



Turbo FAQ

Part Numbers

RS2 turbo (Audi p/n)

034 135 703 D (old number)

034 145 702 B (new number)

RS2 turbo (KKK p/n)

53249707200 (7200 designates RS2)

Frank Amoroso, (Technical Editor, S-Cars.org)

Turbo System 'Valve' Glossary

Wastegate: Integral (1.8t, 2.7tt) or external (2.2t, 2.3t, td). Integral

wastegates have an actuator on the hot side of the turbo that bleeds exhaust gas from going thru the turbine blades. External wastegates are separate from the turbo located in the exhaust manifold that bleeds exhaust gas from going thru the turbine blades. Wastegates bypass exhaust gas from the exhaust manifold to the exhaust system after the turbo (turbo slows>less boost). Mechanical wastegates have a single line from the Intake Manifold from the turbo, offset by a given spring rate, that regulates when the exhaust gas is bled. Electronic Wastegates have a stepper motor or frequency valve that regulates the amount of air that feeds the wastegate (91>98 20vt, 1.8t, 2.7tt), or adds a percentage of IM boost to the top of the wastegate (86-91 10vt). Electronic wastegates are computer controlled externally (add on boost controller) or internally (audi turbo computers 86> with inputs - Knock, Charge Air Temp, Water temp, Throttle Position sensor). Primary Function: Boost regulation

Bypass valve: Located between the turbo and the intake manifold. It has a single line from the IM to the valve, which, on vacuum, opens to bypass excess boost air before the t-body to either the inlet side of the turbo (closed loop - most common) or atmosphere (open loop). **On boost the valve is always closed, regardless of boost level**. Primary Functions: Anti-/lag/boost spike/turbo stall. More information on bypass valves can be found [here](#).

Pop-off, Dump Valve, Blow off Valve: Located in the intake manifold (common) or intake tract.

Mechanically/electronically set to open at a preset boost level. Once that boost level is attained, the valve opens, dumping all boost to either atmosphere (open loop - most common), or to the inlet side of the turbo (closed loop). Primary Function: Failsafe Overboost Shutdown (Secondary Function, Racing: Overboost shutdown - anticheating).

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Boostus Maximus (How much boost is too much?)

Hello fellow S heads,

In my quest to decide on the appropriate boost levels I should be running at altitude, I have put together a spreadsheet (I apologize for the attachment but I wanted to convey the data in tabular fashion) that shows max boost level guidelines for running the K24 and RS2 turbos, without exceeding their respective Pressure Ratios at different altitudes. As well as the effective Pressure Ratios at different boost levels at altitude (mine to be exact, 5,350 feet).

I will not get into the definition of a turbo's Pressure Ratio (PR), but the equation is...

$$\text{Pressure Ratio} = (\text{Atmospheric Pressure} + \text{Boost Pressure}) / \text{Atmospheric Pressure}$$

Given this, one can determine if a given Boost Pressure will cause the turbo to operate outside its efficiency range.

The RS2 compressor map shows a PR of 2.8 to be the top of the scale.

The K24 compressor map shows a PR of 2.4 to be the top of the scale.

This issue is extremely long and involved and there has been volumes written off-list (especially for the RS2).

Here comes my big disclaimer for the people who will get bent out of shape for some reason or another... My purpose in sending this out is not to start a huge email campaign to discuss all of the intricacies involved here, but rather to present MY guidelines based on my research and the data that I have acquired from the likes of Ned Ritchie and Scott Justusson, etc.. Once again these are MY guidelines and they are not to be taken as postulates, they are simple math and I only offer it to you so you can determine how much, if any, your particular setup is running out of its efficiency range.

If you truly want to dig into the details including not only definitions but also how to read a compressor map, I must, once again, strongly encourage you to read Corky Bell's book Maximum Boost. Along those lines if you want to see some Garrett compressor maps (KKK does not release theirs to the general public) check out <http://www.turbonetics.com/>

Note Well: Many tuners run their setups at boost levels that result in PRs that are greater than MY limits (especially at higher altitudes). Since max torque creates the best need for boost, tuners seem to like to overkill it in that range. They have their reasons for doing this and I don't claim to know what those reasons are. I, OTOH, am offering up the objective math.

For my Atmospheric (Barometric) Pressure figures I used the table found at <http://www.paydirt.net/files/paydirt/indu/h20data.stm> These may be conservative figures but tough luck. The pressure for a given altitude is given in PSIA, Pounds Per Square Inch Absolute. The boost pressures are given in PSIG, Pounds Per Square Inch Gauge. For further clarification on both PSI Absolute as well as PSI Gauge see Ned Ritchie's tech tips at <http://www.intendedacceleration.com/>

Here is the data...

