

## LAB AIR

TROX understands the art of competently handling air like no other company. Since its foundation in 1951, TROX has been developing and manufacturing sophisticated components, units and systems for ventilation and air conditioning as well as for fire and smoke protection. Dedicated research and development have made TROX a global leader of innovation in these fields.

Application-oriented solutions for laboratories.

Ventilation and air conditioning in laboratories have to meet specific, extremely stringent safety requirements since their purpose is to protect the people working in these labs. TROX provides bespoke solutions that set new standards for research facilities and laboratories all over the world:

- For all types of laboratories, whether chemical, pharmaceutical, biological or medical, for areas with potentially explosive atmospheres (ATEX) and for related areas such as storage rooms for solvents, chemicals or compressed gas cylinders.
- For all safety levels: Biosafety level BSL 1–4.
- With adjustable, flexible solutions, be it a stand-alone system for a small lab or a solution for a large laboratory with many rooms and hence a large number of fume cupboards and workbenches that are connected by a bus system.

## EXTENSIVE KNOW-HOW

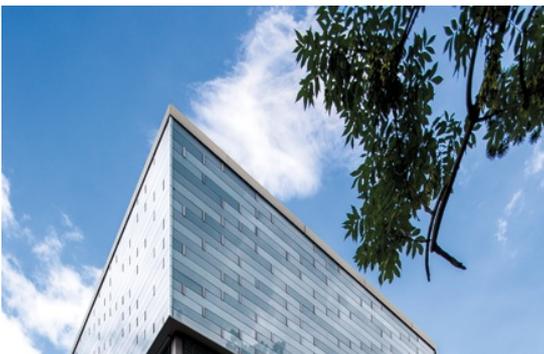


This application brochure deals primarily with the LABCONTROL air management system. LABCONTROL ensures stable and reliable room air conditions and the perfect interaction of the relevant ventilation and air conditioning components. Since its release 20 years ago, it has been constantly adapted to the demands of the market.

The extensive know-how and expertise gained from many meetings and discussions with specialist consultants have led to the development of innovative and practical solutions which fulfil the desire of our customers for simplified assembly, wiring, commissioning, maintenance, and expandability of the system. It is not surprising, then, that TROX air management systems are successfully used in hundreds of laboratories all over the world.

TROX has both the know-how and the expertise to continually raise standards in the field of air distribution for laboratories. Since 1998 our experts have been members of the standards committees for the EN 1822, EN 14175, DIN 1946 Part 7, and other guidelines and have provided valuable input to these bodies.

## COMPLETE SYSTEMS



One-stop shop. Complete solutions from a single source.

TROX provides tailored comprehensive air conditioning solutions that cover each stage of the airflow: from control components to air handling units, to aerodynamically optimised diffusers and efficient filters, and to fire protection and smoke extract components. TROX means that customers can get everything from a single source.

The X-CUBE air handling unit acts as the centre of the automation level and hence makes control even easier. All ventilation components are integrated with the central control system of the air handling unit, which can be used as a self contained control centre for smaller buildings, but which can also be integrated with the central BMS due to modular adapters for all the usual bus communication systems.

Where work safety and the protection of people and the environment are priorities, it is of paramount importance that all components of a lab air system complement each other perfectly.

Fewer interfaces, less coordination effort.



Max Delbrück Centre for Molecular Medicine (MDC), Berlin, Germany

The advantages for specialist consultants and HVAC contractors are obvious: one-stop shop and one face to the customer – for efficient ventilation and air conditioning systems. The result is a drastic reduction of the usual interface or coordination problems in the design stage.

The AHU subsystem: simple, functional, safe.

The X-CUBE air handling unit includes a central automation level and controls and monitors all ventilation and air-conditioning components: volume flow controllers are controlled via Modbus, for example, while fire dampers, smoke control dampers and process air fans are controlled with the proven AS-i system.

## PROTECTION OF PEOPLE AND THE ENVIRONMENT



The EASYLAB control panel shows actual operating values, emits alarm signals, and allows users to set and change functions comfortably.

