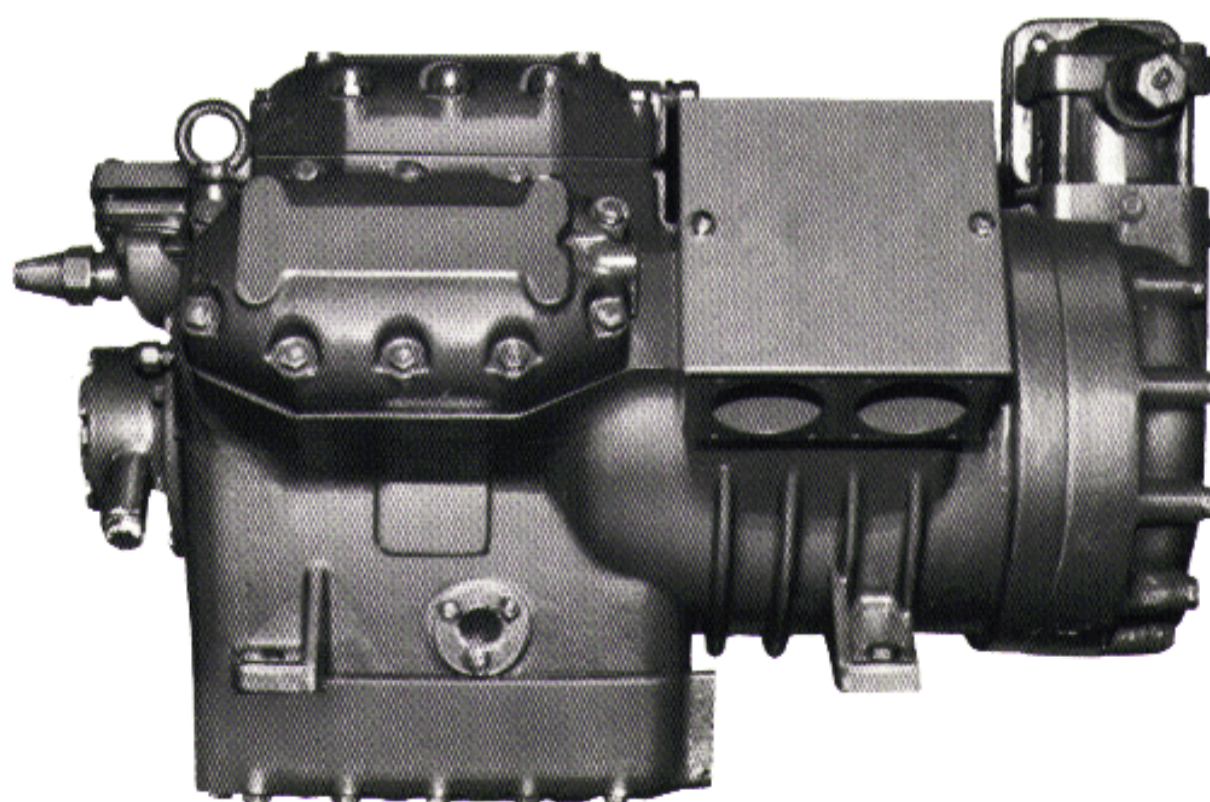


Service Manual

H 74 Compressors



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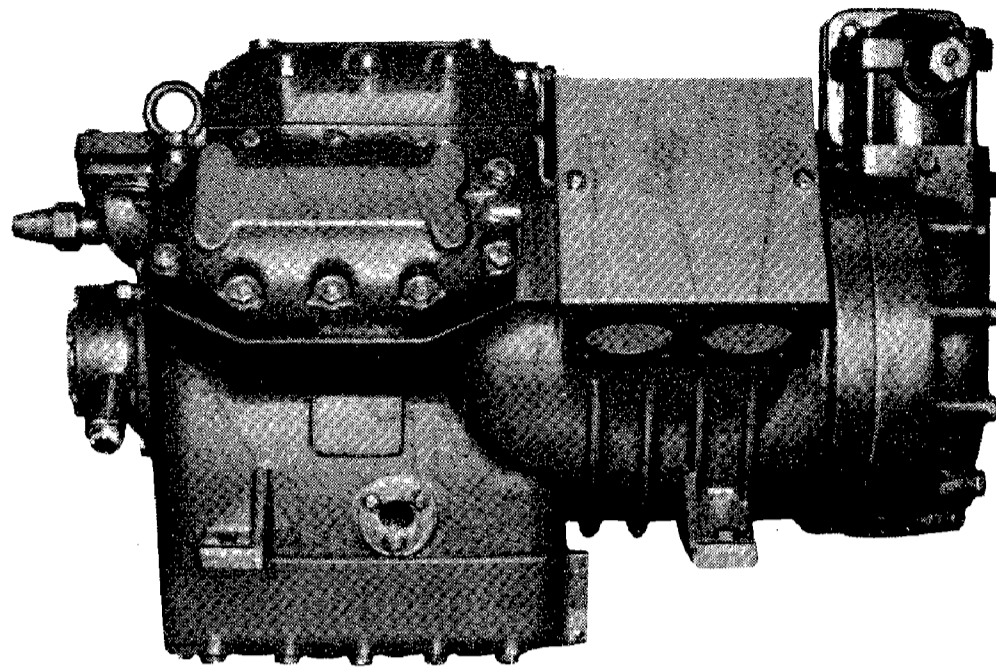
1. Specifications

	4H74FA	4H74MA	4H74TA	6H74FA	6H74MA	6H74TA	8H74JA	8H74QA	8H74WA
Cylinders	4			6			8		
Bore (mm)	74								
Stroke (mm)	45	52	60	45	52	60	52	60	68
Volume (cc)	773.8	894.1	1031.7	1160.6	1341.2	1547.5	1788.2	2063.4	2338.5
Arrangement	90° V Type			60° W Type			45° VV Type		
Speed (rpm)	1450/1750								
*1 Displacement (m ³ /H)	67.32/81.24	77.79/93.88	89.76/108.33	100.98/121.87	116.68/140.82	134.63/162.49	155.58/187.77	179.51/216.65	203.45/245.54
Motor	4 pole, 3 phase, induction motor								
Rated output (kW)	15	19	22	22	26	30	30	37	45
Capacity control (%)	100, 50			100, 66, 33			100, 75, 50, 25		
Refrigerant	R 22 (R 12, R 502)								
Refrigeration oil	SUNISO 3 GSD								
Charge (ℓ)	5			8			8		
Lubrication method	Forced lubrication by trochoid pump (Reversible)								
Discharge pipe connection (mm)	φ 31.8 Copper tube			φ 38.1 Copper tube			φ 44.5 Copper tube		
Suction pipe connection (mm)	φ 44.5 Copper tube			φ 50.8 Copper tube			φ 63.5 Copper tube		
Weight (kg)	195	200	205	232	237	245	330	340	350

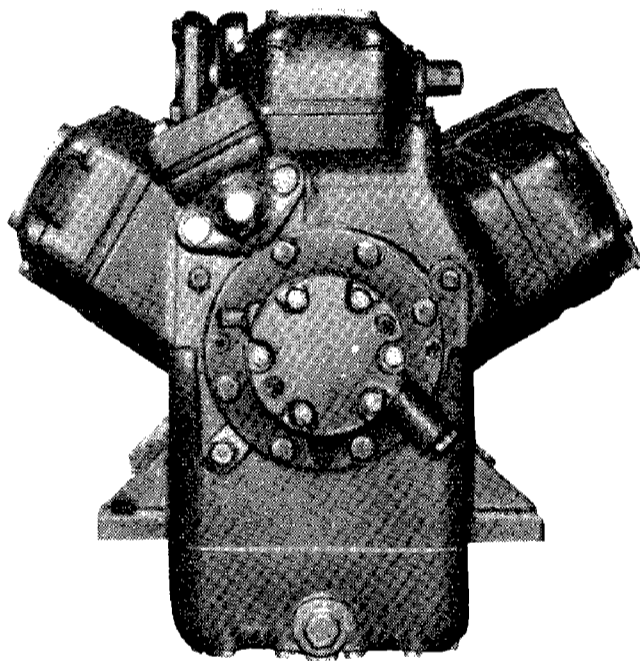
*1 Displacement (m³/H)=Cylinder volume (cc)×Speed (rpm) ×60×10⁻⁶

2. External views

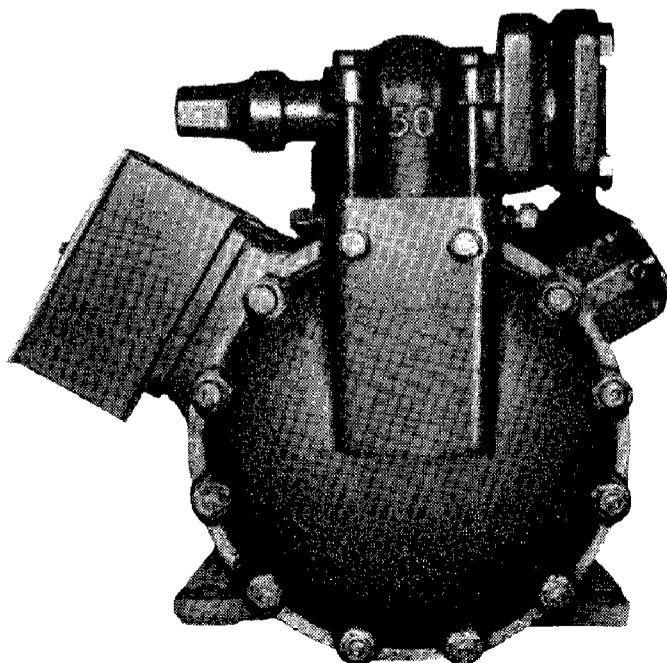
Front



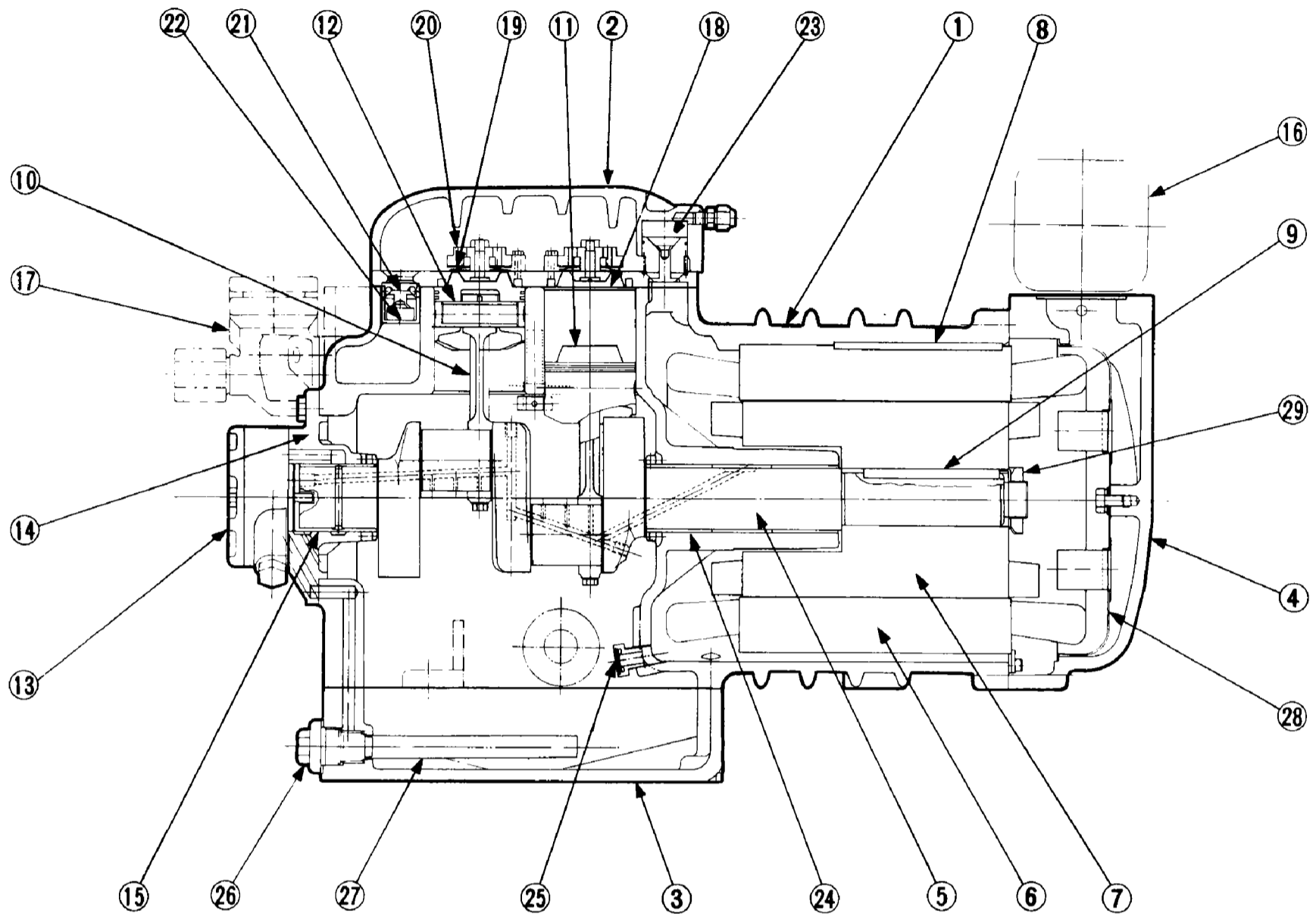
Pump side



Motor side



3. Sectional view

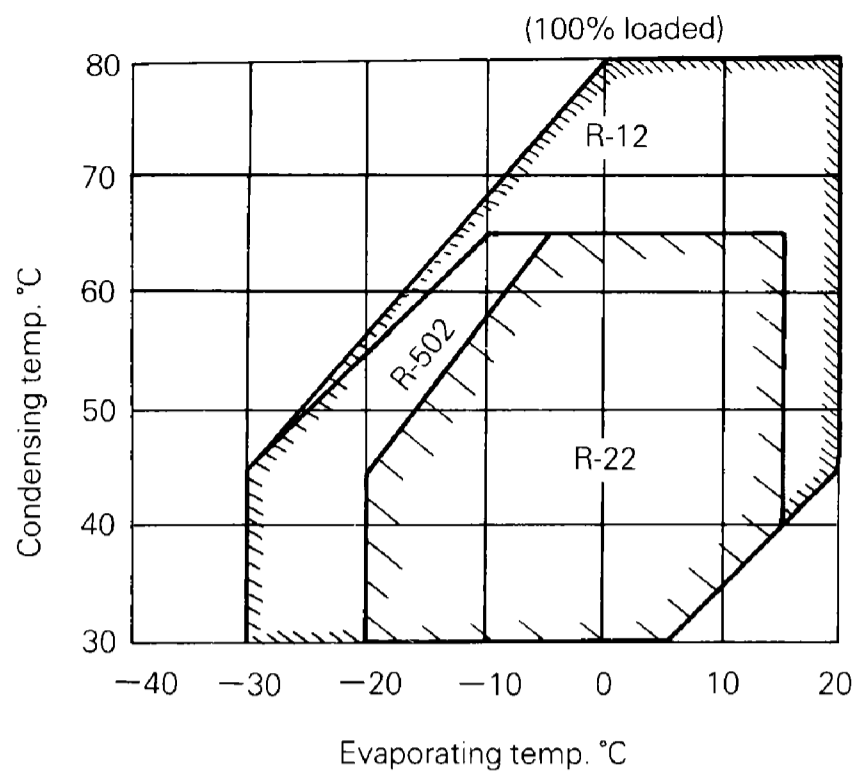


- ① Frame
- ② Cylinder head cover
- ③ Bottom cover
- ④ Side cover
- ⑤ Crankshaft
- ⑥ Stator
- ⑦ Rotor
- ⑧ Stator key
- ⑨ Rotor key
- ⑩ Connecting rod

