



ECH

Occupational
hygiene dedusting
filter units

PURE TRUST.

For your safe and reliable operations.



ECH Occupational hygiene dedusting filter units are a family of products designed primarily for applications in the pharmaceutical industry. They are used in the solids handling, dosage formulation and packaging processes of highly active substances. Occasionally, they provide similar protection in toxicological challenges when handling other compounds such as transition metal catalysts, battery materials etc. ECH Occupational hygiene dedusting filter units are available in three sizes for airflow rates up to 1000 m³/h. For higher airflow rates, as are common in the synthesis and coating of organic intermediates and active pharmaceutical ingredients, please refer to our dust collectors type ECB or ECR.

Reliable and precise engineering of all functional aspects with very highly hazardous and extremely hazardous High-Potency APIs (HPAPIs) (OEB >5)

The OELs of HPAPIs themselves exceed the protection levels of most individual containment provisions. A risk-based assessment along ISPE Baseline 7 in implementation of ICH Q9 is advisable to determine target protection in all handling aspects in a practical manner. The main focus is to evaluate the OEB's of real, often diluted process dusts, taking into account dust migration and other transport issues that separate powder fractions. Optimizing the allocation of the dedusting filter within the process, the logistics of its cleaning, the identification and early detection of failures and their effects are further issues in defining dedusting filters in these applications. TRM Filter communicates with stakeholders about all these concerns and defines the details of its Maximo configuration for a precise and reliable dedusting filter solution.



Safety with comprehensive solutions for hazardous and highly hazardous substances (OEB 3&4)

Safety in dust collection filter systems with OEB 3&4 levels can be ensured through standardized configurations. Exemplary containment qualification by APCPPE (Assessing the Particulate Containment Performance of Pharmaceutical Equipment), formerly SMEPAC, is confirmed by ICH Q9 operational qualification in the operating company's organization. For fully continuous operation, ECH Optimo covers all relevant functions at OEB 4, and for semi-continuous operation, ECH Practico is protected at OEB 3 level.

Safe yet cost-effective upgradable systems for preventive protection against estimated occupational hygiene hazards

In industries where other dusts with typically uncertain but presumed toxicological effects are handled, the ECHA requirement for closed isolators (Strategy 4) is predominant, similar to the OEB 3 requirements met by ECH Practico. Where there is no toxicological evidence that a substance is harmful, the ECHA requirement for open isolators (Strategy 3) is mostly followed and simple protective measures are implemented in ECH Novento. TRM Filter's most economical ECH Enduro is an unprotected dust collection filter system with provisions for a lifetime upgrade to a closed ECHA isolator. As knowledge of the toxicological hazards of chemicals is bound to increase with the development and intensification of REACH, Enduro is your safe investment in a sustainable dust collection filtration system.



