

SK00-6714-DI-002-02

No. 140331

ULVAC

INSTRUCTION MANUAL

OIL MIST TRAP

(CARTRIDGE FILTER ELEMENTS)

MODEL

TM-2

TM-3

TM-4

TM-4S

Read this manual before operation and keep it at your
hand for immediate reference

Components division
ULVAC, Inc.

SPECIAL PRECAUTION FOR SAFETY

APR.07,1999

- △ Read this special precautions and the instruction manual first, and then operate the pump correctly.
- △ This special precautions are classified into following three categories according to the hazardous level.

“△ DANGER ” : An eminently hazardous situation which, if not avoided, could result in death or serious injury.

- (D1) Don't plug or choke the exhaust port during pumping. When the gas passage would be interrupted, the pressure in the pump will rise and may blow up the oil-level-gauge or the pump may explode. The motor should be overloaded.
- (D2) Provide sufficient ventilation when cleaning pump with organic solvent to avoid oxygen deficiency in accordance with appropriate regulations in your country (such as OSHA, etc...).

“△ WARNING ” : A potentially hazardous situation which, if not avoided, could result in death or serious injury.

- (W1) Only the trained servicemen should disassemble, repair or modify the pump. Wrong maintenance may cause ignition or abnormal action of the pump, leading to personal injury.
- (W2) Turn off the power switch, before checking or repairing the pump. If not, the pump may start abruptly and injure the operator.
- (W3) Connect the ground/earth line of the pump, and install the suitable earth leakage breaker. If not, you may receive an electric shock on touching the pump.
- (W4) Connect the wire on the electrical standards and regulations. Incorrect wiring can cause electric shock or fire.

“△ CAUTION ” : A potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

- (C1) Pumps are not always leak-tight. Take the appropriate solutions for the leaking gas from the pump body, when the pump sucks toxic or combustible gas.
- (C2) Don't touch the pump oil, after sucking toxic gas. The oil should be toxic.
- (C3) Keep away from the moving parts : main shaft, shaft joint, V-pully & -belt.
- (C4) Don't cover the pump with a blanket or put it in a close enclosure. The pump will be overheated to burn.
- (C5) Don't touch the pump during or immediately after working. The pump body will be as hot as 90°C at most.
- (C6) Turn off the power, when the pump will not operate or get into trouble. Then contact your local ULVAC representative:

- △ After you have read this notice, keep it in a ready accessible place.

ULVAC, I n c .

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1. INTRODUCTION

Thank you very much for purchasing our oil mist trap.

For proper operation, refer to this instruction manual which will help you to take full advantage of its quality. Improper operation may cause mechanical problems.

Be sure to keep this manual to refer to when you have questions or problems.

2. GENERAL DESCRIPTION

2.1 Features

- (1) Oil mist (oil smoke) removal

This oil mist trap, which removes about 90% of oil mist exhausted from an oil sealed rotary vacuum pump, will keep the work environment from being contaminated with oil mist; as well as serve as a silencer.

- (2) Adoption of cartridge filter elements

The cartridge filter elements have facilitated the replacement of filter elements when clogged or corroded.

