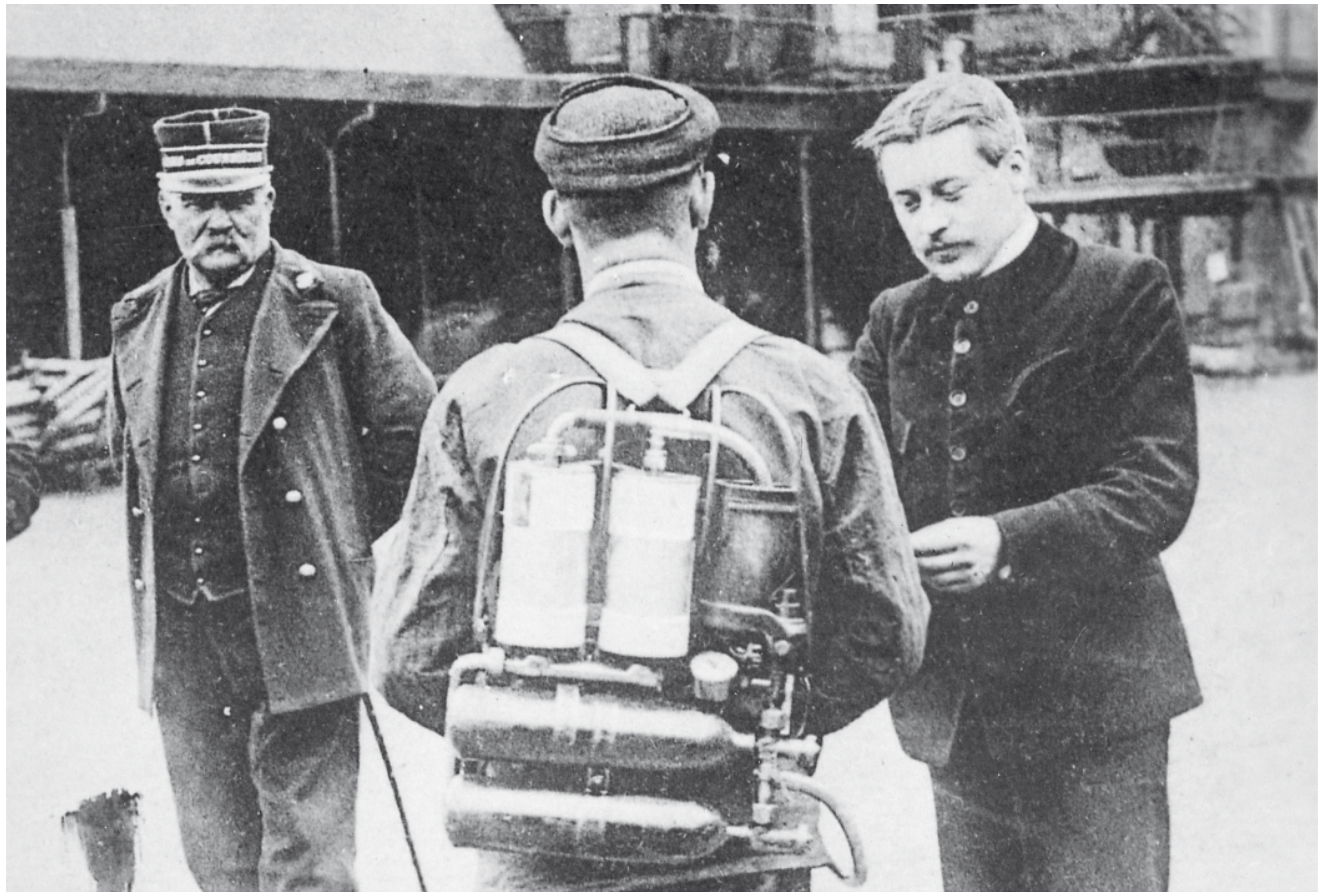
Dräger

Technology for Life
since 1889

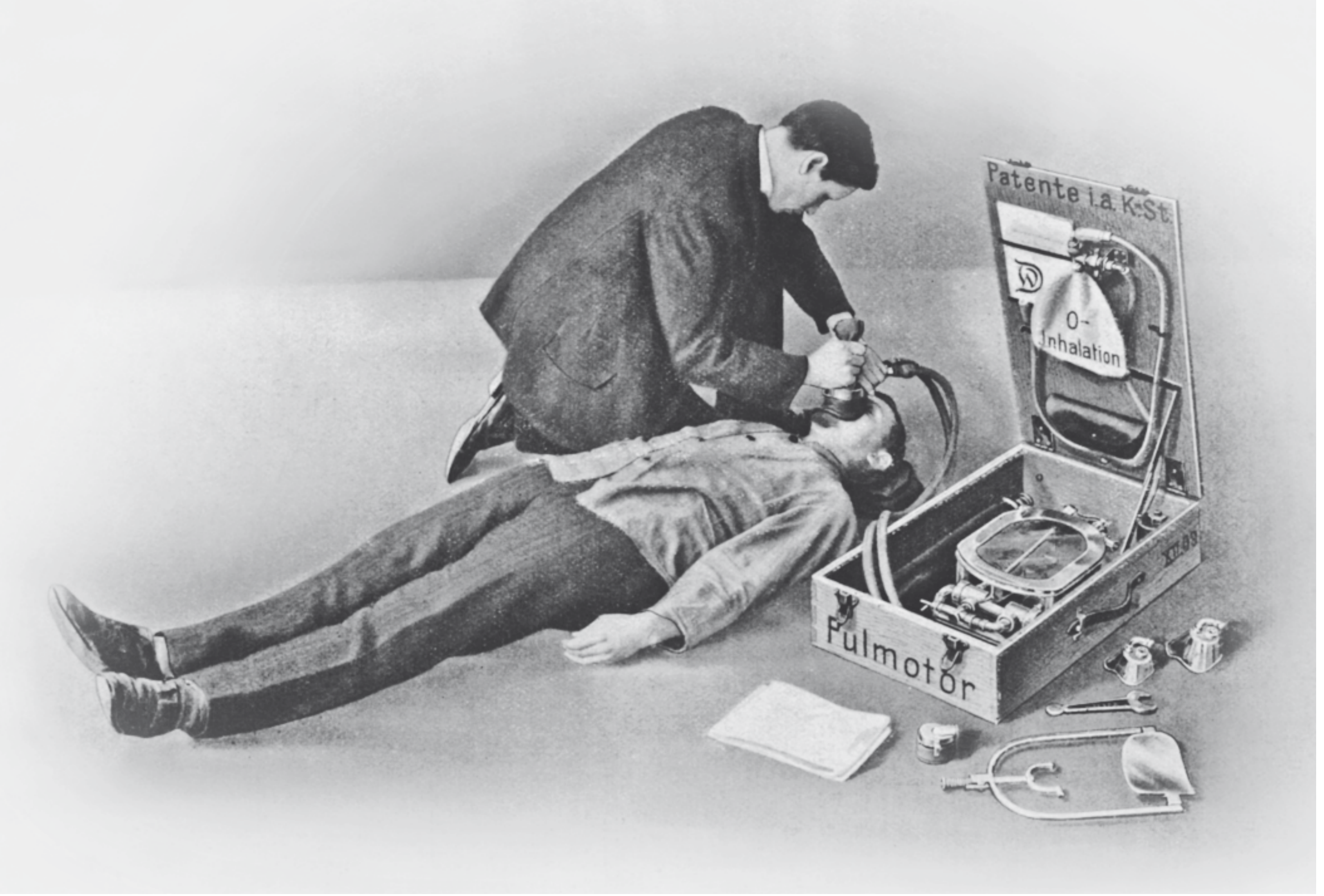
Dräger is technology for life. Every day, we live up to that responsibility by putting all of our passion, knowledge and experience into improving lives with outstanding and innovative technology that puts life first. We dedicate our efforts to those who depend on our technology the world over, to the environment, and to a better future.

Johann Heinrich Dräger is dissatisfied with the existing beer tap systems: The flow of beer is uneven and equipment is often out of order. Johann Heinrich Dräger, trained as a watchmaker, takes up the challenge to his inventive creativity. Puzzling over the technology, he finally develops the first reliable reducing valve for carbonic acid in 1889 – the Lubeca valve. He decides not to sell his invention, but to produce the valve himself.

At the beginning of the 20th century, the use of anesthetic agents implies significant risks. Frequently, patients died because of imprecise proportioning of gases. Johann Heinrich Dräger and Professor Dr. Otto Roth put all their expertise to the development of a new anesthesia device, aiming at finally controlling anesthesia. The “Roth-Dräger” is a ground-breaking innovation, positioning our company as an expert in the field of anesthesia.



The Courrières mine accident, which claimed over 1,000 lives, makes a deep impression on Bernhard Dräger. He travels to France to experience at first hand the working conditions underground. His aim is to make breathing apparatus safer and improve their performance in practice. The new devices will soon prove to be highly effective in mining disasters in Europe and the US. It's no surprise that rescue workers are still called "Draegermen" in the North American mining industry.



Johann Heinrich Dräger witnesses how a young man is saved from the River Thames in London and resuscitated. The event inspired him to further develop a groundbreaking idea: On-site mechanical ventilation to resuscitate people who have lost consciousness through oxygen deficiency. Back in Lübeck, Johann Heinrich Dräger begins work on the Pulmotor, the first series-produced emergency respirator in the world.

The Dräger family: Five generations of entrepreneurs

Johann Heinrich Dräger
∗ 1847 am Sulzbrack, Kirchspiel Kirchwärder
† 1917 in Lübeck

Managed the company
from 1889 to 1912

Dr. Ing. h. c. Bernhard Dräger
∗ 1870 auf der Howe, Kirchspiel Kirchwärder
† 1928 in Lübeck

Managed the company
from 1912 to 1928

Dr. Heinrich Dräger
∗ 1898 in Lübeck
† 1986 in Lübeck

Managed the company
from 1928 to 1984

Dr. Christian Dräger
∗ 1934 in Berlin

Managed the company
from 1984 to 1997

Theo Dräger
∗ 1938 in Berlin

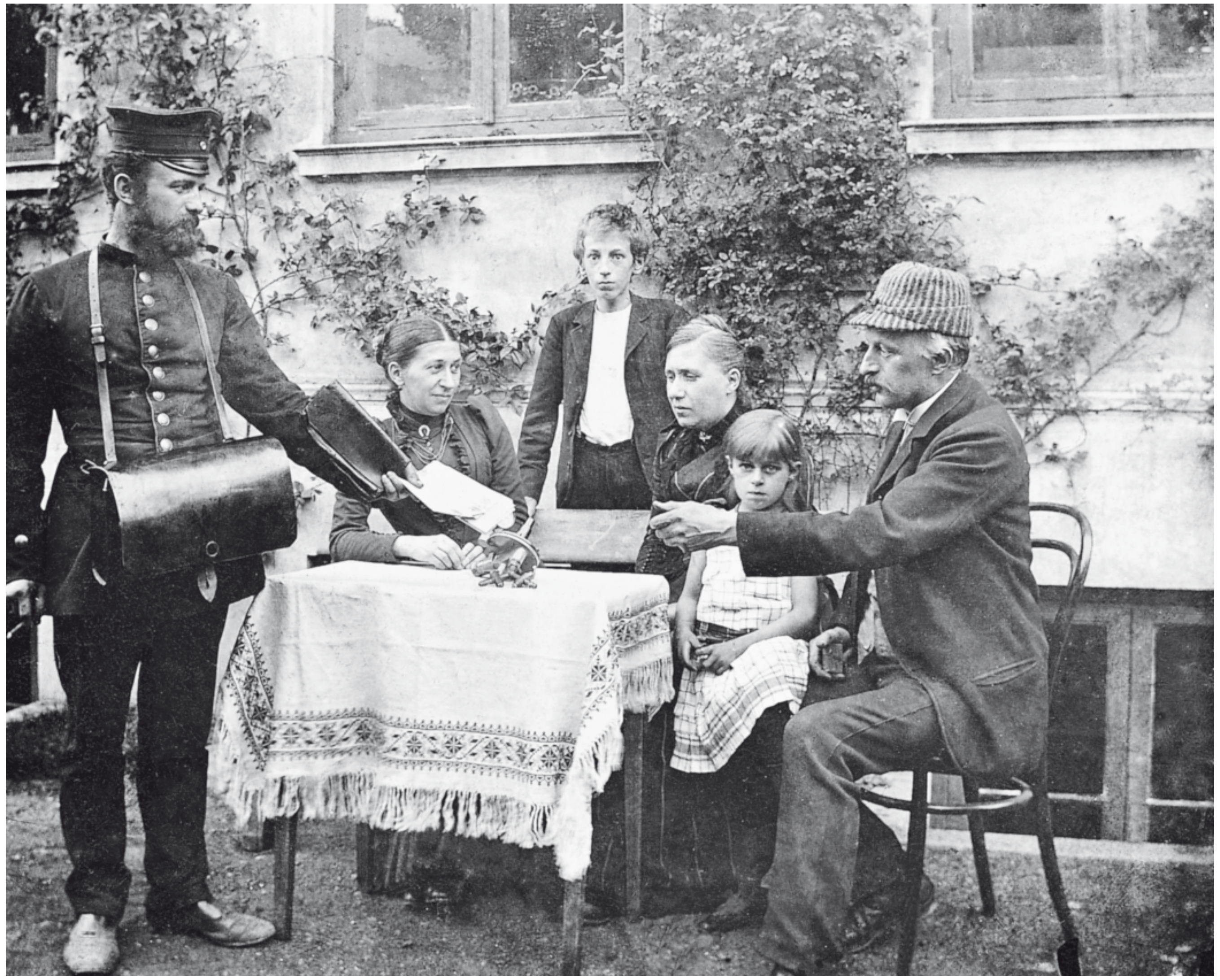
Managed the company
from 1997 to 2005

Stefan Dräger
∗ 1963 in Lübeck

Has managed the company
since 2005

"At first, we just accepted the reducing valve as a complete and properly functioning product without question. We were to be sorely disappointed. My son and I began to think about the problem of the reducing valve, which resulted in an entirely new design."

