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Welcome to the new Performance Products Catalog! You are about to encounter some of the most innovative turbochargers in the industry today. Whether it is the advanced aerodynamic wheel design or our enhancement of the GT product line, you will see many exciting turbocharging additions within this catalog. One of the most evident modifications to our catalog has been the name itself. The “Ballistic Concepts” title has been changed to reflect our renewed emphasis on performance, and so all future product introductions will be under the “Garrett Performance Products” title.

Here are some more reasons to investigate the Garrett Performance Products Catalog:

- The catalog design approach - our team has uniquely modeled this catalog to provide all turbocharger information on one page in an “easy to interpret” manner.

- Application flexibility - kits are now being offered to allow you to choose the optimal turbocharger for your individual application and provide you the flexibility to upgrade now or in the future. Mixing and matching has never been easier!

- Turbine maps! The Garrett team is thrilled to be the first to provide ALL of the data necessary to ensure the best performance for your vehicle!

- Garrett is where you want to be! We have engineering teams on 5 continents that are continually innovating to bring the most up-to-date technology to the industry. And, with some of the most rigorous functional testing in the field you know you are buying the superior product.

The Garrett Aftermarket team has a lot in store for the future, so this catalog design will allow for the addition of product pages and other information as we grow our performance product line - so stay tuned for further updates!

-The Garrett Performance Team

We are also interested in hearing about your turbocharging opportunities, so please feel free to drop us a line at garrett.performance@honeywell.com.
Garrett is the leading innovator of turbochargers in the world, providing engine boosting systems that save fuel and reduce emissions while providing an increase to engine performance.

Garrett’s turbocharging business traces its roots to an aerospace company established in California by entrepreneur Cliff Garrett. Over time, the turbocharging business spun off to establish itself as a serious player in the engine boosting industry. Through names such as AiResearch, AlliedSignal, and the Honeywell of today, Garrett has sustained its reputation for innovating turbocharger technologies generation after generation. From its long list of industry firsts to its leading-edge ball bearing turbos for racecars, Garrett develops and manufactures the same cutting-edge boosting expertise that goes into all Garrett products. Most of the world’s top engine and car manufacturers employ Garrett turbochargers to boost their engines, and with 28,000 turbos produced EVERY DAY you know the Garrett name is one you can trust. Finally, through the Garrett network of Master and Performance Distributors listed on the next page, Garrett’s turbocharging product line is readily available in the aftermarket for you to install on your vehicle!
Looking for an efficient, reliable turbocharger that can handle higher boost pressure? Your search ends with the new Garrett Performance Products Catalog. As the industry leader in turbocharging innovation, Garrett turbochargers incorporate the latest advances in boosting technology and aerodynamic design. Whether you’re looking to install a new turbocharger or need to upgrade an existing one, you’ve come to the right place.

➤ Improved Efficiency
New, efficient turbine stages deliver more power to your engine and allow Garrett turbochargers to spool up faster than ever. Garrett engineers have eliminated old efficiency killers, including on-center turbine housings*, clipped turbine wheels, and antiquated aerodynamics with the new GT product line.

➤ Increased Boost Capacity
Garrett’s new turbochargers feature compressor wheels that can handle a higher boost pressure. So go ahead— increase the PSI. Your Garrett turbocharger can take it!

➤ True Ball-Bearing Turbochargers
Thanks to our single-cartridge, dual ball-bearing technology, Garrett turbochargers generate far less frictional drag and are 10 times more durable than traditional journal-bearing turbochargers. While first developed for racing, over 100,000 ball-bearing turbos have been produced for OE applications, and are now available in a range of sizes for the street.

➤ Proven Durability
The Garrett engineering team puts our turbochargers through more than 20 durability and performance tests before they reach consumers. And since Garrett is the global leader in manufacturing turbochargers, producing more than 7.8 million units every year, you can be assured a Garrett turbo is a dependable one.

* See Turbo Terms in Appendix
Garrett GT Performance Distributors supply upgrade and hybrid turbochargers, Garrett component parts for a wide variety of turbocharger models, and the expertise to apply and support the Garrett line of GT Ball Bearing Performance Turbochargers.

**Limit Engineering**
885 Kiowa Ave.
Lake Havasu City, AZ 86406
928-453-7321
928-453-0789 (fax)
craig@redriver.net.com
www.limitengineering.com

**Precision Turbo & Engine**
616A South Main Street
PO Box 425
Hebron, IN 46341-8904
219-996-7832
219-996-7749 (fax)
rod@precisionturbo.net
www.precisionturbo.net

**Turbos Direct**
2408 Grand Ave.
Phoenix, AZ 85009
602-989-0611
602-253-2641 (fax)
scott@first-auction.phxcoxmail.com

**TiAl Sport**
616 Cass Street
Owosso, MI 48867
989-729-8553
989-729-9973 (fax)
www.tialsport.com

**Advanced Tuning Products**
44777 South Grimmer Blvd.
Fremont, CA 94538
510-445-1682
510-445-1692 (fax)
info@atpturbo.com
www.atpturbo.com
Garrett Engineering House accounts provide the performance market with retro fit turbocharger kits, complete systems and upgrade turbochargers.

**Ford, GM & Dodge Trucks**

**Gale Banks Engineering**
546 Duggan Avenue
Azusa, CA 91702
626-969-9600
626-969-9600 (fax)
peter@galebanks.com
www.bankspower.com

**Jim Wolf Technology**
212 Millar Avenue
El Cajon, CA 92020
619-442-0680
619-579-8160 (fax)
jim@jimwolftechnology.com
www.jimwolftechnology.com

**Audi & Volkswagen**

**Audi Performance Racing**
1027-B Opelika Road
Auburn, AL 36830
800-680-7921
334-502-5180 (fax)
flora@goapr.com
www.goapr.com

**Squires Turbo Systems**
535 North 1200 West
Orem, UT 84057
801-979-6554
ststurbos@hotmail.com
www.ststurbo.com

**Honda**

**Edelbrock**
2700 California Street
Torrance, CA 90503
310-781-2222
310-320-1187 (fax)
jdrallie@edelbrock.com
www.edlebrock.com

**Honda (Motorcycle)**

**Velocity Racing**
2240 S.W. 70th Ave #C-1
Davie, FL 33317
1-866-4-1-SPEED
www.velocityracing.com

**GM**

**Lingenfelter Performance Engineering**
1557 Winchester Road
Decatur, IN 46733
260-724-2552 X303
260-724-0422 (fax)
haines@lingenfelter.com
www.lingenfelter.com

**Turbo Specialties**
17906 Crusader Ave
Cerritos, CA 90703
562-403-7039
562-403-7040 (fax)
res05505@gte.net

**Nissan / Infinity**

**Toyota, Chevrolet, GMC**

**Honda (Motorcycle)**
## Garrett Master Distributors

Garrett Master Distributors supply the market with the complete offering of the Garrett Aftermarket product line.

