

# MYCOM

## W SERIES

*New, Premium Industrial Reciprocating Compressors*

## W SERIES MANUAL



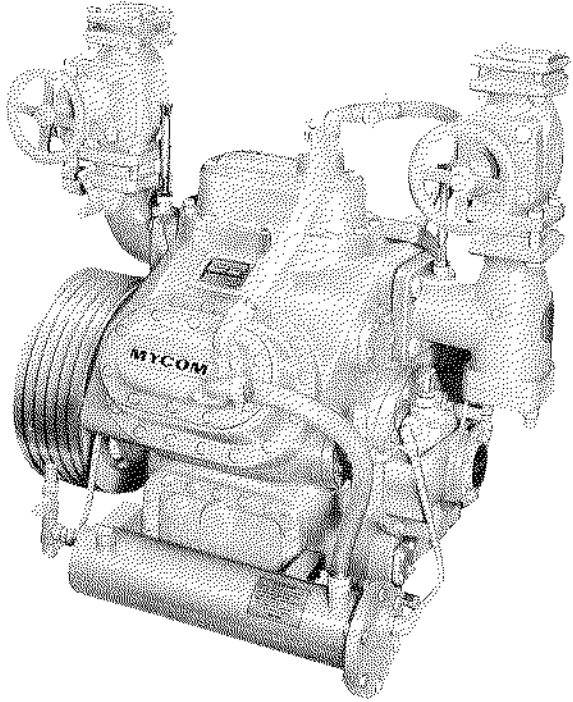
**MAYEKAWA MFG. CO., LTD.**

Tokyo-Japan

# ● MYCOM W Series Multi-cylinder Refrigeration Compressors

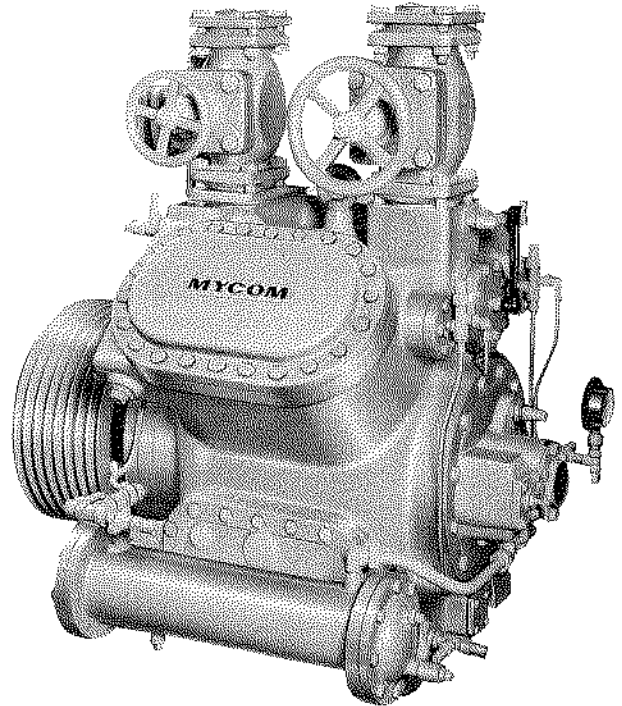
Watercooled headcovers

6WA Watercooled oil cooler



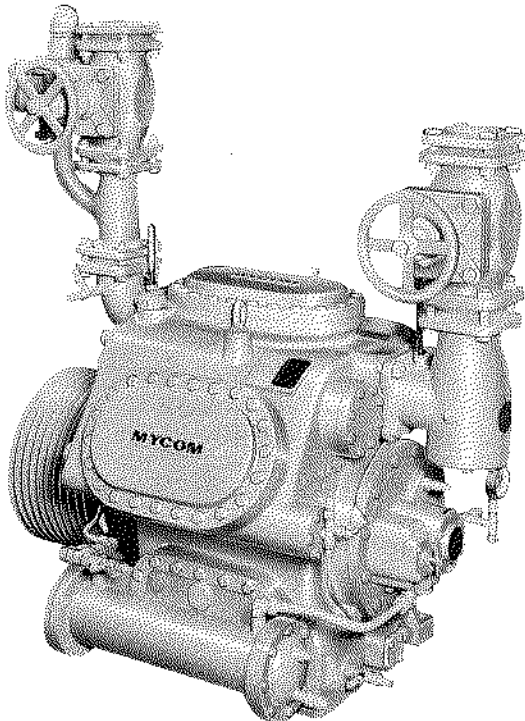
Aircooled headcovers

4WB DX cooled oil cooler



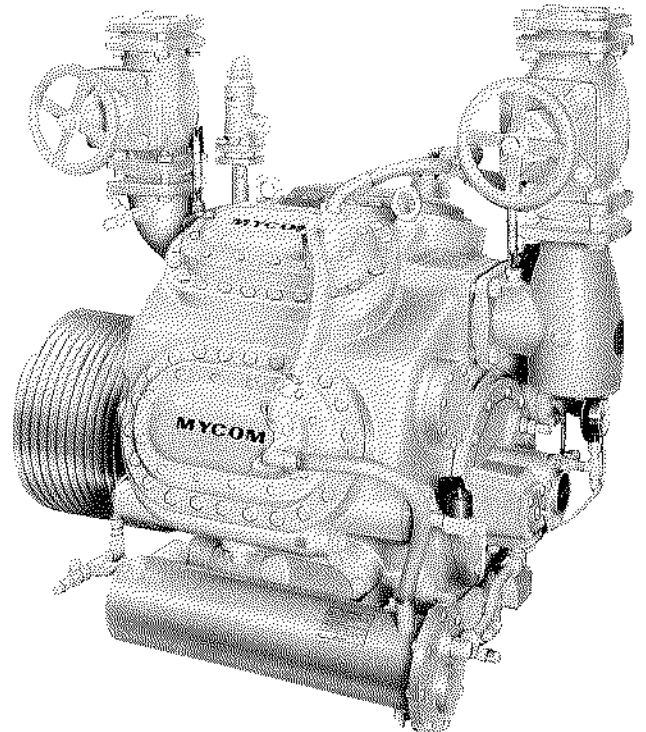
Aircooled headcovers

6WB DX cooled oil cooler



Watercooled headcovers

8WB Watercooled oil cooler



# SPECIFICATIONS (BARE COMPRESSOR)

Item	Single-stage compressor									Compound compressor				
	2WA	4WA	6WA	8WA	4WB	6WB	8WB	12WB	42WA	62WA	42WB	62WB	12.4WB	
Refrigerant	R717, R22, R502, R12, Propane													
Type	Reciprocating, open type													
No. of cylinders	2	4	6	8	4	6	8	12	L-4/H-2	L-6/H-2	L-4/H-2	L-6/H-2	L-12/H-4	
Bore	3-3/4 (95)				5-1/8 (130)				3-3/4 (95)		5-1/8 (130)			
Stroke	3 (76)				3-15/16 (100)				3 (76)		3-15/16 (100)			
Max. speed	r.p.m.	1,100	1,450			1,200			1,450		1,200			
Displacement at max. speed	CFM	42	110	165	220	224	337	450	674	L-110 (187)	L-165 (281)	L-224 (381)	L-337 (579)	L-674 (1,145)
	m <sup>3</sup> /h	(71)	(187)	(281)	(374)	(381)	(573)	(764)	(1,145)	H-55 (94)	H-55 (94)	H-112 (191)	H-112 (191)	H-224 (381)
Driving method*	Belt drive or Direct drive													
Capacity control steps	%	100	100, 50	100, 66, 33	100, 75, 50, 25	100, 50	100, 66, 33	100, 75, 50, 25	100, 66, 33	100, 50	100, 66, 33	100, 50	100, 66, 33	100, 66, 33
Refrigeration oil	ISO VG68 or equivalent													
Oil charge quantity	U.S. gal. (l)	1.32 (5)	3.17 (12)	3.70 (14)	4.49 (17)	5.29 (20)	6.61 (25)	6.87 (26)	13.74 (52)	3.70 (14)	4.49 (17)	6.61 (25)	7.00 (26.5)	14.53 (55)
Connections	Suction	R717	1-1/2" (40A)	2" (50A)	2-1/2" (65A)	3" (80A)	3-1/2" (90A)	4" (100A)	5" (125A)	L-2" (50A)	L-2-1/2" (65A)	L-3" (80A)	L-3-1/2" (90A)	L-5" (125A)
		R22, R502	2-1/2" (65A)	3" (80A)	3-1/2" (90A)	4" (100A)	5" (125A)	H-1-1/2" (40A)	H-1-1/2" (40A)	H-2-1/2" (65A)	H-2-1/2" (65A)	H-3" (80A)	H-3-1/2" (90A)	H-5" (125A)
	Discharge	R717	1-1/2" (40A)	2" (50A)	2-1/2" (65A)	3" (80A)	3" (80A)	3-1/2" (90A)	3" (80A) x 2	L-2" (50A)	L-2" (50A)	L-2-1/2" (65A)	L-2-1/2" (65A)	L-3" (80A) x 2
		R22, R502	2-1/2" (65A)	3" (80A)	3" (80A)	3-1/2" (90A)	4" (100A)	H-1-1/2" (40A)	H-1-1/2" (40A)	H-2" (50A)	H-2" (50A)	H-2" (50A)	H-2" (50A)	H-2" (50A) x 2
Net weight	lb. (kg)	810 (370)	1,280 (580)	1,540 (700)	1,800 (820)	2,420 (1,100)	3,100 (1,410)	3,410 (1,550)	5,500 (2,500)	1,580 (720)	1,850 (840)	3,170 (1,440)	3,430 (1,560)	6,820 (3,100)

NOTE: \* "L": Low stage, "H": High stage - Model 12.4WB - Direct drive only

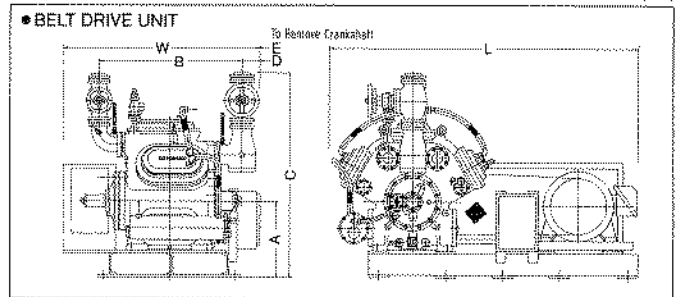
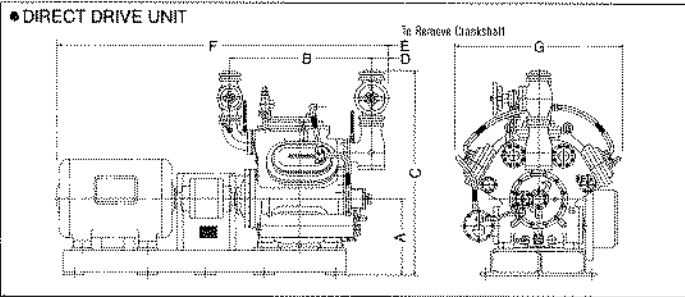
## ITEMS INCLUDED

- Suction shut-off valve ..... 1 pc. (Single-stage), 2 pcs. (Compound)
- Discharge shut-off valve ..... 1 pc. (Single-stage), 2 pcs. (Compound)
- Oil cooler ..... 1 pc.
- Safety valve ..... 1 pc.
- Capacity control actinoid valve\* ..... 1 pc.\*\*
- \* Excludes compressors for chemical plants. \*\*
- Discharge side thermometer ..... 1 pc. Excludes Model 2WA.
- Suction side thermometer ..... 1 pc. (Single-stage), 2 pcs. (Compound)
- Service tools ..... 1 set
- Gasket (Asbestos-free)

## OPTIONAL ACCESSORIES

- Driving method (Belt drive, Direct drive)
- Control panel (Mechanical type, Microprocessor type)
- Head cover (Air-cooled, DX-cooling)
- Oil cooler (DX-cooling)
- Oil filter (External)
- High pressure cut-out switch
- Low pressure control switch
- Oil pressure failure protection switch
- High pressure side pressure gauge
- Low pressure side pressure gauge
- Micro-WI, WII, Micro processor control panel
- Oil pressure gauge
- Gauge board
- Oil heater with thermo-switch
- Oil separator

## OUTER DIMENSIONS (COMPRESSOR UNIT)



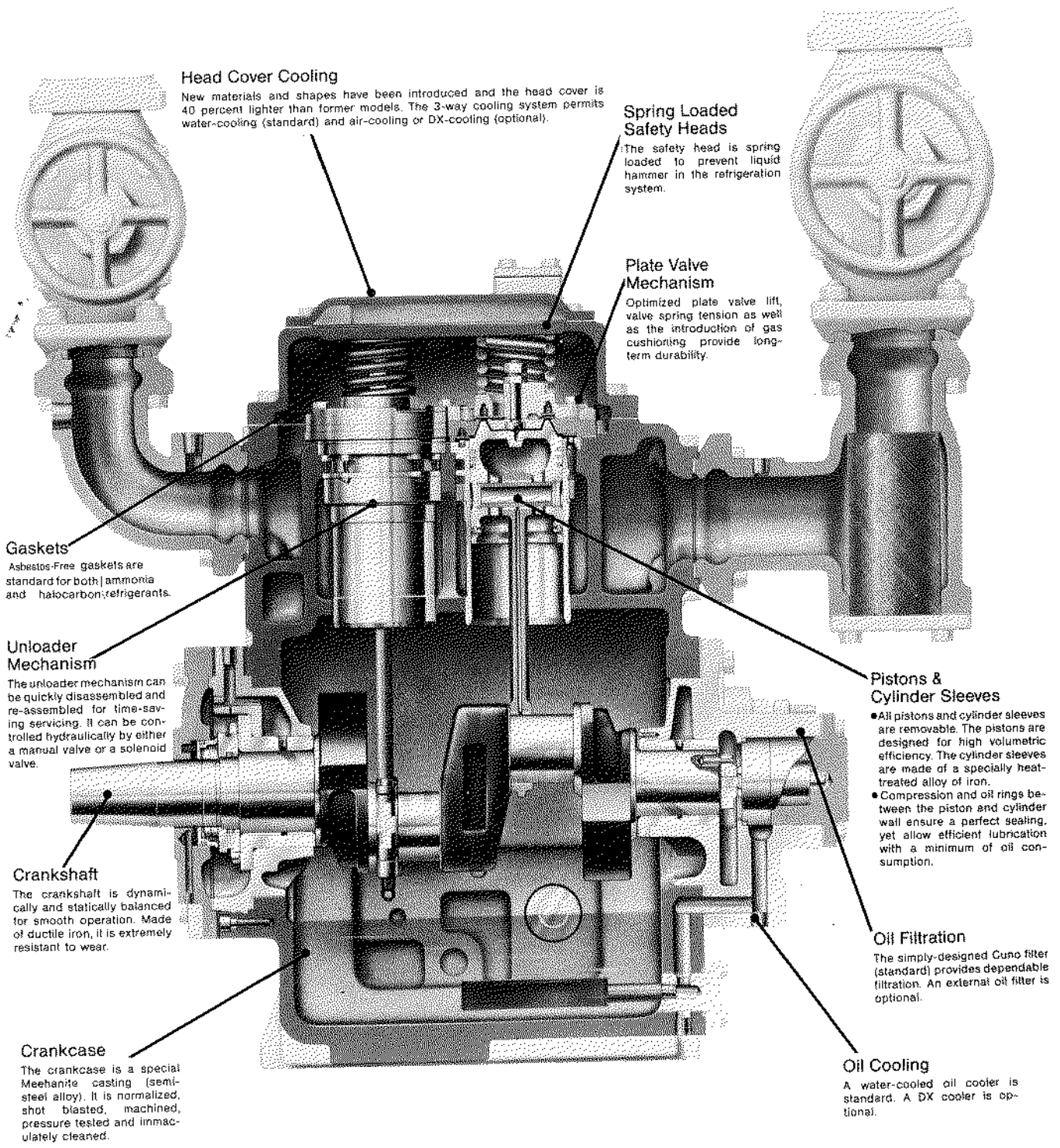
Unit: in.(mm)

Model	Dimensions (Inch)										Pitch dia.	Flywheel No. of grooves	Weight less motor lb. (kg)
	A	B	C	D		E	F	G	L*	W			
				B.D.*	D.D.*								
2WA	12-5/8(321)	--	37-1/2(955)	17(432)	--	21(533)	--	--	58(1,475)	34(865)	13-1/4(336)	SPC x 4	975(442)
4WA	17-3/4(451)	12-1/16(306)	45-7/8(1,165)	15(381)	11(279)	25(635)	66-1/2(1,690)	38(965)	67(1,705)	42(1,070)	15-7/16(392)	SPC x 4	2,005(909)
6WA	17-3/4(451)	32-1/16(814)	47-7/8(1,220)	4(102)	4(102)	25(635)	73-3/4(1,875)	41(1,045)	69-1/2(1,765)	43-1/2(1,105)	15-7/16(392)	SPC x 6	2,280(1,034)
8WA	18-15/16(481)	32-7/16(824)	50-11/16(1,290)	4-1/2(114)	4-1/2(114)	25(635)	78(1,985)	41-1/2(1,055)	71(1,805)	44-1/8(1,125)	15-7/16(392)	SPC x 8	2,605(1,181)
4WB	20-1/2(521)	15-13/16(402)	55-1/2(1,410)	20(508)	12-1/2(318)	27(686)	82(2,085)	44-1/2(1,130)	81(2,060)	55(1,400)	17-9/16(446)	SPC x 8	3,430(1,556)
6WB	21-5/16(541)	40-3/8(1,026)	58-5/16(1,485)	5(127)	5(127)	22(711)	92(2,340)	50(1,270)	82-3/4(2,105)	55(1,400)	17-9/16(446)	SPC x 10	3,980(1,805)
8WB	21-1/4(540)	39-11/16(1,008)	60-13/16(1,545)	6-1/2(165)	5-1/2(140)	30(762)	95(2,415)	48-1/2(1,235)	83-3/4(2,130)	55-1/4(1,405)	17-9/16(446)	SPC x 10 SPC x 12*	4,420(2,005)
12WB	B.D.	23-1/4(591)	61-1/2(1,565)	5(127)	5(127)	72(1,829)	122-1/4(3,120)	55-3/16(1,355)	88(2,235)	79(2,010)	17-9/16(446)	SPC x 12	7,740(3,510)
	D.D.	25-1/4(631)	63-1/2(1,613)	63-1/2(1,613)									7,150(3,243)

Note: \* "B.D.": Belt drive, "D.D.": Direct drive  
 • Dimension L given is less motor. Motor junction box may extend beyond frame especially on larger motor sizes.  
 • Figures in bracket ( ) : mm

• Design and specifications subject to change without notice.

# Sectional View of W Series Compressor



### Head Cover Cooling

New materials and shapes have been introduced and the head cover is 40 percent lighter than former models. The 3-way cooling system permits water-cooling (standard) and air-cooling or DX-cooling (optional).

### Spring Loaded Safety Heads

The safety head is spring loaded to prevent liquid hammer in the refrigeration system.

### Plate Valve Mechanism

Optimized plate valve lift, valve spring tension as well as the introduction of gas cushioning provide long-term durability.

### Gaskets

Asbestos-Free gaskets are standard for both ammonia and halocarbon refrigerants.

### Unloader Mechanism

The unloader mechanism can be quickly disassembled and re-assembled for time-saving servicing. It can be controlled hydraulically by either a manual valve or a solenoid valve.

### Crankshaft

The crankshaft is dynamically and statically balanced for smooth operation. Made of ductile iron, it is extremely resistant to wear.

### Crankcase

The crankcase is a special Meehanite casting (semi-steel alloy). It is normalized, shot blasted, machined, pressure tested and immaculately cleaned.

### Pistons & Cylinder Sleeves

- All pistons and cylinder sleeves are removable. The pistons are designed for high volumetric efficiency. The cylinder sleeves are made of a specially heat-treated alloy of iron.
- Compression and oil rings between the piston and cylinder wall ensure a perfect sealing, yet allow efficient lubrication with a minimum of oil consumption.

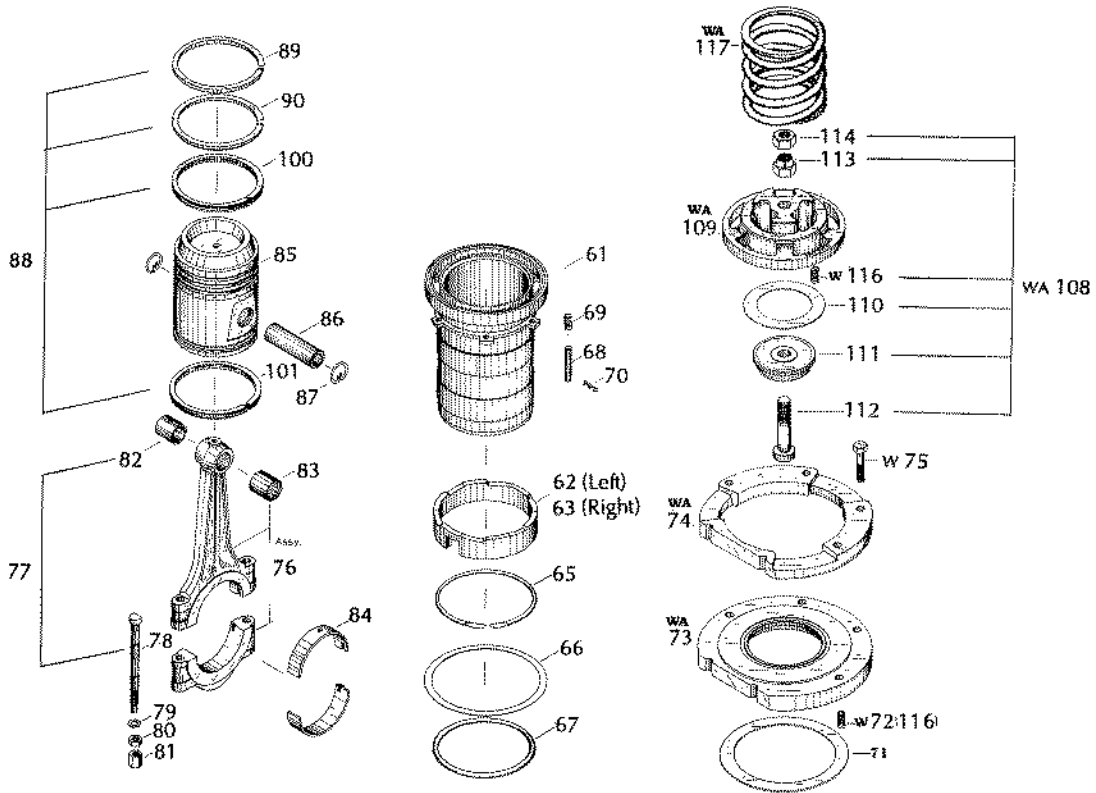
### Oil Filtration

The simply-designed Cuno filter (standard) provides dependable filtration. An external oil filter is optional.

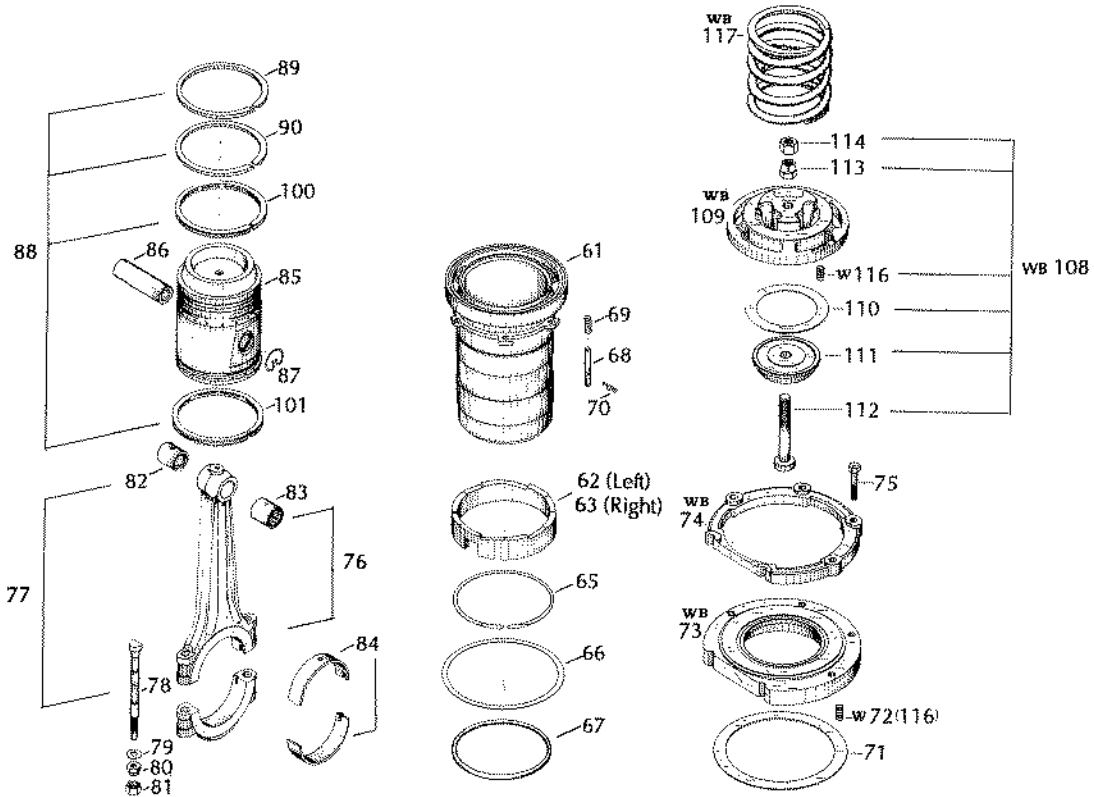
### Oil Cooling

A water-cooled oil cooler is standard. A DX cooler is optional.

