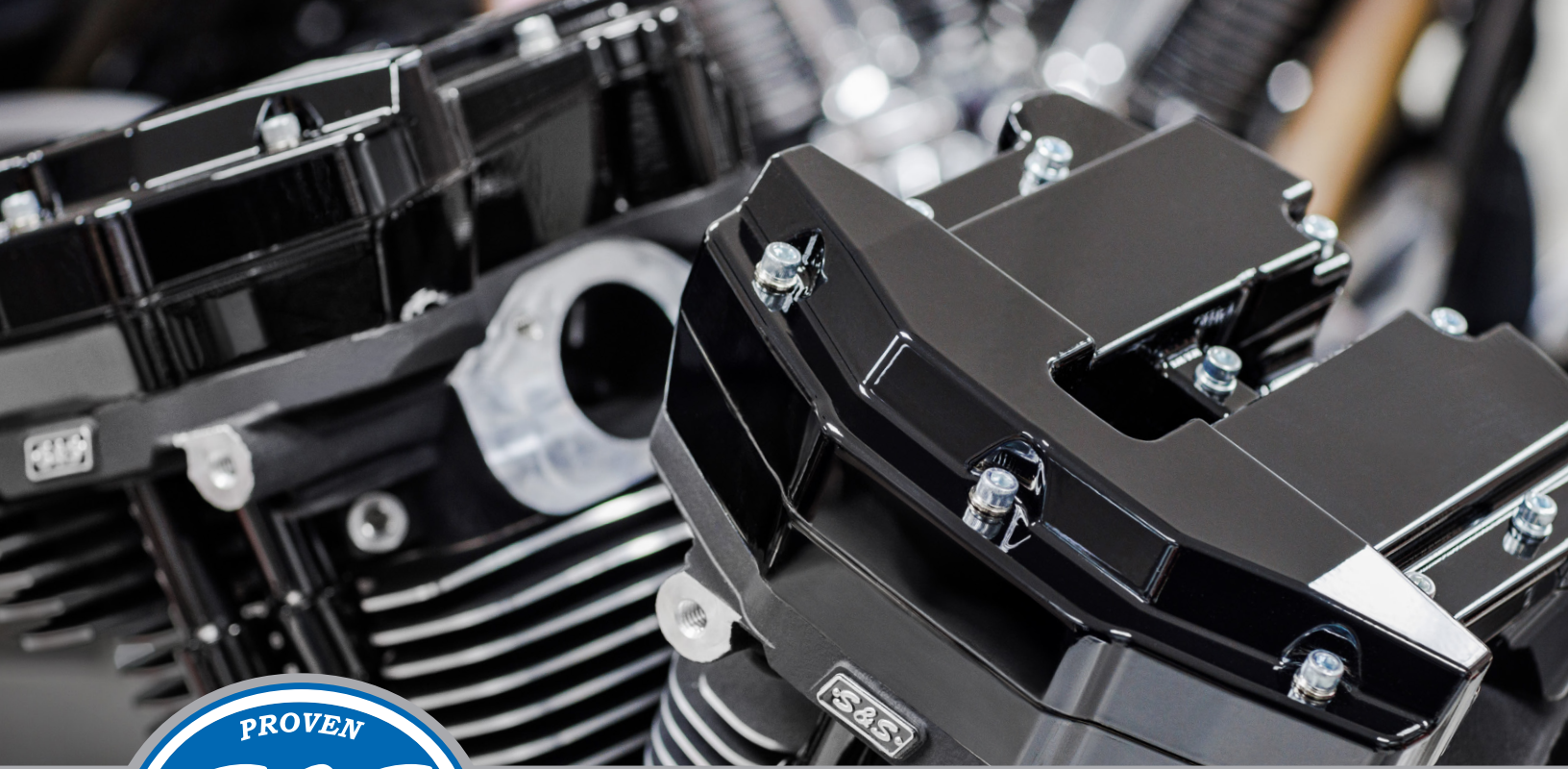


PROVEN S&S PERFORMANCE

# MK SERIES

Owners Manual for the S&S® MK136/136B Engines- Race Only

## Owners Manual

S&S® MK-Series Race Only Engines for 2017-2023 H-D® Touring Models and 2018-2024 H-D® Softail® Models

510-1065 Publication

07.28.2025

**DISCLAIMER**:

S&S parts are designed for high performance, closed course, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or adversely effect your factory warranty. In addition such installation and use may violate certain federal, state, and local laws, rules and ordinances as well as other laws when used on motor vehicles used on public highways, especially in states where pollution laws may apply. Always check federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his or her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

The words Harley®, Harley-Davidson®, H-D®, Sportster®, Evolution®, and all H-D part numbers and model designations are used in reference only. S&S Cycle is not associated with Harley-Davidson, Inc.