### D&W Diesel - Eastern PA, NJ, NY, CT, RI, MA, NH, VT, ME

<table>
<thead>
<tr>
<th>Distributor</th>
<th>Address</th>
<th>Phone</th>
<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>D&amp;W Diesel, Inc.</td>
<td>1503 Clark Street Road, Auburn, NY 13021</td>
<td>315-253-7740</td>
<td>315-282-0031</td>
<td><a href="mailto:r.banas@dwdiesel.com">r.banas@dwdiesel.com</a></td>
</tr>
<tr>
<td>D&amp;W Diesel, Inc.</td>
<td>20 Saginaw Drive, Rochester, NY 14623</td>
<td>315-253-7740</td>
<td>315-282-0031</td>
<td><a href="mailto:r.banas@dwdiesel.com">r.banas@dwdiesel.com</a></td>
</tr>
<tr>
<td>D&amp;W Diesel, Inc.</td>
<td>731 Main Street, North Oxford, NY 1537</td>
<td>315-253-7740</td>
<td>315-282-0031</td>
<td><a href="mailto:r.banas@dwdiesel.com">r.banas@dwdiesel.com</a></td>
</tr>
<tr>
<td>D&amp;W Diesel, Inc.</td>
<td>3005 Walden Ave., Depew, NY 14043</td>
<td>315-253-7740</td>
<td>315-282-0031</td>
<td><a href="mailto:r.banas@dwdiesel.com">r.banas@dwdiesel.com</a></td>
</tr>
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<td>315-282-0031</td>
<td><a href="mailto:r.banas@dwdiesel.com">r.banas@dwdiesel.com</a></td>
</tr>
</tbody>
</table>

### Diesel Injection & Electric - FL, AL, GA, SC, NC, VA, DE, MD, DC

<table>
<thead>
<tr>
<th>Distributor</th>
<th>Address</th>
<th>Phone</th>
<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Injection &amp; Electric Co.</td>
<td>231 Main Street, Forest Park, GA 30297</td>
<td>800-241-4389</td>
<td>404-361-1701</td>
<td><a href="mailto:turboparts@dinjection.com">turboparts@dinjection.com</a></td>
</tr>
<tr>
<td>Diesel Injection &amp; Electric Co.</td>
<td>2437 Silver Star Road, Orlando, FL 32804</td>
<td>407-294-8222</td>
<td>407-298-0301</td>
<td><a href="mailto:tfe@dinjection.com">tfe@dinjection.com</a></td>
</tr>
<tr>
<td>Turbo Fuel &amp; Electric</td>
<td>1647 Canton Road, Marietta, GA 30066</td>
<td>770-424-0330</td>
<td>770-427-9917</td>
<td><a href="mailto:pro@dinjection.com">pro@dinjection.com</a></td>
</tr>
<tr>
<td>Promotive Power</td>
<td>3806 2nd Avenue South, Birmingham, AL 35222</td>
<td>800-633-4392</td>
<td>205-592-3344</td>
<td><a href="mailto:fuel.electric@dinjection.com">fuel.electric@dinjection.com</a></td>
</tr>
<tr>
<td>Fuel &amp; Electric Systems</td>
<td>14201 Industrial Ave., South, Cleveland, OH 44137</td>
<td>315-253-7740</td>
<td>315-282-0031</td>
<td><a href="mailto:r.banas@dwdiesel.com">r.banas@dwdiesel.com</a></td>
</tr>
</tbody>
</table>

### Diesel Injection Service - MI, IN, OH, KY, TN, MS, AR, WV, Western PA

<table>
<thead>
<tr>
<th>Distributor</th>
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<th>Phone</th>
<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Injection Service Co., Inc</td>
<td>4724 Allmond Avenue, Louisville, KY 40209</td>
<td>502-357-7800</td>
<td>502-364-2929</td>
<td><a href="mailto:tombrown@dieselusa.com">tombrown@dieselusa.com</a></td>
</tr>
<tr>
<td>Columbus Diesel Supply</td>
<td>1575 Integrity Drive East, Columbus, OH 43209</td>
<td>614-445-8391</td>
<td>614-445-8104</td>
<td><a href="mailto:benmosko@dieselusa.com">benmosko@dieselusa.com</a></td>
</tr>
<tr>
<td>Fort Wayne Diesel Service</td>
<td>2732 Broadway, Fort Wayne, IN 46807</td>
<td>260-456-1277</td>
<td>260-745-1554</td>
<td><a href="mailto:patkiel@dieselusa.com">patkiel@dieselusa.com</a></td>
</tr>
<tr>
<td>Diesel Injection Service Co., Inc</td>
<td>4710 Allmond Avenue, Louisville, KY 40209</td>
<td>502-361-2531</td>
<td>502-368-7858</td>
<td><a href="mailto:rogerlighter@dieselusa.com">rogerlighter@dieselusa.com</a></td>
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<th>Fax</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Injection Service</td>
<td>3012 Reading Road, Cincinnati, OH 45206</td>
<td>513-281-2131</td>
<td>513-281-1311</td>
<td><a href="mailto:smattstansbury@dieselusa.com">smattstansbury@dieselusa.com</a></td>
</tr>
<tr>
<td>Turbo &amp; Diesel Injection</td>
<td>3760 West Morris Street, Indianapolis, IN 46241</td>
<td>317-247-7373</td>
<td>317-247-5652</td>
<td><a href="mailto:vernbeecher@dieselusa.com">vernbeecher@dieselusa.com</a></td>
</tr>
</tbody>
</table>

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Garrett Master Distributors supply the market with the complete offering of the Garrett Aftermarket product line.

### Garrett Master Distributors

- **D&W Diesel – Eastern PA, NJ, NY, CT, RI, MA, NH, VT, ME**
  - D&W Diesel, Inc.
  - 1503 Clark Street Road
  - Auburn, NY 13021
  - 315-253-7740
  - 315-282-0031 (fax)
  - r.banas@dwdiesel.com

- D&W Diesel, Inc.
- 20 Saginaw Drive
- Rochester, NY 14623
- 315-253-7740
- 315-282-0031 (fax)
- r.banas@dwdiesel.com

- D&W Diesel, Inc.
- 3005 Walden Ave.
- Depew, NY 14043
- 315-253-7740
- 315-282-0031 (fax)
- r.banas@dwdiesel.com

- D&W Diesel, Inc.
- 13 Warehouse Row
- Albany, NY 12205
- 315-253-7740
- 315-282-0031 (fax)
- r.banas@dwdiesel.com

### Diesel Injection & Electric – FL, AL, GA, SC, NC, VA, DE, MD, DC

- **Diesel Injection & Electric Co.**
  - 231 Main Street
  - Forest Park, GA 30297
  - 800-241-4389
  - 404-361-1701 (fax)
  - turboparts@dinjection.com

- **Turbo Fuel & Electric**
  - 2437 Silver Star Road
  - Orlando, FL 32804
  - 407-294-8222
  - 407-298-0301 (fax)
  - tfe@dinjection.com

