Igniting Minds

Celebrating 125 Years of Bosch in the UK

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BOSCH
Invented for life

Contents

Foreword

The United Kingdom has always had a rich history of supporting inventors and engineers. It is not an exaggeration to say that many of the inventions developed in Victorian England still shape the world as we know it today.

In 1885 Robert Bosch spent time as a young man working in a factory plant in Woolwich, southeast London. This gave him a taste for England and ignited a passion to return to the country in the future. It is not a coincidence that he decided to open his first overseas venture in London in 1898. By doing so, he helped ensure that the UK played a key role in developing the global automotive industry for decades to come.

Igniting Minds showcases the legacy of Robert Bosch and how this legacy continues today. He was much more than an entrepreneur – his vision for how the company should focus its efforts and treat its employees is still important today. He was also extremely committed to education and training at all stages in life, international cooperation and understanding and supporting the sciences and healthcare. In particular, *Igniting Minds* highlights the innovation that Robert Bosch is most famous for – the magneto. This was truly a breakthrough moment for the automotive industry.

By developing the magneto, Bosch solved a significant issue facing the emerging automotive industry – how to reliably run a vehicle with internal combustion engine for long distances. Before the Bosch magneto ignition system was established, vehicles could only run short distances if they had a battery ignition. Other systems contained a greater risk of setting the car on fire.

The magneto, driven by the crankshaft, did not need energy supply. It turned the car into a vehicle for everyday use and it allowed drivers and engineers to push the limits of their vehicles; for example, the first Paris to Beijing race in 1907.

Supporting the aspirations of future generations was another cause close to the heart of Robert Bosch. In this book we showcase how he developed the company and, in particular, how the UK was – and remains – a significant market for the company. Today the UK is the second largest European market for the company outside Germany.

Igniting Minds takes the reader on a journey from an initial sales office in central London to a company that, in 2023, employs more than 6,000 associates across the UK and Ireland. The company's growth in this country is a story of expansion and innovation that has continually focused on developing solutions for real-life problems.

As we know, 2023 is a historic year for the United Kingdom as we witness the first coronation in 70 years. It is a moment to reflect and look forward to new possibilities. Reflecting on the success of the last 125 years, we now look forward to the next 125 years with a renewed sense of purpose. The challenges that we face as a global community have never been greater. We must work together to solve them. And we will continue to use the legacy of Robert Bosch to guide us as we develop the solutions that our world requires.

Dr. Stefan Hartung
Chairman, Robert Bosch GmbH

Dr. Markus Forschner
CFO, Robert Bosch GmbH

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MD, Robert Bosch UK

Introduction
Stephen Bayley

When Robert Bosch opened his London office in 1898, the UK was, with the US, the world's leading industrial nation. British and American economies were dominated by railways, steel, oil and chemicals. Few of the businesses contributing to those economies still exist. ICI and Standard Oil are now just memories. Bosch, however, has become a global leader in its fields, which now range from hand tools to powertrain peripherals to AI, from thermotechnology to smart homes.

In 1898, Germany had a rich tradition of achievement in theoretical science and practical engineering, but had not yet created its giant manufacturing industries of today. Instead, Robert Bosch grew up in a culture of workshop production and empirical research. His initial education was as a journeyman-apprentice in a traditional *wanderjahre* – a gap year – moving around the small factories of Germany, learning a bit here and a bit there. Stints of employment included time spent making chains and gas fittings.

The business Robert Bosch founded in Stuttgart in 1886 was called *Werkstätte für Feinmechanik und Elektrotechnik* or "Workshop for Precision Mechanics and Electrical Engineering". To the British mind and eye, the matter-of-fact name is revealing of a German taste for clarity, sometimes at the cost of brevity. For another example, Ferdinand Porsche's business was originally called Dr. Ing. h.c. F. Porsche GmbH, Konstruktionen und Beratung für Motoren und Fahrzeuge. When in 1947 Porsche began manufacturing sportscars under its own name, Bosch was one of its most important suppliers (Ferdinand's son – Ferry – served an apprenticeship at Bosch).

Electricity has always attracted strong creative personalities – eccentrics, even – in the form of Michael Faraday, Benjamin Franklin, Luigi Galvani and Nikolai Tesla. But Robert Bosch was not an inventor; he was a practical man, more of an aggregator and editor, or perhaps an 'agitator of men', as Enzo Ferrari described himself. Many of the technologies Bosch exploited were created elsewhere or developed in joint ventures or other collaborations. The Bosch Fernseh AG equipment used to record the 1936 Olympics was inspired by a research visit to John Logie Baird, inventor of television (*fernseh* literally means 'see far').

Instead, Robert Bosch was an entrepreneur of genius, but his entrepreneurial instincts were tempered by the meticulous discipline of the workshop where he made a bargain with his staff: they were dignified as associates rather than exploited as wage slaves, they were a community rather than a mere workforce, but in return the very highest performance was expected and demanded from each individual. Bosch was a taciturn man, but an idealist too. Uncompromising, as well: 'I owe my success ... to my tenacious thoroughness,' he recalled.

As a precocious twenty-two-year-old and with an admirably inquisitive spirit, carrying a letter of introduction to Thomas Edison from a tutor at Stuttgart Polytechnic, Bosch visited the US. In New York, Bosch was moved by the sight of the Brooklyn Bridge and perhaps saw it as a statement of German authority in engineering, as its designer, John A. Roebling, was born in Mühlhausen, Prussia.

Returning to Germany, Bosch realised that the biggest problem facing the nascent car industry was one of ignition. Namely, how to get a reliable high-voltage spark to explode the petrol-air mixture in the third part of Professor Otto's *Viertaktmotor* (four-stroke engine): induction-compression-ignition-exhaust. The viability of the Otto engine as a power source had been demonstrated by Bertha Benz on 5 August 1888, when she drove her husband's *Patent-Motorwagen* from Mannheim to Pforzheim without accident or incident. But it needed better electrics.

Now there occurred the great symbiosis which established the modern Bosch company: the petrol engine needed sparks and Bosch, with his development of the magneto and the sparking plug, supplied them. There is a sacred mystery about electricity: it is the motion of matter with an electrical charge. Galvani had demonstrated that electricity moves our muscles. We *are* electricity. It also animates machines. Ironically, cars powered by internal combustion rely on electrons.

The magneto and sparking plug made the modern car a reality. Soon, Bosch was supplying the industry with headlights, diesel pumps, electric horns, windshield wipers, indicators and radios. Fifty years after Blaupunkt became a house brand, Bosch was establishing the basic technology of in-car navigation systems. In the 1950s, Dunlop's Maxaret anti-lock braking system was successfully employed on aircraft, but it was Bosch which made ABS a fact of life and death when it came to market in 1978.

However, the reality of manufacturing peripherals is that they are invisible. And Robert Bosch had a keen sense of identity, both his own and his company's. Advertising was always important, with a caricature of the charismatic Belgian racing-driver Camille Jenatzy – known as 'the Red Devil' on account of his beard – used in posters. Inevitably, the entrepreneur in Robert Bosch was interested in consumer perception. The fact is that very few customers know what a magneto actually does or what it looks like. Actually, very few care, so long as it is reliable. Nor does anybody ever say to himself, 'I've had a really good week. I must go and buy some new windshield wipers!'

So Bosch discovered markets. His interest in design was inspired by the Deutscher Werkbund, an industry collective which in 1907 aimed to establish agreed standards of aesthetic excellence in manufactured goods. Long before such things were commonplace, Bosch had instructed his designers 'to deliberately aim for smooth and beautiful lines'.

A Bosch magneto was built on strictly functional principles and therefore readily achieved a fundamental beauty, but a beauty which cannot be seen is perhaps not beauty at all. Instead, the 1928 Forfex electric hair clipper, a product innovation equivalent perhaps in its day to the smartphone, had to work well and be visually pleasing too, as well as agreeably tactile. It was Bosch's first power tool. Soon there were curling tongs. In 1933 came Bosch's first fridge, in the same year in which the Nazis came to power. One of their first destructive acts was to close the influential Bauhaus, recently removed to Berlin. A poignant picture exists in the archives showing Bosch's Blaupunkt showroom in the German capital. Featured prominently are Marcel Breuer's famous 1928 Cesca cantilevered chair. There is no single item of furniture that so readily signals a corporate awareness of modernism. It is a reminder, too, that the Bauhaus was founded in 1919 as a revival of the medieval guilds of *Bauhütte*, collectives of skilled artisans reminiscent, perhaps, of the spirit of Bosch's own first workshop.

In 1956, Bosch hired Hans Erich Slany, one of Germany's first independent industrial designers. Before founding his own studio, Slany had worked at a Stuttgart neighbour, Mercedes-Benz, where he had been one of the team who designed the 300SL, a peerless symbol of Germany's technical authority at the height of the *wirtschaftswunder* (economic miracle).

Slany had a conviction that power tools should have housings in lightweight plastic. Hitherto, metal drills had been heavy and frequent causes of electric shocks as well as repetitive strain injury. And, of course, malleable nylon offered better scope for wilful and attractive *formgebung*,

the wonderful German word for ‘shape-making’. So much did this respect for ergonomics become the company philosophy that Bosch sponsored an exhibition and book called *Making Work Easier*.

As Bosch’s research in battery technology advanced, a cordless drill and hedge trimmer went on sale in 1969. Alas, battery technology was so primitive that customers using the hedge trimmer had to carry a bulky powerpack. Only in 2003 were lightweight lithium-ion batteries sufficiently powerful to make realistically efficient tools unconstrained by cables attached to the mains. And a science-fiction dream had been realised: the remote application of power. It was as if someone had misread the classic dictum of Bauhaus director Mies van der Rohe: ‘cordless is more’.

We use ‘electricity’ as a metaphor of energy, rather as we say ‘chemistry’ is involved in successful personal relationships. Often, the potential for electricity has frightened people. Mary Shelley’s *Frankenstein* was inspired by galvanic experiments and discussions of electricity being able to raise the dead. Her husband, the poet Percy Bysshe Shelley, used to hold parties where he electrocuted people for fun. Bram Stoker, author of *Dracula*, a man on terms with horror, wrote, ‘There are things done today in electrical science which would have been deemed unholy by the very men who discovered electricity, who would themselves not so long before been burned as wizards.’

More positively, Arthur C. Clarke, author of *2001: a Space Odyssey*, explained that any technology sufficiently advanced is indistinguishable from magic. And once, curling tongs must have seemed magical.

So this is the story of what’s behind the fridge: management and direction of subatomic particles make life better. It would be reasonable, if unfashionable, to argue that the fridge and dishwasher (not to mention ABS and hedge trimmers) have made a more useful contribution to civilisation than the internet.

As a mind game, imagine a car or a house which does not include a Bosch product. A poet once said, ‘without electricity, the air would rot’. Without Bosch we could not move, drill, curl, screw, cut, navigate, clean, hammer, freeze or eventually abandon ourselves to future mobility systems we cannot yet imagine.

The first Industrial Revolution was about materials: we extracted iron. The second was about movement: we had railways and cars. The third was about information: communications and data. The fourth Industrial Revolution is happening tomorrow.

It will seem like magic.

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Robert Bosch

Robert Bosch

Man and entrepreneur

Robert Bosch was born on 23 September 1861, in Albeck, near Ulm in southern Germany, into an already large family as the eleventh of twelve children. The Bosch family was comfortable, as his father, Servatius, and mother, Maria Margaretha, had both inherited land. In addition to farming, Servatius was also the landlord of the Krone inn. Servatius had a considerable impact on his son's early beliefs. He had been well-educated, was a proud democrat and believed strongly in justice for all. These were all causes that Bosch later took to heart.

Bosch attended the secondary-technical school in Ulm, but from an early age he knew that his dreams and ambitions lay outside the classroom: 'I more or less muddled my way through school… I also lacked the necessary patience and ambition.' At fifteen, he followed his father's advice and began an apprenticeship as a precision mechanic. Three years later, Bosch completed his apprenticeship. He now had the freedom to explore, broaden his horizons and expand his knowledge.

He worked first as a journeyman, as was the custom at the time, experiencing life at several companies and learning more about his craft. It was during this period that Bosch came into contact with the new field of electrical engineering. He was thrilled by the possibilities it offered. Despite having little background knowledge of the topic, he enrolled at Stuttgart Polytechnic as a non-registered student for the winter semester of 1883–4. It was here that he would learn more about electrical engineering and lose his 'fear of technical terminology… After that, I knew about voltage and currents, and what horsepower was.'

His journey of discovery soon led him further afield to the US and the UK. He briefly worked at Thomas Edison's Edison Machine Works in New York City, as well as spending time at Siemens Brothers in Woolwich, London. Slowly, but surely, he started envisaging what his professional life might look like in the future.

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01 Robert Bosch at the age of 23 (1884)

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He opted for self-employment and opened his own small business, the Workshop for Precision Mechanics and Electrical Engineering, in November 1886.

Bosch's career path was also important in a personal sense, because financial stability would allow him to start a family of his own. One year after beginning his own business, he married his fiancée Anna Kayser. Anna was the sister of Bosch's close friend and confidante Eugen Kayser, a man who was a prominent part of the Bosch company until his untimely death in 1918. Robert and Anna Bosch's daughters, Margarethe and Paula, were born in 1888 and 1889, respectively. One and a half years later, the couple's third child, Robert, was born. With the arrival of their third daughter, Erna Elisabeth, in 1893, the family seemed complete. However, two years later, the Bosch family was dealt a terrible blow when little Elisabeth died suddenly of 'acute diabetes'.

Sadly, a second blow was to follow. Bosch had high hopes for his son, even thinking that he would perhaps take over the family business when the time came. Young Robert took up a post as an apprentice in his father's company in 1909, but his career came to an abrupt end only one year later as he had developed multiple sclerosis. In 1921, young Robert died. He was just thirty years old. The death of their son and the grief they felt after his loss clearly put a great strain on Robert and Anna Bosch's marriage, which in due course resulted in divorce.

Robert Bosch married his second wife, Margarete, in 1927. She was twenty-seven years his junior and filled the Bosch household with life, entertaining guests and organising games; a welcome distraction from Bosch's professional and political pursuits. After a year of marriage, Robert and Margarete celebrated the birth of their son, Robert. In 1931, their daughter Eva was born. By this time Bosch had relinquished responsibility for the day-to-day running of the business and was able to spend more time enjoying family life.

During the last years of his life, Bosch and his family left their Stuttgart home to live at the Bosch Farm near Munich. The farm was an early project of Bosch's, established in the 1920s as a model farming estate. He once said, 'Agriculture is one of the most interesting areas of business there is.' From humble beginnings, the Bosch Farm took shape and Robert Bosch was thrilled by the possibilities: 'Back then, it seemed to me a great feat to be able to transform a mere bog into a land flowing with milk and honey.' The plan was to use state-of-the-art technology to produce high-quality products that could be sold locally. While the estate struggled to become a commercial success, due to the poor quality of the soil, the Bosch family came to love the beautiful location and the peace and quiet of being close to nature. Living life in nature had always been a passion for Bosch. He loved hiking and would often take his family on hiking trips during the summer holidays and even at weekends if his business schedule allowed. This deep interest in the world of plants and animals was passed down to his

02 Robert's first wife Anna (1886)

03 Robert and Anna's children Paula, Margarete, and Robert (1901)

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children. Bosch was also a keen hunter, a pursuit which not only contributed to his love of the outdoors, but made him aware of the importance of conservation. An invitation to join a Bosch hunting expedition was a sign that you were held in considerable esteem. This was especially important among his business associates. He said that hunting reveals a completely different side to people. Those who passed the test could look forward to a strong relationship with Robert Bosch, particularly in business.

As discerning as Robert Bosch was in choosing business partners, he was particularly astute in selecting the people with whom he worked in his company. He seemed to have a 'Midas touch' when trusting associates with senior positions; a crucial talent when building any successful industrial enterprise. Bosch felt it was very important to maintain direct contact with his colleagues. Rather than simply earning a wage, he wanted them to feel that they were a part of the bigger picture, fully integrated into the business and its operations: 'It has also been an established principle of mine to cultivate eager associates by letting each individual work independently as far as possible while at the same time delegating the responsibility that goes with the task.' Ultimately, this willingness to assume responsibility also brought financial benefits. The associates at Bosch received comparatively high wages, for example. Bosch summed up this reciprocal relationship in an essay dating from 1931: 'The reason I pay good wages is not because I have a lot of money. Rather, I have a lot of money because I pay good wages.'

04 Robert Bosch with his second wife Margarete and their children Eva and Robert (1935)

05 A passionate hunter – Robert Bosch and one of his forest wardens (1941)

06 ‘Father Bosch’ with some of his associates (1936)

07 With excellent lighting, production of Bosch horns at the Stuttgart factory (1925)

08 With the help of a drive belt system, insulating bodies for spark plugs made of soapstone are manufactured at the Stuttgart Bosch factory (1920)

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All Bosch’s employees, and particularly those he trusted with authority, were encouraged to grow and prove themselves continually. As a man who ran a tight financial ship, Bosch had little patience for disorder in the workplace or poor quality workmanship. In 1921, he outlined this principle in the *Bosch-Zünder*, the associate newspaper: ‘I have always acted according to the principle that “I would rather lose money than trust.” The integrity of my promises, the belief in the value of my products and in my word of honour have always had a higher priority to me than a transitory profit.’ *Bosch-Zünder* was launched in 1919 to motivate associates and to create a greater sense of community within the company. It was Bosch’s deepest wish to keep his workforce informed about what was going on in the company, and he often contributed articles to the newspaper.

While Bosch demanded much from his associates, he also made sure they had the equipment they needed to succeed. He knew his associates could not produce high-quality products if they were working with inadequate equipment at outdated benches. Ever since its inception, exemplary working conditions and a positive work environment had been the hallmarks of the company. Robert Bosch was convinced that these factors directly influenced his associates’ motivation, which in turn improved the company’s performance as a whole. In line with this belief, as early as 1906, he became one of the very first employers to introduce the eight-hour working day.

It was not long before Bosch was affectionately nicknamed ‘Father Bosch’ by his associates, who recognised his sense

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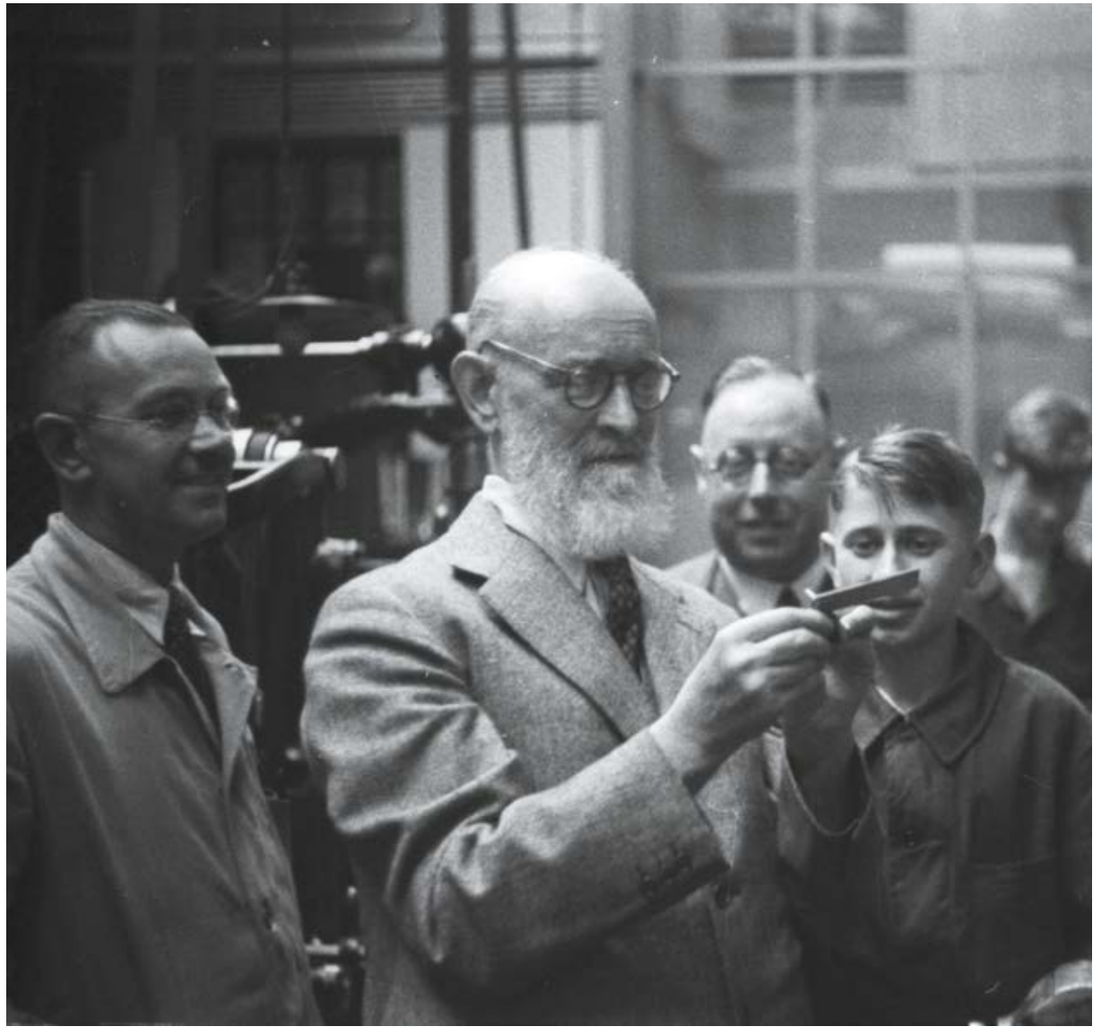

of duty towards the workforce and their welfare. This was a responsibility he continued to take especially seriously. In his business dealings he never forgot that the fate of an increasing number of associates depended on the fortunes of his company. This burden of responsibility weighed heavily on him, particularly in times of upheaval and crisis. As the company developed into a large industrial enterprise, it became harder to maintain a personal relationship with each and every associate. However, the company's commitment to standards and community never faltered. Today, Bosch's own direct commitment to associate welfare lives on in a comprehensive in-company programme of social benefits.