2-2 Specifications

Table 1 Specifications

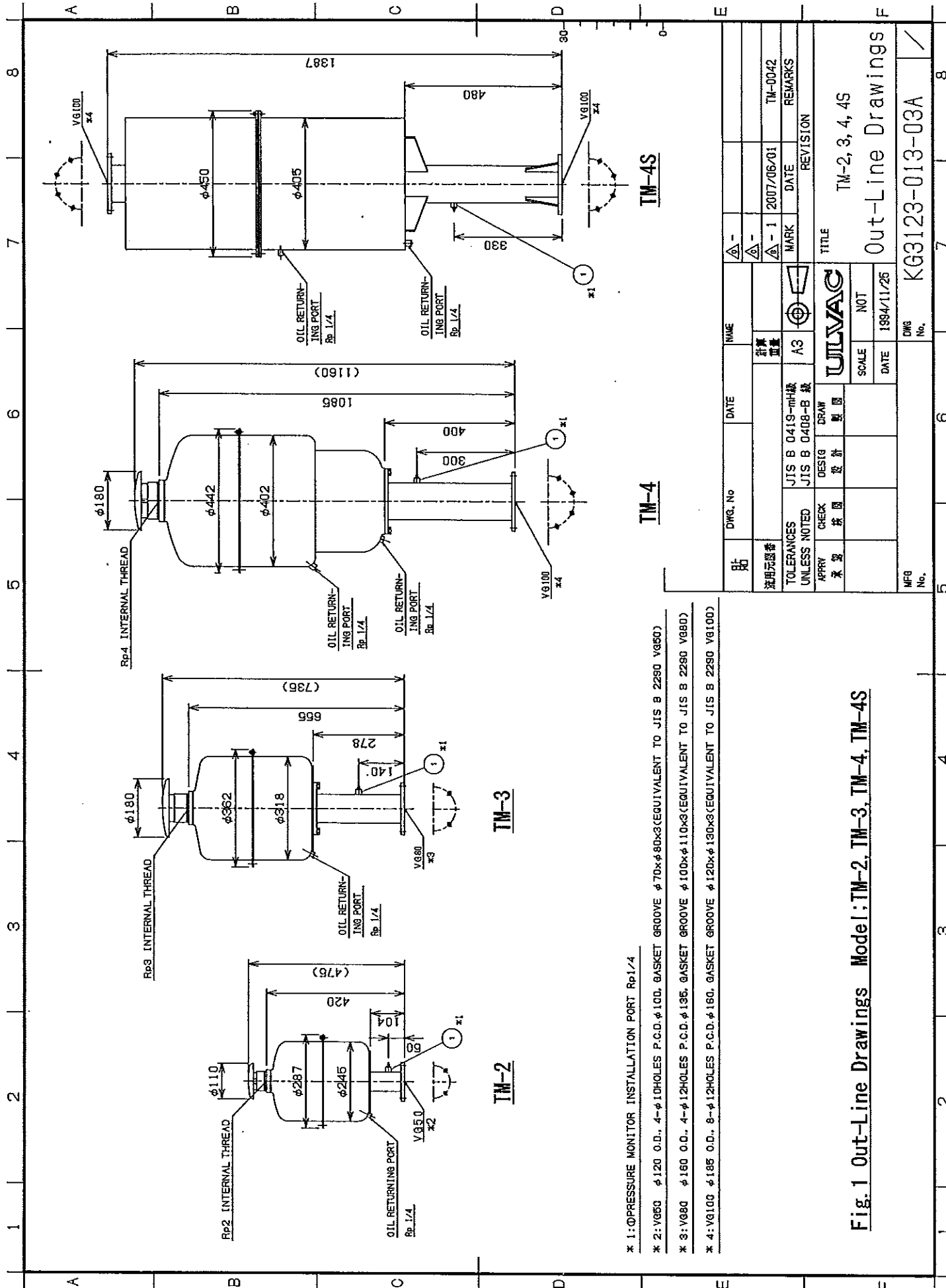
Model		TM-2	TM-3	TM-4	TM-4S
Adopted filter element		TM-2E	TM-3E	TM-4E	TM-4SE
Maximum procession flow	m^3/h *1 (L/min.)	96 (1600)	180 (3000)	420 (7000)	420 (7000)
Caliber of connecting parts*2 (See Fig.1 and2)	Pump side	VG50	VG80	VG100	VG100
	Exhaust side	G2 internal thread*3 [VG50]*4	G3 internal thread*3 [VG80]*4	G4 internal thread*3 [VG100]*4	VG100
Exterior dimension (mm) (See Fig.1 and 2)	Total height	475 [450]*4	735 [700]*4	1160 [1120]*4	1387
	Total width	ϕ 287	ϕ 362	ϕ 442	ϕ 450
Mass (kg)		9.3 [9.8]*4	17 [18]*4	35 [36]*4	64

*1 ; Flow at atmospheric pressure.

*2 ; JIS vacuum flanges (JIS B 2290) are adopted.

*3 ; The G corresponds to the PF in former coding.

*4 ; Codes in [] show specifications for TM-2F, 3F, and 4F.



