

SERVICE MANUAL

MODEL

KM3P4

KM3A1

Torque limiter

TUFF TORQ by KANZAKI

Code : M2-77070-9950

1. Abstract

Reduction gears of KM3P4 and KM3A1 types are adopting the mechanical servo clutch system so called corn clutch. The mechanical servo clutch causes the torque several times as strong as which when engaged and throttled fully (i.e. when the torque is 4/4, see Fig.1).

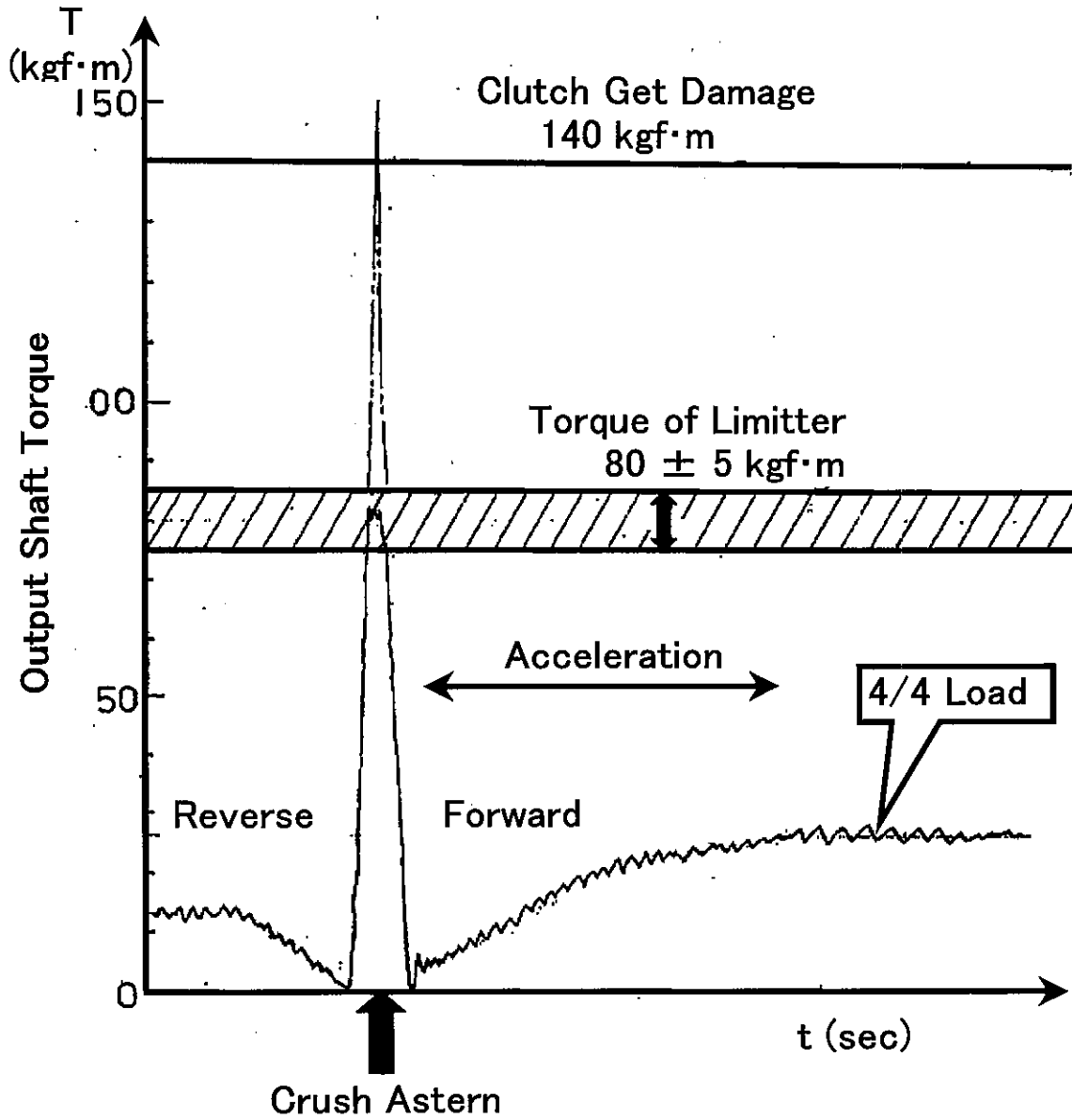
The test of propeller mass was not completely enough and it became clear as a result of monitor that it was larger than our estimation. The strength of the corn clutch is under the control of peak torque. The torque limiter is for cutting down only the peak torque, so that there is no problem to correspond to the output power of 4JH3E with attaching the torque limiters.

