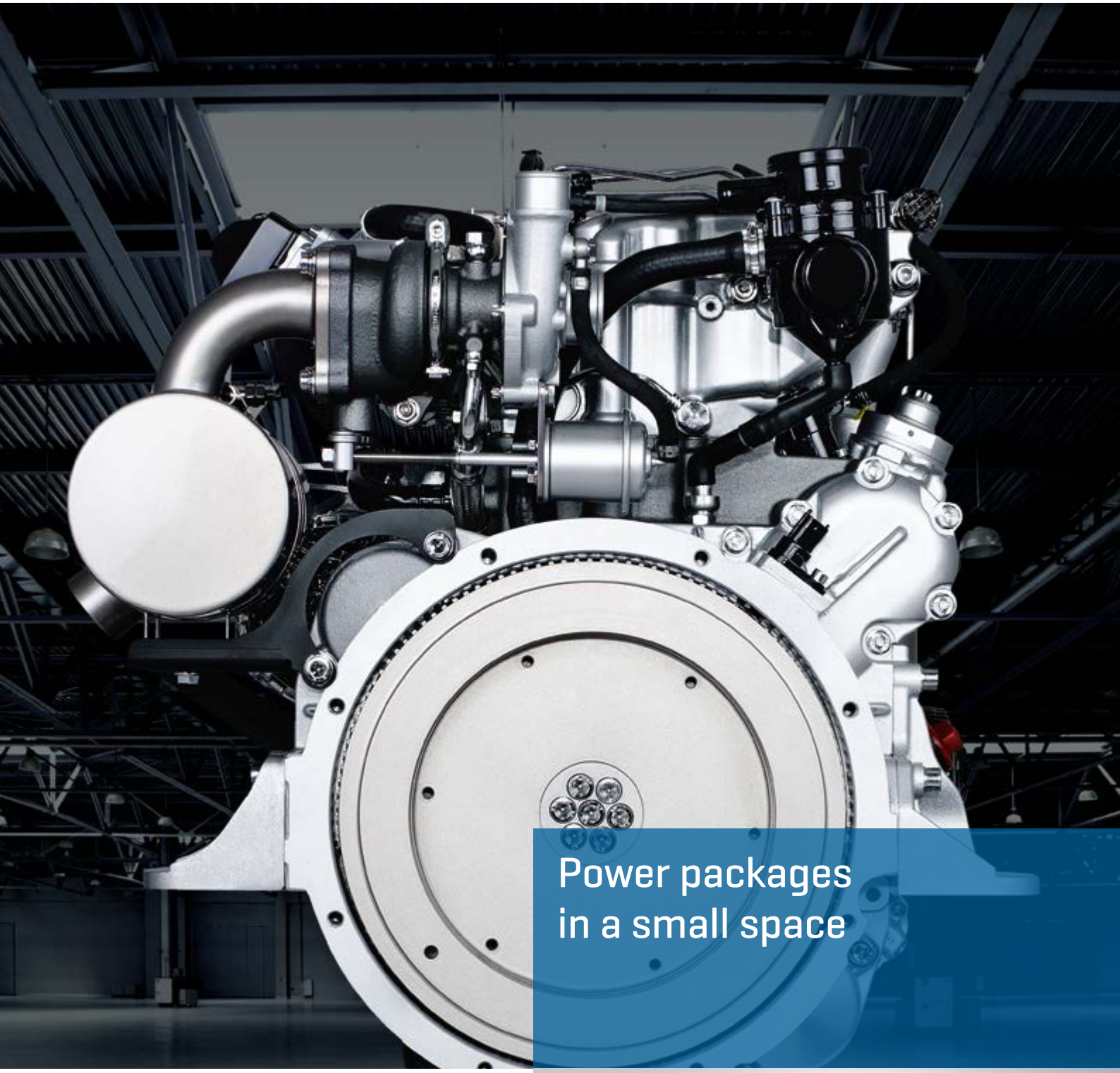
CREATING POWER SOLUTIONS.