Barometric Pressure at 5,350 feet in PSIA	Boost in PSIG	PR	% > RS2 PR of 2.80	% > K24 PR of 2.4
12.15	10	1.823		
	15	2.235		
	16	2.317		
	17	2.399		
	18	2.481		3.40%
	19	2.564		6.82%
	20	2.646		10.25%
	21	2.728		13.68%
	22	2.811	0.38%	17.11%
	23	2.893	3.32%	20.54%
	24	2.975	6.26%	
	25	3.058	9.20%	
	26	3.140	12.14%	
	27	3.222	15.08%	
	28	3.305	18.02%	
	29	3.387	20.96%	
	30	3.469	23.90%	

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PS: Please realize that the max boost levels listed in the tables reflect the top of that particular turbo's efficiency range (per the KKK compressor map), and not what a given motor can safely handle. Put another way: If you buy a RS2 turbo, bolt it onto your 3 cylinder Chevy Sprint turbo, and turn the boost up to 26 psig at sea level, the turbo will run fine, until you blow holes into your pistons.

Is the hybrid K24/K26 turbo the same as the RS2 turbo?

No. The RS2 is all K26 turbo. I've had a couple dozen of RS2 and RS2 Competition turbos apart in the past 6 years. The hot side is based on the smallest of the K26 series housings, with a Porsche specified hot side wheel, and the appropriate milling of the housing (which results in a slightly larger downpipe opening). The center section is stock Audi K26 WC, and the cold side is a K24 cold side housing with a K26 cold side wheel. The RS2/Comp both use the larger K26 shaft for the wheels. The RS2 Competition uses a larger cold side wheel and housing, the hot side stays per early RS2. What throws most folks off, is that KKK left the K24 designation in their part numbers on the cold side tag.

The actual answer to the years of the K24 cars in the US is up for some discussion. The Audi "claim" is that as of 1989.5 (late MC dual knock MAC-14) Audi switched to the K24 turbo on all I5 turbo applications. This switch also "supposedly" came with a revised cam profile, flat flywheel (+ different TOB fork), and 2pc exhaust manifold. IME, 1990 was the bastard year for previous year pieces parts. I've seen 1990's with single pc exhaust, K26 turbos (but all have had the flat flywheel and the revised cam profile).

As of 1991 + intro of the 20vt cars worldwide, all Audi 20vt (I5 only - thought I'd miss that:) turbo cars except for the RS2, were K24 based turbochargers.

Maximum boost to the K24 is altitude corrected at 16psi. At 3200ft the 1991> stock 20vt cars lowered maximum boost threshold to prevent overspin of the turbo. You guys with modded 20vt computers with K24 turbos should reread that last sentence.

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What is a RS2 Comp turbo?

Take a RS2 turbo apart, then a "7200 comp" apart, there is a difference. Cold side housing and turbo wheel are different, BTDT. Basically, if you use whatever KKK's numbering system is at the time (I did this back in 94 - at least 2 numbering systems ago), you will find that the cold side wheel is larger on the 7200 Competition. The RS2 'Competition' is actually and ascribed misnomer, as the "RS2 Comp" really doesn't exist. What does exist is the "7200 Competition". Which is EXACTLY how KKK delivered the RS2 hot side housing, RS2 hot side wheel, and RS2 "+1" cold side wheel and housing. KKK also labeled the box it came in "7200 Competition". I know this, cuz I sold about a dozen of them when they were available.

The easiest way to tell the RS2 plain Jane from the 7200 Competition is that the plain Jane comes with the Audi tag on the cold side, the 7200 Comp doesn't come with any tag on the cold side. The hot side housing and wheel will carry the same part number, so will the center bearing section (it should they are both K26 derivatives).

There is also another cold side (wheel and housing) that is larger than the 7200 Competition. I currently run 1 of these in my fleet.

Everyone has "opinions" on these turbos, and it would appear it's shrouded in grand mystery. I laugh, KKK knew what that hot side was (awesome), and (my guess) KKK was likely restricted in using a Porsche/Audi proprietary "RS2 Turbo". The rules have changed since, because the only way to build a 7200 Comp these days, is to order the RS2 turbo complete, and add larger cold side wheel/housing. Bringing full circle what I did to my first RS2 turbo in 1994.

- original post

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