The silencer product range
Intelligent solutions for flue and heating technology

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The company

Many years experience with scientific skill and expertise
The current climate of environmental concerns has produced a market segment where our flue products are relevant both now and in the future. Innovation has been part of our company history for more than 70 years and includes the successful Diermayer damper for preventing heat losses, systems for locating and solving noise problems and devices for optimising combustion processes.

These products are born out of a desire to take a responsible attitude towards the natural environment while satisfying today’s demands for a high level of comfort. Most of our products help to reduce atmospheric pollution. We are equally committed to bringing quiet and safety into the home. Our products help to increase the quality of life and wellbeing in each heated room by providing a more uniform burn while reducing the operating noises.

When developing new solutions, Kutzner + Weber has always worked in collaboration with scientists and researchers from established institutions. We have been operating under a licence agreement with the Fraunhofer Institute of Building Physics as a scientific partner for the development of special sound absorption solutions since 2001. The high quality of our products and the skill and expertise we demand from our staff on a daily basis reflect our investment in development and in the constant search for better solutions using the most up-to-date technology.

Customers all over the world are benefiting from our high quality products and solution-oriented service. Kutzner + Weber, a subsidiary of the Raab group, produces a full range of flue-gas products in association with the manufacturer of stainless-steel flue systems. We are therefore able to offer you compatible and complete elements virtually from a single source, for both domestic and industrial applications.

Innovative silencer technologies
With this brochure, Kutzner + Weber is offering scientists, consulting engineers, industrialists and end customers a compendium of the latest sound absorbing technologies which have already proved to be effective for boilers, combined heat and power plants and emergency power generators many times over.

"High quality solutions in flue-gas noise technology help people to protect themselves against noise emissions from their boilers."
For a quiet environment
The environmental impact from noise is constantly increasing and people need peace and quiet in their homes. Fortunately, noise from domestic appliances such as dishwashers is constantly decreasing. Modern building methods with good heat insulation and double glazed windows also prevent noise from entering the building from outside.

Modern boiler systems can also produce noise emissions as found again and again by residents or neighbours, particularly quiet residential areas. Many of these noise problems can be solved!

With the correct advice and choice of measures on site, everyone can contribute to a quieter environment. While doing so, the environmental regulations according to TA noise, DIN 4109 and VDI guidelines 2715 must be always be followed.

High standards for quality and functionality
Kutzner + Weber is known for its high-quality products which are manufactured to the highest standards. Many years experience in the flue-gas technology have yielded products which are recognised for their quality by all who used them. Ease of installation is a major consideration during the development of new products of this type. With these silencers, the highest priority is given to their absorption properties and an appropriately long service life.

Available sources of information
In order to make sure that the products are thoroughly documented, Kutzner + Weber offers customers an extensive choice of information sources which are available on request.

The following media on silencers are available:

✔ The price list which gives a quick overview of the entire product range
✔ The installation instructions with dimensional specifications
✔ Insertion loss leaflet with performance data for all series-produced silencers
✔ Noise measurement agencies brochure with background and corresponding addresses
✔ Info. 2 “Noise control” contains a lot of interesting information about the acoustics of boilers
✔ Downloads e.g. the brochures, installation instructions and list of noise measurement agencies from the Internet at www.kutzner-weber.de

The products have the following distinguishing features:
✔ Use of high-grade stainless steels
✔ Insertion losses of all series-produced silencers tested according to DIN EN ISO 7235
✔ No reduction in cross section, so low flow resistances (zeta values)
✔ Special mineral fibre in passive silencers, therefore also suitable for use on condensing boilers
✔ All silencers are provided with a condensate drain as standard

Why silencers?
More than 300 measured systems
Kutzner + Weber has recently compiled a long list of acoustic measurements from noise measuring agencies, supplemented by those carried out the company itself. With the following graph, it is possible to draw some conclusions about the noise level tendencies of oil- or gas-fired, forced-draught boilers at the chimney mouth or the outlet of a flue-gas system. More than 300 acoustic measurements have also been evaluated and assigned to the different boiler capacities. However, some systems may be significantly louder.