09 Always curious, Robert Bosch visiting his Frankfurt sales office (1936)

10 Robert Bosch on the balcony of the Robert Bosch Hospital in Stuttgart, seen through a patients' room (1940)

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The visionary

Robert Bosch was much more than just a successful businessman. He was also committed to social responsibility and donated generous amounts of money to charitable projects, especially in the areas of education and health. As a staunch democrat, pacifist and pro-European, he was politically far ahead of his time.

With Bosch showing a keen interest in education throughout his life, it is hardly surprising that it became one of the main beneficiaries of his endowment activities. In addition to schools, colleges and universities, he also focused on vocational training and adult education. In the field of higher education, the primary beneficiary of these activities was what is now the University of Stuttgart. Based on his own personal experience and his years as an entrepreneur, he knew only too well the importance of educating young people about the great possibilities of technology. His first major foundation, established in 1910, provided 1,000,000 marks of support to research and teaching at what was then the Stuttgart Polytechnic. Alongside his interest in improving conditions at universities and colleges, Bosch also wanted gifted schoolchildren to have the opportunity to study. To that end, he founded and donated 2,000,000 marks to the Förderung der Begabten society in 1916. Robert Bosch was also particularly committed to expanding adult education, a cause he supported in his involvement with the Verein zur Förderung der Volksbildung (Society to Support Public Education). A pioneer in its field, the association had taken over responsibility for the new Stuttgart adult education centre. For Bosch, education was more than just the accumulation of knowledge. It also meant developing

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the ability ‘to make the right political decisions and to recognise false doctrines as such’.

When it came to healthcare, Bosch was a dedicated supporter of alternative medicine. From 1915–16, he supplied a total of 3,000,000 marks to help achieve his ambition of setting up a homeopathic hospital. In 1936, he marked the double celebration of his 75th birthday and the company’s 50th anniversary by donating a further 5,500,000 marks to this project. Bosch’s civic initiatives during his lifetime reached their pinnacle with the opening of the Robert Bosch Hospital in Stuttgart in 1940.

In the politically turbulent era of the Weimar Republic, Bosch wanted more than ever to play his part in promoting a basic understanding of democracy based on the ‘recognition of the rights and merits of others’. As a result, not only did his social commitment become stronger, but also his political involvement. Bosch became a keen supporter of international rapprochement. He joined the German section of the Committee for Franco-German Relations and in 1935 invited German and French war veterans to Stuttgart under the slogan ‘Pioniere des Friedens – Pionniers de la Paix’ (Pioneers of Peace). Following the end of the German monarchy, Bosch saw it as his task to defend the newly founded republic against its numerous political opponents in Germany. He believed the key to this lay in promoting the general welfare of the people, adult education and international understanding. Accordingly, he backed Count Richard Coudenhove-Kalergi’s vision of a pan-European confederation of states. He also supported the reformist views of the national liberal Friedrich Naumann, particularly his German university for political science, which sought to bring together academics and practitioners to teach politics in an environment free from the influence of the state.

Bosch was alarmed by the aggressive, German-centric policies of the National Socialists. His final years were overshadowed by his company’s entanglement in the Third Reich’s war plans and rearmament programs. Due to their personal convictions, Bosch and his company directors supported resistance to the Nazi regime and helped to rescue Jewish associates and others facing persecution. In 1937, Bosch brought the former Lord Mayor of Leipzig, Carl Goerdeler, into the company as an adviser. With the knowledge and support of Bosch and his closest associates, Goerdeler organised a resistance cell against Hitler. For Robert Bosch, the outbreak of war in 1939 was a catastrophe – both on a personal level and for his country. Yet he could only stand by and watch as the use of forced labour became a dreadful reality at his company.

On 23 September 1941, Robert Bosch celebrated his 80th birthday. The following winter, he was plagued by serious illness. He died on 12 March 1942 of complications resulting from an inflammation of the middle ear. Much to the distress of his family, Bosch’s 80th birthday and subsequent death were both pounced

11 Robert Bosch at a meeting of French and German First World War veterans in Stuttgart (1935)

12 A stand with dairy products from the Bosch Farm at the agricultural exhibition in Munich (1933)

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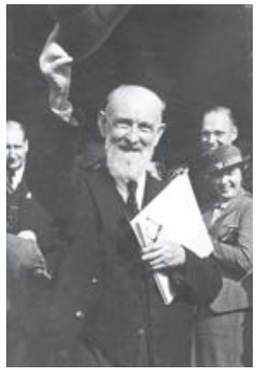

13 The company founder on his 75th birthday, when he also celebrated the 50th anniversary of his enterprise (1936)

on by the Nazis for propaganda purposes. A telephone call from Berlin announced that a state funeral would be held on 18 March 1942. On the eve of the funeral, a simple service took place in the Stuttgart plant in the presence of Robert Bosch's family. Many obituaries paid tribute not only to his entrepreneurial and personal achievements, but also to the social commitment demonstrated by the company founder.

It was Bosch's dearest wish that the company should continue to show a 'strong and meaningful development' after his death. This was not simply a matter of maintaining and administering the status quo, but also one of growing and actively shaping the future. In 1938, he had drawn up his will, which included guidelines for his successors: 'It is a matter dear to my heart that Robert Bosch GmbH should be safeguarded in its substance ... for as many future generations as possible, and that it should remain at all times financially independent, autonomous and able to take appropriate action.' In addition to the long-term safeguarding of the company's future and its development potential, the will's main concerns were that lasting ties should be maintained with Bosch's descendants, and that a proportion of the company's profits be used for charitable and social causes. The Bosch Stiftung, a charitable foundation set up in 1964, continues his work to promote and support the sciences, healthcare, international understanding and education to this day.

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Bosch in the United Kingdom

Bosch in the United Kingdom

1898–1950s
In 1885, Robert Bosch wrote a letter to his fiancée, Anna. In it, he included the passage, ‘I do believe that I could become quite fond of it,’ with ‘it’ being the UK. For a reserved Swabian, the statement verged upon a veritable declaration of love for the country. While working at the Siemens plant in Woolwich (which was to become a parish of London in 1889), twenty-four-year-old Bosch had had an opportunity to get to know the country and its people. He got on well with the locals, learning from the discussions he held with them, mostly in pubs. These encounters – with the British people and his experience of the British economy – inspired Bosch as an entrepreneur. ‘I had often thought about how I could gain a foothold in Great Britain,’ he wrote. By 1898, that time and opportunity had come. The British automotive pioneer Frederick R. Simms had contacted Bosch to engage him in a project to apply the Bosch magneto ignition device to an automobile. The application became a success and so Bosch and Simms came to an agreement to start marketing Bosch products in London. This became the company’s first venture into a market outside Germany.

The UK played a pioneering role in the automotive industry. The cars made by brands such as Wolseley, Napier, Rolls-Royce and Vauxhall needed reliable ignition systems – something Bosch could deliver. To this end, Bosch and Simms founded the Compagnie des Magnétos Simms-Bosch. The company distributed magneto ignition devices and installed them in cars in the British, French and Belgian markets. In 1907, Bosch and Simms went separate ways, and Bosch Magneto Company Ltd took over the business with premises in London’s Store Street (and from 1910 onwards in Newman Street). With the company’s headquarters in the centre of London quickly becoming too small, the management team of Arthur Bennet, John Stevens and Emil Schwer decided to build new business premises on Tottenham Court Road in

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01 In the years 1908–10, the Bosch Magneto Company was located at London’s Store Street

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order to better meet rising demand. The first part of this new building was opened in 1913. By then, 90 per cent of all cars in the UK had been equipped with Bosch magneto ignition systems. Since business continued to boom, the company kept building. However, the outbreak of the First World War in 1914 put an end to this growth. The British state confiscated enemy holdings. In 1917, it sold everything previously owned by Bosch to Vickers, a mechanical engineering and armaments company.

Through it all, the management of what was once Bosch Magneto Company maintained close ties with Bosch. John Stevens founded his own company in London and took on the task of distributing Bosch products in 1919. With a representative in England's capital, Bosch established a new company in the Scottish city of Glasgow in 1924, Bosch Ltd. At the same time, Bosch started looking for British partners to set up a jointly operated production facility within the UK. Shortly before the deal could be sealed, a potential partnership with Vickers failed to come to fruition due to conflicts over the venture's name. The memory of the war was still too fresh to include a well-known German brand name into a British venture. In the years that followed, Bosch continued to look intensively for opportunities to manufacture in the UK. British car manufacturers, such as Morris, made it clear that they would install Bosch equipment in their cars, but only if it were also produced in the UK. In 1927, Bosch came to an agreement with General Motors. It stated that the AC-Sphinx Sparking Plug Company Ltd, Birmingham was authorised to manufacture Bosch licensed horns for the Vauxhall General Motors factory – and for General Motors Ltd in England.

In 1931, however, Bosch finally found a British partner in C.A. Vandervell (C.A.V), a subsidiary of Joseph Lucas Ltd, which was willing to include the name Bosch into the company's name. It was the beginning of a very fruitful cooperation. Bosch brought its patents to the table, while C.A.V. provided a production location in London. All kinds of electrical equipment, such as lighting, was manufactured at the factories between Warple Way and Arden Road. The alliance was close and based on trust. Staff at both companies met regularly on site in London or Stuttgart to

02 Robert Bosch, front row, middle, between his international business associates, including the Bosch Magneto Company management team Emil Schwer, John Stevens and Arthur Bennet (front row: first and second from the left and second from the right, respectively) (1907)

03 & 04 When the premises became too small, the Bosch Magneto Company was relocated from Store Street (above) to Newman Street (below) (1910)

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05 In 1921, John Stevens' company became Bosch's sales agent with premises at London's Rathbone Place (1926)

06 After the expropriation of the Bosch Magneto Company during the First World War, Bosch established the Bosch Ltd in Glasgow (1924)

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exchange ideas, with skilled workers often spending an extended period of time in either location. Fond memories were made on both sides during these exchanges. Bosch Ltd was merged with C.A.V. to form C.A.V.-Bosch, which became the base for the company's activities throughout the UK.

Another project was begun in 1935. KLG Sparking Plugs Ltd, based in Putney, London decided to manufacture Pyranite spark plugs under a Bosch license. Bosch was the first to use Pyranite as insulation for spark plugs and held the patents for this technology, but it was also providing on-site support for KLG in setting up production. KLG associates were trained in Stuttgart, and at the end of 1936 manufacturing began in Putney. People joked it looked very much like a Bosch production site in Stuttgart. In the following years, Bosch associates regularly visited the London factory to make sure the production ran smoothly. The majority of customers were automobile manufacturers such as Rolls-Royce,

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07 The staff of C.A.V.-Bosch gathered for a company outing in the early 1930s, with the number of buses indicating a large workforce

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Bentley and Austin. Subsequently, the KLG candles with stone insulation were also tested in RAF de Havilland engines.

This close co-operation between associates created a difficult situation towards the end of the 1930s as a world war sadly loomed once more. In 1938, when the Sudeten crisis threatened to escalate into war and European statesmen yielded to Hitler's demands for the last time, staff at Lucas Ltd sent a remarkable letter to Bosch in Stuttgart. They wrote, 'We wish you to feel that our friendship for you all and our appreciation of all the many kindnesses you have shown us will always endure. May we ask you to join with us a mutual determination to create an atmosphere from which suspicion and mistrust are removed and our peoples move forward in friendliness and common understanding.' The response from Stuttgart was swift: 'We at Bosch, who have long been fortunate to be associated with many of you in the context of our inspiring and successful collaboration, appreciate your message of friendship in these difficult times... May the benign spirit of this promising affirmation of peace and understanding continue to guide our joint efforts in the future.'

When war seemed unavoidable, Bosch sold its shares in the joint venture to Lucas to avoid a possible expropriation. Thanks to their relationship of trust, the partners signed an agreement affording Bosch a pre-emptive right to buy back the shares. In 1954, Bosch bought back Bosch Ltd, which had been spun off from the joint venture and became the starting point for the company's current presence in the UK.

1960s–present

The turbulent decades of international conflict gave way to a long phase of growth. By the late 1940s, Bosch products like refrigerators and automotive equipment were regularly being sold in the UK by different distributors. In 1953, Scintilla Ltd, based in London, a subsidiary of a Swiss company, became the sole distributor of Bosch power tools in the UK. However, in 1954 Bosch started afresh by buying back the Bosch Ltd company and regained the Bosch trademark rights. The company at this time was based in Hendon, north London.

Alongside Bosch's automotive technology, customers across the UK were able to buy household appliances, power tools, hot-water boilers and radio equipment. To ensure this wide variety of Bosch products became better known, the company operated a sales showroom in London's West End. As there was not a production facility in the country, all products had to be shipped from the Continent. With the business growing larger, storage facilities became necessary to respond quickly to customer demands. In 1968, these demands were met when Bosch established premises in Watford, Hertfordshire. After a significant opening ceremony in May 1968 – with 200 guests representing the worlds of politics and business – 200 associates of Bosch Ltd started working at the new location.

08 The Bosch racing service on tour on race courses in the UK, also visiting London (1954)

09 After buying back Bosch Ltd from Lucas, Bosch started again with a sales office in Hendon (1954)

10 In 1968, when space grew tight, Bosch moved to a large warehouse in Watford (1981)

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There were challenging times ahead. Due to the strong necessity of importing Bosch products, high trade barriers made business difficult. When it became clear that the UK would join the European Community, it was a huge relief for Bosch Ltd. Its staff worked tirelessly to prepare the company and made major structural changes. In 1973 – when the UK acceded to the EEC – they were ready. The Bosch annual business report of that year acknowledged the high levels of customer demand. However, there was still a need to make the Bosch brand better known to the British public. For that purpose, Bosch Ltd commissioned a prize-winning movie.

The Bosch Equation is about a Sherlock Holmes-esque private detective commissioned to find out what makes Bosch products so successful. The movie features the detective's journeys to different manufacturing Bosch locations in Germany – demonstrating, it must be said, a lot of humour and zeitgeist. It was ranked first out of 500 competing movies at an Chicago industrial movie festival in 1974. These activities paid off. In the years between 1976 and 1979, the renamed Robert Bosch Ltd's turnover more than doubled. Orders from private consumers, as well as car producers, rushed in. In 1979, new sales offices and a new warehouse were built at Watford. At this stage the company employed 315 people and served more than 800 key accounts. More than 300 service points provided reliable customer service in the UK. The new building, which had a total floor area of 7,000 sqm, provided space for more than 40,000 different products from the Bosch product range.

Due to economic uncertainties and strong competitors, the team at Robert Bosch Ltd had to make changes. Regular customer service training – as well as order processing and goods traffic via a new data processing system – were introduced. There was also a lack of skilled workers. Nevertheless, Robert Bosch Ltd provided a good working atmosphere, and great activities for socialising attracted new associates to the business. Christmas gatherings, disco dancing at the cafeteria and an afterwork bar (which was attended by everyone!) helped the cause. Rationalising the workflow and establishing a smoothly running distribution network helped increase market share and boost turnover. The business was so successful that the company had to move yet again. In the winter of 1983–4, the 350 associates moved from Watford to Denham, Buckinghamshire. The premises were rented for thirty years until the company finally bought the Denham property in 2014.

Sales of household appliances were supported by the establishment of BSH Home Appliances Ltd in Milton Keynes in 1990. However, Bosch did not make most of the products domestically in the UK. This change would not take place until the early 1990s when, in 1991, Bosch opened a production facility for manufacturing alternators in Miskin, Cardiff, Wales. In 1992, the company took over the thermotechnology (most famous for

11 Since 1983, the headquarters of Bosch in the UK has been located in Denham (2011)

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boilers) manufacturer Worcester, and in 1995 the garden tools manufacturer Atco-Qualcast (known since 2007 as Bosch Lawn and Garden). With these acquisitions the numbers of associates rapidly rose to 3,600 when Bosch celebrated its centenary anniversary in the UK in 1998. The Bosch acquisition of Rexroth in 2001 was a major addition to the company's portfolio and it established new locations in Glenrothes and St Neots. In 2004, Bosch Security Systems opened a Communication and Service Centre in Liverpool. During the following years more acquisitions and expansion followed, including Bosch Healthcare in 2009 and Bosch Smart Home in 2017.

In recent years, Bosch in the UK has navigated some challenging times, including the financial crisis of 2008–09, the Brexit vote of 2016 and the Covid-19 pandemic of 2020–21. In 2010, a global restructuring resulted in the closure of a significant factory in Miskin. The plant produced automotive components, and approximately 800 permanent associates and 100 agency workers lost their jobs when the production was moved to Eastern Europe. In a positive outcome, the site was purchased by another company, Renishaw, and many workers were retained, with the site eventually expanding.

While one plant was closed, others were opened. With more work on automotive development taking place in the UK, Bosch Engineering Group opened an office at the MIRA Technology Park near Nuneaton, Warwickshire, in 2012. A lot of advanced automotive engineering takes place at the facility, which includes

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12 The Bosch automotive Service Training Centre in Uxbridge offered training to 4,500 vehicle technicians every year (2012)

13 In this test car, the latest acquisition 'Five' conducts trials with autonomous driving (2022)

a test track, with many other companies working on top secret projects nearby. The Bosch Warwick Technology Centre, in Coventry, opened in May 2013 to provide engineering support and services for UK customers. Later, Worcester Bosch opened the £9 million Bosch Distribution Centre in Worcester, which merged two facilities into one highly efficient location.

Undoubtedly, of all the pivotal events in recent years, the UK's decision to leave the EU created the greatest level of long-term uncertainty. Bosch in the UK respected the decision to leave and set about finding the best path forwards. It has navigated this challenge and emerged in good shape. The company's ability to move forward after Brexit is due to a variety of reasons, amongst which the market remained strong and consumers have continued to purchase Bosch products. At the same time, businesses have continued to work closely with Bosch on a wide variety of projects.

Throughout the past decade technology has developed at an ever-faster pace and the rise of smartphones and social media has changed society. At the same time, improved internet infrastructure – combined with the Covid-19 pandemic – has altered the way we work. A hybrid approach that combines working from home and working from the office is now the norm. Since 2020, Bosch has invested in a number of companies in the UK and Ireland. It has also continued to acquire businesses, including fire and security group Protec and Five AI, Europe's leading start-up in the field of automated driving. The latter specialises in creating simulation environments for automated vehicles that make it possible to assess and validate system behaviour at scale. Bosch UK is also focusing on the skills and competencies that its workforce of the future will require. This includes enhancing digital skills – such as how artificial intelligence is being included in Bosch's products – and developing better workplace practices – such as stronger collaboration within hybrid teams working across Bosch's fifty locations.

In 2023 , Bosch UK and Ireland is the second largest region for the Bosch Group in Europe, second only to the home market of Germany. Most Bosch divisions have a presence in the UK and Ireland, and both countries have extensive research and development facilities as well as manufacturing and sales operations.

3

Bosch the company

Bosch the company

1886–1926

The earliest years of Robert Bosch’s career, spent as an apprentice and journeyman, awoke a desire within him to set up his own business. On 15 November 1886, Bosch and his first two associates – a mechanic and an errand boy – opened the Workshop for Precision Mechanics and Electrical Engineering in Stuttgart. Bosch took on any precision mechanical and electrical engineering work that came his way. For the most part, this involved installing low-voltage equipment such as telephone terminals, electric bells, door openers or remote electrical water-level indicators. Yet, despite this extensive portfolio, orders were often sparse during the early years. Robert Bosch later referred to his initial years in business as ‘a shambles’.

One of the most important factors that helped the young company on the road to economic recovery was the magneto ignition device, which had already become crucial to the company’s economic success. In 1887, a mechanical engineer had asked Robert Bosch to reproduce a magneto ignition device he had seen in operation at a different company. Bosch agreed, but he did not limit himself to simply reproducing the magneto ignition device. He also refined it, not only making the new device lighter and less prone to failure, but also enhancing its performance. In 1896, the company celebrated the assembly of the one-thousandth magneto ignition device. By that time, the ignition device accounted for the lion’s share of the company’s sales. Even so, no one had any inkling that this product would soon be the medium that would make the Bosch name famous the world over.

The first magneto ignition devices had one major drawback. Their design made them suitable only for engines with only few revolutions per minute. They did not work in the smaller, high-speed engines installed in contemporary motor vehicles. One of those searching for a better ignition system at that time

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01 Entrance to Robert Bosch’s Workshop for Precision Mechanics and Electrical Engineering, Stuttgart (1886)

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was Frederick Richard Simms, a British automotive pioneer. His search eventually led him to Robert Bosch. In 1897, Simms sent a motorised three-wheeler to Stuttgart to have a magneto ignition device installed. In the end, Bosch's master craftsman Arnold Zähringer succeeded in adapting the magneto ignition to the vehicle's fast-revving engine. This safe and reliable solution meant the magneto ignition device could now function in automobiles at high speeds, and was the starting shot for Bosch's meteoric rise as an international automotive supplier.

