

VOSS

75 Years
Experience plus Ideas

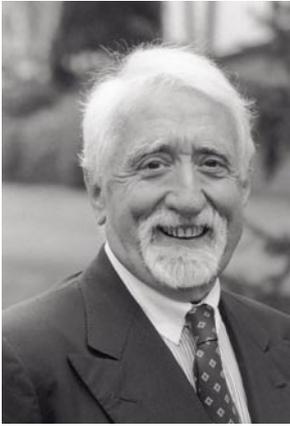
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Milestones in the history of VOSS

- 1931 Company founded
Hermann Voss takes over a small company that manufactures domestic plumbing fittings in Wipperfürth
- 1953 Hans Hermann Voss, Dipl.-Ing., joins the Armaturenfabrik Hermann Voss
Introduction of a new product range: Tube connections for mechanical engineering and vehicle construction
- 1960 Production commences at the Nordkirchen plant
- 1969 Purchase of the "Wollmeyer" textile company's premises at Leiersmühle in Wipperfürth
- 1972-1976 VOSS responds to changed market conditions:
· Founding of own sales and production companies initially for hydraulic components in France, Italy and Spain, and later in Great Britain, USA and Brazil
· Innovation through the expansion of product development
Market introduction of quick connect system 240 for pneumatic brakes in commercial vehicles (1975)
- 1987 Expansion of the plant site in Wipperfürth to over 100,000 m² by taking over a section of the "Kabelwerk" premises
- 1990 Acquisition of the Ravitt company in France, thereby increasing VOSS Group employees to over 1,000
- 1993 First use of VOSS components in cars:
Quick connect system 203
- 1996 Kreissparkasse Köln becomes a shareholder in VOSS Holding
Sales revenue provide future asset diversification of the Hans Hermann Voss-Foundation (founded in 1992)
- 1999 Change in company structure:
· VOSS Automotive
Line and connection technology for commercial and passenger vehicles
· VOSS Fluid
Components for mobile and stationary hydraulics in engineering
· VOSS Immobilien + Service
- 2000 Conversion of production into autonomous sections:
„Factories within the factory“
Expansion of the „Line Assemblies“ section for commercial and passenger vehicles
- 2002 New strategic focus of VOSS Fluid:
Expansion of the product programme, VOSSForm^{SQR}, JIC, ORFS et al. and of international sales and distribution
- 2004 Integration of VOSS-IBS Kunststofftechnik (Plastics technology) into VOSS Automotive
- 2005 Opening of the plant of VOSS Automotive Polska in Legnickie Pole:
Manufacturing of nylon tube assemblies
- 2006 Establishing the joint venture VOSS-Exotech Automotive in Pune, India
Implementation of serial production of VOSS components for exhaust gas after-treatment: SCR modules for diesel engines in commercial vehicles

75 years for VOSS



Dipl.-Ing. Hans Hermann Voss

The publication of this anniversary booklet was a great concern of our late chief partner, Dipl.-Ing. Hans Hermann Voss.

The layout, the choice of photos and the text were drawn up and signed off under his guidance. With typical modesty, he declined to write the introduction.

It is now up to us to do our best to ensure that the VOSS Group continues to be successfully managed in line with his values and business philosophy.

company and its staff, while innovation, dedication, a sense of proportion and a duty of social responsibility were the virtues that characterised his business dealings.

We and all the employees in the VOSS Group and the Hans Hermann Voss-Foundation should now adopt these guiding principles as the basis for our own ideas and activities so that, in the decades to come, VOSS can continue to operate with the same success it has had over the past 75 years.

„Experience plus ideas“ was the key note he chose for the



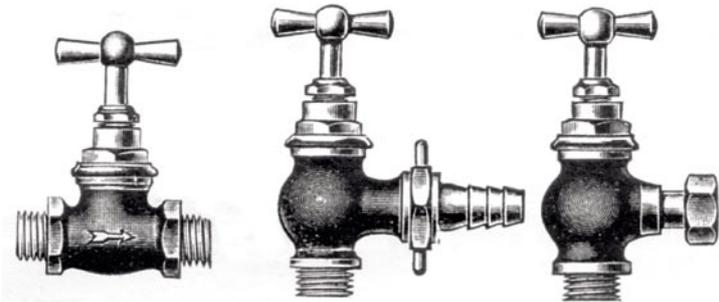
Dr. Harald Klotzbach
Chairman of the advisory board of the VOSS Holding GmbH + Co. KG and chairman of the board of trustees of the Hans Hermann Voss-Foundation



Dr. Heinrich Holtmann
Managing director of the VOSS Holding GmbH + Co. KG

1931 - 1952

The founding of the “Armaturenfabrik” – domestic plumbing fittings manufacture



Plumbing fittings as made by VOSS in the 1930s.

