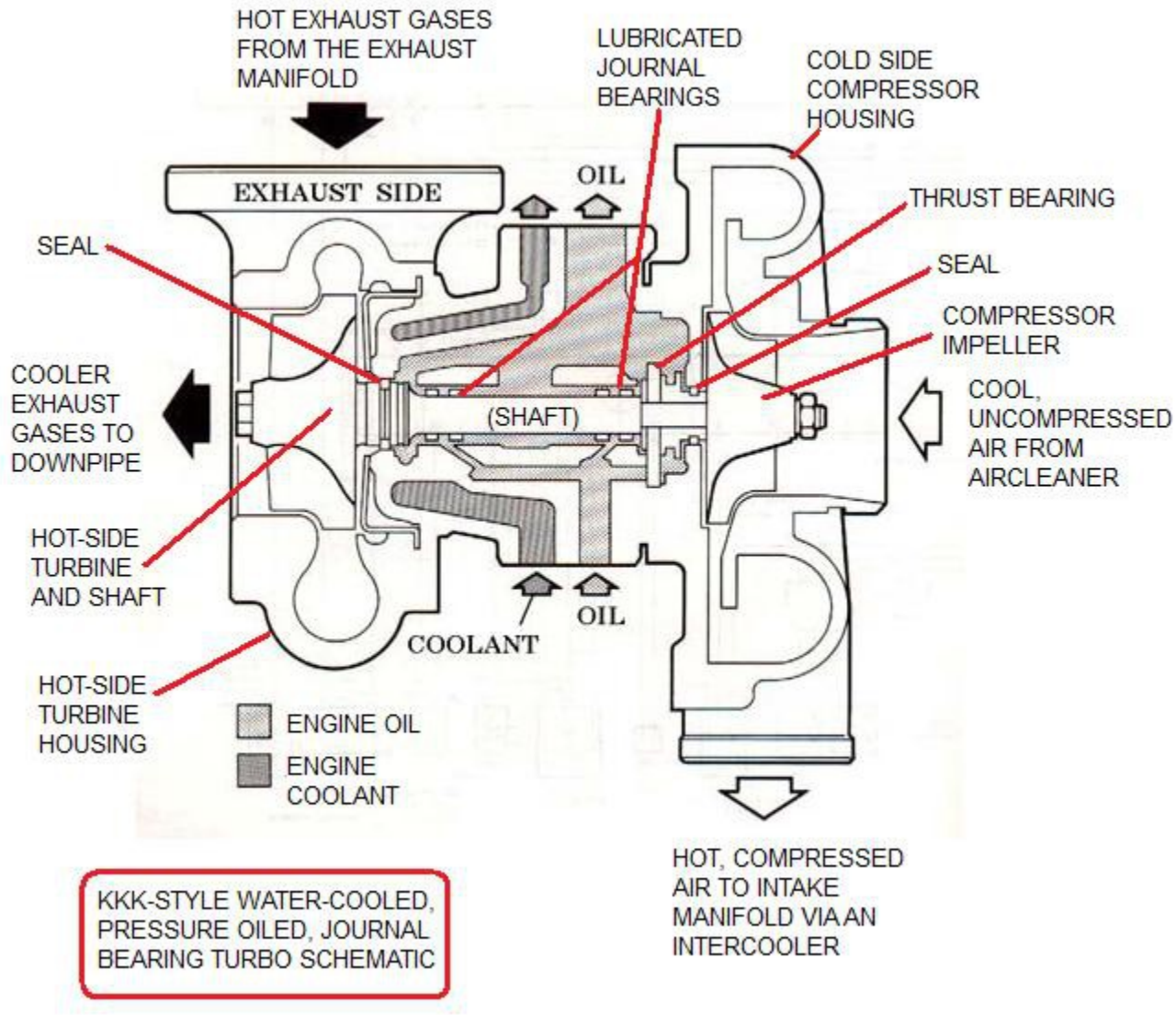
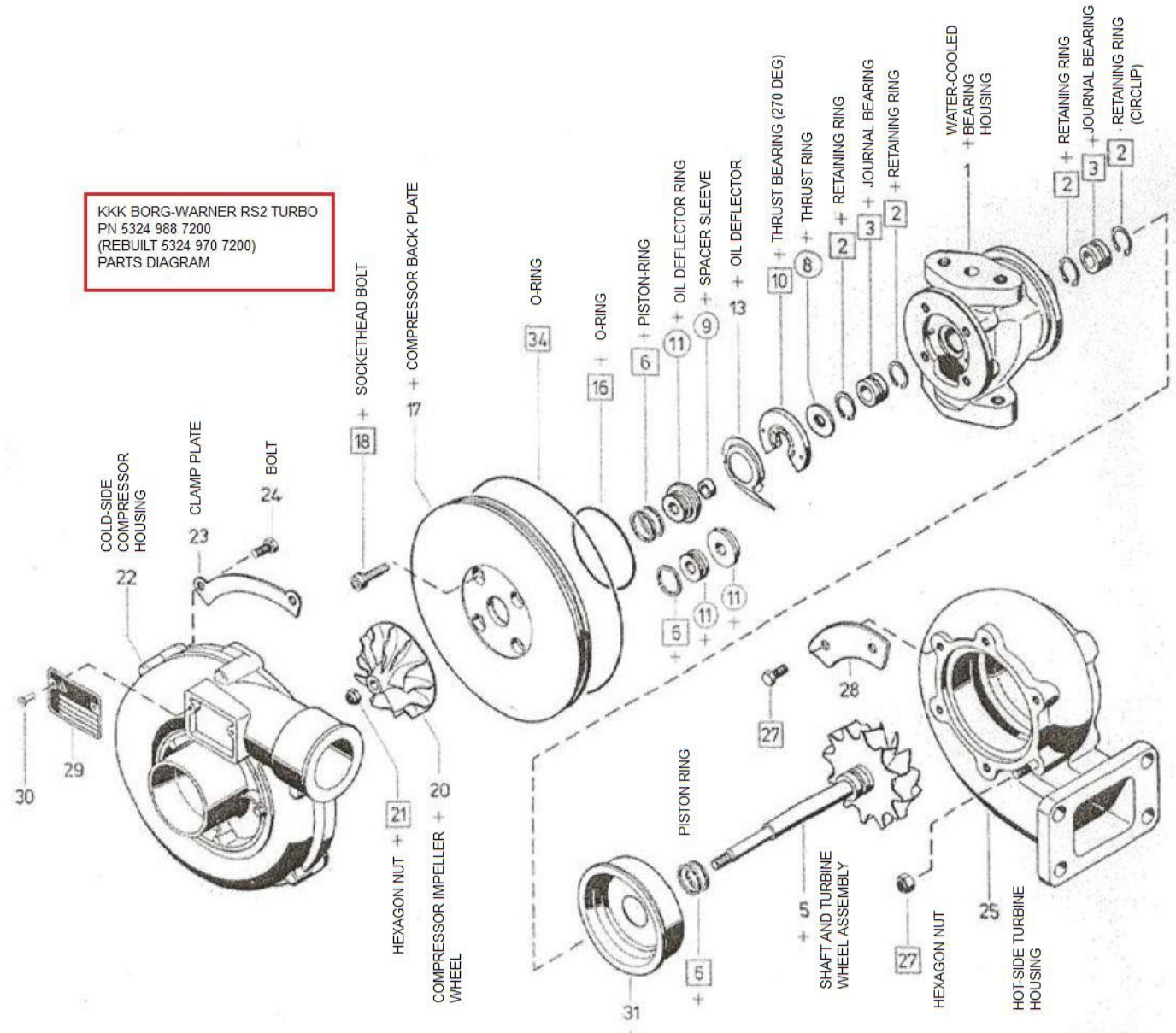
RS2 Turbo Disassembly by twoqu (Robin on the S2Forum) with some additional info by UrS4boy (Dave F.)