Please note:
The curves shown on the graph are typical values only. The noise level of a flue-gas system depends on a number of different factors such as the design of the boiler and the burners, the materials used, the diameters and height of the flue-gas system and, not least, the number of bends in the system. The best way is to specify the flue-gas sound absorbers on a case-by-case basis after the boiler has been commissioned. If this is not possible, then sufficient space should be allowed from the beginning for the silencers to be installed! The VDI guideline 2715 must also be taken into account!
The solution

The correct silencer for your noise problem

Over the years, Kutzner + Weber has acquired a lot of experience in solving noise problems in flue-gas systems and boilers or combined heat and power plants.

The fact that low-frequency noise in our environment comes from oil- and gas-fired forced-draught burners (125 to 500 Hz) or combined heat and power plants (starting from 63 or 80 Hz) is now beyond dispute. Kutzner + Weber has found a series of solutions to this problem which are summarised in the points below. More detailed descriptions for the individual products are given on the following pages.

The Aktiv+ silencers

✔ Good absorption from 125 Hz onwards
✔ Reduction in the level of hum by up to 8 to 10 dB(A) (10 dB(A) perceived audibly as half the noise)
✔ Broad-band absorption due to passive silencer component
✔ Very little space requirement

The low-frequency silencers

✔ Silencers specially designed for the noise frequencies concerned
✔ Optimum absorption from 50 Hz upwards
✔ Absorbs individual frequencies up to 30 dB
✔ Reduction in the level of hum by up to 25 dB(A)
✔ Broad-band absorption when used in conjunction with passive silencers
✔ Particularly suitable for boilers, combined heat and power plants and combustion engines
The slot absorbers
✔ Developed for installation in boilers
✔ Good absorption from 125 Hz onwards
✔ Reduction in the level of hum by up to 8 (10 dB(A) perceived audibly as half the noise)

The modular design
✔ Can be combined with different silencer types
✔ Improves sound absorption properties
✔ Flexibility by spatial adaptation

The reactive resonators
✔ Absorb individual peak levels up to 10 dB
✔ Absorb peak levels between 80 and 250 Hz

The passive silencers
✔ Best absorption at high frequencies between 1,000 and 2,000 Hz
✔ Little absorption at low frequencies (between 80 and 250 Hz)
✔ Constant rise in damper performance towards high frequencies
✔ Reduction in the level of hum not targeted and usually rather small
✔ Absorption improved by bend in the right-corner sound absorber
✔ Increase in the absorption properties possible by modular design
Selective absorption of low frequencies

The importance of low-frequency noise problems has increased in recent years. With low frequencies between 125 and 500 Hz, the highest noise levels in particular are generated in the flue-gas systems of boilers. With combined heat and power plants, these high levels may already appear at 63 or 80 Hz, which can be heard in the environment as unpleasant “humming sounds”. So far, it has not been possible to control this particular effect with conventional silencer technologies.

Design

One special feature of the product is its fibre-free hollow chambers. The silencer has special openings so that the smooth chambers can be easily cleaned, which may be necessary when used for dirty flue-gas gases, e.g. flue gases contaminated with dust, soot or other combustion residues. This means that the silencer can provide unlimited performance over a long period.

Mode of operation

This silencer functions on the basis of combining different resonators. One or more external chambers (depending on the requirement) are acoustically coupled to the flue-gas line via a ring made of perforated sheet steel. A specially developed computer-design program (see below) makes it easy to design and carry out the calculations for these silencers. The program takes into account the effect of both the temperature and the flow rate.

Its robust design means that the service life of the LFS is many times longer than those of conventional silencers. Each of the ends of the low-frequency silencers is reinforced with a clamping collar and an EPDM seal on the casing. They are provided with a condensate drain as standard. Plant operators who decide to use this silencer will be delighted to know that the operating cost of their system will be kept to a minimum. This is made possible by the negligible pressure loss in the special silencer.