**SAFE INSTALLATION AND OPERATION RULES:**

Before installing your new S&S part it is your responsibility to read and follow the installation and maintenance procedures in these instructions and follow the basic rules below for your personal safety.

• Gasoline is extremely flammable and explosive under certain conditions and toxic when breathed. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.

• If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.

• Before performing any installation steps disconnect battery to eliminate potential sparks and inadvertent engagement of starter while working on electrical components.

• Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle with a S&S part on it.

• Consult an appropriate service manual for your motorcycle for correct disassembly and reassembly procedures for any parts that need to be removed to facilitate installation.

• Use good judgment when performing installation and operating motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgment. Start installation when you are fresh.

• Be sure all federal, state and local laws are obeyed with the installation.

• For optimum performance and safety and to minimize potential damage to carb or other components, use all mounting hardware that is provided and follow all installation instructions.

• Motorcycle exhaust fumes are toxic and poisonous and must not be breathed. Run motorcycle in a well ventilated area where fumes can dissipate.

## Limited Warranty

S&S Cycle, Inc. (the "Company") warrants to the original purchaser that each new product manufactured and assembled by the Company will be free, under normal use and maintenance, from significant manufacturing defects in materials and workmanship for one (1) year, subject to the following exceptions, exclusions, obligations, and limitations. All warranty periods shall begin from the date of purchase by the original retail customer or one year from date of manufacture, whichever comes first.

Exceptions/Exclusions

The foregoing limited warranty is not assignable or transferrable and shall not apply: (1) to any engine, part, or component that is used for other than the intended commercial purpose (including, without limitation, any racing or similar competitive activities or where competition applications, such as a turbocharger, supercharger, or nitrous oxide is used with the engine); (2) where the engine, part, or component has been subject to misuse, negligent use or maintenance, improper storage or shipping, old or contaminated fuel left within the fuel systems, operation without adequate cooling or lubricants, or a failure to operate or maintain in accordance with the specifications published by the Company; (3) where the engine, part, or component has been involved in an accident, or has been altered in any way which, in the sole judgment of the Company, adversely affects performance, safety, structural integrity, or reliability; (4) to any engine, part, or component manufactured or furnished by a third party; (5) where any engine, part, or component is (i) assembled by the Company in accordance with the purchaser's specifications or (ii) used in conjunction with or otherwise attached to a part or component manufactured by a third party and with respect to which the Company has not pre-tested and approved the structural integrity, application, and use of such fully-assembled product; (6) to defects or damage caused by the user failing to cease operation of the engine, part, or component as soon as the defect is identified or suspected, or where the engine, part, or component has been used in vehicles for demonstration or development purposes; or (7) to normal wear and tear or to parts or components consumed/expended in the normal operation of the engine (including, without limitation, oil, fuel, spark plugs, lubricants, oil filters, air filters, or fuel filters). This limited warranty shall not apply to any defects in the engine, part, or components powder coat or chrome finish, when that option is selected, if the defects arise from or are caused by negligence of parties other than the Company, an accident, ordinary wear and tear, assembly or disassembly, power washing, natural occurrences (such as stone chips or salt and other substances used on streets and highways), bead blasting, improper maintenance including the use of any harsh cleaning agent, chemical solvent, or solvent. This limited warranty does not cover inconvenience or loss of use of the engine, part, or component, routine maintenance services or adjustments, or the cost of labor to remove, install, or service the engine, part, or component or any part contained therein. This limited warranty covers engine, part, or component and/or workmanship issues only, and not the equipment to which the engine, part, or component may be mounted or attached.

## Remedies

As to valid warranty claims against the Company, the original purchaser's sole and exclusive remedy, and the Company's sole and exclusive obligation under this limited warranty, shall be, at the Company's option, replacement or repair of such defective engine, part, or component. The original purchaser shall notify the Company within ten (10) days after discovery of the alleged defect specifying in detail the nature of the defect. Failure to provide written notice within the ten (10) day period shall constitute a waiver of such warranty claim. Where warranty rights are claimed, all goods claimed to be defective shall be delivered to the Company with transportation charges prepaid, and the original purchaser's copy of the original invoice must be provided to the Company as evidence of the date of purchase.