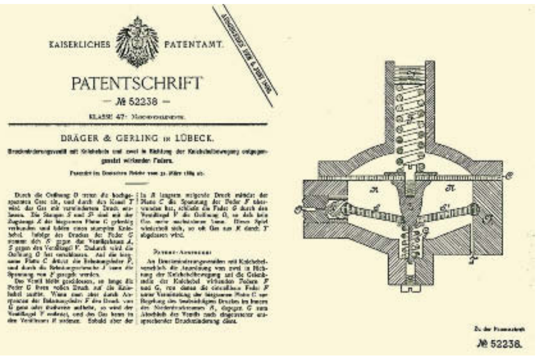
Johann Heinrich Dräger



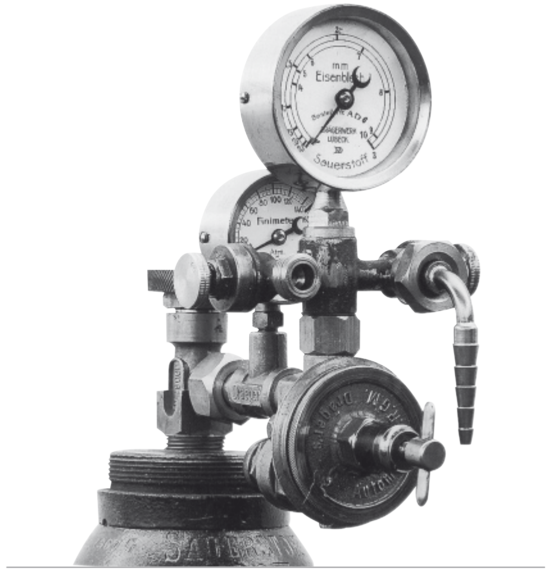
The mail carrier delivers the patent for the Lubeca valve to Johann Heinrich Dräger.

1889

The first Patent



Patent specification for the Lubeca valve



Further development of the Lubeca valve for oxygen

On January 1, 1889, 42-year-old Johann Heinrich Dräger founds the company "Dräger und Gerling" in Lübeck with his business partner Carl Adolf Gerling. Born the son of a watchmaker in a small village on the Elbe, the talented and ambitious precision mechanic manages great professional success. Beginning with orders for minor repairs, Johann Heinrich Dräger eventually founds the successful Lübeck-based company.

The business of the newly founded company is the sale of equipment and innovations, such as beer tap systems, which use compressed carbon dioxide. Though it has been possible since the second half of the 19th century to fill steel cylinders with high-pressure gas, the problem of removing the gas in a controlled and safe manner at low pressure remains. Even the equipment sold by Dräger barely lives up to its task; the flow of gas – and therefore of beer – is hard to control and uneven, and the valves are often faulty.

Dissatisfied with the available technology, Johann Heinrich Dräger and his son Bernhard, who has just qualified as a mechanic, begin working on a new innovation. The result: the Lubeca valve. For the first time, it is possible to precisely control the removal of carbon dioxide from a high-pressure tank. While competitors' valves are considerably heavier, the Lubeca valve is very light – weighing just two kilograms. Johann Heinrich Dräger has his invention patented immediately.

This first patent changes the growing company's business. Johann Heinrich Dräger makes the risky decision not to sell his invention, but to produce and sell it himself. And rightly so – the trading company consequently flourishes to become an industrial enterprise.

1889 – 1899

> “Carbon dioxide is death; oxygen is life.”
>
> Johann Heinrich Dräger

1889	1891	1892	1893	1894	1895	1896	1897	1898	1899
Founding of the workshop and shop “Dräger & Gerling” The first reducing valve for carbon dioxide: the Lubeca valve Bernhard Dräger joins the company as a design engineer	Johann Heinrich Dräger becomes sole proprietor	Launch of pressure gauge production	The original beer tap system proves a hit on the market	Rise in sales: Dräger introduces two-shift production	Realization of an industry standard for connection threads Basic research on oxygen proportioning	Autogenous welding and cutting torch Pressure suction jet “oxygen injector”	Establishment of the company hardship fund “Hülfe”	Construction of the Moislinger Allee factory in Lübeck	Finimeter high-pressure gauge Reducing valve for oxygen and hydrogen “oxygen/hydrogen machine”

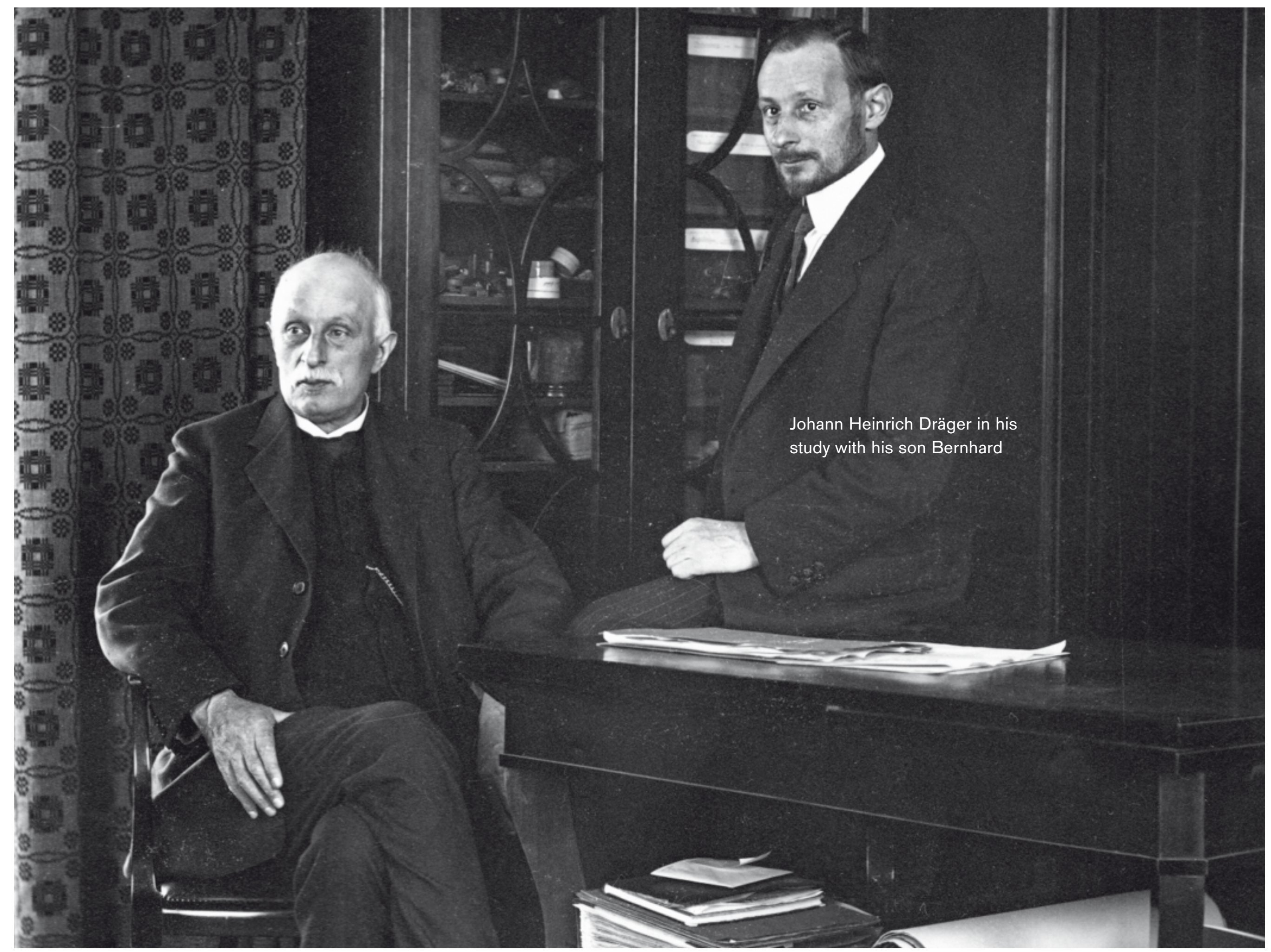
1899

OXYGEN IS THE FUTURE

Oxygen – this is the topic of the future. It provides Bernhard Dräger, the founder’s son, with what is still the company’s guiding philosophy today: Technology for Life. He recognizes the potential of an up-and-coming market that has only begun to develop at the turn of the century, namely the use of compressed oxygen. Bernhard Dräger discovers that the principle of pressure reduction has applications as a basic technology for a variety of products, from soldering and welding equipment to ventilators and respiratory protective devices.

Johann Heinrich Dräger once wrote the following about his son: “He didn’t need to learn the art of invention; he was born with the talent.” And indeed, Bernhard soon becomes the top inventor in his father’s company. He puts his knowledge of physics and mechanical engineering from his studies in Berlin to direct use at the growing company. A period of extensive research and development begins at the end of the 1890s under his leadership. The first results of this targeted product development are launched on the market in 1899: the oxygen/hydrogen machine, a reducing valve for proportioning oxygen and hydrogen, and the Finimeter, a high-pressure gauge that can be used to view the exact fill level in oxygen cylinders for the first time.

Beer tap system



Johann Heinrich Dräger in his study with his son Bernhard

1900 – 1906

Model 1904/09

Bernhard Dräger (center) with his son Heinrich (right) experimenting on measuring lung capacity.

1900
- Oxygen supply device for high-altitude flights

1901
- Oxyhydrogen lamp (limelight) for film projection

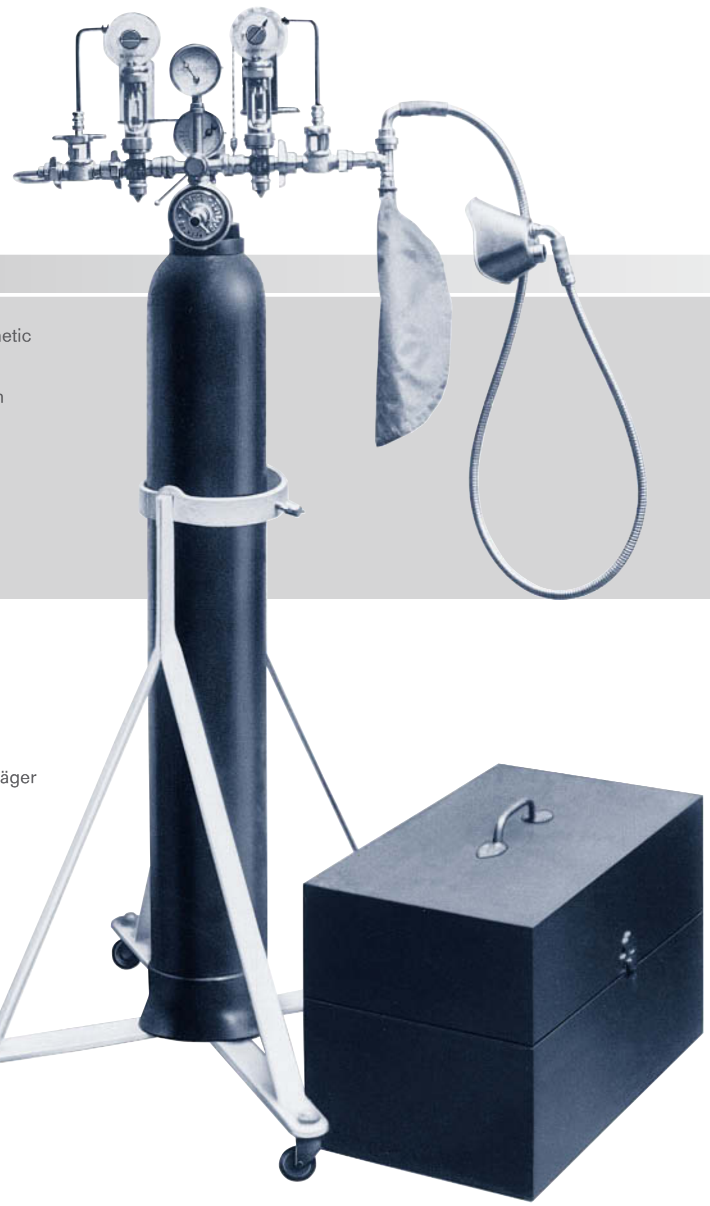
1902
- Roth-Dräger mixed anesthetic apparatus
- Portable oxygen inhalation device
- Founding of Drägerwerk, Heinr. & Bernh. Dräger

1903
- First welding torch
- Alkaline cartridge for purifying breathing air

1904
- Model 1904/09 breathing apparatus
- Launch of profit-sharing arrangement
- Physiological studies for respiratory protection
- Dräger is awarded the gold medal at the World's Fair in St. Louis, USA

1905
- Carbon dioxide sensor
- Air purification systems for submarines

1906
- Braun-Dräger positive pressure machine
- Hydrogen cutting torch



Roth-Dräger

1902

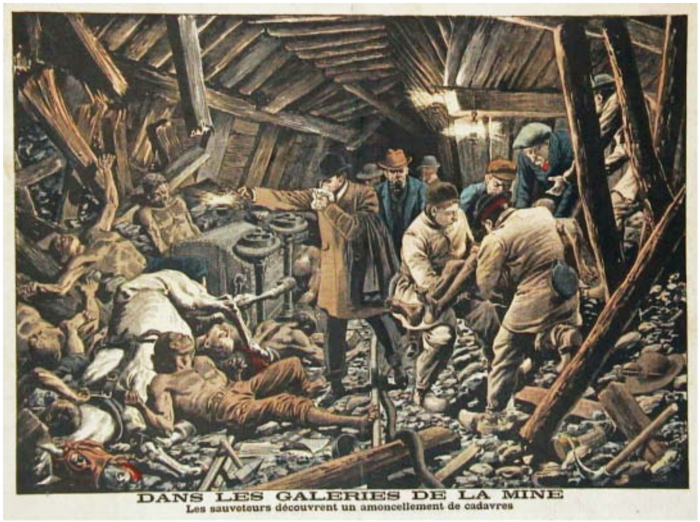
THE TAMING OF ANESTHESIA

Dr. Otto Roth (center) with Dräger's first anesthetic apparatus

Otto Roth presents one of the world's first anesthetic apparatuses for oxygen and chloroform at the German Congress of Surgeons in Berlin. The Roth-Dräger anesthetic apparatus makes it possible for the first time to reliably control the mixture of oxygen and anesthetic agents such as ether and chloroform. Anesthesia is finally tamed.

Johann Heinrich Dräger developed this milestone in surgical medicine in collaboration with his good friend Dr. Roth. The product's economic success quickly follows. In the ten years that follow, 1,500 Roth-Drägers are sold across the globe, establishing Dräger's international reputation as a pioneer of medical technology.

Source: Compagnie des mines de Courrières



Europe's largest mining disaster: rescuers save the partially buried miners caught in the accident.

1906

THE COURRIÈRES MINING DISASTER

On March 10, a massive explosion rocks a coal mine near the French town of Courrières. Approximately 1,600 men are working in the mine at the time, some up to 400 meters underground. Despite immediate assistance, more than 1,000 workers die in the inferno of flames, poisonous gases, collapsing walls and floods. Even German mine rescue teams rush to help their fellow French miners, an act of solidarity that causes quite a stir in these nationalistic times.

The French workers are equipped with the Model 1904/09 breathing apparatus, which is the successor to the Model 1903. The significant improvements made to the breathing apparatus are the result of experiments that Bernhard Dräger conducted himself. In 1904, he traveled to Camphausen near Saarbrücken, Germany, to conduct tests with the local mine rescue team using the Model 1903. His observations revealed that an airflow rate of 20 liters per minute does not suffice to fill the lungs under the stressful conditions of a rescue operation. Rather, 50 to 60 liters are necessary.