- * 1: OPRESSURE MONITOR INSTALLATION PORT Rp1/4
- * 2: V650 φ120 O.D., 4-φ10HOLES P.C.D.φ100, GASKET GROOVE φ70xφ80x3(EQUIVALENT TO JIS B 2290 V650)
- * 3: V680 φ160 O.D., 4-φ12HOLES P.C.D.φ136, GASKET GROOVE φ100xφ110x3(EQUIVALENT TO JIS B 2290 V680)
- * 4: V6100 φ185 O.D., 8-φ12HOLES P.C.D.φ160, GASKET GROOVE φ120xφ130x3(EQUIVALENT TO JIS B 2290 V6100)

TM-4S

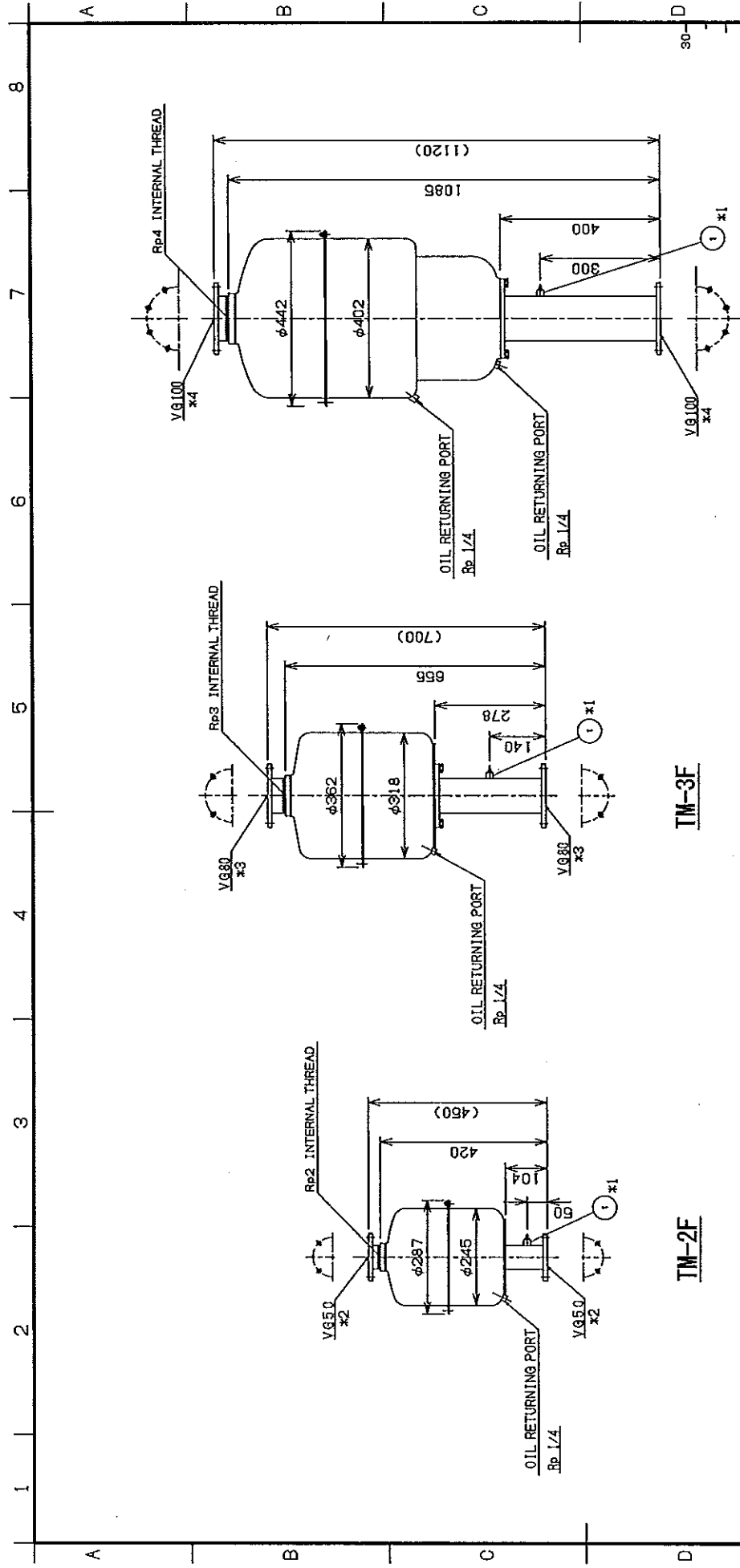
TM-4

TM-3

TM-2

図号	DWG. No.	DATE	NAME	Δ	Δ	Δ	Δ
流用元図番							
TOLERANCES	JIS B 0419-mH級	計算	直量	Δ-1	2007/06/01	TM-0042	REMARKS
UNLESS NOTED	JIS B 0408-B 級	A3	Φ	DATE	REVISION		
APPROV	CHECK	DESIG	DRAW	TITLE			
承認	検図	設計	製図	JULVAC			
				SCALE	NOT	TM-2, 3, 4, 4S	
				DATE	1994/11/25	Out-Line Drawings	
MFG No.	DWG No.	KG3123-013-03A					

Fig. 1 Out-Line Drawings Model: TM-2, TM-3, TM-4, TM-4S



- * 1: OP-PRESSURE MONITOR INSTALLATION PORT Rp1/4
