EXPERT IN ENGINEERED

VACUUM SYSTEMS SINCE 1993

Performance. Reliability. Efficiency.

333 Rt 46 W

Building A,

Fairfield, NJ 07004

1-800-297-3550

www.nescompany.com

Operation & Maintenance Manual

NTRV Two-Stage Oil-Flooded

Rotary Vane Vacuum Pumps

WARNING

Do not operate BLOWER before primed and connected to the constant supply of clean compressant liquid. **IF RUN DRY, BLOWER WILL BE DAMAGED**; always use a strainer to prevent sand and scale from entering the blower with liquid sealant.

Specific operating conditions combined with water hardness may result in excessive lime deposits inside the blower, causing it to bind. Should this condition be evident, flush the blower with a solvent at regular intervals.

This blower has been drained and flushed with water-soluble preservative oil before shipment. After the blower has been in service, do not store without draining as specified in this manual. The freezing of the preservative oil can damage the blower.

USE CAUTION when removing inlet screens. Any foreign material on the screen may fall into the blower and cause extensive damage at start-up.

The base must be mounted to a leveled foundation, and final coupling alignment is done during installation. (Refer to manual No.XXX, Installation Instructions, N.E.S. Company Blowers and Compressors.)

NOTICE

SERVICE AND PARTS

SERVICE AND PARTS FOR NES BLOWERS ARE ASSURED THROUGH A WORLDWIDE NETWORK OF SALES AND SERVICE OFFICES LISTED ON THE BACK COVER OF THIS MANUAL. ANY REQUEST FOR INFORMATION, SERVICE, AND PARTS SHOULD BE DIRECTED TO THE NEAREST NES SITE / FIELD OFFICE.

WHEN ORDERING REPLACEMENT AND SPARE PARTS, SERIAL NUMBERS AND BLOWER SIZES MUST BE PROVIDED.

Serial number and blower size are located on nameplates riveted/fastened to the blower's casing/body. Parts must be identified by index number and name. Refer to blower exploded view and legend found in this manual.

If the location of the nearest office is unknown, information may be secured directly from N.E.S. Company Inc. New Jersey Head Quarters: 333 RT 46 W, BLDG: A, FAIRFIELD NJ 07004. Telephone number is 1-800-297-3550, Fax No. 973-933-6322.

WARRANTY

NES Company warrants that (1) the goods will be of the kind described on its acceptance of Buyer's order as modified by any subsequent mutual agreement of the parties, (2) it will convey to Buyer good title to such goods, (3) such goods will be delivered free of any lawful security interest or lien or encumbrances unknown to Buyer, and (4) such goods will be of merchantable quality and free from defects in material or workmanship defects under normal use and prescribed maintenance for a period of two (2) years from the date of shipment. The warranties specified shall also extend to goods manufactured by others and supplied by N.E.S., unless such goods have been separately stated and quoted by N.E.S., in which case only the warranties in clauses (1), (2) and (3) shall apply. NES MAKES NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE MERCHANTABILITY OF GOODS MANUFACTURED BY ITS SUPPLIERS AND SEPARATELY STATED AND QUOTED HEREIN. N.E.S.'s warranty in clause (4) above shall not apply to goods of standard construction when handling corrosive gases of using corrosive liquid compress ant nor will clause (4) apply to goods which have been damaged, altered, or negligently maintained after delivery. Buyer's exclusive remedy for N.E.S.'s breach of the warranties outlined in clauses (1), (2) and (3) above shall be the replacement by N.E.S. of non-conforming goods with conforming goods, without extra cost to Buyer, F.O.B. point of manufacture, with transportation prepaid to U.S. destination or domestic port, and Buyer's exclusive remedy for N.E.S.'s breach of the warranty contained in clause (4) above shall be the repair by N.E.S. without charge, or the furnishing by N.E.S. F.O.B. point of manufacture, with transportation prepaid to U.S. destination or domestic port of a part or item of equipment to replace any part or item of equipment which is proved to have been defective; provided that (1) Buyer shall have notified N.E.S. of any such breach not later than ten days after the expiration of two (2) years from the date of shipment of the goods, and that (2) N.E.S. shall have the option of requiring the return of any defective material transportation prepaid to establish a claim. N.E.S. shall in no event be liable for the Buyer's manufacturing costs, lost profits, goodwill, expenses, or any other consequential or incidental damages resulting from a breach by N.E.S. of any warranty. THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTENDED BEYOND THE WARRANTIES SET FORTH HEREIN

Manual Index

List of Sections

1 Introduction

1.1 General Safety Information

Please review and adhere to the following instructions prior to installing and operating the pump. Please ensure that corrosive or explosive gases are not pumped. The pump's operation excludes the compression of gases that become explosive under pressure. Standard NTRV series pumps lack corrosion resistance features. For the handling of highly corrosive gases, please consult our technical sales department. Avoid utilizing the pump as a compressor. Vacuum pumps lack specific designs to withstand internal pressure. Excessive pressure from compressed gases in the exhaust line can rupture the pump casing, resulting in personal injury and property damage. Avoid operating the pumps in areas with explosive processes. For the installation and management of the pump, qualified experts must be engaged.

Important safety information is highlighted as **WARNING!** and **CAUTION!** instructions.

1.2 Description of NTRV pumps

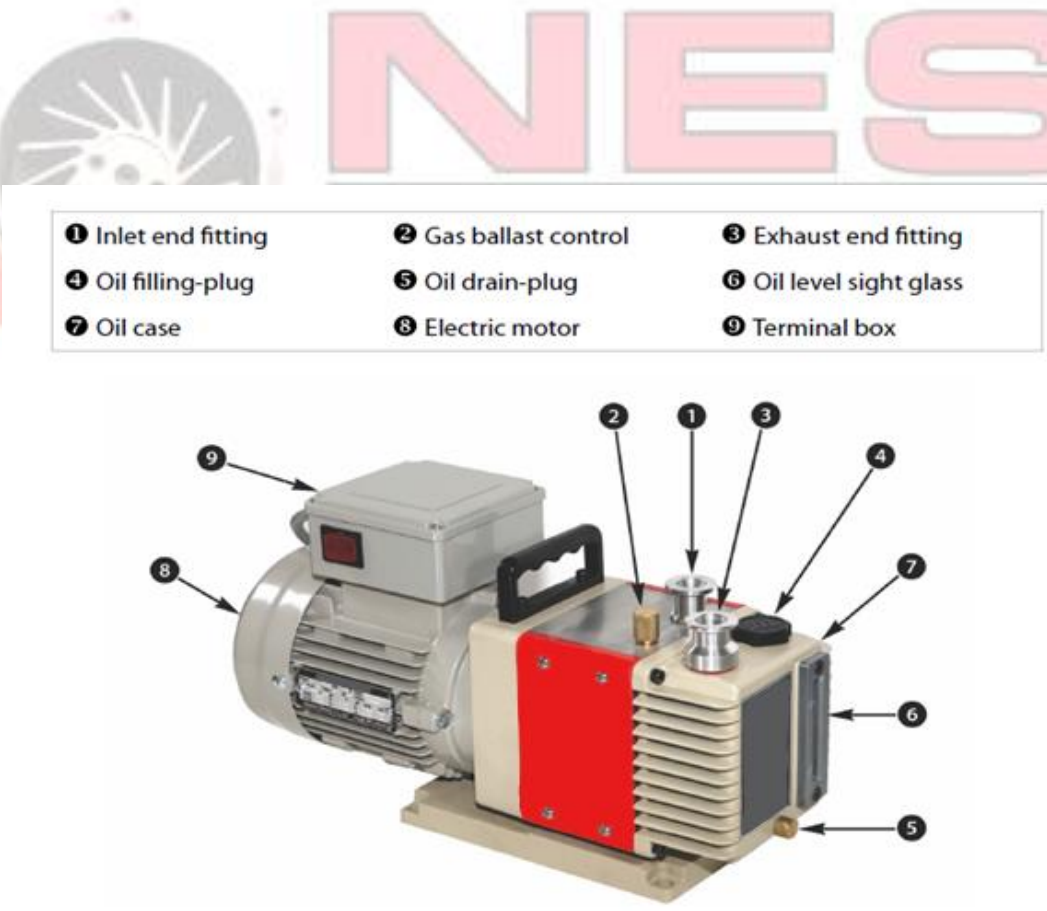


Fig. 1 A typical NTRV05 high vacuum rotary vane pump

❶ Inlet end fitting	❷ Gas ballast control	❸ Exhaust end fitting
❹ Oil filling-plug	❺ Oil drain-plug	❻ Oil level sight glass
❼ Oil case	❽ Electric motor	❾ Terminal box

Fig. 2 A typical NTRV10/NTRV20/NTRV40 high vacuum rotary vane pump

❶ Inlet end fitting	❷ Gas ballast control	❸ Exhaust end fitting
❹ Oil filling-plug	❺ Oil drain-plug	❻ Oil level sight glass
❼ Oil case	❽ Electric motor	❾ Terminal box

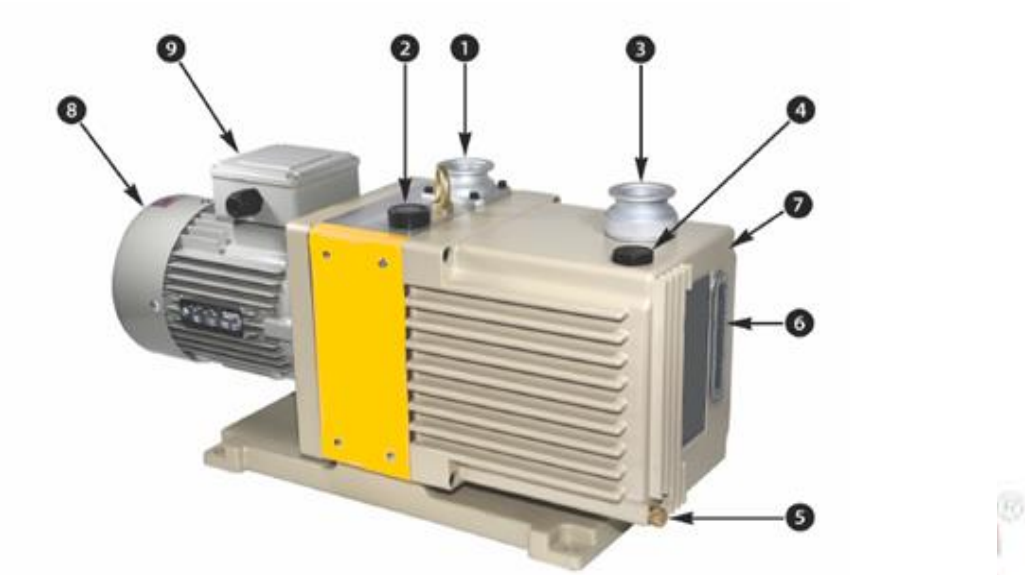


Fig. 3 A typical NTRV60/NTRV80 high vacuum rotary vane pump

❶ Inlet end fitting	❷ Gas ballast control	❸ Exhaust end fitting
❹ Oil filling-plug	❺ Oil drain-plug	❻ Oil level sight glass
❼ Oil case	❽ Electric motor	❾ Terminal box

Fig. 4 A typical NTRV100/NTRV180 high vacuum rotary vane pump

Table 1. Pump data

		NTRV05	NTRV10	NTRV20	NTRV40	NTRV60	NTRV80	NTRV100	NTRV180
Pumping Speed (CFM)		1.8	3.5	7.1	14.1	21.2	28.3	35.3	63.6
Ultimate Pressure [Torr]	Gas Ballast Closed	$\leq 3X10^{-3}$	$\leq 1X10^{-3}$						
	Gas Ballast Open	$5X10^{-2}$							
Power Input [ϕ/Hz/VAC]	Standard	1/60/220				3/60/220,380			
	Options	1/60/110	3/60/220,380			1/60/220			
Full Load Power [hp]		0.16	0.5	0.5	1	2	2	2	5
Motor Speed [RPM]		1700							
Inlet & Outlet Connection Size	Standard	NW16 (NW25 available)	NW25	NW25	NW25	NW40 (NW25 available)	NW40 (NW25 available)	NW40 (NW25 available)	NW40
	For more information on available inlet/outlet connection sizing options, please contact an NES representative.								
Oil Capacity (qts.)		0.21	0.52	0.64	1.59	2.43	2.85	4.76	6.55
Weight (ϕ /lb.)		31.3	1/50 3/42.4	1/51 3/44	1/77 3/70	1/118 3/110.5	1/150 3/143.5	1/180 3/174	3/235
Ambient Temperature [°F]		45-104							
Length (inch)		15.4	16.6	16.6	19	24	24.6	26.1	30.6
Width (inch)		4.7	5.9	5.9	6.7	8.1	8.9	10.4	10.4
Height (inch)		7.9	9.8	9.8	11.3	12.3	13.6	7.9	17.4

2 Installation

WARNING!
DO NOT CARRY OUT ANY UNAUTHORIZED CONVERSIONS OR MODIFICATIONS ON THE PUMP.

2.1 Unpacking & Inspection

Please remove all packing materials and protective covers. Keep the inlet and outlet lids in place until the pump is connected. (The pump comes filled with oil.)

- Verify that the pump and accessories match the type you ordered.
- Inspect the oil level indicated by the sight glass.
- Examine the pump for any loose bolts, oil spills, or damaged/loose parts.
- Refrain from using the pump if it is damaged; inform NES with your order and serial number.

2.2Location

CAUTION!
THE PUMP SHOULD BE SET UP ON A FLAT, HORIZONTAL SURFACE. TERMINAL BOX SHOULD NOT BE EXPOSED TO EXCESSIVE MOISTURE.

The pump is designed to be used in a freestanding position on its baseplate. For secure installation, use bolts to firmly fasten the pump to the ground or a stable object using the holes provided in the baseplate. It's advisable to utilize anti-vibration pads between the baseplate and the mounting surface. Place the pump in a location where you can easily monitor the oil level through the sight-glass and access the controls, including the oil filling plug, oil drain plug, and gas ballast. When installing the pump within an enclosed housing, ensure adequate air circulation. Our default vacuum oil is 'MR-200,' and it's recommended to operate the pump above 45°F. The standard pump is not suitable for installation in areas prone to explosion hazards. If you intend to use the pump in such an environment, please contact us beforehand.

2.3Mechanical Connection

Prior to connecting the pump, ensure to remove the shipping seals from the inlet and exhaust connection flanges. (For domestic and ocean transport, pumps are sealed with white PE seals, while metal blank clamps are used for air shipment to contain oil inside). Exercise caution to prevent oil spillage as the pumps are shipped pre-filled with oil. Retain the shipping seals for potential future storage needs. Before assembly, ensure that sealing surfaces are clean and free of scratches.

2.3.1 Inlet Port Connection

Connection Tip: To achieve the specified pumping speed, minimize the length of the pipeline between the vacuum chamber and the pump. Additionally, ensure that the internal diameter of the pipeline is at least equal to that of the inlet port; a narrow inlet line may reduce pumping speed.

You can protect the pump by using appropriate accessories such as separators, filters, and cooling traps between the vacuum chamber and the pump. However, the conductance value of these accessories

could lead to a reduction in pumping speed.

Connection:

Connect the intake and exhaust lines using a clamp and centering each.

For NTRV05 only

Default: Connect to the NW16(NW25) flange supplied with the pump using the provided clamp and centering.

For NTRV10/2/40 Only

Default: Connect to the NW25 flange supplied on the pump; use the clamp and centering.

