

VOSS

BATTERY EFFICIENCY UNDER CONTROL.

Individual thermal management systems
for cooling plates and immersion cooling.



www.vossusa.com

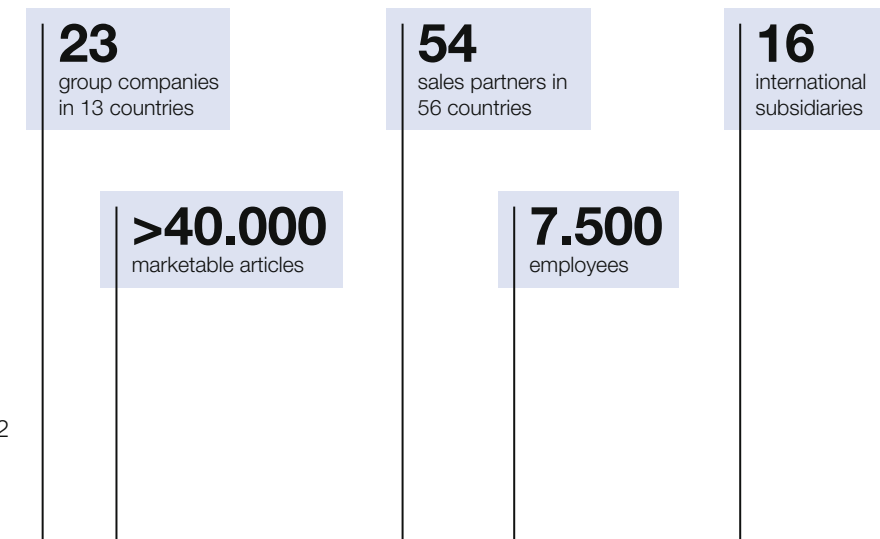
That's who we are

Fluid-management for vehicle and machine construction

As a larger medium-sized group of companies, VOSS develops and produces line and connection systems for the automotive industry and mechanical engineering. The success of the VOSS Group is based on great customer proximity, committed employees, innovative products and the demand for permanent top quality for customers with the highest requirements.

With strategic corporate development, a responsible awareness of people, the environment and the region, VOSS has evolved over the past 90 years to an internationally successful group of companies.

VOSS in figures



Competences for cooling systems.

Our system competence. Your added value.

Our expertise is in the development and production of customer-specific system solutions for the thermal management of mobile and stationary applications. Optimum temperature control is essential for maximum battery performance in electric or hybrid vehicles. To this end, VOSS designs connection and manifold solutions tailored to individual customer requirements, both for classic cooling plate technology and for immersion cooling.

