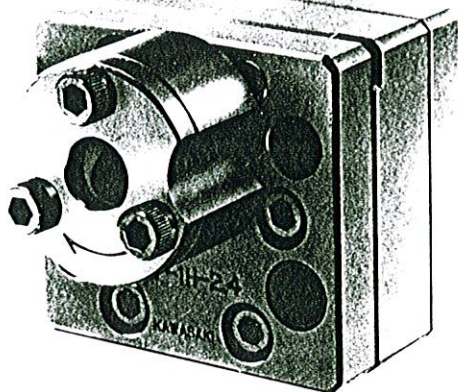


**PRECISION GEAR PUMP**

**CARE & MAINTENANCE OF  
KHP-1H SERIES**



This manual is arranged for the KHP-1H Series Kawasaki Precision Gear Pumps which are primarily used for high temperature polymers. It is also applicable to most of the KH1 and KH1-H Series Pumps, but please check your drawing and parts list to know differences from the KHP-1H Pumps.

The Precision Gear Pumps are made of very precise and high quality parts to realize high performances. To secure perfect interchangeability as well, critical parts are finished to 2 to 5 microns (.0001 to 0.0002 inches) tolerances.

Therefore, please handle with care not to take the slightest burr, nick or foreign particles. Read Do and Don't List before operation. For maintenance, a separate clean area is highly recommended.

**A. Do and Don't List**

- DO**
1. Flush out the plumbing system before connecting the pump.
  2. Put a filter, of 200 meshes or finer if possible, at the suction.
  3. Clean the mating faces of both the pump and pump block. Finish the mounting surface to flatness within 3 microns (0.0001") convex and to smoothness within 0.4S (4 rms) to avoid a polymer leak.
  4. Apply seizure preventing oil, e.g. DAG Dispersion #580, to the the mounting bolts and tighten to the torque listed below.

Mounting bolt, size M10: 500-550 kg-cm (430-480 lb-in)

Turn the pump with a driving tang by hand to insure free rotation.

5. Heat the pump at a rate of 100° C (180° F) per hour or slower. Heat uniformly. Turn the pump again by hand at the operation temperature to insure free rotation. To avoid a crack by thermal shock, preheat the pump to be installed on a hot pump block.
6. Align the drive tang correctly to degrees within 1° angle and 0.1 mm (0.004") parallelness to the pump and make sure it dosen't bottom in the slot of Coupler (12) for right function of the sealing mechanism.
7. Apply heat-resistant, non-evaporating lubricant (e.g. BOS-TIK Never-Seez) between Hub Top (15) and Coupler (12) to

- avoid dry rotation before polymer reaches there.
8. Connect the drive, check the rotation direction of the drive and start the pump slowly.
  9. Apply positive inlet pressure before starting.
  10. Take a proper care if the fluid may degrade or solidify during down periods (e.g. replace the fluid with stable polymer, dismantle and dip in solvent, disassemble and clean). Apply a rust preventing oil (silicone oil, e.g. Dow Corning #710, is mostly recommended) inside the pump when it is stored.

NOTE: Most of the Kawasaki Pumps are supplied inside applied with heat-resistant silicone oil. Disassemble the pump and clean all the parts if the silicone oil may be harmful to your application.

#### **DON'T**

1. Don't run dry.
2. Don't pull from a vacuum or net negative suction head.
3. Don't flush with water or other non-lubricating fluids. (Select the Kawasaki pumps of specific materials if water or other non-lubricating fluid is essential.)
4. Don't pump corrosives, abrasives and/or fluids carrying particles that may harm the pump. (Select the Kawasaki pumps of specific materials in such cases.)
5. Don't cool or heat the pump faster than 100° C (180° F) per hour.

#### **B. Tool for Maintenance**

- |                            |                        |
|----------------------------|------------------------|
| ◇ Bench vise               | ◇ Arbor press          |
| ◇ Lapping plate            | ◇ Torque wrench        |
| ◇ Socket head hex key bits | ◇ Oil stones           |
| ◇ #800 grit emery cloth    | ◇ Chemical brushes     |
| ◇ Polymer burning furnace  | ◇ Cleaning solvent     |
| ◇ Air nozzle               | ◇ Ultrasonic cleaner   |
| ◇ Plastic hammer           | ◇ Screwdrivers (minus) |
| ◇ Lubricant fluid          |                        |

#### **C. Cleaning and Disassembly**

Refer to Drawing 72103E88 on page 7. See the drawing and parts list also if the type description of your pump does not begin with "KHP-1H."

