ALTERNATIVE
FUEL SYSTEMS

Prins

# World leader in alternative fuel systems


FOR AUTOGAS • NATURAL GAS (COMPRESSED AND LIQUIFIED) • BIOGAS • HYDROGEN • DME

ALTERNATIVE FUEL SYSTEMS
Prins

# A green and cost-efficient alternative

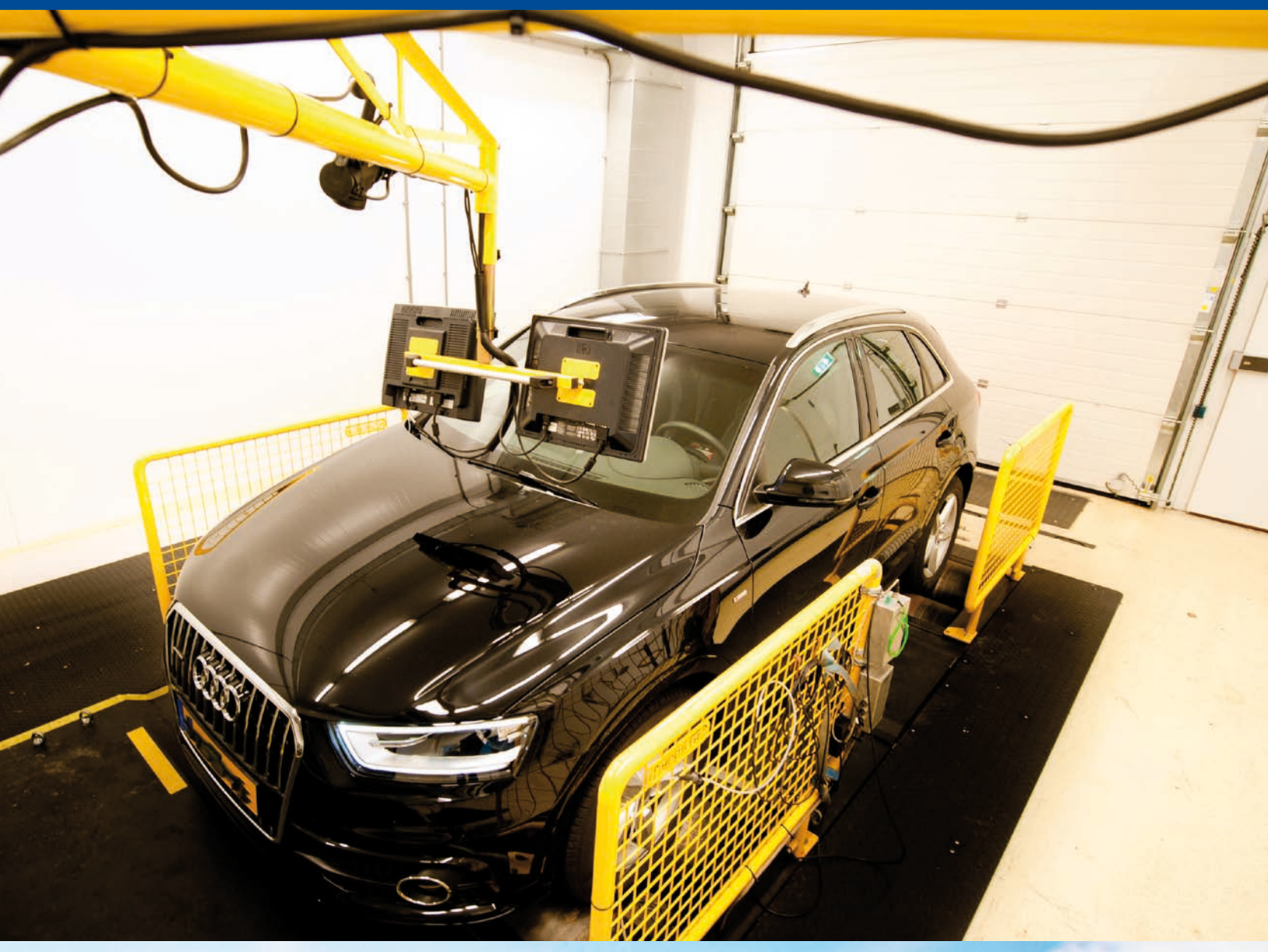
Alternatives to petrol and diesel. They exist. Fuels such as autogas (LPG), natural/biogas (CNG/LNG), hydrogen and Dimethyl Ether (DME). Each fuel has its positive result in costs and emissions. For many years, Prins has been a leading developer and supplier of alternative fuel systems to installers, importers and (Delayed)OEMs all over the world.