I, UrS4boy, have just copied the text and the photos from the thread. I made some minor spelling corrections flagged by WORD and skipped some minor dialogue in the thread. However, I have included some important discussion points by others (to which twoqu replied). I have added a diagram and a link to a RS2 Parts pdf at the end of this document.
Before going to twoqu's write-up, for reference I (UrS4boy) am adding these two diagrams:

This one shows schematically, the inner workings of a KKK Journal Bearing turbo



The second one shows an exploded view of the parts that twoqu discovers as he opens up a damaged RS2 K24-7200 turbo:



Now onto twoqu's write-up.

Note that except where specifically noted, all photos were provided by twoqu to support his write-up.

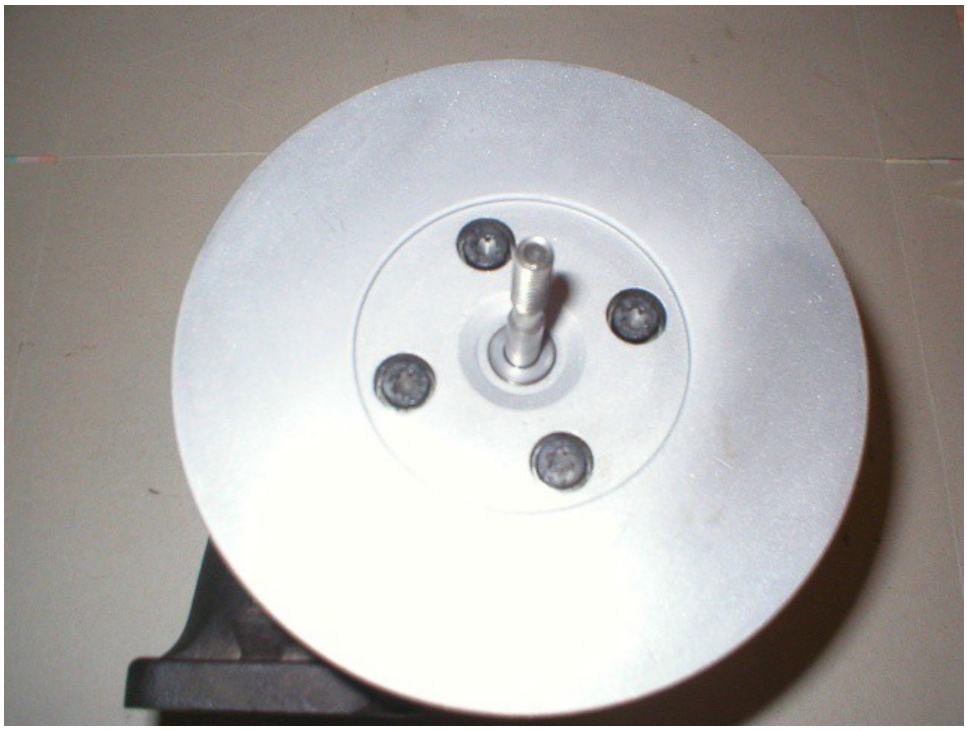
I (twoqu) thought it might be interesting to share some photos of the disassembly of an RS2 turbo. I have tried to keep the procedure in order so that each picture reveals a little more of the components that are hidden away. I have skipped the compressor housing removal. Primarily I wanted to see what if anything was different on the RS compared to its more mundane sister the K26. I have noticed differences. I'll discuss what I find later on.

First, a bit of information. Yes indeed, the RS2 shaft has a left hand thread, that is to say you remove the nut clockwise not anticlockwise. Secondly, there is only one seal at the compressor end. Thirdly, it does not have what I would call a 360 degree thrust bearing. Looks like a regular 270 degree to me.

The following pictures should give you an idea of how an RS2 turbo in particular and turbos in general are constructed. This picture shows the turbo with the compressor housing removed.

The next picture shows the seal plate and its 4 bolt attachment to the centre housing. These bolts are M6 torx I believe. You can just make out the flinger sleeve between the shaft and the seal plate. This serves not only to mount the compressor piston ring seal but also acts as a thrust piece for the compressor wheel to revolve upon.

Compared to a normal K26, the seal plate has a machined recess where the compressor wheel sits.