- ⑪ Piston
- ⑫ Piston pin
- ⑬ Oil pump assembly
- ⑭ Bearing on oil pump side
- ⑮ Bearing metal on oil pump side
- ⑯ Suction stop valve
- ⑰ Discharge stop valve
- ⑱ Suction valve plate
- ⑲ Discharge valve plate
- ⑳ Discharge valve gland

- ㉑ Check valve
- ㉒ Check valve cylinder
- ㉓ Unloader piston
- ㉔ Bearing metal on motor side
- ㉕ Oil check valve
- ㉖ Oil drain plug
- ㉗ Oil suction filter
- ㉘ Suction filter
- ㉙ Crankshaft lock nut

4. Operating limits



NOTES:

- (1) Ambient temperature: $-10 \sim 55^{\circ}\text{C}$
- (2) Inclination: $\leq \pm 10^{\circ}$
- (3) ON-OFF operation: ≤ 6 times/hr.
- (4) ON-OFF frequency: $\leq 100,000$ times

Conditions: (R-22)

Discharge gas temperature: Max. 130°C
Oil temperature: Max. 80°C
Suction super heat: Max. 5°C

Conditions: (R-12)

Discharge gas temperature: Max. 120°C
Oil temperature: Max. 80°C
Suction super heat: Max. 5°C

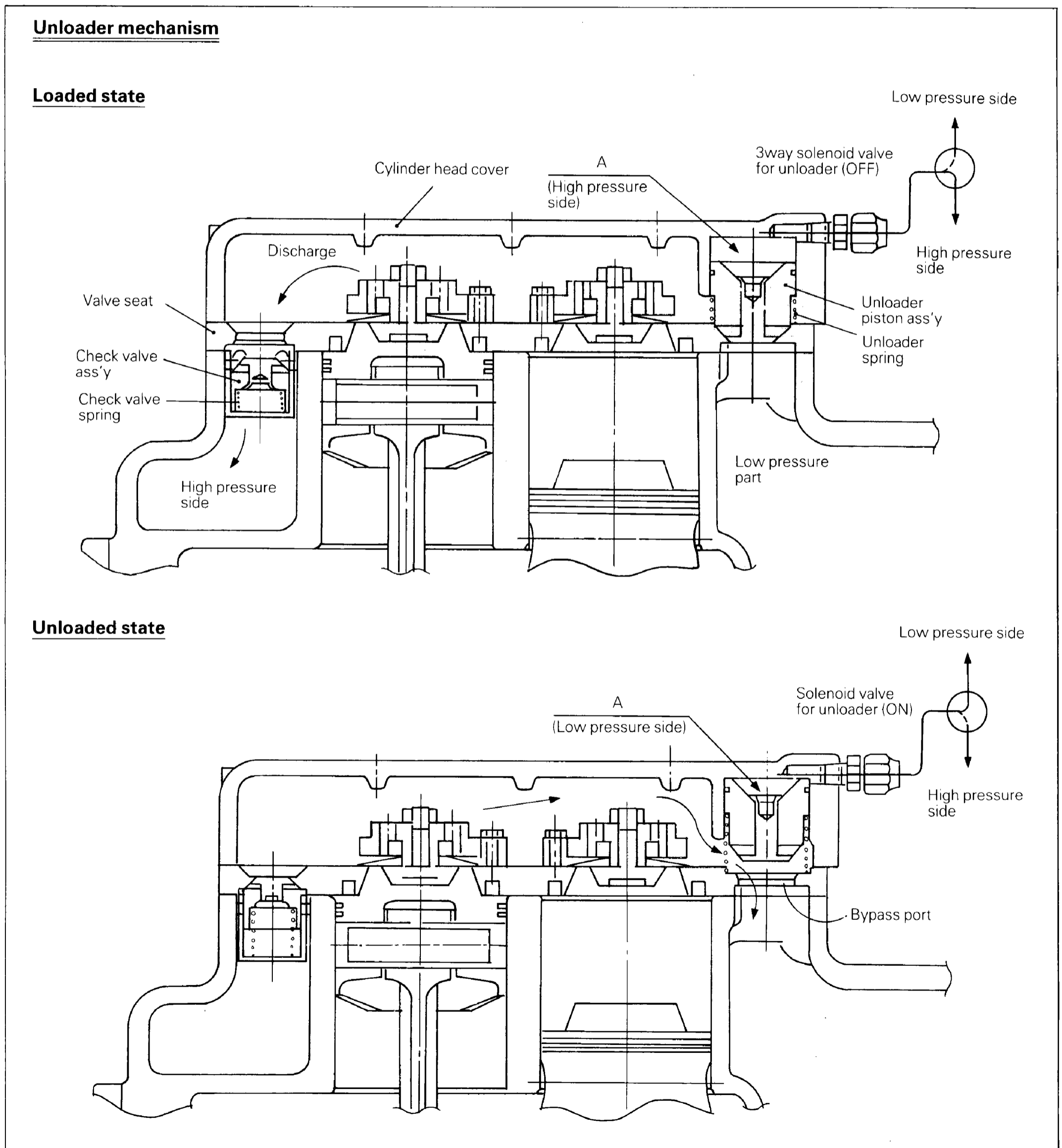
Conditions: (R-502)

Discharge gas temperature: Max. 130°C
Oil temperature: Max. 80°C
Suction super heat: Max. 5°C

5. Unloader mechanism

The unloader mechanism bypasses gas discharged from the specified cylinder to the low pressure side by means of a solenoid valve. Fig. 1 shows the loaded state of the mechanism; i.e. when a pressure difference of over 3kg/cm^2 acts on the pilot chamber (A) of the unloader piston assembly. The unloader piston overcomes the thrust of the unloader piston spring and blocks the bypass port, so gas is discharged to the high pressure side.

Fig. 2 shows the unloaded state (including stopping state); i.e. the thrust of the unloader piston spring opens the bypass port by pushing the unloader piston assembly into the pilot chamber (A), so discharge gas bypasses to the low pressure side. The check valve prevents high pressure gas from other loaded cylinders from flowing back into the cylinder head cover. Change-over from high to low pressure and vice versa is performed by a 3-way solenoid valve. One valve is required per pair of cylinders.



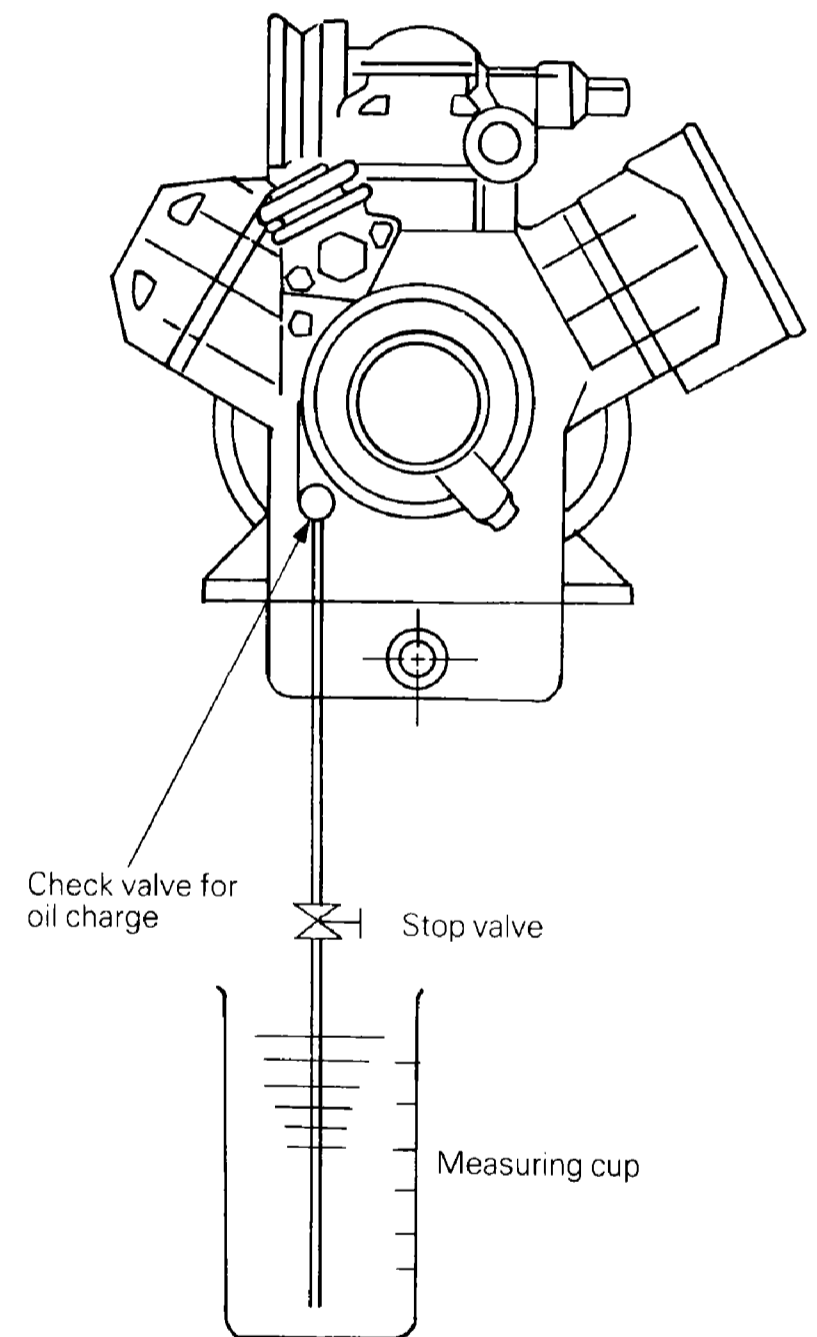
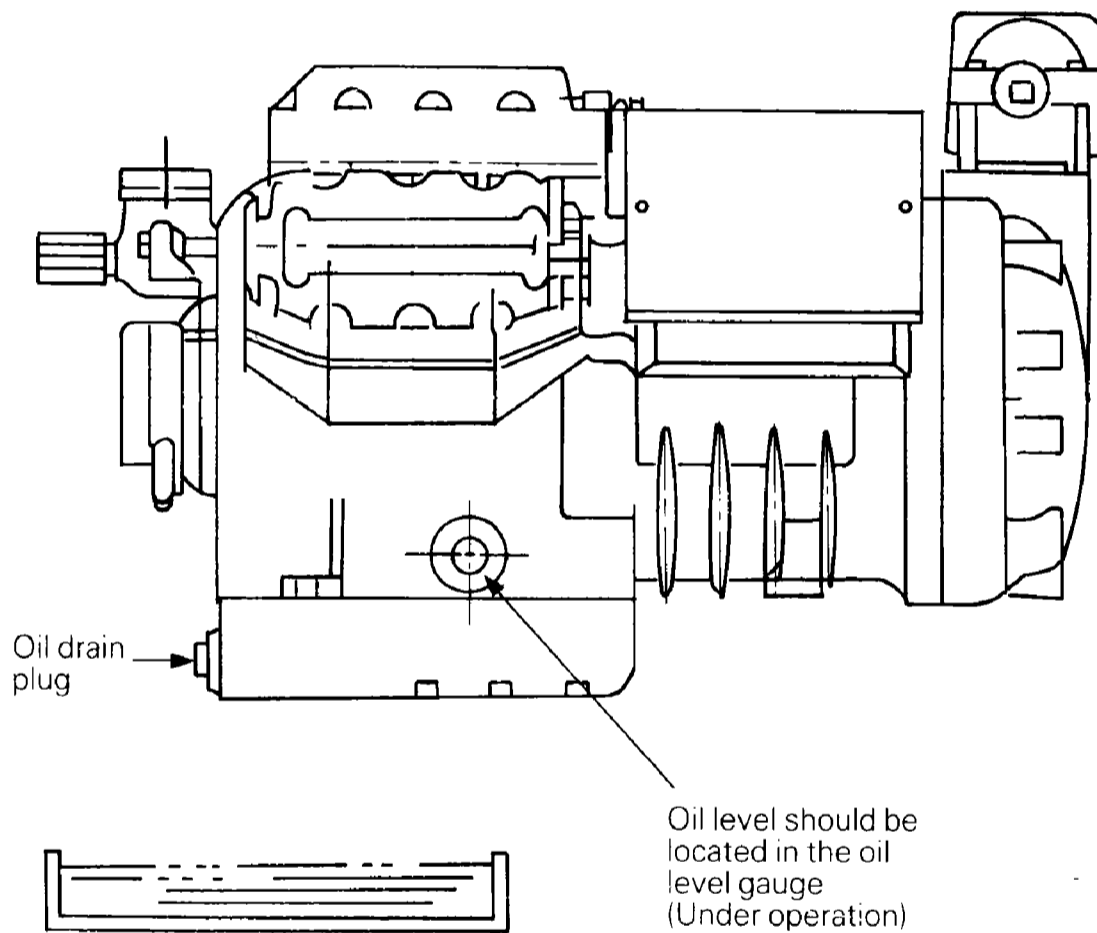
6. Oil change

Points of oil change

Oil should be clean all the times. If oil becomes black, stop operation at once, and change oil. Inspect oil colour after 48 hours of operation and confirm that oil remains new. If oil has become black, it is advisable to change oil again. If the crankcase is cleaned as stated below, life of oil is prolonged.

- 1) Energize the crankcase heater at least 6 hours before and pump down refrigerant and release internal pressure of the compressor.
(In case the compressor is stopped, wait until oil level becomes stable before pump down.)
- 2) Extract old oil from the oil drain plug.
- 3) Inspect the oil filters.

- 4) Tighten up the oil drain plug.
- 5) Inspect the refrigeration system for leakage.
- 6) Connect a hose to the joint with check valve for oil charge and put the other end of pipe into oil.
- 7) Evacuate the refrigeration system with a vacuum pump.
- 8) Suck oil into the crankcase through the hose.
- 9) Charge oil until extracted volume of oil is drawn in, reading the oil level gauge.
- 10) Extract air until vacuum degree becomes -760mmHg with a vacuum pump.
- 11) Release pump down.
- 12) Check oil level and oil pressure in normal operation state.