## Disclaimer/Limitation of Liability

EXCEPT AS SPECIFICALLY SET FORTH ABOVE, NO EXPRESS WARRANTY IS GIVEN BY THE COMPANY WITH RESPECT TO ANY ENGINES, PARTS, OR COMPONENTS. ANY WARRANTY IMPLIED BY LAW, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IS EXPRESSLY LIMITED TO THE DURATION OF THE LIMITED WARRANTY SET FORTH ABOVE. THE COMPANY MAKES NO OTHER EXPRESS WARRANTY. THE COMPANY SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND OR NATURE.

Some states and countries do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you, and you may have other rights which vary from state to state.

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## Introduction

The S&S® engine you have purchased is made in the United States. It is designed to offer Proven Performance® and reliability. Specifications for the MK-Series engines are found in this manual. This manual covers the installation, break-in procedures, maintenance, and specifications for the MK-Series engines.

## Engine Installation

The procedure for installing an S&S engine is similar to the procedure outlined in the factory service manual for the model of motorcycle the engine is being installed in.
Before starting the installation, review this manual for the additional information needed to install the engine and use this info along with the steps of the factory service manual to complete the installation. An upgraded clutch should also be considered, since the S&S engine will produce more power than the stock engine it is replacing.

## Fuel, Intake And Exhaust Systems

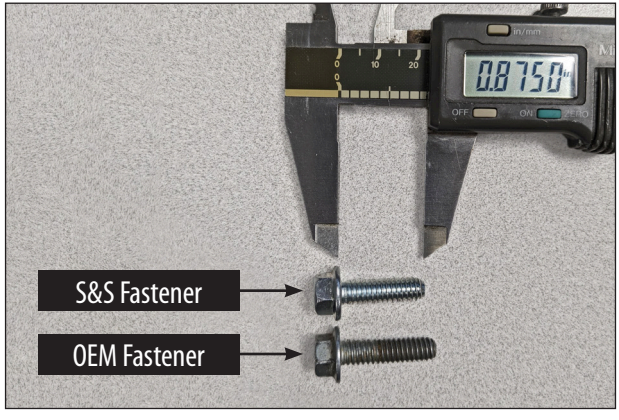
The fuel, intake and exhaust system configurations are up to the end user.
A tune file must be developed with the actual parts that wil be installed onto the motorcycle.

## Tune File

A tune file must be developed with the specific fuel, intake and exhaust systems that will be installed onto the motorcycle. Working with a dyno tuning shop that is familiar with working on high performance Harley Davidson® motorcycles is highly recommended.

## Coolant Line Hook-Up

S&S® MK-Series engines are designed to work with the factory cooling systems. The factory cooling lines, either oil or water, are to be reused.
*** IMPORTANT: The provided ¼" - 20 x ⅞" hex flange head fasteners must be used to secure the cooling lines to the head. The O.E. 1" long fasteners will bottom out and not seal. Replace the sealing O-ring with the ones provided.**



## Fuel Requirements

The gasoline used in your engine should have a US octane rating of 91 or higher. The United States uses the $\frac{(R+M)}{2}$ method of octane rating. In many countries outside the United States, the RON (Research Octane Number) is used, which will result in a higher octane requirement of about 96.

## Oil Recommendations

S&S recommends synthetic engine oil such as S&S Premium Synthetic 20W50. However a premium petroleum based engine oil such as S&S Heavy Duty 20W50 or 25W60 is acceptable.

Regardless of what type of oil you select, be sure to use only oil specifically designated for use in an air-cooled motorcycle, and select the viscosity suggested for the temperature range you will be operating your motorcycle in.

| Viscosity | Ambient Temperature (°F) |
|---|---|
| SAE 20W50 | Above 30° and up to 100° |
| SAE 50 | Above 60° and up to 100° |
| SAE 25W60 | Above 80° |
| SAE 60 | Above 80° |

The oil filter used on an S&S® MK-Series engine should be rated at 10 microns. Spin-on filters should have an anti-drain back valve. S&S filters are available to replace Harley-Davidson® #62700296. The S&S part numbers are 31-4104A Chrome and 31-4103A Black.