In 1931, the engineer Hermann Voss founded the Armaturenfabrik Hermann Voss in the small town of Wipperfürth in the region called Bergisches Land. The founder was born in Barmen on 17th July 1897. He was the fourth of six children and his parents hoped he would become a bank clerk. However, he was more interested in technology than in banking.

So between 1913 and 1915 he chose to gain a practical grounding at the Heinrichshütte in Hattingen and then, after his war service, went to study at the “Staatliche Höhere Maschinenbauschule” (higher state mechanical engineering school) in Elberfeld. In 1921 Voss accepted

a job as a heating engineer at the „Vereinigte Stahlwerke“ (united steelworks) in Bochum. In 1928 he switched to the Wiesmoor power station in East Frisia, where he was appointed technical operations manager.

The power station closed down in 1930. Since 25th October 1929, when trading collapsed on the New York Stock Exchange, the world economy had been submerged in a profound crisis. Thousands of companies were going bankrupt and mass redundancies were taking place. During the Depression the number of power consumers gradually declined so that even power plants found themselves in trouble.

Hermann Voss was now unemployed, but he found a new post as operations manager at the Armaturenfabrik Dr. Koch in Wipperfürth. The company manufactured brass tube fittings for water pipe assemblies. The small factory on Lüdenscheider Straße had 25 employees, and foundry, metal machining and assembly facilities.

When the Armaturenfabrik Dr. Koch also became insol-

vent as a result of the ongoing economic depression, Voss took over the company. On 15th September 1931 the new company, the “Armaturenfabrik Hermann Voss”, out of which in the decades to follow was to grow the VOSS Group, was entered in the companies register.

Six staff were employed in the Armaturenfabrik (fittings factory) during the early years. When the Second World War broke out in 1939, Hermann Voss was called up for army service, but he soon returned to the factory because, as an engineer in an industry vital to the war effort, his work was indispensable. The factory came through the war unscathed – damage was minimal in Wipperfürth and the town hall was the only building to suffer bomb damage.

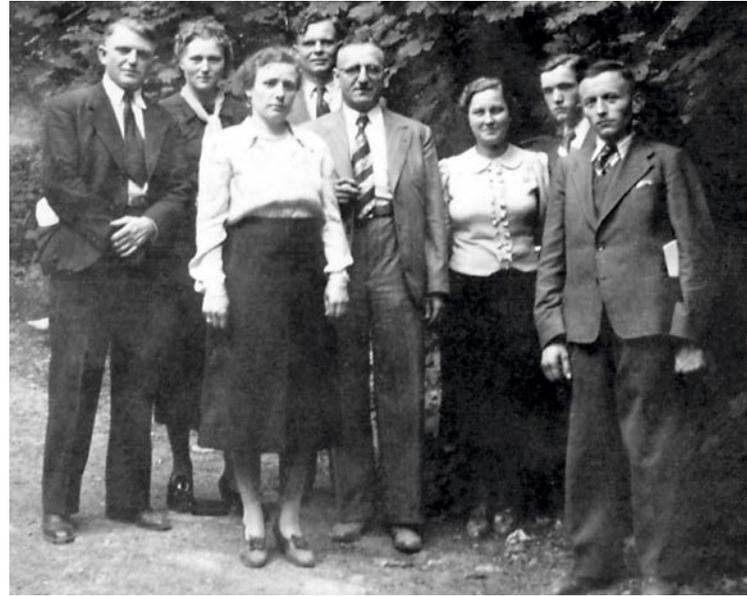
After a brief pause, production recommenced. In the early post-war years, Hermann Voss began to get involved in local politics in Wipperfürth. In 1946 he was appointed deputy mayor, and from 1948 to 1961 he was Mayor of Wipperfürth.

