

# VOSS

Line Technology









Experience plus Ideas

# Performance Based Line Systems

VOSS Automotive is an expert wherever line and connection technology is used for on-road and off-road applications.

Our products ensure secure connections that meet the requirements of our customers. Our core competence comprises individual and system solutions, from development and manufacturing readiness to production and logistics.

VOSS develops and produces lines from a variety of materials suitable for connection systems, for example for fuel, air, hydrogen and urea. VOSS is a development partner for original equipment manufacturers worldwide.

Description	Examples
Air brake lines	
Auxiliary air lines Transmission control lines	
Lines for SCR systems	
Coolant lines	
Fuel lines (supply, return, leak-off rail)	
Hydraulic lines (Hydraulic clutch)	
Air suspension lines	
Lines for windscreen washer systems	
Lines for fuel cells	

Materials	Application	Design forms / combinations	Applicable connections	Temperature range	Pressure range
PA tube, hose, steel or stainless steel tube and hose combination	Commercial vehicles	Straight, pre-formed, steel/hose aluminum/PA tube	Quick connect systems 232 and 230, DKO, cutting ring	-40°C to 100°C	max. 12 bar (18 bar)
PA tube	Commercial vehicles	Straight, pre-formed, bundles	Quick connect systems, e. g. 232 and 230, multi-connectors	-40°C to 115°C/130°C depending on material	max. 10 bar
PA tube, hose	Commercial vehicles Passenger cars Off-road	Unheated, electrically heated and cooling-water heated lines	Quick connect systems 241 and 246, multi-connectors	-40°C to 100°C/120°C depending on material	Depending on SCR system 9 bar
Hydrolysis-stabilized plain tube, hydrolysis-stabilized corrugated tube, multilayer tube, hose	Commercial vehicles Off-road	Straight, pre-formed	Quick connect systems 241 and 246	-40°C to 100°C/120°C depending on material	2 bar, max. 4 bar
Mono-PA tube, multilayer tube, hose	Commercial vehicles Passenger cars Off-road	Straight, pre-formed	Quick connect systems 241, 246, 249, 250	-40°C to 100°C/140°C depending on material	max. 5 bar
PA tube	Passenger cars	Straight, pre-formed	Quick connections	-40°C to 120°C	max. 40 bar
PA tube	Passenger cars	Straight, pre-formed	Quick connect system 203	-40°C to 125°C	max. 18 bar
PA tube, corrugated tube	Passenger cars	Straight, pre-formed	Quick connections	-30°C to 100°C	max. 3 bar
Multilayer tube	Passenger cars	Straight, pre-formed	Quick connections	-40°C to 120°C	max. 12 bar

## High-Quality Materials for Durability

Tubes, hoses and lines are highly sophisticated, multifunctional connecting elements – they must perform their function with absolute reliability and thus determine the basic quality.

To satisfy the ever rising mechanical and thermal requirements, VOSS is continuously working on improvements to the materials and designs for the line and connection technology.

