



# Lindab **Acoustic Solutions**

Product overview



# We simplify construction

At Lindab we are driven by a strong desire to continuously generate improvements and to simplify construction. We do that by developing products and systems that are easy to use and energy efficient, together with industry-leading knowledge, support, logistics and efficient availability.

We want to simplify everything – from designing, ordering, delivery, goal achievement and installation to the entire way of doing business with us. By simplifying in every stage of the construction process, we also contribute to energy-efficiency.

## **A good thinking company**

Good thinking is a deeply rooted philosophy that guides us in everything we do. We firmly believe that good thinking makes good solutions to the challenges we all face. Taking responsibility for what we do and how we do things is therefore important to us. Because good thinking is not only about making life easier and more comfortable for our customers and end users. It is also a matter of thinking in a global perspective, all the time. Knowing that we at Lindab are helping to make the world a better place.

## Acoustic solutions for a quiet and pleasant indoor climate

A ventilation system which supplies indoor environments with fresh air is absolutely vital for well-being. However, the same system simultaneously generates sound and noise to various extents. As your well-being is affected by the ambient noise, it constitutes something of a paradox in your everyday life. We have always taken sound and noise very seriously so that we can provide a quiet and pleasant indoor climate. Researching into sound and conducting tests in our own sound laboratory enables us to deliver silence. The range includes everything from straight, curved and circular attenuators to rectangular beams and low headroom silencers. A complete programme which creates an optimal balance between size, energy consumption and sound attenuation.

Quality, service and knowledge have always been crucial factors for the customers that have chosen us as a partner. So, behind each solution lies industry leading expertise, extensive research, evaluation and full documentation.



# Sound

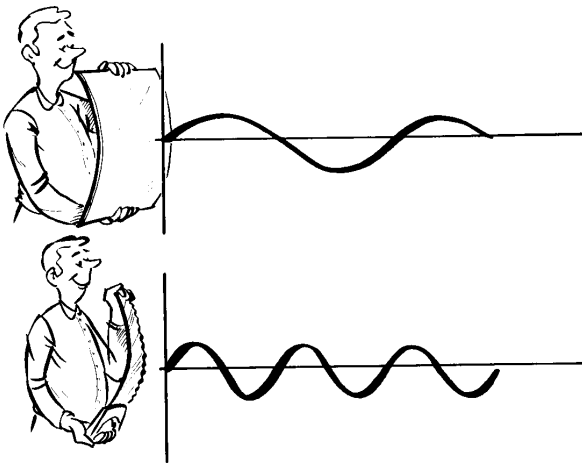
## Noise frequency influences the choice of silencer

The attenuation ability varies with the frequency of sound. Before we look at the choice of silencers, it could be a good idea to describe the concept of frequency in greater detail.

A sound source influences the surrounding air, and makes it vibrate. The character of the sound depends on the variations in pressure which occur in the air.

Let us assume that the sound source is a vibrating plate - the changes in pressure, or the sound will then have the same frequency as the vibrations in the plate. The strength of the sound will depend on the amount that the plate vibrates, i.e. the amplitude of the movement. Let us start off with that:

If there is only one note, of a single frequency, the pressure will vary sinusoidally, so a pure note is referred to as a sine wave.



The characteristics of sound propagation are:

- frequency ( $f$ ), which is measured in hertz, **Hz**, (s<sup>-1</sup>), (and specifies the number of times a second that a new sound wave arrives).
- wave length ( $\lambda$ , "lambda"), which is measured in metres, **m**, (and specifies the distance between two similar points on the curve).

and

- speed of sound ( $c$ ) which is measured in **m/s**, (and specifies the speed of movement of the sound wave).

These three variables have the following relationship:

$$c = f \cdot \lambda$$

The speed of sound in air is also a function of pressure and temperature.

At normal air pressure and + 20 °C is  $c \approx 340$  m/s.