## General Break-In Notes

- Remember that these are air-cooled engines. Sufficient air movement is required to keep engine temperatures within safe operating limits.
- Avoid heavy traffic and congestion or extended idle periods whenever possible.
- Today's heavier bikes and taller gearing can easily push a high performance engine into a lugging condition which increases loads on engine components, causes detonation, builds excessive heat,and increases fuel consumption. If the engine does not accelerate easily when given some throttle, downshift to a lower gear.
- S&S engines benefit from a warm-up period any time they are started, allow engine to reach operating temperature before being subjected to heavy loads or quick throttle revs.

## Break-In Oil Considerations

Either petroleum or synthetic oil designed for air-cooled v-twin engines can be used during the break-in period and during normal use. If preferred, petroleum oil can be used for the break-in period, after which, the engine can be changed over to synthetic oil.

## Break-In Procedure

**1.** Initial start up. Run engine approximately one minute at idle speed. DO NOT crack throttle or subject to any loads during this period as head gaskets are susceptible to failure at this time. During this time, check to see that oil pressure is normal, that oil is returning the oil tank, and that no leaks exist. Shut off engine and thoroughly check for any leaks or other problems. Let engine cool to the touch.

2. After engine has cooled, start up again and allow the motor to build some heat. Slow throttle opening and engine speed up to 1750 RPM are Ok during the second heat cycle. Engine should be run no longer than three to four minutes. When the cylinders become warm/hot to the touch (approximately 150°F) shut the motor down and let it cool to room temp. Follow the same cautions as for the initial start-up, and continue to check for problems.

3. Dyno: A chassis dynamometer **MUST** be used to put the first 50 miles on a new engine. See the notes and procedure below for chassis dyno break-in.

4. 50–500 Miles: Avoid lugging the engine and high heat conditions. Max of 5,000 RPM. Change oil at 500 miles. Break-in is complete, enjoy!

## Notes For Completing Initial 50 Mile Break-In

- When running the bike on the dyno it is critical that engine temperatures are monitored, AFR is kept between 12.5–14.7 and the engine is not overheated. Fans must be used to keep the engine cool. When tuning under higher loads stop regularly and allow the engine to cool.
- A load must be placed on the engine to properly seat the rings. Running a new engine continually with no load will result in cylinder glazing and poor ring seal. The engine should be loaded to simulate close to the weight of the bike, a load of 10–15% on a Dyno jet 250i is usually sufficient. It is not recommended to use an inertia only dyno to break-in an engine as no load can be placed on the engine.

## Dyno Break-In Procedure (First 50 Miles)

1. Follow the same procedure previously outlined for initial start-up and heat cycling the engine.

2. Run the bike for 25 miles on the dyno under varying speeds and loads while going up and down through the gears. Keep engine RPM below 3,500 RPM but do not lug the engine. The dyno must be operated so the engine runs under a load roughly equal to the power needed to move the bike down the road, this would be about 12 hp at 55 MPH. Keep engine temperatures below 250°F at the temp sensor or surface of the head. Stop and cool the engine if needed.

3. Allow the engine to cool down to room temperature.

4. Run the bike for 25 more miles (50 miles total) under varying speeds, loads, and gears as before. Make sure there is some load on the engine. Keep engine speed below 4,500 RPM but do not lug the engine. Limited short bursts of throttle can aid in ring seating as long as the calibration/tune keeps the AFR in control. Keep engine temperatures below 275°F at the temp sensor or surface of the head.

5. Beyond 50 miles continue increasing load and RPM out in steps while validating the calibration is good.

## Tune Up Information

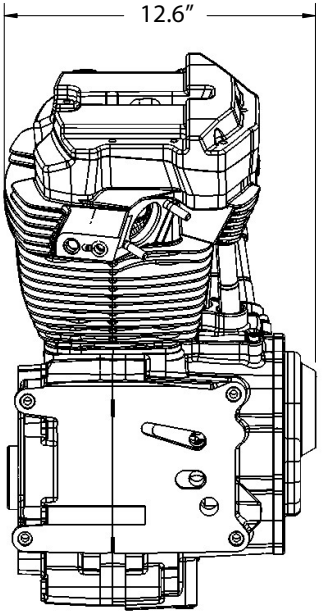
All S&S MK-Series complete engines come from the factory with Champion RG6HCC 10mm long reach spark plugs (S&S PN 560-0399), gapped between .031 and .035 inch.