- **Promotive Power**
  - 1647 Canton Road
  - Marietta, GA 30066
  - 770-424-0330
  - 770-427-9917 (fax)
  - pro@dinjection.com

- **Fuel & Electric Systems**
  - 3806 2nd Avenue South
  - Birmingham, AL 35222
  - 800-633-4392
  - 205-592-3344 (fax)
  - fuel.electric@dinjection.com

### Diesel Injection Service – MI, IN, OH, KY, TN, MS, AR, WV, Western PA

- **Diesel Injection Service Co., Inc**
  - Distribution Center
  - 4724 Allmond Avenue
  - Louisville, KY 40209
  - 502-357-7800
  - 502-364-2929 (fax)
  - tombrown@dieselusa.com

- **Columbus Diesel Supply**
  - 1575 Integrity Drive East
  - Columbus, OH 43209
  - 614-445-8391
  - 614-445-8104 (fax)
  - benmosko@dieselusa.com

- **Fort Wayne Diesel Service**
  - 2732 Broadway
  - Fort Wayne, IN 46807
  - 260-456-1277
  - 260-745-1554 (fax)
  - patkiel@dieselusa.com

- **Diesel Injection Service Co., Inc**
  - Louisville Service Facility
  - 4710 Allmond Avenue
  - Louisville, KY 40209
  - 502-361-2531
  - 502-368-7858 (fax)
  - rogerlighter@dieselusa.com

### Contact Information

- **Garrett Master Distributors**
  - Electric Co.
  - 231 Main Street
  - Forest Park, GA 30297
  - 800-241-4389
  - 404-361-1701 (fax)
  - turboparts@dinjection.com

- **Fuel & Electric Systems**
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  - Birmingham, AL 35222
  - 800-633-4392
  - 205-592-3344 (fax)
  - fuel.electric@dinjection.com

- **Diesel Injection Service**
  - 3012 Reading Road
  - Cincinnati, OH 45206
  - 513-281-2131
  - 513-281-1311 (fax)
  - smattstansbury@dieselusa.com

- **Turbo & Diesel Injection**
  - 3760 West Morris Street
  - Indianapolis, IN 46241
  - 317-247-7373
  - 317-247-5652 (fax)
  - vernbeecher@dieselusa.com
Garrett Master Distributors supply the market with the complete offering of the Garrett Aftermarket product line.

**Area Diesel Service - Eastern KS, ND, SD, MN, IA, WI, IL, MO, MI (Upper Peninsula)**

**Area Diesel Service, Inc.**
North on University - PO Box 115
Carlinville, IL 62626
800-637-2658
217-854-8972 (fax)
larryr@areadiesel.com

**Area Diesel Service, Inc.**
1440 North East 56th St.
Pleasant Hill, IA 50317
515-265-6303
515-265-8657 (fax)
desmoines@areadiesel.com

---

**Magneto and Diesel - TX, OK, LA**

**Magneto and Diesel Service**
6931 Navigation Blvd.
Houston, TX 77011
800-392-5517
713-928-8154 (fax)
jandsell@mddistributors.com
http://www.mddistributors.com

**Magneto and Diesel Service**
6904 North Shepherd
Houston, TX 77091
713-699-4100
713-699-1938 (fax)
krenfro@mddistributors.com

**Magneto and Diesel Service**
827 N. Bell
San Angelo, TX 76903
915-657-0462 (fax)
mmorris@mddistributors.com

---

**Central Motive Power - Eastern MT, WY, UT, AZ, NM, CO, NE, Western KS**

**Central Motive Power Inc.**
6301 North Broadway
Denver, CO 80216
800-822-4332
303-428-6785 (fax)
http://www.centralmotivepower.com

**Central Motive Power Inc.**
3740 Princeton DR. NE
Albuquerque, NM 87401
800-884-2525
505-224-1358 (fax)
mraimondi@centralmotivepower.com

**Pueblo Diesel Injection**
36 North Laser Drive
Pueblo West, CO 81007
719-647-2092
719-547-0344 (fax)
jkramer@centralmotivepower.com

---

**ADP - Canada, CA, OR, WA, ID, NV, AK, HI, Western MT**

**ADP Distributors, Inc.**
105 - 18935 96th Avenue
Surrey, BC V4N 3P3
800-811-1188
604-888-4219 (fax)
george.peterson@adpdistributors.com

**ADP Distributors, Inc.**
119 Spy Court
Markham, ON L3R 5H6
800-601-7888
905-264-0626 (fax)
doug.lipton@adpdistributors.com

**ADP USA, Inc.**
18854 - 72nd Avenue S., Building "A"
Kent, WA 98032
888-338-9166
425-656-1571 (fax)
jim.eberle@adpdistributors.com

**ADP USA, Inc.**
315 Cloverleaf Drive, Unit "G"
Baldwin Park, CA 91706
888-359-3999
626-333-5404 (fax)
chris.bramall@adpdistributors.com
**Garrett Latin American Master Distributors supply Mexico, Central America, and the Caribbean with the complete offering of the Garrett aftermarket product.**

**TURBO SYSTEM DEL NORTE, S.A. DE C.V.**
Ave. Ruiz Cortines # 304
Fracc Hercules
Guadalupe N.L., Mexico
CP 67130
Tel: 011 52 (818) 394-3230
Fax: 011 52 (818) 379-0407
email: turbosystem@prodigy.net.mx
url: www.turbosystem.com.mx
Contacts: Jose Luis/Marco Tamez

**MARIO DIESEL DE CHIHUAHUA, S.A. DE C.V.**
Ave. Ocampo # 2607
Col. Centro
Chihuahua, Chih., Mexico
CP 31000
Tel.: 011 52 (614) 415-7715
Fax: 011 52 (614) 416-0489
email: mdiesel@prodigy.net.mx
url: n/a
Contacts: Mario Acosta

**TURBO REFACCIONES DIESEL DE MEXICO, S.A. DE C.V.**
Av. San Antonio # 47
Col. Mixcoac
Mexico, D.F. Mexico
CP 03800
Tel.: 011 52 (555) 615-0900
Fax: 011 52 (555) 615-0826
email: turborefacciones_diezel@hotmail.com
url: n/a
Contacts: Daniel Araiza

**Radiadores Unidos SA de CV**
Av. Pacífico 181 Col. Los Reyes Coyoacán
México, D.F., Mexico
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Contacts: Arturo Garcia / Martin Rodriguez

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url: www.turbocargadores.com
Contacts: Armando/Magda Rojas

**Delphi Products & Service Solutions Mexico**
Periférico sur 6369, Col Tepepan,
Mexico, DF, Mexico
CP 14610
Tel. 011 52 (555) 676-9855
Fax. 011 52 (555) 641-2580
email: edgar.cruz@delphi.com
url: www.delphi.com
Contacts: Edgar Cruz / Marisol Lemus

**Central Turbo Corp.**
10809 NW 29th Street
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Fax (305) 591-9372
email: sales@centralturbos.com
url: www.centralturbos.com
Contacts: Cadu Tilkian
Garrett European Distributors supply the European region with the complete offering of the Garrett Aftermarket product line.