For NTRV60/80/100/180 Only

Default: Connect to the NW40 flange supplied on the pump; use the clamp and centering.

Inlet filters can be installed for highly dusty applications or for pumping condensable vapor. Valves can be utilized to isolate the pump from the vacuum system and to maintain vacuum when the pump is turned off. We recommend installing the Angle Valve. (Refer to section 7.2)

2.3.2 Outlet Port Connection

WARNING!

IF THE EXHAUST GASES FROM THE VACUUM PUMP POSE A THREAT TO HUMAN HEALTH, THEY MUST BE SAFELY DIRECTED AWAY AND SUBJECTED TO APPROPRIATE POST-TREATMENT.

Connection Tip: Ensuring that the exhaust line is situated lower than the pump can prevent condensate from returning to the pump. Oil vapors might emanate from the exhaust port during low vacuum conditions (760 Torr~10 Torr) due to the significant volume of air drawn into the vacuum pump. To reduce the release of oil vapors, it is advisable to install an extra exhaust filter (Oil mist trap: refer to section 7.2), particularly when the oil mist cannot be directed away through a separate hood or duct system. For detailed inquiries, please reach out to NES.

Connection:

Exhaust connection options mirror those of the Inlet Connection.

Connection Tip: Make sure that the internal diameter of the exhaust line matches or exceeds that of the outlet port; a narrow exhaust line can lead to internal pressure buildup in the pump, which may result in damage to the pump seals and oil leaks. The maximum pressure within the oil casing should not surpass 21.75 PSI (absolute).

CAUTION!

IF THE TEMPERATURE OF THE PUMP BODY EXCEEDS 158°F, SUITABLE GUARDS MUST BE FITTED TO PREVENT CONTACT WITH HOT SURFACES.

Depending on the application type or the nature of the pumped media, it is essential to adhere to the relevant regulations and information sheets.

2.4 Electrical Connection

WARNING!

ELB (EARTH LEAKAGE BREAKER) MUST BE INSTALLED TO PREVENT ELECTRICAL ACCIDENTS. ELECTRICAL CONNECTIONS FOR 3 PHASE MUST BE DONE BY A QUALIFIED ELECTRICIAN.

If you lack knowledge of 3-phase power connections, please consult with NES. NES company cannot be held responsible for any issues arising from electrical connections.

For a 1-phase pump, no specific connection process is required. Simply connect the plug to the power source.

Connection (3-phase):

- Open the cover of the terminal box. You will find 6 electrical cords that need to be connected.
- For a 3-phase motor, 3 external power cords and 1 additional cord for grounding should be provided.
- Refer to the diagram on the back of the terminal cover to connect the motor to the power source.
- After wiring the motor, verify its rotation direction by briefly operating the pump for 2 to 3 seconds before connecting it to your vacuum system. If the rotation is contrary to the direction indicated by the arrow on the motor cap, adjust the codes externally; for instance, change from 1 2 3 to 1 3 2, and recheck the rotation direction.

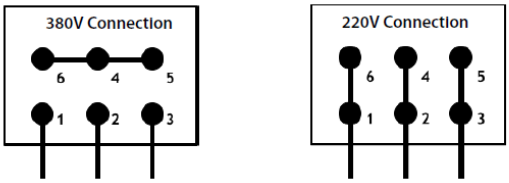


Fig. 5. Examples of 3 phase power connections

380V at 3 phase : high voltage connection /

220V at 3 phase : low voltage connection.

3 Operation

3.1Gas Ballast Control

The gas ballast mechanism introduces a minimal quantity of air (or inert gas) during the compression stage to regulate the saturation pressure of the vapor, thereby preventing the condensation of vapors within the pump. Condensates can lead to oil contamination.

For standard operations, it is advisable to keep the gas ballast closed while using the pump.

GB control closed	GB control open
to achieve ultimate vacuum	to pump high concentrations of condensable vapor
to pump dry gases	to decontaminate the oil

Operating the pump with the gas ballast control open will reduce the ultimate vacuum level and elevate the temperature of the pump body. Additionally, it will accelerate the rate of oil loss from the pump.

3.2Start-up Procedure

WARNING!
NEVER OPERATE THE PUMP WITH A SEALED EXHAUST LINE. THERE IS THE DANGER OF INJURY.

Ensure that all vacuum connections are fully sealed before turning on the pump.

Operating the pump while exposed to normal pressure for extended periods can result in significant mechanical issues.

Avoid running the pump with the inlet port open, as it may overload the pump and lead to oil loss.

Never expose any part of the body to the vacuum, as it could cause personal injury.

Emergency Stop or Power Failure:

There is no specific procedure required to prevent vacuum loss in case of an emergency stop or power failure. The built-in oil regulator in the pump prevents back-flow of oil when the pump stops. However, it is advisable to vent the inlet side of the pump if it stops unexpectedly.

Procedure:

- Check that the pump oil level is between the H and L marks using the oil level sight-glass; if not, refer to section 4.3 (Never operate the pump with the oil level below the L mark).
- Adjust the gas-ballast control to the necessary position if pumping condensable vapor.
- Switch on the electrical supply to the pump.
- For a 3-phase pump, verify the direction of rotation of the motor.
- When starting a pump after a prolonged storage period, it may not reach the ultimate pressure specified due to oil contamination. Consider replacing the vacuum oil with new oil.

3.3Decontamination of Oil

As the oil gradually becomes contaminated during operation by dissolved gases and vapors, the degassing process becomes necessary to prevent pump corrosion. Allow the pump to continue operating with the inlet port closed and the gas ballast control open until the oil is free of condensed vapors.

It is advisable to allow the pump to operate in this mode for approximately 30 minutes after completing the process. To achieve the ultimate pressure, close the gas ballast after this procedure.

3.4 Shutdown Procedure

Under normal circumstances, you can simply switch off the pump to stop it.

When the motor is turned off while the gas ballast is open, the system pressure may rise slowly. (Close the gas ballast to maintain the vacuum level.)

If the pump needs to be shut down for an extended period after pumping aggressive or corrosive media, or if the pump needs to be stored, follow these steps:

- Drain the oil through the oil drain plug.
- Add clean oil until the oil level reaches the H mark and allow the pump to operate for some time.
- Drain the oil again and add clean oil until the oil level reaches the H mark.
- Seal the connection ports.

WARNING!
WHEN PUMPING HARMFUL SUBSTANCE, TAKE ADEQUATE SAFETY PRECAUTIONS.

4 Maintenance & Care Guidelines

4.1Safety guide

WARNING!
OBEY THE SAFETY INSTRUCTIONS GIVEN BELOW. IT CAN CAUSE PERSONAL INJURY AND PROPERTY DAMAGE.

Ensure the pump has cooled to a safe temperature before commencing maintenance tasks.

WARNING!
DISCONNECT THE ELECTRICAL CONNECTION BEFORE DISASSEMBLING THE PUMP. MAKE ABSOLUTELY SURE THAT THE PUMP CANNOT BE ACCIDENTALLY STARTED. (PULL THE MAIN PLUG)

Maintenance of the pump must be carried out by a suitably trained and supervised technician.

Comply with local and national safety requirements at all times.

If the pump has handled hazardous substances, identify the nature of the hazard and implement appropriate safety measures.

CAUTION!
WHEN DISPOSING OF USED OIL, YOU MUST OBSERVE THE APPLICABLE ENVIRONMENTAL REGULATION.

For pumps handling corrosive media, prompt maintenance is recommended to prevent corrosion.

After completing maintenance and reconnecting the power to a 3-phase pump, verify the pump's rotation direction.

Do not reuse damaged O-rings and seals.

4.2Maintenance Frequency

The table below outlines the routine maintenance operations required to keep the pump in normal operation. More frequent maintenance may be necessary if the pump is exposed to corrosive or abrasive gases and vapors; in such cases, we recommend replacing pump seals annually. Adjust the maintenance plan based on your experience.

When conducting pump maintenance, utilize WAS spares and service kits, which contain all the necessary components for successful maintenance operations. The item numbers of the spares and kits are provided in Section 7.1.

NES offers two types of Service Kits (Repair Kits):

The "Minor Repair Kit for NTRV series" is suitable for general overhaul and comprises various metal and rubber parts. It primarily includes disposable parts that require periodic replacement.

The "Major Repair Kit for NTRV series" contains major components (e.g., vanes) that should be replaced during repair processes, in addition to all minor parts (refer to section 7.1).

Overhauling involves disassembling the pump, cleaning all its components, and reassembling it. This process is crucial for enhancing pump performance and extending its lifespan. NES advises users to perform overhauls at least once every two years.

Maintenance Frequency

Operation	Frequency
Check the oil-level	Daily
Replace the oil	2,500 operation hours
Inspect and clean the inlet- filter	Every oil change
Clean or replace the gas-ballast O-ring	Every oil change
Clean the motor fan-cover	Yearly
Clean and overhaul the pump	15,000 operation hours
Fit new blades	30,000 operation hours
Test the motor condition	15,000 operation hours

Oil change Frequency

Application	**Frequency (hrs.)**
High Vacuum in Lab environment, or system seldom exposed to the air	2,500
High Vacuum in manufacturing environment, often exposed to the air	1,200
Vacuum furnace, large gas-exhaust diffusion system, system with booster pump	600
Vacuum drier, vacuum molding, vacuum packing	200
Vacuum distillation, low vacuum tank	120

4.3 Maintenance of Oil

4.3.1 Checking the oil-level

While the pump is in operation, ensure that the oil level consistently falls between the marks H and L on the oil level glass. Regularly monitor the oil level and refill as necessary.

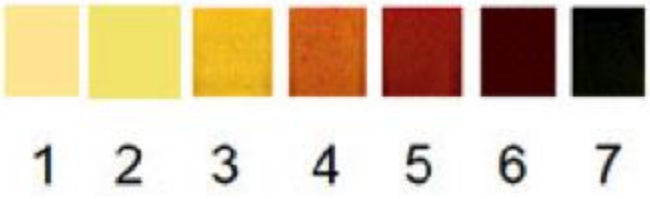
Note: Before adding oil, switch off the pump. It's recommended to power off other components connected to the pump for safety reasons.

If gases or liquids dissolved in the oil lead to a decline in the ultimate pressure, the oil can be degassed by running the pump for approximately 30 minutes with the intake port closed and the gas ballast valve open.

4.3.2 Oil change

To ensure optimal pump operation, it is critical to maintain a consistent supply of the correct and clean oil.

Clean vacuum oil typically lacks odor and appears transparent, although NEOVAC MR-200 has a pale yellow hue. During operation, the color of the vacuum oil progresses from yellow to orange and eventually to reddish-brown due to the introduction of gases and foreign substances. This discoloration compromises vacuum levels and can harm the pump's interior.



Change the vacuum oil when the discoloration darkens from yellow to reddish-brown (indicated as "4" in the provided picture). Once the color deteriorates to levels 6-7, pump interior damage

occurs, necessitating an overhaul before resuming pump operation.

If the vacuum oil becomes cloudy resembling milk, it indicates moisture intrusion. In such cases, halt pump operation and allow the fluid to separate into two layers: vacuum oil and water. Drain the water layer completely via the oil drain plug. Design processes to prevent moisture intrusion and consider installing a cold trap if necessary. Before and after extended storage, additional oil changes are advisable. In cases of rapid oil deterioration, consider implementing dust or oil filters for the pump (refer to sec 7.4: WMT-250/400) and seek further information from relevant contacts.

CAUTION!

ONLY CHANGE THE OIL AFTER THE PUMP HAS BEEN SWITCHED O AND WHILE THE PUMP IS STILL WARM.

Procedure:

- Remove the oil drain plug and allow used oil to drain into a suitable container.
- When oil flow diminishes, reinstall the oil drain plug temporarily, briefly switch on the pump (maximum 10 seconds), and then switch it off again. Remove the oil drain plug once more to drain any remaining oil.
- Reinstall the oil drain plug (verify the gasket and replace if necessary).
- Remove the oil fill plug and replenish with fresh oil.
- Reinstall the oil fill plug.
- Recommended Vacuum Oil: NEOVAC MR-200
- The ultimate pressure is influenced by factors such as the saturation vapor pressure, viscosity, and solubility of gases present in the vacuum oil utilized. It is essential to select an appropriate vacuum oil for the pump's operation.

CAUTION!

WE CAN ONLY GUARANTEE THAT THE PUMP OPERATES AS SPECIFIED BY THE TECHNICAL DATA IF THE VACUUM OIL RECOMMENDED BY US IS USED.

Color (ASTM) -bright yellow (L0.5)
Pour point -17.5°C
Boiling point-195°C / 0.1 Torr
Flash point 256°C min. (COC)
Viscosity-71.0 (40°C, mm2 / sec(cSt))
Vapor pressure-1 X 10-5 (50°C)

4.4 Cleaning of Dust Trap

The pump is equipped with a dirt trap located at the inlet port, featuring a wire mesh structure designed to filter coarse particles. To maintain the specified pumping speed, it's essential to regularly clean the dirt trap:

- Remove the dirt trap from the inlet port.
- Rinse the dirt trap in an appropriate solvent within a suitable container.
- Thoroughly dry the dirt trap using compressed air.
- Inspect the condition of the dirt trap and replace it if it shows signs of damage.

CAUTION!

THE CLEANING INTERVALS DEPEND ON THE APPLICATION. IF THE PUMP IS EXPOSED TO LARGE AMOUNTS OF ABRASIVE MATERIALS, A DUST FILTER SHOULD BE FITTED INTO THE INTAKE LINE.

4.5 Storage & Disposal

CAUTION!

OBSERVE THE STORAGE TEMPERATURE: -30~70°C (-22~158°F)

STORAGE BELOW -30°C (-22°F) WILL PERMANENTLY DAMAGE THE PUMP SEALS.

4.5.1 Storage

For storage, the pump should be kept in a dry environment, ideally at a room temperature of 20°C (68°F). Remove all other components and connections to the vacuum system, and if feasible, purge the pump with dry nitrogen. To prevent corrosion during idle periods, replace the used oil (see section 3.4). Seal the inlets and outlets of the pump using the seals provided upon delivery. Ensure that the gas ballast switch is securely closed. It is advisable to place the pump in a PE bag with silica gel (desiccant) for extended storage. When a pump is being brought into operation after being stored for over one year, it is necessary to conduct standard maintenance on the pump, including the exchange of oil.

4.5.2 Disposal

Disposal of the pump, oil, and any removed components must be carried out safely in compliance with local and national safety and environmental regulations. Special attention should be given to the following:

Components that have been in contact with vacuum oil.

Components that have been contaminated with hazardous process substances.

Do not incinerate fluor elastomer seals and O-rings (e.g., Viton).