Because the domestic market was too small to sell magneto ignition devices on a grand scale, Robert Bosch quickly turned his gaze beyond Germany's borders to those European countries in which the most promising automotive markets had developed. In 1898, Simms and he set up a Bosch company in London, the first outside Germany. This proved to be just the start of a series of moves into the global market. The company's rapid growth across Europe now made major investments necessary. On 1 April 1901, forty-five associates moved into the new Elektrotechnische Fabrik Robert Bosch (Robert Bosch Electrical Engineering Factory). The new building in Stuttgart marked a milestone in the company's development from a small courtyard workshop to an industrial enterprise.

On the very same day the factory opened, a former apprentice, Gottlob Honold, returned to Bosch after studying at university. Bosch assigned Honold the task of improving the design of the magneto ignition device. Ultimately, Honold developed a high-voltage magneto ignition system with spark plugs. When he unveiled the first prototype in December 1901, Bosch was clearly impressed, declaring: 'You've hit the bullseye!' His exclamation marked the beginning of a long history of innovation at Bosch.

02 Workshop supervisors at the Bosch factory in Stuttgart (1905)

03 The US subsidiary Bosch Magneto Company New York/Chicago in New York City (1908)

04 In the early days, winter testing of Bosch products required warm clothing (1913)

05 Assembly belt production of armature gears for the magneto at the Stuttgart Bosch facility (1926)

04

The company now entered a period of rapid growth. The magneto systems were top sellers worldwide, and Bosch had to expand further. In 1906, the company felt ready for the leap across the Atlantic and Robert Bosch Inc. was founded in New York. To circumvent high import duties and reduce delivery costs, Bosch decided to set up his own manufacturing plant in Springfield, Massachusetts in 1910. While the focus was on Europe in the years up to 1906, the company's business policy took on a more international dimension in the years that followed. By 1913, Bosch was represented in many countries on most continents, and that same year the company generated 88 per cent of its sales outside Germany.

With the outbreak of the First World War in 1914, most foreign markets disappeared overnight. Even worse, most of Germany's wartime enemies expropriated the company's assets within their borders – and not just tangible assets, but also property rights, patents and brands. Instead of magneto ignitions, Bosch started manufacturing grenade detonators. Around half the workforce was called up for military service, with their work being taken over by women.

When the war ended in 1918, the company again faced major challenges. Bosch itself had lost most of its assets outside Germany. In many countries, new competitors had appeared on

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06 A variety of Bosch products for cars, motorcycles, bicycles and machines (1928)

07 With cameras from the FESE joint venture, Bosch covered early television events (1934)

the scene, and they were free to use the Bosch patents that had been confiscated. Despite the odds stacked against it, Bosch set about rebuilding its international organisation. Remarkably, by the mid-1920s the company's international sales network was bigger than before the war. However, the situation was far from ideal, not least because Bosch was still heavily oriented towards a single business segment: ignition systems. The company founder had been quick to recognise the dangers of this dependence on just one product line. This concern was the driving force behind Robert Bosch's search for new products to complement the company's range. In 1913, electric lighting for automobiles was launched. The Bosch automotive lighting system included not only headlights, but also a generator, voltage regulator and battery. It was the first-ever electrical system for automobiles, and laid the foundations for later components, such as an electric starter in 1914. Motorcycle and bicycle lights, the klaxon Bosch horn, windshield wipers, servo (power-assisted) brakes and diesel-injection pumps were added to the product portfolio by 1927.

1927–59

Innovative products added to Bosch's growing competitiveness in the 1920s, but they were not the only factor. The company had also begun to rationalise its production methods and had taken the first steps to prepare for assembly-line production. However, in the autumn of 1925, the German automotive market collapsed. German carmakers had missed the trend to cheaper smaller cars and were overtaken by strong competition from the US. Orders faltered at Bosch, as they did elsewhere. With market pressure growing, Bosch found itself faced with a painful reality: its competitors – especially those outside Germany – were producing products of comparable quality at a higher rate and at a lower price. Clearly, this had consequences for Bosch. Within just a few months, the number of associates at the company plummeted from some 13,000 to 8,000, despite the introduction of reduced working hours. The years to 1934 were a period of transformation for Bosch. The collapse of the automotive industry had clearly demonstrated the risk of focusing exclusively on a single industrial sector, and the company's management now began searching for new and diverse lines of business. Within just a few short years Robert Bosch AG transformed itself from an automotive supplier into a diversified electrical engineering group.

The product that kicked off this new era in 1928 was the Forfex hair trimmer. Equipped with a motor in its handle, the Forfex was the precursor to Bosch drills and other Bosch power tools. In 1929, Bosch founded Fernseh AG in partnership with Baird, Zeiss Ikon and Loewe. This joint venture supplied the first all-electronic recording devices for the 1936 Olympic Games in Berlin, and premiered 'home television receivers' in 1938.

Bosch's acquisition of Junkers' gas-fired appliance manufacturing operations in 1932 marked its entrance into the

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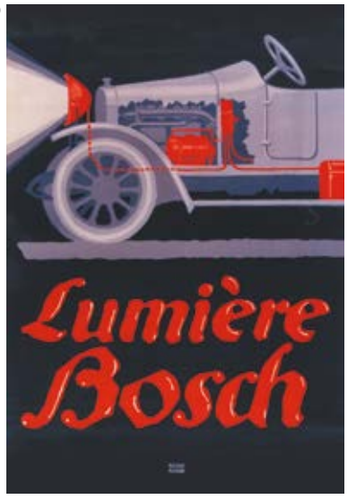

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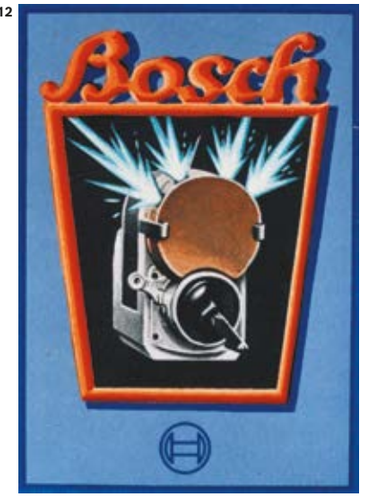

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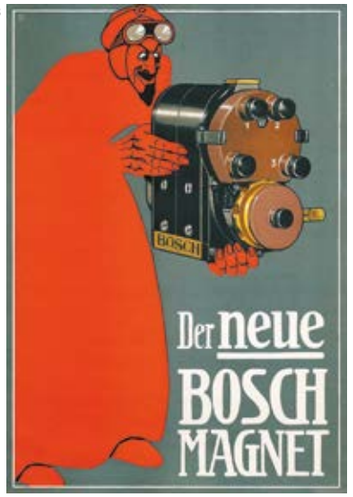

08 'Don't dazzle – give light with Bosch lighting' (1926)

09 Drivers used the Bosch horn for warning when dangerous situations occurred (1921)

10 Advertisements for the Bosch lighting system were printed in different languages (1914)

11 When Bosch started producing bicycle lighting, it quickly conquered the market (1925)

12 The device that made Bosch famous – the magneto ignition system (1923)

13 A race driver advertising icon, 'Red devil' – car races showed the reliability of Bosch products (1911)

14 Spark of innovation – nothing illustrates this better than this Bosch spark plug advertisement (1926)

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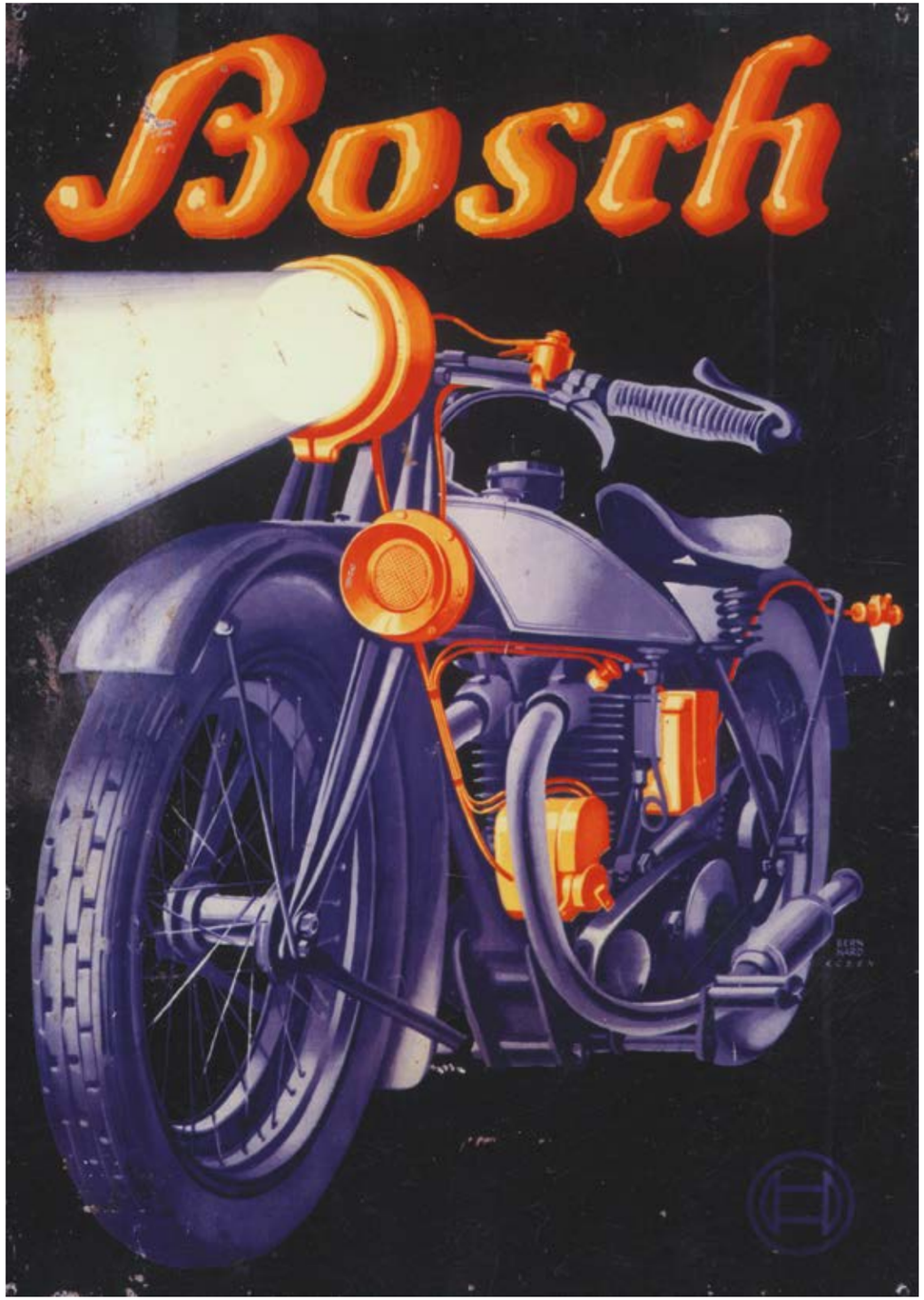

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15 One of many designs for Bosch products from the famous Berlin graphic studio Bernhard/Rosen (1928)

16 Fresh yoghurt – directly from the Bosch Farm near Munich (1931)

17 ‘Don’t bluster – warn other drivers with the help of the Bosch horn’ (1926)

18 A classic advertisement – the flashing Bosch spark plug (1928)

19 Making driving comfortable and safe with the Bosch starter and lighting (1921)

20 A new asset for the hairdresser – the Forfex hair clipper produced by Bosch (1935)

21 Keep food fresh with the Bosch refrigerator (1937)

22

heating industry. In the same year, the Berlin company Ideal (later Blaupunkt) launched the first production car radio in Europe and was later acquired by Bosch. In spring 1933, Bosch presented its first refrigerator at the Leipzig Trade Fair. Finally, Bosch rounded off its new product portfolio when it acquired Bauer, a maker of film and camera technology, in 1934.

Towards the end of the 1920s, with memories of the First World War fading, Bosch judged that the time was ripe to try out a new approach internationally as well. Bosch set up joint ventures and granted production licenses to local companies. It was back to the good old days, or so it seemed. Once again, however, political and economic circumstances in Germany forced the company to take a quite different turn. When the National Socialists came to power in 1933, they followed a policy of extreme economic protectionism and aggressive rearmament. The moral dilemma faced by Bosch management under the Nazi regime could not have been more pronounced. The same company that helped the persecuted and supported the resistance movement was classified by the Nazis as ‘crucial to armaments production’. After war broke out, Bosch was forced to re-gear its entire production to armaments-related goods: equipment for military vehicles, aircraft and ships.

Many of the company’s associates were called to the front while the amount of work continued to grow unabated. Like other businesses involved in armaments production, Bosch was assigned prisoners of war, foreign civilians and concentration camp inmates as labourers. The forced labourers from Eastern Europe, in particular, were compelled to live and work under degrading conditions. As the war progressed, air raids on industrial centres increased. By the end of the war, large parts of the company’s plants had been completely destroyed. Robert Bosch did not live to see the destruction; he passed away in 1942.

In May 1945, 750 Bosch associates in Stuttgart picked up shovels to begin the work of reconstruction. Although the war was over, Bosch was still faced with scarcities of certain raw materials and with the restrictions imposed by the Allied occupying powers. Production was very slow to resume. Once again, it was the spark plug that re-ignited Bosch’s fortunes: the US army’s fleet of vehicles in Stuttgart soon needed large quantities of this small but vital Bosch product. The company’s situation was also greatly improved after the currency reform of 1948 and the introduction of the new German mark. Slowly, but surely, life returned to normal.

As an international player, Bosch was back at square one – just as it had been at the end of the First World War. Fortunately, the company’s longstanding business relations with partners outside Germany proved once again to be remarkably sound. By 1956, the company’s network of agencies and service centres covered more than 130 countries. Even then, the goal was to establish manufacturing sites around the world as a means of tapping into new markets. Gradually, over the course of the 1950s, Bosch not

22 The ‘phantom car’ was displayed to show the wide range of Bosch products hidden under the hood (1951)

23 Products made ‘Down Under’ at the Bosch factory in Clayton, near Melbourne (1958)

23

only expanded its international sales network but also created a close-knit, global manufacturing network with new production plants in India, Australia and Brazil.

Having concentrated almost exclusively on automotive products in the years immediately after the war, Bosch now began to reintroduce refrigerators, radios and power tools into its portfolio. In 1952, Blaupunkt launched Europe’s first FM car radio. In the same year, the Power Tools division brought out its Bosch-Combi power tool, which was aimed at an entirely new category of customer: DIYers. Production at Junkers, Fernseh GmbH and Bauer was also running at full capacity. Bosch also set its sights on another new target group – housewives. In 1952, the company launched its first kitchen machine, followed by the washing machine in 1958.

Gasoline injection, a new engine technology, was also applied by Bosch on an industrial scale for the first time, in two-stroke engines in 1951 and in four-stroke engines in 1954. This was a major Bosch innovation. Hydraulics was another discipline in which Bosch engineers began to make significant progress, in

24 A Bosch researcher with a model of an atom; new products required more basic research (1964)

25 Technical drawers at the Bosch facility in Bangalore (now Bengaluru), India (1982)

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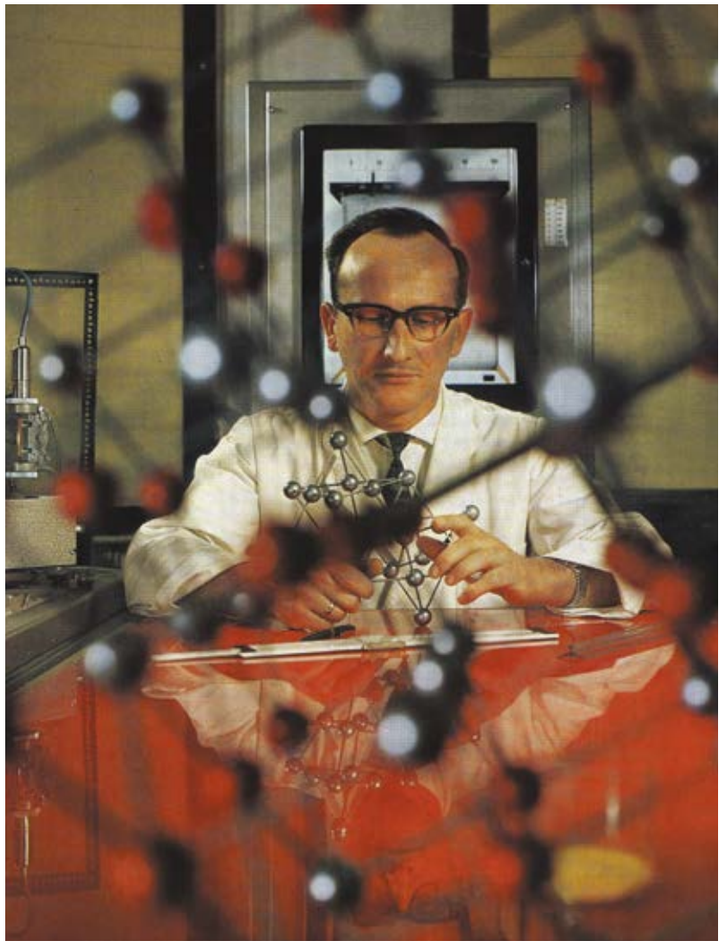

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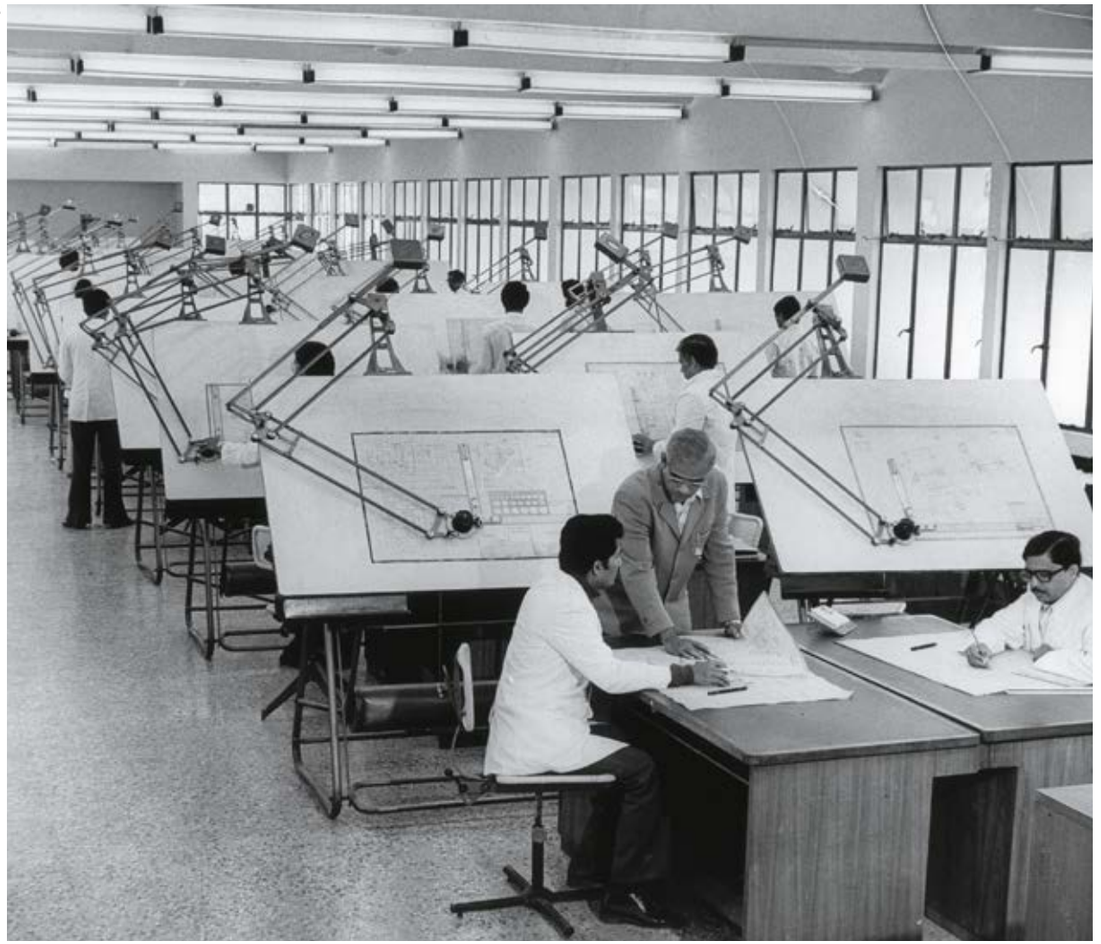

1953. The company's first product in the hydraulics sector was a mobile hydraulic lift, which used the power of the tractor engine to lift and lower the plough. At the same time, Bosch advanced its work in the field of electronics. In 1958, the engineering department presented the 'variode'. No bigger than a pea, this semiconductor device was built into alternator regulators. It was a decisive step along the path to automotive electronics, which remains one of the company's most important business areas to this day.

1960–2000

By the early 1960s, Bosch had regained its position as a major industrial enterprise. Buoyed by the economic boom in Western Europe, the company was posting high growth rates. The number of associates had also risen significantly, from some 15,000 in 1950 to some 70,000 in 1961. A more flexible structure was needed, one better adapted to future growth. With this in mind, a major corporate change process was set in motion that would ultimately transform Bosch into a divisionalised company comprising a tightly linked group of relatively autonomous units, each accountable for its own sales revenue and profits.