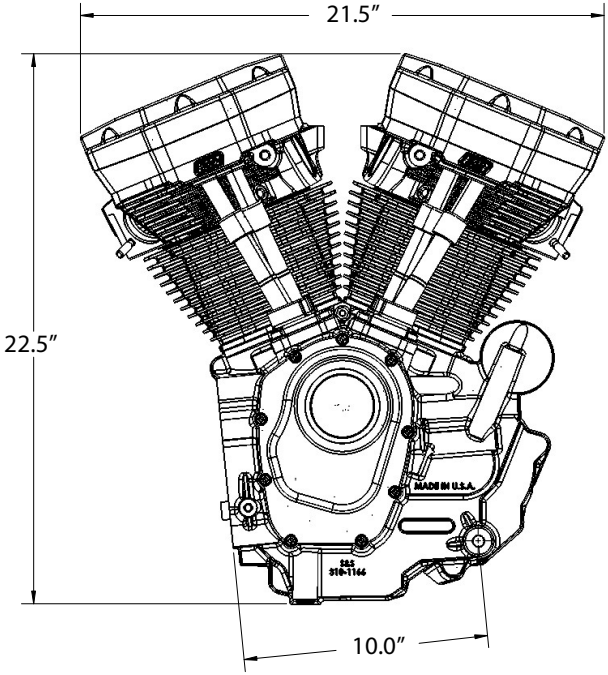
| Engine Service Intervals | |
|---|---|
| Item | Interval |
| Engine Oil and Filter | Change at 500 miles then every 2500 miles thereafter. |
| Air Cleaner Element | Inspect at 500 miles (800km) and every 2500 miles (4000km) thereafter. Replace every 5000 miles |
| Fuel System:High Pressure Line and Injectors | Inspect for leaks prior to initial start up by energizing fuel pump. Inspect as needed. |
| Engine Idle Speed | Non-Adjustable |
| Spark Plugs | Inspect every 5000 miles (8000km). Replace every 10,000 miles (16,000km) or as needed. |
| Engine Mounts | Inspect at 500 miles (800km) adn every 5000 miles (8000km) thereafter. |
| External Fastners (Except Head Bolts) | Re-torque at 500 miles (800km). |
| [1]S&S recommends that petroleum-based oil not spedificaly formulated for motorcycles should be changed every 1,000 miles (1,600 kilometers) after the break-in perfiod.<br>[2]Replace more requenty if required or if engine is operated in a dusty environment. | |

| Engine Specifications | | | | | | |
|---|---|---|---|---|---|---|
| Engine | Displacement | Bore | Stroke | CR | Cam | Pistons |
| MK136 | 136 $in^3$ | 4.320″ | 4.625″ | 11:1 | 550 | Forged Aluminum |