Power packages in a small space

Hatz H-series diesel engines

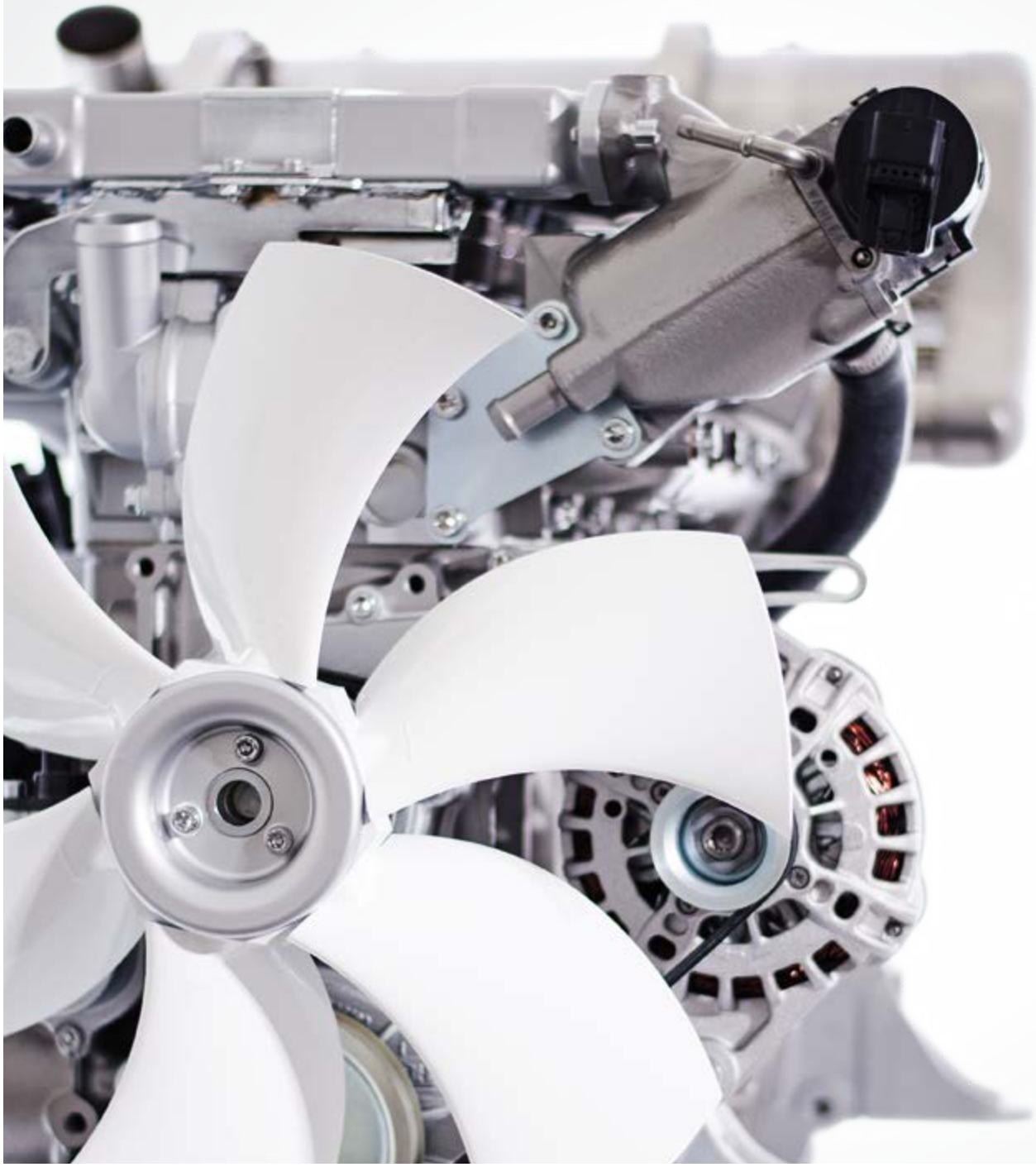
EN

www.hatz-diesel.com

The new generation of efficient Hatz diesel engines.

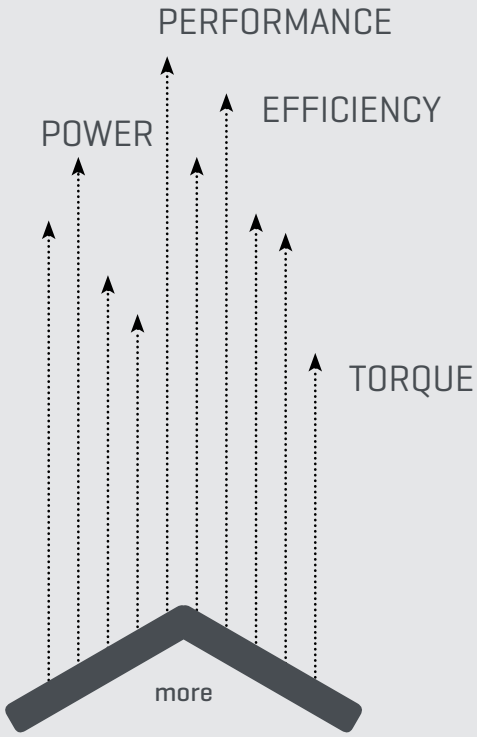
Supported by:
Federal Ministry for Economic Affairs and Energy
on the basis of a decision by the German Bundestag