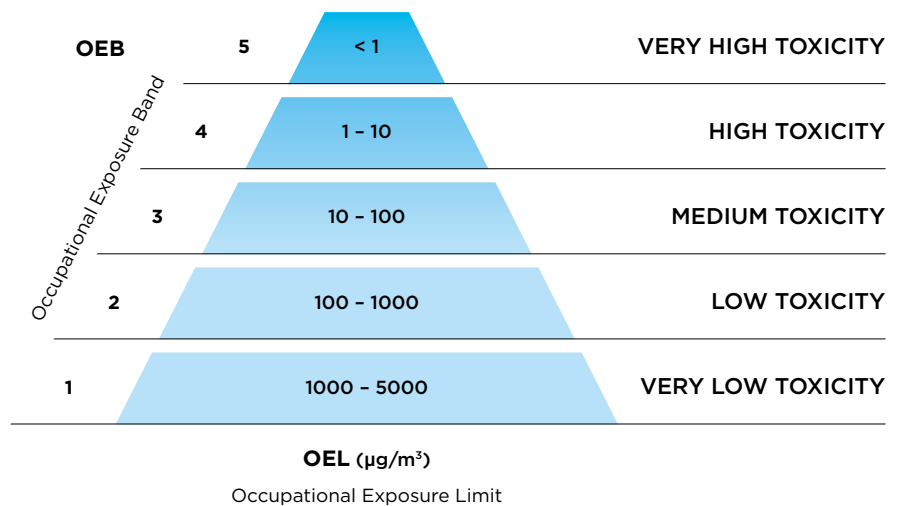
TRM Filter

Glatf

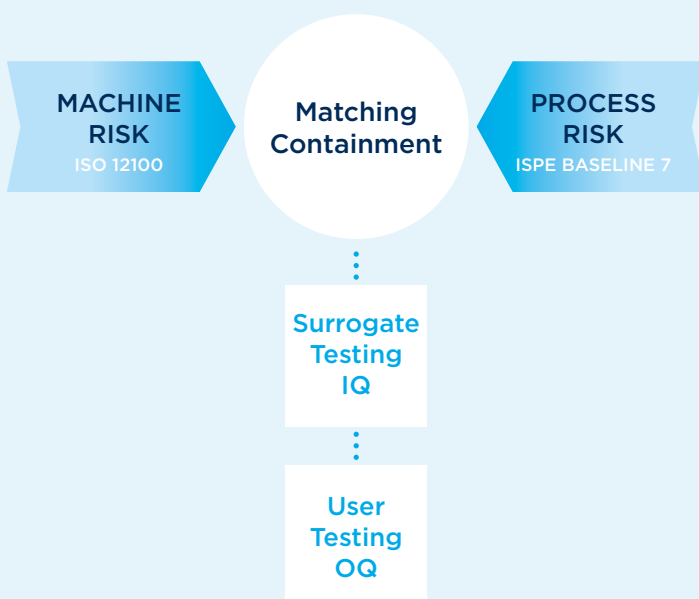
GPCG2
LabSystem

12337 PD 150230
12337 PD 150130
12337 PD 150150
Zuluflüster 1
Inlet air Filter 1
Filter 1 air d'entrée
Zuluflüster 2
Inlet air Filter 2
Filter 2 air d'entrée
Absaugflüster
exhaust air filter
Filter exhaust air

Risk Based Occupational Hygiene with containment filtration

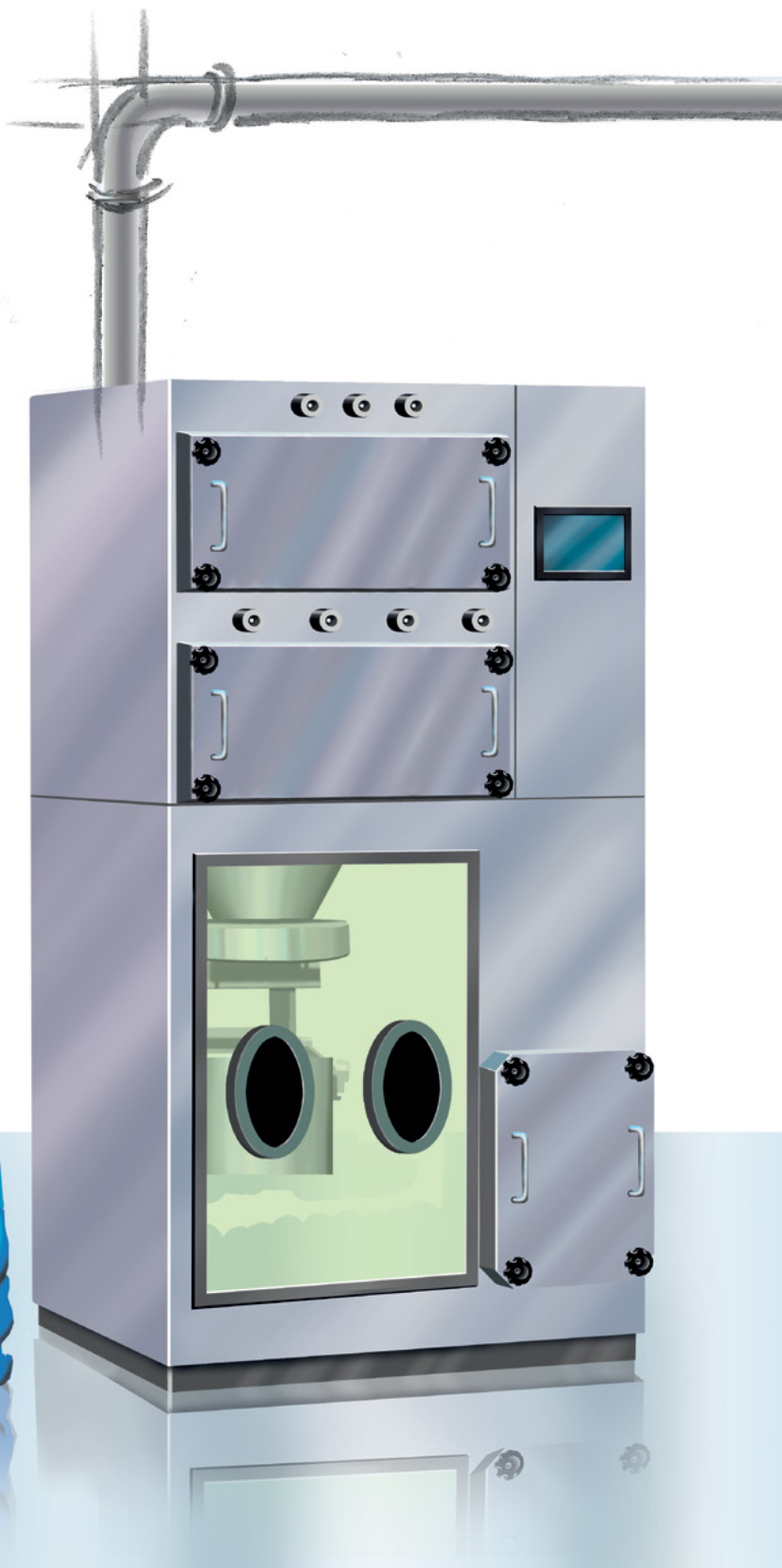


CONFIGURATIONS FROM CONJOINT RISK ASSESSMENT



- Simple risk adjusted containment dedusting from rigorous conjoint risk assessment pursuing ISPE risk based manufacturing baseline 7 and ISO 12100
- Minimal process criticality from ROTATRONIC best filter performance
- Testing according to APCPPE (SMEPAC)