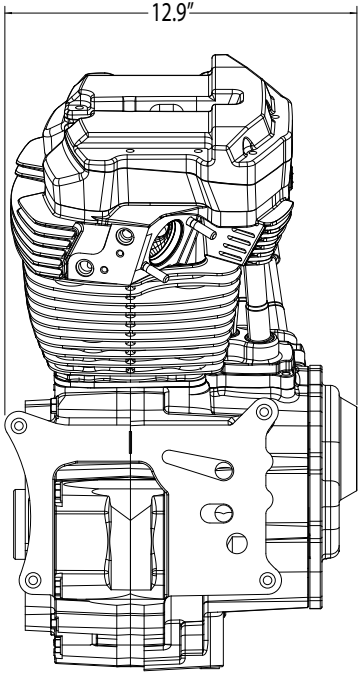
## Engine Dimensions

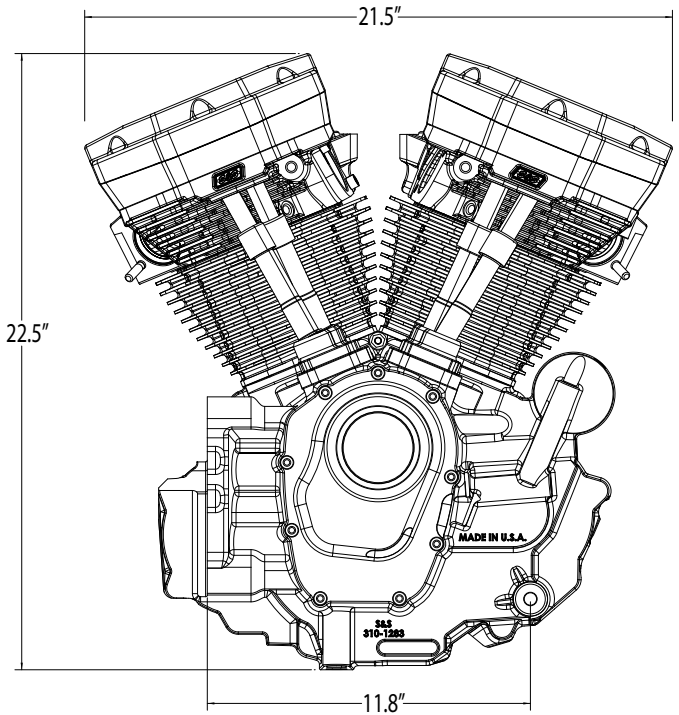
The diagram below shows the basic dimensions of the S&S MK-Series Touring engines.



| Engine Specifications | | | | | | |
|---|---|---|---|---|---|---|
| Engine | Displacement | Bore | Stroke | CR | Cam | Pistons |
| MK136B | 136 $in^3$ | 4.320″ | 4.625″ | 11:1 | 475 | Forged Aluminum |



## Important Engine Operating Information

- S&S engines are not recommended for inexperienced riders because the increased performance requires a higher level of riding skill.
- Do not lug your S&S engine. This is a high performance engine, designed to produce excellent horsepower at higher RPM. We recommend that the engine not be operated below 2500 RPM at more than a light load. Shift to a lower gear to keep the engine speed up when accelerating or under high load.
- To avoid engine damage, do not operate the engine above 6200 RPM.

## Service Specifications For S&S Engines

For the most part if an S&S engine requires service, a qualified mechanic who services Harley-Davidson® engines can do the work. However the specifications for S&S engines are somewhat different. These charts are provided for reference. For more detailed information about any specific S&S component, installation instructions are available for free download from the S&S website www.sscycle.com.

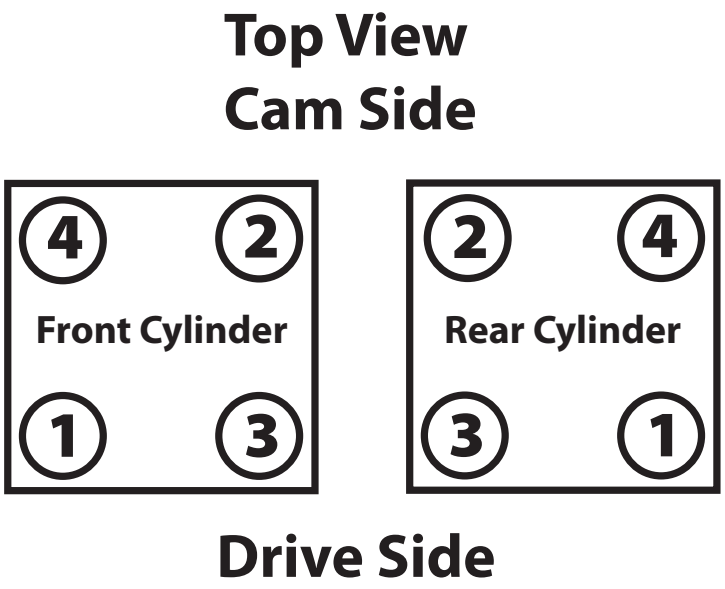
**Torque Specifications**

| Item | Torque | Recommended |
|---|---|---|
| Balancer Bearing Retainer Screw | 80-110 in-lb | Blue Threadlocker |
| Bearing Retainer Plate Screws | 30 in-lb | Blue Threadlocker |
| Breather Screw | 90-120 in-lb | Blue Threadlocker |
| Cam Cover Screws | 90-120 in-lb | Blue Threadlocker |
| Cam Gear Screw | 35 ft-lb | Red Threadlocker |
| Cam Support Plate Screw | 90-120 in-lb | Blue Threadlocker |
| Compensator Bolt 1st Torque<br>Compensator Bolt 2nd Toruqe | 100 ft-lb<br>175 ft-lb | Red Threadlocker |
| Compression Releases | 17-19 ft-lb | |
| Coolant Line Screws | 90-120 in-lb | Blue Threadlocker |
| Crankcase Screws | See Figure 2 Below on page 12 | |
| Crank Position Sensor Screw | 80-90 in-lb | Blue Threadlocker |