The peak torque when engaged is decided by the rotation number and the propeller inertia mass. The excessive peak torque caused by the status of rotation number and the propeller inertia mass might damage the clutch. For the purpose of protecting the clutch from the excessive peak torque, KM3P4 and KM3A1 are equipped with the torque limiters (Also KM4A and KM5A, the superior types).

2. Torque limiters

The torque limiters of KM3P4 and KM3A1 is a mechanical multi-plate clutch comprised of multiple friction plates and steel plates which is as same as that of the hydraulic multi-plate marine clutch. The multiple friction plates and steel plates are arranged mutually by turns and biased by the spring plate for transmitting the power. The transmitting torque of the torque limiter is adjusted by the adjustment shim to be the predetermined degrees. When the peak torque is caused by engagement, the multiple friction plates and steel plates slip to each other to reduce the peak torque (The torque limiter is adjusted not to slip under 4/4 load).

KM3P4 / KM3A1 Marine Gear
Output Shaft Torque When Engaged
R \Rightarrow F

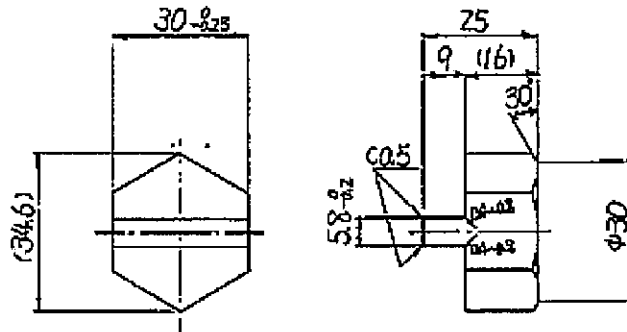


3. Disassembly

- ① Remove the clutch assembly from the engine mounting flange.
- ② The input shaft of the clutch is fixed by vice.
The shift lever is made into the reverse position at this time.
- ③ Remove the nut of torque limiter by using the socket.
(special tool : 177070-09030)

【 Notice 】

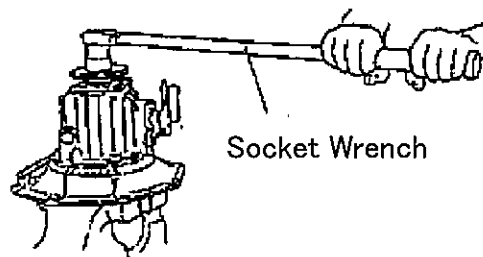
Remember that the nut has a left-handed thread.