5 Troubleshooting

Symptom	Possible cause	Corrective actions
The motor is noisy and does not rotate.	Voltage of power and connection.	Correct voltage or its connections.
	Any foreign material in the pump.	Remove the substance and/or change oil.
	Motor (Open internal circuit)	Replace open windings.
The pump is noisy and overheated.	Any foreign material blocks the exhaustvalve.	Remove the foreign material.
	Leakage in the system	Find the part and fix the leakage.
	Leakage valve is open	Close the valve.
	All valves in the vacuum line	Close if found open.
Vacuum level drops continuously.	Low oil level	Top vacuum oil up.
	Leakage on the connected device	Close the intake and recheck.
	Condensed moisture in oil	Change oil.
	Oil regulator failure	Replace the oil regulator.
	Gas ballast open	Close the gas ballast.
Motor rotates but pump does not run.	Worn out coupling	Replace coupling parts.
	Worn out key between motor and pump	Replace the key and set screws
	Any foreign material blocks the pump	Overhaul the pump
Pump fails to start.	Status of connected voltage	Align the voltage with motor specification.
	Wiring is malfunctioning	Check and repair wiring.
	Too viscous oil.	Use recommended oil and change if contaminated.
	Oil temperature is below 7°C	Warm up the pump and oil.
	Any foreign material blocked	Overhaul the pump.
	Motor is malfunctioning	Overhaul or replace the motor.
Failure to reach ultimate vacuum.	Leakage in the system	Do leak test.
	Measurement range of the gauge	Use suitable gauge for the vacuum level.
	Incorrect way of measuring vacuum	learn how to use the gauge correctly.
	Type of oil or contamination level	Use recommended oil and change it ifcontaminated.
	Valve failure	Repair or replace the valve
	Insufficient pump capacity	Replace the pump with sufficient capacity.
Pumping speed is too slow.	Contamination of dirt trap	Clean or replace the dirt trap.
	Design of piping system.	Make the connected pipes bigger thanpump and have minimum length.