CAUTION: 1) Be careful not to drop the disassembled parts on a concrete floor or not to allow them to knock together.

2) Never strike the pump parts with an iron hammer.

1. Solidified polymer have to be removed by carburizing before disassembling the pumps. Place them in a suitable furnace and gradually heat. Take care polymer not to flash. A fluidized bed cleaning bath is also acceptable. Determine temperature and time for your polymer by trial.



CAUTION: 1) Avoid exposing the pump to thermal shock. Raise temperature at a rate of 100° C (180° F) per hour or slower.

- 2) Be careful of polymer not to flash. Heat the pump well below the following tempering temperatures, or steel hardness may draw back or parts may be deformed:

JIS SKH51 (AISI M2):	570° C (1,060° F)
JIS SKH54 (AISI M4):	570° C (1,060° F)
JIS SKD11 (AISI D2):	515° C ( 960° F)

2. Gradually cool the pump to room temperature.

CAUTION: Never cool hot pumps dipping in a liquid bath or blowing cool air. Cool in a room temperature at a rate of 100° C (180° F) per hour or slower.

NOTE: Disassembling while hot may be easier if proper protection against a skin burn is taken.

3. Remove Hub Screws (14). Disassemble Hub Top (15), Hub (11) and Coupler (12).
4. Disinsert Dowels (10) using an arbor press applying a bar a little smaller than the Dowels.

CAUTION: Never hammer the Dowels (10) to disinsert.

5. Remove Plate Screws (13). Separate Front Plate (01), Gear Casing (02) and Back Plate (03). Use minus screwdrivers to the notches at the corners to separate them easily.
6. Take off Gears (07)(08), Arbor (05) and Key (09).

CAUTION: 1) Be careful not to drop Gears (07)(08) and cause damage to the gear teeth.

- 2) Never use pliers to lift the Gears (07)(08). Never use a screwdriver to pry them upward.

NOTE: Be careful to retain the Key (09).

7. NOTE: In normal maintenance, don't disinsert Stud (06) and Bushing (04) pressfit in the Plates (01)(03). Press out with an arbor press if these parts have to be replaced.

8. Clean the components dipping in an appropriate solvent and thoroughly remove polymer ash and other sticking articles. Using an ultrasonic cleaner with the solvent will be more recommendable. Use chemical brushes to clean between gear teeth, bores and reliefs. Use clean, lint free rags and compressed air to dry the components.

CAUTION: Never drop the components into a tank or container. Place them gently onto the bottom to avoid damage.

## D. Treatment and Replacement

- ◇ The components that have only small dints or scratches, if not at such critical parts or areas like sharp gear-pocket corners of Gear Casing (02), sharp gear-tooth edges of Gears (07)(08), can be used mostly by removing the lifted parts around the bruises with oil stone or emery cloth.

- ◇ Make flat by lapping if Front Plate (01), Back Plate (03) and Hub Top (15) are worn.

NOTE: 1) Place a layer of #800 grit emery cloth on a lapping plate and fix. Apply light pressure to the component and turn it until the worn part is removed.

- 2) Don't lap Gear Casing (02) or Hub (11) since their plain surfaces are not to wear. Gears (07)(08) and Coupler (12) are allowed to reduce slightly (up to 4 microns or 0.00015 inches).

- ◇ When Gears (07)(08), Gear Casing (02), Arbor (05), Stud (06), Bushings (04) and Coupler (12) are found apparently worn, replace them with new ones.

NOTE: 1) Don't use the Gears (07)(08) or Gear Casing (02) of which sharp edges are damaged.

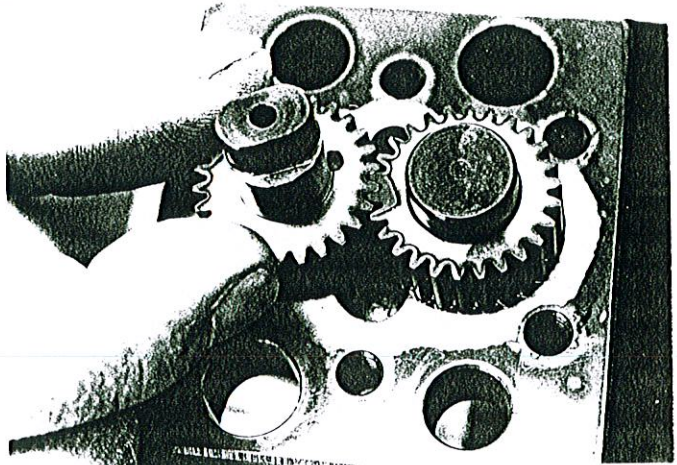
- 2) Comparing dimensions with new parts will help inform worn degrees.