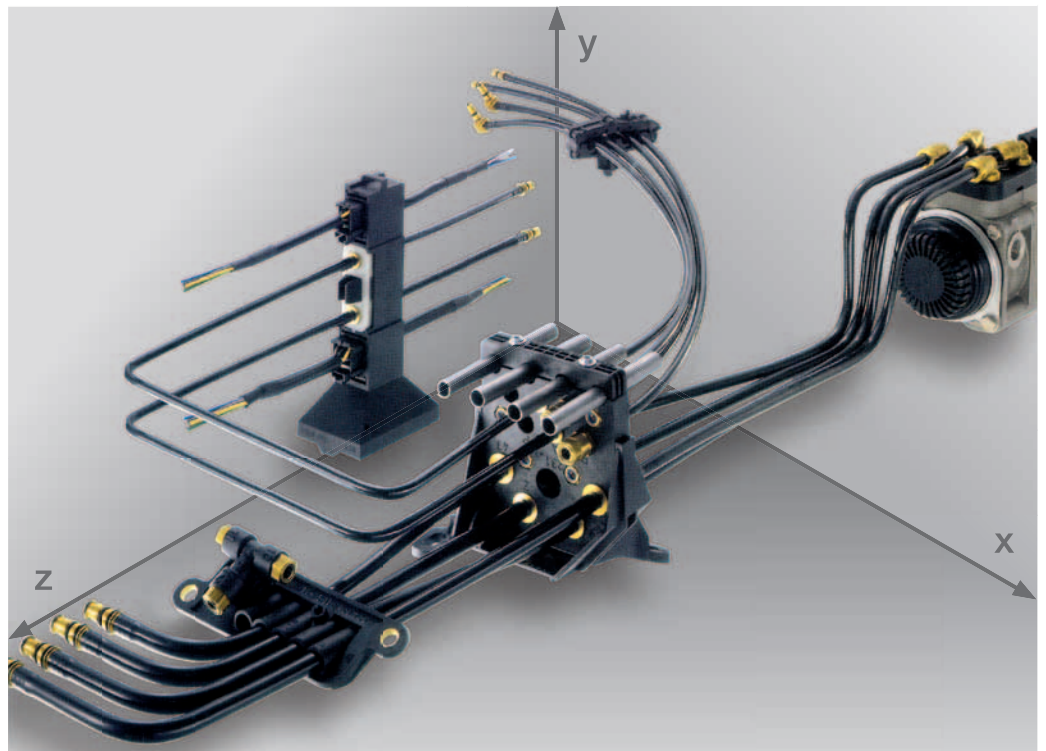
VOSS uses materials such as PA tubing with and without inner or outer coating, stainless steel, aluminum, nylon, steel or brass, for innovative solutions in diverse areas of application.



*Examples of material combinations (from left)  
Nylon, aluminum, steel, stainless steel with inner coated PA tube, brass/hose*

## Complex Designs

VOSS develops and produces the right solution, from the individual line through to the system. Whether individually pre-formed or bundled, all combinations can be customized to customer requirements. The integration of electrical lines in the line bundle or the complete pre-assembly of modules are also part of the range of services.



## From Analysis to Production

### Analysis

A highly qualified team analyzes the existing connection and line technology directly in the complete vehicle. The target of cost reduction by utilizing all potentials applies for assembly times, line routing, weight or part diversity. The customer receives concrete optimization proposals, including documentation and sample installation or clear suggestions for new products.



### Design and Development

Pioneering solutions result from ideas and experience. VOSS Automotive has comprehensive expertise when it comes to complete systems where the relevant connecting technology is just part of the whole. A process oriented project management guides all development work culminating in series production. This ensures short development times optimized to the customer. The coordinated target specifications are therefore complied with across all locations.

### Prototypes and Samples

The creation of samples and prototypes is an indispensable project stage in the preparation towards production startup. The requisite optimization work is carried out in our own prototype workshop as part of the concrete development projects. The production of pilot and start-up series is also conducted here. That means target specifications are optimally achieved in regard to time and cost, while weak points are remedied at an early stage.



### Production

Perfection in production forms the basis for perfect quality. Fully automatic machines are themselves monitored and controlled via high-performance camera systems. Semiautomatic systems use complex monitoring processes to ensure fault-free products. All workflows and processes are certified – some of them several times.

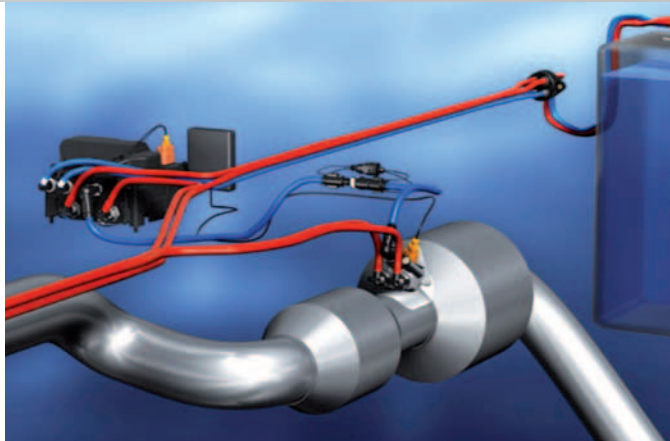
### Quality

Consistent quality policies are the backbone of the VOSS corporate strategy. VOSS products meet international quality standards that bring about high process safety, optimized workflows and long service lives. The quality management of VOSS Automotive is certified in all production locations according to ISO TS 16949, the environmental management in Germany, Brazil and Poland also in accordance with ISO 14001.