Dedusting OSD processes



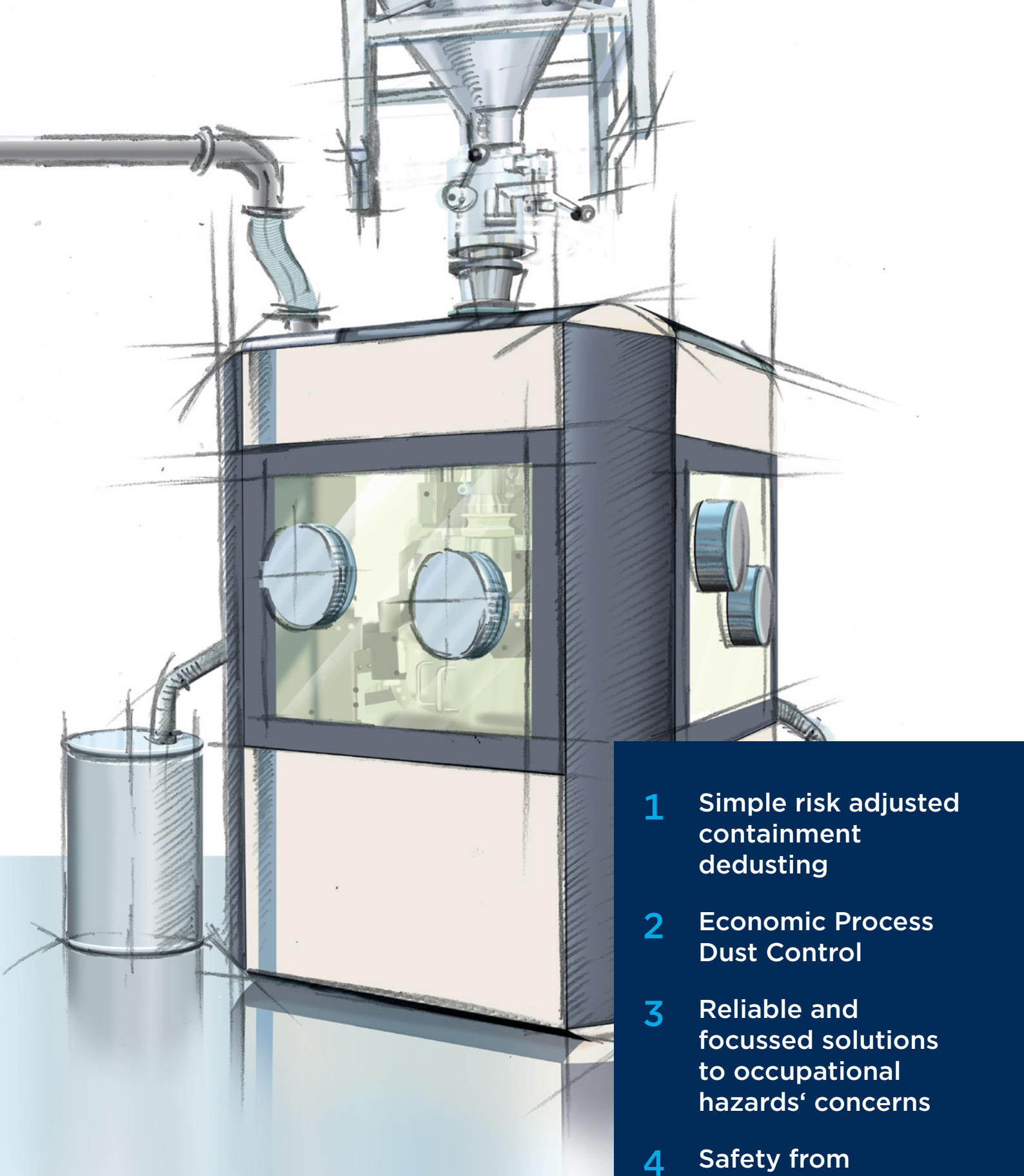
ECH Maximo

for continuous dedusting of
very highly hazardous and
extremely hazardous HPAPIs
(OEB \geq 5)



ECH Optimo

for continuous dedusting
of highly hazardous and
hazardous dusts
(OEB 5 & OEB 4)