As an innovator Prins is the world leader in developing and supplying systems for the latest engine technologies like 'Direct Injection (DI)' and hybrid systems. The company offers Bi-fuel, Mono-fuel and Dual-fuel applications. Even Tri-Fuel applications are possible.

Prins is a Dutch total solution provider serving a worldwide customer base and delivering a wide range of alternative fuel products for light-, medium- and heavy-duty vehicles. The company is continuously developing and innovating with a strong focus on durability and sustainability.

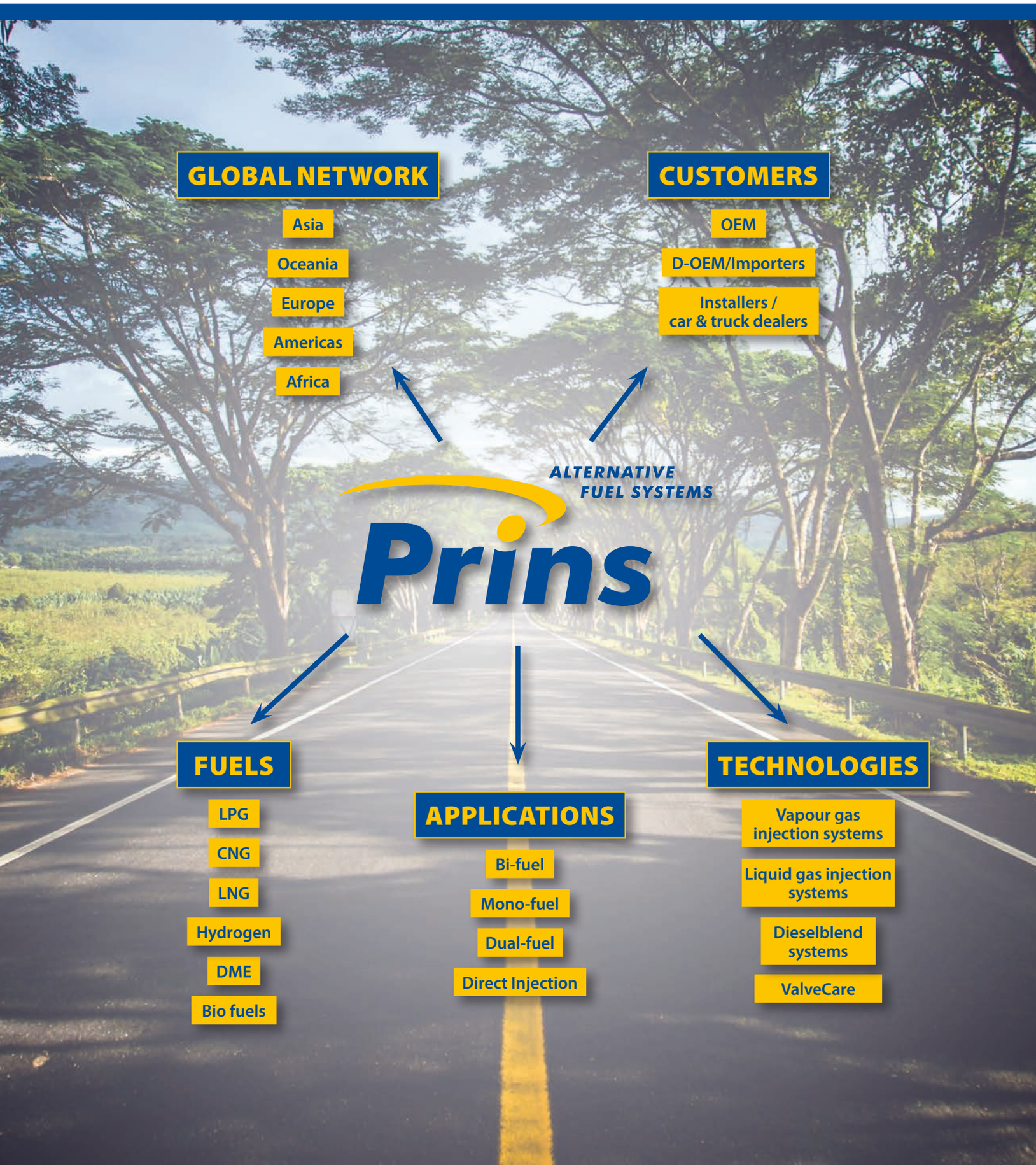
Bart van Aerle,
CEO Prins Autogassystemen B.V.