## E. Assembly

CAUTION: Never strike or force the parts together to fit in. They will drop into place if properly aligned. Use an arbor press to insert press-fit components.

NOTE: It is recommended for easy assembly works and safe operation to apply clean oil (silicone oil, e.g. Dow Corning #710, or other suitable fluid for your application) to the sliding parts.

1. Press Stud (06) into Back Plate (03) and Bushings (04) into Front Plate (01) and Back Plate (03) when they were disinserted, using Driven Gear (08) as a guide for pressing the Stud (06) upright and perpendicular to the Back Plate (03).
2. Place the Back Plate (03) on a table, inside face up.
3. Assemble Driving Gear (07), Arbor (05) and Key (09). Place the stub end of the Arbor into the Bushing (04) in the Back Plate (03) and rotate several times to insure free rotation.
4. Position Driven Gear (08) over the Stud (06), rotate several times to insure free rotation.
5. Carefully lower Gear Casing (02) over the Gears (07)(08). Mate the larger port of the Gear Casing (02) with the larger hole in the Back Plate (03).

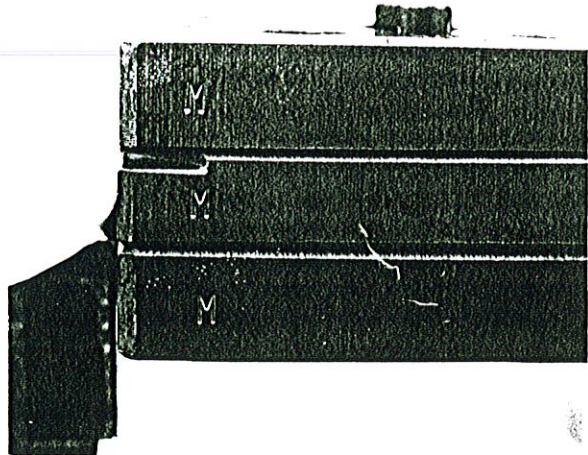


(Photo 1)



Turn the Arbor (05) several times to insure free rotation.

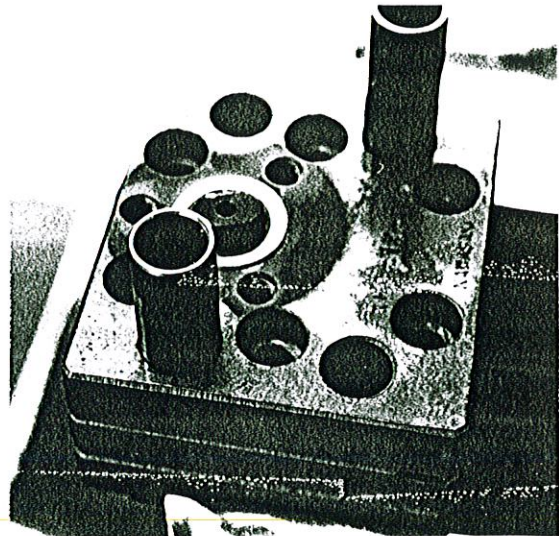
6. Carefully lower Front Plate (01) over the Arbor (05) and the Stud (06).
7. See the dented letters are to the same direction in the Plates to confirm that the plates are located correctly. Rotate the Gears to ensure free rotation.



(Photo 2)

8. Insert Dowels (10) into place. Rotate the Gears to ensure free rotation.

NOTE: Dowels are not press-fit in any of the Plates. Tap in using a plastic hammer if necessary.



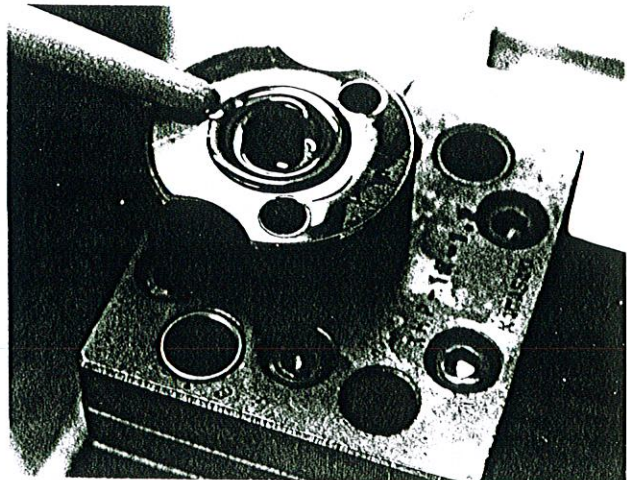
(Photo 3)

9. Lubricate Plate Screws (13) with heat resistant lubricant (e.g. DAG Dispersion #580), install and tighten to the following torque:

Plate Screw (13), size M6: 100-120 kg-cm (85-105 lb-in)

Make sure the pump turns freely.