Hermann Voss had successfully managed to found his company in difficult times

and establish it as a solid, medium-sized company in Wipperfürth. The business fitted in well with the small town's industrial character. Alongside firms operating in the textile and electrical sectors, the area was also home to metalworking companies such as the "Press-, Stanz- und Hammerwerk Kordt & Rosch" (Kordt & Rosch punch and hammer plant), the "Fabrik für Präzisionspreßstoffteile Paul Kuhbier" (Paul Kuhbier factory for precision moulding materials), the "Wipperfürth Metallwarenfabrik" (Wipperfürth metal goods factory), the "Rheinische Eisengießerei Dix & Co" (Rhenish iron foundry Dix & Co) and the "Metallwarenfabrik Teckemeyer"

(Teckemeyer metal goods factory).

To begin with, Voss continued to produce the same products as his predecessor – brass domestic plumbing fittings of up to 2 inches. However, with the declaration of the Four Year Plan which the national socialist government launched in 1936 as preparation for war, brass was rationed and the Armaturenfabrik had to cease production of brass plumbing fittings. Instead, the company began making steel connecting fittings for fuel pipes. When the Second World War was over, VOSS recommenced production of plumbing fittings.



Company outing in 1939.
In the centre: company founder Hermann Voss.



Hermann Voss in 1981.



The premises at 8 Lüdenscheider Straße in 1950.

1953 - 1969

New beginnings and expansion with products for vehicles and the mechanical engineering industry

Hans Hermann Voss in 1952. The son of the company's founder joined the company in 1953.



In May 1953 Dipl.-Ing. Hans Hermann Voss, the 26-year old son of Hermann Voss, joined the company. During the last two years of the war, Hans Hermann Voss had been an air force assistance and in 1946 he took the school-leaving exams that he had been forced to miss. Between 1948 and 1953 he studied mechanical engineering at the "Technische Hochschule Stuttgart" (Stuttgart technical college). He joined the company at a time when the manufacture of plumbing

fittings was being abandoned. He immediately took on the task of finding replacement products. While trawling for new products and new customers, Hans Hermann Voss stumbled across an old enquiry from the Graubremse company in Heidelberg. The company was a recognised manufacturer of brakes, particularly for trailers. The enquiry, which still dated from the war years, was an attempt by Graubremse to find a reliable supplier of tube couplings, particularly cutting rings.

The cutting ring, developed in the late 1920s, is one of the most vital connecting parts for tubes and tube sockets. The hardened cutting ring is radially shaped by attaching a union nut until its cutting edge has cut into the end of the tube and the material visibly bulges. This form-fit connection creates a sealed, non-vibrating unit for high demands.

Hans Hermann Voss went to Heidelberg to find out whether the old enquiry, now over ten years out-of-date, could possibly still be current. Graubremse were, in fact, still interested, but the tube couplings were now – according to the Graubremse people – still patent-protected.

However, Hans Hermann Voss did not return from Heidelberg empty-handed,

but won an order for some fork heads. Fork heads are needed when redirecting and displacing forces from, for example, vertical to horizontal motion in automotive and mechanical engineering. They are used in the gearboxes of cars and trucks to shift forces from the gear lever to the gears. The first delivery was made in September 1953.

Subsequent research into patents revealed that the one for the tube couplings that Graubremse wanted had expired, so VOSS began by making up some prototypes. Before long, serial production of tube couplings was underway for Graubremse. In the wake of this first success, Hans Hermann Voss succeeded a year later in also winning the truck maker MAN over as a new client.

During the years that followed, other tube coupling clients were signed up. The Armaturenfabrik enjoyed meteoric financial growth – in 1953 sales totalled 52,600 DM, but just five years later this figure had risen to 1,211,600 DM. Revenues had increased twenty-fold.

Now the company needed to expand production efficiently, and in 1957 VOSS set up a second operation in Wuppertal-Elberfeld. In 1960 the company purchased factory premises in Gladbacher

Brochure for Graubremse in Heidelberg.



Straße in Wipperfürth, and the same year opened a new production site in Nordkirchen, near Münster – some 60 miles away from Wipperfürth. In 1964 VOSS started renting a production hall on the site owned by the well-established Wipperfürth textile company Wolltuchfabrik Bernhard Meyer KG, known as Wollmeyer.