*Our ambassador, the Prins Mascot, symbolises eco-friendly and economical driving.*



***'Quality, Innovation and Customer Care: it's in our nature'***

# The total solution provider




For more than 30 years, Prins Autogassystemen has been a leading player in the development and production of alternative fuel systems. As a Westport Fuel Systems company, Prins provides (D)OEM customers, importers and installers in over 70 countries with cost-efficient and innovative solutions for a wide variety of engine types and engine technologies. All partners and customers are trained and certified in-house to ensure proper installation and maintenance of the Prins systems. Prins has been ISO 9001:2015 certified and all Prins staff members are dedicated and highly qualified. They operate in accordance with most IATF 16949:2016 standards. The After Sales Service department and the global network of Prins service locations provide customers with ongoing support.

## *Why Prins:*

- ***Leading developer and supplier of high-quality components and alternative fuel systems***
- ***One-stop shopping***
- ***Worldwide service network***
- ***Innovative – with a proven track record***
- ***Focus on sustainability***

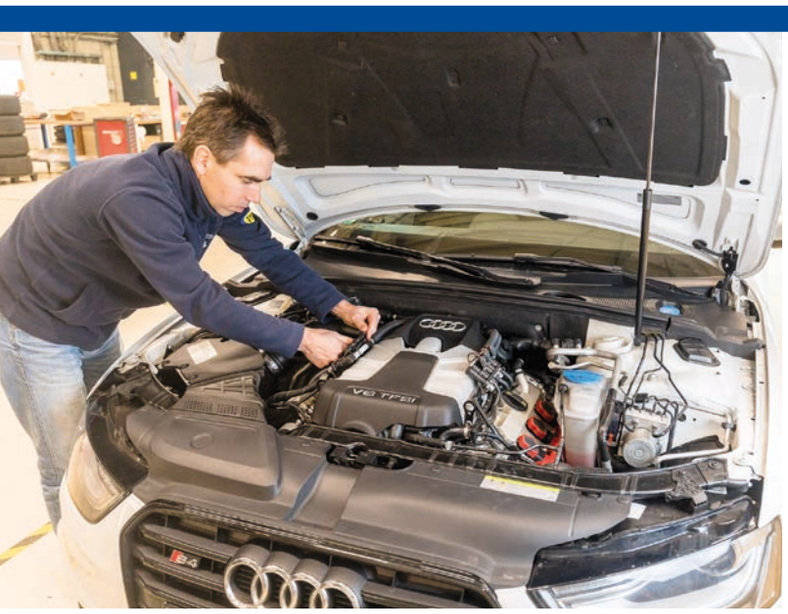
# Engineering at a global level

Innovation is at the center of Prins. Prins has developed a high-tech sequential vapour gas injection system (VSI) suitable for both LPG and CNG applications and indirect as well as direct injection engines (VSI-DI).
Prins has also been able to develop systems for the latest families of direct injection engines with direct liquid gas injection: Direct LiquiMax for LPG applications. For the medium- and heavy- duty vehicle segment, Prins has engineered Dieselblend, in which diesel is used with LPG, CNG or LNG in an optimal mix ratio for the most reliable and optimal drivability. Prins also developed a DME fuel system for light -, medium - and heavy duty together with other first-tier technology partners and technical universities.

The in-house Research & Development (R&D) department develops all core components, software and systems. Together with the Application department (system integration), immediate testing and application is possible. Core components and software can often be found integrated over the full range of systems to ensure optimal exchange and integration.

## Patents

Prins has patented most of its important innovations. In addition, applicable solutions for and on behalf of Prins are continuously being developed together with partners and suppliers.





