
TWISTED WEDGE ALUMINUM HEADS FOR SMALL BLOCK FORD

Overview

Included Parts

Technical Specs

Recommended Components

Installation Notes

Replacement Parts

Warranty

Flowbench Results

Image

Twisted Wedge Aluminum Heads for Small Block Ford

Overview

	Material	Combustion Chamber Volume	Intake Port Volume	Exhaust Port Volume	Valve Sizes	Valve Springs	Valve Locks	Retainers	Rocker Studs	Guideplates	O-Ringed	Quantity
TFS-51400002	A356-T61 Aluminum	61cc	170cc	66cc	2.02 in. Intake, 1.60 in. Exhaust	1.470 in. Single Springs with Dampers	7 Degree Machined Steel	Chromemoly Steel	ARP 3/8 in.	For 5/16 in. Hardened Pushrods	No	Pair
TFS-51400003	A356-T61 Aluminum	61cc	170cc	66cc	2.02 in. Intake, 1.60 in. Exhaust	1.470 in. Single Springs with Dampers	7 Degree Machined Steel	Chromemoly Steel	ARP 3/8 in.	For 5/16 in. Hardened Pushrods	Yes	Pair

Included Parts

Two assembled cylinder heads
Two packs of 10 head bolt washers
Two packs of four 5/16 in. guideplates
Two packs of eight 3/8 in. rocker arm studs
Two 5/8 in.-11 threaded inserts
Instruction packet

Twisted Wedge Aluminum Heads for Small Block Ford

Material:

A356-T61

Combustion Chamber Volume:

61cc

Intake Port Volume:

170cc

Intake Port Dimensions:

2.00 in. high x 1.20 in. wide

(designed to use a Fel-Pro #1250 intake gasket)

Exhaust Port Volume:

66cc

Exhaust Port Dimensions:

1.50 in. high x 1.25 in. wide

(designed to use a Fel-Pro #1415 exhaust gasket)

All port locations are OEM

Valves:

CNC-ported, one piece, non-magnetic stainless steel with hardened tips

Intake Valve:

2.02 in. head diameter, 11/32 in. stem diameter, .260 in. tip height, 4.960 in. OAL

Exhaust Valve:

1.60 in. head diameter, 11/32 in. stem diameter, .260 in. tip height, 4.980 in. OAL

Springs:

1.470 in. diameter single with damper

110 lbs at 1.800 in. installed height

Open Pressures: 290 lbs at .500 in. lift and 305 lbs. at .540 in. lift giving 360 pounds per inch spring rate

Maximum Recommended Lift:

.540 in.

Valve Seats:

Tungsten alloy compatible with unleaded fuel

Valve Guides:

.500 in. O.D. x 2 in. long, special manganese bronze alloy

Valve Seals:

Viton

Retainers:

Chromemoly steel, machined for 7 degree locks

Locks:

7 degree machined steel

Rocker Studs:

170,000 psi tensile strength

3/8 in. top thread, 7/16 in. base thread

Guideplates:

Carburized steel

Requires 5/16 in. hardened pushrods, approximately +.500 in. longer than stock

Casting Features

A356-T61 aluminum

CNC-machined--all threads rolled and chamfered

Drilled with all OEM-type accessory holes

Valve cover rails raised .350 in.

Machined to use a 3/4 in. reach, 5/8 in. hex, gasket, or taper seat spark plug

Proper Application

Trick Flow Twisted Wedge Heads are designed as an emissions legal, high performance replacement for OEM cylinder heads. Modification of street heads for racing will void their warranty.

Recommended Components

Head Gasket:

Fel-Pro 8548PT-2 for mild engines with non O-ringed heads

Fel-Pro 1011-2 for higher performance engines
with non O-ringed heads

Fel-Pro 1022 and 1023 for non O-ringed heads with

wider combustion chambers due to porting (1022 is for the left bank, 1023 is for the right bank)