## Choosing silencers

The fan is the primary sound source in a ventilation system, but intrusive noise can also be caused by an unsuitable choice of duct components and terminal units:

$$L_W = 40 + 10 \cdot \log q + 20 \cdot \log p_t \text{ dB (above 1 pW)}$$

$q$  = air flow (in m<sup>3</sup>/s) through the fan

$p_t$  = total pressure rise (in Pa) in the fan

40 = "specific noise power level" which considers the efficiency of the fan at its point of operation, and the SI units for  $q$  and  $p_t$ .

The noise generated in the fan must be attenuated in the duct system, at some point before the room terminal unit. Some of the attenuation is "natural", examples are given above. This attenuation is often not enough, and additional silencers can be put in the duct system - in the main channel near the fan to damp the fan noise to all the duct branches or in the branch ducts only to damp particularly sensitive rooms.

Low air speeds should be selected in the ducts, to avoid disturbing noise in the rooms.

- At a given air speed, a doubling of that speed corresponds to a 12 dB increase in noise levels. Low air speeds also cut operating costs.
- At a given air speed, the fan power required increases as the square of the air speed.

Duct Ø315



In this example, calculation has shows that the existing attenuation in the duct system is not enough. The table shows that more attenuation is needed. What to choose?

**Example**

	63	125	250	500	1k	2k	4k	8k	
Before	X	X	X	X	X	X	X	X	dB
After	X	X	X	X	X	X	X	X	dB
Difference	2	4	9	19	21	12	7	7	dB

**Lindab** has a large range of silencers with varying characteristics and dimensions. Lets see what might fit!

SLU-50	63	125	250	500	1k	2k	4k	8k
Required	2	4	9	19	21	12	7	7
600	0	2	4	10	22	9	6	7
900	2	3	7	16	31	13	8	9
1200	2	3	8	20	39	16	9	10

This is the narrowest silencer, so the longest one, 1200 mm, should be selected to meet the requirements. The deviations at the 125 and 250 Hz band, 1 dB, are small and will not be noticeable. This is one of the possible alternatives

SLU-100	63	125	250	500	1k	2k	4k	8k
Required	2	4	9	19	21	12	7	7
600	2	5	9	14	12	6	4	5
900	3	6	13	20	19	10	6	7
1200	4	8	16	27	25	15	9	10

This silencer has a thicker layer of absorbing material (100 mm instead of 50 mm) and thus has better low frequency insertion loss, but also has a larger external diameter than SLU-50. To meet the requirements, you should choose the longer one, 900 mm. The deviations at the 1k - 4k frequencies are small and will not be noticeable. This is another of the possible alternatives.

SLGPU	63	125	250	500	1k	2k	4k	8k
Required	2	4	9	19	21	14	7	7
600	2	5	11	22	31	35	26	18
900	3	7	15	29	40	44	34	23
1200	3	8	19	36	46	50	39	26

This silencer has the same thickness of absorbing material as SLU 100 (100 mm) but also has a 100 mm thick baffle which increases damping (but also the pressure drop across the silencer). You only have to choose the shortest one, 600 mm, to meet the requirements at all frequencies by a wide margin. This is still another possible alternative.

The final choice of alternatives is determined by other considerations:

- **SLU-50 1200**  
if there is space lengthways, (but perhaps tight at the sides).
- **SLU-100 900**  
shorter, but needs more room at the sides.
- **SLGPU 600**  
If the lengthways space is limited and if the slight increase in total pressure drop is not important - e.g. in a branch duct where part of the available pressure has to be restricted anyway when the air flows are adjusted.

Decide how safe the values in the sound calculation are, and choose a silencer with the corresponding margin of safety. It is always more expensive and more difficult to add attenuation afterwards, if it was not installed from the beginning. If the users ever become dissatisfied with the noise, it is difficult to get them to change their views.