*Automechanika Innovation Award*

*Automechanika Green Directory Award*



*INPRO Award*

## Reliability and quality

Besides functionality, Prins greatly values reliability and quality. The testing of components and complete systems is done at various facilities both within and outside Prins. Amongst other things, the systems are tested for exhaust emissions, power and drivability under various climatic conditions. All components are validated in-house, comply with EU R67/R10/R110/ R115/CSA/EPA/IS0 15500 regulations, and are 100% C.O.P.-tested before dispatch.

Products are also globally subjected to durability, heat and cold tests. For the ultimate performance tests, Prins makes its products available to several racing teams that use alternative fuels.

## Award winning

Prins and its products are regularly awarded with leading industry awards. The company won the INPRO Award, the Automechanika Innovation Award, and the Automechanika Green Directory Award, all for the Direct LiquiMax. Prins also won the golden Sustainable Entrepreneur Award and VSI-2.0 DI was awarded the INPRO Award.

## The various alternative fuels:

**LPG (Liquified Petroleum Gas)** also known as **Autogas** is a familiar, eco-friendly fuel. LPG is a by-product of oil refinement and is released through the extraction of natural gas. Driving on autogas means saving on fuel costs, reducing $CO_2$ emissions by up to 21% and reducing the percentage of particles by up to 95%, without compromising your driving pleasure.

**CNG (Compressed Natural Gas)** is less expensive and cleaner than other fuels that are currently available. Biogas, also called green gas, is produced through fermentation. **LNG (Liquefied Natural gas)** is the liquid form of natural gas. Because of its positive properties like its larger range and storage capacity, it is used in the transport sector.

**Hydrogen** and **DME** are fuels that are expected to be available on a large scale in the near future. Already, Prins is carrying out extensive testing projects with these fuels in order to be ready when the market is. The purpose of these projects is the development of a fuel system with minimal emissions.

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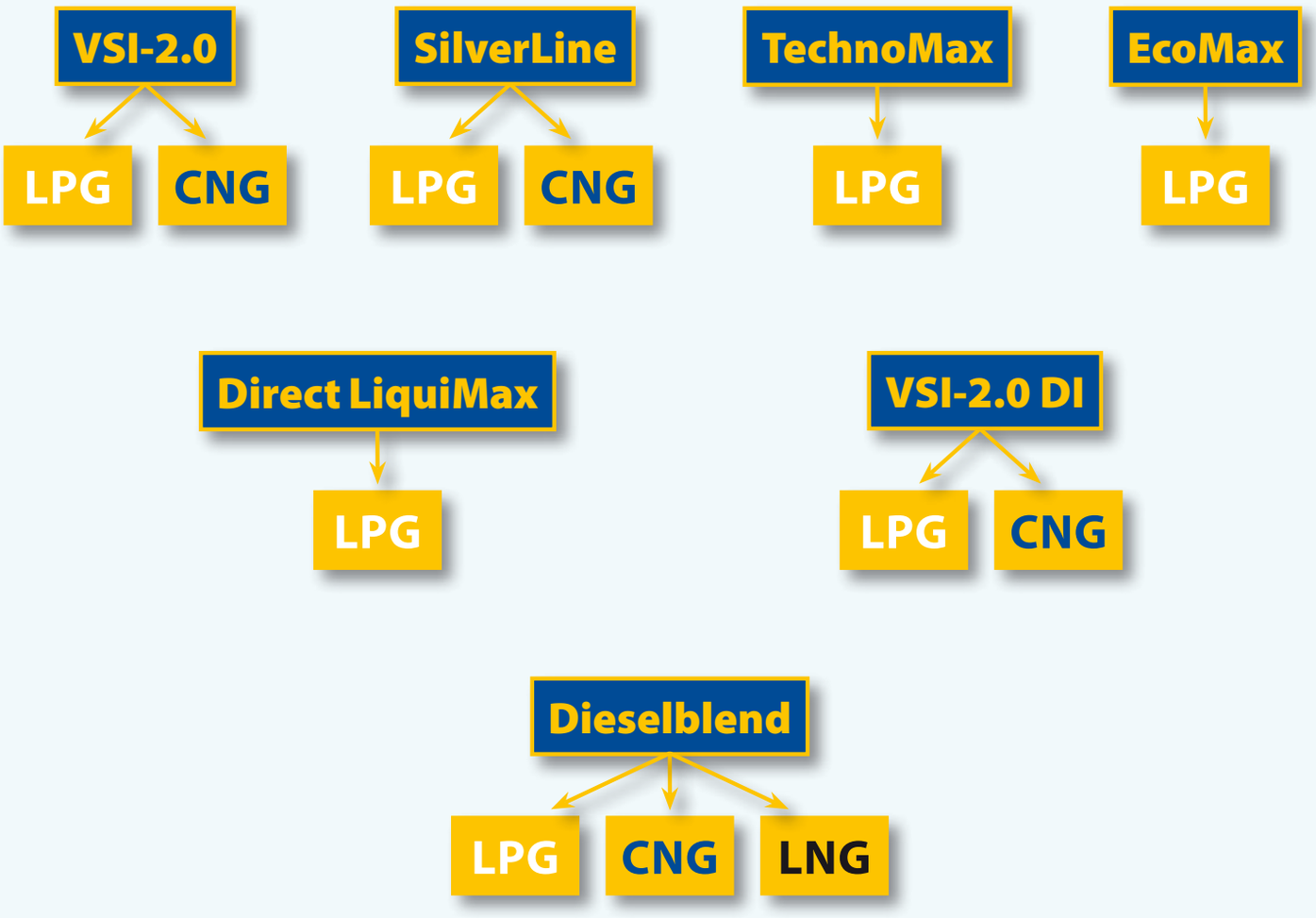
VSI-2.0
GOODYEAR
WRANGLER