- 1 Simple risk adjusted containment dedusting
- 2 Economic Process Dust Control
- 3 Reliable and focussed solutions to occupational hazards' concerns
- 4 Safety from transparent designs and execution
- 5 Loss prevention with on-target dust aspiration



ECH Practico
for semi- continuous
dedusting of hazardous
dusts (OEB 4 & OEB 3)

Dedusting powder transformations

- 1 Simple hygienic compliance to regulatory requirements in dedusting
- 2 Economic Systems Design
- 3 Economic & Safe Investment by upgradable installations
- 4 Reliable and precise hygienic operation
- 5 Safety from transparent designs and execution



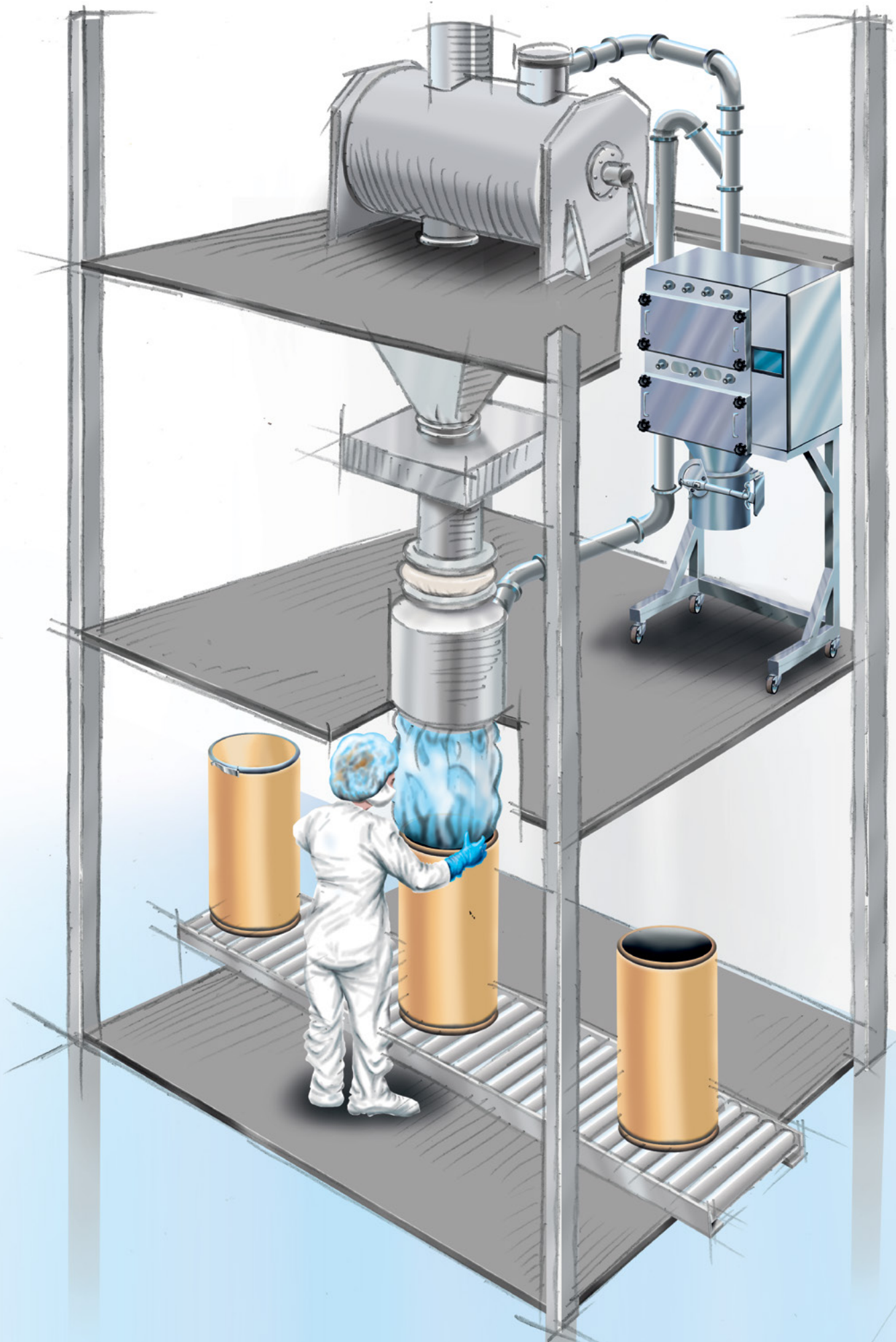
ECH Practico
for semi- continuous dedusting of hazardous dusts (OEB 4 & OEB 3)



ECH Novento
for semi- continuous dedusting of intermediates in open systems (up to OEB 3)