The release of the Hatz H-series started in 2014. Today, the model portfolio embraces various three-cylinder and four-cylinder models. The new generation of compact and efficient industrial engines is based on common-rail technology, turbocharger and external exhaust gas recircultation.



Downsizing approach
A groundbreaking downsizing approach was adopted in development of the H-series engines. The key objectives were the reduction of size and weight with simultaneously higher power and good exhaust gas values. The results are very convincing: Weight and consumption values are lower than those of any other engine in this class. This could be achieved, among other factors, thanks to the iHACS technology (intelligent Hatz Advanced Combustion Strategy) with its sophisticated combustion chamber geometry, Bosch injection technology, minimised friction and a maximum charge air pressure of 1.7 bar.

Conservative-innovative engine for a long service life
All mechanical components were designed and developed with a conservative-innovative approach. The H-series engines are equipped with two valves per cylinder, achieving high efficiency, mechanical robustness and functional simplicity. This is expressed in turn by the familiar long service life. Use of premium products for all important components also underlines this.



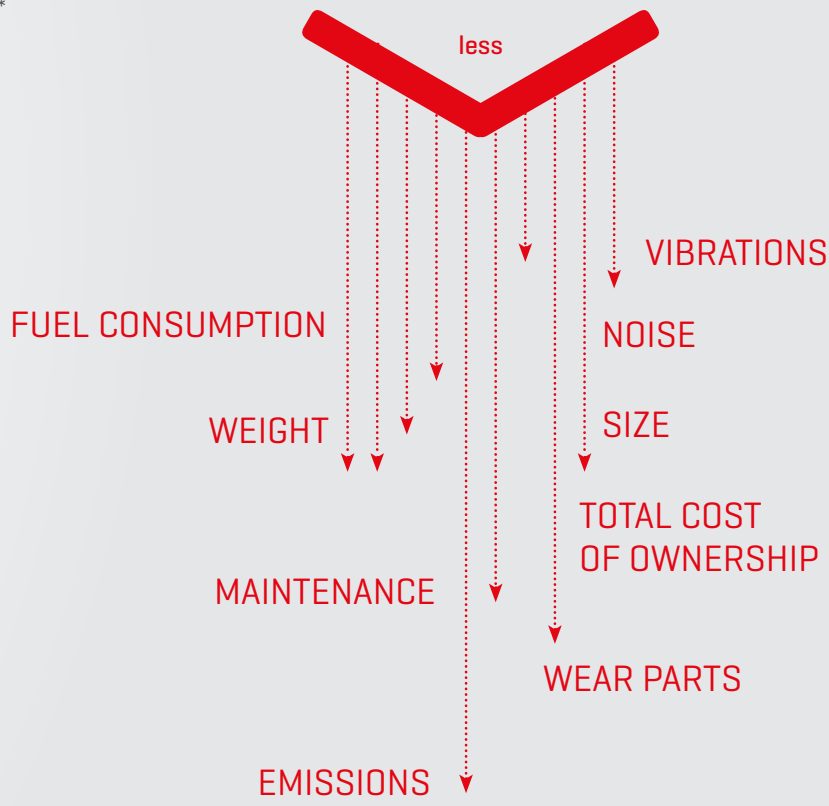
H-series

ROBUST BASIC ENGINE / VARIOUS MODELS

HIGH-QUALITY COMPONENTS

TIER 4F/STAGE IIIB COMPLIANCE **WITHOUT DPF**

ENGINEERED FOR EU STAGE V*



Modern engine family
Compact, light, economical, robust and environmentally friendly: The common-rail diesel engines of the Hatz H-series provide everything expected from powerful and modern industrial engines. They impress through their quiet running, dynamics and maintenance friendliness. Their constantly low fuel consumption over a wide load range sets the benchmark.

* according to the proposal of the EU Commission from September 25th, 2014

Innovation meets reliability. No contradiction for Hatz.