Bernhard incorporated these trend-setting findings into the design of the new Model 1904/09. Among other things, he integrated an improved alkaline cartridge that increased service life to two hours. These were improvements that saved lives in the Courrières mining disaster. According to the Parisian daily newspaper Le Journal: "The apparatuses perform miracles."

Workers at an iron ore mine of the United States Steel Corporation

DRÄGERMAN

Heroes underground
At the beginning of the 20th century, Dräger developed the revolutionary Model 1904/09 respiratory protective device. From that point on, rescue teams used it to save workers in the mines. The emergency responders in America were so thrilled by the product's quality that they proudly called themselves "Draegermen". Ever since then, the term "Draegerman" has been used as a synonym in America and Canada for a member of a mine rescue team. You can still find it in dictionaries today. The term achieved great notoriety in the world of entertainment, too. In one of the first Superman comic books in 1938, "Draegermen" come to the aid of the hero rescuing people trapped by a collapse in a mine.

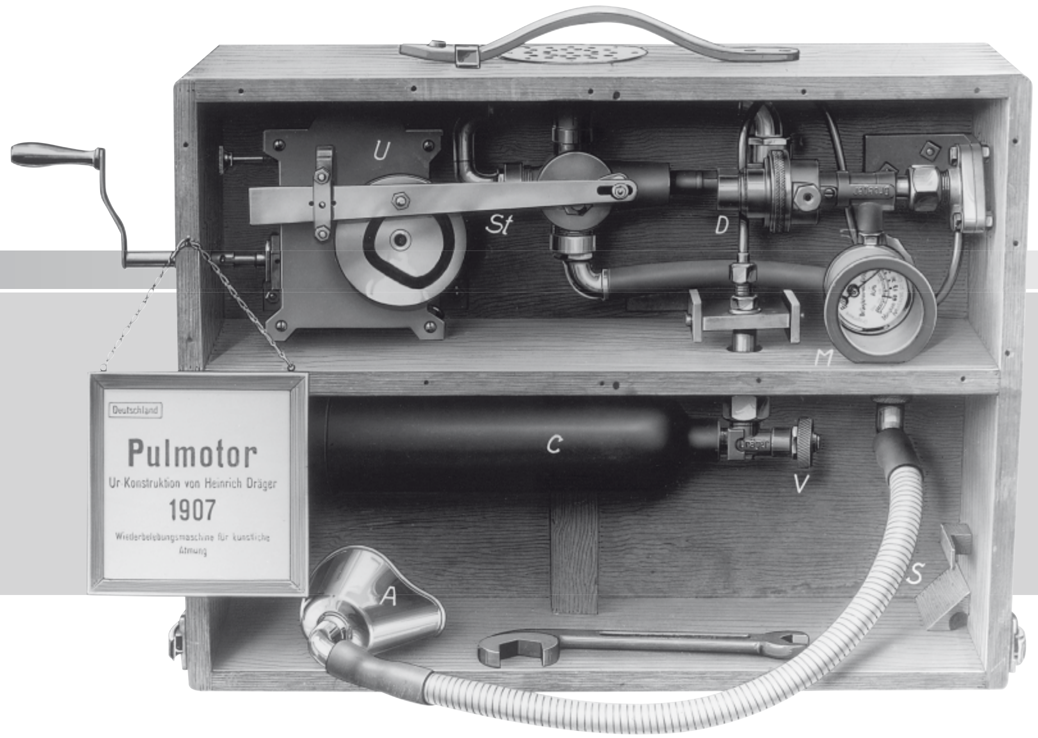
1907

1907

The first ventilator: Pulmotor

Establishment of the first foreign subsidiary: Draeger Oxygen Apparatus Co., New York, USA

Diving rebreather for submarine crews



The Pulmotor prototype

1907

PULMOTOR – THE FIRST VENTILATOR

While journeying abroad, Johann Heinrich Dräger watches as a young man is pulled from the Thames and resuscitated. With these images in mind, Johann Heinrich Dräger resolves to create a device for “pumping fresh air or oxygen into the lung”. Back at home, he begins to develop the world’s first ventilator. The original Pulmotor creates alternating positive and negative airway pressure and operates with pressurized oxygen. It is a ground-breaking concept that will become the basis of mechanical ventilation for decades to come.

Ventilation consequently becomes a matter that is near and dear to Johann Heinrich and Bernhard Dräger. Bernhard Dräger and the engineer Hans Schröder further develop the Pulmotor, which becomes a bestseller for the young company. The easily portable ventilator makes it possible for the first time to revive people on the spot who have lost consciousness due to a lack of oxygen.

Further development of the Pulmotor: 3,000 ventilators are in use, just five years after the launch of serial production in 1908.

The Pulmotor is first used in mines to resuscitate buried workers after a collapse. Hospitals begin using this pioneering technology not long afterward.

1907

The former Dräger building at
No. 11 Broadway in 2007

Dräger Review – Dräger's customer magazine – makes an assured prediction for 1914: "Diving with the hoseless apparatus is so safe and simple that even elderly enthusiasts need not shy away from diving to depths of 10 to 20 meters."

1907

FIRST DRÄGER SUBSIDIARY IN NEW YORK

Johann Heinrich Dräger takes the opportunity to show Hamburg-born Walter E. Mingramm his new breathing apparatus when Mingramm visits the Dräger factory on behalf of a Mexican company. Excited by the new technology, Mingramm returns to Mexico and makes the bargain of his life. Inspired by the thought of opening a Dräger subsidiary in the United States, he returns to Lübeck. Bernhard Dräger seizes the opportunity and accompanies him to America to see for himself what the situation in America is like. Just a short while later, Bernhard Dräger and Walter E. Mingramm open the company Draeger Oxygen Apparatus Co. in a skyscraper at No. 11 Broadway. The branch moves to Pittsburgh in 1908.

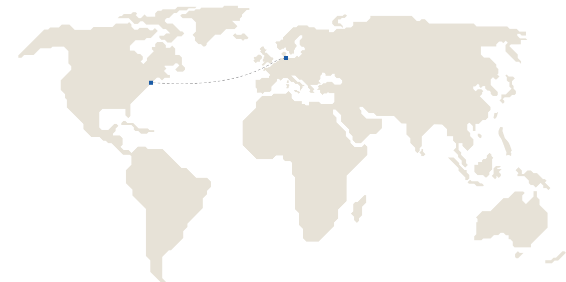
Source: Hans Hass, Photo: picture alliance

Diving and film pioneer Hans Hass on an
excursion with his underwater camera

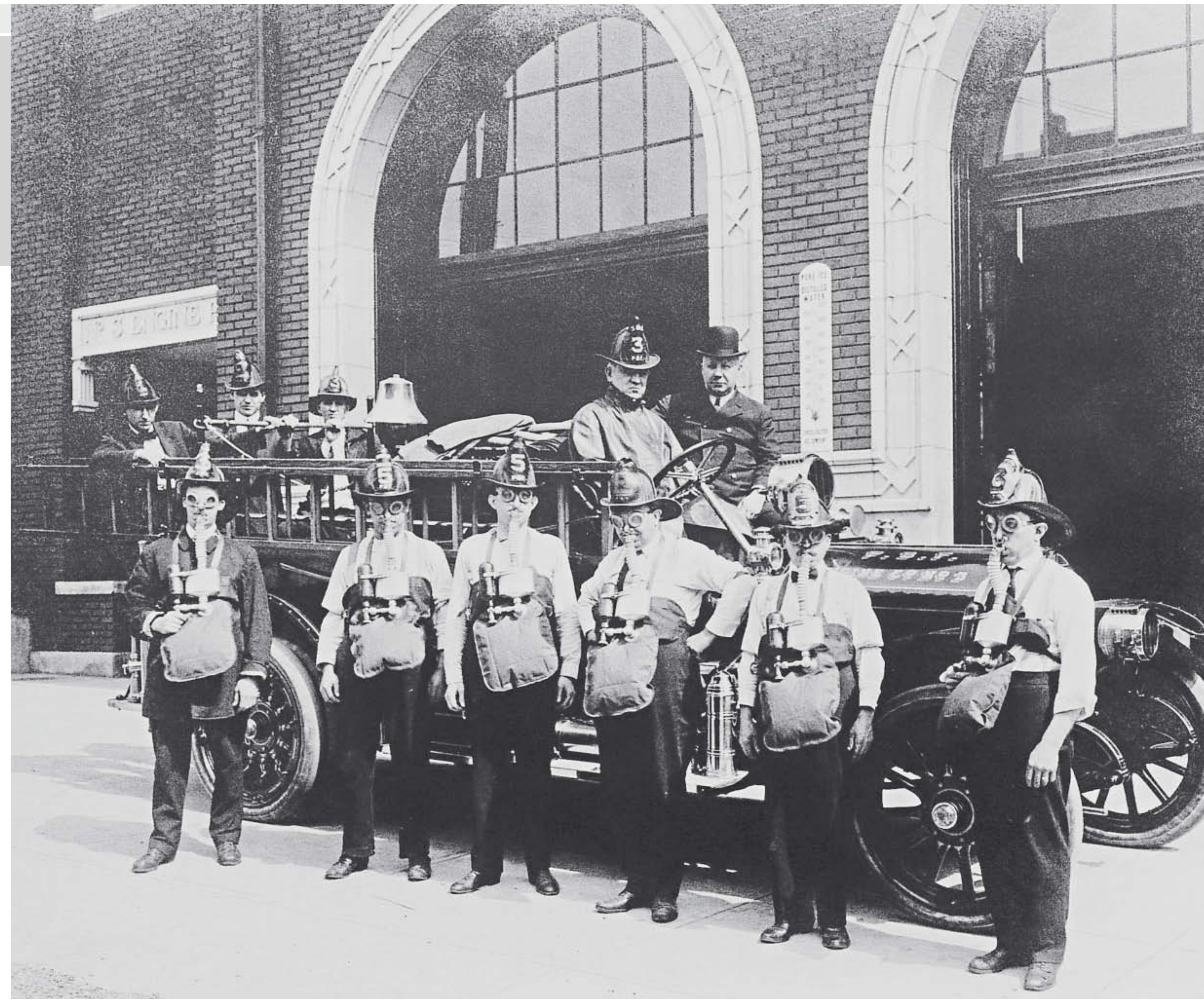
1907

FROM DIVING RESCUER TO DIVING EQUIPMENT

Dräger engineer Hermann Stelzner uses the breathing apparatus with alkaline cartridge and breathing bag as a guide in developing the first diving rescuer. Diving rescuers are often the only chance that submarine crews have at surviving an accident. In 1912, Dräger unveils the first freely portable diving apparatus. What makes this apparatus special is that it offers human beings the chance for the first time to move freely about under water for longer periods of time. In fact, up to 40 minutes. The air hose used to connect the diver with the supply ship, in addition to the back weights, are replaced by two oxygen cylinders and an absorber. Beginning in 1939, Austrian diving and film pioneer Hans Hass begins to develop the immediate forerunner to modern diving rebreathers with Dräger. This original model enabled underwater expeditions and experiments that had not previously been possible.



In 1907, passage from Hamburg to
New York took approximately two weeks.



Employees of the Pittsburgh
fire department in 1918

1908 – 1914

Dräger-Tübben

1908
- Dräger-Wiss acetylene welding torch
- Dräger burnout protection
- Serial production of the Pulmotor

1909
- High-altitude oxygen breathing apparatus for balloon flights

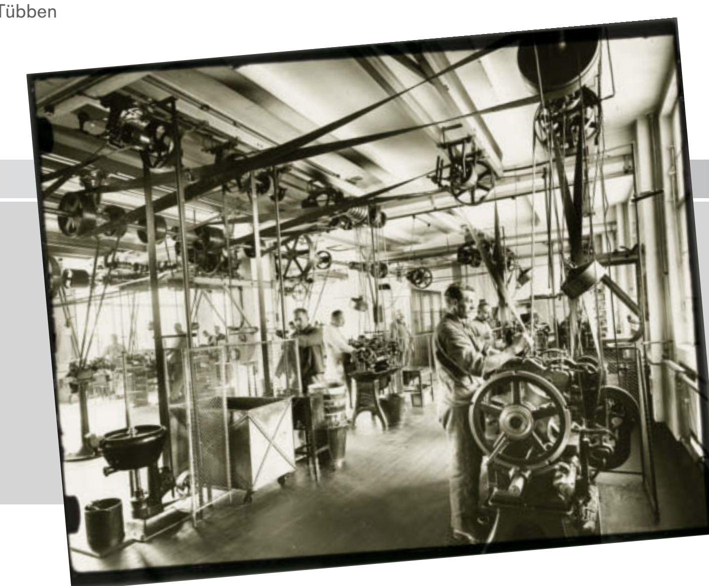
1910
- Further development of the Roth-Dräger anesthetic apparatus for serial production
- Model 1910/11 oxygen injector apparatus
- Establishment of a company for the financing of employee homes

1911
- Roth-Dräger-Krönig positive pressure mixed anesthetic apparatus
- Systematic diving experiments

1912
- Bernhard Dräger becomes sole proprietor
- First German issue of the customer magazine “Drägerheft”
- Hoseless diving apparatus
- Combined anesthetic apparatus for positive pressure anesthesia and mechanical ventilation

1913
- New factory building “Haus 3”
- Dräger-Tübben self-rescuer
- World altitude record for airplanes (6,120 meters) set with Dräger high-altitude breathing apparatus
- Underwater simulation system for testing deep-sea diving equipment

1914
- Export quota of 40 percent to Canada and USA
- Establishment of company’s unemployment insurance plan
- Start of World War I



Turning shop

1912

THE FIRST DRÄGER REVIEW

At a time when customer magazines are not yet terribly common, Dräger publishes the first German “Drägerheft” (“Dräger Review”) to explain to customers the complex technology behind the company’s innovative products. Bernhard Dräger is the driving force behind this. He chooses Wilhelm Haase-Lampe to be his partner for the publication, who would have a hand in shaping the magazine as its editor for 38 years. From the very beginning, the Dräger customer magazine makes a statement and, as the preface to the first issue states, it will report “on work in the workshop and its results publicly.” These reports are specifically presented in an objective manner and not as commercial advertisements. A very modern approach, indeed.

1928

1988

2012

Aus dem Draegerwerk Lübeck

Fabrik & Konstruktionsbureau für Sauerstoffapparate
Laboratorium für technische Physik – Chemie & Physiologie

Nummer 1. Periodische Mitteilungen. Juli 1912.

Zum Geleit.

Das Drägerwerk, Lübeck.

Der Dräger-Taucher-Apparat. Freitragbar, schlauchlos.

Although the Dräger Review’s look has changed a lot in the last century, its objective is still the same: to inform customers.

1913

A FACTORY WITH A “BENEFICIAL WORKING ENVIRONMENT”

In 1913, Bernhard Dräger opens the doors to his new, modern factory made of reinforced concrete. The building is surrounded by green spaces and features spacious, sunlit rooms, wide corridors and staircases, modern elevators, a telephone network, and generous sanitary facilities. These progressive working conditions are complemented by the social security measures that the Dräger family offers to employees from the outset. Already in 1897, Johann Heinrich Dräger founds the “Hülfe” company hardship fund. The company for the financing of employee homes follows in 1910, and in 1914, Bernhard Dräger sets up a company unemployment insurance plan.