- * 2: Vg50 $\phi 120$ O.D., 4- $\phi 10$ HOLES P.C.D. $\phi 100$, GASKET GROOVE $\phi 70 \times \phi 80 \times 3$ (EQUIVALENT TO JIS B 2290 Vg50)
- * 3: Vg80 $\phi 160$ O.D., 4- $\phi 12$ HOLES P.C.D. $\phi 195$, GASKET GROOVE $\phi 100 \times \phi 110 \times 3$ (EQUIVALENT TO JIS B 2290 Vg80)
- * 4: Vg100 $\phi 195$ O.D., 5- $\phi 12$ HOLES P.C.D. $\phi 160$, GASKET GROOVE $\phi 120 \times \phi 130 \times 3$ (EQUIVALENT TO JIS B 2290 Vg100)

TM-2F

TM-3F

TM-4F

貼紙	DWG. No.	DATE	NAME	計算 数量	MARK	DATE	REVISION
液相圧力計				A3	TM-0042	2007/06/01	
TOLERANCES UNLESS NOTED	JIS B 0419-mf級						
APPROY 承認	CHECK 検査	DESIGN 設計	DRAW 製図				
TITLE			UJLVAC				
SCALE			NOT				
DATE			1994/11/25				
MFG No.			KG3123-013-04A				
DWG No.			TM-2F, 3F, 4F				
REVISION			Out-Line Drawings				

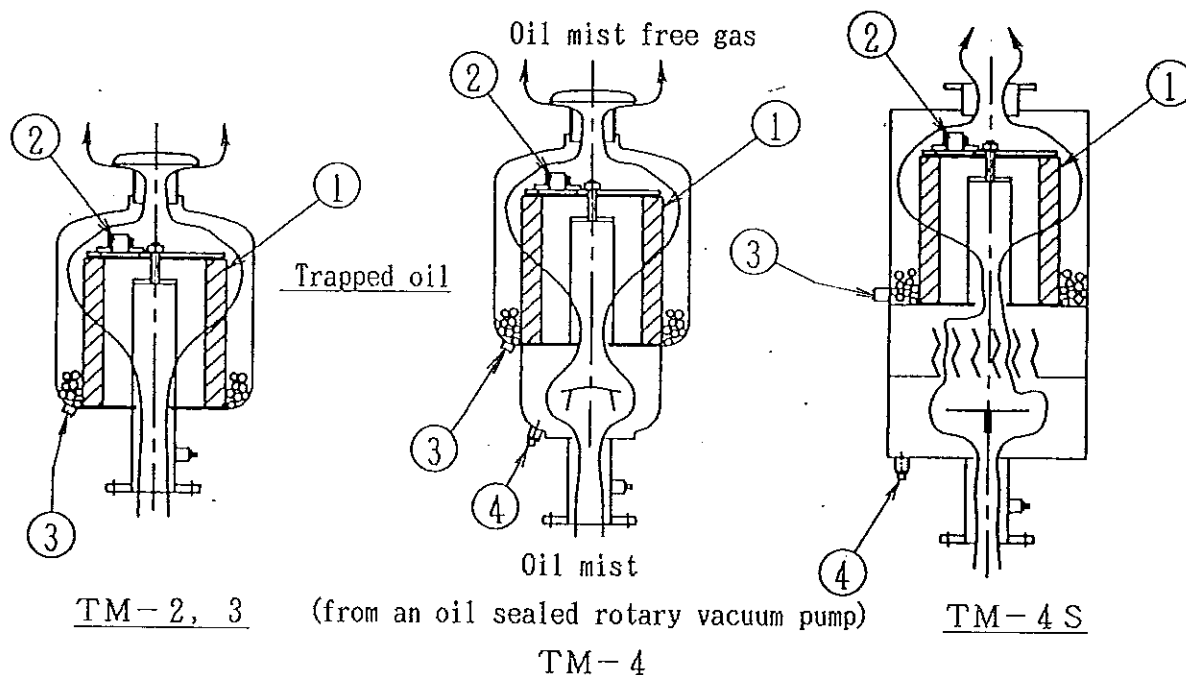
Fig.2 Out-Line Drawings Model:TM-2F, TM-3F, TM-4F