# Product range

*The Prins alternative fuel systems can be categorised according to type of fuel and its application. Prins has systems for both vaporous and liquid injection. The result: a wide range of products and a Prins system for almost any vehicle. Irrespective of whether it is for cars or buses, lighter or heavier transport. Prins systems even fit marine and industrial use.*
*The Prins systems consist of components that are finely attuned to each other and are sometimes interchangeable. Prins also supplies complete sets with all relevant accessories and parts, and offers its customers the convenience of a total solutions provider.*



## VSI-2.0 platform: VSI-2.0, SilverLine, TechnoMax and EcoMax

Prins VSI-2.0 (Vapour Sequential Injection) is a second generation platform with highly advanced bi-fuel injection systems (LPG and CNG) for up to 16 cylinders. These universally applicable systems have acquired a solid top ranking worldwide. The components are of OEM quality. Keeping easy and quick installation in mind.

Together with the VSI system, Prins optionally supplies the ValveCare product, a unique additive dosaging system with liquid to prevent excessive wear of the valves and valve seats of engines that are sensitive to driving on LPG or CNG.

A cleaning fluid specially developed for cleaning (DI) petrol injectors. To keep the Prins LPG/CNG system and the original fuel system in optimum condition and to ensure a long service lifespan. InjectorCare easily removes heavy-ends and oil residue that may be left behind in the original fuel system and LPG/CNG system over time.

## Main components

**Computer**
(AFC or ECU) which controls the system

**Fuel switch** integrated in the dashboard

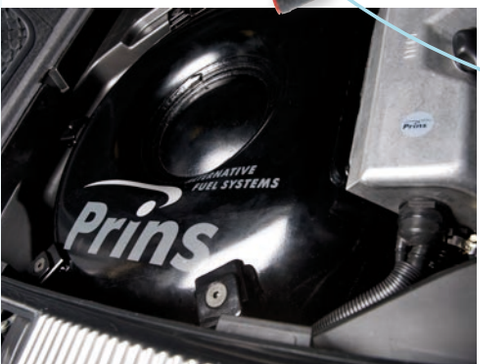
**VSI-2.0 CNG,**
CNG regulator

**eVP-500,**
electronic LPG vaporiser

**Filter unit**
filters the fuel to prevent pollution of the injectors

**VSI-2.0 reducer,**
traditional LPG vaporiser

**Keihin injectors**
inject the correct amount of fuel




**Tank** to store fuels, there are multiple types and sizes of tanks available

## VSI-2.0 DI

Because of its chemical and physical properties, LPG is extremely suitable as fuel in combination with direct injection engines. Extensive tests have shown that the efficiency of the engine increases dramatically by using LPG, and this results in a $CO_2$ reduction of 10 to 21% and in reduction of particles of up to 95% compared to petrol. The Prins LPG systems are designed in a way that the vehicle hardly uses petrol.

