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**Steam boilers**



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## Hot water boilers Heating boilers



	Uni Condens	UT-L	UT-M	UT-H	UT-HZ
Output MW	0.8–1.2	0.6–25	0.7–19	0.8–18	13–38
Temperature max. °C	110	120	190	210	210
Pressure max. bar	6	16	16	30	30

## Steam boilers



	U-MB	CSB		UL-S(X)	ZFR(X)
Output t/h	0.2–2	0.3–4.8	0.3–5.2	1.2–28	18–55
Temperature max. °C	204	110	204	300	300
Pressure max. bar	16	0.5	16	30	30

## Efficiency



Heat recovery boiler HRSB	4-pass boiler with burner	3-pass boiler without burner	Recovery and use
Heat recovery steam boiler	Heat recovery boiler steam/hot water		Waste heat

## Components



Boiler and system control	Water	Steam/Condensate	Fuel supply
Control cabinet	Modules	Modules	Burner systems

# Quality boilers for more than 150 years

Bosch Industriekessel is renowned worldwide as a specialist supplier of boiler systems in all sizes and output categories. For over 150 years we have been providing innovation in industrial boiler construction.



The company, which began in 1865 as a small boiler maker under the Loos family name, has developed in recent decades into a leading global system supplier for industrial boilers. More than 115,000 boiler systems supplied to over 140 countries worldwide con-

firm the renowned quality, reliability and efficiency of our industrial boilers, which are manufactured in Gunzenhausen (Germany) and Bischofshofen (Austria).

## Efficient systems

Our modular boiler systems can reduce operating costs by up to 25% when compared with conventional boilers. In addition to minimising fuel consumption, our boiler systems also reduce the consumption of water, chemicals and electric power as well as the work involved in operation and supervision.

## Perfectly controlled

Thanks to their intelligent boiler control, the availability and also the efficiency of the systems increase. Automatic control features, such as for example for cold starts or multi-boiler systems, significantly extend the lifespan of the boiler systems.



Whether it is 3D data, technical drawings or documents for tendering and approval, the experts from Bosch offer specialist support at every phase of the project – from conception through to commissioning. Trust and openness between partners ensure that mutual success is achieved. Thanks to the customised dimensioning and equipping of the boiler systems, individual solutions can be created and modules retrofitted easily.



#### **Precision due to welding in ideal position**

Thanks to horizontal welding with highly modern welding processes, a more homogeneous structure, a deeper root penetration and notch-free welding surfaces are achieved.

#### **Use of welding robots**

Semi-automatic and fully automatic welding robots are used for consistently high quality on highly-stressed welding seams.

#### **Low-stress materials**

Modern plasma and laser cutting systems ensure smooth metal processing and cutting. This means that our boilers have higher stress reserves during operation.

#### **In-house manufacture of flame tubes**

All smooth and corrugated flame tubes are manufactured in-house and are subject to the most stringent quality requirements. Up to 100% of the welding seams are X-ray inspected.



#### **Health and safety at work and promotion of young talent**

Only happy and focused employees will deliver top quality. The very latest safety concepts and equipment and materials for the work to be carried out are part of our overall manufacturing concept, just like the training and further education of our staff.

#### **Experts with certified knowledge**

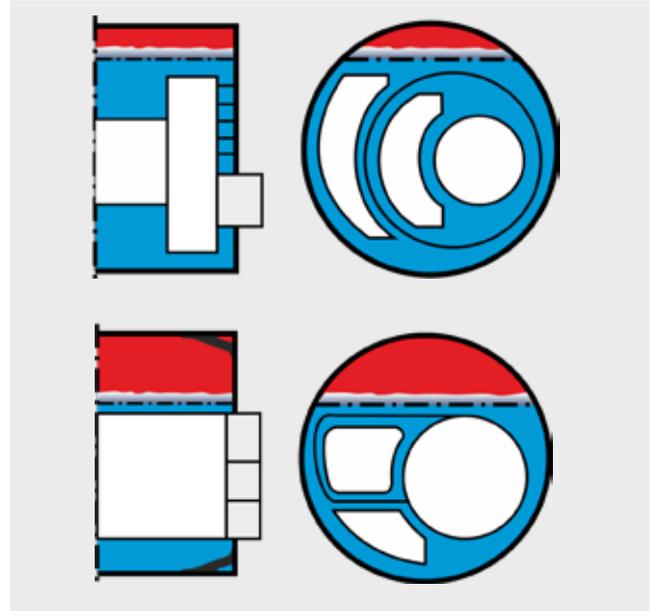
Our nearly 200 boiler welders have more than 1,000 welding exam qualifications. This means that welding of the highest level in accordance with internationally recognised standards is achieved.

### Optimum design

Thanks to an ideal ratio between water content and steam chamber, Bosch boilers are optimised in their design for rapid heating and a high level of steam quality. Ideal temperature distribution and release of vapour bubbles enables the boilers to be operated very efficiently even during periods of dynamic loads. Compared to other boiler designs, the Bosch design with its high steam chamber minimises high-water shutdowns and water entrainment. Our intelligent three-component control, combined with pilot signals from large consumers and less frequent pre-ventilation (burner starts), also enables the boiler to react particularly quickly and reliably to load peaks.

### High level of durability

The boiler design traditionally used in old steam locomotives has been continuously developed. The design with its fully inserted flame tube and without stud bolts offers the maximum level of robustness and an increased resistance to cold starts.



Boiler designs with flue gas passes side by side (drawing above) and optimised steam chamber from Bosch (drawing below).



### Certified quality

We manufacture our products in line with current standards and in accordance with the relevant applicable specifications for over 140 countries. The quality management systems in our plants are certified in accordance with strict guidelines. At the customer's request, we also carry out additional checks.

### Maximum quality monitoring

We consider quality to be a top priority. Plant inspectors certified by TÜV and TÜV employees monitor and document our quality during manufacture and through to acceptance.

### Precision and analysis

An in-house laboratory for welded seam inspections and material analyses provides maximum transparency. Over 25,000 X-rays of welded seams are analysed in our three X-ray chambers every year.



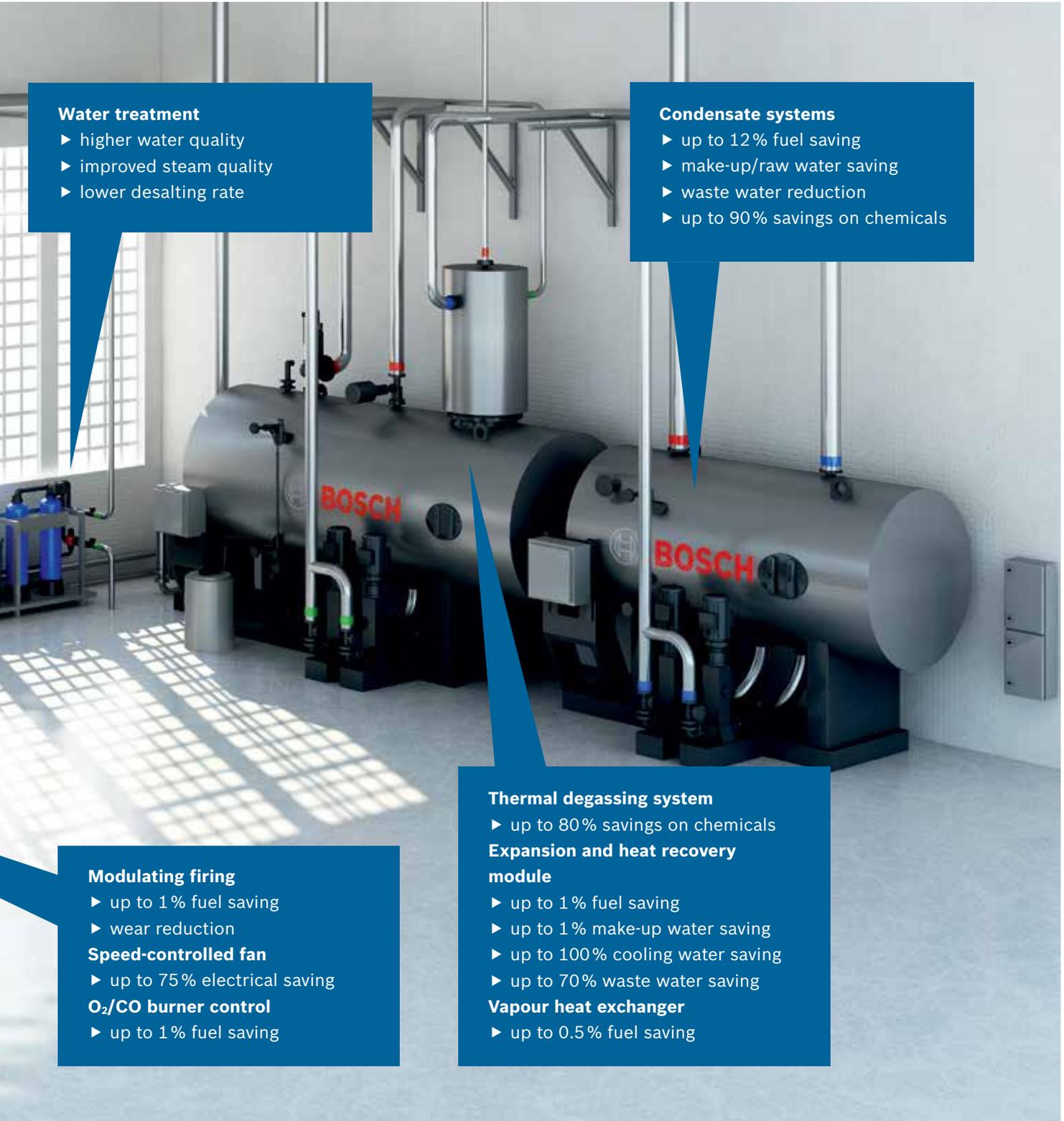
# Energy-saving system technology

High-efficiency boiler systems with optimally-matched boiler house components ensure low energy consumption and low emissions.



