

## ► Fresh air for students ►►

TROX SCHOO LAIR – Energy-efficient ventilation solutions for schools





## ► The art of handling air ►►

**Good air is a factor in your quality of life.** Whether outside in the open air or in an enclosed space, we only feel truly well in the fresh air. Air, the elixir of life, lets us breathe freely. It is invigorating and inspiring and gives us the energy and stamina to learn and work.

**TROX understands the art of competently handling air** like no other company. Since 1951, TROX has been developing sophisticated components and systems for the ventilation and air conditioning of internal spaces. Due to extensive research and development, TROX has been one of the sector's leaders in this technology for years.

**For the energy efficient renovation of schools,** TROX provides decentralised ventilation and air conditioning solutions that perfectly meet the special requirements of schools.

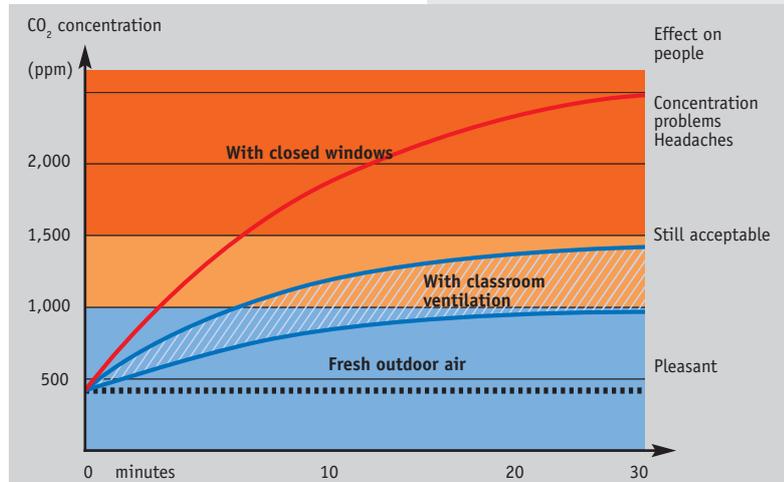
## ► Renovation of school buildings: challenges and opportunities ►►

### Saving costs through energy efficient renovation

Due to Konjunkturpaket II (Economy Package) of the German Federal Government and States, € 13.3 billion is available to communities for renovation activities. This money is urgently needed since 20,000 schools alone are in need of renovation. Through an energy efficient renovation of schools, communities can permanently save a lot of money. Half of the annual energy costs a community has to pay can be attributed to the schools. An energy efficient renovation can lower the energy consumption of a school by on average 70%. This opens up a massive savings potential for communities, which considerably relieves the budget year after year.

### Mechanical ventilation is absolutely necessary

The replacement of facades and windows improves the imperviousness and thermal insulation of the building envelop and makes a mechanical ventilation of classrooms absolutely necessary. Otherwise, a danger of mould is not the only threat in case of insufficient ventilation. The air quality in particular can dramatically reduce in classrooms occupied with up to 30 pupils. In city centres, DIN EN 13779 requires a CO<sub>2</sub> concentration of 1,200 ppm above the content in outdoor air as the standard value for a low room air quality (IDA 4). Higher concentrations lead to a drop in performance, headaches, and indisposition. A bad indoor environment means a bad learning environment!



Classroom measurements have shown that the CO<sub>2</sub> concentration during normal window ventilation often dramatically exceeds the recommended limit. Values up to 11,000 ppm have been measured in some places.

Experts thus recommend that schools fundamentally be provided with mechanical ventilation systems to guarantee a satisfactory air quality in the classroom. For energy savings, these ventilation systems should be equipped with a heat recovery unit.

**“For renovation, a controlled, mechanical supply and extract ventilation system with an integral heat recovery unit has become vital.”**

*(Dr. Ing. Dieter Thiel, Head of Research and Development, Schmidt Reuter Integrale Planung und Beratung GmbH, Cologne)*



The renovation of the facades of public buildings with thermal insulation is at the top of the list of priorities of German communities.



