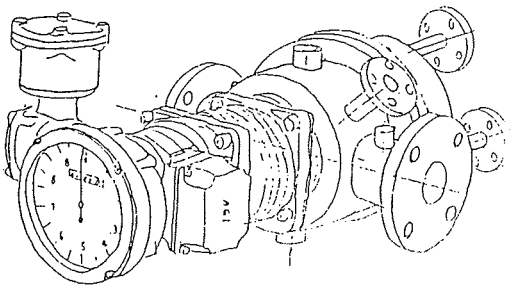
OVAL INSTRUCTIONS

Ins. No. B-209-5-E

OVAL MODELS 55 & 56 FLOWMETERS
- Pocketless, Jacketed, New Magnetic Coupling System 7 -

GENERAL

The Oval models 55 and 56 meters are of an integral jacketed type and are used by circulating warm water or steam in their outer case. A special magnetic coupling is used to pick up rotor revolutions directly from outside the measuring chamber. With wetted parts count reduced to a minimum of rotors and shafts only, these pocketless, single-case construction meters find many valuable applications in metering liquids such as:

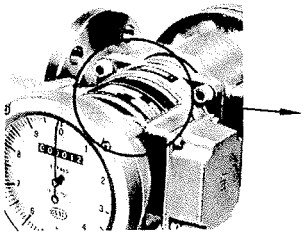


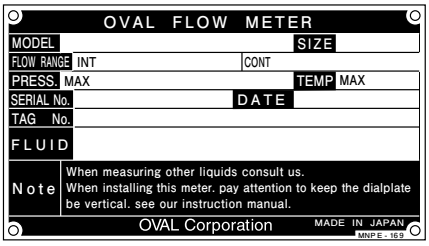
1. Liquids that to become highly viscous or solidify with decreasing line temperature.
2. Liquids that produce educts.
3. Liquids that need warming at steady temperatures during metering.

These meters are so designed and built that they measure the flow while kept warm by steaming the jackets.

OPERATING CONDITIONS

To fully enjoy the high accuracy and long durability of your meter, make sure that flowrate, pressure, temperature and viscosity are within the ratings as stamped on the meter register's nameplate.





Relevant Instruction Manuals

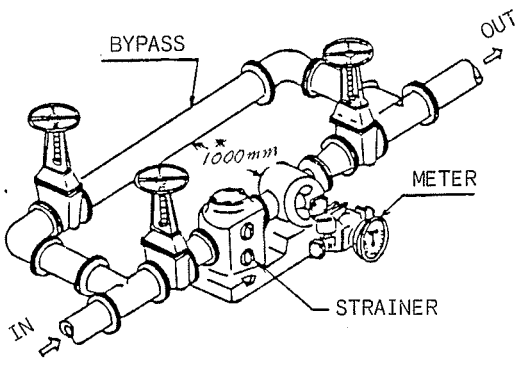
This instruction manual mainly describes the primary elements of Oval flowmeters. For details of related assemblies, such as signal generators and registers, see respective instruction manuals:

(1) Signal generator ...	Prefix T	(e.g. T-519-4)	Instruction Manual
(2) Register	" R	(e.g. R-401-3)	"
(3) Converter (accuracy adjustor)	" G	(e.g. G-003-AG1)	"
(4) Cooling tube	" A	(e.g. A-901-8)	"

PIPING

- Standard Piping -

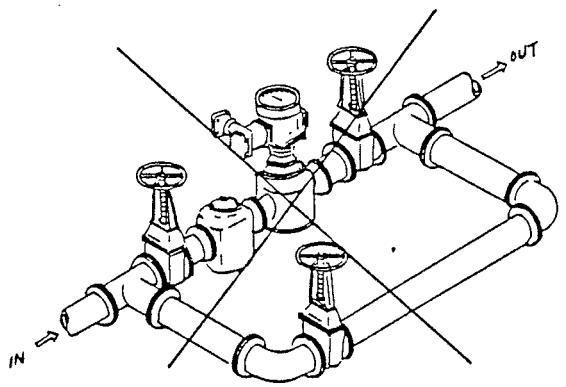
o Horizontal Line



Marked * is the space required for disassembly and inspection.

o In case flow direction is from R to L, change places of meter and strainer.