The low-frequency silencers

"Low-frequency noise must be controlled using selective measures."

A silencer has been developed for high sound absorption at low frequencies and high stresses under a licence agreement with the Fraunhofer Institute of Building Physics in Stuttgart. As with other products from Kützer + Weber, the low-frequency silencers (LFS) are patent protected.

Fraunhofer Institut Bauphysik

A silencer has been developed for high sound absorption at low frequencies and high stresses under a licence agreement with the Fraunhofer Institute of Building Physics in Stuttgart. As with other products from Kützer + Weber, the low-frequency silencers (LFS) are patent protected.

Screenshot of the LFS design program

Example system

Ring made of perforated steel steel for the noise inlet
The design of the low frequency silencers using Kutzner + Weber application technology is ideally based on a frequency analysis of the noises from boilers or combined heat and power plants or a noise-level measurement in the third-octave spectrum. This procedure ensures that all noise frequencies are also actually absorbed.

Absorption properties
These low frequency silencers are an ideal addition to the Kutzner + Weber product range since they fill a gap in the frequency range previously not catered for. With many conventional solutions, low frequencies can only be absorbed by using silencers which are very bulky, heavy and long.

Applications
The low frequency silencers have been developed for reducing the noise levels on oil- and gas-fired boilers. However, they can be used with all fuels. They can therefore easily be used on condensing boilers. LFSs have a long service life on plants with engines in particular, such as combined heat and power plants or emergency power generators. With the all-welded design, it is possible to increase the tolerance of the silencer to heat and pressure.

Advantages:
- Absorption from 50 Hz upwards
- Absorption up to 30 dB possible at any frequency
- Reduction in the level of hum possible by up to 25 dB(A)
- Broad-band absorption when used in conjunction with passive silencers
- Long service life
- Insignificant pressure loss

Example of a low frequency silencer with three chambers

Area of application:
- Overpressure-tight up to 1,000 Pa
- Flue gas temperatures up to 400° C
- Nominal Ø 50 to 600 mm
- Chimney top silencer with tailor-made mounting available

Noise emission:
The flue gases emerge from here at up to +30 dB lower.

Because the metal chambers are open and smooth, they are easily cleaned when access openings are provided.

Very durable high-grade stainless steel 1.4571/1.4404 design

Clamping collar with EPDM seal

Perforated sheet steel for noise inlet into the resonator chambers

Condensate-tight and provided with a drain

Because the inner pipe has a smooth surface, the pressure loss is negligible.

Each of the chambers of the low frequency silencer filters out a certain frequency range. The dimensions of the silencer are calculated by the computer design program.
Half the audibly perceived noise
Modern, forced-draught boilers emit high noise levels at low frequencies which cannot be absorbed sufficiently by passive silencers. Kutzner + Weber, working in collaboration with the Fraunhofer Institute of Building Physics, has developed the Aktiv+ silencer with the support of the German environmental Foundation (DBU). This technology is patented.

Design
The series ASD silencer has been developed as a porous fibre absorber combined with an active module mounted at right angles on the side. The principal component, which is mounted on the side of the silencer, is a compact, metal cartridge which houses a loudspeaker, microphone, amplifier and power supply. In order to shield the components from flue gas, a special foil is provided as an interface to the flue channel.

Silencers with diameters larger 180 mm are supplied with an additional outlet on the side, a reactive resonator.

The Aktiv+ silencer can also be extended if necessary by removing the ends and adding further modules.

Mode of operation
The operating principle is based on the increase in the sound absorption of well-known resonators by electro-acoustic activation. With the microphone in direct proximity to the loudspeaker diaphragm, the diaphragm movements are increased by means of an amplifier to produce a significant improvement in the hollow chamber effect (Helmholtz principle) in the module mounted on the side. This creates the optimum sound absorption conditions for the low-frequency flue-gas noises within a very short length of chamber.

