BOSCH
Invented for life

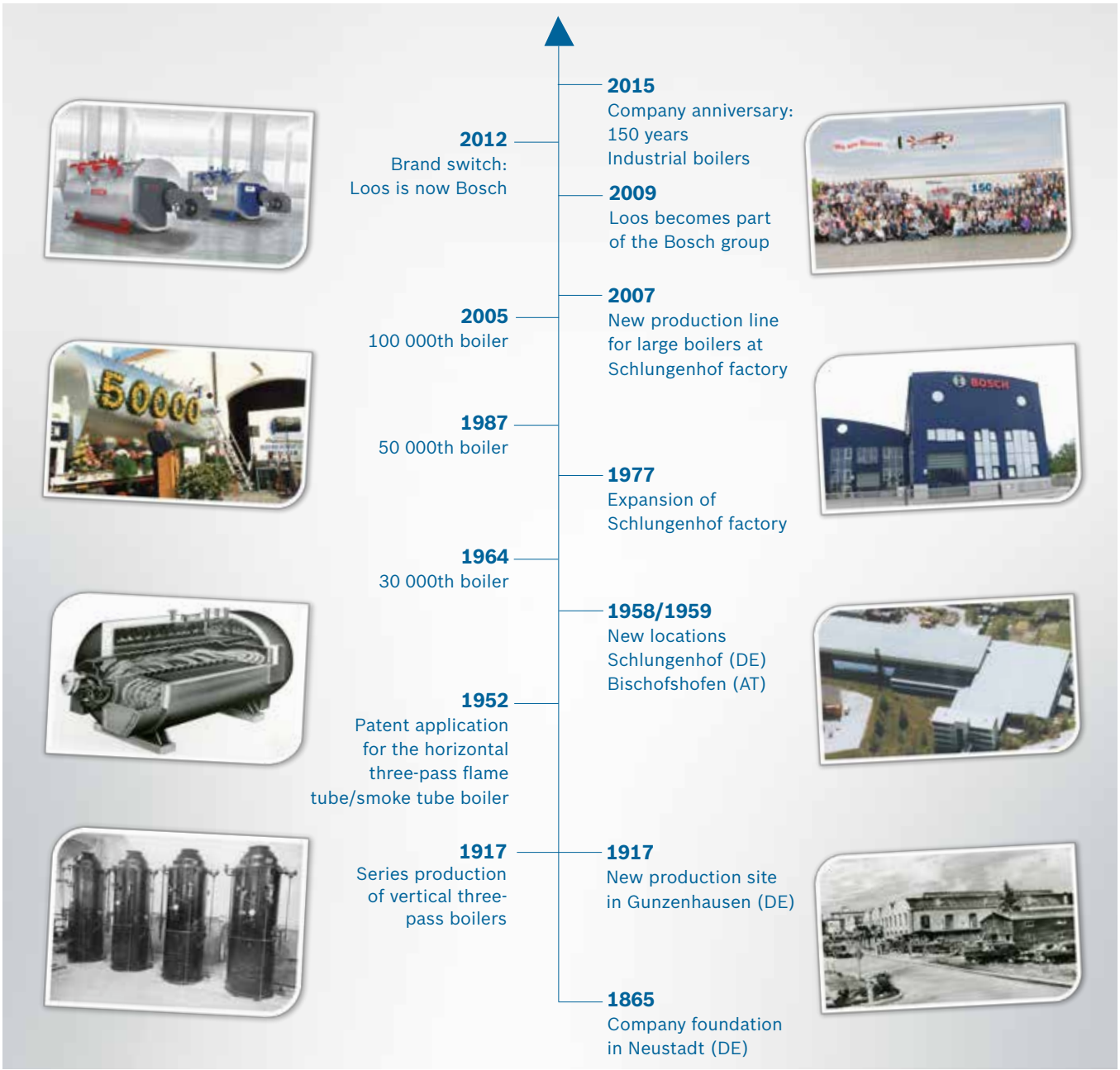
Quality, precision and a sense of responsibility

www.bosch-industrial.com

The basis for production excellence

Driving force
for more than 150 years

Bosch Industrial Boilers has been the leader in thermal systems and system solutions for more than 150 years. Trendsetting innovations and the consequent development of our products are the basis for outstanding efficiency and sustainability. More than 115,000 boiler systems delivered into more than 140 countries is proof of the high quality and reliability of our industrial boilers.