# WA · WB Cylinder Assembly, Exploded View



## WA series

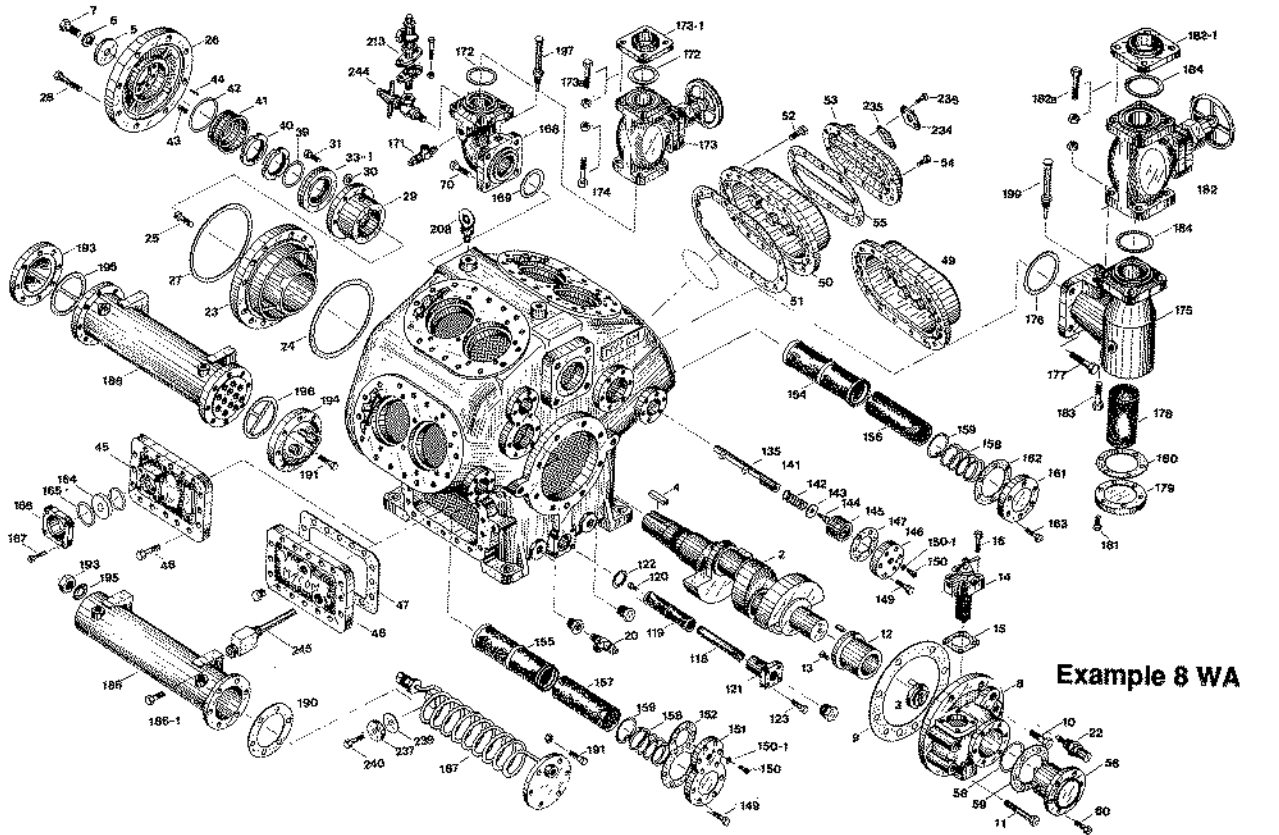


## WB series

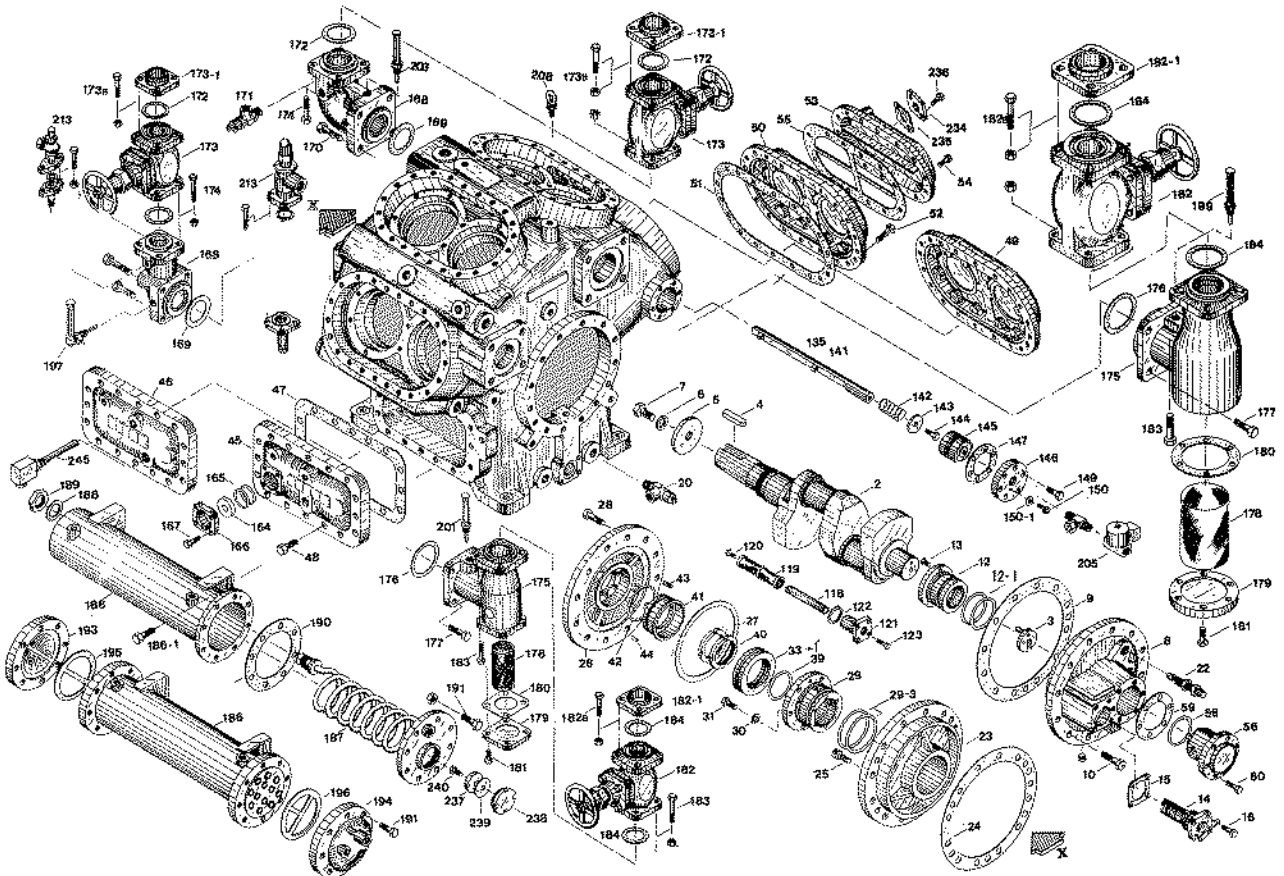


# Exploded View of Compressor

## WA · WB Compressor Assembly, Exploded View



Example 8 WA



Example 62 WB

## MYCOM RECIPROCATING COMPRESSOR PARTS LIST

Index No.	Description	Index No.	Description
1	Crankcase	34/38 *	Assembly parts, double seal collar
2	Crankshaft	34 *	Fixing ring
3	Drag crank	35 *	Floating seat
4	Key, pulley	36 *	Stop pin
5	Flat washer, pulley	37 *	"O" ring, Double seal collar
6	Lock washer, pulley	38 *	Spring
7	Set bolt, pulley hub	39	"O" ring, shaft seal collar
8	Main bearing head	40	Locknuts (2 p'cs)
9	Gasket, main bearing head	41	Shaft seal ring
10	Screw, hex. head cap (short)	42	"O" ring, shaft seal ring
11	Screw, hex. head cap (long)	43	Helical springs
12	Main bearing	44	Roll pin
12-1(225)	"O" ring, main brg (WB Compound Comp. Omy)	45	Handhole cover , with fittings and oil sight glass
13	Pin, main bearing	46	Handhole cover , without oil sight glass
14	Assembly, cuno-filter	47	Gasket, handhole cover
15	Gasket, cuno-filter cover	48	Bolt, handhole cover
16	Bolt, cuno-filter cover	49	Head cover (air cooled)
17 *	Cuno-filter case for Models 12WB & 12-4WB only	50	Head cover (water cooled)
18 *	Gasket, cuno-filter case for Models 12WB & 12-4WB only	51	Gasket, head cover
19 *	Bolt, cuno-filter for Models 12WB & 12-4WB only	52	Bolt, head cover
20	Drain valve	53	Jacket cover, head cover
22	Regulating valve, oil pressure/oil relief valve	54	Bolt, Jacket cover
23	Bearing head.	55	Gasket, Jacket cover
24	Gasket, bearing head	56	Oil pump assembly, consisting of 56, 57 & 60
25	Bolt, bearing head	57	(discontinued numbers)
26	Cover plate	58	"O" ring, oil pump
27	Gasket, cover plate	59	Gasket, oil pump
28	Bolt, cover plate	60	Bolts (6 p'cs), oil pump
29	Thrust bearing	61	Cylinder sleeve
29-3 (226)	"O" ring, thrust brg (WB Compound only)	62	Cam ring, leftward sloped
30	Washers (6 p'cs), thrust bearing	63	Cam ring, rightward sloped
31	Bolts (6 p'cs), thrust bearing	64	(discontinued numbers)
32 *	Assembly, shaft mechanical seal (including No.33-1, 39, 41 & 42)	65	Retaining ring
33-1	Double shaft seal collar	66	Gasket, cylinder sleeve
		67	"O" ring, cylinder sleeve for compound compressor high-stage side only

68	Lift pin	123	Bolt, oil strainer cover
69	Spring, lift pin	125/134 *	Intermediate bearing, for Models 12WB & 12-4WB only
70	Split pin, lift pin		
71	Suction plate valve	135/141	Push rod, unloader device
72	Spring, suction plate valve	142	Spring, unloader device
73	Valve plate	143	Washer, push rod
74	Cage guide, discharge valve	144	Screw, push rod
75	Bolt, discharge valve cage guide	145	Unloader piston
76	Assembly, connecting rod (high stage)	146	Cover, unloader piston
77	Assembly, connecting rod (standard)	147	Gasket, unloader piston cover
78	Bolt, connecting rod	149	Bolt, unloader piston cover
79	Washer, connecting rod	150	Allen screw, unloader piston cover
80	Nut, connecting rod (No.1)	150-1	Washer allen screw
81	Nut, connecting rod (No.2)	151	Unloader & suction end cover 8WA
82	Bushing, connecting rod (standard)	152	Gasket, 8WA
83	Bushing, connecting rod (needle bearing)	153	(discontinued numbers)
84	Bearing halves	154	Suction strainer (filter)
85	Piston	155	Suction strainer (filter)
86	Piston pin	156	Fine screen, suction strainer
87	Lock spring, piston pin	157	Fine screen, suction strainer
88	Piston ring set	158	Spring, suction strainer
89	Piston ring, FC-PC-BF	159	Lock spring, suction strainer
90	Piston ring, FC-UC	160	Lock spring, suction strainer (see fig 57)
91/99	(discontinued numbers)	161	Suction end cover
100	Oil ring, FC-PC-BC3P	162	Gasket, suction end cover
101	Oil ring, FC-PC-BC3	163	Bolt, suction end cover
100/107	(discontinued numbers)	164	Oil sight glass
108	Assembly, discharge plate valve	165	"O" ring, oil sight glass
109	Discharge valve cage	166	Gland, oil sight glass
110	Discharge plate valve	167	Bolt, oil sight glass gland
111	Valve seat, discharge	168	Elbow, discharge
112	Bolt, discharge valve seat	169	Gasket, discharge elbow
113	Nut, discharge valve seat (No.1)	170	Bolt, discharge elbow
114	Nut, discharge valve seat (No.2)	171	Purge valve
116	Spring, discharge plate valve	172	Gasket, discharge shut-off valve inlow
117	Spring, safety head	173	Discharge shut-off valve
118	Screen supporter, oil strainer	174	Bolt & nut, discharge stop valve
119	Screen, oil strainer	175	Scale trap
120	Bolt, oil strainer	176	Gasket, scale trap faucet crankcase side
121	Cover, oil strainer	177	Bolt, scale trap
122	Gasket, oil strainer cover	178	Screen, scale trap



179	Cover, scale trap	238	Plug, Zinc plate
180	Gasket, scale trap cover	239	Gasket, Zinc plate
181	Bolt, scale trap cover	240	Bolt, Zinc plate
182	Suction shut-off valve	236	Bolt, water cooled head cover jacket piping
183	Bolt & nut, suction shut-off valve	245	Electric oil heater
184	Gasket, suction shut-off valve		
185 *	Assembly, oil cooler (water cooled)		
186	Shell, oil cooler		
186-1	Bolt, shell fitting	Remarks:	
187	Coil assy, Watercooled oil cooler	1.	State serial number of compressor for which replacement parts are being ordered.
188	Gasket, Coil assy	2.	If serial number is not available, it is necessary to indicate compressor model number, type of refrigerant used, and invoice number for compressor.
189	Nut, Coil assy	3.	Nos.76/77 connecting rod and Nos.185/192 oil cooler are supplied as assemblies.
190	Gasket, oil cover shel and flange	4.	Parts numbers marked * in index column are not shown in exploded drawing. These parts are for special application depending on type of refrigerant used or other non-standard conditions.
191	Bolt, oil cover shel and flange		
192	Assembly, oil cooler (refrigerant cooled)		
193	End cover B		
194	End cover A		
195	Gasket, endcover A		
196	Gasket, endcover B		
197	Assembly, thermometer (high-stage side)		
199 *	Assembly, thermometer (low-stage side)		
201 *	Assembly, thermometer, high-stage suction side	<b>"W" Series</b>	
203 *	Thermometer assembly, low-stage discharge side	Care must be exercised when ordering spare parts.	
205 *	Solenoid valve	Spare parts for reciprocating compressors are classified by type, i.e., those for the WA, WJ and WB models as well as the conventional A, J and B models. Some compressor parts have no interchangeability whatsoever while others may be fitted with common parts. When ordering spare parts for "W" Series compressors, note that the following parts are exclusive to the series.	
206 *	Fitting, oil piping (12WB & 12-4WB)		
207 *	Manual valve, unloader		
208	Hanger eye bolt	Index No.	Name
210 *	Oil pressure gauge, 75 mm dia.	49, 50, 53	Head and jacket covers
211 *	Oil pressure gauge, 100 mm dia.	52	Screw, head cover
212 *	Nipple, oil gauge	72	Spring, suction valve
213 *	Safety valve (external mounting)	73	Valve plate
214 *	Safety valve (internal mounting)	74	Discharge valve cage guide
25 (12-1)	"O" ring, main bearing (Compound only)	75	Screw, discharge valve cage guide
26 (29-3)	"O" ring, thrust bearing (Compound only)	108	Discharge valve assembly
227 *	Oil tank	109	Discharge valve cage
234	Oval flange, water cooled head cover jacket piping	116	Spring, discharge plate valve
235	Oval flange gasket, water cooled head cover jacket piping	117	Spring, safty head
237	Zinc plate, Water cooled oil cooler		

# SERVICE MANUAL, MYCOM MULTI-CYLINDER REFRIGERATION COMPRESSORS

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# SERVICE MANUAL FOR WA, WB, WJ MYCOM MULTI-CYLINDER REFRIGERATION COMPRESSORS

## CHAPTER 1. CONSTRUCTION

### 1. General Design

The Mycom multi-cylinder compressor is small and light-weight, maximizing use of floor space and weight per unit of refrigerating capacity. It is so designed that capacity control is achieved automatically by an unloader mechanism which is operated by regulating the suction pressure. When starting, load is automatically reduced by this mechanism, enabling the compressor to start with minimum torque. Load is applied only after the compressor attains working speed, thus reducing load on the motor. This means that it can be operated by a motor of smaller capacity than competing makes.

Compressor speed is max. 1200 rpm to 1450 rpm but operation is comparatively noiseless thanks to the dynamic balancing system employed. Various refrigerants can be used simply by changing a few parts.

Mycom compressors are divided into two series. One is Model WA, having 3.75" (95mm) bore and 3" (76mm) stroke, and the other is Model WB having 5.125" (130mm) bore and 3.9375" (100mm) stroke. These are also divided into two types: single stage and two stage (compound). The construction of the compound compressor is the same as that of the single stage compressor except that the compound type has two discharge and suction sections.

All parts are fabricated by the limited gauge system and are interchangeable. Replacement of parts can be achieved in a matter of minutes during periodic inspection or when repairs are necessary. All products are shipped only after extensive factory performance tests.

Please note, however, that the compressor's superior characteristics cannot be displayed if it is not properly handled. Careful reading of this manual will insure correct operation and maintenance of your Mycom compressor.

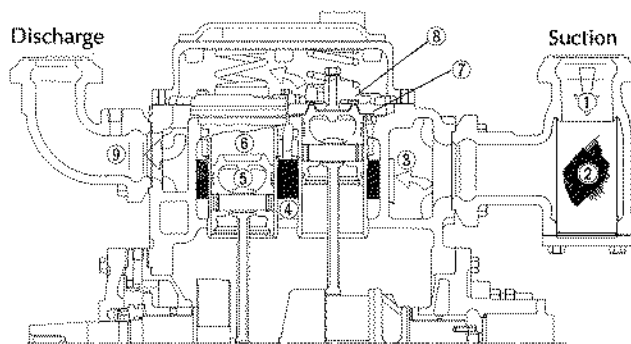
## 2. Mechanisms

### 2.1. Gas compression mechanism

#### 2.1.1. Single stage compression (Ref. Fig. 1)

The refrigerant vaporized in the evaporator, enters the scale trap (2) through the suction stop valve (1) of the compressor, where scale is removed by a screen installed inside the trap. It then passes through the suction strainer (3) and enters the crankcase suction chamber (4). When the piston (5) starts a suction stroke, the pressure in the cylinder sleeve (6) drops, allowing the gas in the suction chamber to enter the cylinder after pushing up the suction valve (7). When the piston begins its upstroke, the suction valve is closed and the gas is compressed. When the gas pressure becomes higher than the pressure in the discharge section,

it pushes up the discharge valve (8) and the compressed gas is sent into the discharge section. It is then discharged through the discharge elbow (9) to the condenser.



**Fig. 1 Compression Mechanism**

Models WA & WB are of the same construction

- |                       |                         |
|-----------------------|-------------------------|
| ① Gas from stop valve | ⑥ Cylinder sleeve       |
| ② Scale Trap          | ⑦ Suction plate valve   |
| ③ Suction strainer    | ⑧ Discharge plate valve |
| ④ Suction chamber     | ⑨ Discharge elbow       |
| ⑤ Piston              |                         |

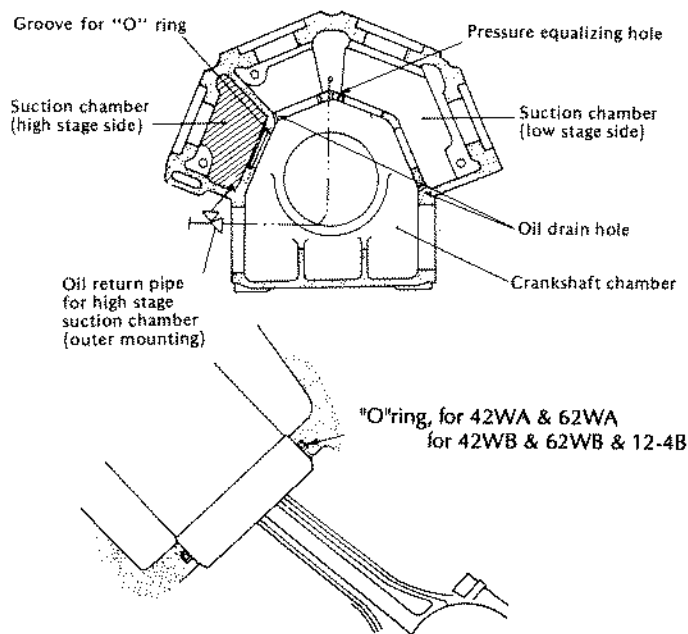
#### 2.1.2. Compound compression

(Two-stage compression by a single compressor)

The compound compressor is constructed with two suction chambers and two discharge ports and the interior is divided into two sections in order to perform the functions of two single-stage compressors.

Two cylinders of the compressor function as the high stage while, depending on the size of the compressor, the other four or six cylinders work as the low stage. Viewed from the oil pump side, the low stage cylinders are on the right side of the compressor. (Ref. Fig. 2) The suction chamber and the crankshaft chamber are connected by a pressure equalizing hole of 12mm dia. and another 5mm dia. hole is found between the bottom of the suction gas chamber and the crankshaft chamber which serves as a drain for oil returned from the evaporator and to prevent foaming.

The high stage side is located on the same side as the oil cooler. The high side suction chamber is separated from the low side suction chamber by a wall and airtightness is maintained by the use of an "O" ring in the lower end of the cylinder sleeve. The cylinder is thus sealed off from the crankshaft chamber as this suction chamber reaches a mediate evaporative pressure during operation.



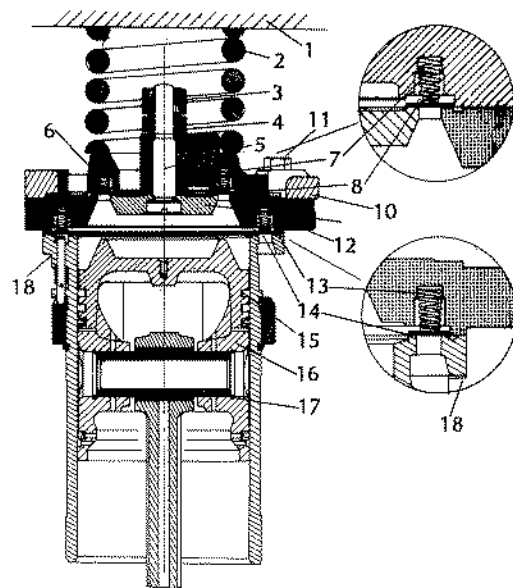
**Fig. 2 Sectional view of compound type crankcase**

From the oil drain in the high side suction chamber, piping is led to the low stage suction chamber for the purpose of cycling any oil which collects in the high side chamber. This flow is regulated by a manually operated stop valve. Oil from the high side passes to the low side and then to the crankcase through the oil drain at the bottom of the low side suction chamber. The pressure differential between high and low sides pushes the oil through the pipe. Care should be taken not to open the stop valve more than a quarter turn as this may result in gas of medium pressure flowing into the low side. Please note, however, that if the valve is completely closed, the high side suction chamber will fill with oil and oil hammering will occur.

Special note should be taken that when a compound compressor is being used for single stage operation it is necessary to reduce the pressure in the low stage suction chamber periodically in order to permit accumulated oil in the high side to flow to the low side.

## 2.2. Safety head and valve mechanism

The safety head spring is compressed between the head cover and the discharge valve assembly. It serves to prevent damage resulting from liquid hammer caused by refrigerant, oil, or foreign matter entering the cylinder by absorbing abnormal pressure.



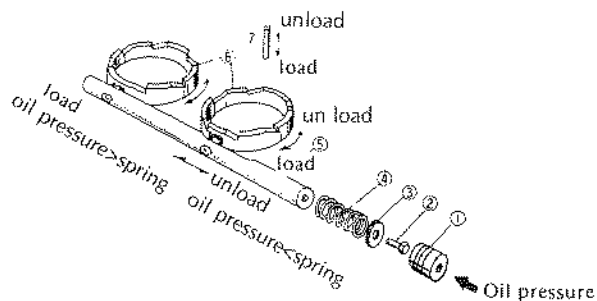
**Fig. 3 Sectional view of valve mechanism**

1. Head cover
2. Spring, safety head
3. No. 2 nut, discharge valve
4. No. 1 nut, discharge valve
5. Bolt, discharge valve seat fastening
6. Discharge valve cage
7. Spring, discharge plate valve
8. Discharge plate valve
9. Valve seat, discharge
10. Cage guide, discharge valve
11. Bolt, discharge valve cage guide fastening
12. Valve plate
13. Spring, suction valve
14. Suction plate valve
15. Piston ring
16. Piston
17. C y linder sleeve
18. Gasket, cylinder sleeve

## 2.3. Unloader mechanism

Operation of the mechanism is controlled hydraulically by means of either a manual valve or a solenoid valve. Fig. 6 shows the unloader mechanism in a loaded condition, oil pressure being applied to its unloader piston. Figure 4 shows the unloaded condition of the mechanism where no oil pressure is applied and the unloader piston is pushed back by spring force. The push rod then begins to operate, rotating the cam ring counterclockwise.

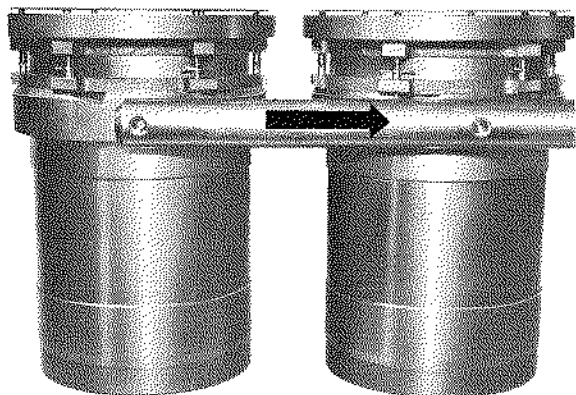




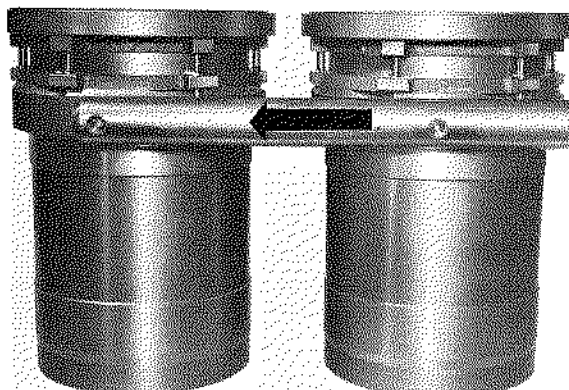
**Fig. 4 Unloader mechanism**

- |                            |                      |
|----------------------------|----------------------|
| 1. Unloader piston         | 5. Unloader push rod |
| 2. Screw, push rod         | 6. Cam ring          |
| 3. Washer, push rod        | 7. Lift pin          |
| 4. Spring, unloader device |                      |

The cam ring has a slant cut and the lift pin produces vertical movement along the slant face. The lift pin pushes up the suction valve on the upper surface of the sleeve.