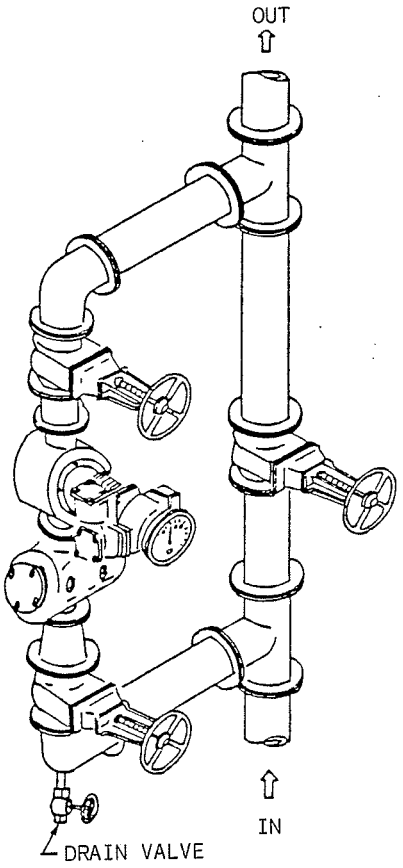
Never install the meter like this!



o Vertical Line

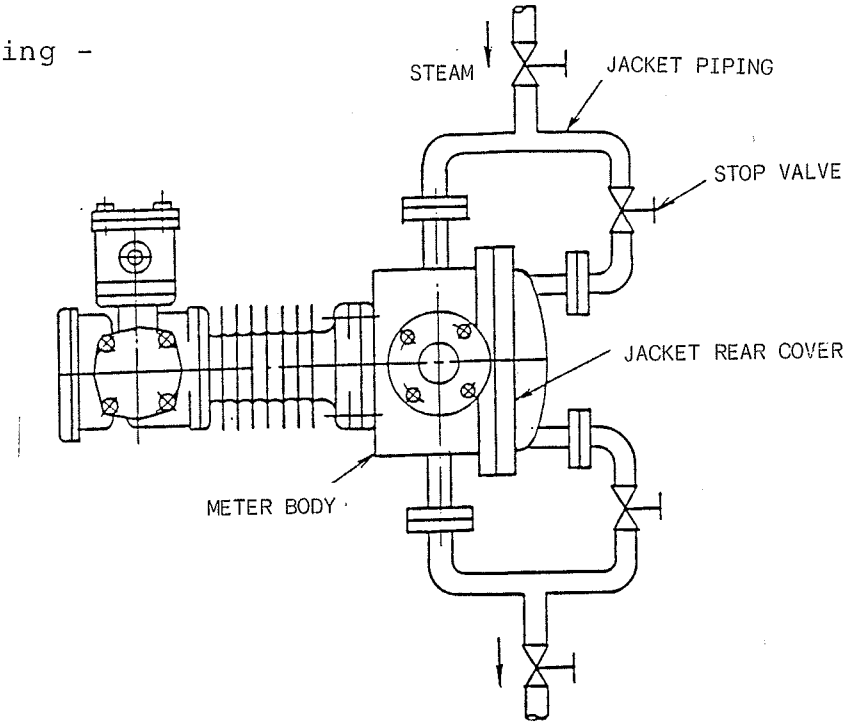
o Install on a bypass line as shown to prevent scales falling from top of the piping assembly.

o In case flow direction is from top to bottom, change places of meter and strainer.



1. The arrow marks on the meter and strainer body must conform to the direction of flow.
2. The meter must be located downstream of the pump. If located upstream of the pump, air suction will cause errors of measurement. Pressure of the metered liquid should be higher than that of the atmosphere.
3. The strainer should be provided immediately upstream of the meter.
4. In case the metered liquid is allowed from a storage tank without using a pump, give it a pressure (head) greater than the pressure loss of the meter and piping.
5. For inspection and servicing convenience, provide a maintenance space around the meter.
   1) The maintenance space should be large enough for the serviceman to use tools, such as wrenches, for in-line disassembly and removal of the meter from the line.
   2) Also provide a maintenance space similar to the above for strainer net cleaning and inspection.
6. Piping to the meter should be so arranged that elongation and contraction of the piping assembly due to rapid temperature changes or pipe strains will not cause excessive stresses on the meter.
7. Avoid application of excessive forces (pipe strains) on the meter.