![Diagram of passive and active modes of operation](image-url)
Absorption properties
Due to the successful combination of a passive and Aktiv+ silencer, the Aktiv+ silencer is particularly suitable for the sound absorption of frequencies between 125 to 2,000 Hz.

Applications
The Aktiv+ silencer can be used for reducing the noise from oil- and gas-fired boilers and can be easily used in the flue-gas system of condensing boilers. For this reason, the electronic components are protected by a special foil and the condensate is safely carried away via the flue gases. However, they are not suitable for use on combined heat and power plants and units.

Advantages:
✔ Can be mounted in tight spaces
✔ Absorbs low frequencies from 125 Hz upwards
✔ Almost halves the noise
✔ Insertion loss according to DIN EN ISO 7235 available and can be requested

Area of application:
✔ Overpressure-tight up to 200 Pa
✔ Flue gas temperatures up to 200°C
✔ Nominal Ø 80 to 300 mm
The **passive silencers**

**Design**
These series AGM flue-gas silencers are porous sound absorbers (mineral fibre). The mineral fibre is protected against abrasion by a stainless steel fleece. The expanded metal provides inherent durable stability. The ends of the silencers can be removed and the silencers extended with the appropriate modules. All silencers are provided with a condensate drain (which must always be connected) as standard.

**Mode of operation**
The mineral fibre used by Kutzner + Weber is very fine with an open porous structure. The passive silencer reduces the noise by absorbing the sound energy by friction against the fibres as noise passes through. Different types of mineral fibre were acoustically tested according to DIN EN 29053-B at the Fraunhofer Institute of Building Physics in order to determine the flow resistance and find the optimum mineral fibre.

**Absorption properties**
The passive silencers are particularly suitable for reducing the noise level of medium and high frequencies. Their optimum absorption is achieved between 1,000 and 2,000 Hz. When the overall length is larger, low frequencies can also be damped.

**Applications**
Series AGM silencers are suitable for use with all regular combustion heating appliances and can be used on condensing boilers without restriction.
The **passive extension modules**

The internal structure of the AVM series extension modules are of identical design to the passive silencers mentioned above. The noise level can be noticeably reduced by extending the standard silencer.

![Image of a silencer]

### Advantages:
- Modular design
- Hydrophobic, condensate-repellent mineral fibre
- Mineral fibre acoustically tested according to DIN EN 29053-B (flow resistance)
- Insertion loss according to DIN EN ISO 7235 available and can be requested

### Area of application:
- Overpressure-tight up to 1,000 Pa
- Flue-gas temperatures up to 400° C
- Nominal Ø 80 to 350 mm
- Chimney top silencers with tailor-made mounting available

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The **passive corner sound absorber**

Passive silencers also include the series AWM angled silencers which therefore have the same structure. The right-angled design is often the only option for installing silencers in boiler rooms where space is very restricted. Often, the space is not sufficient for installing the standard tubular sound absorbers.

![Image of an angled silencer]

- Sound absorption improved by angular design
- Suitable for cramped conditions

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The **modular system**

Due to their modular design, the series AGM, AVM, AWM, ASD and LFS silencers can be used in combination with each other.

To make sure that the connections are safe, supporting collars must be fitted inside at the factory. Extra wide sealing collars and extra wide sealing tape can be used to connect and seal the outer casing of the two modules.

![Image of a modular system configuration]

### Advantages of the modular design:
- Optimum use can be made of the available space
- The silencers can be extended when sound absorption needs to be increased.
- The noise frequencies can be targeted precisely by selecting the appropriate sound absorption technology
When space is really tight
Because space is sometimes tight in boiler rooms, it is not always possible to install silencer technology with standard products. This is where the specially designed silencers, such as those with certain angular designs or with connections at a certain position, come into use. The Kutzner + Weber production facility is ideally suited to meet these market requirements and has already produced “creative” silencer solutions.