Certain disadvantages came with the growing number of sites – it was extremely difficult to properly coordinate the different processes. During the 1960s, the Armaturenfabrik Hermann Voss was designing, producing, storing and managing on so many sites that people would refer to the company as the “Ver-einigte Hüttenwerke” (united smelting works).

The unwieldy company structure was a consequence

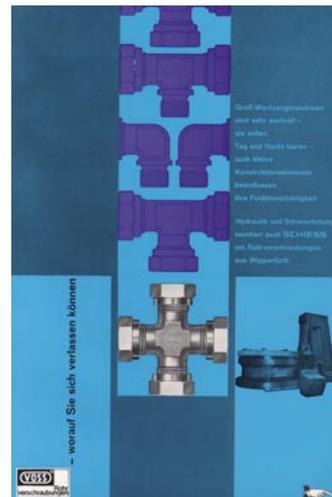
of the need to respond as rapidly as possible to the soaring demand. But renting or building new production facilities in different locations could only be interim solutions, and a thorough reorganisation of production became increasingly vital.

A solution emerged in 1969, when the Wollmeyer company found itself in financial difficulties and the owner was obliged to sell off all of the company’s land. The Leiersmühle site was a little over 60,000 m². With an area of this size, all the logistic problems that VOSS had been faced with in recent times could be solved in one fell swoop.

VOSS bought the site, set up a large centralised plant and began to concentrate production here. However, before production could get

smoothly underway, a lot still needed to be done. Piles of textiles still littered what is now the administrative building, and large amounts of machinery lay around the halls requiring a great deal of effort to remove. In the same vein, the buildings had to be fitted out for their new purpose and gradually refurbished.

VOSS acquired not only Wollmeyer’s factory site but also 140 employees. However, the textile company’s old



Solderless DIN 2353 tube couplings for hydraulic systems in mechanical engineering and plant construction. VOSS delivered these to companies like the machine tool manufacturer SCHIESS.



Truck production at the MAN plant in Nuremberg in 1954.



Main building of the Wipperfürth textile company Wolltuchfabrik Bernhard Meyer KG, known as Wollmeyer, in 1969. That year, VOSS bought the factory site and established its headquarters here.

labour force now needed to be retrained before they could be deployed on the machines to make fittings. The VOSS workforce rose from around 360 prior to the Wollmeyer acquisition to almost 500 afterwards.

Between 1953 and 1969 VOSS grew to be one of the largest employers in Wipperfürth. The company had production sites throughout the region and was selling its products all over Germany and also abroad. Contemporary brochures reveal that VOSS was beginning to go international.

While, in the early 60s, there were only sales outlets in the Federal Republic of Germany, by the turn of the decade VOSS also had a good sales network elsewhere. VOSS customers could buy products directly from their own dealers in Belgium, Denmark, Spain, France, Italy, the Netherlands, Austria, Finland, Sweden, Norway, Switzerland, Israel and South Africa.

The products that had brought VOSS its greatest success since 1953 had been fittings for hydraulic systems and pneumatic brakes. In particular, these included tube couplings, which can be used to assemble connecting tubes between the main elements of hydraulic power units, control systems and pneu-

matic brakes in heavy trucks. The offering also included bent and reinforced tube assemblies and various types of valves. VOSS was also providing assembling devices at this time. The product range largely consisted of modular units, and was based on well over 10,000 individual components.

The product range was constantly being expanded and optimised. For instance, Hans Hermann Voss developed a banjo coupling with improved technical flow with an eccentric ring channel and cross-holes running diagonally in the single-piece hollow screw. With the new tube coupling which was used in hydraulic systems, the hollow screw could be tightened even



Advert for VOSS cutting rings. VOSS has produced cutting rings since 1953.



VOSS production facility on Gladbacher Straße in 1971.

under operational conditions. This invention was patented in 1960.

In 1967 Hans Hermann Voss registered another patent. This time it was related to optimising the cutting ring. A new cutting ring moulding produced a better incision, more material bulging and a spring effect. This improved

the connection's grip and attaching the union nut required less torque.

Those two patents indicated the direction which VOSS was taking – marketing its own developments. VOSS began to contribute significantly towards improving the technical quality of tube couplings.



Checking material before processing it.



The hall on the new site at Leiersmühle – empty but ready for occupancy.