**Fig. 5 Unloader mechanism in unloaded condition**



**Fig. 6 Unloader mechanism in loaded condition**

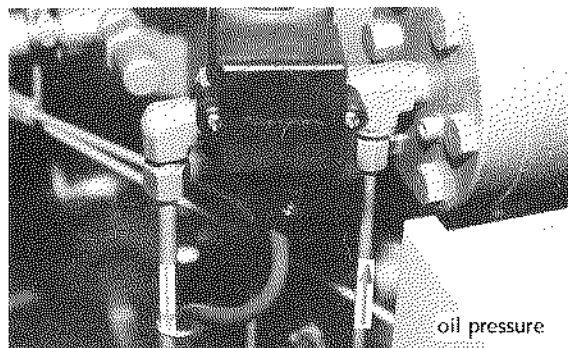
Consequently, gas escapes to the suction side even if the piston starts compression strokes. This indicates that the unloader mechanism is in an unloaded condition (Ref. Fig. 5).

On the contrary, when the lift pin is lowered and the valve is operating on the seat surface, the unloaded mechanism is in a loaded condition (ref. Fig. 6).

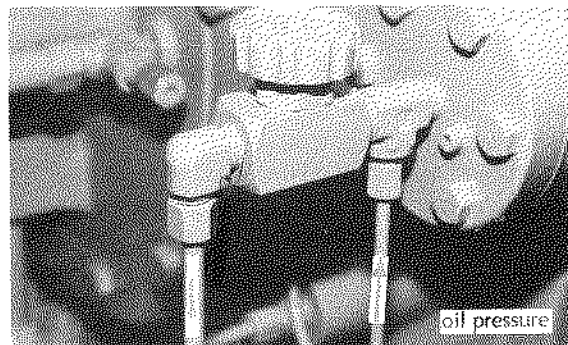
As oil pressure from the oil pump is applied to the unloader mechanism through a throttle nozzle, the unloader mechanism returns to the unloaded position if the oil pressure is released by opening the manual valve or opening the solenoid valve while it is operating.

The unloader piston cover (Ref. Fig. 7) has a solenoid valve or a manual valve mounted externally.

(1) Solenoid valve



(2) Manual valve



- |                              |                            |
|------------------------------|----------------------------|
| (1) Solenoid valve operation | (2) Manual valve operation |
| load .....by closing         | load .....by closing       |
| unload .....by opening       | unload .....by opening     |

**Fig. 7 Standard type unloader cover and manual valve**

The unloader piping of models 12WB and 12-4WB is internal and a special piston cover is utilized. Unloading is achieved by opening the manual valve or solenoid valve, while loading is achieved by closing of the valve.

Capacity control for single stage operation is directly proportionate to the displacement volume, while for compound or two-stage operation it is reduced by the displacement volume of the low stage side. The ratio of displacement volumes of the high and low stages change as follows.

62WA, 62WB L:H = 3:1 / 2:1 / 1:1

42WA, 42WB L:H = 2:1 / 1:1

12.4WA L:H = 3:1 / 2:1 / 1:1

## 2.4. Lubrication mechanism

Lube oil is pressure-fed and circulated by means of an oil pump (Fig. 8) employing a trochoid gear. The pump is driven directly off the crankshaft. An arrow on the outer rim of the pump assembly indicates the direction of rotation.

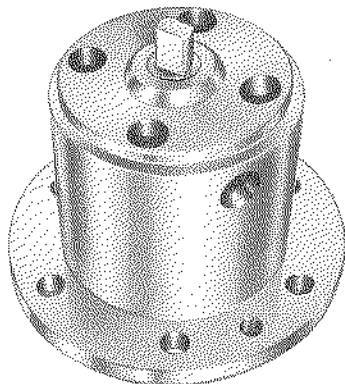


Fig. 8 Oil pump assembly

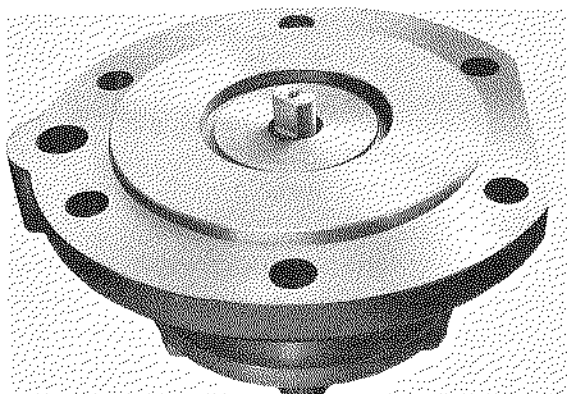


Fig. 9 Oil pump assembly for 12WB & 12-4WB

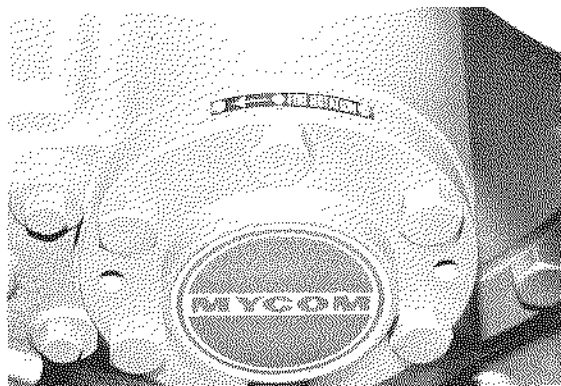


Fig. 10 Compressor rotation direction plate

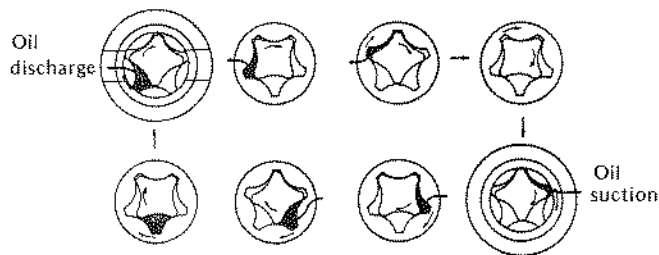


Fig. 11 Oil pumping sequence

### 2.4.1. Oil Flow for Model WA

Lube oil from the crankcase is drawn through the oil strainer by the pump and then force-fed to a multi-plate type cuno-filter. Compressors for marine use are equipped with an oil tank which feeds the oil except for model 2WA, which functions in the same manner as the standard compressor.

Oil from the cuno-filter follows two paths; one for lubricating the compressor, and the other for operating the un-loader mechanism. Lubricating oil passes through the oil cooler and then to the crankshaft, the oil passes through the thrust bearing and crankshaft where it lubricates the connecting rod bearings and main bearings.

The oil pressure regulating valve is mounted at the extreme end of the lubricating path. Thus the oil pressure gauge indicates a pressure slightly lower than that at the main lubricating points along the path.

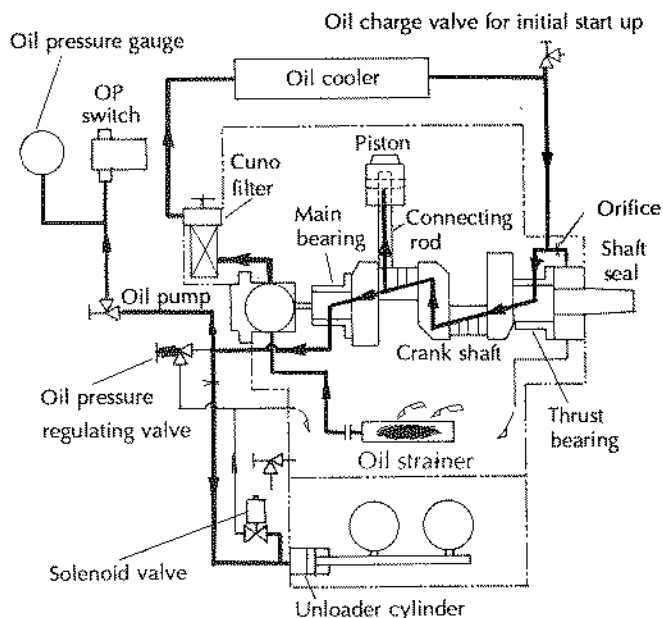
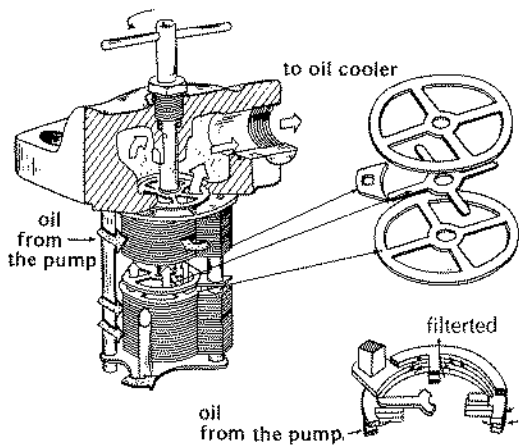
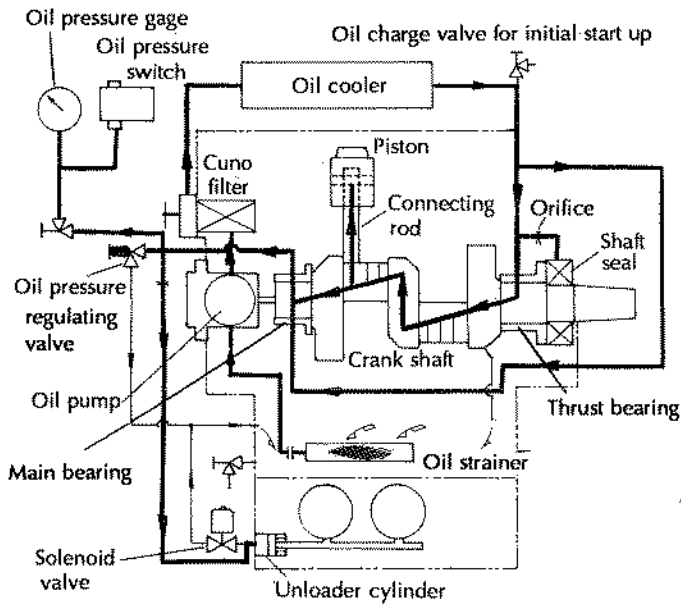


Fig. 12 Oil flow chart for Model WA

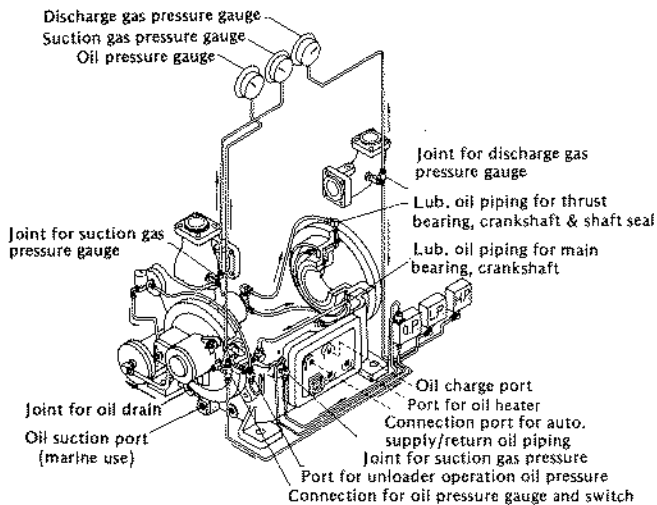


**Fig. 13 Cuno-filter mechanism**

**2.4.2. Oil flow for Model WB**

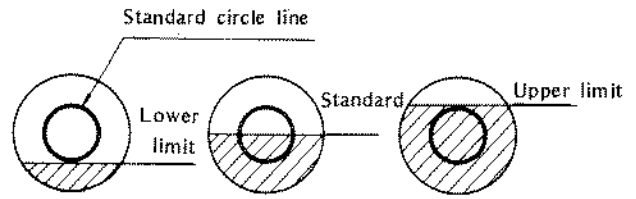


**Fig. 14 Oil flow chart for Model WB**



**Fig. 15 Oil piping of Model WB**

a) Oil level in the crankcase may be checked through the oil sight glass mounted on the handhole cover.



**Fig. 16 Oil level on the sight glass**

Initial oil quantity

UNIT : l

Model	2WA	4WA	6WA	42WA	8WA	62WA
Upper limit	6.5	16.0	16.6	16.6	19.8	20.6
Normal	5.0	13.5	11.9	11.9	16.3	16.9
Lower limit	3.5	11.5	7.5	7.5	13.0	13.4
Oil tank volume	-	30.0	30.0	30.0	35.0	35.0

4WB	6WB	42WB	8WB	62WB	12WB	124WB
24.9	29.8	30.7	31.2	32.1	59.5	62.5
19.8	24.0	25.4	25.6	26.2	48.0	50.5
15.4	19.4	19.7	20.3	20.9	38.8	40.5
40.0	45.0	46.0	50.0	50.0		

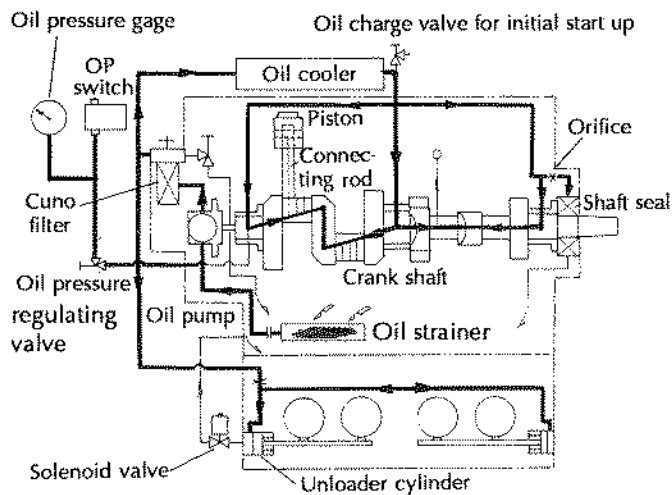
b) Oil can be easily charged from the charging mouth, even while the compressor is in operation, if the internal pressure of the crankcase is lower than the atmospheric pressure.

In case of Gas flowback at work, close the suction stop valve slightly and, after checking that the pressure in the crankcase has dropped below the atmospheric pressure, charge the oil. Put the oil charging hose deep enough into the oil tank to prevent air being sucked in.

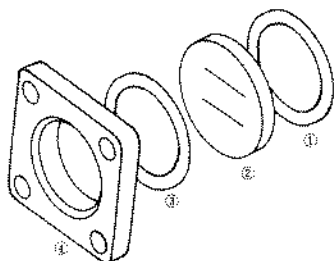
The container used for charging oil must be kept clean. If residue of other oil type remains in the container, it may cause a future trouble.

**2.4.3. Oil flow for Models 12WB and 12-4WB**

The oil flow system is similar to the Model WB system, but an intermediate bearing on the crankshaft is also lubricated. Therefore, the oil flows from the center to the ends of the crankshaft through internal paths and holes inside the crankcase (refer to Fig. 17).



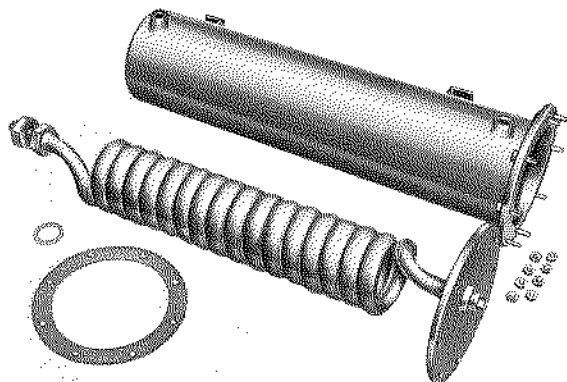
**Fig. 17 Oil flow chart for Models 12WB & 12-4WB**



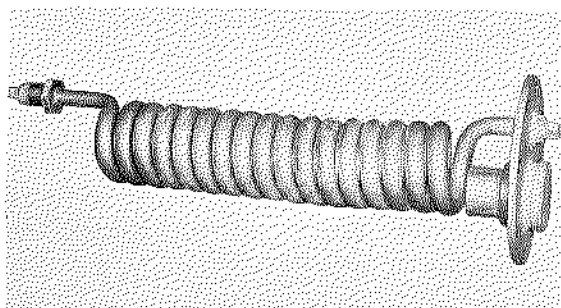
**Fig. 18 Exploded view of oil sight glass**

- (1) "O" ring
- (2) Oil sight glass
- (3) "O" ring
- (4) Gland, oil sight glass

**2.5 Oil cooler**



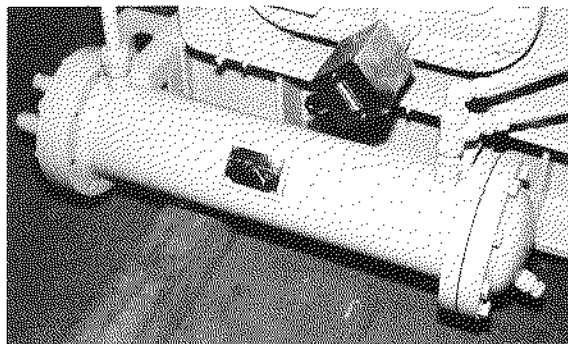
**Fig. 19 Oil cooler, Type WA**



**Fig. 20 Oil cooler, Type WB**

Both Type WA and Type WB employ a shell & coil type oil cooler, as shown on Figs. 19 and 20.

The quantity of cooling water required varies upwards of 30 L/min. (the quantity is determined by the water temperature). Keep the oil temperature under 45°C at the oil cooler outlet. The oil coolers of 12WB and 12-4WB employ a shell & tube system with 4 passes and have high cooling capacity even though small in size.

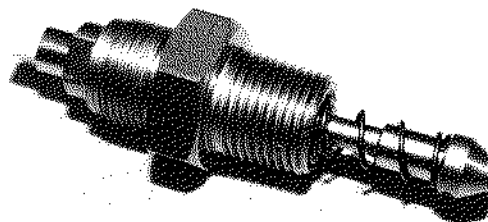


**Fig. 21 DX oil cooler**

**2.6. Abnormal oil pressure protection**

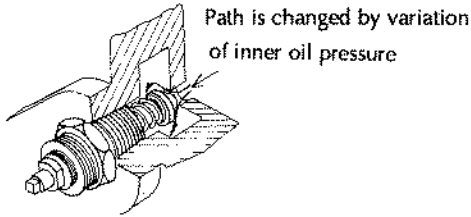
All models are equipped with an oil pressure regulating valve for abnormal oil pressure protection on the rear side of the Cuno-filter chamber. It vents any abnormally high oil pressure resulting from high viscosity at start up.

If the oil pressure cannot be raised dust may have clogged the valve seat. In this case, check valve operation once again or remove the valve and clean.



**Fig. 22 Oil pressure regulating valve**

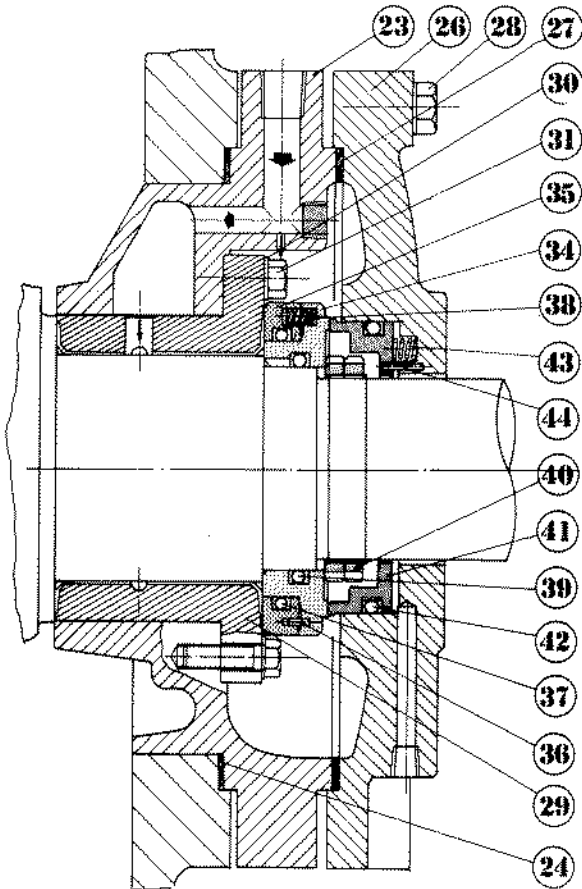
(with relief for abnormal high pressure)



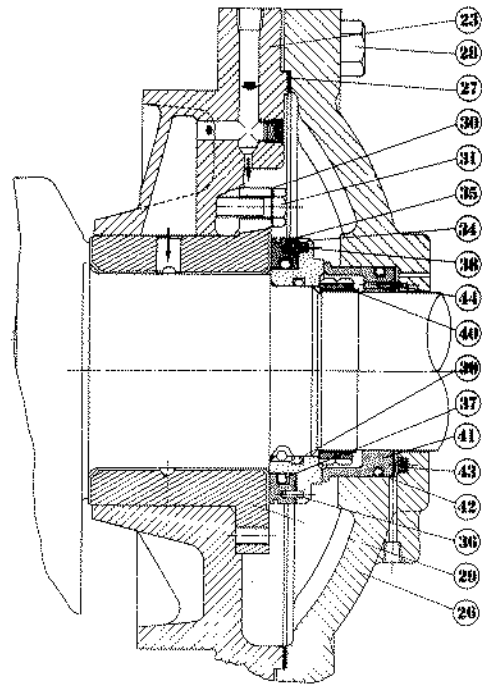
**Fig. 23 Oil pressure regulating valve**

### 2.7. Shaft seal mechanism

The shaft seal mechanism (Figs. 24 & 25) is a simple and efficient sealing device consisting of a shaft seal collar (33-1), shaft seal ring (41) and "O" rings (37,39 & 42). The shaft seal collar is fixed to the shaft by a locking ball and thus rotates with the crankshaft. The seal ring is locked to the cover plate by a roll pin (44) and alignment of the friction surfaces of these two parts is assured by the installation of a helical spring (43). The seal is pressure-fed with oil from the pump and is sealed by "O" rings and a lapped friction surface. Leakage of refrigerant and oil is completely eliminated.



**Fig. 24 Sectional view of shaft seal, Type WA**



**Fig. 25 Sectional view of shaft seal, Type WB**

- 23. Bearing head
- 24. Gasket, bearing head
- 26. Cover plate
- 27. Gasket, cover plate
- 28. Bolt, cover plate
- 29. Thrust bearing
- 30. Washer, thrust
- 31. Screw, thrust bearing
- (32). Mechanical shaft seal assembly (33-1, 39, 41, 42)
- 33-1). Collar assembly, double shaft seal (34, 35, 36, 37, 38)
- 39. "O" ring shaft seal collar
- 40. Lock nut
- 41. Shaft seal ring
- 42. "O" ring, shaft seal ring
- 43. Helical spring
- 44. Roll pin

### 2.8. Safety valve

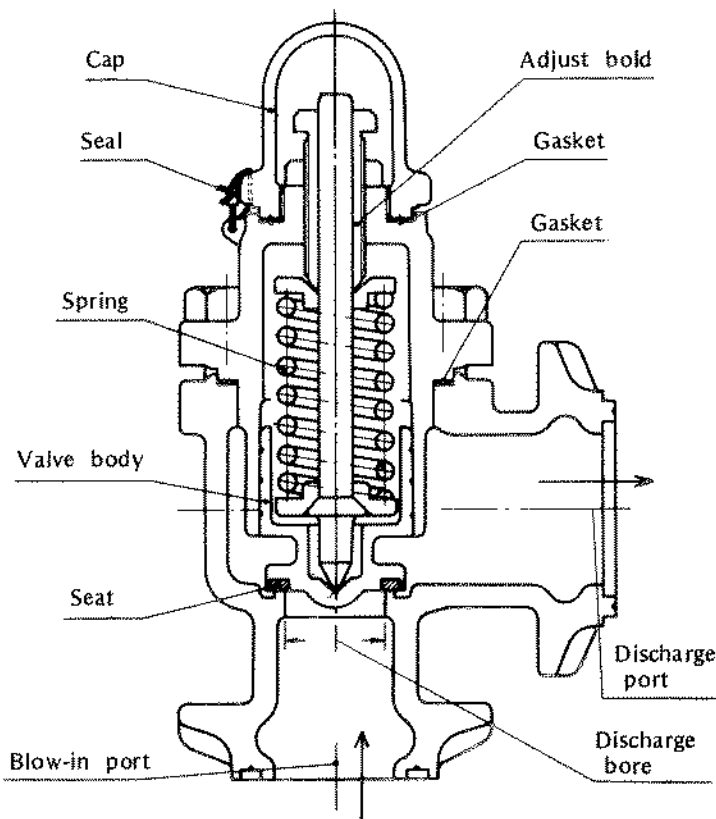
The valve is set at the following discharge pressures:

	psig	(kg)
Ammonia	275	19.5
R-22	275	19.5
R-12	275	19.5

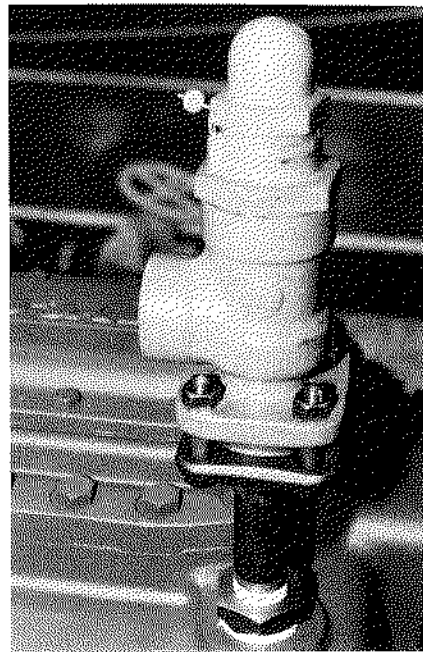
The valve should be tested at least once a year (minimum pressure test). Test apparatus and standard pressure gauges are necessary for adjustment.