Socket : 177070-09030

material : S45C

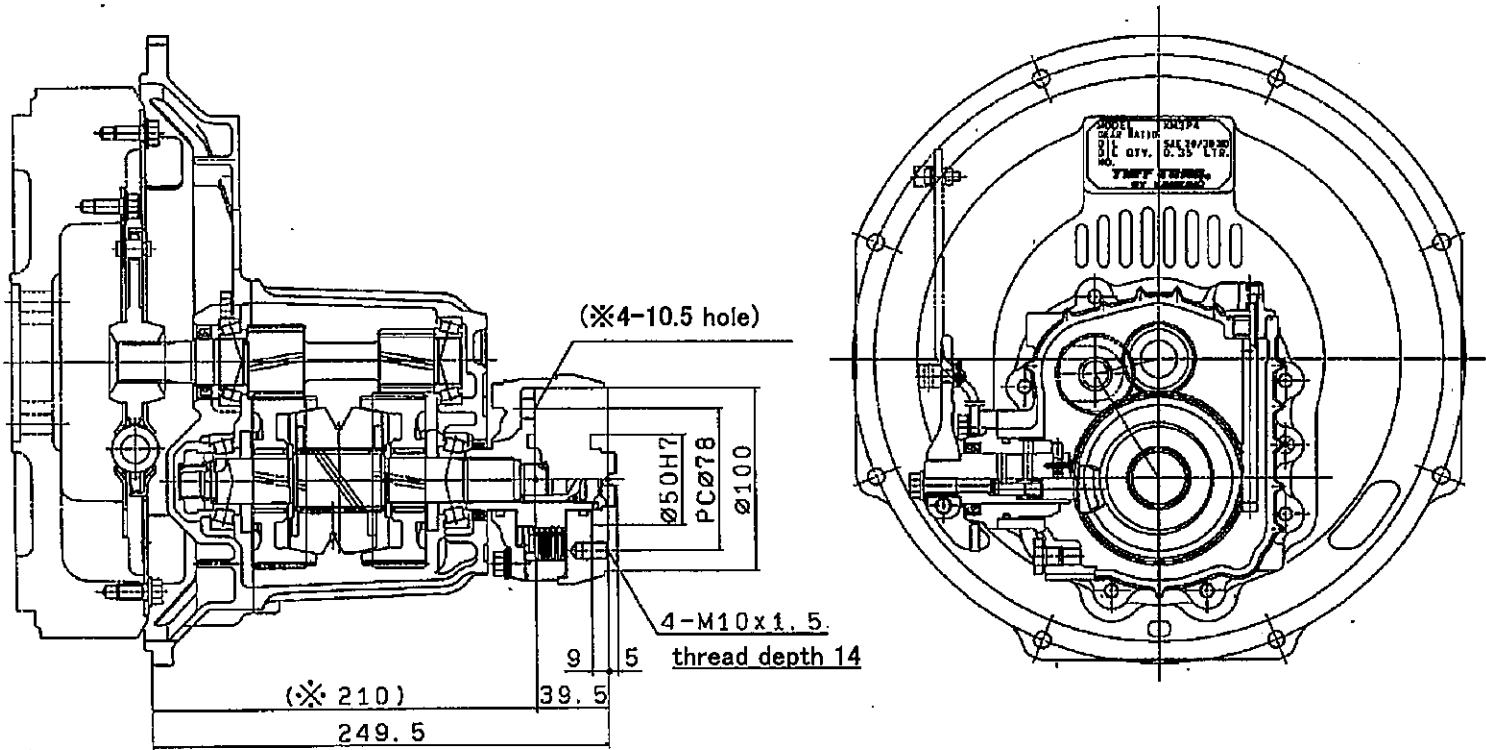
Hardness : HB 203 ~ 258



- ④ Withdraw the nut of torque limiter and remove the torque limiter assembly from the output shaft.

