Table of Contents

EVO: Oiling & Lubrication - Sub-03G 3
Comparing the 98 and the 07 Style Oil Pumps 3
Volume and Flow Comparison 3
Visual Differences and Dims 5

Go To Technical Menu

EVO: Oiling & Lubrication - Sub-03G

Comparing the 98 and the 07 Style Oil Pumps

- Below is a collection of comparison pics between the (98-06 style pump parts) and the (07 and up style pump parts). Click on a pic to enlarge.
- The 98-06 pump and internals are all the same except for these known differences.
- For the purpose of the following illustrations, the 98-99 pump is shown below but the only visual difference from it and the 2000-2006 oil pump is the bottom cover (which is also the feed cavity) and the front fitting that runs to the oil filter. The gerotors and internal components are the same from 98-06.
- The main feature with 07 and up pump is the larger scavenger gerotor action with wider teeth allowing to move more oil at the same speed from the sump.
- See also Images of 07-later Buell Oil Pump - 26357-02B which is the same pump as the 07 XL pump but with different oil line fittings.

Volume and Flow Comparison

See also this XLForum discussion starting around post #140:
https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-motor-engine/sportster-motorcycle-motor-top-end/201713-1250-unhappiness-2020-edition/page14?t=2078814&page=14
Click Here to view calculated volumes of 1977-present Sportster oil pumps.

The scavenge gerotors in the 07 oil pump are considerably taller than in 06-prior oil pumps which easily points to the 07 scavenge side pumping out more oil from the motor.
And the feed gerotors are considerably shorter than in 06-prior oil pumps as well.
So it'd be easy to assume that the 07 feed side pumps a lot less oil than in previous years due to the smaller height.

Height of gerotors in general:
The height of the gerotors (feed or return respectively) was changed several times from the beginning of the use of the gerotor pump in 1977 to present Sportsters.
Click Here to see 77-Present Sportster Oil Pump Comparisons in the REF section of the Sportsterpedia. (shows visual differences in height and OD of the different year gerotors)
Prior to 2007, the amount of oil the gerotors can carry was only “adjusted” by changing their height. The taller the gearset, the more oil you can cram between the gears.

Outside diameter of the gerotors:

The MoCo changed the OD of the feed gerotors in 07 to match the OD of the return side (the pump housing bore is now the same from the feed to the return side).
06 and prior feed gerotors are smaller OD than their return counterparts and the housing bore is respective to those gearsets.
However the outside diameters, themselves, do not pertain in any way to the amount of oil the pump can deliver.
The change in OD occurred to allow for a wider tooth profile to be cut between the inner and outer gerotor sets.
The wider tooth profile allows for more oil delivery.
It's the area between the gearset teeth (inner and outer) that determines the amount of oil delivered no matter what the OD of the gearset is.
So the change in OD was more of a mechanical necessity flowing the same amount of oil as before the change.

Tooth Profile:
The relationship of the inner and outer gearset (or tooth profile) is the same from 1977-2006.
In fact, you can place a 98 inner return gear into a 77 outer return gear and still check the clearance with a feeler gauge just like they were made together that way.
You can do the same with different height feed gerotors from 77-06.
They will be different heights but the inner to outer clearance and general movement will be the same (respective of wear).
In the 2007-up pump, the teeth in both gearsets were changed to a wider profile. The wider profile alone allows for more oil volume to and from the pump.
So even if 06 and 07 gerotors were all the same height, the addition of the wider profile in 07 would give more oil.