Fel-Pro 1006 or TFS-51400901 for all engines
with O-ringed heads

Head Bolts, Studs, and Adapter

Block Type	Head Type	
	TFS-51400002 (non O-ringed Head)	TFS-51400003 (O-ringed head)
Standard 289/302 block (7/16"-14 head bolt holes)	Bolts: ARP 154-3601 or Studs: ARP 154-4001	Bolts: ARP 254-3708 or Studs: ARP 154-4005 or Bolts: ARP 154-3601 with TFS-51400419 bushings or Studs: ARP 154-4001 with TFS-51400419 bushings
351W or 302 race block (1/2"-13 head bolt holes)	Drill out restriction, then: Bolts: ARP 154-3603 or Studs: ARP 154-4003	Bolts: ARP 154-3603 or Studs: ARP 154-4003

Threaded Inserts:

TFS-51400265 for non-emissions vehicles needing to plug the rear A.I.R. passage

Moly Lube:

ARP-100-9903

RTV Sealer:

Permatex Ultra Black #598BR

Thread Sealer:

Permatex Aviation Form-a-Gasket #3H

Thread Locker:

Loctite Blue #242 for medium strength applications, Loctite Red #271 for high strength applications

Roller Rocker Arms:

Crane Gold Race 36750-16 (3/8" stud, 1.6 ratio)

Crane Gold Race 36755-16 (3/8 in. stud, 1.7 ratio)

Crane Gold Race 86757-16 (7/16 in. stud, 1.6 ratio)

Crane Gold Race 36757-16 (7/16 in. stud, 1.7 ratio)

TFS-51400510 (3/8 in. stud, 1.6 ratio)

TFS-51400511 (3/8 in. stud, 1.7 ratio)

TFS-51400520 (7/16 in. stud, 1.6 ratio)

TFS-51400521 (7/16 in. stud, 1.7 ratio)

Ford Motorsport M6564A351 (3/8 in. stud, 1.6 ratio)

Ford Motorsport M6564D351 (3/8 in. stud, 1.7 ratio)

Rocker Arm Studs:

3/8 in. ARP rocker studs are included with the heads. If you need a 7/16 in. rocker stud use ARP-234-7206. It has a step under the hex to properly locate the guideplate.

Intake Gasket:

Fel-Pro #1250

Exhaust Gasket:

Fel-Pro #1415

Head Gasket Kits:

TFS-51400904 for engines with non-O-ringed heads

TFS-51400905 for engines with O-ringed heads

Head Alignment Dowels:

TFS-51400420

Pushrods:

All heads require longer than stock hardened pushrods.

Trick Flow offers heavy duty, hardened pushrods for most applications.

Headers:

Most headers will fit without modifications. Always check header fitment before installing the heads. Refer to the Checking Header Clearance section in the instructions.

Spark Plugs:

The following plugs are recommended as a starting point:

Champion RC9YC AC-FR3LS

NGK-FR5 Autolite-3924

Accel-416

NOTE: Blower and nitrous applications will require you to run a colder heat range spark plug. Try several heat ranges as needed.

For more information contact:

Trick Flow Specialties

1248 Southeast Avenue

Tallmadge, OH 44278

Sales & Tech: (330) 630-1555

Fax: (330) 630-5565

Twisted Wedge Aluminum Heads for Small Block Ford

Installation Notes

Recommended Tools

- * Shop manual for your vehicle
- * Basic mechanics tool set with SAE and metric size sockets and combination wrenches
- * 0-150 ft.-lbs. torque wrench
- * Refrigeration-type quick disconnect tools for fuel connections on EFI engines
- * Timing light, vacuum gauge, and spark plug gapper
- * 7/16 in.-14 or 1/2 in.-13 tap and tap handle
- * 3/16 in. and 17/32 in. drill bits and drill (may not be required depending on application)
- * Machinists rule or dial indicator (for checking piston-to-valve clearance)
- * Straightedge
- * Feeler gauge
- * Modeling clay
- * Adjustable pushrod
- * Solid mock-up lifter

Additional Parts Required

You will need the following components to complete the installation of your Trick Flow heads. See Recommended Components for specific part numbers. Trick Flow also has complete Head Gasket kits featuring top quality gaskets made for us by Fel-Pro. The kits will save you time and money.