6 Technical Data

6.1 Dimensions

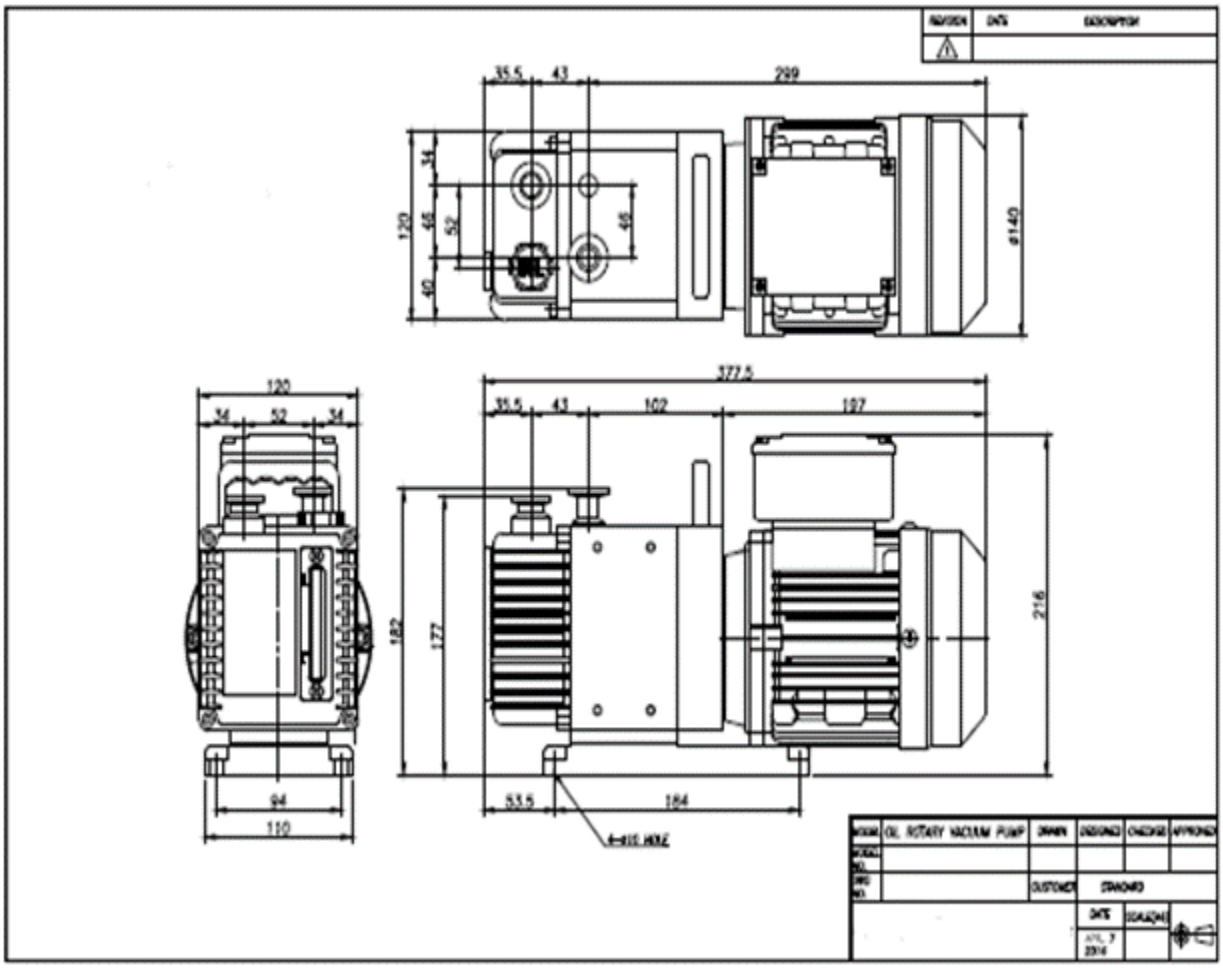


Fig. 6 Dimension of NTRV05

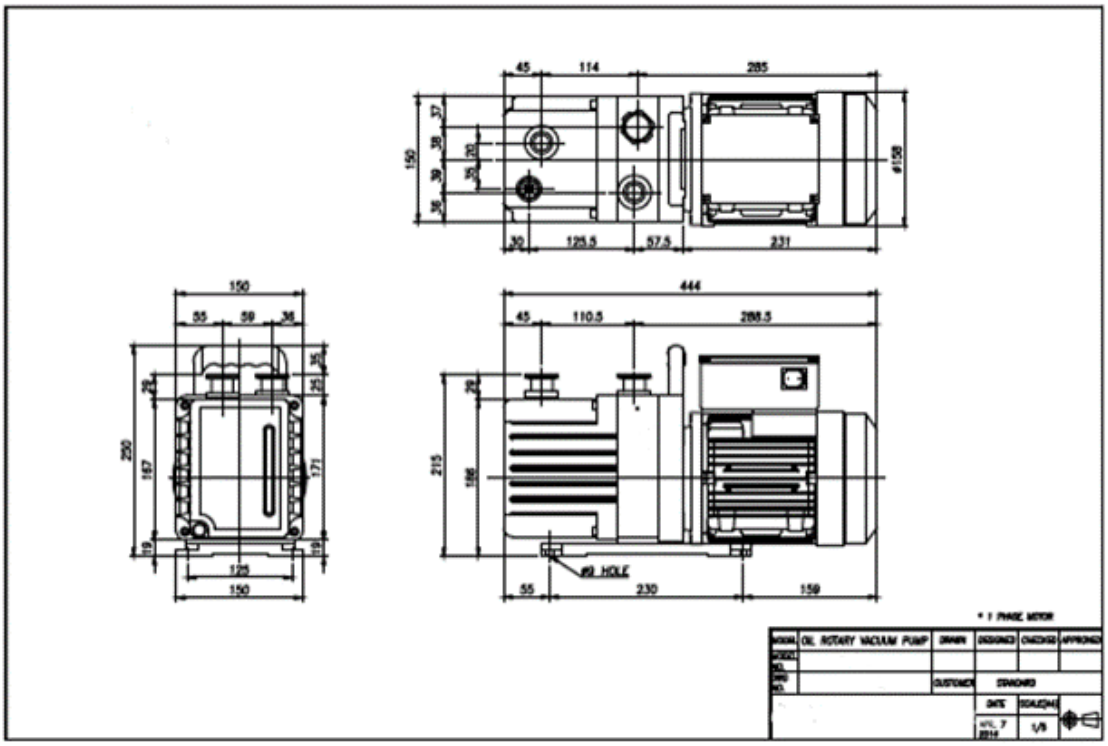


Fig. 7 Dimension of NTRV10

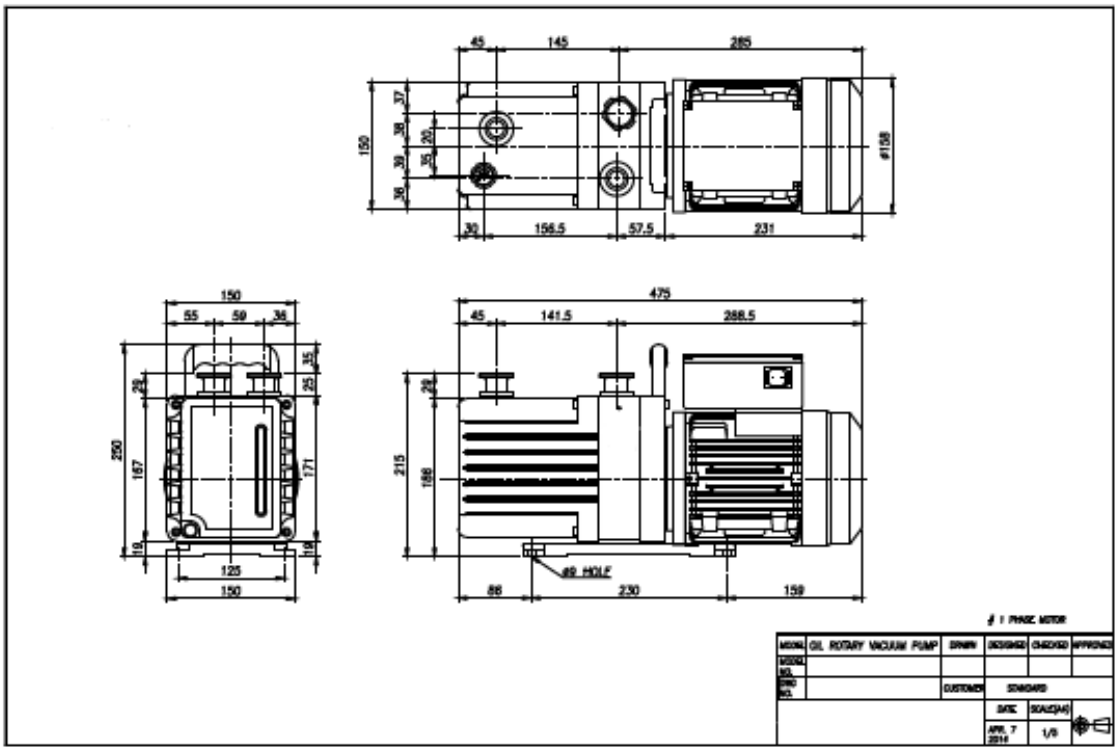


Fig. 8 Dimension of NTRV20

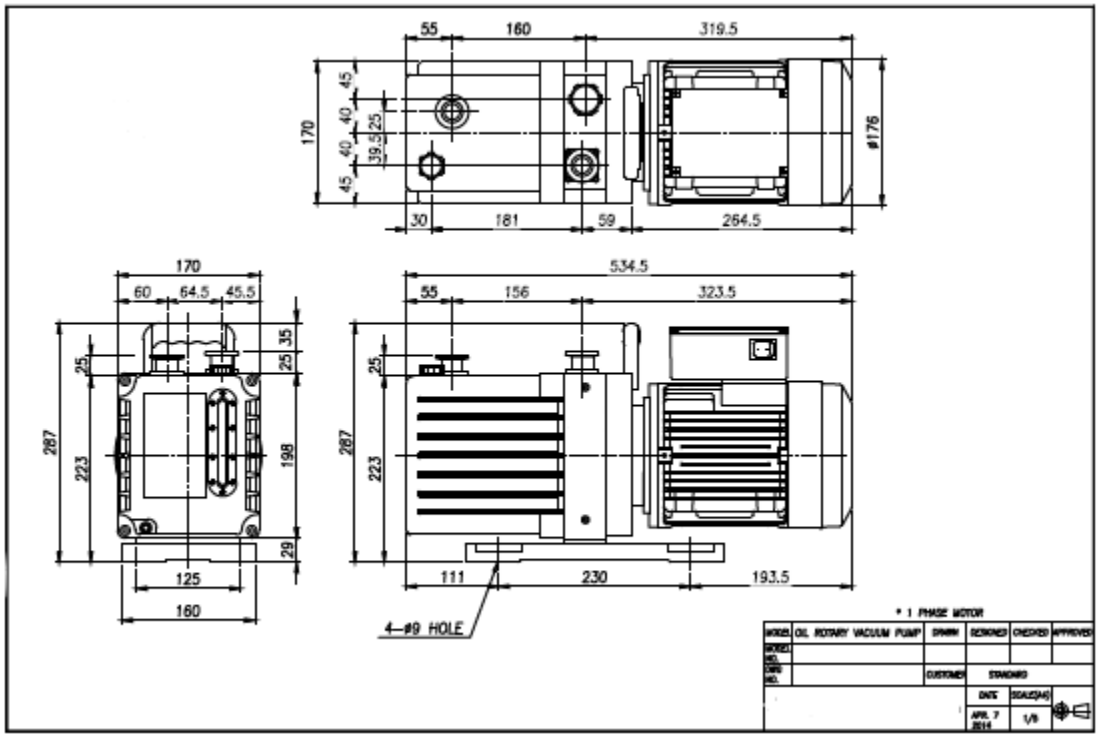


Fig. 9 Dimension of NTRV40

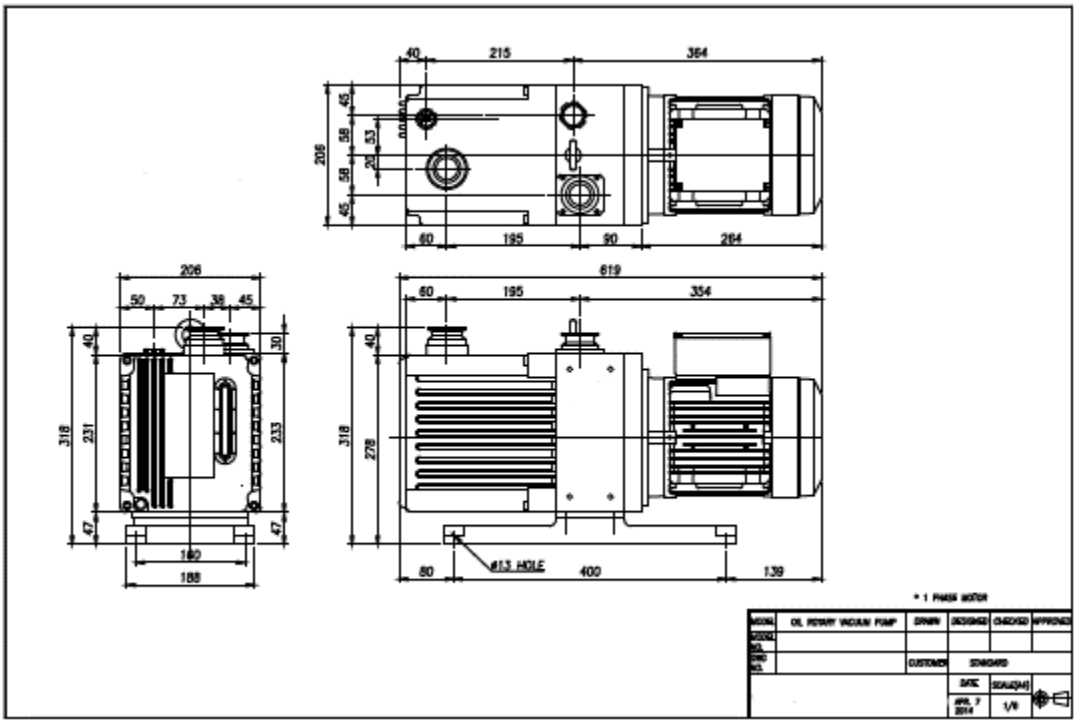


Fig. 10 Dimension of NTRV60

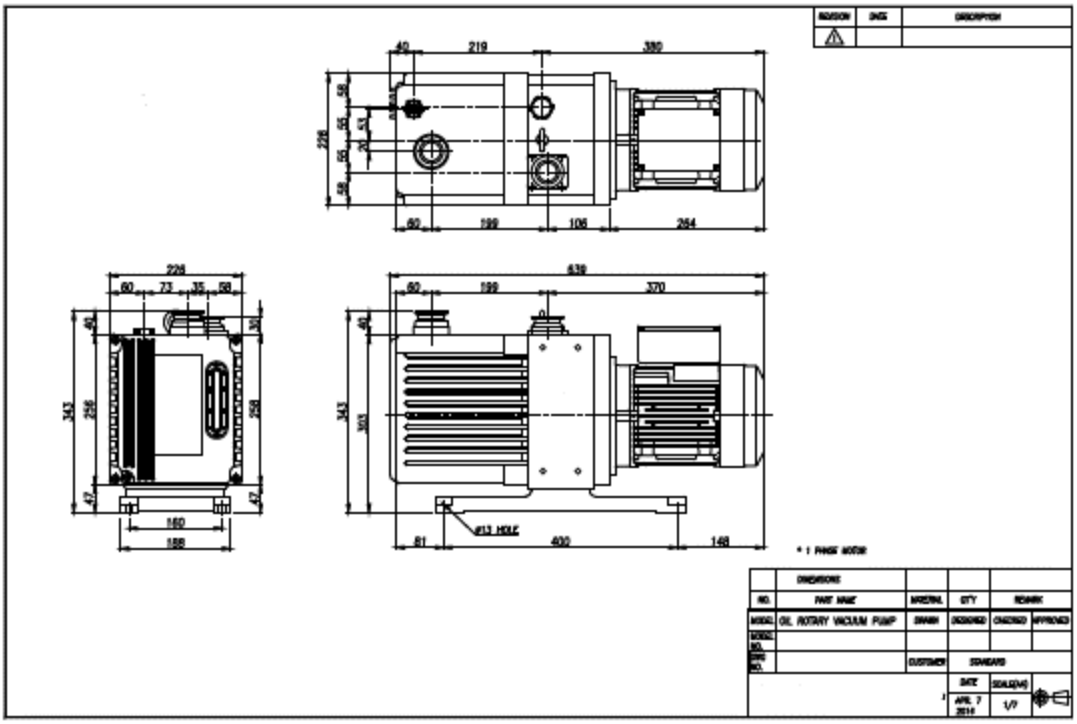


Fig. 11 Dimension of NTRV80

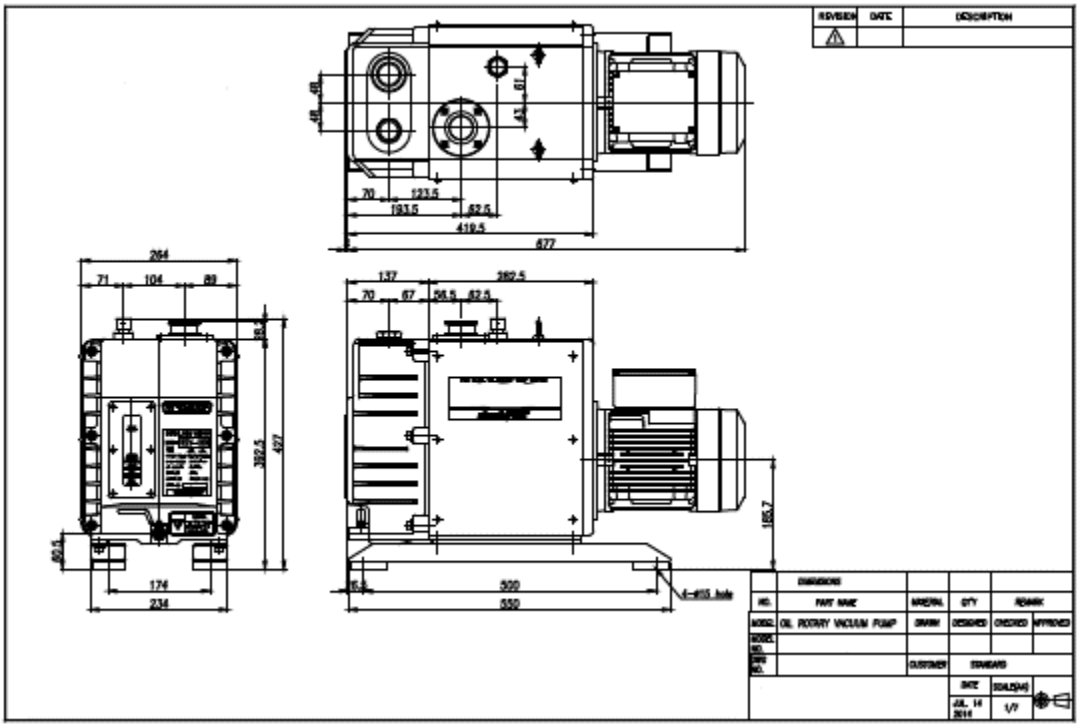


Fig. 12 Dimension of NTRV100

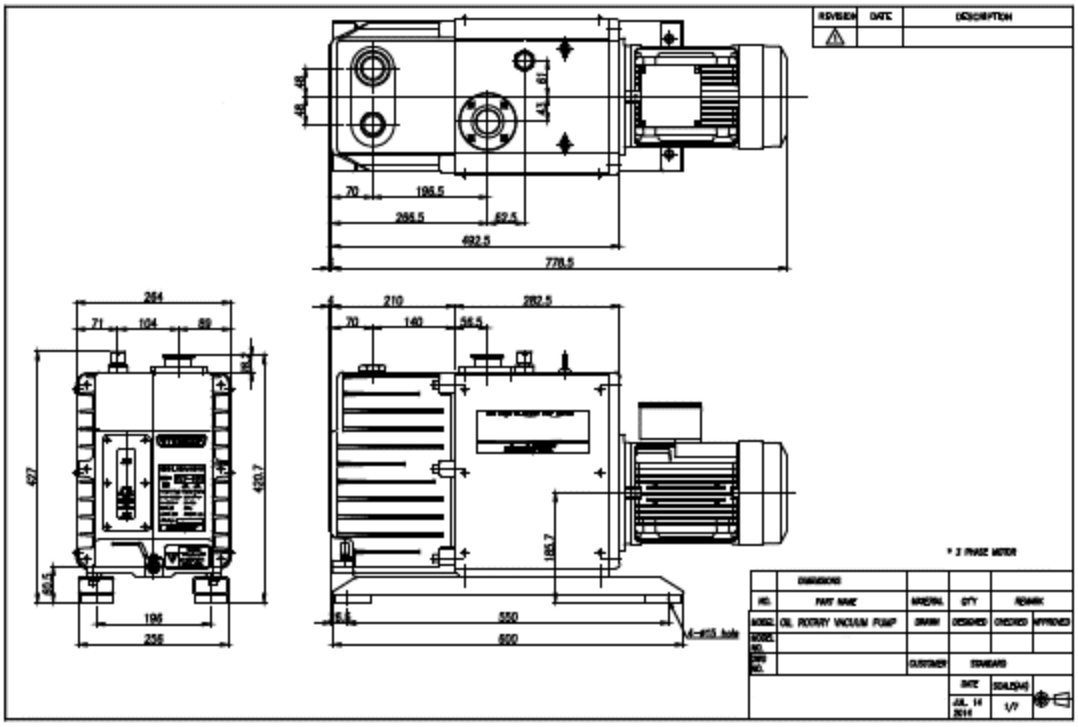


Fig. 13 Dimension of NTRV180

6.2 Exploded View

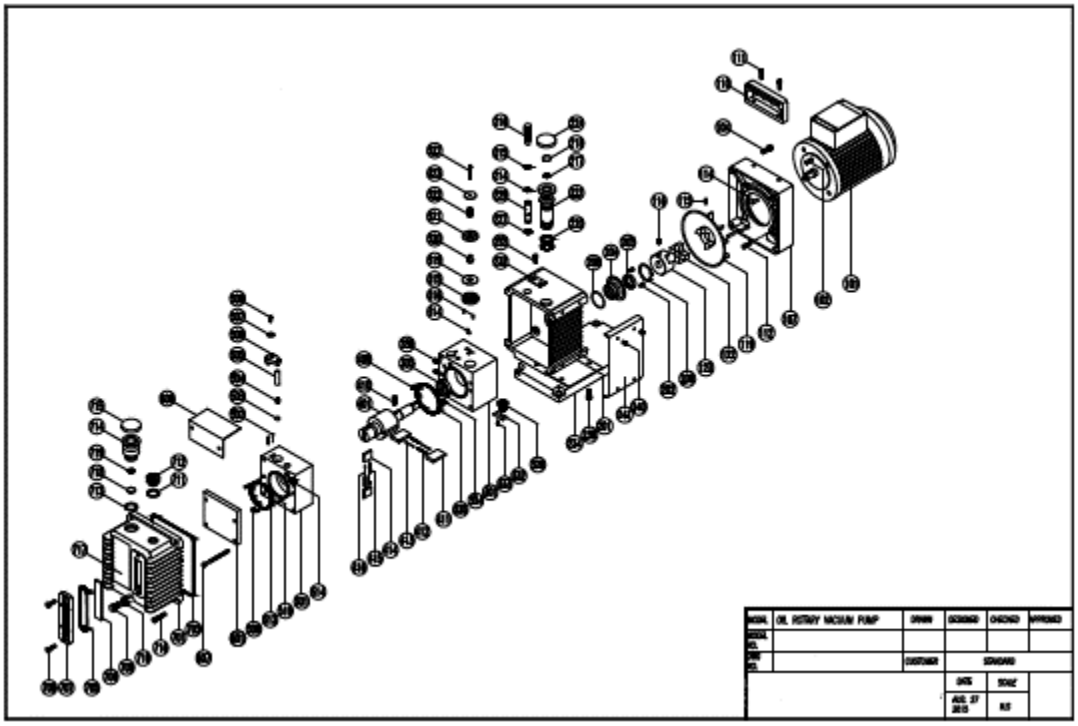


Fig. 14 Exploded view of NTRV05

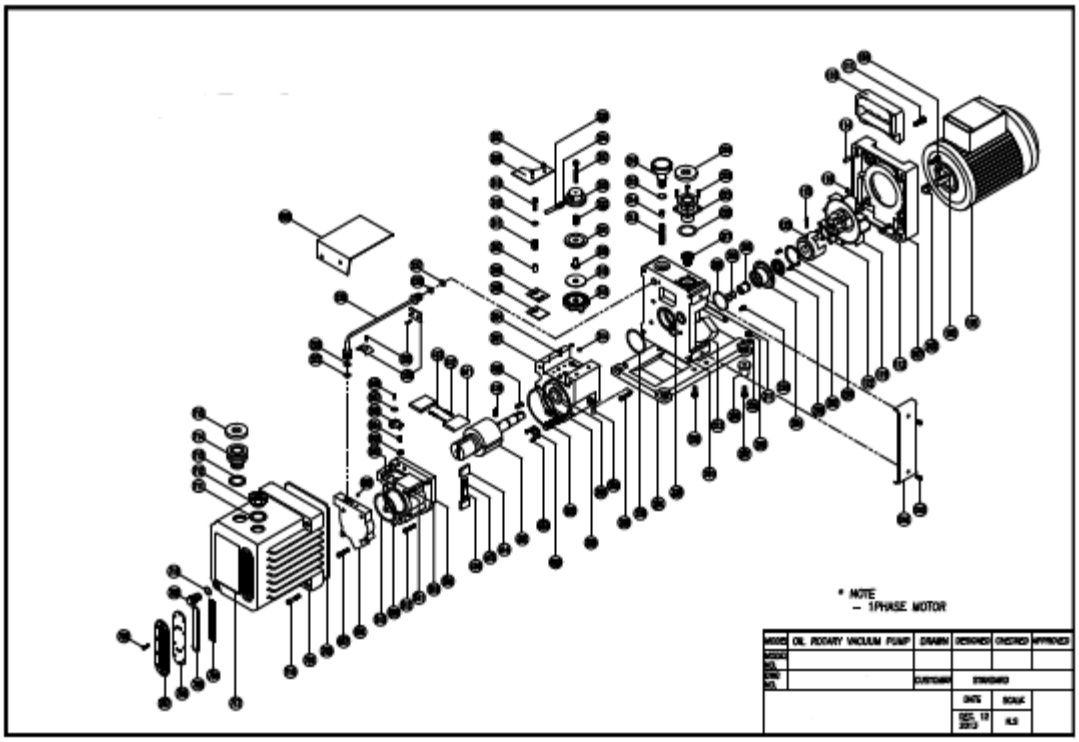


Fig. 15 Exploded view of NTRV10

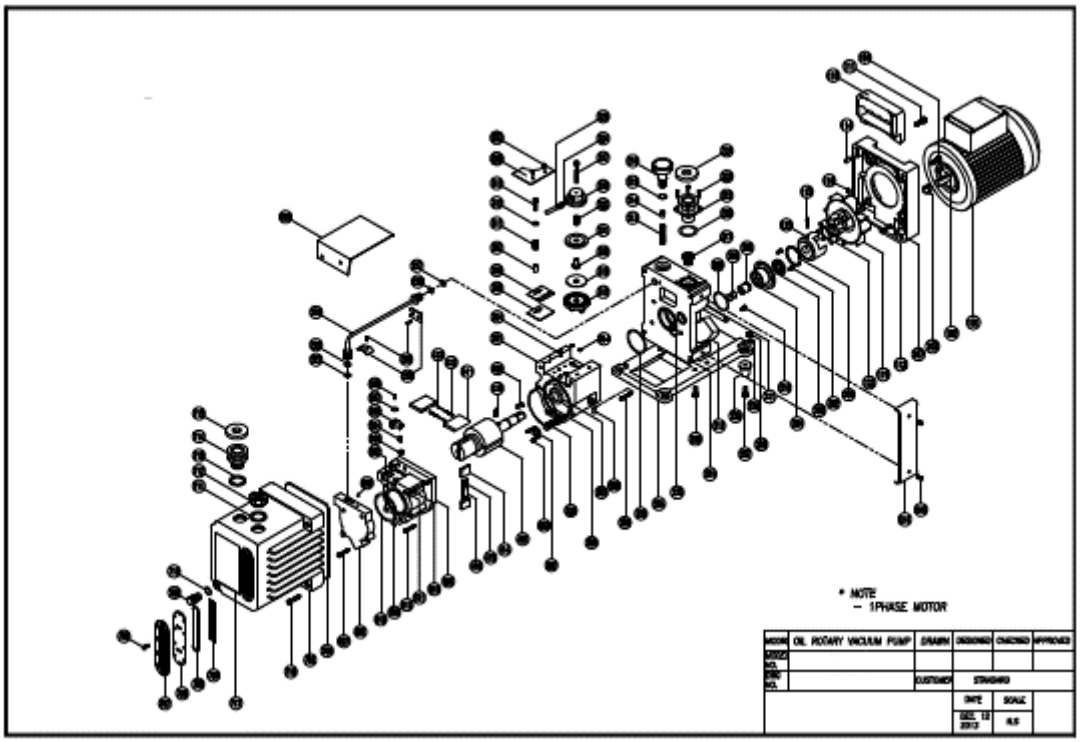


Fig. 16 Exploded view of NTRV20

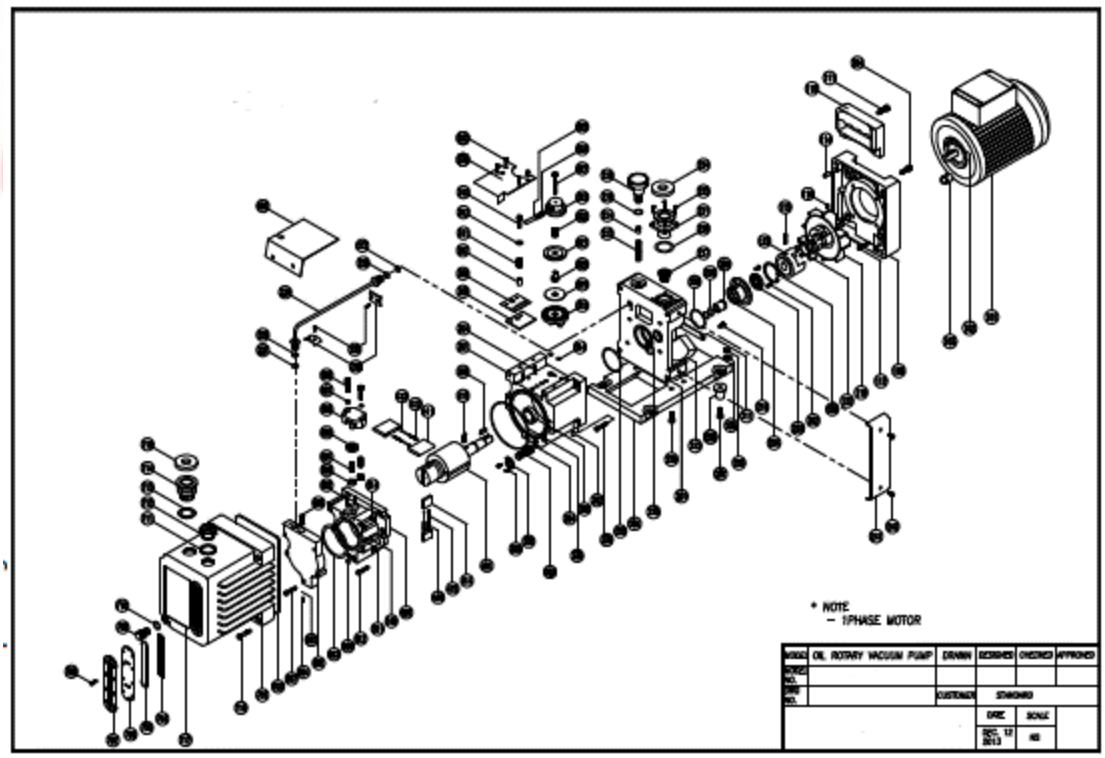


Fig. 17 Exploded view of NTRV40

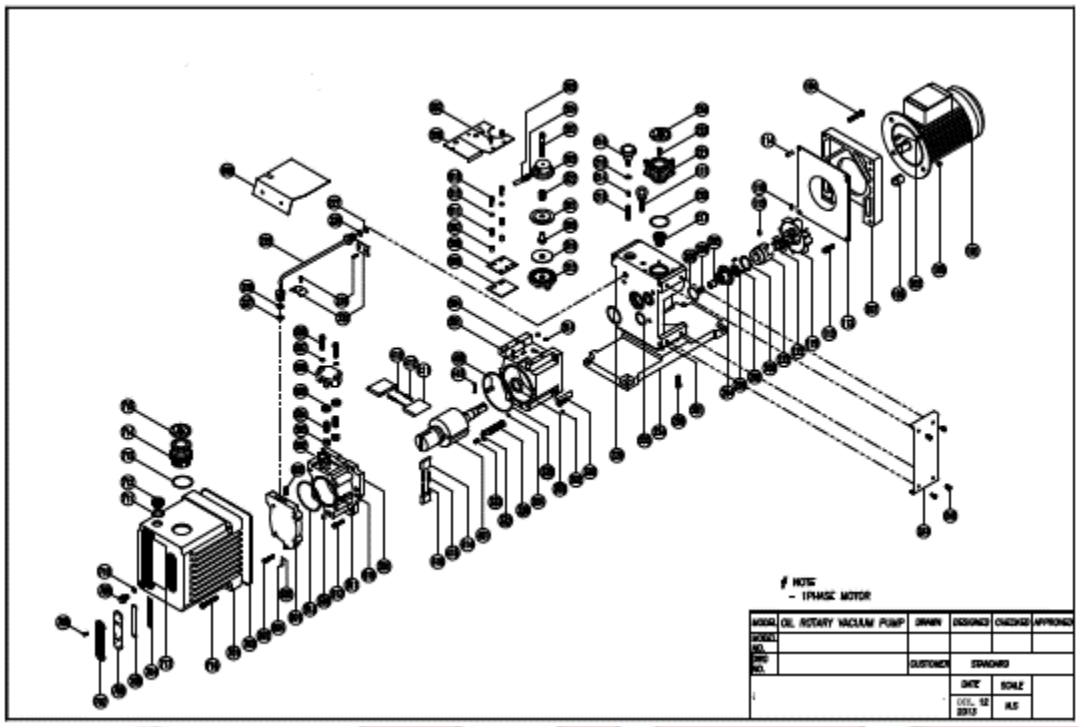


Fig. 18 Exploded view of NTRV60

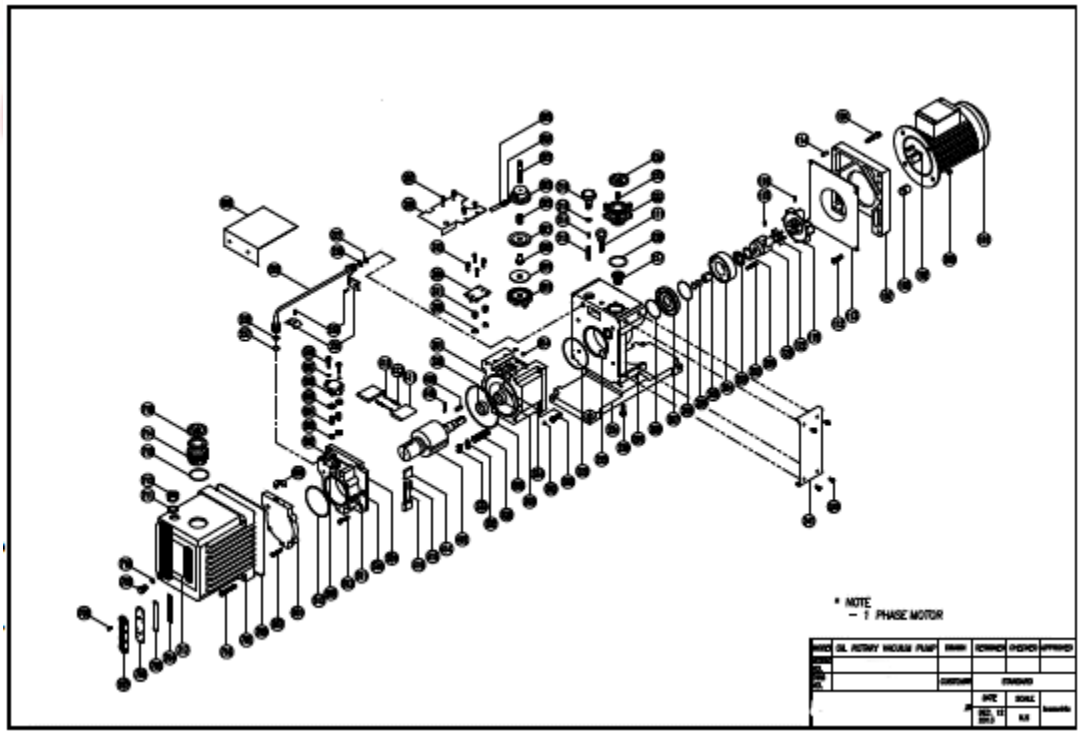


Fig. 19 Exploded view of NTRV80

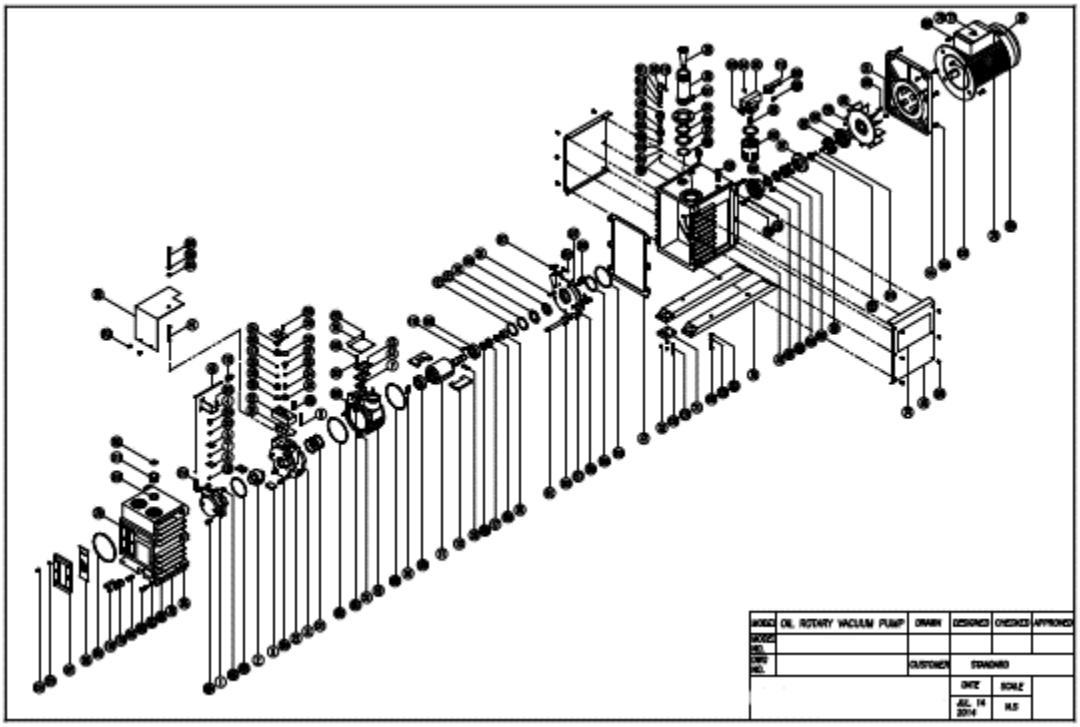


Fig. 20 Exploded view of NTRV100

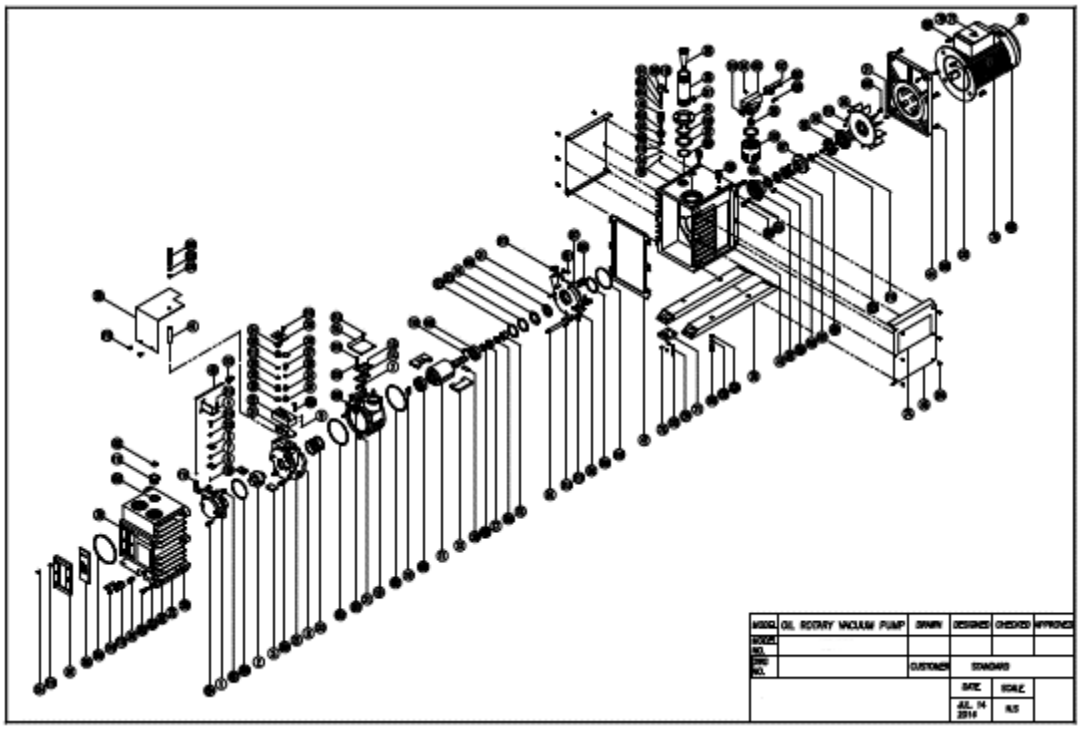


Fig. 21 Exploded view of NTRV180

6.3 Spare Parts List

Part List (BOM LIST : NTRV05)

Part No.	Code No.	Description	Specification	Qty
101	JWME01010510	MOTOR (1PHASE)	1P 220V 120W 50/60Hz	1
102	WPMI01020500	KEY (FOR MOTOR)	4X4X10R	1
104	WPMIM5X40HN	BOLT	M5X40	4
107	WPMA0107050	MOTOR PLATE	130x120x35t	1
