

CREATING POWER SOLUTIONS.



Ready for the EU Stage V  
emission regulation

Hatz industrial diesel engines



# Challenge for engines. On the way towards zero emissions.

The demands on engine design are becoming ever greater due to stricter exhaust gas regulations. With the introduction of EU Stage V, the permissible emission values are being driven to even lower levels. With its engines in the power range up to 56 kilowatts, Hatz already chose the right technology at an early stage in order to meet these challenges successfully.



**EU Stage I** from 1999  
Particulate mass 0.85 g/kWh  
Performance class 37–75 kW

**EPA Tier 4 final** since 2013  
Particulate mass 0.03 g/kWh  
Performance class 19–56 kW

**EU Stage V** from 2019  
Particulate mass 0.015 g/kWh  
Performance class 19–56 kW

Performance class	EU Emission Directive		EPA Emission Directive	
	2013	2019	2013	2019
0 < P < 8 kW	-	Stage V (PM 0.4/0.6 / NOx+HC 7.5)	Tier 4 final (PM 0.4/0.6 / NOx+HC 7.5)	
8 ≤ P < 19 kW	-	Stage V (PM 0.4 / NOx+HC 7.5)	Tier 4 final (PM 0.4 / NOx+HC 7.5)	
19 ≤ P < 37 kW	Stage IIIA (PM 0.3 / NOx+HC 7.5)	Stage V (PM 0.015 / NOx+HC 4.7 / PN 1x10 <sup>12</sup> )	Tier 4 final (PM 0.03 / NOx+HC 4.7)	
37 ≤ P < 56 kW	Constant: Stage IIIA (PM 0.3 / NOx+HC 4.7) Variable: Stage IIIB (PM 0.025 / NOx+HC 4.7)	Stage V (PM 0.015 / NOx+HC 4.7 / PN 1x10 <sup>12</sup> )	Tier 4 final (PM 0.03 / NOx+HC 4.7)	

Since 1999, the more stringent exhaust gas standards for mobile machinery have resulted in the reduction of the emission of particulates and nitrogen oxides by more than 95 percent, especially in the USA and Europe – two of the largest sales markets. Regarded globally as the most important regulations, the standards in the USA with EPA Tier 4 final and the EU with the latest version of Stage IIIB have become established in the industrial engine sector.

**New exhaust gas standard EU Stage V in Europe**

From January 2019 industrial diesel engines with a power output of less than 19 kilowatts will also be affected for the first time by EU Stage V. Unlike the markets regulated according to EPA standards, this performance class has so far been without regulation in the EU. The EU Stage V now specifies the particulate mass limit (PM) at maximum 0.6 g/kWh, the emission limits for nitrogen oxides and hydrocarbons (NOx+HC) at 7.5 g/kWh and is thus comparable with EPA Tier 4 final.

For diesel engines between 19 and 560 kilowatts, a limit for the particulate numbers of  $1 \times 10^{12}$ /kWh has been introduced. According to the current state of the art, this makes the use of a diesel particulate filter (DPF) unavoidable.

In comparison to EU Stage IIIB, the particulate mass limit will be reduced by 40 percent to 0.015 g/kWh and will thus be 50 percent lower than EPA Tier 4 final.

**High demands on the technology**

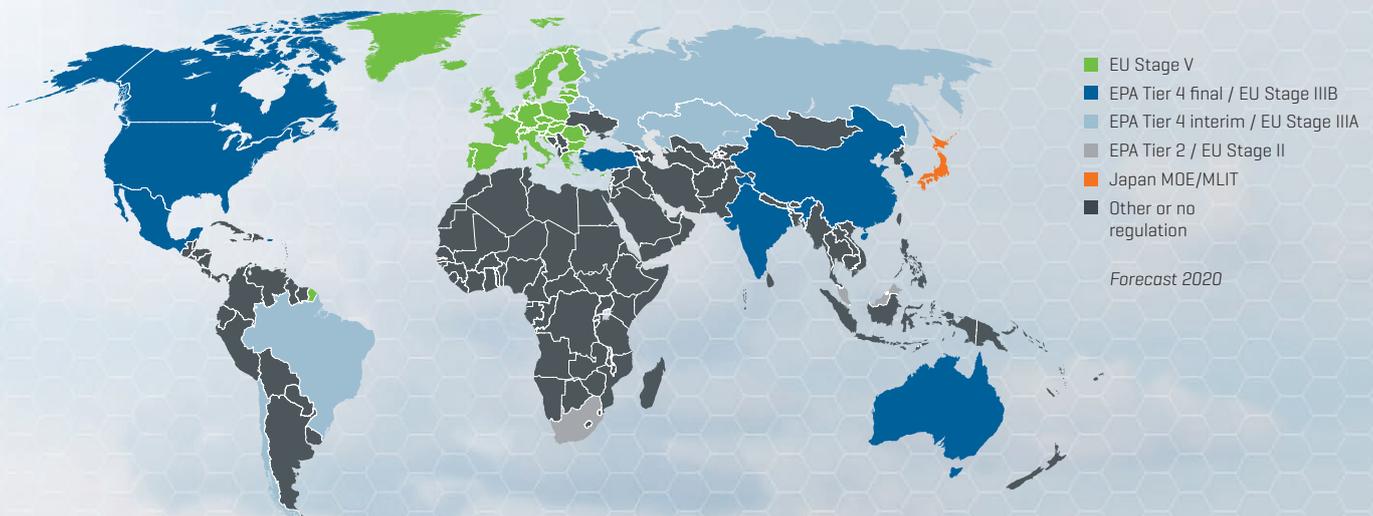
Ever lower emission values are good for the environment, but a growing technical challenge for all engine and machinery manufacturers at the same time. The advances in the emissions relevant areas of engine development (injection, combustion, turbocharging and exhaust after-treatment) have made it possible for today's Hatz diesel engines to be among the cleanest on the market and are moving towards zero emissions.