ECH Enduro
for upgradable semi-continuous dedusting of dusts

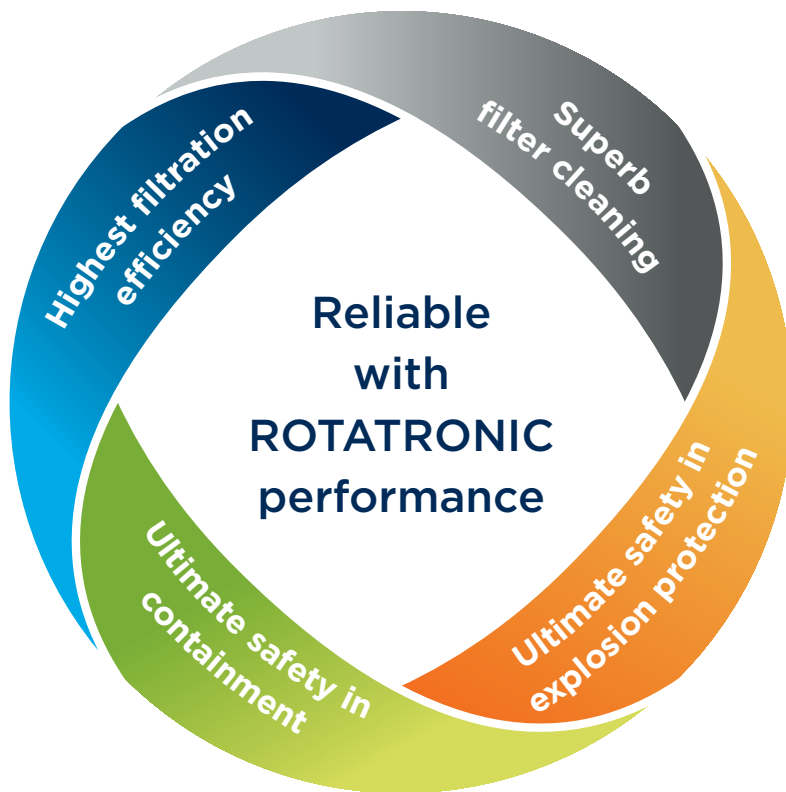


ECH-10S Maximo



Minimal Maintenance from Best Filtration

- ✓ Minimal Interference dedusting process
- ✓ Fewest critical maintenance operations

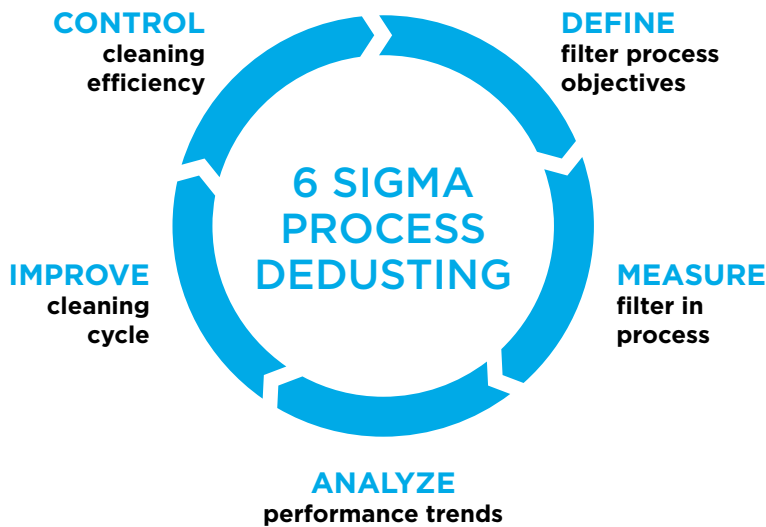


ROTATRONIC
Smart filter cleaning technology

Reliable ROTATRONIC filter performance

- Longest filter life with ROTATRONIC
- Fast and smooth cleaning of all filter surface by ROTATRONIC Mechanics
- Predictable best performance operation by ROTATRONIC Control

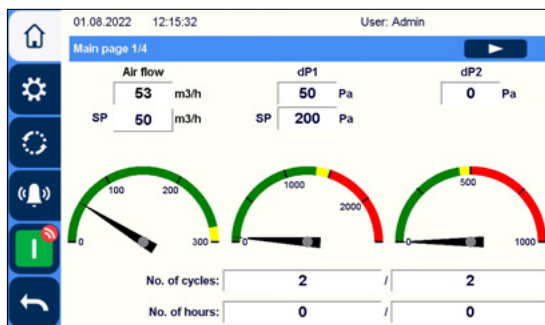
ROTATRONIC Control



Total cost of ownership is an important factor in the selection of a dust collection system. To reduce the cost of replacing filter cartridges, it is essential to use dust collectors with integrated filter cleaning systems (using compressed air). They extend the life of the filter and prevent dust migration into the deeper layers of the filter media, thus maintaining pleat stability at its best performance.

Since many factors influence the optimal cleaning performance, we have developed the ROTATRONIC cleaning system. Its integral part is ROTATRONIC Control, a smart filter cleaning technology based on 6-sigma process optimization. The clogging tendency of the filter media and the development of the differential pressure across the filter cartridges are constantly monitored during the dust removal process. The setpoint is continuously adjusted and the filter media is always cleaned at the ideal level. Its behaviour, including its ageing, becomes predictable.