This is a short summary about what to have in mind when you choose silencer for your ventilation system. For more detailed information and background see the chapter;

**General information and theory >>**

# Lindab Acoustics

At Lindab we are constantly working to improve the efficiency of our ventilation solutions and to make it simple for you to implement them in your construction project. We update and complement our extensive knowledge of indoor climate and ventilation by genuinely listening to and working for our customers. This gives us the possibility to reach and develop new solutions based on your specific needs.

## Sound laboratory

Our sound laboratory in Farum, Denmark, provides Lindab with even better knowledge about acoustics and how to design and dimension the ventilation systems of the future for increased sound and climate comfort. The laboratory has an impressive 21 metre measuring duct and a reverberation room weighing 147 tonnes, suspended on 32 pneumatic vibration dampers. All the test for sound attenuators we do according to ISO EN-7235 standard.

Lindab acoustic products include silencers for all purposes from residential ventilation to big industrial and marine products. As a leading silencer manufacturer Lindab can guarantee a wide product range of tested acoustic solutions that are developed, designed and produced to be easily installed and maintained.



## Unique materials

Our research and development in acoustics involves both developing silencers and the materials contained in them.

### **Silencers with Lindtec® or Acutec® are simple and effective**

Through our research we have developed, among other things, the absorption materials Lindtec® and Acutec®.

Lindtec® is a mineral wool and Acutec® is a hygienic polyester in a recyclable friendly material that with its excellent damping properties makes our silencers totally unique. Acutec® is bacteria resistant and does not bind moisture and condensation, even at high pressure in ducts and silencers.

Silencers with both Lindtec® and with Acutec® have a surface that is easy to clean and maintain.



*The absorption material in our silencer with Lindtec® or with Acutec® always has a surface that makes the silencer easy to clean and maintain.*

## Exceptional software

### **Simplify your selection with LindQST**

Lindab Quick Selection Tool (**LindQST**) is an advanced web tool that simplifies the selection and calculation of sound attenuators, with all documentation directly on the web. LindQST plugin can also be integrated with CAD-software for building design.

### **Professional sound calculation with DIMsilencer**

DIMsilencer is a user-friendly programme that provides a quick and professional sound calculation, as well as an easy product selection. The room module in DIMsilencer makes it possible to make sound calculations adapted to the conditions in each room, and you can make a complete system calculation from complete system to individual room. Data in DIMsilencer is based on measured values and the programme can be fully integrated with MagiCad.

### **MagiCAD® makes design easier**

Lindab simplifies construction and therefore we of course offer software that helps you with the design. With Lindab's CADventPlugin for MagiCAD® you have a well-equipped toolbox for sketching, dimensioning, calculating, counting, ordering and presentation of complete HVAC systems. The CADventPlugin makes it possible to use in MagiCAD to transfer the product specific project from design straight to order placement via Lindab web shop.



*Lindab's various Product Selection Tools can help designers and constructors to select, calculate and create comfortable silent indoor acoustics in a quick and easy way.*

SLRS attenuators that reduces both dimensions and energy consumption

## Keep the noise down, and the costs

A ventilation system is important to ensure a good indoor climate with fresh air. However, such a system has many noise sources. Noise from fans, dampers and other components must be dampened if the total indoor climate experience is to be comfortable. Therefore there is a need for silencers to ensure that the acoustics also contribute to the good indoor climate.

## Less noise and less energy consumption

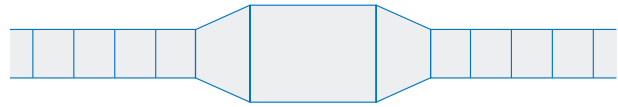
It's more than about reducing the noise. With the range of products that are the result of Lindab's research and development, you can also reduce your costs and your energy consumption. Pressure loss is an important parameter for the total operating costs of your ventilation system. Therefore, our solutions are generally designed to reduce the pressure loss as much as possible. This applies to ducts, fittings, fixtures and silencers.