**No real challenge for Hatz**

Hatz industrial engines up to 19 kilowatts are already certified today to Tier 4 and also fulfil the Stage V requirements without any modification. In the power range 19 to 56 kilowatts, the new H-series fulfils the specifications of Tier 4 final and – equipped with a diesel particulate filter – also EU Stage V in the future. This allows Hatz customers to safely plan for the future.

**Global exhaust gas standards**

Throughout the world, there are different exhaust gas regulations that apply to industrial engines. The bandwidth ranges from no regulations to very strictly regulated. In addition to the standards of the US environmental protection authorities EPA (Tier X) and the EU (Stage X), other countries have their own regulations that move however approximately at the level of the EU/US specifications: Switzerland, Japan, South Korea, China and India.



# Always one step ahead. Hatz engines up to 19 kilowatts.

Since 2010, Hatz has been the only manufacturer whose entire engine range below 19 kilowatts has qualified to EPA Tier 4. As the requirements of the new EU Stage V emission level in this engine class correspond with the previous US standards, the Hatz engines already fulfil the future EU exhaust gas regulations today.



Hatz engine series  
up to 19 kW

## B-series

The B-series is the industrial diesel engine that will meet all expectations. With a power range from 1.5 to 8 kW, the engine can be used for numerous applications. In regard to robustness and lifetime, the single-cylinder series sets standards in the market.

## D-series

The Hatz D series is best suited for challenging tasks. It is characterized by high power and the unique design in particular. Thus, with 11.2 kW, the 1D90 engine is the highest performance single-cylinder diesel engine in the world.

Max. Speed range rpm	1,500-3,600	1,500-3,600
Power range kW	2.5-7.9	3.5-11.2
Current certification EPA / EU	Tier 4 final / not necessary	Tier 4 final / not necessary
Fulfils EU Stage V	Yes	Yes



### Stage V from the market leader

In the range of single-cylinder and two-cylinder engines up to 19 kilowatts, Hatz has been one of the market leaders for decades. Hatz diesel engines have always proven to be reliable and durable under the most difficult of conditions all over the world. This is due not least to the quality of the individual components, such as the injection equipment that is produced completely in-house and signifies a considerable technology advantage.

The introduction of the EU Stage V emission level will not cause any changes to our engines and our customers can also rely on the proverbial Hatz reliability in the future.

### No changes with Stage V for Hatz customers

With the introduction of EU Stage V, diesel engines with a power output of less than 19 kilowatts will also be subject to exhaust gas regulation in the European Union for the first time. In EPA-regulated markets, the Tier 4 specifications have applied to these engines since 2010. Since then, all Hatz engines in this performance class have been delivered around the world subject to these EPA specifications.

EU Stage V corresponds in emission values and test specifications to EPA Tier 4 of model year 2012. Thus, Hatz engines up to 19 kilowatts already meet the requirements of EU Stage V today and Hatz customers can – without having to fear modifications – continue to use the established and tested engines.

The characteristics and output power of today's engines remain unchanged, only the crankcase breather is converted into a closed circuit which guides the ventilation from the crankcase back to the intake manifold. This results in no changes however to the installation on the customer side.

Unlike Tier 4 final, EU Stage V does not require an NRTC (Non-road Transient Cycle) certification run, which means there are no limitations on the usable speed range. No exhaust gas treatment is required with Stage V for Hatz engines in this class.



### G-series

The engines of the G-series are universally usable industrial diesel engines. They score highly with low weight due to the lightweight metal design, low fuel consumption and high reliability as no V-belt is used.



### 2M41

The M-series is the long running success among the industrial diesel engines. The robust basic drive train, notably the sturdiest crankshaft of all engines on the market, has remained unchanged since its market introduction 30 years ago. Running times of several tens of thousands of hours are no problem for these engines.