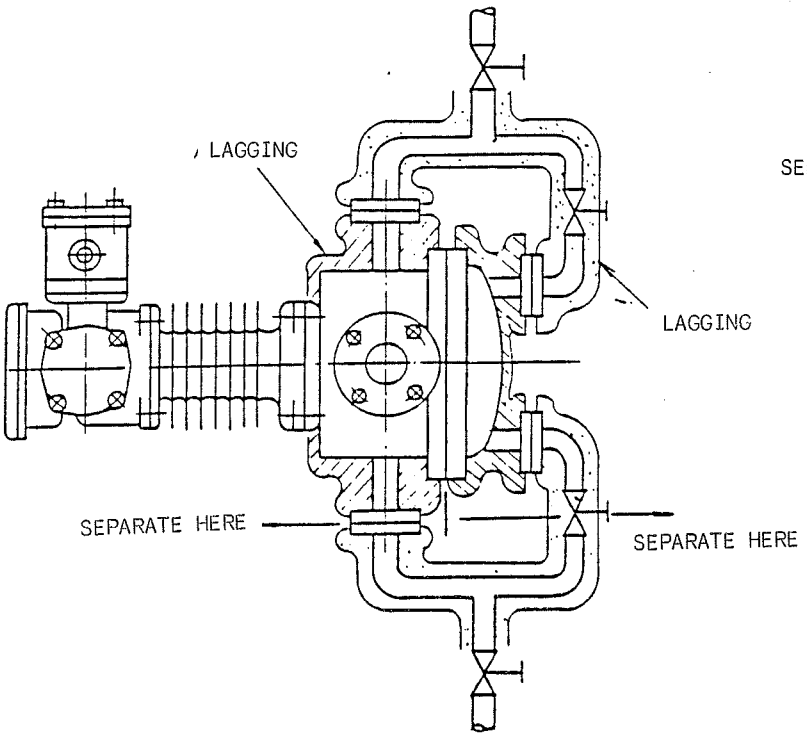
- Steam Piping -



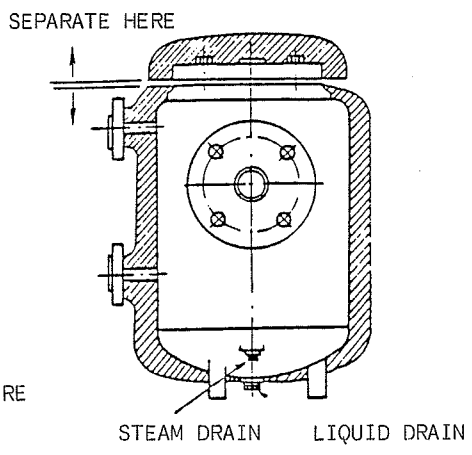
- Steam Piping -

1. This meter consists of a meter body and jackets on the rear cover. Connect the steam line with each jacket connection.
2. The steam line of the rear cover and that of the meter body should be arranged in a row with stop valves provided as shown. In the case the fluid is easy to solidify at room temperature, heat the meter body with steam to prevent solidifying and you can inspect the inside of the meter with the meter cover removed.

- Laggin Work -



- Lagging the Meter -



- Lagging the Jacketed Strainer -

- Flushing the Piping Assembly -

Remove the meter from the pipeline and replace it with a short pipe section. before flushing. An attempt fo flush the piping assembly with the meter installed will result in a costly damage. So, do not fail to remove the meter.

- Lagging Precautions -

1. Before providing lagging material, the entire system should be inspected for liquid and steam leaks.
2. For maximum accessibility for servicing, the meter body, rear cover and individual connection flanges should be provided with lagging in a split, or separable construction.
   Take into consideration readily removal of the following bolts and nuts:
   1) Rear cover fitting bolts
   2) Bolts and nuts securing the individual flanges
3. The strainer should be covered with lagging material in such a manner that the top cover is readily removed for servicing.
   It is necessary to service the strainer periodically.
4. Under no circumstances should the cooling fins be heated. Fialure to follow this instruction may lead to heating the register and pulse generator to an intolerable level.

OPERATING PRECAUTIONS

1. Before delivering the flow of fluid to the meter, the jackets should be heated with steam for at least one hour.

   CAUTION: If a large quantity of liquid is allowed to flow without preheating the meter, nonuniformity of heat distribution inside the meter will cause localized heat strains which could cause locked rotors.