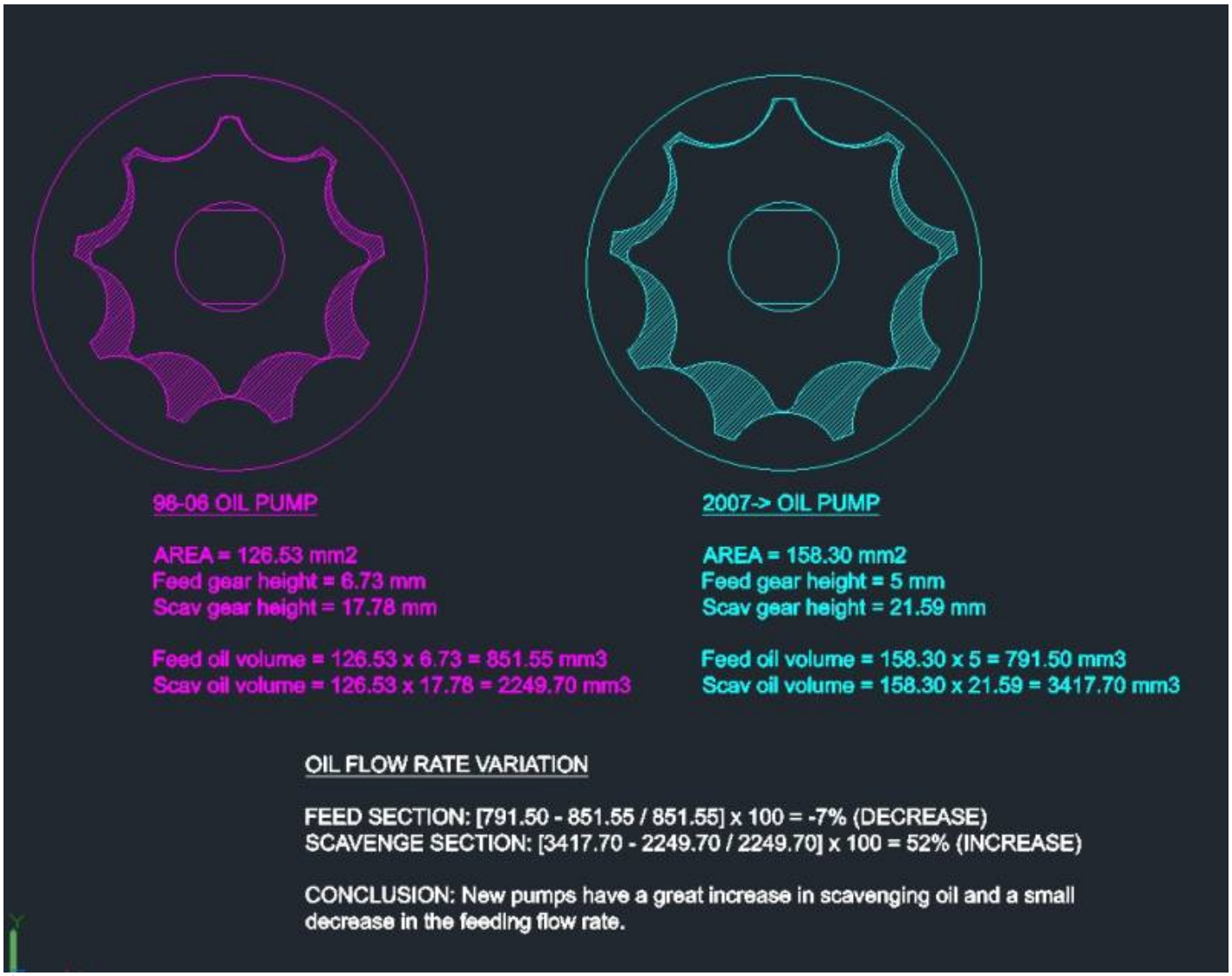
Return Gerotors:
In addition to the wider tooth profile, the 07 return gerotors were made taller than in 06.
If you simply do the math of the height change from the 06 return side, that doesn't give a good description of the return volume change.
You would need to take in consideration both the height change as well as the wider tooth profile.

