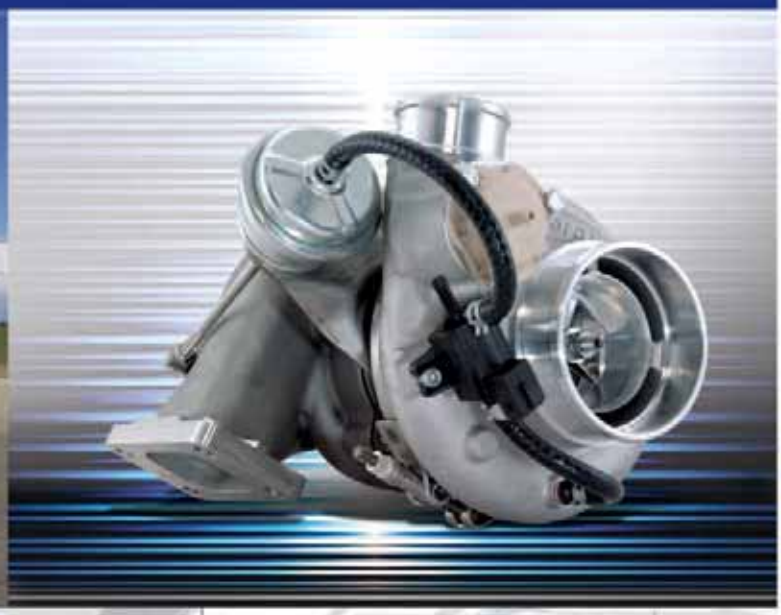
Performance Turbocharger Catalog



2011 Edition

BorgWarner
Turbo Systems

About BorgWarner

Turbo Systems

For over 100 years, BorgWarner has exhibited their commitment to the automotive industry and motorsports through the momentum of their technological advances. In the late 1990's, BorgWarner took the step of becoming a pacesetter in leading turbo technologies. In October of 1998, BorgWarner, Inc. purchased 100% of the net assets of German turbocharger and turbo machinery manufacturer, AG Kühnle, Kopp & Kausch renaming it 3K-Warner Turbosystems. In March of the following year BorgWarner acquired Kuhlman Corporation in order to gain access to Schwitzer, Inc., which was a leading manufacturer of turbochargers for commercial transportation and industrial equipment. Since the integration of 3K-Warner Turbosystems and Schwitzer, BorgWarner Turbo Systems continues to set new technological standards in the field of engine boosting.

BorgWarner Turbo Systems provides customers worldwide with a comprehensive range of 3K and Schwitzer replacement turbochargers and spare parts.

LOUIS SCHWITZER
-Automotive Hall of Fame

Fast forward to the new millennium and BorgWarner Turbo Systems has become a well positioned player in the engine boosting arena, with development centers, production sites and sales offices throughout the world. In keeping with our maxim "Local Power—Global Strengths" we use all of the resources and talents available within our worldwide organization to surpass the needs of our customers. To ensure that our sites work efficiently across the world, we have standardized vital processes and best practice methods, without compromising location-specific flexibility and autonomy. Our goal is to continually offer you solutions that are perfectly tailored to meet the specific requirements of you and your market.

Table of Contents

Commitment to Performance....4
Trophy History....5
Technology & Innovation....6-7
Race Sponsorships....8-9
Match-Bot Instructional....10-11
About EFR....12-13
EFR 6255....14
EFR 6258....15-16
EFR 6758....17-18
EFR 7064....19-21
EFR 7670....22-24
EFR 8374....25-27
EFR 9180....28-29
EFR Ancillary Parts....30-31
Intro to AirWerks....32
S1BG....33
S200....34
S200SX....35
S300SX3....36-37
S300GX....38
About S400SX....39
S400SX3....40
S400SX4....41-42
S510....43
BV50 (997 Turbo Upgrade)....44
K26....45
K27-3072....46
K29-3775....47
K03-2074 (JCW Mini upgrade)....48
K03-2080 (Audi A4 upgrade)....49
K04-2075 (Audi upgrade)....50-51
K04-2283 (Audi upgrade)....52
K16 (Volvo upgrade)....53
Warranty Statement....54

World Headquarters: Kircheimbolanden, Germany

Commitment to performance

AirWerks is an independent aftermarket program from BorgWarner Turbo Systems. This venture is focused on creating exceptionally high engine performance through forced induction technology. Why do the world's most prominent auto manufacturers select products from BorgWarner Turbo Systems? Simply put, we are the world leader in turbos for high speed, high temperature gasoline engines. The BorgWarner Turbo Systems performance line features an assortment of carefully chosen K and S series turbochargers and the EFR series to meet a wide array of high-performance engine requirements. These turbos will be steadily improved based on the latest findings in aerodynamic and materials technology.

Audi 90 (Quatro) GTO was one of the most technologically advanced four-door race cars to ever hit the tracks. The 1988 Trans Am Manufacturer's champion was banned from the 1989 season due to its dominance. Boost was provided by a single BW K-series turbocharger.

Innovation, a fruit of competition

Racing has long been known as a fertile research and development arena and proving ground for new technology. BorgWarner takes full advantage of its rich racing heritage using some of the same materials and aerodynamic techniques that produced boost for winning cars, elevating and incorporating it into the hardware available through BorgWarner Turbo Systems. Partnerships fostered at the track can create alignment and uncommon results, in the marketplace.

BorgWarner

Trophy History

BorgWarner Indianapolis 500 Trophy, synonymous with top performance, speed and leading-edge automotive technology

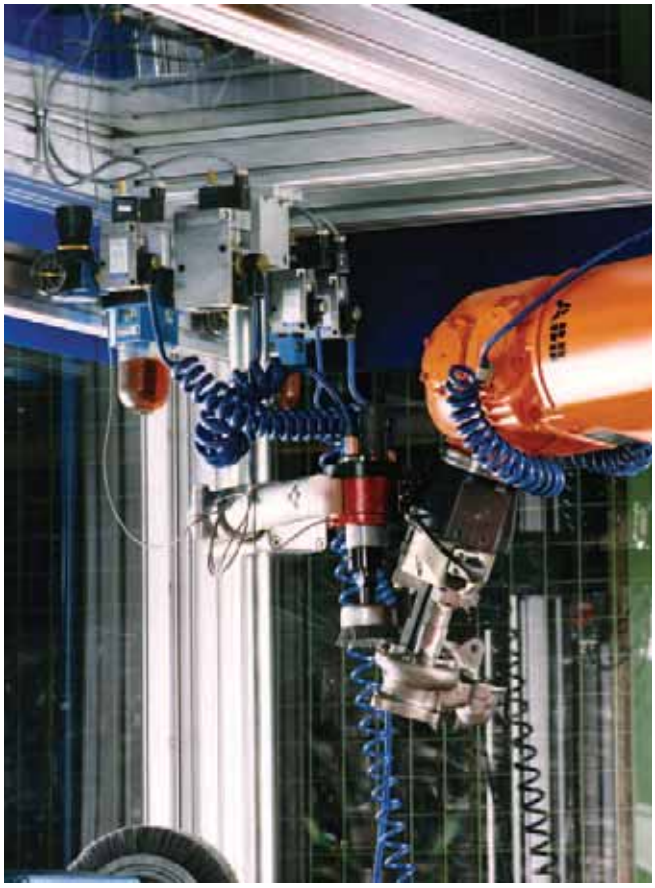
In 1936, Eddie Rickenbacker of the Indianapolis Speedway unveiled the BorgWarner Trophy and officially announced it as the prize for the champions of the Indy 500.

Commissioned by The BorgWarner Automotive Company in 1935, the trophy is made of sterling silver standing over 5 feet and weighing nearly 155 pounds. The Trophy bears the likeness of every driver that has won the Indy 500 since 1911 along with their victory date, and average speed in a checkerboard pattern.

Today the trophy is housed in the Hall of Fame Museum at the Indianapolis Motor Speedway. Each May, the Borg-Warner Trophy is featured at a number of Indianapolis 500 events, including the drivers' meeting at the track and the 500 Festival Parade in downtown Indianapolis, both on the day before the race. Immediately after each race, the trophy is hoisted into Victory Circle with the winning car and driver for photographs. The first Indy 500 champion that accepted the trophy, Louis Meyer shortly after receiving it said, "Winning the BorgWarner Trophy is like winning an Olympic medal."

Innovation, speed, flexibility, quality and a customer focus are the yardsticks by which our customers measure us. We therefore not only explore new avenues in technological development – we also seek ways to further improve cooperation with our customers in product development, manufacturing and quality assurance. Yet the fast exchange of the latest product data with the customer is also becoming increasingly important in setting up optimum processes. From the very start of development, we involve people from design, production, purchasing and quality assurance to save time and money and ensure that the turbocharging systems we supply meet proven serial production quality in terms of reliability and performance right from start of production.

The latest generations of compressor and turbine stages assure optimum thermodynamic results. With the further development of materials and processing methods – such as forged milled compressor wheels – we not only optimize performance, but also enhance durability and reliability of our turbocharging systems.



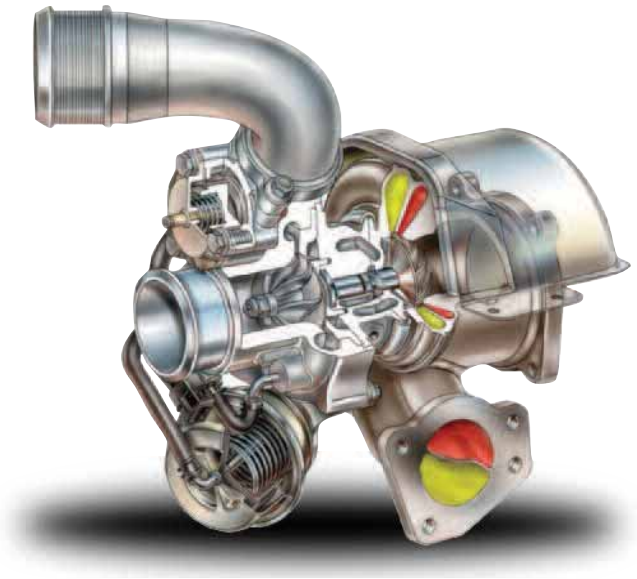
Extended Tip Technology

Select BorgWarner turbochargers employ BorgWarner "S" generation compressor wheels that incorporate extended tip technology. This compressor wheel design feature promotes greater airflow using a low inertia wheel that performs like a wheel of greater size and mass. Extended tip technology enables the user to have faster spool-up at lower engine speeds while providing the boost for the powerful top-end performance that most turbocharger enthusiasts have come to desire. Turbochargers have to meet different requirements with regard to map height, map width, efficiency characteristics, moment of inertia of the rotor and conditions of use. New compressor and turbine types are continually being developed for various engine applications with compressor wheels having an increased influence on the engines operational characteristics. These wheels are designed using computer programs that develop a three-dimensional calculation of the air flow and pressure.

The twin scroll turbocharger generates higher boost pressure at low revs

Twin scroll technology produces results similar to twin-turbo applications but in a smaller package with lower weight and cost. In turbochargers of this type, the channels between the exhaust manifold and turbocharger of the first and fourth as well as the second and third cylinders are separated from each other. The exhaust gas streams are directed into so-called scrolls (spirals) and then reunited again directly at the turbine wheel. Separating the streams in this way offers improved performance.

With this type of charging, spontaneous boost pressure can be built up 500 RPMs earlier, which significantly improves response in the low rev band. The engineers at BorgWarner have also mastered the problem of high exhaust gas temperature in gasoline engine turbocharging – despite the genuine challenge presented by such a compact turbine casing with two scrolls. One approach employed by the engineers here was to develop a new downsizing method of casting turbine housings to improve their temperature resistance and guarantee the quality needed. The benefits of the twin scroll turbocharging technology and other market-leading technologies by BorgWarner Turbo Systems offer passenger vehicles, dynamic performance, low fuel consumption and lower CO2 emissions.



BorgWarner

Race Sponsorships

Team: Mike Ryan Motorsports
Driver: Mike Ryan
Vehicle: Freightliner
Racing Venue: Pikes Peak International Hill Climb
Current Turbo(s) of choice: Compound S410GX & S510SX

Team: Stuckey Racing
Driver: Phillip Palmer
Vehicle: Dodge 5.9
Racing Venue: NHDRA
Current Turbo(s) of choice: Compound S400SX & S500SX

Team: Kiggly Racing
Driver: Kevin Kwiatkowski
Vehicle: 1991 Plymouth Laser FWD
Racing Venue: Drag Racing
Current Turbo(s) of choice: Single S400SX

Team: Sierra/Sierra Enterprises
Driver: Dave Empringham
Vehicle: Mitsubishi Evo
Racing Venue: Redline Time Attack
Current Turbo(s) of choice: EFR-8374D

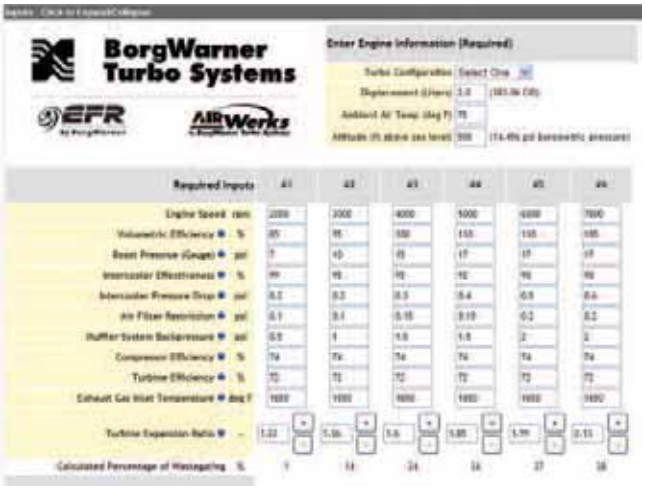
Team: Osofast Racing
Driver: Brent Rau
Vehicle: Mitsubishi Eclipse
Racing Venue: Drag Racing
Current Turbo(s) of choice: Single S400SX

Driver: Jeremy McElrath
Vehicle: 1998 Ford Mustang
Racing Venue: ORSCA & PTRA
Current Turbo(s) of choice: Twin S500SX

Team: Seth-Hunter Racing
Driver: Greg Seth-Hunter
Vehicle: Chevy Nova
Racing Venue: PSCA
Current Turbo(s) of choice: Twin S500SX

BorgWarner

Match-Bot Instructional



The team at BorgWarner has developed an interactive turbo matching program that is internet based. Called Match-Bot, the first step is to enter the engine input data. For each piece of input data, helpful pop-up's are provided. These helpful tips guide the user through entering appropriate engine targets by means of giving example ranges of numbers. Parameters such as BSFC, VE, and exhaust gas temperature is often difficult for the user to estimate, but helpful suggestions are offered each step of the way.

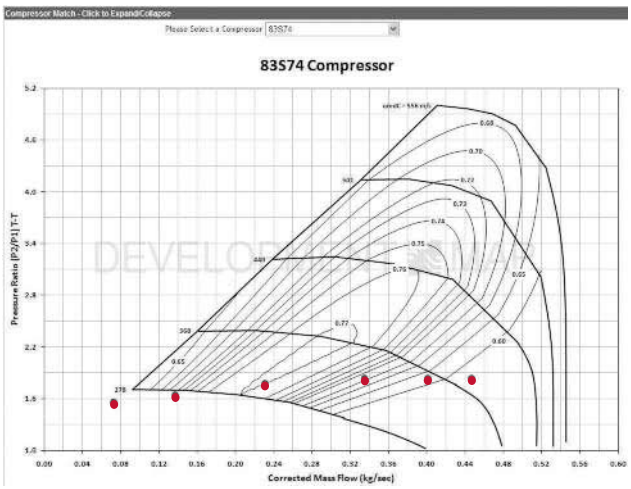
Calculated Outputs

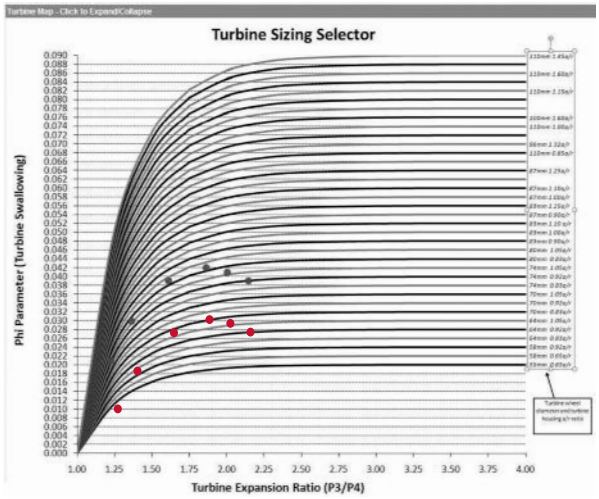
		#1	#2	#3	#4	#5	#6
Compressor Pressure Ratio	\	1.5	1.71	2.07	2.22	2.23	2.23
Compressor Outlet Temp	deg F	163.19	193.68	240.33	257.73	259.03	259.84
Intake Manifold Air Temp	def G	75.88	80.93	83.27	89.62	93.4	93.48
Intake Manifold Air Density	lb/in3	0.000063	0.000071	0.000085	0.000089	0.000089	0.000089
Density Ratio (Intercooled)	\	1.48	1.67	2.01	2.12	2.1	2.1
Actual Flow Rate (Not Corrected)	lb/min	9.74	18.44	31.04	45.05	53.69	59.78
Actual Flow Rate (Not Corrected)	cfm	141.24	267.37	450.03	653.17	778.45	866.78
Correct Air Flow Rate	lb/min	9.83	18.61	31.43	45.62	54.55	60.75
Correct Air Flow Rate	kg/sec	0.074	0.14	0.237	0.344	0.412	0.459
Correct Air Flow Rate	kg/hr	267	506	854	1240	1483	1651
Correct Air Flow Rate	m3/sec	0.067	0.127	0.215	0.312	0.373	0.416
1/BSAC	hp-min/lb	9.4	9.4	9.4	9.4	9.3	9.3
Turbo Shaft Power	Hp	4.9	12.49	29.98	46.97	56.38	63.05
Engine Power	Hp	92.4	174.9	294.4	427.3	509.3	567.1
Torque	lb-ft	242.64	306.22	386.57	448.85	445.78	425.46
Fuel Requirement	lb/hr	50.8	96.2	161.9	25	280.1	311.9
		TURBINE MATCH OUTPUTS					
Exhaust Manifold Pressure	psi	3.8	6.6	11.1	15.1	18.3	20.6
Engine Delta Pressure (dP)	psi	3	3	4	2	-1	-4
Turbine Swallowing Parameter	PHI	0.021	0.03	0.039	0.042	0.041	0.039
Turbine Corrected Flow @ 59F	lb/min	14.9	21.6	27.9	30.1	29.4	28.2
Is the Wastegate Flow Choked	\	No	No	No	No	Yes	Yes
Wastegate Flow Area @ CF=0.8	in2	0.06	0.36	0.7	1.39	1.88	2.26
Port Diameter Requirement	mm	7	17	24	34	39	43

Text-Based Output is Provided as Well as Graphical Mapping

Match-Bot Instructional

The Match-Bot interactive tool can be found at www.borgwarnerboosted.com





The user's operating points are interactively plotted onto any chosen compressor map.