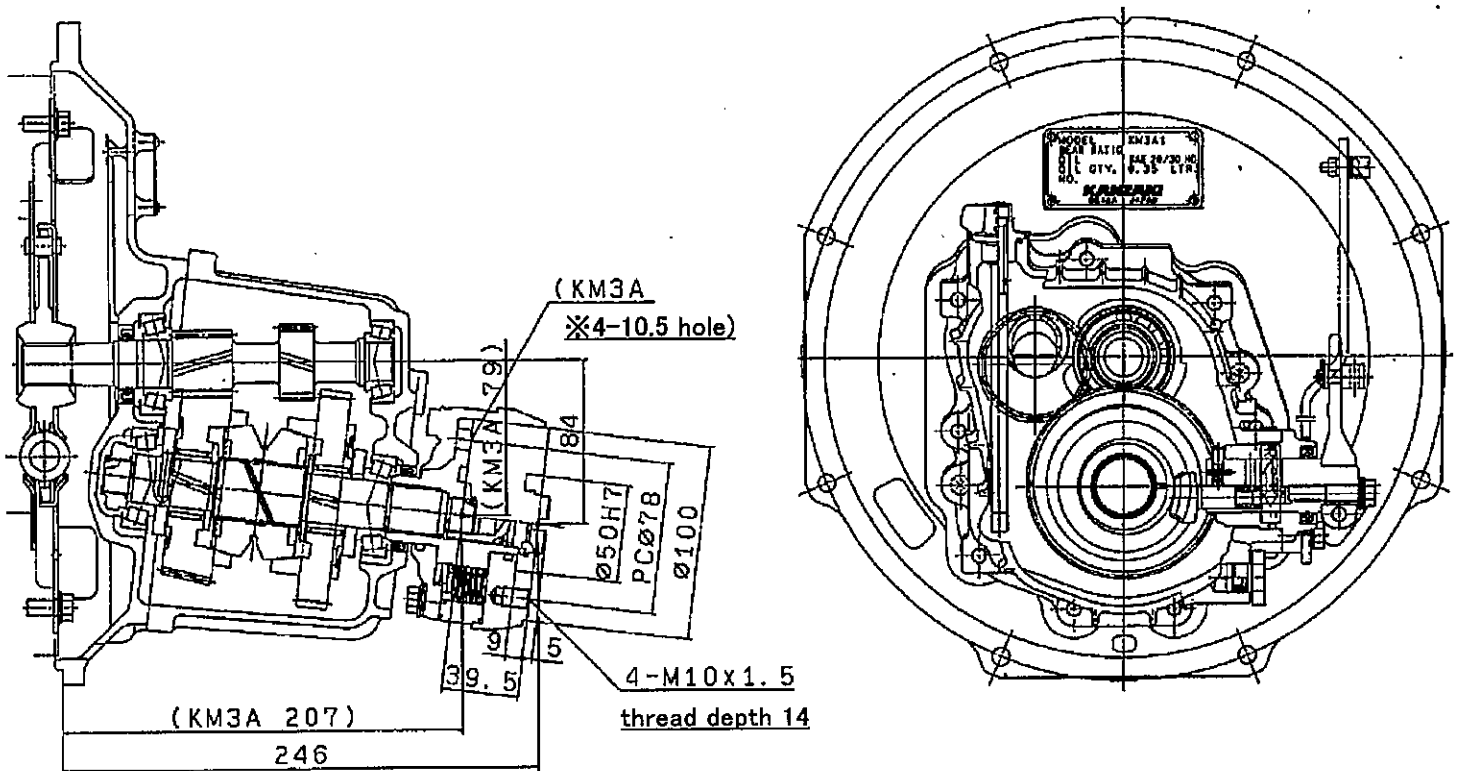
KM3P4 Sectional Drawing

Dry mass ; 15.0kg with Torque limiter
12.0kg with out Torque limiter

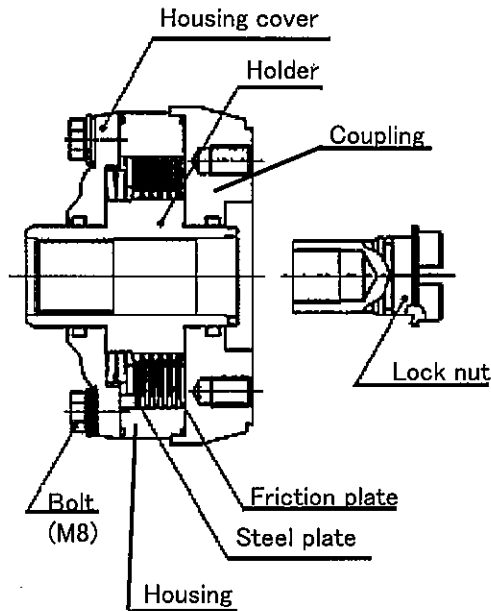


KM3A1 Sectional Drawing

Dry mass ; 15.0kg with Torque limiter
12.0kg with out Torque limiter



- ⑤ Disassembling the torque limiter
Remove the fixing bolts (6 × M8 bolts.),
And take out the housing cover, holder, friction plate,
steel plate and so on.



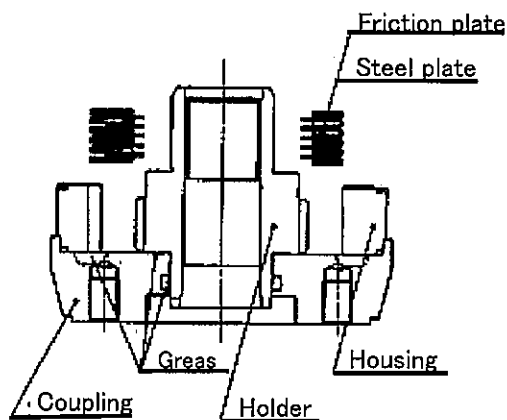
4. Reassembly

① Reassembly of the torque limiter

- Apply recommended grease to the sliding surface of the holder and o-ring.
- Housing, coupling, and the holder are set and a little grease is put into housing.
(The coring portion of coupling is filled with grease.)
- Apply the grease to the both side of the friction plate and insert the 5 friction plates and 6 steel plates into the housing.