1970 - 1990

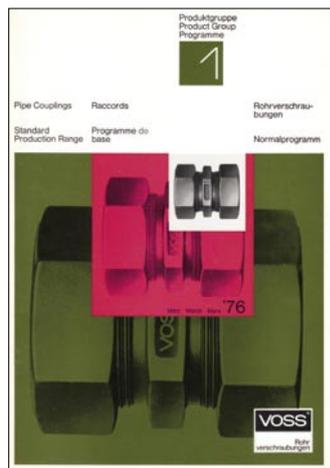
System partner for line and connection technology in international vehicle manufacturing and mechanical engineering industries

VOSS hydraulic fittings: the range in the early 1970s.



Up to the late 1960s, the fittings market was a sellers' market. On occasion, delivery times extended to 14 months. In the early 1970s, however, VOSS, like many other companies, suffered a dramatic decline in revenues as a result of the economic crisis.

The 1976 catalogue featured three languages – VOSS had become international.



A sales figure of 32.8 million DM in 1971 plummeted to just 23.2 million DM the following year.

VOSS responded to the slump by expanding its market and setting up sales companies in a number of European countries. The idea of cranking up the company's activity abroad had been mooted even before this, but no concrete action had been taken while the domestic market still had plenty of potential.

Now, though, driven by the new turn of events, VOSS turned to international markets. In 1972 VOSS opened its first branch outside Germany, a sales company in Stiring-Wendel, in eastern France. In 1975 this branch was relocated to Sartrouville, near Paris. In the following years, with the aim of establishing closer relationships with regional markets and its customers, VOSS opened further support sites in all the major French industrial areas. Additional sales companies in Great Britain, Italy, Spain and the USA followed in the wake of that first one in France.

The pursuit of international markets and new production developments helped the company through the crisis so

that VOSS was soon enjoying increased revenues once more. Moreover, the firm had, within ten years, evolved from being primarily a company supplying the German market to one that operated on a global level.

The decade of the 1980s was, again, one of the company's most successful periods. It was rounded off with the purchase of the production halls and administrative building belonging to neighbours "Bergmann Kabel" (Bergmann cable) in 1987 and the acquisition of the French company Ravitt in 1990. By now the VOSS workforce numbered over a thousand, while revenues stood at 166 million DM.

Highlight of the VOSS product development was the invention of a new connection system for the commercial vehicle area in the 1970s – in 1975, the company came up with the 240 quick connect system, the first quick connect system for air brakes in commercial vehicles. The main features of the 240 system were its ease of use and the ability to mount it to standard screw plug holes. The system was developed in partnership with MAN.

Building on the experience that VOSS had gained while

developing the quick connect system, the company also began to produce connecting parts and fittings for water technology in the gardening sector. These products were extremely innovative and won industry prizes for their design, but the incursion into the water technology sector proved tougher than expected, as the existing sales channel used for fittings was inappropriate for the new products. The division was handed over to the Henkel subsidiary VOSS-Thompson, sold on to Brill in 1980 and subsequently acquired by Gardena.

In 1983 another quick connect system – the 230 – was launched for commercial vehicles. Its introduction was aimed at convincing Daimler Benz of the benefits of the new quick connection technology. Daimler Benz had failed to use the 240 system because it was too large for the tube bundle in their commercial vehicles and did not fit through the chassis' line holes. The new 230 system required less space, and Daimler Benz became a customer.

VOSS was also producing valves, tubing and hoses for commercial vehicles,

and the tube couplings with which VOSS had entered the commercial vehicle market in 1953 still formed part of the product range. The company was increasingly becoming a systems supplier, offering not just individual components but multiple, interlocking components. For example, it could supply all the components required for the line and connection technology in commercial vehicles' braking systems. If the customer so required, VOSS could supply complete solutions.

For VOSS, the commercial vehicle sector was becoming increasingly significant, but the mechanical engineering area continued to do solid business. Towards the end of the 1980s, mechanical engineering was bringing in around half of the company's revenues. For hydraulic systems in the mechanical engineering sector, VOSS could supply tube couplings, hose assemblies, valves and, from 1978 onwards, ZAKO flange connections.



Between 1974 and 1980, VOSS was also producing plastic connecting parts and fittings for water technology.