Feed Gerotors:
The 07 feed gerotors were made shorter than in the 06 pump. The 2007 HD Technical Forum documentation explains the differences in the new improved oil pump.
Per that document,
The feed gerotors are thinner to accommodate taller scavenge gerotors but redesigned for no loss of capacity (from the 06 gearset).
As in above, 2006 and prior gerotors carried more or less oil depending on how tall the gerotor set is.
The taller the gearset, the more oil is carried.
However, due to the wider tooth profile, the MoCo was able to deliver nearly the same amount of oil with a thinner gerotor set.
In essence, the practice of changing oil volume now has a plan B (changing tooth profile).
However, the 07 feed gerotors do deliver slightly less feed oil than 86-06 pumps.

The magic is there! That explains why the feed gerotors still keep their oil moving capacity in spite of them now having less height. [1)]
The outer gerotors' 9 point star diameter is now larger, so the inner gerotor's 8 point star are too.

Area and Flow Rate Comparison:

The feed gerotors from 06 and 07 pumps were measured and drawn on Autocad by XLF member, xLoneRiderx.
The area and volume for each is shown in the drawing below. The values are shown in metric but can be converted.
According to the drawing, the 2007 oil pump has a 7% decrease in feed flow and a 52% increase in scavenge flow over the 1998-2006 oil pump.

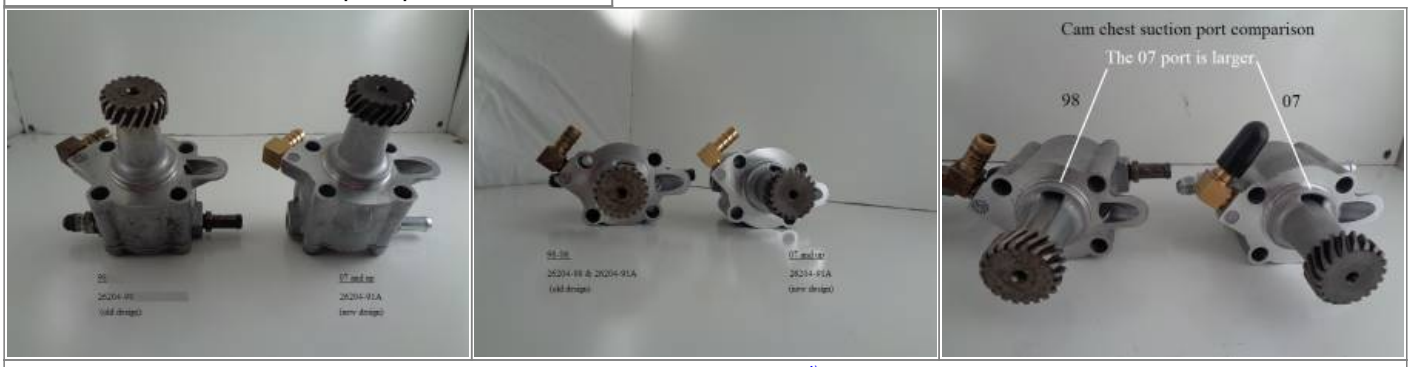


2)

Visual Differences and Dims

- Dimensions shown below are approximate. The 98 pump shown below is used with some probable wear. The intention is to show major differences in the two pump versions only.
- The outside of the pump bodies are visually the same except the 07 is slightly taller and the bottom cover has different casting numbers.

98 and 07 oil pumps [3)]



98 and 07 oil pumps [4)]

98 and 07 oil pumps [5)]