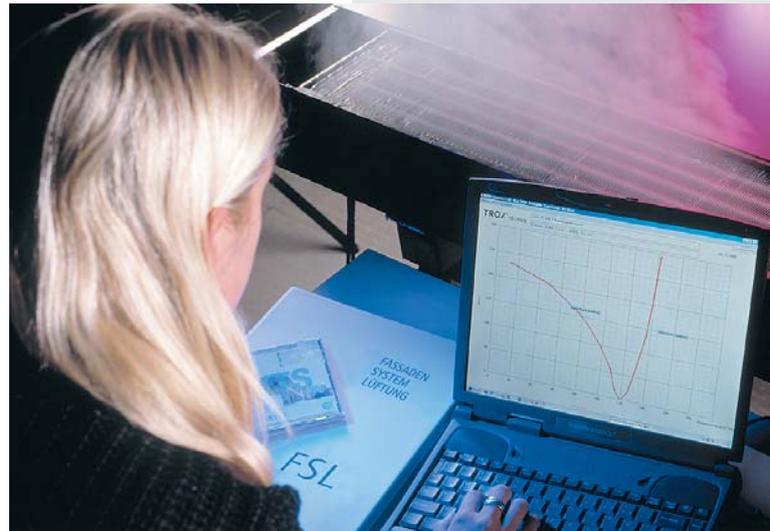
## ► Flexible, efficient, and affordable ►►

**Classrooms place high demands** on supply and extract ventilation. They are sometimes used extensively with up to 30 people. For each person, a fresh air flow rate from 15 to 20 m<sup>3</sup>/h (4 to 6 l/s) is usually assumed. This results in an overall volume flow rate from 300 to 600 m<sup>3</sup>/h (83 to 167 l/s) per classroom.

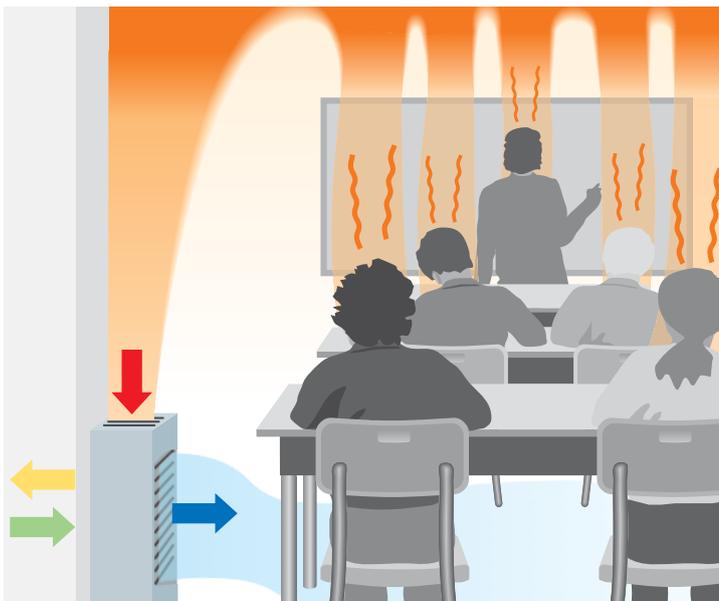
To realise an optimum air distribution, the supply air should preferably be supplied to the room at a minimum of two points for example using displacement flow. In the case of a construction with a heat exchanger module, the units are efficiently supplied with water as the energy transfer medium.

Decentralised ventilation systems are very flexible.

They can be regulated for individual rooms and specific requirements, thus minimising operating costs.



*In TROX laboratories, ventilation systems are tested and optimised under realistic conditions.*



### Advantages of decentralised ventilation units

- Low investment costs
- Installation can take place in an affordable manner within the scope of a general window and facade renovation.
- Simple design and installation due to standardised units
- Minimum spatial requirement in the sill/facade area
- Low operating costs
- Flexible use according to the needs of the individual room
- No or minimal fire protection requirements

*The used and heated air is exhausted to outside and if appropriate passes through a heat recovery module to temper the incoming fresh air.*

## ► TROX SCHOOLAIR for schools ►►

**For decades, TROX has been developing air-handling products** that meet the requirements of demanding customers. Quality and joy in innovation has resulted in TROX being the technology leader in the ventilation and air conditioning sector.

Decentralised ventilation units from TROX are available in various construction configurations and with various equipment features from a simple construction to a comprehensive multifunctional unit. All units have been tested in practice for years.

In renovation applications undersill units are particularly suitable for installation under windows or into window frames.