- Economizer**
  - ▶ up to 7% fuel saving
- Flue gas condenser**
  - ▶ up to 7% fuel saving
- Air preheating**
  - ▶ up to 2% fuel saving
- Feed water cooling**
  - ▶ up to 1.8% fuel saving

- Settings and maintenance**
  - ▶ up to 3% fuel saving
  - ▶ extended service life
  - ▶ process reliability
  - ▶ improved operation



**Water treatment**

- ▶ higher water quality
- ▶ improved steam quality
- ▶ lower desalting rate

**Condensate systems**

- ▶ up to 12% fuel saving
- ▶ make-up/raw water saving
- ▶ waste water reduction
- ▶ up to 90% savings on chemicals

**Thermal degassing system**

- ▶ up to 80% savings on chemicals

**Expansion and heat recovery module**

- ▶ up to 1% fuel saving
- ▶ up to 1% make-up water saving
- ▶ up to 100% cooling water saving
- ▶ up to 70% waste water saving

**Vapour heat exchanger**

- ▶ up to 0.5% fuel saving

**Modulating firing**

- ▶ up to 1% fuel saving
- ▶ wear reduction

**Speed-controlled fan**

- ▶ up to 75% electrical saving

**O<sub>2</sub>/CO burner control**

- ▶ up to 1% fuel saving

# UNIVERSAL steam boiler CSB

Ultra-compact steam boiler for the smaller output range. Enables future-proof low emissions and a high efficiency level. The ideal solution for food and beverage industries, manufacturing industries, hospitals, laundries and hotels.



## Technical data type CSB

Heat transfer medium	Low-pressure saturated steam	High-pressure saturated steam
Design	Shell boiler	
Output in kg/h	300 up to 4,800	300 up to 5,200
Safety pressure in bar	up to 0.5	up to 16
Max. temperature in °C	110	204
Fuel	Oil, gas, multi-fuel firing	

## High level of efficiency for reduced operating costs

The integrated economizer uses flue gas heat to reduce fuel consumption and lower the flue gas temperature. Together with the innovative insulation concept and Bosch compound insulating materials, this allows for a particularly high level of boiler efficiency.

- ▶ High efficiency rating of up to 95.3% with integrated economizer (optional)
- ▶ Reduced power consumption of the burner fan thanks to low resistance on the flue gas side
- ▶ Fit for the future: Thanks to the low-NO<sub>x</sub> burner and generously dimensioned flame tube, the boiler already reliably falls below the strict EU emissions limits of the MCPD for 2025 and/or local emissions regulations

## User-friendly operating concept

- ▶ Compact control CSC with touchscreen mounted on the boiler
- ▶ Alternatively available with boiler control BCO which offers additional functions: Remote access via MEC Remote, connection to automation systems and efficiency assistant MEC Optimize

## Reliable performance and customised equipment

The steam-drying unit and the generously dimensioned steam chamber in the Universal CSB design guarantee a high level of steam quality that suits your processes.

- ▶ Available in high-pressure and low-pressure versions
- ▶ Flexible boiler equipment including firing unit, flue gas heat exchanger, water treatment and control system
- ▶ Universal, can be used with e.g. natural gas, biogas, fuel oil or multi-fuel firing
- ▶ Certified in accordance with the European Pressure Equipment Directive (high-pressure steam boilers), internationally applicable with country-specific safety equipment

## Quick installation and hassle-free maintenance

- ▶ Compact design optimised for ease of transport and simple installation
- ▶ Smooth commissioning thanks to pre-wired compact control and pre-assembled modules
- ▶ Easy cleaning, maintenance and service thanks to telescopic reversing chamber
- ▶ No inserts in the heat exchanger tubes allow good accessibility



## Design

The steam-drying unit and the generously dimensioned steam chamber in the Universal CSB design guarantee a high level of steam quality that suits your processes. The high-quality production of the entire boiler body using the latest in welding robots allows for a particularly high level of robustness and durability.

Thanks to the special helical heat exchanger tubes, the heat exchange per m<sup>2</sup> of heating surface is improved significantly. The use of inserts in the exhaust system

is not required, which makes cleaning significantly easier. Furthermore, the energy requirement for the burner fan is reduced thanks to the low flue-gas-side resistance.

The telescopic reversing chamber of the industrial steam boiler makes maintenance and inspection work easier. It can be opened safely by a sliding system without needing very much space. Likewise, the entire rear tube plate is fully accessible.

## Associated boiler house components

- ▶ Flue gas heat exchanger ECO
- ▶ Feed water cooling module FWM
- ▶ Condensate service module CSM
- ▶ Water service module WSM
- ▶ Water treatment module WTM
- ▶ Pump module PM
- ▶ Water analyzer WA
- ▶ Feed water regulation module RM
- ▶ Blow-down, expansion and cooling module BEM
- ▶ Expansion and heat recovery module EHM
- ▶ Expansion, heat recovery and blow-down module EHB
- ▶ Vapour cooler VC
- ▶ Gas regulation module GRM
- ▶ Oil supply module OSM
- ▶ Oil circulation module OCM
- ▶ Oil pressure regulation module ORM
- ▶ Oil preheater module OPM
- ▶ Steam distributor SD
- ▶ Steam accumulator module SAM
- ▶ Controls for optimising combustion
- ▶ Compact steam boiler control CSC
- ▶ Boiler control BCO
- ▶ System control SCO
- ▶ Remote access MEC Remote
- ▶ Efficiency assistant MEC Optimize
- ▶ Control for large-scale plants MEC System

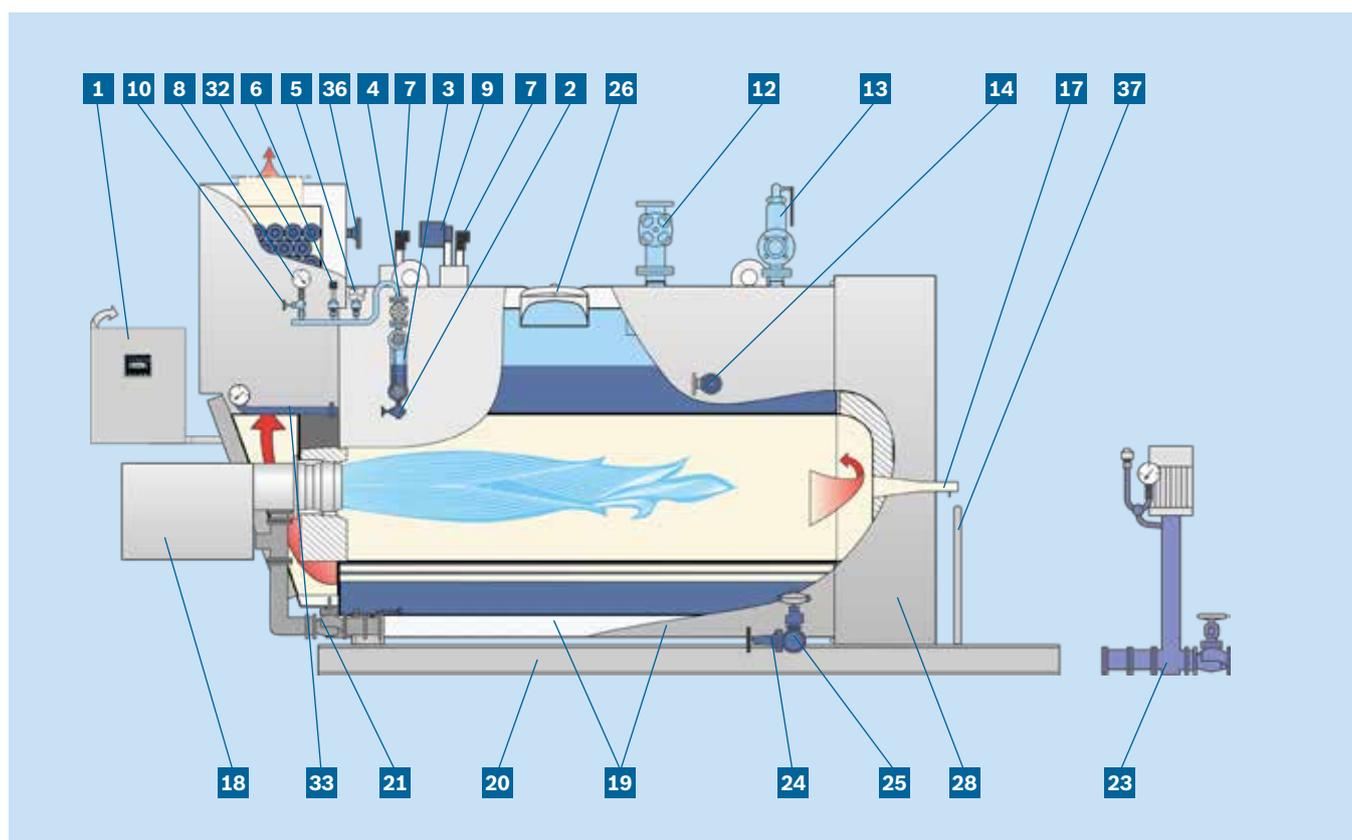


Compact steam boiler control CSC

## Equipment

We offer the UNIVERSAL steam boiler CSB as a complete boiler system including equipment\*. The basic equipment comprises the boiler pressure vessel, the control and safety components, the burner unit, an integrated economizer, a pump module, a terminal box and the compact control CSC mounted on the boiler. Alternatively, you can select

the boiler control BCO that allows connection to automation systems. The sensors, actuators and country-specific safety equipment are already wired and combined in the terminal box. Pre-assembled, plug-in and coded cable bundles simplify the connection between the boiler control cabinet and the terminal box.



- |   |   |
|---|---|
| <b>1</b> Control switchgear cabinet with compact steam control CSC, swivel-mounted (alternatively boiler control BCO) | <b>17</b> Sight hole  |
| <b>2</b> Blow-off tap   | <b>18</b> Burner  |
| <b>3</b> Reflective water level indicator   | <b>19</b> Insulation with protective shell                      |
| <b>4</b> Manostat tube shut-off valve, maintenance-free   | <b>20</b> Base frame  |
| <b>5</b> Pressure limiter   | <b>21</b> Gas regulation module                                 |
| <b>6</b> Pressure transducer (4–20 mA)  | <b>23</b> Pump module   |
| <b>7</b> Low-level limiter electrode  | <b>24</b> Drain shut-off valve, maintenance-free                |
| <b>8</b> Pressure gauge   | <b>25</b> Quick shut-off blow-down valve                        |
| <b>9</b> Level transducer (4–20 mA)   | <b>26</b> Inspection opening, steam side                        |
| <b>10</b> Pressure gauge shut-off valve with testing function   | <b>28</b> Telescopic rear reversing chamber for easy inspection |
| <b>12</b> Steam removal valve   | <b>32</b> Flue gas heat exchanger ECO                           |
| <b>13</b> Full-lift safety valve  | <b>33</b> Connection piping ECO/boiler                          |
| <b>14</b> Desalting and fully automatic conductivity measurement (here not drawn)                                     | <b>36</b> Water inlet connection ECO                            |
|   | <b>37</b> Bow-type handle for reversing chamber                 |

\*The equipment level is variable and can be freely configured to customer requirements.