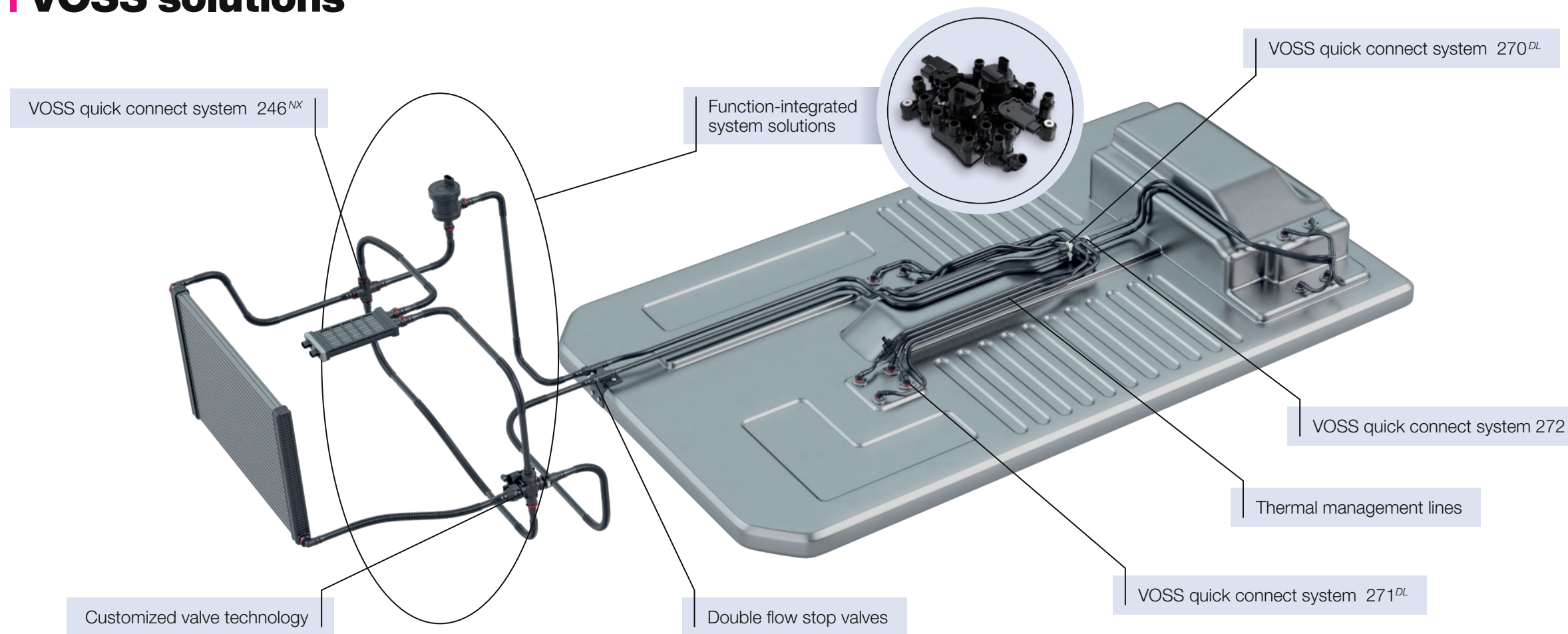
This includes the development of precisely fitting line routings for the smallest and most complex installation spaces as well as the integration of supplementary system components such as quick connect systems, valves, sensors or customer-specific components. Depending on the level of optimization, we work with our customers to develop compact, ready-to-install and functionally integrated modules for minimum assembly effort. In this way, customers and users benefit from the system competence of the entire VOSS Group. This includes not only our innovative product solutions but also our comprehensive services:

- Vehicle analysis and benchmarking
- Innovative product and system development
- Continuous accompanying simulations and FE analysis
- Own test vehicle fleet for field tests under real conditions
- Rapid prototyping and pre-series production
- Validations and tests during the entire product development process
- Worldwide standardized production and assembly processes
- Intelligent logistics concepts
- First installation advice & service also after series production
- Extensive theoretical and practical training
- Worldwide availability of our products & services
- Comprehensive certifications and compliance with the highest quality standards

Applications



VOSS solutions



Components for thermal management systems

Thermal management lines

Individual solutions for coolant distribution based on line routing and function integration

- Integration of different connection systems, e.g., VOSS QC systems 270, 271, 272 and 246^{MX}, or special solutions according to VDA standard
- Realization of minimum installation space
- Component and installation space optimization through function integration in customer-specific manifolds and connectors
- Integration of temperature sensors possible



- Leak-tight and maintenance-free media-bearing systems along the entire service life of the vehicle
- Minimized pressure losses
- Hydraulic balancing through defined cross-section changes
- Various combinations of hose and tube, plain and corrugated tube, or straight and preformed lines possible
- Customized flexibility by different corrugated tube wave shapes

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VOSS quick connect system 271 ^{DL}

Robust plastic plugs for the fir-tree connection of plastic tubes

- Suitable for components with recessed ports, or with material for profiled bores
- Quick and safe assembly
- Double Lock (DL) for additional safety and active confirmation of the correctly connected QC system
- Very low system height
- Release mechanism can be supplied in two different positions for easy access
- Nominal sizes S6, S10, S14, S18
- Temperature range -40 °C to +85 °C
- Operating pressure max. 2 bar



Components for thermal management systems

VOSS quick connect system 270^{DL}

Robust plastic couplings for the fir-tree connection of plastic tubes

- Particularly suitable for connections to filigree cooling plates and similar components
- Quick and safe assembly
- Double Lock (DL) for additional safety and active confirmation of the correctly connected QC system
- Very low system height
- Release mechanism can be supplied in two different positions for easy access
- Nominal sizes S6, S10, S14
- Temperature range -40 °C to +85 °C
- Operating pressure max. 2 bar



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VOSS quick connect system 272