The H-series contains a whole series of technical refinements. They not only distinguish the engines with the most compact dimensions in its class: They also enable best fuel efficiency compared to the competition. Value was placed in particular on the Hatz well-known reliability for every innovation.

Impressive full package
The Hatz 4H50TIC was nominated among the top three in 2015 at the renowned GreenTec Award in the Automobility category.

BOSCH common-rail system for ultimate fuel efficiency
One of the key factors for the high power density of the H-series is the common-rail system. Hatz opted for the Bosch off-highway CRS, a common-rail system with 1800 bar. It works with three precisely calculated injections per power stroke: A pre-, main- and post-injection. Together with the other Bosch components matched ideally to each other – high-pressure pump, injector control unit, and off-highway injectors – the perfect balance is achieved between dynamics, quiet combustion noise, low pollutant levels, and economy.

Real drive consumption close to the optimum
When it comes to fuel efficiency, the four-cylinder model Hatz 4H50TIC sets new standards for the best point with a specific consumption of just 210 g/kWh. The special feature here is that consumption values close to the optimum operating point are achieved in a wide load and speed range. This is unrivaled today and makes the Hatz 4H50TIC the most efficient engine in the 37 to 56 kilowatts class.

Optimum combustion strategy for every need
The exhaust gas return system was further developed by Hatz engineers to have a positive effect on the exhaust gas values. A pre-cooling unit for the exhaust gas return (EGR) significantly reduces the exhaust gas temperature before the EGR valve, protecting it against thermal damage and sooting. An optimized EGR-mixing-nozzle is also used. It uniformly distributes the recirculated exhaust gases together with the fresh combustion air to all four cylinders. Together with the common rail system, the result is an outstanding exhaust gas quality which ensures that the TIC models are only equipped with a diesel oxidation catalytic converter (DOC) and there is no need for an additional particle filter. Furthermore the engines significantly undercut the emission limits of EPA Tier 4 Final and EU Stage IIIB.

Outstanding emission values from the very beginning
Hatz also offers the three-cylinder and four-cylinder TI models that work without EGR and DOC and achieve maximum outputs of 62 kilowatts for countries that do not place special requirements on emission values or in which only fuels with a high sulfur content are available. Compliance with the EPA Tier 2 and EU Stage II emission levels is still achieved without any exhaust gas treatment.

Fit for tomorrow's limits
The H-family was developed from the very beginning with a focus on fulfillment of future tighter regulations, such as EU Stage V that will make a diesel particulate filter (DPF) inevitable. These TICD models are fitted with the customised Hatz diesel particulate filter system optiHEAT that can be optimally adapted to the machine and installation situation. Thus, the OAPC requirements in Switzerland are also fulfilled.

High maintenance friendliness
A maintenance interval of 500 hours means the engine scores top points with regard to customer friendliness and reliability. The extended intervals are due to hydraulic valve adjustment and large-sized filters. Additionally, the engine has a shut-off sensor system that switches off the engine in an emergency to avoid major damage. The robust construction and careful selection of all components ensure that the engine is fit for the most demanding applications.

Internal friction
A further key element for the extraordinarily high fuel efficiency is the reduction of internal friction due primarily to the conservative design with only a few moving parts. A major contribution to this is made by the two-valve technology in conjunction with roller tappets as well as the lower camshaft that reduces installation space. Additionally, exclusively high-end materials are used for the conrod and bearings.

Not only the power counts. The internal values are also convincing.

Hatz has opted for premium products from well-known suppliers primarily from Germany for all the essential parts of the engine such as the injection system, crankcase, crankshaft, camshaft, exhaust gas recirculation valve, catalytic converter and sensor package.

EGR mixing nozzle

- Perfect mixture of fresh air and recirculated exhaust gas
- Homogeneous combustion over all cylinders
- Optimised load on components and uniform wear

Bore/stroke ratio

- Ideal bore/stroke ratio delivers an optimal thermodynamic surface to volume ratio, and therefore results in lower thermal losses at the cylinder walls