## UNIVERSAL steam boiler U-MB

The product designation U-MB stands for “UNIVERSAL Modular Boiler” (three-pass steam boiler in modular design). The U-MB type consists of several modules, which fulfil your individual requirements perfectly. Typical application areas are the food and beverage industry, laundry and cleaning businesses, as well as smaller industrial companies.



## High level of efficiency for reduced operating costs

The boiler components are configured with a focus on low emissions, high steam quality and optimum energy efficiency.

- ▶ High level of efficiency due to the integrated economizer
- ▶ Maximisation of efficiency thanks to modular heat recovery modules

### User-friendly operating concept

- ▶ Intuitive PLC-based boiler control
- ▶ Automatic start-up, standby and shutdown control SUC
- ▶ Ready to connect to automation systems
- ▶ Digital efficiency assistant MEC Optimize
- ▶ Protected remote access MEC Remote

### Reliable performance and customised equipment

The three-pass steam boiler can be used universally for all applications. Naturally it can be combined with all the other available system components from our modular range for fuel and water supply, water disposal, water analysis and heat recovery.

- ▶ Comprehensive, series-wide basic equipment
- ▶ Shell boiler and three-pass technology
- ▶ Small space requirement due to compact footprint
- ▶ The modular design, which is based on the systematic use of design features and parts that are also used in other type series, ensures a particularly attractive price-performance ratio

### Quick installation and hassle-free maintenance

- ▶ Compact design for bringing the boiler into site easily if space is limited
- ▶ Reduced installation effort thanks to supply as a single unit – the equipment, firing and economizer have already been fitted in the factory
- ▶ Simplified wiring on site thanks to plug-in connections
- ▶ Smooth commissioning due to pre-parameterised boiler control



#### Technical data of the type U-MB

Heat transfer medium	High-pressure saturated steam
Design	Three-pass flame tube/smoke tube technology
Output in kg/h	200 up to 2,000
Safety pressure in bar	up to 16
Max. temperature in °C	204
Fuel	Oil, gas, multi-fuel firing

## Design

The steam boiler U-MB is designed as a three-pass flame tube/smoke tube boiler. It consists of several modules, namely the heat generating section in three-pass design, the steam chamber on top of this, and an integrated economizer. Thanks to its three-pass design, there is no requirement for flow components in the smoke tubes.

The heat generating section of the U-MB is based on the UNIMAT boiler design – proven for decades and many thousands of times in practice. The generously sized flame tube geometry enables an efficient combustion process.

## Associated boiler house components

- ▶ Flue gas heat exchanger ECO
- ▶ Flue gas heat exchanger ECO for condensing use
- ▶ Feed water cooling module FWM
- ▶ Condensate service module CSM
- ▶ Water service module WSM
- ▶ Water treatment module WTM
- ▶ Pump module PM
- ▶ Water analyzer WA
- ▶ Feed water regulation module RM
- ▶ Blow-down, expansion and cooling module BEM
- ▶ Expansion and heat recovery module EHM
- ▶ Expansion, heat recovery and blow-down module EHB
- ▶ Vapour cooler VC
- ▶ Gas regulation module GRM
- ▶ Oil supply module OSM
- ▶ Oil circulation module OCM
- ▶ Oil pressure regulation module ORM
- ▶ Oil preheater module OPM
- ▶ Steam distributor SD
- ▶ Steam accumulator module SAM
- ▶ Controls for optimising combustion
- ▶ Boiler control BCO
- ▶ System control SCO
- ▶ Remote access MEC Remote
- ▶ Efficiency assistant MEC Optimize
- ▶ Control for large-scale plants MEC System

The choice of the steam section has a critical influence on the steam quality. A generous sizing has a very positive impact on the residual steam moisture.

The integrated economizer has a direct influence on the energy efficiency. The heat contained in the flue gases is used for preheating the boiler feed water, meaning that fuel consumption and emissions are reduced.

The steam generator is tested for type examination and is manufactured to the strict guidelines of the Module D Quality Assurance System of the Pressure Equipment Directive.



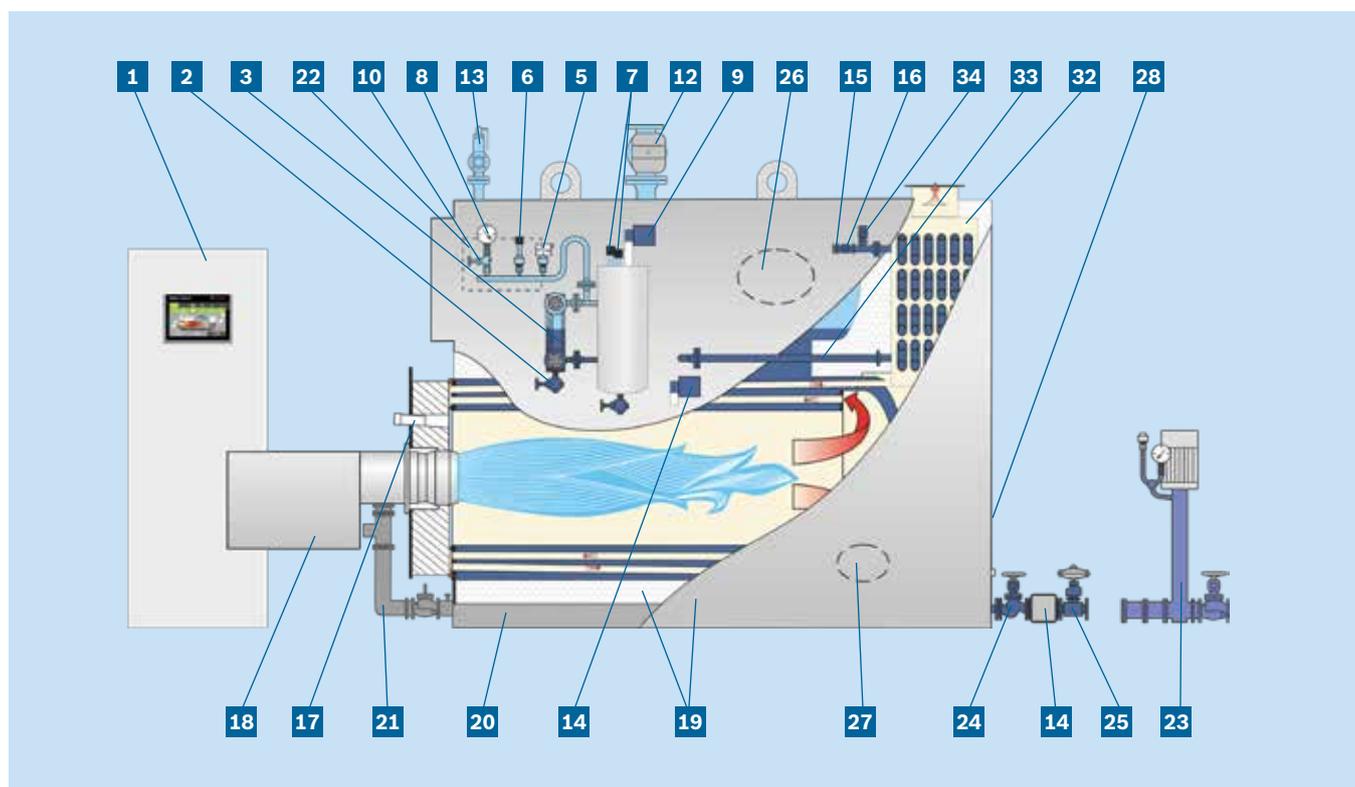
Expansion, heat recovery and blow-down module EHB

For further information please see our brochure 'Boiler house components'.

## Equipment

We offer the UNIVERSAL steam boiler U-MB as a complete boiler system including equipment.\* The basic equipment comprises the boiler pressure vessel, the control and safety components, the burner unit, an integrated economizer, a pump module, a terminal box and the control switchgear cabinet including the easy-to-operate boiler control BCO. The sensors, actuators

and country-specific safety devices are already wired and combined in the terminal box. Pre-assembled, plug-in and coded cable bundles simplify the connection between the boiler control cabinet and the terminal box. The free-standing or wall-mounted switchgear cabinet can be adapted and set up to best suit the requirements on site.



- |  |  |
|--|--|
| <b>1</b> Control switchgear cabinet with boiler control BCO      | <b>17</b> Sight hole                             |
| <b>2</b> Blow-off tap  | <b>18</b> Burner                                 |
| <b>3</b> Reflective water level indicator                        | <b>19</b> Insulation with protective shell       |
| <b>5</b> Pressure limiter  | <b>20</b> Base frame                             |
| <b>6</b> Pressure transducer (4–20 mA)                           | <b>21</b> Gas regulation module                  |
| <b>7</b> Low-level limiter electrode                             | <b>22</b> Terminal box                           |
| <b>8</b> Pressure gauge  | <b>23</b> Pump module                            |
| <b>9</b> Level transducer (4–20 mA)                              | <b>24</b> Drain shut-off valve, maintenance-free |
| <b>10</b> Pressure gauge shut-off valve with testing function    | <b>25</b> Quick shut-off blow-down valve         |
| <b>12</b> Steam removal valve                                    | <b>26</b> Inspection opening, steam side         |
| <b>13</b> Full-lift safety valve                                 | <b>27</b> Inspection opening, water side         |
| <b>14</b> Fully automatic conductivity measurement and desalting | <b>28</b> Inspection opening, flue gas side      |
| <b>15</b> Feed water non-return valve                            | <b>32</b> Flue gas heat exchanger ECO            |
| <b>16</b> Feed water shut-off valve, maintenance-free            | <b>33</b> Connection piping ECO/boiler           |
|  | <b>34</b> Vent shut-off valve ECO                |

\*The equipment level is variable and can be freely configured to customer requirements.

# UNIVERSAL steam boiler UL-S/UL-SX

The UNIVERSAL UL-S boiler type is a three-pass shell boiler, which fulfils all the requirements in the medium and high output ranges. Typical application areas are processing industries, commercial sectors and public buildings.



Technical data	Type UL-S	Type UL-SX
Heat transfer medium	High-pressure saturated steam	High-pressure superheated steam
Design	Three-pass single-flame tube/smoke tube technology	Three-pass single-flame tube/smoke tube technology
Output in kg/h	1,250 up to 28,000	2,600 up to 28,000
Safety pressure in bar	up to 30	up to 30
Max. temperature in °C	235	300
Fuel	Oil, gas, multi-fuel firing	Oil, gas, multi-fuel firing

## High level of efficiency for reduced operating costs

You can save up to 7% with the integrated economizer for waste heat recovery. Other optional modules, such as continuous feed water control for a constant water level in the boiler, speed-controlled burner fans for electricity reduction and O<sub>2</sub>/CO controls for optimum combustion quality, achieve an even higher efficiency and reduce the environmental impact.

