## HOW TO CHOOSE AND SIZE A TURBOCHARGER

It's no longer necessary to use black magic or cast a voodoo spell to choose the right turbocharger. Turbonetics makes it easy! Each turbocharger section of the catalog features Turbonetics Top Performers based on the displacement and power. While there are many other variables to consider, our catalog will certainly get you started. We have over 125 years of forced induction sales and engineering expertise in our building to help you select the best possible combination of turbochargers and intercoolers. Feel free to contact Turbonetics and or any of our distributors, if you have questions. The dealer locator feature is available online at WWW.TURBONETICSINC.COM.


### HERE ARE SOME THINGS TO CONSIDER:

**POWER**

- Think in horsepower not boost.
- Boost is just a number that you will have to run on your engine to make a certain horsepower.
- How much power do you want to make? Be realistic, the more accurate that you are, the better tuned your forced induction system will be.
- Can your vehicle (not just the engine, but the entire setup) handle such power?
- Remember the turbocharger is generally not the weakest link.
- Forged pistons, connecting rods, head studs, etc.
- "As much as possible" is not a goal.

**INTENDED USAGE**

- What are you using the vehicle for?
- Race or street use?
- The way that you will be using the vehicle dramatically changes the sizing of the turbocharger and intercooler needs.
- Your choice of transmission type and gearing will greatly affect the performance and characteristics of the turbocharger, keep this in mind.

**PACKAGING**

- Will the turbocharger(s) fit in your vehicles space constraints? Consider using differently sized compressor housings to more easily fit a given location.

## REMEMBER TO CHOOSE WISELY

Most street/autocross/drift enthusiasts will prefer a smaller turbocharger due to its fast response. A turbo system equipped with a smaller turbocharger is generally considered more fun to drive. The tradeoff is the final power output of the setup. On another note, dedicated track cars are aimed for peak power over boost response. There's no doubt track cars spend more time in the upper RPM than average street cars. So, a small sacrifice in boost response is offset by the huge power potential. Larger frame turbochargers are preferred by track car owners due to their maximum power capacity.

For most street applications the best solution for selecting turbine wheels and turbine housings, is to choose the smallest wheel diameter available that meets the horsepower level wanted. Turbine wheel HP limits are located on page 9. It is also important to remember that response/spool-up time is greatly affected by turbine wheel diameter and turbine housing A/R. The A/R sizing can be used as a tool to fine tune the response range in the RPM band. The smaller the A/R, the faster the turbocharger will be able to spool up from the increase in exhaust gas velocity entering the turbine housing. Backpressure has become a major tuning issue associated with high performance turbocharged engines and the turbine wheel and turbine housing A/R are both critical to maximizing the performance of the turbo system. Backpressure is the pressure that the exhaust gas generates trying to enter into the turbine housing inlet. If backpressure becomes too great (a 2:1 ratio), the exhaust gases can not escape the cylinder head and can possibly cause major tuning, performance and durability issues. It is important to try to keep the backpressure to boost pressure ratio as low as possible and should be no greater than 1.5:1 for best performance (Example: 15 psi of boost to 22.5 psi of backpressure).





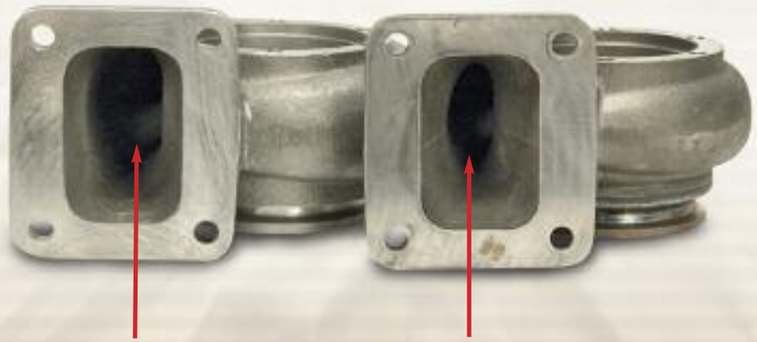
## WHAT YOU NEED TO KNOW

As the volume decreases in the volute of the housing, the exhaust gas is able to maintain velocity and a high energy level thus increasing turbine wheel speed. A small turbine housing A/R can also be a choke point with too small a size limiting the efficiency of the system by increasing backpressure and preventing total horsepower capability.

If the boost pressure to backpressure remains equal (1:1) the engine essentially thinks it is naturally aspirated. The boost pressure can continue to be turned up higher and higher until the backpressure climbs too high (above 1.75-2.0:1) or the strength limitations of the engines components are reached. Some backpressure can be a good thing for street/driving use as the pressure differential helps with turbine wheel speed and transient boost response. For racing applications it is critical to maximize the turbine housing as much as possible to keep backpressure low and efficiency high while still providing the necessary response time. There are no written rules to sizing turbine housings and as such professional recommendations and testing are often the best way to start.

## A/R RATIO

Let's say you have selected a Turbonetics turbocharger and have successfully installed it on your setup - you love the power it delivers but would like to improve low-end torque (or high-end power). It's an easy task with a large selection of Turbonetics turbine housing A/R options. Simply change to another A/R turbine housing and fine tune your setup! Utilizing a smaller A/R will amplify the exhaust gas energy to the turbine wheel. This will allow quicker spool up. However, this will reduce the maximum power potential on high RPM. On the other hand, a larger A/R will delay the delivery of the exhaust gas energy to the turbine wheel. This will allow high RPM power at expense of low-end torque. If you are having traction issues due to high power/boost in low RPM, a larger A/R turbine housing will help you to achieve the optimal power band. On another note, compressor housing A/R options are almost nonexistent as they are not critical for turbocharger performance.



*Notice how tight the throat of the volute is on the right turbine housing. The smaller A/R dramatically improves turbine response time.*