7. Overhaul

(1) Recommended intervals

Suction valve Discharge valve Valve spring	7500 hrs
Piston ring	15000 hrs
Crankshaft metal Crankpin metal	15000 hrs
Piston Piston pin	30000 hrs

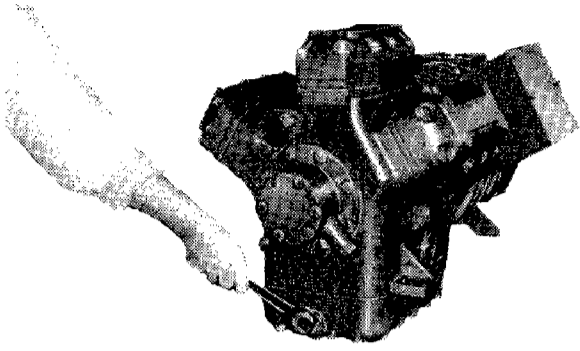

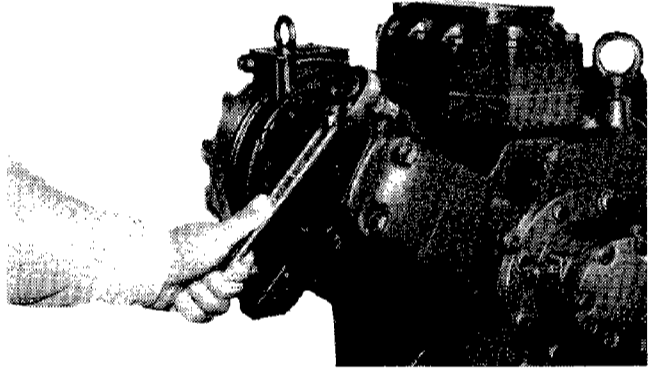
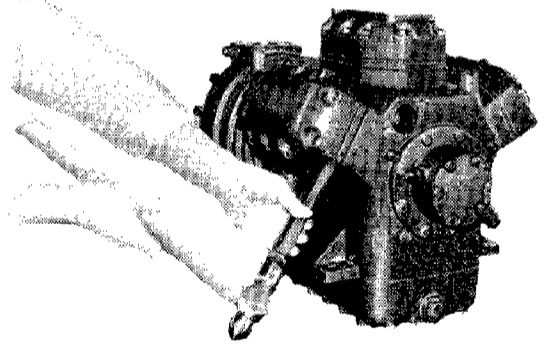
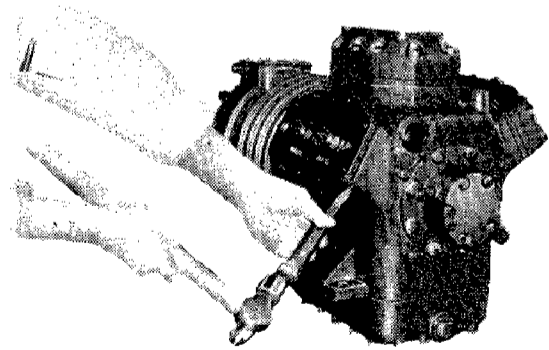
Recommended intervals are based on normal operating conditions, so use them merely as guides for stocking spares. Actual required intervals may vary considerably depending on such factors as kind of refrigerant, condensing temperature, evaporating temperature super heat degree, speed and so on.

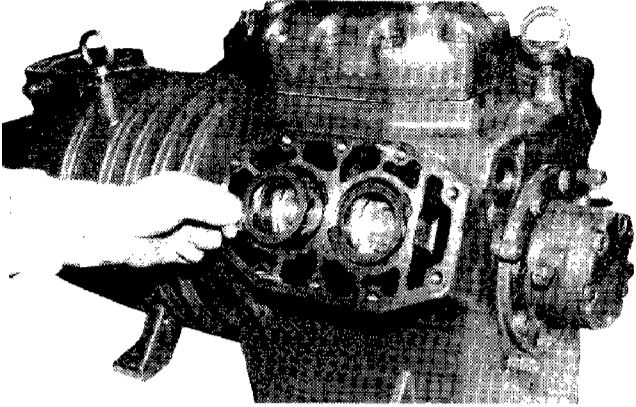
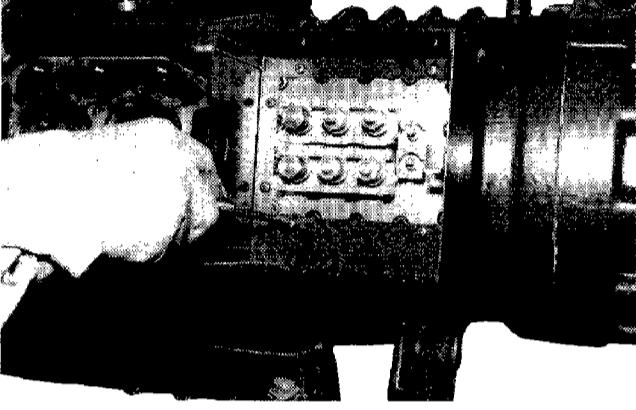
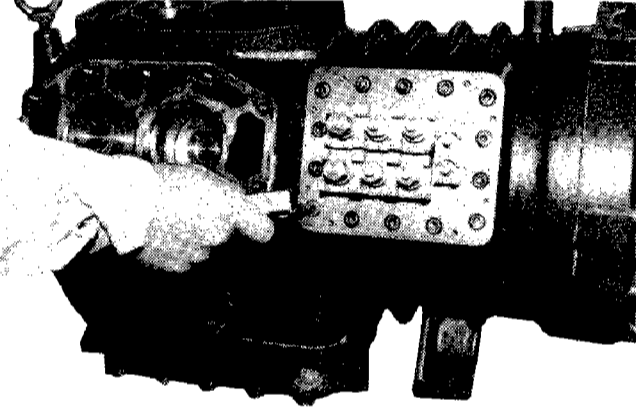
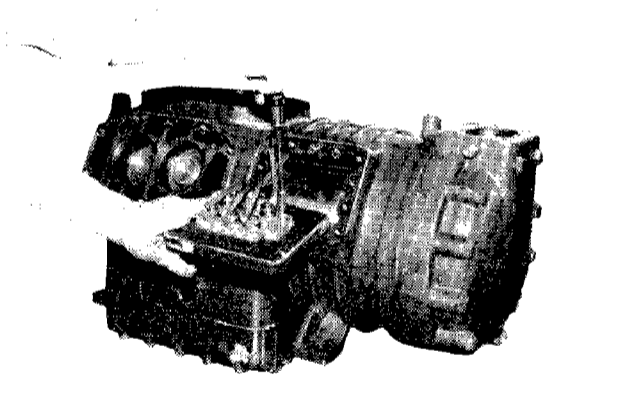
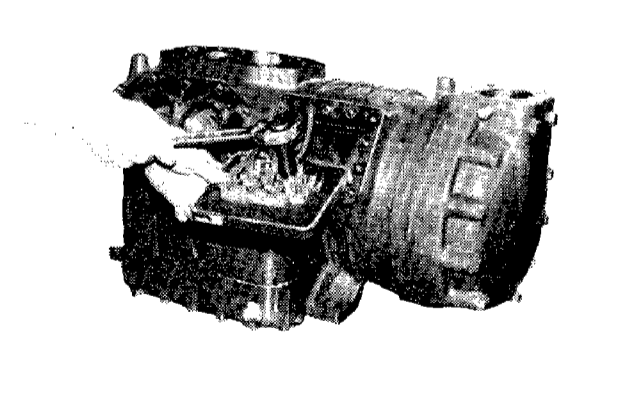
Only experience will help you determine these intervals more accurately.

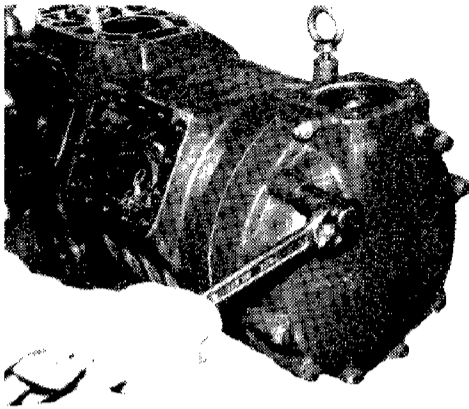
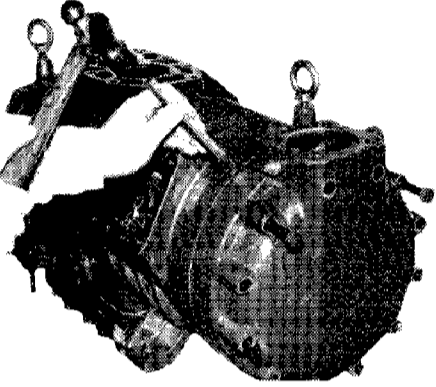
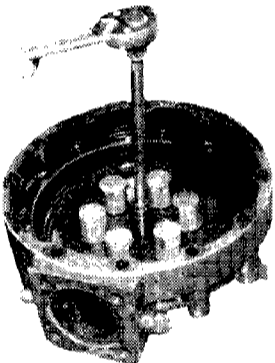
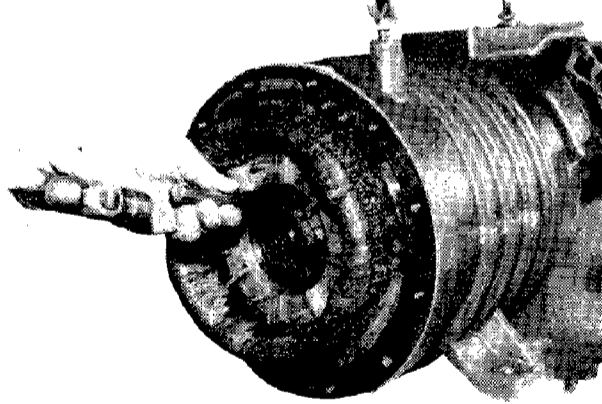
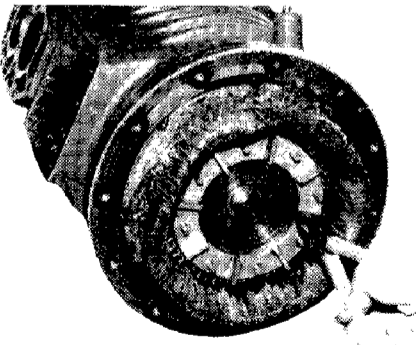
(2) Repairing standards of compressor parts

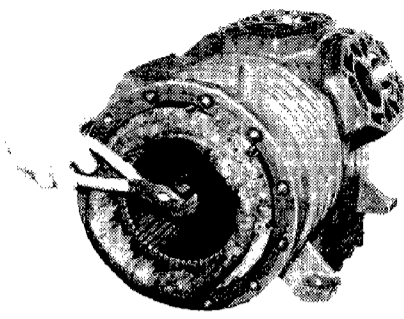
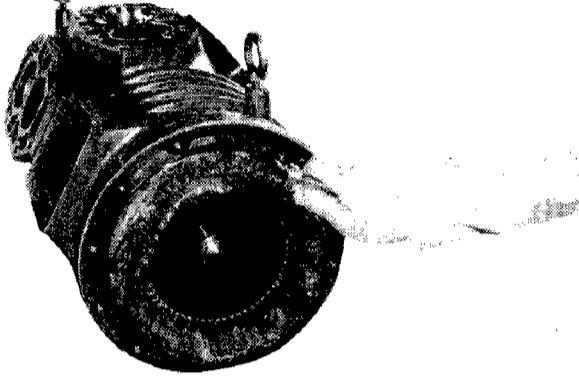
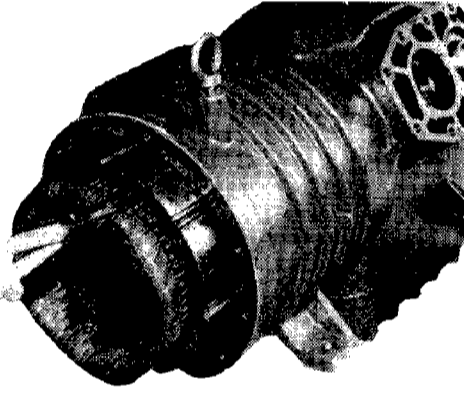
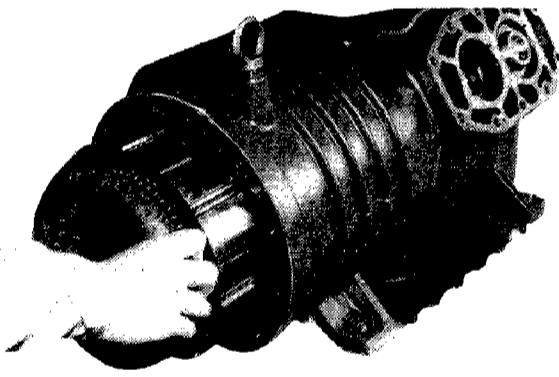
Models	4, 6H74*A	8H74*A
Cylinder bore	$\phi 74^{+0.030}_0$	
External dia. of piston skirt	$\phi 74^{-0.130}_{-0.150}$	
Standard clearance	0.130~0.180	
Critical clearance	0.35 or more	
Critical wear of cylinder bore	0.10	
Critical wear of piston	0.20	
External dia. of piston pin	$\phi 20^0_{-0.010}$	
Dia. of piston pin hole	$\phi 20^{+0.013}_0$	
Standard clearance	0~0.023	
Critical clearance	0.14 or more	
Critical wear of piston pin	0.05	
Internal dia. of hole on rod small end	$\phi 20^{+0.030}_{+0.015}$	
Standard clearance	0.015~0.040	
Critical clearance	0.14 or more	
Critical wear of small-end hole	0.05	
External dia. of crankpin	$\phi 49^{-0.035}_{-0.050}$	$\phi 54^{-0.035}_{-0.050}$
Internal dia. of crankpin metal	$\phi 49^{+0.026}_{-0.005}$	$\phi 54^{+0.026}_{-0.005}$
Standard clearance	0.030~0.076	0.030~0.076
Critical clearance	0.19 or more	0.19 or more
Critical wear of crankpin	0.05	0.05
Critical wear of crankpin metal	0.10	0.10
Diameter of crankshaft	$\phi 50^{-0.075}_{-0.090}$	$\phi 56^{-0.075}_{-0.090}$
Internal dia. of main shaft bearing metal	$\phi 50^{+0.025}_{+0.005}$	$\phi 56^{+0.025}_{+0.005}$
Standard clearance	0.080~0.115	0.080~0.115
Critical clearance	0.2 or more	0.2 or more
Critical wear of crankshaft bearing	0.05	0.05
Critical wear of main shaft bearing	0.10	0.10
Width of piston ring	$2.0^{-0.010}_{-0.030}$	
Width of ring groove	$2.0^{+0.020}_0$	
Abutment clearance of ring	0.20~0.40	
Standard clearance	0.010~0.050	
Critical clearance	0.15 or more	