Certificates
prove high quality standards

Numerous certificates and licences for our products in more than 140 countries all over the world are testament to the high quality and production standards of Bosch Industriekessel. All Bosch boilers and boiler house components conform to respective European guidelines for CE-labelling, especially the Pressure or Gas Equipment Directive based on technical standards (e.g. TRD, AD 2000 and EN norms such as EN 12953). The majority of our products and components are in conformity with the requirements for EC type examination. Customised solutions receive an approval for specific use by a notified body (e.g. TÜV Süd) before they leave the factory.

We manufacture our products according to the latest national standards e.g. EAC (Russia, Belarus, Armenia, Kyrgyzstan, Kazakhstan), TSG G0001 (China), SVGW/VKF (Switzerland), SI 4280 (Israel) and many more. Our equipment according to EN 12953 for boiler systems is approved for operation without permanent supervision (BOSB 72h).

Bosch Industriekessel production sites use certified quality management systems e.g. EN ISO 9001, EN ISO 14001, Module D according to the Pressure Equipment Directive, SI 430 (Israel) and MLSE (China). In addition, Bosch Industriekessel is a certified manufacturer to the highest quality requirement level for welding companies according to EN ISO 3834 Part 2. Our corrugated flame tubes are subjected to a process qualification according to TRD and the Pressure Equipment Directive. We are licensed to provide maintenance for boiler systems and our international service network allows us to offer customer service in more than 140 countries all over the world, in some cases with 24/7 availability.

Type approval for different boiler types,
approval for specific use for special designs

International certifications and licences

Quality management and production

Optimum boiler construction
thanks to more than 150 years of experience

Optimised design for modern steam supply

Modern steam boilers do not only have to work efficiently, they also have to manage dynamic pressure demands with a consistently high steam quality. When it comes to dynamics, water content and steam space are the factors most often taken into consideration, although other factors are physically more relevant. Far more crucial for the power reserve and the dynamics with consistently high steam quality are the water quality, the control quality and the height of steam space. Bad water quality leads to a "turbulent" water level and foaming. The risk of water entrainment is thus increased.

The patented arrangement of the flame tube and the passes of Bosch boilers (fig. 2) is ideal for a maximum steam space at a low water content. At spontaneous power peaks the water level inside the boiler rises because of the increased amount of steam bubbles in the boiler's water. Here the height of the steam chamber provides the highest safety for preventing a water level caused emergency shut-down and for minimising water entrainment. In addition, extremely fast reaction to load peaks is reliably achieved by our intelligent three-component control, pilot signals from large scale consumers and by avoiding preventilating (burner start). State of the art design methods such as "design by rules" and "design by analysis" (e.g. FEM) keep tensions in the boiler low.

Other advantages of the Bosch boiler design are:
- Higher steam quality especially for dynamic requirements
- Low water content allows faster heating from cold start condition
- Most compact design reduces required space, radiation and downtime losses
- Lower flame chamber load and reduced NO_X emissions