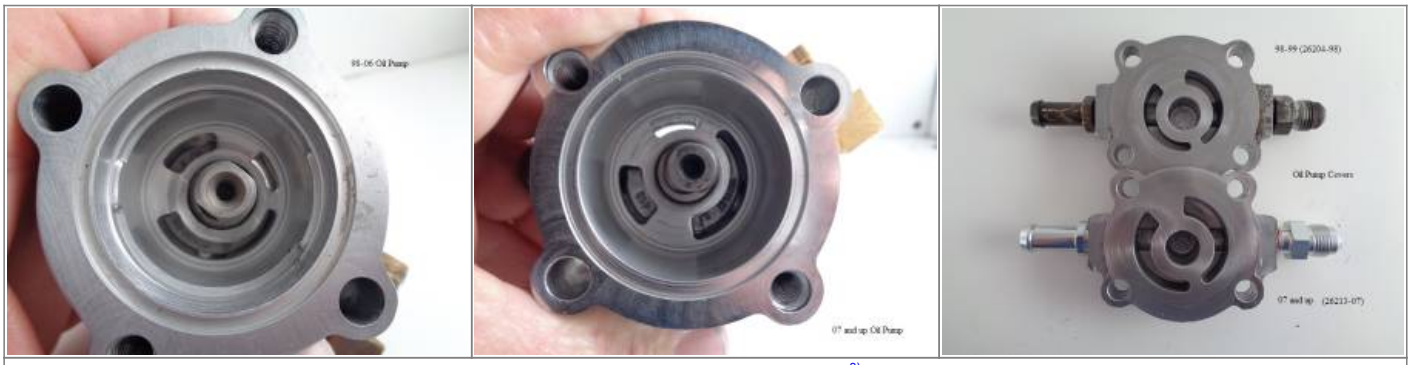
- Necks are the same height from the top of the pump body to the pump gear. The pump body on the 07 is app. (.018“) taller.

98 and 07 oil pumps [6)]

- Scattered parts show visual internal differences. See also dimensions below.

98 and 07 oil pump internals [7)]

- The 98-06 pump body has two bumps inside to hold the separator plate in place with 2 separate bores for the two different O.D. gerotors.
- 07 and up doesn't have the bumps for the plate and has a single bore for both gerotor sets.
- The return slots inside the 07 pump body above the scavenger gerotors have been enlarged and the feed cavity in the bottom cover is also bigger than the 98-99 cover.

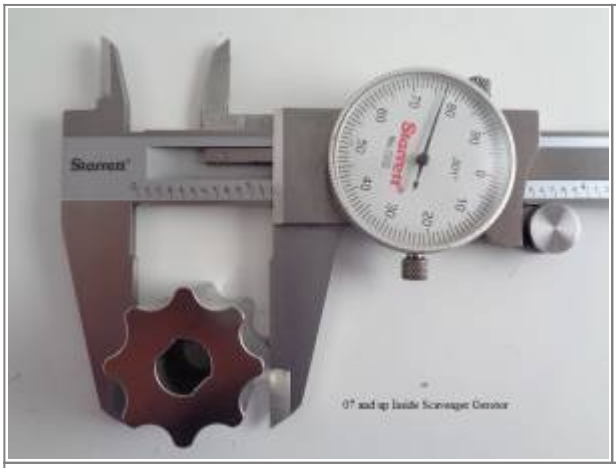


98 and 07 oil pump internals [8)]

- The 07 scavenger gerotor set is larger in diameter and taller than the 98-06.
- The inside scavenger gerotor is app. (.137”) larger in dia. and app. (.150“) taller.

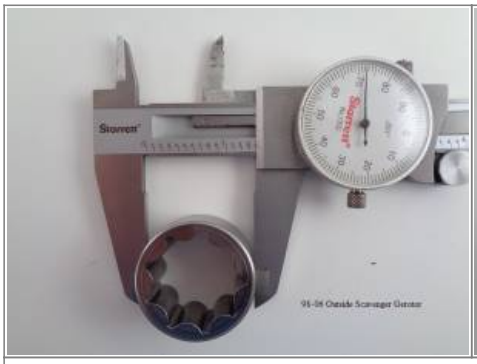
98 inside scavenger gerotor [9)]

98 and 07 inside scavenger gerotors [10)]



07 inside scavenger gerotor [11)]

- The 07 outside scavenger gerotor is app. (.127”) larger in dia. and app. (.150“) taller.
  The gear shaft was made longer for the taller body casting / gerotors and the scavenger gerotor sits closer to the bottom of the 07 pump.