- * Head gaskets
- * Intake gaskets
- * Exhaust gaskets
- * Head bolts
- * Head bolt bushings (depending on application)
- * Two additional threaded inserts (for non-emissions applications)
- * Intake bolts
- * Exhaust bolts
- * Moly lube
- * Spark plugs
- * RTV sealer
- * Pushrods
- * Rocker arms
- * Thread sealer
- * Thread locker

Note: For optimum performance on non-emissions 5.0 EFI engines, it is highly recommended to use fuel injectors rated at 24 lbs.-hr. minimum and a free flowing exhaust with a minimum diameter of 2 1/2 in.

Installation Instructions

1. Pushrod and Rocker Arm Recommendations

Longer than stock pushrods must be used in all applications. We strongly recommend that you verify the valve tip wear pattern using the procedure outlined in the Tech Bulletin. After setting the rocker to the proper height as shown in [Figure 5](#), the pushrod length you obtain should be within .150 in. of the following lengths. See Recommended Components for roller rocker arm recommendations.

289/302 engines with any recommended rocker arm

Camshaft Type	Pushrod Length
Hydraulic roller	6.750 in.
Hydraulic flat tappet	7.300 in.

351W Engine with any recommended rocker arm

Camshaft Type	Pushrod Length
Hydraulic roller	8.050 in.
Hydraulic flat tappet	8.600 in.

2. Cylinder Head Removal

Consult your shop manual for the proper removal procedure for your particular vehicle. It's a good idea to jot down notes or drawings as you proceed. Taking pictures or even making a video of the disassembly will help you greatly when reinstalling complicated bracketry and vacuum line routing. Be sure the #1 cylinder is at TDC on the compression stroke, then mark the distributor's rotor position before disassembly. Leave the engine in this position for the upcoming piston to valve clearance checks.

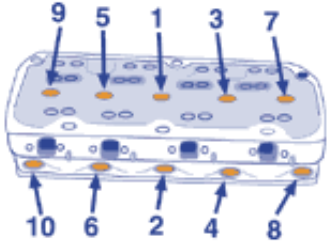
3. Prepping the Block

With the old heads removed, now is a good time to inspect your cylinder bores for scratches, ridges, and cracks. If everything looks OK, put some paper towels in the cylinders to catch loose debris as you scrape the old head gaskets off the deck surface of the block. Remove your old head alignment dowels and all traces of gasket, oil, or grease that may be present then wipe the surface with brake cleaner.

Check the deck surfaces for flatness by laying a straightedge across the deck lengthwise, then try to stick a .004 in. feeler gauge under the straightedge anywhere on the deck surface. If you can get the feeler gauge under, it's time to have your block decked.

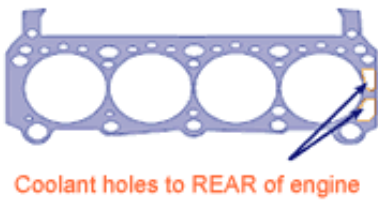
Once the block decks have been cleaned and checked, use the correct tap to chase the threads in the head bolt holes. This will clean out old sealer and debris. This is very important for sealing the new head bolts and torquing the heads down evenly on the block! You may want to put an "X" on the bolt pattern diagram (Figure 1) by the holes that you've already done so you don't lose track. After cleaning the head bolt hole threads, carefully take the paper towels out of the cylinders and discard. Wipe the cylinders out with paper towels until they are very clean, then coat the cylinder walls with a thin film of engine oil.

Figure 1



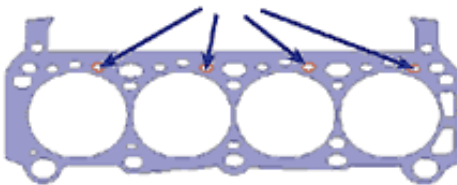
Next, install the new head alignment dowels, then place your new head gaskets on as shown in Figure 2.

Figure 2



Note that the large coolant holes always go toward the rear of the block. If you have a pre-1972 block or a 351 SVO block, you must modify the coolant passages in the deck surface as shown in Figure 3. Using the head gasket as a template, drill into the water jacket at the locations shown with a 3/16 in. drill bit. This modification must be done to prevent overheating due to steam pockets forming in the high side of the block. Be sure to tape off or otherwise cover the deck surface and cylinder bores when you are drilling.