110	WPRE01100500	HANDLE (BLACK)	FOR NTRV05	1
111	WPMIM5X20HN	HANDLE FIX. BOLT	M5x20	2
112	WPMIM5X20HN	MOTOR PLATE FIX. BOLT	M5x20	4
114	WPMI01140500	MOTOR PLATE GUIDE PIN	Ø4x10(S45C)	2
115	WPMIM4X12HN	COUPLING FAN FIX. BOLT	M4x12	1
116	WPMIM4X80HN	COUPLING FIX. BOLT	M4x8	1
119	WPMA0119050	COUPLING FAN	DIECAST(Ø11)	1
122	WPRE01220500	COUPLING JOINT	36x12x10(RUBBER)	1
123	WPMA0123050	COUPLING	DIECAST(Ø11)	1
201	WPMA0201050	MAIN PLATE	DIECAST	1
202	WPMIM4X10HF	HOUSING FIX. BOLT	M4x10(FLAT HEAD, Ni PLATED)	2
203	WPRV02030500	OIL SEAL(FOR HOUSING)	D Ø25xØ15x5t	1
204	WPMA0204050	OIL SEAL HOUSING (SLEEVE)	Ø44.5/30x19L	1
208	WPRSS2600000	O-RING	S-26(SILICON)	1
209	WPMI02090500	SNAP RING	R-25	1
214	WPRSAN008000	O-RING	AN-008(SILICON)	1
215	WPRSP8000000	O-RING	P-8(SILICON)	1
216	WPMC0216050	GAS BALLAST KNOB	Ø14 x 39.5	1
217	WPMS02170500	STRAINER ASSEMBLY	Ø0.2 X 32# X Ø16	1
218	WPMI02180500	SNAP RING	SR-15	1
220	WPRSP1400000	O-RING	P-14(SILICON)	1
221	WPMA0221050	INTAKE FLANGE	NW16(Ø30x74.2)	1
224	WPRE0224N160	NW16 FLANGE CAP	NW-16(CAP)	1
227	WPRSP8000000	O-RING	P-8(SILICON)	1
229	WPMA0229050	G/B BODY	Ø10.8 x 34(BRASS)	1
232	WPMC0232050	GAS BALLAST CLAMP	t2.3x22x17	1
233	WPMIM4X8HN0	G/B CLAMP FIX BOLT	M4X8	1
234	WPMA0234050	BASE PLATE	DICASTING	1
239	WPMIM6X1500	BASE PLATE MOUNTING BOLT	M6x15	4
240	WPMIM4X8HB0	SIDE COVER FIX BOLT	M4 X 8(ROUND HEAD, NiPLATED)	8
241	WPRE024105Y	SIDE COVER	ABS(YELLOW)	2
301	WPMI03010500	1ST STAGE STATOR	FC 80x56L	1
303	WPRV03030500	OIL SEAL (for 1st block)	S Ø32xØ22x7t	1