This picture shows what's beneath the seal plate. The first component is what some describe as a "flinger sleeve". The compressor seal, imagine a small piston ring, sits around this and when compressed in the seal plate provides a mechanical seal. I will have to check but its looks like a 14mm seal rather than the 19.3mm seal of a normal K26. The O ring seals the centre housing to the seal plate.

This picture shows the underneath of the seal plate

This picture shows what appears to be a flat washer like spacer. Underneath this spacer is another distance spacer sleeve which had stuck to the bottom. You can see all the individual components in a later post.

This picture shows the oil deflector. The tang of the oil deflector projects into the oil return galley. The deflector is located either side by two tangs which sit inside the hollow pins that locate the turbo thrust bearing.

This picture shows the actual turbo thrust bearing. It is located on two pins, one either side. As you can see, the bearing has a segment missing where the oil gallery is. So it is a 270 degree bearing. A 360 degree bearing would have virtually a full circle of bearing material. I believe that 360 degree bearing are available for this family of turbos. So that's something to investigate before rebuild.

This picture shows another flat washer that sits behind the turbo thrust bearing. You can clearly see one of the pins that locate the bearing in the housing. Presumably the circular hole is an oil supply gallery.

This picture shows the top of the shaft poking through. You can see how the shaft is waisted. Difficult to be accurate but I have measured the shaft diameter in the bearing housing at 9.94mm and the waisted shaft section at 7.0mm. The normal K26 shaft has those dimensions and the RS2 compressor wheel is a snug fit on it.

This picture shows the individual components in the order they were removed. Top first, bottom last. Note the spacer sleeve that was stuck to the bottom of the first flat spacer washer.

So as I suspected, despite the K24 designation, the RS2 owes more to its K26 sister. I will be able to show some of the differences at a later point when (if) I dismantle the turbo further. The RS2 shaft appears to be undercut before the thread unlike the regular K26. Not entirely sure why, but ARP also does this with their studs. It appears that this permits greater clamp loadings if I understand it correctly. Although I can't see why that be necessary. As for the left handed shaft, I believe that this is to prevent the compressor wheel unwinding the nut when stalled.

Please note that this is for information only. I have only dismantled this turbo to try and salvage the compressor side as it has already suffered damage to the turbine wheel. The plan is to try and duplicate the "small" RS2 turbo that several of the German tuners used in their conversions and to stop Paul N bringing the subject up every few months I think I have a suitable turbine and shaft from an AET hybrid.

I hope I have illustrated that a turbocharger is a relatively simple bit of machinery. It certainly would be possible to replace the bearings and seals yourself providing there were no other issues. The only problems being the availability of such parts and basic information relating to the torque of the critical nut and the issue of balancing. Looking at the back of the RS2 compressor wheel, I would guess they are balanced to a certain tolerance as a separate unit. Usually when a turbo has been balanced by a specialist you can see the grinding marks on the back of the wheel, whereas the RS has a nicely machined recess. I get a pic later. So perhaps the rotating components are selected on tolerances. That would make more sense than individual balancing of assemblies. I can't see KKK dismantling and reassembling turbos to get them spot on. Anyway that’s just an observation. If I feel up to, I'll try and dismantle the centre housing further and expose the turbo bearings in the housing and show the turbine piston ring seal. I can then compare the components better.

> Originally Posted by **SteveH**
> 
> *Robin, nice write up*
>
> *I've never seen the inside of the kkk unit, are you planning on putting it back together yourself or having it rebuilt by one of the well known turbo suppliers?*

Steve, Well it depends. Ideally I would like to have it professionally assembled. Perhaps even looking at upgrades like the 360 degree thrust bearing. I have seen a K14 one and it looks like it is located on the same way on the two pins. Pretty sure they used to bolt them in on T3's etc.
However, I guess they will turn their noses up at this because they will say every component is nacked and why don't I buy a new or reconned one from them. Errr.. well the last "hybrid" died before it had a chance to get its turbine shaft dirty thats why! Perhaps a compromise can be reached, without any warranty/guarantee. Need to cultivate someone.
If I fook it up that fine. Apart from the balancing, I can't see why I could not atempt a rebuild subject to getting the parts and some basic technical information. Indeed o/s and u/s are available but this presumes some knowledge of what the shaft diameters and seal dimensions should be. Might look across the pond. They seem more relaxed about supply of spares/rebuild kits.