Function-optimized QC systems for thermal management solutions

- System-specific connection contour according to VOSS QC system 270
- Fast and 100% secure installation thanks to autolatch function (automatic engagement of the retaining element after successful insertion)
- Pressure-locked retaining element (no release of the connector possible under pressure)
- Reduced insertion force due to optimized installation of the O-ring
- Minimum installation height
- Retaining element available in four different positions for easy access
- Optionally available with visible locking indicators
- Nominal sizes S6, S10, S14, larger sizes available on request
- Temperature range -40 °C to +85 °C
- Operating pressure max. 2 bar



Components for thermal management systems

VOSS quick connect system 246^{NX}

Plastic QC system for convenient connecting, positioning and releasing

- System-specific 246 connection contour for low height of aggregate connections and adapters
- Quick, safe assembly and disassembly
- High positive engagement of release clip to connecting profile allows higher pressures
- Release mechanism can be rotated into eight different positions for easy access
- Nominal sizes 8 and 12 for different tube sizes
- Temperature range -40 °C to +120 °C
- Operating pressure max. 10 bar



VOSS

Double flow stop valves

Double-sided flow stop valve for disconnecting cooling circuits – for maintenance purposes and changing battery modules

- Can be integrated into various QC systems of different sizes
- Automatic opening of the valve during assembly
- Automatic closing of the valve during disassembly
- Leakage-free over the entire service life
- Compact and robust design
- Consistent flow with very low pressure loss



Components for thermal management systems

Customized valve technology

Future-oriented valve solutions for thermal management applications

- Broad spectrum of expertise: mechanically, pressure, thermally and electrically actuated valves
- In-house developed actuators tailor-made communication protocols
- Integration of VOSS quick connect systems possible
- Modular design concept for individual requirements
- Combination with customer-specific manifolds and connectors
- Minimal internal leakage flows
- Easy integration into function-integrated system solutions (modules)



Function-integrated system solutions

Customized thermal management modules for the optimization of cooling water circuits

- Integration of valves, lines, connection systems, sensors or manifolds into ready-to-install assemblies
- Reduction of single components and circuit complexity
- Minimized line length and optimal utilization of installation space by combining different line sections
- Significant weight savings on the aggregate side and in the water set
- Optimization of system pressure losses and thus the effectiveness of the system through individually designed flow channel cross-sections
- Effective control of the different cooling circuits by implementable VOSS own proportional valves with in-house developed actuators
- Improved assembly behavior due to ergonomic arrangement of the connection points and pre-checked functions
- Only one central electronic interface to the vehicle electrical system
- Minimized assembly time in the production line
- Optimized organizational effort through reduction of part numbers and responsibilities
- For maximum performance and battery life and thus increased vehicle range with minimal emissions
- Minimization of the CO₂ balance due to the use of recycled material