10. Place Coupler (12) over the Arbor (05), slide Hub (11) over the Coupler (12).
11. Apply heat-resistant, non-evaporating lubricant (e.g. BOSTIK Never-Seez) at the sliding area of the Coupler (12) and Hub Top (15) of the pump for high viscosity polymers.

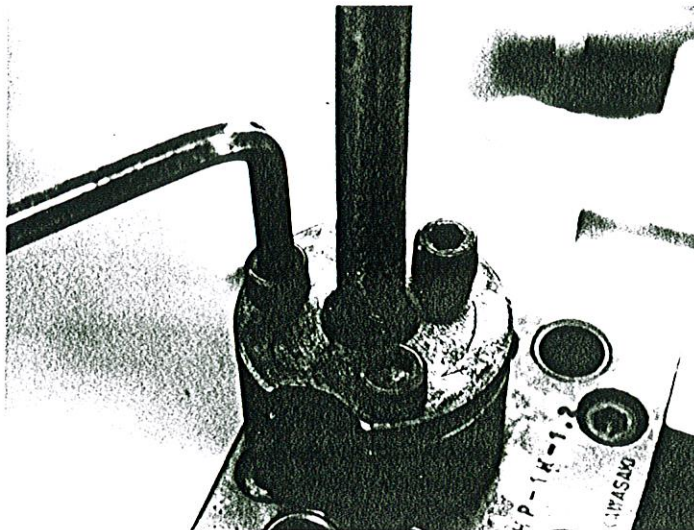


(Photo 4)

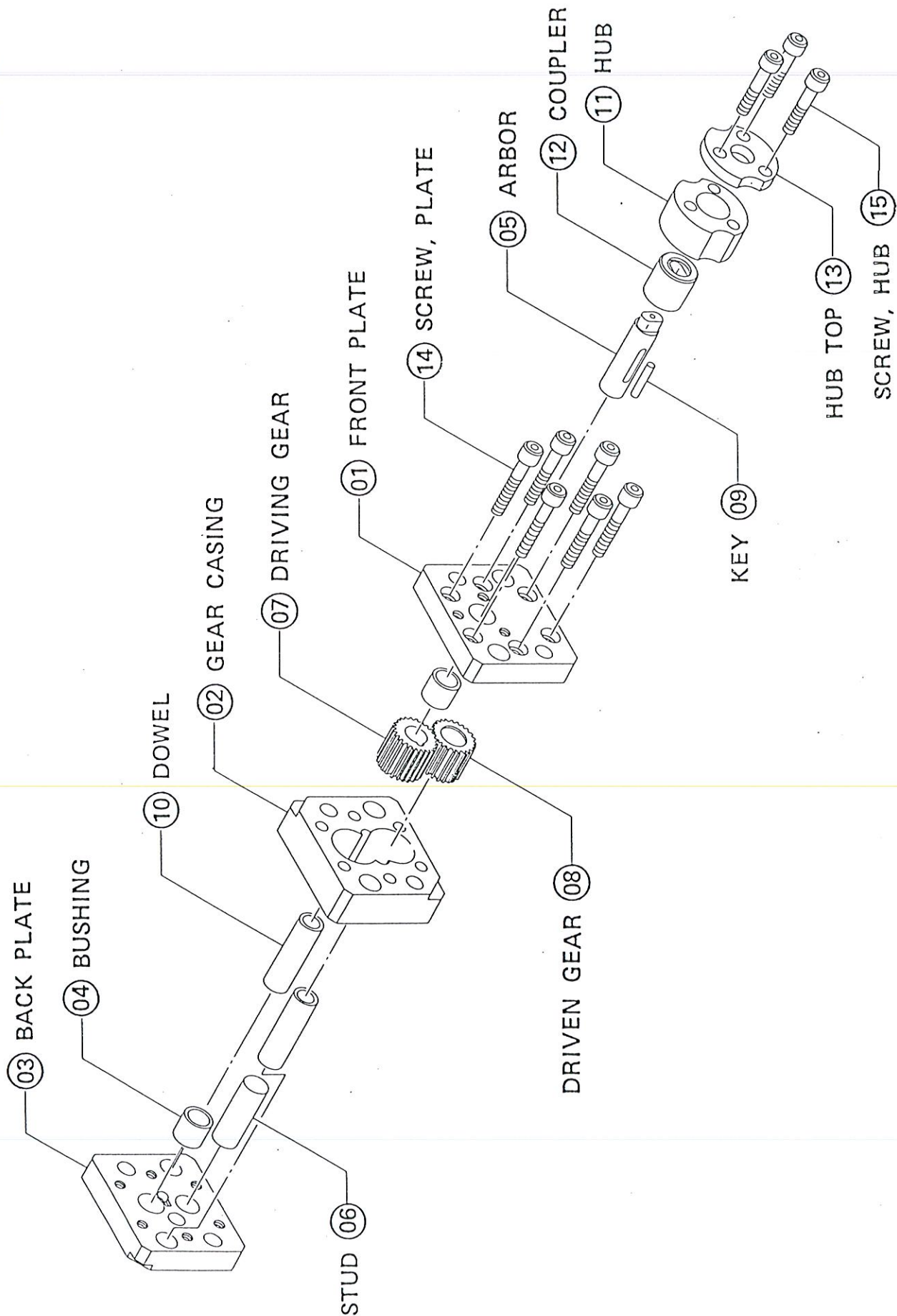
12. Place the Hub Top (15) on the Hub (11). Insert Hub Screws (14) and tighten to the following torque:

Hub Screw (14), size M6: 100-120 kg-cm (85-105 lb-in)

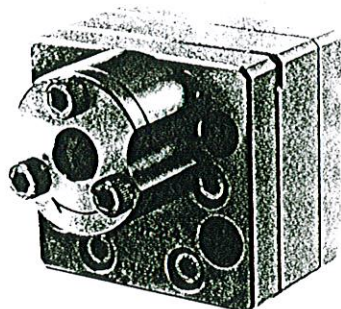
Insert a drive tang into the Coupler (12) and turn to insure free rotation of the pump.



(Photo 5)

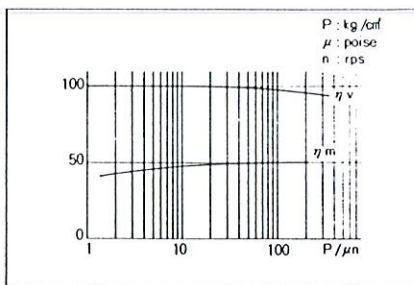






### ④性能曲線

粘度、圧力、回転数より容積効率( $\eta_v$ )、機械効率( $\eta_m$ )を求め、計算式から流量、動力を計算してください。



### ●PERFORMANCE CURVE

Obtain volumetric efficiency ( $\eta_v$ ) and mechanical efficiency ( $\eta_m$ ) from the curve according to viscosity, pressure and rpm. Then calculate capacity and required power by the formulas.

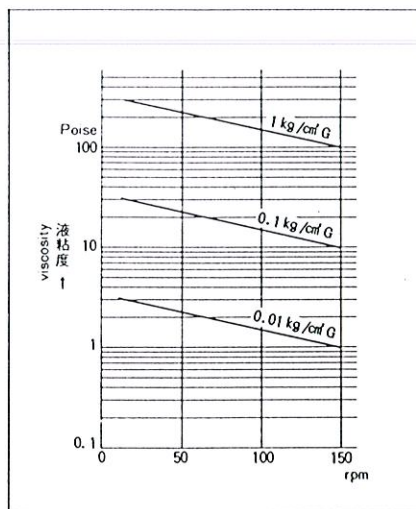
吐出量  
capacity (cc/min) = (cc/rev) × rpm ×  $\eta_v$

所要動力  
required power (kw) =

$\frac{(\text{kg/cm}^2) \times (\text{cc/rev}) \times \text{rpm} \times 1/1000}{612 \times \eta_m}$

### ⑤所要入口圧力

粘度と回転数から必要なポンプ吸入圧力を求めてください。

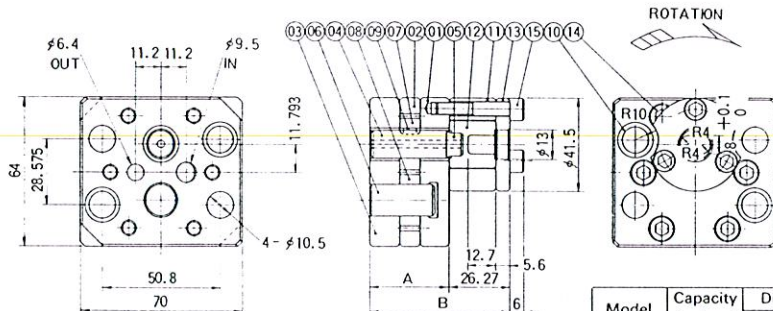


### ●REQUIRED INLET PRESSURE

Obtain required inlet pressure from the curve according to the viscosity and rpm.

