INSTRUCTION MANUAL

INSIDE BEARING PUMP

(FOR CARGO PUMP)

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TAIKO KIKAI INDUSTRIES CO.,LTD.

■ INSIDE BEARING PUMP

SAFETY INSTRUCTIONS

⚠ CAUTIONS FOR YOUR SAFETY

Before using this pump, read the INSTRUCTION MANUAL(S). Follow WARNING LABEL(S), INSTRUCTION(S) and CAUTION PLATE(S) in order to use it correctly. It is also highly recommended to ALWAYS KEEP the INSTRUCTION MANUAL(S) at the SAME PLACE for easy access.

TRANSPORTATION, INSTALLATION, PIPING, WIRING, OPERATION, INSPECTION and MAINTENANCE WORK must be done by ONLY a LICENSED and / or AUTHORIZED PERSON(S) who has enough knowledge on health and safety rules and regulations as well as on his or her profession.

In any respect, we will NOT GUARANTEE any DEATH, INJURIES, DAMAGES AND LOSSES which are result in modification without our written authorization or using and assembling unauthorized parts. When DISPOSING a pump, any accessories, used parts and oil, they should be treated as a general INDUSTRIAL WASTE.

WARNING LABEL(S) and SIGN in the instruction manual(s) are classified into WARNING, CAUTION and NOTICE as described below.

⚠ WARNING	: indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	: indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	: indicates a potentially hazardous situation which, if not avoided, may result in damaging or defecting a product. It will be only used for protecting the property, but not for personal safety.

Footnote: ANSI Z 535

⚠ WARNING

TRANSPORTATION and INSTALLATION:

＊TRANSPORTATION work must be carried by only a LICENSED or AUTHORIZED PERSON(S) who has enough knowledge on his or her profession : special attention and caution are required when fitting a HANGING WIRE in relation to its weight and gravity center.
DROPPING or FALLING → DEATH or SERIOUS INJURY.

OPERATION and MANIPULATION

＊NEVER ALLOW an UNAUTHORIZED PERSON to operate the pump. DO NOT TOUCH or contact to ROTATING parts or portion(s).
ROTATING → ROLLED IN, BIT, PINCHED and SPILLED(contacted things).

⚠ CAUTION

OPERATION and MANIPULATION

＊DO NOT TOUCH or contact to SEALING part or HOT parts while the pump is IN OPERATION.
HOT → BURNED and INJURED

INSPECTION and MAINTENANCE

＊When OVERHAULING the pump, carefully handle the HEAVY weighted parts; especially, fitting a HANGING WIRE.
DROPPING or FALLING → INJURY.

＊Before STARTING a MAINTENANCE work, clearly SIGN IN MAINTENANCE WORK and CUT ELECTRIC SUPPLY.
ELECTRIC SHOCK → DEATH
UNINTNDED ROTATION → ROLLED IN, BIT and PINCHED.

⚠ NOTICE

OPERATION and MANIPULATION

＊Without a specific purpose, do not manipulate the valves and cocks attached to or supplied for the pump.
WRONG MANIPULATION → DAMAGING or DEFECTING the pump.

■ INSIDE BEARING PUMP

CONTENTS

Foreword

Foreword

This instruction manual has been prepared for “Taiko Type-Inside Bearing Pump” and describes the essential items for handling and maintenance of the pump. The service life of the pump depends on correct handling and maintenance.

It is imperative, therefore, that the instructions given in this manual should be closely followed.

If you have any questions regarding this manual, please consult our Head office or one of our branches.

If you have a “Taiko Type-Outside Bearing Pump”, do not use this manual, but refer to the instruction manual for the Outside Bearing Pump.

NOTE

■ INSIDE BEARING PUMP

1. Outline of Construction

This Gear Pump is constructed of one set of gears, a shaft supported by the bearings, casing, side cover, etc. This Gear Pump is of the positive-displacement type. It picks up oil between each of the gear teeth on the suction side and by the action of the gears turning, continuously carried the oil along inside of the casing around to the discharge side.