Products for the commercial vehicle sector: cutting ring fittings, the 230/240 quick connect systems, valves and manifolds.

1991 - 2006 Into the 21st century



BMW X5: the 203 quick connect system is used in its air suspension with levelling system.

In the early 1990s, Hans Hermann Voss turned his mind to putting his legacy in order. He had no legal heirs, and so in 1992 he established the Hans Hermann Voss-Foundation to inherit his share of the company. The intention behind the Foundation was to prevent any third-party takeover and thus safeguard the independence of the medium-sized organisation. The Foundation's objectives include support for natural science and research, education and

Commercial vehicle manufacturer DaimlerChrysler is one of VOSS Automotive's top customers.

training and the support of both young and old. Provision is also made for supporting charitable projects.

The establishment of the VOSS Holding in 1996 paved the way for further fundamental changes to be undertaken three years later. On 1st January 1999, the machine components division was spun off from the Armaturen-fabrik. An autonomous unit called "VOSS Fluidtechnik" was set up, and the "Fluid" moved into the premises of the former cable-maker.

The vehicle components and mechanical engineering divisions had formed a unit alongside one another for decades, as the product range largely overlapped. Now, however, the two areas had diverged to such a degree that it seemed advisable to separate them. In 2001, the names of these two VOSS Holding divisions

were changed – the Armaturenfabrik Hermann Voss was renamed VOSS Automotive and VOSS Fluidtechnik became VOSS Fluid.

Parallel with this reorganisation, VOSS completely altered its global production structure. Since 2000, VOSS production has been carried out in autonomous sections, "factories within the factory". Their main feature is that they can operate with a high degree of self-government. Duplication of work throughout the factory is tolerated because the division into smaller, independent sections brings with it improved self-organisation, optimisation and dynamics.

These changes were required if the company were to continue to be a major player in the market. In particular, the globalisation process has brought tougher market



conditions. VOSS was prepared for this and has been strengthening its activities abroad in recent times.

In 1995, the company set up a manufacturing operation in Brazil, and in 2004 it established VOSS Automotive Polska in Poland. In May 2005, an ultra-modern component assembly plant was opened in Legnickie Pole, in Poland. A new sales office in China and a joint venture in India, where a factory for making VOSS components is planned, indicate that the company is intensifying its international activity.

In the period either side of the millennium, the legal and company structure and the production organisation of VOSS changed dramatically. The changes were needed if the firm were to continue to enjoy the same success and be as market-oriented as



in the 75 years since it was founded. The figures presented by VOSS in 2005 indicate that this new direction is a sound one – revenues were 183 million euros, well above those of the previous year. Midway through 2006, the company had a global workforce of 1,250.

The innovative product programme is also worthy of the new century. In 1993 VOSS

entered the car market, on the back of the 203 quick connect system that had been used in pneumatic applications in commercial vehicles since 1989. The first 203 system user was VW. In the automotive sector it soon became the standard in the air suspension systems of many European car manufacturers, such as Audi, Bentley, BMW, Jaguar, Land Rover and VW.

New product development is given high priority at VOSS. In 2001 the VOSS Automotive development department was given its own trial and prototype workshop.



Many VOSS products are deployed in mechanical engineering applications. ZAKO flanges are used in this Schuler press.



For the O&K Mining RH 200 – one of the world's largest hydraulic diggers – VOSS supplies ZAKO flanges for the hydraulic connections on the digger's cantilever arm and cutting ring fittings for use throughout the digger, for example in the control lines.

In the years that followed, VOSS was constantly expanding this division, going beyond simply developing and producing line and connection systems to also make auxiliary products. In the air suspension sector, examples are additional air and filter expansion volumes.

The 232 quick connect system was specially developed for commercial vehicles and

launched in 1999 – it is an upgrade of the 240 and 230 systems. The main feature was a response to customers' requests for enhanced safety in the assembly process. This was achieved by a dual snap-in system in the retaining clip and by an audible alarm to signal an incorrect connection.

Other successful quick connect systems are: the 241, used in cars as the connecting

element for fuel lines, particularly as a transition from rigid to flexible lines; the 291, as the connecting element for hydraulic lines, for example in power steering and servo clutches in cars; and the 246, used in cars and commercial vehicles as the connecting element between fuel lines and components and to connect lines.