2.4 Structure (See Fig.3)

- (1) Gas (air, nitrogen, etc.) exhausted from an oil sealed rotary vacuum pump blows up the oil inside and enters an oil mist trap along with particles of misted oil. These fine oil particles (oil mist) get trapped when going through a filter element. Rather large aggregated oil particles are collected between the main body of the oil mist trap and the filter element, and get exhausted from an oil returning port. Most of the oil mist will be removed before the gas comes out from the outlet.
- (2) This unit has a pressure-releasing device.

Clogging of a filter element may cause hazardous pressure rise at start-up or during evacuation of a vacuum chamber. A pressure-releasing device, which opens a mechanical valve to release internal pressure when it reaches 0.04MPa (0.4kg/cm²) (gauge pressure), is a standard equipment. With this device, internal pressure will never rise too rapidly.

(Note) When starting a pump, especially when the oil temperature is low, the pressure-releasing device which functions for a moment to meet the temporary rise of internal pressure may let out a little smoke. Nevertheless, it is not attributed to filter element clogging.



- ① Filter element ② Pressure-releasing device ③ Oil returning port
 ④ Oil returning port (Used only when continuously operating at high intake pressure)

Fig.3 Structures

3. METHOD OF USE

3.1 Examination

The products are delivered with maximum care, but for reassurance, confirm the followings after unpacking.

- (1) That the product is what you have ordered.
- (2) That it has proper accessories (an instruction manual, other ordered parts, etc.)
- (3) That there was no damage, or loosening of screws or nuts during the transportation.

If there was any problem, contact our sales department or the specified dealer.

3.2 Installation to the Pump

To install the unit to the pump:

- (1) Confirm that there is no flaw or adhesion of dusts on flanges of the pump and the TM, or on the O-ring ditch.
- (2) Attach an O-ring to the O-ring ditch of the flange at the lower part of the TM, and fasten it to the outlet port of the pump with a hexagon bolt.

3.3 Ducting

The exhaust side of TM-2, 3, and 4 has a shade as a standard equipment. When ducting, detach it and use an internal thread. For TM-2F, 3F, 4F, and 4S, a JIS ducting flange (JIS vacuum flange) is useful.

(Note) When ducting, be careful not to put too much force on the main body of the oil mist trap. Too much force may damage the product.

3.4 How to Handle Trapped Oil

TM-series products structurally exhaust trapped oil out of the main body through an oil returning port. Connect a nylon hose to the oil returning port and collect the exhausted oil in a separate container. You can return it to the pump from the oil filler port when the pump is operating without load or not operating at all. However, oil contaminated with water, dust, or some agent such as acid that deteriorates the oil may cause mechanical troubles, and hence shall not be returned to the pump.