314	WPRSP3000000	O-RING	P-3(silicon))	1
315	WPMC0315050	DISTRIBUTER SLEEVE	Ø26.8 x 5.5(BRASS)	1
316	WPMI03160500	SPRING PIN	Ø3 x 6	2
319	WPRV03190500	DISTRIBUTER VALVE(R Rubber)	26x6.2x1.5(VITON)	1
320	WPMI03200500	DISTRIBUTER SPACER	Ø10.2 x 11	1
321	WPMC0321050	DISTRIBUTER WEIGHT	Ø20 x 7.5(brass)	1
322	WPMS03220500	DISTRIBUTER SPRING	W0.6 x Ø16/17.2 x 14L	1
323	WPMI03230500	DISTRIBUTER PUSHER	Ø20 x 4	1
327	WPMIM4X25HN	BOLT(FOR DISTRIBUTER)	M4x25	1
328	WPMI03280500	OIL FILTER ASSEMBLY	Ø0.2 X 32# X Ø17	1
332	WPMI03320500	OIL FILTER FIXTURE	t2.0 x 39 x 24	1

Part No.	Code No.	Description	Specif i cation	Qty
333	WPMIM4X8HN0	OIL FILTER FIX. BOLT	M4x8	1
334	WPRSP3000000	O-RING	P-3(silicon)	1
335	WPRSG5500000	O-RING	G-55(SILICON)	1
339	WPRSP8000000	O-RING	P-8(SILICON)	1
401	WPMI04010500	ROTOR ASSEMBLY	FCD500	1
409	WPMI04090500	KEY	4X4X10R	1
410	WPME04100500	OIL PUMP BLADE	5X5X17.7	1
411	WPME04110500	1ST STAGE BLADE	25 x 24 x 6t(ROUND 28x54x6.5)	2
412	WPMS04122100	1ST STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
413	WPMI04132100	1ST STAGE BLADE SPRING GUIDE	Ø1.8/3 X 26(Ø2/3 x 26)	2
414	WPME04140500	2ST STAGE BLADE	20 x 18.5 x 6t(ROUND 23x43x6.5)	2
415	WPMS04152100	2ND STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
416	WPMI04162100	2ND STAGE BLADE SPRING	Ø1.8/3 X 26(Ø2/3 x 26)	2
501	WPMI05010500	2ND STAGE STATOR	FC 80x35L	1
502	WPMI05022100	VALVE GUIDE PIN (SPRING PIN)	Ø3 x 20	2
503	WPMS05030500	2ND STAGE VALVE	0.3t(STS304)	1
504	WPMS05042100	2ND VALVE SPRING	W0.6 X Ø7.3/8.5 X 17L	1
505	WPMA0505050	SPRING SUPPORT SPACER	A/L	1
506	WPMI05060300	SPRING SUPPORT(for 2nd valve)	DIECAST(SMALL)	1
507	WPMIW5G0000	WASHER	Ø5(SAFETY WASHER)	1
508	WPMIM5X20HN	BOLT	M5 X 20	1
509	WPRSP3000000	O-RING	P-3(silicon))	1
510	WPMI05100500	TAPER PIN	Ø6x25(M5 TAP)	2

513	WPRSG4500000	O-RING(for body)	G-45(SILICON)	1
514	WPRSP9000000	O-RING	P-9(SILICON)	1
601	WPMI06010500	END PLATE	FC 80x9.5L	1
607	WPMIM5X1100	END PLATE FIX. BOLT	M5 X 110	4
608	WPMS06080500	OIL BAFFLE(SUS)	t0.7x88x92	1
701	WPMA0701050	OIL BOX		1
703	WPRSAN160000	O-RING(FOR OIL BOX)	AN-160(silicon)	1
705	WPRSP4800000	O-RING(FOR WINDOW)	P-48(silicon)	1
706	WPRE07060500	OIL WINDOW	PC,15x76.5x3t	1
707	WPMA0707050	OIL LEVEL BACK PLATE	DICASTING	1
708	WPMIM5X10HF	OIL LEVEL BACK PLATE FIX. BOLT	M5 X 10(+,FLAT, Ni plated)	2
709	WPMC0709050	OIL DRAIN PLUG	M-8(BRASS)	1
710	WPRSP7000000	O-RING	P-7(silicon)	1
711	WPRSAN118000	O-RING(for oil filling plug)	AN-118(SILICON)	1
712	WPRE07122100	OIL FILLING PLUG	M-24	1
713	WPRSAN118000	O-RING(for exhaust flange)	AN-118(SILICON)	1
714	WPMA0714070	EXHAUST FLANGE(OUTLET)	NW-16	1
715	WPRE0224N160	EXHAUST ASSEMBLY CAP	NW-16(CAP)	1
716	WPMIM5X15HN	OIL BOX FIX. BOLT	M5X 15	4
717	WPMA0717050	NAME PLATE	0.2t, AL STICKER	1
718	WPMI0718050	SNAP RING	R-16	1
719	WPMI0719050	STRAINER(#32x0.2t)		1

Part List (BOM LIST : NTRV10/20)

Part No.	Code No.	Description	Specif i cation	Qty
101	JWME01010310	MOTOR (1PHASE)	1P 220V 400W 50/60Hz ±5%	1
102	WPMI01020300	KEY (FOR MOTOR)	5X5X15R	1
103	WPMC01030300	RING (FOR COUPLING SPACE)	Ø20/14X8.5 (BRASS)	1
104	WPMIM6X35HN	BOLT	M6X35	4
107	WPMA01070300	MOTOR PLATE	DIECAST	1
110	WPMA01100700	HANDLE	DIECAST	1
111	WPMIM6X15HN	BOLT	M6X15	2
112	WPMIM6X20HN	BOLT	M6X20	4
114	WPMC01140700	MOTOR PLATE GUIDE PIN	Ø6 X 13L(BRASS)	2
115	WPMIM5X8HS00	BOLT	M5X8 (SET SCREW)	2
116	WPMIM5X8HS00	BOLT	M5X8 (SET SCREW)	1
119	WPMA00190300	COUPLING FAN	DIECAST(Ø14)	1
122	WPRE01222100	COUPLING JOINT	RUBBER	1
123	WPMA01230700	COUPLING	DIECAST(Ø15)	1
201	WPMA02010300	MAIN PLATE	DIECAST	1

202	WPMIM4X10HF0	BOLT	M4 X 10(FLAT HEAD,Ni-PLATED)	3
203	WPRV02030700	OIL SEAL (FOR HOUSING)	Ø22/32 X 7	1
204	WPMA02040700	OIL SEAL HOUSING(SLEEVE)	Ø40/32 X 25.5	1
205	WPMI02050700	BUSHING	Ø22/18x20,SCM415	1
206	WPRSS1800000	O-RING	S-18(SILICON)	2
208	WPRSG3500000	O-RING	G-35(SILICON)	1
209	WPMI02090700	SNAP RING (FOR HOUSING)	R-32	1
210	WPMIM4X80HN	BOLT	M4X8	2
211	WPMI02110300	SUCTION FELT STRAP	1t x 92 x 13 x R34	1
212	WPME02120700	OIL SUCTION FELT	FELT	1
213	WPMI02132100	G/B SPRING (FOR KNOB)	W0.9 X Ø4.5/6.3 X 33L	1
214	WPMC02142100	G/B BRASS PIN(FOR KNOB)	Ø4.5 X 6.2 X 11.5(BRASS)	1
215	WPRSP10A0000	O-RING	P-10A(SILICON)	1
216	WPRE02162100	GAS BALLAST KNOB	Ø40	1
217	WPMS02170700	STRAINER ASSEMBLY	Ø0.2 X 32# X Ø17	1
220	WPRSP3000000	O-RING	P-30(SILICON)	1
221	WPMZ02210700	INTAKE FLANGE	NW-25	1
223	WPMIM4X12HN	BOLT	M4 X 12	4
224	WPRE0224N250	NW25 FLANGE CAP	NW-25(CAP)	1
225	WPRSP2000000	O-RING	P-20(SILICON)	1
226	WPRSG4500000	O-RING	G-45(SILICON)	1
227	WPRSAN109000	O-RING	AN-109(SILICON)	2
228	WPRSP10A0000	O-RING	P-10A(SILICON)	2
229	WPMC02290100	G/B TUBE ASSEMBLY(STANDARD)	BRASS	1
232	WPMI02322100	GAS BALLAST CLAMP	16 X 26 X 2.0T	2
233	WPMIM4X12HN	BOLT	M4X12	2
234	WPMA02340300	BASE PLATE	DIECAST	1
235	WPMIM6000000	NUT	M6	4
236	WPMIW6X18N0	WASHER	Ø6 X 18(FLAT)	4
237	WPMIM6X20HN	BOLT	M6 X 20	4
238	WPRE02380700	BASE RUBBER	Ø24 X 12	4
239	WPMIM6X15HN	BOLT	M6 X 15	4
240	WPMIM4X8HB0	BOLT	M4 X 8(ROUND HEAD,Ni-PLATED)	4

Part No.	Code No.	Description	Specification	Qty
241	WPRE024101YW	SIDE COVER	ABS(YELLOW)	2
301	WPMI03010100	1ST STAGE STATOR	FC-25	1
302	WPMC03022100	TAPER PIN	Ø5.9 X Ø6.5 X 7	2
303	WPRV03030700	OIL SEAL(for block)	Ø25/35 X 7	1
304	WPMI03041300	VALVE GUIDE PIN(SPRING PIN)	Ø3 X 20	2
305	WPRV03050100	1ST STAGE VALVE	24 X 36 X 2t(VITON)	1
306	WPMI03060100	1ST VALVE BACK PLATE	25 X 36 X 1.6t	1
307	WPMS03071300	1ST VALVE SPACER	Ø8/6.3 X 13(SUS)	1
311	WPMI03111300	1ST VALVE SPRING	W1 X Φ9/11 X 15.5L	1

312	WPMSW5N0000	WASHER	Ø5(SUS FLAT)	1
313	WPMIM5X22HN	BOLT	M5 X 22	1
314	WPRSP6000000	DISTRIBUTER SLEEVE O-Ring	P-6(SILICON)	2
315	WPME03152100	DISTRIBUTER SLEEVE ASSEMBLY		1
319	WPRV03192100	DISTRIBUTER VALVE	Ø45 X 9 X 1.5(VITON)	1
320	WPMI03202101	DISTRIBRTER SPACER	Ø15 X 16(S45C,NEW TYPE)	1
321	WPMC03212100	DISTRIBUTER WEIGHT	Ø44 X 4.7t	1
322	WPMI03222100	DISTRIBUTER SPRING	W0.6 X Ø8.3/9.5 X 17L	1
323	WPMA03232100	DISTRIBUTER CAP	Ø50 X 20	1
324	WPMA03242100	TUBE FITTING	Ø8 x 1/8"PC	1
325	WPRE03250100	HOSE	73MM	1
327	WPMIM5X50HN	BOLT	M5 X 50	1
328	WPMI03280300	OIL FILTER ASSEMBLY		1
332	WPMI03320300	OIL FILTER FIXTURE	t2.0(PRESS)	1
333	WPMIM4X8HN0	BOLT	M4 X 8	2
335	WPRSS8000000	O-RING	S-80(SILICON)	1
336	WPMI03360100	1ST VALVE OIL BAFFLE	52 X 46 X 1.2t	1
337	WPMIM4X8HN0	BOLT	M4 X 8	2
338	WPMIM6X25HN	BOLT	M6 X 25	3
401	WPMI04010100	ROTOR ASSEMBLY(NEW TYPE)	FCD-64	1
409	WPMI04090700	KEY	5 X 5 X 11 X 17.5L	1
410	WPME04100700	OIL PUMP BLADE	8 X 6 X 21	1
411	WPME04110100	1ST STAGE BLADE	25 X 32 X 6t(ROUND 28x70x6.5)	2
412	WPMS04122100	1ST STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
413	WPMI04132100	1ST STAGE BLADE SPRING GUIDE	Ø1.8/3 X 26(Ø2/3 x 26)	2
414	WPME04140100	2ND STAGE BLADE	22 X 22 X 6t(ROUND 25x50x6.5)	2
415	WPMS04152100	2ND STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
416	WPMI04162100	2ND STAGE BLADE SPRING	Ø1.8/3 X 26(Ø2/3 x 26)	2
501	WPMI05010100	2ND STAGE STATOR	FC-25(Φ49x42t)	1
502	WPMI05022100	VALVE GUIDE PIN (spring pin)	Ø3 X 20	2
503	WPRV05032100	2ND STAGE VALVE	Ø14.5 X 7(VITON)	1
504	WPMI05042100	2ND VALVE SPRING	W0.6 X Ø7.3/8.5 X 17L	1
506	WPMI05060300	SPRING SUPPORT(for 2nd valve)	DIECAST(SMALL)	1
507	WPMIW5G00000	WASHER	Ø5(GEAR, SPRING)	1
508	WPMIM5X20HN	BOLT	M5 X 20	1
509	WPRSP6000000	O-RING	P-6(SILICON)	1
510	WPMI05102100	TAPER PIN(ONE SCREW)	Ø7 X 25L(M6)	2
511	WPMIM6000000	NUT	M6	2
512	WPMIM6X25HN	BOLT	M6 X 25	5

Part No.	Code No.	Description	Specif i cation	Qty
513	WPRSG5500000	O-RING	G-55(SILICON)	1
601	WPMI06010300	END PLATE	FC-25	1

603	WPMC06030300	TAPER PIN	Ø3.5 X Ø2.9 X 6.0	1
607	WPMIM6X30HN	BOLT	M6 X 30	4
608	WPMI06080100	2ND DISCHARGE BAFFLE	100 X 140 X 1.2t	1
701	WPMA07010100	OIL BOX	DIECAST	1
703	WPRS07030300	O-RING(for oil box)	167 X 126 X 2t(SILICON)	1
704	WPMS07041500	OIL LEVEL PLATE SUS	10 X 95 X 0.2t	1
705	WPRS07052100	O-RING(for oil window)	112.5x2(S-75,SILICON)	1
706	WPRE07062100	OIL LEVEL WINDOW	34 X 122 X 3, PC	1
707	WPMZ07072100	OIL LEVEL BACK PLATE	DIECAST	1
708	WPMIM35X11C	BOLT	M3.5 X 11(CROSS, Ni-PLATED)	10
709	WPMC07091300	OIL DRAIN PLUG	M10(BRASS)	1
710	WPRSAN109000	O-RING(for drain plug)	AN-109(SILICON)	1
711	WPRSAN118000	O-RING(for oil filling plug)	AN-118(SILICON)	1
712	WPRE07122100	OIL FILLING PLUG	M24	1
713	WPRN07130700	O-RING(for exhaust flange)	Ø30/20.5 X 2.5t(NBR)	1
714	WPMZ07140700	EXHAUST ASSEMBLY(OUTLET)	NW-25	1
715	WPRE0224N250	NW25 FLANGE CAP	NW-25(CAP)	1
716	WPMIM6X35HN	BOLT	M6 X 35	4
717	WPMA0717010/20	NAME PLATE	0.2t, AL STICKER	1