Figure 3



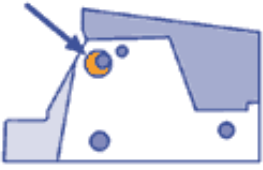
Dome Piston Warning!

OEM style dome pistons will interfere with Trick Flow's unique combustion chamber design. Conventional flat top pistons will work. Many aftermarket piston manufacturers make Trick Flow-specific pistons for high compression and high valve lift applications.

4. Checking Header Clearance

Place one of your new heads on a suitable work top and install the recommended spark plugs. Bolt the headers on the head and check for any plug interference--it is much easier to find out now instead of waiting until the engine is in the chassis. Be sure to check both headers. Now is also a good time to install the additional threaded inserts that are required in the rear of the heads on non-emissions vehicles. These are nearly impossible to install once the heads are bolted to the engine in the chassis. Secure the inserts with a small amount of blue Loctite. See Figure 4.

Figure 4



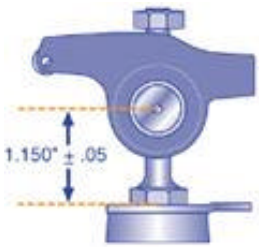
5. Checking Piston to Valve Clearance and Valvetrain Geometry

If you choose to use the stock cam in your engine, and it has not been moved from its factory position, you do not have to check piston to valve clearance. It is still a good idea to familiarize yourself with the procedure since you may want to go to a larger cam in the future.

If you have an aftermarket cam or are reinstalling ANY cam (especially with a multi-keyway timing set), you must follow this procedure to assure safe operating clearances between your pistons and valves:

- A. Make sure you're still on the compression stroke of the #1 cylinder (both lifters will be in the down position). Place a solid mock-up lifter in the lifter bore of the valve that you'll be checking. (Make sure that the lifter is the same height as your original--you'll need it for checking valvetrain geometry later.)
- B. Coat the top of the piston with a very thin layer of oil, then place a few 1/4 in. thick strips of modeling clay across the upper half of the piston. Place the head gasket you will be using on the block and bolt on the head with five or six head bolts, torqued only to 30 ft.-lbs.
- C. Install the valvetrain for the position you are checking (intake or exhaust) with your adjustable pushrod set to one of the lengths shown in Step 1. Tighten the rocker to zero lash, rotate the crank at least twice, then remove the head and gently remove the clay. Carefully cut the clay in slices and look for the thinnest section of the valve impression. This impression is a 3D representation of the closest approach of the piston to the valve.
- D. Carefully measure the clay with a machinist's scale or calipers. The intake side should have at least .080 in. (5/64 in.) of clearance, and the exhaust should have at least .100 in. (7/64 in.) of clearance. Repeat the procedure for the other valve.
- E. When you are done with the second valve, reinstall the head in the same manner as before so you can verify proper pushrod length and valvetrain geometry. For ideal geometry on the Twisted Wedge Ford Street Head, the height from the center of the rocker fulcrum down to the top of the guideplate should be 1.150" (+/- .050") as shown in Figure 5. To check your rocker height, make sure the lifter is at its lowest position, then install your adjustable pushrod and set it to the same length that you used for checking piston to valve clearance. Next, place your rocker on the stud and adjust the pushrod length until you get the proper rocker height. After the required checks are completed, place the crankshaft at TDC on the compression stroke of the #1 cylinder. This will be the starting position for the valve adjustments.

Figure 5



6. Installing the Trick Flow Heads

With the block clean and all checks completed, position the head gaskets per the manufacturer's markings. As mentioned before, the large coolant holes always go towards the rear of the block. O-ringed heads must always use a Loc-Wire head gasket.

When the gasket is positioned correctly, don't be alarmed if some of the holes in the block are restricted by a smaller hole in the gasket. This is done intentionally to regulate coolant flow. (If you have a pre-1972 or a 351 SVO block, see the Prepping the Block section about the addition of water transfer holes in the deck surface.)

With the gaskets in place, push the heads down evenly onto the new dowels so the head is flat against the gasket. Next, place all head bolt washers on the head to protect the aluminum surface. Put a small amount of ARP moly lube on the tops of all washers once they are in place.