In addition to optimizing the cleaning process, the ROTATRONIC Control also functions as a central node to which all installed accessories and peripheral equipment are connected. Monitoring and control of all aspects of the filtration process is made possible by a user-friendly graphic interface (touch screen), on which the essential parameters can also be displayed in diagram form. The ROTATRONIC Control offers numerous upgrade and connection options:



Graphical user interface of the standard ROTATRONIC Control (the user interface of the ROTATRONIC Control offers an alphanumeric display)

Simplicity

The intuitive ROTATRONIC user interface ensures the best overview of the operating parameters and the history log.

Efficiency

Lower total cost of ownership through longer filter element life, lower energy consumption, less maintenance, and waste.

Versatility

Thanks to numerous options, the ROTATRONIC Control can be connected to various central control systems (SCADA, BMS, etc.).

- A connection to the control systems of an individual production process or to the central system of a company (SCADA, BMS).
- The connection of additional sensors for monitoring and recording the following parameters: Emissions at the outlet of a filter, humidity, temperature and airflow.
- A remote start option allows connection to other devices in the process.

ROTATRONIC Mechanics



The performance of dust collectors can be measured with different parameters. One of these is certainly cost efficiency, which is significantly influenced by the frequency of required filter replacements and the associated costs, i.e., downtime, logistics, labor, consumables and waste management.

Several factors influence the service life of filter elements, from dust properties (variation in particle size, moisture and adhesion properties of the dust, etc.) to the type of filter media and the design of the filter elements. However, the key factor is the efficiency of the filter cleaning process.

In addition to the innovative ROTATRONIC Control, we have also developed unique ROTATRONIC Mechanics which includes special rotating cleaning nozzles and the lifting mechanism.

The nozzles rotate during the filter cleaning process and are guided close to the clean air surface of the pleated filter element. In doing so, they direct compressed air over a short distance onto the filter medium. This enhances the cleaning effect of the compressed air and enables uniform and stable operation at reduced air pressure. The shape of the special cleaning nozzles in ECH dust collectors has been carefully designed to minimize internal pressure loss, ensure effective cleaning of the filter cartridge over its entire surface, and reduce the load on the filter medium.

During the filter cleaning process, the airflow through the ECH dedusting filter system is stopped by the pneumatically-driven flap at the inlet. This maximizes the cleaning efficiency of the ROTATRONIC Mechanics system.