Turbine matching is also performed. The user dials in the match until all the points land on a single turbine curve (the user's example above is not completed yet since the points towards the right droop below the line).

An Equation for Engine Boosting Excellence

The EFR line of turbos was born out of an internal BorgWarner Turbo Systems program labeled Advanced Aftermarket Products or AAP. So, the first thing you might be wondering is what does a new product line of high-performance turbochargers have to do with commercial applications? Commercial/industrial turbo products have extreme requirements for durability, reliability, and aerodynamic performance. Since modern passenger car applications use turbos smaller than 55mm in turbine wheel diameter, it's the aerodynamic development from the commercial side of the business (i.e. everything larger) that feeds into what the performance enthusiast wants and needs for big power production. Boost pressures of 45-50 psi (3 bar+) are the norm, not the exception. Also required is resistance to abusive thrust loads, high vibrations, and robustness for a wide range of lubrication conditions. Additionally, our commercial product validation standards are among the highest in the engine boosting industry – all good things that also benefit the performance enthusiast or racer. Those are the commonalities, now here are the differences. Unlike commercial applications, high performance users want lightweight, compact, versatile designs. They also deliver the turbocharger very high exhaust gas temperatures and have high expectations for fast response. They also place value in cosmetic appearance and want integrated features that aid the installation process and remove the need for other turbo related accessories. Those performance and packaging requirements are quite common among the modern aftermarket passenger car turbo customer.

So, what happens when you tie together all those necessities and put them in front of passionate car people looking to advance the pace of aftermarket boosting solutions? There is a discovery that something new is needed in order to meet the needs of the next generation turbo consumer. There is the need for an "it" that really changes the game or raises the bar or whatever other metaphor you care to use.

Under the product leadership of Brock Fraser, Director, Global Commercial Diesel Application Engineering, a team was assembled and the project began with the proverbial clean-sheet of paper. No legacy products, no preconceived notions of what a turbo could or could not have; no restrictions. The aerodynamics for the product line were selected using a range of optimized combinations that would give users turbo solutions anywhere between 250 and 1000 horsepower capability per turbo. Next, a list of every notable design characteristic for an engine boosting device was tabled. Specific interest was given to new ideas that had never been formed in metal or had never been combined into an aftermarket turbo. Ninety-five percent of the input "stuck" with only the truly exotic being excluded as those elements that would take too long to develop. Moreover, the turbo would be so expensive that the average performance enthusiast who wanted to buy the product could not afford it!

Rugged Commercial Turbo DNA + **Leading Edge Passenger Car Technology** + **Passion for Imagination and High Expectations**

=

Advanced Aftermarket Products or AAP

After the AAP program took shape, the concept was presented to members of the BorgWarner senior management team. It didn't take long for them to embrace the vision of giving the performance aftermarket something truly remarkable. Management's approval to proceed with our mission led to one of the most aggressive new program introductions in the history of BorgWarner's independent aftermarket. Weeks and months of product development would bring forth a creation that would set a new standard in the performance aftermarket.

The result is the new EFR (Engineered for Racing) line of turbos from BorgWarner. These turbos contain a bevy of key attributes such as Gamma-Ti turbine wheels, dual ceramic ball bearing cartridges and investment cast stainless steel turbine housings. Collectively, those features help give the EFR line its innovative appeal and will provide a breakthrough experience in durability, device responsiveness and installer/user satisfaction.

EFR Series

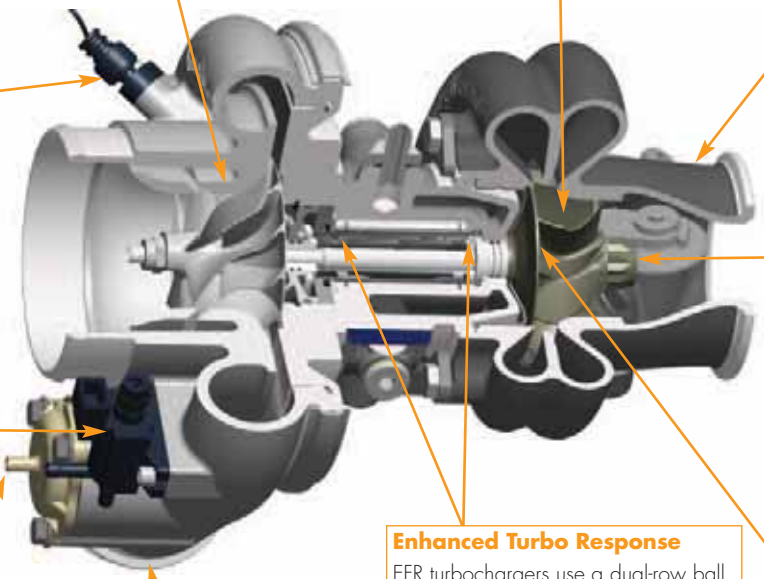
A Look Inside

Forged Milled Compressor Wheels (FMW)
EFR turbos contain wheels that are fully milled from forged aluminum, commonly known as "billet". Cut from custom forgings, their strength exceeds that which is available from typical bar-stock and also exceeds the material properties of an aluminum casting.

Gamma-Ti Turbine Wheel & Shaft
Gamma-Ti turbine wheel cuts turbine inertia by roughly 50% dramatically improving turbo response. Turbine sizes range from 55 to 80mm in exducer diameter.

Heat Resistant Turbine Housings
Investment cast stainless steel turbine housings improve durability and offer an extremely smooth internal flow channel. Turbine housings have thin walls to reduce weight and thermal inertia.

Sensor Mounting Convenience
Speed sensor mounting provisions are also supplied on every compressor cover. Speed sensors are sold separately.



High Flow Wastegates
Purpose designed large wastegate ports give the wastegated EFR turbos the capability of handling the flow requirements of high performance applications.

Boost Control Solenoid Valve (BCSV)
A boost control solenoid is included with every EFR turbo.

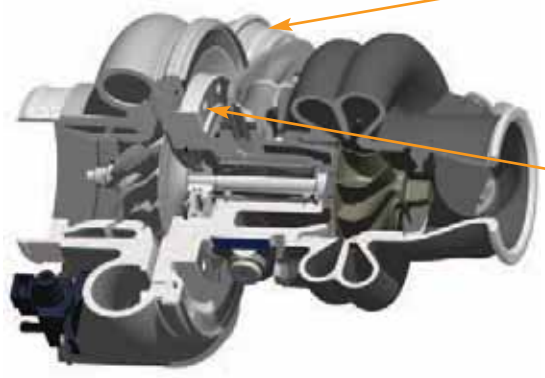
High Turbine Efficiency
The EFR turbine wheels have the characteristic of very high efficiencies and have been paired with our "Superback" and "Fullback" back-disk shapes. The Superback shape adds a curved profile to the backdisk and has the effect of lowering centrifugal stress and permitting higher rotational speeds.

Enhanced Turbo Response
EFR turbochargers use a dual-row ball bearing cartridge with ceramic balls and metal cage. This bearing system provides substantial friction reduction at low turbo speeds and in the process helps improve turbo response.

Simplified Installation
Integrated compressor recirculation valve (CRV) to help avoid compressor surge and backflow during a throttle lift event. This feature helps to simplify the installation task and lowers overall system install cost.

Flexible Compressor Cover
The EFR turbo "large" cover has a dual-machined outlet, both for a hose connection and a v-band connection.

Adjustable Wastegate
The fabrication and installation task is simplified with wastegated EFR models that feature adjustable wastegates available in three different canister sizes.



Ease of Orientation
Turbo orientation flexibility is facilitated by the wastegate bracket to bearing housing mounting arrangement.

EFR 6255

200 - 350 HP Turbo

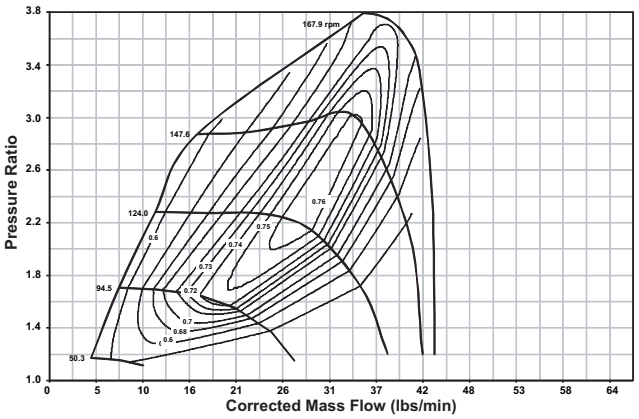
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T25 mounting flange

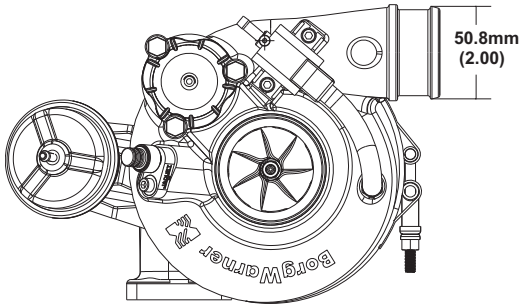
Not included with turbo assemblies:

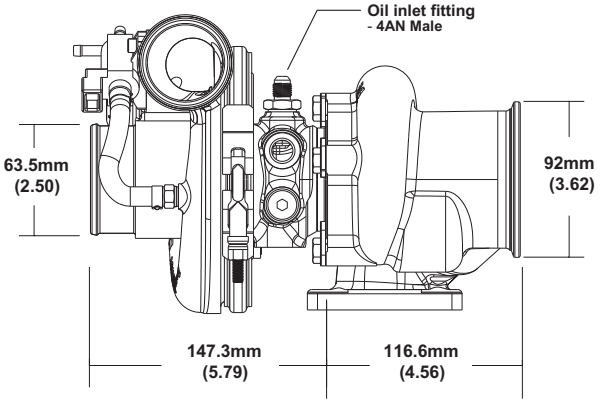
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

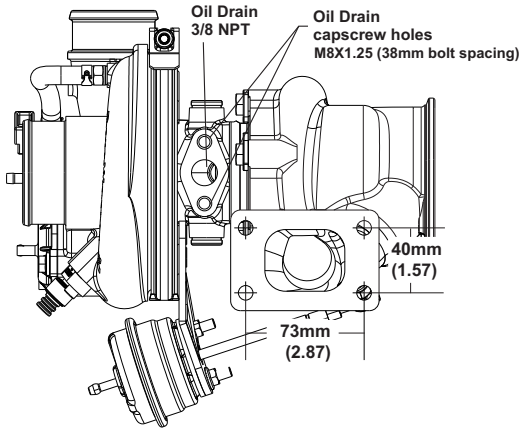
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
11581009007	0.64	T25	Single Scroll WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179149	B1	179139	62	49	55	.64	T25

EFR 6258

225 - 400 HP Turbo

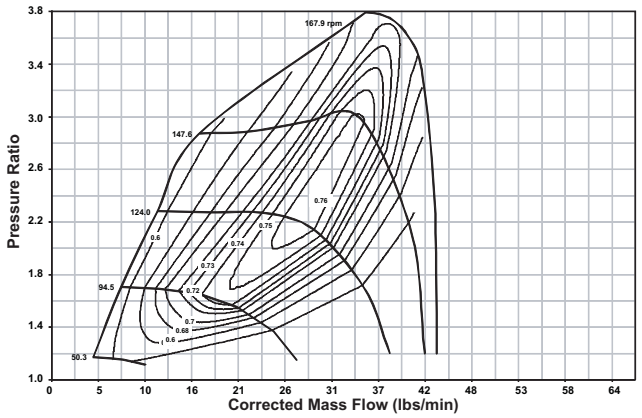
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T25 mounting flange

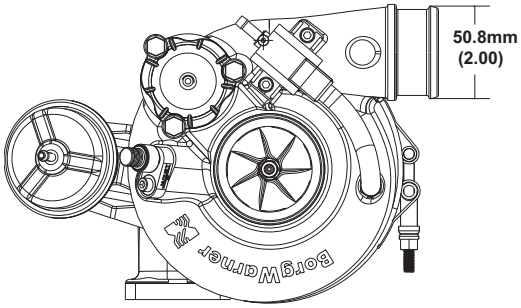
Not included with turbo assemblies:

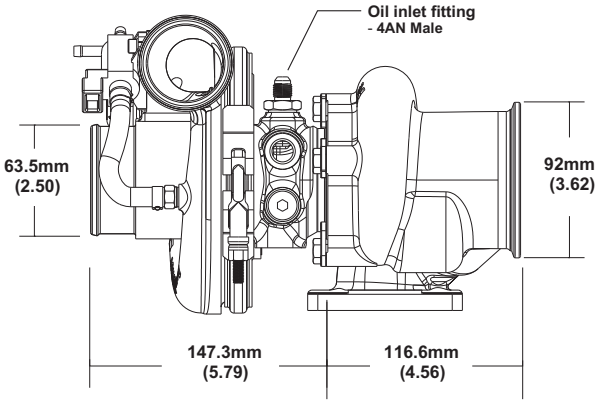
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

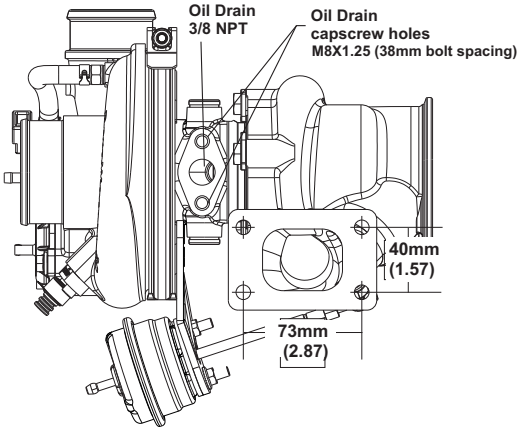
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

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Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
11581009006	0.64	T25	Single Scroll WG
11581009007	0.92	T4	Twin Scroll WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179150	B1	179140	62	49	58	.64	T25

EFR 6258

225 - 400 HP Turbo

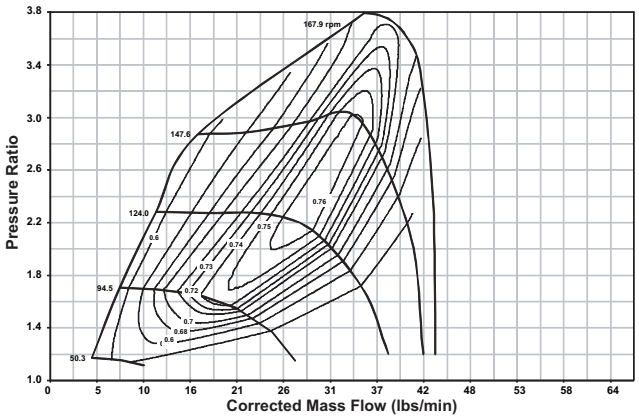
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

Not included with turbo assemblies:

- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

Compressor Map



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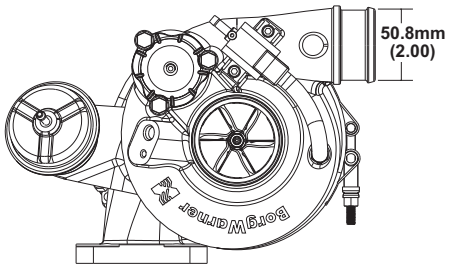

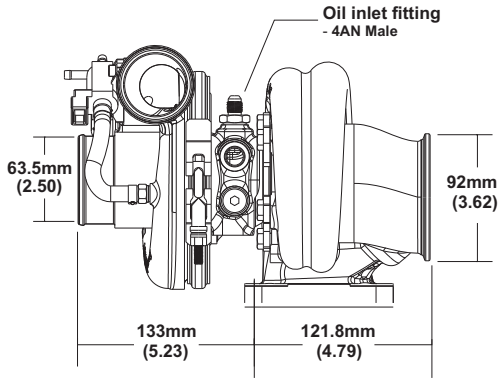

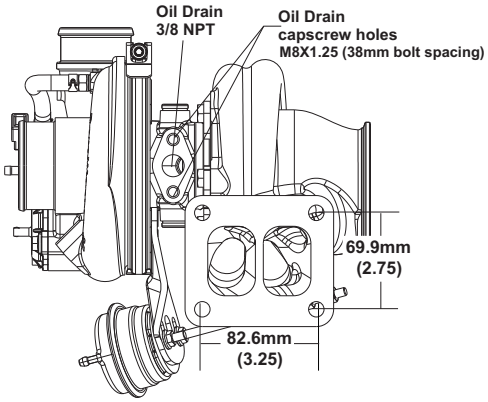

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11581009007	0.92	T4	Twin Scroll WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179359	B1	179140	62	49	58	.92	T4

EFR 6758

275 - 450 HP Turbo

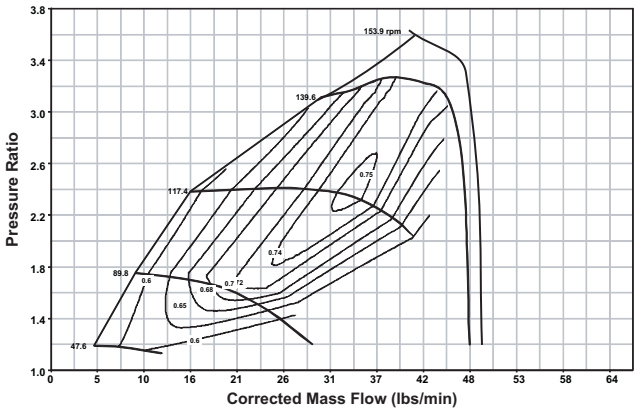
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T25 mounting flange