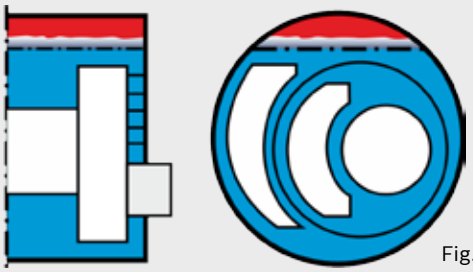


Fig. 1

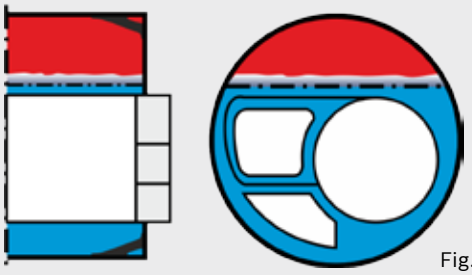


Fig. 2

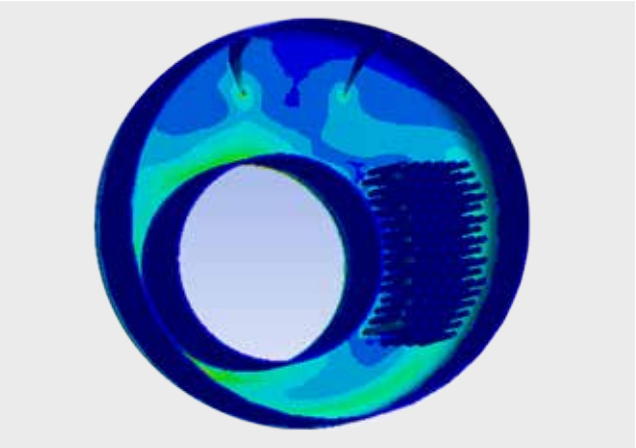
Boiler design with passes lying side by side (fig. 1) and with optimised vapor space (fig. 2).

Diagonal stays instead of stud bolts

In other boiler designs the reversing chamber is fixed to the boiler end with stud bolts and there is no direct connection between the flame tube and the boiler end. During start-up of a boiler high forces occur between the warm flame tube and the cold boiler body. Stud bolts can distribute this force only punctually. This causes unfavourable stress peaks in their connecting weldseams.

Other disadvantages of the stud bolt construction are:
- Stud bolts are more prone to flexural stress
- Frequent changes in temperature can lead to stud bolts being torn off

For Bosch's industrial boilers (formerly Loos) the construction principle has been developed further and the use of stud bolts has been discontinued. The flame tube is fixed at both ends of the boiler body and occurring tensions can be passed on via diagonal stays (corner anchors). To prevent additional radiation of heat, the boiler's inspection door is filled in with a special Bosch composite material with extremely high insulation qualities. It is designed to be maintenance-free during the entire service life when commissioned and operated correctly. This UL-S design method has proved itself for more than 60 years in more than 80,000 boiler systems. Some of the first boilers of this kind from the early 1950s are verifiably still in daily operation today.