## ●ポンプ本体/PUMP

### 構造・外形寸法図/STRUCTURE・DIMENSIONS



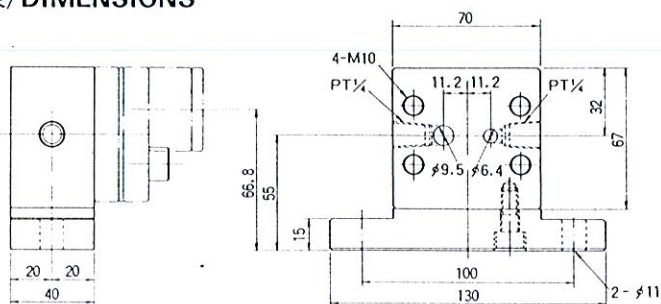
Model	Capacity (cc/rev)	Dimension A	B
KHP-0.15	0.15	27.28	53.55
-0.3	0.3	29.15	55.42
-0.6	0.6	30.58	56.85
-1.2	1.2	35.76	62.03
-2.4	2.4	46.12	72.39
-3.0	3.0	42.5	68.77

## ●部品表/PARTS LIST

部品番号 Part No.	品名 name	1台当 個数 Q'ty/set
01	フロントプレート front plate	1
02	ギヤケース gear casing	1
03	バックプレート back plate	1
04	ブッシング bushing	2
05	アーバー arbor	1
06	スタッド stud	1
07	ギヤA driving gear	1
08	ギヤB driven gear	1
09	キー key	1
10	ダウエル dowel	2
11	ハブ hub	1
12	カップラー coupler	1
13	ハブトップ hub top	1
14	締付ボルト plate screw	6
15	ハブボルト hub screw	3