The special passive silencers

"Where standard solutions do not fit, help is on hand from the Kutzner + Weber development department."

Area of application:
✔ Nominal Ø 80 mm
✔ Connections to the outlet
✔ Suitable for air-flue-gas operation

The chimney top silencer

Preventing noise emissions into the neighbourhood
Another special silencer was developed particularly for the outlet of flue-gas systems of 80 mm nominal diameter. The design of the actual absorbing body corresponds to that of the series AGM passive silencer described above.

It is designed to take the combustion air of an air-flue-gas system. These silencers are typically used for noise which is emitted from the chimney outlet into the neighbourhood. They can be retrofitted without the need for significant structural alteration.

Area of application:
✔ For nominal Ø 80/125 mm
✔ Concentric design
✔ Suitable for air-flue-gas operation

The concentric flue-gas silencers

Supply air and flue-gas in one
These silencers were developed particularly for installation in concentric flue-gas systems with 80/125 mm nominal diameters. The design of the actual absorbing body corresponds to that of the series AGM passive silencer. They are of double-walled design, so that the combustion air can be sucked through the annular gap and are intended for use on condensing boilers etc. They are fitted with a condensate drain as standard.
The passive silencers for large plants

Large nominal diameters also possible
The ARE series silencers are designed for large plants and are available for a nominal diameter of 400 mm upwards.

Design
The sound absorption material consists of mineral fibre. The mineral fibre is protected against abrasion by a stainless steel fleece. Perforated sheet steel is used to give it shape and stability. The ends of the silencers are welded to the casing, so these silencers can be used at larger overpressures. A condensate drain is provided as standard.

Mode of operation
The mineral fibre used by Kutzner + Weber is very fine with an open porous structure. The passive silencer reduces the noise by absorbing the sound energy from the noise by friction against the fibres as it passes through. Different types of mineral fibre have been acoustically tested according to DIN EN 29053-B at the Fraunhofer Institute For Building Physics, in order to determine the flow resistance and find the optimum mineral fibre.

Absorption properties
The passive silencers are particularly suitable for the sound level reduction of medium and high frequencies. Their optimum absorption is achieved between 1,000 and 2,000 Hz.

Applications
Series ARE silencers are suitable for use on all regular combustion heating appliances and can be used on condensing boilers without restriction.

Area of application:
- Overpressure-tight up to 5,000 Pa
- Flue-gas temperatures up to 400° C
- Nominal Ø 400 to 800 mm
- Chimney top silencers with tailor-made mounting available

Advantages:
- Long service life due to high-grade stainless steel 1.4571/1.4404
- Hydrophobic, condensate-repellent mineral fibre
- Mineral fibre protected by perforated sheet steel
- Mineral fibre acoustically tested according to DIN EN 29053-B (flow resistance)

The centre baffles
For large cross sections with nominal diameters greater than 350 mm, the sound absorption of the silencers is improved by the inclusion of centre baffles. The centre baffles (type AME) are installed in AGM silencers of nominal diameter 350 mm and all ARE series silencers specified above.

Advantage:
- Improved reduction in noise level
The reactive resonators

A special solution which needs little space
Reactive resonators can be used to reduce individual prominent peak levels. These resonators are flanged on the side, either on a T-piece or on a passive silencer. For dimensioning, a calculation must be carried out on an individual basis for a specified frequency and temperature. Reactive resonators do not contain fibre material and are therefore not subject to wear and are maintenance-free and of robust design.

Advantages:
✔ For reducing peak levels up to 10 dB
✔ For low frequencies up to 400 Hz
✔ Very little space requirement

The vibration damper

Used as connection collars, structure-borne sound absorbers are also easy to connect
The structure-borne sound absorbers made from EPDM reduce sound vibrations generated by the flue-gas system and compensate for thermal expansion.
They are particularly suitable for simple connection between boiler connectors and the flue-gas system downstream etc.