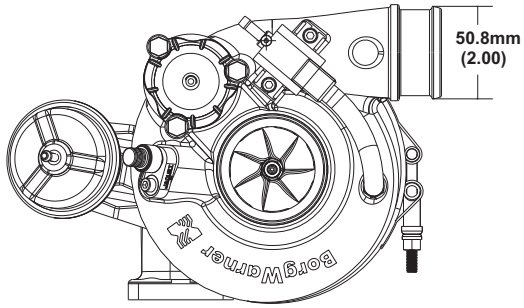
Not included with turbo assemblies:

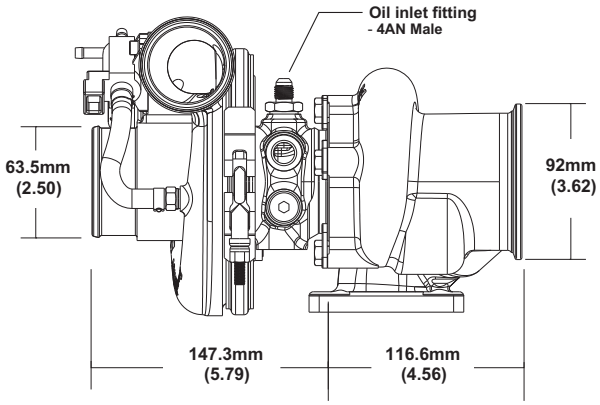
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

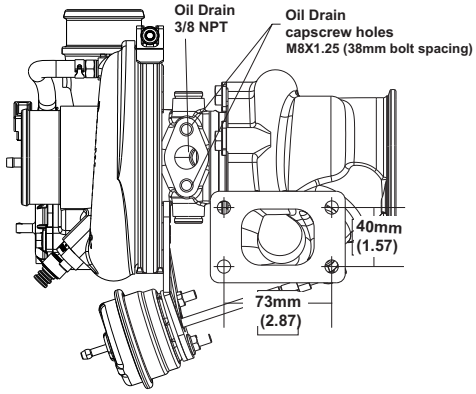
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
11581009006	0.64	T25	Single Scroll WG
11581009007	0.92	T4	Twin Scroll WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179388	B1	179375	67	54	58	.64	T25

EFR 6758

275 - 450 HP Turbo

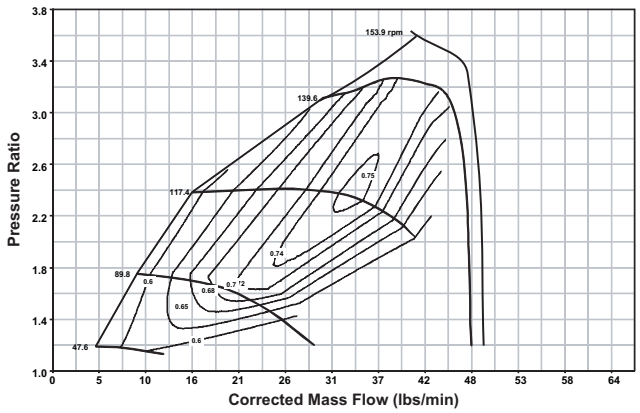
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

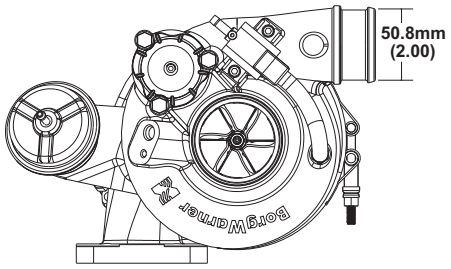
Not included with turbo assemblies:

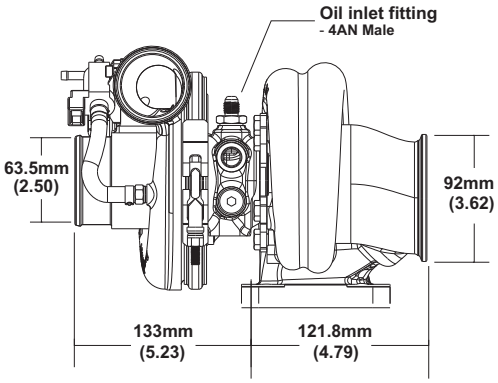
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

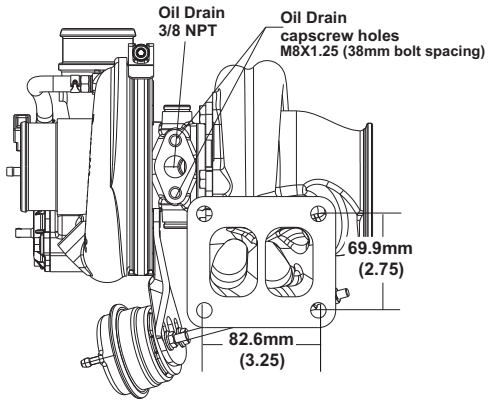
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
11581009006	0.64	T25	Single Scroll WG
11581009007	0.92	T4	Twin Scroll WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179374	B1	179375	67	54	58	.92	T4

EFR 7064

300 - 500 HP Turbo

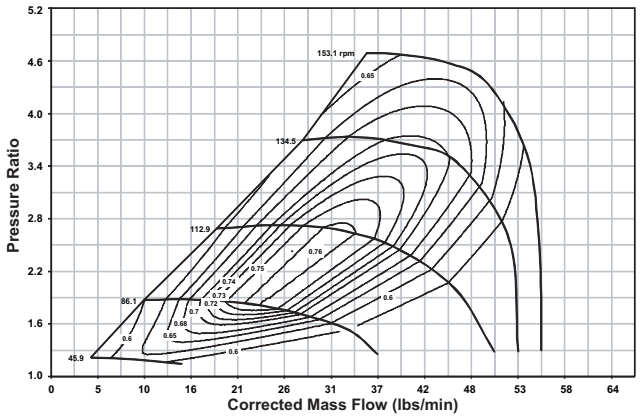
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T3 mounting flange

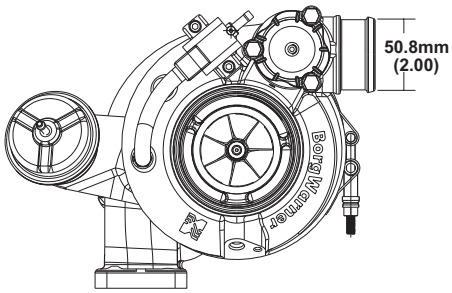
Not included with turbo assemblies:

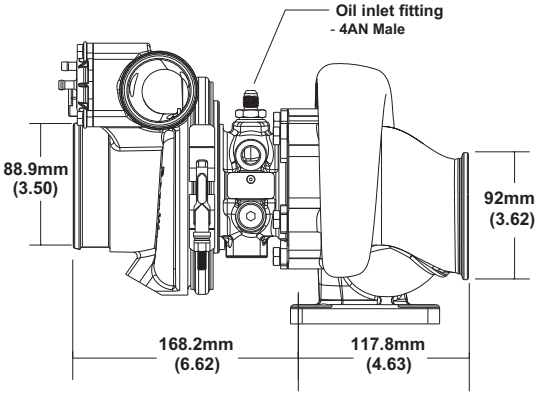
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

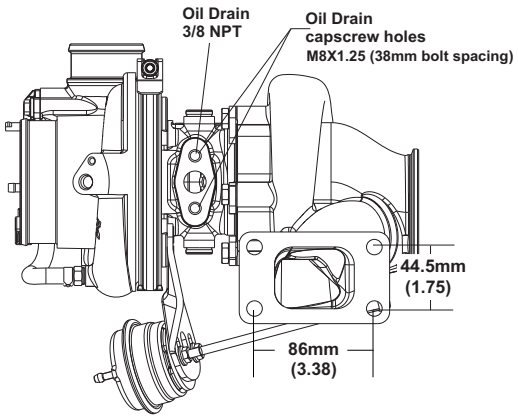
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12641008006	0.83	T3	Single Scroll WG
12641008007	0.92	T4	Twin Scroll WG
12641019016	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179355	B2	179354	70	52	64	.83	T3

EFR 7064

300 - 500 HP Turbo

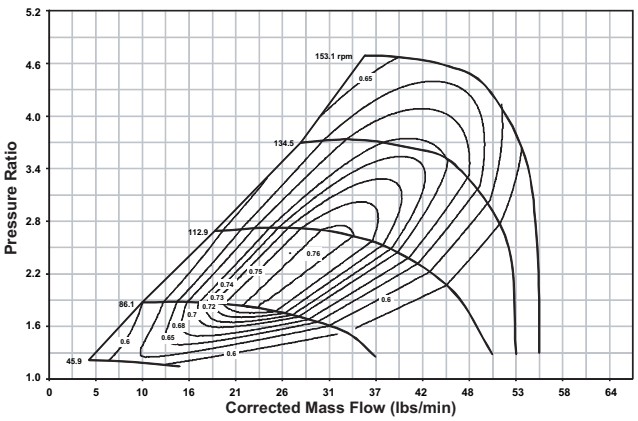
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

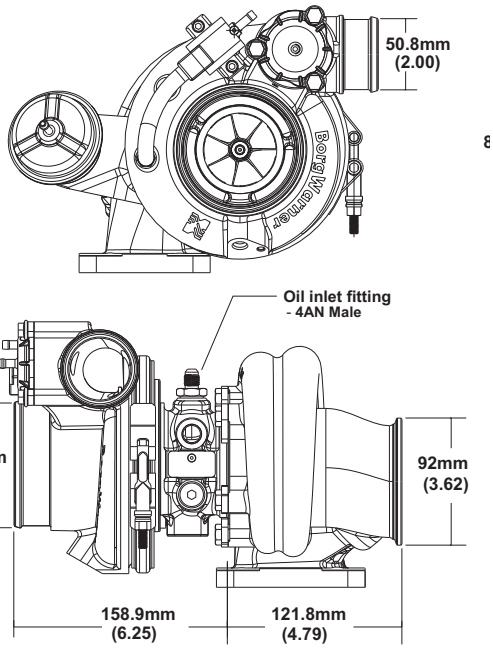
Not included with turbo assemblies:

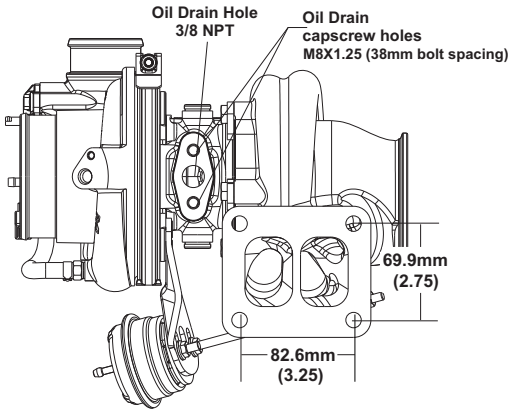
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

Compressor Map



Turbo Frame Dimensions





Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12641008006	0.83	T3	Single Scroll WG
12641008007	0.92	T4	Twin Scroll WG
12641019016	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179389	B2	179354	70	52	64	.92	T4

EFR 7064

300 - 500 HP Turbo

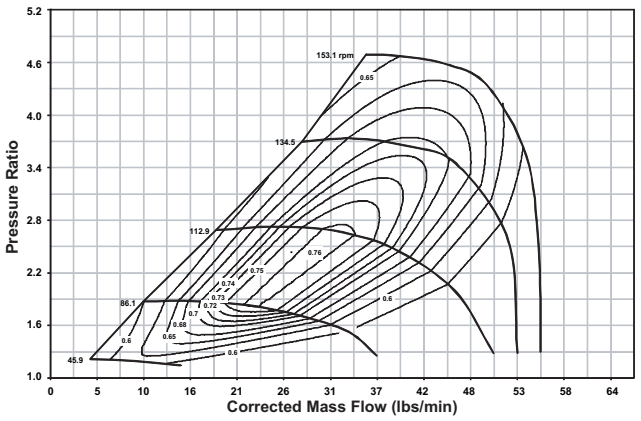
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

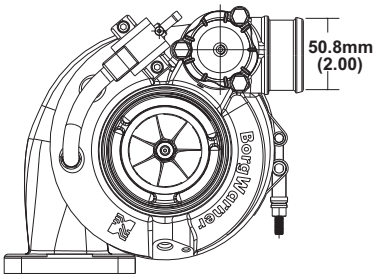
Not included with turbo assemblies:

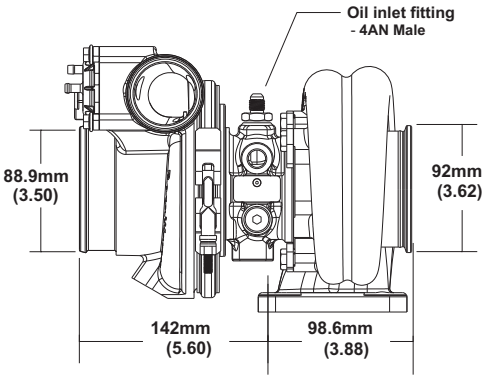
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

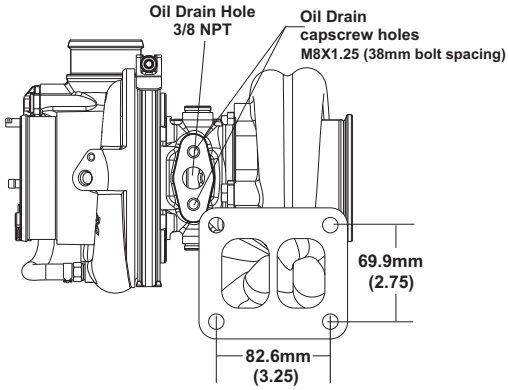
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12641008006	0.83	T3	Single Scroll WG
12641008007	0.92	T4	Twin Scroll WG
12641019016	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179391	B2	179354	70	52	64	1.05	T4

EFR 7670

375 - 600 HP Turbo

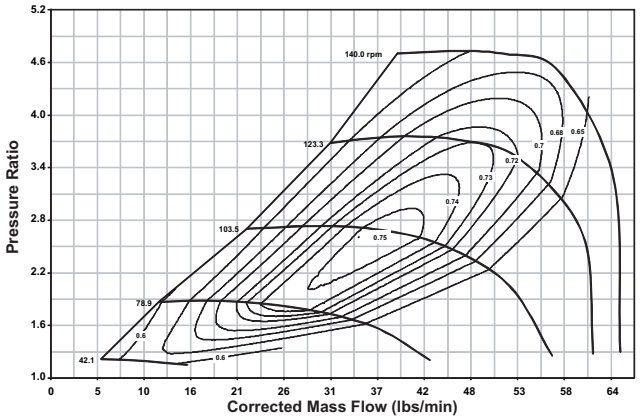
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T3 mounting flange

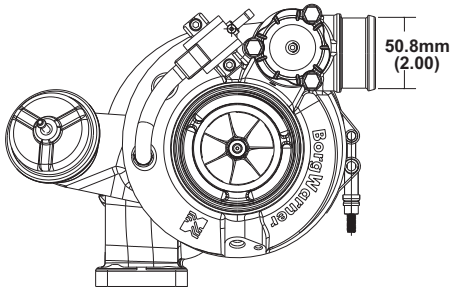
Not included with turbo assemblies:

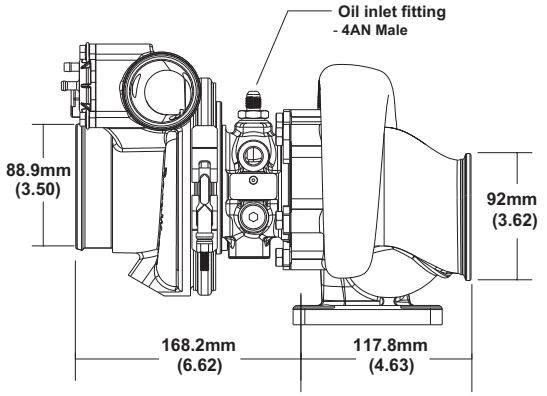
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

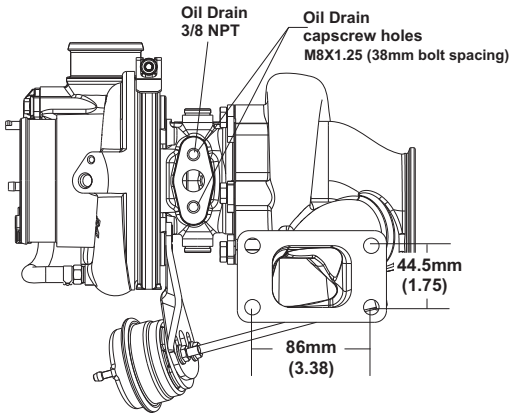
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12701008014	0.83	T3	Single Scroll WG
12701008016	0.92	T4	Twin Scroll WG
12701019047	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179351	B2	179350	76	57	70	.83	T3

EFR 7670

375 - 600 HP Turbo

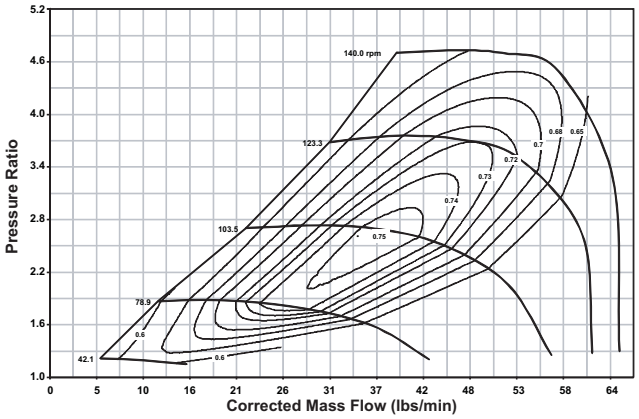
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

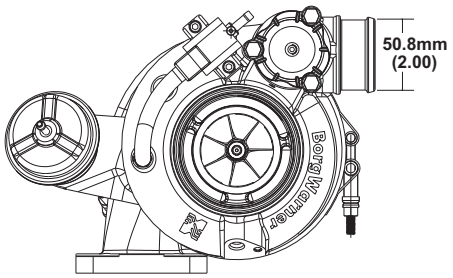
Not included with turbo assemblies:

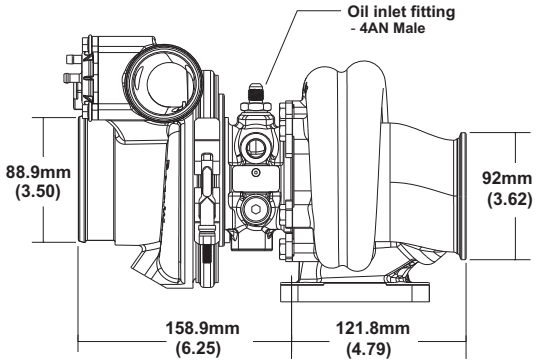
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

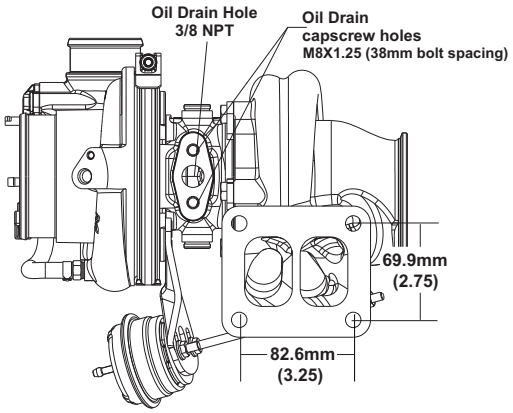
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12701008014	0.83	T3	Single Scroll WG
12701008016	0.92	T4	Twin Scroll WG
12701019047	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179390	B2	179350	76	57	70	.92	T4

EFR 7670

375 - 600 HP Turbo

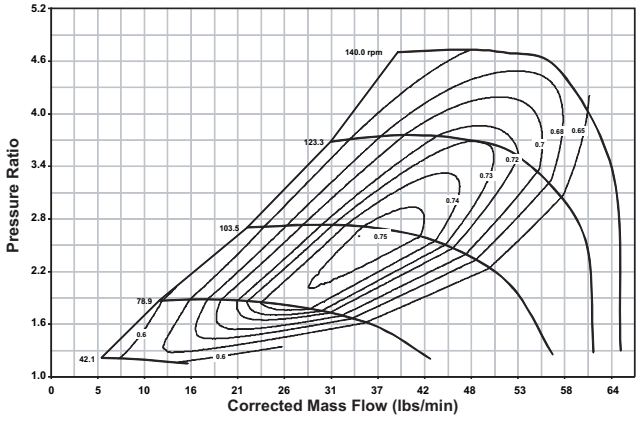
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

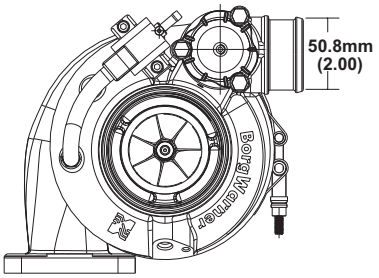
Not included with turbo assemblies:

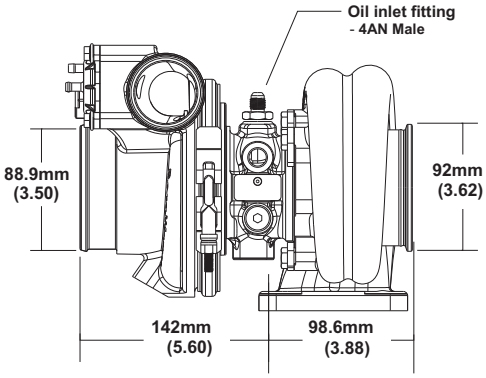
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

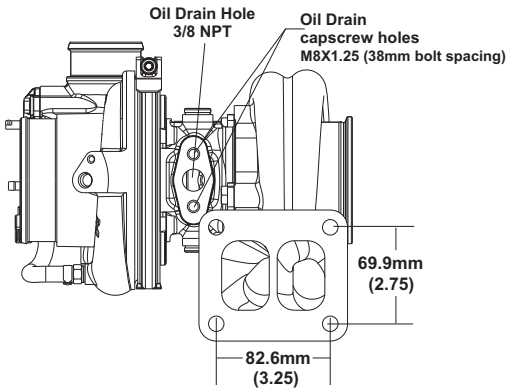
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12701008014	0.83	T3	Single Scroll WG
12701008016	0.92	T4	Twin Scroll WG
12701019047	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179392	B2	179350	76	57	70	1.05	T4

EFR 8374

475 - 750 HP Turbo

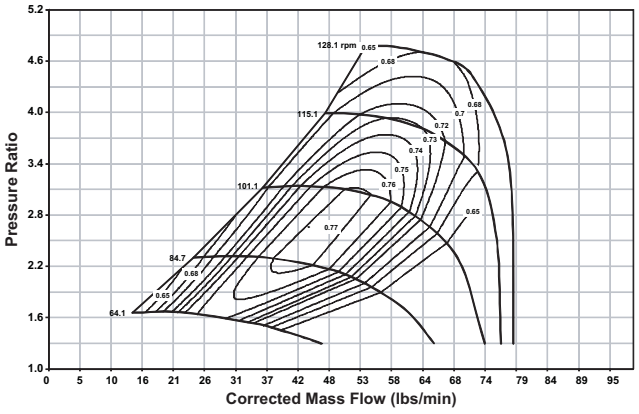
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T3 mounting flange

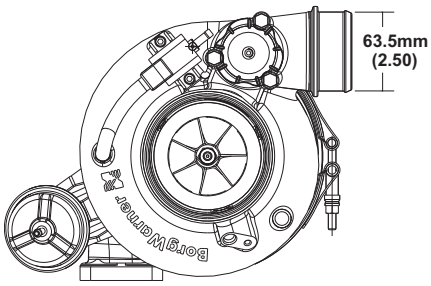
Not included with turbo assemblies:

- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

Compressor Map



Turbo Frame Dimensions



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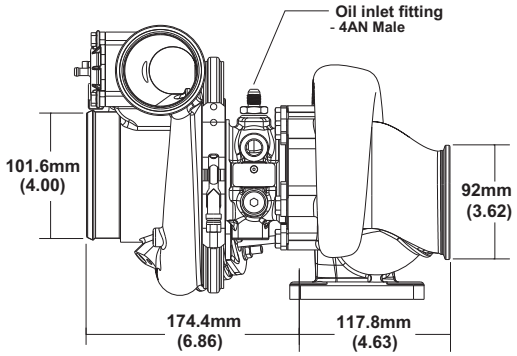
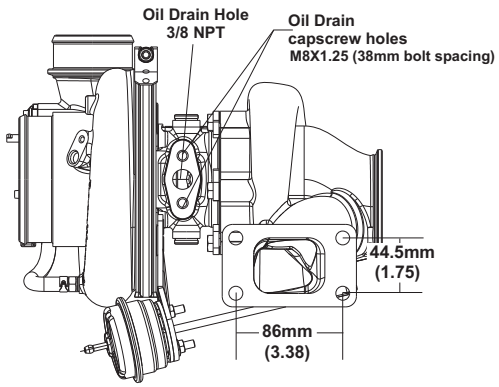




Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12741019002	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179258	B2	179257	83	62	74	.83	T3

EFR 8374

475 - 750 HP Turbo

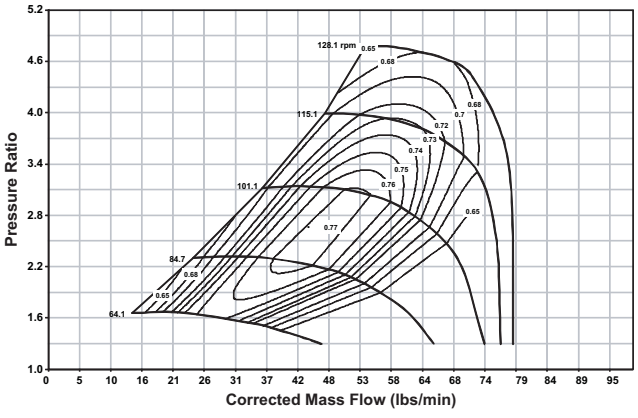
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

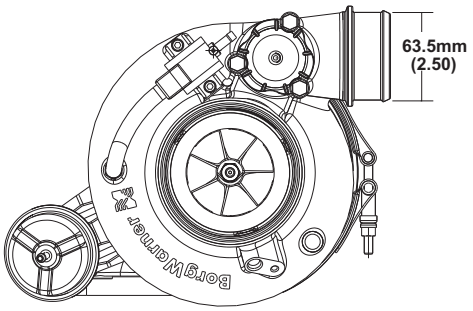
Not included with turbo assemblies:

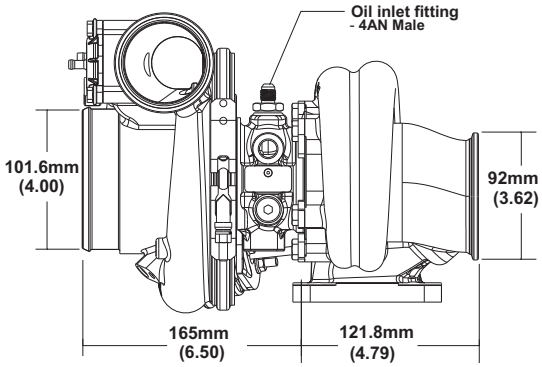
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

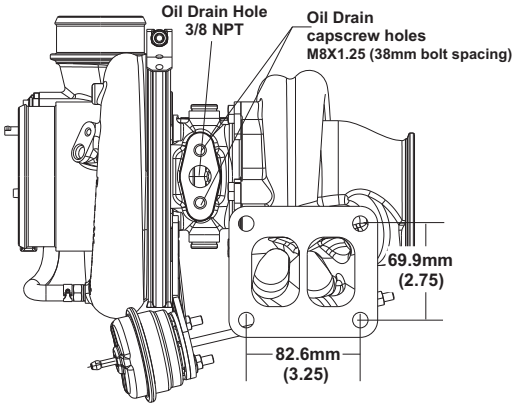
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12741008000	.83	T3	Single Scroll WG
12741008001	.92	T4	Twin Scroll WG
12741019002	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179357	B2	179257	83	62	74	.92	T4

EFR 8374

475 - 750 HP Turbo

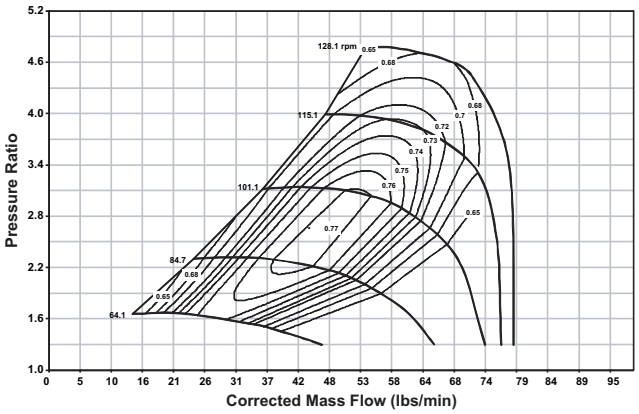
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

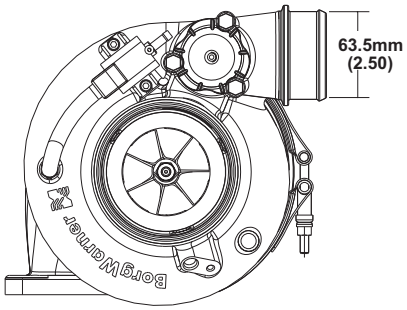
Not included with turbo assemblies:

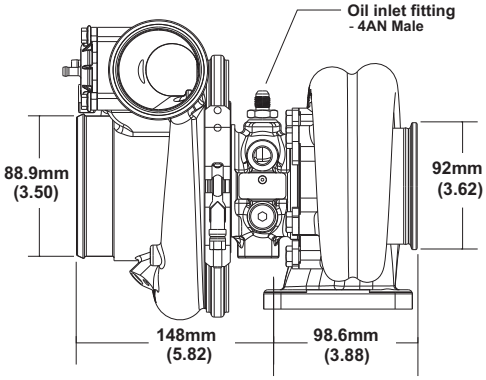
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

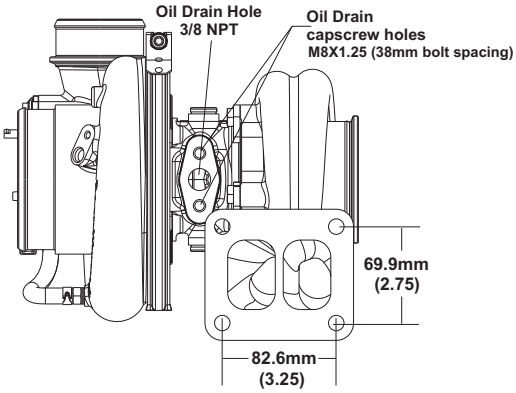
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12741008000	.83	T3	Single Scroll WG
12741008001	.92	T4	Twin Scroll WG
12741019002	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179393	B2	179257	83	62	74	1.05	T4

EFR 9180

600 - 1000 HP Turbo

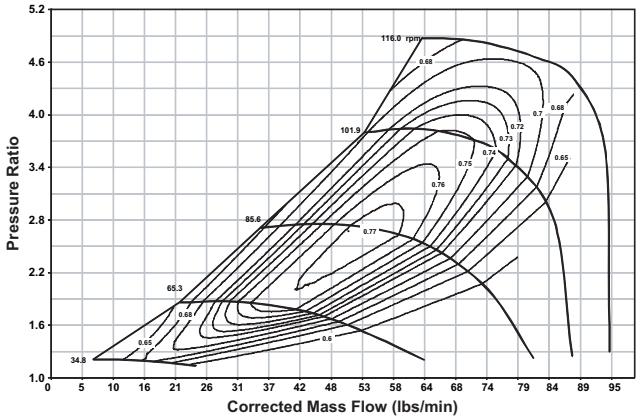
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Large internal wastegate
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T3 mounting flange

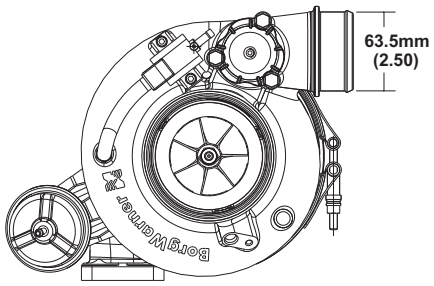
Not included with turbo assemblies:

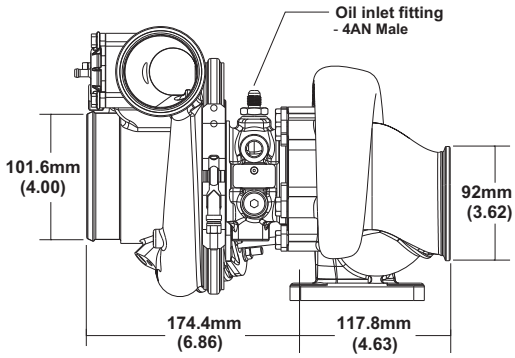
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

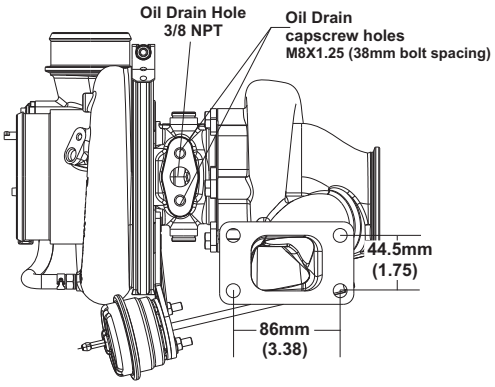
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12801008002	.83	T3	Single Scroll WG
12801019001	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config
179358	B2	179356	91	68	80	.83	T3

EFR 9180

600 - 1000 HP Turbo

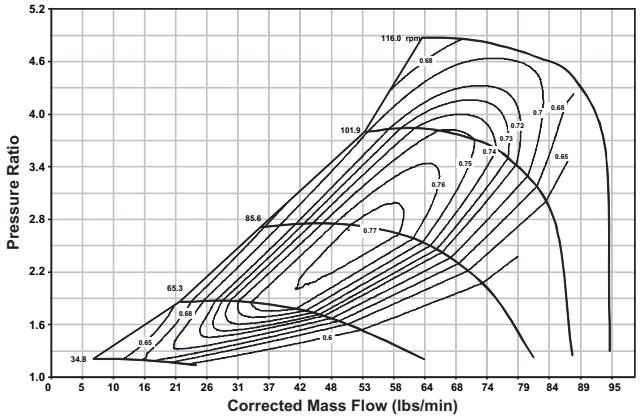
Turbo Features

- Gamma-Ti turbine wheel
- Dual ceramic ball bearing assembly with metal cage
- Forged milled extended tip compressor wheel
- Stainless steel turbine housing
- Water cooled bearing housing
- Compressor recirculation valve (a.k.a BOV)
- Boost control solenoid valve
- Standard T4 mounting flange

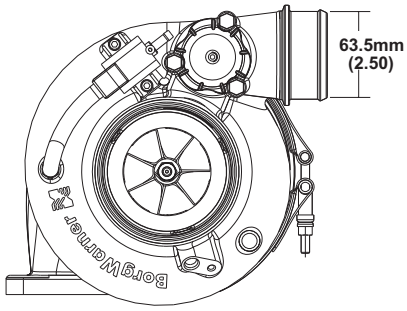
Not included with turbo assemblies:

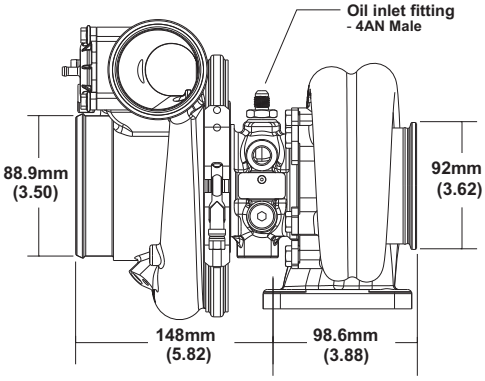
- Speed sensor
- Turbine outlet V-Band
- Turbine inlet gasket
- Oil drain gasket or drain port fitting

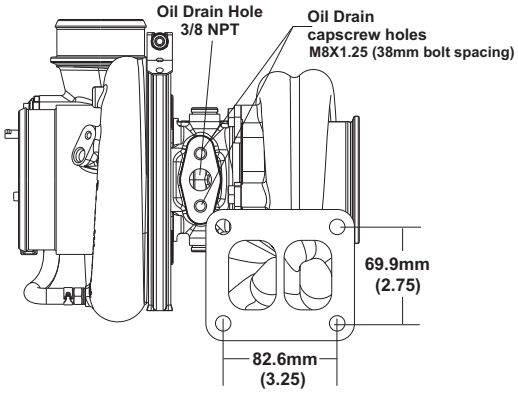
Compressor Map



Turbo Frame Dimensions







Super Core Configuration

The following parts are not included as part of the super-core assembly: turbine housing, assembly clamp plate hardware, wastegate parts.