## ●ポンプブロック/PUMP BLOCK

### 寸法表/DIMENSIONS

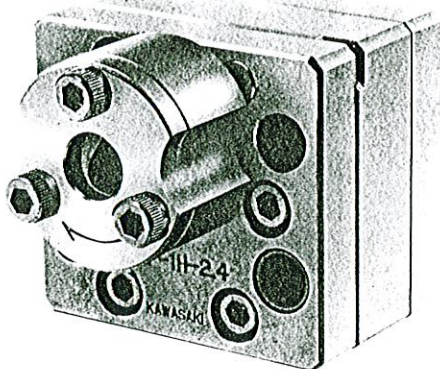


### ●取付ボルト/mounting bolt

寸法 size	M10
材質 material	SCM435
締付トルク tightening torque	5~5.5kg-m



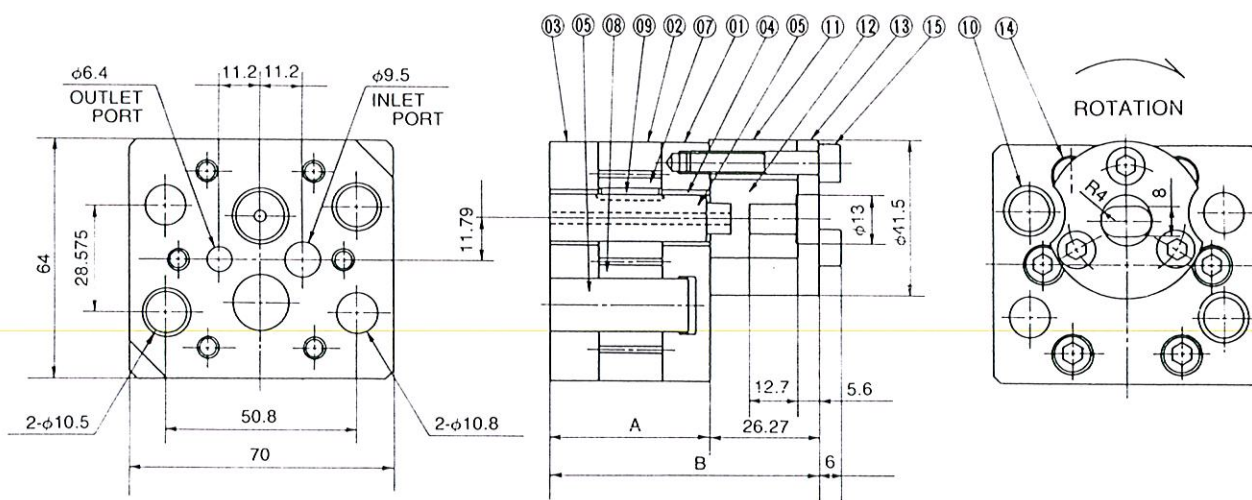
# KHP-1H SERIES



Main Application : Melt Spinning  
 Number of ports : Inlet 1 ; Outlet 1  
 Displacement/ port : 0.1 ~ 6 cm<sup>3</sup>  
 Inlet pressure : 0.5 MPa ~ 19.6 MPa { 5 kgf/cm<sup>2</sup> ~ 200 kgf/cm<sup>2</sup> }  
 Outlet pressure : Max. 49.1 MPa { Max. 500 kgf/cm<sup>2</sup> }  
 Differential pressure : Please refer to DWG. as shown below.  
 Temperature : Max. 350 °C  
 Viscosity : Max. 400 Pa · s { Max. 4,000 Poise }  
 Speed : 10 ~ 40 min<sup>-1</sup>  
 Standard material : High speed tool steel  
 Torque list :

	Bolt size	Torque	
		N · m	kgf · cm
For plates	M6	9.8 ~ 11.8	100 ~ 120
For hub	M6	9.8 ~ 11.8	100 ~ 120
For mounting	M10	49 ~ 53.9	500 ~ 550

## STRUCTURE DIMENSIONS (mm)



Model	Capacity (cm <sup>3</sup> )	Diff. Press		A	B	Mass. (kg)
		MPa	kgf/cm <sup>2</sup>			
KHP-1H-0.1	0.1	39.2	400	27.01	53.28	1.2
KHP-1H-0.15	0.15	39.2	400	27.28	53.55	1.2
KHP-1H-0.3	0.3	39.2	400	29.15	55.42	1.3
KHP-1H-0.6	0.6	39.2	400	30.58	56.85	1.4
KHP-1H-1.2	1.2	39.2	400	35.76	62.03	1.6
KHP-1H-1.6	1.6	39.2	400	39.21	65.48	1.7
KHP-1H-1.8	1.8	39.2	400	40.93	67.2	1.8
KHP-1H-2.4	2.4	39.2	400	46.12	72.39	1.9
KHP-1H-3	3.0	29.4	300	42.5	68.77	1.8
KHP-1H-4	4.0	29.4	300	48.2	74.47	2
KHP-1H-5	5.0	24.5	250	54	80.27	2.2
KHP-1H-6	6.0	24.5	250	59.7	85.97	2.4

## • PARTS LIST

Parts No.	Name	Q'ty/set
01	Front plate	1
02	Gear casing	1
03	Back plate	1
04	Bushing	2
05	Arbor	1
06	Stud	1
07	Driving gear	1
08	Driven gear	1
09	Key	1
10	Dowel	2
11	Hub	1
12	Coupler	1
13	Hub top	1
14	Plate screw	6
15	Hub screw	3

FOR AUTOMOTIVE SEALANT APPLICATIONS, PUMP HAS BEEN  
MODIFIED TO INCORPORATE OUTER SEALS FOR ADDED INNER SEAL LIFE.

SEAL ASSEMBLY PROCEDURE

REMOVE SEAL ASSEMBLY ON PUMP AND EXAMINE PARTS FOR WEAR,  
SCRATCHES OR DAMAGE.

CLEAN PARTS WITH SOLVENT AND BRUSH (FIBER OR EQUIVALENT).

~~HAND POLISH SEAL RING AND HUB TOP LIGHTLY (2 - 4 H FINISH)  
IF NEEDED. SOME SMALL SCRATCHES PERMISSIBLE. IF PARTS  
ARE BADLY WORN, REPLACE.~~

REPLACE SEAL IN GLAND AND PACK WITH VASOLINE PETROLEUM  
JELLY OR EQUIVALENT.