2. When measuring materials easy to solidify, keep the meter warmed with steam.
3. Make sure that there is no steam leaking to wet the register and other critical parts.
4. Always open the stop valve in the steam line to the rear cover.

MAINTENANCE

o Although suggested service intervals may vary with individual service conditions, the meter should be disassembled and inspected once a year in normal use.

Symptom	Treatment
Metered fluid suddenly fails to flow.	Disassemble the meter body (measuring chamber).
With the register integral with the cooling tube removed, the internal transmission gear train fails to move in response to fluid flow.	Disassemble the magnetic coupling (following magnet) assembly.
The input gear in the converter assembly (cooling tube) is immovable or is hard to hand rotate.	Inspect the register and converter assemblies.
The input gear does turn but the pointer and totalizer drums fail to advance.	

DISASSEMBLY AND INSPECTION

When you disassemble the meter body, adhere to the following procedure without fail.

1. Oval Rotor Inspection

- Meter Body Disassembly -

(1) In case the meter has been used for liquids that tend to solidify, disassmble the meter while introducing steam in the meter body and front cover jackets. Taking too much time will make disassembly very difficult with solidified liquids in spite of the heated meter body.

(2) Fully shut off the valves before disassembly.

(3) When you remove the lagging, take lagging after assembly into consideration.

(4) Disconnect steam piping to the jackets from the connection flanges.

(5) Take off the four hex socket head bolts holding the coolong tube in place and separate the cooling tube integral with the converter and register.

(6) Take off the hex bolts (108) and separate the jacket rear cover (102).

(7) Take off the socket head bolts (109) and separate the rear cover (103).

(8) Take off the four bolts (214) securing the top cover (202) and remove the top cover.
Screwing top cover fitting bolts into the two threaded slots will facilitate top cover separation.

CAUTION: Metered fluid will run out of the measuring chamber. Receive it with a suitable receptacle.

(9) Inspect the inner walls and inner members of the measuring chamber. Hand rotate the Oval rotors (203). If they are hard to rotate or immovable, insufficient preheating at the beginning of operation is the most likely cause for it.
Draw the rotors out and examine the measuring chamber. Exercise care not to drop the rotors, which may result in a permanent damage to the rotors. Solids clogged in the gear teeth, if any, should be removed and the gear teeth cleaned.

2. Trapezoidal Ring Replacement and Following Magnet Inspection

(1) Reduction gear assembly inspection

TAke off two hex socket head bolts (104) with a hexagonal wrench key and two reamer screws (105) with a screwdriver. The reduction gear assembly (320) is now ready to be separated. Extract it, exercising care not to bump the transmission gears which are in engagement.

(2) Magnetic coupling assembly inspection (following magnet assembly)

Remove the stop ring (C-ring) (303) securing the following magnet holder (303) in place, using the stop ring pliers. Draw the following magnet assembly out by pulling the transmission gear by hand.

CAUTION: Output is taken out from the two rotors in this flowmeter. When you extract the following magnet assemblies, keep a record by, for example, by putting marks on mutually corresponding parts, to insure that they are reinstalled in their respective positions. See the assembly drawing on page 8 in case the direction of flow is from right to left.

(3) Trapezoidal ring replacement in the model for high temperature service

1 If liquid leaks from the trapezoidal rings (216), take off the fitting bolts (212) and remove the blind cover (208).

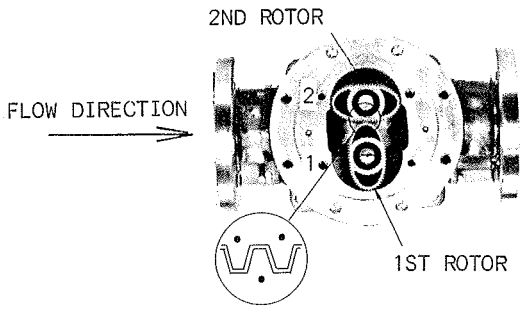
2 The trapezoidal rings used to seal off leaks from rotor shafts are made of Teflon and are no longer serviceable once they are disassembled. Replace with new ones without fail.

3 At assembly, force the rotor shafts against the bottom of the measuring chamber in order to minimize axial plays. Also make sure to see that the non-turn polarization on the top cover is in phase. Hex socket head bolts should be tightened evenly according to shop practice.