These structural changes were accompanied by a wave of expansion, spurred by strong worldwide growth. The company went on to purchase manufacturing sites in German regions with a surplus of labour and an underdeveloped industrial infrastructure. At the same time, the company pumped money into research and development, doubling its budget to 4 per cent of revenue by 1963. In the years that followed, this figure continued to rise, enabling the company to maintain its position as a leader in the core areas of automotive technology.

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In addition to in-house innovation, the company's continued growth was also dependent on acquiring technologies or even whole companies. In 1967, Bosch forged alliances with a competitor, Siemens AG, in the field of household appliances and pooled their activities in a joint venture. Its successor organisation, BSH Hausgeräte GmbH, is today wholly owned by Bosch.

The new goals and structures of Bosch were also reflected in a new company constitution. Since Robert Bosch's death in 1942, the executors of his will had been laying the foundations for the company's current constitution, striking a balance between the founder's economic and social goals. The objective was to safeguard the health and profitability of the company in order to secure its commitment to civic initiatives. In 1964, the predecessor of the Robert Bosch Foundation acquired a majority stake in Robert Bosch GmbH from the heirs of the company founder. Today, the Robert Bosch Stiftung holds 94 per cent of the share capital of Robert Bosch GmbH.

At the same time, newly developed automotive electronic systems became a major factor in the company's growth. These systems brought about a fundamental shift in the Bosch product range, which had previously been dominated by mechanically and electrically controlled products. The Jetronic gasoline-injection system, premiered in 1967, was quickly and widely adopted because it considerably reduced both consumption and emissions. Later, Jetronic systems offered improved technology and permitted operation with a three-way catalytic converter – thanks to the lambda sensor, which Bosch launched in 1976. It reduced exhaust emissions by 90 per cent. Once again, Bosch was setting new standards.

In 1979, the launch of the Motronic system marked a further milestone. This system, which controlled both fuel injection and ignition, featured a microprocessor with a freely programmable memory. This was the advent of computers and software in automobiles – and this in an essential driving function. One year before Bosch launched Motronic, the company had rolled out another world first: the ABS antilock braking system. This was the first digital electronic system installed in a motor vehicle. ABS prevents car wheels from locking when the brakes are applied, thus shortening braking distance and helping to keep vehicles manoeuvrable. Another pioneering Bosch innovation was vehicle navigation systems. In 1983, the company produced EVA, the 'electronic pilot for drivers'. This was the first prototype of an independent vehicle navigation unit. The experimental system was the basis for the world's first voice-guided satellite navigation system for motor vehicles, which went into production in 1995.

Bosch continued to scale-up its activities globally, such as in the burgeoning Asian markets, where its sales and manufacturing network expanded from the mid-1970s onwards. In the US, Bosch became an original equipment manufacturer for gasoline-injection

26 Testing the Bosch gasoline injection systems in different climatic conditions (1983)

27 China became an important market for Bosch in the 1990s (1996)

28 Early research for a future technology – measuring the control electronics of an electric car (1970)

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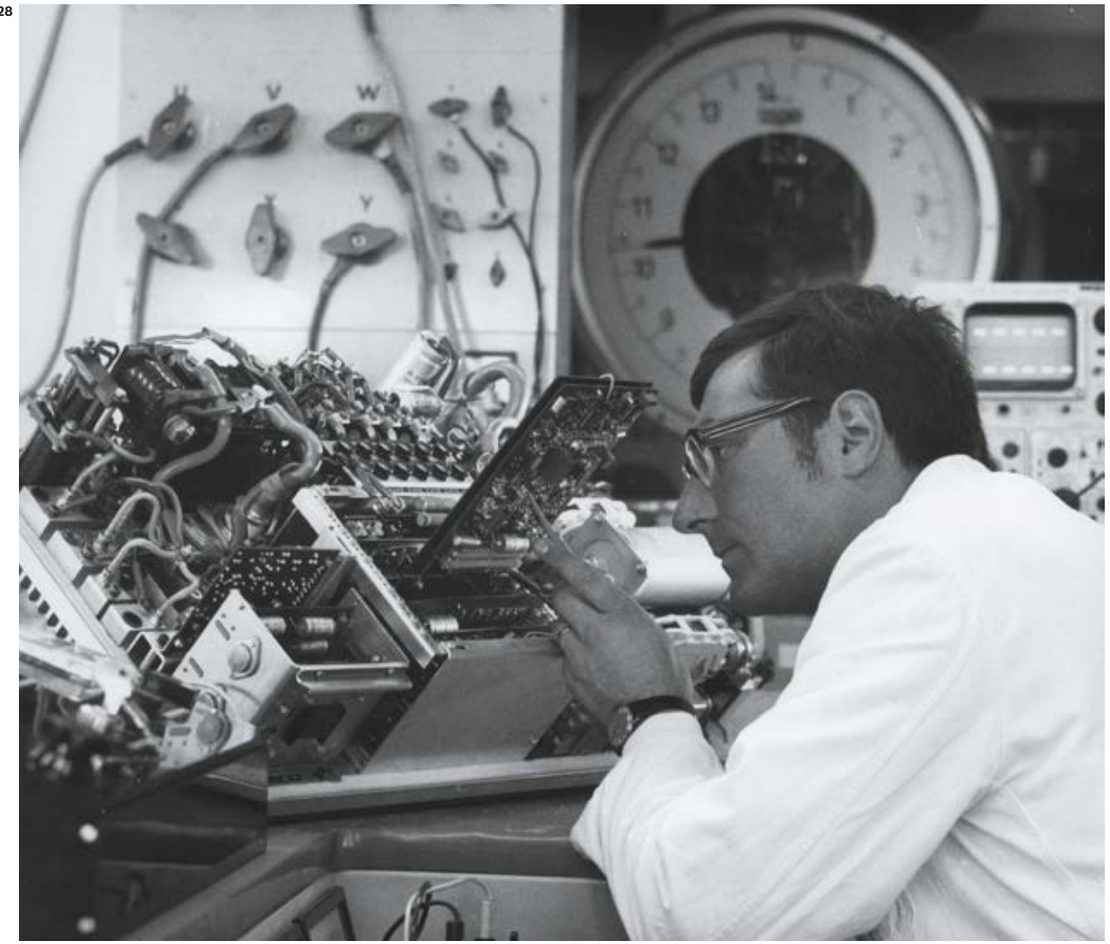
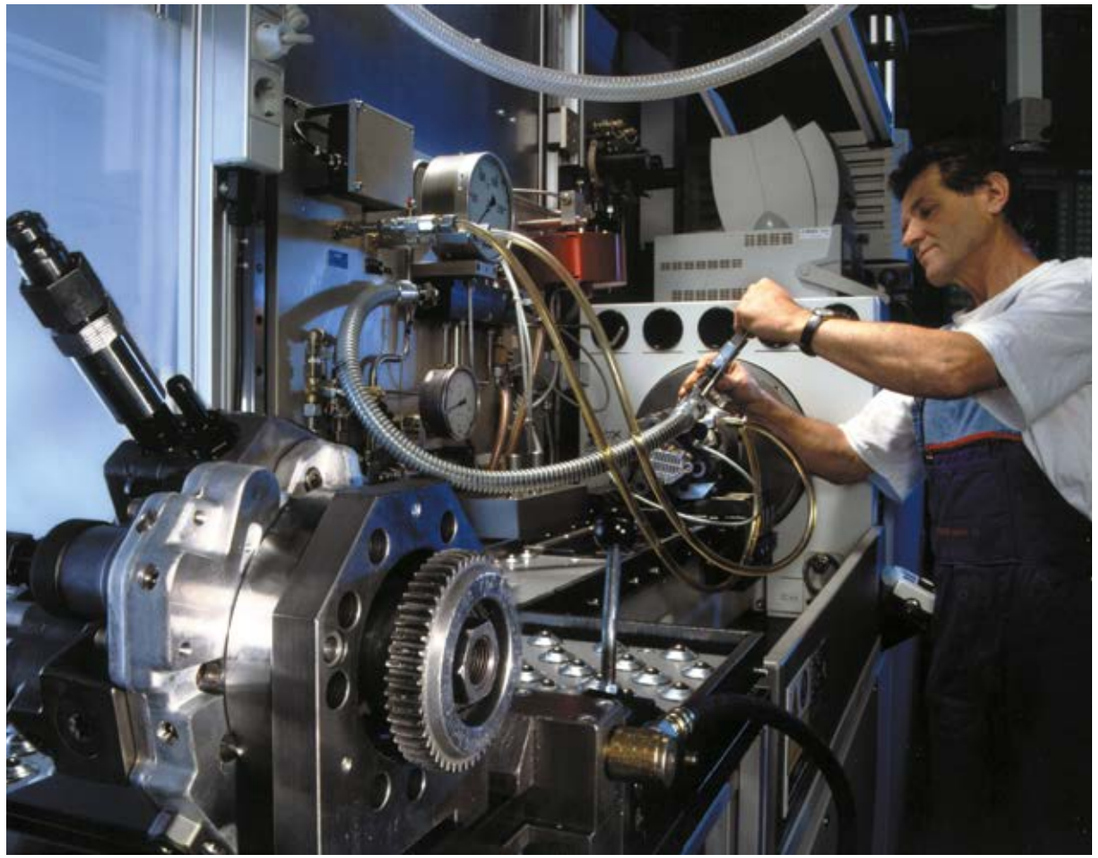


systems in new cars. In 1983, Bosch opened an engineering and calibration centre in Farmington Hills, Michigan.

The fall of the Iron Curtain in 1989 marked the beginning of a new era for Bosch, making the most of the new opportunities in Eastern Europe. By 1994, Bosch already had companies of its own in thirteen former Soviet Bloc countries. At the same time, Bosch was further expanding operations in Asia. Political reforms meant there were signs of good business opportunities in key Asian markets – notably India, South Korea and China. In Japan, to this point the company's key Asian market, Bosch gradually increased its stake in Zexel Corporation. In 2005, Zexel was merged with other Bosch companies in Japan, resulting in the creation of Bosch Corporation, headquartered in Tokyo.

Once the Chinese government recognised in the early 1990s how important non-Chinese suppliers were to the development



of the domestic automotive industry, this market also opened up to Bosch. After lengthy negotiations, a breakthrough was made in 1995: the Chinese government awarded Bosch a strategically important contract to equip Chinese-made vehicles with electronic gasoline-injection systems. Bosch began manufacturing these systems at its Shanghai-based joint venture United Automotive Electronic Systems Co., Ltd (UAES) in 1996. In the same year, production of diesel technology began at the joint venture Europe-Asia Diesel Fuel Injection Co., Ltd in Wuxi, while the manufacture of power tools and household appliances started in Hangzhou, and spark plug production got underway in Nanjing.

Throughout the 1990s, innovative electronic components formed the backbone of the company's success. One prime example was the CAN controller area network, a system for the digital transfer of data in motor vehicles that Bosch debuted in 1991. This system allowed automotive electronic systems to be interconnected. ESP, introduced in 1995, was another technological milestone and commercial success. This electronic

29 A test bench in the production facility for common rail systems in Jihlava, Czech Republic (2001)

30 Thanks to Industry 4.0, the machines at the Bosch location in Blaichach-Immenstadt, Germany can communicate with each other, allowing them to respond flexibly to the production parameters of upstream processes (2021)

stability program can help to save lives by preventing skidding accidents. Bosch also set new standards with its innovative diesel -and gasoline-injection systems, making it possible to substantially reduce CO_2 and other pollutant emissions.

Since 2000

The new millennium started brightly for Bosch. In 2001, the takeover of Mannesmann AG's industrial technology operations, and the subsequent merger of Bosch Rexroth AG and Bosch Automation Technology, boosted Bosch's Industrial Technology business sector. Another milestone in the restructuring of the company was the acquisition of Buderus, a long-established manufacturer of heating systems, in 2003. This 'focused diversification' was a prescient move to further reduce the company's dependence on the automotive industry. The idea behind it was to achieve a more balanced sales structure and a broader spread of opportunities and risks.

The new Building Technology division that was created in 2002 also owed a lot to acquisitions, including Philips Communication Security Imaging, Telex Communications and CCTV Extreme. Some business areas were also spun off to form independent entities. For example, Bosch Sensortec GmbH, set up in 2005, markets microelectromechanical sensors – originally developed for the automotive market – for applications in smartphones. Despite the period of economic volatility that began in 2001, the Automotive Technology business sector continued to invest in the expansion of important manufacturing sites around the world.

By mid-2004, the number of Bosch associates worldwide had risen to some 242,000, with part of the growth attributable to the reviving global economy. Both before and after 2004, Bosch was able to introduce a large number of innovations in this field, including driver assistance systems that employ sophisticated sensor systems to prevent accidents and to make driving simpler. These include adaptive cruise control, night vision systems and automatic emergency braking.

The company's positive business performance during this period provided the perfect springboard for new strategic approaches. The growing understanding of climate change presented a twofold challenge for Bosch, requiring the company to continue reducing the fuel consumption and CO_2 emissions of conventional gasoline and diesel engines, while at the same time encouraging the development of alternative powertrain designs. Bosch subsequently developed components for hybrid powertrains, which went into production in 2010. In the years that followed, production of components for fully electrical powertrains also began.

Other business sectors also placed resource conservation at the forefront of their development activities. Examples of products that help conserve resources include household appliances that consume less water and energy, and economical space-heating


C 5

31 Bosch engineers testing autonomous driving (2013)

32 Technology of tomorrow – Bosch tests fuel cells in vans (2022)

33 Today, all product classes at Bosch are connectable, with one example being smart homes (2022)

31

32

systems. In order to reduce dependence on fossil fuels, Bosch did not rely on energy efficiency alone. The company also drove forward its business with systems that generate power from renewable sources such as the sun, water, wind and geothermal energy. As early as 1983, Bosch had begun selling solar collectors for water-heating systems.

Bosch's long-term strategy involves a broader understanding of corporate social responsibility – a further refinement of the principles of the company founder Robert Bosch. For him, corporate social responsibility essentially implied striking a balance between economic and social needs. In our time, it has become necessary to extend this concept to include environmental protection.

33

The global economic crisis of 2008–09 caused Bosch sales to fall by around 15 per cent in 2009, with the company recording an operating loss for the first time since 1945. However, by 2010 Bosch had put the crisis behind it and posted its highest ever sales revenue. The crisis did not affect the company's long-term strategy. On the contrary, finding a balance between business success and social concerns is integral to the company's strategy to this day.

During the following years the internet of things (IoT) and the new business models associated with it have increasingly moved into focus, particularly in the areas of mobility and manufacturing, as well as energy and facility management. The infrastructural basis for this already exists, as hundreds of millions of devices around the world are web-enabled and connected, from smartphones and household appliances to power tools, manufacturing lines and vehicles. To seize the future opportunities associated with IoT, Bosch has initiated a wide range of research activities, focusing in particular on artificial intelligence. In this respect, Bosch has established the Bosch Center for Artificial Intelligence and broadened its horizons beyond AI solutions to include other areas of focus, such as the first-ever AI ethics guidelines to be adopted by a business enterprise. Further examples of activities aimed at developing and launching IoT-

34

34 Solar power is being used more and more at the Bosch location in Nashik, India; the facility has reduced its carbon emissions radically since 2015 (2020)

supported solutions include the subsidiaries Robert Bosch Smart Home GmbH and Bosch Connected Devices and Solutions GmbH, which provides electronic products and software expertise to make devices and objects intelligent and web-enabled in a wide range of areas of application.

In the Mobility Solutions business sector, there is the new Connected Solutions division for connected mobility solutions and services. Bosch believes its success in these endeavours depends crucially on competence in both hardware and the '3Ss' of sensors, software and services. Bosch is increasingly transitioning from being a manufacturer of purely physical products to being a hardware and software company. In order to have the speed and agility to develop promising products and business models despite the size of the company, Bosch has also set up its own start-up platform.

Throughout the company, the focus for the decades ahead lies squarely on meaningful technical solutions that connect the physical and digital worlds in mobility, industry and homes. In all these activities, sustainability remains a constant, both for economic reasons and because climate action is essential for survival and for a good quality of life for future generations. In keeping with this philosophy, the manufacturing, administration and research at over 400 Bosch locations worldwide have been proudly carbon neutral since late 2020.

4

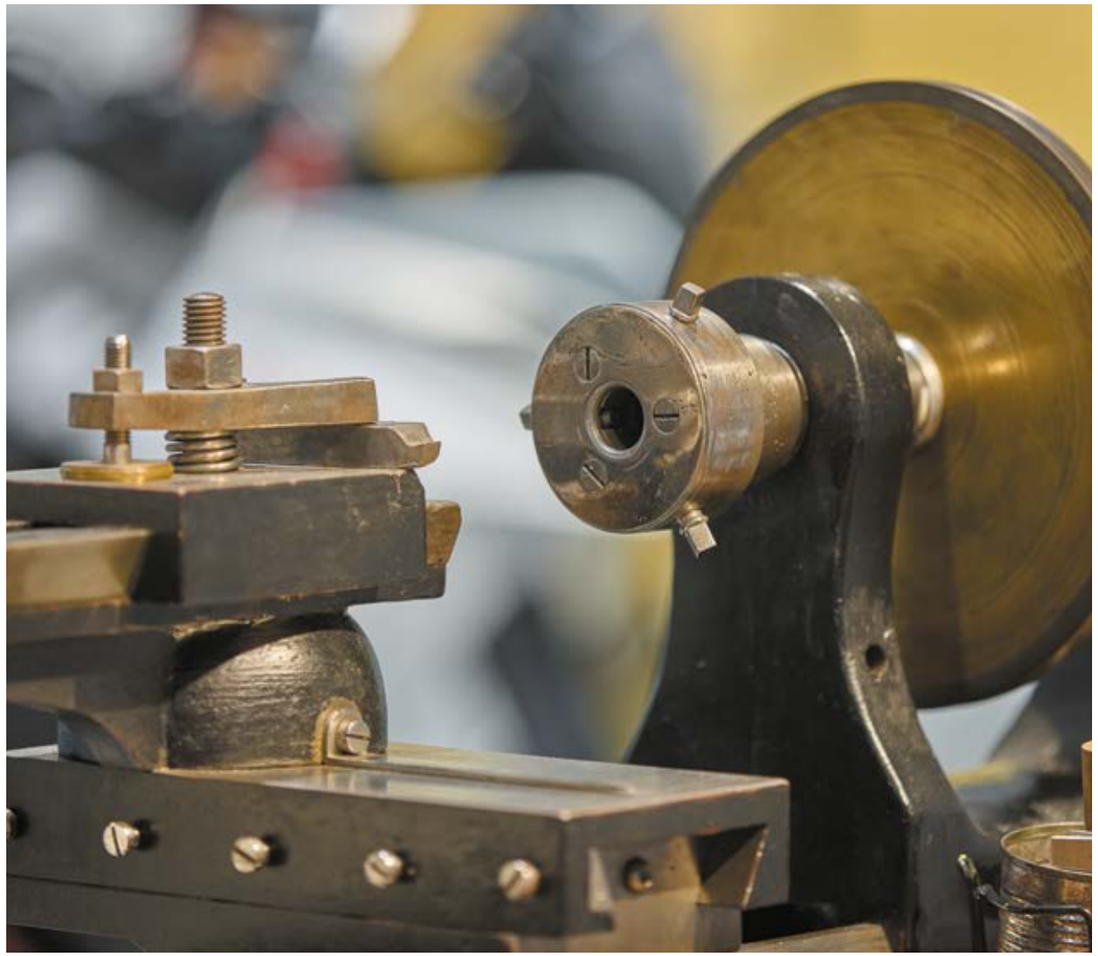
Invented for life

Lathe

1887

The beginnings of Robert Bosch's company were modest. He founded his workshop for precision mechanics and electrical engineering in a backyard building in 1886. From the very start, Bosch placed great value on making sure his workshop was well-equipped with machines and tools, as he was a firm believer that proper equipment was essential to manufacturing high-quality products. On 29 September 1887, in his first year of business, Bosch bought a lathe with foot drive, a high-quality, state-of-the-art piece of equipment. The expensive purchase quickly paid for itself. Thanks to his good workshop equipment, he and his mechanics were able to manufacture high-quality and reliable products – such as the first magneto ignition device in the same year.

The magneto ignition for automobiles, first manufactured in 1897, helped the young company achieve its earliest successes. In order to supply the required volumes, Bosch did all he could to adapt its machinery and equipment to the various types of ignition devices. To this day the company's own plants, as well as many customers worldwide, use Bosch's innovative industrial technology in their manufacturing operations.