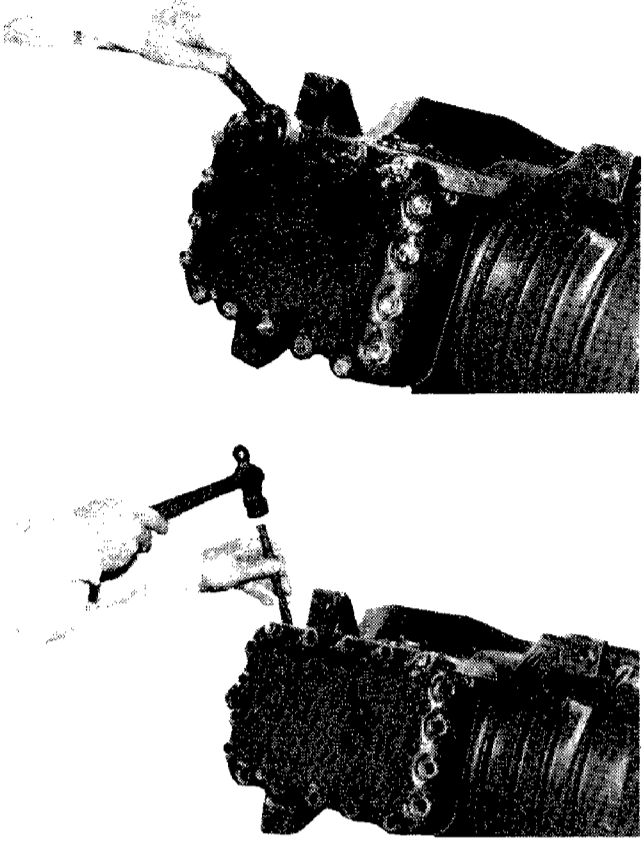
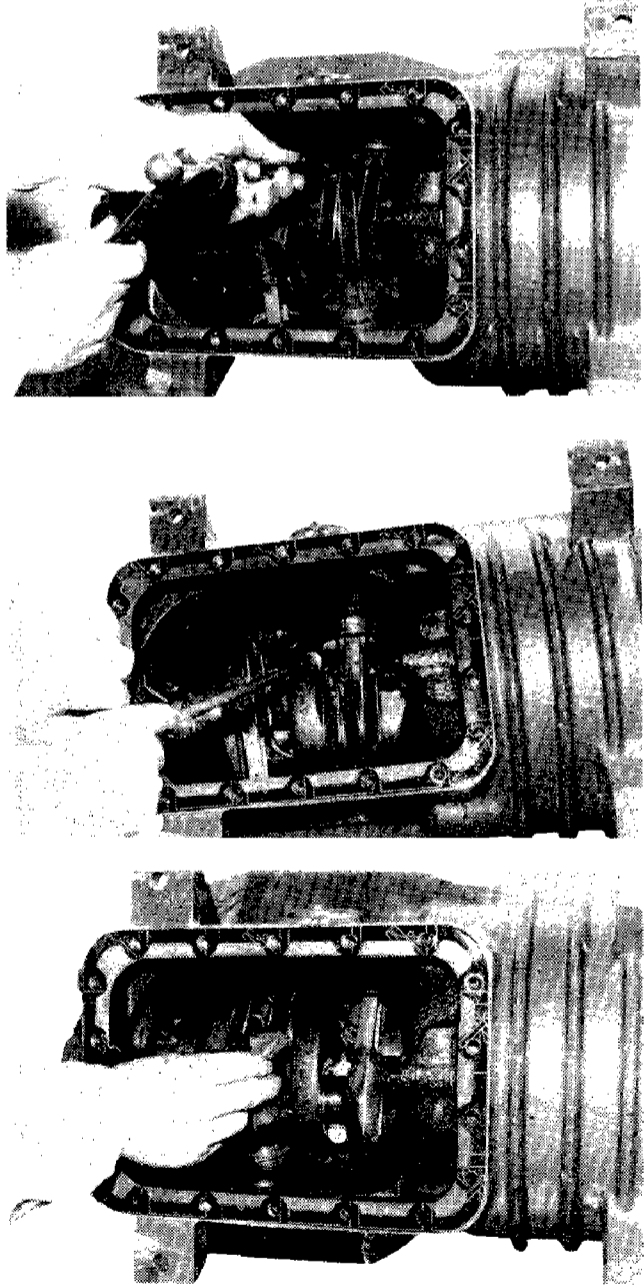
8. Dismantling

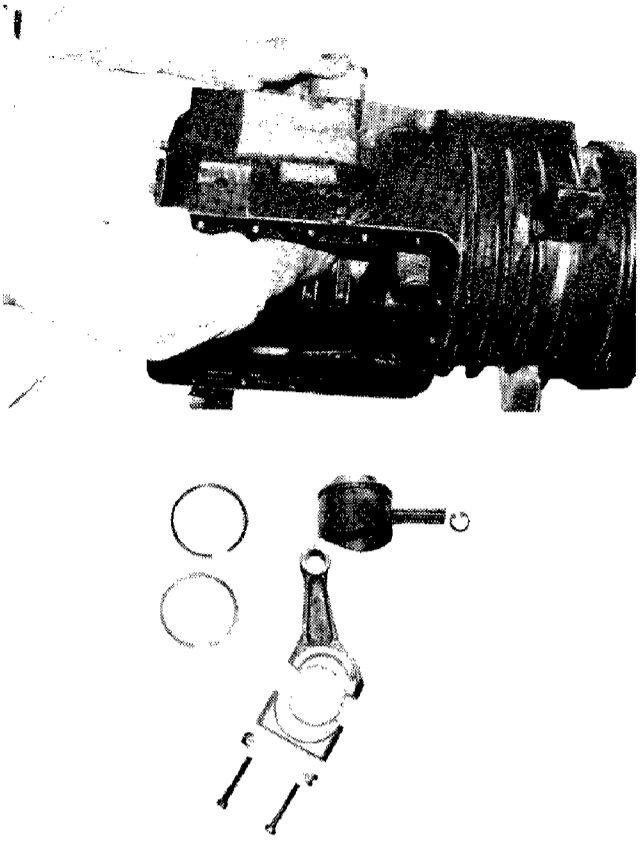
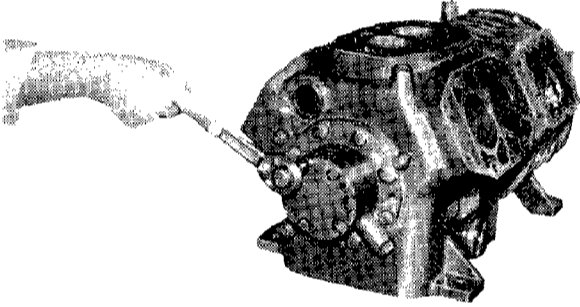
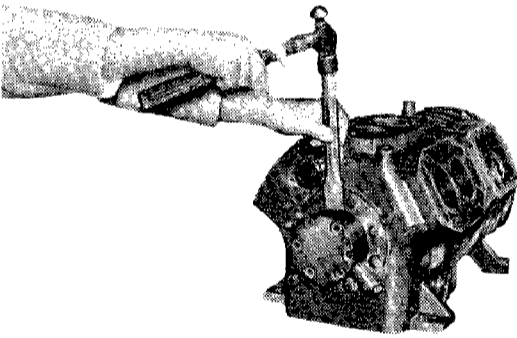
Items	Steps	Notes	Required tools
<p>1. Oil draining</p>  	<p>① Release remaining pressure.</p> <p>② Remove the oil drain plug.</p> <p>③ Drain all oil.</p> <p>④ Remove the oil filter and spring.</p>	<ul style="list-style-type: none"> • Release it from the high and low pressure gauge ports. • Do not lose the gasket. • Do not lose the oil filter spring. 	<p>24mm box wrench or spanner</p>
<p>2. Remove the cylinder head cover and valve seat.</p>   	<p>① Remove the set bolts from the cylinder head cover.</p> <p>② Remove the cylinder head cover from the valve seat.</p> <p>③ Remove the valve seat.</p> <p>④ Take out the positioning pin for valve seat.</p>	<ul style="list-style-type: none"> • Remove all bolts except two which are arranged diagonally. • Loosen the remaining two bolts gradually. • If it is hardly removed, lightly insert a chisel between the cover and the frame. • Do not impair the seat surface. • Do not lose the pin. 	<p>17mm box wrench</p> <p>Chisel, Hammer</p>

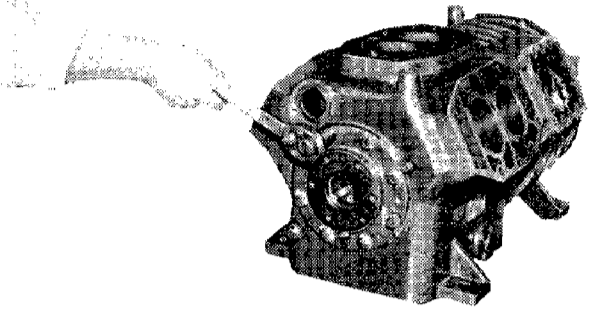
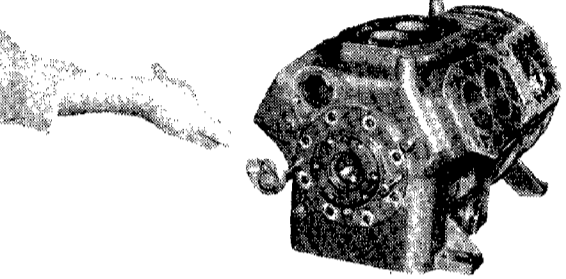
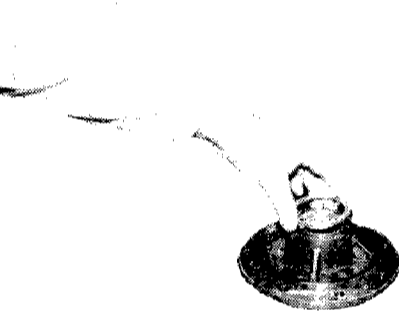
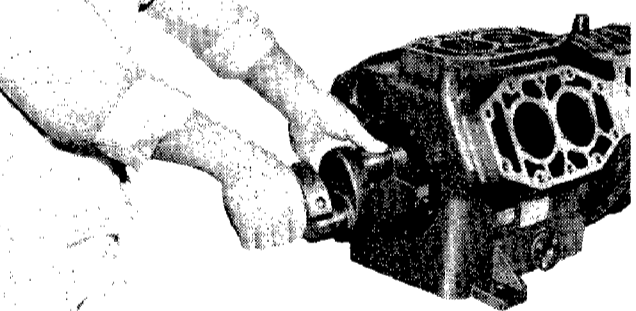
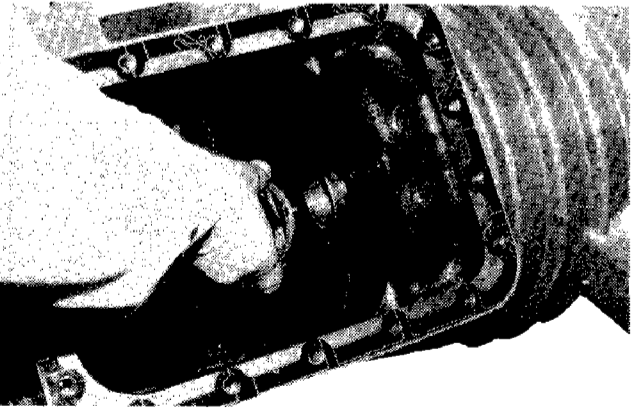
Items	Steps	Notes	Required tools
	<p>⑤ Remove the suction valve plate.</p>		
<p>3. Remove the terminal strip.</p>			
	<p>① Remove the set bolts from the terminal cover.</p>		<p>+(plus) screwdriver</p>
	<p>② Remove the set bolts from the terminal strip.</p>	<ul style="list-style-type: none"> • Do not perform the following steps so long as replacement of the stator is not necessary. 	<p>6mm hexagonal socket-wrench</p>
	<p>③ Pull out the terminal strip lightly toward you.</p>		
	<p>④ Loosen the nuts for lead wires of the terminal strip (both protector and main nuts), and take out the terminal strip.</p>	<ul style="list-style-type: none"> • Do not lose the nuts and washers. • Grip the terminal strip and pull out the strip so as not to impair the lead wires. 	<p>8mm box wrench 17mm box wrench</p>

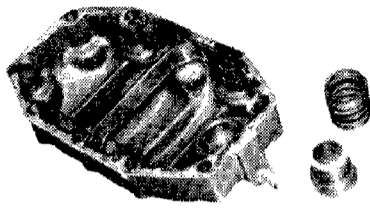

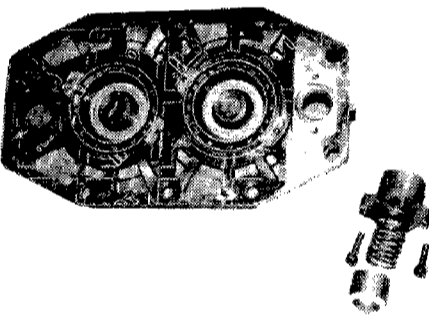


Items	Steps	Notes	Required tools
<p data-bbox="140 296 740 376">4. Remove the side cover and suction filter</p>   	<ol style="list-style-type: none"> <li data-bbox="778 405 1161 485">① Remove the set bolts from the side cover. <li data-bbox="778 802 1093 882">② Remove the side cover. <li data-bbox="778 1296 1161 1414">③ Remove the set bolts from the suction filter. 	<ul style="list-style-type: none"> <li data-bbox="1208 414 1655 532">• Loosen the two bolts at the top and remove the other bolts. <li data-bbox="1208 811 1655 1267">• If it is hardly removed, insert a chisel between the cover and the frame. • Do not impair the seat surface. • Make sure that the side cover comes off from the frame, and remove it. Remove it toward you so as not to impair the coil end of the stator. <li data-bbox="1208 1305 1655 1375">• Do not impair the filtering net or deform it. 	<p data-bbox="1693 414 1868 485">17mm box wrench</p> <p data-bbox="1693 811 1949 852">Chisel, Hammer</p> <p data-bbox="1693 1305 1966 1422">17mm box wrench or universal wrench</p>
<p data-bbox="140 1722 651 1802">5. Take out the motor, rotor and stator.</p>  	<ol style="list-style-type: none"> <li data-bbox="778 1825 1134 1943">① Set up the lock washer at the crankshaft lock nut. <li data-bbox="778 1958 1134 2037">② Loosen the crankshaft lock nut. <li data-bbox="778 2222 1115 2263">③ Take out the rotor. 	<ul style="list-style-type: none"> <li data-bbox="1208 2222 1570 2263">• Do not drop the rotor. 	<p data-bbox="1693 1825 1949 2119">Chisel, Hammer For 4.6H: 55mm box wrench or pipe wrench For 8H: 60mm box wrench or pipe wrench</p> <p data-bbox="1693 2222 1783 2263">Pliers</p>

Items	Steps	Notes	Required tools
	<p>④ Remove the rotor.</p>		Pliers
	<p>⑤ Remove the set bolts from the motor fixture.</p> <p>⑥ Take out the motor fixture and washer.</p>	<ul style="list-style-type: none"> • Do not remove them so long as replacement of the stator is not necessary. • Carefully handle them so as not to lose, because they are small parts. 	5mm hexagonal-socket wrench
	<p>⑦ Pull out the stator a little.</p> <p>⑧ Take out the stator key.</p>		Pliers
	<p>⑨ Pull out the stator.</p>	<ul style="list-style-type: none"> • Do not drop the stator. • Note that the lead wires are not caught by the terminal holes. 	