## Sound attenuators for new construction and renovation

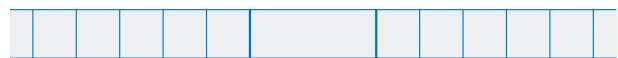
If, for example, you are renovating an existing system with SLRS silencer and keeping the dimensions, you can halve the noise or reduce the pressure loss by up to 40%. At the same time, energy consumption will be considerably lower. It's good for the SFP value and the climate – both in the office and in the accounting department. Lindab has developed silencers in many different dimensions for both new construction and the renovation of houses, offices and production facilities. A common feature of the solutions is that they reduce both noise and costs.

## An investment with more return

A good ventilation system provides a good climate and it is a wise investment both in terms of health and economy. Healthier and happier employees mean higher production efficiency and effectiveness. With the right products, the solution gives the energy savings that also make it a good energy investment.

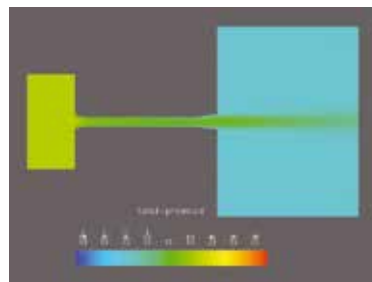


The dimensions of conventional attenuators make it necessary to fit transition joints between the silencer and the duct system to allow for an acceptable pressure drop.

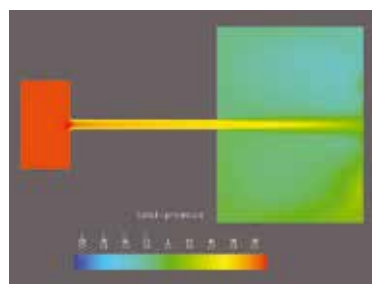


With Lindab's SLRS sound attenuators, transition joints are not required. SLRS silencers are significantly smaller than conventional silencers, but just as easy to fit.

SLRS attenuators sound baffles are optimized in terms of pressure loss, so that it is possible to keep the same dimension for silencers as for the duct.



**SLRS sound baffle**  
The CFD simulation image on the left shows the pressure loss profile for SLRS silencer with a significantly lower pressure loss than the conventional silencer.



**Conventional sound baffle**  
The CFD simulation image on the left shows the pressure loss profile of the conventional sound baffle available on the market today

# The choice of acoustic products

Product type	Circular connection							Rectangular connection			
	Circular curved	Circular curved - low height	Circular straight	Circular straight with centre pod / baffle	Circular straight with centre baffle	Circular straight - low height	Exhaust air terminal device	Flexible silencers	Rectangular curved	Rectangular straight	Rectangular straight - low height
<b>Product name</b>	BSLCU BSLU	KVDP-90K KVDP-90L	PVA PVD SLGU SLU SLXU	PVAP PVDP SLGPU	SLBGU SLBU	KVAP KVDP KVDPX  LRBCB LRCA LRCB LRCEC	EXAD SLKNU	FSA FSAFU FSAMF AKUCOM  SLFA SLFK SLFU	BDDL SLRB	DACKA MINKA  DLD DLDY  SLRS TUNE-S	LRLB LRLS
<b>Residential ventilation</b>											
<i>MVHR silencer</i>	•	•••	••			•••		• 1)			
<i>Duct (secondary) silencer</i>	••	••	••	•	•	•••		• 1)			
<b>Non-residential ventilation</b>											
<i>Axial fans</i>			•	•••			•				
<i>MVHR silencer</i>									•••	•••	
<i>Duct (secondary) silencer</i>											
Rectangular ducts									•••	•••	•••
Round ducts			•••	•••	•••	•••	••				
Extract								••• 2)			
Cross talk	•••	••	•••			•••		• 1)		•	••
VAV-systems											
- VRA										•••	•••
- VRU/FTCU			•••	• 3)		•••					

••• very good    •• good    • suitable

1) Makes sure that the noise emitted through silencer does not affect the surroundings.

2) High air-volumes.

3) Big air volumes.