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oliver_meyer@t-online.de  
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Israel  
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00 972 356 17116 (fax)  
lebarlo@netvision.net.il

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7 095 796 98 92 (fax)  
konstantin.tsarev@honeywell.com

**ENGINE PARTS PTY**  
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South Africa  
27 11 3975280  
27 11 3974403 (fax)  
donh@engineparts.co.za

**EUGEN TROST GmbH**  
Kesselstra Be 23  
70327 Stuttgart  
Germany  
49 711 4013 421  
49 711 5763 300 (fax)  
heinz.schoellmann@trost.d  
lars.seigemund@trost.d

**ENGINE PARTS PTY**  
Patrick Street, Jet Park  
Boksburg 1459, P.O. Box 674  
Isando 1600,  
Johannesburg  
South Africa  
27 11 3975280  
27 11 3974403 (fax)  
donh@engineparts.co.za

**Express Dizel Pomp SRL**  
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11111  
BUCHAREST  
Romania  
00 40 21 420 04 33  
00 40 21 420 02 69 (fax)  
ROMDIESEL@DNT.RO

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063 114 393 385  
35 114 375 468 (fax)  
paulo.marques@bomboleo.com

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Kailte Kara Ve Deniz  
Yedekleri Ticaret Ve Sanayi  
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90 232 4869067  
90 232 4353559 (fax)
Garrett European Distributors supply the European region with the complete offering of the Garrett Aftermarket product line.

**KIRCHNER TURBO SERVIS**  
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385 1 6141872 (fax)  
turbo@turbo.hr

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Dokumuler Sokak No.23  
Eskisehir  
Turkey  
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90 222 2173595 (fax)

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36 26 397253 (fax)  
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48 089 649 22 43 (fax)  
mremo@motoarena.pl

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Norway  
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47 35515063 (fax)  
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Greece  
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Garrett European Distributors supply the European region with the complete offering of the Garrett Aftermarket productline.

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358 9 350 52 777 (fax)
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31 3 55422453 (fax)
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32 51702812 (fax)
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33 3 20762661 (fax)
filiep.vlaminck@turbos-hoet.fr

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Germany
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49 7272 76752/774370 (fax)
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**RUSTURBO**
Moscow
Russia
How to know you are selecting a true Garrett Ball Bearing Turbocharger
Garrett Ball Bearing Turbochargers always end with an "R" as in GT28R. The R denotes the "rolling" element found in the single cartridge, dual ball bearing design Garrett uses on all GT Ball Bearing Turbochargers contained in the Performance Products Catalog.
**GT12 Performance Products**

**COMPRESSOR**

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<thead>
<tr>
<th>Turbo</th>
<th>CHRA</th>
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<tbody>
<tr>
<td>GT12</td>
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<td>708247-7</td>
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**TURBINE**

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<th>Trim</th>
<th>A/R</th>
<th>Type</th>
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<tbody>
<tr>
<td>35.5mm</td>
<td>72</td>
<td>0.43</td>
<td>Wastegated</td>
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</table>

Watercooled CHRA

**Powershift**

Horsepower 50 - 130
Displacement .4L - 1.2L
GT15, 72 trim, 0.35 A/R

GT15, 45mm, 60 trim, 0.48 A/R

Powershift

Horsepower 100 - 220
Displacement 1.0 - 1.6L

Corrected Gas Turbine Flow (lb/min)
Pressure Ratio (T/s) P1T/P2S

Turbo CHRA

GT15 466755-3 431876-93

<table>
<thead>
<tr>
<th>COMPRessor</th>
<th>TURBINe</th>
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<tbody>
<tr>
<td>Wh Dia</td>
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<tr>
<td>45mm</td>
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Watercooled CHRA
**COMPRESSOR**

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<th>A/R</th>
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<td>55</td>
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**TURBINE**

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<thead>
<tr>
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<th>Type</th>
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<tr>
<td></td>
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<td>Wastegated</td>
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</table>

**Horsepower** 140 - 260

**Displacement** 1.4 - 2.0L
**COMPRESSOR**

<table>
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<tr>
<th>Turbo</th>
<th>CHRA</th>
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<th>Trim</th>
<th>A/R</th>
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<tbody>
<tr>
<td>GT22</td>
<td>452187-6</td>
<td>52mm</td>
<td>60</td>
<td>0.51</td>
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<tr>
<td></td>
<td>452214-3</td>
<td>59.4mm</td>
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<td>0.42</td>
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**TURBINE**

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<tr>
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<th>Type</th>
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<tr>
<td>50.3mm</td>
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<td>0.67</td>
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<tr>
<td>50.3mm</td>
<td>72</td>
<td>0.56</td>
<td>Free Float</td>
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**TURBINE OPTION**

<table>
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<th>Trim</th>
<th>A/R</th>
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<tr>
<td>436313-6</td>
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<td>0.67</td>
</tr>
<tr>
<td>451503-1</td>
<td>72</td>
<td>0.56</td>
</tr>
</tbody>
</table>

**Powershift**

- Horsepower: 160 - 280
- Displacement: 1.7 - 2.2L

**Max Efficiency 72%**

**GT22 52mm, 60 trim, 0.51 A/R**

**GT22 59.4mm, 52 trim, 0.42 A/R**

**GT22, 72 trim, 0.67 A/R**

**GT22, 72 trim, 0.56 A/R**

- Corrected Gas Turbine Flow (lb/min)
- Pressure Ratio (T/s) P1T/P2S
- Corrected Air Flow (lbs/min)
- Max Efficiency 72%

**Garrett® Performance Products**
**COMPRESSOR**

<table>
<thead>
<tr>
<th>Turbo</th>
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<tbody>
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<td>GT25R</td>
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**TURBINE**

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<th>Trim</th>
<th>A/R</th>
<th>Type</th>
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</thead>
<tbody>
<tr>
<td>GT25R</td>
<td>53mm</td>
<td>62</td>
<td>0.64 Wastegated</td>
<td>Watercooled CHRA</td>
</tr>
</tbody>
</table>

**Performance Products**

- **PowerShift**
  - Horsepower: 170 - 250
  - Displacement: 1.4 - 2.2L

**GT25R 54.3mm, 60 trim, 0.80 A/R**

- Corrected Gas Turbine Flow (lb/min)
  - Max Efficiency: 65%

- Pressure Ratio (T/s): P1T/P2S
  - 1.50
  - 2.00
  - 2.50

- Corrected Air Flow (lbs/min)
  - 72%
  - 73%
  - 65%

**GT25R, 62 trim, 0.64 A/R**

- Corrected Gas Turbine Flow (l/s):
  - Max Efficiency: 65%

- Pressure Ratio (T/t): P2c/P1c
  - 0
  - 5
  - 10
  - 15
  - 20
  - 25
  - 30
  - 35