Part List (BOM LIST : NTRV40/60)

Part No.	Code No.	Description	Specif i cation	Qty
101	JWME01010411	MOTOR (1PHASE)	1P 220V 750W 50/60HZ	1
102	WPMI01020400	KEY (FOR MOTOR)	6X6X15R	1
103	WPMA01030400	RING (FOR COUPLING SPACE)	Ø25/19X24 (AL)	1
104	WPMIM6X35HN	BOLT	M6X35	4
106	WPMA01060400	MOTOR PLATE ASSEMBLY	DIECAST	1
110	WPMA01100700	HANDLE	DIECAST	1
111	WPMIM6X20HN	BOLT	M6X20	2
112	WPMIM6X35HN	BOLT	M6X35	4
114	WPMC01140700	MOTOR PLATE GUIDE PIN	Ø6 X 13L(BRASS)	2
115	WPMIM5X8HS00	BOLT	M5X8 (SET SCREW)	2
116	WPMIM6X12HS0	BOLT	M6X12 (SET SCREW)	1
119	WPMA01190400	COUPLING FAN	DIECAST(Ø19)	1
122	WPRE01222100	COUPLING JOINT	RUBBER	1
123	WPMA01230700	COUPLING	DIECAST(Ø15)	1
201	WPMA02010400	MAIN PLATE	DIECAST	1
202	WPMIM4X10HF0	BOLT	M4 X 10(FLAT HEAD,Ni-PLATED)	3
203	WPRV02030700	OIL SEAL (FOR HOUSING)	Ø22/32 X 7	1
204	WPMA02040700	OIL SEAL HOUSING(SLEEVE)	Ø40/32 X 25.5	1
205	WPMI02050700	BUSHING	Ø22/18x20,SCM415	1
206	WPRSS1800000	O-RING	S-18(SILICON)	2
208	WPRSG3500000	O-RING	G-35(SILICON)	1

209	WPMI02090700	SNAP RING (FOR HOUSING)	R-32	1
210	WPMIM4X80HN	BOLT	M4X8	2
211	WPMI02110400	SUCTION FELT STRAP	1t x 92 x 13 x R34	1
212	WPME02120700	OIL SUCTION FELT	FELT	1
213	WPMI02132100	G/B SPRING (FOR KNOB)	W0.9 X Ø4.5/6.3 X 33L	1
214	WPMC02142100	G/B BRASS PIN(FOR KNOB)	Ø4.5 X 6.2 X 11.5(BRASS)	1
215	WPRSP10A0000	O-RING	P-10A(SILICON)	1
216	WPRE02162100	GAS BALLAST KNOB	Ø40	1
217	WPMS02170700	STRAINER ASSEMBLY	Ø0.2 X 32# X Ø17	1
220	WPRSP3000000	O-RING	P-30(SILICON)	1
221	WPMZ02210700	INTAKE FLANGE	NW-25	1
223	WPMIM4X12HN	BOLT	M4 X 12	4
224	WPRE0224N250	NW25 FLANGE CAP	NW-25	1
225	WPRSP2200000	O-RING	P-22(SILICON)	1
226	WPRSG4500000	O-RING	G-45(SILICON)	1
227	WPRSAN109000	O-RING	AN-109(SILICON)	2
228	WPRSP10A0000	O-RING	P-10A(SILICON)	2
229	WPMC02291200	G/B TUBE ASSEMBLY	BRASS	1
232	WPMI02322100	GAS BALLAST CLAMP	16 X 26 X 2.0T	2
233	WPMIM4X12HN	BOLT	M4X12	2
234	WPMA02340400	BASE PLATE	GRAVITY CASTING	1
235	WPMIM6000000	NUT	M6	4
236	WPMIW6X18N0	WASHER	Ø6 X 18(FLAT)	4
237	WPMIM6X25HN	BOLT	M6X25	4
238	WPRE02380700	BASE RUBBER	Ø24 X 12	4
239	WPMIM6X20HN	BOLT	M6X20	4
240	WPMIM4X8HB0	BOLT	M4 X 8(ROUND HEAD,Ni-PLATED)	4

Part No.	Code No.	Description	Specif i cation	Qty
241	WPRE024101YW	SIDE COVER	ABS(YELLOW)	2
301	WPMI03010400	1ST STAGE STATOR	FC-25	1
302	WPMC03022100	TAPER PIN	Ø5.9 X Ø6.5 X 7	2
303	WPRV03030700	OIL SEAL(for block)	Ø25/35 X 7	1
304	WPMI03041300	VALVE GUIDE PIN(SPRING PIN)	Ø3 X 20	2
305	WPRV03050400	1ST STAGE VALVE	54 X 50 X 3t(VITON)	1
306	WPMI03060400	1ST VALVE BACK PLATE	54 X 50 X 1.6t	1
307	WPMS03071300	1ST VALVE SPACER	Ø8/6.3 X 13(SUS)	1
311	WPMI03111300	1ST VALVE SPRING	W1 X Φ9/11 X 15.5L	1
312	WPMSW5N0000	WASHER	Ø5(SUS FLAT)	1
313	WPMIM5X22HN	BOLT	M5 X 22	1
314	WPRSP6000000	DISTRIBUTER SLEEVE O-Ring	P-6(SILICON)	2
315	WPME03152100	DISTRIBUTER SLEEVE ASSEMBLY	DIECAST	1
319	WPRV03192100	DISTRIBUTER VALVE	Ø45 X 9 X 1.5(VITON)	1
320	WPMI03202101	DISTRIBRTER SPACER	Ø15 X 16(S45C,NEW TYPE)	1

321	WPMC03212100	DISTRIBUTER WEIGHT	Ø44 X 4.7t	1
322	WPMI03222100	DISTRIBUTER SPRING	W0.6 X Ø8.3/9.5 X 17L	1
323	WPMA03232100	DISTRIBUTER CAP	Ø50 X 20	1
324	WPMA03242100	TUBE FITTING	Ø8 x 1/8"PC	1
325	WPRE03250400	HOSE	130MM	1
327	WPMIM5X50HN	BOLT	M5 X 50	1
328	WPMI03281800	OIL FILTER ASSEMBLY		1
332	WPMI03321800	OIL FILTER FIXTURE	t2.0(PRESS)	1
333	WPMIM4X8HN0	BOLT	M4 X 8	2
334	WPRSP6000000	O-RING	P-6(SILICON)	1
335	WPRSS9500000	O-RING	S-95(SILICON)	1
336	WPMI03360400	1ST VALVE OIL BAFFLE	112 X 147 X 1.2t	1
337	WPMIM5X10HN	BOLT	M5 X 10	4
338	WPMIM6X25HN	BOLT	M6 X 25	4
401	WPMI04010400	ROTOR ASSEMBLY(NEW TYPE)	FCD-64	1
409	WPMI04090700	KEY	5 X 5 X 11 X 17.5L	1
410	WPME04100700	OIL PUMP BLADE	8 X 6 X 21	1
411	WPME04110400	1ST STAGE BLADE	55 X 40 X 6t(Round 58x86x6.5)	2
412	WPMS04122100	1ST STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
413	WPMI04132100	1ST STAGE BLADE SPRING GUIDE	Ø1.8/3 X 26(Ø2/3 x 26)	2
414	WPME04140400	2ND STAGE BLADE	40 X 29 X 6t(원43x63x6.5)	2
415	WPMS04152100	2ND STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
416	WPMI04162100	2ND STAGE BLADE SPRING	Ø1.8/3 X 26(Ø2/3 x 26)	2
501	WPMI05010400	2ND STAGE STATOR	FC-25(Φ62.5x60t)	1
502	WPMI05022100	VALVE GUIDE PIN (spring pin)	Ø3 X 20	2
503	WPRV05032100	2ND STAGE VALVE	Ø14.5 X 7(VITON)	2
504	WPMI05042100	2ND VALVE SPRING	W0.6 X Ø7.3/8.5 X 17L	2
505	WPMC05051800	SPRING SUPPORT SPACER(BRASS)	Ø17.5/10.5 X 5L	2
506	WPMI05061800	SPRING SUPPORT(for 2nd valve)	DIECAST(Large)	2
507	WPMIW5G00000	WASHER	Ø5(GEAR, SPRING)	2
508	WPMIM5X20HN	BOLT	M5 X 20	2
509	WPRSP6000000	O-RING	P-6(SILICON)	1
510	WPMI05102100	TAPER PIN(One side Screw)	Ø7 X 25L(M6)	2

Part No.	Code No.	Description	Specif i cation	Qty
511	WPMIM6000000	NUT	M6	2
512	WPMIM6X30HN	BOLT	M6 X 30	6
513	WPRSG7000000	O-RING	G-70(SILICON)	1
601	WPMI06010400	END PLATE	FC-25	1
602	WPMI06021000	END PLATE BALL	Ø4(SUJ2)	1
604	WPMIM5X5HS00	BOLT	M5 x 5(SET SCREW)	1

605	WPMI06051000	SPRING PIN(for end plate)	Ø10 x 20	1
607	WPMIM6X30HN	BOLT	M6 X 30	5/4
608	WPMI06080400	2ND DISCHARGE BAFFLE	118 X 121 X 1.2t	1
701	WPMA07010400	OIL BOX	DIECAST	1
703	WPRS07030400	O-RING(for oil box)	193.6 X 142.3 X 2.6t(SILICON)	1
704	WPMS07041500	OIL LEVEL PLATE SUS	10 X 95 X 0.2t	1
705	WPRS07052100	O-RING(for oil window)	112.5x2(S-75,SILICON)	1
706	WPRE07062100	OIL LEVEL WINDOW	34 X 122 X 3, PC	1
707	WPMZ07072100	OIL LEVEL BACK PLATE	DIECAST	1
708	WPMIM35X11C	BOLT	M3.5 X 11(CROSS, Ni-PLATED)	10
709	WPMC07091300	OIL DRAIN PLUG	M10(BRASS)	1
710	WPRSAN109000	O-RING(for drain plug)	AN-109(SILICON)	1
711	WPRSAN118000	O-RING(for oil filling plug)	AN-118(SILICON)	1
712	WPRE07122100	OIL FILLING PLUG	M24	1
713	WPRN07130700	O-RING(for exhaust flange)	Ø30/20.5 X 2.5t(NBR)	1
714	WPMZ07140700	EXHAUST ASSEMBLY(OUTLET)	NW-25	1
715	WPRE0224N250	NW25 FLANGE CAP	NW-25(CAP)	1
716	WPMIM6X35HN	BOLT	M6 X 35	4
717	WPMA0717040/60	NAME PLATE	0.2t, AL STICKER	1

Part List (BOM LIST : NTRV80)

Part No.	Code No.	Description	Specifi cation	Qty
101	MOTOR	3P 220/380V 1.5KW 50/60Hz	NTRV60, NTRV80	1
102	WPMI01021400	KEY (FOR MOTOR)	8X7X22R	1
103	WPMA01031400	RING (FOR COUPLING SPACE)	Ø30/24X28 (AL)	1
104	WPMIM8X30HN	BOLT	M8X30	4
107	WPMIM8000000	NUT	M8(FLANGE NUT FOR B5)	4
111	WPMI01111400	HOOK(EYE BOLT)	M10X20	1
112	WPMIM8X30HN	BOLT	M8X30	4
113	WPMA01130800	FAN COVER	258 X 226 X 1.5T (RM :	1
114	WPMC01141400	MOTOR PLATE GUIDE PIN	Ø8 X 20L(BRASS)	2
115	WPMIM6X12HS0	BOLT	M6X12 (SET SCREW)	1
116	WPMIM8X10HS0	BOLT	M8X10(SET SCREW)	1
119	WPMA01191400	COUPLING FAN ASSEMBLY	DIECAST	1
122	WPRE01222100	COUPLING JOINT	RUBBER	1
123	WPMI01231400	COUPLING	CR0010(Ø20)	1
201	WPMA02010800	MAIN PLATE	DIECAST	1
202	WPMIM6X35HN	BOLT	M6 X 35	3
203	WPRV02030800	OIL SEAL(for housing)	Ø32/45 X 7	1

204	WPMA02040800	OIL SEAL HOUSING	Ø93/40 x 22	1
205	WPMI02050800	BUSHING	Ø32/24x20	1
206	WPRSAN021000	O-RING	AN-021(SILICON)	2
207	WPMI02070800	OIL PUMP HOUSING(SLEEVE)	Ø95/32 x 16	1
208	WPRSG6000000	O-RING	G-60(SILICON)	1
209	WPMI02090800	SNAP RING (FOR HOUSING)	R-45	1
213	WPMI02132100	G/B SPRING (FOR KNOB)	W0.9 X Ø4.5/6.3 X 33L	1
214	WPMC02142100	G/B BRASS PIN(FOR KNOB)	Ø4.5 X 6.2 X 11.5(BRASS)	1
215	WPRSP10A0000	O-RING	P-10A(SILICON)	1
216	WPRE02162100	GAS BALLAST KNOB	Ø40	1
217	WPMS02171400	STRAINER ASSEMBLY	Ø0.2 X 32# X Ø27	1
220	WPRSP4500000	O-RING	P-45(SILICON)	1
221	WPMA02211400	INTAKE FLANGE	NW-40(ROUND85x54),ANODIZED	1
223	WPMIM5X15HN	BOLT	M5 X 15	4
224	WPRE0224N250	NW25 FLANGE CAP	NW-25(CAP)	1
225	WPRSP3000000	O-RING	P-30(SILICON)	1
226	WPRSG1050000	O-RING	G-105(SILICON)	1
227	WPRSAN109000	O-RING	AN-109(SILICON)	2
228	WPRSP10A0000	O-RING	P-10A(SILICON)	2
229	WPMC02291200	G/B TUBE ASSEMBLY	BRASS	1
232	WPMI02322100	GAS BALLAST CLAMP	16 X 26 X 2.0T	2
233	WPMIM4X12HN	BOLT	M4X12	2
234	WPMA02341400	BASE PLATE	DIECAST	1
239	WPMIM8X35HN	BOLT	M8X35	4
240	WPMIM5X12HB	BOLT	M5 X 12(ROUND HEAD,Ni-PLATED))	8
241	WPRE024108YW	SIDE COVER	ABS(YELLOW)	2
301	WPMI03010800	1ST STAGE STATOR	FC-25	1
302	WPMC03022100	TAPER PIN	Ø5.9 X Ø6.5 X 7	2
303	WPRV03030800	OIL SEAL(for block)	Ø35/47 X 7	1
305	WPRV03050800	1ST STAGE VALVE	Ø23 X 13(VITON)	2
306	WPMI03060800	1ST VALVE BACK PLATE		1

Part No.	Code No.	Description	Specifi cation	Qty
311	WPMI03110800	1ST VALVE SPRING	W0.7 X Φ10/11.4 X 35L	2
313	WPMIM5X15HN	BOLT	M5 X 15	4
314	WPRSP6000000	DISTRIBUTER SLEEVE O-Ring	P-6(SILICON)	2
315	WPME03152100	DISTRIBUTER SLEEVE ASSEMBLY		1
319	WPRV03192100	DISTRIBUTER VALVE	Ø45 X 9 X 1.5(VITON)	1
320	WPMI03202101	DISTRIBRTER SPACER	Ø15 X 16(S45C,NEW TYPE)	1
321	WPMC03212100	DISTRIBUTER WEIGHT	Ø44 X 4.7t	1
322	WPMI03222100	DISTRIBUTER SPRING	W0.6 X Ø8.3/9.5 X 17L	1
322	WPMS03222100	DISTRIBUTER SPRING	W0.6 X Ø8.3/9.5 X 17L(SUS)	1
323	WPMA03232100	DISTRIBUTER CAP	Ø50 X 20	1
324	WPMA03242100	TUBE FITTING	Ø8 x 1/8”PC	1