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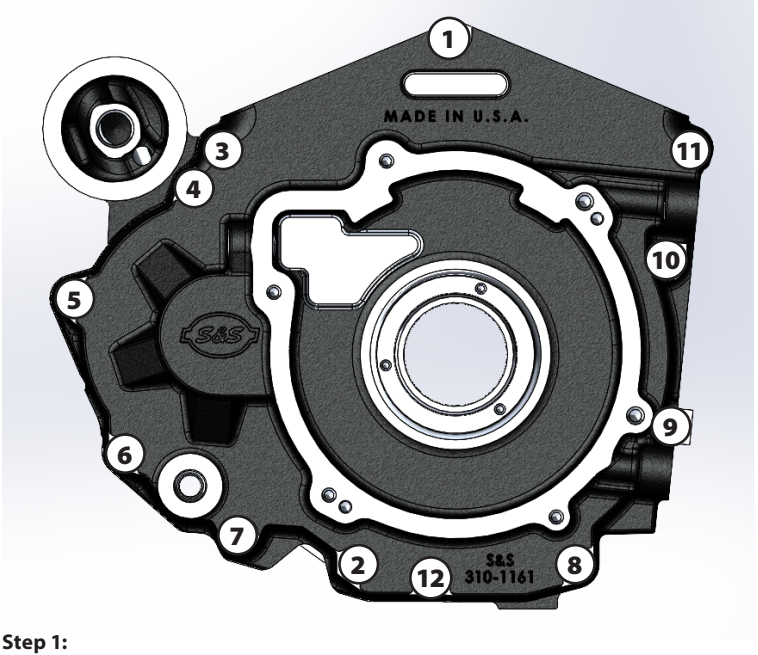
| | | |
|---|---|---|
| Cylinder Head Bolts | Initial Torque: 10-20-30 ft-lbs<br>Final Torque: 10-20-25-30-35-45 ft-lbs | Oil on threads, perform initial Torque then loosen bolts ¼ turn then perform Final Torque. See Figure 1 on Page 12 |
| Cylinder Studs | 10 ft-lbs | Red threadlocker on the internal threads of engine case |
| Engine to Transmission 1st Torque<br>Engine to Transmission 2nd Torque | 15 ft-lb<br>34-39 ft-lb | |
| Exhaust Flange Nuts | 100-120 in-lb | |
| Front Engine Mount Bolt and Nut | 50-55 ft-lb | |
| Front Upper Engine Mount Bracket Screws | 45-50 ft-lb | |
| Front Upper Engine Mount Stabilizer Link Screws | 30-35 ft-lb | |
| Head Temperature Sensor | 11-16 ft-lb | |
| Horn Bracket Screws | 35-40 ft-lb | |
| Inner Primary to Engine/Transmission | 26-28 ft-lb | |
| Knock Sensor Screw | 13-17 ft-lb | |
| Oil Block Off Plate | 120 in-lb | Blue Threadlocker |
| Oil Filter | ½ to ¾ turn after gasket contact | |
| Oil Pump Bolt | 90-120 in-lb | Blue Threadlocker |
| Pinion Gear Screw | 24 ft-lb | Red Threadlocker |
| Piston Oilers | 30 in-lbs | Blue Threadlocker |
| Pushrod Locknuts | | |
| Rocker Box Screws (top and bottom) | 90-120 in-lb | Blue Threadlocker |
| Rocker Arm Nut | 18 ft-lb | Oil |
| Spark Plug | 80-106 in-lb | 0.031-0.035" gap |
| Tappet Cover Screws | 140 in-lb | Blue Threadlocker |
| Tappet Cuff Screws | 100 in-lb | Blue Threadlocker |

*Figure 1 - Cylinder Head Bolts*




Intial Torque: 10 - 20 - 30 ft*lbs
Loosen each ¼ turn
Final Torque: 10 - 20 - 25 - 30 - 35 - 45 ft*lbs