- ▶ High level of efficiency due to three-pass technology, an integrated economizer and effective heat insulation concept
- ▶ Flue gas temperatures below 50 °C are possible with use of condensing technology
- ▶ The boiler can be equipped with a separate fourth pass for waste heat use (e.g. from CHP units)
- ▶ Low-emission combustion down to below 50 mg NO<sub>x</sub> thanks to the use of highly developed firing systems and careful matching of the best boiler and burner combination

### User-friendly operating concept

- ▶ Intuitive PLC-based boiler control
- ▶ Automatic start-up, standby and shutdown control SUC
- ▶ Ready to connect to automation systems
- ▶ Digital efficiency assistant MEC Optimize
- ▶ Protected remote access MEC Remote

### Quick installation and hassle-free maintenance

- ▶ Simplified wiring on site thanks to plug-in connections
- ▶ Smooth commissioning thanks to pre-assembled modules and a pre-parameterised boiler control
- ▶ Easy to maintain – simple to inspect on both the flue gas side as well as the water side
- ▶ Easy subsequent extension and modernisation

### Reliable performance and customised equipment

We manufacture the proven UL-S steam boiler in different output sizes with up to 28 tons of steam. This boiler series can also be efficiently operated as an intelligent controlled boiler cascade.

- ▶ High level of pressure consistency and steam quality, even with widely fluctuating steam demand, thanks to a high steam chamber and three-component control
- ▶ Large steam formation surface thanks to asymmetric design
- ▶ Suitable for almost all burner systems
- ▶ The boiler pressure vessel can also be used as a pure waste heat boiler (without burner) downstream from CHP units or gas turbines
- ▶ Design that has been proven thousands of times in practice – durable and reliable



## Design

Our three-pass patent dating from 1952 forms the basis for the outstanding and ongoing success of this type series. The lateral flame tube (1<sup>st</sup> pass) and the adjacent smoke tube bundles (2<sup>nd</sup> and 3<sup>rd</sup> pass) are ideally integrated into the pressure vessel together with the fully wetback reversing chamber. This design results in a large heating surface with smallest overall dimensions. Additionally, the UL-S boiler has thus a

maximised steam chamber which is particularly advantageous for dynamic steam demands. The flame tube is fixed at both ends of the boiler body and occurring tensions can be passed on via diagonal stays (corner anchors). In comparison to stud bolt constructions the Bosch design increases robustness and durability of the boilers (as described on page 5 of this brochure).

## Associated boiler house components

- ▶ Flue gas heat exchanger ECO
- ▶ Flue gas heat exchanger ECO for condensing use
- ▶ Feed water cooling module FWM
- ▶ Condensate service module CSM
- ▶ Water service module WSM
- ▶ Water treatment module WTM
- ▶ Pump module PM
- ▶ Water analyzer WA
- ▶ Feed water regulation module RM
- ▶ Blow-down, expansion and cooling module BEM
- ▶ Expansion and heat recovery module EHM
- ▶ Expansion, heat recovery and blow-down module EHB
- ▶ Vapour cooler VC
- ▶ Air preheating system APH
- ▶ Gas regulation module GRM
- ▶ Oil supply module OSM
- ▶ Oil circulation module OCM
- ▶ Oil pressure regulation module ORM
- ▶ Oil preheater module OPM
- ▶ Steam distributor SD
- ▶ Steam accumulator module SAM
- ▶ Superheater module
- ▶ Controls for optimising combustion
- ▶ Compact steam boiler control CSC
- ▶ Boiler control BCO
- ▶ System control SCO
- ▶ Remote access MEC Remote
- ▶ Efficiency assistant MEC Optimize
- ▶ Control for large-scale plants MEC System



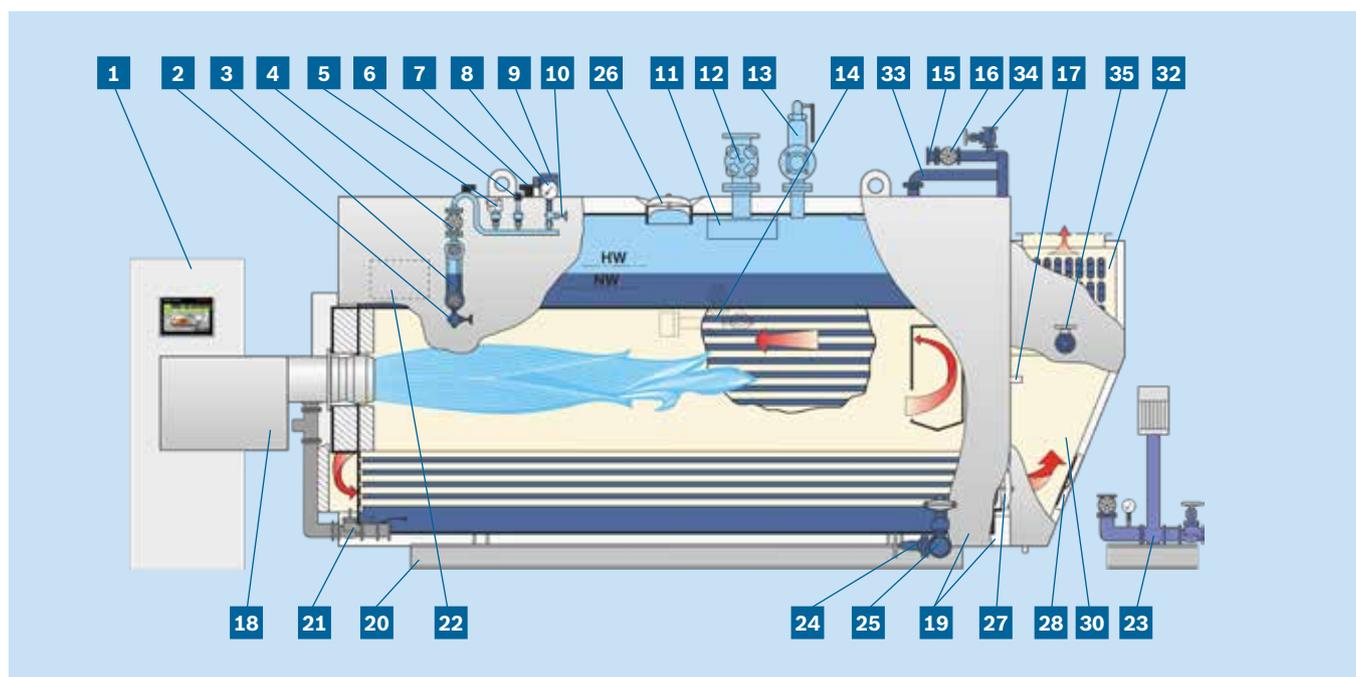
Integrated flue gas heat exchanger and flue gas heat exchanger for condensing use

For further information please see our brochure 'Boiler house components'.

## Equipment

We offer the UNIVERSAL steam boiler UL-S/UL-SX as a complete boiler system including equipment\*. The basic equipment comprises the boiler pressure vessel, the control and safety components, the burner unit, an integrated economizer, a pump module, a terminal box and the control switchgear cabinet including the easy-to-operate boiler control BCO. For UL-S boilers with an output of up to 4,000 kg/h, the affordable CSC control

version can be used as an alternative. The sensors, actuators and country-specific safety devices are already wired and combined in the terminal box. Pre-assembled, plug-in and coded cable bundles simplify the connection between the boiler control cabinet and the terminal box. The free-standing or wall-mounted switchgear cabinet can be adapted and set up to best suit the requirements on site.



- |  |   |
|--|---|
| <b>1</b> Control switchgear cabinet with boiler control BCO (alternatively the CSC control version can be used for boilers with an output of up to 4,000 kg/h) | <b>16</b> Feed water shut-off valve, maintenance-free |
| <b>2</b> Blow-off tap  | <b>17</b> Sight hole                                  |
| <b>3</b> Reflective water level indicator  | <b>18</b> Burner                                      |
| <b>4</b> Manostat tube shut-off valve, maintenance-free  | <b>19</b> Insulation with protective shell            |
| <b>5</b> Pressure limiter  | <b>20</b> Base frame                                  |
| <b>6</b> Pressure transducer (4–20 mA)   | <b>21</b> Gas regulation module                       |
| <b>7</b> Low-level limiter electrode   | <b>22</b> Terminal box                                |
| <b>8</b> Pressure gauge  | <b>23</b> Pump module                                 |
| <b>9</b> Level transducer (4–20 mA)  | <b>24</b> Drain shut-off valve, maintenance-free      |
| <b>10</b> Pressure gauge shut-off valve with testing function  | <b>25</b> Quick shut-off blow-down valve              |
| <b>11</b> Steam dryer  | <b>26</b> Inspection opening, steam side              |
| <b>12</b> Steam removal valve  | <b>27</b> Inspection opening, water side              |
| <b>13</b> Full-lift safety valve   | <b>28</b> Inspection opening, flue gas side           |
| <b>14</b> Fully automatic conductivity measurement and desalting   | <b>30</b> Flue gas collection chamber                 |
| <b>15</b> Feed water non-return valve  | <b>32</b> Flue gas heat exchanger ECO                 |
|  | <b>33</b> Connection piping ECO/boiler                |
|  | <b>34</b> Vent shut-off valve ECO                     |
|  | <b>35</b> Drain shut-off valve ECO (draining)         |

\*The equipment level is variable and can be freely configured to customer requirements.

# UNIVERSAL steam boiler ZFR/ZFR-X

The UNIVERSAL ZFR steam boiler is a shell boiler in three-pass technology with two flame tubes and completely separate smoke gas paths. It is used wherever a reliable steam and heat supply with high output is required. The typical application areas are energy suppliers, public buildings, processing industries and commercial businesses in all sectors of the economy.



Technical data	Type ZFR	Type ZFR-X
Heat transfer medium	High-pressure saturated steam	High-pressure superheated steam
Design	Three-pass double-flame tube/smoke tube technology	Three-pass double-flame tube/smoke tube technology
Output in kg/h	18,000 up to 55,000	18,000 up to 55,000
Safety pressure in bar	up to 30	up to 30
Max. temperature in °C	235	300
Fuel	Oil, gas, multi-fuel firing	Oil, gas, multi-fuel firing

## High level of efficiency for reduced operating costs

In the case of the UNIVERSAL steam boiler ZFR, the modulating output regulator for 'unrestricted' single-flame or double-flame tube operation and the continuous feed water control are mandatory. In order to use additional potential savings, we can offer you optional modules for increased efficiency, e.g. speed-controlled burner fans or combustion controls through maintaining O<sub>2</sub> and/or CO levels.