【 Note 】

- 1) Apply the grease to the both side of the friction plate.
- 2) The friction plates and the steel plates are set by turns so that the steel plate become both outsides.
- 3) Since the steel plate is caught between the housing and the coupling, the friction plate may be caught the coupling and the holder, the friction plate and the steel plate are inserted after setting the holder, and the coupling and housing first.

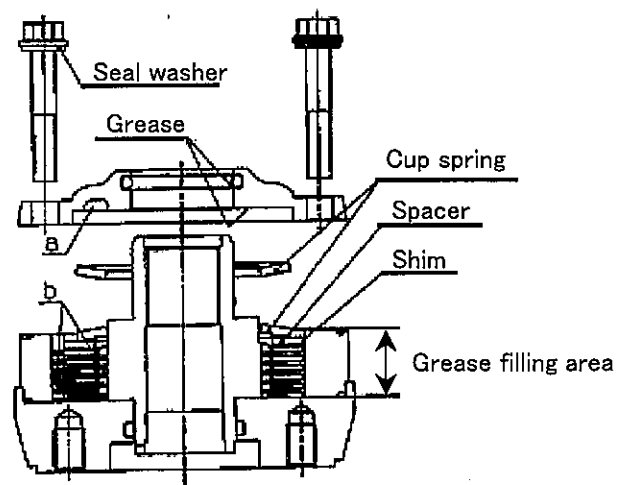


- Shim (standard thickness : 0.5mm), spacer, and one of cup spring are assembled in order on the steel plate.

In this state, it is filled up with grease to the end of housing.

【 Notice 】

- 1) The direction of an assembly of the cup spring.
- 2) The b section is filled up with grease.



- Apply the grease to the O-ring and sliding surface of the housing cover.

- 1) There is a coring portion in the the housing cover of the old model at the a section.

In that case, please fill up the a section with grease.

However, please be not filled up more than the capacity of the a section.

- 2) Please be not filled up with grease other than the specification section of the housing cover.

- The seal washer is attached to the bolt and tighten the bolt with regulation torque.

Tightening torque	$25.50 \pm 1.96 \text{ N}\cdot\text{m}$ [$2.6 \pm 0.2 \text{ kgf}\cdot\text{m}$]
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- The grease used for torque limiter

Molybdenum disulfide grease or the equivalent

【 Notice 】

This grease is not applying to the assembly inside a marine gear

② Adjustment of the torque limiter

- 1) After an assembly, the coupling is fixed and turn the holder about 1 time both clockwise and counter-clockwise.
- 2) Then, static torque is measured using a torque wrench.
The static torque means a value in case a limiter begins to be slippery.

Static torque	$785 \pm 49 \text{ N}\cdot\text{m}$ [$80 \pm 5 \text{ kgf}\cdot\text{m}$]
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(Both directions)

- 3) When the static torque varies from a standard value, it adjusts using adjustment shim.
Add the shim by 0.2mm, the static torque increases by $50.0 \text{ N}\cdot\text{m}$ ($5.1 \text{ kgf}\cdot\text{m}$)
Reduce the shim by 0.2mm, the static torque decreases by $50.0 \text{ N}\cdot\text{m}$ ($5.1 \text{ kgf}\cdot\text{m}$)

【 Notice 】

Shim is putting in between the spacer and the steel plate.

- 4) The static torque is measured again and it checks that it is within the limits of the standard value.

③ Attachment of the torque limiter

- 1) Insert the torque limiter into the output shaft of marine gear.
When insertion of a spline is difficult, please give light taps with a plastic headed hammer.
- 2) Apply grease to the oil seal lip of the torque limiter insertion part.
When inserting the torque limiter, it is caution of appearance which the oil seal lip dose not reverse.
- 3) Fit the O-ring to the lock nut and tighten the lock nut by using the socket and the torque wrench.

【 Notice 】

Apply lube oil to the o-ring.

Remember that the nut has a left-handed thread.