~~ASSEMBLE SEAL RING AND PACK CAVITY WITH VASOLINE PETROLEUM  
JELLY OR EQUIVALENT.~~

INSTALL SEAL AND GLAND ON PUMP AND TORQUE BOLTS ~~6 KGM.~~

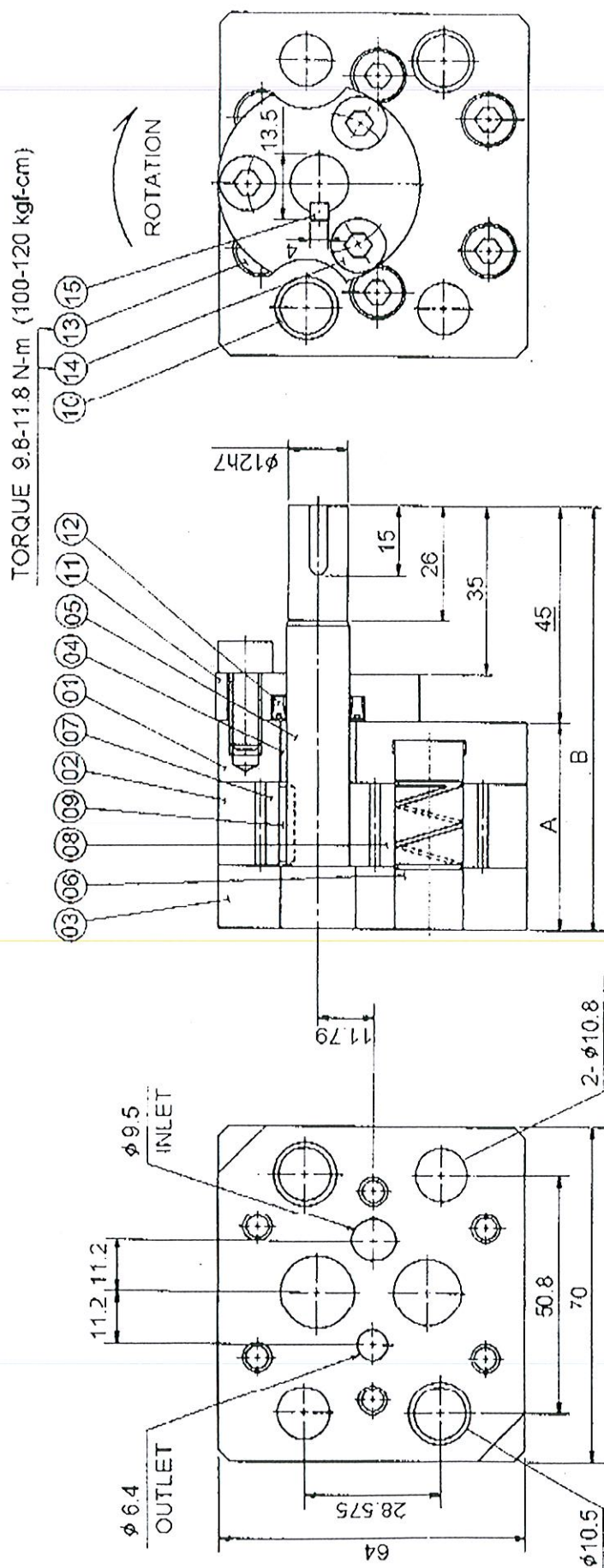
85-100 LB-IN

CHECK TO ENSURE SHAFT ROTATES FREELY.

NOTE - INSTALL SEAL WITH SEAL LIP  
AS SHOWN ON DRWG.







TYPE	DISPLACEMENT	A	B
KH1-0.15-40H	0.15 cm <sup>3</sup>	27.3	72.3
KH1-0.3-56H	0.3	29.2	74.1
KH1-0.6-48H	0.6	30.6	75.7
KH1-1.2-64H	1.2	35.8	80.8
KH1-2.4-42H	2.4	46.1	91.1
KH1-3-52H	3.0	42.5	87.5
KH1-4.5-02H	4.5	51.1	96.1
KH1-8-14H	8.0	59.7	104.7

P#	DESCRIPTION	P#	DESCRIPTION
01	FRONT PLATE	09	KEY GEAR
02	GEAR CASING	10	DOWEL
03	BACK PLATE	11	SEAL HOUSING
04	BUSHING	12	POLYSEAL
05	ARBOR	13	SCREW PLATE
06	STUD	14	SCREW HUB
07	DRIVING GEAR	15	KEY DRIVE
08	DRIVEN GEAR		

## APPENDIX

Standard 'KH1-H with Polyseal' pump is installed with just one Polyseal. And another set can be added as below if necessary. The double-seal version will be especially effective for pumping such moisture-cure liquid as di-isocyanate in polyurethane forming by keeping sealing fluid like Vaseline between the two seals.