Construction of the factory building “Haus 3”, which is still in use today.

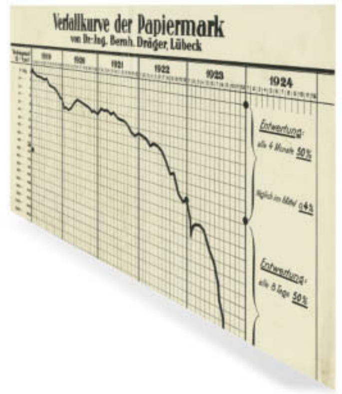
The Dräger family at the topping-out ceremony

1915 – 1925

Hyperinflation in Germany

During the months of hyperinflation in 1923, the value of the German currency fell so quickly that workers received their wages every day in many places. People fetched the bills with bags and suitcases and rushed to the stores to exchange the money for goods as quickly as possible. Retailers were forced to constantly raise their prices because the German mark rapidly decreased in value nearly every day. Many retailers only bartered, trading goods and services for food and coal. Some even completely closed shop. The situation led to great social tensions.

A pound of butter in September 1923 cost 50 million German marks. Nine years prior, a pound of butter cost 1.20 marks.



Economic crisis: Workers demonstrate in front of the factory gates.

1915
- Mass production of respiratory protection masks

1916
- Start of gas warfare on the Western Front

1917
- Johann Heinrich Dräger passes away on May 29, 1917
- Expansion of the factory building "Haus 3" and construction of the administrative building "Haus 1"

1918
- The number of employees increases to more than 2,000
- The November Revolution in Germany and the end of World War I

1919
- Closed-circuit system and absorber cartridge
- Demobilization threatens the company's viability

1920
- Spearheading of the introduction of the DIN standard for connections

1923
- Factory closure for seven days

1924
- First closed-circuit anesthetic apparatus for acetylene
- Model 1924 closed-circuit breathing apparatus
- Draegerogen self-rescuer

1925
- Carbon dioxide air inhalation unit
- Rebreather for rescue divers

Filter production

Model 1924

1916

RESPIRATORY PROTECTIVE DEVICES FOR WORLD WAR I

After being forced to graduate early from secondary school, Heinrich Dräger, Bernhard Dräger's oldest son, is drafted into the Empire's army and serves in a field artillery regiment on the Western Front. Equipped with Dräger respiratory protection, the young soldier manages to survive several gas attacks. In 1915, Dräger already begins developing respiratory protection equipment on behalf of the Prussian War Ministry. A total of 4.6 million respiratory protective devices are produced over the course of the war. The enormous demand for military and civilian protection triggers further growth: the number of employees grows, new buildings are constructed and output increases. The end of the war in 1918 results in a massive drop in production levels and hard times for the entire company.

1923

TIMES OF CRISIS

Inflation and economic crisis leave their mark on Dräger. The company closes its plant for a week due to reorganization. After the end of the war, the market for Dräger devices shrinks and the company is forced to manufacture alternative products such as linens, clothing and curtains.

On top of this, the company faces the loss of international patents and many competitors copy the products developed in Lübeck. Bernhard Dräger attempts to counter this trend with increased product innovation. It will take some time before the company regains its foothold in its old markets.

Alternative production of textiles after World War I

1924

BREATHING SAFELY UNDERGROUND

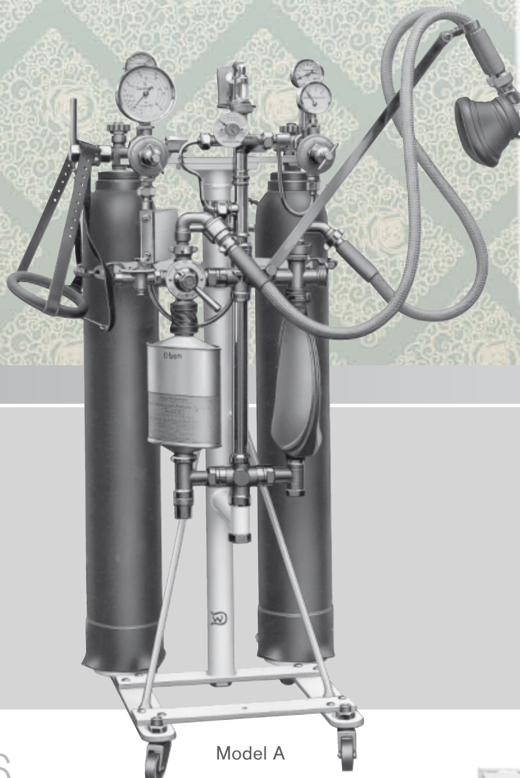
The Model 1924 breathing apparatus is nothing short of a revolution thanks to a mask that replaces the uncomfortable method of breathing inside a helmet. The breathing apparatus can also be more easily adjusted to meet the needs of the person wearing it. Wearers can decide between positioning the hose on the side or on the shoulder and also between lung-governed demand or constant oxygen supply.

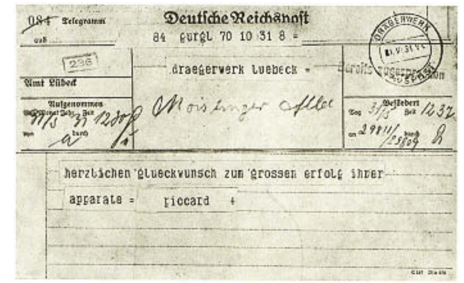
Advertisement for the Model 1924 breathing apparatus

The development of the Draegerogen is another milestone in mine rescue services. The self-rescuer is light, easy to use and does not require an oxygen cylinder, which makes it ideal for miners. The main component of this apparatus is a sodium superoxide cartridge that releases breathable air for up to an hour. This technology is still used for mine safety today.

New export market sales: respiratory protective devices prior to shipment to the USSR

1926–1932




Deutsche Reichspost
84 gurgl 70 10 31 8 =
draegerwerk luebeck =
herzlichen glueckwunsch zum grossen erfolg ihrer apparate = piccard +

Dr. Auguste Piccard's letter of thanks to Drägerwerk Lübeck

All's well that ends well
On May 27, 1931, Dr. Auguste Piccard and his assistant Paul Kipfer ascended into the stratosphere with a gas balloon. Piccard, who was a student of Albert Einstein and a professor of physics, made it his goal to research cosmic and nuclear radiation. He chose Augsburg as the perfect starting place for his flight. Based on his calculations, he planned to arrive in the Black Forest after approximately nine hours. He had miscalculated, however. The balloon shot up and was carried away by the wind. A controlled landing was not possible because a gas valve would not open. The two researches finally landed after 17 hours on a glacier in the Ötztal in Tyrol. It was fortunate that Dräger's oxygen supply sufficed for 20 hours.

1926	1927	1928	1929	1930	1931	1932
Model A anesthetic apparatus Temporary closure; two-thirds of employees dismissed Establishment of the chemistry department	Dr. Heinrich Dräger joins the company	Bernhard Dräger passes away on January 12, 1928 Dr. Heinrich Dräger takes over as head of the company	Dräger light metal cylinders for respiratory protection Dräger counter-lung diving rebreather for submarine crews	Collaboration with Swiss high altitude and deep sea researcher Dr. Auguste Piccard	Oxygen devices for the first flight into the stratosphere Dr. Heinrich Dräger becomes sole proprietor Dr. Heinrich Dräger establishes a money and banking study group (Keynesian lobby)	Oxygen system for parachutists Dr. Heinrich Dräger sells the Nütschau estate to support the company financially

Model A

1926

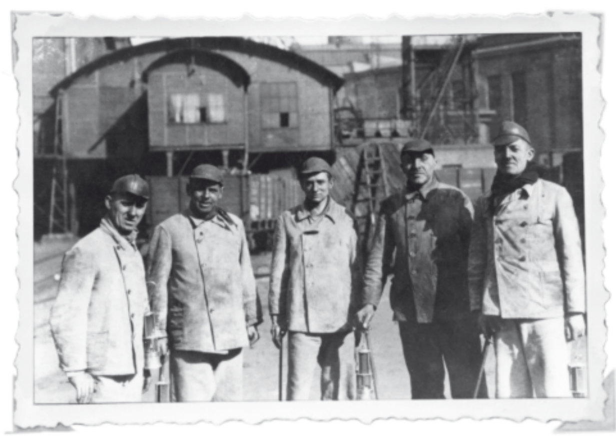
A NEW STANDARD IN THE OR: THE CLOSED-CIRCUIT ANESTHETIC APPARATUS

Laughing gas, which is a gaseous analgesic, begins to enjoy widespread use in operating rooms. Laughing gas is very expensive, however. That is why Dräger launches the Model A in 1926, which is the first serially manufactured closed-circuit anesthetic apparatus that reuses exhaled air. Alkaline cartridges used in breathing apparatuses scrub carbon dioxide from exhaled air, which prevents hypercapnia. With the closed-circuit technology, only a little laughing gas escapes into the ambient air. This demonstrates not only efficient use of anesthetic agents, but it also prevents the personnel in the OR from becoming drowsy themselves. In addition, the closed-circuit apparatus facilitates controlled positive pressure ventilation. A milestone in the history of anesthesia, Model A already has all the features expected of a modern-day anesthesia device.

1928

CUSTOMER LOYALTY IN THE AGE OF TRANSATLANTIC STEAMERS

Bernhard Dräger passes away in 1928. His son Heinrich, who has a doctorate in agricultural economics, takes over at the helm of the company.



Dr. Heinrich Dräger (center) during his first mine tour at the site of the Victoria Mathias Mine, Essen

That same year, he travels for three months through the US and Canada to familiarize himself with these key markets. He visits the company's traditional customers – such as hospitals, mines and large fire departments – and gets to know Dräger's subsidiaries. In the 1930s, he travels extensively in the US, the Soviet Union and other countries. The cultivation of international customers and knowledge of their domestic markets becomes one of Dräger's factors for success. Dr. Heinrich Dräger makes a point of steering the company toward the global market – and with success: By 1931, exports account for more than half of the production volume.

1931

THE CONQUEST OF THE STRATOSPHERE

Swiss explorer and physicist Dr. Auguste Piccard ascends to the previously uncharted height of 15,781 meters in a balloon basket made of light metal alloy. This is the first flight into the stratosphere in human history! Breathing at this altitude is not possible. This dangerous experiment is made possible in part by Dräger technology – a liquid oxygen and a compressed oxygen breathing apparatus accompany the researcher on his expedition. His flight marks the beginning of a new era of exploration: Previously inaccessible depths at sea and areas in space begin to open up as respiratory protection technology further develops.

Piccard's 14,000-cubic-meter gas balloon before the launch in Augsburg

Dr. Auguste Piccard and assistant Paul Kipfer in front of the light metal alloy balloon basket that they designed

1933 – 1942

A classic
The Dräger-Tube is nearly the same today as it was 80 years ago. It is a thin, glass tube sealed at both ends. A chemical indicator is contained inside that changes color if it detects a specific gas or vapor. The amount of that gas present in the air can quickly be read off a graduated scale on the tube.

From A for alcohol to X for xylol
Dräger-Tubes and mobile and stationary gas detection devices are now among the standard gas detection equipment. They are used in industry, fire services, disaster protection, laboratories, environmental protection and many other fields. We are now able to detect and measure 500 hazardous gaseous substances in the air, liquids and soil.

An advertisement for the “people’s gas mask” in Dräger Review

Female forced laborers producing respiratory protection masks at the Hamburg-Wandsbek factory.

1933
- Model 160 breathing apparatus for miners
- Onset of gas detection technology at Dräger with the development of a carbon monoxide detection instrument for in-house production

1934
- Expansion to Group as part of “First Four-Year Plan”
- Dr. Tiegel-Dräger ether vapor anesthetic apparatus

1935
- MÜ type positive pressure mixed anesthetic apparatus

1937
- Dräger-Tubes for mobile gas detection

1938
- Hardship fund for illness, death and other emergencies

1939
- Start of World War II
- Production of respiratory protective devices expanded

1940
- Break in development of civilian products due to military production

1941
- Model 10 self-contained breathing apparatus for short-term use

1942
- Production interrupted following air attack
- The number of employees tops 5,000
- Dr. Heinrich Dräger makes efforts on behalf of those persecuted by the Third Reich

1937

DRÄGER-TUBES: A LITTLE GLASS LABORATORY

One of the primary dangers in mining is colorless, tasteless and odorless: carbon monoxide. If inhaled, the poisonous gas inhibits the transport of oxygen in the blood and leads to suffocation. In order to detect this invisible threat, mine workers used to carry canaries in cages with them as a kind of living early warning system. The birds are extremely sensitive and react to even the smallest amounts of the gas. Workers knew that they needed to leave the mine immediately if the bird fell from its perch. In 1937, Dräger developed the Dräger-Tube, which is a gas detection tube that can quickly detect carbon monoxide in the air. The time for canaries in mines had passed.

Source: Fox Photos / Getty Images

Gas protection, once upon a time: Caged canaries react to toxic gases before they endanger people.

1937

MORE MILITARY ORDERS THAN EVER

The “people’s gas mask” is introduced in Germany in 1937. Training courses and brochures teach people how to use and look after them. Fortunately, the people’s gas mask never sees use in a real emergency situation.

Already in 1933, the Reichswehr Ministry places more and more orders with Dräger for a military rescuer based on the tried-and-tested mine self-rescuers. These orders pose a problem for Dr. Heinrich Dräger: A new factory is needed just for the production of the military rescuer. After the experiences of World War I, however, he is wary of establishing surplus capacity. Back then, concentrating only on military production almost bankrupted the company. In addition, Germany’s autarchic policy poses a threat to Dräger’s position on the global market that it has only just won back. At the same time, too much restraint means sacrificing the domestic market to competitors.

Dräger endeavors to strike a balance between civilian and military production, and does so successfully. Even when arms productions are at their highest, civilian production still accounts for 47 percent of total sales. However, in 1939, development of civilian products has to be stopped. As a result, the company lags behind the international competition in terms of technology after the war.

1941

FORCED LABOR AT DRÄGER, TOO

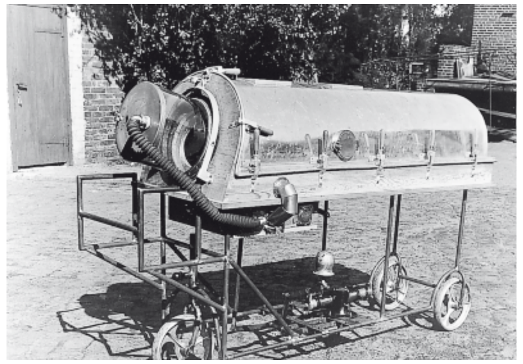
The employment of forced laborers is a dark chapter in Germany’s industrial history. The National Socialist government systematically organized these laborers to replace industrial workers fighting on the front lines and so maintain war production. In 1944, around a quarter of all workers employed in industry in Germany are forced laborers.