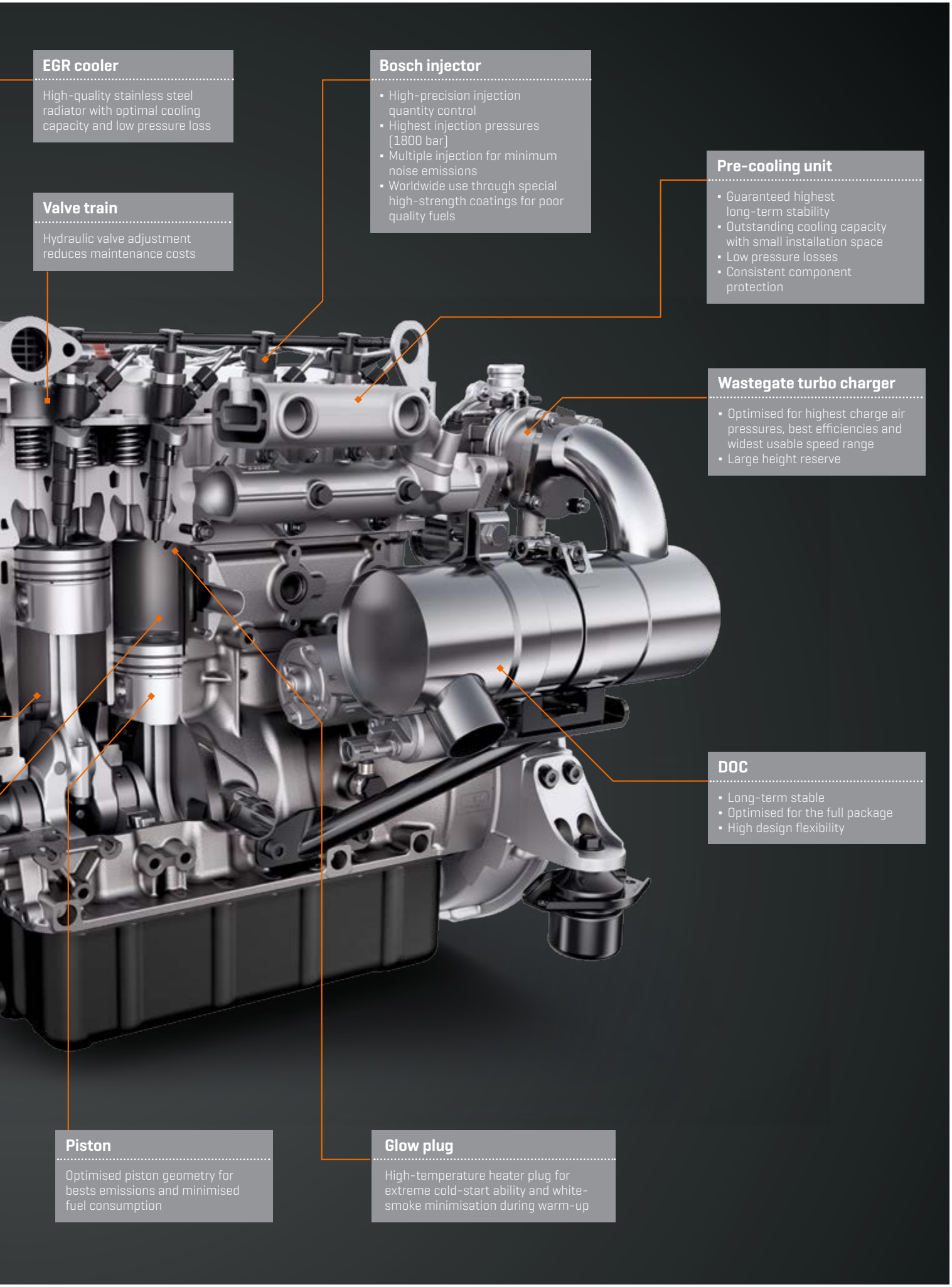
iHACS

- Intelligent Hatz Advanced Combustion Strategy
- A Bosch ECU controls the torque-optimised combustion process developed by Hatz, with a focus on best real drive consumption and minimised noise emissions

Robust but lightweight construction
The engine crankcase is made from thin-walled gray cast iron, the cylinder head and cylinder head cover from cast aluminum, and the oil sump from sheet metal. All parts are optimised for lightweight construction and structural mechanics.