- Corrected Air Flow (lbs/min)
  - 72%
  - 73%
  - 65%
### GT28R Ball Bearing

**Performance Products**

**GT28R**

**Turbo**
- CHRA: 466541-1
- WH Dia: 60mm
- Trim: 60
- A/R: 0.60

**Turbine**
- WH Dia: 53mm
- Trim: 62
- A/R: 0.64
- Type: Wastegated

**Powershift**

- Horsepower: 200 - 280
- Displacement: 1.6 - 2.5L

**Corrected Gas Turbine Flow**

<table>
<thead>
<tr>
<th>Corrected Air Flow (lbs/min)</th>
<th>Pressure Ratio (T/s) P1T/P2S</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td>1.10</td>
<td>2.00</td>
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<tr>
<td>1.20</td>
<td>2.50</td>
</tr>
<tr>
<td>1.30</td>
<td>3.00</td>
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</table>

**Max Efficiency 65%**

**Watercooled CHRA**
GT28RS

The Disco Potato

Ball Bearing

Horsepower 250 - 320
Displacement 1.8 - 2.7L

<table>
<thead>
<tr>
<th>COMPRESSOR</th>
<th>TURBINE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wh Dia</td>
<td>Trim</td>
</tr>
<tr>
<td>60mm</td>
<td>62</td>
</tr>
<tr>
<td>60mm, 62 trim, 0.6 A/R</td>
<td>53.85mm, 76 trim, 0.86 A/R</td>
</tr>
</tbody>
</table>

Max Efficiency 68%

Corrected Air Flow (lbs/min)

Corrected Gas Turbine Flow (lb/min)

Pressure Ratio (T/s) P1T/P2S

Pressure Ratio (t/t) P2c/P1c

GT28RS, 76 trim, 0.64 A/R

GT28RS, 76 trim, 0.86 A/R

Performance products

Powershift

Watercooled CHRA
The 700382-12 GT30R is a customizable Garrett ball bearing GT turbo that is packaged without the turbine housing. (It includes a CHRA and compressor housing.) Either 740902-1 or 740902-2 turbine housing kits are available.

The turbine housing kits include turbine housing, clamps, bolts, and turbine inlet gasket. The housing is designed with T3 inlet flanges and a 4 bolt outlet.
GT32, 73 trim, 0.78 A/R
GT32, 73 trim, 0.69 A/R

Max Efficiency 68%

Corrected Gas Turbine Flow (lb/min)
Pressure Ratio (T/s) P1T/P2S

GT32 71mm, 52 trim, 0.50 A/R

Max Efficiency 68%

Corrected Air Flow (lbs/min)
Pressure Ratio (t/t) P2c/P1c

Horsepower 200 - 420
Displacement 2.0 - 2.7L

Turbo CHRA
GT32 452203-1 436058-3

<table>
<thead>
<tr>
<th>COMPRESSOR</th>
<th>TURBINE</th>
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<tbody>
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<td>452203-1</td>
<td>436058-3</td>
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<tr>
<td>WH Dia</td>
<td>Trim</td>
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<tr>
<td>64mm</td>
<td>73</td>
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<tr>
<td>TURBINE OPTION</td>
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<tr>
<td>451225-26</td>
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<td>435066-32</td>
<td>73</td>
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COMPRESSOR TURBINE

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<th>COMPRESSOR</th>
<th>TURBINE</th>
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<tbody>
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<td>436058-11</td>
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<td>52</td>
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<td>731428-1</td>
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<td></td>
<td></td>
<td>76mm</td>
<td>52</td>
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</table>

GT35 71mm, 52 trim, 0.50 A/R
GT35 76mm, 52 trim, 0.50 A/R

Max Efficiency 71%

Corrected Gas Turbine Flow (lb/min)

Pressure Ratio (T/s) P1T/P2S

Horsepower 260 - 510
Displacement 2.5L - 3.2L

POWERSHIFT

Corrected Air Flow (lbs/min)

Pressure Ratio (t/t) P2c/P1c

GT35, 84 trim, 1.18 A/R
GT35, 84 trim, 1.05 A/R

GT35, 71mm, 52 trim, 0.50 A/R

GT35, 76mm, 52 trim, 0.50 A/R

Max Efficiency 71%
**COMPRESSOR**

- **Turbo:** GT35R
- **CHRA:**
  - Turbo CHRA Wh Dia Trim A/R
    - GT35R 68mm, 56 trim, 0.70 A/R
    - GT35R 84 trim, 1.06 A/R
    - GT35R 84 trim, 0.82 A/R

**Horsepower**
- 400 - 600

**Displacement**
- 3.0 - 4.5L

**Corrected Gas Turbine Flow (lb/min)**
- Max Efficiency 74%

**Pressure Ratio (T/s) P1T/P2S**
- 1.50
- 2.00
- 2.50
- 3.00

**Corrected Air Flow (lbs/min)**
- 72%
- 79%
- 65%

**Powershift**
- Ball Bearing
- Watercooled CHRA

**Turbo**
- GT35R
  - 714568-1 706451-5
  - 82mm 56 0.70

**Turbine**
- Wh Dia  Trim  A/R
  - 68mm  84  1.06 Free Float
  - 68mm  84  0.82 Free Float

**Table:**

<table>
<thead>
<tr>
<th>Turbo</th>
<th>CHRA</th>
<th>Wh Dia</th>
<th>Trim</th>
<th>A/R</th>
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**Watercooled CHRA**
### COMPRESSOR

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### COMPRESSOR OPTION

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<th>Wh Dia</th>
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<th>A/R</th>
<th>Type</th>
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<tbody>
<tr>
<td>GT37 76mm, 52 trim, 0.54 A/R</td>
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<td>GT37 82mm, 52 trim, 0.54 A/R</td>
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<td>72.5mm</td>
<td>84</td>
<td>1.12</td>
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Horsepower 300 - 550
Displacement 2.8 - 3.8L
GT40 Turbo CHRA Wh Dia Trim A/R Wh Dia Trim A/R

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<thead>
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<td>703457-2</td>
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<th>Wh Dia</th>
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### COMPRESSOR - TURBINE

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<th>Wh Dia</th>
<th>Trim</th>
<th>A/R</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT42</td>
<td>731376-1</td>
<td>94mm</td>
<td>56</td>
<td>0.60</td>
<td>Free Float</td>
</tr>
<tr>
<td></td>
<td>731376-2</td>
<td>102mm</td>
<td>53</td>
<td>0.60</td>
<td>Free Float</td>
</tr>
</tbody>
</table>

### GT42, 84 trim, 1.15 A/R

- Max Efficiency: 69%

### GT42, 94mm, 56 trim, 0.60 A/R

- Max Efficiency: 72%

### GT42, 102mm, 53 trim, 0.60 A/R

- Max Efficiency: 72%

### Turbo CHRA Options

<table>
<thead>
<tr>
<th>Turbo</th>
<th>CHRA</th>
<th>Wh Dia</th>
<th>Trim</th>
<th>A/R</th>
<th>Type</th>
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<tbody>
<tr>
<td>451888-9</td>
<td>94mm</td>
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<td></td>
<td>82mm 84 Free Float</td>
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</table>