Turbine Housing Options

Turbine Housing Part Number	A/R	Inlet Flange Shape	Housing Config.
12801008002	.83	T3	Single Scroll WG
12801019001	1.05	T4	Twin Scroll Non-WG

Turbo Part Number	Turbo Frame Size	Super Core Part Number	Comp. Wheel Outer Dia. (mm)	Comp. Wheel Inducer Dia.	Turbine Wheel Outer Dia.	Turbo A/R	Inlet Flange Config.
179394	B2	179356	91	68	80	1.05	T4

Speed Sensor Kit

Part Number 179430

(1) Speed sensor, frequency output
(1) Speed sensor hold-down bolt
***Note: Speed Sensor signal conversion and display accessories can be purchased at: www.roadragegages.com

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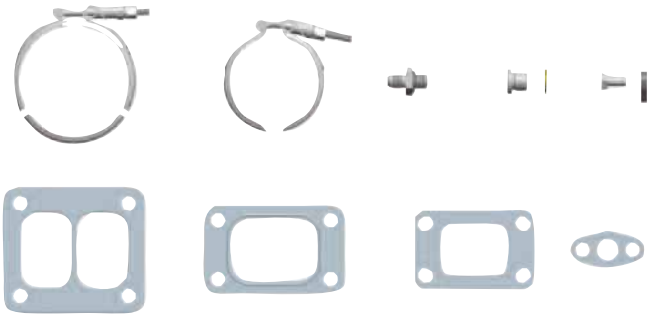
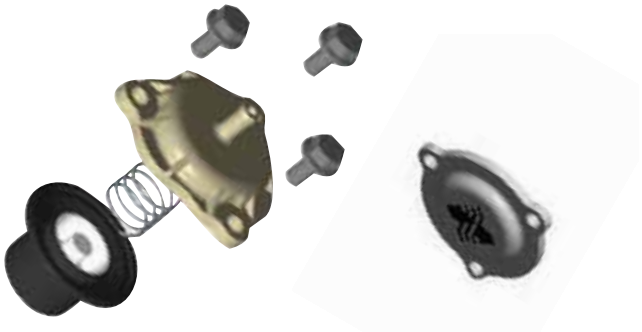


Hardware/Installation Kit

Part Number 179423

(1) Turbine housing outlet V-band clamp
(2) V-band clamp nuts
(2) Water port plugs
(6) Water port plug sealing washers
(2) Oil drain flange gaskets
(1) Oil inlet fitting (-4an) w/seal and washer
(1) Compressor cover outlet V-band clamp for 83 & 91mm
(5) Clamp plate bolts
(1) Turbine inlet gasket for T25 flange
(1) Turbine inlet gasket for T3 flange
(1) Turbine inlet gasket for T4 divided flange



Compressor Recirculation Valve Kit

Part Number 179425

(1) CRV plastic cover w/hose nipple
(1) CRV disabling block-off plate
(1) CRV diaphragm/piston assembly
(1) CRV spring
(3) Cover plate bolts w/locking compound

Boost Control Solenoid Valve (BCSV) Kit

Part Number 179425

(1) Boost control solenoid valve
(2) BCSV screws
(4) Hose clamps
(1) Compressor cover boost port fitting
(1) Comp cover boost port washer
(1) Wastegate signal hose, 110mm
(1) Wastegate signal hose, 410mm

Wastegate Hose Kit

Part Number 179426

(1) Wastegate signal hose, 410mm
(2) Hose clamps

EFR Wastegate Canister Selection Guide

Core Assy	0.64a/r TH	0.83a/r TH	0.92a/r TH
6255	179282, 179283 or 179284	N/A	N/A
6258	179282, 179283 or 179284	N/A	179420, 179421 or 179422
6758	179282, 179283 or 179284	N/A	179420, 17942 or 179422
7064	N/A	179285, 179286 or 179287	179285, 179286 or 179287
7670	N/A	179285, 179286 or 179287	179285, 179286 or 179287
8374	N/A	179285, 179286 or 179287	179285, 179286 or 179287
9180	N/A	179285, 179286 or 179287	179285, 179286 or 179287

EFR Wastegate Canister Bracket Kit Selection Guide

Core Assy	0.64a/r TH	0.83a/r TH	0.92a/r TH
6255	179427	N/A	N/A
6258	179427	N/A	179428
6758	179427	N/A	179428
7064	N/A	179428	179428
7670	N/A	179428	179428
8374	N/A	179429	179429
9180	N/A	179429	179429

Each Wastegate Bracket Kit Includes:

(1) Stainless steel bracket
(3) Bracket to bearing housing screws
(2) Canister to bracket lock nuts
(1) Actuator rod nut (outboard side)
(1) Long 410mm wastegate signal hose
(2) Hose clamps

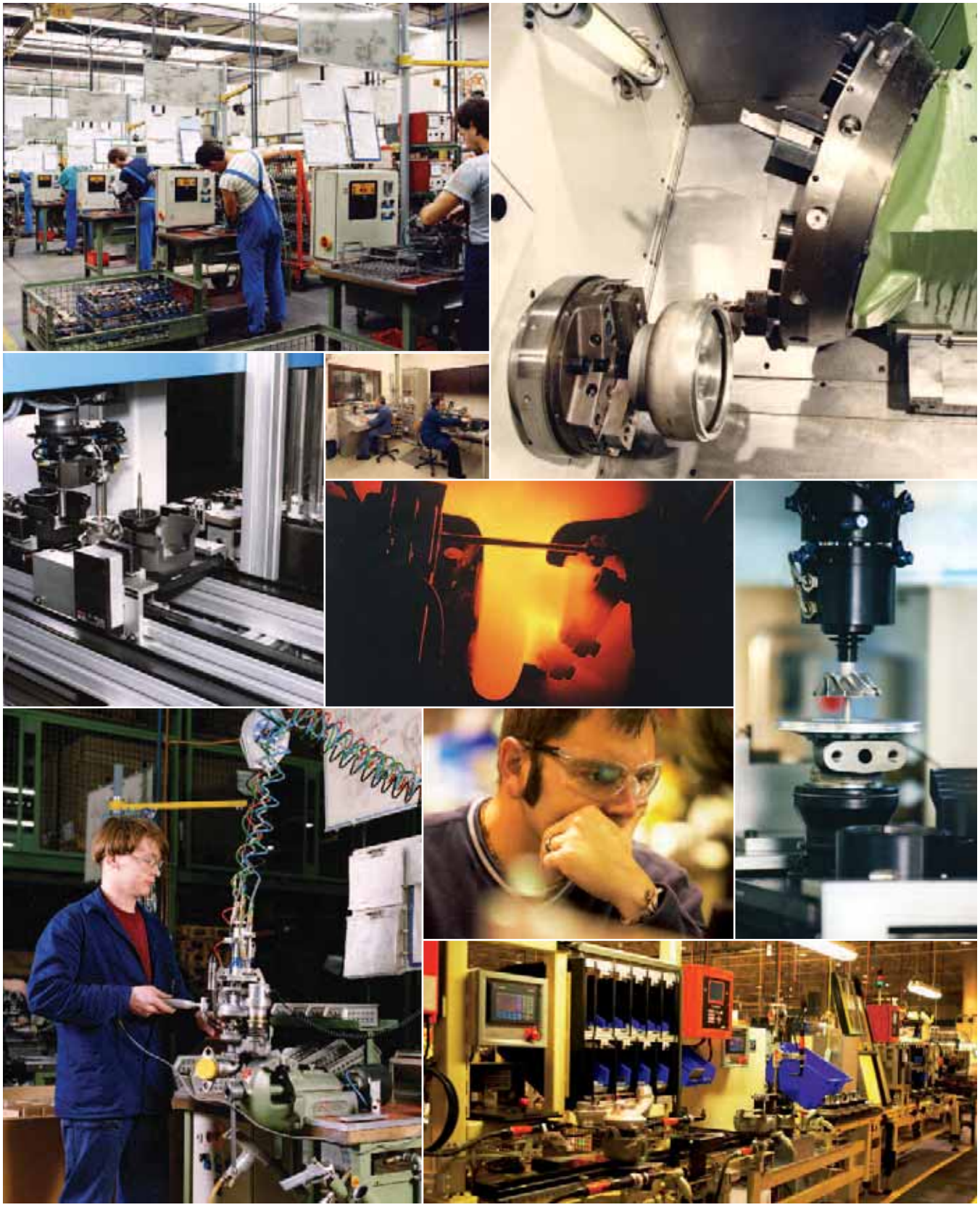
EFR Turbine Housing Product Selection Guide

Legend

Turbo Assy P/N / Loose Turb Hsg P/N

WG = Wastegate

Turbine Housing Config							
0.64 A/R T25-flange Single Scroll WG	179149 / 11551008004	179150 / 11581009006	179388 / 11581009006				
0.83 A/R T3-flange Single Scroll WG				179355 / 12641008006	179351 / 12701008014	179258 / 12741008000	179358 / 12801008002
0.92A/R T4-flange Twin Scroll WG		179359 / 11581009007	179374 / 11581009007	179389 / 12641008007	179390 / 12701008016	179357 / 12741008001	
1.05 A/R T4-flange Twin Scroll Non-WG				179391 / 12641019016	179392 / 12701019047	179393 / 12741019002	179394 / 12801019001



S1BG

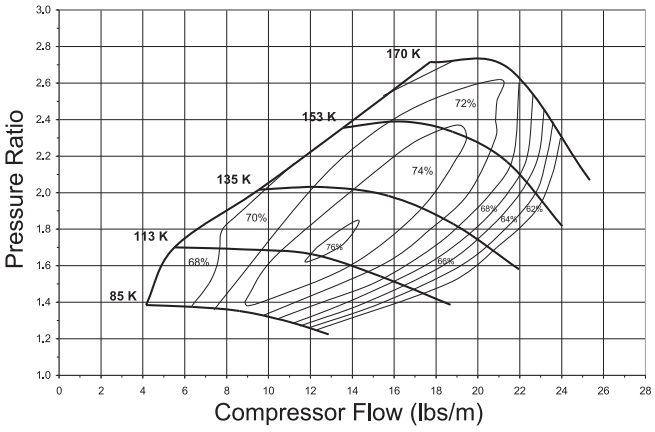
120 - 220 HP Turbo

AIRWerks by BorgWarner Turbo Systems

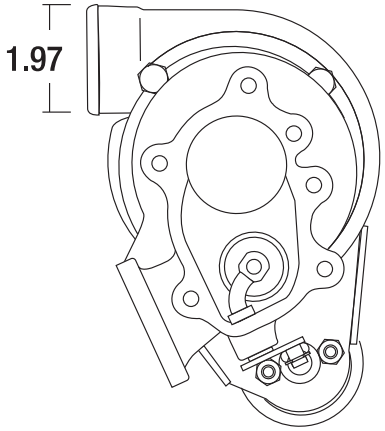
Turbo Features

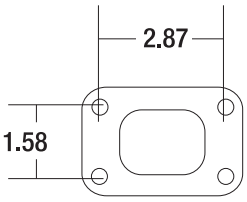
- Twin hydrodynamic journal bearings.
- Integrated wastegate assembly
- Twin scroll stainless steel turbine housing
- Adjustable compressor and turbine housing orientation

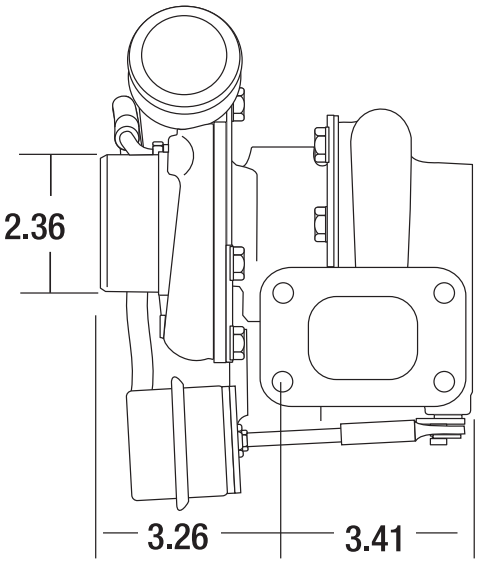
Compressor Map



Turbo Frame Dimensions







Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
313295	1.90	1.35	34	1.85	1.57	40	.35	N/A	318374
313296	2.08	1.55	39	2.08	1.80	46	.46	315358	318374
313683	2.08	1.55	39	2.08	1.80	46	.61	N/A	318374
313297	2.28	1.70	43	2.08	1.80	46	.61	313737	318374
313798	2.28	1.70	43	2.08	1.80	46	.81	N/A	318374

S200

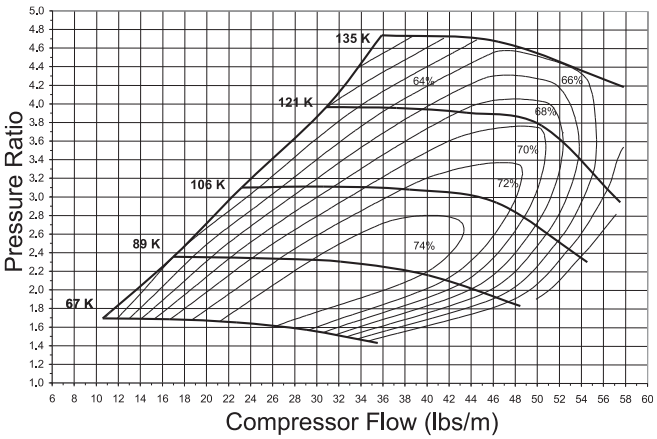
320 - 580 HP Turbo

AIRWerks by BorgWarner Turbo Systems

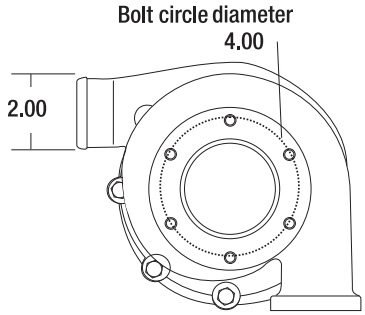
Turbo Features

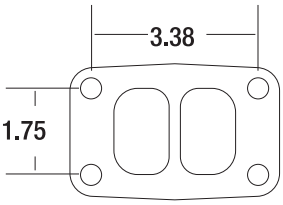
- Twin hydrodynamic journal bearings.
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Compressor cover recirculation grooves

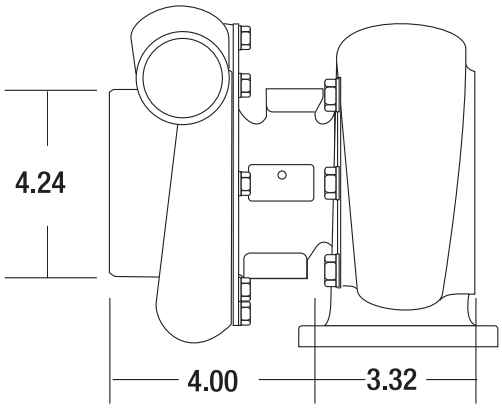
Compressor Map



Turbo Frame Dimensions







Extended Tip Technology

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
317222	3.14	2.20	56	2.92	2.54	65	.85	316999	318382
317246	3.14	2.20	56	2.92	2.54	65	.76	316999	318382

S200SX

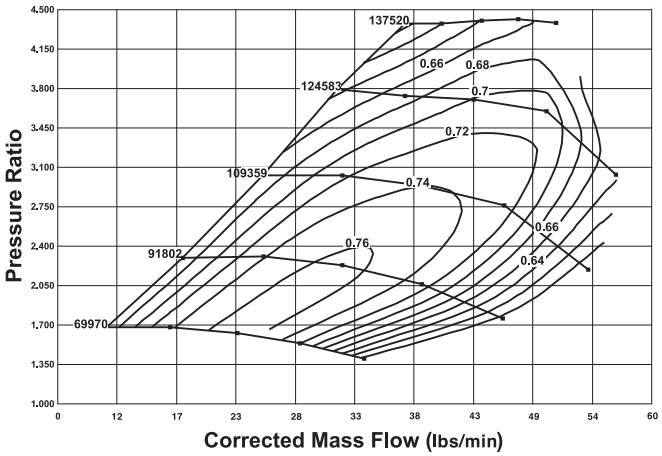
120 - 220 HP Turbo

AIRWerks by BorgWarner Turbo Systems

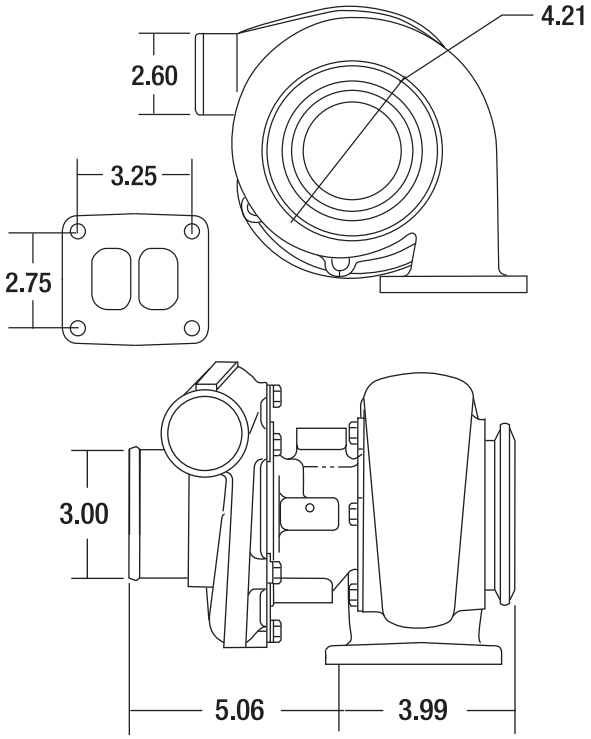
Turbo Features

- Twin hydrodynamic journal bearings.
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation

