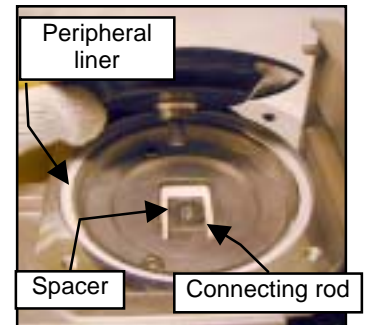


Photo 8

- (6) When one of the diaphragms is pushed downwards (to bottom dead center), the other diaphragm moves upwards (to top dead center). The edge of the diaphragm may then be

held with the fingers (Photo 6).

- (7) While holding the edge of the diaphragm, turn it in the anti-clockwise direction to remove it (Photo 7). Remove the remaining diaphragm in the same way.

Note: Use two persons if the diaphragm is difficult to remove.

Note: A spacer (washer) is located between the diaphragm and the connecting rod. Ensure that this spacer does not drop into the pump (Photo 8).

Note: The connecting rod may fall into the pump.

After removing the diaphragms, it is convenient to insert the pump head cover hexagon socket head cap screw (M6 x 25) into the threaded hole in the connecting rod.

- (8) Remove any foreign matter from the threaded hole in the connecting rod by wiping with solvent.

- (9) Apply a small amount of vacuum grease to the spacer and threaded portion of the new diaphragm, and fit by rotating in the clockwise direction (Photo 9).

Note: Check that the peripheral liner is in place (Photo 8). Ensure that the spacer removed in (7) is fitted.

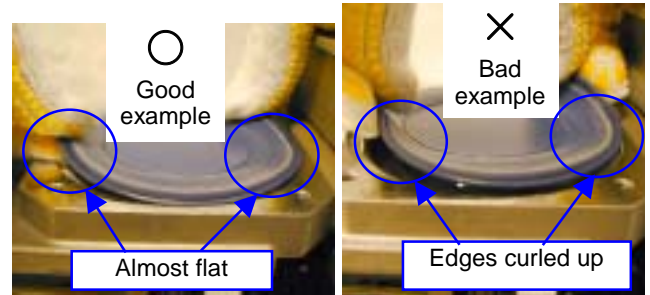


Photo 9

Note: To prevent wrinkling of the Teflon sheet, fit the diaphragm while holding it firmly as shown in Photo 9.

- (10) Fit the other diaphragm in the same manner.



Photo 10

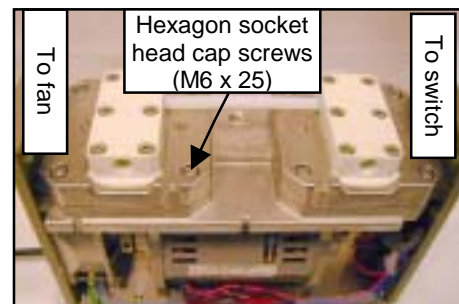


Photo 11

- (11) Apply a small amount of vacuum grease over a length of 5mm at each end of the connecting tube, and push the connecting tube onto the connectors as far as possible to connect the two pump heads (Photo 10).

- (12) Place the connected pump heads on the casing and fix in place with the hexagon socket head cap screws (M6 x 25).

Note: Tighten the hexagon socket head cap screws (M6 x 25) equally in diagonally opposite pairs to a torque of 12Nm.

Note: Take care to ensure that the connected heads are fitted in the correct orientation (Photo 11).

- (13) Place the top panel in position, and fix in place with the truss head screws (M4 x 10).

- (14) Lay the pump horizontally and fix the front panel in place with the truss head screws (M4 x 10).

- (15) Stand the pump upright and fit the inlet and outlet pipes.

1) -2. DTC-41K(Special)

+ Replace diaphragms in accordance with 'DTC-41(Special)' steps (4)~(12).

2) Replacing inlet and outlet valves (simultaneous replacement of both diaphragms is recommended)

Use tools No.1, 2, 3, 4, 6 and 7.

2) -1. DTC-41(Special)

- (1) Remove the front panel, top panel, and pump head cover in accordance with steps (1)~(5) in '1) Replacing diaphragms'.
- (2) Remove the hexagon socket head cap screws (M5 x 20), separate the pump head and valve retainer, and remove the inlet and outlet valves (Photo 12).
- (3) Disassemble the other pump head in the same manner, and remove the inlet and outlet valves.
- (4) Clean the pump heads and valve retainers with solvent.