3. Assembly

(1) Install the thrust rings (207) in place.

(2) Install the rotors with their match marks correctly aligned as shown in the photo.
The 1st rotor (punched match mark .), and the 2nd rotor (punched match marks ..).
In case the direction of flow is from right to left as shown in the figure at right, be sure that the 1st rotor is installed underside of the 2nd. Make sure of freely rotor rotation.



NOTE: Direction of flow is viewed from the register side.
Fig. 7

(3) Install the top cover (201). A pressure release slot is present on the inlet side. Bolts should be tightened evenly.

(4) Insert the magnetic coupling assemblies (following magnet assemblies) into the two shaft slots and secure them using the stop ring pliers. Prevent the following magnets from turning freely at this time. Use extra care not to make mistakes in inserting them in correct positions.

NOTE: The following magnet assembly with a pinion is the one for the 1st rotor and, in case the direction of flow is from right to left, it comes underside (see the assembly drawing on page 9).

(5) Install the reduction gear assembly (320). Insert it into position, using care to ensure correct engagement with the transmission gears (two places).

(6) Install the gaskets and assemble the top cover and rear cover, in this order.

(7) By lightly blowing air from the flange on the inlet side, make sure to see that the rotors rotate and that the transmission gears turn.

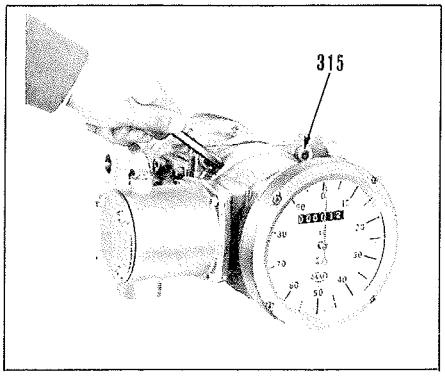
CAUTION: Avoid spinning the rotors violently with highly compressed air.

(8) Lastly, install the cooling tube and converter assembly.

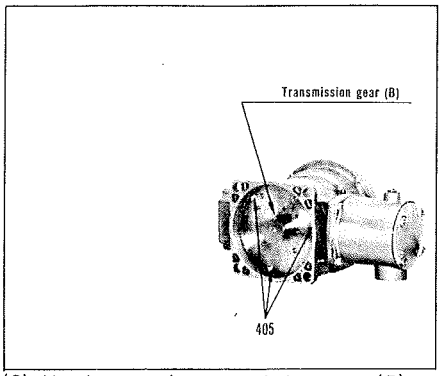
PRECAUTIONS AT ASSEMBLY

1. When you assemble the rotors in the measuring chamber, observe particularly the following points:
   In case the direction of flow is from right to left, the first rotor (punched mark ".") comes underside. Ensure correct rotor installation, adhering to the steps of assembly procedure given on the previous page (page 6).
2. In this particular flowmeter, "phasing of poles" of the drive magnet and the following magnet is of vital importance.
   When you reassemble the meter after disassembly, install the rotors and then install the following magnet assemblies, exercising care not to allow the magnets to slip.
   Adhere to the steps of assembly procedure given on the previous page (page 6).

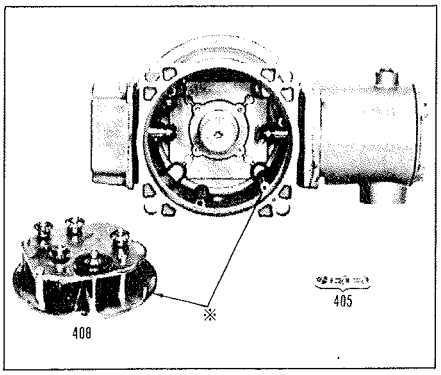
4. TRANSMISSION GEAR BOX AND CHANGE OF FLOW DIRECTION



(1) Remove four bolts (315) with a hex. socket wrench. Hold the transmission gear box with both hands and carefully detach the register assembly complete with the gear box from the meter body.



(2) Hand-rotate the transmission gear (B) to insure that the pointer turns smoothly without binding.



(3) Remove three screws (405) and, holding the transmission gear (B) with both hands, withdraw reduction gear train (408). Now you can inspect the internal gear mechanism of the transmission gear box for condition. Re-assemble the transmission gear box after properly aligning the location of the dowel pin (marked with an asterisk "※").