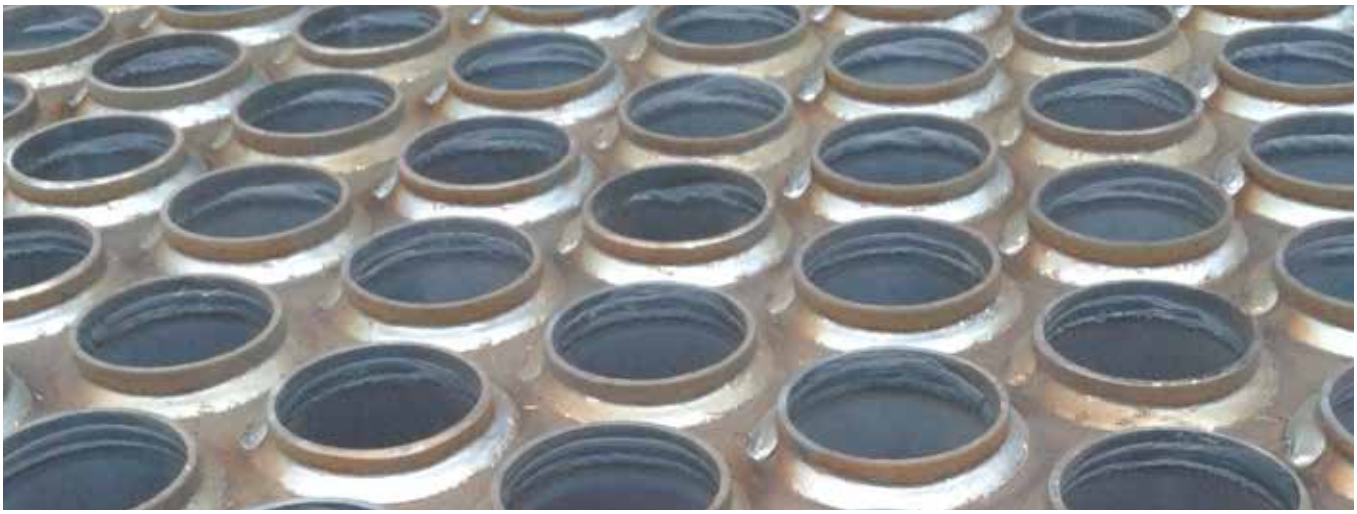


In contrast to tie rods, diagonal stays enable uniform tension distribution and a long service life.

Proper welding of flame tube and smoke tube for more safety and stability

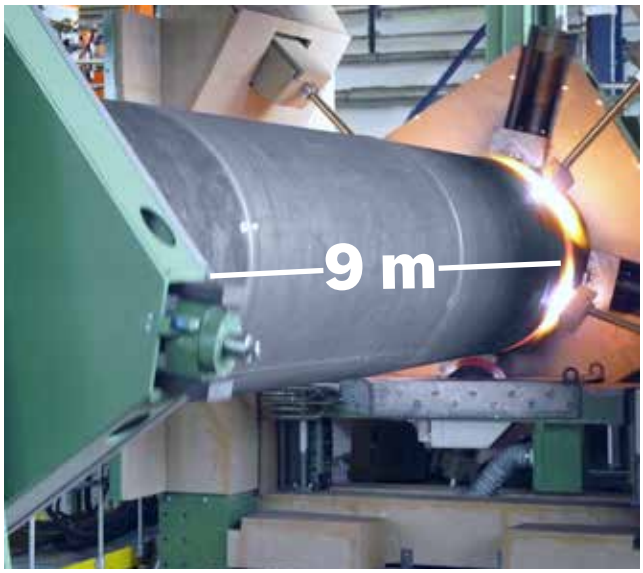
The connections between flame and smoke tubes and the boiler's ends are amongst the most important parts in a high-pressure boiler. These connections must resist high tensions and temperatures. This is why for Bosch boilers the smoke tubes are welded in by modern robots and the flame tubes by semi-automatic welding plants. Semi-automatic or fully automatic welding processes enable homogeneous and especially robust connections. In addition, special grooves are used to enable better cooling of thermally highly stressed weldseams. Particularly for thicker sheet metal this provides excellent cooling even in high load condition.

Burner passages however are made without water cooling in order to increase the boiler's durability. Complicated and costly repairs including a complete hydraulic pressure test are thus prevented. Thanks to Bosch's special insulation concept in the burner passage, heat emission losses and heat input of our industrial boilers can be minimised. Furthermore, it increases the robustness and maintainability of the boilers because the insulation material is designed for the entire service life of the boiler when commissioned and operated correctly.



Welding with precision

Boilers up to 120 tons can turned quickly, safely and gently, positioned and processed ideally in the Bosch factories thanks to our high load process cranes and our high production halls. In outdated production facilities boilers of more than 60 tons often have to be positioned horizontally because of height restrictions. As a result flame tube and smoke tubes need to be welded in a vertical position which can lead to quality problems as the liquid metal always follows gravity.



Welding in a horizontal position allows a more homogeneous structure, a higher penetration depth, and the highest welding quality due to an overall more consistent welding process.

For the individual assembly of a boiler with flanges and customised equipment, the components are connected manually using the metal active gas welding (MAG) procedure.

To achieve non-porous seams it is essential that the inert gas in the welding process is not blown away. We ensure this by protecting our work areas with wind-protected work stations, special ventilation systems and radiant ceiling heating instead of conventional hot air blowers.