Jamo commented:

Quote:

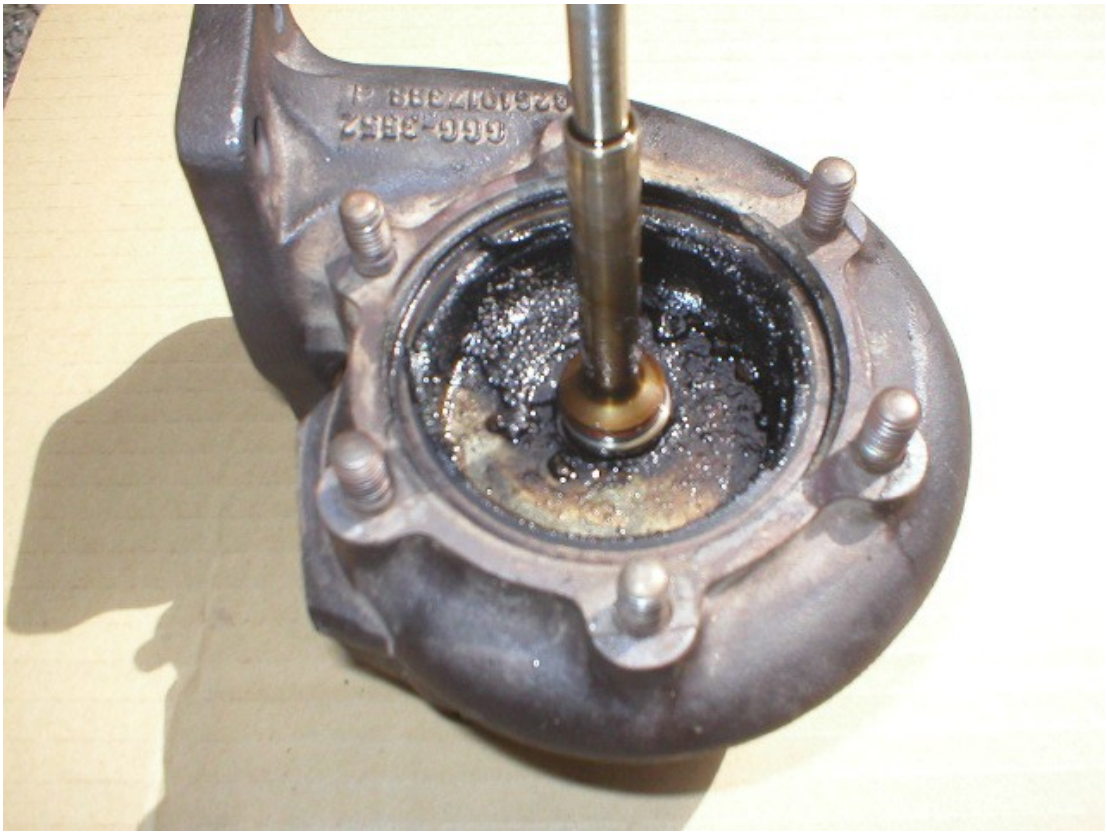
> The 270 vs. 360 Bearing Dilemma
> Many conventional journal- bearing turbos use a 270-degree thrust-bearing washer (at left), while the new breed of conventional and ball-bearing turbos employ 360-degree thrust bearings. The advantages of a 360-degree bearing include a full circle of lubrication, six orifices on the washer instead of three for the 270-degree unit, and an updated pad strategy to better disperse oil where it's needed. Turbonetics uses 360-degree bearings on all of its T04B and T04E turbochargers. There isn't much of a dilemma here; if you have the opportunity to use a 360-degree bearing, jump at it.

Back to twoqu's postings:

Ok! It was a bit of a struggle but here is the rest of it.
This is what greeted me once the centre housing was removed from the turbine housing.

The turbine housing and shaft. Look at how carbon has built up on the inside of the heat shield.

