2013 SRT8® Powertrain
OVERVIEW

Chrysler Canada: 6.4-litre HEMI® Engines from the Chrysler Group Deliver Power, Torque and Efficiency to SRT Vehicle Lineup

For Chrysler Group race car engine aficionados, the number 392 may ring a familiar bell, but that's where any similarity ends with 60 years of Chrysler HEMI® engine heritage.

The four 2013 SRT8 models equipped with the 6.4-litre HEMI V8 engines deliver plenty of power and torque, along with volumetric efficiency and drivability – starting at the bottom end and continuing throughout the rpm range.

With ratings of 470 horsepower and 470 lb.-ft. of torque for the Dodge Challenger SRT8, Dodge Charger SRT8, Chrysler 300 SRT8; and 470 horsepower and 465 lb.-ft. of torque for the Jeep® Grand Cherokee SRT8, there's no question the 6.4-litre/392 cubic-inch HEMI V8 engines from the Chrysler Group are potent.

The broad torque curve illustrates that engineers have designed the 6.4-litre HEMI to provide power where it is needed most – from 1,200 rpm to up to 4,200 rpm, including an additional 70 lb.-ft. of torque available at the low end.

With more than 73 horsepower on tap from each litre of displacement, the 6.4-litre HEMI is the highest specific-power, naturally aspirated, two-valve engine offered on the market today.

It starts with the block

Constructed with high strength iron that is unique for the SRT8 vehicle lineup, the 6.4-litre HEMI starts with a 90 degree, deep-skirted design. The block features a bore of 103.9 mm. Five main bearing supports provide a rigid structure for the crankshaft and have been fitted with powdered steel main bearing caps. The four bolt mains are attached via two vertical and two horizontal bolts.

The forged, micro-alloyed steel crankshaft with a stroke of 94.6 mm provides the basis for an extremely strong rotating and reciprocating assembly. To provide even more strength, the crankshaft in the 6.4-litre HEMI is fillet rolled with a 1,950-kg (4,300-lb.) rolling load.

Fitted to the crankshaft are powdered metal forged connecting rods measuring 157.5 mm long. Cast aluminum pistons with full floating piston pins are used. Pistons include two compression rings and an oil control ring that are designed to provide reduced friction.

To help maintain consistent combustion chamber temperatures, piston-cooling jets are located in each cylinder. The jets spray oil on the undercrown of each piston to help reduce surface temperatures and reduce hot spots on the pistons that could lead to pre-ignition.

Cast pistons with a compression height of 30.75 mm are used, which have been optimized to reduce friction and noise under both hot and cold engine operation. The compression ratio of the 6.4-litre HEMI is 10. 9:1. Premium fuel with an octane rating of 91 is recommended.

Oiling System

The 6.4-litre HEMI is fitted with a cast aluminum oil pan that is designed to provide superior oil management characteristics and additional structural rigidity to the engine. The pan has been designed with special channels, baffles and scrapers to help funnel engine oil back into the bottom of the pan and away from the crankshaft for increased power. Externally, strengthening ribs have been cast into the oil pan for additional structure.

The integral gasket and windage tray design are fitted between the pan and engine block to reduce the amount of oil that comes in contact with the crankshaft. This helps prevent the possibility of horsepower loss due to engine oil aeration or sloshing during high “g” maneuvers.

A single gerotor oil pump provides pressure for the oiling system and is driven directly off the crankshaft nose with a one-to-one drive ratio. Oil flow is proportional to the speed of the engine. An oil cooler is fitted to ensure temperatures are kept in check even under track conditions.

Oil change intervals are recommended at 10,000 km under normal driving conditions. Within the engine control module (ECM), frequent starts and stops are monitored. If the ECM senses too many starts and stops, or the engine has been running at very high ambient temperatures for sustained amounts of time, an alert will advise the driver to change the oil at 5,000 km.

Oil pan capacity is 6.6 litres (7 quarts) with a filter change. Pennzoil Ultra 0W-40 synthetic oil is recommended.

High Flow Cylinder Heads
One of the biggest contributors to the power for the 6.4-litre HEMI is the cylinder heads.

Constructed of A319 (modified) aluminum alloy, the cylinder heads help reduce the mass of the engine and are extremely robust to the high thermal and mechanical loads generated. Chemical composition modifications have been made to the aluminum alloy material to improve the high strength fatigue properties of the heads.

No special machining is necessary on the intake and exhaust ports. During the casting process, special fine core sand, AFS 90, is used to provide the intake ports with the surface finish and exceptional air flow characteristics required for such a high performance engine.

Combustion chamber volume is 73.4 cc. Valve angles are 18 degrees on the intake and 16.5 degrees on the exhaust side. Large intake valves measure 54.3 mm and feature hollow stems to help reduce mass and enable the engine to run at 6,200 rpm.

Spent exhaust gases exit through sodium-filled exhaust valves that are 42 mm in diameter. Sodium is added into the valve stem during the manufacturing process of the valve and when the exhaust valve gets hot, the sodium liquefies to transfer heat from the valve head to the valve guides via the “cocktail shaker” effect induced by valve motion. Typically found on high performance engines, these exhaust valves help prevent hot spots in the combustion chamber and valve head and reduce the possibility of pre-ignition.