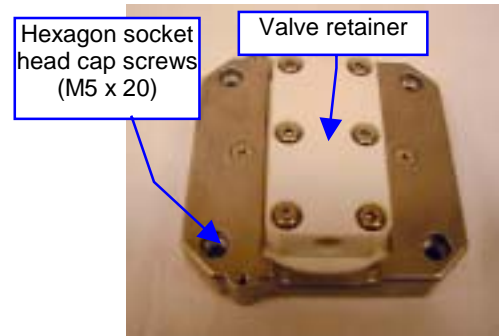


Photo 12

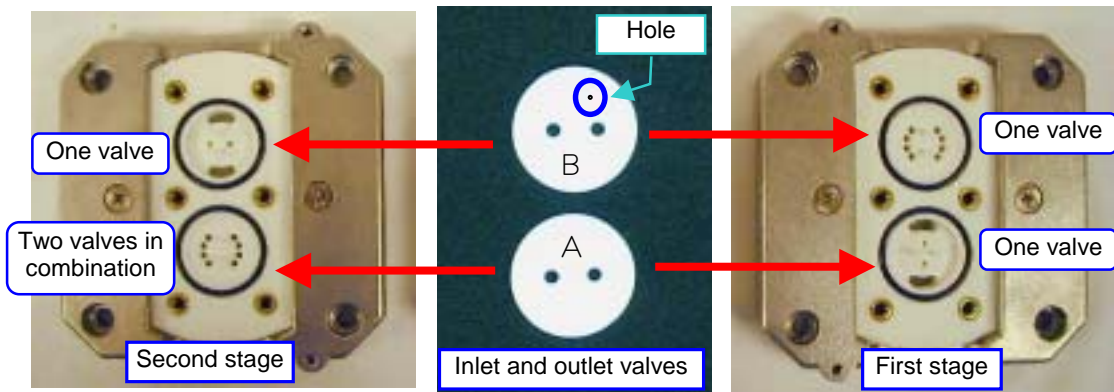


Photo 13

- (5) Fit the new inlet and outlet valves as shown in Photo 13.
Note: Check that the number of valves installed is correct, and whether or not the installed valves include holes (Photo 13).
- (6) Fit the valve retainer to the pump head.
Note: Check that the O-rings are fitted correctly to the inlet and outlet valves.
Note: Repeatedly tighten equally in diagonally opposite pairs to a torque of 0.5Nm.
- (7) Fit the inlet and outlet pipes.
- (8) Use the above procedure for the other pump head.
- (9) Join the two pump heads and fit to the casing in accordance with steps (11)~(15) in '1) Replacing diaphragms'.

2) -2. DTC-41K(Special)

+ Replace inlet and outlet valves in accordance with 'DTC-41(Special)' steps (2)~(7).

3) Replacing O-rings (simultaneous replacement of O-rings and diaphragms is recommended)

Use tools No.1, 2, 3, 4, 5, 6 and 7.

The following procedure is common to the DTC-41(Special) and DTC-41K(Special).

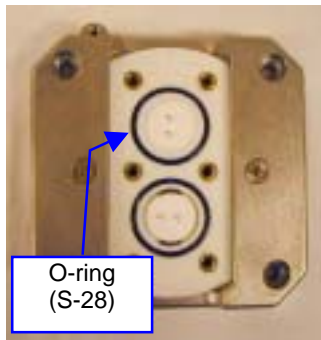


Photo 15

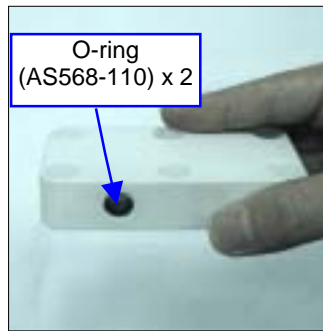


Photo 16

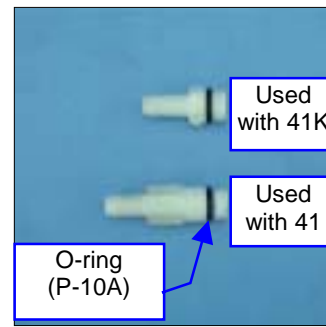


Photo 17

- (1) Remove the pump head from the casing, and then remove the valve retainer in accordance with steps (1) and (2) in '2) Replacing inlet and outlet valves'.
- (2) Remove the O-rings (Photo 15, 16, 17).
- (3) Clean the inlet and outlet pipes, pump heads and valve retainers with solvent.
- (4) Apply a small amount of vacuum grease to the new O-rings and fit each in place.
Note: AS568-110 requires two O-rings (total of four O-rings).
- (5) Fit all components in accordance with steps (6) and (7) in '2) Replacing inlet and outlet valves'.

4) Replacing bearings

Contact the manufacturer's service division for replacement of bearings.