Another angle of the carbon built up.



The turbine shaft. Completely shot! There will be no data from this!

The centre bearing housing after a quick wash off with some parts cleaner.
You can just make out the circlip that secures the bearing in the housing.

Circlip removed to expose the bearing

One of the two bearings removed. You can also see the other circlip in the housing. The bearings are sandwiched between two circlips.

Similiar procedure for the turbine end.

Remove circlip to expose bearing.

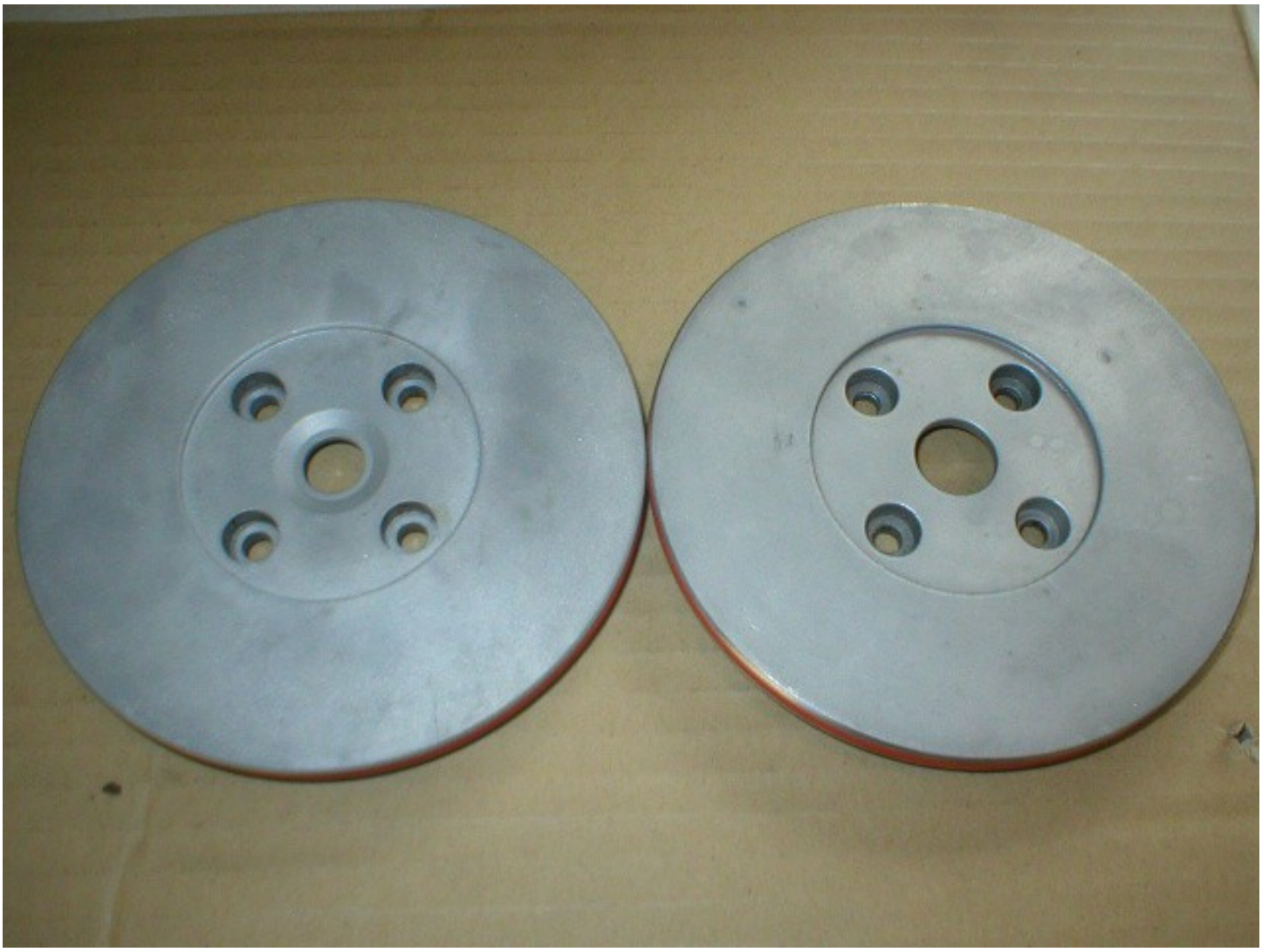
Remove bearing. Again the other circlip can be seen.