Head Bolt Note: On vehicles with torque-to-yield head bolts (1992 1/2 and later), the head bolts must be replaced. See the Recommended Components.

Coat all bolt or stud threads with a premium thread sealer (Permatex 3H "Aviation Form-a Gasket" for bolts, Loctite Blue for studs), then torque the bolts as shown in Figure 1 using four steps:

7/16 in. Head Bolts: Torque to 35. ft.-lbs., 50 ft.-lbs., and 70 ft.-lbs., then tighten only the long bolts an additional 10 ft.-lbs.

1/2 in. Head Bolts: Torque to 35 ft.-lbs., 70 ft.-lbs., and 100 ft.-lbs., then tighten only the long bolts an additional 10 ft.-lbs.

Retorquing shouldn't be necessary after initial break-in, but can be done if desired.

7. Installing and Adjusting the Valvetrain

Place the proper length pushrods into the pushrod holes. Coat the base threads of the rocker studs with oil (do not use antiseize!), then put the guideplates on. When everything is lined up correctly, torque the studs to 55 ft.-lbs. (using motor oil). Place your rockers on the studs, and make sure they are centered side to side (see **Figure 6**). Adjust the valvetrain according to your cam maker's specifications. If you are using a hydraulic cam and no specs are available, turn the rocker arm adjusting nut 1/2 to 3/4 of a turn after zero lash. For mechanical cams, you must get the correct lash specification from the cam maker.

Figure 6



In either case, the simplest method of valve adjustment is to follow the firing order, turning the crankshaft a 1/4 turn between each cylinder. For example, turn the crankshaft until the first cylinder listed in the firing order is at the TDC position on the compression stroke. Both valves will be in the closed position. Adjust the valves as described above, then rotate the crank exactly 1/4 turn and repeat for the next cylinder in the firing order. For other methods, consult your shop manual.

Firing Orders

289 and standard 302: 1, 5, 4, 2, 6, 3, 7, 8

351W and 302 HO (5.0L): 1, 3, 7, 2, 6, 5, 4, 8

8. Reassembling the Rest of the Engine

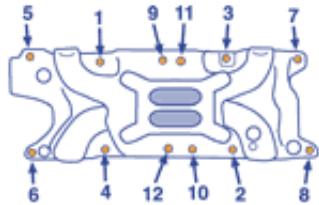
Install as many items as you can without putting the valve covers on. For late model EFI engines, it is recommended to test fit the upper intake before prelubing the valvetrain (see the note on EGR below). This will allow you to minimize the time between prelubing and initial startup.

Intake Manifold Tips

Apply a 1/4 in. bead of Permatex Ultra Black (part number 598BR) to the front and rear manifold surfaces. Do not use any gasket on the end rails, only the sealer. Outline the water openings at the ends of the head with the Ultra Black to help prevent water leaks.

Apply a small amount of motor oil (do not use antiseize!) to the intake bolts and gradually torque them to 22 ft.-lbs. using the sequence shown in **Figure 7**. This procedure must be repeated several times until all bolts reach the 22 ft.-lb. requirement. The intake manifold will work its way into a properly seated position during this process.

Figure 7



EGR Note: On late model 5.0L EFI engines, the EGR valve boss on the bottom side may require some modification to clear the valve covers (see **Figure 8**). Place the upper manifold on the base, if applicable, and torque to 20 ft.-lbs. as shown in **Figure 9**.

Figure 8

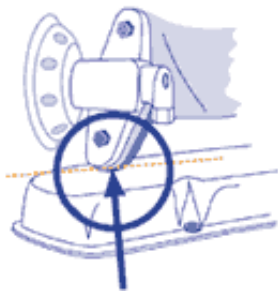
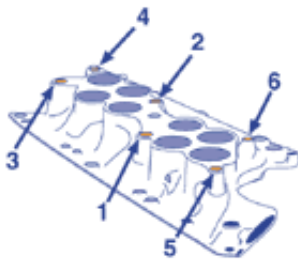


Figure 9



Exhaust Manifold/Header Tips

Lay your straightedge across the mating flange of your headers or exhaust manifold to make sure they are flat. If they are not, you should have them milled flat. Put a little bit of motor oil (do not use antiseize!) on the exhaust bolts and tighten them down from the center out to the ends. You're trying to pull the flange down evenly. After the engine has been run a few times, it is a good idea to retighten the exhaust bolts. If they loosen up, the leaking exhaust gas will burn out the gasket.