Basic features

- Three-/four-cylinder turbo common-rail diesel engine with 1.5 or 2.0 litres respectively
- Bosch off-highway common-rail system with 1800 bar
- Bosch injectors (off-highway version)
- Bosch high pressure pump with electrical lift pump
- Bosch rail
- Bosch ECU in 12 V or 24 V version, external
- Bosch starter motor & Bosch alternator
- High-tech cylinder head with optimised cooling and two-valve system
- Hydraulic valve tappets
- Wastegate turbo charger for optimised torque characteristics
- Intercooler
- Engine mounted DOC after turbine
- Closed crankcase breather
- Gear wheel driven camshaft, no tooth belt, no chain



EGR cooler

High-quality stainless steel radiator with optimal cooling capacity and low pressure loss

Valve train

Hydraulic valve adjustment reduces maintenance costs

Bosch injector

- High-precision injection quantity control
- Highest injection pressures (1800 bar)
- Multiple injection for minimum noise emissions
- Worldwide use through special high-strength coatings for poor quality fuels

Pre-cooling unit

- Guaranteed highest long-term stability
- Outstanding cooling capacity with small installation space
- Low pressure losses
- Consistent component protection

Wastegate turbo charger

- Optimised for highest charge air pressures, best efficiencies and widest usable speed range
- Large height reserve

DOC

- Long-term stable
- Optimised for the full package
- High design flexibility

Piston

Optimised piston geometry for bests emissions and minimised fuel consumption

Glow plug

High-temperature heater plug for extreme cold-start ability and white-smoke minimisation during warm-up

The new power package in the H-family: Hatz 3H50.

Together with the well-established Hatz 4H50 engines, the newly developed three-cylinder engines will form the water-cooled product family of the H-series from 2018. Following the family concepts, the various 3H50 models are also orientated on the currently valid and future emission standards.

NEW

Developed for compact applications
The three-cylinder engines are the ideal solution for today's compact machine class smaller than 37 kilowatts. The goal is not only to house engines in a compact installation space: The form and operation of the machines must remain unchanged. As soon as exhaust emission after treatment becomes necessary, the little brother of the four-cylinder engine profits in particular from the compactness of the H-family.

Smaller space requirement, increased power
The automotive industry has been successfully practicing the downsizing concept for years. Three-cylinder engines inherited this concept as part of the H-family. Thus, the Hatz 3H50 at just 1.5 litres will replace engines with displacements over 2.5 litres in the future. The torque and response behaviour are considerably superior to the present generation. At the same time the consumption values are significantly reduced. In a word: right-sizing.

Compliant with emission standards
The Hatz 3H50TI doesn't need any exhaust emission after treatment at all. The engine achieves compliance with the EU Stage IIIA and US EPA Tier 4 Interim standards in the power range from 19 to 37 kilowatts. Primarily for the US market and Canada as well as some Asian countries the Hatz 3H50TIC was developed. In order to ensure compliance with the emission standards US EPA Tier 4 final and EU Stage IIIB, the combination of EGR and DOC reduces substances potentially harmful to the environment to the required level. In conjunction with the customised Hatz diesel particulate filter system optiHEAT, the Hatz 3H50TICD is optimally prepared for future emission standards such as EU Stage V*.

New three-cylinder Hatz 3H50
The first three-cylinder models will go into series production in 2018 and expand the Hatz H-series by powerful, efficient and compact engines in the power range up to 46 kilowatts.

* according to the proposal of the EU Commission from September 25th, 2014

The models of the H-family.

3H50TIC / 4H50TIC

- Turbo common-rail diesel engine
- World first downsizing industrial diesel engine
- Lowest consumption values in its class thanks to iHACS technology (intelligent Hatz Advanced Combustion Strategy)
- Thin-wall molding cylinder block, therefore compact in size and lightweight
- Hydraulic valve adjustment
- US EPA Tier 4 final and EU Stage IIIB compliance

3H50TICD / 4H50TICD

- Basic engine (TIC) additionally equipped with separable DOC/DPF combination filter
- DPF system optiHEAT (optimised Hatz Exhaust After treatment Technology) optimally customisable to vehicle-/machine design
- Optimised for long periods between two regeneration intervals
- Delivery as a complete system ex works
- Engineered for the proposed EU Stage V* emission regulation

3H50TI / 4H50TI

- Basic engine (TIC) further developed for markets with low-quality fuel
- Components which react sensitive to sulfur like exhaust gas recirculation (EGR) and diesel oxidation catalyst (DOC) are avoided
- Fuel with up to 5000 ppm sulfur content possible
- Higher output compared to TIC model
- Higher ambient temperatures possible
- Fulfills US EPA Tier 2/EU Stage II emissions regulations
- Additionally EU Stage IIIA (19–37 kW) certified

Open Power Unit (OPU)