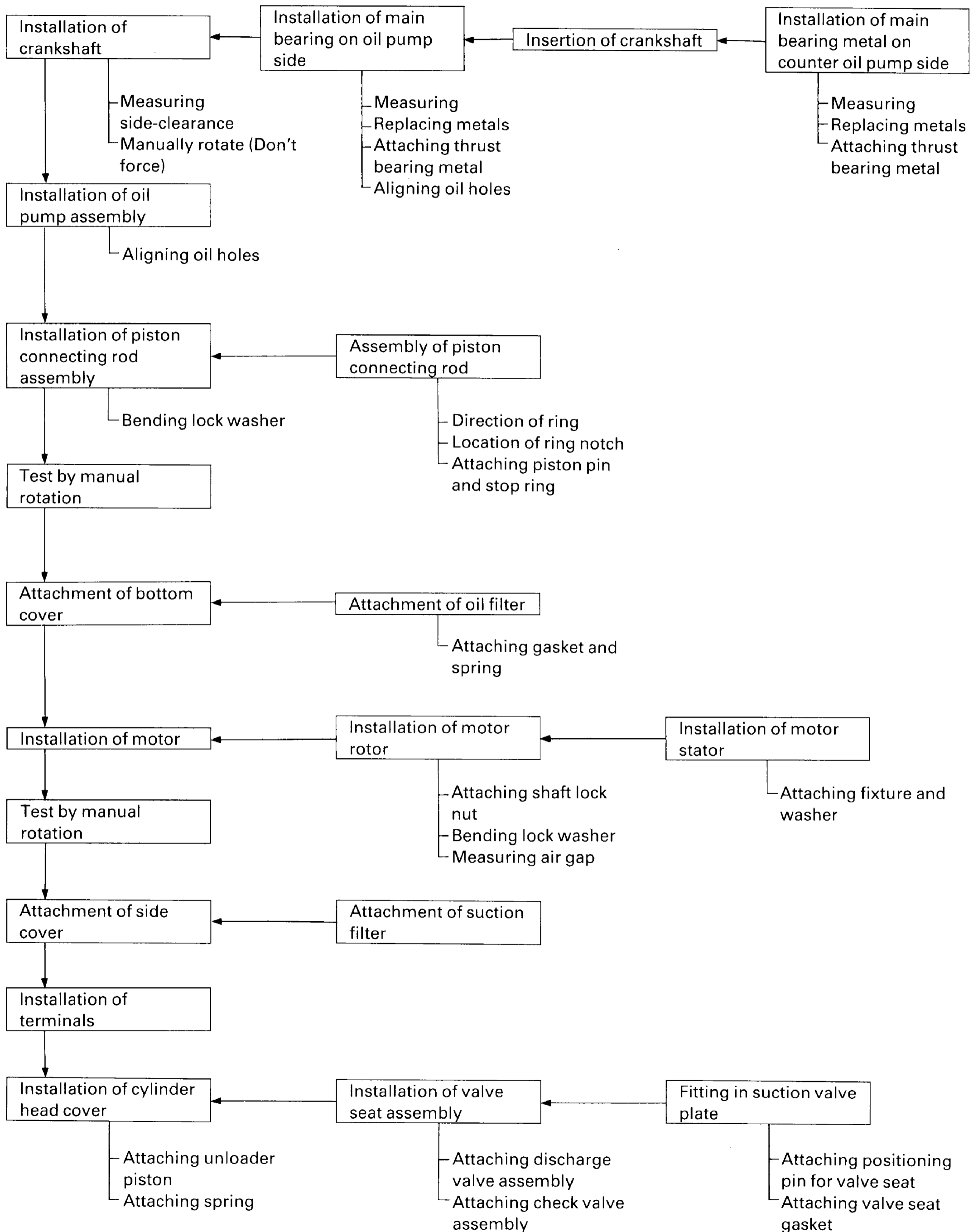
Items	Steps	Notes	Required tools
<p>6. Remove the bottom cover.</p> 	<p>① Remove the set bolts from the bottom cover.</p> <p>② Remove the bottom cover.</p>	<ul style="list-style-type: none"> • Loosen the two bolts at the top and remove the other bolts. • If the bottom cover is hardly removed, insert a chisel between the cover and the frame. • Do not impair the seat surface. • Make sure that the bottom cover comes off from the frame, and then remove it. 	<p>17mm box wrench</p> <p>Chisel, hammer</p>
<p>7. Remove the piston • connecting rod assembly.</p> 	<p>① Set up the lock washer for connecting rod.</p> <p>② Remove the tightening bolts from the connecting rod.</p> <p>③ Remove the cap from the connecting rod.</p>		<p>Chisel (small), Hammer (small)</p> <p>13mm box wrench or 13mm universal wrench</p>

Items	Steps	Notes	Required tools
	<p>④ Push the piston assembly out of the cylinder top and take it out.</p>	<ul style="list-style-type: none"> • Do it, turning the crankshaft. • Connect the connecting rod removed with the cap. (by numbers) 	
<p>8. Remove the oil pump assembly.</p>  	<p>① Remove the set bolts from the oil pump.</p> <p>② Remove the oil pump assembly.</p>	<ul style="list-style-type: none"> • Do not remove two hexagonal socket head bolts from the oil pump assembly. • If it is hardly removed, insert a chisel with one bolt remained. • Do not impair the seat surface. 	<p>13mm box wrench</p> <p>Chisel, Hammer</p>

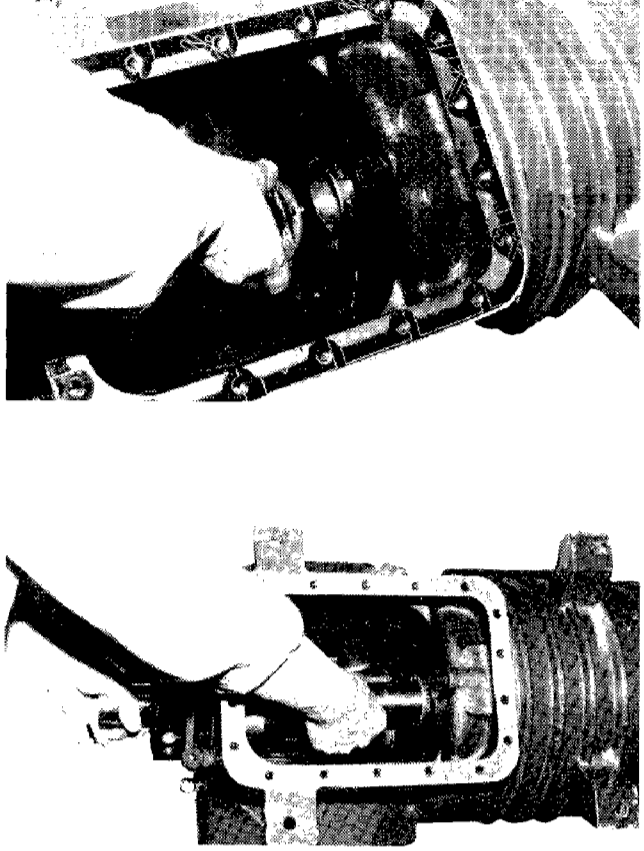
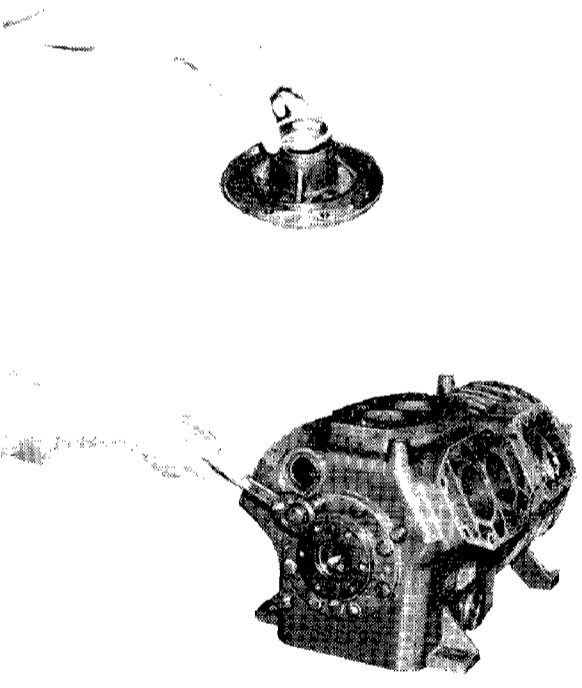
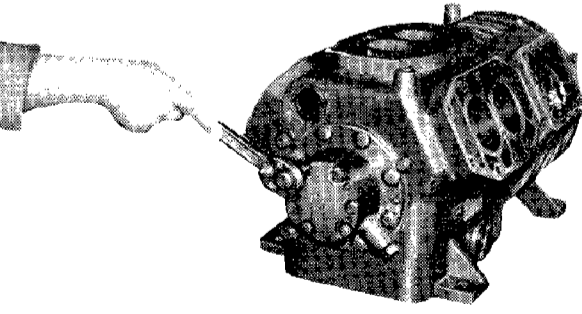
Items	Steps	Notes	Required tools
<p data-bbox="123 296 683 376">9. Remove the main bearing on the oil pump side.</p>   	<p data-bbox="761 405 1138 532">① Remove the set bolts on the main bearing on the oil pump side.</p> <p data-bbox="761 802 1087 929">② Remove the main bearing on the oil pump side.</p> <p data-bbox="761 1199 1108 1325">③ Remove the thrust metal assembly on the oil pump side.</p>	<p data-bbox="1193 802 1630 884">• If it is hardly removed, use a push bolt.</p>	<p data-bbox="1676 414 1847 493">17mm box wrench</p> <p data-bbox="1676 802 1906 884">M8 bolt 13mm box wrench</p>
<p data-bbox="123 1619 559 1658">10. Take out the crankshaft.</p>  	<p data-bbox="761 1684 1119 1811">① Pull out the crankshaft to the oil pump side.</p> <p data-bbox="761 2081 1108 2207">② Remove the thrust metal assembly on the motor side.</p>	<p data-bbox="1193 1684 1534 1811">• Do not impair the crankshaft and main bearing metal.</p>	

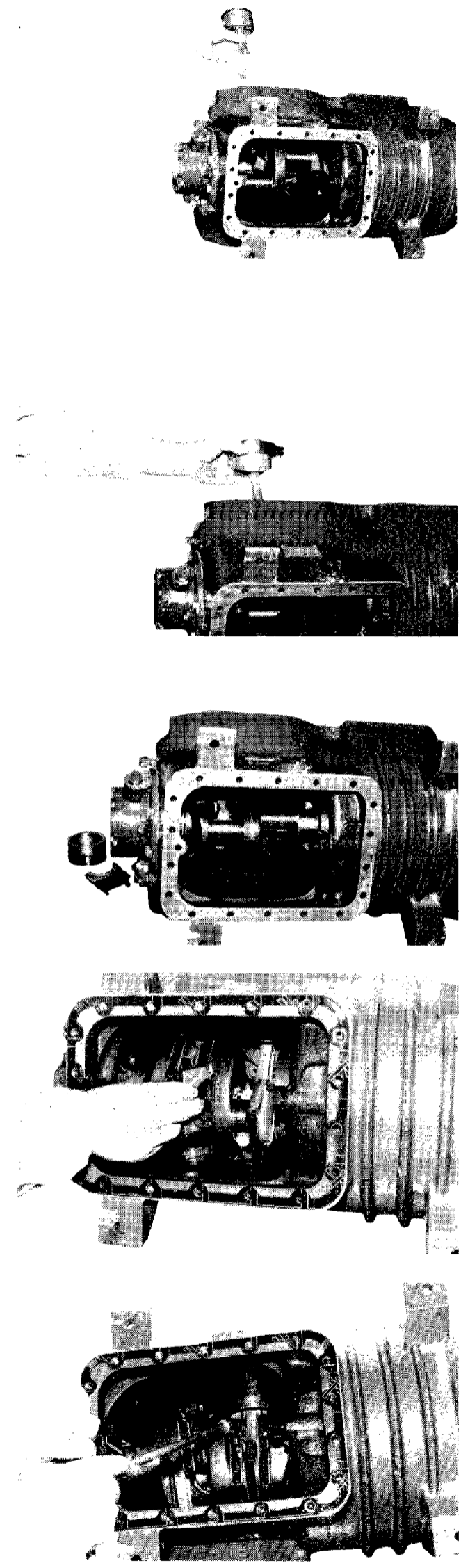
Items	Steps	Notes	Required tools
<p>11. Remove other assembled parts. (1) Unloader piston</p> 	<ol style="list-style-type: none"> ① Remove the unloader piston spring. ② Take out the unloader piston. 	<ul style="list-style-type: none"> • If it cannot be taken out by hand, lightly charge the air from the unloading port and pull it out. Be careful that the piston may sometimes jump out. 	<p>air</p>
<p>(2) Check valve cylinder and discharge valve gland</p>    	<ol style="list-style-type: none"> ① Remove the set bolts from the check valve cylinder. ② Remove check valve and check valve spring. ③ Remove the clamp bolt from the discharge valve gland. ④ Remove the nuts for discharge valve gland. 	<ul style="list-style-type: none"> • Since "LOCK TIGHT" is used, do not remove them unnecessarily. • Since "LOCK TIGHT" is used, do not remove it unnecessarily. • Carefully handle them so as not to lose, as they are small parts. 	<p>4mm hexagonal socket wrench</p> <p>8mm box wrench</p> <p>13mm box wrench</p>