Fendt is a VOSS Fluid customer, procuring hydraulic components. Fendt has been a VOSS customer since as far back as the early 1950s.



As a system supplier, VOSS Automotive not only develops quick connections but also: develops line guide designs for pneumatic, hydraulic, fuel and air conditioning systems; deploys the VOSS multi-connector technology to reduce the number of assembly steps; and works from client specifications or in joint development projects to produce manifolds with and without valves for the pneumatic and fuel systems application areas.

In the hydraulic connection technology area, VOSS not only produces DIN and standard parts for the cutting ring, conical seal, flared and flanged couplings area, but also comes

up with innovations such as VOSSForm^{SQR}. This new tube coupling system satisfies the principal requirements of hydraulic connections, including safety, quality and profitability.

Looking into the future, VOSS is working closely with its customers to develop new products for vehicle systems using new technologies such as hydrogen propulsion, fuel cells, CO₂ air-conditioning technology and SCR systems. The SCR technology is an exhaust gas after-treatment process which can lower nitrogen oxide emissions. For this environmentally friendly innovation, VOSS is building a

whole range of complete line, connection and atomising nozzle solutions for cars and commercial vehicles. For example, interesting solutions to heat the urea lines and the urea tank that are part of the technology are becoming available, based on electrics and cooling water.

Thus VOSS is showing once again that the company remains true to its tradition of innovation and customer focus.

Which makes it 75 years now that VOSS has been demonstrating its experience and a fine wealth of ideas.



Line set to connect components in SCR systems for exhaust gas after-treatment in commercial vehicles.

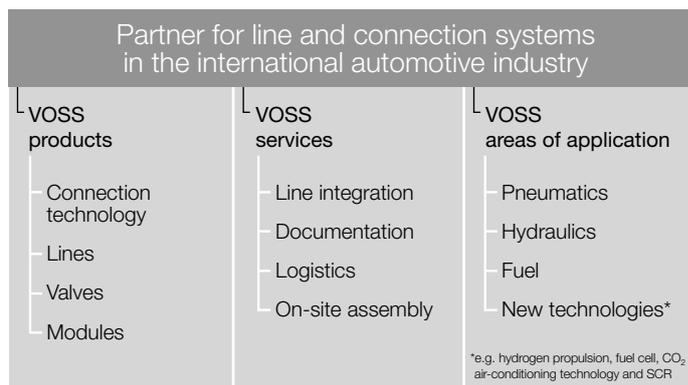


VOSS flared couplings have been used in ICE high speed trains since 1997.

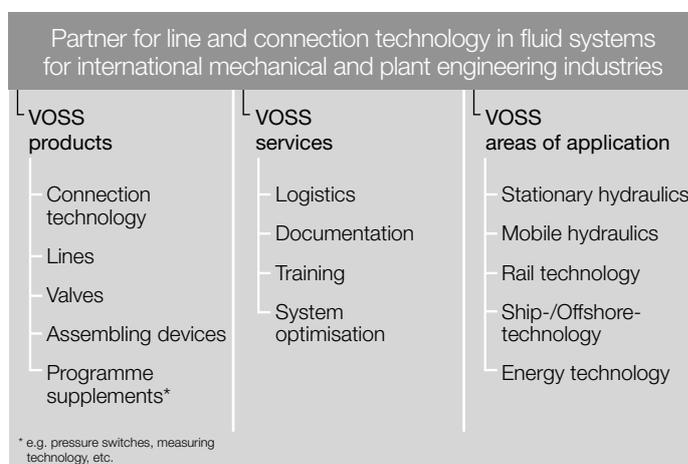
VOSS today



The VOSS Group's main site in Wipperfürth. To the left is the site of the former Wollmeyer company, to the right that of Bergmann Kabel (Bergmann cable).