Bearings are inside of the packing and are lubricated by the oil handled.

After lubricating the bearings, lubricating oil returns to the suction side through the oil way provided in side cover.

2. Transportation

When transporting the pump, it is necessary to proceed as follows:

a. When lifting, be careful to use cables which will safely bear the weight of the unit lifted and attach them properly.
b. Be careful to avoid damage to fittings such as piping, valves, cooks, gauges, etc.

3. Prevention of Vibration

In order to minim the vibration of pump and piping, pay close attention to the reinforcement of the pump foundation and piping supports.

4. Installation

In order to minimize the vibration of pump and piping, pay close attention to the reinforcement of the pump foundation and piping supports.

a. Allow ample space for operation and maintenance.
b. Locate the pump after carefully considering suction pipe losses and suction head.

5. Piping

In installing piping, pay attention to the following:

Pump must be set as close to the oil setting tank as possible, and suction head must be as low as possible.

Suction pipe must be as short as possible, and bends of suction pipe and other fittings kept to a minimum.

a. Strainer must be provided on the suction pipe to protect pump.
b. Suction pipe must be free from air or air invasion.
c. Valves on the suction side must not allow air invasion through their glands.

d. Flange connection to the suction and the discharge nozzles should be placed correctly in order to avoid disturbance of pump alignment when flange bolts are unduly tightened or when piping is vibrating.
e. Precaution must be taken so that thermal stress or the weight of piping and valves may not abnormally affect the pump.
f. Interior of piping must be as clean as possible.

6. Connection

6.1 Alignment

On completing installation, the alignment must be checked and care must be taken so that no misalignment will occur after connecting with piping.

Even through misalignment occurs, readjustment must be made carefully by loosening the bolts on both the suction and the discharge flanges and also on the foundation.

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6.2 Checking of alignment

a. After removing coupling bolts as shown in Fig.1 or Fig.2 check alignment by measuring parallel and angular misalignment at 4 points, 90° apart, on the coupling periphery.

b. For measurement on the shaft coupling periphery, a dial indicator is fixed, as shown in Fig.1 (A), on the motor end coupling and the pump end coupling periphery. Give the pump end coupling one complete turn by hand. Half of the variation in readings is taken as the value of measurement, which must comply with the value in Table 1.

c. For comparing the distance between coupling faces at four points using a thickness gauge, as shown in Fig.1 (B), give the shaft one complete turn by hand. The value of measurement must comply with the value in Table 1.

d. Ensure the direction of pump rotation is correct.

e. Fit the bolts to the coupling.

f. Rotate by hand to check for smooth movement.

g. On completing the adjustment of alignment, insert dowel pins.

h. Coupling periphery and end faces should be protected against rust or damage.

Table 1　Permissible amount of misalignment

PUMP		Side face (mm)	Coupling end face (mm)
CJH, CJL	60,120,150,200	0.1 and less	0.2 and less
	300,400,500,600	0.15 and less	0.5 and less