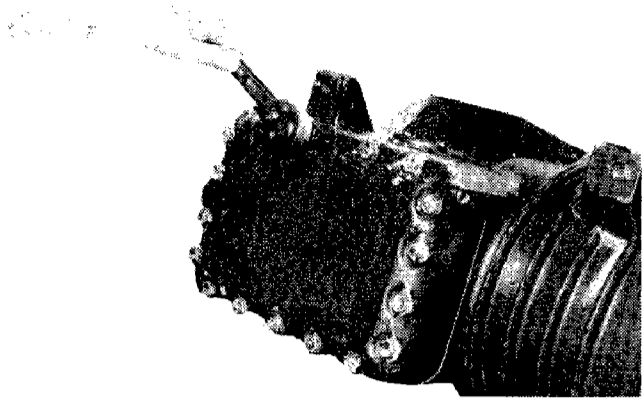
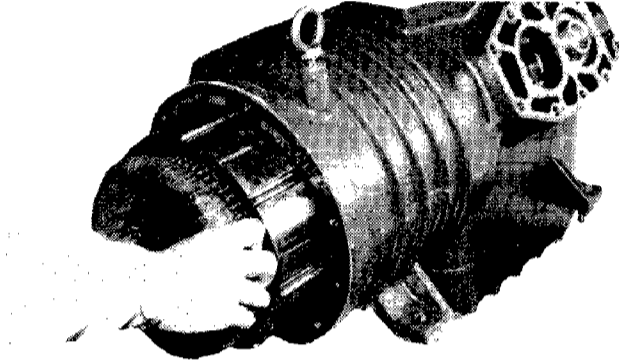
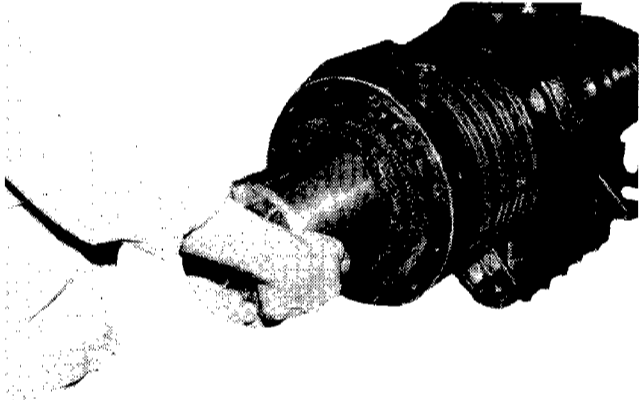
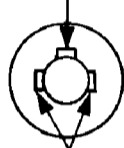
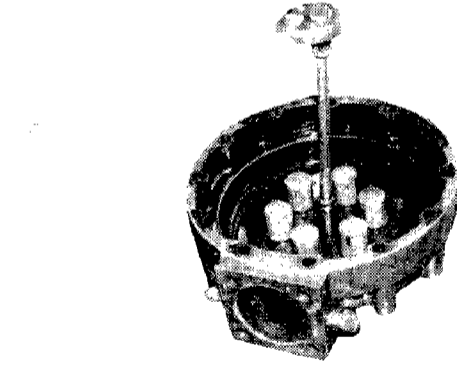
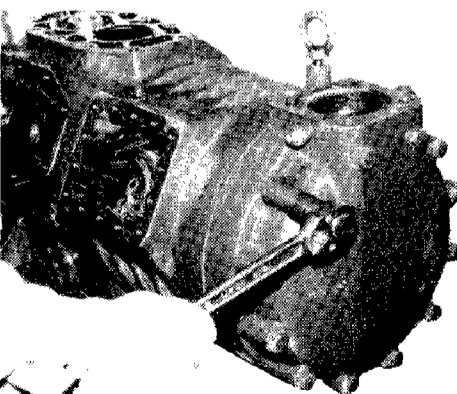
9. Assembling sequence

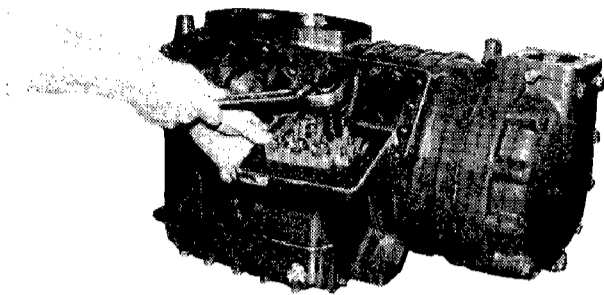
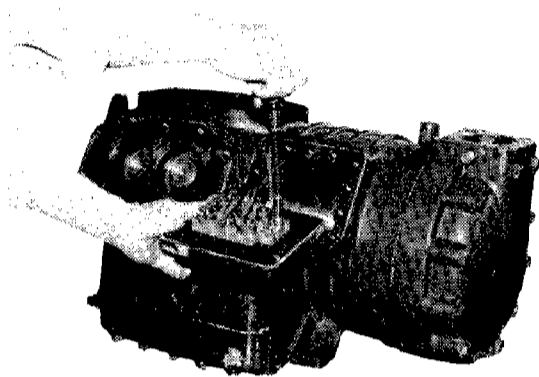
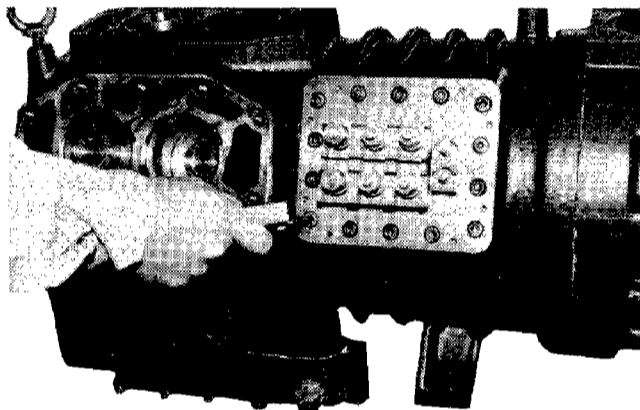
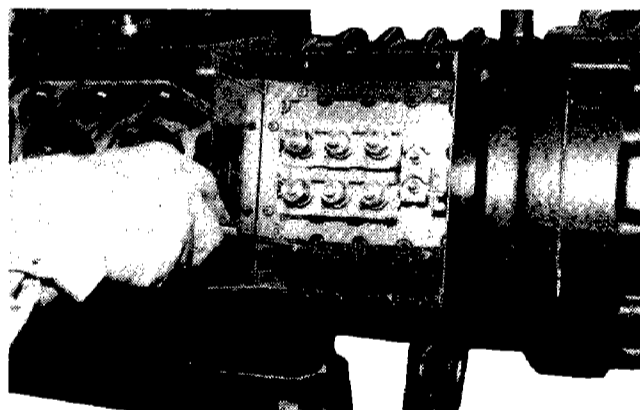


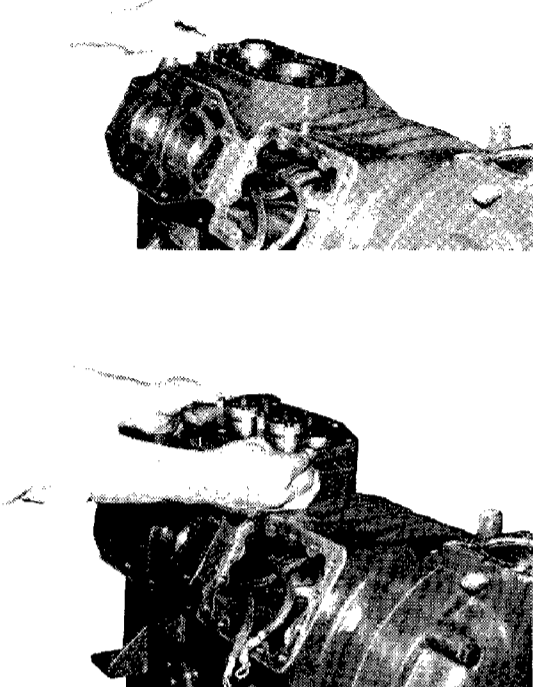

10. Assembling

Items	Steps	Notes	Required tools
<p>1. Insert the crankshaft.</p> 	<ol style="list-style-type: none"> ① Attach the thrust metal assembly on the motor side. ② Apply refrigeration oil to the crankshaft and metal. ③ Insert the crankshaft from the oil pump side. 	<ul style="list-style-type: none"> • Do not impair the crankshaft and metal. 	<p>Refrigeration oil</p>
<p>2. Attach the main bearing on the oil pump side.</p> 	<ol style="list-style-type: none"> ① Attach the thrust metal assembly on the oil pump side. ② Attach the gasket to the main bearing on the oil pump side. ③ Apply refrigeration oil to the crankshaft and main bearing metal. ④ Attach the main bearing on the oil pump side. 	<ul style="list-style-type: none"> • Apply refrigeration oil to the gasket. • Make sure that oil holes of each part are aligned. • Make sure that the mark on the gasket which shows its mounting direction is located at the lower part. • Make sure that the crankshaft turns lightly. (Side clearance should be within the predesigned range.) • Apply refrigeration oil to the gasket. 	<p>Refrigeration oil</p> <p>17mm box wrench</p>
<p>3. Install the oil pump assembly.</p> 	<ol style="list-style-type: none"> ① Attach the gasket to the oil pump assembly. ② Install the oil pump assembly. 	<ul style="list-style-type: none"> • Put the oil holes of the gasket, oil pump assembly and main bearing together. • Make sure that the mark of the gasket which shows its mounting direction is located at the lower part. 	<p>Refrigeration oil</p> <p>13mm box wrench</p>

Items	Steps	Notes	Required tools
<p data-bbox="131 299 691 338">4. Install the piston connecting rod.</p> 	<ol style="list-style-type: none"> <li data-bbox="770 358 1159 602">① Apply refrigeration oil to the internal surface of the cylinder, piston pin, and the pin part of the crankshaft. <li data-bbox="770 617 1159 749">② Insert the piston assembly from the cylinder face side. <li data-bbox="770 852 1159 984">③ Push in the piston ring with a piston insertion tool. <li data-bbox="770 984 1159 1117">④ Push the piston head to insert the piston into the cylinder. <li data-bbox="770 1249 1159 1455">⑤ Accurately insert the large end of the connecting rod to the pin part of the crankshaft. <li data-bbox="770 1646 1159 1778">⑥ Apply refrigeration oil to the metal of the connecting rod cap. <li data-bbox="770 1778 1159 1881">⑦ Attach the connecting rod cap. <li data-bbox="770 1940 1159 2043">⑧ Tighten up the clamp bolts. <li data-bbox="770 2043 1159 2131">⑨ Bend the lock washer. <li data-bbox="770 2131 1159 2366">⑩ Make sure that the connecting rod moves to right and left lightly. (Do it after tightening each and every bolt.) <li data-bbox="770 2366 1159 2543">⑪ After tightening all bolts, make sure that the crankshaft turns lightly. 	<ul style="list-style-type: none"> <li data-bbox="1195 617 1638 837">• Insert it in a way that the screw holes on the large end side of the connecting rod can be seen from the service side. <li data-bbox="1195 852 1638 955">• Do not damage the piston ring. <li data-bbox="1195 984 1638 1161">• Fix the piston insertion tool, and push the piston head accurately with fingers. <li data-bbox="1195 1249 1638 1425">• Make sure that the large-end metal (without the cap) is fitted in accurately. <li data-bbox="1195 1778 1638 1911">• Make sure that the crankpin metal is fitted in accurately. <li data-bbox="1195 1940 1638 2043">• Do not tighten them one-sidedly. 	<p data-bbox="1685 367 1936 405">Refrigeration oil</p> <p data-bbox="1685 852 1936 934">Piston insertion tool</p> <p data-bbox="1685 1955 1936 2116">13mm box wrench or 13mm universal wrench Hammer, chisel</p>

Items	Steps	Notes	Required tools
<p>5. Attach the bottom cover.</p> 	<ol style="list-style-type: none"> ① Attach the oil filter, spring and oil plug. ② Attach the bottom cover and the gasket to the frame. 	<ul style="list-style-type: none"> • Place the mark on the gasket which shows its mounting direction on the oil pump side. • Apply refrigeration oil to the gasket 	<p>Refrigeration oil, 17mm box wrench</p>
<p>6. Install the stator and rotor</p>  	<ol style="list-style-type: none"> ① Insert the stator. ② Insert the stator key. ③ Attach the motor fixture and washers. ④ Insert the rotor. ⑤ Insert the rotor key. ⑥ Attach the lock washer for crankshaft lock nut and nut. ⑦ Bend the lock washer at three points. 	<ul style="list-style-type: none"> • Place the lead wires at the innermost side. • Insert it along the key groove. • Do not impair the stator. • Numbers of washers to be used are determined so as not to come out of the stator end. • Insert it from its concave side. • Do not insert the key into the grooves for machining the rotor. • Do not impair the rotor. • Tighten up the shaft end nut with predetermined torque. • Bend the lock washer at three points where it can be bent easily. 	<p>5mm hexagonal-socket wrench Key groove</p>  <p>Grooves for machining</p> <p>For 4.6H: 55mm box wrench or pipe wrench For 8H: 60mm box wrench or pipe wrench Chisel, Hammer</p>
<p>7. Attach the side cover.</p>  	<ol style="list-style-type: none"> ① Attach the suction filter. ② Attach the side cover and gasket to the frame. 	<ul style="list-style-type: none"> • Do not impair the filtering net or deform it. • Apply refrigeration oil to the gasket. • Note that two set bolts at the upper part of the side cover only are long. • Do not hit the stator coil end. 	<p>17mm box wrench</p> <p>Refrigeration oil 17mm box wrench</p>

Items	Steps	Notes	Required tools
<p data-bbox="144 296 576 332">8. Install the terminal strip.</p>    	<p data-bbox="783 355 1151 611">① Attach the gasket to the terminal strip. ② Attach the terminals for main lead wires to the main internal terminal strip.</p> <p data-bbox="783 752 1151 964">③ Attach the terminals for lead wire protectors to the internal terminal strip for protectors.</p> <p data-bbox="783 1155 1129 1237">④ Install the terminal strip to the frame.</p> <p data-bbox="783 1552 1140 1634">⑤ Attach the terminal cover.</p>	<ul data-bbox="1215 361 1655 649" style="list-style-type: none"> • Apply refrigeration oil to the gasket. • Attach the terminals, UVW and ZXY correctly. • Do not drop nuts and washers into the motor chamber. <ul data-bbox="1215 758 1587 840" style="list-style-type: none"> • Do not impair the lead wires. <ul data-bbox="1215 1155 1647 1275" style="list-style-type: none"> • Insert it so that the lead wires run along the inside of the frame. 	<p data-bbox="1698 361 1964 482">Refrigeration oil, 17mm box wrench</p> <p data-bbox="1698 758 1974 793">8mm box wrench</p> <p data-bbox="1698 1155 1927 1275">6mm hexagonal-socket wrench</p> <p data-bbox="1698 1552 1889 1634">+ (plus) screwdriver</p>