Our globally unique, self-developed corrugated tube machine is able to manufacture fully automatically corrugated flame tubes with up to 9 metres length. The machine has 12 servomotors and 3 lasers for monitoring and precise control. It manufactures corrugated flame tubes accurate to a fraction of a millimetre thanks to laser technology. Corrugated flame tubes are a vital part of the boiler and amongst the highest stressed parts, making precision and process quality essential.

High-tech welding robots for highest quality

To ensure a particularly high and constant quality, the smoke tubes are welded fully automatically using five robot systems. Compared to conventional welding robots, the special robot used in Bosch industrial boiler production (see figure below) brings many benefits. There are no tool-positioning tolerances because of the fully automatic single measurement of the tubes.

Because we use a crane system the intelligent robot is very versatile and can be moved quickly and easily to each boiler. The quality of those weldseams is essential for the long life of the boilers because the smoke tube weldseams are exposed to high thermal and mechanical loads during operation.

Less weldseams, higher quality

By using larger sheet metal, fewer weldseams are required. This increases the strength and quality of the boiler shell and providing maximum robustness with greater resistance to stress. We therefore produce our large boiler bodies with less weldseams than usual. Our specialized production equipment is capable of handling sheet metal with more than 3.5 m width.

Low-stress material increases the service life

The use of laser and plasma cutting machines for cutting the vessel and pressure vessel parts allows particularly low tolerances to be achieved. Precise angles and a minimised heat input are additional advantages compared to common gas cutting machines.

Cutting with CNC-controlled plasma systems causes less thermal stress input at the cutting points of the plates. Adjustable cutting heads up to 45 degrees allow simultaneous joint preparation. All boiler body parts are processed with this procedure at Bosch.

Smaller sheet metal parts for boiler components and small boiler bodies are cut at the fully automatic CNC-controlled laser cutting machine. With the smallest joints and burr-free edges the fast, precise and low-stress cut workparts can undergo further processes without the need for reworking.

Investing in safety and excellent working conditions – because only satisfied employees deliver best quality

The health of our employees is a top priority for us. Every year we invest in employee safety and modern working conditions.

For example, the special fall protection device in the boiler production halls in Gunzenhausen (Germany) is unique. The workers are completely and safely secured without being limited in their mobility. Working at height on boilers which are up to 9 metres high in a standing position is always carried out with this fall protection. Basic safety equipment for production employees includes climbing harnesses, special head impact protection and safety clothing.

A special fresh air supply system avoids circulation of dust and thus provides excellent production conditions and a healthy climate. "A few years ago hardly anyone could imagine that the air quality can be improved to today's high standard", emphasises Ferdinand Smola, production manager at Gunzenhausen.

Our welders wear special helmets that ensure a constant supply of filtered fresh air. There are also brand new special devices which measure the vital functions of the workers. This ensures that in the case of an emergency colleagues, first aiders and the shift supervisor are alarmed instantly and are thus able to help quickly.

"It makes me especially proud that suggestions from us in production are also considered and implemented to constantly improve our boilers."

Lukas Gruber, certified boiler welder

Certified experts and qualified young talent for outstanding quality “made in Germany”.

Precision and analysis

As a pioneer in the industrial use of welding technology in boiler construction, Loos (now Bosch Industriekessel) first established its own laboratory for analyses next to the production halls nearly a century ago. It was here that the basic knowledge of welding was imparted. Today it is modernized and used to analyse weldseams and for materials testing.

Quality control is also carried out in the laboratory, including frequent tensile tests, hardness measurements and macrosections as well as impact tests under normal conditions and under the influence of temperature.

Besides the test laboratory, the development area is an inherent part of the Competence Centre for industrial boiler systems in Gunzenhausen (Germany). We initially draft and simulate developments in 3D. Results are verified on prototypes at multiple testing bays to further optimise construction and boiler control before running endurance tests.