## Individual Solutions

### Heated SCR Lines



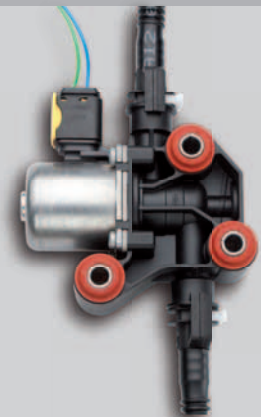
To transport AdBlue® from the reservoir to the SCR catalyst, VOSS offers individual solutions for heating lines and connectors. Whether electrically heated or by coolant, VOSS delivers customized results in different materials – if possible based on standard components of the VOSS system modules.



*SCR coolant module*

### Integrated Modules

VOSS Automotive produces subassemblies, comprising several individual components in line with special customer specifications. These modules can typically contain quick connect systems, distributors, valves, test points, tubes and hoses. Individual components such as tanks, bulkhead plates and holders can also be integrated.



### Line Connections



*4-fold multi-connector*

The system competence of VOSS includes the ideal integration for connection components. These are responsible for connecting components and assemblies to the line. VOSS develops application and specific connections made from different materials e. g. for fuel, air, coolant, hydraulic fluid and AdBlue®.

## Multi-connector Technology

VOSS multi-connectors are one of the most significant product groups at VOSS. They enable the simultaneous connection of several lines via one plug-in process at the module interfaces. Connecting parts can be designed non fir-tree or with fir-tree profiles. Further advantages include:

- The use of elbow plugs
- Cost saving through fewer assembly steps
- Simple correction options for incorrect assemblies without dismantling the tube from the plug



*Installation location for multi-connector plates*

Solutions from an extensive product portfolio, new product variants and innovations allow VOSS Automotive to ensure a high level of customer satisfaction in the international commercial vehicle and car industry, as well as in off-road vehicle and engine construction.

From the initial project ideas and joint development, through to supply from the worldwide production group of VOSS sites, all process steps are planned and realized in close coordination.

## Coolant Lines

VOSS manufactures cooling water lines of different sizes made from inner coated PA tubing, PA 12 or corrugated PA tubing for use in commercial vehicles. The lines are designed in line with customer requirements or the installation space situation, preformed on request and preassembled with the matching connection systems to form lines ready for assembly.



*Mounted coolant line component*

## Fuel Lines

In the area of fuel lines, VOSS offers customer-specific solutions, which fulfill even the highest requirements for the pressure and temperature range. These results are often incorporated in design and geometry solutions which take into account of the most complex assembly space conditions in the vehicles.

Depending on the requirement, PA tubes or hoses are used. The materials of the connecting components and their geometry are also specified or developed specific to the application.

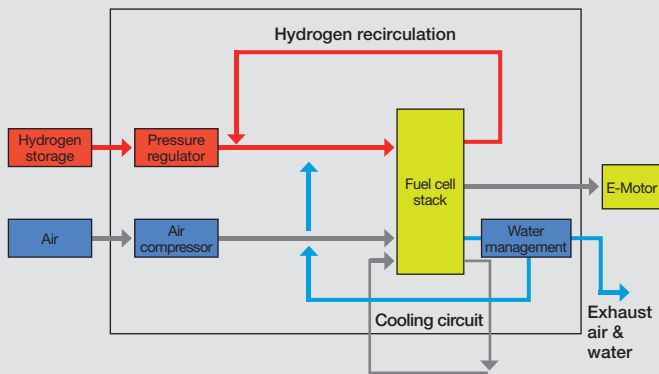


*Fuel line module*

# Perspectives

## Fuel Cells

For applications in fuel cell and hydrogen systems, VOSS develops special multilayer tubes and adapted connections, based on particular requirements such as deionized water originating in the system. The lines can be designed both unheated for hydrogen transport as well as heated for draining the process water.