6.5 Troubleshooting List

Table 6.3 Troubleshooting List

Problem	Causes	Solutions	Reference
Problems with starting and rotation of pump	(1) Not connected to power supply.	(1) Connect power supply.	3-4.
	(2) Switch is OFF.	(2) Set switch to I.	
	(3) Problem with power supply voltage.	(3) Ensure that voltage variation is within +/-10%.	
	(4) Problem with pump wiring.	(4) Rewire the pump. Contact the manufacturer.	
	(5) The breaker has operated.	(5) Investigate the reasons for operation.	
	(6) The thermal protection relay has operated.	(6) Switch power OFF, and eliminate the cause of operation of the relay. Contact the manufacturer.	
	(7) Low ambient temperature.	(7) Ensure that ambient temperature is 0-40 °C.	
	(8) Low voltage.	(8) Adjust the power supply voltage, and check the power supply cable.	
	(9) Fault in power supply.	(9) Replace or repair.	
	(10) Problem with power supply switch.	(10) Replace or repair.	
	(11) Broken wire in power cord.	(11) Replace or repair.	
	(12) Problem with motor.	(12) Replace or repair.	
	(13) Damaged condenser, or connection problem.	(13) Replace or repair.	
	(14) Locked connecting rod.	(14) Disassemble pump head and check interior.	
	(15) Problem with bearings.	(15) Replace or repair.	
	(16) Miscellaneous damage to pump components.	(16) Disassemble and repair (replace damaged components).	
Pressure does not diminish	(1) Pump is too small for capacity of vacuum vessel.	(1) Select another pump.	5-1. 5-1. 5-1.
	(2) Pressure measurement is incorrect.	(2) Measure the pressure correctly.	
	(3) Vacuum gauge is unsuitable.	(3) Measure with a calibrated vacuum gauge suitable for the pressure range.	
	(4) The inlet piping is too small in diameter, or too long.	(4) Connect piping of an inside diameter greater than the inlet diameter, or reduce the distance between the pump and vacuum vessel.	
	(5) Ambient temperature unsuitable.	(5) Ensure that ambient temperature is 0-40 °C.	
	(6) Leaks in inlet piping.	(6) Clean and replace.	
	(7) Leaks from piping or connections.	(7) Check for leaks in piping, check diameter and length of piping, and repair.	
	(8) Foreign matter inside pump.	(8) Remove foreign matter, disassemble and clean, and replace components.	
	(9) Foreign matter inside pump.	(9) Disassemble and repair (replace valves and diaphragm etc).	
	(10) Problem due to ingestion of liquid or	(10) Replace.	
	(11) Damage to diaphragm.	(11) Replace.	
	(12) Miscellaneous damage to pump components.	(12) Disassemble and repair (replace damaged components).	
Pump surfaces are abnormally hot (more than room temperature + 30 °C)	(1) Continuous operation with high pressure gas.	(1) Do not run the pump continuously at near-atmospheric pressure.	
	(2) High temperature gas.	(2) Fit cooling equipment (eg. gas cooler) to the inlet.	
	(3) Problem with power supply voltage.	(3) Ensure that voltage variation is within +/-10%.	
	(4) Motor has seized.	(4) See the section on problems with pump rotation.	

7. In Conclusion

Please contact the manufacturer's sales division if you have any questions.

Warranty

The warranty for this pump is valid for a period of one year after shipment from the factory. Faults which occur during the period of the warranty will be repaired free of charge provided they are clearly the responsibility of the manufacturer. Note that the warranty does not cover the following conditions.

- (1) When the pump has been operated in a manner other than that described in this manual.
- (2) When the pump has been used with inflammable or corrosive gases, in dusty or very hot and humid locations, in radioactive areas, and under other special conditions.
- (3) When the fault is due to modification or repair by personnel other than those employed by the manufacturer or service companies as specified by the manufacturer.
- (4) When the fault is due to natural disasters or earth movements.
- (5) When the fault is due to a consumable having exceeded its specified life.
- (6) When the pump has been used at other than the rated power supply.
- (7) When the internal pressure has risen abnormally (eg. the pump has been operated when closed).
- (8) When the pump has been damaged due to having been dropped etc.
- (9) When it is determined by the manufacturer's technical personnel that the pump has been used under unsuitable conditions.

This warranty applies to the diaphragm-type of dry teflon vacuum pump itself, and does not cover losses due to faults in the pump.

The repair or warranty covers only repaired or replaced components.

This warranty is valid only in Japan.

ULVAC

Inspection Certificate

Product: Diaphragm-type
Dry Teflon Vacuum Pump
Models: DTC- 41(Special) , 41K(Special)

Inspected by:

Pump Usage Check Sheet

This sheet provides the necessary description when requesting disassembly and repairs.

Enter the following information required for safety purposes by the repair technician, and send it together with the pump to be repaired.

Date: _____

Customer name: _____

Person in charge: _____

Telephone: _____ Extension: _____

Company from which pump was purchased: _____

Person in charge: _____

Telephone: _____ Extension _____

Model: _____ Production No. _____

1. Reasons for requesting repair (select from below)

- Fault Condition Abnormal noises
- Pressure problems
- Operation problems
- Other _____
- Periodic checks and repairs
- Other _____

2. Gases used with pump

(1) Gases toxic to human operators Yes No

(2) Type and names of gases _____

3. Duration of use Approx. ____ hours 24 hr continuous operation
 Intermittent operation

4. Other _____

5. Details of request

- Repair estimate please
- Repair immediately if the estimate is within budget _____
- Other _____

Copy this sheet for use as required.

Your request for repair and inspection may be refused if this sheet is not included with the pump.