*Figure 2 - Crankcase Bolt Torque Pattern for MK Touring Series*




**Step 1:**

Tighten fastener #1 to 60 in*lbs

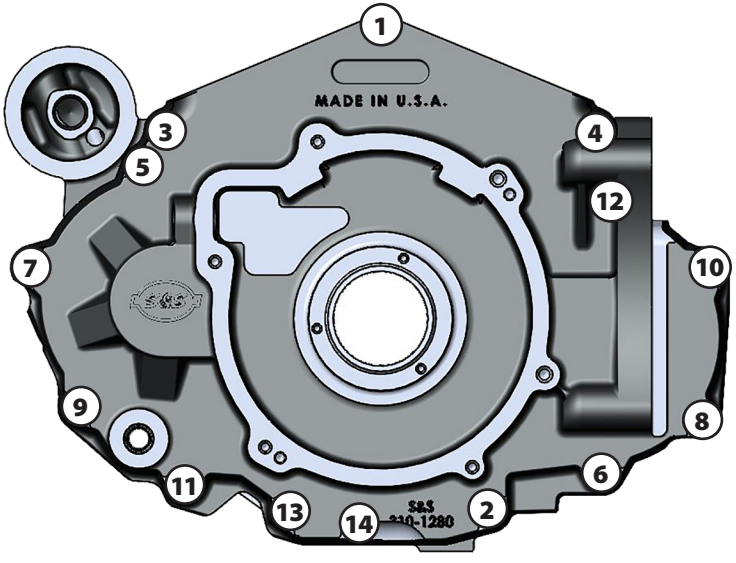
Tighten fasteners #2 thru #12, in sequence, to 120 in*lbs

**Step 2:**

Tighten fasteners #2 thru #12, in sequence, to 20 ft*lbs

Tighten fastener #1 to 120 in*lbs

*Figure 2 - Crankcase Bolt Torque Pattern for MKB Softail Series*




**Step 1:**

Tighten fastener #1 to 60 in*lbs

Tighten fasteners #2 thru #14, in sequence, to 120 in*lbs

**Step 2.**

Tighten fasteners #2 thru #14, in sequence, to 20 ft*lbs

Tighten fastener #1 to 120 in*lbs

| Clearance Specifications and Wear Limits | | | |
|---|---|---|---|
| Item | Description | Specification | Limit |
| Rocker Arm | Shaft in bushing | .0007"- .0018" | .0035" |
| | Busing fit in rocker arm (press fit) | .0012"- .0032" | < .0012" |
| | Rocker arm end play | .001"- .012" | |
| Cylinder Head | Valve to guide fit (intake) | .0006"-.0014" | .0030" |
| | Valve to guide fit (exhaust) | .0015"-.0021" | .0040" |
| | Valve guide in head (press fit) | .0020" | |
| | Intake valve seat in head (press fit) | .0060" | |
| | Exhaust valve seat in head (press fit) | .0050" | |
| | Seat width intake | .0400" | |
| | Seat width exhaust | .0500" | |
| | Chamber voume | 89cc | |
| | Valve stem protrusion | 1.758" | |
| | Max allowable protrusion difference (side to side) | 0.003" | |
| | Intake valve head diameter | 1.610" | |
| | Exhaust valve head diameter | 1.303" | |
| | Intake valve length | 4.058" | |
| | Exhaust valve length | 4.078" | |
| | Valve spring installed height | 1.565" *(± .010")* | |
| Pistons and Cylinders - 4.320" bore | Fit in Cylinder | .0025"-.0035" | |
| | Top ring end gap | .024"- .028" | *continued on page 16* |

| | | | |
|---|---|---|---|
| | 2nd ring end gap | .028"- .032" | |
| Connecting Rods | Side play | .005"- .024" | .040" |
| | Wristpin clearance | .0007"- .0013" | .0020" |
| Flywheel Assembly | Max allowable pinion shaft runout for gear drive cams | .003" | w/o compensator or charging system |
| | Endplay - with compensator assembly tightened | .0035"- .0045" | |
| | Main bearings | Harley-Davidson® OE style bearing not compatible on right side with bearing retainer plate | |
| | | Bearing Removal: Remove the output shaft seal and thrust washer from the drive side crankcase. Heat crankcase halves to 350F. Remove cam side bearing by pressing from the inside towards the outside. | |
| | | Bearing Installation: Heat crankcase halves to 350F. Install the drive side bearing so it is bottomed on the machined shoulder in the crankcase. Install the cam side bearing from the outside to the inside. The outer bearing race should be flush to the adjacent machined surface of the cam chest. | |
| Cam Chest | Camshaft in bushing | .0007"- .0020" | .0030" |
| | Pinion shaft in bushing | .0011"- .0024" | |
| Lifters | Fit in guide | .0008"- .0020" | .0030" |

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notes




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