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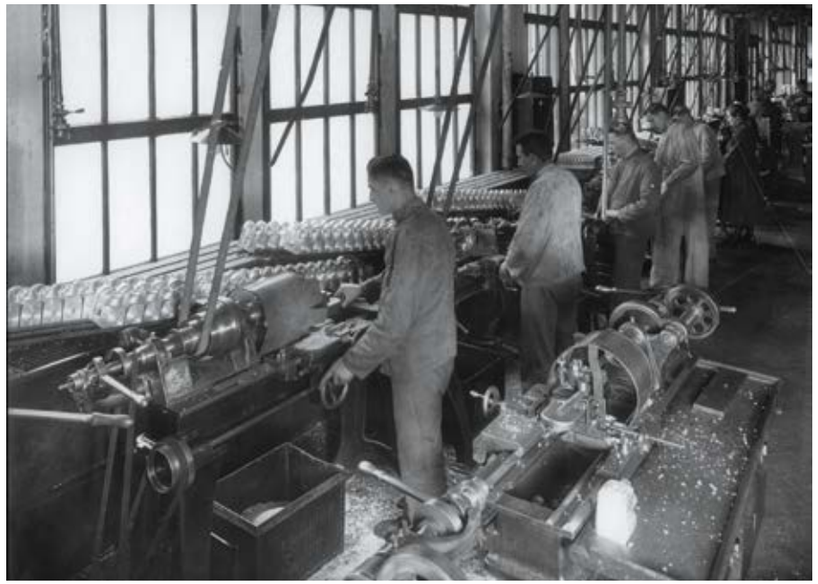

02

01 Workers turning housings for magnetos (1925)

02 Precision work on the lathe in the Stuttgart factory (1919)

03 Production of injection nozzles in Nashik/India (1975)

03

Telephone

1887

After opening his workshop, Robert Bosch carried out all the precision mechanical and electrical engineering work that came his way. To take on customers' orders, he had a telephone installed very early on. For the most part, these orders involved installing low-voltage equipment such as telephone terminals, electric bells, door openers, remote electrical water-level indicators and, later, pneumatic tube pipelines and electric lighting. Yet, despite this extensive portfolio, orders were often sparse during the early years, leaving Bosch struggling to keep his workforce busy and pay their wages. He would later say that the beginnings 'were a bit of a shambles'. Construction of the Stuttgart electricity works in 1895 helped change the young company's fortunes, with Robert Bosch landing new contracts to install equipment. Electricity was increasingly becoming an essential part of people's lives, with all the possibilities provided by electrical devices such as making long-distance calls. Who would want to be without a phone today?

01


ROB. BOSCH
Rothebühlstr. 75 B.
Telephone, Haustelegraphen.
Fachmännische Prüfung und Anlegung von Blitzableitern. (37
Anlegung und Reparatur elektr. Apparate,
sowie aller Arbeiten der Feinmechanik.

01 The first advertisement of the Robert Bosch workshop in the daily newspaper (1887)

Magneto

1897

Bosch’s origins as a supplier of automotive equipment began in 1887, when Robert Bosch built a low-voltage magneto ignition device for a stationary engine at the request of a customer. By breaking an electric circuit with the aid of a movable lever, it generated an electric spark to ignite the air-fuel mixture. In 1897, Bosch successfully installed a greatly improved magneto on a motorised three-wheeler. This apparatus, which at first glance appears unwieldy, became a key product for the company.

Five years later, Bosch’s chief engineer, Gottlob Honold, developed the high-voltage magneto ignition system, also known as the electric arc ignition. By means of two coils on the armature, it generated a high-voltage current. This was conducted to a spark plug via a simple cable connection and jumped the gap between its electrodes in the form of a spark. With this new product, the company grew rapidly. Magneto ignition became the standard ignition system in automobiles until around 1930. It was reliable, had a long service life and was suitable for universal use in all common engines.

In 1918, the magneto inspired Honold in his design for the Bosch logo, which still stands today: the armature in a circle.

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01 An advertisement for the Bosch magneto from the Viennese sales agency Dénes and Friedmann (1905)

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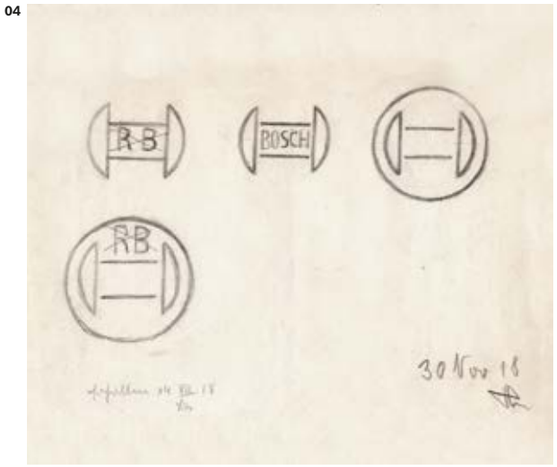

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02 Mechanic Richard Schyle with an early functional model of the magneto (around 1905)

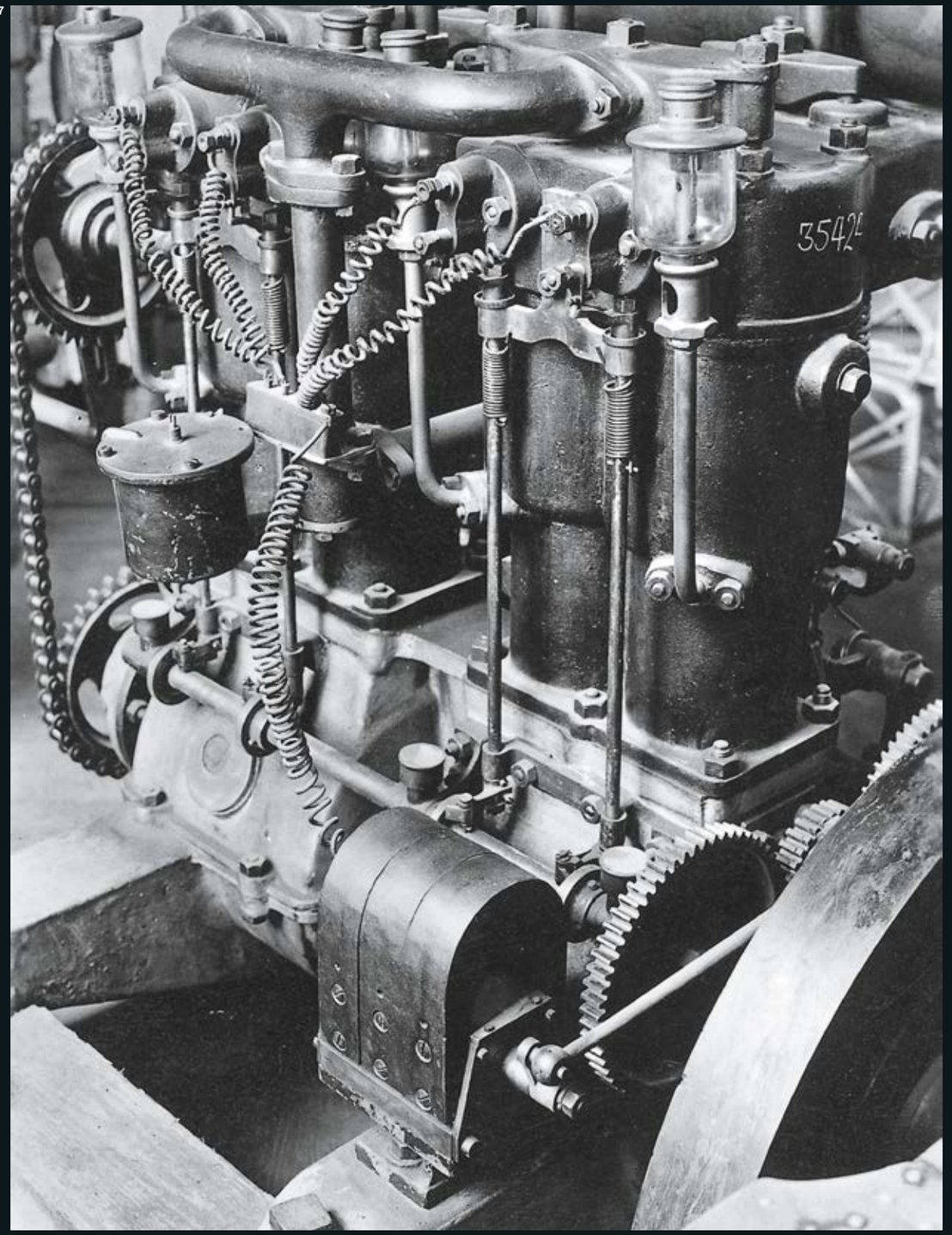
03 A reason to celebrate: Bosch associates present the one-thousandth magneto ignition device (1901)

04 Gottlob Honold’s design for the Bosch logo, ‘Armature in a circle’ (1918)

05 A motor tricycle with built-in Bosch magneto (1899)

06 Workers assembling magneto ignition devices at the Stuttgart plant (1926)

07

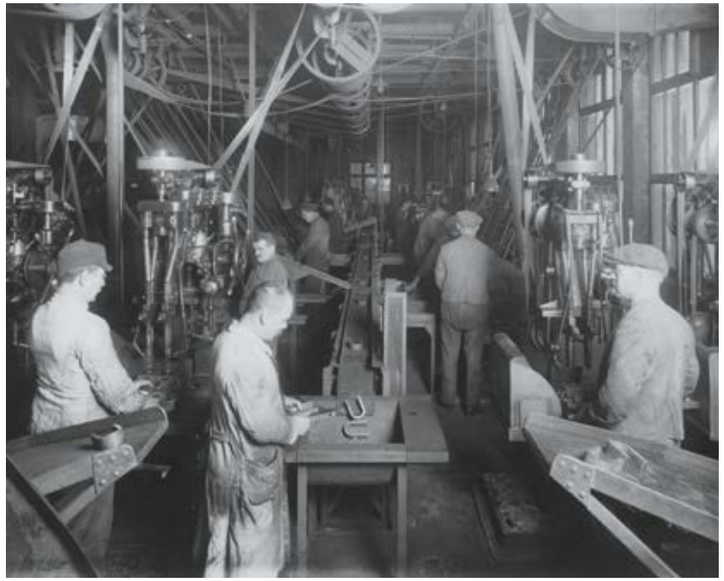


07 Bosch magneto on the engine of the first Zeppelin airship (1899)

08 Working on magneto blanks at the Stuttgart plant (1927)

09 A 1901 veteran vehicle, a French Mors, on the 2023 RM Sotheby's London to Brighton Veteran Car Run. The car is equipped with a Bosch magneto and is now owned by the Royal Automobile Club. Photo by Greg Chalmers.

08



09

Spark plug

1902

The first magneto ignition devices worked with a complicated break-spark rodding to create the ignition spark in the combustion chamber. This rodding had to be redesigned for every engine. It also required considerable maintenance and was prone to breakdown. To remedy these issues, Robert Bosch gave his chief engineer, Gottlob Honold, the brief of designing a magneto ignition device without break-spark rodding in the summer of 1901. After just a few months, he presented the high-voltage magneto ignition system with spark plug. A spark plug design with fixed electrodes had been in use since about 1860. Honold developed a better ceramic for the insulating body and a heat-resisting alloy for the electrodes.

When Bosch demonstrated the new system at a stand at the Paris Automobile Show in November 1902, the audience was not convinced. That inconspicuous spark between the spark plug's electrodes was supposed to ignite the air-fuel mixture? Interestingly enough, it was the spark plug – developed as an indispensable complement to the magneto – that outlived its companion and has been produced by Bosch from 1902 to this day.

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01 A table for choosing the right spark plug (1928)

02 Spark plugs for the Morris vehicles (1928)

03 A standard for the world – spark plugs from Bosch (around 1930)

04 The Bosch advertising figure ‘Red Devil’, with a spark plug (1913)

05 & 06 Female workers manufacturing spark plugs (1925)

Lighting

1913

During the first decade of the twentieth century, car traffic had increased significantly, with cars also driving at a higher speeds. At night that could be dangerous, especially without reliable lighting. With this in mind, Bosch developed and marketed an automotive lighting system, starting in 1913. The Bosch electrical lighting system comprised headlights, a generator, a regulator and a battery. It was the first complete electrical system for cars from Bosch. A filament bulb in a reflector housing illuminated the road, drawing its current from a battery. The battery was fed by a generator that received dynamo-electric power when the crankshaft of the running engine turned. A regulator ensured an even supply of power to the battery.

It was the first all-in-one system available from a single source and it made sure that all the parts were perfectly matched. The Bosch light became increasingly popular. To make vehicles more visible at night and in adverse weather conditions, Bosch also developed tail-lights, position lights, fog lights and later even tailor-made lighting systems for all common vehicle models. When the British C.A.V. and Bosch joined forces in 1932, lighting systems for all kind of vehicles were manufactured in ‘allied excellence’ – as their slogan pointed out – at the London production site.

01

01 A headlight for automobiles (1928)

02

As Light as Day

This is how the road should be in night runs. The speed of the car may then be utilised to the full without risk. The driver must be able to detect any unevenness or bend of the road even a long way off. The feeling of perfect safety depends on the reliability and capacity of the dynamo. For unquestionable superiority and economy in operation, fit Bosch constant voltage dynamo and

The new BOSCH Headlights

03

Night Driving – Light Driving

For lighting up signposts or any particular object, an auxiliary light is needed. This requirement is met by the Bosch spotlight – a small searchlight of long range which can be switched on and pointed by hand in any direction at one operation. It also pilots you in reverse, can be used as an inspection lamp, and a driving mirror by day. Withal an ideal additional item of equipment –

The Indispensable BOSCH Spotlight

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02 & 03 An advertisement for Bosch headlights (around 1930)

04 Women workers in headlight production (1922)

05 A demonstration of the Bosch searchlight (1921)

06 A vehicle for testing headlights (1954)

Horn

1921

In the early days of motor vehicles, horns were anything but common. However, as vehicles became more affordable, traffic grew steadily and safety regulations became stricter. Cities quickly filled with the din of croaking klaxon horns and the tweeting of engine pipes. Another solution had to be found. ‘Clear sound, immediate reaction, wide range, low energy consumption, reliability and agreeable shape’ were the requirements for the new Bosch-Horn, which Bosch applied for patent on 12 April 1914. The result was a buzzer system. It involved an electromagnet that caused a membrane to vibrate, generating a relatively pure sound. Using the ‘closed pipe’ principle from organ-building, the engineers installed a second membrane that generated harmonic frequencies. In combination, the root and the overtone complemented and amplified each other, generating the pleasing, pure sound that would become typical of cars horns. The result was a powerful tone with a range of more than 1 km – and a construction principle which defined the standards of horn technology to the present day.

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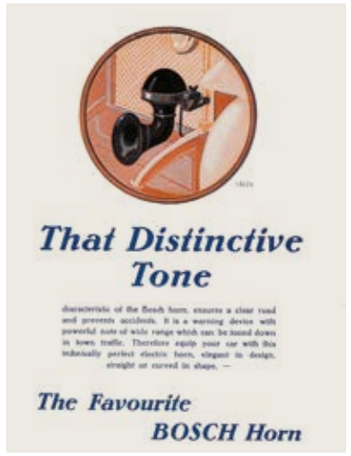

01 An advertisement for the Bosch horn from the 1920s

Bosch Car Service

1921

Early motorists were usually technically skilled and took care of repairs themselves, or they hired a mechanic to look after their expensive vehicles. Over time, cars became more affordable and electrical equipment such as lighting and starters made driving much easier and far more comfortable. As the number of cars rose, so too did demand for professional and expert service.

As an early global player, Bosch had equipped its sales outlets across the world with workshops from the very start. By around 1920, drivers in nearly all countries with a significant number of cars were able to visit those sales locations to buy Bosch products and take advantage of maintenance and repair services – albeit not necessarily in their immediate vicinity. In 1921, the company revived the idea on a larger scale and announced its plans to create ‘bases or support centres … at home and abroad in large cities with brisk motor vehicle traffic’. These ‘bases’ were intended to be independent companies, not directly affiliated with the company, that would handle the sale and installation of Bosch products.

The Bosch Service designation, featuring the Bosch Service lantern logo and a standardised Bosch Service agreement, followed in 1926.

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02

01 Workshop of the Bosch Car Service in Manila, Philippines (1935)

02 Bosch Car Service in Brazil (1961)

03 Bosch Car Service Otto Dürr in Augsburg, Germany (1961)

04 An advertising board of Bosch Car Service in Oviedo, Spain (1958)

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03

Bosch bell

1923

Today, Bosch sensors are found wherever technology is in use. There are several of them in every smartphone worldwide – and in every car. Bosch unveiled its first sensor a century ago: the Bosch bell. This device warned drivers when they were losing tyre pressure.

Car ownership increased significantly in the early 1920s. The boom in motorisation coincided with a shortage of rubber, the basic ingredient of tyres. This made tyres extremely costly, and Bosch advertised the Bosch bell, with the slogan ‘Paying for tyres is the most painful part of driving a car’. A sudden loss of pressure often meant it was too late to save the tyre. However, the Bosch bell could help catch slow punctures. The bell was screwed on to each of the tyre rims and consisted of a mechanical bell mechanism housed in an egg-shaped casing. The spoon-like toggle lever hung over the side of the tyre towards the tyre tread. If the tyre lost air gradually, it would make the sidewall wider, pushing the lever away and triggering a loud ringing sound under the cup. The motorist was warned and could refill the tyre and look into why it was leaking air.

Apart from its function, this smart but relatively simple innovation has little to do with the sensors of today, but it was a start.

01

01 The title page of the technical description of the Bosch bell (1923)

Comfortable driving

1926/ 1928/ 1936

Driving in light traffic and sunshine was easy. However, this changed with the large increase in the number of automobiles in the 1920s. More and more drivers also wanted to be on the road in all weathers. To meet this demand, Bosch developed various solutions that made driving much more comfortable.

The Bosch electric wiper, unveiled in 1926, made driving in the rain considerably safer by ensuring a clear view at the press of a button. Comprising an electric motor, which powered a rubber-lined lever via a worm and gear mechanism, the wiper finally delivered a solution for the problem of bad visibility when it was wet outside.

In 1928, the direction indicator relieved drivers of the need to make hand signals out of the window to warn of a turn. The so-called Bosch trafficator basically consisted of an electromagnet which, when the switch was activated, swung the trafficator arm out of its housing. At the same time, the trafficator arm was illuminated by a bulb in order to make it clearly visible in the dark.

From 1936, the installation of a Bosch car heating system promised much greater comfort when driving in winter. Besides warming up the interior, the car heater cleared fogged-up windshields and provided a clearer view for the driver.

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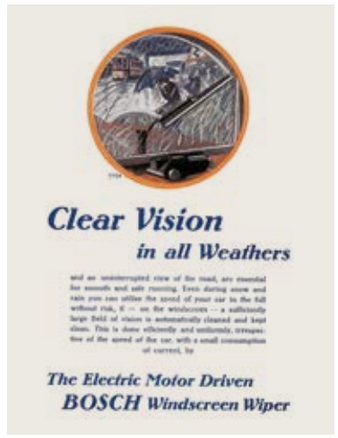

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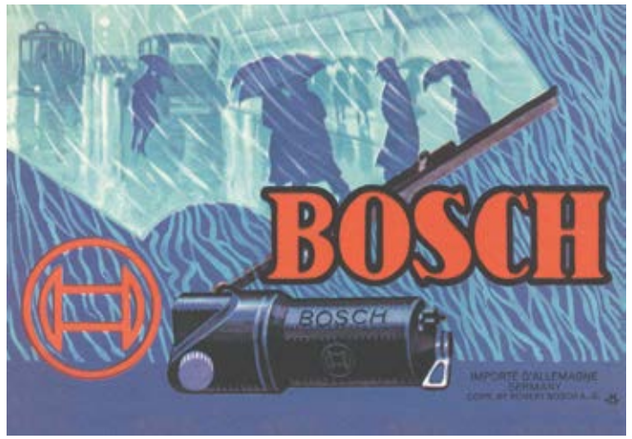

05

01 Cosy warmth thanks to the car heater, advertising motif from 1951

02 An advertisement for the Bosch indicator (1930)

03 & 04 Ensuring a clear view – the Bosch windscreen wiper, advertising motifs from 1926

05 First test drives in winter; already with a Bosch light and starter, but still without other comfortable equipment (1913)

Diesel injection

1927

By around 1920, experts were vaunting the diesel engine as the powertrain of the future. Bosch realised early on how significant this would prove to be. The electric ignition, the most important part of the product portfolio, was not necessary in a diesel engine. Bosch faced a dangerous situation for his company and made a decision: he officially started developing diesel injection pumps in 1922. The first diesel truck was rolled out in Germany in 1924, enabling Bosch to test its new pumps under normal driving conditions. Bosch gave the go-ahead for the series production of in-line injection pumps for trucks on 30 November 1927.

Diesel technology also appeared promising for passenger cars, but for this application the engines and injection pumps were too large, and smaller engines with smaller pumps were not yet powerful enough. However, Bosch was working on a solution in this area, and in 1927, unbeknown to the public, a Stoewer sedan car converted to Bosch diesel technology clocked up more than 40,000 km. It was not until 1936, however, that the first manufacturers ventured on to the market. Mercedes-Benz presented its 260 D car, and Hanomag a 1.9-litre diesel car engine, but it was not until 1938 that the latter was first installed, in the Hanomag Rekord car.