In laboratories, where hazardous substances are handled, the design of the ventilation and air conditioning system has to focus on the protection of lab staff and of the environment. Three prime objectives according to EN 14175 have to be achieved:

- Retention capacity and contamination control: Fume cupboards must prevent dangerous concentrations of gases, fumes or dusts from escaping and being released into the lab.
- Air change: Fume cupboards must prevent the development of an atmosphere that can ignite or even explode.
- Splash and shatter protection: Fume cupboards must prevent spray or flying fragments from injuring people.

While splash and shatter protection can obviously be ensured by the construction of a fume cupboard, the first two points require volume flow control. This is why air management also has the principal task of creating conditions that meet these requirements reliably and efficiently, in Germany to DIN 1946-7 and EN 14175:

- Providing sufficient fresh air while complying with the comfort criteria stated in EN 15251.
- Diluting and removing hazardous substances that might have been released in the fume cupboard or lab in order to prevent health risks that may result from breathing contaminated air.
- Satisfying the extract air and supply air demand for lab equipment.

Volume flow rates.

The extract air flow determines the required supply air flow. The extract air quantity depends on the type and size of a lab and on the fume cupboards and other extraction equipment. At night, a reduced air change rate is sufficient.

Pressure differences.

In laboratories, research institutes and similar facilities, the air conditioning system must ensure different pressure conditions in order to prevent the release of substances from a lab into other parts of the building. These pressure conditions can be achieved in two ways:

Constant supply air to extract air difference and hence constant air transfer.

Room pressure control based on a pressure setpoint value.

Removal of substances.

Contaminated air must be diluted, cleaned and removed from a building on the shortest possible way.

## ROOM AIR QUALITY AND COMFORT IN THE WORKPLACE



Rhine-Waal University of Applied Sciences, Kamp-Lintfort, Germany

Apart from ensuring that the protection goals are achieved, room air conditioning must also create a comfortable environment with a high room air quality and a comfortable climate. The degree to which the room air quality affects motivation, well-being and general acceptance of a workplace cannot be underestimated. Studies have shown that an increase in the supply air flow rate leads to a significantly higher performance and general satisfaction, and that good air is directly related to fewer allergies and infections and hence fewer absences due to sickness.

Focus on people in the workplace.

Whether fume cupboard or desk, a flexible air conditioning system must ensure maximum well-being and ultimate safety in the workplace at all times.

Apart from the important task of retaining contaminated air, the air conditioning system must create a comfortable work environment, and then without creating too much noise.

The wide spectrum of air conditioning systems, units and components puts TROX into a unique position: being able to find a bespoke solution for different conditions and for each lab building. The sheer number of proven solutions, and the extensive expertise that TROX engineers have built up over the years and by working on the most diverse projects, provide our customers with tailored air conditioning systems and overall safety.

## ENERGY-EFFICIENT AND DEMAND-BASED VENTILATION



To operate a laboratory as efficiently as possible and to considerably lower the operating costs, which are substantial in any case, it is necessary to reduce the volume flow rates to the lowest level that is hygienically safe. Air treatment and air distribution should be as efficient as possible. TROX air management systems achieve a very high level of efficiency due to intelligent volume flow rate control. The ventilation and air conditioning system runs with full power only when people are actually working in a lab. At other times a lower room air change rate will be sufficient. The air conditioning system must try to achieve a balance between effective air distribution, energy efficiency of the system, and safety and comfort of the staff. Ventilation and air conditioning are energy-efficient only if they meet the following requirements:

- Automatic hydraulic balancing of volume flow rates
- Supply air and extract air balancing
- Minimising damper blade pressure losses
- Demand-based volume flow rate adjustment to room usage
- Adapting fan speeds to the air requirement
- Communication between the components of the system
- Smooth integration with various central building management systems

Demand-based optimisation saves energy.

Based on the air hygiene requirements we are referring to very high air change rates: 150 to 200 air changes per hour for fume cupboards, and for example 8 air

changes for a room. It is, hence, extremely important that the air management system reacts to changing conditions of use. Volume flow rates and fan speeds should be adjustable, based on demand. When the damper position is signalled to the central BMS or to the X-CUBE control system, the fan speed can be adjusted accordingly in no time.

Air terminal devices need, however, a certain minimal volume flow rate to be effective. The TROX air management system can shut off individual air terminal devices above workplaces that are not in use. This means that the supply air flow rate can be reduced to a feasible level without a negative effect on comfort and performance of the air terminal devices.