# Category overview

## Circular

### Circular Straight

Traditional silencer with 50, 100 or 150 mm insulation. Absorption material is mineral wool or Acutec® polyester covered by perforated plate. Also with centre splitter or pod to provide better attenuation.

**Use:** All building types.

**Size:** ø63...1600 mm, length 300...3200 mm

**Important features:** Low cost silencer with good tightness. Good attenuation with centre baffle.



### Circular Straight

#### - With centre pod / baffle

Traditional silencer with 50, 100 or 150 mm insulation. Absorption material is mineral wool or Acutec® polyester covered by perforated plate. Also with centre splitter or pod to provide better attenuation.

**Use:** All building types.

**Size:** ø63...1600 mm, length 300...3200 mm

**Important features:** Low cost silencer with good tightness. Good attenuation with centre baffle.



Click on the product for link to detailed technical information and accessories, or visit [www.lindab.com](http://www.lindab.com)

### Circular Straight

#### - Low built

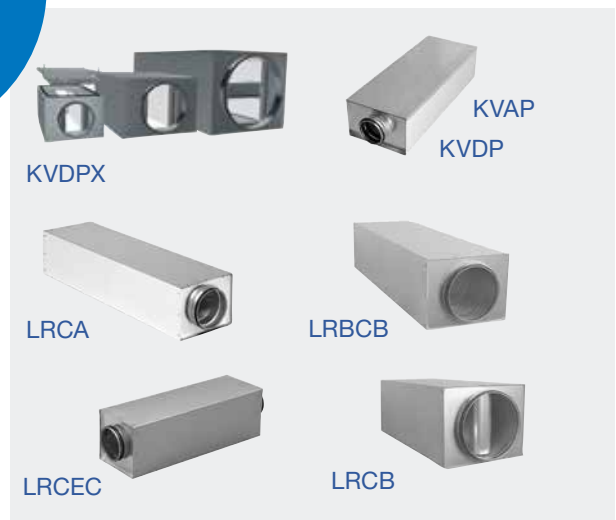
#### Effective silencer to narrow places

Low height silencer with very good attenuation. It is easy to install in narrow places. Absorption material is mineral wool or Acutec® polyester.

**Use:** All building types. Especially residential houses.

**Size:** ø63...630 mm, length 300...1250 mm.

**Important features:** Effective silencing with low pressure drop. Also openable models for maintenance of duct system.



# Category overview

## Circular

### Circular Curved

#### Traditional silencer

Bend silencer with 50 or 100 mm insulation. Absorption material is mineral wool covered by perforated plate.

**Use:** All building types.

**Size:** ø125...630 mm.

**Important features:** Combination of good attenuation and suitable in places where you don't have space for straight silencer.



### Circular Curved - Low built

#### Effective silencer to narrow places

Effective silencer to narrow places Low height curved silencer with very good attenuation. Absorption material is Acutec® polyester.

**Use:** All building types. Especially residential houses.

**Size:** ø100...200 mm, length 600 and 1000 mm

**Important features:** Combination of good attenuation and corner for places where you don't have space for straight silencer.



### Extract air terminal device

#### Combination of a traditional silencer and exhaust air terminal device

Silencer with 50 or 100 mm insulation and conical inlet with net. Absorption material is mineral wool covered by perforated plate. Acutec® polyester on request.

**Use:** Malls, sport halls and other big rooms where we need big exhaust air volumes with low noise.

**Size:** ø100...400 mm, length 600...1200 mm.

**Important features:** Combination of high air volumes and low noise.

Click on the product for link to detailed technical information and accessories, or visit [www.lindab.com](http://www.lindab.com)



# Category overview

## Circular

### Flexible silencers

#### Easy to install silencer

Flexible perforated inner duct, attenuation material mineral wool or Acutec® polyester which is covered by plastic outer jacket make this silencer very easy to install.

Use: All building types.

Size: ø100...315 mm, length 550 and 1100 mm.