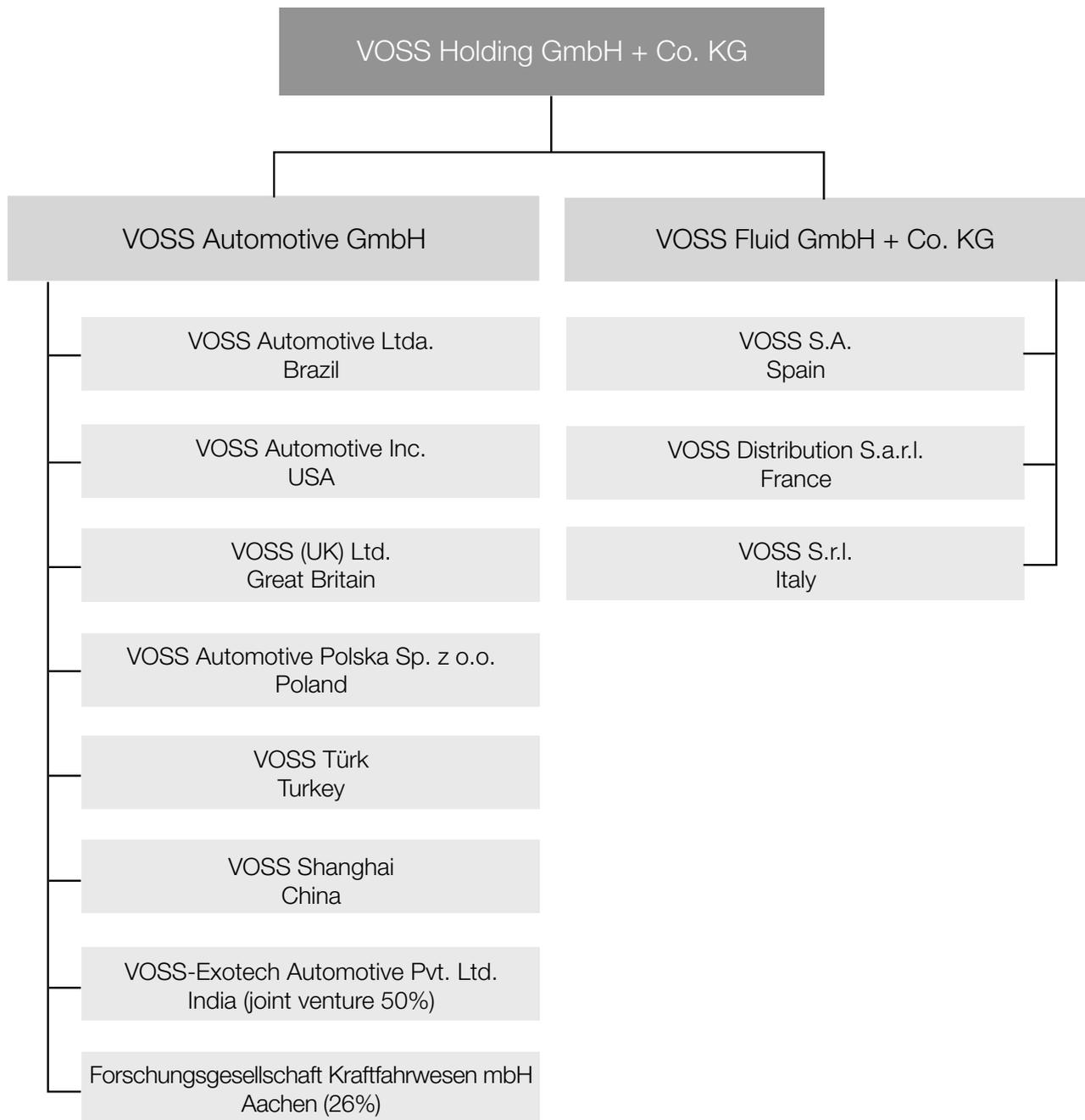


VOSS Automotive – products, services, application areas.



VOSS Fluid – products, services, application areas.

VOSS corporate structure



Source notes and photos

Sources:

VOSS Group archive

Archive of the "Deutsches Museum München"

(German museum Munich)

"Rheinisch-Westfälisches Wirtschaftsarchiv"

(Rhenish-Westphalian commercial archive)

Conversations with contemporary witnesses Hans Hermann Voss,

Dr. Heinrich Holtmann, Hilmar Hester, Klaus Hörter,

Rudolf Kemper, Renate Müller and Werner Güth

Photos:

VOSS Group image archive

Neumann & Kamp Historische Projekte image archive: p. 4, p. 15 bottom

Archive of the "Deutsches Museum München": p. 6 bottom

MAN Nutzfahrzeuge AG archive: p. 7 bottom

BMW AG archive: p. 12 top

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