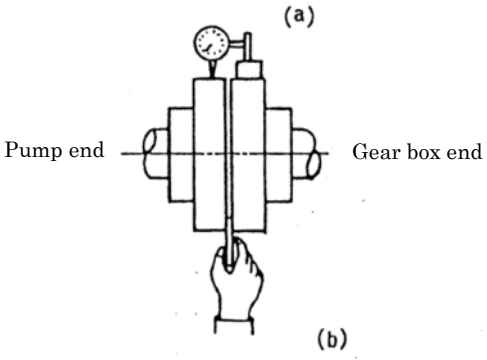

Fig.1 Check with dial indicator and thickness gauge

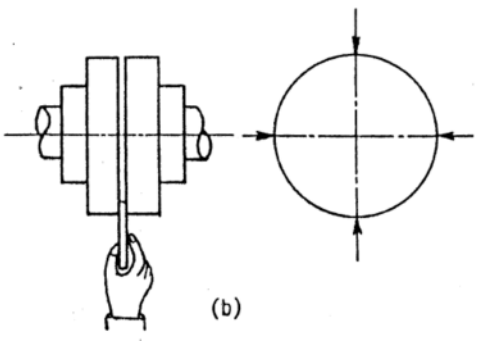

Fig.2 Check with straight edge and thickness gauge

Note : A thickness gauge should be used for alignment only at the times of repair, intermediate inspection and periodical inspection. It is preferable to use a dial indicator for checkup after initial installation and connection to the piping arrangement.

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7. Operation

Operation after installation or reassembly must be carried out in the following order.

7.1 Precaution before Operation:

a. Check to make sure the bolts and the nuts on each joint are not loosened.
b. Ensure that the cocks or the valves of gauges, etc. are opened.
c. Check that the rotating direction of pump is the same as the direction of the arrow on the plate provided on the side cover.
d. Fully open the valves on both the suction and the discharge sides.
e. Turn the pump shaft by hand to see that it turns smoothly.
f. It the temperature difference between the temperature of the oil handled and the casing is more than 40℃ or so, oil being pushed into the casing suddenly may cause misalignment of the pump due to thermal distortion and seizure.
   If the pump is used at especially high temperature (more than 70℃), operate only after warm up (jacket point to pump casing supply steam or heating oil.), or by first making the temperature of the casing rise to about the temperature of the oil handled.

7.2 Operation

a. Start the pump, but initially cycle it "On and Off" once or twice. Enter into operation only after confirming that there is no abnormal condition in regard to the rotating direction, vibration, noise, starting current, etc.
b. When pump revolutions have risen and oil has been discharged from air vent, close air vent. The pump is now in operation.
c. Since gears, shafts, bearings and sliding surfaces of mechanical seal are lubricated by the oil handled, dry operation should be absolutely avoided.

8. Maintenance

8.1 Cautions during Operation

a. Be careful to operate as nearly as practical within the limits of design.
b. Monitor the pump for vibration and noise, pressure gauge. If an abnormal condition is observed, stop the pump immediately.
c. Pay attention to bearing temperature rise. If the bearing housing can be felt by hand safely, all is well. Otherwise, measure the temperature with a thermometer. The permissible bearing temperature is “ambient temperature plus 40℃” or “liquid temperature plus 20℃”. It should be kept below these limits.
d. Never throttle the valves on both the suction and discharge side. Adjust the flow by means of the bypass circuit on the discharge side.
e. Never operate with the valve closed on the discharge side, otherwise a temperature rise of the liquid in the casing will cause seizure.
f. Keep the strainer clear.

8.2 Cautions during Standstill

a. Keep the valves on the suction and discharge side closed.
b. When the pump is shut down over a long period, the pump must be rotated by hand periodically (once a week or so).

9. Inspection

9.1 Periodic Inspection

Except in the case of abnormal conditions, it is desirable to carry out inspection periodically as follows：since conditions vary according to the method of mounting, place of installation, liquid handled, etc, the operator should make his plan of inspection accordingly.

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Item	Action to be taken	Period			
		Every nautical	Every 12 mouth or 1000 hrs.	Every 5 years or 4000 hrs.	Overhaul
Bolt	Replace it if deformed				○
Roller bearing	Check inner and outer races and rollers for traces of exfoliation, and if found, replace it.			○	○
Oil seal	Check for proper fitting and amount of leakage. Replace it if leakage is too much.	○		○	○
	Check conditions of mating faces.			○	○
	Grease up	○			○
Shaft	Check conditions of contact, flaw in sliding faces, and bend of shaft.			○	○
"O" ring	Check surface flaw and condition of deterioration. Replace it if deformed.			○	○
Gear	Check booth surfaces, outside diameter, side face and connection with shaft. Measure width and follow the procedures shown in Table 2.			○	○
Shaft coupling bolts and rubber ring	Check condition of wear and renew them if abnormal points and found.		○		○

Note : 1) The hours quoted refer to the operating hours.

