

AVO Ball-bearing Turbochargers for the 2002 through 2007 Subaru WRX and STI

AVO's big ball-bearing turbocharger for the Subaru Impreza WRX and WRX STI are true bolt-in applications. Based upon our famous Edge Series design, these turbos have been designed from the ground up to provide better reliability, performance, and response than the factory turbocharger units. All our turbochargers come with all the stainless steel water and oil fittings for the turbocharger. Also included is the famous AVO 15psi adjustable solid boost actuator, which provides for much better boost response and to maintain boost levels at higher RPM's.

All of our ball-bearing turbochargers are water-cooled and comes with the proper oil and water lines. Our turbochargers have been designed to perform in the harshest conditions possible, and have been tested in them as well. AVO products are not designed to be as reliable as OEM - they are designed to be much better than OEM. High nickel content housings ensure our turbos will go the distance. Another key performance points is the Garrett® compressor and turbine wheels, which are lightweight with knife-like edges for unmatched spooling, yet built strong for reliability. An AVO ball-bearing turbocharger is likely to outlast your engine.

AVO380



With a medium-sized CHRA center matched to the AVO 3-4 exhaust housing, this turbocharger combines quick response with good mid-range response. It is an excellent choice for most users with this combination of near-stock response mated to much better performance throughout the powerband.

Flow Rate	Compressor Housing	Exhaust Housing	Turbine Wheel
44lb/min	0.60 S AR	AVO 3-4	46.95mm

AVO420



With a medium-sized CHRA center matched to the AVO 4-5 exhaust housing, this turbocharger combines quick response with good mid-range response. The larger exhaust housing allows for higher boost levels than the 380 without worry of boost creep. It is an excellent choice for most users with this combination of near-stock response mated to much better performance throughout the powerband.

Flow Rate	Compressor Housing	Exhaust Housing	Turbine Wheel
44lb/min	0.60 S AR	AVO 4-5	46.95mm

AVO450



With a larger CHRA center matched to the large AVO 4-5 exhaust housing, this turbocharger will put down some serious numbers. It is an excellent choice for most users, as it still has good response while providing great top end performance and big torque numbers. With a 50lb/min flow rate, serious power will be yours! I

Flow Rate	Compressor Housing	Exhaust Housing	Turbine Wheel
50lb/min	0.60 SAR	AVO 4-5	46.95mm

AVO500



With a large CHRA center matched to the big AVO 4-5 exhaust housing, this turbocharger is the choice for big power seekers. This turbocharger will seriously warp your drivetrain! Extensive supporting mods are necessary to make use of the 500, but the results are worth it!

Flow Rate	Compressor Housing	Exhaust Housing	Turbine Wheel
50lb/min	0.60 L AR	AVO 4-5	51.98mm

AVO550



Elvis. The King. The AVO 550 will put a serious hurting on the competition at the strip or circuit. With a big CHRA center matched to the big AVO 4-5 exhaust housing, this turbocharger is the choice for big power seekers. This turbocharger will seriously warp your drivetrain! Extensive supporting mods are necessary to make use of the 500.

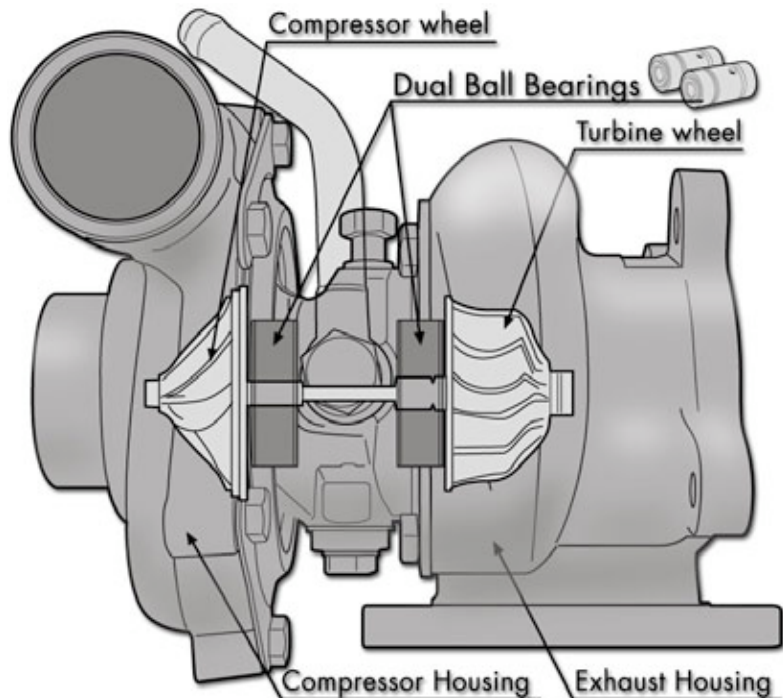
Flow Rate	Compressor Housing	Exhaust Housing	Turbine Wheel
55lb/min	0.60 L AR	AVO 4-5	54.98mm