**Important features:** Small storage and transport volume. The insulation reduces noise passing through the silencer.



[Click or scan to view the installation instructions for Lindab's Circular silencers >>](#)

# Category overview

# Rectangular

## Rectangular Straight

### Effective silencer

Silencer with the attenuation splitters. Attenuation material is mineral wool or Acutec® polyester. Several models available according to requirements, with low pressure loss and good attenuation.

**Use:** Shopping centres, schools, hospitals, industry etc...

**Size:** According to requirements

**Important features:** Sized to air volumes, required attenuation and space. Versions also available with access to baffles.



## Rectangular Straight - Low built

### Effective acoustic

For small ducts Rectangular silencer with low installation height. Attenuation material is mineral wool or Acutec® polyester.

**Use:** All building types.

**Size:** Width 200...1000 mm, height 150...400 mm, length 650...1250 mm.

**Important features:** Sized to air volumes, required attenuation and space.



Click on the product for link to detailed technical information and accessories, or visit [www.lindab.com](http://www.lindab.com)

# Product overview

## Rectangular

### Rectangular Curved

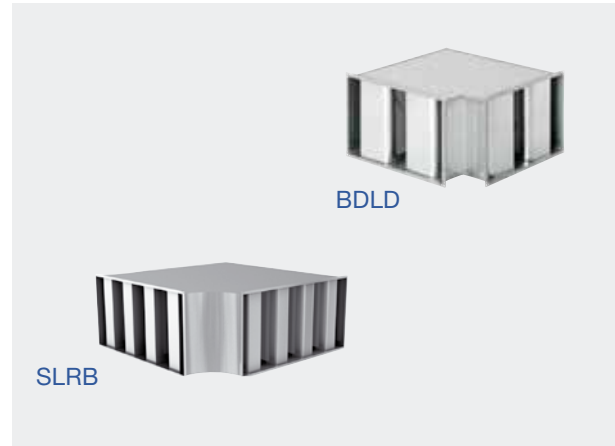
#### Effective silencer

Silencer with the attenuation splitters and corner. Attenuation material is mineral wool or Acutec® polyester. Several models according to requirements.

**Use:** Shopping centres, schools, hospitals, industry etc...

**Size:** According to requirements

**Important features:** Sized to air volumes, required attenuation and space. Versions also available with access to baffles.



### Rectangular Splitters

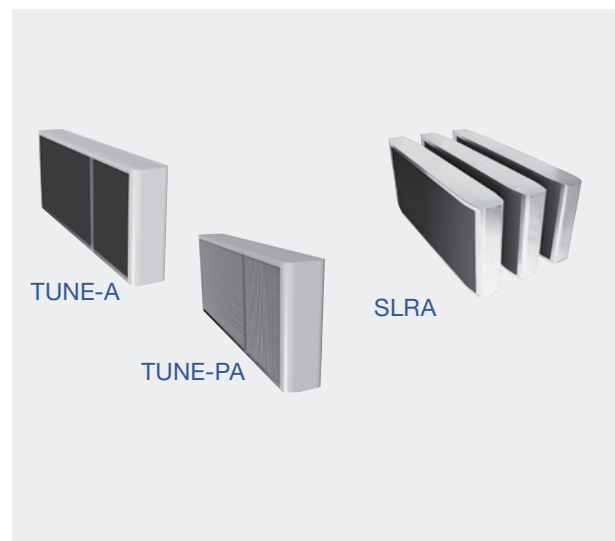
#### Effective acoustics

Individual silencer splitters are used to provide good attenuation in places where it is not possible to use prefabricated rectangular silencers. Attenuation material is mineral wool or Acutec® polyester. We advice you to use our IT tool DIMsilencer for calculation of your silencer.