9.2 Overhaul

At overhaul, pay attention to the following：

a. Refer to the assembly drawing in order to understand the construction of the pump. Perform overhaul in the correct sequence.
b. When separating fit and flange faces, use jack bolts and wooden hammers, and never apply force with chisels or drivers.
c. When removing the rotating element, take care to avoid creating flaws on sliding faces and machined surfaces.
d. When removing rotating parts from the shaft, remove the locking device and draw each one off carefully.
e. Handle long, slender parts such as shaft carefully to avoid bending them.
f. Handle the parts carefully, and arrange them on sheets of paper or cloth to keep them in order.
g. At overhauling, put suitable match marks (as many as possible) to avoid mistakes when reassembling.

9.3 Assembly

Carry out assembly by reversing the order of disassembly and taking attention as follows.

a. Remove dust and stain from each part by washing it thoroughly with kerosene oil. Repair any parts on which a flaw is found.
b. Fit the locking device perfectly in each rotating part which has one.
c. When fitting and combining parts with match marks, be sure to follow them.
d. Sliding surfaces of bearings, faces should be sufficiently lubricated by grease.
e. When installing bearings and side cover, be sure that the course of the oil way to bearings for service and return oil is correct in regard to direction of suction and discharge.
f. Pay attention that bolts, etc. are tightened correctly.
g. Check alignment as mentioned in para.6.
h. Turn the shaft by hand to see that it turns smoothly.

10. Trouble shooting and Remedial Actions

When troubles have occurred, their causes should be traced and necessary remedies should be carried out.

The following table describes troubles, their causes, and remedies.

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Troubles	Causes	Remedies
Pump starts, but does not discharge oil.	・ Valves are not open. ・ Valves will not open. ・ Suction pile or strainer is clogged. ・ Pump rotating direction is wrong.	・ Open valves. ・ Repair valves. ・ Clean suction pipe or strainer. ・ Change wiring
Pump starts, but specified capacity and pressure are not reached.	・ Safety valve is open. ・ Suction pipe or strainer is clogged. ・ Liquid viscosity is too low. ・ Gear shaft is worn. ・ Suction pressure is too high. ・ Gauges are wrong.	・ Adjust setting of safety valve (refer to ※1). ・ Clean suction pipe or strainer. ・ Check the specification. ・ Replace gear or shaft with a new one. ・ Check the specification. ・ Replace gauges with new ones.
Pump starts, but bearing get overheated.	・ Lubrication is not sufficient. ・ Connection is wrong. ・ Bearings are wrong. ・ Pump shaft is bent. ・ Load of thrust has increased. ・ Bearing assembly is wrong.	・ Check course of oil way to bearing for service and return oil. ・ Check alignment. ・ Replace bearings. ・ Replace shaft. ・ Check whether side of bearing are warm excessively or suction pressure is too high. If abnormal condition is observed, suction pressure must be set to specification. ・ Readjust bearings.
Pump starts, but vibration or noise occurs.	・ Connection is wrong. ・ Pump shaft is bent. ・ Installation is wrong. ・ Foundation is weak. ・ Other vibration is transmitted. ・ Cavitation exists. ・ Safety valve is chattering. ・ Foreign matter exists in the pump. ・ Tooth contact is wrong.	・ Check alignment. ・ Replace shaft. ・ Correct installation. ・ Reinforce foundation. ・ Reinforce piping. ・ Set suction pressure and viscosity to the design specifications. ・ Repair safety valve. ・ Overhaul and remove foreign matter. ・ Repair or replace gear.