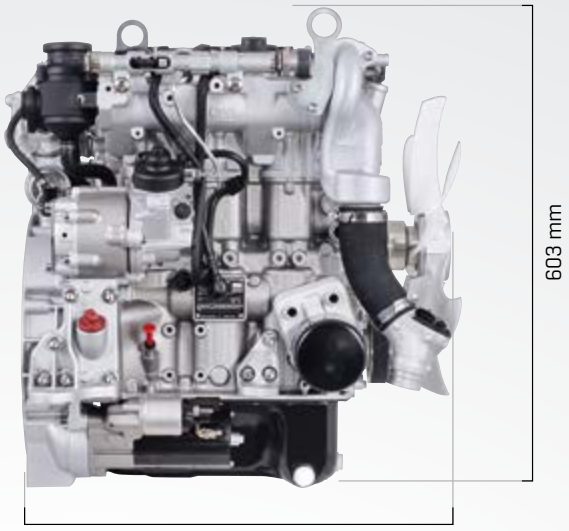
- Radiator and intercooler mounted vibration-isolated
- Delivery as a complete system ex works
- Just application and all application-based external parts need to be connected
- Available as TICD, TIC or TI version

4H50TIC Silent Pack

- Based on OPU version but 60 % quieter (- 4 dB(A)
- Efficent weather and touch protection
- Easy accessibility of all control and service points
- Same high release temperature as non-encapsulated version

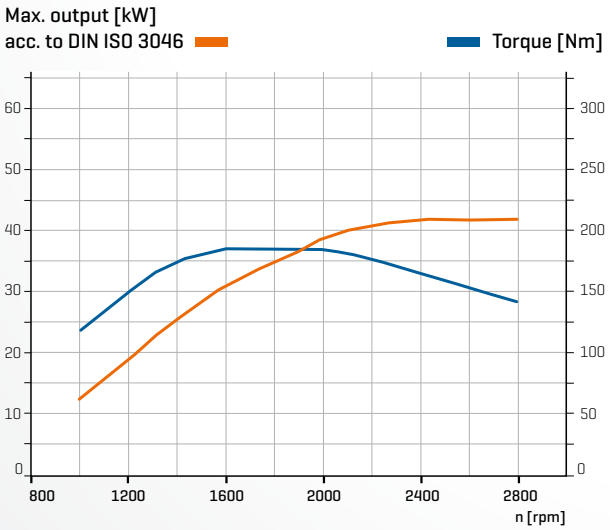
Pictures on this page show four-cylinder models

Technical data 3H50

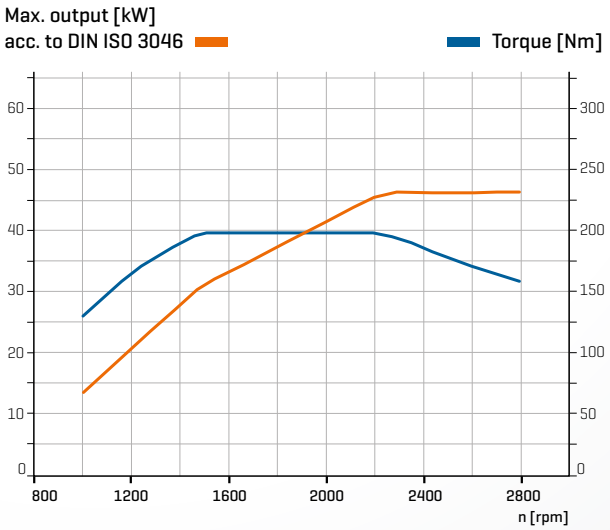


Engine type		3H50TICD	3H50TIC	3H50TI
Cylinders		3	3	3
Displacement [l]		1.464	1.464	1.464
After treatment		EGR, DOC/DPF	EGR, DOC	–
Emission compliance	EU Stage V*	19-56 kW	–	–
	US EPA Tier 4 final	–	19-56 kW	–
	EU Stage IIIA	–	37-56 kW const.	19-37 kW
	EU Stage IIIB	–	37-56 kW var.	–
	EU Stage II	–	–	37-75 kW
L x W x H [mm]		576 x 541 x 603**	576 x 541 x 603**	576 x 541 x 603
Weight [kg]		161	154	133
Max. output [kW @ rpm]		42 @ 2,800	42 @ 2,800	46 @ 2,800
Max. torque [Nm @ rpm]		185 @ 1,600-2,000	185 @ 1,600-2,000	200 @ 1,600-2,200
Option		OPU	OPU	OPU