The above are our standard pressure settings for safety valves. If any other pressure setting is required, please contact us at the time of your order.

A spring type safety valve is employed as shown in Figure 26.



**Fig. 26 Safety valve**



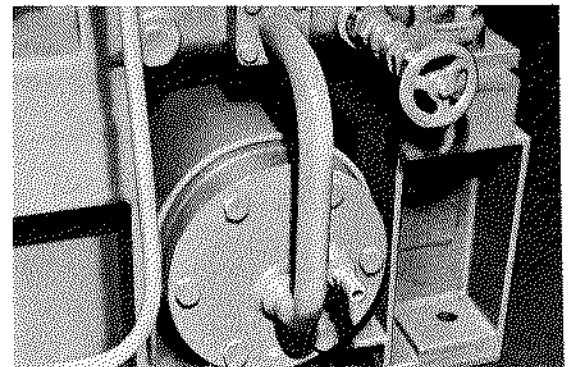
### 2.9. Oil tank for marine use

We manufacture special compressors and oil tank units for marine use. These units are designed to eliminate oil pressure drop resulting from rolling and pitching at sea.

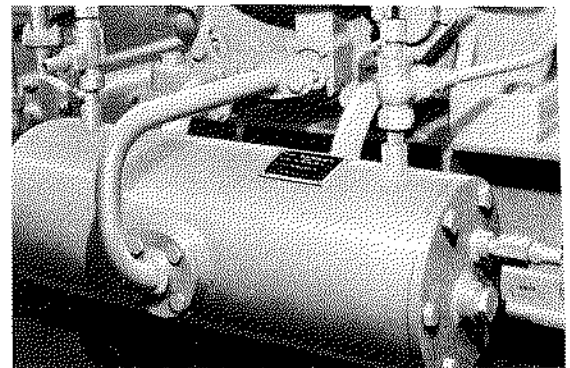
Oil tanks for 4WA to 8WB have two shapes. Fig. 27 shows a tank mounted under the compressor and Fig. 28 shows a side mounted tank. The former type has no pressure equalizing piping, and is connected with flange at the lower center part of the crankcase. The other type has two oil flow pipes and one pressure equalizing pipe for purging gas and is connected to the handhole cover. There is a stop valve in the middle of this pipe. It should not be closed during operation.

The tank cover has a valve for draining oil. The inside of the oil tank must be cleaned after each voyage.

The normal oil level is the same as for land use. Adjust to keep the level in the middle of the sight glass.



**Fig. 27 Oil tank, bottom mounting type for marine use**



**Fig. 28 Oil tank, side mounting type for marine use**



## CHAPTER 2. DISASSEMBLY AND REASSEMBLY

### 1. Disassembly

#### 1.1. Stopping operation

There are two reasons for disassembly of the compressor. One is for routine checking and the other is for repairs.

##### 1.1.1. Routine checking

In general, routine checking is planned so as to limit the downtime of the compressor, and is for maintenance and safety control. It must guarantee smooth operation at least until the next routine check, so may include replacement or repair of parts.

First, the compressor must be stopped and the refrigerant in the low pressure side collected into the liquid receiver. If each unit in a multi-compressor system can be checked alternately, it is equal to temporary stopping, i.e., close the suction stop valve of the compressor, and exhaust refrigerant from the crankcase.

After stopping the compressor, close the discharge stop valve to allow refrigerant gas in the discharge assembly to escape to the low pressure side through the by-pass piping. If the compressor has an automatic control circuit which works by suction pressure for load reduction and stopping, this electric circuit must be changed over to the manual circuit or shorted.

If ammonia remains, it gives off a strong odor. Purge as soon as possible.

In case of Freon, reduce pressure gradually until it becomes 0 kg/cm<sup>2</sup>G, then stop the compressor. The pressure will rise after a while, so repeat this handling until the pressure does not rise again.

Care must have taken not to reduce pressure too quickly. If roughly handled, refrigerant in the oil evaporates, foams and causes oil pumping or oil hammer.

##### 1.1.2. Repairs

When disassembly and repair is required due to trouble, the compressor must be stopped with the same handling as described above if the necessary time for stopping is available. In many cases, there is no time for gradual stopping when abnormal conditions are found, however. Even so, do not forget the correct handling of valves, otherwise it may further endanger the equipment.

##### 1.1.3. Purging refrigerant

Ammonia gas must be discharged into water. Water absorbs ammonia gas up to 600 times its own volume so even if a small amount is used it is able to absorb a fairly large quantity of gas. In this case, care should be taken to ensure

that the water is not sucked into the compressor.

In case of Halocarbon refrigerant, close the liquid outlet valve on the liquid receiver and collect as much refrigerant as possible into the receiver and the condenser by operating the compressor. When the suction pressure reaches close to vacuum, close the suction and discharge valves and all valves on the high pressure line, then stop operation (care must be taken not to exhaust excessive gas into the air). Halocarbon gas stays close to the floor and care must be taken to exhaust the gas outdoors using a pipe or hose to protect potential suffocation.

Should liquid flow-back occur, it is advisable to bleed both refrigerant and compressor oil into a container.

#### 1.2. Preparation for disassembly

a) The crankcase is in a vacuum state when the compressor is stopped. It should be brought to atmospheric pressure.

Drain the oil from the crankcase through the oil drain valve by removing the oil plug through the hand hole. Also drain through the piping of the low pressure gauge.

If the compressor is equipped with an automatic oil supply system, do not forget to close all valves of the system. This must also be done for the automatic oil return type oil separator.

b) During disassembly work, cut off all power switches not in use.

c) Drain water from the jacket heads and block. Drain cocks are provided on the side of the crankcase and the bottom of the oil cooler.

d) Remove belts or coupling and take off the flange and flywheel as shown in Figures 29 & 30.

e) Both flywheel and coupling flange are tapered on the compressor side so that they are easily removed by loosening them slightly. Handle the components with care.

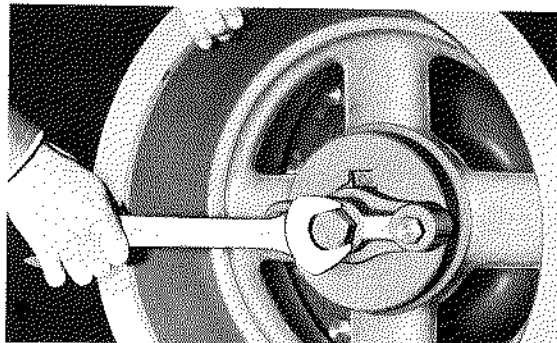
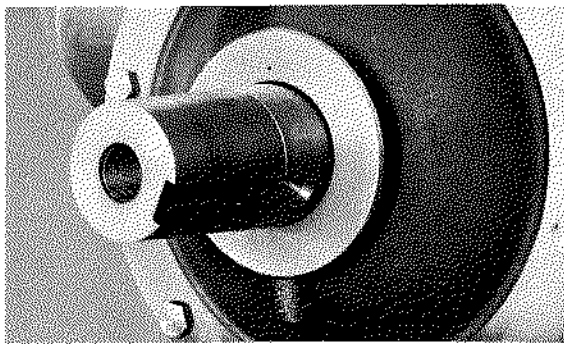


Fig. 29 Dismantling flywheel



**Fig. 30 Crankshaft without flywheel**

### 1.3. Notes on disassembly

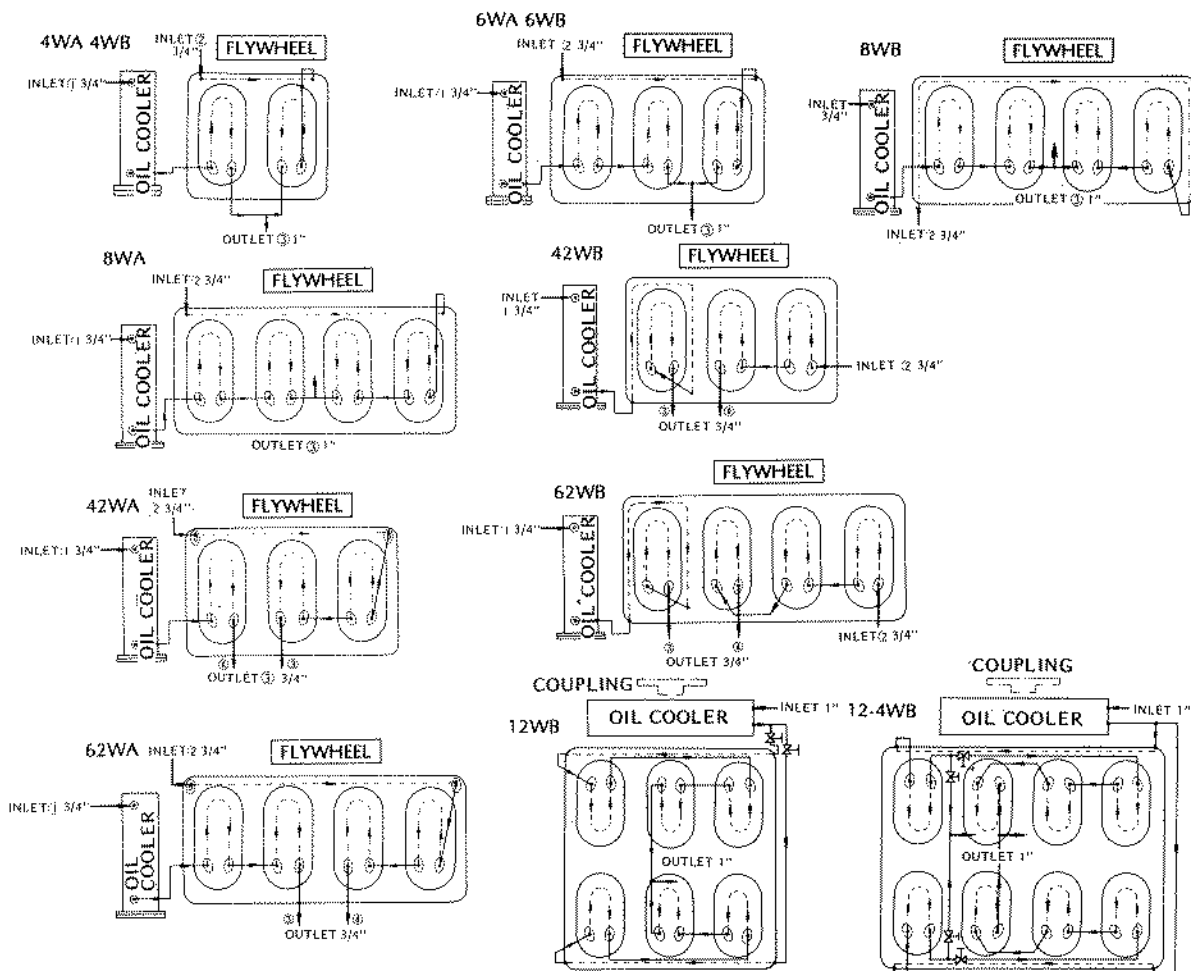
- Tools must always be kept clean (refer to Supplement II).
- Neatly arrange disassembled parts in order on a table or a surface which is clean, free of moisture and nonabrasive.
- To clean parts, use pure alcohol, carbon tetrachloride, trichlore-ethylene or light oil. Warmed (45 to 50°C) compressor oil may also be used.

After washing, coat surfaces with lubricating oil. Parts will become rusty if left without an oil film.

- Before assembling, clean the parts with compressed air, a sponge or clean cloth and coat with clean lubricating oil. Avoid using rags which shed fibers as these will cause clogging of the oil piping.
- When mounting gaskets, it is advisable that graphite-mixed oil or nondrying packing be applied on one side of the gasket to make future disassembly easier.
- When cylinders are disassembled, component parts should be arranged neatly in order of each cylinder. In particular, take special care not to mix connecting rods.

### 1.4. Removal of water piping

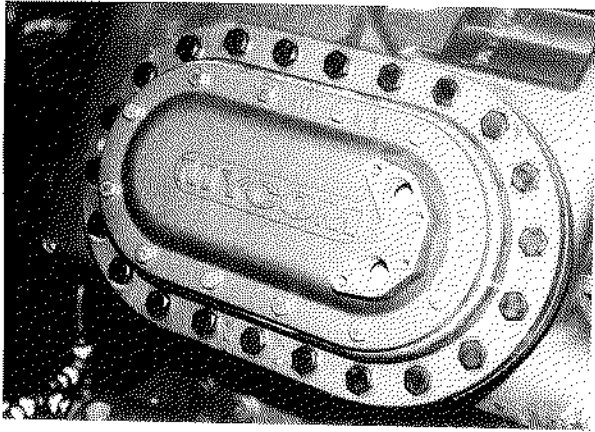
- The standard cooling water flow is as illustrated in Figure 31.
- Land standard models employ vinyl hose, so loosen the hose bands.
- Marine standard models employ steel pipe, so remove the flange connections.



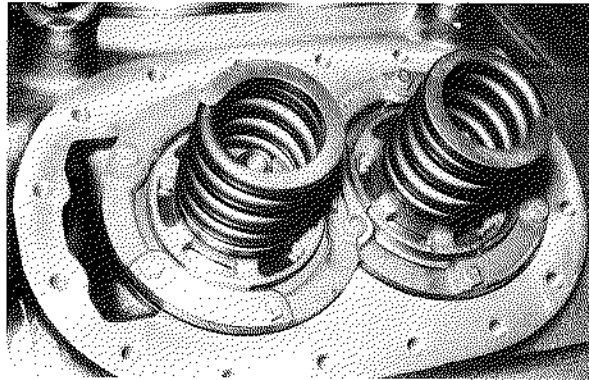
**Fig. 31 Standard cooling water flow chart (Jacket head cover)**

### 1.5. Removal of head cover

- a) Two types of head cover exist, those with and those without water jackets.
- b) In the case of Model WB compressors, first replace any two symmetrically opposite screws with the long ones provided in the hand tool kit. Now, remove all screws other than these two long ones from the head cover. Finally loosen these two gradually until the head springs break the gasket free.
- c) If the gasket adheres to the main body or to the head cover, tap the head cover on the side with a mallet after loosening the two screws, or peel the gasket off carefully with a felt chisel or screwdriver. Be careful not to damage the gasket.



**Fig. 32 Jacket head cover, Model WB**

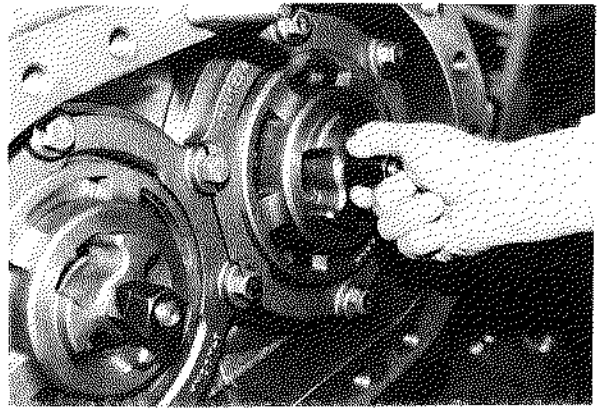


**Fig. 33 View after head cover removed**

### 1.6. Removal of head springs

The safety head springs shown in Figure 33 are pressure-attached between the head cover and discharge valve assembly and their position is determined by the seat of the cage. They can be taken off easily by hand. When carbonized oil, slag and the like adhere to them, the discharge valve assembly occasionally comes off with the spring.

Remove the springs only, taking care that no carbonized oil or slag falls into the cylinder.



**Fig. 34 Removing discharge valve assembly**

### 1.7. Discharge valve (assembly)

- a) As the assembly is kept in position by the cage guide only, the valve assemblies can easily be removed by hand (Fig. 34). However, when carbonized oil and slag adhere to them remove carefully taking care not to allow any foreign matter to drop into the cylinder.
- b) Avoid disassembly if the parts appear to be in good condition, i.e., no abrasion of valves, damage to spring or presence of carbonized oil or slag. When disassembly is necessary, do it with care using the tools in the hand tool kit. (ref. 3-16).
- c) Sequence of disassembly

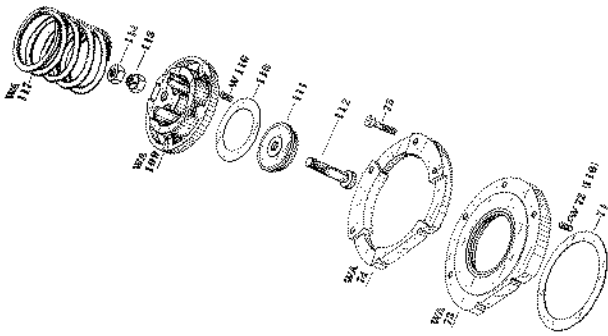
- 1) Unscrew and remove both parts of locknut assembly.

#### NOTE

The discharge valve assembly must be firmly held in order to prevent the assembly turning when the locknuts are slackened-off, and again when tightening the nuts on reassembly. The valve assembly must NOT be held in a vice as this practice may distort the discharge valve seat, forming 'high spots' which will prevent the valve seating correctly. Instead, hold the valve assembly using the special tool provided in the compressor tool kit, illustrated in fig. 86

- 2) Pull out bolt (112).

- 3) When the bolt has been pulled out, the discharge valve seat (111), discharge valve (110) and discharge valve spring (116) will come loose. Be careful not to lose the springs as they are very small.



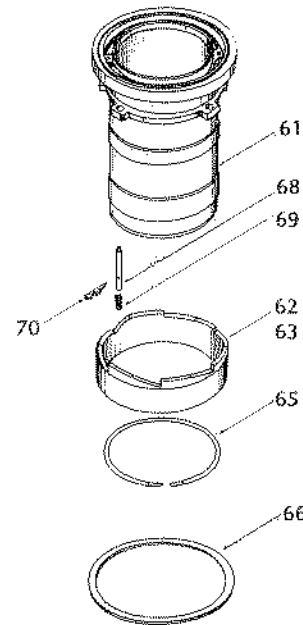
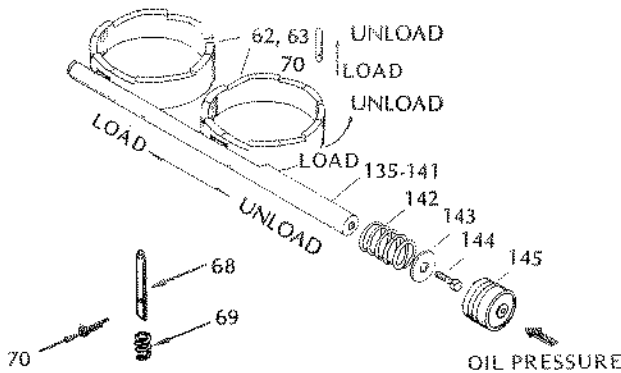
**Fig. 35 Discharge and suction valve assemblies, Model WA**

**1.8. Suction valve (assembly) (refer to Fig. 49).**

- a) Loosen screws (W75) and take off.
- b) The cage guide (W74) and valve plate (W73) can be removed together by pulling out by hand.
- c) The springs (W72) for the suction valve (W71) are generally tightly fixed in the holes of the valve plate (W73) but handle them with care as some may be loose.
- d) The suction valve remains on the seat surface of the cylinder sleeve. Do not separate the valve plate and cage guide. Place them with the spring side upwards to protect the seat surface from scratches.

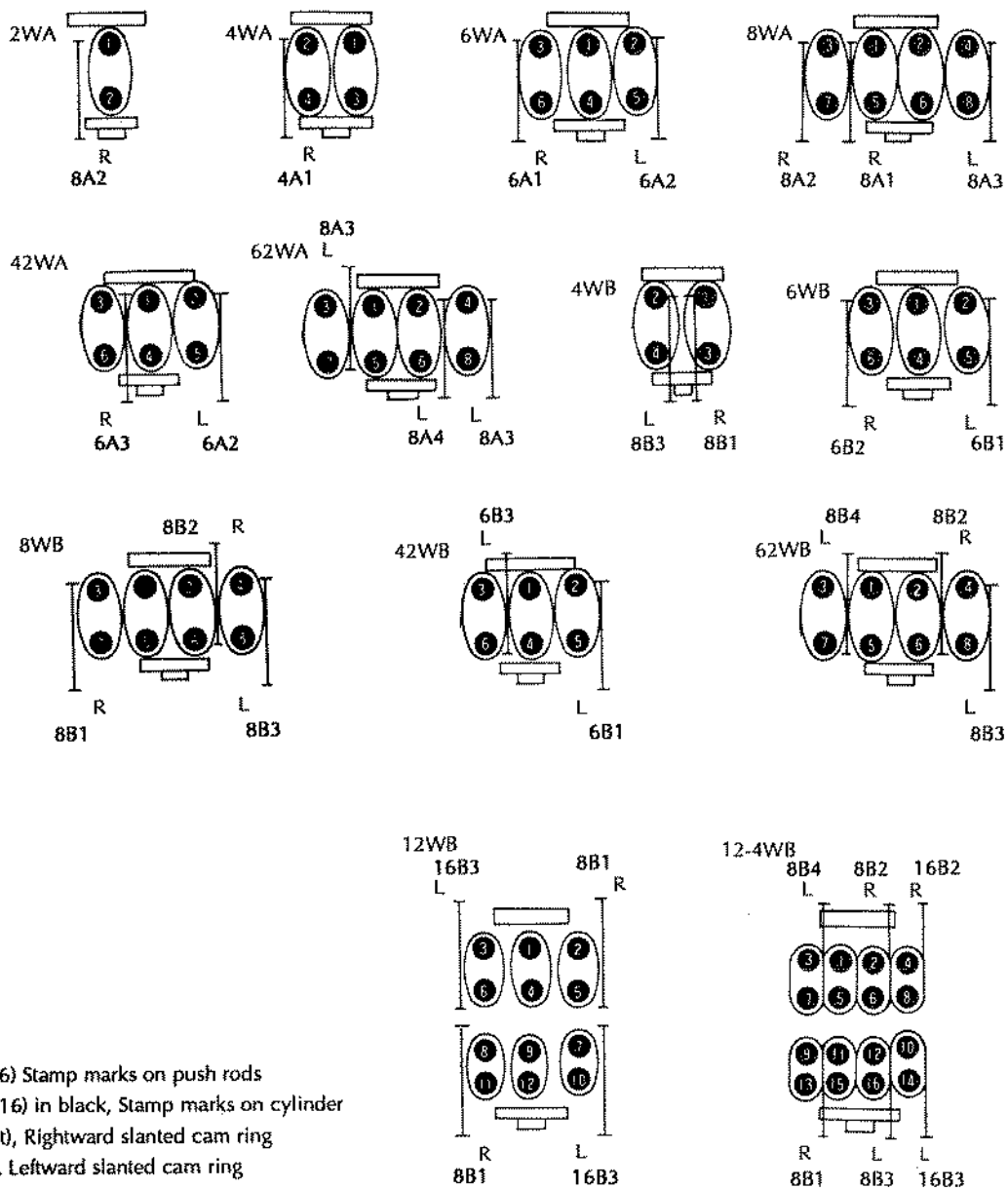
**1.9. Unloader mechanism**

- a) Take off oil piping. It is not necessary to take off the screwed fitting on the unloader piston cover except on Model 12WB.
- b) When electric wiring is connected to the solenoid valve, disconnect this first.
- c) Remove the unloader piston cover together with the solenoid valve.
- d) Pull out the unloader piston (145) using the eyebolt supplied in the hand tool kit, or push in the unloader piston with your thumb and release it quickly so that it is pushed out by the elastic power of the spring (142).
- e) Pull out push rod (135-141) as shown in Figs. 36 & 38. Spring (142) and washer (143) are attached to the push rod with a screw (2); do not separate.
- f) The size of the push rod varies depending on the position. Do not forget to record the original position for these push rods so they can be reinstalled correctly later (Fig. 39-1).



- |                              |                             |
|------------------------------|-----------------------------|
| 145. Unloader piston         | 66. Gasket, cylinder sleeve |
| 144. Screw, push rod         | 65. Retaining ring          |
| 143. Washer, push rod        | 61. Cylinder sleeve         |
| 142. Spring, unloader device | 69. Spring, lift pin        |
| 135-141. Push rod            | 68. Lift pin                |
| 62,63. Cam ring              | 70. Slit pin, lift pin      |

**Fig. 36 Cylinder sleeve and unloader mechanism**



**Fig. 37 Unloader and cylinder sleeves**

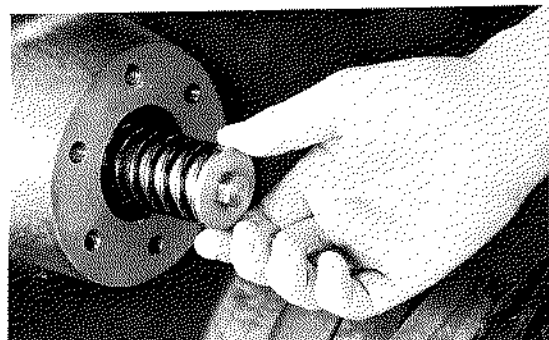
**1.10. Oil cooler**

a) The cylinder section is disassembled after removing the hand holle cover. Take off the oil cooler before removing the hand hole cover (not necessary to take off if marine type). The oil cooler is attached by two screws on the right and left sides. Loosen slightly, slide the oil cooler upwards and remove from the slot (ref. Fig. 40).

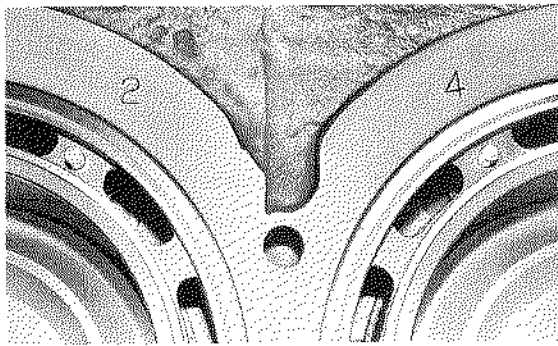
b) Disassembly of the oil cooler is done in the following order.