At Dräger during this time, around 1,200 of the 7,000 employees are forced laborers; they are civilians, mostly from occupied countries in the east, such as the Soviet Union, Poland and Yugoslavia. The 50 prisoners of war are the minority. In 1944, the Reich’s Armament Ministry offers Dr. Heinrich Dräger the chance to employ concentration camp inmates, which he turns down. At the same time, he actively shields Jewish company employees, such as philosopher Hans Blumenberg, from the grasp of the National Socialist authorities.

Dr. Heinrich Dräger is one of the few exceptions in the industry to take this stance, and, in doing so, he incurs the strong disapproval of the Ministry. Only after considerable pressure from the war office does he allow a field camp of the Neuengamme concentration camp, with 500 work inmates, to be set up at the company’s Hamburg-Wandsbek operation. As in all field camps of this kind, the prisoners are under the control of SS teams. Drägerwerk has little influence on their treatment. With Dräger’s support, the technical manager of the plant nonetheless continues to do his best to protect the Eastern European workers from SS harassment, and as a result, suffers reprisals himself. Shortly before the end of the war, Dr. Heinrich Dräger manages to delay the closure of the camp to protect the prisoners from deportation.

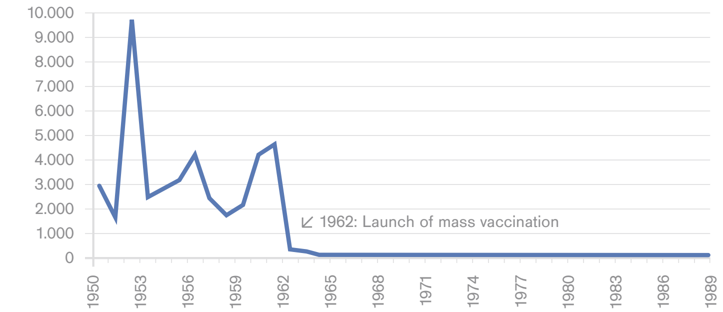
At the end of the 1980s, Dräger is one of the first companies to address the issue of forced labor. It also contributes to the German foundation for forced labor compensation.

1943 – 1949



The prototype of the iron lung with a torpedo tube frame

Polio – a deadly disease
“Polio is terrible, the oral vaccine is sweet” was the slogan of a German vaccination campaign in the 1960s. Prior to this, Germany had regularly experienced outbreaks of polio. Between 1955 and 1961, over 10,000 people suffered from polio and the paralysis it causes. The number of polio cases significantly decreased after the oral vaccination was introduced, and there have been no new cases in Germany since 1990.



The number of polio cases declines in West Germany after the launch of large-scale immunization efforts.

Source: 1950 – 1980 formerly BGA, from 1980 on www.gbe-bund.de

1943
Oxygen system for military planes: HL a 732 high-altitude breathing apparatus

1944
22 production plants with some 7,000 employees

Conflict over employment of concentration camp prisoners

1945
Mass layoffs

1946
Model D oxygen laughing gas anesthetic apparatus

1947
Iron lung ventilator for long-term use

1948
Formation of a general works council

Integrated multi-gas anesthesia with the Model F closed-circuit anesthetic apparatus

1949
Re-launch following currency reform

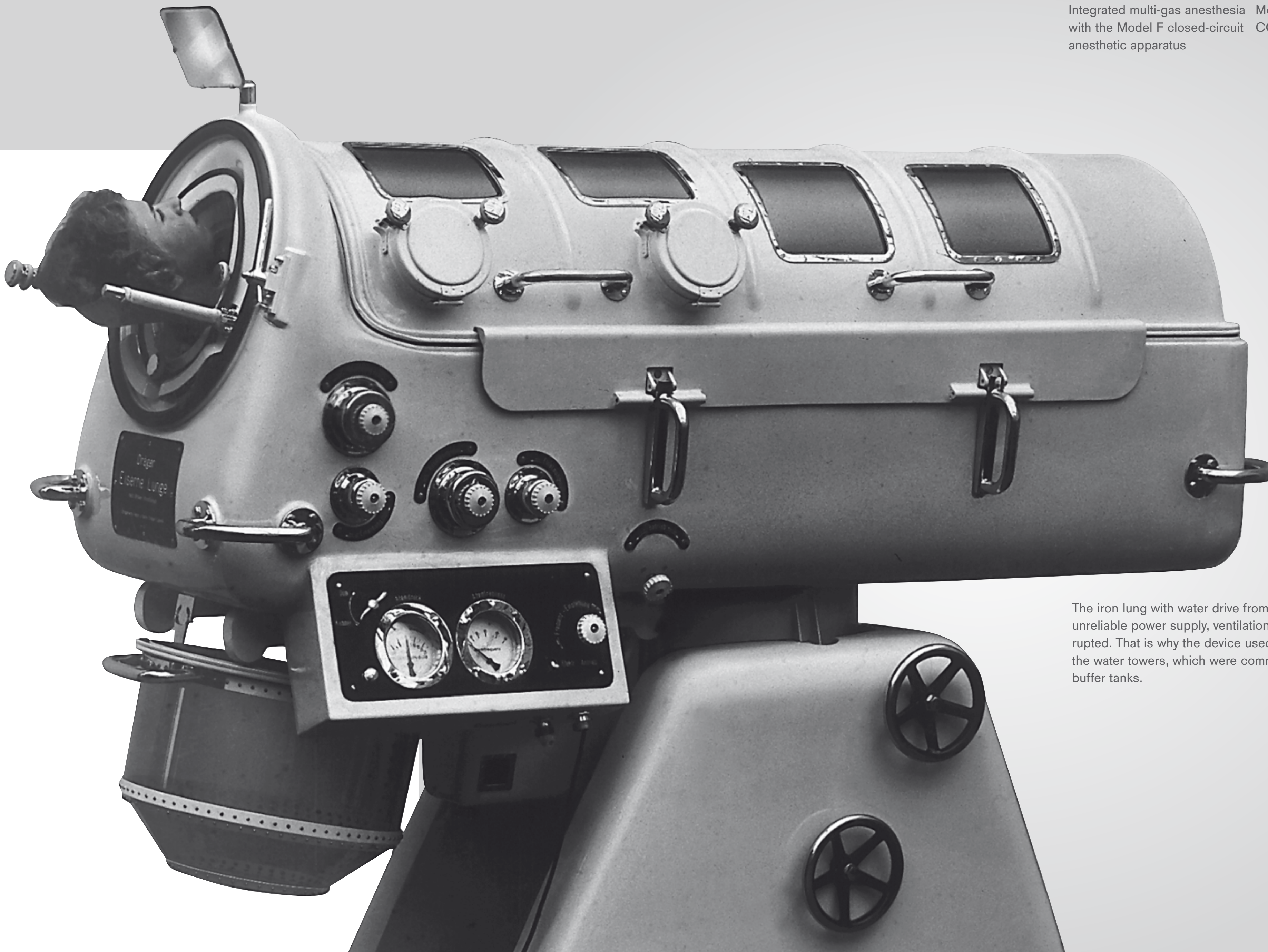
Model 623 self-rescuer with CO filter

1947

THE IRON LUNG AND THE BATTLE AGAINST POLIO

A major global polio epidemic breaks out after the war. The illness impairs the respiratory muscles. Thousands of children and adults face the awful possibility of suffering an agonizing death by suffocation since the conventional ventilators of the time are not designed for long-term use. In 1947, a doctor from Hamburg named Axel Dönhardt crafts the first German iron lung, which is based on an American model. Incredibly, his iron lung is made from scrap metal left over from the war. Dräger begins serial production of the iron lung not long afterward, saving many polio patients’ lives after World War II.

Serial production of the iron lung



The iron lung with water drive from 1950. Despite an unreliable power supply, ventilation could not be interrupted. That is why the device used the water supply of the water towers, which were common at the time, as buffer tanks.

1950 – 1952

Instructions for the Dräger fuel gauge in a VW Beetle

Romulus and Remus
In the 1950s and 1960s, Dräger developed a number of anesthetic apparatuses for a wide range of uses and demands. Dräger produced "Remus", which is the twin of the anesthetic apparatus "Romulus", for the American market. Remus enjoyed considerable market success, which was no mean feat for a German industrial product so soon after the war.

1950	1951	1952
Model G multi-gas anesthetic apparatus	Oxygen tent for oxygen inhalation therapy	Romulus universal anesthetic apparatus
	The first incubator for newborns: II-M-100	Pulmomat automatic ventilator for anesthetic apparatuses
	PA 30 breathing apparatus	The first closed-circuit diving apparatus: Diving Apparatus 138
	Fuel gauge for Volkswagen	

A protected environment and loving care for a good start in life

1951

A CHANCE AT LIFE

Nature created the perfect conditions in the womb to foster new life – quiet, safe and warm. It shields unborn babies from bumps and jolts and provides a calm environment devoid of stress. In order to give premature babies a good start in life, Dräger begins developing incubators in the 1950s. They create a stable, completely enclosed microclimate for the tiny patients. Temperature, humidity, oxygen, noise level and lighting all do their part to facilitate the infant's healthy development in spite of a low birth weight.

Protecting premature babies
On average, a normal pregnancy lasts 40 weeks from conception to birth. Thanks to medical advancements, premature babies born already during the 24th week of pregnancy now have a chance to survive.

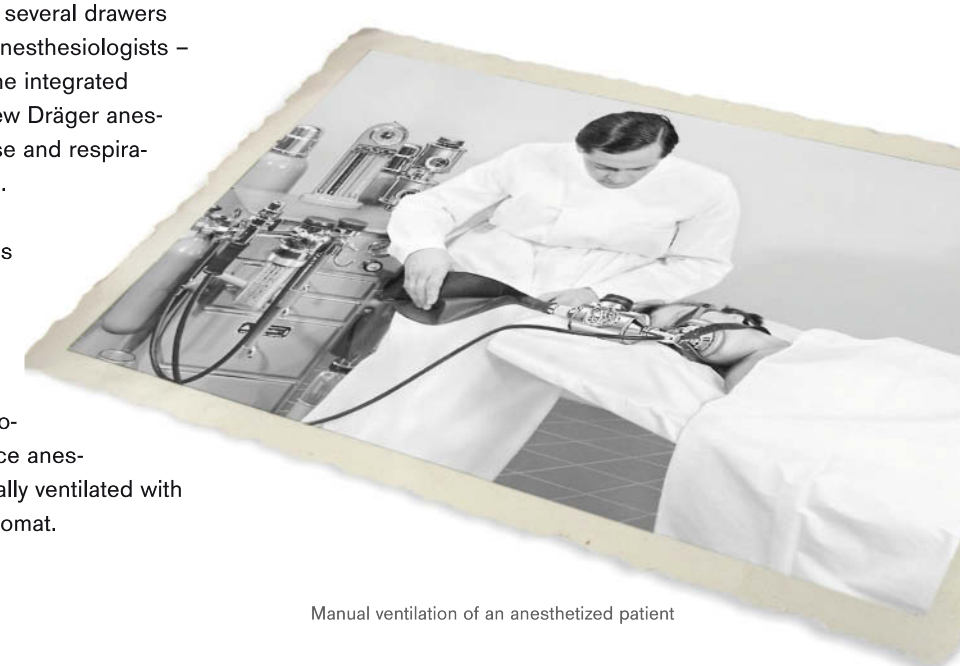
Romulus

1952

ERGONOMICS IN THE OR

After the war, the working environment in hospitals changes radically and the role of ergonomics at the workplace becomes increasingly important. Dräger responds to these new demands with the Romulus anesthetic apparatus. Beneath the gas proportioning valves, there is a cabinet with several drawers and a writing or storage tray for anesthesiologists – a simple but effective solution. The integrated blood pressure gauge and the new Dräger anesthesia monitor for measuring pulse and respiratory rate are also useful additions.

That same year, Dräger introduces the Pulmomat. It is a ventilation module that can be attached to all Dräger closed-circuit anesthetic apparatuses. The Pulmomat makes the anesthesiologist's job considerably easier since anesthetized patients had to be manually ventilated with a breathing bag prior to the Pulmomat.



Manual ventilation of an anesthetized patient

1953 – 1957

Source: Jamling Tenzing Norgay

Edmund Hillary and Tenzing Norgay on Mount Everest

1953

THE MASTERY OF MOUNT EVEREST

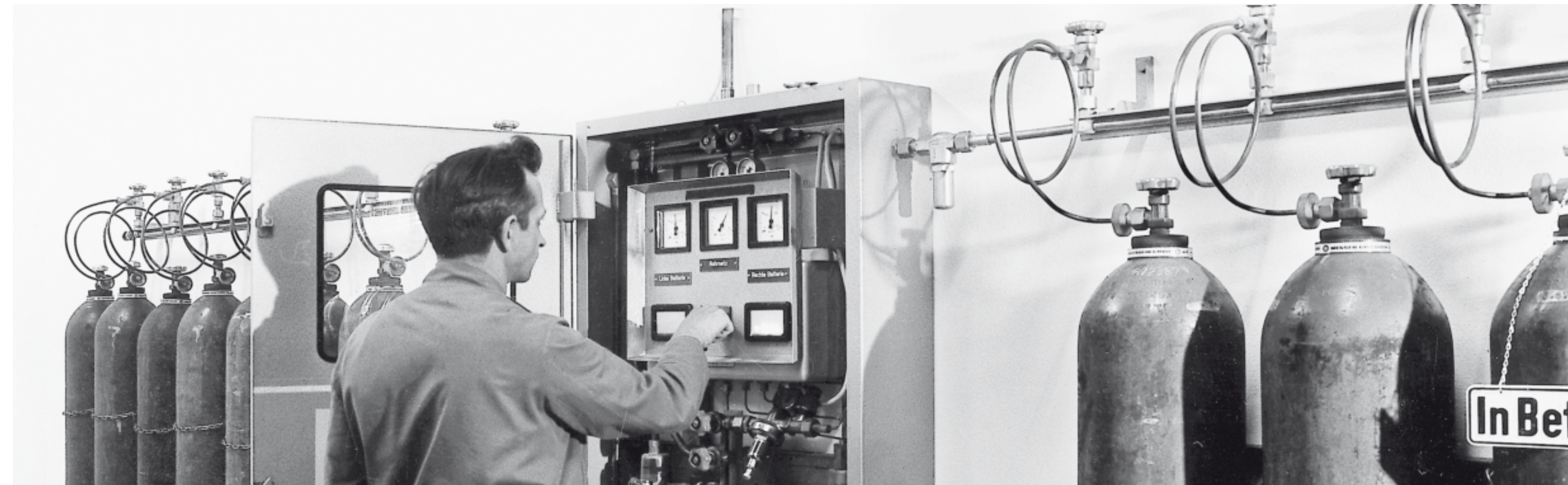
On the day of Queen Elizabeth II's coronation, the British newspaper "The Times" reports a sensation: The world's highest mountain has been conquered! The race to reach the summit is also a technological race: 8,848 meters above sea level, the air is thin. It is too thin, in fact, to breathe easily. When Edmund Hillary, the mountain climber from New Zealand, and Sherpa Tenzing Norgay reach the summit of Mount Everest, Dräger technology is there, too: oxygen devices and cylinders. Equipped with an adapter, to which Dräger contributed its expertise, Hillary and Norgay are able to climb to the highest point on Earth thanks to air from the extra Dräger cylinders.