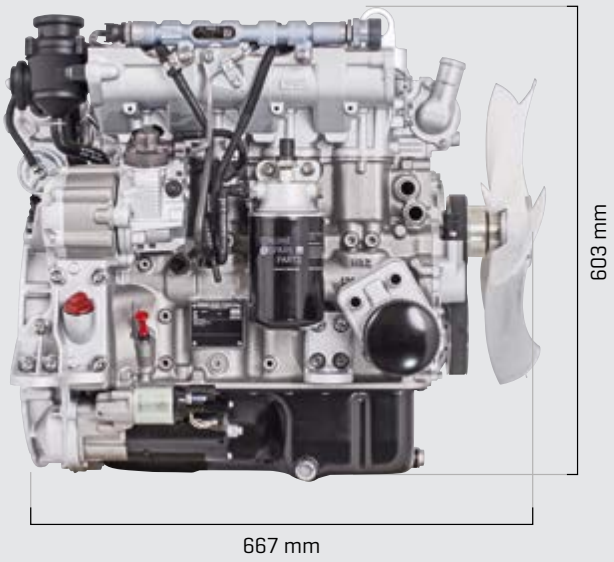
Performance curves 3H50TIC / 3H50TICD



Performance curves 3H50TI

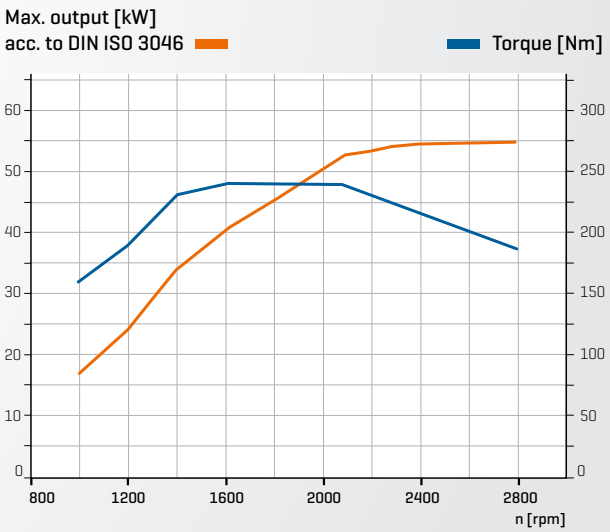


* according to the proposal of the EU Commission from September 25th, 2014 ** measures without DOC/DPF or DOC respectively

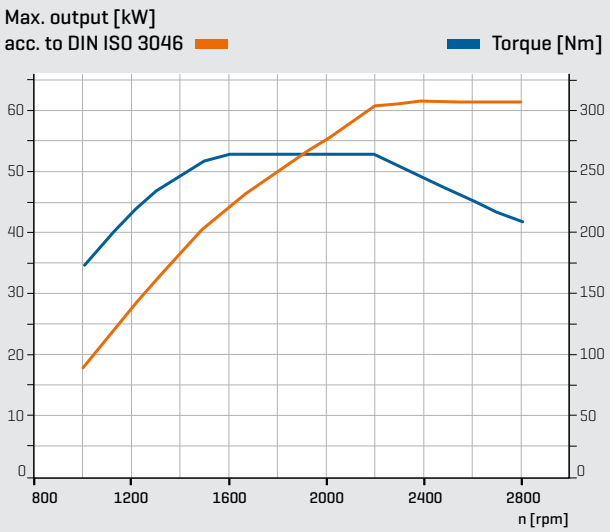


Engine type		4H50TICD	4H50TIC	4H50TI
Cylinders		4	4	4
Displacement [l]		1.952	1.952	1.952
After treatment		EGR, DOC/DPF	EGR, DOC	–
Emission compliance	EU Stage V*	19-56 kW	–	–
	US EPA Tier 4 final	–	19-56 kW	–
	EU Stage IIIA	–	37-56 kW const.	19-37 kW
	EU Stage IIIB	–	37-56 kW var.	–
	EU Stage II	–	–	37-75 kW
L x W x H [mm]		667 x 545 x 603**	667 x 545 x 603**	667 x 545 x 603
Weight [kg]		180	173	152
Max. output [kW @ rpm]		55 @ 2,800	55 @ 2,800	62 @ 2,800
Max. torque [Nm @ rpm]		240 @ 1,600-2,100	240 @ 1,600-2,100	265 @ 1,600-2,200
Option		OPU	OPU, Silent Pack	OPU

Performance curves 4H50TIC / 4H50TICD



Performance curves 4H50TI



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702 540 49 EN-08.16 Printed in Germany

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