Higher quality through industry leading quality assurance methods

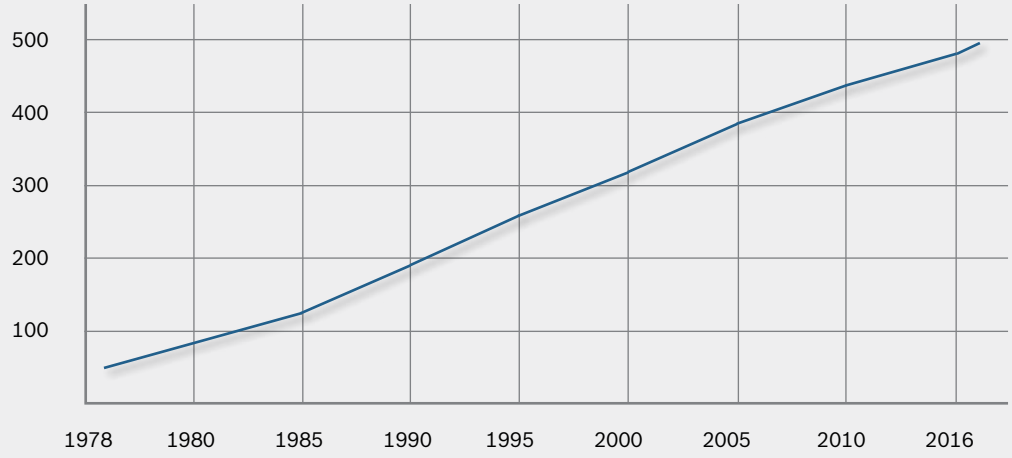
Quality control by X-ray is part of our boiler production process. Our constantly high welding quality is confirmed on around 25,000 developed films per year. Our trained staff can check, evaluate and document weldseams at any time during operation. Going beyond the standard quality requirements up to 100 percent of a boiler's weldseams are X-rayed. This also includes even our biggest boilers. In addition, we conduct ultrasonic tests, dye penetrant tests, magnetic particle tests and hydraulic pressure tests for our pressure vessels. Our high quality standards of course apply also to the production of our control cabinets. Every single of our controls is completely pre-configured and all functionalities are tested in a simulated boiler house. This ensures the highest quality of these customized products and allows fast and flawless commissioning.

Promotion of young talent and training of experts

The welding laboratory, modern test facilities and our own apprentice workshop allow the qualification of new employees and the approved certification of professionals and boiler specialists at our own location in cooperation with "TÜV Süd". The high educational level of our employees is an important part of our quality concept. More than 200 professional boiler welders at Bosch Industriekessel possess more than 1,000 welding certificates.

More than 50 of our production employees are granted a special role: They are officially certified by a notified body as testing specialists and undertake quality control already in early stages of production. TÜV employees are on site every day for tests and documentation in our production facility. The documented, professional production of our products is the basis for our quality promise to our customers.

Apprentices since 1978 (cumulative)



Continuous qualification of industrial and commercial apprentices, IT specialists and technical draughtsmen

Bosch Industriekessel GmbH

Nuernberger Strasse 73
91710 Gunzenhausen
Germany
Tel. +49 9831 56253
Fax +49 9831 5692253
sales@bosch-industrial.com
Service Hotline +49 180 5667468*
Spare Parts Hotline +49 180 5010540*

Bosch Industriekessel Austria GmbH

Haldenweg 7
5500 Bischofshofen
Austria
Tel. +43 6462 2527300
Fax +43 6462 252766300
sales-at@bosch-industrial.com
Service Hotline +43 810 810300**
Spare Parts Hotline +49 180 5010540*

info@bosch-industrial.com
www.bosch-industrial.com
www.bosch-industrial.com/YouTube

* EUR 0.14/min from German landline; maximum mobile phone price: 0.42 Euro/min
** max. EUR 0.10/min from Austrian landline
Different charges may apply for calls from mobile networks and for international calls.