1953

BLOW, READ, FINISHED

Dräger developers, who were still quite tired after a spur-of-the-moment lab party the day before, had gathered on time for a meeting. However, this particular morning will not be business as usual because the employees are exhausted. This gives the department manager an idea: It must be possible to measure alcohol levels through the breath – using Dräger-Tubes. The first attempt is a success. It is possible for the first time to objectively determine with a simple breath test if and to what extent a subject is under the influence of alcohol, without having to conduct a blood test.

The Alcotest in action: The driver blows into a tube until the bag is filled with air. Using the scale, the police officer can see at a glance if the legal limit has been exceeded.



1953

Summit of Mount Everest is reached for the first time

PA 34 and DA 59 self-contained breathing apparatuses

Alcotest tubes for alcohol breath tests

Company retirement fund "Dräger Sozialkasse"

Central gas supply systems in hospitals

1954

Development of mobile pressure chambers for diving equipment

Delphin II self-contained breathing apparatus for recreational and rescue divers

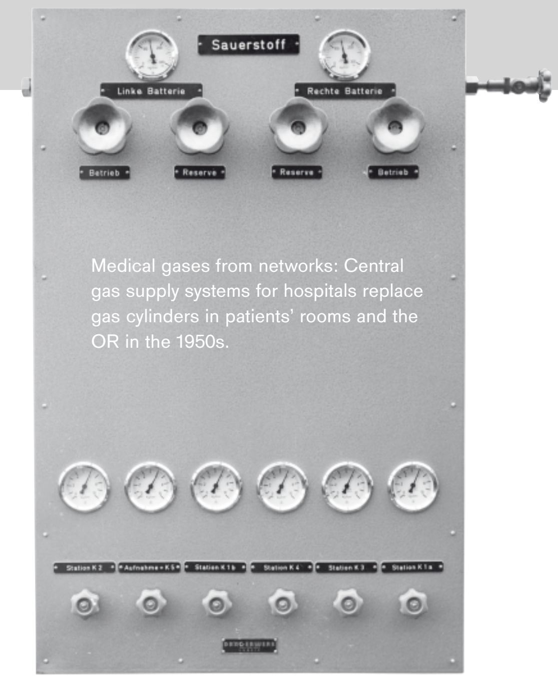
1956

Fabius anesthetic apparatus

1953

CENTRAL GAS SUPPLY SYSTEMS IN HOSPITALS

At the beginning of the 1950s, central systems become responsible for supplying hospital wards and operating rooms with medical gases. This is a revolution that relieves doctors and nursing personnel of carrying heavy pressurized gas cylinders back and forth in the hospital. Dräger uses its experience with pressurized gas supply to further develop gas supply systems. Over the years, the systems continue to become safer and the quality of the gases better. In this way, Dräger makes an important contribution to the development of the efficient, modern hospital.



Medical gases from networks: Central gas supply systems for hospitals replace gas cylinders in patients' rooms and the OR in the 1950s.

0.2 per mill
Talkativeness rises, inhibitions lowered, response time is increased.

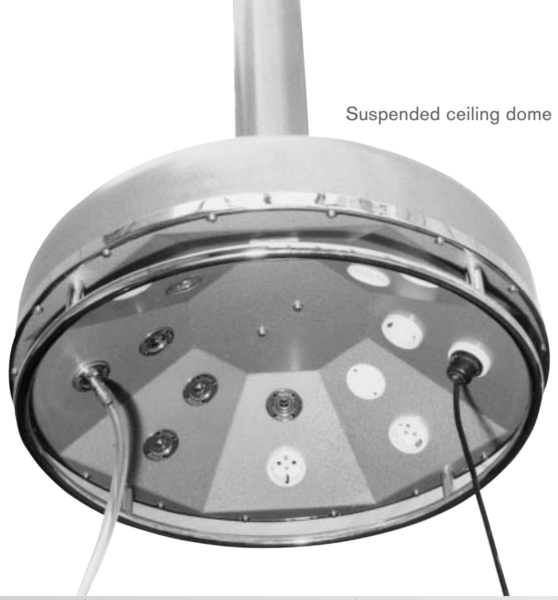
0.8 per mill
First balance problems occur, also the sense of sight is impaired. Response time slows 30- to 50-fold.

0.5 per mill
The sensation of pain is dampened, decreased visual acuity and hearing. Miscalculation of speeds.

1.0 per mill
Onset of real intoxication. Emotions and behavior are clearly altered.

1958 – 1966

The first English-language edition of the Dräger Review



Suspended ceiling dome

Mine rescue worker with a BG 174 practicing emergency ventilation with a Backpack Pulmotor

BG 174

1958

- Vapor anesthetic agent vaporizer
- Quality assurance: introduction of group production

1959

- Assistor 640 ventilator for pressure-controlled ventilation
- First English-language issue of the customer magazine “Dräger Review”

1960

- Octavian anesthetic apparatus

1961

- Dr. Christian Dräger joins the company
- Maintenance of F-104 Starfighter air supply system
- Ceiling supply units for operating rooms

1963

- Sulla anesthetic apparatus

1964

- Incubator 6000/6500 for newborns with air monitoring

1965

- Development of plastic high-pressure gas cylinders

1966

- BG 174 breathing apparatus
- HFB 320-Jet oxygen system for airplanes
- Inkubator 5100 transport incubator

1958

DRÄGER’S VAPOR PROVIDES PRECISION ANESTHESIA

Ether is highly explosive. Anesthesiologists and patients put their lives at risk every time anesthesia is induced. This situation changes at the end of the 1950s when the recently discovered anesthetic halothane quickly becomes the new standard. Unlike ether, halothane is not flammable. However, dosage must be precise. Dräger masters the challenge with Vapor, the newly developed vaporizer for liquid anesthetic agents. It is fixed to the anesthetic apparatus and supplies fresh gas flow with targeted doses of anesthetic agents. This marks the beginning of precision dosing in the OR, which had not previously been possible.

The design of Dräger Vapors makes them compatible with anesthesia devices beginning in 1948. It comes as no surprise that the Vapor is a bestseller. Over 500,000 of them have been sold to date.

1966

MORE AIR FOR INSIDE THE MINES

The launch of Dräger’s BG 174 introduces a much lighter rescue device that holds enough oxygen for up to four hours of use. The BG 174 is a sensation because its forerunner weighed over four kilos more for the same performance. A smaller load on the back means more energy for the rescue operation, increased concentration and ultimately better safety. Increased safety is a real comfort for the mine workers’ families. The closed-circuit oxygen device feeds the exhaled air back into the device, and an alkaline cartridge scrubs the carbon dioxide from it. Once enriched with pure oxygen, the air mixture that results from this process can safely be inhaled again. This principle is the same as it was in the first device in 1902. The BG 174 quickly establishes its position on the global market and becomes “the” standard device for rescue services.

The men of the mine rescue team practice transporting the sick and injured underground

1967 – 1974

Researching under pressure

Helgoland was Germany's first stationary underwater lab. It was the base station for divers conducting research on marine flora and fauna. The "aquanauts" had everything they needed – even a television – for a stay of several weeks on the seabed, albeit packed into a tiny space. During the lab's first deployment, the divers worked for 22 days at a depth of 23 meters. The process of pressure equalization before resurfacing was almost like a dream for the divers – literally – as beds had been set up in the decompression chamber.

The "Yellow Submarine" lab has been a part of the exhibit the Deutsches Meeresmuseum in Stralsund since 1998. It was completely renovated and today stands as a monument to German marine research technology.

1967	1968	1969	1970	1974
Halothan-Cato 10 mobile (field) anesthetic apparatus	Founding of North American Draeger Inc. Theo Dräger joins the company	Helgoland underwater lab First 300-bar technology self-contained breathing apparatus: Model PA 54 SMS 1 mixed gas rebreather	Dr. Heinrich Dräger becomes Chairman of the Executive Board after Drägerwerk AG is founded Dr. Christian Dräger and Theo Dräger become members of the Executive Board Oxygen systems for the military planes Alpha Jet and Tornado	Dr. Heinrich Dräger establishes the Dräger Foundation

1969

A LAB UNDER THE SEA

It looks like the pet project of a James Bond villain: The Helgoland underwater lab is an orange, 14-meter steel giant. Thanks to a sophisticated gas supply and pressure chambers from Dräger, this lab makes it possible to stay underwater for weeks at a time, even in frigid seas. It represents a milestone in underwater research. The lab will prove its usefulness already by the beginning of the 1980s. Its purpose is to collect geological seabed data off the coast of Helgoland, in the Lübeck Bay and in the North Atlantic. The data is fundamental to offshore technology.

Divers in the decompression chamber

1969

HIGH PRESSURE INNOVATION IN RESPIRATORY PROTECTION

Until this point, firefighters had to carry two heavy cylinders with 200-bar filling pressure to be equipped with the legally prescribed minimum supply of 1,600 liters of air. When the German federal states' ministries for internal affairs announce their plan to equip all voluntary firefighters with self-contained breathing apparatuses, Dräger pushes for the introduction of 300-bar filling pressure, setting new standards for directives, regulations and ordinances. The six-liter cylinder with 300-bar filling pressure replaces the two four-liter cylinders and rapidly becomes the norm for self-contained breathing apparatuses throughout Europe.

Filling station for 300-bar pressure gas cylinders

Model PA 54

1975 – 1980

Its look has hardly changed: the Panorama Nova full-face mask then and now

1975

- PA 80 self-contained breathing apparatus becomes international standard
- Panorama Nova full-face mask
- LAR V diving rebreather
- UV-1 intensive care ventilator
- Central electronics department

1978

- Oxylog emergency ventilator

1979

- The company goes public with the issue of preferred shares

1980

- Commencement of electronization and miniaturization
- Basic research into new materials
- Stationary detection devices

Oxylog

1975

ELECTRONICS FOR THE FUTURE

The establishment of the central electronics department puts Dräger on a path toward the future that leads away from traditional precision engineering. The early basic research soon begins to pay off: As of the 1980s, electronics are increasingly replacing mechanic and pneumatic technology. The new technology catches on well – particularly in the field of gas detection – with sensors that can detect more gases than ever before, thus producing data that can be better processed. Starting in 1983, Dräger begins manufacturing sensors and chips in ultra-modern clean rooms.

1978

RESCUE FROM ABOVE

At the end of the 1960s, air rescue by helicopter was still considered unnecessary, expensive and excessive. However, as the number of traffic fatalities in Germany climbs to nearly 20,000 in the 1970s, the notion of an air rescue network starts to catch on. Indispensable on a rescue helicopter: An emergency ventilator is used during patient transport to the clinic. Dräger sets new standards with the first Oxylog since the ventilator enables users to seamlessly adjust key parameters such as respiratory rate and volume. The effectiveness of the ventilation process can be directly monitored on the device. Victims' chances of survival are even higher with the Oxylog than they were with its forerunner, the Pulmotor.

Helicopter rescue operation with the handy Oxylog

1979

DRÄGER GOES PUBLIC

Drägerwerk AG goes public by issuing preferred shares. From now on, it is both a family business and stock corporation. And the separation is clear: The capital stock is divided into half common shares and half preferred shares. The common shares are held by the family and are the only shares with voting rights. The preferred shares with higher dividends are traded freely on the open market. In the interest of the company, one person remains in charge of making decisions, taking responsibility and ensuring long-term success.

Theo and Dr. Christian Dräger at the Hamburg Stock Exchange

1981 – 1985

Abstract figures are a relic of the past: The electronic ventilator E-VA presents the ventilation waveforms on a monitor for the first time.

from 1924 | from 1940 | from 1951 | from 1983

A look at Dräger's logo over time
Products, brochures, packaging and vehicles: Dräger launched its distinctive corporate identity at the beginning of the 1980s. The blue logo replaced the ones before it and has been the same ever since. According to a rumor, it is suggested that the letter "g" shows a lung turned on its side.

1981	1982	1983	1984	1985
First Malenter Symposium on population policy	First electronic ventilator: EV-A Permox oxygen inhalation device	Launch of Dräger's corporate identity Clean rooms for chip and sensor manufacturing Capital increase through the issue of participation rights	CCBS deep-sea diving apparatus for depths of up to 600 meters Dr. Heinrich Dräger joins the Supervisory Board Dr. Christian Dräger becomes Chairman of the Executive Board	Ultra-clean gas filter system for Biorack on Spacelab D1 mission Evita intensive care ventilator

1982

REVOLUTION IN VENTILATION

Over the course of the 20th century, electrical engineering becomes more important than precision mechanics. Slowly but surely, digital technology becomes the new standard and replaces analog technology. Dräger adapts to the times and works with high pressure on the ventilator of tomorrow. Electromagnetic valves in the electronic ventilator EV-A make it possible to precisely control the flow of breathing gas and ventilation pressure. For the first time, ventilation can be adjusted to a patient's spontaneous breathing. Graphic monitoring represents another milestone. In addition to numerical data and text, ventilation waveforms also appear on an integrated monitor. This innovation sets Dräger apart from other manufacturers, who introduce graphic monitoring only for the first time several years later.

1985

DRÄGER IN SPACE

On October 30, 1985, the Challenger space shuttle takes off on its ninth voyage to space. A laboratory called Spacelab is on board to enable research under space conditions. Dräger develops a system out of micro and activated carbon filters that creates ultra-clean air conditions for the Biorack testing unit, in which research will be conducted on various bacteriological and chemical processes. Later, Dräger again becomes a part of the history of space travel when, starting in 1993, oxygen sensors from Lübeck will become an essential component of all NASA space shuttle missions for the next 20 years.