### GT42R - Ball Bearing CHRA Options

- Ball Bearing Option Available

---

**Garrett®**

**Performance Products**

**GT42**

**Ball Bearing Option Available**

**Poweshift**

- Horsepower 500 - 1000
- Displacement 4.4L - 6.5L
<table>
<thead>
<tr>
<th>COMPRESSOR</th>
<th>TURBINE</th>
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<td><strong>GT60</strong></td>
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<tr>
<td>Turbo</td>
<td>CHRA</td>
</tr>
<tr>
<td>731377-1</td>
<td>730496-1</td>
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**GT60 141mm, 56 trim, 1.05 A/R**

Max Efficiency 79%

**Horsepower 1450 - 2000**

**Displacement 6.2L - 10L**

**Powershift**

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<thead>
<tr>
<th>Corrected Air Flow (lbs/min)</th>
<th>Pressure Ratio (T/s) P1T/P2S</th>
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<tr>
<td>0</td>
<td>1.50</td>
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<td>1.00</td>
<td>2.00</td>
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<td>2.00</td>
<td>3.00</td>
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<tr>
<td>2.50</td>
<td>3.50</td>
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<table>
<thead>
<tr>
<th>Corrected Gas Turbine Flow (lb/min)</th>
</tr>
</thead>
<tbody>
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<td>2.00</td>
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<tr>
<td>2.50</td>
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<tr>
<td>3.00</td>
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<table>
<thead>
<tr>
<th>Turbo</th>
<th>CHRA</th>
<th>Wh Dia</th>
<th>Trim</th>
<th>A/R</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>141mm</td>
<td>56</td>
<td>1.05</td>
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<thead>
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<th>Turbo</th>
<th>CHRA</th>
<th>Wh Dia</th>
<th>Trim</th>
<th>A/R</th>
<th>Type</th>
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</thead>
<tbody>
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<td></td>
<td>441319-97</td>
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<td>1.25</td>
<td>Free Float</td>
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In addition to the GT products contained in the 2002 Garrett Performance catalog, Garrett provides coverage for a broad selection of traditional turbocharger models. These models are serviced with two product segments.

**Component Parts**
The component product segment provides the ability to service and/or make available component parts to Garrett customers who service performance turbochargers that have failed. This product also provides the ability to assemble standard or hybrid turbocharger or cartridge configurations.

**Traditional Assemblies**
The traditional assembly product segment is comprised of turbocharger and cartridge assemblies that have been applied to a broad spectrum of existing performance applications.

These components and/or assemblies may provide coverage for the following models:

<table>
<thead>
<tr>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
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<td>T28</td>
<td>TA31</td>
<td>TBB25</td>
<td>TMF55</td>
<td>TV92</td>
<td></td>
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<td>BTV75</td>
<td>T300</td>
<td>TA34</td>
<td>TBO3</td>
<td>TP38</td>
<td>TV94</td>
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<td>BTV85</td>
<td>T31</td>
<td>TA45</td>
<td>TBO5</td>
<td>TV45</td>
<td>TV95</td>
<td></td>
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<tr>
<td>BTW75</td>
<td>T350</td>
<td>TA51</td>
<td>TBO6</td>
<td>TV51</td>
<td>TW41</td>
<td></td>
<td></td>
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<tr>
<td>T2</td>
<td>T35</td>
<td>TAO3</td>
<td>TBP404</td>
<td>TV61</td>
<td>TW81</td>
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<tr>
<td>T3</td>
<td>T45</td>
<td>TB02</td>
<td>TC43</td>
<td>TV63</td>
<td>UTG75</td>
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<td></td>
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<td>T4</td>
<td>T51</td>
<td>TB03</td>
<td>TC04</td>
<td>TV70</td>
<td>UTV71</td>
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<td>T6</td>
<td>T52</td>
<td>TB22</td>
<td>THO8A</td>
<td>TV71</td>
<td>UTV75</td>
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<td>T12</td>
<td>T04</td>
<td>TB25</td>
<td>TL75</td>
<td>TV75</td>
<td>UTV94</td>
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<td></td>
</tr>
<tr>
<td>T18A</td>
<td>T04B</td>
<td>TB28</td>
<td>TL92</td>
<td>TV80</td>
<td>UTV95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T25</td>
<td>T04E</td>
<td>TB34</td>
<td>TM54</td>
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<td>T04S</td>
<td>T04S</td>
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<td>TMF51</td>
<td>TV84</td>
<td>UTV83</td>
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</table>

Contact Your Authorized Garrett Distributor for technical data and product availability.
High-Performance Stainless Steel Wastegate Assemblies: Garrett Performance Products is pleased to be the exclusive distributor of TiAl wastegate & blowoff valve assemblies. All wastegate assemblies are constructed with stainless steel valves and valve bodies. Actuator housings are CNC machined billet aluminum, with an optimal actuator to valve ratio of 2.2:1 for maximum flow capacity. The units are also designed with high temperature Nomex diaphragms and oxidation resistant Super Alloy components.

<table>
<thead>
<tr>
<th>Valve Size (diameter)</th>
<th>Part Number</th>
<th>Spring Rate (bar/psig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38mm</td>
<td>721490-0002</td>
<td>.36/5.2</td>
</tr>
<tr>
<td></td>
<td>721490-0003</td>
<td>.47/6.8</td>
</tr>
<tr>
<td></td>
<td>721490-0004</td>
<td>.59/8.6</td>
</tr>
<tr>
<td>40mm</td>
<td>721491-0004</td>
<td>.55/8.0</td>
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<tr>
<td></td>
<td>721491-0005</td>
<td>.66/9.6</td>
</tr>
<tr>
<td></td>
<td>721491-0006</td>
<td>.77/11.2</td>
</tr>
<tr>
<td>46mm</td>
<td>721492-0005</td>
<td>.60/8.7</td>
</tr>
<tr>
<td></td>
<td>721492-0006</td>
<td>.70/10.2</td>
</tr>
<tr>
<td></td>
<td>721492-0007</td>
<td>.80/11.6</td>
</tr>
</tbody>
</table>

Stainless Steel CNC Wastegate Flanges

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Type</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>38mm</td>
<td>716463-0001</td>
<td>Outlet Flange</td>
<td>2 x thru hole</td>
</tr>
<tr>
<td></td>
<td>716463-0002</td>
<td>Inlet Flange</td>
<td>2 x M8-1.25</td>
</tr>
<tr>
<td>40mm</td>
<td>716466-0001</td>
<td>Inlet Flange</td>
<td>4 x M8-1.25</td>
</tr>
<tr>
<td></td>
<td>716464-0001</td>
<td>Outlet Flange</td>
<td>4 x thru hole</td>
</tr>
<tr>
<td>46mm</td>
<td>716465-0001</td>
<td>Inlet or Outlet Flange</td>
<td>4 x thru hole</td>
</tr>
</tbody>
</table>
50mm Compressor Blow Off Valve Assemblies: The Garrett (TiAl) Blow-Off valve design is the result of extensive development and testing. The 50mm compressor bypass valve is a vital component of any turbocharged blow-through induction system. This custom TiAl manufactured blow-off valve will improve throttle (time to boost) response as well as help relieve the damaging effects of compressor “surge loading”. The CNC machined housings are available in several high luster anodized colors.