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01 An advertisement for the Bosch oiler by Lucian Bernhard (1914)

02 Workers drilling injection pump housings (1935)

03 Testing a diesel injection pump (1950)

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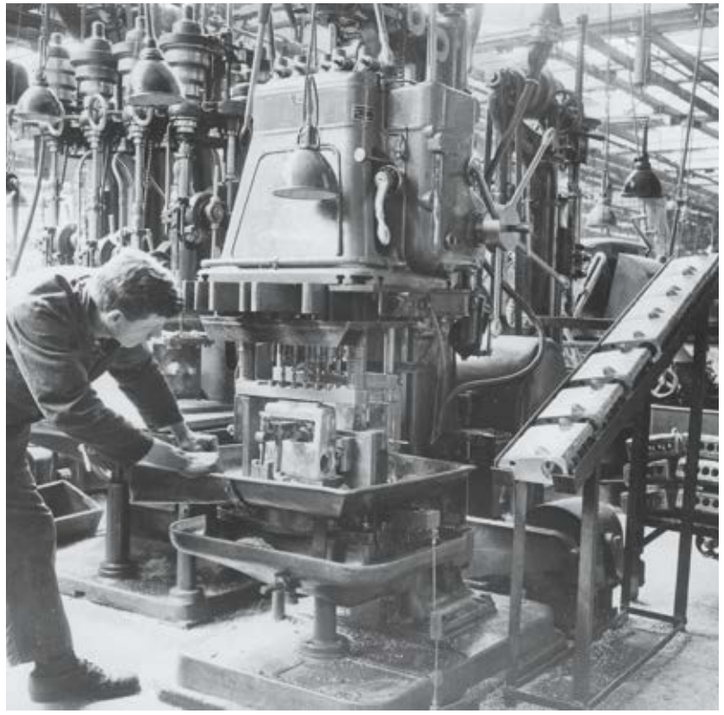

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Forfex

1928

In 1928, the Forfex hair clipper was the first Bosch power tool to be launched on the market. Very popular with hairdressers, the Forfex was the starting point for Bosch to develop other power tools – with the principle of the motor in the handle. From 1930 onwards, Bosch engineers further developed these tools for manufacturing operations at Bosch itself. They proved particularly useful for screwdriving and grinding operations in production. From 1932, Bosch also offered them for construction and craft businesses. The Bosch hammer, the world's first electric hammer drill with a swirl hammer mechanism, proved to be very robust in tough, continuous use. In 1952, another Bosch power tool came on to the market that appealed to the group of DIYers – the Bosch Combi tool. It was based on a handy universal tool with suitable attachments for all kinds of work. The Bosch Combi could be used for sanding, brushing, drilling, milling and grinding. Accessories included the Bosch Combi base, the emery plate with angle table, and the sawing and planing table. From 1984, working with Bosch power tools became even more convenient. The first cordless hammer drill offered construction workers the opportunity to use their power tools anywhere and independently of power connections.

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01 An advertisement for the Forfex curling iron (1930)

02 More turnover in the hairdressing salon, thanks to Forfex (1937)

03 An early power tool – the Bosch hand-held motor (1937)

04 A female worker at a drilling device (1940)

05 A worker with Bosch grinder (1940)

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Car radio

1932

In 1932, the Autosuper 5 (AS 5) marked the first step in the long history of the Blaupunkt car radio. Following the acquisition of Ideal-Werke (later Blaupunkt) by Bosch in 1932, engineers from both companies designed Europe's first mass-produced car radio. Weighing in at a hefty 12 kg, the Autosuper 5 only just about fitted under the dashboard, and could be installed in cars, aircraft or motorboats. The entire number of AS 5 radios produced is estimated at just 400, making it a luxury article, five of which cost as much as a small car. Technical problems also prevented more wide-scale distribution at first. The tubes were not yet able to withstand vibrations from bumpy country roads for long periods. By the time the successor model, the 5A75, came out in 1935, these problems had been solved.

Unlike a radio for the home, however, it had to be rendered compatible with the car. This included fixing powerful antennas across the roof of the car, shielding the radio against interference from the ignition and using vibration-resistant radio tubes. It was not until the 1950s that car radios became an affordable mass product. The Blaupunkt brand is no longer part of the company, with Bosch preferring instead to focus entirely on car multimedia in its role as an original equipment supplier to automakers.

01

01 On the road with the Blaupunkt car radio (1951)

Junkers boiler

1932

With gas-fired products growing more and more popular, safety became an increasingly important issue. In gas-using devices, unused gas could still escape even after the flame went out, creating a substantial danger of explosion and gas poisoning. In 1929, Bosch developed a safety gas switch that was capable of activating itself in mere seconds. Standing between it and the market, however, was a wide-ranging patent held by the Dessau-based heating and hot-water appliance company Junkers & Co. Initial talks proved slow and difficult.

Yet, before an agreement could be reached – and larger-scale marketing activities initiated – the Great Depression changed the situation drastically. With his entire group of companies in dire financial straits, the company's founder, Hugo Junkers, decided in 1932 to sell his natural gas appliance division to Bosch. With its cost- and energy-efficient gas-fired bath water heaters and hot water boilers for kitchens, Junkers thermotechnology had made an important contribution to hygiene. By the late 1950s, however, a new trend was on the horizon. People were demanding higher living standards, which meant having the comfort of both heating and hot water in their homes. In response, Junkers launched their combi boiler in 1966. This device combined two functions – gas central heating and hot water supply.


JUNKERS

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01 Workplace in Junkers gas heater production (1960)

02 Women workers assembling hot-water appliances (1953)

03 Hot water for the kitchen (1905)

04 An advertisement for Junkers hot-water boilers, by Harry Maier (1960)

Refrigerator

1933

‘Practical, elegant, and full of character.’ That was how advertising from 1933 introduced the Bosch electric refrigerator. The model unveiled at the Leipzig spring trade fair stood out from competitors’ refrigerators, mainly because of its rounded drum shape. This new domestic appliance certainly offered a whole range of benefits.

Technical factors meant that a rounded drum shape was cheaper to manufacture than square chests, and also enabled a more energy-efficient design for the refrigeration system. Although its price of 350 Reichsmarks was comparatively low, the refrigerator was nonetheless still beyond the reach of most households. Despite this, a successful product development process had begun. Once it became clear that opinion was divided on both the appearance and effectiveness of the round model, the product planners reacted quickly. The subsequent appliances from 1935 and 1936 used the classic square cabinet shape and had a much larger capacity of 90 and 120 litres, respectively. The technology was continuously improved, with ever-more convenient additions being made to subsequent models. In the 1950s, refrigerator production was in full swing. The Bosch refrigerator became the ‘helping hand in every kitchen’.


Bosch


kälter

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01 A kitchen with a Bosch refrigerator (1933)

02 Food and drinks always well chilled (1936)

03 Refrigerator assembly at the Giengen plant in Germany (1952)

04 An advertisement with a housemaid filling a Bosch refrigerator (1933)

05 An advertisement for the refrigerator (1955)

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Gasoline injection

1951

As early as 1912, Bosch began experimenting with gasoline injection. What the researchers wanted to achieve was a precise supply of fuel to both stationary and vehicle engines. The attempts were not yet successful, mainly because engine performance had not met expectations. Gasoline injection's opportunity finally arrived with the demands of aviation in the 1930s. Compared to the commonly used carburettor, gasoline injection ensured greater reliability, as well as more power.

In 1951, Bosch gasoline injection was presented in a two-stroke Gutbrod Superior 600 and a Goliath GP 700 at the Frankfurt auto show. With its precise fuel metering, it reduced the vehicle's gasoline consumption by some 20 per cent and increased its power – from 23 to 28 horsepower – in the Gutbrod Superior. The increased power that the fuel-injected four-stroke engines delivered was also the main selling point of the Mercedes-Benz 300 SL sports car. This was the first series-produced four-stroke vehicle with direct gasoline injection, introduced in 1954. Followed by an indirect injection system for large-series engines, the fuel-injection system was established in the car and replaced the carburettor.

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01 Advertising poster for the Gutbrod Superior vehicle (1953)

02 A gasoline-injection pump on the engine of a Gutbrod Superior (1952)

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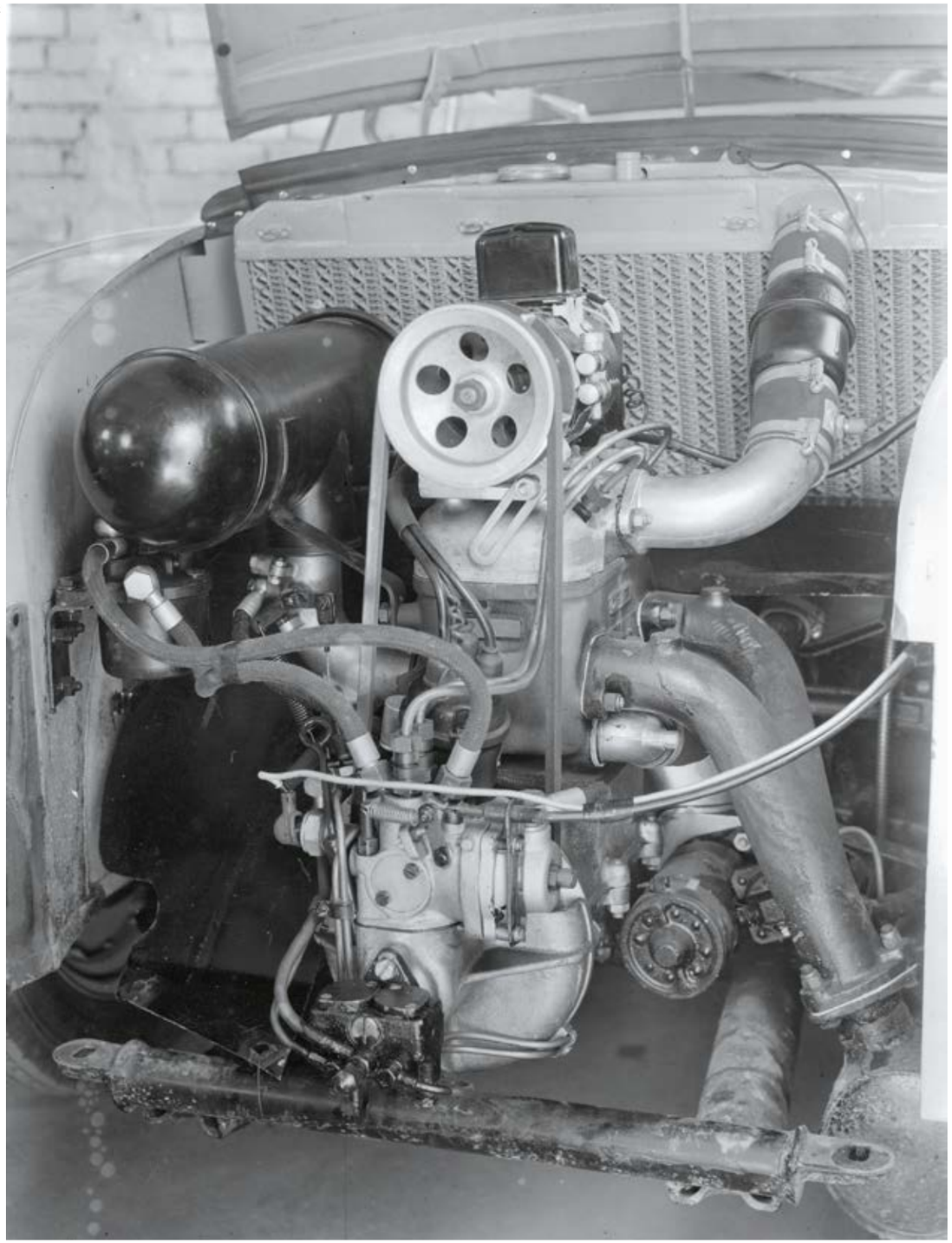


Kitchen machine

1952

According to the results of internal Bosch research, a housewife required a daily intake of 3,700 calories to cope with various tasks – the same as that of a railway engine driver. Strenuous and time-consuming activities were part of daily life for the average housewife. In the kitchen, she mixed, kneaded, chopped, sliced, passed vegetables through a sieve, made purées, grinded, grated – all for the physical welfare of the family. At any rate, it was the often-overlooked housewife who inspired Bosch engineers in 1952 to develop a piece of equipment that greatly eased the burden of household chores: the Bosch New Age kitchen machine. It effortlessly performed all the drudgery involved in food preparation, and the energy it required came exclusively from the wall socket. A pear-shaped baseplate formed the basis. While the wider end of the baseplate provided space for a mixing bowl, the narrower end housed the 400-Watt-motor. The kitchen appliance could be conveniently tilted sideways and, in this stable position, could mince large amounts of meat with the help of a specific attachment. Further functions were performed by the mixer, the strainer, the coffee grinder and the cutting and grating disks, as well as the mixing bowl with mixing arm. Today's Bosch kitchen machines are equipped with SensorControl Plus automatic programs and a powerful 1500-watt motor. The basic principle, however, is still the same.

01

01 An advertisement for the kitchen machine – 'The housewife's support' (1952)

02

03

02 A demonstration of the kitchen machine at the Bosch sales office in Stuttgart (1962)

03 The kitchen machine at a trade fair presentation (1979)

04 An advertisement for the Bosch kitchen machine (1955)

04

Washing machine

1958

At the beginning of the twentieth century, washing clothes was still a very physically demanding and time-consuming affair. The washing had to be transferred to and from several vats for soaking, washing and rinsing. In 1949, Bosch launched the sonic washer on to the market, which was designed to get dirt out of the washing through vibration. The benefits of this machine included its lightweight design and simple handling, but it did not mean an end to hard work, because most of the steps in the washing procedure remained the same. Nonetheless, it was the beginning of a path which Bosch continued to explore.

In 1958, the Bosch W5 automatic washer was introduced, a machine that was completely different from anything that had gone before. It took care of virtually every part of the washing process. The water was drawn in a drum, where the laundry was then cleaned by rotation using detergent. The simple turn of a knob was enough to pump out the wastewater and rinse. However, the first Bosch washing machine could not spin the washing and so the wet and heavy clothes had to be heaved into a separate machine. This changed in 1960, when Bosch brought the first fully automatic washing machine to the market, integrating washing and spinning in one device. It was also space-saving and could fit into every kitchen.

01

01 An advertising brochure for the first Bosch washing machine (1958)

02

03

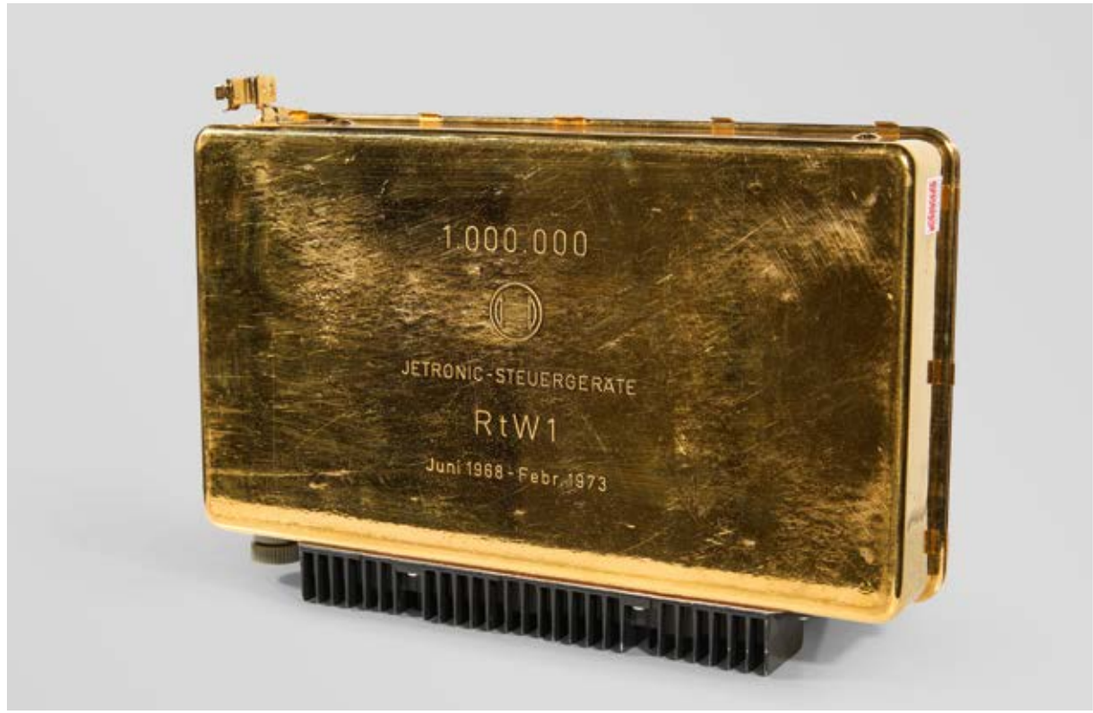
02 & 03 Advertisements for a washing machine, with a housewife and her daughter, from 1958 (left) and 1961 (right)

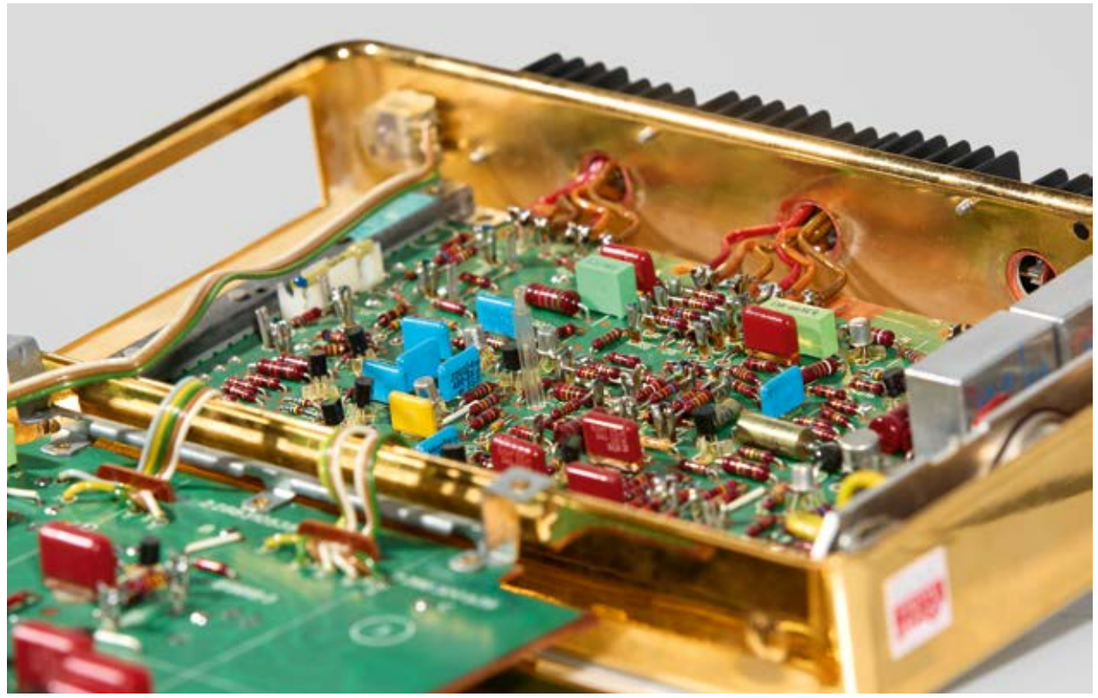
Jetronic

1967

The key breakthrough for this new technology came after 1967, when the Clean Air Act was passed in the state of California, and emissions legislation became tougher. Only with electronic gasoline injection were many models able to comply with these emissions standards. The know-how Bosch had gained gave it a decisive advantage. As early as 1959, tests had begun on converted vehicles, and the first systems were practically ready for production by 1965. The concept that Bosch presented in 1967 was a promising one. The electronic D-Jetronic paved the way for electronic open-loop and closed-loop control systems to become established in the automotive industry. For example, the Volkswagen 1600 E – launched in the US in 1967 – was only able to comply with the new US emissions standards thanks to the Bosch Jetronic system. It is hardly surprising that manufacturers such as BMW, Citroën, Mercedes-Benz, Opel, Porsche, Renault, Saab and Volvo had already turned to Jetronic by 1972, and that this contributed to the system's success – first in the US and then in Europe.

More variations of the Jetronic design were to follow. These electronic injection systems had another remarkable side-effect, in that they were maintenance-free over the entire service life of the vehicle.