Reinhard Furrer, the German-Austrian astronaut scientist, on the first Spacelab mission

1986 – 1990

Multiwarn

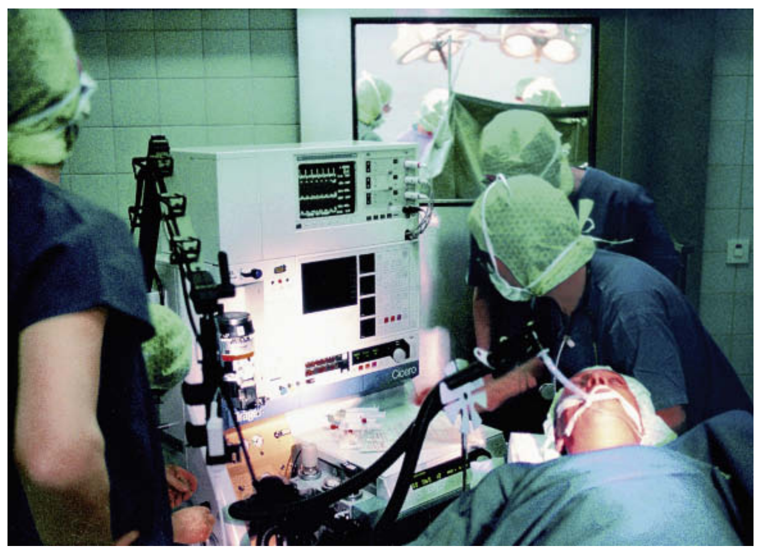
1986	1987	1988	1989	1990
Dr. Heinrich Dräger passes away on June 28, 1986	Incubator 8000 Oxyboks K self-rescuer for miners Type 720 PF chemical protection suit	Cicero integrated anesthesia workstation Multiwarn portable gas detection instrument	New factory building at Revalstraße site in Lübeck Babylog 8000 intensive care ventilator for infants and premature babies	Self-mixing principle in diving apparatus Eurofighter pilot air supply system

1988

WORLD PREMIERE OF CICERO

Cicero, the first integrated anesthesia workstation, is presented at the World Congress of Anaesthesiologists in Washington, D.C. It radically changes the working environment in operating rooms. All functions, such as gas proportioning and ventilation, as well as device and patient monitoring are combined in one device. The ventilator is electronically controlled and operates with an electric motor, replacing gas as the propulsion system. Its monitor clearly displays vitals and other data, enabling anesthesiologists to attend even more closely to patients.

To develop a practice-oriented working environment, doctors in Europe, Asia and America were surveyed about their experiences. In addition to technical innovation, a strong focus on customers remains a cornerstone of product development for Dräger.



The dawn of a new era in anesthesia: An integrated monitor displays all of the patient's vitals.

Incubator 8000

Ventilating infants and premature babies poses a special challenge. The lung is particularly sensitive and cannot under any circumstances be overstretched. The Babylog 8000 makes it possible to proportion extremely small ventilation volumes of just a few millimeters, which is the equivalent of the volume of a thimble.

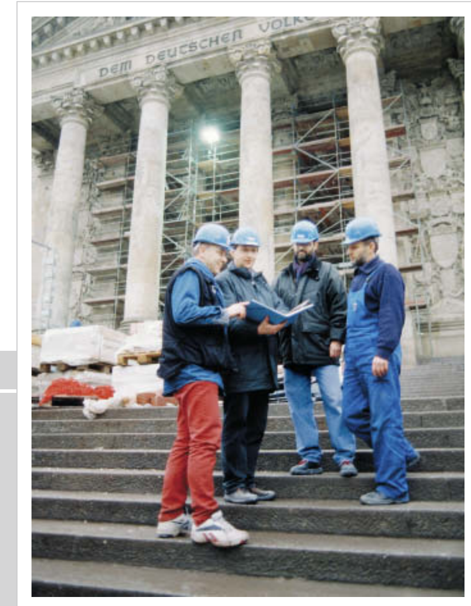
1989

GENTLE VENTILATION FOR THE SMALLEST

Premature babies are the most sensitive of all patients, which is why they require very special treatment. 1989 sees a miniature revolution in neonatal care: Dräger launches a ventilator designed for ventilating premature babies and infants. The special ventilation modes and precisely proportioned, volume-oriented ventilation with a flow sensor close to the patient have been especially attuned to the needs of the small patients. For two decades, the Babylog 8000 stands for gentle ventilation, a principle that is now widespread.

1991 – 1999

Alcotest 7110 Evidential



Governing Mayor of Berlin Klaus Wowereit (left) meets with Dräger employees

1992

Pac II warning instrument

PA 94 self-contained breathing apparatus

Futura respiratory protective mask

Airbus A340 emergency oxygen system

Stefan Dräger joins the company

1993

Federal Ministry of Family Affairs, Senior Citizens, Women and Youth recognizes Dräger as "most family-friendly large concern"

BG 4 breathing apparatus

1994

Dräger Interlock breath-alcohol-controlled vehicle immobilizer

1995

First comprehensive patient data management system

Evita 4 ventilator

1996

Emergency oxygen systems for the Boeing fleet

Julian anesthesia workstation

1997

Draegerman PSS 500 self-contained breathing apparatus

Babytherm 8010 infant warming system

Theo Dräger becomes Chairman of the Executive Board

Dr. Christian Dräger joins the Supervisory Board

1998

Draegerman PSS 100 self-contained breathing apparatus

Alcotest 7110 Evidential breath-alcohol detection instrument that can be used as evidence in court

microPac and MiniWarn portable gas detection instruments

1999

Stationary gas detection for the Reichstag building in Berlin

1992

DRÄGER ON BOARD

At the end of the 1980s, Dräger decides to gain a foothold in the commercial aerospace industry in addition to astronautics. And with success: Starting in 1992, the recently introduced long-distance aircraft Airbus 340 is equipped with oxygen supply devices from Lübeck. In an emergency, the system supplies passengers with breathable air for up to 22 minutes. Other manufacturers begin to take notice of the successful collaboration with Airbus. Starting in 1996, Boeing equips its 777 – the world's largest twin-engine commercial aircraft – with Dräger technology.

1994

FIRST BLOW, THEN TURN THE KEY

Traffic accidents are frequently caused by drunk driving. And while it has been possible since the 1950s to measure breath alcohol concentration with the Alcotest, a person can still end up driving under the influence of alcohol. A breath-alcohol ignition interlock device is created that can prevent drunk driving. The driver blows into the Dräger Interlock, which is connected to the car's electronic systems. If the breath alcohol concentration in the driver's breath sample exceeds the programmed limit, the engine will not start. At first, this technology primarily catches on in North American and Scandinavian countries.

The concept of interlock technology has been around since the 1960s. Dräger's first breath-alcohol ignition interlock device went into serial production around 30 years later.

Source: Jürgen Matern

1999

CLEAN AIR IN THE NEW REICHSTAG

The Reichstag building in Berlin reopens in 1999. To protect politicians and visitors from attacks involving toxic gas or fumes, Dräger installs stationary gas detection systems that monitor the air in the new building. Dräger sensors quickly and reliably detect even the smallest traces of poisonous gases in the parliament or the party or meeting rooms. Dräger's gas detection systems guarantee a safe working environment not only in government buildings, but anywhere where such safety is critical, such as in semiconductor factories, at power plants or on oil platforms.

2000 – 2004

2000

THE SHUTDOWN THAT ISN'T

Shutdowns and turnarounds are some of the most complex and challenging tasks that industrial facilities will face. All necessary service, maintenance and repair work has to be carried out within a very short period of time under strict safety protocols. Since the entire plant quite literally comes to a standstill during this time, every minute counts. As part of its Shutdown & Rental Management services, Dräger ensures that all safety technology processes run smoothly, which guarantees the protection of employees and the plant in turn. The concept: Dräger provides a single, comprehensive service that includes training security personnel and providing and maintaining the necessary equipment, as well as monitoring tens of thousands of procedural steps. Not to mention that Dräger does this following the motto: "Zero outages, zero unexpected incidents and zero accidents."

An FDNY fire truck on the streets of Manhattan, New York

2000	2001	2002	2003	2004
Participation in the World's Fair Expo 2000: "the anesthesia workstation of the future"	Caleo incubator Savina mobile ventilator Telemetric system for monitoring those wearing respiratory protective devices: PSS Merlin	Pac Ex 2 gas warning device Systems contract for Airbus A380 Zeus anesthesia workstation Joint venture with Siemens: acquisition of Siemens monitoring business for a 35-per-cent share in Dräger Medical AG & Co. KGaA	Stock exchange listing on the German TecDAX index Sale of Dräger Aerospace Stefan Dräger becomes a member of the Executive Board	Acquisition of the American incubator specialist Air-Shields Alcotest 6510 breath-alcohol detection instrument

2001

NEW YORK, SEPTEMBER 11

Terrorists hijack airplanes and crash into the Twin Towers of the World Trade Center. Large scale rescue operations involving firefighters and rescue teams are initiated. The emergency responders dashing into the burning towers have to protect themselves. They need respiratory protective devices, masks, filters, gas detection instruments and thermal imaging cameras. Dräger's response is the Emergency Response Program, which defines procedures for rescue operations. An inventory of available devices and equipment is immediately taken, a task force with Dräger employees is made, and special transportation is arranged. Everything is ready in half a day, which is precious time that can save lives – both those of the victims and the rescuers – during large-scale operations like the one on September 11, 2001.

2002

ANESTHESIA AT ITS VERY BEST

Zeus, the chief Olympic god in Greek mythology, is the namesake of Dräger's new anesthesia workstation. It represents the forefront of modern anesthesia starting at the dawn of the new millennium. For the first time, one workstation unites all processes, from anesthesia and ventilation to intravenous therapy, patient monitoring and data management. Technically, Zeus offers first-rate ventilation and fully automated anesthesia in a closed system that makes the anesthesiologist's job easier. The device itself can be integrated into the hospital's IT network.

Zeus

2005 – 2008

DrägerSensor XXS

Polaris

2005	2006	2007	2008
Stefan Dräger becomes Chairman of the Executive Board Theo Dräger joins the Supervisory Board DrägerSensor XXS: new generation of electrochemical sensors for portable gas detection instruments	Cornerstone laid for the research and administration building in Lübeck	Legal form changed to Drägerwerk AG & Co. KGaA Firefighting and rescue trains for the Swiss Bundesbahn	Dräger DrugTest 5000 drug analysis system Evita Infinity V500 ventilator Signing of the "Charter of Diversity"

2006

DRÄGER BUILDS FOR THE FUTURE IN LÜBECK

In August 2006, Stefan Dräger, the fifth-generation CEO, lays the cornerstone for the new research

and administration building in Lübeck. The family-run company, steeped in tradition, shows its commitment to its roots in Lübeck with this investment. The new building's architecture and infrastructure focuses on transparency, flexibility and direct lines of communication. Using new energy-efficient designs and a combined heat and power unit, Dräger uses 30 percent less energy than the maximum amount permitted by the Energy Conservation Ordinance.

2008

QUICK AND EFFECTIVE DRUG DETECTION

For a long time, a blood or urine analysis was the only way to prove drug abuse. However, through an on-site analysis of a saliva sample, the Dräger DrugTest 5000 makes it possible to quickly identify anywhere if a person has recently taken drugs and, if so, which ones. Within a matter of minutes, the drug analysis system can simultaneously identify different substance classes: cocaine, opiates, benzodiazepines, cannabis, amphetamines and methamphetamines. The drug analysis system can be used just as easily by police during traffic checks as it can in emergency rooms or drug rehab.

DrugTest 5000

4,600 K

Human beings receive 70 percent of all information using one sensory organ: the eye. Brightness is a key factor in this process. Colors appear most natural in daylight. However, too much light fatigues the eye just as much as too little light will. That is why it is so important during operations that the surgical environment has the best possible lighting. With its neutral white LEDs and a color temperature of 4,600 Kelvin, Polaris provides even, consistent lighting that is very similar to natural light. In addition, the individual LEDs are arranged in a way that ensures a fully illuminated surgical environment even when several surgeons are working on the same operation.

2009 – 2010

X-zone 5000

2009

Global economic crisis: an internal turnaround program secures 100 million euros in savings and curbs the sales decline to just 0.9 percent

Surgical lighting using LED technology: Polaris

Zeus Infinity Empowered anesthesia workstation

Conclusion of a collective agreement for the future for all German Dräger companies

2010

SmartPilot View anesthesia software

Babylog VN500 ventilator for premature babies and infants

PSS 3000 and PSS 5000 self-contained breathing apparatuses

X-zone 5000 gas detection system for area monitoring

Capital increase through the issue of common shares with voting rights

Dissolution of the joint venture with Siemens; the medical division is once again completely under Dräger's control

2010

DRÄGER FURTHER OPENS UP TO THE CAPITAL MARKET

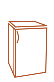
As part of a capital increase, Dräger introduces common shares to the market, which had until now only been held by the family. The capital increase makes it possible to strengthen the company's equity basis without giving up its long-term position as a listed family-run company. The new shares generate around 100 million euros in net proceeds for Dräger. They will be used to reduce debt and promote growth. After the capital increase has been completed, the Dräger family will hold a total of 71.36 percent of the company's common shares with voting rights.

2010

AREA MONITORING MADE FLEXIBLE

Work areas potentially subject to toxic gases have to be strictly monitored. Monitoring can be achieved in two ways: with stationary gas detection instruments that constantly monitor the entire facility, or with mobile gas detection instruments that all employees carry on their person. The X-zone 5000 combines the benefits of both systems. The portable device covers a range of 25 meters and can be wirelessly connected to 25 other devices. If gas is detected, the device sounds an alarm that can be seen and heard. At the same time, it notifies all the other gas detection instruments.

0 decibels
The quietest sound a human can hear has a volume of 0 decibels.



30 decibels
A low whisper or the hum of a refrigerator generates a noise level of 30 decibels.