- 1) Take off oil piping and bolts.
- 2) Pull out flange after loosening bolts and nuts.

3) Pull out coil simultaneously with flange (ref. to Figs. 19 & 20).



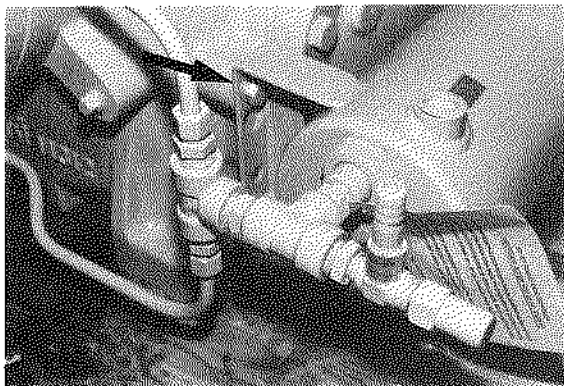
**Fig. 38 Removal of push rod**



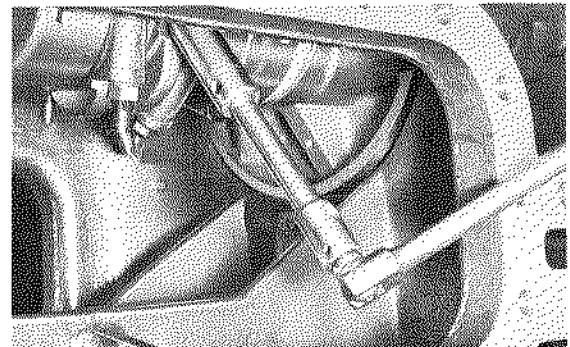
**Fig. 39 Cylinder number mark (case side)**

No.	Compressor model	2WA	4WA	6WA	8WA	42WA	62WA	4WB	6WB	8WB	42WB	62WB	12WB	12.4WB
1	Art. No.		4AU8	6AU8	8AU8			8BU8	6BU8	8BU8	6BU8		8BU8	8BU8
	Mark		4A1	6A1	8A1			8B1	6B1	8B1	6B1		8B1	8B1
	Full length (mm)		275	264	324			397	412.5	397	412.5		397	397
2	Art. No.	8AU9		6AU9	8AU9	6AU9			6BU9	8BU9		8BU9		8BU9
	Mark	8A2		6A2	8A2	6A2			6B2	8B2		8B2		8B2
	Full length (mm)	280		286	280	286			381.5	372		372	428	372
3	Art. No.				8AU10	6AU8	8AU10	8BU10		8BU10	42BU8	8BU10	16BU25	8BU10
	Mark				8A3	6A3	8A3	8B3		8B3	6B3	8B3	16B3	8B3
	Full length (mm)				258	308	258	366		366	356.5	366	428	366
4	Art. No.						8AU9						8BU21	8BU21
	Mark						8A4						8B4	8B4
	Full length (mm)						302						341	341
5	Art. No.													16BU24
	Mark													16B2
	Full length (mm)													434
6	Art. No.													16BU25
	Mark													16B3
	Full length (mm)													428

**Fig. 39-1 List of unloader push rods**

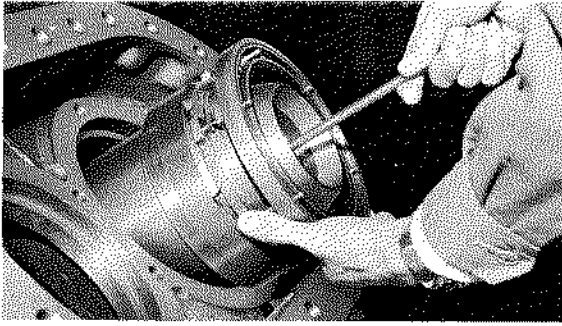


**Fig. 40 Dismantling oil cooler**

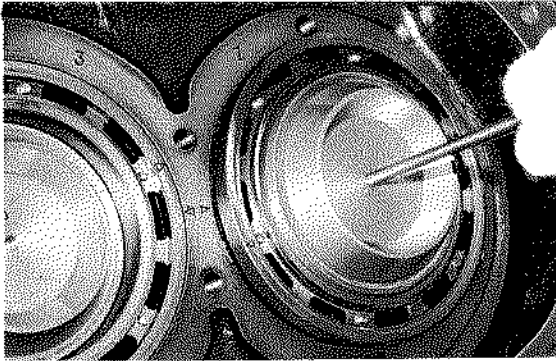


**Fig. 41 Removing con-rod cap**





**Fig. 42 Removing piston and cylinder**



**Fig. 43 Piston improperly aligned for removal**



**Fig. 44 Removing piston from cylinder sleeve**

### 1.11. Handhole cover

- a) Remove the oil feed piping. If the compressor is equipped with an oil tank for the automatic oil supply system, take off the pressure equalizing pipe.
- b) Remove all screws except the one at the top center.
- c) Remove the gasket by partially unscrewing the one remaining screw. Hold the cover securely and remove

it carefully. Be careful not to drop the cover. If it is equipped with an oil feed pipe, take care not to damage the float valve installed inside.

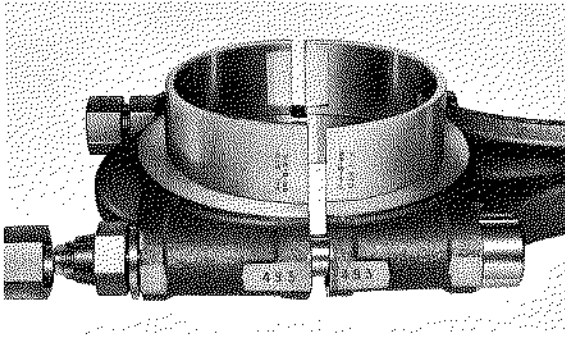
### 1.12. Disassembly of cylinder sleeve and piston

As the size of the connecting rod big end is larger than the inside diameter of the cylinder sleeve, take the cylinder sleeve, together with piston and connecting rod, from the crankcase.

- a) Remove the bolts and nuts of the connecting rod through the hand hole as shown in Fig. 41. Remove the double lock nuts one by one.
- b) When the nuts have been removed, pull off the cap.
- c) Screw the supplied eyebolt into the hole tapped in the piston top (ref. to Figs. 42 & 43).
- d) Turn the crankshaft so that the piston comes to the dead bottom position. The connecting rod must now be pulled off the bolts (index No. 78).
- e) The cylinder sleeve and piston can normally be lifted out together by the eyebolt. If the cylinder sleeve is too tight, loosen it by tapping the bottom end of the sleeve with a wooden block or by hooking a piece of bent iron wire around the guard of the sleeve and pulling.
- f) Should the cylinder sleeve be too tight and only the piston comes out, the compression rings will be withdrawn and released from the cylinder, making disassembly difficult (ref. to Fig. 43).
- g) When lifting, be careful not to allow the end of the connecting rod to hit the web plate of the crankcase.
- h) As the connecting rod is part of a set including the cap and sleeve, all these pieces should be grouped in order.

#### 1.12.1. Cylinder sleeve

- a) Place the cylinder sleeve on the table with its upper surface (suction valve side) downward to prevent damage. To prevent damage to the seat surface it is best to take out the lift pin. This can be done by turning the cam ring and then pulling it out, holding the connecting rod (ref. to Fig. 44).
- b) Usually, it is unnecessary to disassemble the cylinder sleeve. There are two types of cam rings; one of them has slots facing right, the other, slots facing left. A cam ring, must therefore be selected according to the position of the cylinder sleeve in the crankcase (ref. to Fig. 37).



Manufacturing assembly number  
(there is a cylinder number on  
the backside. See Fig. 64)

**Fig. 45 Assembly numbers of connecting rods**



**Fig. 46 Removing rings**

### 1.12.2. Piston and connecting rod

Put the piston with its top facing downwards. Remove the snap ring of the piston pin with a pair of pliers, tap the piston pin with a wooden block and pull out carefully. Do not taken off the bearings from the rod except when a change is necessary.

The connecting rod body and cap have manufacturing assembly numbers (three figures) and one or two figures to indicate the piston assembly number (cylinder number) stamped on the surface. Keep each pair together (ref. to Fig. 45).

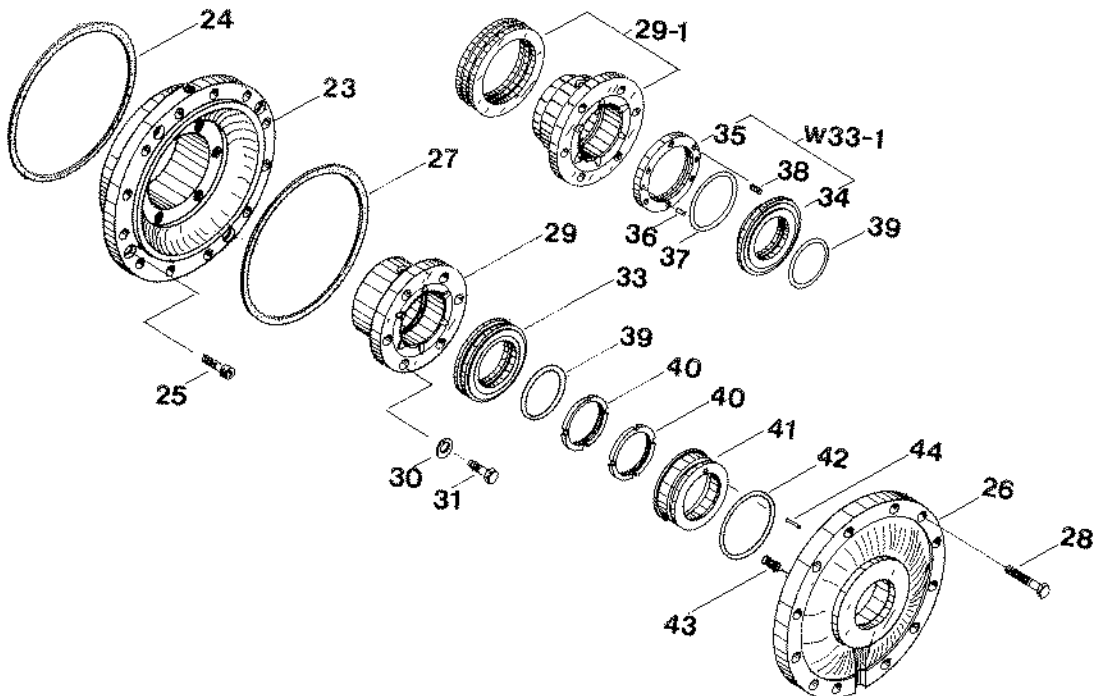
### 1.12.3. Piston ring

Take off the rings as shown in Fig. 46 only if replacement is necessary.

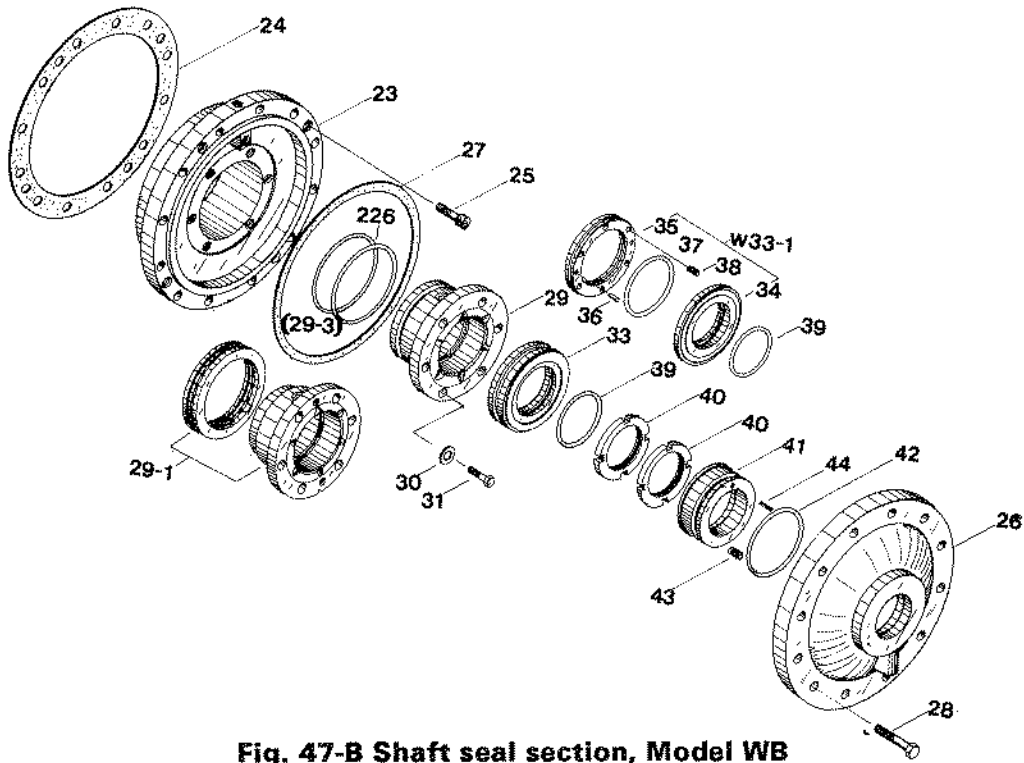
### 1.13. Shaft seal section

Refer to the following order for disassembly (Figs. 47 to 53).

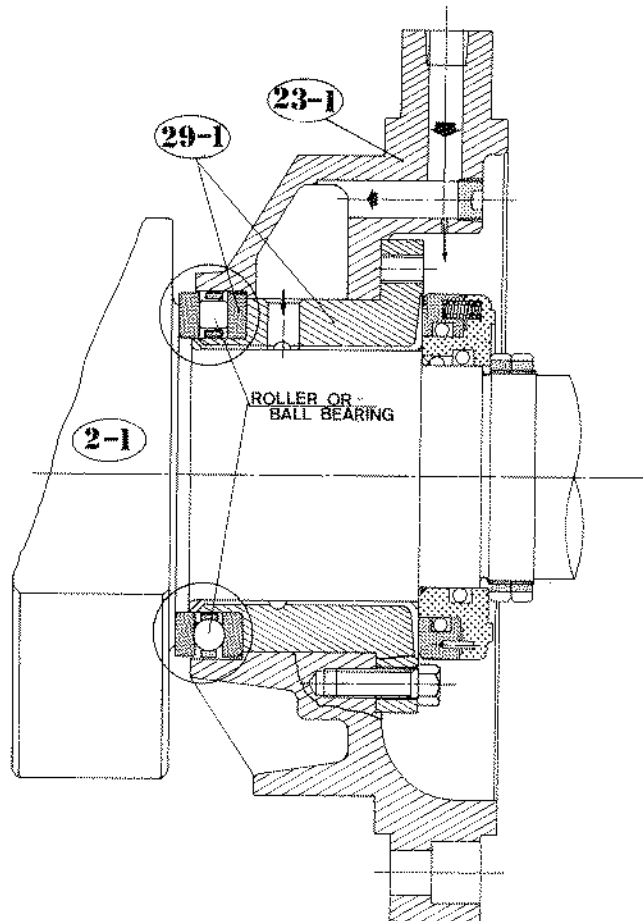
- a) Remove all but two screws from the cover plate, leaving the two symmetrically positioned screws.
- b) Next, loosen these two screws alternately in the same manner as for the head cover. There is inside this cover an oil reservoir so position a tray under the cover plate during the work.
- c) When the screws are removed, the cover plate disengages from the seat of the bearing head. Draw it out, holding it perpendicular to the crankshaft. Be careful not to drop it on the crankshaft.



**Fig. 47-A Shaft seal section, Model WA,**



**Fig. 47-B Shaft seal section, Model WB**



**Fig. 48 Ball bearing type thrust**

No.	Part name	Model WA	Model WB	12WB & 12-4WB
		Q'ty	Q'ty	Q'ty
23	Bearing head	1	1	1
24	Gasket, bearing head	1	1	1
25	Screw, bearing head	4	4	4
26	Cover plate	1	1	10
27	Gasket, cover plate	1	1	1
28	Screw cover plate	8	12	1
29	Thrust bearing	1	1	1
30	Washer, thrust bearing	6	6	2
31	Screw, thrust bearing	6	6	1
33	Shaft seal collar	1	1	1
33-1	Shaft double seal collar	1	1	6
39	O-ring shaft seal collar	1	1	6
40	Locknut	2	2	1
41	Shaft seal ring	1	1	4
42	O-ring, shaft seal ring	1	1	1
43	Helical spring	DC 9 DB 12	10	1
44	Roll Pin	1	1	1

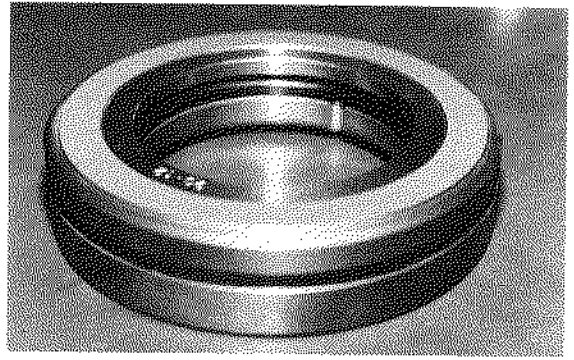
**Thrust ball bearing type parts**

29-1	Thrust ball bearing	1	1	1
23-1	Bearing head BB	1	1	1
2-1	Crankshaft BB	1	1	1

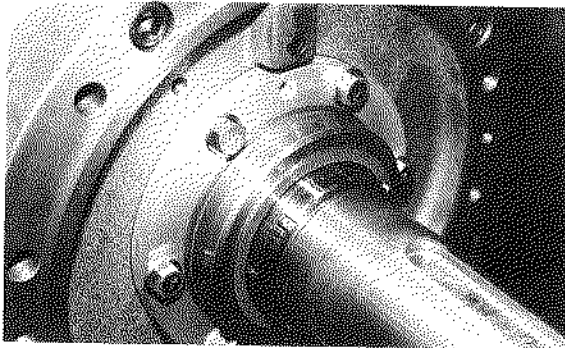
**Shaft seal components (ref. Fig. 47 to 48)**

### 1.13.1. Shaft seal collar

- a) When the shaft seal mechanism is as shown in Figs. 47A & 47B, remove the locknuts (40), using extreme care not to scratch the bearing surfaces of the shaft seal collar (33) (ref. to Figs. 50).
- b) When the locknuts have been removed, pull out the shaft seal collar (33-1) through the groove on the outer circumference as shown in Fig. 52. Never risk gouging it by putting a screwdriver between the seal collar and the thrust bearing (29) even when it will not part easily. The components of the double seal collar are shown in Fig. 52.

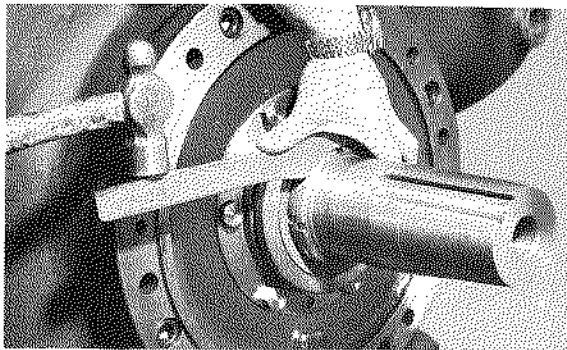


**Fig. 52 Double seal collar**

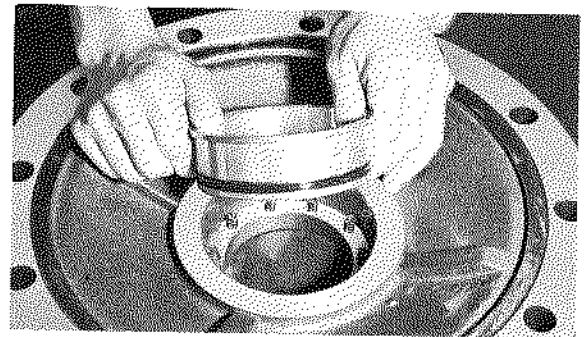


**Fig. 49 Shaft seal without cover plate**

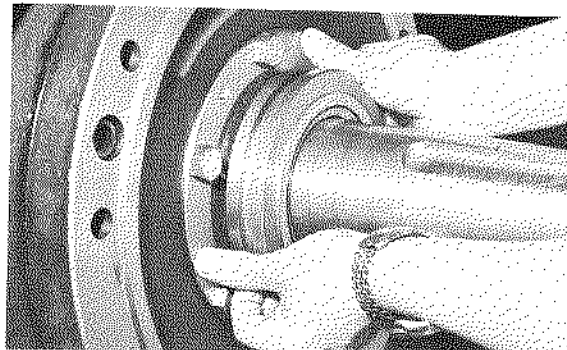
No.	Part name	Type WA	Type WB
		Q'ty	Q'ty
39	a. "O" ring, shaft seal collar	1	1
34	b. Retainer ring, double seal collar	1	1
38	c. Spring, double seal collar	6	8
37	d. "O" ring, double seat	1	1
36	e. Pin, double seal collar stopper	1	1
35	f. Floating seat, double seal collar	1	1



**Fig. 50 Unscrewing locknut**



**Fig. 53 Removing seal ring**



**Fig. 51 Removing seal collar**

### 1.13.2. Thrust bearing

When the screws have been removed, draw out the thrust bearing with the pulling screws by lifting up the crankshaft slightly.

### 1.13.3. Bearing head

Remove the screws (25) and then draw the bearing head out with the pulling screws in the hand tool kit. Just before it comes away through the opening of the crankcase, it should be held by two people, as it is very heavy (about 20 kgs). It should be pulled out carefully keeping it perpendicular to the crankshaft.

## 1.14. Oil pump

- a) Before removing, take note of the arrow mark (ref. to Fig. 10) indicating the direction of rotation.
- b) To remove the oil pump, press out the pump by inserting eye-bolts in the two blind bolt holes and pressing out evenly.
- c) Leave the oil pump as an assembly unless it is absolutely necessary to disassemble. An "O" ring remains on the main bearing and must also be removed.

### 1.14.1. Drag crank

When the oil pump is pulled out, the crankshaft end is seen where the drag crank is attached. It can easily be taken off from the crankshaft by hand.

## 1.15. Crankshaft

### 1.15.1. Models WA & WB

Wrap the bearing surfaces in cloth to protect them from damage. The crankshaft is held at one end by the main bearing, therefore it is best to keep the other end in position with a wooden block inserted from the hand-hole side.

If the crankshaft is twisted before it is pulled out completely, it will scar the bearing surface of the main bearing. Pull it out straight, slowly and carefully.

### 1.15.2. Models 12WB & 12-4WB

To remove the crankshaft of Models 12WB & 12-4WB, disassemble the main bearing head first. The shaft is then

held only by the intermediate bearing, as shown Figure 55.

- a) Before disassembling the main bearing, drain the oil inside the cuno-filter case by pulling out the drain plug. About 3 litres can be collected.
- b) Remove the oil pump assembly (56) by loosening screws (60). Do not loosen screws DG1-7-1. These screws are loosened only when reversing the direction of revolution. For this purpose, loosen screws (DG1-7-1) and turn the oil pump assembly 180°.
- c) Remove the drag crank (3).
- d) Using a box wrench, loose the locknut (133) of the taper pin (131) which holds the intermediate bearing to the main body (refer to Figure 56).
- e) When the locknut has been slackened off about 5 mm, tap the taper pin (131) and pull out.
- f) Although not included in our standard tool kit, a special shaft disassembly tool is available by order and will make this job much easier (refer Fig. 55).
- g) Push out the shaft with a wood block from the handhole cover side until the shaft comes out at the position shown in Fig. 55. Now hang the shaft at the intermediate bearing and pull out completely.
- h) Release the intermediate bearing by propping up the main bearing and thrust bearing sections with wooden blocks. Draw out the taper pin (134), and the mediate bearing will separate into two pieces.