Advantages:
✔ Simple appliance connector
✔ Compensation up to 10 mm
✔ Pressure- and condensate-tight connection up to 200 Pa
✔ For flue-gas temperatures up to 200°C
✔ Nominal Ø 80 to 500 mm
The **slot absorbers**

**Inconspicuous but effective**
With this type of silencer, the sound can be reduced immediately after the source of noise. Slot absorbers can be adapted to the most complicated space conditions in boilers in order to exploit any available space to reduce the level of noise.

Slot absorbers have been developed in close collaboration with the Fraunhofer Institute of Building Physics. Kutzner + Weber was the first to introduce them as a product ready for the market. This method of sound adsorption is **patent protected**.

**Design**
The porous absorbers used in these silencers are almost completely covered by discs with narrow slots. The design of the slit width and slot distances for a stipulated frequency range was arrived at by using a computer program specially developed for the purpose. The silencer dimensions can therefore be specified.

**Mode of operation**
The slot absorbers operate in a similar way to conventional resonators. However, unlike Helmholtz resonators for example, they can be adapted to wider bands.

**Advantages:**
- Dimensions and geometry according to customer requirement
- Sound absorption in restricted spaces
- Particularly suitable for installation in boilers
- Wide range of options in shape and size
- Very robust design
- Proven in series operation

**Absorption properties**
The silencers start to absorb sound at a frequency of approx. 125 Hz. They can reduce the level of hum in the ideal case by up to 8 dB, which is perceived audibly as almost half the noise.

**Fraunhofer Institute for Building Physics (IBP)**

These slot absorbers are made from the high-grade PP plastics. Their housings are welded complete and are overpressure tight.

They are made from high-grade stainless steel 1.4571/1.4404 and are also suitable for use at high temperatures.
Certificated acoustic measurement

Solving noise problems
With its current range of a few hundred items, Kutzner + Weber is well placed to solve noise problems on the basis of acoustic measurement. Kutzner + Weber can therefore offer its customers a comprehensive service. An extensive network of sound measurement agents is on hand for carrying out acoustic measurements in Germany, Austria, Hungary and Switzerland. All sound measurement agents have to attend training courses run by the Fraunhofer Institute of Building Physics (IBP), Brüel & Kjær and Kutzner + Weber.

"Quick acoustic measurements throughout Germany, Austria, Hungary and Switzerland."

All acoustic measurements are carried out using Class 1 sound-level measurement equipment.
Advantages at a glance

✔ **Solution to noise problem guaranteed**
Kutzner + Weber undertakes to guarantee solving the noise problem for appliances where the silencers have been designed on the basis of an acoustic measurement by in-house application technology.

✔ **Certificated acoustic measurement agents**
Sound measurements are only carried out by agencies who regularly attend the training courses run by the Fraunhofer Institute of Building Physics (IBP), Brüel & Kjaer and Kutzner + Weber. These agencies receive a certificate from Kutzner + Weber.

✔ **Cost-optimised silencers**
Based on the available third-octave spectra, silencers can be provided with the optimum design, so oversizing is avoided.

✔ **Rapid problem solving**
Acoustic measurements are offered fast and flexibly.

✔ **Easy search of sound measurement agency**
The sound measurement agent can be easily found on the Internet at www.kutzner-weber.de/service. For Germany and Austria, the measurement agent is selected by a postcode search of where the measurement is to be carried out.

✔ **Cost-effective acoustic measurements**
The sound measurement agents charge a uniform price for carrying out the sound measurements, according to the expense.

✔ **Installing the silencers**
Because of their many years experience in flue-gas technology, the sound measurement agents are able to install silencers if necessary according to customer requirement.

✔ **Class 1 measurement equipment**
All sound measurement agents use a recognised and reliable, Class 1 sound-level measurement instrument from Brüel & Kjaer.

"We advise on solving noise problems using acoustic measurements based on scientific investigations"