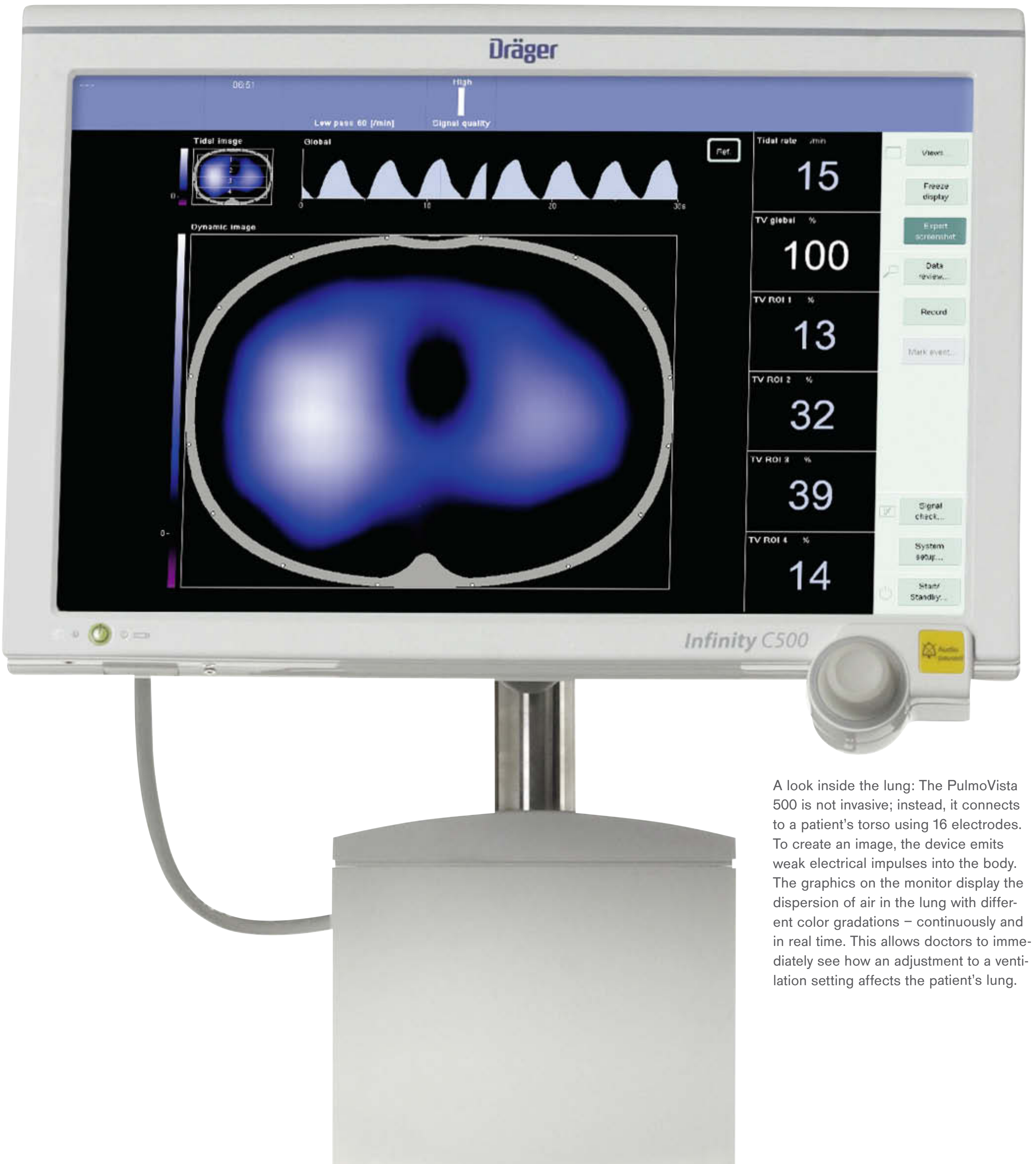
90 decibels
Urban traffic zooms by at 90 decibels.

140 decibels
An aircraft's jet engines boom at 140 decibels during take-off.

The ear is the most active sense organ in humans, which makes it our primary warning system. Sounds above 100 decibels are extremely loud to the human ear, so a sudden noise at this volume will startle us. The X-zone 5000's alarm tone has a full 108 decibels. The device for area monitoring at industrial plants sounds a booming alarm the moment it detects toxic gases in its vicinity.

2011 – 2012

16 electrodes



A look inside the lung: The PulmoVista 500 is not invasive; instead, it connects to a patient's torso using 16 electrodes. To create an image, the device emits weak electrical impulses into the body. The graphics on the monitor display the dispersion of air in the lung with different color gradations – continuously and in real time. This allows doctors to immediately see how an adjustment to a ventilation setting affects the patient's lung.

Almost like the real thing: From the induction room to the OR and the ICU, all of a hospital's key areas have been recreated at the Dräger Design Center. Customers can design and test their workstations here under realistic conditions.

2011	2012
Opening of the first Dräger Design Center in Lübeck	Perseus A500 user-configurable anesthesia workstation
PulmoVista 500 lung function monitor	Polytron 5000 stationary gas detection
	Rescue trains for Deutsche Bahn

2011

MAKING VENTILATION VISIBLE

What may seem obvious and simple to a healthy human is, in fact, a highly complex and sensitive process: breathing. Ventilators assist patients when they are no longer able to breathe on their own. Finding the right ventilation setting is crucial. Too much pressure will overstretch the lung, whereas too little pressure can result in a partially collapsed lung. By using electrical impedance tomography, PulmoVista 500 makes it possible for the first time to see the mechanical ventilation of the lung right at the patient's bedside. A monitor displays in real time how the air disperses in the organ. This allows doctors to immediately check the lung's condition, make specific adjustments to the ventilation setting and start possible therapy options.

2012

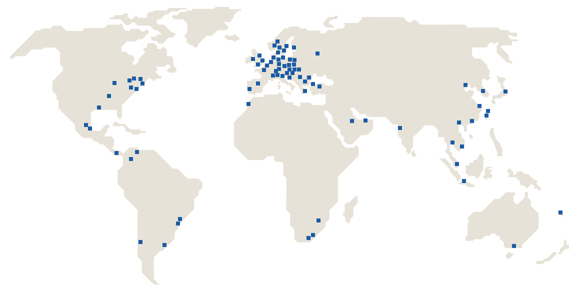
PURE POSSIBILITIES

Dräger presents the Perseus A500 at the World Congress of Anesthesiologists in Buenos Aires, Argentina. The new design makes it possible for users to configure their workstation to best suit their needs as they work. Over 100 versions of the Perseus are possible using just the different hardware components, shelves and storage space alone. Adding to this is the range of available software options, such as ventilation modes or assistance systems.

Perseus A500

2013 – 2014

HPS 7000



From Lübeck to the world: Dräger has sales and service subsidiaries in over 50 countries.

2013

HPS 7000 firefighter helmet

Employee share program

2014

Dräger celebrates 125 years

2013

EMPLOYEE SHARE PROGRAM

As part of an employee share program, Dräger employees have the chance to participate in the company. One bonus share is issued for every three shares an employee purchases. Dräger has a tradition of assuming responsibility for its employees. Already in 1904, Johann Heinrich Dräger launched a company program using sales premiums to foster employee participation. His grandson Heinrich, who advocated that individuals become responsible for their own pension plans in a number of publications on economic theory, established the first wealth creation program for employees in 1957.

2014

125 YEARS OF DRÄGER

When Johann Heinrich Dräger founded a company for beer tap systems on January 1, 1889, he laid the cornerstone for the Dräger that we know today. The Lubeca valve, which was the first reliable reducing valve for carbonic acid, revolutionized the world of pressurized gases. The technology behind the valve was applied in many different fields where it made what had previously been impossible, possible. Today, Dräger is a company that develops “Technology for Life”. This technology protects, supports and saves lives in hospitals, mines, rescue services and industry. Dräger has well over 10,000 dedicated employees in more than 50 countries. It is a company that remains true to its roots and whose headquarters are in the Hanseatic City of Lübeck.

125 years of heartfelt dedication

The anniversary logo consists of 125 spheres. One sphere for each year of the company’s history. No two spheres are the same, either in size or color. They are as unique as Dräger’s history.

1889

2014

A pain-free operation

It is said that most people fear pain more than death. Until the introduction of ether-induced anesthesia, patients' pain limited what a surgeon could do. Modern anesthesia has now made it possible for surgeries to last for hours without the patient feeling a thing.

Morphine, alcohol and amputations in the wintry cold of an exposed battlefield – until Ether Day in Boston in 1846, physicians came up with a number of ideas to increase the pain threshold of their patients. It was the only way that they could perform operations that would not otherwise have been possible.

The use of ether marks the beginning of modern anesthesia. The liquid was applied to some absorbent cotton and evaporated as the patient inhaled the fumes. They weren't the only ones, though – everyone else in the operating room breathed them in, too. Finding the right amount of an anesthetic agent is not easy. If there is too much, the patient won't wake up; if there is too little, the patient feels pain. Doctors spent years researching anesthesiology.

Working in close collaboration with surgeon Dr. Otto Roth, Johann Heinrich Dräger developed the Roth-Dräger mixed anesthetic apparatus. He used compressed oxygen in steel cylinders and a patented drip dosing system for the liquid anesthetic agent. However, in addition to the oxygen pressure reducing valve that Dräger invented, the real star was the injector, known as the pressure suction jet. It captures the fumes of the anesthetic agent along with the breathing gas. This was a sensation: for the first time, humans had the upper hand on anesthesia.

Dräger continued to work together with researchers and users to further develop its devices, inventing its own technology in the process, but also going back to previous and now familiar ideas. One such example is the closed-circuit breathing technology originally developed for mine rescue teams. It prevents exhaled air containing anesthetic agents from escaping into the OR's ambient air.

Modern anesthesia devices are also designed as workstations. In addition to the devices' own monitoring parameters, their sensors also measure patients' vitals. They display the vitals on monitors, compare them against alarm limits and sound alarms as needed, making anesthesiologists' work more transparent and ultimately increasing patient safety.

Working in a hostile environment

Humans face difficulty when exposed to extreme environmental conditions: we are soon unable to breathe at great heights, we can dive for only a few minutes at a time, and poisonous gases create trouble for us in underground mines. It is impossible to work where there is no clean air.

At the beginning of the 20th century, company founder, Johann Heinrich Dräger, and his son Bernhard developed a closed-circuit respiratory protective device for mine rescue teams during rescue missions. The special thing about this device: Two Dräger inventions came out of it that continue to play a key role in the field of respiratory protection. The first is the pressure reducing valve, which reduces the pressure of compressed oxygen in steel cylinders to ambient pressure levels. The second is the injector, known as the pressure suction jet, which forces exhaled air through an alkaline cartridge that scrubs carbon dioxide from the air.

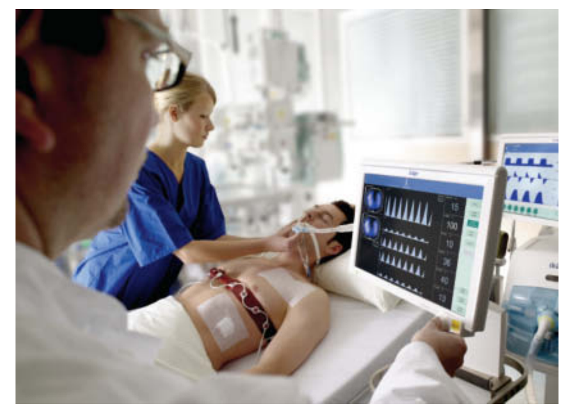
The underlying principle is so straightforward that modern-day breathing apparatus technology continues to be based on it. Human physiology is not as straightforward, however. Following extensive experiments that he conducted on himself, Bernhard Dräger discovered that the amount of oxygen required for physical labor is three times higher than was previously thought. His findings continue to be relevant for years to come.

Although the basic technology has hardly changed over the decades, the devices themselves continued to evolve. The advancements include lower weight and higher performance, a cooling system for the breathable air, and electronic displays and warning devices. Among those devices was the self-rescuer from 1913 that every miner could carry with him while working in the mines. At the beginning of the 1950s, Dräger began developing self-contained breathing apparatuses for gas protection teams, firefighters and divers.

Human life has always been our focus. That is why everything from chemical protective suits, firefighter helmets, sensor technology, telemetry and communications equipment to thermal imaging cameras continuously makes people safer when they use this equipment. This also extends to fire simulation systems for fire and mine rescue team emergency training under controlled conditions.

If respiration fails

We breathe every moment of our lives because the body requires oxygen. At rest, humans need around 200 to 300 milliliters per minute – the volume of a wineglass. During periods of physical activity, we need considerably more oxygen. But what happens when someone is no longer able to breathe on their own?



If someone stops breathing, they die. Or at least, that was the case for many millennia. But there's a solution: Artificial ventilation can resuscitate someone who isn't breathing.

The company's founder, Johann Heinrich Dräger, came up with the idea for a machine that is able to provide automated ventilation even for longer periods of time when he was on a business trip to London. While he was there, he saw a man who was pulled from the Thames and manually resuscitated. His observations and reflections led to the Pulmotor, which was developed in 1907 and was the first serially produced ventilator. This little machine created constant alternating positive and negative airway pressure. This was how it pumped fresh air or oxygen into the lungs. A clockwork mechanism controlled the machine's inhalation and exhalation movements.

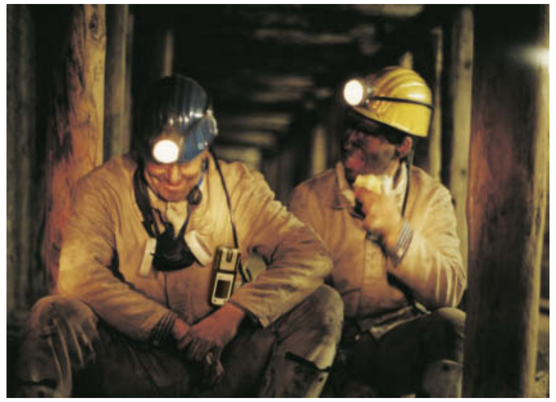
However, simple mechanical resuscitation was only the first step in saving lives. What happens if ventilated patients suddenly begin to breathe again on their own? Researchers working on respiratory physiology uncovered the solution to the problem quite by accident. Newer ventilation equipment recognizes and supports spontaneous breathing. They also factor in a patient's age and physical state.

Measurement and control technology with precise electromagnetic valves, ultra-sensitive sensors and high-performance microprocessors have long since replaced the Pulmotor's clockwork mechanism. According to physicians, "weaning should be a consideration already when you start artificial ventilation." The latest technology goes above and beyond this demand.

Since 2011, it has been possible for doctors to look inside the lung during ventilation thanks to the lung monitor PulmoVista 500. The monitor continuously displays the dispersion of air in the lung in real time. This information allows the doctor to adjust the ventilator's settings to meet the patient's particular needs. Modern ventilation is more than precision proportioning of breathable air; it is also as gentle as possible on the lungs.

Something in the air

In a mine, if a canary fell from the perch inside its cage, that meant there was danger in the air. However, the human nose often does not recognize what the danger is. This is where gas detection devices take over.



Carbon monoxide is the result of improper combustion. The invisible, tasteless and odorless gas can lead to cases of poisoning and even death. The same is true for fermentation gases that humans have known about ever since they began making beer and wine. But the warning systems to protect people from suffocating, being poisoned or exposed to explosions were modest: a candle that goes out when there is too little oxygen or a canary that falls from its perch, alerting miners to carbon monoxide.

Industrialization meant even more dangerous gases, including coal gas and methane. This is to say nothing of the gases produced in the chemical industry. Not a single one is very healthy for human beings.

Scientists discovered and analyzed the composition of gases with the help of chemical reactions. The lab tests, however, were costly and time-consuming. In Germany in 1937, the Dräger-Tube provided a remedy – a miniature lab inside a glass flask. With the help of a pump, a certain amount of ambient air is piped through the tube. If the gas in question is present, a chemical reaction will cause the color in the tube to change. The concentration of the gas at that moment can be found on a graduated scale on the tube.

What sounds so simple is, in fact, not so trivial considering the approximately 500 gases and vapors that Dräger-Tubes are made to detect. What works well in the lab may prove tricky in practice. Factors such as temperature, humidity and gas mixtures cannot affect how the tube functions. This is a big responsibility, which is why Dräger itself exclusively develops and produces Dräger-Tubes.

The same is true for the sensors, which Dräger has developed since the 1970s. Unlike Dräger-Tubes, the sensors are designed for continuous gas detection and sound alarms via the detection instruments in an emergency. The German Parliament decided to rely on this technology starting in 1999. Dräger gas detection systems monitor the air in the Reichstag in Berlin so that fiery debate is the only thing liable to ignite in the building.

www.draeger.com/history

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