(Note) Do not connect the oil returning port and the pressure monitor installation port with a nylon hose, etc. Oil mist will not be trapped under such condition.

4. INSPECTION AND MAINTENANCE

4.1 Periodical Inspection

Install an pressure gauge (option) to the pressure monitor installation port to measure the pressure inside pump. The filter element is recommended to be replaced under the following conditions.

- ① If the pressure is constantly 0.03Mpa (0.3kg/cm²) (gauge pressure) or higher.
- ② If the element is used for more than 3000 hours.

4.2 Replacement of Filter Element (See Fig.4)

4.2.1 Dismounting a Filter Element

- (1) Stop the pump. Disconnect the pipe on the exhaust side if connected.
- (2) Loosen the ⑥ hexagon nut and remove the ① upper lid.
- (3) Loosen the ⑨ hexagon nut and remove the ⑩ seal washer.
- (4) Remove the ③ filter holder (with a pressure-releasing device).
- (5) Remove the ④ filter elements.

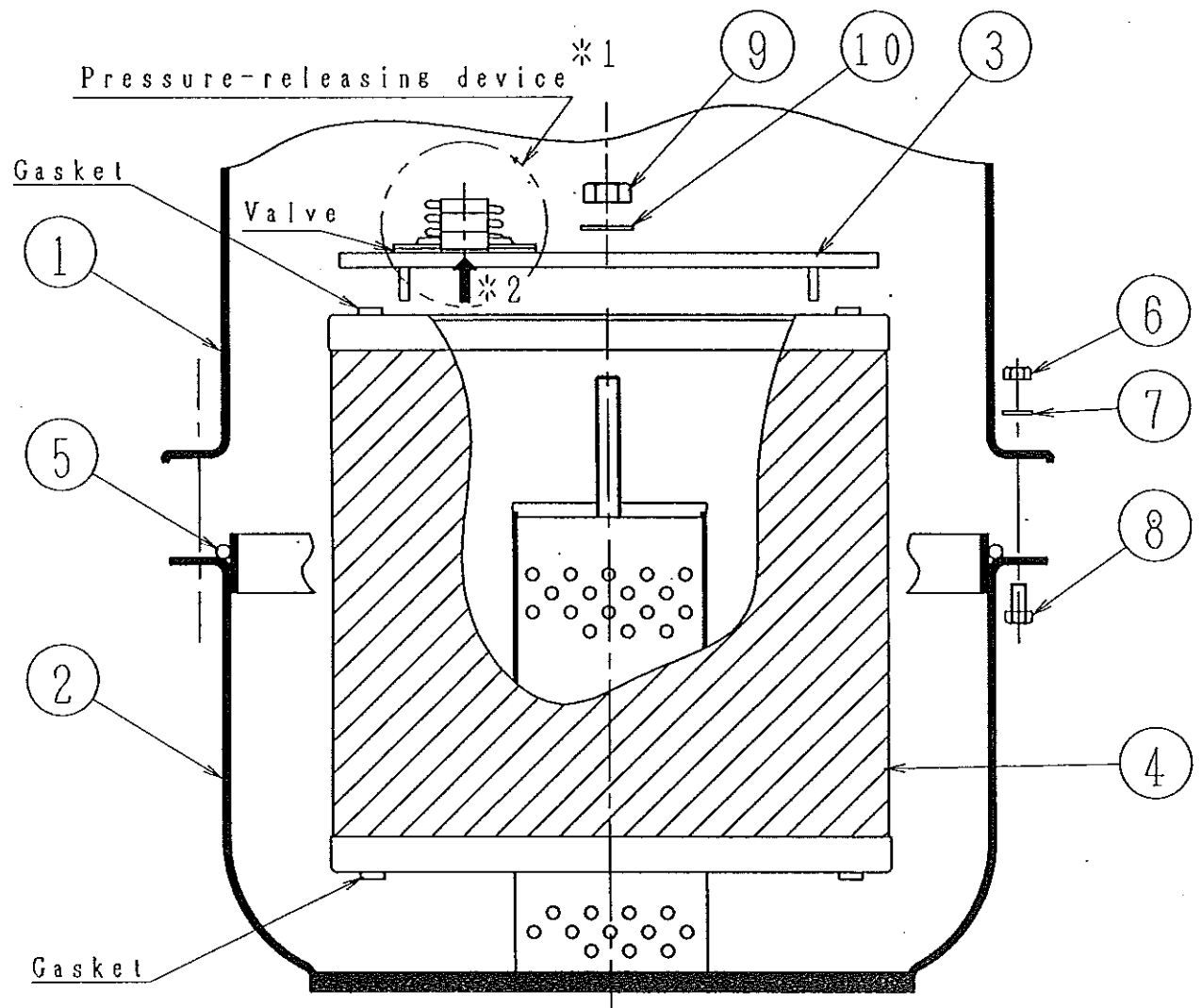
Dismounting of the filter element is completed.