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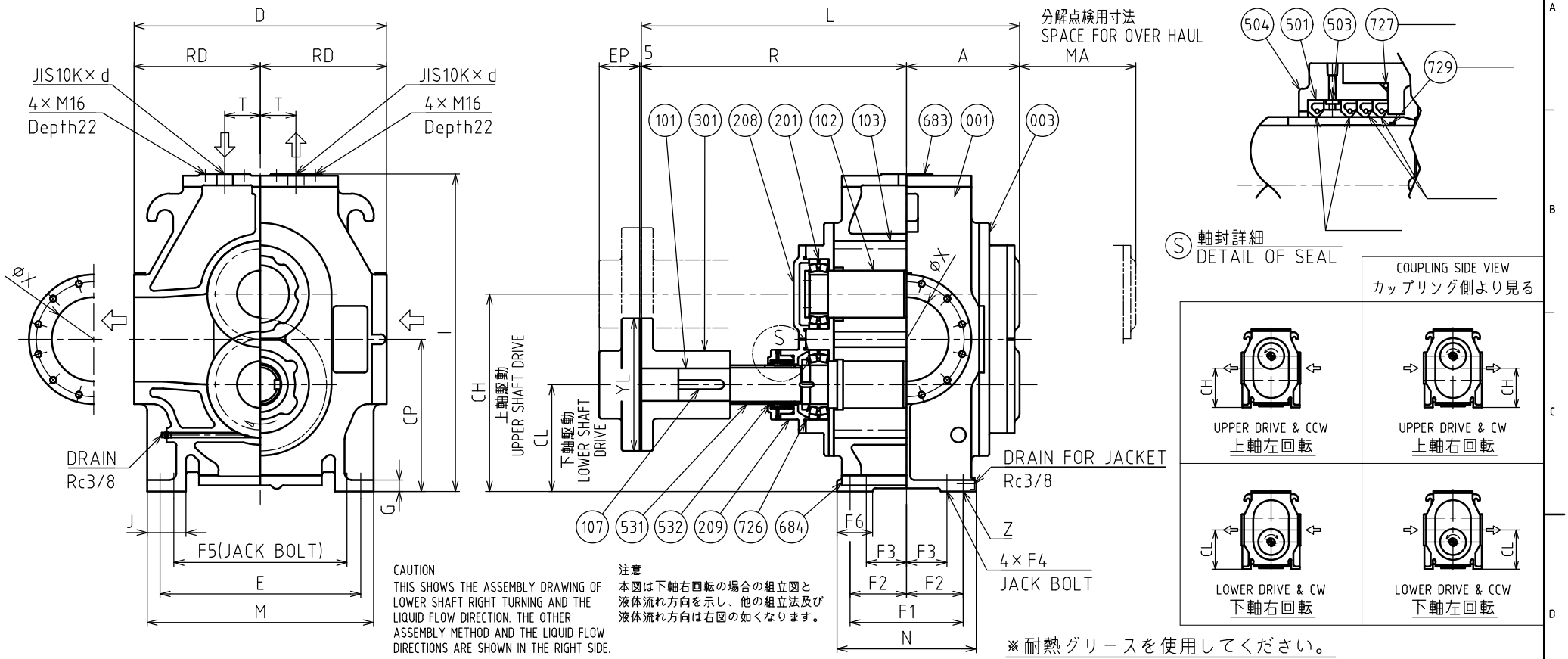
If troubles can not be remedied after carrying out the above counter-measures, the causes may be in the design conditions of the pump. Please consult he shipyard or our company and tell us the following.

1. Pump type, manufacturing number, use, etc...
2. Oil condition (kind, viscosity, temperature, etc.).
3. Special conditions of piping line (suction pressure, fitting position and mesh of strainer, number of piping bends, etc.).



CAUTION
THIS SHOWS THE ASSEMBLY DRAWING OF LOWER SHAFT RIGHT TURNING AND THE LIQUID FLOW DIRECTION. THE OTHER ASSEMBLY METHOD AND THE LIQUID FLOW DIRECTIONS ARE SHOWN IN THE RIGHT SIDE.