- ▶ High level of efficiency due to three-pass technology and integrated economizer
- ▶ Effective heat insulation concept
- ▶ Pollutant-reduced combustion thanks to the use of highly developed firing systems and careful matching of the best boiler and burner combination and flame tube geometry

### User-friendly operating concept

- ▶ Intuitive PLC-based boiler control
- ▶ Automatic start-up, standby and shutdown control SUC
- ▶ Ready to connect to automation systems
- ▶ Digital efficiency assistant MEC Optimize
- ▶ Protected remote access MEC Remote

### Quick installation and hassle-free maintenance

- ▶ Simplified wiring on site thanks to plug-in connections
- ▶ Smooth commissioning thanks to pre-assembled modules and a pre-parameterised boiler control
- ▶ Easy to maintain – simple to inspect on both the flue gas side as well as the water side
- ▶ Easy subsequent extension and modernisation

### Reliable performance and customised equipment

The double-flame tube/smoke tube boiler with separate smoke gas passages is also suitable for operation with just one burner. This results in a very high load flexibility. Boiler components such as economizer and superheater can easily be added thanks to their modular design.

- ▶ High level of pressure consistency and steam quality even with widely fluctuating steam demand
- ▶ Suitable for almost all burner systems
- ▶ Extremely high level of control range can be achieved thanks to single-flame tube operation
- ▶ Acceptance in accordance with the European Pressure Equipment Directive, thus can be used worldwide
- ▶ Design that has been proven thousands of times in practice – durable and reliable



## Design

Its suitability for the unrestricted parallel or single operation of its firing units is not only due to the stable separation on the flue gas side. The special design measures for neutralising the tension forces in single-flame tube operation are crucial for permanent stability. The flame tubes are pushed through in the front and rear floors and welded tightly all around. In contrast to boiler designs with stud bolts, inadmissible bending stresses are avoided. The integrated rear flue gas chamber thus offers the advantages of the fully wet-back cooling while significantly reducing its mechanical stress. Water circulation and heat transport are increased by means of guide profiles on the boiler base. Additionally, flow paths between the flame tubes

and the smoke tube areas further accelerate the circulation.

A fully automatic operation with one or both burners is possible without restriction due to the approved single-flame tube operation. Even different fuels in both firing units do not present any barriers. The control range is doubled and each low load phase is run with one burner and with consequent gain in efficiency level.

For further information please see our technical report 'Double-flame tube boilers'.

## Associated boiler house components

- ▶ Flue gas heat exchanger ECO
- ▶ Flue gas heat exchanger ECO for condensing use
- ▶ Feed water cooling module FWM
- ▶ Condensate service module CSM
- ▶ Water service module WSM
- ▶ Water treatment module WTM
- ▶ Pump module PM
- ▶ Water analyzer WA
- ▶ Feed water regulation module RM
- ▶ Blow-down, expansion and cooling module BEM
- ▶ Expansion and heat recovery module EHM
- ▶ Expansion, heat recovery and blow-down module EHB
- ▶ Vapour cooler VC
- ▶ Air preheating system APH
- ▶ Gas regulation module GRM
- ▶ Oil supply module OSM
- ▶ Oil circulation module OCM
- ▶ Oil pressure regulation module ORM
- ▶ Oil preheater module OPM
- ▶ Steam distributor SD
- ▶ Steam accumulator module SAM
- ▶ Superheater module
- ▶ Controls for optimising combustion
- ▶ Boiler control BCO
- ▶ System control SCO
- ▶ Remote access MEC Remote
- ▶ Efficiency assistant MEC Optimize
- ▶ Control for large-scale plants MEC System



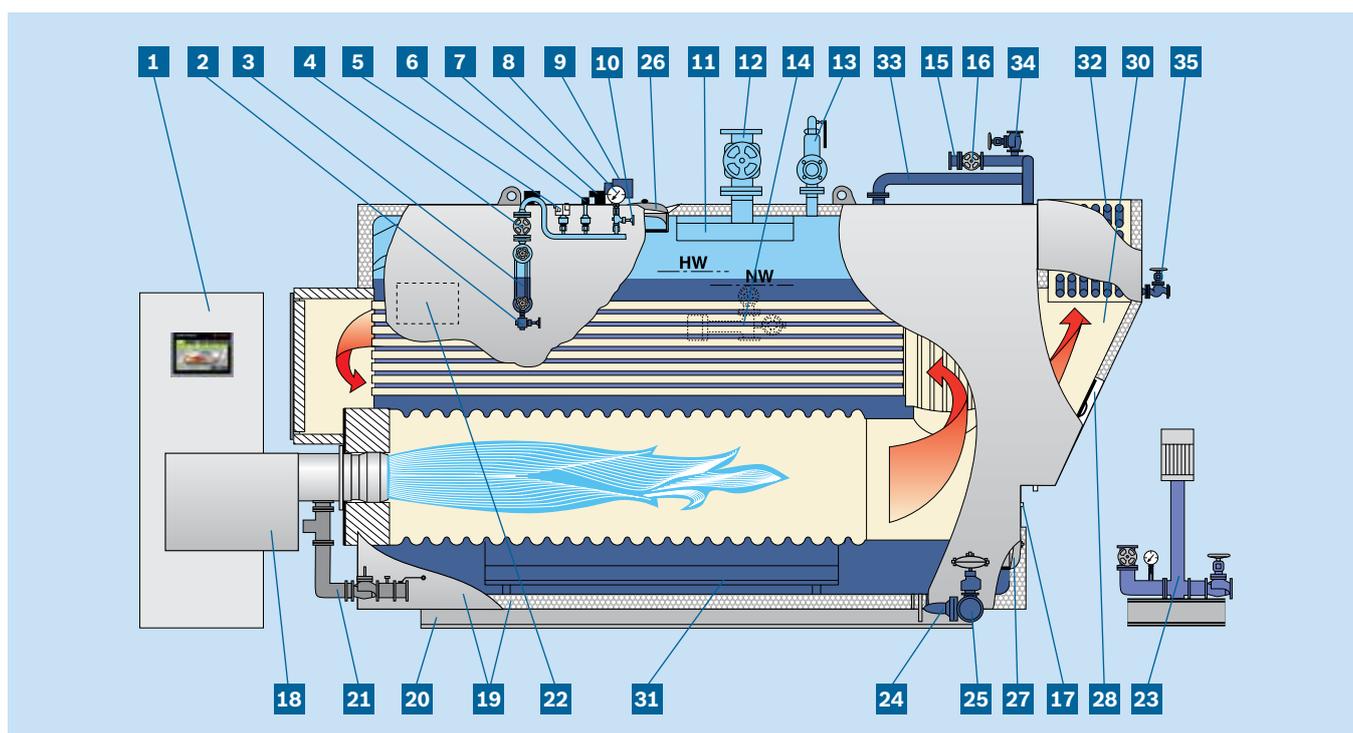
Water service module WSM

For further information please see our brochure 'Boiler house components'.

## Equipment

We offer the UNIVERSAL steam boiler ZFR/ZFR-X as a complete boiler system including equipment\*. The basic equipment includes the boiler pressure vessel, the control and safety components, the burner unit, an integrated economizer, a pump module, a terminal box and the control switchgear cabinet including the easy-to-operate boiler control BCO. The sensors, actuators

and country-specific safety devices are already wired and combined in the terminal box. Pre-assembled, plug-in and coded cable bundles simplify the connection between the boiler control cabinet and the terminal box. The free-standing or wall-mounted switchgear cabinet can be adapted and set up to best suit the requirements on site.

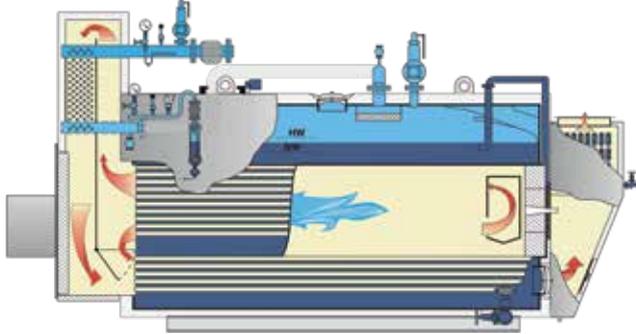


- |  |  |
|--|--|
| <b>1</b> Control switchgear cabinet with boiler control BCO      | <b>18</b> Burner                                 |
| <b>2</b> Blow-off tap  | <b>19</b> Insulation with protective shell       |
| <b>3</b> Reflective water level indicator                        | <b>20</b> Base frame                             |
| <b>4</b> Manostat tube shut-off valve, maintenance-free          | <b>21</b> Gas regulation module                  |
| <b>5</b> Pressure limiter  | <b>22</b> Terminal box                           |
| <b>6</b> Pressure transducer (4–20 mA)                           | <b>23</b> Pump module                            |
| <b>7</b> Low-level limiter electrode                             | <b>24</b> Drain shut-off valve, maintenance-free |
| <b>8</b> Pressure gauge  | <b>25</b> Quick shut-off blow-down valve         |
| <b>9</b> Level transducer (4–20 mA)                              | <b>26</b> Inspection opening, steam side         |
| <b>10</b> Pressure gauge shut-off valve with testing function    | <b>27</b> Inspection opening, water side         |
| <b>11</b> Steam dryer  | <b>28</b> Inspection opening, flue gas side      |
| <b>12</b> Steam removal valve                                    | <b>30</b> Flue gas collection chamber            |
| <b>13</b> Full-lift safety valve                                 | <b>31</b> Water circulation guide profiles       |
| <b>14</b> Fully automatic conductivity measurement and desalting | <b>32</b> Flue gas heat exchanger ECO            |
| <b>15</b> Feed water non-return valve                            | <b>33</b> Connection piping ECO/boiler           |
| <b>16</b> Feed water shut-off valve, maintenance-free            | <b>34</b> Vent shut-off valve ECO                |
| <b>17</b> Sight hole   | <b>35</b> Drain shut-off valve ECO (draining)    |

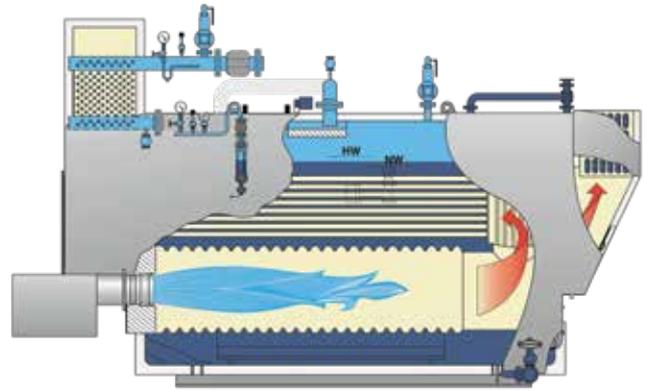
\*The equipment level is variable and can be freely configured to customer requirements.