True Ball-Bearing Turbochargers

Thanks to single-cartridge, dual ball-bearing technology, Garrett® turbochargers generate far less frictional drag and are 10 times more durable than traditional journal-bearing turbochargers. New, efficient turbine stages deliver more power to your engine and allow ball bearing turbochargers to spool up faster than ever and have proven to be far more durable than journal bearing turbochargers.

Journal Bearings vs. Ball Bearings

For a long time, journal bearings have been the standard technology used within a turbocharger, dating from when turbochargers were mainly used in diesel trucks. In the last few decades, turbochargers are being used with increasing frequency within passenger cars, which operate over a longer rpm range and use smaller petrol motors. To address the needs of the modern automobile, ball-bearing cartridges were designed to improve turbocharger response. Expensive at first, it is now an affordable technology advancement that provides significant performance improvements to the turbocharger.

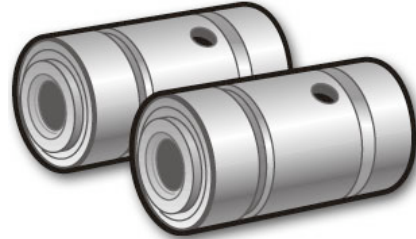


The ball bearing cartridge design is a single sleeve system that contains a set of angular contact ball bearings on either end, whereas the traditional bearing system contains a set of journal bearings and a thrust bearing.

Journal Bearing



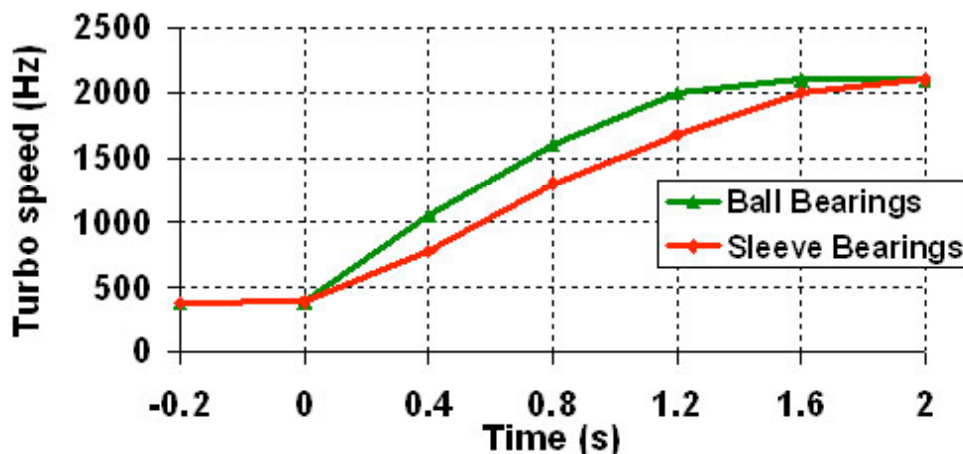
Ball Bearing



Turbo Response

When driving a vehicle with the cartridge ball bearing turbocharger, you will find exceptionally crisp and strong throttle response. Ball bearing turbochargers spool up 15% faster than traditional journal bearings. This produces an improved response that can be converted to quicker 0-60 mph speed. And many AVO turbocharger users agree, with some feeling that it feels like they are driving a big, normally aspirated engine thanks to the incredible increase in response and the linear delivery of power.