325	WPRE03250800	HOSE	185MM	1
327	WPMIM5X55HN	BOLT	M5 X 55	1
328	WPMI03281800	OIL FILTER ASSEMBLY		1
332	WPMI03321800	OIL FILTER FIXTURE	t2.0(PRESS)	1
333	WPMIM4X8HN0	BOLT	M4 X 8	2
334	WPRSP6000000	O-RING	P-6(SILICON)	1
335	WPRSG1450000	O-RING	G-145(SILICON)	1
336	WPMI03360800	1ST VALVE OIL BAFFLE	135 X 179 X 1.2t(REFER DEV.FIG.)	1
337	WPMIM5X10HN	BOLT	M5 X 10	4
338	WPMIM8X25HN	BOLT	M8 X 25	4
339	WPMI03390800	BEARING (for 1st block)	NU1007 (fag,nsk)	1
401	WPMI04010800	ROTOR ASSEMBLY(NEW TYPE)	FCD-64	1
409	WPMI04090800	KEY	7 X 7 X 40R	1
410	WPME04100800	OIL PUMP BLADE	8 X 7 X 35	1
411	WPME04110800	1ST STAGE BLADE	75 X 55 X 7t(ROUND78x58x7.5)	2
412	WPMS04122100	1ST STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
413	WPMI04132100	1ST STAGE BLADE SPRING GUIDE	Ø1.8/3 X 26(Ø2/3 x 26)	2
414	WPME04140800	2ND STAGE BLADE	36 X 41 X 7t(ROUND39x88x7.5)	2
415	WPMS04152100	2ND STAGE BLADE SPRING	W0.4 X Ø2.7/1.9 X 30L(SUS)	2
416	WPMI04162100	2ND STAGE BLADE SPRING	Ø1.8/3 X 26(Ø2/3 x 26)	2
501	WPMI05010800	2ND STAGE STATOR	FC-25(Φ88x61t)	1
502	WPMI05022100	VALVE GUIDE PIN (spring pin)	Ø3 X 20	2
503	WPRV05032100	2ND STAGE VALVE	Ø14.5 X 7(VITON)	1
504	WPMI05042100	2ND VALVE SPRING	W0.6 X Ø7.3/8.5 X 17L	1
505	WPMC05051800	SPRING SUPPORT SPACER(BRASS)	Ø17.5/10.5 X 5L	2
506	WPMI05061800	SPRING SUPPORT(for 2nd valve)	DIECAST(LARGE)	2
507	WPMIW5G00000	WASHER	Ø5(GEAR, SPRING)	1
508	WPMIM5X20HN	BOLT	M5 X 20	1
509	WPRSP6000000	O-RING	P-6(SILICON)	1
510	WPMI05102100	TAPER PIN(ONE SCREW)	Ø7 X 25L(M6)	2
511	WPMIM6000000	NUT	M6	2
512	WPMIM6X30HN	BOLT	M6 X 30	6
513	WPRSG1000000	O-RING	G-100(SILICON)	1
601	WPMI06010800	END PLATE	FC-25	1
606	WPMC06060800	NIPPLE	1/8"(L TYPE)2EA ASSEMBLED	2
607	WPMIM6X30HN	BOLT	M6 X 30	4
608	WPMI06080800	2ND DISCHARGE BAFFLE	170 X 180 X 1.2t	1

Part No.	Code No.	Description	Specif i cation	Qty
701	WPMA07010800	OIL BOX	DIECAST	1
703	WPRS07030800	O-RING(for oil box)	250 X 195 X 2.6t(D SHAPE)	1
704	WPMS07041500	OIL LEVEL PLATE SUS	10 X 95 X 0.2t	1
705	WPRS07052100	O-RING(for oil window)	112.5x2(S-75,SILICON)	1
706	WPRE07062100	OIL LEVEL WINDOW	34 X 122 X 3, PC	1

707	WPMZ07072100	OIL LEVEL BACK PLATE	DIECAST	1
708	WPMIM35X11C	BOLT	M3.5 X 11(CROSS, Ni-PLATED)	10
709	WPMA07090800	OIL DRAIN PLUG	M10(AL)	1
710	WPRSAN109000	O-RING(for drain plug)	AN-109(SILICON)	1
711	WPRSAN118000	O-RING(for oil filling plug)	AN-118(SILICON)	1
712	WPRE07122100	OIL FILLING PLUG	M24	1
713	WPRSP4500000	O-RING(for exhaust flange)	P-45(SILICON)	1
714	WPMA07141800	EXHAUST ASSEMBLY(OUTLET)	M52xP2.0+NW40,ANODIZED	1
714	WPMI07141400	EXHAUST ASSEMBLY(OUTLET)	CAP TYPE(ASS'Y STATUS)	1
715	WPRE0224N400	NW40 FLANGE CAP	NW-40(CAP)	1
716	WPMIM8X40HN	BOLT	M8 X 40	4
717	WPMA0717080	NAME PLATE	0.2t, AL STICKER	1

Part List (BOM LIST : NTRV100/180)

Part No.	Description	Qty
1	LV STATOR	1
2	LV ROTOR	1
3	LV VANE	2
4	LV BUFFLE	1
5	LV Ex V/V PLATE	1
6	LV Ex V/V PACKING	1
7	VALVE SPACER	5
8	INTER STAGE	1
9	OIL REGULATOR	1
10	HV STATOR	1
11	HV ROTOR	1
12	HV VANE	2
13	HV Ex V/V PLATE	1
14	HV Ex V/V PACKING	1
15	HV BUFFLE	1
16	BEARING WASHER	1
17	BUSH(1)	1
18	BUSH(2)	1
19	DRIVE MEMVEL	1
20	OIL VANE	1
21	PIN	8
22	DISTRIBUTOR BODY	1
23	DIS' UP PLATE	1
24	DIS' GUIDE SHAFT	1
25	DIS' PAD(1)	1
26	DIS' PAD(2)	1
27	DIS' PISTON	1
28	DIS' PLUG	1
29	DIS' PACKING(1)	1

30	DIS' PACKING(2)	1
31	FRONT PACKING	1
32	DIS' SPRING(1)	1
33	DIS' SPRING(2)	1
34	DIS' BUSH	1
35	INLET NOZZLE	1
36	INLET FLANGE	1
37	INLET PACKING	1
38	INLET FILTER	1
39	BUFFLE	1
40	BUFFLE SPONGE	1
41	BUFFLE SPACER	1
42	SPONGE SPACER	1
43	ADAPTER	1
44	MOTOR MAINTAIN	1
45	SIDE PANEL(A)	1
46	SIDE PANEL(B)	1
47	OIL BOX GASKET	1
48	GASBALLAST PIPE	1

Part No.	Description	Qty
48	GASBALLAST PIPE	1
49	GASBALLAST BODY	1
50	GAS' HANDLE	1
51	GAS' SHAFT	1
52	GAS' BUSH	1
53	GAS' SETPIS	1
54	GAS' SPRING	1
55	OIL BOX	1
56	SIDE GLASS	1
57	SIDE GLASS B.K.T	1
58	NIPPLE	1
59	FRONT BEARING	1
60	OIL VANE HOUSING	1
61	OIL STRAINER	1
62	OIL FILTER A/T	1
63	FILTER NIPPLE	1
64	SET SCREW	1
65	FAN	1
66	MOTOR COUPLING	1
67	R/P COUPLING	1
68	COUPLING PAD	1
69	COUPLING COLLAR	1
70	BASE	1
71	BASE PAD	4
72	PAD COLLAR	16

73	SPEC LABEL	1
74	SIDE PANEL STICKER(A)	1
75	SIDE PANER STICKER(B)	1
76	MOTOR NAME PLATE	1
77	WIRE STICKER	1
78	WIRE STICKER	1
79	NOTICE STICKER(1)	1
80	NOTICE STICKIER(2)	1
81	ROTATION STICKER	1
82	OPEN/CLOSE STICKER	1
101	MOTOR	1
102	OIL FILTER	1
103	BALL BEARING	2
104	OIL SEAL	1
105	OIL SEAL	1
106	OIL SEAL	1
107	SNAP RING	1
108	SNAP RING	1
109	SNAP RING	1
110	KEY	1
111	OIL PLUG	1
113	RING JOINT	1
114	RING JOINT	1

Part No.	Description	Qty
115	STEEL BALL	1
116	SPRING PIN	1
117	SPRING	1
118	BALL VALVE	1
119	SET SCREW	1
120	SPRING PIN	1
121	WAVE WASHER	5
122	KEY	1
201	WRENCH BOLT	1
202	WRENCH BOLT	6
203	WRENCH BOLT	6
204	WRENCH BOLT	13
205	WRENCH BOLT	9
206	WRENCH BOLT	4
207	WRENCH BOLT	1
208	WRENCH BOLT	4
209	WRENCH BOLT	6
210	WRENCH BOLT	13
211	WRENCH BOLT	4

212	ROUND HEAD WRENCH BOLT	2
213	WRENCH BOLT	9
214	ROUND HEAD BOLT(+)	6
215	WRENCH BOLT	2
216	ROUND HEAD WRENCH BOLT	28
217	SET SCREW	10
218	SEAL WASHER	5
219	SEAL WASHER	6
220	SPRING WASHER	5
221	PLAIN WASHER	11
222	TOOTHED LOCK WASHER	6
223	HEXAGON NUT	2
224	SPRING WASHER	2
225	PLAIN WASHER	20
226	EYE BOLT	2
301	O-RING	1
302	O-RING	2
303	O-RING	1
304	O-RING	1
305	O-RING	1
306	O-RING	1
307	O-RING	2
308	O-RING	2
309	O-RING	1
310	O-RING	2
311	O-RING	2
312	O-RING	1
313	O-RING	1
314	O-RING	1
315	O-RING	1

7 Accessories

7.1Service Kit

No	C/N	Description	Qty	Standard	Remarks
1	203	OIL SEAL(FOR BODY)	1	S Ø25/15x5t	Minor and Major
2	204	CENTER RING(SLEEVE)	1	Ø30 x 12	Minor and Major
3	205	OIL SEAL(FOR BODY)	1	S Ø25/15x5t	Minor and Major
4	214	O-RING	1	AN-008(SILICON)	Minor and Major
5	215	O-RING(for body)	1	P-8(SILICON)	Minor and Major
6	220	O-RING	2	P-14(silicon)	Minor and Major

7	227	O-RING	1	P-8(SILICON)	Minor and Major
8	303	OIL SEAL(for 1st block)	1	S Ø32xØ22x7t	Minor and Major
9	314	O-RING	2	P-3(silicon)	Minor and Major
10	319	DISTRIBUTER VALVE(circle rubber)	1	26x6.2x1.5(VITON)	Minor and Major
11	334	O-RING	1	P-3(silicon)	Minor and Major
12	710	O-RING	1	G-55(SILICON)	Minor and Major
13	711	O-RING	1	P-8(SILICON)	Minor and Major
14	503	2ND STAGE VALVE	1	Ø14.5 X 7(VITON)	Minor and Major
15	509	O-RING	1	P-6(silicon)	Minor and Major
16	513	O-RING(for body)	1	G-45(SILICON)	Minor and Major
17	703	O-RING(FOR OIL BOX)	1	AN-160(silicon)	Minor and Major
18	705	O-RING(FOR WINDOW)	1	G-50(silicon)	Minor and Major
19	706	OIL WINDOW	1	PC,15x76.5x3t	Minor and Major
20	710	O-RING	1	P-7(silicon)	Minor and Major
21	711	O-RING(for oil filling plug)	1	AN-118(SILICON)	Minor and Major
22	713	O-RING(for exhaust flange)	1	Ø30/20.5 X 2.5t(NBR)	Minor and Major
Minor Kit (No.1~22)					
23	322	DISTRIBUTER SPRING	1	W0.6 x Ø16/17.2 x 14L	Major only
24	410	OIL PUMP BLADE	1	5X5X17.7	Major only
25	411	1ST STAGE BLADE	2	25 x 24 x 6t	Major only
26	412	1ST STAGE BLADE SPRING	2	W0.4 X Ø2.7/1.9 X 30L(SUS)	Major only
27	413	1ST STAGE BLADE SPRING GUIDE	2	Ø1.8/3 X 26(Ø2/3 x 26)	Major only
28	414	2ND STAGE BLADE	2	20 x 18.5 x 6t	Major only
29	415	2ND STAGE BLADE SPRING	2	W0.4 X Ø2.7/1.9 X 30L(SUS)	Major only
30	416	2ND STAGE BLADE SPRING GUIDE	2	Ø1.8/3 X 26(Ø2/3 x 26)	Major only
31	504	2ND VALVE SPRING	2	W0.6 X Ø7.3/8.5 X 17L	Major only
Major Kit (No.1~31)					

7.2 Accessories List

Product	Item	Specification	Remark
Oil Mist Trap	**Oil Filter Element-150(PC)**	NW25	Outlet Filter
	Oil Filter Element-150(Metal)		
	Oil Filter Element-250(Metal)		
	Oil Filter Element-250(PA)	NW40	
	Oil Filter Element-350(Metal)		
	Oil Filter Element-450(Metal)		
Material Filter (Dust Filter)	**Dust Filter Element-250**	NW25	Inlet Filter
	Dust Filter Element-400	NW40	
Clamp	**Clamp**	NW16 / NW25 / NW40 / NW50	In/Outlet pipe connection
Centering	**Centering - NBR**	NW16 / NW25 / NW40 / NW50	Clamp fitting sealing
	Centering - Viton		
Hose Nipple	**Hose Nipple**	NW25 - Φ12 / Φ16 / Φ26 , NW40 - Φ36	for vacuum hose fitting
PT Nipple	**PT Nipple**	1/4 , 3/8 , 1/2 , 3/4 , 1 for NW25	Screw Nipple
Reducer	**Reducer**	VG50-NW25 / VG150-NW25 NW25-NW16/NW40-NW25/NW50-NW40	Adjust In/outlet size
Angle Valve	**Air single bellows**	NW25 / NW40	
	Air single O-ring		
	Air double bellows		
	Air double O-ring		
	Manual bellows		
	Manual O-ring		
Auto Vent Valve	**Auto Vent Valve**	NW25 / NW40	
Sol Valve	**Sol Valve**	NW25 / NW40	
Z-Line Valve	**Manual O-ring**	NW25 / NW40	
	Manual bellows		
Vacuum Hose	**Vacuum Hose**	Φ8 / Φ13 / Φ20 / Φ32	Soft rubber hose
Bellows	**Bellows**	NW16 / NW25 / NW40 / NW50	Metal pipe to suspend
Blank	**Blank**	NW16 / NW25 / NW40 / NW50	Metal lid to end fitting
Cross	**Cross**	NW16 / NW25 / NW40 / NW50	Cross Fitting

Elbow	**Elbow**	NW16 / NW25 / NW40 / NW50	Elbow Fitting
Tee	**Tee**	NW16 / NW25 / NW40 / NW50	T-shape Fitting
Welding Flange	**Welding Flange**	NW16/NW25/NW40/NW50-15mm/30mm	For welding