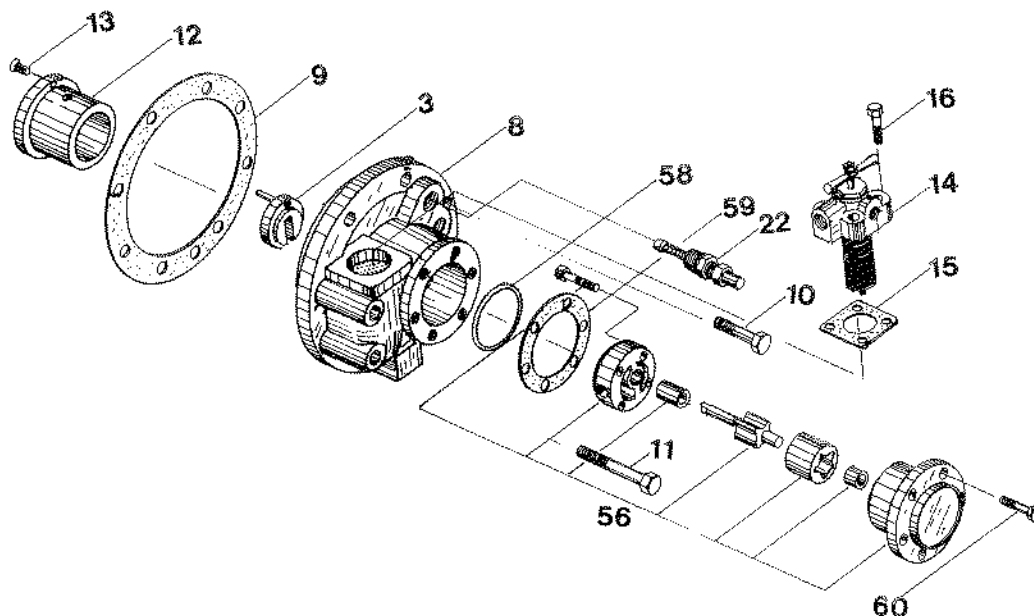
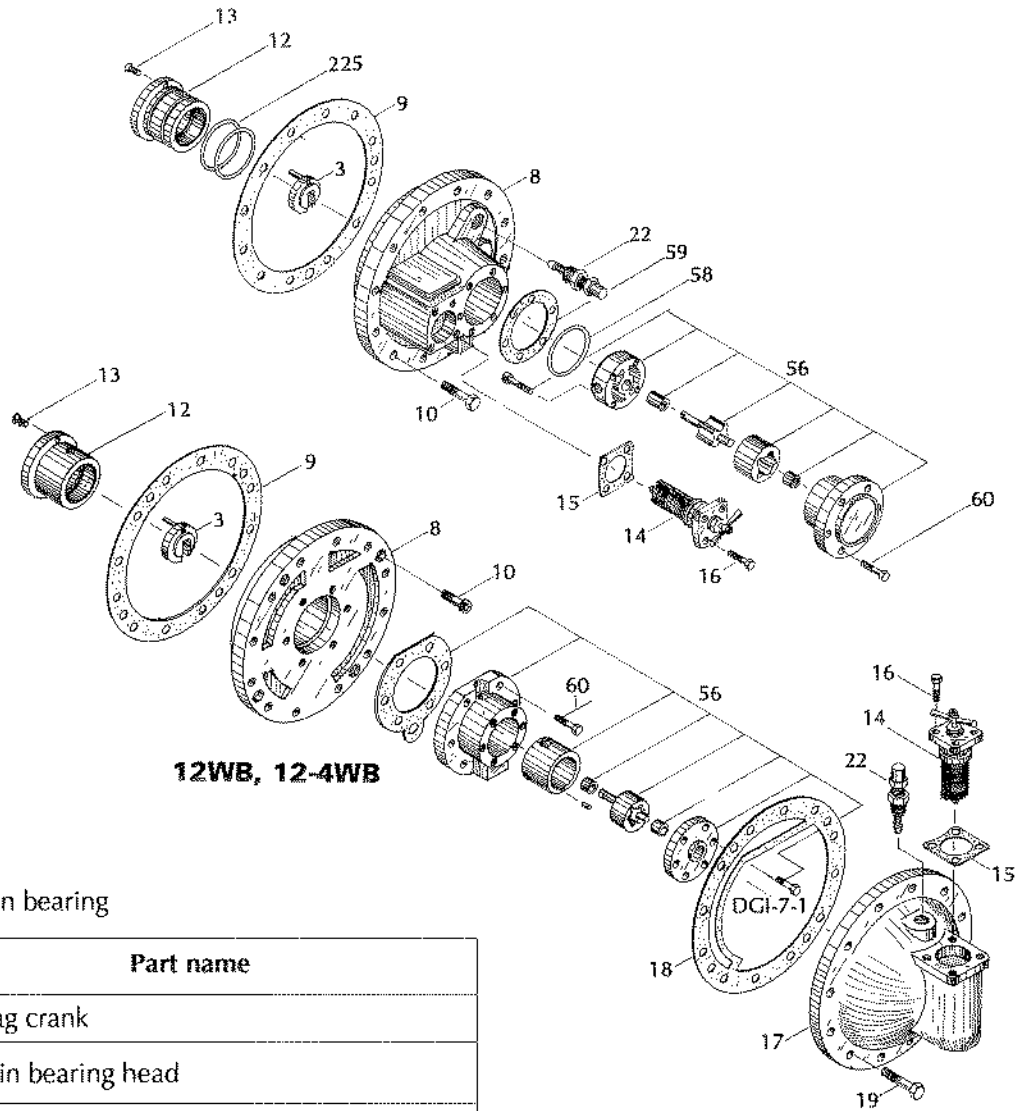


Fig. 54 Main bearing section, Model WA & WJ

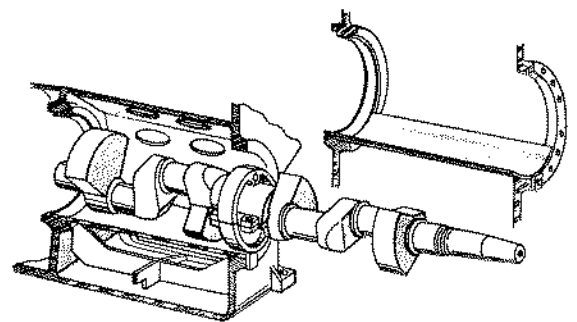
**Fig. 54 Main bearing section, Model WB**



**12WB, 12-4WB**

Parts list of main bearing

Index No.	Part name
3	Drag crank
8	Main bearing head
9	Gasket, main bearing head
10	Screw, main bearing head
12	Main bearing
13	Screw, main bearing
14	Cuno-filter assembly
15	Gasket, cuno-filter cover
16	Screw, cuno-filter cover
17	Case, cuno-filter
18	Gasket, cuno-filter case
19	Screw, cuno-filter case
22	Oil pressure regulating valve/oil relief valve
56	Oil pump assembly
60	Screw, oil pump



**Fig. 55 How to pull out crankshaft, Models 12WB & 12-4WB**



- c) Take off the gasket attached to the main bearing head casing. Care must be taken not to damage the gasket.

### 1.17. Strainer

The following are utilized.

Model	2WA	4WA	6WA	8WA	42WA	62WA	4WB	6WB	8WB	42WB	62WB	12WB	12-4WB
Scale trap	—	—	1	1	—	1	—	1	1	2	2	—	—
Suction strainer	1	1	2	2	1	—	1	2	2	—	—	2	2

#### a) Scale trap

Remove the end cover of the scale trap. The screen is then easily removed as it is simply held down by the cover. Sometimes a small quantity of oil remains in the trap, therefore, when removing the cover, put a tray underneath.

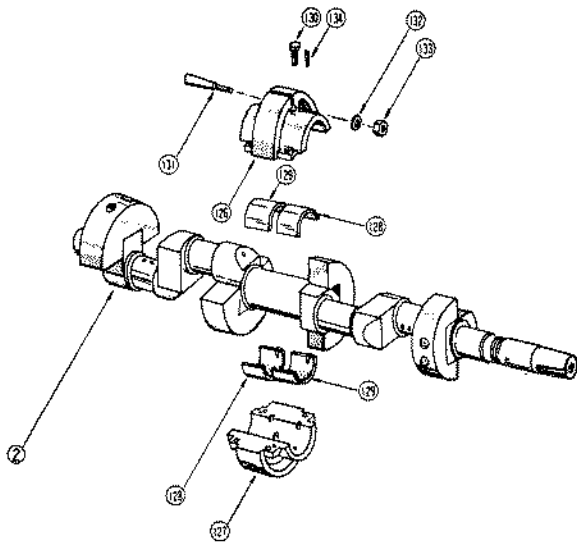
#### b) Suction strainer

The suction strainer is held down by a spring. Take off the screws for the cover, remove the spring, and then the suction strainer. The cloth-bag the strainer is locked with a snap ring, as shown in Fig. 57, and is easily removed.

The suction strainers of Models 12WB & 12-4WB have no spring.

#### c) Oil strainer

The oil strainer can be removed easily by opening the oil strainer cover and/or handhole cover.



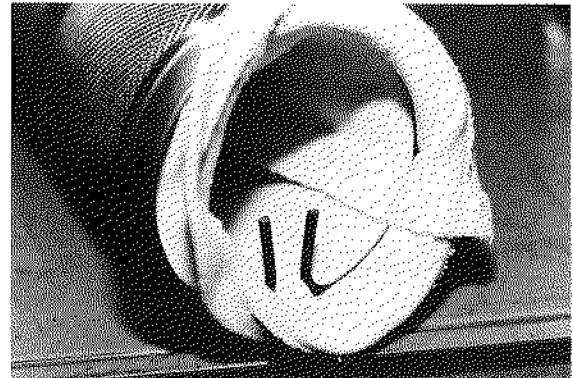
**Fig. 56 Intermediate bearing for Models 12WB & 12-4WB**

Parts list of crankshaft section:

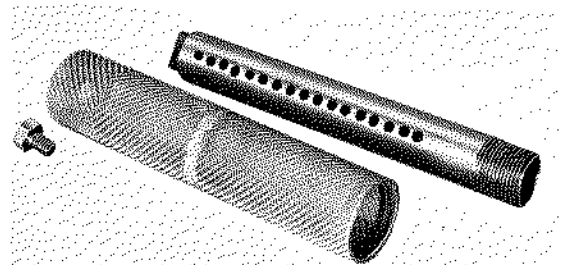
Index No.	Part name	Q'ty
2	Crankshaft	1
	Oil drain plug	1
126	Intermediate bearing (upper)	1
127	– do – (lower)	1
128	– do – metal A	2
129	– do – metal B	2
130	– do – screw	4
131	Taper pin	1
132	Washer, taper pin	1
133	Locknut, taper pin	1
134	Taper pin (threaded)	2

### 1.16. Main bearing head

- a) Remove the pipes for oil pressure service and then remove the main bearing head with care in the same way as the bearing head. The cuno-filter cannot be turned if the filter disks are bent.
- b) Loosen the screws (10). During disassembly of Model WA, the screws cannot be taken out without disassembling the cuno-filter first. On Model WB this is possible.



**Fig. 57 Removing suction strainer**



**Fig. 58 Oil strainer**

## 2. Reassembly

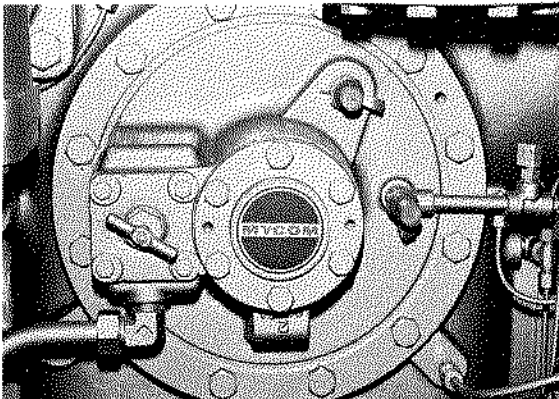
### 2.1. Checking parts

When replacing parts (in accordance with established standards given in chapter 3, Supplement) after inspection or repair is finished, parts are assembled in the reverse order of disassembly.

- a) Clean the parts and the crankcase thoroughly using light oil, etc. and coat surfaces with lubricating oil.
- b) Before assembling, apply a sufficient quantity of oil, particularly to moving parts.
- c) When cleaning, do not use woolen fabrics, as fibres will remain.
- d) After inspection, gaskets should be coated with lubricating oil or a graphite/oil mixture.
- e) Tighten the screws diagonally.
- f) Take care in assembling Models 12WB & 12-4WB. The assembly order for the shaft section is different from other models.

### 2.2 Assembly of main bearing and main bearing head

- a) When assembling, note carefully the position of the gasket hole; oil will not be sucked up if there is any deviation in the position of the oil suction port. Special care must be taken for Models 12WB & 12-4WB.
- b) Position the main bearing on the main bearing head before the crankcase is fixed, checking the position of the pin for the main bearing and also confirming the position of the oil hole.
- c) Install the cuno-filter after the main bearing head has been installed.
- d) In the case of Models 12WB & 12-4WB, the shaft must be assembled before attaching the main bearing and head.



**Fig. 59 Main bearing head, Model WB**

### 2.3. Installation of crankshaft, Models WA & WB

Set the crankshaft into the crankcase taking care to protect the bearing surfaces from damage.

When a block is used to insert the crankshaft, be careful not to leave any residue inside the crankcase. Inspect after assembly is finished.

Put the crankshaft completely into the main bearing in one move.

### 2.4. Installation of crankshaft, Models 12WB & 12-4WB

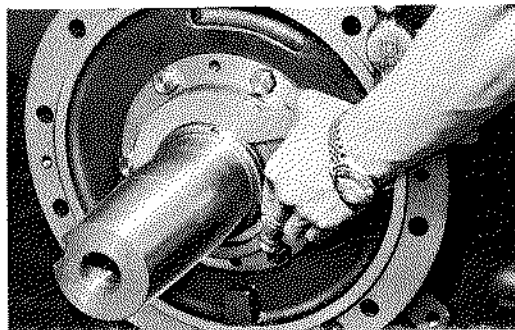
- a) Fix the intermediate bearing to the crankshaft first. Each half of the bearing holds two babbit halves. Confirm that the locking notches match and that the oil groove and oil hole are correctly orientated. If set in reverse, oil will escape and serious damage will result.

Set the notched edge of the bearing babbit in first and then push in the opposite side. When renewing the metal especially, take care that the bearing metal is not damaged against the housing. If necessary file smooth.

- b) When installing the metal, the ends protrude slightly but this is unimportant as the metals shape themselves to the housing when installation is completed.
- c) Confirm that the marks at both ends of the metal match. Measure the inner diameter with a cylinder gauge before setting onto the shaft. The out-of-roundness must be within 0.02 mm.
- d) Before tightening, apply compressor oil to the bearing surfaces. Fasten the bolts alternately and drive in the lock pin until tight.
- e) After completing the fastening, turn the intermediate bearing by hand. It should turn smoothly and freely. The taper pin must be positioned on the top before installing the shaft in the housing. This positioning cannot be accomplished after installation.
- f) Check for scars or marks on the outer surround and correct if found.
- g) Slide into the crankcase. The taper pin must be positioned on the top.
- h) Temporarily fasten the taper pin and locknut.
- i) After installing the main bearing, bearing head and shaft seal assembly, adjust the intermediate bearing placed with even gaps at each end, then fasten the locknut of the taper pin securely.

## 2.5. Bearing head and thrust bearing

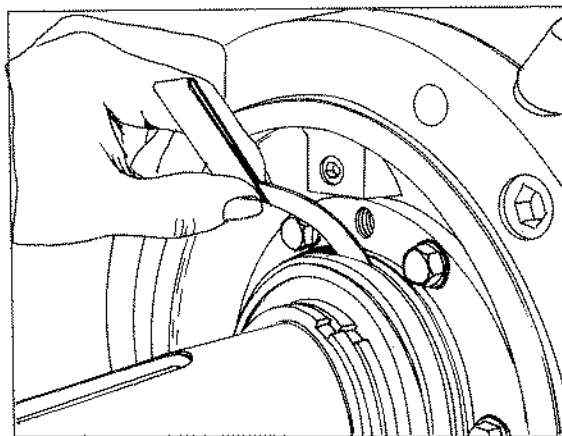
- a) Model WA, WB, 12WB and 12-4WB compressors have pipes for sealing oil return. Take care not to bend these pipes. The direction of oil escape must be towards the oil in the crankcase.
- b) Check that the pipe is correctly positioned in relation to the bearing head and match the two ports carefully.  
  
If the thrust bearing is an aluminum backed metal, do not forget to use a washer when fastening.
- c) After manting the thrust bearing, turn the crankshaft by hand to check for abnormality.
- d) The four screws must be fastened tightly. If this cannot be accomplished, disassemble the cover plate and set them up again.



**Fig. 60 Setting locknuts**

## 2.6. Shaft seal

- a) Turn the notch of the seal collar upward, fit the locking ball of the crankshaft in the notch, and insert the seal collar by hand, taking care not to damage the "O" ring.  
  
If it does not enter easily, push it forward by tightening the locknut carefully; check whether the locking ball is seated in the notch.
- b) Tighten the locknuts alternately, tapping the spanner handle with a hammer. (Fig. 60)  
  
Take care not to damage the contact surface of the seal collar.
- c) After pulling out the crankshaft by rotating it by hand, measure the clearance between the seal collar and the flowing collar with a thickness gauge at the top and bottom and also right and left positions (ref. Fig. 61).
- d) Fit the seal ring on the cover plate. Push the roll pin in the hole and examine its operation by applying equal force on the seal ring by hand.
- e) Apply a sufficient quantity of oil to the contact surfaces of the seal collar and seal ring.
- f) Inspect the gasket. If it is a new gasket, apply oil and fit to the cover plate.
- g) Fit the cover plate over the crankshaft. Tighten the bolts uniformly and ensure that the oil drain pipe points downward.



**Fig. 61 Measuring thrust gap**

**WA & WB = 0.08 ~ 0.20**

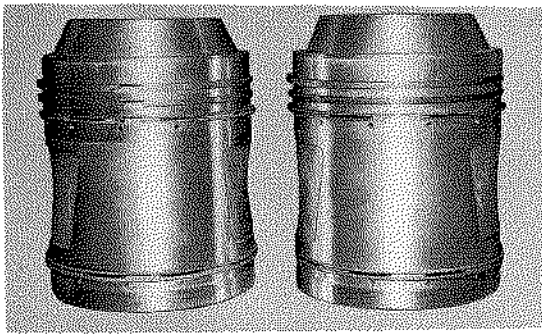
## 2.7. Oil pump

- a) Insert the drag crank so that the pin hole on the crankshaft comes to the top. The groove should be in the center.
- b) Attach the "O" ring to the oil pump.
- c) Insert the oil pump with its notch in the same direction as the groove of the drag crank. Do not tighten forcibly if the shaft of the oil pump does not enter into the groove.
- d) Tighten the screws uniformly after checking the direction of rotation.

## 2.8. Cylinder section

### 2.8.1. Piston

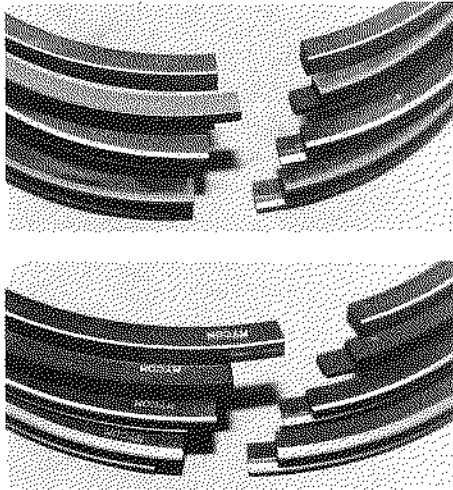
- a) Mount the compression and oil rings on the pistons. Do not align the ring gaps (Ref. Fig. 62).
- b) In mounting compression rings, the stamped surfaces should be facing upwards (ref. Fig. 63).



Incorrect

Correct

**Fig. 62 Arrangement of rings**



**Fig. 63 Ring marks A & B**

c) The standard arrangement of the rings is shown below. This can, however, differ depending on conditions.

Combination of Piston Rings (Same usage for WA and WB type):

Ring	SINGLE STAGE		COMPOUND	
	NH3	R23, R502	NH3	R22, R502
1st	FC-PC-BF		FC-PC-BF	
2nd	FC-VC		(GA-P)	FC-UC
3rd	FC-PC-BCP3			
4th	FC-PC-BC3			

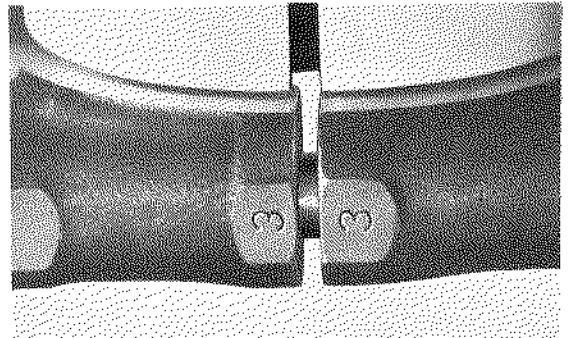
**Fig. 79 List of piston ring components For Model WA & WB compressors**

- d) Special care must be taken when handling piston rings as they warp easily. Warping may cause oil loss.
- e) It must be confirmed that the rings move freely in the grooves of the piston. If not, the ring is probably warped. The blow between the ring and groove width is about 0.05 to 0.09 mm as standard.

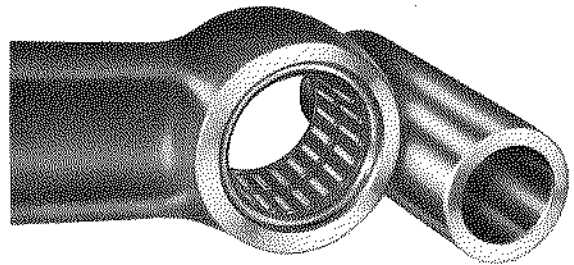
### 2.8.2. Connecting rod

Connect the piston and the connecting rod with the piston pin. It is ideal if the piston pin is tight in the pin hole of the piston but slightly loose in the bushing hole of the connecting rod. The tolerance between the bushing and the piston pin is 0.03 to 0.06 mm. For this reason, it is sometimes driven into the pin hole utilizing a block pad.

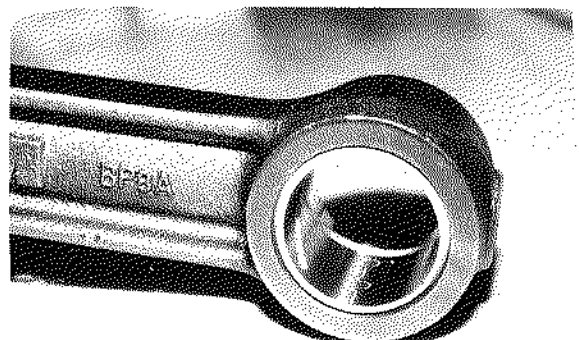
When replacing the bearings, do not mix the upper and lower halves. Fit the halves into the rod and cap. Do not forget to put the half having the oil hole in the center in the rod side, not in the cap. When the connecting rods are being assembled on the crankshaft, the numbers punched on the rod and cap must be matched (ref. Fig. 64).



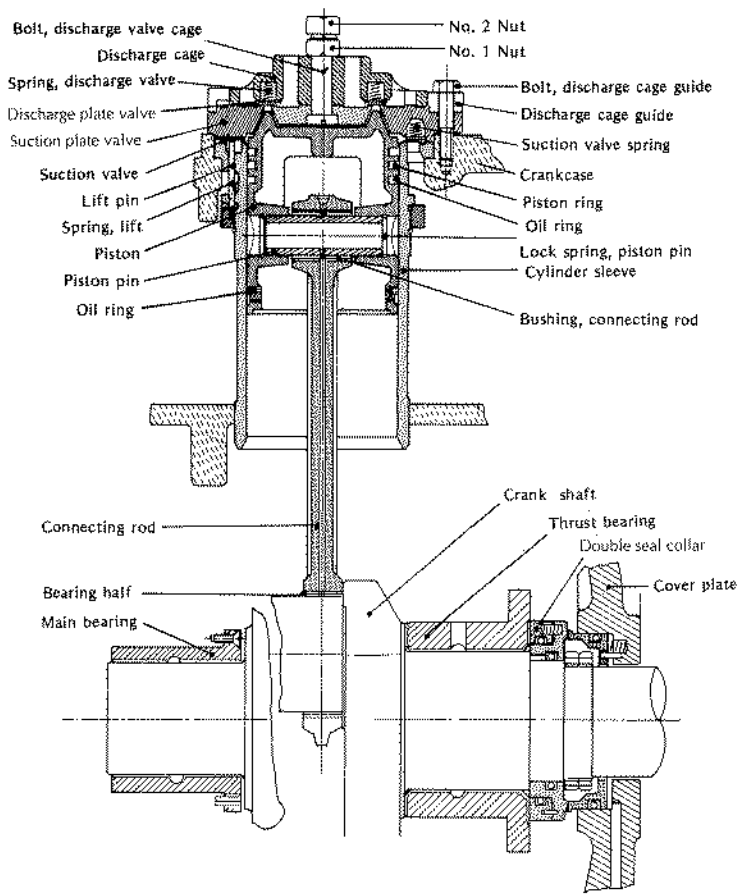
**Fig. 64 Assembly numbers for connecting rod**



**Fig. 65 Bushing and piston pin of connecting rod, high stage**



**Fig. 66 Bushing, standard**



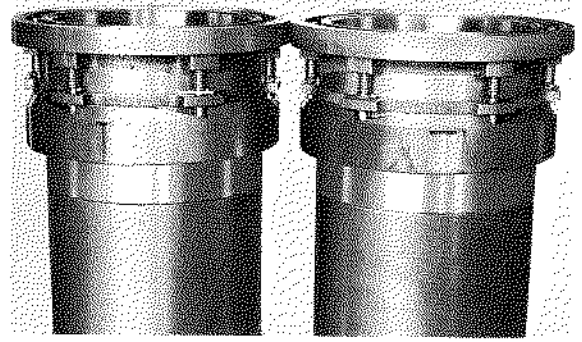
**Fig. 67 Piston, connecting rod and crankshaft (sectional)**

### 2.8.3. Cylinder sleeve

a) Check the direction of the notch on the cam ring referring to the cylinder numbers marked on the crankcase and the direction of the push rods.

b) The lower end of the cylinder sleeve is chamfered so that the piston and rings can be inserted easily. If the top ring enters, the piston can be pushed in easily. Push it in taking care not to damage the other rings.

Care should be taken not to damage the seat surface of the sleeve or the corners of the piston. Such damage will scar the inside of the cylinder sleeve during operation.



**Fig. 68 Example of incorrect assembly**  
The slanted notches are facing in opposite directions.



**Fig. 69 Inserting piston into sleeve**

### 2.9. Installation in casing

- Screw the eyebolt into the piston head.
- Attach the cylinder sleeve gasket to the back of the sleeve guard with oil.
- Inspect the assembled connecting rod and cap.
- Check the cylinder number.
- Turn the crankshaft to bring the appropriate crank pin to dead bottom.
- Bring the piston to the dead top point of the cylinder sleeve.
- Do not insert the crank fastening bolt pin, as it may damage the shaft. The numbering marks of the connecting rod and cylinder sleeve must be turned to face the handhole side.
- Assemble in the reverse order of disassembly. When the

guard of the cylinder sleeve enters the seat of the crankcase, push down the piston and install the connecting rod on the crankshaft, supporting its large end by hand. Take care not to damage the crankshaft with the bolts.

- i) Mount the cap. Be sure to match the paired numbers stamped on the surfaces.
- j) Tighten the bolts with a torque wrench to the torque values indicated below. The proper torque must be applied, otherwise the cap of the rod will become out-of-round.

#### Bearing Half Tightening Torque

ft·lb (kg·cm)

Nut	Model WA	Model WB
1st	45 (600)	90 (1200)
2nd	35 (450)	60 (800)

- k) Install the cylinders one by one, rotating the crankshaft slowly. The cylinder sleeves will jump up if the crankshaft is rotated abruptly as it is not yet tightened down.
- l) Check the lateral play of the connecting rods.