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01 Components of the D-Jetronic from 1967

02 Measurements of the Motronic electronic engine management system at the Technical Centre in Schwieberdingen, Germany (1983)

03 Testing the Jetronic in the laboratory (1970)

04 Electrical measurement of the Bosch Motronic (1985)

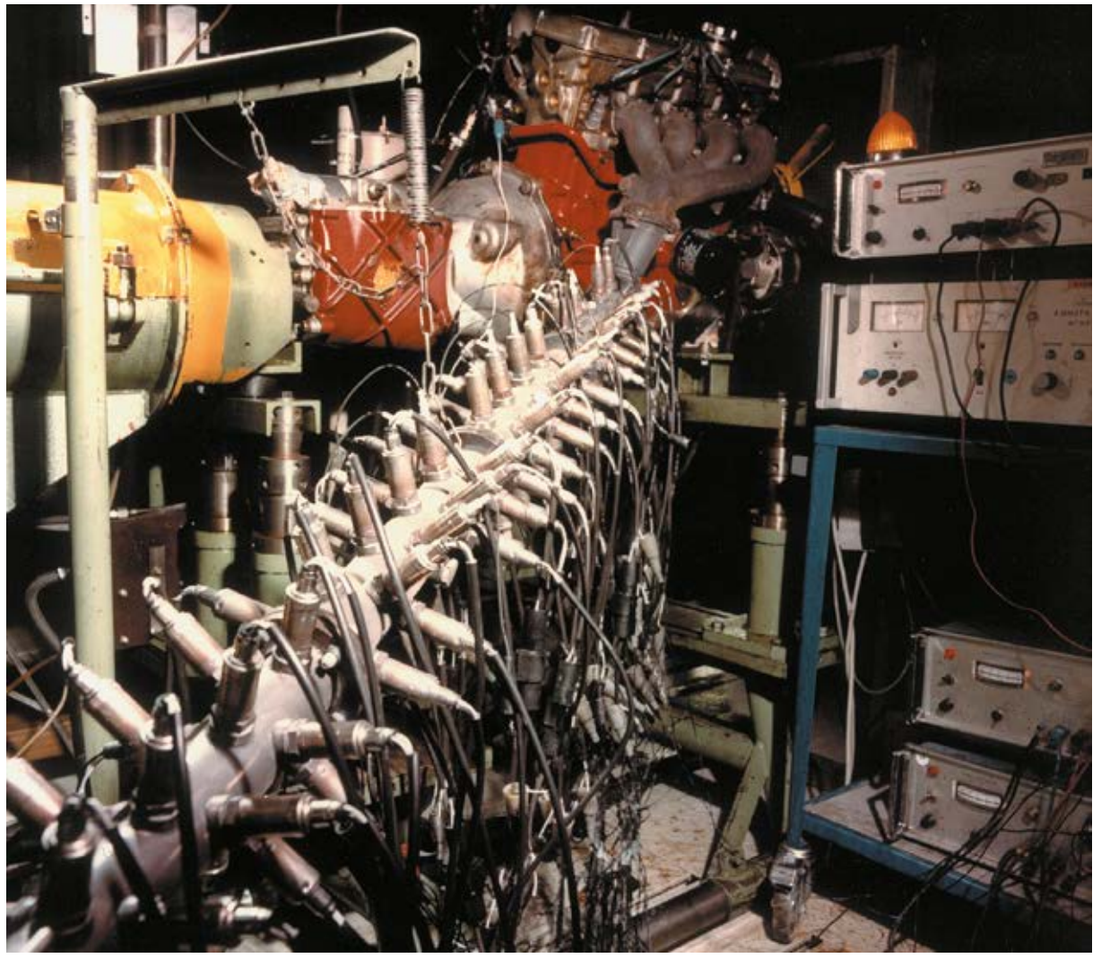
Lambda sensor

1976

At Robert Bosch GmbH, the topic of thermodynamic relationships took on major significance in 1968. The company had started to use the technology required for the lambda sensor to measure the oxygen content in the lead smelters used for producing batteries. This expertise would go on to prove its worth when the environmental agencies in the United States announced strict exhaust emissions laws in 1970. Bosch recognised the impact this would have and started to experiment with lambda sensors for mixture regulation. Insights from other business units also flowed into the process. Knowledge about manufacturing heat-resistant ceramics in spark plug production provided the suitable materials, as the sensors had to be able to withstand exhaust temperatures of up to 1,000°C.

The lambda sensor, launched by Bosch as a world first in 1976, allowed for the operation of a controlled three-way catalytic converter. The role of the catalytic converter was to after-burn the emissions created by the incomplete combustion. The lambda sensor's role was to measure the oxygen content in the combustion products before they reached the catalytic converter as they are expired. After all, the required 90 per cent reduction in exhaust emissions could only be achieved if the sensor identified errant exhaust gas compositions, passed this information to the engine management system (ignition and injection) and thus ensured the necessary corrections in the mixture provided.

01



02

01 Testing of lambda sensors (1984)

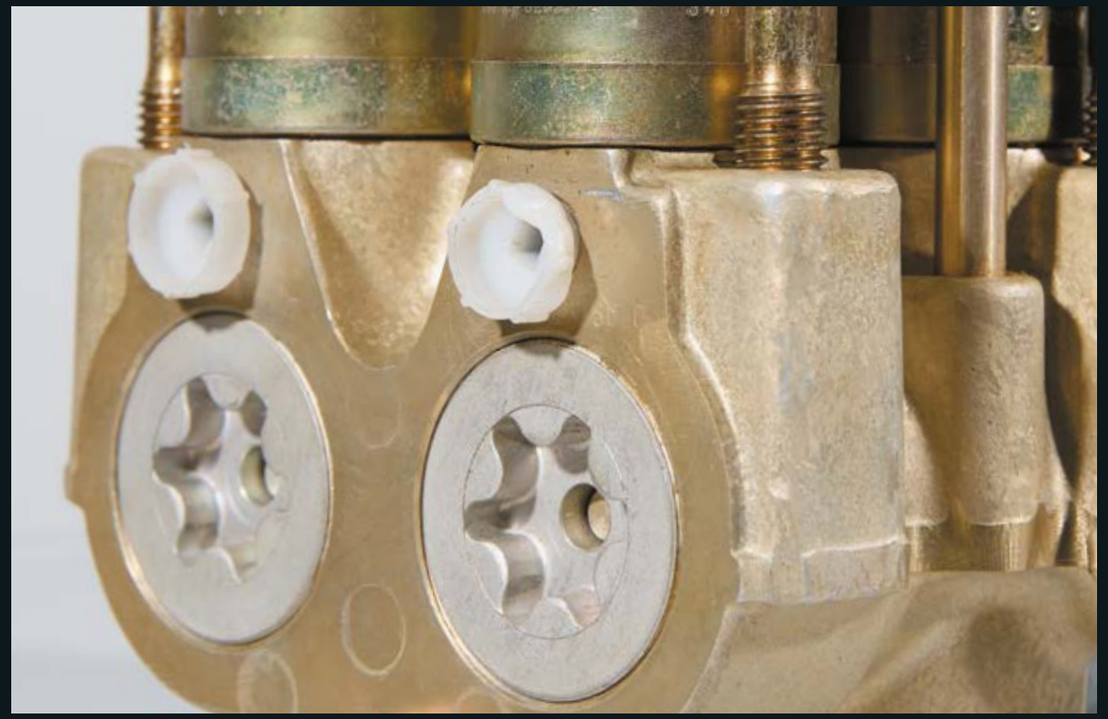
02 A test field for lambda sensors (2000)

ABS + ESP

1978 / 1995

As early as 1936, Bosch registered a patent for a ‘mechanism to prevent locking of the wheels of a motor vehicle’. The availability of semiconductor technology, starting in the 1960s, set the stage for what was to come. In 1978 ABS 2 was unveiled, Bosch’s first production-ready electronically controlled antilock braking system. The ABS reliably stopped wheels from locking-up under heavy braking and kept vehicles steerable, helping to avoid uncontrolled skidding following emergency braking in many cases. From the start, the additional safety was undisputed. ABS 2 and its successors gradually became standard equipment in all vehicle segments.

A few years later, Bosch engineers started working on the idea of an anti-skid mechanism to support the ABS and keep the vehicle stable while braking in corners. In 1995, the new electronic stability program (ESP) was presented. It used sensor signals to continuously compare the actual movement of the vehicle with the direction specified by the driver. If a rapid analysis of this data in the control unit indicated that a dangerous – and uncontrollable – situation was imminent (e.g. skidding), ESP intervened to correct this. By reducing the engine torque and braking each wheel individually, the system helped to avert accidents by preventing the vehicle from breaking away or skidding, and by stabilising the car.



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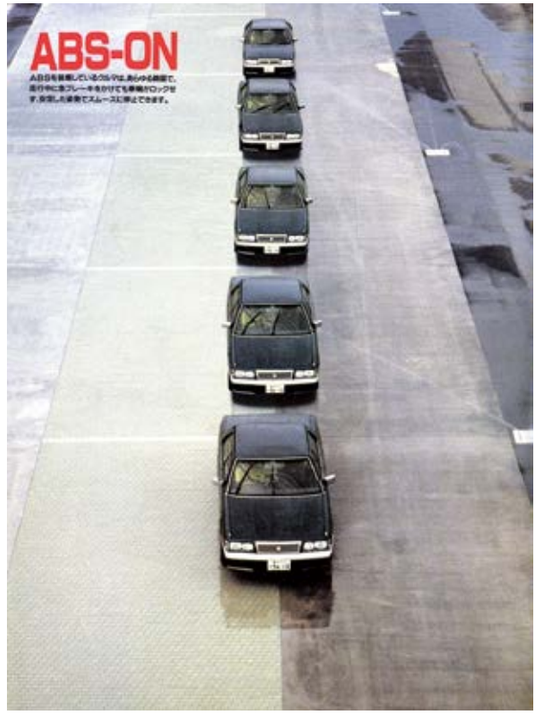


02

01 & 02 A demonstration with and without ABS (1984)

03

04

05

03 Test site in Sweden for winter testing of ABS (1978)

04 Challenging test conditions for ABS on ice in Arjeplog, Sweden (1975)

05 Commercial vehicle testing ESP (2001)

Airbag

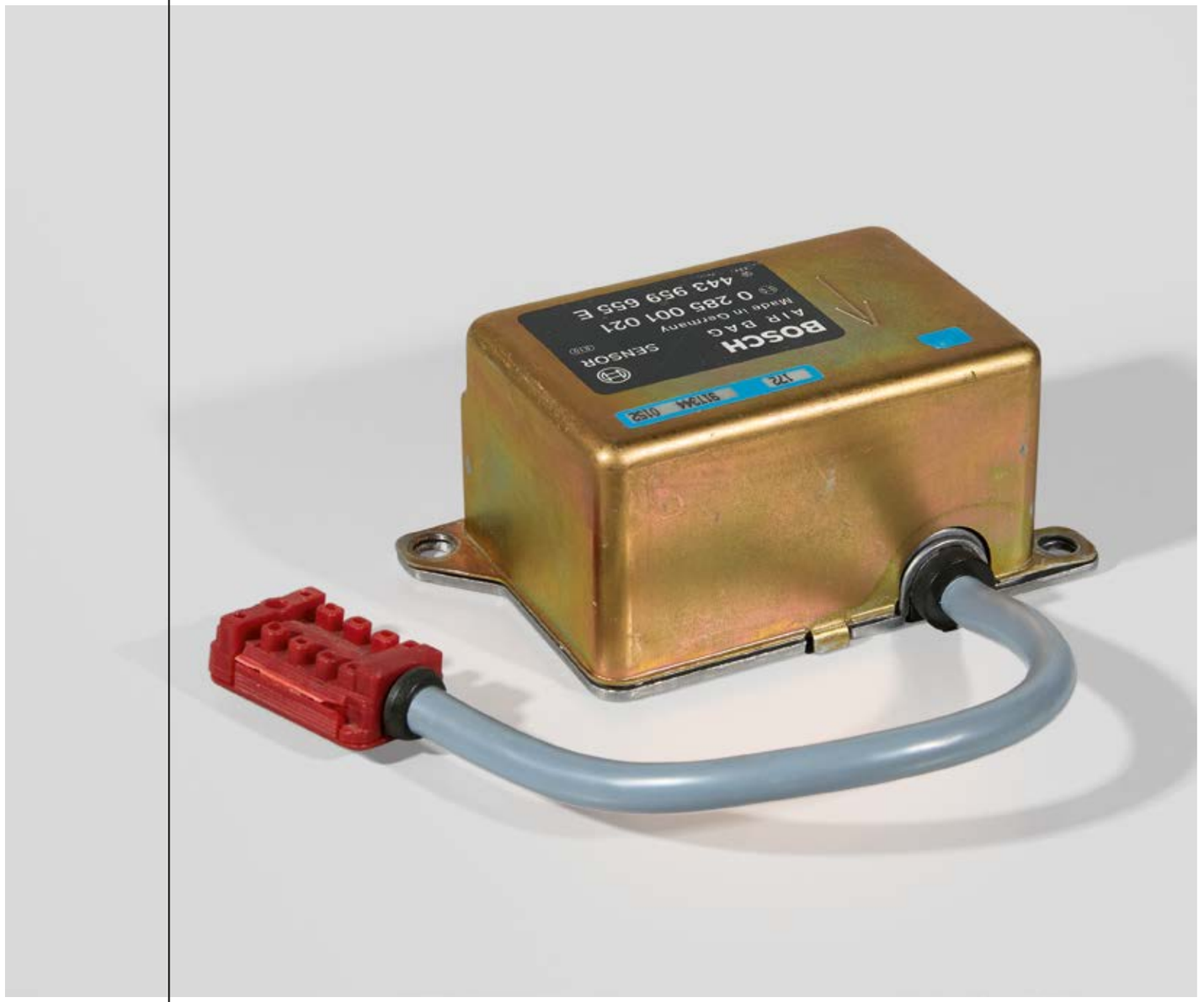
1980

A plastic airbag that inflates within milliseconds of the start of a collision marked a major improvement in the protection provided to a vehicle's occupants. In the worst case, when impact was unavoidable, serious consequences and injuries could be mitigated or even prevented altogether. The control unit used to trigger the airbag system played a crucial role here. A 'triggering apparatus for an inflation process in a bag', for which Bosch applied for a patent in the spring of 1976, marked the first important step in development at the company. One key component of this apparatus was an acceleration sensor that measured the deceleration on impact in relation to time, so the protective airbag was inflated at the right time. The device's tasks were complex right from the start. Accidents needed to be identified accurately and the severity gauged, and then the airbag and belt tensioner had to be triggered at the right time. The electrical and electronic components were also monitored constantly to prevent improper actuation, and to display information on the system's availability and functionality.

Bosch's electronic control unit for passive restraint systems went into series production in 1980 and saw its first use in the Mercedes-Benz S-Class in 1981. Still, even though airbag systems are always standing by to ensure the safety of all vehicle occupants, the safest course of action is to prevent any need for their use in the first place.

01

01 Greater safety, thanks to the airbag and safety belt tensioner (1980)



Navigation system

1989

Finding your way around unfamiliar surroundings has long been a problem for motorists. Bosch engineers were determined to find a solution that would make it faster and safer for people to get to where they needed to go. The prototype driver navigation system was unveiled in 1983, and it proved ground-breaking: EVA was the first-ever experimental autonomous navigation system. It had a digital map with destinations translated into a number code. Once the start and destination coordinates had been entered, EVA autonomously calculated the best route. Wheel sensors recorded the routes taken and any changes in direction, and compared the vehicle's movements with the selected route. This made it possible to carry out updates if the driver accidentally took a wrong turn. The system was not ready for series production at that time, as it would have been necessary to create digital data for large areas. However, the fundamental principle of EVA is the basis for all navigation systems used today. By the mid-1990s, the satellite-assisted positioning system GPS was introduced, and thus Bosch was able to introduce its TravelPilot with integrated voice output function in 1995. As a result, drivers could keep their eyes firmly fixed on the road ahead.

01

01 The prototype driver navigation system EVA was the first ever experimental autonomous navigation system (1983)

Swivel-arm robot

1984

About forty years ago, ‘silent helpers’ who carry out their work with a precision measured in hundredths of a millimetre found their way into manufacturing facilities: swivel-arm industrial robots. Behind each robot lies a complex, computer-controlled technology that permits it to work with great precision. Without them, manufacturing that requires maximum precision would be unthinkable. Bosch had already begun to develop swivel-arm industrial robots in the early 1970s. Within the framework of a project promoted by the German Ministry for Research and Technology, Bosch’s Industrial Equipment Division developed a prototype that was first used in 1976. This prototype could handle heavy loads of up to 50 kg. It was the first swivel-arm industrial robot of its kind anywhere in the world. Although the market situation and the high costs made series production impossible at that time, development continued. In 1984, after having been successfully tested on their own production lines, Bosch introduced the assembly swivel-arm robot SR 800. The technology had been improved and, above all, costs had been reduced far enough to remove the last barriers to introduction on the global market.

Today, Bosch is a supplier in the area of special purpose machinery around the world.


BOSCH

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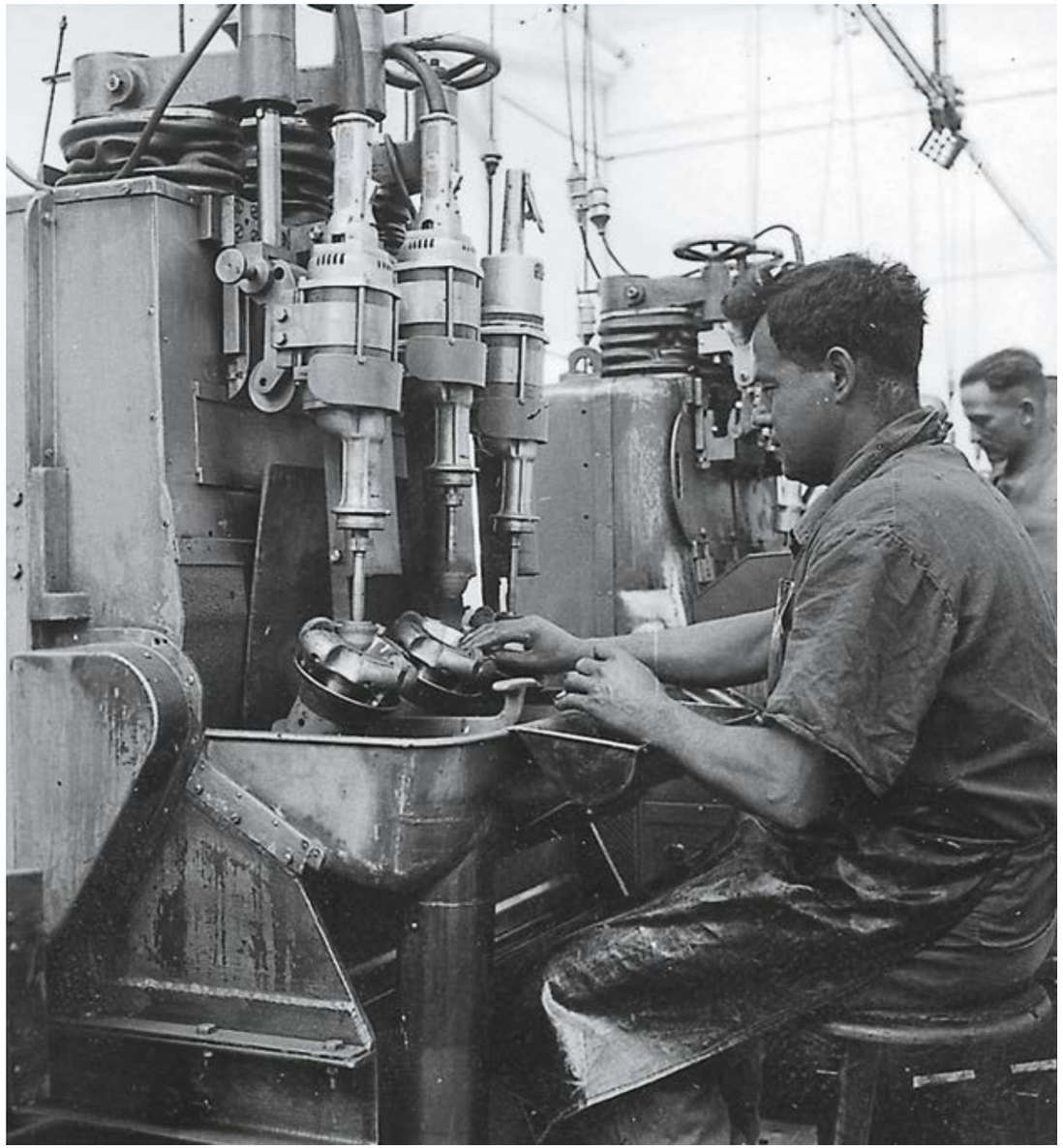
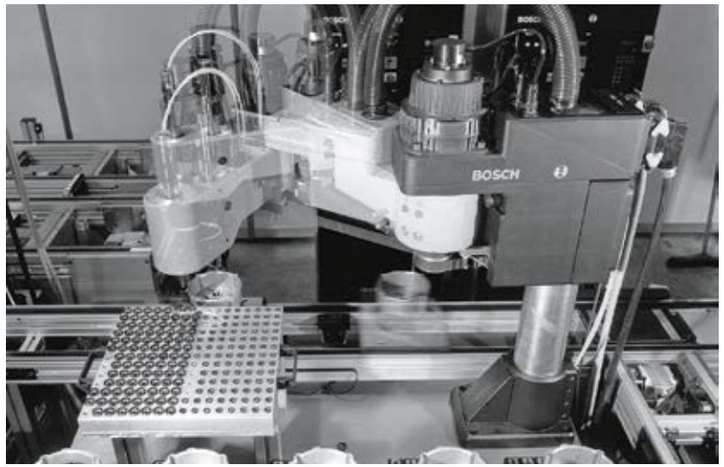


01 Bosch high-frequency grinders were used on the company's own production line (1936)

02 & 03 The Bosch swivel-arm robot helped make production faster and more precise (1986)

04 IoT and AI help with manufacturing – throughout the entire process like smart swivel-arm robot APAS (2022)

02



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Ixo cordless screwdriver

2003

With the Ixo, Bosch brought the world’s first cordless screwdriver with a lithium-ion battery to market in 2003. This handy device is used for many small screw-driving and assembly tasks in the household. Over the years the Ixo became a cult screwdriver with many benefits. The possible applications are as varied as the DIYers and their projects themselves. The Ixo Collection therefore offers a wide range of adapters for drilling, cutting and screwdriving, as well as for use as a barbecue fan, corkscrew or spice mill. Today, the LED light ring fixture gives a consistently clear view, without any shadows, when screwdriving. Another benefit is the very low self-discharge rate. Once charged, most of the energy is still available even after a year without use, so the Ixo is always ready to go. At the same time, the Ixo fits well in the hand, thanks to its ergonomic shape and extensive soft grip. It also has incredible endurance: DIYers are able to process up to 190 screws quite easily with a single battery charge.