(Note) In replacing a filter element, wash off the dust adhering inside the main body or the pressure-releasing device if any. Also, check the operation of the pressure-releasing device (that the valve is lifted when pushed with a finger). If it does not operate properly (if not lifted), replace the filter holder (with an pressure-releasing device) when remounting.

4.2.2 Mounting of a Filter Element

- (1) Confirm there is no dust adhering or flaw on the ④ filter element installation surface.
 - (2) Attach the ④ filter elements in the ② lower lid. Vacuum grease (ULVOIL G-100) on the gaskets on the top and bottom ends of the filter element will facilitate the next dismounting.
 - (3) Attach the ③ filter holder (with a pressure-releasing devise). The holder shall be placed so that the gaskets of the ④ filter element do not shift out from it.
 - (4) Put a new ⑩ seal washer and fasten the ④ filter element with a ⑨ hexagon nut.
 - (5) Fasten the ① upper lid with a ⑥ hexagon nut, a ⑦ plain washer, and a ⑧ hexagon head bolt. The ⑤ packing between the ① upper lid and the ② lower lid shall be replaced when there is any flaw on the ⑤ packing.
- Mounting of the filter element is completed.

(Note) ⑩ seal washer cannot be used repeatedly.



*1: If it does not operate properly, replace the filter holder (with an pressure-releasing device) when remounting.

*2: The valve is lifted when pushed with a finger.

No.	Model Description	TM-2		TM-3		TM-4		TM-4S	
		Remarks	Q'ty	Remarks	Q'ty	Remarks	Q'ty	Remarks	Q'ty
1	Upper lid	for TM-2	1	for TM-3	1	for TM-4	1	for TM-4S	1
2	Lower lid	for TM-2	1	for TM-3	1	for TM-4	1	for TM-4S	1
3	Filter holder	for TM-2	1	for TM-3	1	for TM-4	1	for TM-4S	1
4	Filter element	TM-2E	1	TM-3E	1	TM-4E	1	TM-4SE	1
5	Packing	O-ring G240	1	O-ring G300	1	O-ring V380	1	Flange gasket	1
6	Hexagon nut	M6	8	M6	12	M6	16	M8	12
7	Prain washer	M6	8	M6	12	M6	16	M8	12
8	Hexagon head bolt	M6×12	8	M6×12	12	M6×12	16	M8×30	12
9	Hexagon nut	M10	1	M10	1	M12	1	M12	1
10	Seal washer	DT-1-10	1	DT-1-10	1	DT-1-12	1	DT-1-12	1

Fig. 4 Replacement of Filter Elements

5. CAUTION

5.1 Clogging of Filter Elements

Clogged filter elements will raise the pressure inside the pump, and cause damage to pump parts or filter elements. The pressure must be watched with a pressure gauge (option) in usage such as;

- ① When making the pump operate under high intake pressure, or evacuating high temperature gas continuously.

Such usage raise the pump temperature and deteriorate the oil to sludge. Sludgy oil adheres to the filter element and causes clogging. Moreover, in continuous usage under such conditions, a great amount of oil mist will be trapped in the filter element and make an oil film on its fibers and cause being clogged even with non-deteriorated oil.

- ② When evacuating high-viscosity liquid or fine particles in normal temperature.
- ③ When there is a reaction product.