### TROX SCHOOLAIR-B

- Horizontal installation in front of the sill
- Mechanical, noise-controlled ventilation
- Integral heat recovery
- Optional heat exchanger module for heating and/or cooling
- Horizontal displacement flow discharge
- Energy-efficient EC centrifugal fans
- Low sound power level



◀▶ L / H / D: 1,500 x 645 x 420 mm  
➡ 42 – 69 l/s · 150 – 250 m<sup>3</sup>/h  
• Boost 320 m<sup>3</sup>/h  
❄ Cooling capacity up to 1,170 W  
🔥 Heating capacity up to 3,920 W

### TROX SCHOOLAIR-V

- Vertical installation on the sill or next to the window
- Mechanical, noise-controlled ventilation
- Integral heat recovery
- Optional heat exchanger module for heating and/or cooling
- Horizontal displacement flow discharge
- Energy-efficient EC centrifugal fans
- Low sound power level



◀▶ L / H / D: 400 x 2,400 x 360 mm  
➡ 42 – 69 l/s · 150 – 250 m<sup>3</sup>/h  
• Boost 320 m<sup>3</sup>/h  
❄ Cooling capacity up to 1,170 W  
🔥 Heating capacity up to 3,920 W

### TROX SCHOOLAIR-D

- Installation under the ceiling directly near the lintel area on the outer facade
- Mechanical, noise-controlled ventilation
- Integral heat recovery
- Optional heat exchanger module for heating and/or cooling
- Optional unit casing including a supply air diffuser
- Energy-efficient EC centrifugal fans
- Low sound power levels



◀▶ L / H / D: 1,275 x 330 x 510 mm  
➡ 23 – 34 l/s · 80 – 120 m<sup>3</sup>/h  
• Boost 160 m<sup>3</sup>/h  
❄ Cooling capacity up to 550 W  
🔥 Heating capacity up to 1,800 W

❄ All specified capacities refer to an outdoor air temperature of 32 °C and a supply air temperature of 18 °C.  
🔥 All specified heating capacities refer to an outdoor air temperature of 12 °C and a supply air temperature of 35 °C.

## ► Comfort made to measure ►►

### Minimum noise characteristics

The units create a peaceful atmosphere in the classroom. They have very quiet fans and optimum internal sizing to ensure that the air velocities inside the unit are low, overall resulting in low noise levels. In addition, efficient noise insulation attenuates intrusive external noise levels.

### Optimum energy efficiency

The integral heat recovery prevents the heat of the room air being discharged outside without being used. Heat exchangers recover the heat in the room air exhaust, preheating the incoming fresh air in winter, also there is an option for precooling in summer. Energy-saving EC fans, short air transport distances, and the demand-based regulation of the decentralised ventilation units reduce the consumption of energy.

### Optional cooling function

The units can be optionally equipped with a cooling function so that pleasant room air conditioning is guaranteed, even in summer. A prerequisite for this is the corresponding chilled water supply. If this option is not employed, the supply air can be used directly for free cooling using the heat recovery bypass.

### Intelligent control system

The units can be controlled on the basis of the CO<sub>2</sub> content of the indoor air or extract air so that a high indoor air quality is continuously guaranteed. Alternatively, you can simply and efficiently use fixed volume flow rates for each operating mode (*Lessons/Break/Unoccupied*).



*Vocational School Centre  
for Technology and Business.  
Dresden, Germany*

In 2007, the Vocational School Centre for Technology and Business in Dresden was renovated for more energy efficient use by the State capital according to plans of Rieger architects . Now, 90 TROX SCHOOLAIR H ventilate the rooms of the school in an energy-saving manner.

*Vocational School Centre  
for Technology and Business.  
Dresden, Germany*





### ► TROX SCHOOLAIR: An overview of the advantages ►►

- Improved well-being and higher performance and concentration due to an optimum supply of fresh air
- Complete solution for ventilation, heating, and cooling (no additional heaters and air conditioning required)
- Saving of heating energy due to heat recovery
- Low investment costs due to affordable unit price and low design and construction costs
- Fast and simple installation by the delivery of units that are ready for installation
- Great flexibility due to purpose designed equipment and demand-based regulation



*Hechingen Commercial School with 1,150 students, Hechingen, Germany*

In 2008 and 2009, fifty SCHOOLAIR-H units were installed as part of the active refurbishment of the school. Now each class room is ventilated individually and many class rooms are regulated according to demand.



# TROX<sup>®</sup> TECHNIK

The art of handling air

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