Items	Steps	Notes	Required tools
<p>9. Install the valve seat assembly.</p> 	<ol style="list-style-type: none"> ① Insert the valve seat positioning pin. ② Attach the valve seat gasket. ③ Install the suction valve. ④ Install the valve seat assembly. 	<ul style="list-style-type: none"> • Apply the refrigeration oil to the gasket. • Locate the mark on the gasket which shows its mounting direction on the oil pump side. • Install it so as to suit the valve seat positioning pin, with the discharge valve gland set upside. 	<p>Refrigeration oil</p>
<p>10. Attach the head cover of the cylinder.</p> 	<ol style="list-style-type: none"> ① Attach the gasket to the cylinder head cover. ② Insert the unloader piston into the cylinder head cover. ③ Place the unloader springs on the valve seat. ④ Attach the cylinder head cover to the valve seat. ⑤ Tighten up the bolts on the cylinder head cover. 	<ul style="list-style-type: none"> • Apply refrigeration oil to the gasket. • Locate the projecting margin of the gasket which shows its mounting direction on the oil pump side. • Apply refrigeration oil to the cylinder part. • Insert the spring into the piston smoothly. • Make sure that the spring is seated accurately in the guide of the valve seat. • Tighten them evenly. 	<p>Refrigeration oil</p> <p>17mm box wrench</p>

11. Tightening torque

Strength	Sizes	Tightening torque kg-cm	Positions
5T	M5	27~40	Terminal cover
10T		64~89	Discharge valve gland (set bolts), Check valve
5T	M6	47~62	Oil level gauge, Stator (set bolts)
10T	M8	272~362	Terminal strip, Oil pump assembly, Discharge valve gland (nuts)
5T	M10	227~307	Suction filter
10T		560~740	Cylinder head cover, Bearing on oil pump side, Bottom cover
10T	M12	940~1260	Side cover, Stop valve VSL34 (4, 6H Discharge)
5T	M16	930~1230	Stop valve VSL50D (6H Suction), VSL60D (8H Suction)
10T		2230~2980	Stop valve VSL40D (4H Suction, 8H Discharge)
---	M6	90~100	Connecting rod (4, 6H)
---	M8	200~250	Connecting rod (8H)
---	M18	450~500	Equalizer
---	PT3/8	300~400	Oil check valve
---	M30	450~600	Oil drain plug
---	M30	900~1200	Crankshaft lock nut (4, 6H)
---	M40	900~1200	Crankshaft lock nut (8H)
---	M5	24~30	Terminal stud (Protector)
---	M10	190~210	Terminal stud (Main)
---	M6	20~30	Terminal top cover

■ Standard tightening torque of NPTF dry seal screws

Size of NPTF	Tightening torque (kg-cm)	Additional tightening torque
1/8 - 27	180±25	220
1/4 - 18	440±35	550
3/8 - 18	700±50	850
1/2 - 14	1.050±70	1.350
3/4 - 14	1.080±90	2.100

■ Standard tightening torque of flare nuts

Nominal designation (O.D.)	Tightening torque (kg-cm)
1/4 (6.4)	160±20
3/8 (9.5)	470±30
1/2 (12.7)	650±30
5/8 (15.9)	1.000±50
3/4 (19.1)	1.750±50
1/4-3/8 (VCG 32)	300±30

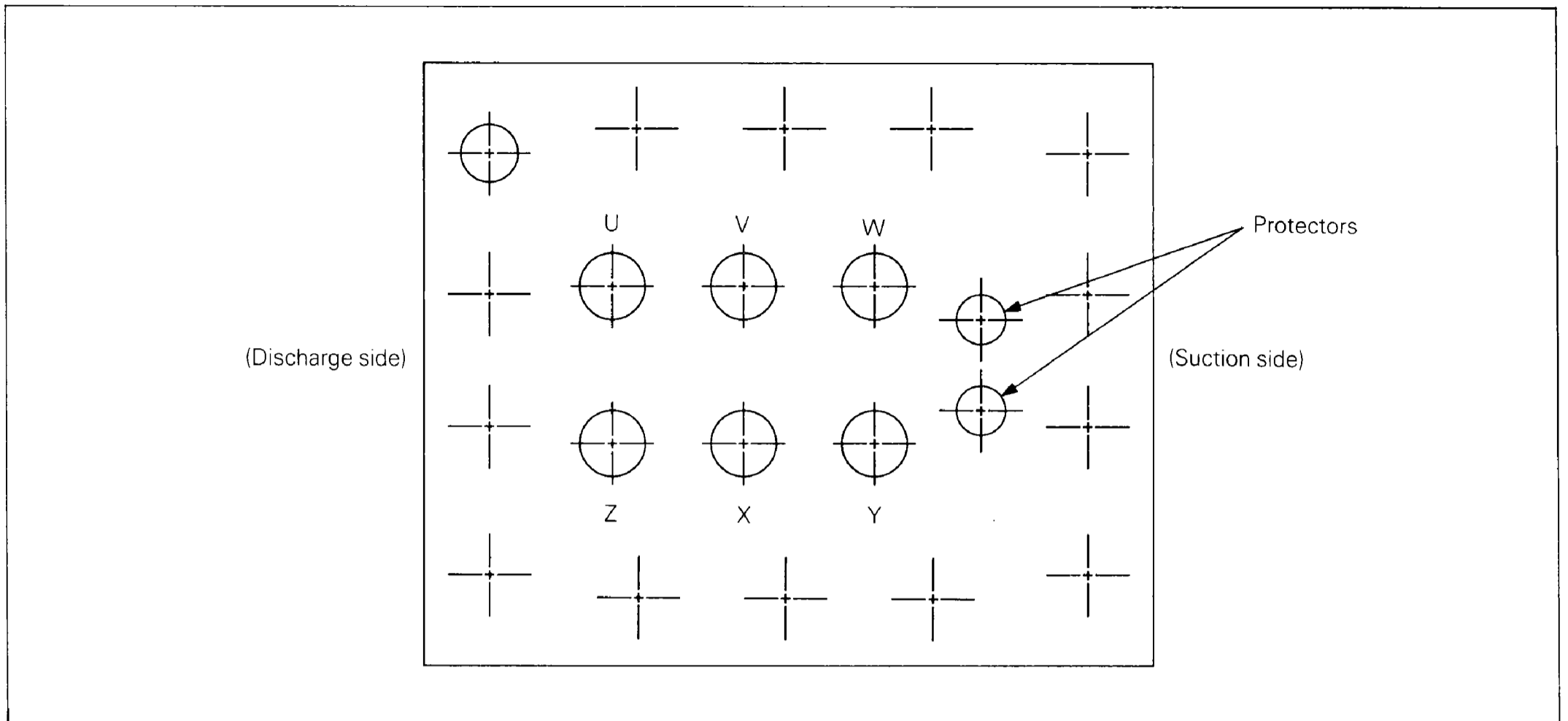
Note: The torque tabulated above are for tightening hand engagement + 2 threads ~ 2.5 threads.

■ Standard torque of ISO hexagonal bolts

Distinction by strength	Nominal designation of bolts	5T		9T		Reference 10T		Reference Width across flat of bolt head
		Tightening torque (kg-cm)	σ kg/m generated by tightening torque	Tightening torque (kg-cm)	σ	Tightening torque (kg-cm)	σ	
Standard tightening torque of flare nuts	M3	7.2		13.5		17.9		5.5
	M4	16.2		30.4		39.2		7
	M5	31		57		74		8
	M6	52		97		125		10
	M8	125		235		302		13
	M10	257		483		620		17
	M12	436	22.4	818	42	1,050	54	19
	(M14)	692		1,295		1,665		22
	M16	1,030		1,930		2,480		24
	M18	1,430		2,680		3,450		27
	M20	2,050		3,850		4,950		30
	M22	2,770		5,190		6,670		32
	M24	3,550		6,650		8,480		36
	M27	5,280		9,890		12,730		41
M30	7,160		13,470		17,270		46	

Note: The above table can be used when spring washer is used.

12. Wiring terminals

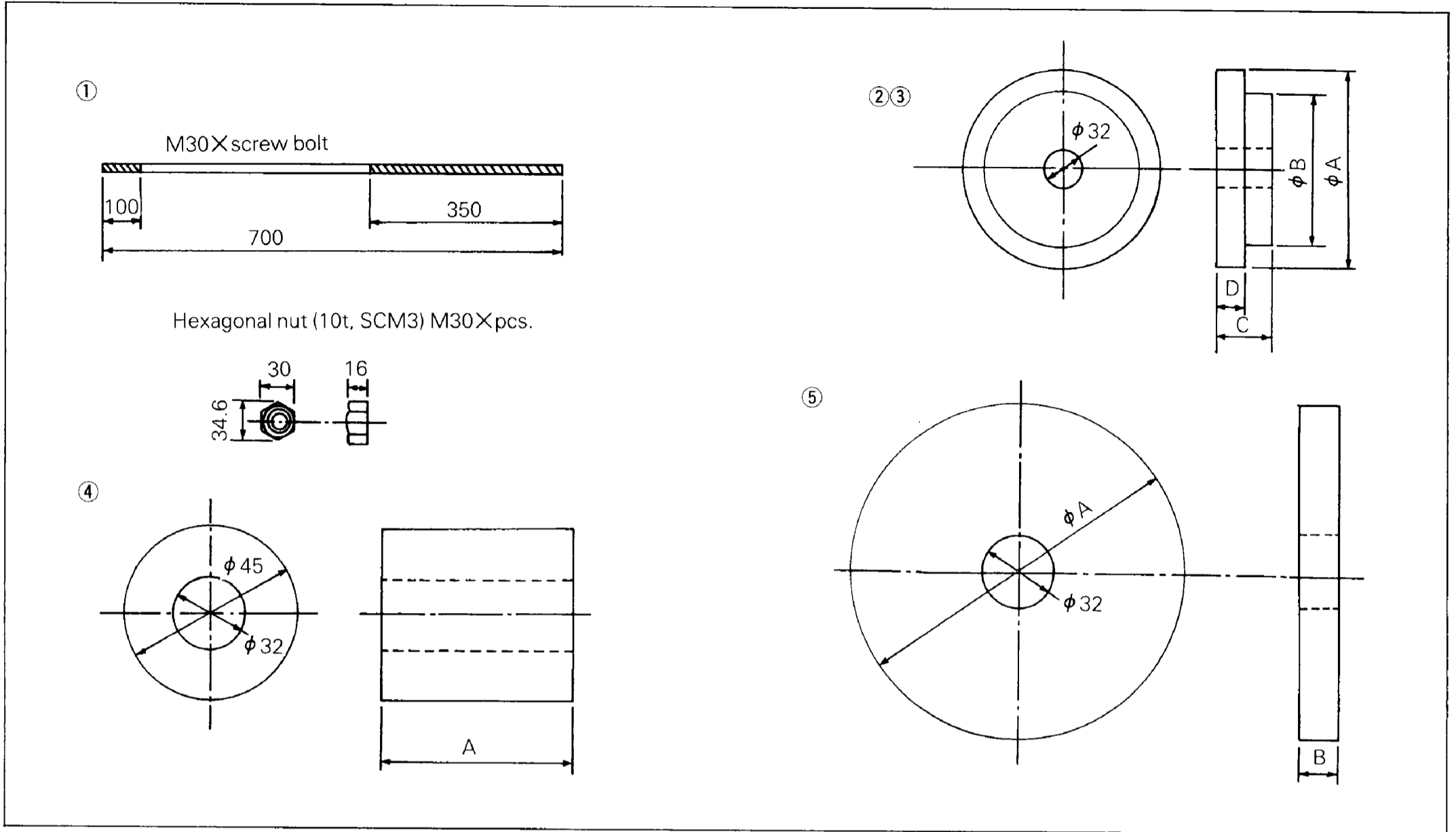


13. Clearances

Main positions		Clearances [mm]
Crankshaft side clearance		0.25~1.1
Piston top clearance		-0.15~0.35
Air gap	4.6H	0.4 or more
	8H	0.5 or more

14. Jigs and tools

(1) Metal remover



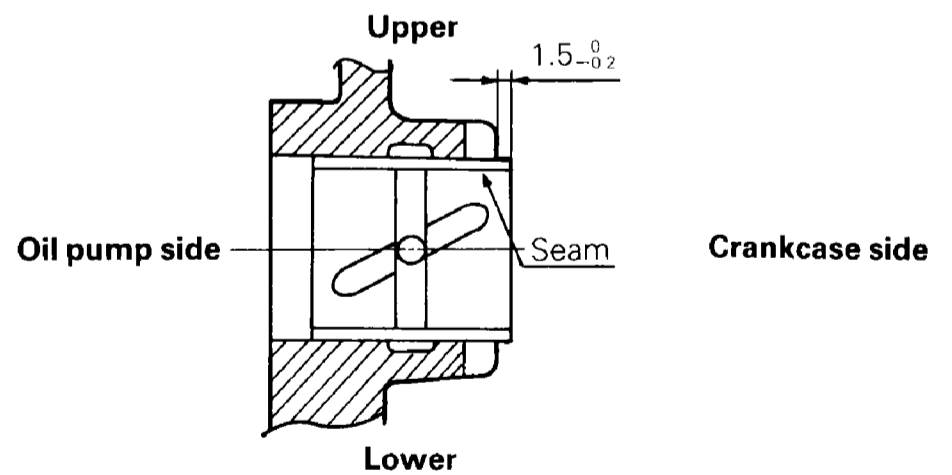
Parts No.	Number Position	② (For pulling out)				③ (For pressing in)				Relevant models
		A	B	C	D	A	B	C	D	
KA		54	49.5	30	10	63	49.5	30	10	4, 6H74
Ki		60	55.5	30	10	76	55.5	30	10	8H74

Parts No.	Number Position	④	Relevant models
		A	
KA		150	4, 6H74
Ki		200	8H74

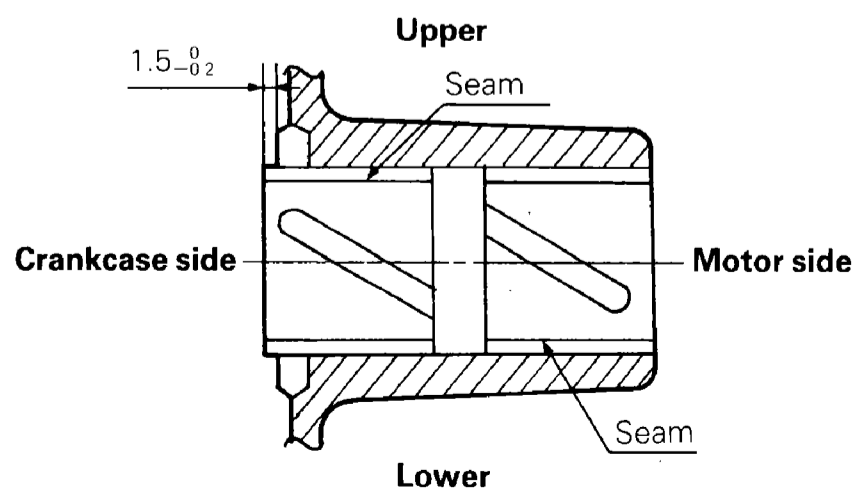
Parts No.	Number Position	⑤		Relevant models
		A	B	
KA		180	30	4, 6H74
Ki		220	30	8H74

Notes; Insert the bearing metals as shown below.