Compressor Map



Turbo Frame Dimensions



Extended Tip Technology

Turbine Housing

Part Number	A/R
177193	1.00
177192	1.15
177194	1.22

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
177258	2.74	1.81	46	2.74	2.42	61	.83	176639	318383
177267	2.74	1.95	50	2.74	2.42	61	1.09	176642	318383
177257	2.74	2.00	51	2.74	2.42	61	.83	176638	318383
177268	3.00	2.19	56	2.74	2.42	61	1.22	176637	318383

S300SX3

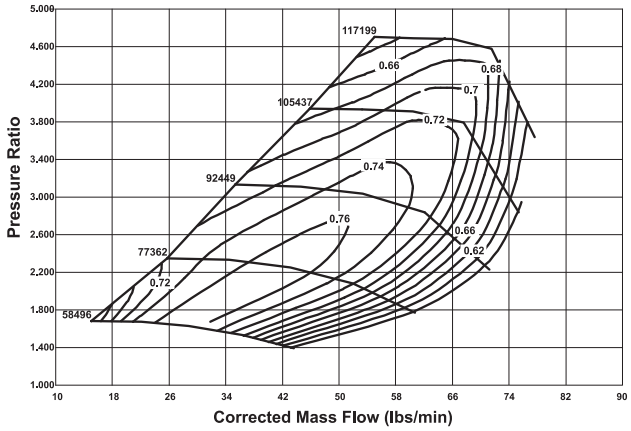
320 - 800 HP Turbo

AIRWerks by BorgWarner Turbo Systems

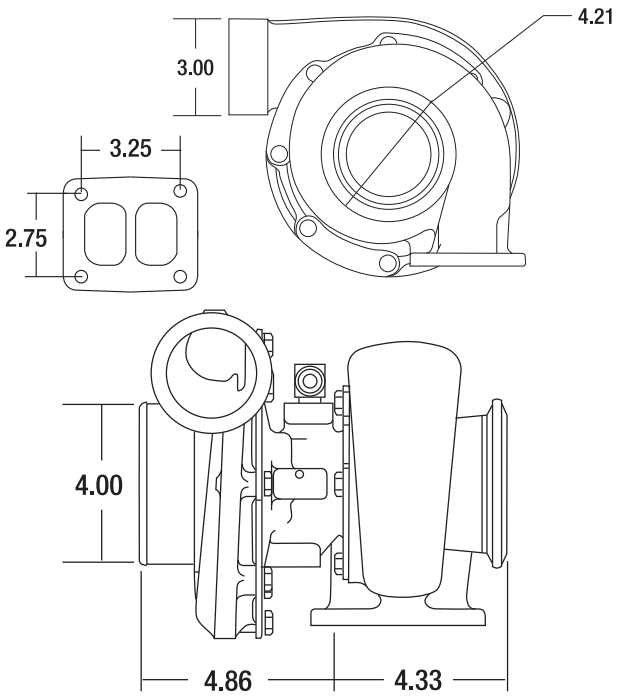
Turbo Features

- Twin hydrodynamic journal bearings
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation

Compressor Map



Turbo Frame Dimensions



Extended Tip Technology

Turbine Housing

Part Number	A/R	Notes
177211	0.88	
177208	0.91	
177209	1.00	(177272 Only)
177210	0.88	(177272 Only)

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
177281	3.60	2.60	66	3.14	2.89	73	.88	176634	318393
177275	3.60	2.60	66	3.14	2.89	73	.91	176646	318393
177272	3.29	2.36	60	3.00	2.66	68	.91	176635	318393

S300SX3

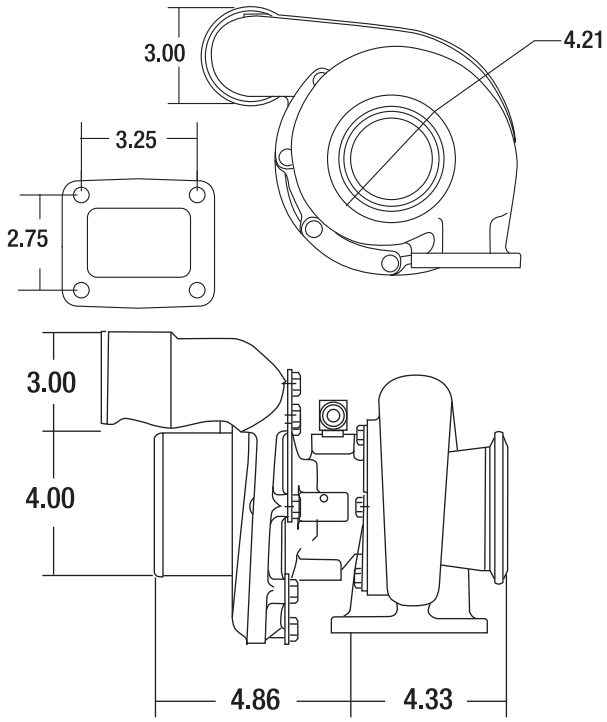
320 - 800 HP Turbo

AIRWerks by BorgWarner Turbo Systems

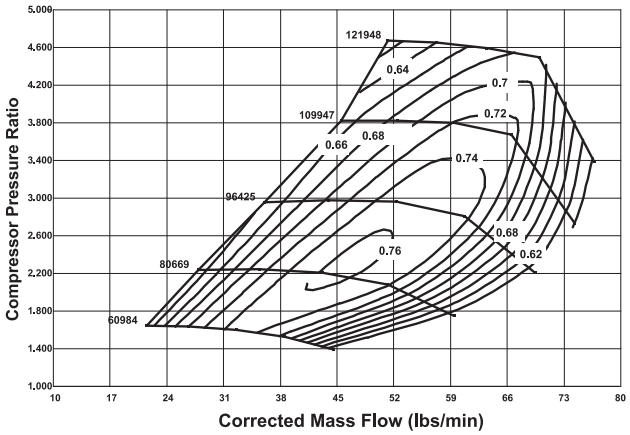
Turbo Features

- Twin hydrodynamic journal bearings
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Compressor cover recirculation grooves

Turbo Frame Dimensions



Compressor Map



Extended Tip Technology

Turbine Housing

Part Number	A/R	Notes
177207	0.91	(177280 & 283 Only)
177209	1.00	(177280 & 283 Only)
177211	0.88	(177284 Only)

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
177280	3.29	2.36	60	3.00	2.66	68	.88	171901	318393
177283	3.44	2.48	63	3.00	2.66	68	.88	176648	318393
177284	3.60	2.60	66	3.14	2.89	73	.91	176650	318393

S300GX

Cummins 5.9 Upgrade

AIRWerks by BorgWarner Turbo Systems

BorgWarner S300G Upgrade Turbo for Cummins 5.9 Engines

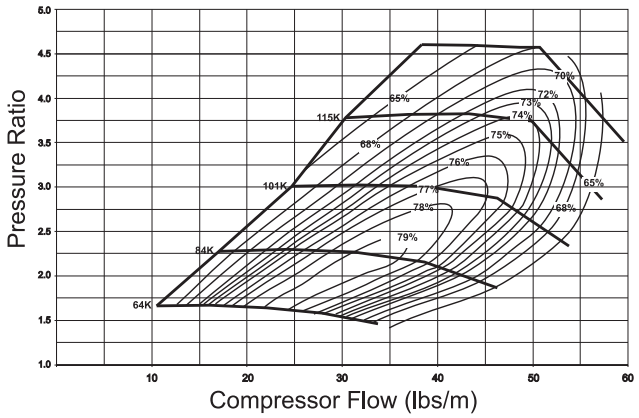
Turbo Features

The BorgWarner S300GX replacement turbo is more than a great match for your Cummins 5.9 engine. The S300G is aerodynamically designed to provide boost that can propel your Cummins 5.9 engine to 400 wheel horsepower. A rugged thrust bearing system helps insure the durability of your S300G, even under these extreme load conditions.

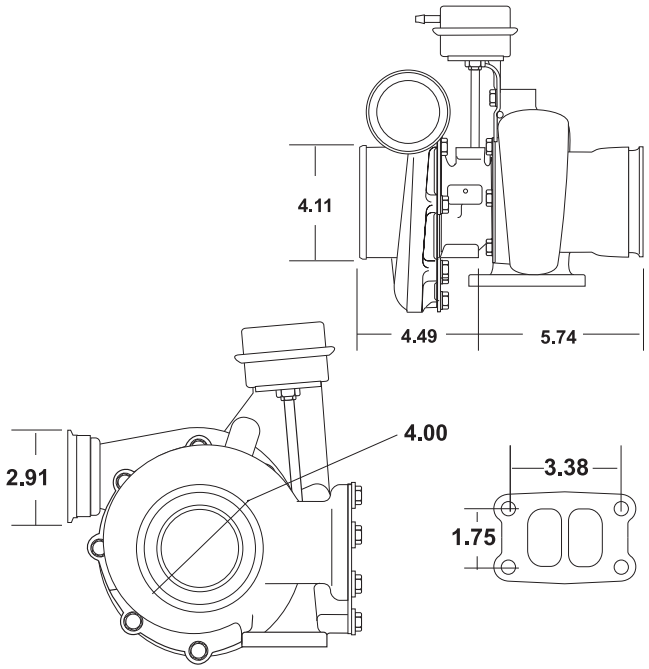
To realize the full horsepower potential of your S300G, we highly recommend the use of the following upgrade components:

- 4" Exhaust System
- Performance Chip
- High Flow Fuel Injectors
- High Flow Air Filter
- Ram Air Intake Tube
- Boost Control Fitting

Compressor Map



Turbo Frame Dimensions



Dodge 5.9 Engine Performance Turbo Upgrade Chart

Model Year	Transmission Type	Stock Horsepower	BW TS Turbo Part Number	Turbo Mfr. Model Number
1994	Auto	160	174430	S300G
1994	Manual	175		
1994	One Ton Truck	240		
1995	Auto	160	174430	S300G
1995	Manual	175		
1996	Auto	180	174430	S300G
1996	Manual	215		
1996	California Emission	180		
1997	Auto	180	174430	S300G
1997	Manual	215		
1997	California Emission	180		
1998	12 Valve Auto	180	174430	S300G
1998	12 Valve Manual	215		
1998	12 Calif Emission	180		
1998.5	12 Valve Auto & Manual	215	174430	S300G
1999	Auto	215	174430	S300G
1999	Manual	230		
2000	Auto	215	174430	S300G
2000	Manual	230		
2001	Auto	235	174430	S300G
2001	Manual	245		
2002	Auto	235	174430	S300G
2002	Manual	245		

S400SX
with extended tip technology

BorgWarner involvement in the sport compact arena created a BorgWarner first… a purpose built, engineered for high performance, production turbocharger.

The formal S400SX turbo program came to life in 2004 as a project that teamed BorgWarner with GM Racing. The objective of the AirWerks program was to help create reliable and consistent boost for GM's Pro FWD sport compact race cars. After several meetings with the GM Racing team, the basic design and performance targets were established.

The S400SX turbos were constructed under the supervision of the BorgWarner Turbo and Emissions Systems Aftermarket Product Development Team and select members of the North American Technical Sport Center Headquarters. The units were built as prototypes and the suffix "X" was added to the standard model nomenclature to help distinguish this unique motorsport component from the standard commercial product assembled at the same location.

By the end of the 2005 race season, the S400SX had begun to create a presence in the sport compact arena. The GM Racing Cobalt was the first and only front-wheel-drive/four-cylinder to surpass 200mph in the quarter mile. Moreover, it ran the quickest and fastest FWD pass ever with 7.292s @ 201.61. The very same year, Brent Rau pushed his Mitsubishi Eclipse to a new ET record of 6.976 and established a new Pro Outlaw RWD MPH record of 198.29. The introduction of the S400SX with these initial race teams proved to form lasting relationships which are still honored today.

S400SX3

500 - 1050 HP Turbo

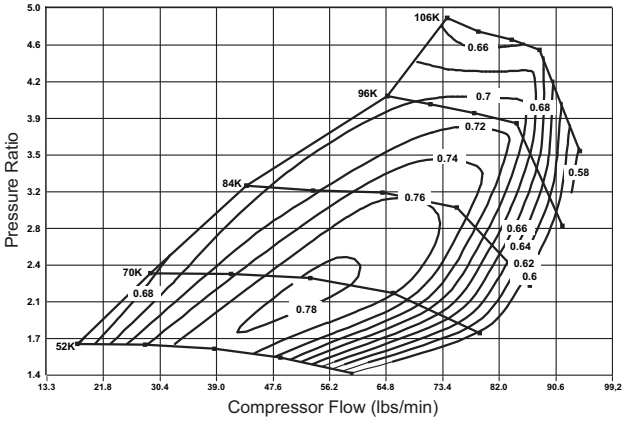
AIRWerks by BorgWarner Turbo Systems

Turbo Features

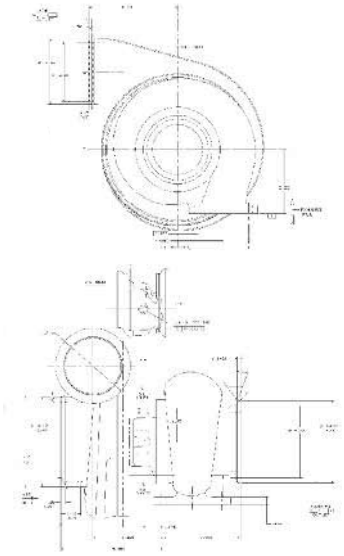
- Twin hydrodynamic journal bearings
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Standard turbine inlet and outlet allows for drop-in to existing turbocharged applications
- Compressor cover recirculation grooves

Compressor Map

(Applicable to part number 177101)



Turbo Frame Dimensions



Extended Tip Technology

Turbine Housing

Part Number	A/R
177102	0.90
177103	1.00
177104	1.10
177105	1.25

Compressor Cover

Part Number	Notes
177212	(177248 Only)
177352	w/Attenuator (177248 Only)
177354	w/Attenuator (177101 Only)

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
177248	3.94	2.80	71	3.29	2.93	74	1.10	176807	318396
177101	3.94	2.94	75	3.29	2.93	77	1.10	176807	318396

S400SX4

500 - 1050 HP Turbo

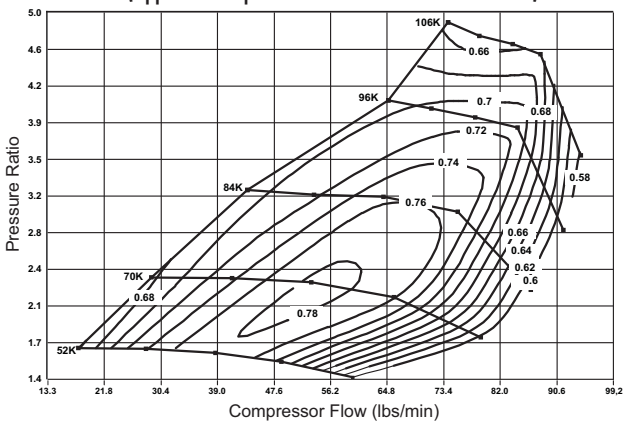
AIRWerks by BorgWarner Turbo Systems

Turbo Features

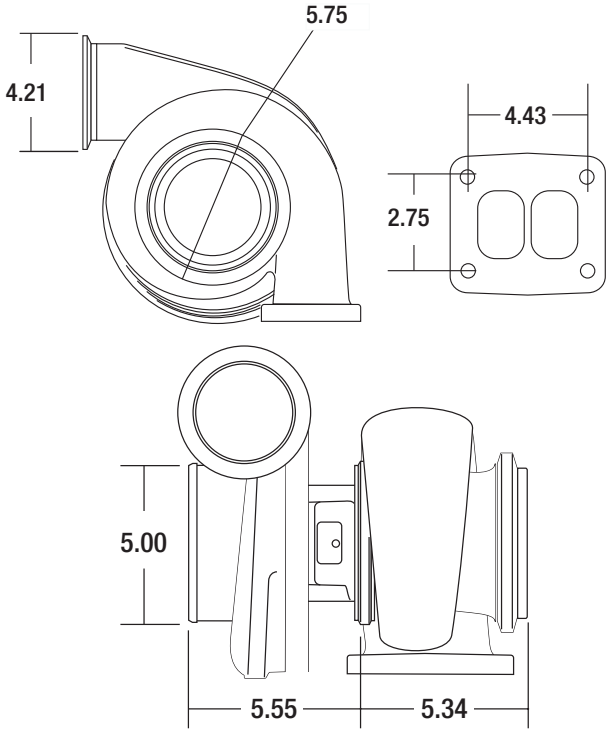
- Twin hydrodynamic journal bearings
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Compressor cover recirculation grooves

Compressor Map

(Applicable to part numbers 171702 and 176806)



Turbo Frame Dimensions



Extended Tip Technology

Turbine Housing

Part Number	A/R
176809	0.90
176810	1.00
176812	1.25
(176806 Only)	

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
171701	3.94	2.80	71	3.77	3.47	88	1.32	171699	176391
171702	3.94	2.94	75	3.77	3.47	88	1.32	171703	176391
176806	3.94	2.94	75	3.29	2.93	74	1.10	176807	176391