Basic diagram fuel-cell power plant

Due to our decades long experience in developments of commercial vehicle compressed air brakes, fuel and hydraulic systems and car air suspension, VOSS Automotive comprehensively fulfills the requirements of customers and also utilizes this knowledge for new applications, for example fuel cell and hydrogen technology or projects such as heated fuel lines for vehicles in extremely cold regions.

These, and other projects for future applications in the on-road and off-road field, are formulated from our own advanced development at VOSS.

## Heated Fuel Lines

As part of a customer project, VOSS Automotive develops heated fuel lines for use in extremely cold regions. Heated PA tubes with heated connectors of the VOSS quick connect system 246 are used here, these keeping the lines free at low temperatures or liquefying flocculated diesel.



Prototype mounting of electrically heated fuel lines

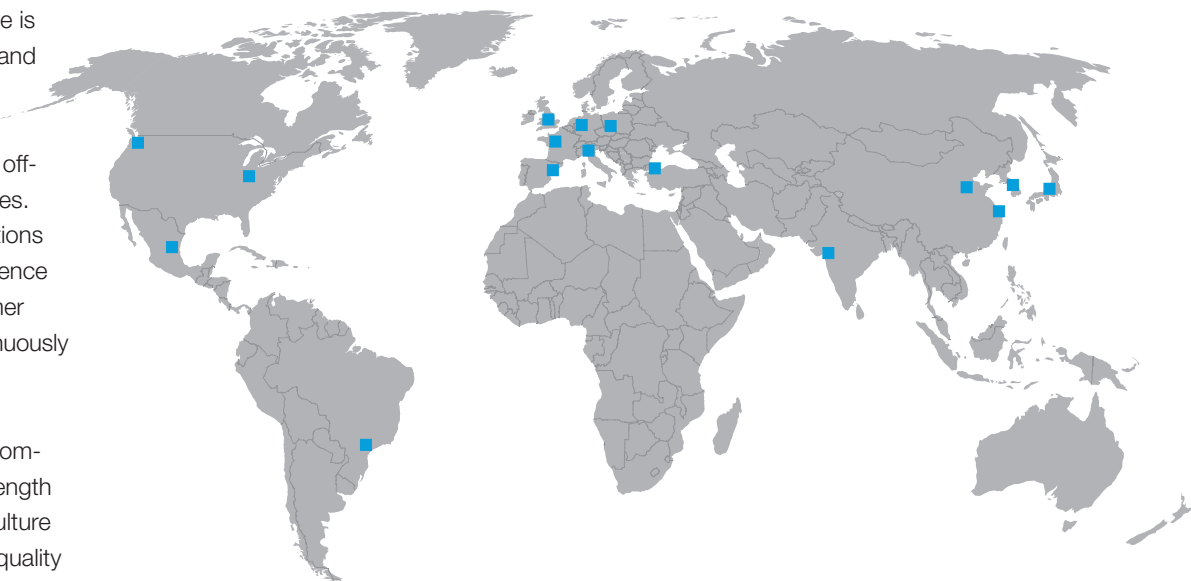


## Lifelines for the Automotive World

Line assemblies	Brake systems	Air suspension systems	Fuel systems	SCR systems	Cooling circuits	Transmission control	Hydraulic clutch	Windscreen washer	Fuel cell and hydrogen technology
Trucks									
Buses									
Passenger cars									
Machines for agriculture and forestry									
Construction machinery									

Today, VOSS Automotive is a global partner for line and connection technology in the automotive, commercial vehicle and off-road equipment industries. VOSS has over 16 locations worldwide and our presence and proximity to customer based locations is continuously expanding.

Our customers trust a company that derives its strength from its employees, a culture of cooperation and the quality of its technologies.



# VOSS



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