01

01 The Ixo cordless screwdriver is multi-functional and can also be used as a corkscrew (2022)

Wind turbines

2009

The desire to harness green energy with sustainable and environmental credentials has led the manufacturers of wind turbines to develop innovative technology to derive solutions that create as much electricity as possible.

Bosch technology has helped to increase power output from larger turbines that are usually deployed in offshore, deep water locations.

Bosch technology has included developing specialist subsea handling equipment to position foundation piles to the seabed and creating the inventory necessary to optimise the turbines ability to harness the wind. This has involved placing the blades in the optimum position to maximise efficiency combined with innovative solutions to aid maintenance. This technology – developed in the UK – has resulted in wind turbines with practically twice the power and size of the first generation types deployed in the Hornsea Wind Farm – standing 361m tall and able to yield outputs to a maximum of 15MW per turbine.

Indego

2012

After its launch in 2012, Bosch's Indego robotic lawnmower was for many years the only robotic lawnmower offering intelligent, parallel-line navigation as opposed to random 'pinball-style' mowing. The Bosch LogiCut navigation system maps the shape and size of the lawn that is to be mowed - and remembers where it has already mown.

This reduces the amount of time the mower is required on the lawn by up to 40% - saving time and effort. Indego quickly became the market leader and in 2015 Bosch built on that success when Indego became the very first robotic lawnmower to give users the ability to manage their mower remotely, from wherever they are in the world, via an app.

Vivalytic

2018

Vivalytic is a universal platform for molecular diagnostics that can carry out many complex tests fully automatically. In developing the analysing system, Bosch Research used its core competencies in sensor technology, automation, miniaturisation and connectivity. The system automates the entire process, from preparing the sample to producing the results. When an infection occurs, the cause of the disease must be identified as quickly as possible. Laboratory employees simply take a cartridge, which already contains the necessary chemicals for the analysis, and fill it with the sample material. Then they insert the cartridge into the Vivalytic Analyser, which treats the sample materiel with ultrasound. The generic materials are then extracted and duplicated. In the next step, bioanalytical testing and analysis are performed. Finally, the device intuitively presents the results.

In March 2020, shortly after the outbreak of the Covid-19 pandemic, Bosch succeeded in developing and launching a rapid test for detecting infection with the SARS-CoV-2 coronavirus. Since then, the innovative system has become an indispensable tool, both in the laboratory and for tests at the point-of-care. The test portfolio is constantly being expanded.

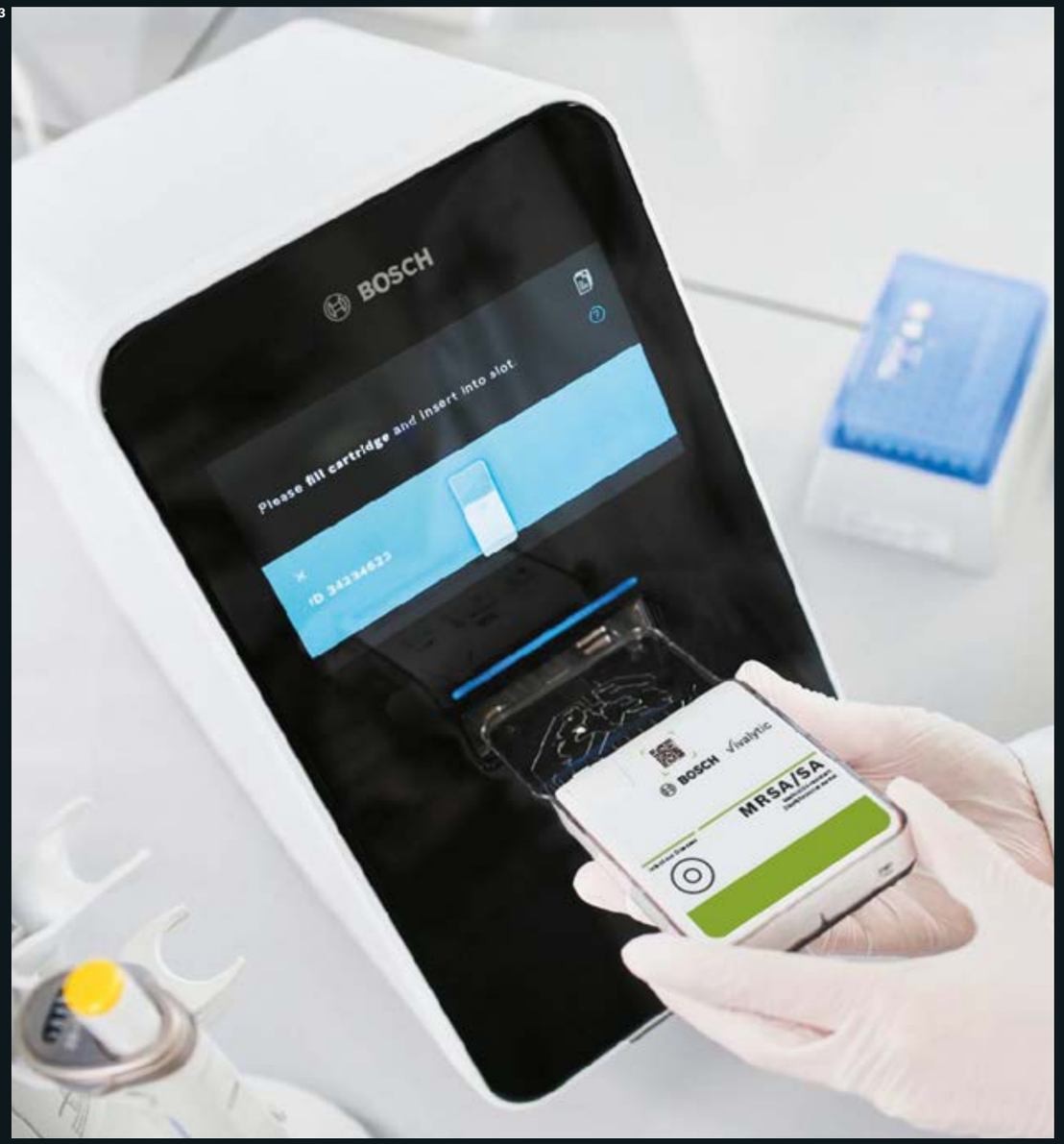
01

02

01 Robert Bosch in the pharmacy of the Robert Bosch Hospital (1940)

02 A video technology system from Bosch is used during an operation at the eye clinic of the University of Frankfurt (1975)

03



03 A test cartridge is inserted into the Vivalytic analyser (2020)

Cordless Rotary Hammer

2020

BITURBO Brushless is the most powerful cordless power hammer on the market. It can deliver corded performance using a single 18V battery. With a maximum drilling diameter of 45mm in concrete and an impact energy of 12.5 J it is a 18V cordless equivalent of a 8 KG corded rotary hammer.

It features a number of measures to protect the user including vibration reduction counterweights and a decoupled handle. This is designed to provide additional comfort and safety for the user. It also features Soft Start, Electronic Precision Control and Adaptive Speed Control for comfortable and precise work processes whilst drilling and chiselling. Finally it features an intelligent user interface with Bluetooth connectivity which helps to avoid unexpected work interruptions and allows instant updates and individualised tool settings.


BOSCH

Secure Diagnostic Access

2021

Bosch has a long track record of providing customers with a complete range of diagnostic and workshop equipment – and a full range of spare parts – for passenger cars and commercial vehicles. Modern vehicle electronics are increasingly threatened by tampering and hacking attacks. More and more vehicle manufacturers, therefore, protect access to the diagnostic data of their new vehicle models. As a result, car repair shops no longer have full access to vehicle electronics. Instead, where available, they must first obtain access to these records via the respective manufacturer-specific gateways and payment concepts.

Many vehicle manufacturers have different access requirements and payment concepts for accessing their vehicle data. As a consequence, the access process can be particularly challenging for independent car repair shops. To address this Bosch has developed Secure Diagnostic Access (SDA), a central, integrated and standardised solution, which allows easy access to protected vehicle electronics.

SDA enables central access to the various participating manufacturer solutions by using a single ID consisting of an e-mail address of the repair shop employee and a password. This single ID cannot just be used for SDA – it can also be used for other Bosch applications such as booking technical training courses at Bosch Service Training Centres or for smart home applications.

Wafer

2021

From cars and e-bikes to household appliances and wearables – semiconductors are an integral part of all electronic systems. The story started for Bosch in the 1960s, with semiconductor technology that made it possible to use electronics in cars. Integrated circuits and hybrid circuits enabled new products such as the ABS anti-lock braking system to become reliable million-sellers. Unlike mechanical circuits, they are capable of analyzing processes in milliseconds and effecting necessary changes. To connect each electronic system with the next to ensure smooth interaction. Bosch brought the Controller Network Area to market in 1991 which enabled the exchange of information between actuators, electronic control units, and sensors. Sensors play an important role in ensuring that electronics function optimally. First developed in the late 1980s, microelectromechanical sensors (MEMS), were a milestone. MEMS can be manufactured using a procedure similar to electronic switches. On a single 300mm wafer like this one, thousands of integrated circuits or MEMS can be manufactured. After a sophisticated photochemical process that can take months, the wafer is split up into the individual components, known as chips or microchips. For MEMS, Bosch developed an innovative plasma etching production process that makes it possible to precisely form the tiny movable structures one can barely see without a microscope. Known as the “Bosch process,” it has since become the global standard in microelectronics.

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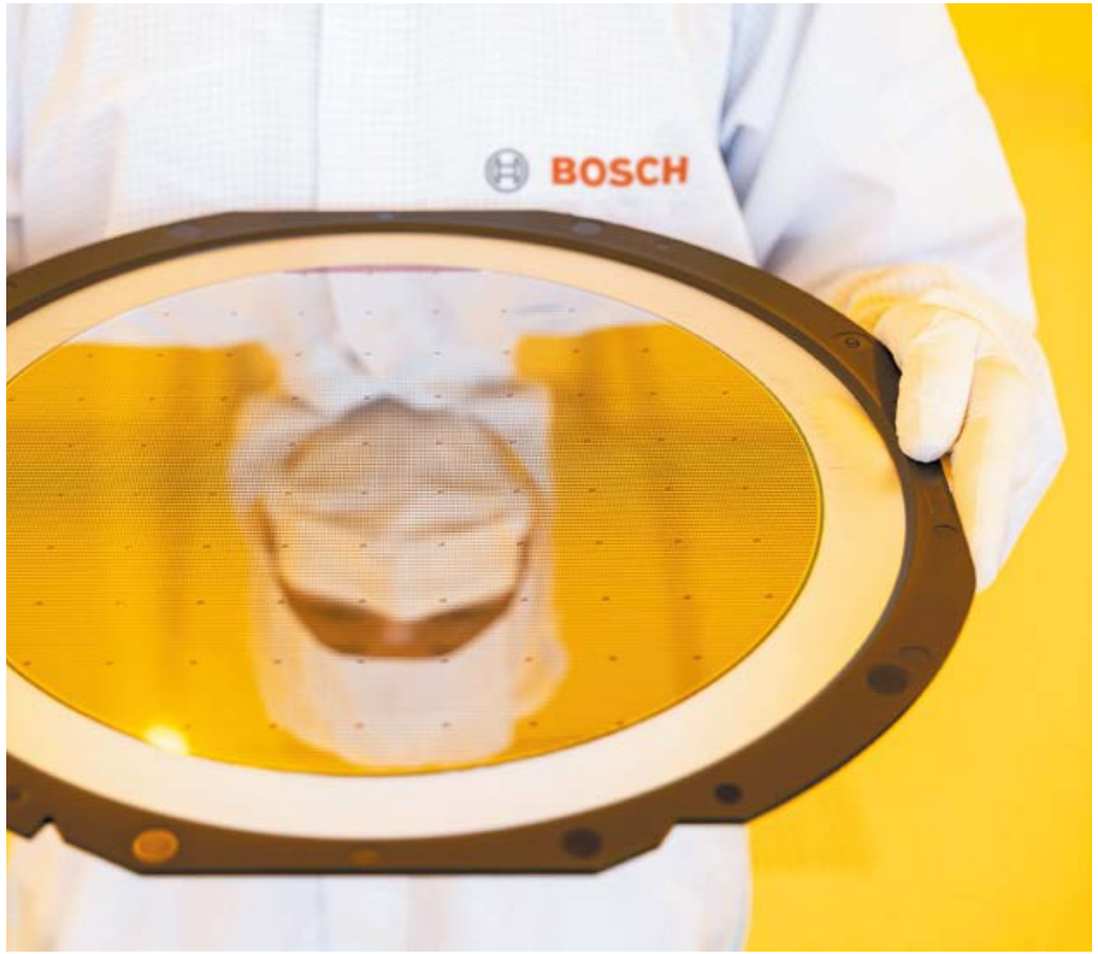

03

01 The cleanroom of the semiconductor plant in Dresden is illuminated with a special yellow light that contains no ultraviolet radiation (2021)

02 300-millimetre wafers from the production line in Dresden (2021)

03 AI-assisted adjustment work of a robot arm that is part of the semiconductor production process in Dresden (2021)

MIC IP Starlight camera

2022

The Bosch “MIC IP starlight 7100i” camera is one of the most advanced of its kind. With starlight imaging technology and excellent lowlight sensitivity, the camera is the perfect solution for robust and high-quality imaging needs. The camera is designed specifically to operate in demanding environments and it therefore exceeds the capabilities of conventional IP (internet protocol) cameras. It is highly reliable and operates even in areas subject to harsh shock/vibration conditions and extreme weather. In short it delivers reliable, high quality video images.

Because the camera is an ideal choice for a wide range of environments it is very popular in the transportation (highways, bridges/tunnels and ports) and critical infrastructure settings. The camera is able to deal with complex scenes and can be used in mission-critical applications involving harsh environments that require high-resolution imaging.

Hydrogen boiler

2022

Hydrogen technology is coming to the fore in the debate around climate change and the UK's commitment to achieving net zero by 2050. Within the UK more than 80% of homes (23 million) are connected to the gas grid and domestic heating accounts for about 15% of the UK's CO2 emissions. Every year about 1.6 million boilers are installed across the UK.

Worcester Bosch has developed the 1st hydrogen ready boiler in the UK. A hydrogen-ready boiler is a gas-fired heating boiler which is capable of burning either natural gas or pure (100%) hydrogen. Hydrogen-ready boilers are the key to enabling conversion of the existing gas distribution networks from natural gas (which is mostly methane) to hydrogen. Hydrogen is a carbon free energy carrier and combustion of hydrogen produces no carbon dioxide or carbon monoxide at the point of use.

Hydrogen can be manufactured from water using electricity as a renewable energy source, or from natural gas accompanied by carbon capture and storage. A hydrogen-ready boiler is intended to provide a like-for-like replacement for an existing natural gas boiler, allowing the appliance to be replaced with a hydrogen-ready variant when it reaches the end of its natural life. A hydrogen-ready boiler can be quickly and easily converted to burn hydrogen at the time when the local network switches over.

Series 6 freestanding fridge freezer

2023

Fridges are now commonplace in most households. The Series 6 fridge freezer is the latest in a long line of Bosch developments in refrigeration. Rated Energy Efficiency A with near 0°C climate-controlled compartments, this fridge ensures that fruit and vegetables remain fresh for longer, helping to reduce food waste. The “No Frost” technology means that defrosting the freezer is a thing of the past, saving time and effort. The metal back wall evenly circulates cool, fresh air to maintain consistent temperatures across all levels of the fridge. The fridge is designed to be fitted right next to walls, furniture and other appliances to save space and create flexibility in kitchen design.

Chronology

1886 Foundation of the Workshop for Precision Mechanics and Electrical Engineering, Stuttgart, Germany

1897 First production of magneto ignition systems in a motor vehicle

1898 First sales office outside Germany opens in London, United Kingdom

1901 First factory building opens in Stuttgart

1905 First manufacturing site outside Germany starts in Paris, France

1906 Eight-hour working day introduced

1906 First sales office in the US opens in New York

1906 First sales office in Africa opens in Johannesburg, South Africa

1907 First sales office opens in Melbourne, Australia

1909 First sales office opens in Asia opens in Shanghai, China

1912 First manufacturing site outside Europe starts in Springfield (MA), USA

1913 Apprentice training department opens with a dedicated workshop

1913 First Production of the Bosch automotive lighting system

1918 Armature in a circle trademark introduced

1919 First issue of the associate newspaper Bosch-Zünder

1920 Foundation of Hanseatische Notruf AG

1921 The first Bosch Service repair shop opens in Hamburg, Germany

1927 First production of diesel injection technology

1928 First production of power tools (Forfex hair trimmer)

1929 Foundation of the Bosch-Hilfe retirement and surviving dependants' providence fund

1932 Acquisition of heating systems business of Junkers & Co. GmbH in Dessau, Germany

1932 First production of Europe's first ready-for-series production car radio

1933 First production of household appliances (refrigerator)

1940 Opening of the Robert Bosch Hospital, Stuttgart, Germany

1951 First production of gasoline-injection technology for passenger cars

1953 First production of hydraulic power units

1964 Foundation of Robert Bosch Stiftung (Robert Bosch Foundation)

1967 Foundation of Bosch-Siemens Hausgeräte GmbH

1967 First production of the Bosch Jetronic electronic gasoline injection system

1976 First production of the world's first lambda sensors

1976 Development of the world's first swivel-arm industrial robot begins

1978 First production of the ABS antilock braking system

1979 First production of the Motronic digital engine management

1980 First production of airbag control units

1984 First production of cordless hammer drills

1989 First production of TravelPilot navigation systems

1995 First production of micromechanical sensors (MEMS)

1995 First production of the ESP®[RL2] electronic stability program

1997 First production of the common-rail diesel injection system

2001 Acquisition of Mannesmann Rexroth AG and foundation of Bosch Rexroth AG

2003 Acquisition of Buderus AG

2005 Foundation of Bosch Sensortec GmbH

2008 Acquisition of Innovations Software Technology GmbH

2010 First production of full parallel hybrid powertrain for passenger cars

2011 First production of drive components for e-bikes

2012 -Call automatic emergency call system introduced

2013 First production of Indego robotic lawnmowers

2013 First production of an electric vehicle with a complete powertrain

2015 First production of healthcare products

2015 Center for research and advance engineering opens in Renningen, Germany

2016 First production of smart home products

2018 Foundation of Bosch Connected Industry for Industry 4.0

2018 Automated valet parking for driverless parking introduced

2019 Bosch starts partnership with Ceres Power Holdings plc. for technology development and manufacturing of solid-oxide fuel-cells (SOFC)

2020 CO2 neutrality in research, manufacturing, and administration at Bosch

2020 First production of Vivalytic rapid test for Covid-19

2021 Bosch opens its new 300-millimeter wafer fab in Dresden, Germany

Acknowledgements

Igniting Minds would not have been possible without the contribution of a number of people.

I would like to begin by thanking Christine Siegel and Bettina Simon from the historical department at Bosch for their time, expertise and advice on the contents that make up this book. Dietrich Kuhlgatz's technical insights have also been invaluable to us – especially around the development of the early magneto.

I am also grateful to other Bosch colleagues who have contributed either content, support or ideas to this book. They include Christine Dittrich, Nathalie Martin-Heubner, Mark Heard, James Bolton, David Scholes, Sue Pennington, David Fulker, Gary King, Lizzie Baker and Wilson Janey.

I am particularly indebted to Stephen Bayley for writing such an informed and well curated introductory chapter. This captures the essence of Robert Bosch the man, the world in which he lived and the legacy that his company is still a part of today. James Turgoose has reviewed and, where necessary, re-drafted every section of this book to ensure a consistent tone throughout. I am grateful to him.

Igniting Minds is a key part of a wider scope of work that is being undertaken by Bosch as we celebrate 125 years in the UK this year. Our plans include a Robert Bosch exhibition at Cromwell Place, South Kensington in June 2023, which is being created by Charles Marsden-Smedley. This promises to be a unique way to bring the legacy of Robert Bosch to the British public – directly – in an inspirational and engaging way. The exhibition will be open to the public for five days from 13–18 June and I encourage you to attend.

Bosch has always had a strong relationship with the Royal Automobile Club and I am delighted that we will be working closely together this year. The RAC is kindly hosting an exhibition focused on Bosch's automotive legacy this year. I would like to thank colleagues at the RAC for their support.

We are also planning significant events at both the German Embassy and the Houses of Parliament later this year. We are bringing together a wide range of people to celebrate our 125 anniversary and I would like to thank the "core team" who are helping to make this happen alongside me – especially Alexandre Fabricio, Sue Shrosbree, Helen Neal, Mallika Basu, Charles Marsden-Smedley, Neil Skidmore, and James Turgoose.

Finally, and most importantly, I also wish to pay tribute to Ocky Murray, our editor in chief of *Igniting Minds*, for his patience, inspiration and creativity. Ocky has created a stunning book that reflects the values of Robert Bosch. I hope this is a treasured possession in your home for many years to come.

It is therefore a great pleasure to invite the reader to enjoy this book and to learn more about Bosch – both Robert Bosch the man and the company that he established. To work for Bosch is a great privilege and we hope that *Igniting Minds* is a fitting way to showcase the values that made Robert Bosch the visionary that he was.

Eman Martin-Vignerte
Government Affairs Director, Bosch UK

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