1) Bearing metal on oil pump side.

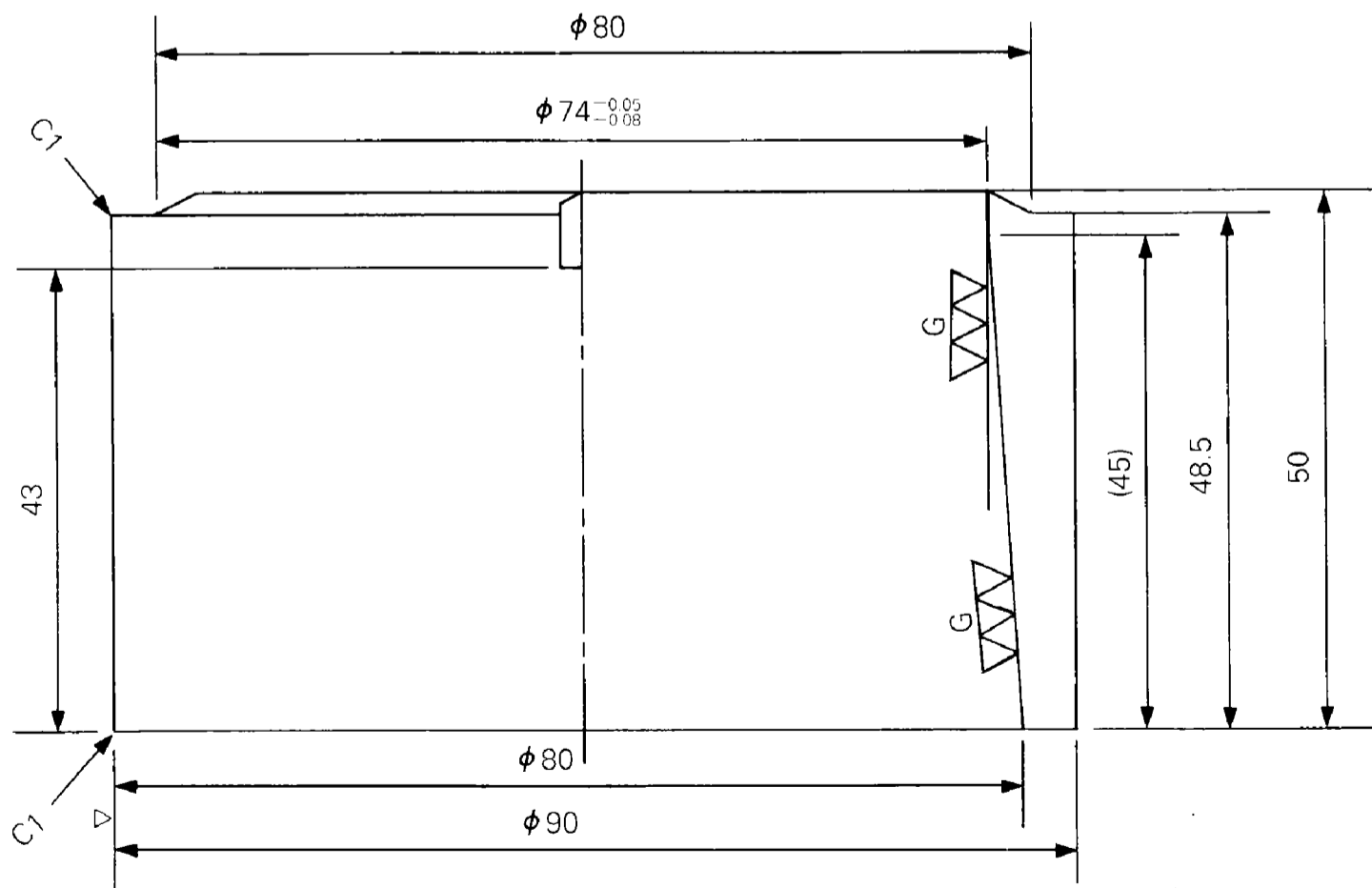
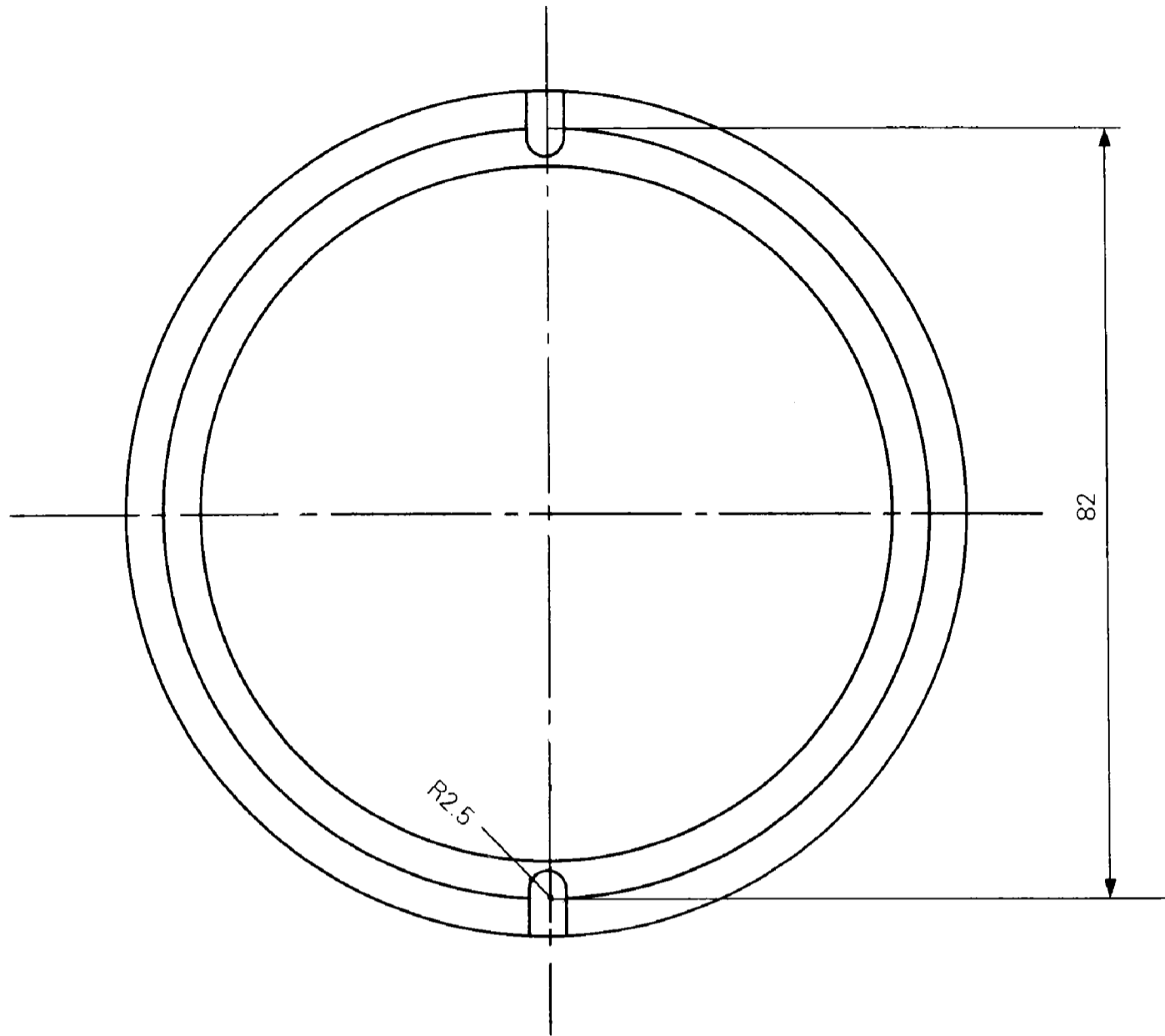


2) Bearing metal on motor side.

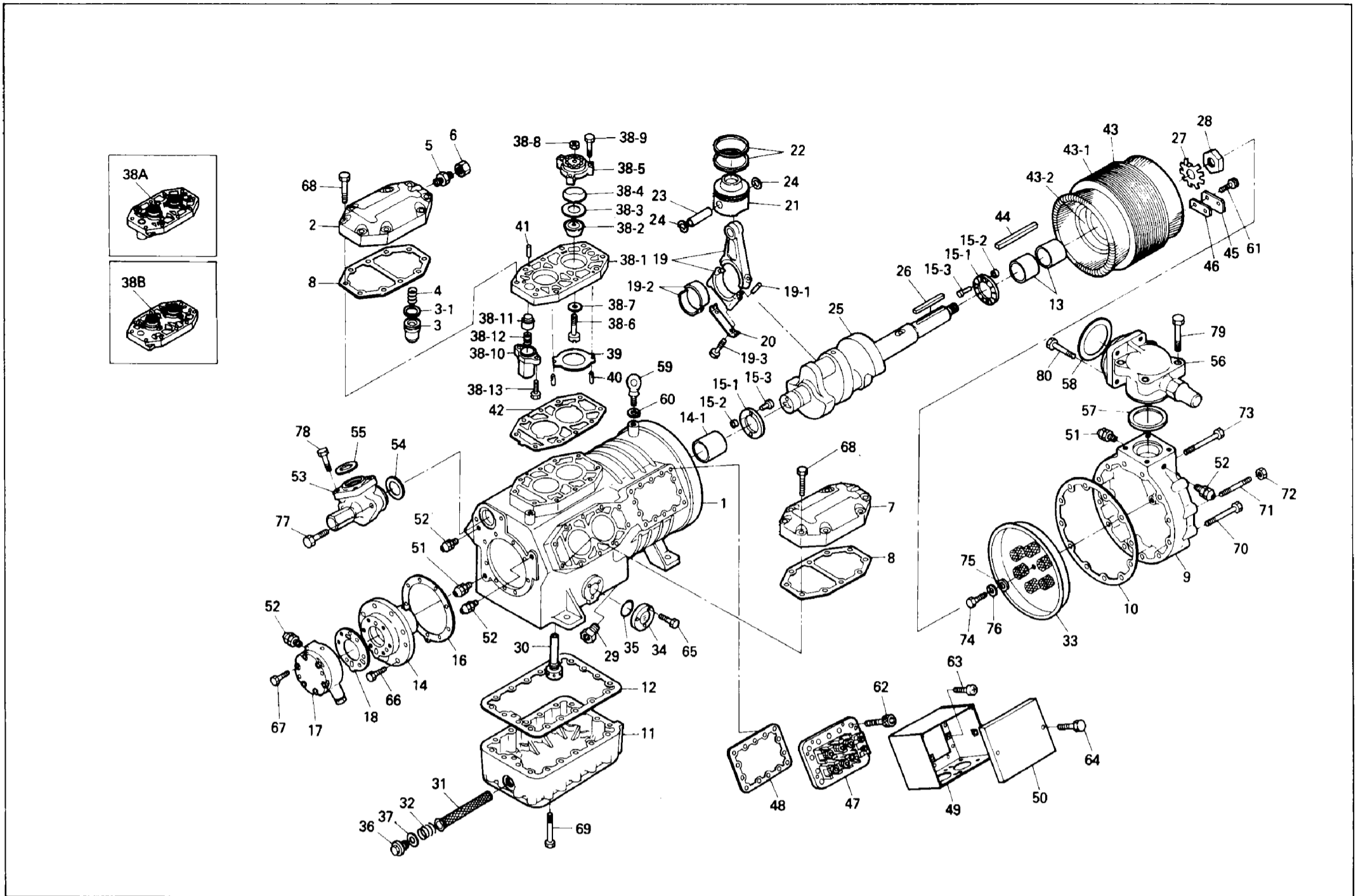


(2) Piston insertion tool

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15. Parts list



No.	Parts Name
1	Frame
2	Cylinder head cover (A)
3	Unloader piston ass'y
3-1	Piston ring, unloader
4	Spring, unloader piston
5	Union joint, unloader line
6	Flare nut
7	Cylinder head cover (B)
8	Packing, cylinder head cover
9	Side cover
10	Packing, side cover
11	Bottom cover
12	Packing, bottom cover
13	Bearing metal, motor side
14	Bearing, oil pump side
14-1	Bearing metal, oil pump side
15	Thrust metal ass'y
15-1	Thrust metal
15-2	Spacer, thrust metal
15-3	Lock pin, thrust metal
16	Packing, main bearing
17	Oil pump ass'y
18	Packing, oil pump
19	Connecting rod ass'y
19-1	Knock pin, connecting rod
19-2	Crank pin metal
19-3	Set bolt, connecting rod
20	Lock washer, connecting rod
21	Piston
22	Pressure ring
23	Piston pin
24	Retainer, piston pin

No.	Parts Name
25	Crankshaft ass'y
26	Key, crankshaft
27	Lock washer, crankshaft
28	Lock nut, crankshaft
29	Oil check valve ass'y
30	Equalizing pipe ass'y
31	Oil suction filter
32	Mounting spring, oil filter
33	Suction filter
34	Oil level gauge
35	"O"ring, oil level gauge
36	Oil drain plug
37	Packing, oil drain plug
38A	Valve seat ass'y (A)
38B	Valve seat ass'y (B)
38A-1	Valve seat (A)
38B-1	Valve seat (B)
38-2	Inner valve seat
38-3	Discharge valve plate
38-4	Spring, discharge valve
38-5	Discharge valve gland
38-6	Set bolt, discharge valve gland
38-7	Copper packing
38-8	Nut, discharge valve gland
38-9	Set bolt, discharge valve gland
38-10	Cylinder, check valve
38-11	Check valve
38-12	Spring, check valve
38-13	Hex. socket screw
39	Suction valve plate
40	Spring pin, suction valve plate
41	Knock pin, valve seat

No.	Parts Name
42	Packing, valve seat
43	Built in motor
43-1	Stator
43-1-1	Thermal protector
43-2	Rotor
44	Key, motor stator
45	Lock plate, built in motor
46	Spacer, built in motor
47	Terminal ass'y
48	Packing, main terminal
49	Terminal cover
50	Terminal top cover
51	Gauge joint with check valve
52	Gauge joint with check valve
53	Stop valve, discharge side
54	Packing, stop valve
55	Packing, companion flange
56	Stop valve, suction side
57	Packing, stop valve
58	Packing, companion flange
59	Hook bolt
60	Spring washer, hook bolt
61	Hex. socket bolt, lock plate
62	Hex. socket bolt, main terminal
63	⊕ screw, terminal cover
64	Hex. bolt, terminal top cover
65	Hex. bolt, oil level gauge
66	Hex. bolt, main bearing
67	Hex. bolt, oil pump
68	Hex. bolt, cylinder head cover
69	Hex. bolt, bottom cover
70	Hex. bolt, side cover