注意
本図は下軸右回転の場合の組立図と液体流れ方向を示し、他の組立法及び液体流れ方向は右図の如くなります。

※耐熱グリースを使用してください。
PLEASE USE HEAT-RESISTANT GREASE

TYPE 形式	ØX	A	R	L	CL	CH	CP	I	G	J	E	M	F1	F2	N	Z	RD	D	YL	EP	MA	d	T	F3	F4	F5	F6	BEARING ベアリングNo.	PUMP MASS 質量(kg)
CJH - 200	180	265	540	805	260	475	367	715	28	100	400	460	180		240	4× Ø24	290	580	260	100	600	32	80				80	21316	540
- 300	200	305	720	1025	320	587	454	906	30	110	590	660	290		360	4× Ø28	350	700	330	110	600	50	110	65	M16	590	100	21320	900
- 400	250	350	820	1190	330	610	470	980	35	120	620	700	350		430	4× Ø35	390	780	410	125	600	50	110	80	M20	620	110	22224	1170
- 500	300	405	900	1305	390	734	562	1145	40	120	740	820		210	500	6× Ø35	420	840	425	150	600	50	118	160	M24	700	110	22226	1470
- 600	300	405	900	1305	390	734	562	1145	40	120	740	820		210	500	6× Ø35	420	840	425	150	600	50	118	160	M24	700	110	22226	1540

729	O RING Oリング	RUBBER 特殊ゴム	1		504	SEAL CASE シールケース	DUCTILE C.I. FCD400	1		107	KEY キー	CARBON STEEL S45C	1	
					503	SEAL RING シールリング	MILD STEEL SS400	1						
727	O RING Oリング	RUBBER 特殊ゴム	1		501	OIL SEAL オイルシール	RUBBER 特殊ゴム	4		103	GEAR 歯車	DUCTILE C.I. FCD400	2	
532	SLEEVE スリーブ	STAINLESS STEEL SUS304	1		301	COUPLING カップリング	CAST IRON FC200	1SET		102	DRIVEN SHAFT 従動軸	CARBON STEEL S45C	1	
531	SLEEVE スリーブ	MILD STEEL SS400	1		209	BEARING COVER ベアリングカバー	DUCTILE C.I. FCD400	1		101	DRIVE SHAFT 主動軸	CARBON STEEL S45C	1	
726	O RING Oリング	RUBBER 特殊ゴム	4		208	BEARING COVER(A) ベアリングカバー(A)	DUCTILE C.I. FCD400	3		003	SIDE CASE サイドケース	DUCTILE C.I. FCD400	2	
684	JACKET COVER(UNDER) ジャケットカバー(下)	DUCTILE C.I. FCD400	1		201	BEARING ベアリング	BEARING STEEL SUJ2	4		001	CASING ケーシング	DUCTILE C.I. FCD400	1	
683	JACKET COVER(UPPER) ジャケットカバー(上)	DUCTILE C.I. FCD400	1							No.	NAME 名称	MATERIALS 材質	Q'ty 数量	REMARKS 備考

形式 TYPE	CJH- 00CB	質量 MASS	
名称 NAME	ITEM NO.	承認 APPROVED BY	K.MATSUO
外形構造図 GENERAL VIEW		審査 CHECKED BY	T.UCHIYAMA
		作成 DRAWN BY	H.ASAI
投影法 PROJECTION	尺度 SCALE N	大見工番 TAIKO KIKAI W.NO.	
日付 DATE	サイズ SIZE A3	図番 DRAWING NO.	TK-6211A1 1/1

TAIKO KIKAI INDUSTRIES CO.,LTD.

TK-6211A1

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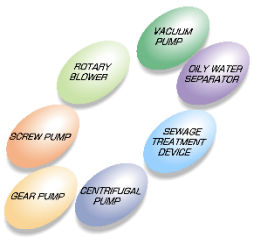

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