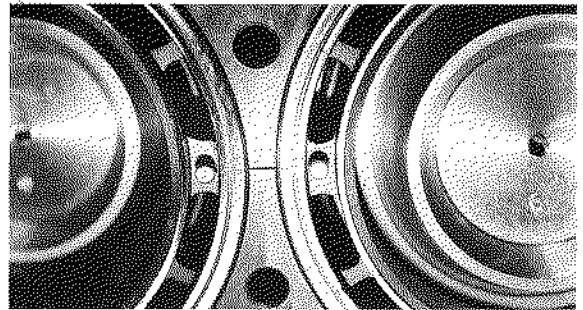
### 2.10. Unloader mechanism

- a) Check the mounting position of the push rod. It enters smoothly when pushed in slowly if the cam ring notch is accurately located.
- b) When the push rod has been inserted, correctly locate the position of the cylinder sleeve, setting it to the countermark (refer to Fig. 70).
- c) Insert the unloader piston. Examine the movement of the lift pin by pushing the unloader piston with your thumb.
- d) If the lift pin does not protrude above the seat surface of the cylinder sleeve when the countermarks meet and the unloader piston is pushed, nor goes back when it is released, check whether the length of the push rod is correct or whether the correct cam ring is installed.
- e) When all inspections are finished, mount the unloader piston cover.

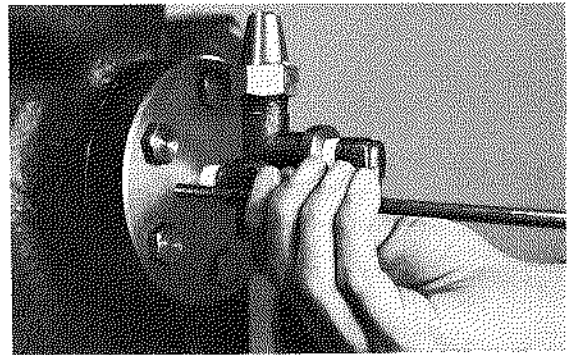
In the case of newly replaced sleeves, take special care when stamping marks. If the setting is incorrect, unloading will become irregular and damage to the valve may result.

To stamp the marks on a new sleeve, push in the unloader piston using a hanger eye-bolt to bring the lift pins of the

new sleeve to a position level with the seat. So positioned, the lift pin moves in and out at the middle part of the piston strike. Now set the other lift pins. Position the same as above by turning the sleeve and then stamping the marks.



**Fig. 70 Assembly marks for sleeve setting**



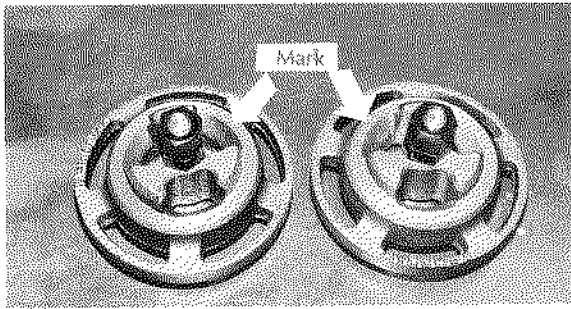
**Fig. 71 Pushing unloader piston with eye-bolt**



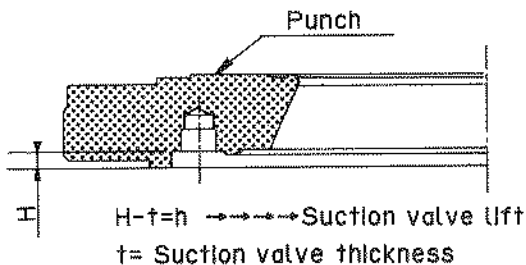
**Fig. 72 Unloader cover cap screw & washer**



## 2.11. Valve plate



**Fig. 73 Marks for discharge valve assembly mark**



**Fig. 74 Marks, valve plate**

- Mount the suction valve springs. The springs are slightly tapered. Push them in with the large end down, twisting against the coils.
- For the cylinder with the unloader mechanism, remove the cap bolt on the unloader cover, screw in an eyebolt, and put the bank in the loaded position. Lower the lift pins by pushing the unloader piston with the eyebolt screwed in as shown in Fig. 71. Neglecting this step will result in damage to the suction valve or problems such as gas leakage after assembly.
- Join the suction valve assembly and the valve plate. Check that the valve is set properly.
- To identify the valve plate, two classifications according to the model of the compressor are used:

Classification 1: 2WA, 4WA, 6WA, 8WA, 42WA, 62WA,

Classification 2: 4WB, 6WB, 8WB, 12WB, 42WB, 62WB, 12-4WB

### 1) Classification 1

The valve plate in effect caps the cylinder sleeve which extends above the surface of the crankcase 0.004 in (0.1 mm). If the sleeve does not extend this far above the surface, add another cylinder gasket to meet requirements.

### 2) Classification 2

The valve plate in effect is seated inside the cylinder. In this case the sleeve top is 0.0354 in (0.9 mm) below the top of the cylinder wall.

- Put on the guide and tighten the bolts. Ensure that the bolts are tightened evenly.
- When the valve plate has been attached, pull out the eyebolt from the unloader cover. Do not forget to screw in the cap screw (allen head) immediately after removal of the eyebolt (ref. Fig. 72).

## 2.12. Fittings

- Fit the screen for the scale trap, the suction strainer and the oil strainer.
- Before attaching the hand hole cover, feed a sufficient quantity compressor oil into the crankcase.
- Attach the Hand hole cover, the oil cooler and then connect the oil piping. Clean the oil pipes by blowing air compressed.

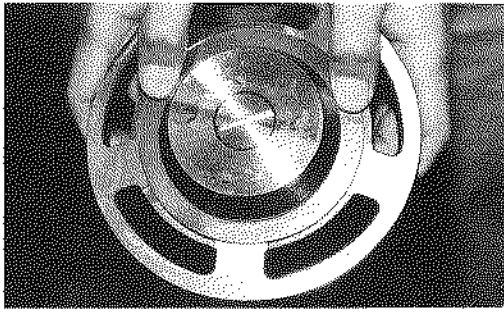
## 2.13. Discharge valve (assembly)

- Remove any carbonized oil or slag with a wire brush, taking care not to damage the seat surface.
- Put the discharge valve on the springs and tighten the bolt, pressing down the valve seat by hand.
- Tighten No. 1 and No. 2 (grooved) nuts. Torque to the values given below.

ft-lb (kg-cm)

Nut	Model WA	Model WB
No. 1	80 (1100)	90 (1200)
No. 2	60 (800)	60 (800)

- When assembly of these parts is finished, check operation as shown in Fig. 75.



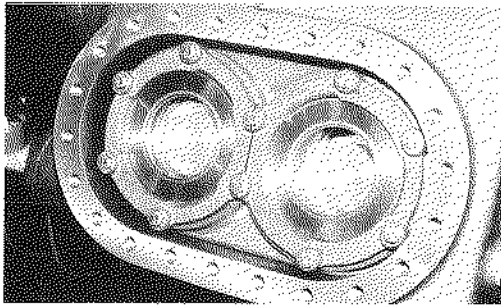
**Fig. 75 Testing discharge valve**

**2.14. Mounting parts**

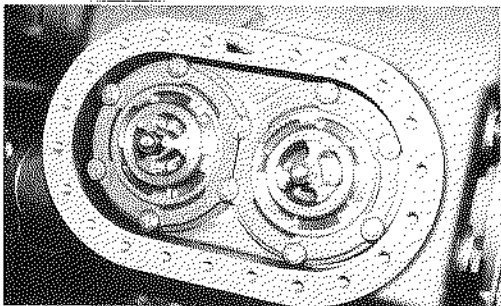
When break-in running operation is finished, mount the discharge valves, the safety head springs and the head covers. Mounting the head cover is easily done by screwing a headless bolt into the top center to support the cover.

Torque values of the head cover bolts are as follows:

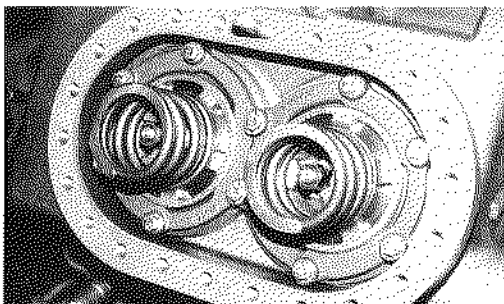
Model WA	60 (800) ft-lb (Kg-cm)
Model WB	90 (1200) ft-lb (Kg-cm)



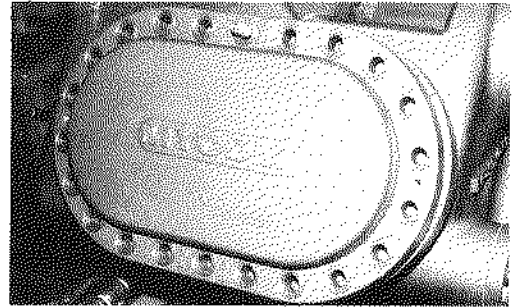
**Fig. 76 Checking cylinder surface after break-in running**



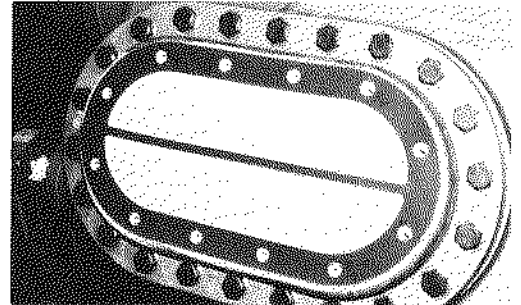
**Fig. 77 Mounting discharge valve assembly**



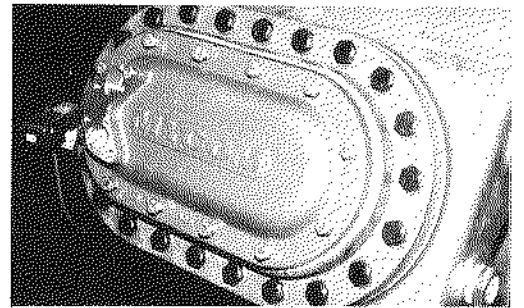
**Fig. 78 Mounting head spring**



**Fig. 79 Mounting air-cooled head cover WB**



**Fig. 80 Mounting water-cooled head cover with gasket, WB**



**Fig. 81 Mounting water jacket cover, Model WB**



**Fig. 82 Mounting water jacket cover, Model WA**

**2.15. Water Jacket piping**

Install after cleaning the inside of the water jacket thoroughly.

**2.16. Final inspection**

Carry out final inspection before starting refrigerating operation. Check whether the eyebolt has been removed from the unloader piston cover, whether the self-flaring nuts for the oil pipes are securely tightened, etc.



## CHAPTER 3. INSPECTION & REPLACEMENT

(mm)

### 1 Standards for changing of parts

To operate Mycom compressors in their best condition, inspect according to the following standards and make repairs whenever necessary.

\* Standard clearance given page 50

#### 1.1. Compressor oil in the crankcase

Check the oil in the crankcase through the sight glass at the hand hole cover. If scale, metal powder, etc. are found, determine the source correct. The cause may be scale from suction side piping, abrasion of cylinders or piston rings, etc.

If yellow metal powder is found in the oil, it is from abrasion of the piston rings.

#### 1.2. Suction strainer, oil strainer and cuno-filter

Clean with trichlorethylene, carbon tetroxide or light oil. Inspect to make sure solder is not worn or the screen is not broken. A broken screen allows foreign matter so enter and cause compressor scuffing. The stainless steel screen must be flux welded.

Inspect to see if cuno-filter discs and blades move smoothly. Sometimes, the blades are bent. If residue is deposited inside, remove with a safety razor and clean the inside by passing light oil or blowing compressed air from inside (in the direction of the oil pipe fittings). If this is done from outside, foreign matter will remain inside and enter the oil pipe during operation, causing abrasion and scuffing on the moving parts of the compressor.

#### 1.3. Crankshaft

Abrasion of the bearing must be checked and the bearing measured with a micrometer. In practice, it is sufficient to measure the gap between the metals. Abrasion can easily be found by feeling the bearing surface. If scars are found, they must be polished with fine emery paper or a oilstone.

The oil hole passing through the shaft must be well cleaned. Clean and pass oil through the hole several times. Do not forget to install the plug securely afterward.

Replace the crankshaft only if abrasion exceeds the values listed below:

\* Padding is absolutely not permitted.

	Model WA	Model WB
Connecting rod bearing	69.85	89.82
Thrust bearing	82.40	111.85
Main bearing	66.90	91.85

#### 1.4. Shaft seal parts

If the moving surface of the seal collar or the seal ring does not make good contact, correct the surface by lapping or grinding with a fine compound. After correcting clean off the compound thoroughly. The moving surface of the seal collar should not be stepped. Replace any "O" rings which have hardened, expanded or cracked.

#### 1.5. Piston, piston pin and piston ring

The piston is rarely subject to abrasion. When its outer diameter becomes smaller than the value shown below, replace the piston with a new one.

Detail of piston ring see 1-15.

(mm)

Piston	Model WA	Model WB
Outer diameter	94.8	129.78

If vertical scratches are found on the surface, remove with emery paper or a whetstone. If the width of the ring groove has become markedly wide - larger than 0.10 mm - replace, as this will cause excessive oil consumption. The piston pin should fit tightly in the pin hole of the piston. If the clearance between the pin and the hole becomes larger than 0.20 mm (Model WA) or 0.25mm (Model WB), replace the pin. Clearance for a new pin is 0.10 mm.

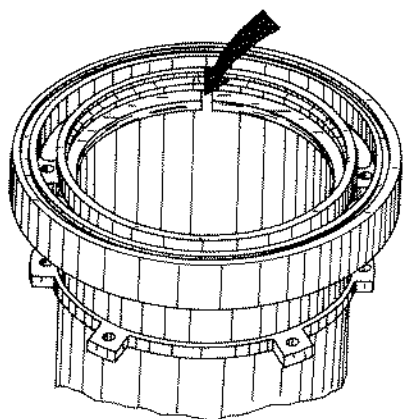
Replace the piston pin when the outer diameter becomes smaller than the values below:

(mm)

Piston pin	Model WA	Model WB
Outer diameter	25.05	39.90

The life of compression rings varies according to the operating conditions under which they are used. Judge whether they must be replaced during inspection. If the contact between the compression ring and the cylinder wall is not good or abrasion is unusual, replace the defective compression ring with a new one.

If abrasion is uniform and the amount of abrasion is not clear, either replace with a new one or determine the clearance by putting the ring in a comparatively new cylinder sleeve; if it is larger than the value shown below, replace the ring with a new one.



**Fig. 83 Piston ring**

(mm)

Ring	Model WA	Model WB
Top ring gap clearance	2.0	2.5
S.T.D. clearance	0.3~0.5	0.55~0.75

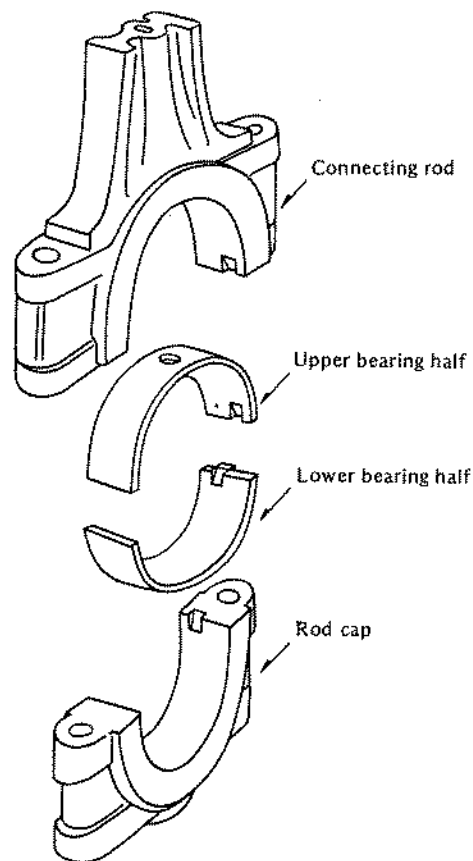
### 1.6. Connecting rod

Replace the connecting rod if the clearance between the bushing and piston pin (new) exceeds 0.20 mm. To replace the bushing only, a jig is required. If replacement is unavoidable, give a honing finish after pressure-insertion. When inserting, make sure that the piston pin hole is perpendicular to the rod. The bearing halves should be replaced if the clearance between the bearings and crankpin exceeds the value shown below.

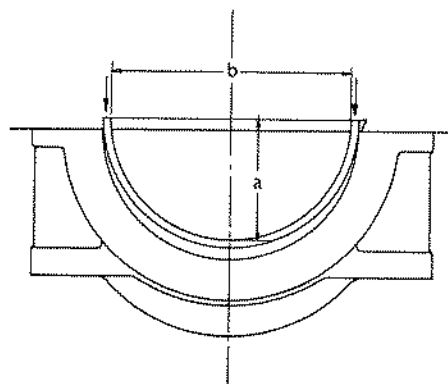
(mm)

Connecting rod	Model WA	Model WB
Clearance	0.25	0.30

The bearing is designed so that the radius is larger than that of the connecting rod and the bearing halves make a perfect circle when tightened, i.e., the diameter of the bearings is larger than that of the connecting rod. If the two halves have the same diameter, replace with new ones even if not worn. To assemble, install each bearing half with the notches in the same direction.

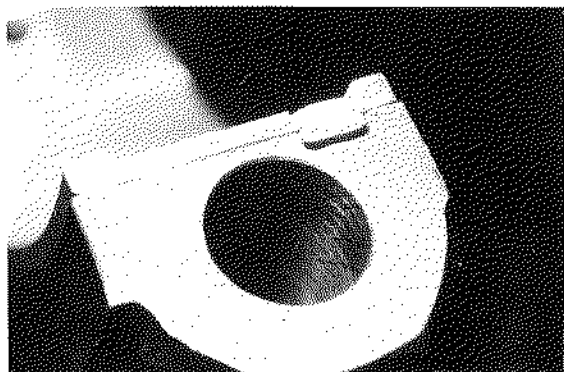


**Fig. 84 Connecting rod and bearing halves**



**Fig. 85 Bearing tolerance**

- 1) To replace the bearing halves with new ones, when you find that the width of the groove of the bearing notch section is larger than that of the connecting rod groove section by a maximum of 0.1 mm, reduce the excess with a fine file and then join together.



**Fig. 86 Connecting rod bearing notches**

- 2) In case of replacement, make sure the edge of the bearing is not protruding beyond that of the connecting rod. Standard dimension of the bearing is  $2a < b$ . When it is  $2a = b$ , do not use as it is a bearing of inferior quality. The bearings will not be secured unless you push them in with your thumbs.

### 1.7. Cylinder sleeve

The standard height of the seat surface of the cylinder sleeve is 0.5 mm. The guard thickness is reduced when the seat surface of the cylinder sleeve guard is lapped, so adjust the reduced thickness with gaskets for the cylinder sleeve. The thickness of one gasket is 0.2 mm

If the inner surface of the sleeve is not a mirror surface but has vertical scratches, cloudiness or marks of seizure from scale, smooth the surface with a piece of fine GC grinder or emery paper which is finer than No. 1200. The degree of abrasion can be seen by comparing with the upper part - about 3 mm from the top - where the top compression ring does not reach. The clearance between the piston and the cylinder sleeve determines whether the latter should be replaced.

If the maximum clearance between the bottom of the piston and the cylinder sleeve exceeds the value shown below, replace only the sleeve. If the clearance is still

larger than the value mentioned below even after the sleeve has been renewed, replace the piston also.

(mm)

Cylinder sleeve	Model WA	Model WB
Maximum clearance with piston	0.30	0.35
Maximum inside diameter	95.15	130.15
Standard inside diameter	95.0	130.0

### 1.8. Discharge valve and suction valve (assembly)

Remove carbon deposits with a wire brush. The life of a plate valve is about 6,000 hours. When this period has elapsed it is recommended that you replace the plate.

The maximum allowable abrasion is 0.2 mm from the standard thickness, which is 1.3 mm for Model WA and 1.4 mm for Model WB.

Even if the seat surface is not worn, replace it with a new one if the surface of the valve does not make uniform contact with the springs. Also check the springs.

Valves seats for discharge and suction valves:

A seat surface which is not worn uniformly can be adjusted by lapping. If the valve seat has dents or marks due to refrigerant leakage, replace the seat, depending on the severity of the dent or mark.

The maximum allowable abrasion of the valve seat is 0.25 mm.

The cylinder gasket must be prepared beforehand to prevent the seat from mixing with others, as top clearance is changed after correction of the seat.

#### Suction Valve Plate

- \* Three types of suction valve plate are available for Model WA, WB and WJ compressors. These suction valve plates are classified according to suction valve lift, size and number of suction valve springs. Suction valves should be selected according to operating conditions and must be confirmed by the dye stamp on the valve plate with reference to the following.

Refrigerant Type		NH3 (L)		R12, R22 & R502 (L)		PROPANE (L)	
WA Single-stage		WN	(1.1)	WR	(1.9)	WR	(1.9)
WA Compound	Booster	*N	(1.1)	*N	(1.1)	*N	(1.1)
	High-stage	WN	(1.1)	WN	(1.9)	WR	(1.9)
WB Single-stage		*WN	(1.2)	*WN	(3.0)	*WR	(3.0)
WA Compound	Booster	*N	(1.2)	*R	(1.5)	WR	(1.2)
	High-stage	WN	(1.2)	WR	(3.0)	WR	(3.0)

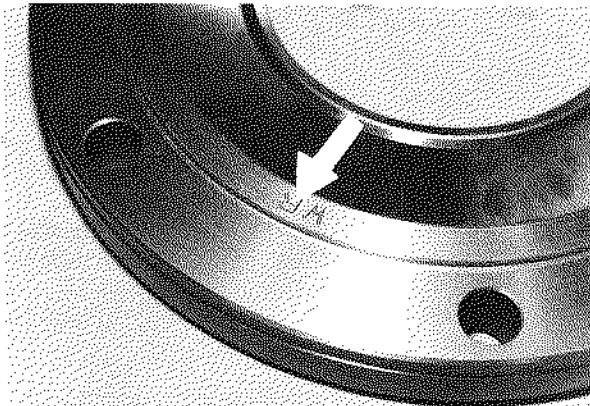
Thickness of plate valve for WA and WB compressors :

WA : 1.3 mm

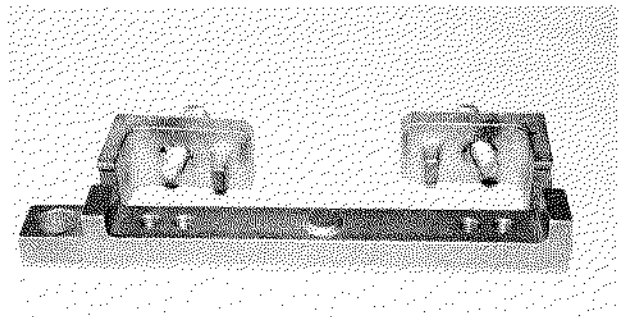
WB : 1.4 mm

### Discharge Valve Cage Assembly

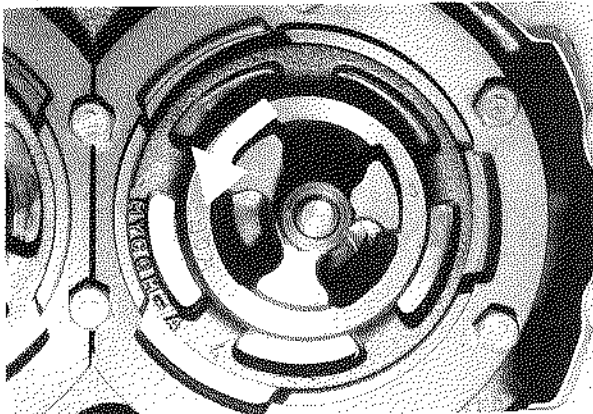
Discharge valve cage assemblies for Model WA and WB are also classified into three types having three different lift cages. The proper discharge valve cage assembly can be determined by referring to the dye stamp marks and the following table.



**Fig. 87 Stamp, Valve plate & cage**



**Fig. 88 Discharge valve cage assembly tool**

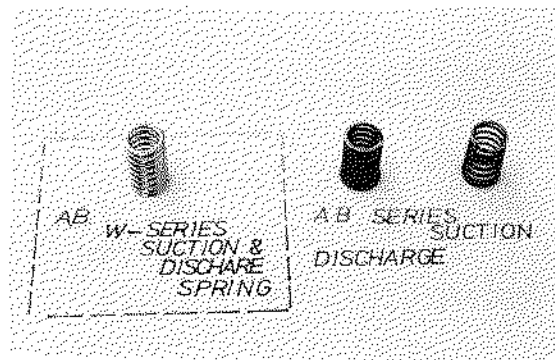


Refrigerant Type		NH3 (L)		R12, R22, & T502 (L)		PROPANE (L)					
		Standard	Booster	Standard	Booster	Standard					
WA Single-stage		WCN	(0.9)	*CN	(0.9)	WCR	(2.1)	*SR	(0.6)	WCR	(2.1)
WA Compound	Booster	*CN	(0.9)	/	/	*SR	(0.6)	/	/	WCR	(2.1)
	High-stage	WCN	(0.9)			WCR	(2.1)			WCR	(2.1)
WJ		/	/	/	/	WCR	(2.1)	SR	(0.6)	WCR	(2.1)
WB Single-stage						WCN	(1.0)	*SN	(1.0)	WCR	(2.4)
WB Compound	Booster	*SN	(1.0)	/	/	*SR	(1.2)	/	/	WCR	(2.4)
	High-stage	WCN	(1.0)			WCR	(2.4)			WCR	(2.4)

\*Figures in brackets indicate plate valve lifting height.

Thickness of discharge valve for WA and WB compressors:

- \* Dye stamps ("CN", "SN" and "SR" are the same as for WA and WB compressors with respective discharge valve springs.
- \* The actual working lift of the discharge valve is the figure obtained from the list minus the thickness of the discharge valve.