## Direct LiquiMax (DLM)

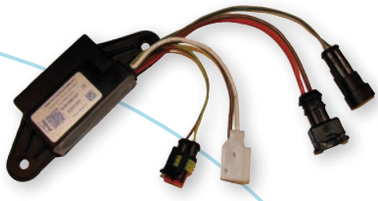
As a dedicated system, Prins VSI is also suitable for the latest generation of Direct Injection engines. We then call the system VSI-2.0 DI. The VSI-2.0 DI system has proven its strength in three-, four- and five-cylinder vehicles, and in particular in six-, eight- and ten-cylinder vehicles, tailored to the latest generation of vehicles.

Not only our VSI-2.0 DI system that injects vapourized LPG in the engine is suitable for car models with a DI engine. Prins also developed an LPG system that injects liquid LPG directly under high pressure (20-250 bar) into the engine and makes optimal use of the OEM electronics and components that are already present in the vehicle. It can be applied as a mono or bi-fuel solution. With Direct LiquiMax the driver will not notice any difference between driving on LPG or petrol.

# Main components

**Computer** (AFC or ECU) which controls the system


**Fuel switch** integrated in the dashboard



**Intelligent pump control** actuates and monitors the fuel pump

**Fuel module** with high pressure turbine pump and jet pump function


**Fuel management unit** for switching between petrol and LPG

**Boost pump** for multiplication of the petrol pressure during the switch from LPG to petrol



**Tank:** to store fuels. There are multiple types and sizes of tanks available

# Prins Dieselblend

When a Prins Dieselblend system is added to a diesel engine, it can use the much cleaner and cheaper LPG, CNG or LNG fuel. Especially where large distances are driven, it pays off to use an alternative fuel while the original engine is still intact. This way, substantial savings on fuel costs can be realised as well as considerable reduction of the emissions of $CO_2$ and $NO_x$. This supports the Lean and Green principle.

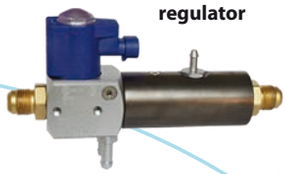
The single-point and sequential multipoint vapour injection system is fitted parallel to the original engine management system. Thus, in principle Prins has a system available for all diesel engines. The systems are fully computer-controlled to inject the correct amount of LPG, CNG or LNG and this is specifically tailored to the engine's characteristics.

***Reliability***
With components of high quality, refined adjustment and worldwide professional support, Prins offers a reliable dedicated system. Drivers will notice no difference in driving performance and experience.

## Main components

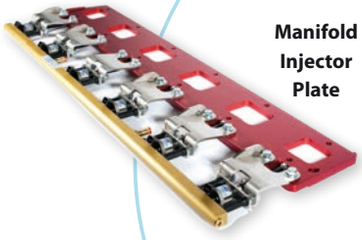
**Computer** (AFC or ECU) which controls the system

**Fuel switch** integrated in the dashboard



LNG pressure **regulator**

CNG **regulator**



**Manifold Injector Plate**

CNG **regulator**

SPI unit, **single point injection**

**Keihin injectors** that inject the correct amount of fuel

**Filter Injector Unit:** filters the gas and injects the correct amount of Fuel

LPG: **vaporiser**

**Tank:** there are several options for positioning the storage tanks for LPG, CNG and LNG


# Corporate Responsibility

***Quality, Innovation and Customer Care are important to Prins. It underlines the direction for internal and external decision making from the choice of products, material use, staff, training and management style.***

## Service at large

Prins believes in doing business the right way; corporate responsibility is everyone's responsibility. This is deeply rooted in our operational management and it enables Prins to deliver a remarkable financial, social and environmental performance.
This driven and dynamic corporate culture makes it possible to attract exceptional people.

## Customer care

Customer care is one of the core values of Prins. The After Sales Service department closely collaborates with service partners worldwide. They are trained in-house at Prins. Drivers are provided with professional assistance throughout the entire world. Local partners are listed at www.prinsautogas.com.

## Social Responsibility

It is important to Prins to show corporate social responsibility and consequently we have a strong focus on people, planet and profit.

Together with suppliers, manufacturers, customers, and other partners and stakeholders, Prins is building towards a sustainable future. Prins is convinced that only through collaboration it is possible to continue to offer quality in a responsible manner.


Prins
AFC / Prins colour switch
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