### 2L41

Economic, reliable, quiet: These are the properties that distinguish the engines of the L-series. Their extremely long service life is attributed to the robust design. Their high operating reliability allows L-series engines to be operated dependably even in remote areas or in applications without constant monitoring.

2,000–3,200

10.5–15.1

Tier 4 final / not necessary

Yes

1,500–2,000

16.5–18.9

Tier 4 final / not necessary<sup>1</sup>

Yes

1,500–2,000

16.5–18.9

Tier 4 final / not necessary<sup>1</sup>

Yes

<sup>1</sup> EU Stage IIIA certified for power above 19 kW

# Fit for the future. Hatz engines from 18.4 kilowatts up.

The requirements of the EU Stage V emission level cannot be fulfilled by diesel engines with a power output of more than 19 kilowatts without diesel particulate filters. Hatz already took this path at an early stage in the development of the new H-series engine generation and is thus well prepared for the future.



Hatz engines  
from 18.4 kW up

## 3H50T<sup>2</sup>

A groundbreaking downsizing approach was adopted in the development of the H-series engines. The liquid-cooled three-cylinder engines are the ideal solution for today's compact machine class of just below 19 kilowatts until less than 37 kilowatts.



## 3H50TICD<sup>3</sup>

Thus, the three-cylinder 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.



Max. speed range rpm	1,500–2,800	1,500–2,800
Max. power kW	18.4	42
Certification EPA / EU	Tier 4 final / <b>Stage V</b>	Tier 4 final / <b>Stage V</b>

<sup>2</sup> Available early 2019 <sup>3</sup> Available Dec. 2018

### Based on a perfectly designed basic engine

In the development of the H-series, Hatz had already placed the emphasis on future stricter exhaust gas regulations. The specifications for the H-engines included low fuel and oil consumption, friction losses as low as possible and downsizing for optimum load profile. In addition, the combustion is perfected with iHACS (intelligent Hatz Advanced Combustion Strategy). All of this results in fewer particulates being emitted, hence making the exhaust gas treatment more efficient. Engines of the H-family are therefore designed to be extremely compact and provide maximum flexibility during installation in the machine.

### The right exhaust gas treatment for every purpose

optiHEAT – optimised Hatz Exhaust Aftertreatment Technology – provides our customers with the optimum exhaust gas treatment for the target market with an ideal match with the machine and the customer requirement. In order to fulfil the EPA Tier 4 final, CARB and EU Stage IIIB exhaust gas regulations above 19 kilowatts, the basic H50TIC model is only equipped with a combination of exhaust gas recirculation [EGR] and diesel oxidation catalyst [DOC]. Below 19 kilowatts, the new three-cylinder 3H50T model does not need any after treatment at all to achieve EPA Tier 4 final and EU Stage V compliance.

### Ideally prepared for Stage V

Thanks to the high product maturity and the best preconditions of the basic model for a proven exhaust aftertreatment process, the step to a Stage-V-compliant engine is not far. To meet the specifications of EU Stage V and LRV in Switzerland, the TIC basic model is equipped with a splittable – and hence maintenance-friendly – DOC/DPF combined filter, thus becoming the H50TICD. The basis for a long service life of the diesel particulate filter are the lowest possible raw emissions of the engine that are best achieved with a turbocharger and charge air cooler. In addition, the operating time within the optimum system temperature range must also be as high as possible. With optiHEAT and intensive research and development work, the Hatz engineers have been successful in the design of the matching DPF. In this context, “optimised” not only means the ideal model size design of the DPF system for the requirements of the machine, but also optimum adaptation to the load/temperature profile under real conditions as well as a regeneration strategy matched to requirements. The expandable modular system also allows flexible installation and simple maintenance.

**Summary:** With one basic model and the correct variation in the exhaust gas treatment, all major markets can be served with an ideal engine/machine combination.



### 4H50TICD<sup>3</sup>

Compact, light, economical, robust and environmentally friendly: The Hatz H-series common rail diesel engines provide everything expected from powerful and modern industrial engines. Above 19 kilowatts they also fulfil the EU Stage V emission level with the Hatz DPF system.



### H50TIC basic model

The H50TIC basic model fulfils the currently applicable EPA Tier 4 final and EU Stage IIIB emission standards with only a combination of exhaust gas recirculation [EGR] and diesel oxidation catalyst [DOC]. In combination with the individual Hatz diesel particulate filter system, the H-series engines above 19 kilowatts as TICD models are ideally prepared for future emission standards such as EU Stage V. Below 19 kilowatts, the 3H50T achieves this without exhaust after treatment.

1,500-2,800

55

Tier 4 final / Stage V

**iHACS**

intelligent HATZ ADVANCED  
COMBUSTION STRATEGY

**optiHEAT**

optimised HATZ EXHAUST  
AFTERTREATMENT TECHNOLOGY

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