Note: Blow-off Valve Assemblies include fitting and V-band clamp.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>714341-0001</td>
<td>Red</td>
</tr>
<tr>
<td>714341-0002</td>
<td>Blue</td>
</tr>
<tr>
<td>714341-0003</td>
<td>Gray</td>
</tr>
<tr>
<td>714341-0004</td>
<td>Violet</td>
</tr>
<tr>
<td>714341-0005</td>
<td>Machined Aluminum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>722783-0001</td>
<td>Aluminum (6061)</td>
</tr>
<tr>
<td>722783-0002</td>
<td>Steel (1018)</td>
</tr>
<tr>
<td>722783-0003</td>
<td>Stainless Steel (304L)</td>
</tr>
</tbody>
</table>
The Garrett Performance Intercoolers (also known as Charge Air Coolers) work together with the turbocharger as a part of the total induction system. When air is compressed in the turbocharger it gains a great deal of heat. The heated air has lower oxygen density and therefore is not able to produce as much energy when fed into the cylinders. The job of the intercooler is to remove heat added by compression in the turbocharger and in turn promote more thorough combustion yielding more power, less emissions, and greatly reducing detonation.

Performance estimates made under the following conditions:
charge air inlet temperature = 250 degrees F
pressure ratio = 2.0 (approximately 14.7psi)
cooling air temperature = 75 degree F
cooling air flow rate set with 1 in. H2O pressure drop

---

### AIR TO AIR INTERCOOLER CORES (tube-header construction)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>A Hot Flow Length (in)</th>
<th>B No Flow Length (in)</th>
<th>C Cold Flow Length (in)</th>
<th>Weight (lbs.)</th>
<th>Estimated Power (hp)</th>
<th>Charge Air ∆ P (psi)</th>
<th>Charge Air ∆ T (F)</th>
<th>Effectiveness (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>485257-6001</td>
<td>24</td>
<td>15.5</td>
<td>2.2</td>
<td>29.4</td>
<td>450</td>
<td>1</td>
<td>138</td>
<td>79</td>
</tr>
<tr>
<td>485643-6003</td>
<td>26</td>
<td>18.5</td>
<td>2.8</td>
<td>33</td>
<td>600</td>
<td>0.94</td>
<td>142</td>
<td>81</td>
</tr>
<tr>
<td>485740-6002</td>
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<td>12</td>
<td>2.8</td>
<td>15.3</td>
<td>400</td>
<td>1</td>
<td>141</td>
<td>80</td>
</tr>
<tr>
<td>485980-6002</td>
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<td>16</td>
<td>2.8</td>
<td>21.8</td>
<td>480</td>
<td>0.9</td>
<td>150</td>
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<td>11</td>
<td>3</td>
<td>15.2</td>
<td>420</td>
<td>1</td>
<td>119</td>
<td>68</td>
</tr>
</tbody>
</table>

(continued)
### AIR TO AIR INTERCOOLER CORES (bar-plate construction)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Hot Flow Length (in)</th>
<th>No Flow Length (in)</th>
<th>Cold Flow Length (in)</th>
<th>Weight (lbs.)</th>
<th>Power (hp)</th>
<th>Charge Air Δ P (psi)</th>
<th>Charge Air Δ T (F)</th>
<th>Effectiveness (%)</th>
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</thead>
<tbody>
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<td>2.8</td>
<td>8.8</td>
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<td>0.96</td>
<td>123</td>
<td>70</td>
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<td>5</td>
<td>205</td>
<td>1</td>
<td>109</td>
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<td>3</td>
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<td>11.7</td>
<td>3</td>
<td>8</td>
<td>200</td>
<td>0.29</td>
<td>104</td>
<td>60</td>
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</tr>
<tr>
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<td>12</td>
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<td>701596-6001</td>
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<td>12.8</td>
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<td>575</td>
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<td>132</td>
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</table>
The following section includes information that is found in several reference books. The Garrett Engineering team is including this information as a quick reference to help you match a Garrett turbocharger to your engine. Examples are incorporated to help walk you through the matching process.

**Turbine Maps**

1. **Turbine Expansion Ratio** – The degree of exhaust expansion as it passes through the turbine.

   Example:
   
   Exhaust manifold pressure (EMP) = 15 psi  
   Turbine outlet pressure (Outlet P) = 1 psi  
   Atmosphere (Atmos) = 14.7 psi at sea level

   \[
   \text{ER} = \frac{\text{EMP} + \text{Atmos}}{\text{Outlet P} + \text{Atmos}} = \frac{15 + 14.7}{1 + 14.7} = 1.89
   \]

2. **Turbine Corrected Flow** – The turbine flow is also corrected for temperature and pressure at the turbine inlet (exhaust manifold).

   Example:
   
   Engine air flow (Actual Flow) = 50 lb/min  
   Exhaust manifold pressure (EMP) = 25 psi  
   Exhaust temperature (Gas Temp) = 1500° F  
   Barometric Pressure (Baro) = 14.7 psi

   \[
   \text{Corrected Flow} = \frac{\text{Actual Flow} \sqrt{([\text{Gas Temp} + 460]/519)}}{([\text{Baro} + \text{EMP}]/14.7)}
   \]

   \[
   \text{Corrected Flow} = \frac{50 \sqrt{([1500 + 460]/519)}}{([14.7 + 25]/14.7)} = 36 \text{ lb/min}
   \]

   (continued)
Compressor Maps:

1. **Pressure Ratio** - Ratio of **absolute** outlet pressure divided by **absolute** inlet pressure.

   Example:
   
   Intake manifold pressure (Boost) = 12 psi
   Pressure drop, intercooler (ΔP_intercooler) = 2 psi
   Pressure drop, air filter (ΔP_air_filter) = 0.5 psi
   Atmosphere (Atmos) = 14.7 psi at sea level

   \[
   \text{PR} = \frac{\text{Boost} + \Delta P_{\text{intercooler}} + \text{Atmos}}{\text{Atmos} - \Delta P_{\text{air filter}}}
   \]

   \[
   \text{PR} = \frac{12 + 2 + 14.7}{14.7 - 0.5} = 2.02
   \]

2. **Corrected Airflow** - Represents the corrected mass flow rate of air, taking into account air density (ambient temperature and pressure).