PARTS LIST

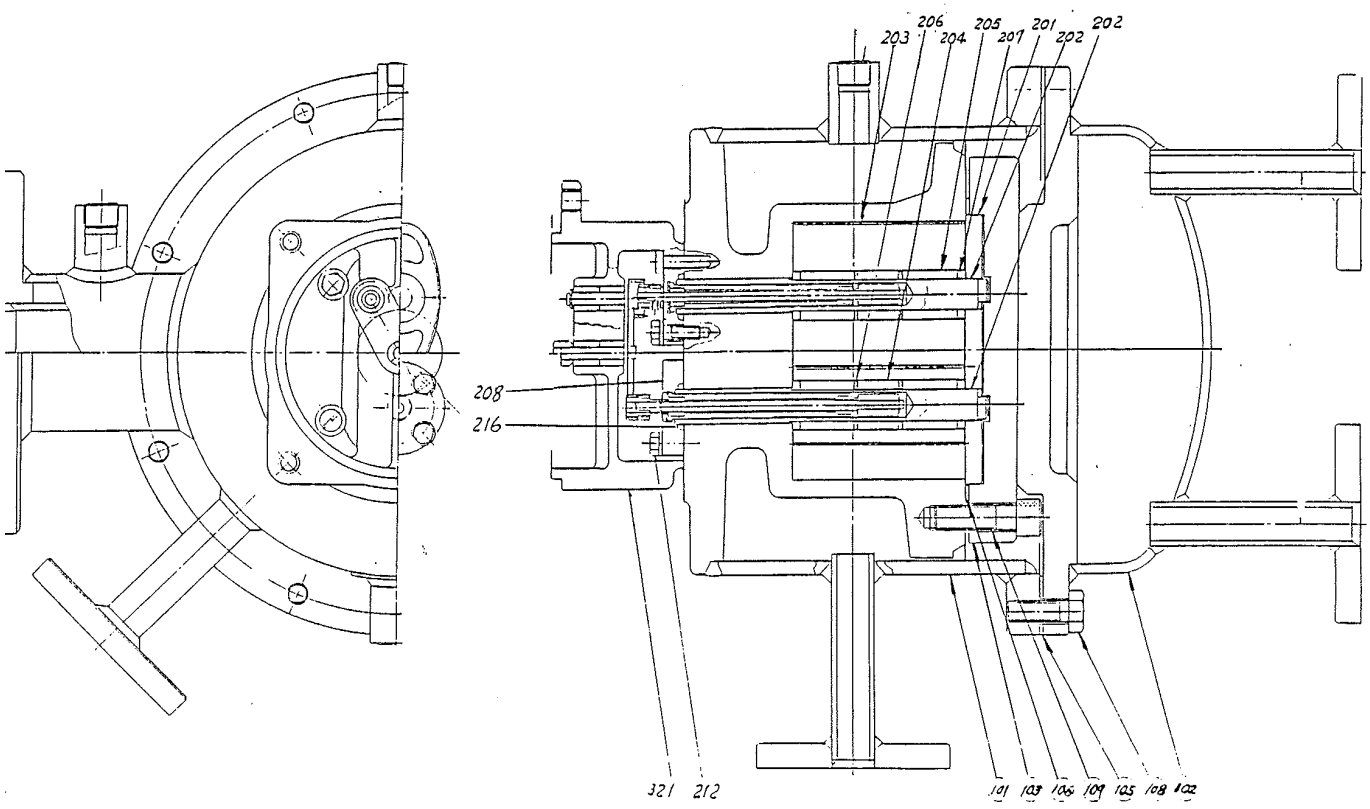
- Meter Body -

▲: Replacement parts

Sym.No.	Part Name	Q'ty	Remarks
101	Meter Body	1	
102	Jacket Rear Cover	1	
103	Rear Cover	1	
▲105	Gasket	1	
106	Gasket	1	
108	Bolt, Jacket Rear Cover	8	
109	Hex Socket Head Bolt	8(6)	Q'ty in brackets for Model 56
201	Top Cover	1	Locating pin provided.
202	Rotor Shaft	2	
203	Rotor (1st, 2nd rotors)	2	
204	Drive Magnet	2	
205	Rotor Bearing	4	An assembly *
206	Slip Stop	4	
207	Thrust Ring	4	
208	Blind Cover	2	
212	Setscrew, Blind Cover	8	M6 x 20
214	Fitting Screw, Top Cover	4	M6 x 16
▲216	Trapezoidal Ring	2	