**Use:** Malls, schools, hospitals, industry etc...

**Size:** According to requirements

**Important features:** Sized to air volumes, required attenuation and space.

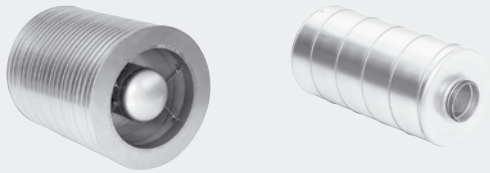


[Click or scan to view the installation instructions for Lindabs Rectangular silencers >>](#)

# Product overview

# Smoke

## Circular Straight - Smoke Control Systems



SLGPUSS2

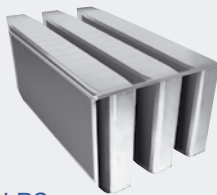
SLUSS2

## Circular Curved - Smoke Control Systems



BSLUSS2

## Rectangular - Smoke Control Systems



SLRS

Click on the product for link to detailed technical information and accessories, or visit [www.lindab.com](http://www.lindab.com)

# Customized solutions

Lindab has a wide product range of other silencers for different purposes. We produce attenuating ducts, silencers with fire classification, [industrial solutions](#) and solutions for [marine & off-shore](#).

**Size:** Sized to air volumes, required attenuation and space. Also available as openable.

**Materials:** Can be galvanized steel, stainless steel, steel S235, aluminium...

**Material thickness:** 0.5...5 mm.



# Product Selection Tools

What if we could help you shorten your design and installation phase, minimising the risks and creating better designs? We know your time is costly. To help you develop optimal, reliable solutions in the shortest possible time, we provide you with what you need: a large range of intelligent and rational tools that make your working day easier.

## lindQST

Lindab Quick Selection Tool is an advanced web tool that simplifies the selection and calculation of our air- and waterborne products, silencers and fire dampers. All documentation directly on the web. LindQST plugin also integrates with CAD-software for building design.

[www.lindQST.com](http://www.lindQST.com)

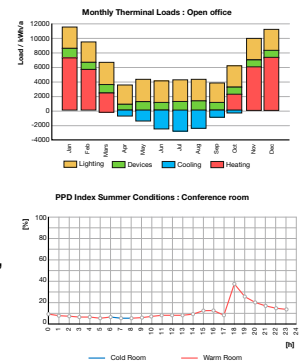


## DIMsilencer

Based on the specified requirements DIMsilencer provides quick, professional sound calculation as well as simple product selection combined with a high degree of user-friendliness.

## TEKNOsim

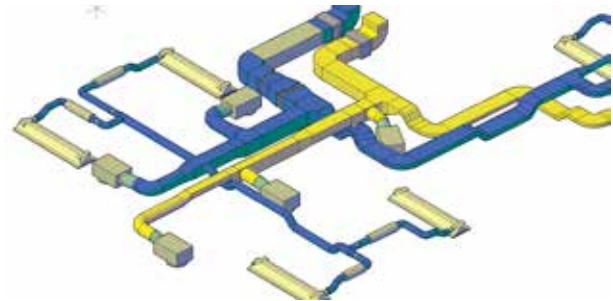
TEKNOsim Europe is the software that provides fast, easy and reliable climate simulation. It is easy to use, and provides you with clear, understandable results.



## CADvent

CADvent is a flexible 3D-design tool that helps you to easily design complete ventilation solutions.

The versatile software offers intelligent functions like Drafting, Design, Product selection, Calculation, Analysis and Bill of material.



## Vent Tools

The mobile app, Vent Tools, is a collection of useful tools such as Duct performance-, Air Capacity- and Duct Length Calculator. Accessible from the smartphone in your pocket.





## Good Thinking

**At Lindab**, good thinking is a philosophy that guides us in everything we do. We have made it our mission to create a healthy indoor climate – and to simplify the construction of sustainable buildings. We do that by designing innovative products and solutions that are easy to use, as well as offering efficient availability and logistics. We are also working on ways to reduce our impact on our environment and climate. We do that by developing methods to produce our solutions using a minimum of energy and natural resources, and by reducing negative effects on the environment. We use steel in our products. It's one of few materials that can be recycled an infinite number of times without losing any of its properties. That means less carbon emissions in nature and less energy wasted.

**We simplify construction**