2020

BRENA®

RACING DEPT.

READ THESE INSTRUCTIONS BEFORE INSTALLATION!

Follow these instructions for the correct procedures to install Brena Racing's Klingelnberg crown wheel and pinion into a Mitsubishi Evo transfer case.

Careful assembly is absolutely critical to quiet, efficient and reliable operation of these hypoid gears.

If you are not experienced in assembling hypoid gears, we recommend you leave the installation to a drivetrain specialist. This is not an easy assembly and requires specialist tools and a range of shims.

The example below shows an Evo 8 non-ACD billet housing, but the principles and settings are the same for the Evo 4 - 10.

Brena Racing make what we believe to be the strongest hypoid gear set on the planet for the Evo transfer case range. The gears themselves are highly unlikely to fail - but we have seen that the OEM housings are not rigid enough for the power that modern tuning can produce (with the exception of the Evo 4-6 transfer case). Case failure will lead to gear failure. For this reason, Brena Racing recommends using billet housings in high horsepower applications 500whp+ and in competition use. Contact us brena@brenaracing.it and we can put you in touch with reputable manufacturers of billet transfer cases.

In total there are 4 adjustments that must be made for the correct operation of the transfer case.

1. Adjusting pinion bearing preload
2. Adjusting carrier bearing preload
3. Adjusting backlash
4. Adjusting pinion height

1. ***Adjusting pinion bearing preload***

This is controlled by the small shim sitting on the shoulder of the pinion. By increasing the shim thickness, the preload is lowered. Installing a thinner shim increases bearing preload.

The optimal bearing preload is 0.9-1.1Nm of turning torque on the pinion - measured with a torque measuring wrench, when the pinion nut is tightened.

Pic 1: torque measuring wrench

Pic 2: pinion bearing preload adjustment shim

2. ***Adjusting carrier bearing preload***

This is controlled by the total stack height of the combination of carrier shim A and carrier shim B.

To determine the correct preload, install carrier shim A (engine side) and the carrier. On top of carrier bearing B (driveshaft side), place 3 strips of 1.6mm solder kept in place with a bit of grease. Place the housing on and tighten the side cover bolts to crush the solder down.

Loosen the bolts and remove the side cover, and carefully remove the 3 strips of solder. Measure all three and take an average. For the correct amount of bearing preload, add 0.10mm to the value.

pic 3: shim A

pic 4: shim B

Correct carrier shim stack height = carrier shim A + avg solder + 0.10mm

Example:
Shim A (installed) = 0.98mm

solder 1 = 1.03mm
solder 2 = 1.11mm
solder 3 = 1.04mm
avg solder = 1.06mm

:. correct carrier shim stack height = 0.98 + 1.06 + 0.10
= 2.14mm total carrier shim stack height

In this case, our starting point for carrier shim B thickness would be **1.16mm**

pic 5: solder on carrier bearing B

3. Adjusting backlash

The correct setting for backlash with Brena Racing crown wheel and pinion is 0.14-0.18mm.

Measure backlash with a dial indicator through the inspection port in the main housing. Backlash is adjusted by changing the thicknesses of carrier shim A (engine side) and carrier shim B (driveshaft side). To increase backlash, you should increase the thickness of carrier shim A, while reducing carrier shim B thickness by the same amount - you must maintain the total carrier shim stack height calculated in step 2.

4. Pinion height adjustment

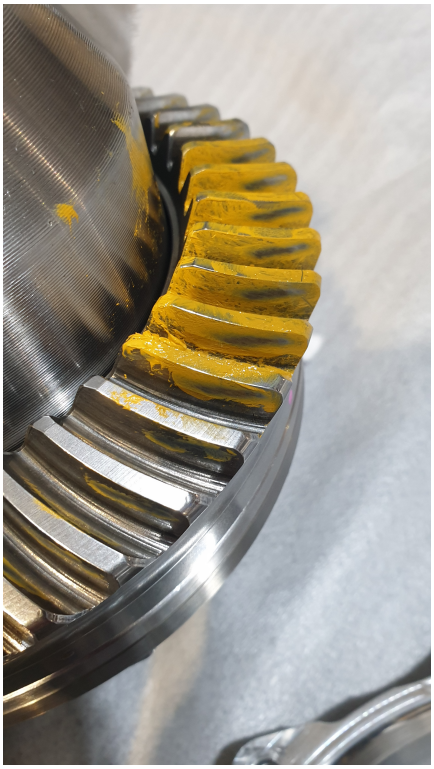
Once you have the backlash in the correct range, we must check the pinion height by interpreting a mesh pattern.

Paint the crown wheel teeth with a gear markup paste (preferred) or bearing blue (harder to see). rotate the pinion approximately 12 times in each direction while dragging the carrier assembly to create some load.

The pattern on a Klingelnberg tooth profile should be slightly external on the tooth (towards the “heel”) on both the convex and concave sides. ideally the pattern should be at the half-way point between the root of the tooth and the top of the tooth.

If the pattern is high on the tooth, reduce the pinion height by reducing the pinion shim thickness. If it is too close to the root of the tooth, increase the pinion shim thickness.

Pic 6: pinion height shim



Pic 7: convex side optimal pattern

Pic 8: concave side optimal pattern

If you follow these instructions, the transfer case will work reliably.

A final note:

Please use a high quality 75w140 GL-5 competition gear oil (Motul, Amsoil). At least 600ml must go in. Many problems are related to lack of oil or incorrect oil.