A single camshaft and roller followers control the valve actuation. Short pushrods actuate the rocker arms. Rocker arms are fitted to a pair of shafts, one exhaust and the other intake, positioned in the cylinder head. Five pedestals support each rocker shaft.

Variable-cam timing, which was introduced in 2009 to the HEMI, is used on both the intake and exhaust of the engine. The single camshaft can be varied by as much as 37 degrees hence retarding or advancing inlet and exhaust simultaneously.

Controlled by a solenoid that regulates oil flow, the cam phaser is integral with the camshaft-timing sprocket.

Cam timing strategies have been predetermined to maximize both fuel economy and power. At full load, for example, volumetric efficiency is maximized to get as much air into the engine as possible. At part throttle, the variable-cam timing system is calibrated for optimum fuel economy, lower pumping losses and reduced emissions.

A total of 16 spark plugs, or two per cylinder, are used in the engine. The two plug-per-cylinder layout is preferred due to the port and valve locations within the engine. The 6.4-litre HEMI uses valve locations that are perpendicular to the crankshaft axis in order to generate a high flow port/combustion chamber configuration. Two plugs per cylinder are employed to shorten the individual flame paths and provide optimum combustion characteristics. Spark energy is provided through a coil-on-plug ignition system.

The result is excellent power across the rpm band, improved fuel economy and cleaner emissions.

Induction

A fresh, cool intake charge is supplied to the 6.4-litre HEMI through an active intake manifold that includes switching valves to create variable length runners in the intake.

The active intake system is designed to harness the pressure waves, which exist in the runners, to improve the volumetric efficiency of the engine. The intake manifold switches between short and long runners depending on engine speed, which allows tuning over a wider RPM range than a fixed geometry intake.

The intake manifold is fitted with an 80 mm throttle body that is controlled by the Engine Control module (ECM).

Constructed of thermoplastic, the intake system provides near identical distribution of the fuel/ air charge across all eight cylinders. Thermoplastic also contributes to cooler intake charge temperatures since heat is not transferred metal-to-metal as compared to an aluminum intake and cylinder head.

Fuel Saver Technology

An engine delivering both high performance and fuel economy may seem at odds with each other. Standard Fuel Saver Technology is featured on Dodge Challenger, Dodge Charger, Jeep Grand Cherokee and Chrysler 300 SRT8 models when equipped with an automatic transmission.

Fuel Saver Technology is designed to shut fuel delivery to four cylinders under certain driving conditions when full power is not needed such as cruising situations. In order to reduce the pumping losses from the de-activated cylinders, the intake and exhaust valves are kept closed by switchable tappets operated via oil pressure. The system effectively turns the 6.4-litre HEMI into a very capable 3.2-litre powerplant.

Throttle response is instantaneous – if the driver needs to accelerate quickly, the system switches from four cylinders to eight cylinders almost imperceptibly.

Exhaust System

Stainless steel headers that have been designed to provide minimal amounts of back pressure are standard on the Dodge Challenger SRT8, Dodge Charger SRT8 and Chrysler 300 SRT8. Exhaust headers are free flowing and are constructed with an inner and outer shell to help promote better light off of the catalysts.

Due to some packaging constraints, Jeep Grand Cherokee SRT8 models are fitted with cast iron exhaust manifolds that are designed to provide exceptional exhaust flow without decreasing engine performance.

As an added benefit, SRT8 models of Chrysler 300, Jeep Grand Cherokee and Dodge Charger also are equipped with an active exhaust system as part of the Fuel Saver Technology.

Unlike some active exhaust systems that increase the level of noise, the system on SRT8 models acts just the opposite. The active exhaust is designed to increase the window of operation for the Fuel Saver Technology system and incorporates a pressure activated valve in the exhaust system. The valve provides acceptable exhaust noise levels when in Fuel Saver mode leading to improved fuel economy and retains the characteristic V8 note at higher engine speeds.

Fuel Saver Technology without active exhaust also is available on the automatic transmission Dodge Challenger SRT8. Engineers responded to buyer tastes who felt that the more defined exhaust note produced by the passive exhaust was in keeping with the Challenger brand image.

Additional Technical Details

Displacement – 6.416 litres

Power – 470 bhp

Torque – 470 lb.-ft. *

Mass – 252 kg (554 lb.)

Bore – 103.9 mm

Stroke – 94.6 mm

Compression Ratio – 10.9:1

Fuel – Premium Gasoline 91 (R + M)/2

Cylinder Centres – 113.3 mm

Deck Height – 231.8 mm

Con Rod Length – 157.5 mm

Compression Height – 30.8 mm

Combustion Chamber Volume – 73.4 cc

Main Bearing Diameter – 65 mm

Big End Bearing Diameter – 54 mm

Piston Pin Diameter – 24 mm

Intake Valve Diameter/lift – 54.3/15 mm

Exhaust Valve Diameter/lift – 42.0/14 mm

*465 lb.-ft. on Jeep Grand Cherokee SRT8

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