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*Powertrain*

## **All New Saab 9-5 Sedan: Less Is More with All Turbo Engine Line-up**

- Responsible performance with efficient four-cylinder turbo engines
- CO<sub>2</sub> values from just 139 g/km
- Three fuel types: gasoline, E85 and diesel in all-turbo line-up

The new 9-5's all-turbo powertrain line-up brings together Saab expertise in turbocharging with state-of-the-art engine technologies.

With gasoline and BioPower (E85 compatible) engines developing more than 100 hp per liter, the new 9-5 Sedan also advances Saab's rightsizing powertrain strategy. That means efficient turbocharged engines as small as 1.6 liters can make a fitting partner for Saab's new premium sedan. With diesel power, CO<sub>2</sub> emissions as low as 139 g/km are also on offer. All transmissions are six-speed.

### **Gasoline choice**

All engines feature electronic management, electronic throttle control, direct ignition and four valves per cylinder operated by overhead, maintenance-free, chain-driven camshafts. For longevity and reliability, turbochargers are water-cooled and use air-to-air intercooling to increase intake charge density.

To give minimal piston friction and wear characteristics, while also benefiting fuel and oil consumption, the cylinder walls of the engines are laser-etched for an extremely smooth finish. Under-skirt piston oil cooling and sodium-filled exhaust valves are further efficiency measures.

### **1.6 Turbo**

The engine line-up starts with this powerful four-cylinder motor giving 180 hp/132 kW and excellent torque of 230 Nm all the way from 2,200 rpm to 5,500 rpm. It includes an 'overboost' function, which raises torque to 266 Nm for up to five seconds on a wide open throttle.

Rated among the most powerful series production engines in its displacement class, this 'rightsized' powertrain gives the new 9-5 strong performance: zero to 100 kph in 9.5 seconds, and impressive fuel consumption and CO<sub>2</sub> emissions of 7.8 l/100 km and 179 g/km, respectively.

For strength and reduced noise, the cylinder block is in cast iron. A die cast, structural aluminum oil pan adds further stiffness and noise suppression. Additional refinements include the use of hollow camshafts, for reduced weight and lower reciprocating mass, and a

dual-mass flywheel for improved running refinement. A map-based thermostat control raises the coolant temperature at low engine speeds, or under light loads, to help reduce internal lubricant friction and also improve fuel consumption.

## **2.0 Turbo - Gasoline and BioPower**

The performance stakes are raised with this all-aluminum engine, which is also available in BioPower specification, enabling it to run on gasoline and/or E85 fuel (85% bioethanol, 15% gasoline) in any blends. In both configurations, it delivers peak power of 220 hp/162 kW and plentiful torque of 350 Nm from just 2,500 rpm.

This engine is offered with front wheel drive or Saab XWD, the industry-leading all-wheel-drive system. It features variable valve timing and direct injection to further improve fuel consumption, emissions and performance. The camshafts have hydraulically operated vane-type cam phasers which allow both the inlet and exhaust valve timing to be adjusted independently, according to varying engine speed and load. The many benefits include a broader spread of torque, higher maximum power and improved fuel consumption.

Direct injection delivers fuel under high pressure directly into the combustion chamber during the compression stroke. This enables the separation of air and fuel delivery, allowing improved scavenging of the combustion chamber to give substantially more low-end torque and reduced engine knocking.

A twin-scroll turbocharger is also used, which virtually eliminates turbo lag at low engine speeds and delivers a throttle response comparable to that of a naturally-aspirated engine. Each of the two scrolls on the turbine is fed by a separate exhaust passage - one from cylinders one and four, the other from cylinders two and three. Other features include: twin counter-rotating balance shafts for smooth running; a forged steel crankshaft for added strength and aluminum pistons to reduce reciprocating mass.

With front wheel drive, this engine propels the new 9-5 from zero to 100 kph in 7.9 seconds, giving combined fuel economy of 8.4 l/100 km and CO<sub>2</sub> emissions of 194 g/km.

## **2.8V6 Turbo**

Available exclusively in Aero specification with Saab XWD and a 6-speed automatic transmission, this engine has a classic 60° angle between the cylinder banks to give optimum balance for vibration-free running to match its silky power delivery. It delivers 300 hp/221 kW and an impressive 400 Nm of torque between 2,000 and 5,000 rpm, giving zero to 100 kph acceleration in just 6.9 seconds.

Variable valve timing on both intake and exhaust sides ensures a near linear delivery of torque, irrespective of engine speed and load. The single, twin-scroll turbocharger is mounted centrally above the transmission and fed by both banks of cylinders. The use of two inlet tracts, one for each cylinder bank, separates the exhaust gas pulses,

improving gas flow, reducing energy losses and raising turbocharger efficiency.

The exhaust manifolds are double-skinned with hydroformed stainless steel liners to improve cold start emissions by minimizing heat absorption to the manifold. Air injection into each exhaust manifold for up to 30 seconds after a cold start also helps the central pre-catalyst, positioned upstream of the main catalytic converter, achieve 'light off', its effective working temperature, as early as possible.

The strong, forged-steel crankshaft runs in four main bearings and the steel connecting rods are sinter forged for extra strength and durability. The polymer-coated, aluminum pistons and the floating wrist-pins are cooled and further lubricated by triple under-skirt oil jets.

## **Diesel Choice**

Both 16-valve, 2.0 liter turbo diesel engines have a cast-iron cylinder block with laser-etched cylinder walls and an aluminum alloy cylinder head. The twin overhead camshafts are chain driven and maintenance-free. The engines also feature electronic management, common rail, direct and multiple fuel injection, a weight-saving plastic intake manifold and a dual-mass flywheel for greater running refinement. Maintenance-free exhaust particulate filters to meet Euro 5 emissions requirements are fitted as standard.

### **2.0 TiD**

The 16-valve, 2.0 liter turbo diesel engine develops 160 hp (118 kW) and 350 Nm of torque and offers CO<sub>2</sub> emissions of just 139 g/km, together with impressive fuel economy of just 5.3 l/100 km over the combined cycle. It has a variable geometry turbocharger for excellent low-end response.

### **2.0 TTiD**

The more powerful two-stage turbo version is available with front wheel drive and Saab XWD. It delivers 190 hp/ 140 kW, and 400 Nm of torque from just 1,750 rpm for exceptional pulling power. With front wheel drive, it offers zero to 100 km/h acceleration in less than 9 seconds, together with combined cycle fuel economy of 6.0 l/100 km and CO<sub>2</sub> emissions of just 159 g/km.

The series sequential two-stage system uses two turbochargers of different sizes with by-pass valves that direct the exhaust gas stream between the two turbines. At low engine speeds, the small turbocharger supplies boost pressure independent of engine load. At intermediate engine speeds under higher loads, both the small and large turbochargers provide boost pressure; while at high engine speed and load, only the large turbocharger is engaged.

This arrangement provides the driver with the 'best of both worlds': good, instant torque at low engine speeds - via the low-inertia small

turbo -and strong, top-end power at higher engine speeds when the large turbo is engaged.

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