98 outside scavenger gerotor [12)]

98 and 07 outside scavenger gerotors [13)]

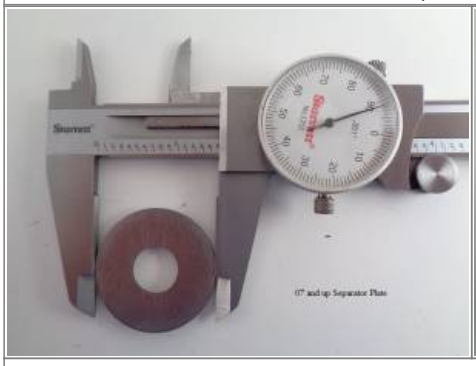
07 outside scavenger gerotor [14)]

98 and 07 scavenger gerotors installed [15)]

- The 98-06 separator plate is constructed to remain still while the gerotors turn and held in place by small castings in the pump body.
  It has an offset hole (installed only in one direction) to properly mate to the standard non-centered gear shaft.
- The 07 separator plate is app. (.040”) larger in dia. (now no shelf to sit against) and app. (.050“) thinner than the 98-06.
  It also has a larger hole in the center to allow it to spin free around the standard non-centered gear shaft.

98 separator plate [16]

98 and 07 separator plates [17]



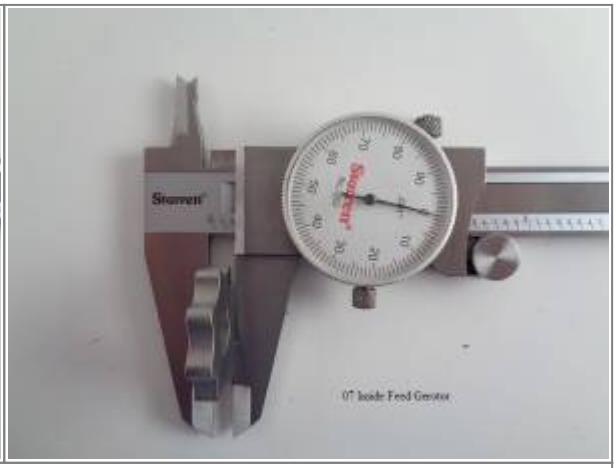
07 separator plate [18]

98 separator plate [19]

- The 07 feed gerotor set has a larger I.D. while utilizing the same O.D for each version.
- The 07 inside feed gerotor is larger in dia. by app. (.137”) but also thinner by app. (.064“) than the 98-06.

98 inside feed gerotor [20]

98 and 07 inside feed gerotors [21]



07 inside feed gerotors [22)]

- The outside feed gerotors on both versions are the same O.D.
- However, the 07 version is cut with less meat on the inside walls to accommodate the larger inside gerotor.
  It's also app. (.064”) thinner than the 98-06 version.

98 outside feed gerotor [23)]

98 and 07 outside feed gerotors [24)]

07 outside feed gerotor [25)]

98 and 07 feed gerotors installed [26)]

Go To Technical Menu

1)

xLoneRiderx of the XLFORUM
https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-motor-engine/sportster-motorcycle-motor-top-end/201713-1250-unhappiness-2020-edition/page16?t=2078814&page=16

2)

drawing by xLoneRiderx of the XLFORUM

https://www.xlforum.net/forum/sportster-motorcycle-forum/sportster-motorcycle-motor-engine/sportster-motorcycle-motor-top-end/201713-1250-unhappiness-2020-edition/page11#post4489346

3) , 4) , 5) , 6) , 7) , 8) , 9) , 11) , 12) , 14) , 16) , 18) , 19) , 20) , 22) , 23) , 25)

photos by Hippysmack of the XLFORUM

10) , 13) , 15) , 17) , 21) , 24) , 26)

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