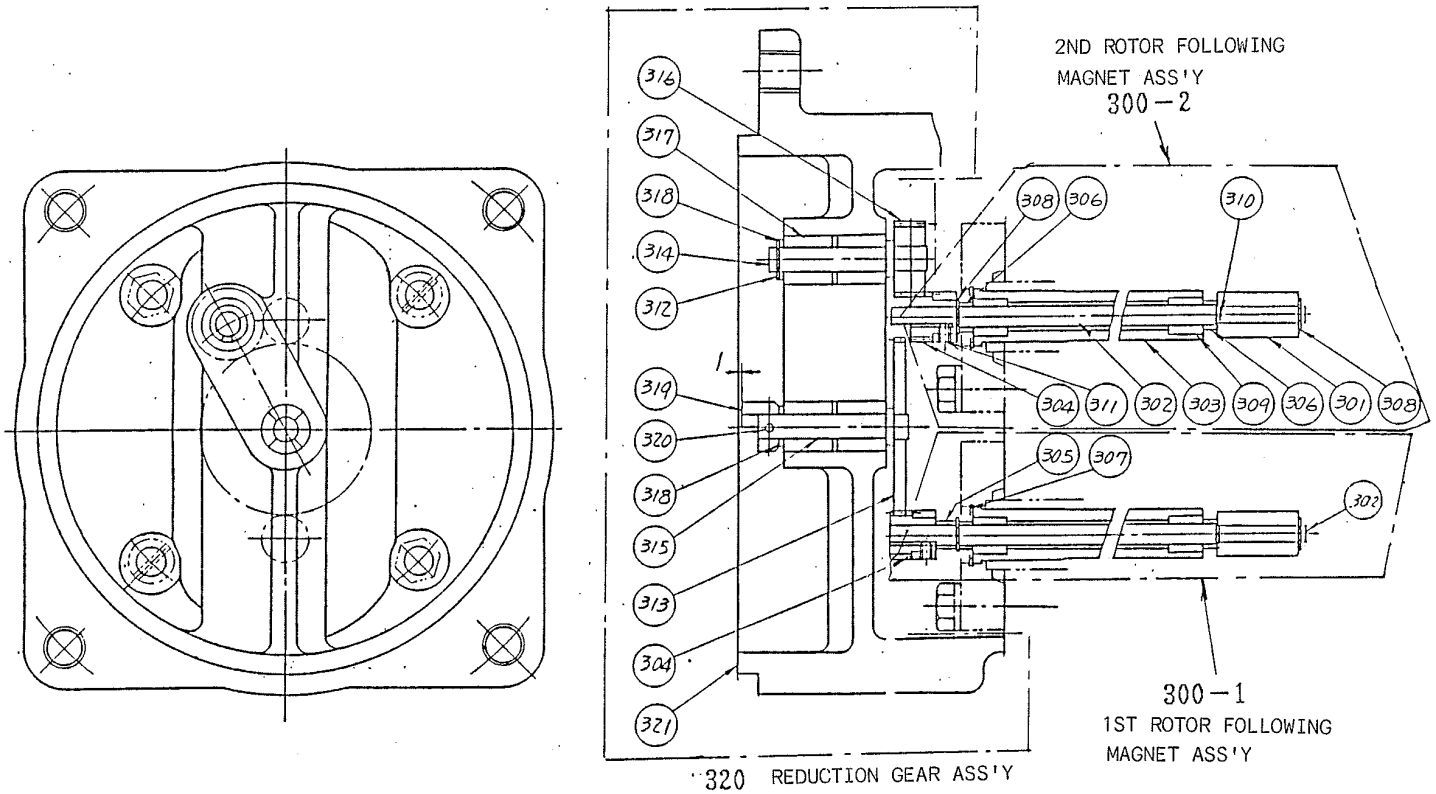
o When you order replacement parts, please specify the meter model, stock no., (confirm it on the nameplate), instruction manual no., assembly no., symbol no., part name and the quantity desired.