**Fig. 89 W series discharge & suction valve springs**

### 1.9. Oil pump

If oil pressure does not rise even after adjusting the oil pressure regulating valve during operation and if the cause is not abrasion of the bearings, take the following steps.

Move the oil pump shaft back and forth holding the shaft with your fingers. If there is a crack in the bushing or on the side, the part is worn away. In this case, replace the whole assembly. Never disassemble the pump if nothing is wrong with it, however.

If the oil pressure does not rise when the oil pump is normal, inspect the oil pressure regulating valve and/or the oil strainers for abnormality.

### 1.11. Main bearing and thrust bearing

If the gaps between main bearing, thrust bearing and shaft become larger than the values shown below, renew.

The motor side of the thrust bearing is easily abraded so do not over tension the belts.

WA = 0.08 ~ 0.20    WB = 0.08 ~ 0.20 Double collar

### 1.10 Free length of springs

The springs for discharge and suction valves are changed during periodic inspection carried out every 6,000 hours of operation. Renew other springs when they become shorter than the standard free length. The maximum allowable shortening is 10% from the standard length

Standard free length of springs:

(mm)

Spring	Model WA	Model WB
Helical	19.0	16.0
*Suction valve	13.8 ± 0.3 (Booster 12.7)	
*Discharge valve		
*Head	63 ± 1.5	79 ± 1.6
Lift pin	10.0	12.5
Unloader device	72.0	75.0

(mm)

	Model WA	Model WB	
			Mediate bearing
Maximum clearance between bearing and shaft	0.25	0.30	0.45
Inner diameter:			
Main bearing	67.15	92.18	
Thrust bearing	82.65	112.18	
Thrust gap	maximum 0.3	0.3	

### 1.12. Gasket

Replace if broken or elasticity is gone. Check the matching of holes for bolts and oil during assembly.

### 1.13. Bolts

Inspect to see whether the bolts for connecting rods and discharge valve seats are broken. Replace them if the threads are dull. Also inspect the threads of the head cover screws and replace if dull. Special care should be taken after trouble such as oil hammer, liquid hammer and/or burning have occurred.

### 1.14 Selection of compressor oil

The quality of the lubricating oil significantly affects the life of a compressor. Use oil of the best quality. If a large amount of carbonized oil or slag adheres to the discharge valve cage, or if moving parts show premature abrasion when the compression ratio and the discharge pressure are not high and oil consumption is normal, check the following:

- a) Whether the oil contains impurities or any foreign matter, or whether the oil is of poor quality.
- b) Whether the oil is stained or aged, even when it is an oil of fine quality.

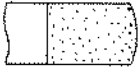
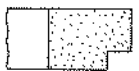
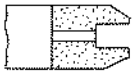

Judging the quality of lubricating oil is very difficult. Generally, it can be judged only after actual use. Therefore, the best way is to buy a well-known brand from a reliable dealer. Avoid selecting oil by price only.

The important factors for the oil are viscosity against temperature rise, low pour point and high flash point. After purchasing, oil should be stored with the utmost care to avoid contamination by impurities such as water or dust. This could cause abrasion or corrosion of the compressor when the oil is used.







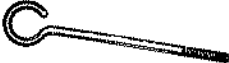







Class No.	Color (union)	Reaction	Flash Point	Viscosity 86°F (30°C)	Redwood per sec. 122°F (50°C)	Corrosion	Pour Point	Rate of Emulsification by Evaporation (per sec)
150	Max 3	Neutral	311°F up (155°C)	152 ± 20	Min 60	Max 1	Lower than -27.5°C	Max 200
300	Max 4	Neutral	329°F up (165°C)	301 ± 20	Min 91	Max 1	Lower than -22.5°C	Max 200

Class No. 300 oil is usually used; Capella D, Daphne CR 42 (or CR45), or Suniso 4G are most suitable for Mycom WA and WB compressors.

### 1.15 Piston rings

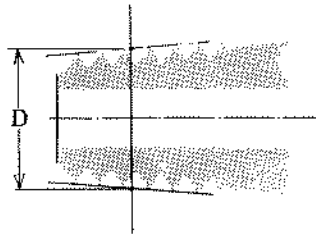
	Sectional view	Kind	Specification	Parts No.	
				Model WA	Model WB
PISTON RING		FC-PC-BF	For Freon & NH <sub>3</sub> , 1st	SAP411	SBP411
		FC-UC	For Freon & NH <sub>3</sub> , 2nd	SAP413	SBP413
OIL RING		FC-PC-BC <sub>3P</sub>	For Freon & NH <sub>3</sub> , 3rd Same thickness piston ring	SAP527	SBP527
		FC-PC-BC <sub>3</sub>	For Freon & NH <sub>3</sub> , 4th	SAP528	SBP528

## 2 Special Tool Kit

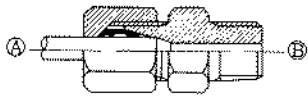
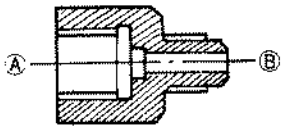
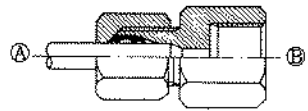

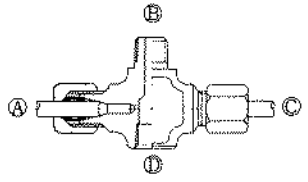
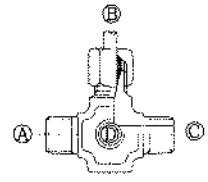
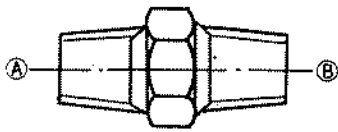
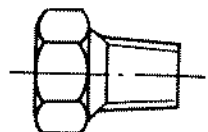
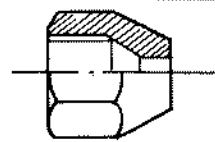
Name		Q'ty	Series A	Series B
Box Spanner		1	Width across flats of socket	Width across flats of socket
		1	" 14 mm "	" 17 mm "
		1	" 17 mm "	" 21 mm "
		1	" 21 mm "	" 26 mm "
		1	" 21 mm "	" 21 mm long socket "
		1	" 26 mm "	" 26 mm "
Box Spanner Handle		1	300 ℓ	300 ℓ
Hexagon Bar Spanner		1	Width across flats 5 mm	Width across flats 5 mm
		1	" 10 mm	" 14 mm
Double Headed Wrench		1	14 ~ 17 mm	14 ~ 17 mm
		1	17 ~ 19 mm	17 ~ 19 mm
		1	21 ~ 23 mm	21 ~ 23 mm
Pulley Puffer		1	With 1 bolt 5 3/4" x 100 mm	With 1 bolt 3/4" x 100 mm
			With 2 bolts 1 1/2" x 45 mm	With 2 bolts 1/2" x 45 mm
Locking Nut Spanner		1	Small	Large
Hanger Eye Bolt		1	1/4"	5/16"
Monkey Wrench		1	10"	10"
Extension Bar		1	6"	10"
Ratchet handle		1	1/4"	1/4"
Sponge		1	20 x 160 x 160 (mm)	20 x 160 x 160 (mm)
Oil Charging Hose		1	15φ x 20φ x 750 (mm)	15φ x 20φ x 750 (mm)
Discharge Valve Disassembly Tool		1	With 2 bolts	With 2 bolts
Stud Bolt, Polished		2	1/2" x 69 mm	5/8" x 60 mm

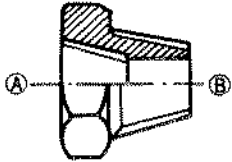
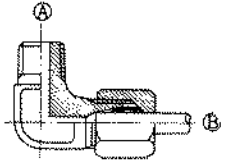
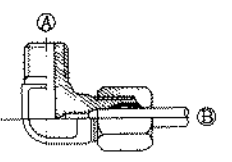
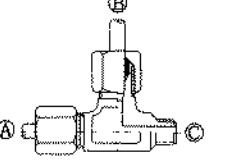
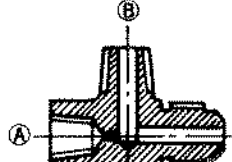
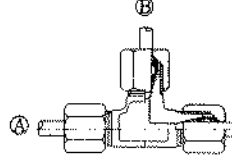
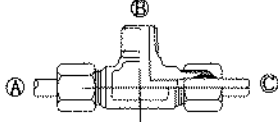
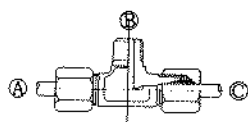
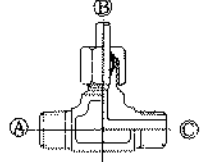
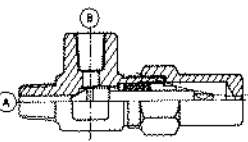
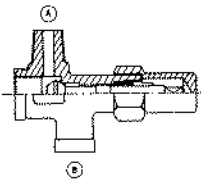

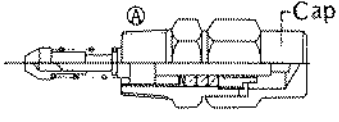
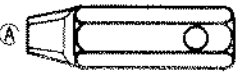
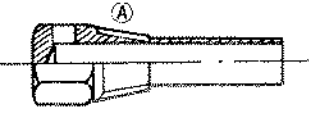


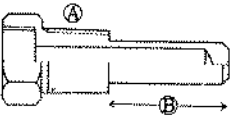

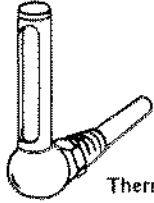

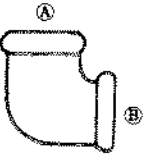
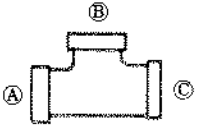
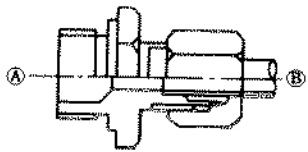
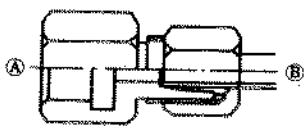
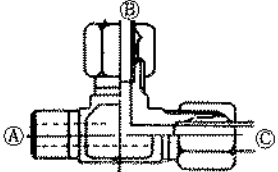
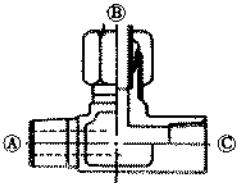
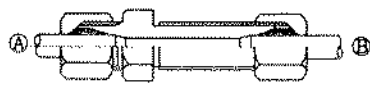
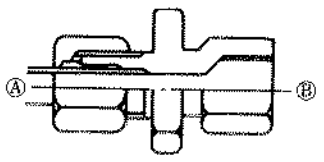
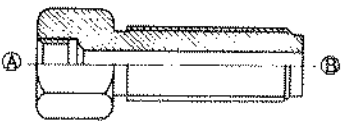
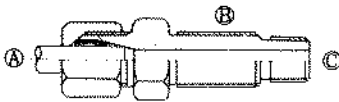
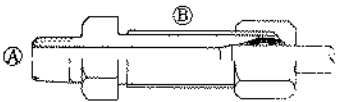
### 3 Pipefitting



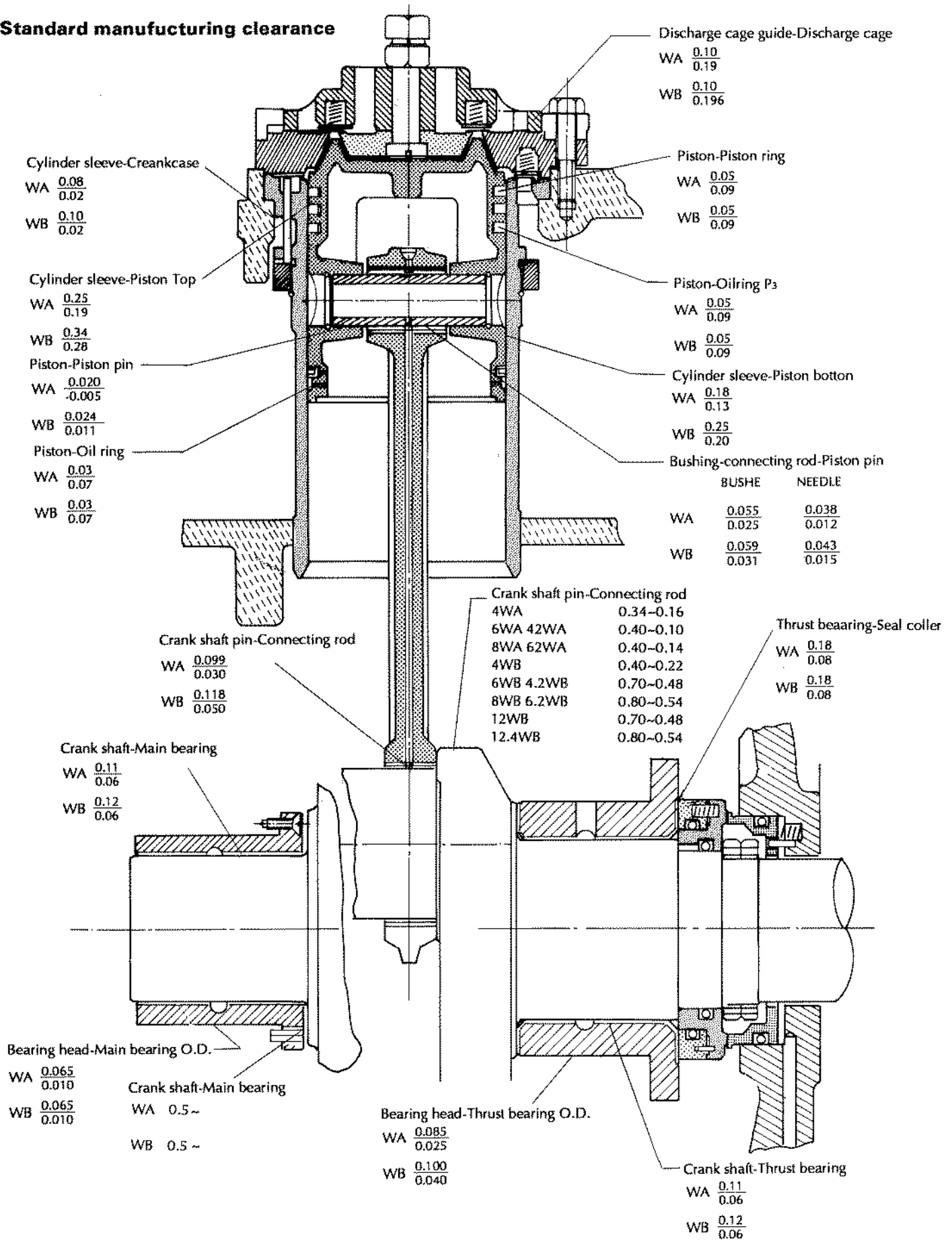
P.T. (inch)	D (ømm)
1/8	9.8
1/4	13.1
3/8	16.6
1/2	20.9
3/4	26.4
1	33.2
1 1/4	41.9

 <p style="text-align: center;">Straight Half Union</p>		 <p style="text-align: center;">Gauge fitting</p>		 <p style="text-align: center;">Gauge fitting</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ
JO 4610 JO 4010 JO 4020 JO 4030 JO 4040 JO 4570 JO 5020	6 φ × 1/8 P.T. 6 φ × 1/4 P.T. 6 φ × 3/8 P.T. 8 φ × 1/4 P.T. 8 φ × 3/8 P.T. 12 φ × 3/8 P.T. 12 φ × 1/2 P.T.	JO 4170 JO 4160 JO 4250	1/4 P.T × 6 φ 3/8 P.T × 6 φ 1/4 P.T × 1/4 P.T	JO 4240 JO 5450	6 φ × 3/8 P.T. 8 φ × 3/8 P.T.
 <p style="text-align: center;">Union</p>		 <p style="text-align: center;">Cross (reduction)</p>		 <p style="text-align: center;">cross</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ × Ⓒ × Ⓓ	Art. No.	Ⓐ × Ⓑ × Ⓒ × Ⓓ
JO 4180 JO 5010	6 φ × 6 φ 8 φ × 8 φ	JO 4230	6 φ × 1/4 P.T × 6 φ × 1/4 P.T	JO 4220 JO 4960	3/8 P.T × 6 φ × 1/8 P.T × 1/4 P.T 3/8 P.T × 8 φ × 3/8 P.T × 1/4 P.T
 <p style="text-align: center;">Hexagonal nipple</p>		 <p style="text-align: center;">Hexagonal plug</p>		 <p style="text-align: center;">Flare nut</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ
JO 4531 JO 4532 JO 4533	1/4 P.T × 1/4 P.T 3/8 P.T × 3/8 P.T 1/2 P.T × 1/2 P.T	JO 4541 JO 4542 JO 4543 JO 4544 JO 4545 JO 4546	1/4 P.T 3/8 P.T 1/2 P.T 3/4 P.T 1 P.T 1 1/4 P.T	JO 4190	6 φ

 <p>Hexagonal bushing</p>		 <p>L type half union</p>		 <p>L type half union (Reduction)</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ
JO 5001	1 ¼ P.T × 1 P.T	JO 4600	¼ P.T × 6 φ	JO 4090	¼ P.T × 6 φ
JO 5002	1 ¼ P.T × ¾ P.T	JO 4080	¼ P.T × 6 φ	JO 4970	¼ P.T × 8 φ
JO 5003	1 P.T × ¾ P.T	JO 4690	¾ P.T × 6 φ	JO 4990-1	¾ P.T × 12 φ
JO 5004	1 P.T × ¾ P.T	JO 4050	¼ P.T × 8 φ		
JO 5005	¾ P.T × ½ P.T	JO 4060	¾ P.T × 8 φ		
JO 5006	¾ P.T × ¾ P.T	JO 4070	½ P.T × 12 φ		
JO 5007	½ P.T × 1 ½ P.T	JO 4990	¾ P.T × 12 φ		
JO 5540	1 P.T × 1 P.T				
 <p>Tee</p>		 <p>Tee</p>		 <p>Tee</p>	
Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ × Ⓒ
JO 5110	6 φ × 6 φ × ¼ P.T	JO 4100	¼ P.T × ¼ P.T × 13 φ	JO 4110	6 φ × 6 φ × 6 φ
				JO 5030	8 φ × 8 φ × 8 φ
 <p>Tee</p>		 <p>Tee</p>		 <p>Tee</p>	
Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ × Ⓒ
JO 4120	6 φ × ¼ P.T × 6 φ	JO 4130	6 φ × ¼ P.T × 6 φ	JO 4140	¾ P.T × 6 φ × ¾ P.T
JO 4150	6 φ × ½ P.T × 6 φ				
JO 5070	8 φ × ¼ P.T × 8 φ				
JO 5080	8 φ × ¾ P.T × 8 φ				
 <p>Angle valve</p>		 <p>Manual unloader valve</p>		 <p>Purge valve</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ
JO 5840 (N)	¼ P.T × ¼ P.T	JO 5990 (N)	P.T ¾ × P.T ¼	JO 6080	¾ P.T × 17 φ
JO 5850 (R)	¾ P.T × ¾ P.T	JO 6000 (N)			
JO 5800 (N)	¾ P.T × ¾ P.T	JO 6010 (R)			
JO 5810 (R)	¾ P.T × ¼ P.T				
JO 5720 (N)					
JO 5830 (R)					
 <p>Oil By-pass valve (relief)</p>		 <p>Oil return fitting</p>		 <p>Pressure equalizing plug (for 2A)</p>	
Art. No.	Ⓐ	Art. No.	Ⓐ	Art. No.	Ⓐ
JO 5920 (N)	without cap ¼ P.T	JO 6110	¾ P.T	JO 4950	¾ P.T
JO 5930 (R)					

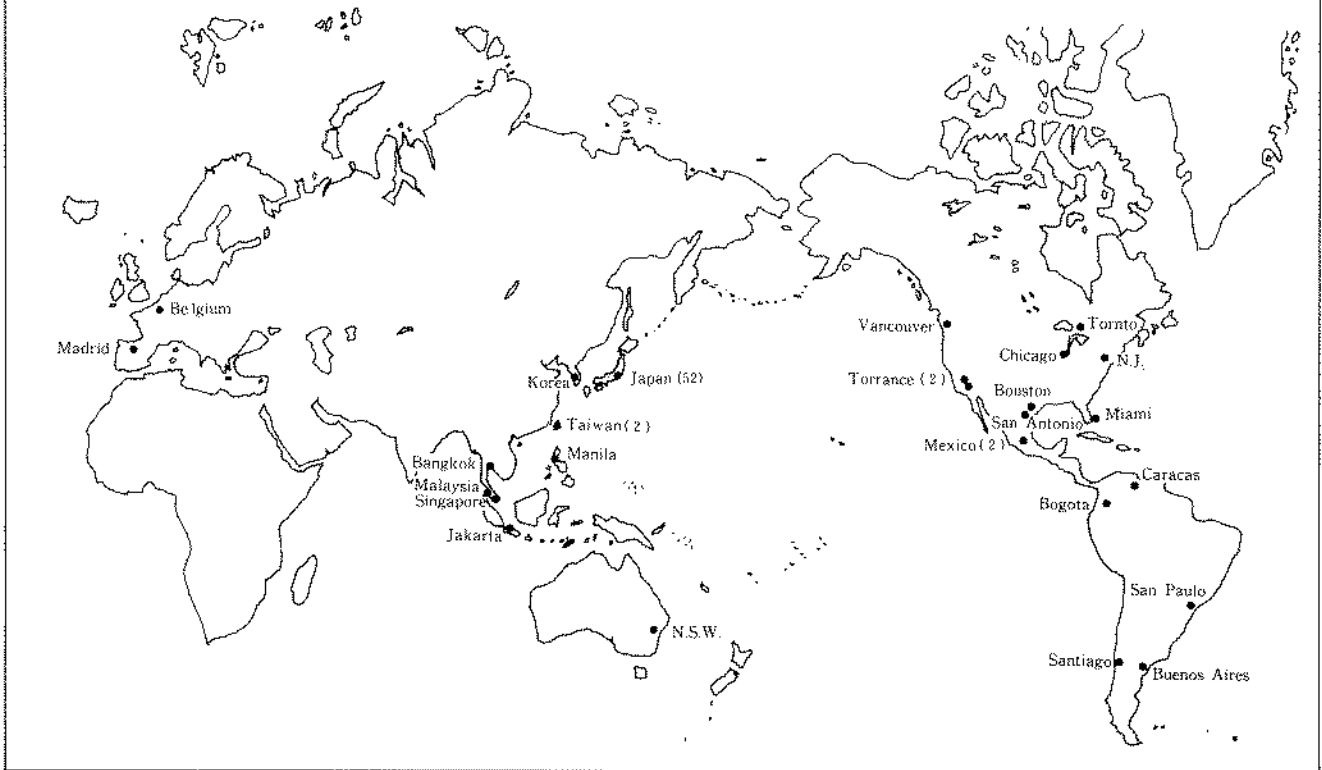
 <p>Temperature measuring plug</p>		 <p>Thermometer (I type)</p>		 <p>Thermometer (L type)</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.		Art. No.	
JO 470A JO 480A	$\frac{1}{2}$ P.T × long $\frac{1}{2}$ P.T × short (for 42A)	THS TLS	For high pressure use: (0 ~ 200°C) For low pressure use (-50 ~ 50°C)	THL TLL	For high pressure use (0 ~ 200°C) For low pressure use (-50 ~ 50°C)
 <p>Square plug (for low pressure)</p>		 <p>Elbow</p>		 <p>Tee</p>	
Art. No.		Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ × Ⓒ
JOAP 8 JOAP10 JOAP15 JOAP20 JOAP25 JOAP32 JOAP40	$\frac{1}{4}$ P.T $\frac{3}{8}$ P.T $\frac{1}{2}$ P.T $\frac{3}{4}$ P.T 1 P.T 1 $\frac{1}{4}$ P.T 1 $\frac{1}{2}$ P.T	JOL 8H JOL10H JOL15H JOL20H	$\frac{1}{4}$ P.T × $\frac{1}{4}$ P.T $\frac{3}{8}$ P.T × $\frac{3}{8}$ P.T $\frac{1}{2}$ P.T × $\frac{1}{2}$ P.T $\frac{3}{4}$ P.T × $\frac{3}{4}$ P.T (For high pressure use)	JOT 8H JOT10H JOT15H JOT20H	$\frac{1}{4}$ P.T $\frac{3}{8}$ P.T $\frac{1}{2}$ P.T $\frac{3}{4}$ P.T For high pressure use
 <p>Seat for unloader manipulate valve</p>		 <p>Half union</p>		 <p>Special tee (reduction)</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ × Ⓒ
JO 4270 JO 4260	W19 thread 16 × 6 φ W19 thread 16 × 8 φ	JO 4240 JO 5450	$\frac{3}{8}$ P.F × 6 φ $\frac{3}{8}$ P.T × 8 φ	JO 5510	$\frac{3}{8}$ P.T × 12 φ × 6 φ
 <p>Special tee</p>		 <p>Electric control fitting</p>		 <p>Electric control fitting</p>	
Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ
JO 5520	$\frac{3}{8}$ P.T × 12 φ × $\frac{1}{4}$ P.T	JO 5680	8 φ × W16 <sup>18</sup> thread/in	JO 3030	6 φ × W11 <sup>20</sup> thread/in
 <p>Electric control fitting</p>		 <p>Electric control fitting</p>		 <p>Electric control fitting</p>	
Art. No.	Ⓐ × Ⓑ	Art. No.	Ⓐ × Ⓑ × Ⓒ	Art. No.	Ⓐ × Ⓑ
JO 3020	W11 <sup>20</sup> thread/in × W16 <sup>18</sup> thread/in	JO 3010-1	8 φ × W16 <sup>18</sup> thread/in × $\frac{1}{4}$ P.T	JO 5690	$\frac{1}{4}$ P.T × W16 <sup>18</sup> thread in

# Standard manufacturing clearance



## MYCOM Worldwide After-sales Service Networks

Outside Japan : 27 subsidiaries  
In Japan : 52 subsidiaries



We reserve the right to change design specifications according to technical developments and improvements without notice.

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