Exhaust Leak Note: What sounds like a lifter tick is often an exhaust gas leak. They both vary directly with RPM and sound alike. Rule out exhaust leaks before tearing the intake off to replace the lifters.

9. Prelubing the Valvetrain

You are now ready to prelube the valvetrain. Lubricate the rocker arms, springs, and valve stems with about 1/2 quart of oil per head. It is a good idea to use an oil squirt-can to get inside the valve spring and lube the valve stem and seal area.

YOU MUST NOT START THE ENGINE WITH THE TOP HALF DRY!

The valve cover rails on the Trick Flow heads have been raised approximately .350 in. to provide clearance for roller rocker arm poly locks. This will make the valve covers sit higher. Take this into account when reassembling accessories that mount on or cross over the valve covers.

10. Break-In and Tuning

After installing the valve covers, assemble the rest of the engine and align the distributor rotor to the mark you made during disassembly so that the engine starts as quickly as possible. If the cylinders are getting the right amount of fuel with a correctly timed spark, the engine will start quickly.

To ensure long life and trouble-free usage, allow 2-4 hours of normal driving time before running the engine hard. This allows proper break-in of your valvetrain. If you are also breaking in a new cam, it's a good idea to change the oil after a half hour. This will help to remove the many small particles that are shorn off in the break-in process. After proper break-in is complete, you can use a synthetic oil if you wish.

Recommended total timing is from 34 to 36 degrees for maximum power. The best setting will depend on your particular engine combination and ambient conditions.

Twisted Wedge Aluminum Heads for Small Block Ford

Replacement Parts

TFS-51410002	Cylinder Head Assembly, non O-ringed
TFS-51413002	Cylinder Head, bare w/seats and guides, non O-ringed
TFS-51400413-1	Valve Spring, each
TFS-51400413	Valve Spring, set of 16
TFS-51400423-1	Retainer, each
TFS-51400423	Retainer, set of 16
TFS-51400444-1	Valve Locks, machined, pair
TFS-51400444	Valve Locks, machined, set of 32
TFS-51400211	Intake Valve, each
TFS-51400212	Exhaust Valve, each
TFS-51400454	Valve Stem Seals, set of 16
TFS-51410623	Guideplates, set of 4
TFS-51400623	Guideplates, set of 8
TFS-51400417	7/16 in. Head Bolt Washers, set of 10
TFS-51400265	Threaded Insert, each
TFS-51400614-1	3/8 in. Rocker Stud, each
TFS-51400614-8	3/8 in. Rocker Studs, set of 8
TFS-51400614	3/8 in. Rocker Studs, set of 16
TFS-DP-4	Instruction packet, each

Warranty

Trick Flow Specialties warrants its assembled street high performance cylinder heads to be free from defects in both materials and workmanship for a period of one year from date of purchase. All other products, including race cylinder heads, are warranted for a period of 90 days from date of purchase. This warranty covers manufacturing defects only. Damage due to negligence or improper installation will not be covered. Alterations made to the product such as porting, milling, welding, or other custom modifications are done at the owner's sole risk and will void the warranty. Trick Flow's sole obligation shall be to repair or replace any product that is defective under this warranty. This warranty covers only the product itself and not the cost of installation or removal.

Customers who believe they have a defective product should either return it to the dealer from whom it was purchased or call Trick Flow at 1-330-630-1555 with a complete description of the problem. After obtaining a return authorization number, the product must be returned freight prepaid. If a thorough inspection by the factory indicates defects in workmanship or materials, our sole obligation shall be to repair or replace the product.

Airflow Chart

Lift Value (in.)	As Cast	
	Intake Flow	Exhaust Flow
	CFM	CFM
0.100	63	53
0.200	141	107
0.300	205	144
0.400	233	171
0.500	251	187
0.600	251	193

NOTE:

Tests conducted at 28 in. of water (pressure)
Intake valve size 2.020 in./exhaust valve size 1.600 in.

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