Air management systems – flexible and ready to meet any challenge. TROX air management systems have a flexible, modular structure such that they can be expanded or adapted to changing conditions.

## TROX SOLUTIONS FOR LABORATORIES



### COMPLETE LAB AIR DESIGN

Comprehensive and flexible solutions for every requirement  
On the following pages we present innovative lab air systems from TROX. The information is meant to help you design and install various air conditioning systems for laboratories.

The tables on the fold-out page provide information required for the sizing of lab air conditioning systems. You are then invited to follow the way of the air from the central air distribution and the supply air discharge to the air treatment and filtration and finally removal of contaminated air.



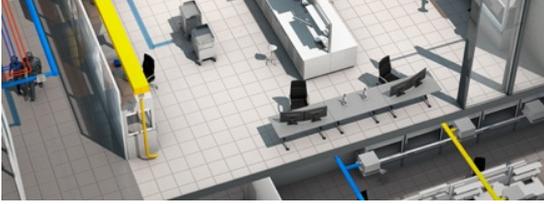
### INNOVATIVE, INTUITIVE, EASY.

The TROX Easy Product Finder (EPF) design programme simplifies the design and sizing process enormously due to its intuitive navigation functions. Once you have entered the room name, area, height and other basic project parameters, the software suggests the correct components and automatically calculates the respective performance data. The result is just a few mouse clicks away. Two examples shall illustrate the sizing results that can be achieved with the EPF. The tables at the top show the room data which a user has entered and an overview of the room balance values. The lower tables give the results, i.e. selected control components and their volume flow rate ranges.



The Easy Product Finder has become an invaluable tool for the building services industry, due to:

- reliable technical data
- interactive design wizard
- many report functions, e.g. reports on entry parameters, sizing results, specification texts and bills of material



## MANY PARTS, ONE SYSTEM – INTELLIGENT AND EASY



Altana AG, Wesel, Germany

LABCONTROL EASYLAB controller.

To provide safety and comfort in laboratories at all times, the components of an air conditioning system are interconnected. An intelligent air management system records all relevant data, evaluates them and ensures that setpoint values are maintained. With LABCONTROL and the EASYLAB controller TROX has developed an air management system which is ideal for highly sensitive areas.

EASYLAB allows all controllers in the network to immediately communicate once they have been installed, i.e. no component addressing is required. Due to their modular hardware structure controllers can be adapted to individual requirements. Plug-in connections combine easy installation with flexible expansion options. Once a fume cupboard has been commissioned, it can be included in the room control, and removed again, at any time and without readjustment. This is real plug and play.

Air handling unit as control centre.

Intelligent functions have been added to the TROX air handling unit in order to further facilitate control of the overall air conditioning system. All ventilation and air conditioning components can be integrated with the air handling unit.

The X-CUBE air handling unit acts as the control centre on the automation level, a setup which drastically reduces the number of communication interfaces and data points on an existing central BMS. This saves costs, cuts the installation and commissioning effort, and ensures safe communication of the ventilation and air conditioning components. This is an important step towards the simplification of the ventilation and air conditioning design as part of building automation. Standard protocols are used for the integration with the central BMS.

## LAB AIR STRATEGIES

Integrated room air design for laboratories

Developing and implementing a comprehensive room air conditioning strategy that meets the most critical safety and comfort requirements is only possible through the close cooperation of specialist consultants, HVAC contractors, users and manufacturers, and then from the beginning, i.e. from the design stage onwards. The TROX know-how and the complete TROX product portfolio can be combined for both new buildings and refurbishment projects.

The illustration on the fold-out page shows you how a lab with innovative TROX products and systems may look like.