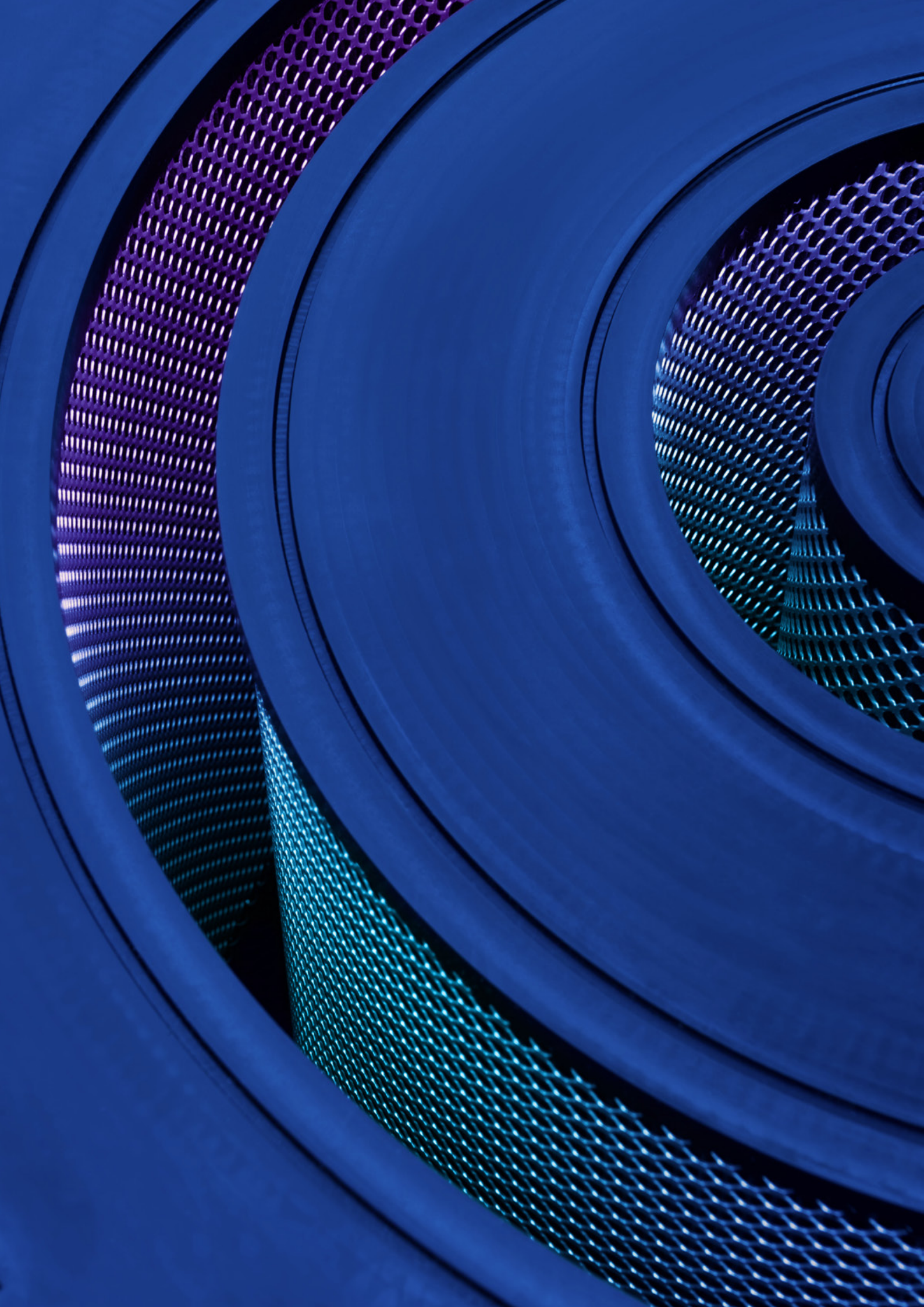
Cost optimization

Superb cleaning performance of the ROTATRONIC Mechanics has a beneficial impact on various costs and procedures associated with the replacement of filter element.

Reduced exposure

The less frequent filter replacement brings with it perhaps the most important advantage of the ROTATRONIC System, namely the reduced exposure time of service personnel.

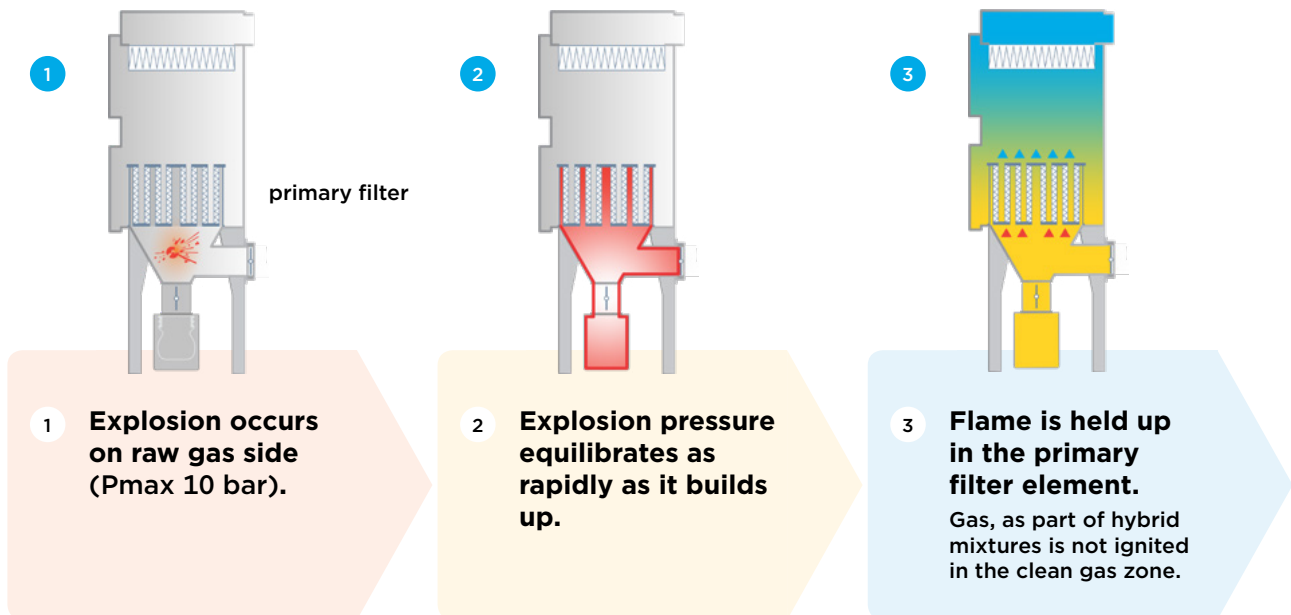
Both the ROTATRONIC Mechanics and the ROTATRONIC Control are among our main distinguishing features compared to the alternatives on the market.