S400SX4

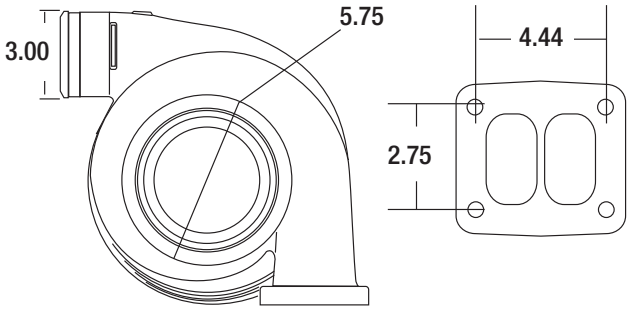
750 - 1250 HP Turbo

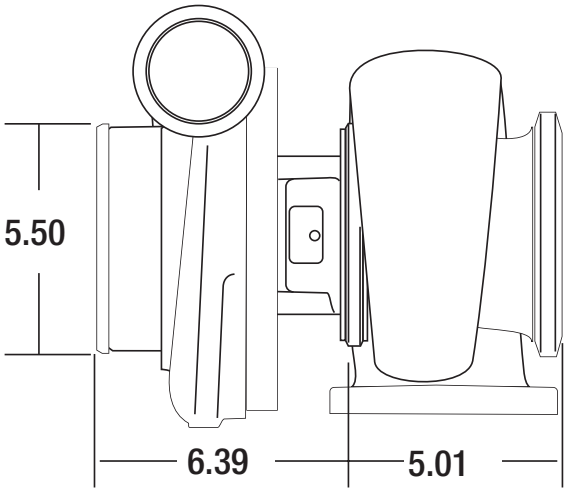
AIRWerks by BorgWarner Turbo Systems

Turbo Features

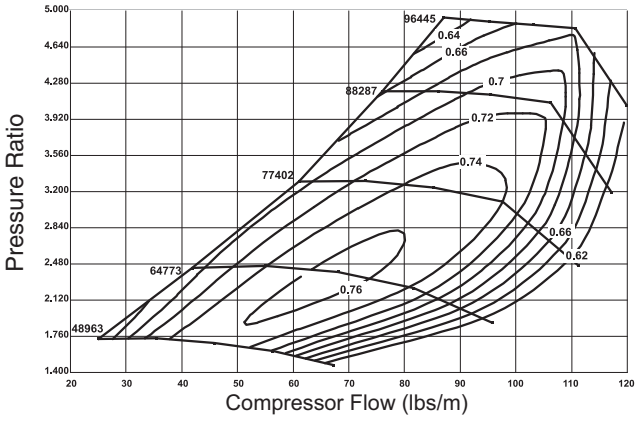
- Twin hydrodynamic journal bearings
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Compressor cover recirculation grooves

Turbo Frame Dimensions





Compressor Map



Extended Tip Technology

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
177287	4.32	3.16	80	3.77	3.47	88	1.32	176654	176391

S510

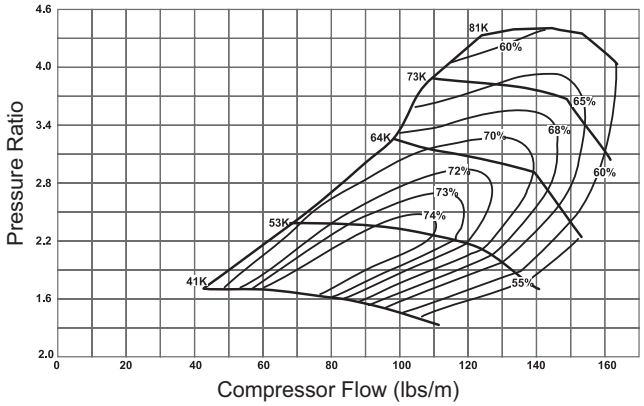
1000 - 1650 HP Turbo

AIRWerks by BorgWarner Turbo Systems

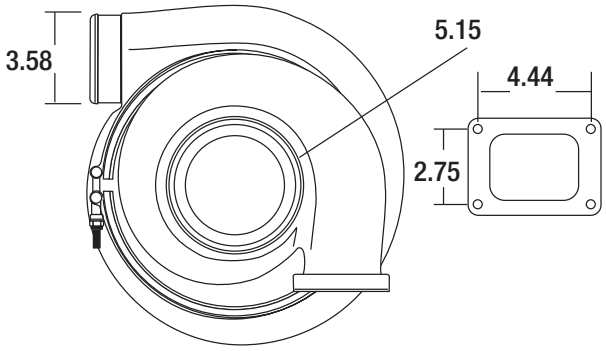
Turbo Features

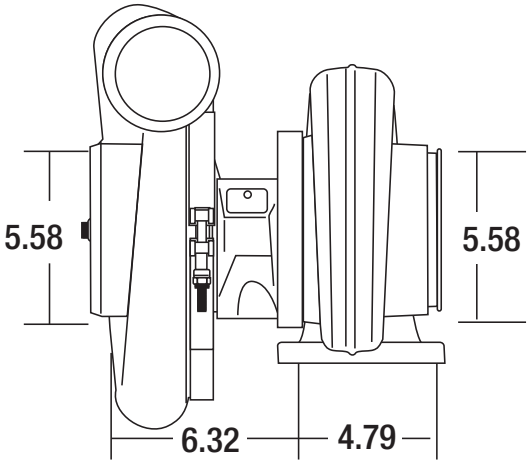
- Twin hydrodynamic journal bearings
- Extended tip technology compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Compressor cover recirculation grooves

Compressor Map



Turbo Frame Dimensions





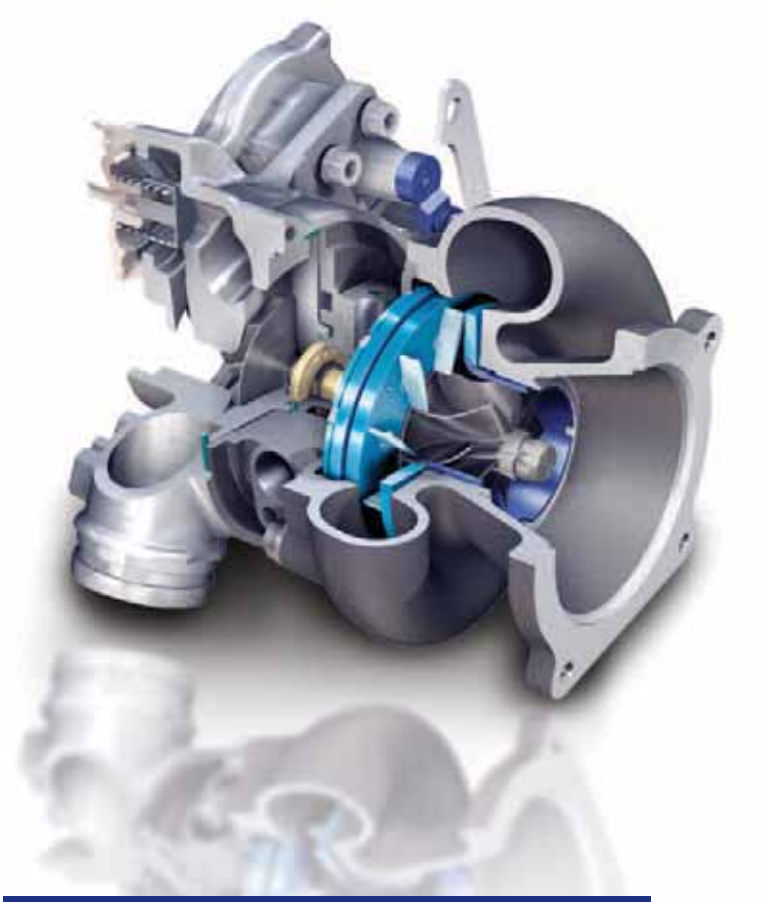
Extended Tip Technology

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
174289	5.18	3.75	95	4.32	3.90	99	1.15	174291	176311
174290	5.18	3.75	95	4.32	3.90	99	1.45	174291	176311

BV50

Porsche 997 Upgrade

AIRWerks by BorgWarner Turbo Systems



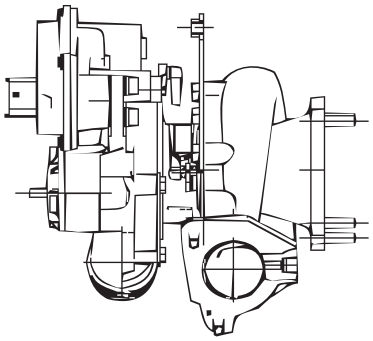
BV50

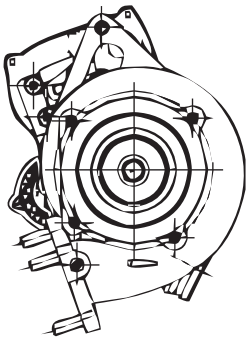
BorgWarner was the first manufacturer in the world to offer VTG turbochargers for gasoline engines in mass production. BV turbos employ materials and designs that are optimally tuned to the high thermal loads in gasoline engines. BorgWarner has developed a robubst VTG mechanism that works reliably even in the toughest of conditions and also employ a CFD-Optimized vane design that provides excellent efficiency.

Turbine Housing

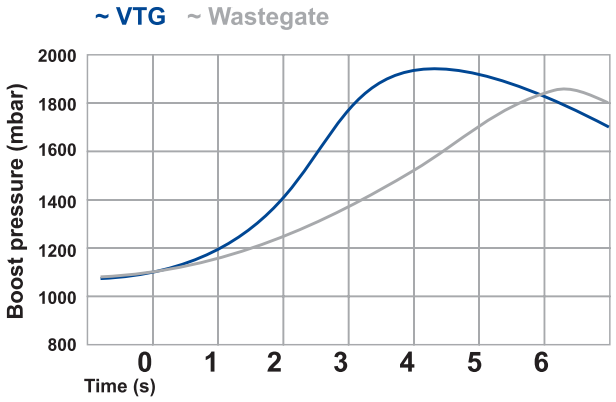
Part Number	A/R
177193	1.00
177192	1.15
177194	1.22

Turbo Frame Dimensions





Turbo Comparison



Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
177258	2.74	1.81	46	2.74	2.42	61	.83	176639	318383
177267	2.74	1.95	50	2.74	2.42	61	1.09	176642	318383
177257	2.74	1.10	51	2.74	2.42	61	.83	176638	318383
177268	3.00	2.19	56	2.74	2.42	61	1.22	176637	318383

K26

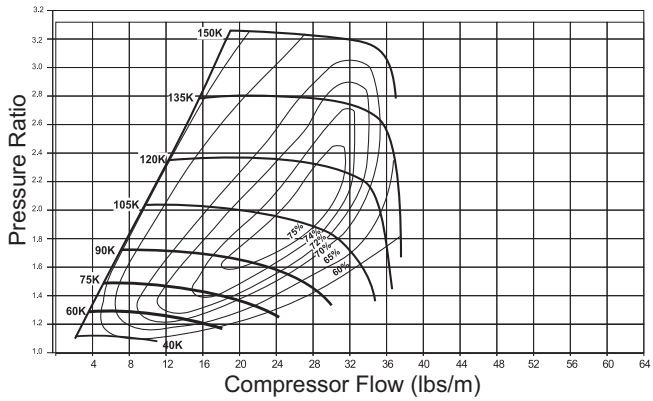
300 - 350 HP Turbo

AIRWerks by BorgWarner Turbo Systems

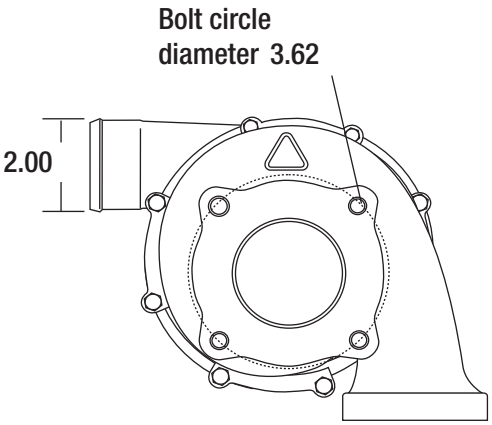
Turbo Features

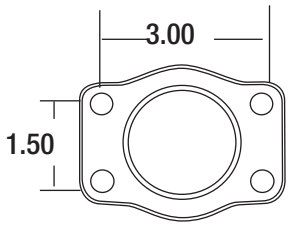
- Twin hydrodynamic journal bearings.
- Open volute design
- Adjustable compressor and turbine housing orientation
- Compact design
- High temperature alloy turbine housing

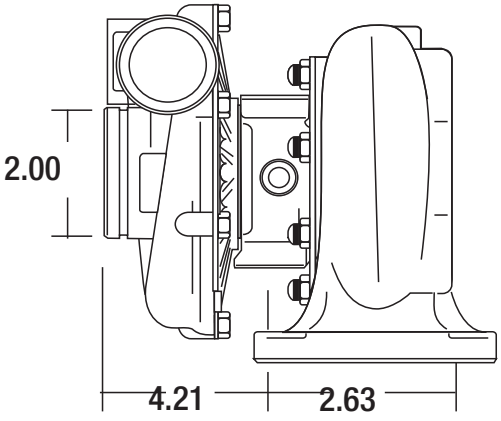
Compressor Map



Turbo Frame Dimensions







Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
5326-988-6720	2.60	1.73	44	2.52	1.88	48	6²cm	5326 710 0507	5326 711 0501
5326-988-7042	2.60	1.80	46	2.52	2.17	55	8²cm	5326 710 0522	5326 711 0501

K27-3072

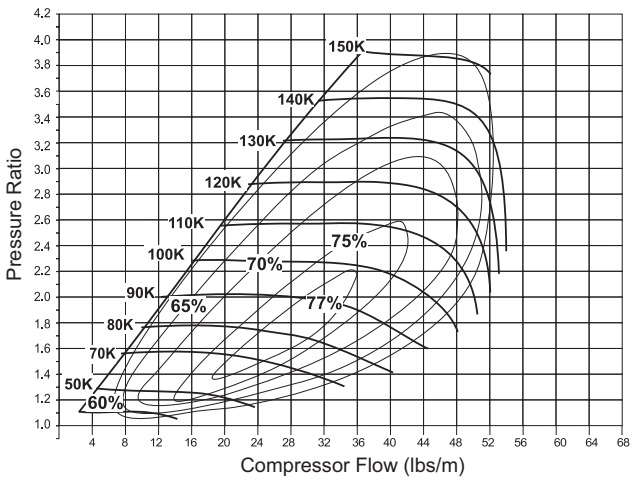
340 - 430 HP Turbo

AIRWerks by BorgWarner Turbo Systems

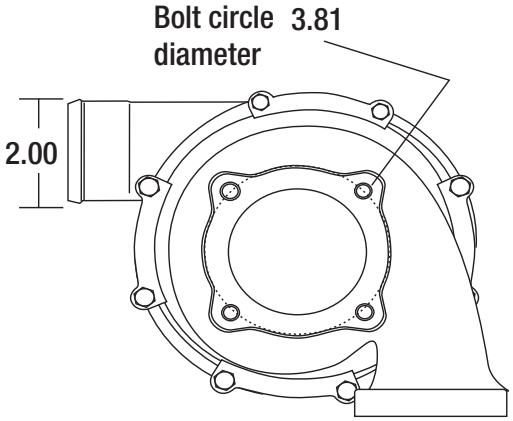
Turbo Features

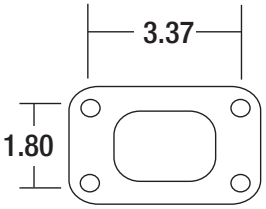
- Twin hydrodynamic journal bearings.
- Open volute design
- Adjustable compressor and turbine housing orientation
- Compact design
- High temperature alloy turbine housing

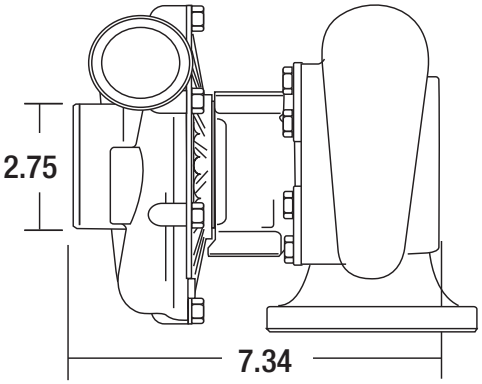
Compressor Map



Turbo Frame Dimensions







Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
5327 988 7200	3.00	2.16	55	2.75	2.31	59	11²cm	5327 710 0518	5326 711 0040

K29-3775

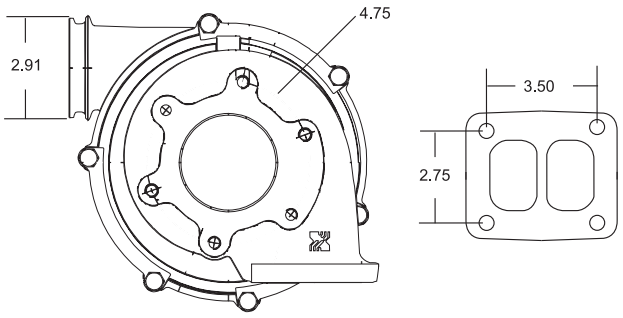
500 - 800 HP Turbo

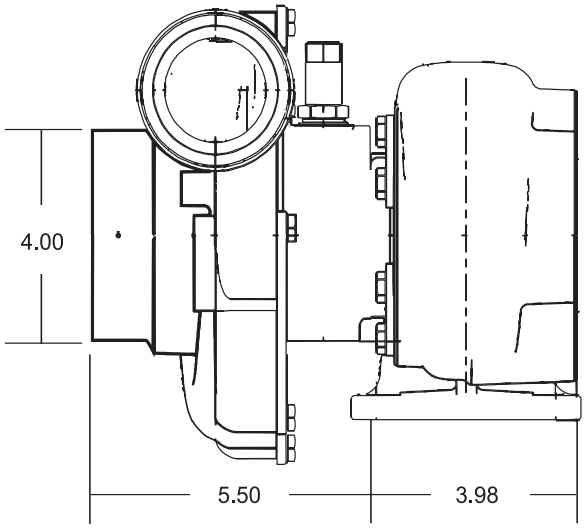
AIRWerks by BorgWarner Turbo Systems

Turbo Features

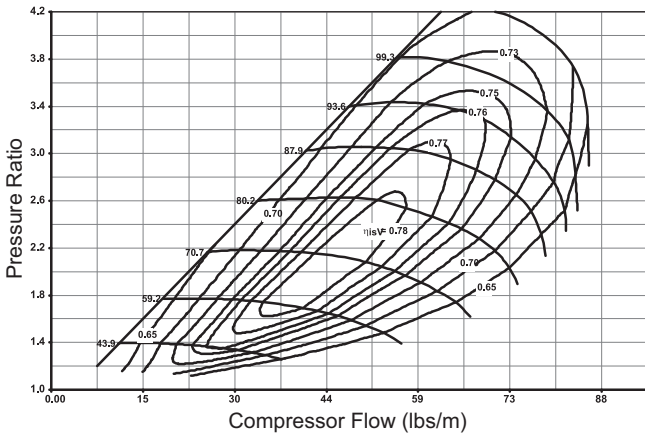
- Twin hydrodynamic journal bearings.
- Forged milled compressor wheel
- Twin scroll turbine housing
- Adjustable compressor and turbine housing orientation
- Compact design