Marked *: Order as an assembly of rotors (203, 204, 205, 206) (1st rotor and 2nd rotor).



NOTE: For outline dimensions and those for connection with piping assembly, see approval drawings.

- Following Magnet Assembly -



- Following Magnet Assembly -

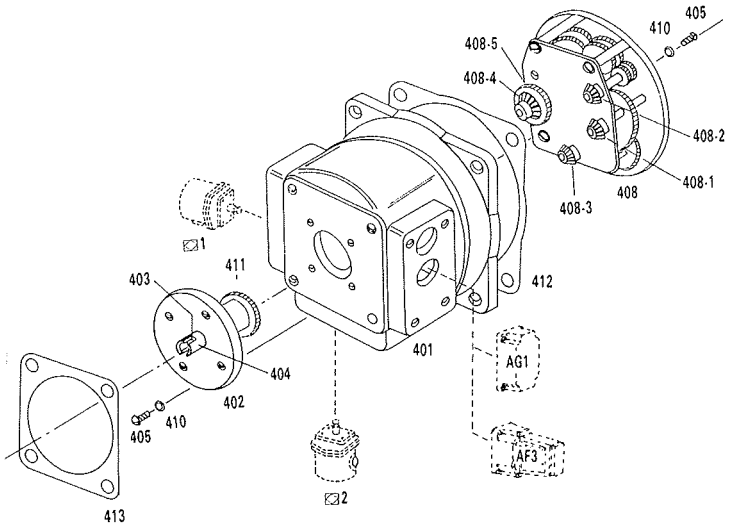
Unit No.	Part Name	Q'ty	Remarks
300	Following Magnet Assembly	1	* Units 300-1 and -2
300-1	Following Magnet Unit, 1st Rotor	1	
300-2	Following Magnet Shaft, 2nd Rotor	1	

- Reduction Gear Assembly -

Unit No.	Part Name	Q'ty	Remarks
320	Reduction Gear Assembly	1	

o When you order replacement parts, please specify the meter model, stock no., (confirm it on the nameplate), instruction manual no., unit no., part name and the quantity desired.

■TRANSMISSION GEAR BOX ASSEMBLIES



Sym.No.	Part Name	Qty.
401	Transmission Gear Box	1
402	Bushing Holder	1
403	Output Shaft	1
404	Coupling	1
405	Screw	7
※408	Reduction Gear Assembly	1 set
408-1	Bevel Gear to AG1	1
408-2	Bevel Gear from AG1	1
408-3	Bevel Gear to Unit Pulser	1
408-4	Bevel Gear to Non-Unit Pulser	1
408-5	Output Gear-A	1
410	Washer	7
411	Output Gear-B	1
412	Gasket-A	1
413	Gasket-B	1

※ When ordering, please specify the code stamped on the back plate ····· example, GB2 55 1/10 10 ℓ.
▨1 Generating Unit Pulser (For remote totalizer)
▨2 Generating Non-Unit Pulser (For remote indicator)
AG1 : Accuracy Adjusting Gear Box
(Instruction No. G-003-AG1-E)
AF3 : Convenient Accuracy Adjuster
(Instruction No. G-003-F3-1-E)

■ ABOUT LUBRICATION

● Do not fail to use proper lubricants, or equivalent, shown below at disassembly and inspection.

Lubrication Point	*Fluid Temperature*	*Gears*		*Bearings*		*Couplings*
		Plain	*Bevel*	*Plain*	*Ball*	
Following Magnet Assembly	*−10 to +120°C*	*G2*			*L3*	*G2*
	+120 to +260°C	*G2*		☆		
Transmission Gear Box	*−10 to +120°C*	*L3*	*G2*	*L3*	*L3*	

● *Lubrication Oil Specifications and Examples of Products*

Symbol	*Viscosity or Consistency*	*Pour Point or Drop Point*	*Example of Products by Trade Name*
L3	*36.4 cst/30°C*	*−37.5°C*	*Nisseki Launa 40 (JX Nippon Oil & Energy Trading Corp.)*
G2	*300/25°C*	*300°C −*	***Moly Hi-temp Grease No.1 (Sumico Lubricant Co., Ltd.)***

L: Lubricating oil G: Grease ☆: Do not lubricate plain bearings.

2019.07 Revised
2018.04 Revised △
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