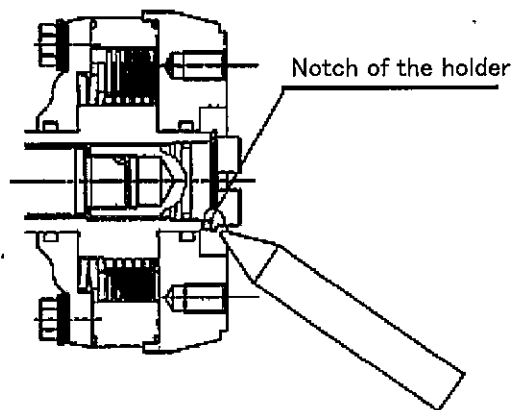
- 4) The input shaft of the clutch is fixed by vice.
And tighten the lock nut with regulation torque.

Tightening torque	$98.0 \pm 15 \text{ N}\cdot\text{m}$ { $10.0 \pm 1.5 \text{ kgf}\cdot\text{m}$ }
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【 Notice 】

The shift lever is made into the forward position at this time.

- 5) Calk the flange part of the lock nut located on the notch of the holder.



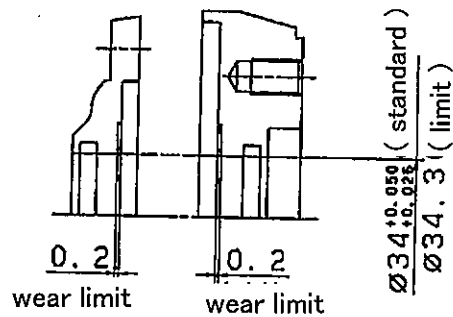
- ④ Fill with the recommended oil into the marine gear.

Quantities of oil

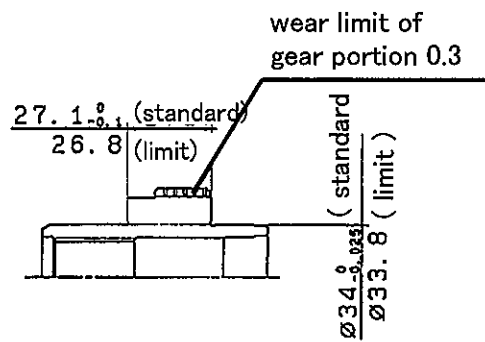
KM3P4	0.5 liters
KM3A1	0.65 liters

5. Inspection and servicing

① Housing cover and coupling



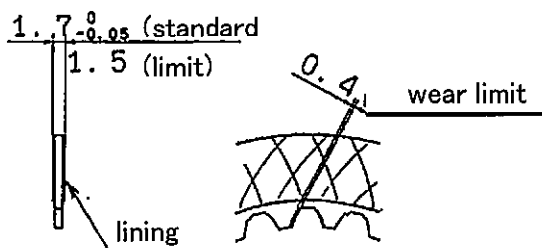
② Holder



③ Housing

Wear limit of the portion of the groove for steel plate 0.3
(3 places)

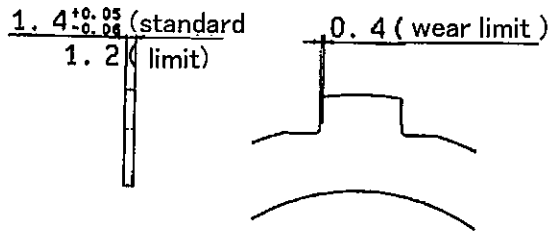
④ Friction plate



【 Notice 】

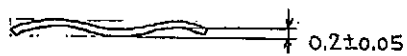
Exchange, when discoloration or gloss shown in the friction plate surfaces.

⑤ Steel plate

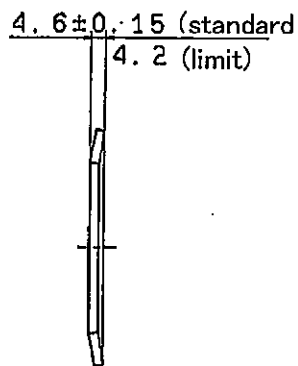


【 Notice 】

The sing wave (0.2 ± 0.05 mm) is prepared in the steel plate at the time of manufacture. It is not unusual.



⑥ Cup spring



⑦ Others

- seal washer : It is certainly exchanging for a new parts at that time of disassembling and reassembling.
- o-ring : It exchanges, when there are modification, damage, and hardening.
- other parts : It exchanges, there are modification and damage.