# Superheater module

Single-flame and double-flame tube/smoke tube boilers with superheaters for superheated steam generation.



Sectional drawing UL-SX



Sectional drawing ZFR-X



If superheated steam is required instead of saturated steam, a superheater module can be placed on the front reversing chamber. A bypass flap constantly controls the temperature of the superheated steam over a large load range. The smoke tube areas remain easily accessible thanks to the hinged door of the reversing chamber.

- ▶ Modular system, controlled on the flue gas side – no injection water required for temperature control of the superheated steam
- ▶ Easy maintenance and installation – simple cleaning possibility of the second and third boiler pass
- ▶ Long service life thanks to low thermal loading of the heat exchanger bundle of the superheater

For further information please see our technical report 'Superheater module'.

# Reference power plant Ledvice in the Czech Republic

Formidable output for giant power plant: Four steam boilers with superheaters generate 167 t/h of superheated steam.

The Ledvice power plant in the Czech Republic, situated between the cities of Teplice and Břilina, is part of the energy company ČEZ. The energy supplier operates at this site, among others, a power unit with an electricity output of 660 MW. Based on the principle of combined heat and power generation, the waste heat produced during power generation is fed into the district heating network instead of simply being released unused into the atmosphere. Heat is supplied to a total of around 300 companies and 20,000 inhabitants.

Four ZFR-X double-flame tube boilers generate up to 167 tons of steam per hour for starting up the steam turbine (power generation). The superheater modules increase the temperature to minimise residual moisture in the steam. The resulting superheated steam improves the efficiency level of the plant and ensures a gentle start-up process. In addition, the boilers also support the district heating supply. Extensive safety and automation equipment allows for a high level of operation reliability and reduces supervision.



The superheater modules are installed on the front reversing chamber of the boilers.

## Four-pass boiler with burner

The conventional fired boiler generates process heat while simultaneously utilising the heat potential from waste heat sources.



### Technical data of the four-pass boiler, type UL-S

Heat transfer medium	High-pressure saturated steam
Design	Three-pass flame tube/smoke tube boiler with integrated fourth smoke tube pass
Output in kg/h	700 up to 28,000
Safety pressure in bar	up to 30
Max. flue gas temperature of the waste heat source in °C	550
Min. flue gas volumes of the waste heat source in kg/h	500
Max. flue gas volumes of the waste heat source in kg/h	23,500
Fuel of the waste heat source	Natural gas (other flue gas types on request)
Output range of combinable CHP units in MWel	Approx. 0.2 to 4
Fuel of the boiler firing	Oil, gas, multi-fuel firing

### Benefits at a glance

- ▶ Improved efficiency and environmental friendliness through the use of waste heat sources
- ▶ Normally no peak-load boiler needed – saves space, equipment and costs
- ▶ High supply reliability thanks to own firing
- ▶ Matched, modular system for easy planning and fast installation
- ▶ Complete system including CHP unit and intelligent system control on request
- ▶ Intuitive boiler control based on PLC with very high transparency of operating data
- ▶ Smooth commissioning due to pre-parameterised boiler control
- ▶ Simplified wiring on site thanks to plug-in connections
- ▶ Robust, reliable and durable
- ▶ Reduced component diversity with regard to spare parts inventory
- ▶ Service from a single source

This industrial steam boiler variant is a conventional fired three-pass boiler with additional integrated smoke tube pass for the utilisation of waste heat. It is predominantly used in combination with CHP plants or gas turbines. In the fourth pass of the boiler, the hot flue gases from the upstream combustion processes are used to help generate process heat.

The use of waste heat boilers without firing normally

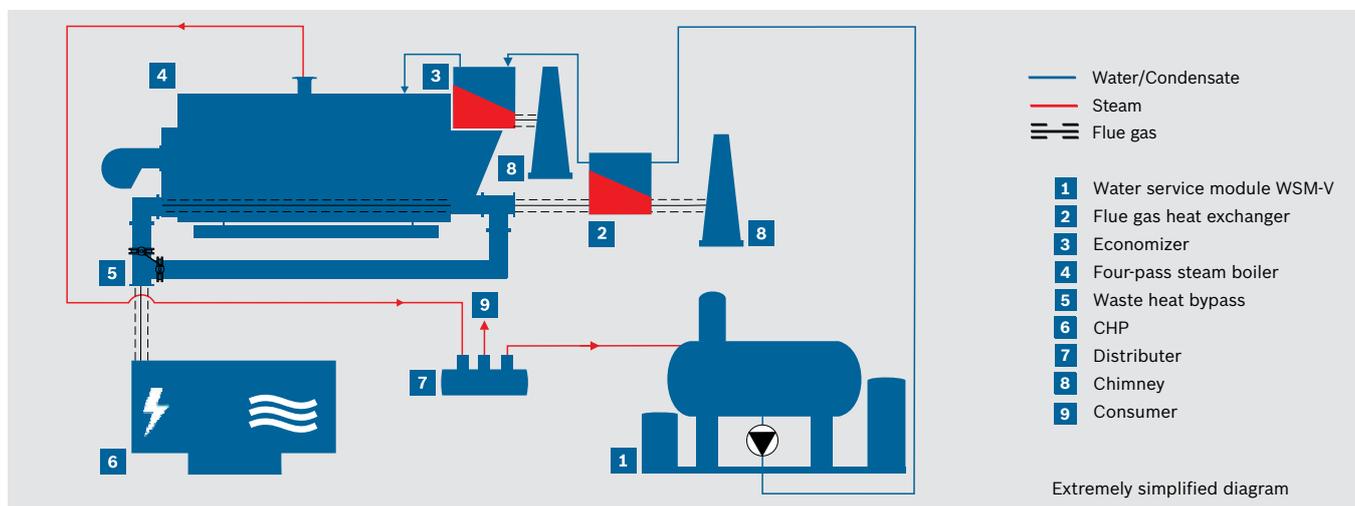
requires an additional peak-load boiler. On the design variant with own firing, the fourth pass supplies the base-load output and the firing system switches on if demand increases. This eliminates the need for set-up time and costs, space requirements and investment costs for an additional pressure vessel with complete safety equipment and feed pumps. Furthermore, the use of heat exchangers in the flue gas system of the CHP plant is reduced.

### Design

The design of our waste heat boilers with burner corresponds to the basic design of the UL-S series. The boilers are fitted with an additional integrated smoke tube pass (fourth pass) for waste heat utilisation.

### Equipment

The equipment options are identical to that available for the UNIVERSAL steam boiler UL-S series.



# UNIVERSAL heat recovery steam boiler HRSB

The heat recovery boiler uses accumulated flue gas heat to generate process steam.



Used in combination with a combined heat and power unit, the heat recovery steam boiler HRSB can play a significant part for using primary energy efficiently. The hot flue gases from the upstream combustion processes are passed to the heat recovery boiler and used for steam generation. Thanks to its modular design and compact dimensions, it is the ideal choice for both new plants and modernisation projects alike.

## Design

The heat recovery steam boiler, which is certified in accordance with the PED (Pressure Equipment Directive), is available in eight standardised versions. It consists of a highly efficient tubular heat exchanger. An optional economizer increases the efficiency even further. In addition, we offer a flue gas bypass. If no steam is extracted, the boiler will use it for diversion on the flue gas side. This means that the CHP unit or other waste heat sources can continue operating without interruption.

## Equipment

The heat recovery steam boiler is insulated and features state-of-the-art safety equipment. The flue gas bypass is supplied separately to facilitate transportation and is fitted and insulated on site. The boiler

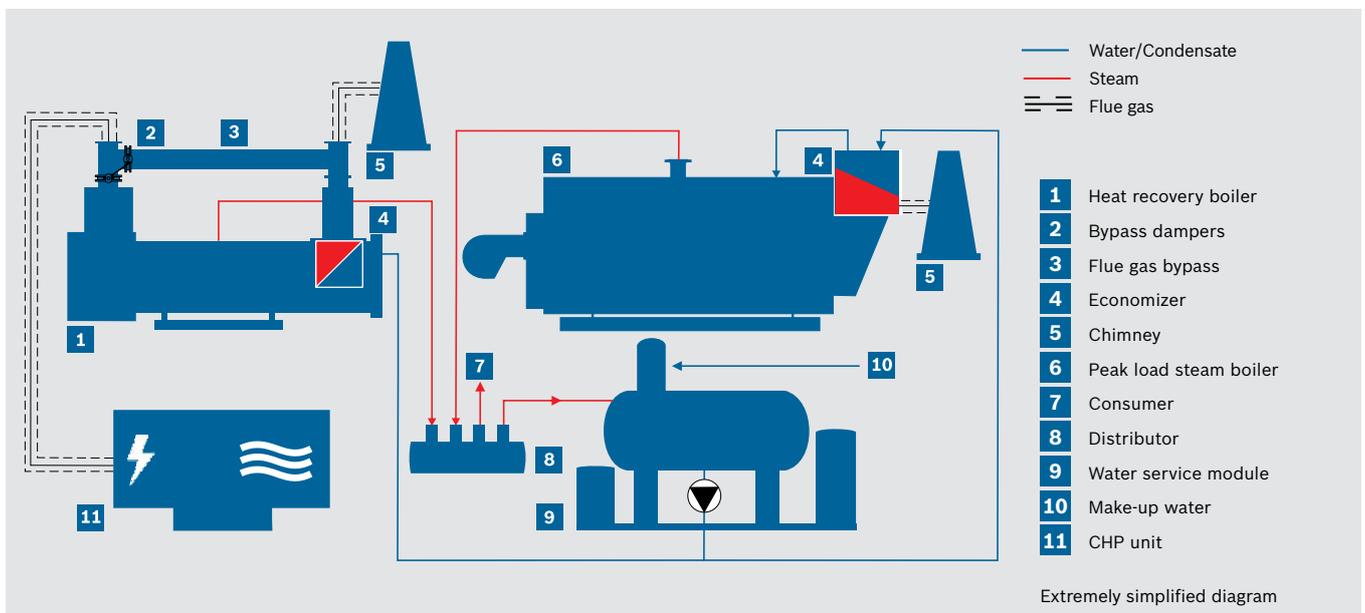
control BCO, based on PLC, can be controlled via touch-screen and is housed in a separate floor standing or wall-mounted control switchgear cabinet.