Speed response when throttle is suddenly opened
at 2000 rpm (2 litre S.I engine)



Reduced Oil Flow

The ball bearing design reduces the required amount of oil required to provide adequate lubrication. This lower oil volume reduces the chance for seal leakage. Also, the ball bearing is more tolerant of marginal lube conditions, and diminishes the possibility of turbocharger failure on engine shut down.

Improved Rotor Dynamics and Durability

Ball-bearing cartridges offer much better damping and control over shaft motion, allowing enhanced reliability for both everyday and extreme driving conditions. Too much shaft motion can lead to an early failure of the turbocharger, and is a leading cause of early failure with journal bearing turbochargers. In addition, the opposed angular contact bearing cartridge eliminates the need for the thrust bearing - commonly a weak link in the turbo bearing system.

Water Cooling

Following a hot shutdown of a turbocharger, heat soak begins. This means that the heat radiating off the hot engine head, exhaust manifold, and turbine housing finds its way to the center housing of the turbo, raising its temperature. Extreme temperatures in the center housing can result in oil coking, another cause of turbocharger failure.



To minimize the effects of heat soak-back, AVO only uses water-cooled turbo center housings.

These use coolant from the engine to act as a heat sink after engine shutdown, preventing the oil from coking. The water lines utilize a thermal siphon effect to reduce the peak heat soak-back temperatures after you turn the car off. Please take care with the layout of the pipes, which should minimize peaks and troughs with the (cool) water inlet on the low side.

Wastegate & Turbo Housings

AVO Edge Series Turbochargers are designed from scratch, so that we could eliminate the inherent design flaws of the factory turbocharger. 1 of the biggest flaws is the small internal wastegate on the factory design. We engineered in an extra-large internal wastegate. This has the advantage of keeping the system looking as stock as possible, bolting up to the car like the factory unit, but without the factory faults. The AVO turbine housing is designed for maximum flow within an internally wastegated housing, as we run the largest wastegate swing valve possible to eliminate chances of boost creep in high horse power engines. The quality of the AVO turbine housing is far above the rest with thousands of hours invested into R&D to insure our turbo housing performance. We only use the highest quality, high-temperature casting, which are machined on a 5-axis CNC machine to insure we maintain the precise tolerances necessary for maximum performance and reliability.



Turbine A/R

What is A/R? A/R is Air/Ratio, the internal area size of a turbocharger housing or compressor. Turbine performance is greatly affected by the A/R of the housing, as it is used to adjust the flow capacity of the turbine. Using a smaller A/R will increase the exhaust gas velocity into the turbine wheel. This provides increased turbine power at lower engine speeds, resulting in a quicker boost rise. However, a small A/R also causes the flow to enter the wheel more tangentially, which reduces the ultimate flow capacity of the turbine wheel. This will tend to increase exhaust backpressure and hence reduce the engine's ability to "breathe" effectively at high RPM, adversely affecting peak engine power.

Conversely, using a larger A/R will lower exhaust gas velocity, and delay boost rise. The flow in a larger A/R housing enters the wheel in a more radial fashion, increasing the wheel's effective flow capacity, resulting in lower backpressure and better power at higher engine speeds.

When deciding between A/R options, be realistic with the intended vehicle use and use the A/R to bias the performance toward the desired powerband characteristic. This is why we offer a range of turbocharger options, so you can find the perfect match for your horsepower goals.

Compressor Covers

AVO Compressor covers are specially designed for maximum flow and response. In our quest for maximum performance and reliability, we only use the highest quality castings and finish off our covers with 5-axis CNC machining to maintain the precision necessary for a high performance

Compressor A/R

While compressor performance is not as sensitive to changes in A/R, they do still have some influence on performance. We have made sure to create the best size for optimal performance



Actuator

An AVO adjustable boost actuator gives the AVO turbo with a more controlled boost response while ensuring boost is maintained at a preset PSI level, resulting in increased torque and hp. The AVO actuator delivers constant boost all the way to redline and beyond. As an extremely safe, reliable and effective means of raising your boost level, the actuator comes with a minimum spring pressures of 15 psi and is adjustable for higher boost levels.



Testing

AVO believes in testing their turbochargers under all possible conditions that our customers may use them in, from the street to the circuit. From the engine dyno to endurance racing, we don't leave anything to chance.