### Air management

- [Fume cupboard control](#)
- [Room balancing](#)
- [Room pressure control](#)

### Air discharge patterns

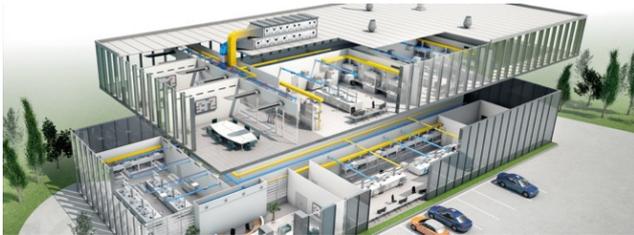
- [Airflow control strategies for laboratories](#)
- [Tailored components for air discharge](#)
- [Air-water systems for the dissipation](#)

- of high heat loads

#### Air treatment

High-tech room air conditioning for

- labs
- ATEX – Certified TROX safety
- products



- Expert consultancy and support throughout all stages of a project: from the design stage to handing over the system, and also after installation
- Comprehensive service support: commissioning, system integration, maintenance, modernisation
- Easy connection to higher-level systems due to standard interfaces
- Maximum data transparency due to open systems such as LonWorks®, Modbus and BACnet
- Air management system solutions from a single source reduce the number of interfaces required
- Reduced fire load due to bus systems that reduce the wiring
- Support of flexible building usage: systems can easily be adapted to meet new requirements
- Rapid amortisation of investment costs due to reduced operating costs
- Energy savings due to optimised systems operation
- High level of operational reliability due to system self-monitoring



X-CUBE air handling units handle volume flow rates of up to 100,000 m<sup>3</sup>/h (28 m<sup>3</sup>/s) for the ventilation and air conditioning of rooms – including filtration, heating, cooling, heat recovery, and humidifying and dehumidifying

and dehumidifying.

X-CUBE Compact (not shown in the building illustration) is a compact air handling unit for volume flow rates of 600 to 6000 m<sup>3</sup>/h and a heat recovery efficiency in excess of 80 % (dry, to EN 308); it is the ideal solution for small and medium-sized applications.

TROX room air management systems provide demand-based volume flow rate control to ensure the best possible room air quality and temperature while they help to save energy at the same time.

FMS Flow Monitoring System is an electronic, self-powered monitoring system for fume cupboards. VMRK, a circular volume flow rate measuring unit, recommends itself for ducts with contaminated air.

Constant volume flow control  
Circular, mechanical self-powered CAV controllers for the precise control of constant volume flows of contaminated extract air.

Swirl diffusers with optimised acoustic and aerodynamic properties come in a wide range of designs and constructions to suit every architectural requirement. They can be installed in suspended ceilings or just below the ceiling and hence visible.

Ceiling diffusers are ideal for large, modern laboratories with soft cooling methods such as adiabatic cooling; their controlled velocity profile at the point of discharge is an advantage.

Induction units are air-water systems and represent energy-efficient solutions for the ventilation and air conditioning of rooms. Ceiling mounted units can be fitted with additional functions or building services, e.g. lighting.

Ventilation grilles and continuous horizontal runs with adjustable front blades can be installed in walls and floors.

Jet nozzles throw the air far into the room. The nozzles are actuated electrically, manually, or with an SMA actuator (self-powered) and can be operated in heating or cooling mode.

TROXNETCOM makes use of decentralised, open communication systems and hence allows for inexpensive fire protection solutions that can be easily intergrated with the central BMS.

Fire dampers are certified for all European countries and prevent fire and smoke from

and prevent fire and smoke from spreading through ventilation ducting.

The fire area is consequently shut off from other parts of the building.

X-FANS process extract air fans are made of plastic and fitted with special seals and are hence ideal for the removal of aggressive media.

External weather louvres protect air conditioning systems against the direct ingress of rain, leaves and birds into fresh air and exhaust air openings.

Multileaf dampers

Multileaf dampers are used in ducts or in wall or ceiling openings to shut off or restrict the airflow. Combinations of external weather louvres and multileaf dampers or non-return dampers have a dual function. They provide not only weather protection but also a means for shut-off, and they prevent air from flowing against the intended airflow direction.

One-stop shop.

In addition to the products shown here, TROX offers many more and in fact covers the entire range of components and systems for ventilation and air conditioning:

- Filters and filter systems
- Sound attenuators made of PPS
- Other air terminal devices for mixed flow and displacement flow, and for installation in ceilings, walls and floors.
- Air-water systems
- Decentralised ventilation systems
- Splitter attenuators and silencers
- Smoke control dampers
- X-FANS smoke exhaust fans
- X-FANS fans