### Technical data of the type HRSB

Heat transfer medium	High-pressure saturated steam
Design	Heat recovery shell boiler
Output in kg/h	400 up to 4,100
Safety pressure in bar	10 and 16
Max. flue gas temperature of the waste heat source in °C	550
Min. flue gas volumes of the waste heat source in kg/h	500
Max. flue gas volumes of the waste heat source in kg/h	23,500
Fuel of the waste heat source	Natural gas (other flue gas types on request)
Output range of combinable CHP units in MWel	Approx. 0.5 to 4

## Benefits at a glance

- ▶ Increase in efficiency and environmental responsibility through use of waste heat sources
- ▶ Matched, modular system for easy planning and fast installation
- ▶ Complete system including CHP unit on request
- ▶ High efficiency through efficient tubular heat exchanger and good thermal insulation
- ▶ Additional efficiency gain thanks to optional integrated economizer
- ▶ Intuitive boiler control based on PLC with very high transparency of operating data
- ▶ Smooth commissioning due to pre-parameterised boiler control
- ▶ Simplified wiring on site thanks to plug-in connections
- ▶ Robust, reliable and durable
- ▶ Reduced component diversity with regard to spare parts inventory
- ▶ Service from a single source



### UL-S series as three-pass waste heat boiler

- ▶ The UL-S series can also be used as pure waste heat boiler
- ▶ For use in high flue gas temperatures
- ▶ For use in combination with combined heat and power units or gas turbines
- ▶ Utilisation of waste heat for generating steam



# Boiler control BCO

The intuitive, PLC-based boiler control BCO offers a very high level of operating data transparency, automates the boiler operation and provides intelligent control features.

The BCO collects and stores all important process data and visualises via touchscreen panels a wide range of information such as operating conditions or measured values. The integrated Condition Monitoring software analyses these data and shows inefficient operating modes via a traffic-light model.

Further, the boiler control performs various control tasks fully automated, for example, it activates the blow-down and desalting processes or controls the feed water regulation module. The automatic start-up, standby and shutdown control SUC for high-pressure steam boilers is available as an additional function. The SUC is used for automated start-up and shutdown processes at the press of a button or in response to an external request signal. Its integrated automatic functions protect the system against unnecessary stress during cold starts, in the heat maintenance mode and in normal operation.

## Benefits at a glance

- ▶ Intuitive operation through the use of graphic symbols on touchscreen displays
- ▶ Integrated monitoring and protective functions ensure a high level of supply and operating reliability
- ▶ Easy connection to higher-level visualisation and automation systems
- ▶ Optional remote access using MEC Remote
- ▶ Condition Monitoring for consistently high system efficiency and availability
- ▶ Fully automatic high-pressure steam boiler operation with the start-up, standby and shut-down control SUC

## Features

- ▶ Touchscreen display in 9, 12, 15 or 19 inches
- ▶ Performance and water level control, low-load control
- ▶ Condition and efficiency monitoring
- ▶ Operating hours counter for boilers, pumps and burners
- ▶ Diagnostics function and message history
- ▶ Register of the number of burner starts
- ▶ Plain text display of operating and fault messages
- ▶ Display and intermediate storage of all measured values and states relevant to operation



In addition to the basic functions, further options and functions can be added to the BCO control.

# MEC Optimize – the digital efficiency assistant

Based on the operating mode of the system, MEC Optimize predicts the service life of individual components, suggests measures to increase efficiency, and instructs the user in implementing them.

MEC Optimize is integrated in the boiler control cabinet and records all data from the boiler and other connected plant components. The operating data is stored locally for many years and evaluated via trend analyses. If the fuel consumption increases, for example, due to excessive desalting rates or soiling in the boiler, the efficiency assistant reports possible causes. As an option, it is possible to send notifications for defined cases directly to the operator's mobile phone via the remote connection technology MEC Remote.

Another important optimisation aspect is the maximisation of the boiler lifetime. MEC Optimize not only serves as a digital boiler logbook but interprets the entered values and helps the operator to identify and correct conditions that promote corrosion or are even safety-critical. MEC Optimize also helps to avoid production

losses due to interrupted process heat: The permissible loads and switching cycles are stored for all important components. Based on the operating mode, the efficiency assistant determines the state of the component, predicts the probable remaining lifetime and supports in maintenance planning.



## Benefits at a glance

- ▶ Improved energy efficiency – identification of increased energy losses through intelligent data analysis
- ▶ Durable boiler system – automatic monitoring of the operating behaviour
- ▶ Increased system availability – wear prognoses allow for optimum maintenance planning
- ▶ Higher operating safety – intelligent boiler logbook with automatic evaluation of the test data
- ▶ Historical operating data – continuous data acquisition makes system optimisation and troubleshooting easier
- ▶ Digital document storage – all important system documents are saved locally and can be retrieved at any time
- ▶ Optional remote connection via MEC Remote – sends current system status and reports important events via SMS or e-mail to the operator
- ▶ Easy integration of the system into automation systems (BACnet IP, Modbus TCP, OPC UA) or visualisation on a PC/tablet

# Remote access MEC Remote

Using MEC Remote, operators can gain remote access to their hot water and steam boiler systems conveniently and securely. This means the entire boiler and system control can be visualised using standard Internet-enabled devices.

The operator can monitor via the overview map all its plants at the same time. As an option, MEC Remote can send reports of any abnormalities or faults via SMS or e-mail. This significantly reduces the monitoring required for systems with high reliability requirements, such as those in constant operation.

At request also the Bosch experts can use the remote access to perform extended parametrisation, programming (PLC) and fault analysis directly on your system. If components fail, the service experts can utilise remote analysis to narrow down the cause and ensure they arrive with the appropriate equipment. This optimises service costs and increases system availability.

One of the most important requirements of a remote connection is maximum security. We provide a sophisticated role concept that controls both access authorization and approved visualisation levels. The remote access function itself has a multi-level security concept. The external data connection can be turned on or off on the hardware at any time in the boiler house using a key.

In addition to logging in with user name and password via encrypted data transfer (https), there is also a mobileTAN procedure to be followed. The operating data from the industrial boilers are only saved locally on the system, not in a cloud. The company ESCRYPT GmbH developed the security concepts for MEC Remote, and the company Cirosec GmbH undertakes regular security audits.



## Benefits at a glance

- ▶ Access to operating data, any time, anywhere
- ▶ Overview of all boiler systems at all locations
- ▶ Quick, convenient and cost-effective monitoring of system data
- ▶ Secure transmission thanks to a multi-level security concept
- ▶ Optional remote support from Bosch Industrial Service
- ▶ Notifications via SMS or e-mail for defined events, if required
- ▶ With the combination of MEC Remote and MEC Optimize all data of the boiler plants can be monitored at any time and from anywhere

# Service competence

With us you can benefit from a comprehensive portfolio from a single source. In addition to perfectly tailored system solutions, we also offer our customers a wide range of services – fast, professional and all over the world.

## Always there for you: first-class service

Our customer service is there for you around the clock every day of the year. Thanks to our closely knit network of service areas, we can ensure the shortest possible response times.

Beside maintenance services, fault tracing and repairs, we also offer you support with the regular inspection of your system. Not sure whether your system is still state of the art and working efficiently? Here too we will be pleased to assist you, we will analyse your system and modernise it if required.

During normal working hours, please contact your local customer service engineer. The contact details can be found on the control cabinet of your boiler system. We place great value on personal service, direct contact also saves valuable time.

Customers from abroad should please contact our 24 hour Service Hotline. That also applies if a fault occurs outside normal working hours. If you call via a landline, you will be connected to the customer advisor, who is responsible for your country/region. Your problem will be located in the course of professional advice over the phone, or alternatively we will coordinate an on-site visit.

Service Hotline Germany/International:  
+49 180 5667468\*

Service Hotline Austria:  
+43 810 810300\*\*

\* EUR 0.14/min from German landline;  
maximum mobile phone price: 0.42 Euro/min  
\*\* max. EUR 0.10/min from Austrian landline

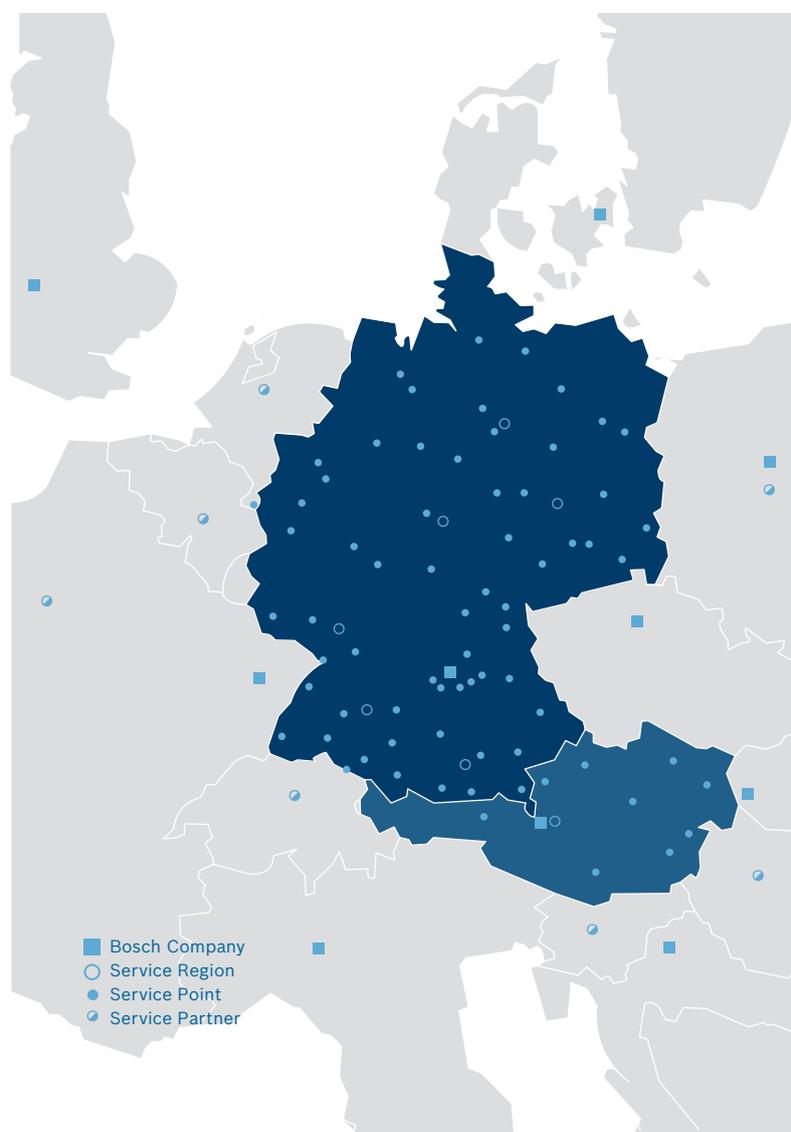
Different charges may apply for calls from mobile networks and for international calls.