Here is a comparsion between the RS2 shaft on the left and the ordinary K26 on the right. Notice the discolouration on the RS2 shaft, sort of straw coloured. I have not cleaned the other shaft. That’s exactly how it came out. It wasn't in operation long enough to get any carbon deposited on it.
Also you can see the two piston ring seals used at the turbine end.

Here is a closer shot of the shafts. You can see the slight differences. If you look closely you can see the lefthanded thread of the RS2 against the righthanded thread of the ordinary K26. The RS2 slopes from left to right, the K26 slopes from right to left. Notice how the RS2 is undercut. Another point is that the RS2 has I believe an M7 thread whilst the ordinary K26 has an M6 thread. The shaft dimensions appear to be the same.

This shot shows a comparison between the back of the RS2 compressor wheel and the compressor wheel from the hybrid. Notice that the RS2 one has had one machining operation performed on it. The hybrid wheel has had a few touches of the grinder applied to it. Another point of interest is that the RS2 compressor wheel is domed whilst the hybrid K26 is flat.

The seal plates are matched to the comp wheels. Notice the recess in the RS2 one. You can also see the difference in the size of the centre bore. The RS2 one is for the 14mm piston ring seal. The K26 is for the 19.3mm piston ring seal. Another difference is that the RS2 uses one seal at the comp end whilst the K26 uses two.



So from what I have seen, In order to graft the RS2 cold side onto anything else you would need all the components, comp cover, comp wheel, seal plate and the matching internal parts from the centre housing that I have pictured earlier. We know the centre housings are common and the bearings themselves both the thrust and the sleeve.

Here is a picture of the sleeve bearings from the inside of the centre housing. Notice the heavy discolouration on the bearing from the turbine end.

Here is a picture of the turbine housing. This seems to have a different style of numbering than Paul N's one. The numbers are closer together and it is a lower case d.

Here is a picture of one large crack. This runs from where the turbine scroll ends to nearly all the through the exit. There are eight further cracks around the inside of the turbine.

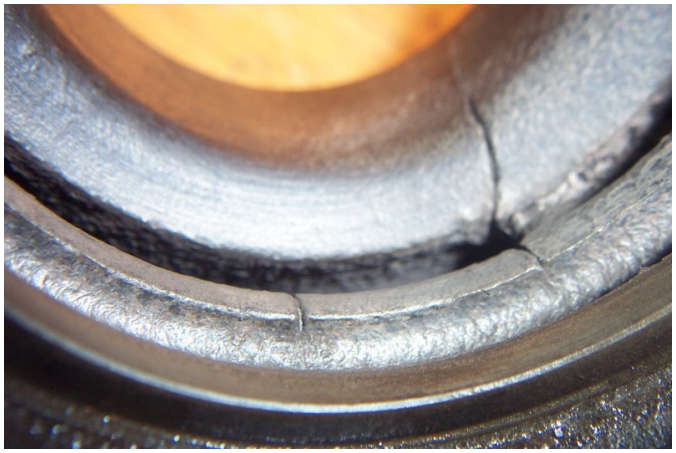


Photo Courtesy of Paul N. (S2Central.net)

Below is a pic of the repair kit from those nice people at Melett!(http://www.melett.com/turbocharger-catalogues.php). It includes all the parts needed to attempt a rebuild. You can just see the 360 degree bearing in the bottom righthand corner. I will take some comparsion shots later. Now before everyone starts ordering bits up, please think about it!

Whilst I hope I have shown that a turbocharger is a relatively simple piece of engineering, unless you have a known undamaged turbo that you wanted to freshen up, there would be little point in attempting a rebuild. Any mechanical damage would need the attention of a specialist. At the very least you would need very accurate measuring equipment, better than I have really. I can only measure down to 1/100ths of a mm.