Turbo Frame Dimensions





Compressor Map



Utilizing Forged Milled Compressor Wheel (FMW) Technology

- Stronger Than Cast Wheels
- Higher Pressure Ratio
- Resists High Cycle Fatigue

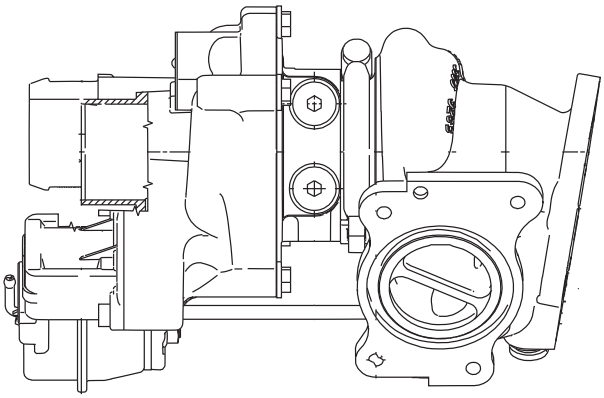
Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
5329 988 7115	3.70	2.79	70.93	3.23	2.80	71.00	17²cm	N/A	5331 711 0005

K03-2074

JCW Mini Upgrade

AIRWerks by BorgWarner Turbo Systems

Turbo Frame Dimensions



Turbo Features

- High temperature alloy turbine housing
- Extended tip compressor wheel
- Dual scroll turbine housing
- Water cooled bearing housing

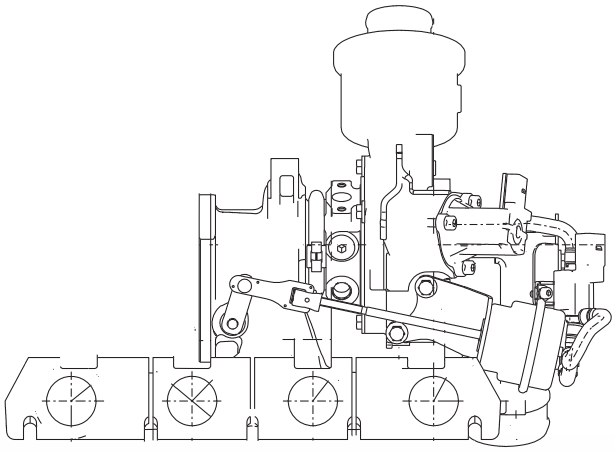
Manufacturer	Vehicle	Year	Upgrade HP	Engine	Upgrade Turbo Part Number	Model Spec	Stock Turbo	Stock Turbo HP Limit	Remarks
Mini	JCW	From 2006	255	EP6 DTS	5303 988 0146	K003-2074D	5303 988 0118	215	Twin Scroll Turbine Housing

K03-2080

Audi A4 Upgrade

AIRWerks by BorgWarner Turbo Systems

Turbo Frame Dimensions



Turbo Features

- High temperature alloy turbine housing
- Extended tip compressor wheel
- Water cooled bearing housing

The 1.8 TFSI also uses a compact integrated turbocharger module. Since the manifold and turbine housing are combined to form a single component made of a highly heat-resistance material, this system not only saves space, it also offers thermodynamic advantages.

Manufacturer	Vehicle	Year	Upgrade HP	Engine	Upgrade Turbo Part Number	Model Spec	Stock Turbo HP Limit	Stock Turbo	Remarks
Audi	A4	From 2007	255	1.8 TFSI	5303 988 0106	K03-2080D	5303 988 0141	215	Integrated Manifold

K04-2075

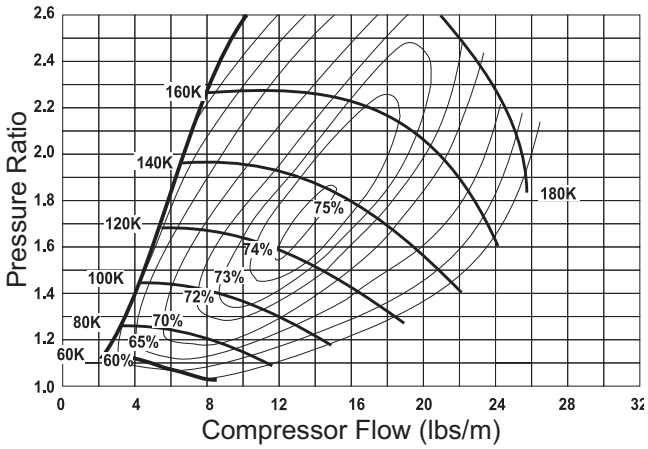
220 HP Turbo

AIRWerks by BorgWarner Turbo Systems

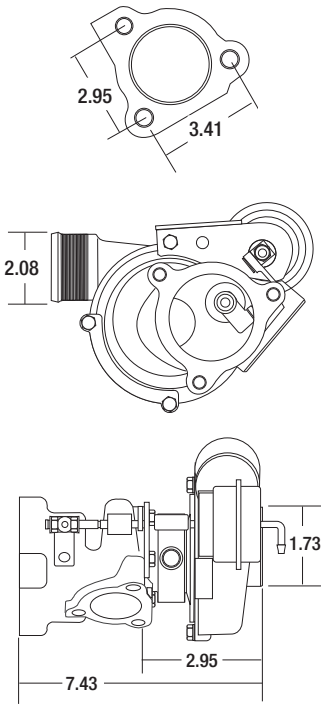
Turbo Features

How about a BorgWarner AirWerks K04 series performance upgrade turbo, developed specifically for Audi and VW 1.8 liter engines? This upgrade option can enhance engine performance as much as 15%. Ultimate output may vary depending on prior engine condition, fuel settings and other supporting performance components. Only qualified companies and tuner shops should attempt to make performance modifications to the engine and the vehicle.

Compressor Map



Turbo Frame Dimensions



Application Model	Model Year	Engine Spec	Rated HP
Audi A4 A6 / 1.8T	95-99	1.8 liter 5-Valve, Inline	220
Passat	96-99	1.8 liter 5-Valve, Inline	220

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
5304 988 0015	2.20	1.70	42	1.97	1.65	42	.8 sq.in.	5304 710 0503	5303 711 0000

K04-2075

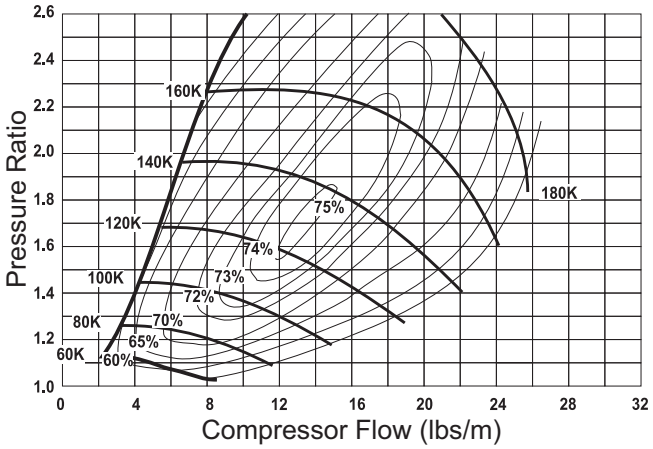
220 HP Turbo

AIRWerks by BorgWarner Turbo Systems

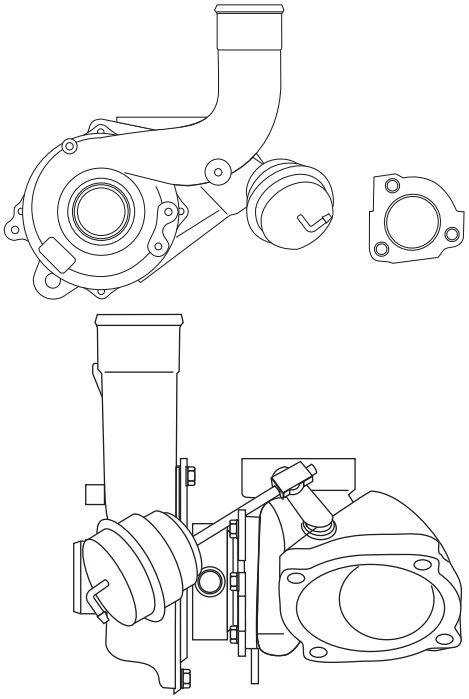
Turbo Features

How about a BorgWarner AirWerks K04 series performance upgrade turbo, developed specifically for Audi and VW 1.8 liter engines? This upgrade option can enhance engine performance as much as 15%. Ultimate output may vary depending on prior engine condition, fuel settings and other supporting performance components. Only qualified companies and tuner shops should attempt to make performance modifications to the engine and the vehicle.

Compressor Map



Turbo Frame Dimensions



Application Model	Model Year	Engine Spec	Rated HP
Audi A3 1.8T, VW Beetle	96-01	1.8 liter 5-Valve, Transverse	220
Golf	1996	1.8 liter 5-Valve, Transverse	220

Turbo Part Number	Comp. Wheel O.D	Comp. Wheel Inducer Dia.	Comp. Wheel Inducer Dia. (mm)	Turbine Wheel OD	Turbine Wheel Exducer	Turbine Wheel Exducer (mm)	Turbine A/R	Cartridge Assembly	Service Kit
5304 950 0001	2.20	1.70	42	1.97	1.65	42	.8 sq.in.		5303 711 0000

K04-2283

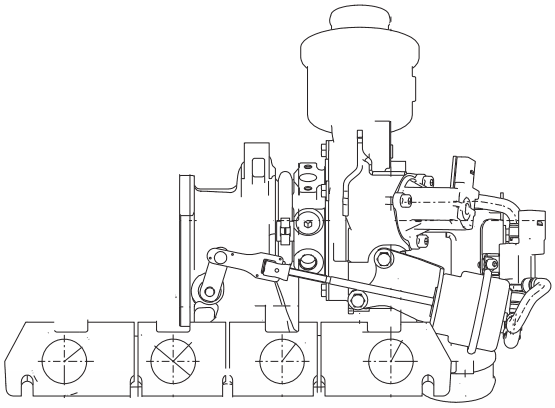
325 Peak Horsepower

AIRWerks by BorgWarner Turbo Systems

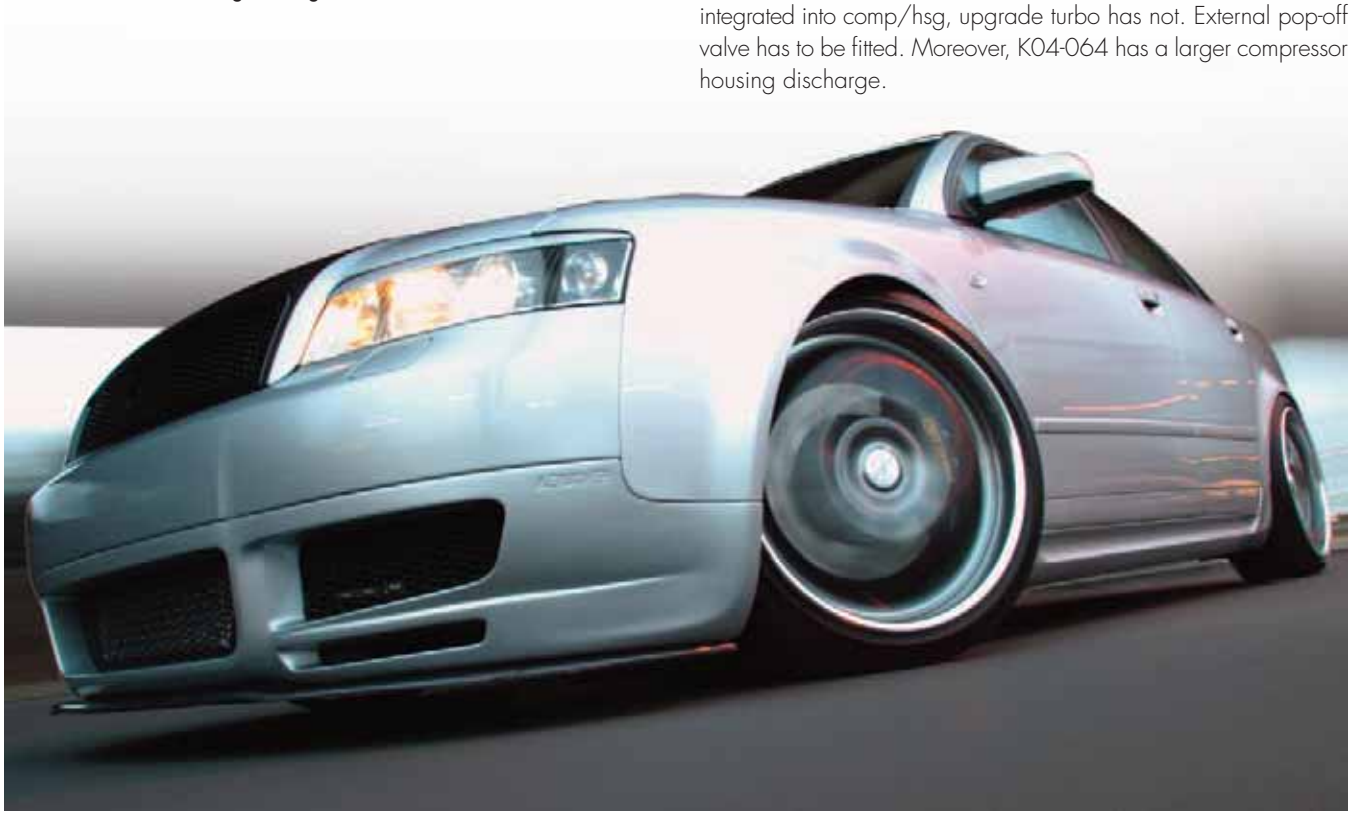
Turbo Features

- High-temperature alloy turbine housing
- Extended tip compressor wheel
- Water cooled bearing housing

Turbo Frame Dimensions



The electrical recirculation valve, which is also integrated into the compressor casing, guarantees fast response times when closing the throttle valve. The use of a "latest generation" turbine wheel helps increase the efficiency of the turbocharger significantly, while optimized thermodynamics have led to further improvements in fuel consumption and transient behavior, i.e. the acceleration of the engine at full throttle. Original turbo has electronic pop-off valve integrated into comp/hsg, upgrade turbo has not. External pop-off valve has to be fitted. Moreover, K04-064 has a larger compressor housing discharge.



Manufacturer	Vehicle	Year	Upgrade HP	Engine	Upgrade Turbo Part Number	Model Spec	Stock Turbo HP Limit	Stock Turbo	Remarks
Audi	A4	From 2004	325	2.0 TFSI	5304 988 0064	K04-2283D	5303 988 0105	255	Integrated Manifold

K16-2480

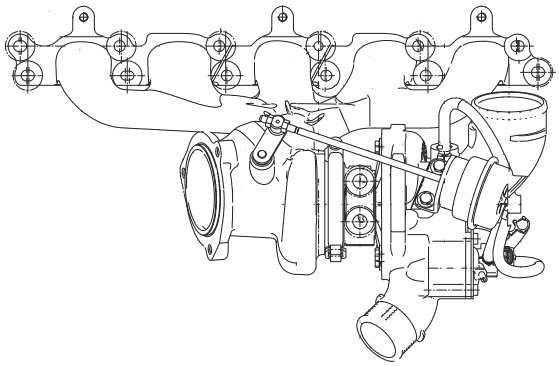
370 Peak Horsepower

AIRWerks by BorgWarner Turbo Systems

Turbo Features

- High-temperature alloy turbine wheel
- Extended tip compressor wheel
- Water cooled bearing housing

Turbo Frame Dimensions



Volvo's requirement for the developers at BorgWarner was to replace the bi-turbo boosting of the previous engine with a new unit with single-turbo boosting. The new 6-cylinder engine also had to possess at least the same transient response as its predecessor, and of course fuel consumption and emissions needed to be brought up to date. With the K16 used in the Volvo 6-cylinder engine, BorgWarner unveils the first in a wide range of gasoline engines from 1.6 to 3.0 liter displacement or between 150 and 285 bhp.

Manufacturer	Vehicle	Year	Upgrade HP	Engine	Upgrade Turbo Part Number	Model Spec	Stock Turbo	Stock Turbo HP Limit	Remarks
Volvo	S40/V50/XC60/C70	From 2003	370	2.5L RNC-RS	5316 988 0010	K16-2480D	5304 988 0033	300	Integrated Manifold

Warranty Statement

Turbo Systems

Limited Warranty: BorgWarner Turbo Systems, Inc. ("BWTS") warrants that its goods or merchandise will be free from defects in material and workmanship for its intended use and service. This warranty shall extend for a period of twelve (12) months from the date of purchase by end user. BWTS will repair or provide a replacement product, at BWTS's sole option, for any defective part. Replaced parts will be warranted in time only through the remaining period of this warranty. BWTS shall not be obligated to repair or replace any defective part unless it receives notice, in writing, within 14 days of discovery of a defect. Any action for breach of warranty, contract or otherwise, shall be barred unless BWTS is provided with notice as provided herein. Specifically excluded from this warranty are design defects or damage caused by improper installation, misuse, neglect, improper maintenance, handling or operation of the product or unauthorized repair or alterations or externally induced physical damage.

Further, this warranty shall not apply if any person attempts to repair or replace the defective part without BWTS written authorization. Any auxiliary equipment sold hereunder and not manufactured by BWTS carries only such warranty as given by the manufacturer thereof and which is hereby assigned without recourse to BWTS. No warranty is made for any other claims or special, indirect or consequential damages (including but not limited to component removal or installation, equipment down time, prospective profits or other economic losses) because of any defect deemed warrantable by BWTS.

This is bwts's sole warranty and is in lieu of all other warranties, express or implied, including, without limitation, implied warranty of merchantability, or fitness for a particular purpose.

No representative or distributor of BWTS has the authority to change or alter this warranty. This warranty may only be modified by an agreement signed by an authorized officer of BWTS.

Any claim made under this limited warranty must be presented to BWTS, with valid proof of date of purchase by end-user. All merchandise or goods shipped to BWTS, for warranty consideration, must be shipped prepaid - freight. Collect shipments will be refused.

No warranty on competition applications or applications not approved in writing by BorgWarner Turbo Systems.

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