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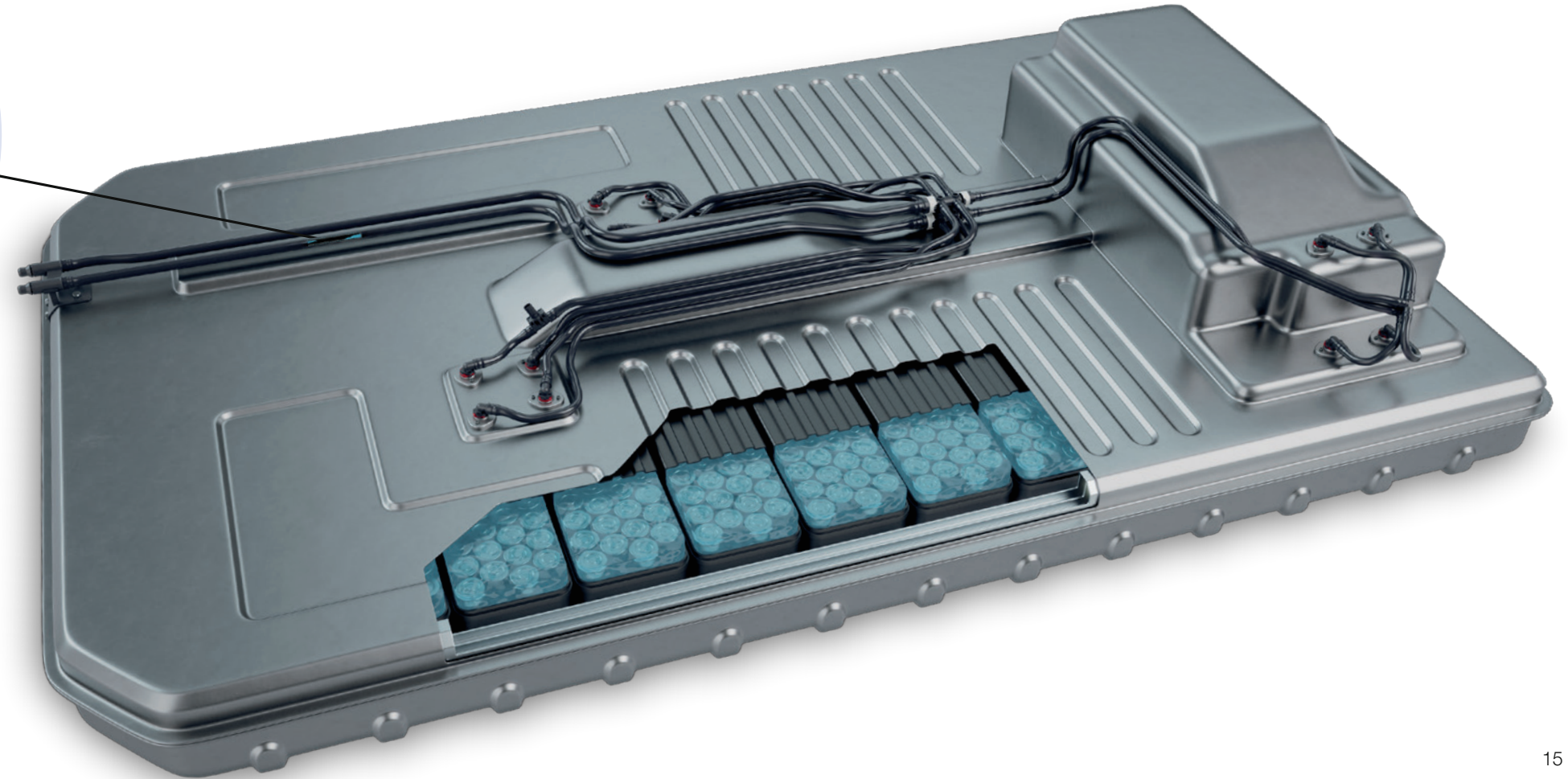
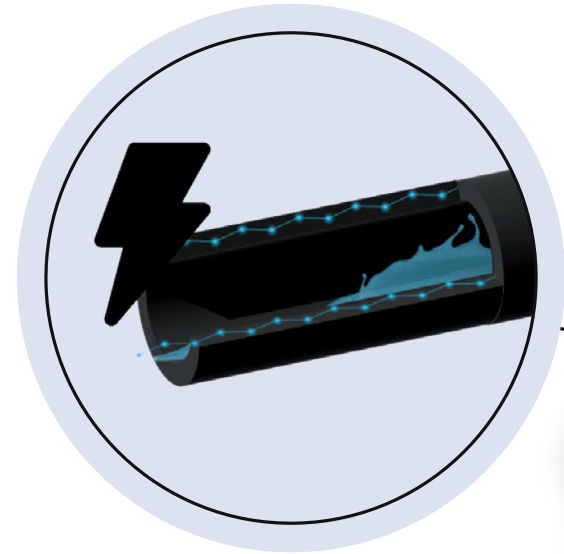
Immersion cooling

Line and connection technology made from electrically conductive materials

In addition to solutions for the thermal management of classic cooling plate technology, VOSS also develops and produces individual systems for immersion cooling, in which an electrically non-conductive coolant is circulated around the cells.

VOSS Automotive uses electrically conductive materials for its products to avoid static charging, which is caused by the permanent flow of liquid (friction) through the plastic tube, whereby the voltage is transmitted to a grounding point.

VOSS valves, quick connect systems, lines or entire modules consist of a fiber-reinforced, recyclable plastic housing, which means that no additives are washed out of the material by the liquid, as otherwise there would be a risk of material weakness, which would increase the conductivity of the medium. In addition, 5-20 percent weight can be saved.



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