The problem lies in the way turbos are rebuilt. In order to recover the various components they are machined. So centre housings are bored larger which means they need greater o/d bearings. Shafts are machined undersize which means that bearings with a smaller i/d are used. It's possible that the grooves that the piston rings sit in have been machined as well and there are different size seals to accommodate that too! I have measured as accurately as possible and by a process of elimination been able to work out that I am on std sizes. This was only possible through the patience of the guy at Melett who gave me the relevant dimensions. In fact I need to revise the shaft diameter. I had rather hurriedly measured it at 9.94mm when in fact it was 9.96mm!

I was starting with a known good hotside. That is to say it was undamaged and was not leaking any oil into the turbine housing. Likewise the coldside form the RS2 showed no sign of leakage (unlike the hotside!). I had been patiently waiting for a good RS2 coldside to become available. So that’s why I am attempting this. All I needed from the RS2 turbo was the compressor housing, wheel and seal plate. Although interestingly, I have noticed a slight difference in the centre housings. I’ll explain later!

http://www.melett.com/turbocharger-catalogues.php

Ok, here’s the money shot! The so called 360 degree bearing is on the left. Obviously it has a far greater area than the usual thrust surface of a regular one. It is a direct replacement. I was concerned that other modification might be necessary. I have heard that Garrett ones were bolted in.

Another picture from the rear.

Here is a pic of a K14 with a 360 degree thrush bearing set up!

Right back to the plot! Can anyone spot the difference between the RS2 centre housing on the left and the regular housing on the right?

And for those as impatient as me, the answer! The RS2 housing has an additional oil gallery to the rear. Presumably to aid lubrication of the turbine end. The screwdriver indicates the angle. I'll have to see if I think this housing is suitable to use. I was just going to use the other one as it had no history of leaking. However, I like things to be well lubricated!

This is getting to be a bit of an obsession. Looks like this one has a centre housing with a different casting designation on it!

Quote:

> Originally Posted by **ezveedub**
> *Trust me, the center housing is the exact same housing as a K26 off a 5000 Turbo. As a matter of fact there where several center sections for the K26, I have been checking the Borg Warner catalog and the RS2 turbo is K26 turbo, with a special K24 turbine and housing. But its dimensions make it a K26. They put a left hand threaded nut and turbine shaft on these RS2 turbos. They also made a specific K24 part number for the turbine housing, but if you look at the number cast on the hot housing, its a K26 series. There are many numbers on the parts, but they don't match the parts catalog. I found the cold side back plate has 4 ID numbers, and its a K26 series, yet the parts catalog rates this a K24 part number. I'm working on reworking some K26's with RS2 parts. Also, if you trash the hot side parts, you'll need to buy a new one, as the shaft and housing are not available from Borg Warner. But I did find some parts are interchangeable as listed by Borg Warner.*
> *Regards,*
> *Ezveedub*

Hi!
Thanks for the input. However clearly the centre sections are not the same on the RS2 and the 5000 or (200 in Europe) as that's what's I am making the comparison with! The other turbo picture also shows a housing with a different casting designation. I can only report what I have found. It appears the RS2 has an additional oil gallery and it has a different treatment around the body under the flange when compared to the normal K26 centre housing despite having the same casting numbers. The only external difference being the ribbing and the 5150 number.
We have already established the shaft has a left-hand thread. We know the RS2 is all K26 despite what others have posted. I am assuming that as the K24 designation was in use at the time, KKK used that instead.
I am interested in getting as much factual information on this thread as possible. So if you want to post the p/n's from the BW catalogue on here that would be useful.

Twoqu (Robin)

There is more but the level of detail dropped off. More discussion at:

http://www.s2forum.com/forum/showthread.php?t=17109&page=5

The complete S2Forum thread is at:

http://www.s2forum.com/forum/showthread.php?t=17109

Additional info (RS2 parts diagram) at http://12v.org/urs/RS2%20Turbo%20Parts%20Catalog.pdf

Enjoy. Hope you approve Robin.

UrS4boy Oct. 2012