## Reliable supply of spare parts

Spare parts are available immediately from our warehouse, even those parts which have been in service for many years. Our Spare Parts Hotline is also manned outside business hours and on Sundays and public holidays.

Spare Parts Hotline Germany/International:  
+49 180 5010540\*

For further information please see our brochure 'Services' and under [www.bosch-industrial.com](http://www.bosch-industrial.com)



# Reference Beck+Heun in Mengerskirchen

20% energy savings with new Bosch boiler system.

The Beck+Heun GmbH, a leading manufacturer of roller shutter casings, had modernised their machine fleet with the objective of increasing production capacities and to produce resource-conserving. The new steam boilers UL-S have been dimensioned with a peak load of 8 t/h of steam. The process heat is used to support the pre-expanding of polystyrene granules which are subsequently processed for the fabrication of roller shutter casings. The previous process heat generation plant comprised three boilers with a total capacity of 5.5 t/h of steam.

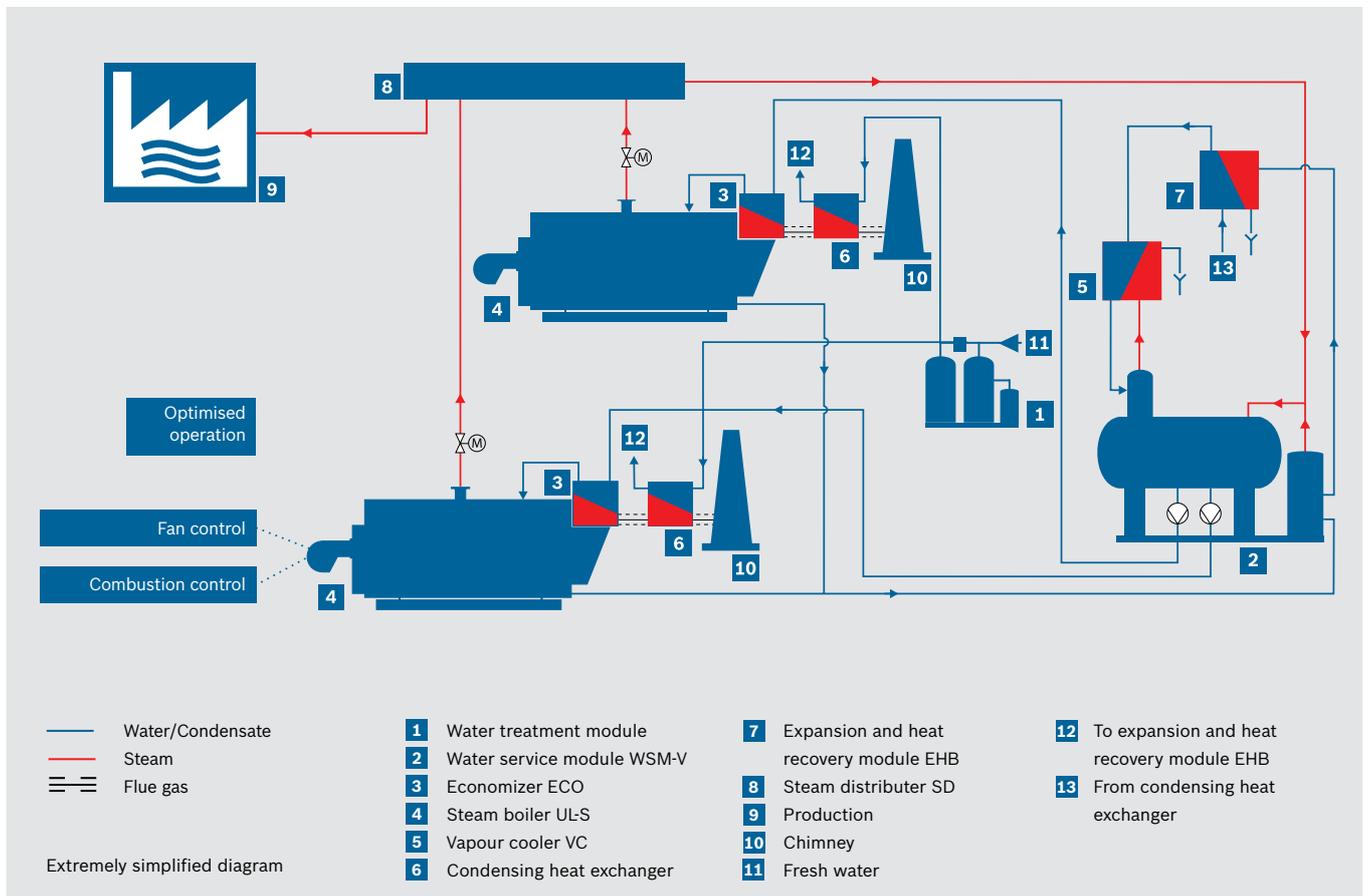
## Result

The new boiler system not only produces 45% more steam, it is also around 20% more efficient than the old system. The fuel demand was reduced by nearly



The two efficient Bosch steam boilers supply a total of up to 8 t/h of steam.

1,900 MWh a year. Furthermore, the minimised CO<sub>2</sub> emissions improve the ecological balance.



# Reference Haribo in Hungary

Expansion of the steam supply with modular boiler technology from Bosch.

Due to production extension at the Hungarian location Nemesvámos, the confectionery manufacturer Haribo had a higher process heat demand. For many years, the existing U-HD steam boiler supplied the production with steam and heated the buildings. For the expansion of the steam supply Haribo selected a Bosch steam boiler UL-S with 4 t/h and optimally-matched components. The modular design and the pre-configured system control enabled a fast integration of the existing and new boiler plant into the steam network. 6 t/h of steam are now available for production processes. The heating supply was decoupled and is provided by a separate heating boiler from Bosch Thermotechnology.

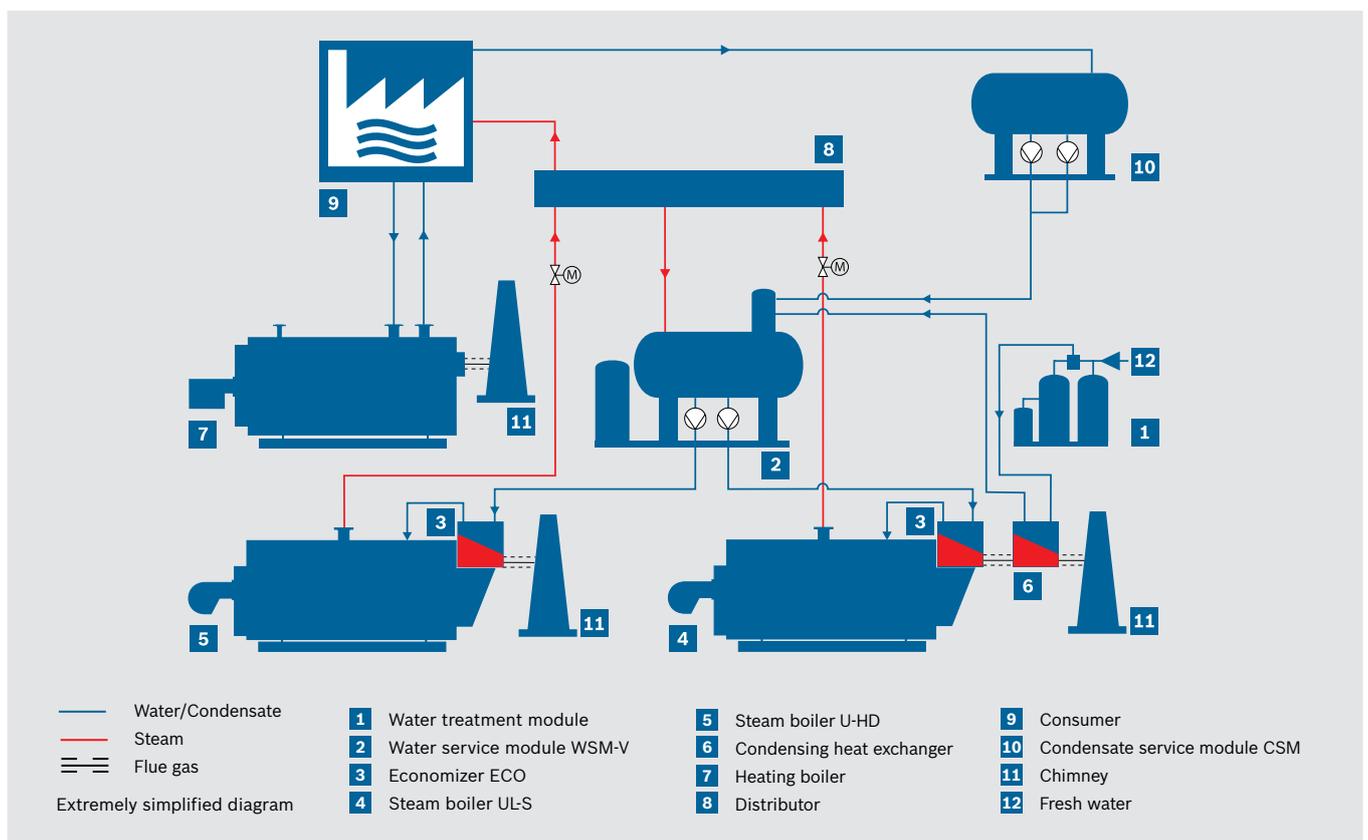
## Result

The new boiler system from Bosch is intelligently controlled and provides a reliable and energy-efficient

operation. Regular maintenance services increase the availability and optimise the fuel consumption. Thanks to its modularity, the energy system can be easily expanded in case of further increases in capacity.



The new, modular steam boiler UL-S with heat recovery equipment for maximum efficiency.



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