To control the timing of filter element change, we recommend installation of pressure gauge for other usage, too. Moreover, frequent need for filter element change suggests the use of an oil mist trap one rank higher.

5.2 Pressure-releasing Device

The Pressure-releasing devices are designed to prevent rapid pressure rise inside a pump. If this device constantly operates, it is dangerous to keep the pump running. In such cases, stop the pump immediately and change the filter element. Also, while this device is operating, oil mist exhausted from the pump will not be trapped in the filter element, but be exhausted directly from the air outlet of the oil mist trap.

5.3 Exhaust of Inflammable Gas and Gas having property of increase the susceptibility of substances to burn

In case of the process for the inflammable gas such as hydrogen or the gas having a property of increase the susceptibility of substances to burn such as the oxygen, following countermeasure shall be taken. Otherwise, oil mist trap explosion may occur.

- (1) Please use duct piping made of electrically conductive materials (electricity conducting) without exception. If non-electrically conductive materials are used, static electricity shall be generated when the exhaust gas passes that results in an origin of ignition by charged electricity and generation of sparks. Ground the duct piping appropriately.
- (2) The exhaust outlet shall be in a flammable status by filling oil mist at atmospheric pressure. Please fill dilution gas from the space between the pump and the oil mist trap.
- (3) Please flow dilution gas from the aspiration side, if necessary. (Decide the volume of dilution gas by confirming the pump performance because it may decline the pump performance.)

6. WARRANTY

- (1) The equipment is guaranteed against defects in material or workmanship for one year after delivery.
- (2) Should any failure occur by normal operating procedure as defined below within this period, replacement of defective parts or repair shall be done at no charge.
 - ① Temperature of operating atmosphere is 10~40°C.
 - ② Evacuation gas is dry air or dry nitrogen 0~40°C.
 - ③ Operation is done according to this instruction manual.
- (3) However, the following is not covered by this warranty.
 - ① Failure due to force majeure, such as a natural calamity and fire.
 - ② Failure due to unusual atmosphere such as salty or polluted air.
 - ③ Failure due to operation under conditions not specified in this instruction manual.
 - ④ Failure that may be regarded by our engineer as caused by not complying with the operating conditions of this equipment.

7. MAJOR REPLACEMENT PARTS

Table 2 Major Replacement Parts List(TM-2)

No.	Description	Material	Q' ty	Remarks
1	Filter element		1	TM-2E
2	O-ring	NBR	1	JIS B 2401 G240
3	Seal washer(M10)		1	DT-1-10

Table 3 Major Replacement Parts List(TM-3)

No.	Description	Material	Q' ty	Remarks
1	Filter element		1	TM-3E
2	O-ring	NBR	1	JIS B 2401 G300
3	Seal washer(M10)		1	DT-1-10

Table 4 Major Replacement Parts List(TM-4)

No.	Description	Material	Q' ty	Remarks
1	Filter element		1	TM-4E
2	O-ring	NBR	1	JIS B 2401 V380
3	Seal washer(M12)		1	DT-1-12

Table 5 Major Replacement Parts List(TM-4S)

No.	Description	Material	Q' ty	Remarks
1	Filter element		1	TM-4SE
2	Frangé gasket	non-asbestos	1	
3	Seal washer(M12)		1	DT-1-12



This mark is applied to the electronic information product sold in the People's Republic of China. The figure at the center of the mark is the validity date of environmental protection. This product does not influence the environment, the human body and the property during the period reckoning the manufacturing date as long as the caution for safe use regarding the products are observed.
 *The environmental protection validity date is not the product warranty period.

Table1. Making format for names and contents of hazardous substances or elements

Name of parts	Hazardous substances or elements					
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
Body	○	○	○	○	○	○
Element	○	○	○	○	○	○

○: indicating that content of the hazardous substance or element in all homogeneous materials of the part does not exceed the requirements for concentration limits specified by SJ/T11363-2006.
 ×: indicating that content of the hazardous substance or element in, at least one kind of, homogeneous materials of the part exceeds the requirements for concentration limits specified by SJ/T11363-2006. Producer may further explain the technical excuse to the items marked with "X" perspecific conditions here.