   Example:
   
   Air Temperature (Air Temp) = 60° F
   Barometric Pressure (Baro) = 14.7 psi
   Engine air consumption (Actual Flow) = 50 lb/min

   \[
   \text{Corrected Flow} = \frac{\text{Actual Flow} \sqrt{(\text{Air Temp} + 460)/545}}{\text{Baro}/13.95}
   \]

   \[
   \text{Corrected Flow} = \frac{50 \times \sqrt{(60 + 460)/545}}{14.7/13.95} = 46.3 \text{ lb/min}
   \]

3. **Efficiency Contours** - The efficiency contours depict the regional efficiency of the compressor set. This efficiency is simply the percentage of turbo shaft power that converts to actual air compression. When sizing a turbo, it is important to maintain the proposed lugline with a high efficiency range on the map.

4. **Surge Line** - The surge region, located on the left-hand side of the compressor map, is an area of flow instability typically caused by compressor inducer stall. The turbo should be sized so that the engine does not operate in the surge range. When turbochargers operate in surge for long periods of time, bearing failures may occur.

5. **Choke Line** - The choke line is on the right hand side of the compressor map and represents the flow limit. When a turbocharger is run deep into choke, turbo speeds will increase dramatically while compressor efficiency will plunge (very high compressor outlet temps), and turbo durability will be compromised.
Do you know what tests your turbo has endured??? Garrett is one of the few turbocharging manufacturers that subjects our turbo’s to several OE qualification tests. These turbocharging “qual tests” ensure Garrett produces a safe and reliable turbo for OE applications. When you buy a Garrett turbo you can be sure it is a reliable one!

- **On-Engine Durability** - A 1,000-hour general turbocharger durability test that is run on-engine in one of Garrett’s engineering laboratories. Some engines die before our turbos do!

- **Gas Stand Cyclic Durability** (aka The Non-Sissy Test) - A 500 hour general turbocharger durability test. This is basically a “beat the crap out of the turbo” test. Survive this one and you’ve got one tough turbo!

- **Compressor & Turbine Housing Containment** - A compressor/turbine wheel is weakened to “hub” burst at a specific speed. No portion of the wheel is allowed to penetrate a “containment shroud” surrounding the turbocharger. A test to ensure safety.

- **Shaft Motion** - The maximum tolerances of the bearing system are tested for rotordynamic stability beyond the maximum turbocharger operating speed. This means no bearing problems and a long turbo life.

- **Thrust Bearing Capacity** - A test that stresses the thrust bearing at extreme conditions. This test makes sure your Garrett turbocharger can tolerate the load you put it through.

- **Compressor & Turbine Seal** - Multiple turbochargers are run on-engine under conditions designed to cause seal leakage. No significant leakage is allowed during these tests.

- **Heat Soakback** - A turbocharger instrumented with thermocouples is taken beyond maximum operating temperature and shut down hard! Repeat the test four more times and make sure maximum temperatures stay within our strict limits to avoid oil “coking” or build up inside the center housing. This is particularly critical for high temperature gasoline applications.

(continued)
Compressor & Turbine Performance - The entire operating range of both the compressor and turbine are mapped on one of Garrett's "Performance Gas Stands." These test cells are calibrated to strict standards to assure accuracy and consistency.

Compressor & Turbine Blade Frequencies - Garrett has strict requirements for compressor and turbine blade natural frequency. This is critical on large trims where the blade must be stiff enough to withstand potentially damaging vibrations.

Thermal Cycle - A 200-hour endurance test that cycles the turbocharger from low temperature to "glowing red" every 10 minutes. To ensure a long turbo life, no cracking of the turbine housing or distortion of the heat shroud are allowed.

Rotor Inertia - A measurement made to document the rotational inertia of Garrett’s compressor and turbine wheels. Garrett’s products are known for their high flow / low inertia characteristics.

Shaft Critical Speed - An analytical “test” that ensures that destructive shaft “critical speeds” are well out of the turbocharger operating range. For example, large wheels may require a large shaft diameter to avoid the “shaft bending” critical speed.

Compressor Fatigue - Garrett will not sell compressor or turbine wheel castings that have not passed a strict “test to failure” cyclic fatigue test. Garrett runs tests on a regular basis to ensure quality and to constantly improve our products.

Turbo Vibration - The entire turbocharger is vibrated on Garrett’s large shaker table. Vibration levels are monitored to ensure product durability.
Statement of Warranty

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Use of compressor maps and turbine maps

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Appendix A

**TURBO TERMS**

**A/R** - A/R describes a geometric property of all compressor and turbine housings. Increasing compressor A/R optimizes the performance for low boost applications. Changing turbine A/R has many effects. By going to a larger turbine A/R, the turbo comes up on boost at a higher engine speed, the flow capacity of the turbine is increased and less flow is wastegated, there is less engine backpressure, and engine volumetric efficiency is increased resulting in more overall power.

**CHRA** - center housing rotating assembly – The CHRA includes a complete turbocharger minus the compressor, turbine housing, and actuator.

**Clipped Turbine Wheels** - When an angle is machined on the turbine wheel exducer (outlet side), the wheel is said to be ‘clipped’. Clipping causes a minor increase in the wheel’s flow capability, however, it dramatically lowers the turbo efficiency. This reduction causes the turbo to come up on boost at a later engine speed (increased turbo lag). High performance applications should never use a clipped turbine wheel. All Garrett GT turbos use modern unclipped turbine wheels.

**Free-Float** - A free floating turbocharger has no wastegate device. This turbocharger can’t control its own boost levels. For performance applications, the user must install an external wastegate.

**GT** - The GT designation refers to Garrett’s state-of-the-art turbocharger line. All GT turbos use modern compressor and turbine aerodynamics which represent huge efficiency improvements over the old T2, T3, T3/T4, T04 products. The net result is increased durability, higher boost, and more engine power over the older product line.

**On-Center Turbine Housings** - On-center turbine housings refer to an outdated style of turbine housing with a centered turbine inlet pad. The inlet pad is centered on the turbo’s axis of rotation instead of being tangentially located. Using an on-center housing will significantly lower the turbine’s efficiency. This results in increased turbo lag, more backpressure, lower engine volumetric efficiency, and less overall engine power. No Garrett OEM’s use on-center housings.

**Trim** - Trim is an area ratio used to describe both turbine and compressor wheels. Trim is calculated using the inducer and exducer diameters. As trim is increased, the wheel can support more air/gas flow. Use these formulas when calculating trim:

\[
\text{Trim}_{\text{Compressor}} = \frac{(\text{Inducer Diameter})^2}{(\text{Exducer Diameter})^2} \times 100
\]

\[
\text{Trim}_{\text{Turbine}} = \frac{(\text{Exducer Diameter})^2}{(\text{Inducer Diameter})^2} \times 100
\]

**Wastegate** - A wastegated turbocharger includes an integral device to limit turbo boost. This consists of a pneumatic actuator connected to a valve assembly mounted inside the turbine housing. By connecting the pneumatic actuator to boost pressure, the turbo is able to limit its maximum boost output. The net result is increased durability, quicker time to boost, and adjustability of boost.