Inherent Explosion Protection in Closed System



- ✓ Explosion resistant built as explosion pressure is released to clean gas side
- ✓ Filter element acting as flame arrestor at the primary filter stage



- Explosion risk contained on raw gas side
- Downstream ignition of solvents prevented
- Explosion safely tamed inside the deduster system
- Explosion safe for dusts and hybrid mixtures up to Kst 500 bar*m/s
- Anti-static filter media, safe even for hybrid mixtures

Maintenance free explosion protection

- Endurable Explosion protection
- Minimal maintenance of explosion protection components compared to suppression systems
- Life-long inherent explosion safety



ECH-20D Optimo

ECH-05D Practico



Containment configurations and other options

■ Standard equipment ○ Optional equipment

| | Enduro | Novento | Practico | Optimo | Maximo |
|--|--------|---------|----------|--------|--------|
| OEB Target Level | none | up to 3 | 3-4 | 4-5 | ≥ 5 |
| HOUSING MATERIAL | | | | | |
| Powder coated steel | ■ | ■ | ■ | ■ | |
| Stainless steel AISI 304 | ○ | ○ | ○ | ○ | ■ |
| Stainless steel AISI 316 | ○ | ○ | ○ | ○ | ○ |
| SURFACE FINISH - INSIDE | | | | | |
| Fine brushed | ○ | ○ | ○ | ○ | ■ |
| Fine brushed Ra < 1 | ○ | ○ | ○ | ○ | ○ |
| Polished Ra < 0.4 | ○ | ○ | ○ | ○ | ○ |
| SURFACE FINISH - OUTSIDE | | | | | |
| Fine brushed | ○ | ○ | ○ | ○ | ■ |
| Fine brushed Ra < 1 | ○ | ○ | ○ | ○ | ○ |
| Polished Ra < 0.4 | ○ | ○ | ○ | ○ | ○ |
| FILTER EXCHANGE TECHNIQUES | | | | | |
| Open access | ■ | | | | |
| Bag-in/Bag-out exchange | ○ | ■ | | | |
| Advanced Bag-in/Bag-out exchange | ○ | ○ | ■ | ■ | ■ |
| Single point primary filter integrity test | ○ | ○ | ○ | | |
| Multi point (grid) primary integrity test | ○ | ○ | ○ | ■ | ■ |
| Primary filter sealing test | | | ○ | ○ | ○ |
| Single point secondary filter integrity test | ○ | ○ | ○ | | |
| Multi point (grid) secondary integrity test | ○ | ○ | ○ | ■ | ■ |
| Secondary filter sealing test | | | ○ | ○ | ■ |
| Dust immobilization provisions | | | ○ | ○ | ■ |
| WIP provisions | | | | ○ | ■ |
| DUST DISCHARGE | | | | | |
| Dust bin with bag | ■ | | | | |
| Bag with lid | ○ | ■ | | | |
| Safe change bag | ○ | ○ | ■ | | |
| Continuous liner | ○ | ○ | ○ | ■ | ■ |
| Manual butterfly | ○ | ■ | ■ | | |
| Pneumatic butterfly | ○ | ○ | ○ | ■ | ■ |
| Manual lifting/closing mechanism | ■ | ■ | ■ | | |
| Pneumatic lifting/closing mechanism | ○ | ○ | ○ | ■ | ■ |
| Flexible glovebox isolator | | | | ○ | ■ |
| Rigid glovebox isolator | | | | ○ | ○ |
| WIP provision for glovebox | | | | ○ | ○ |
| ATEX | | | | | |
| 1 - mIE > 3 mJ | ■ | ■ | ■ | ■ | ■ |
| 3 - St2@mIE < 3 mJ | ○ | ○ | ○ | ○ | ○ |
| 4 - Hybrid mixture | ○ | ○ | ○ | ○ | ○ |
| PROCESS TEMPERATURE | | | | | |
| Up to 50°C | ■ | ■ | ■ | ■ | ■ |
| Up to 110°C | ○ | ○ | ○ | ○ | ○ |
| OTHER | | | | | |
| Wheels | ○ | ○ | ○ | ○ | ○ |
| Adjustable legs | ○ | ○ | ○ | ○ | ○ |
| Height reduction provisions | | | | ○ | ○ |
| Integrated fan | ○ | ○ | ○ | ○ | ○ |
| High performance external fan | ○ | ○ | ○ | ○ | ○ |
| Fan silencer | ○ | ○ | ○ | ○ | ○ |
| Process control interface | ○ | ○ | ○ | ○ | ■ |
| Manual airflow control | ■ | ■ | | | |
| Pressure airflow control | ○ | ○ | ■ | ■ | ■ |
| Volumetric airflow control | | | ○ | ○ | ○ |
| Dust mass balance control | | | ○ | ○ | ○ |
| Dust level indicator | ○ | ○ | ○ | ■ | ■ |
| 3rd stage filter HEPA/ULPA | | | | ○ | ○ |
| ROTATRONIC Control (Eaton PLC) | ■ | ■ | ■ | ■ | ■ |
| ROTATRONIC Control (Siemens PLC) | ○ | ○ | ○ | ○ | ○ |

Technical characteristics

| | ECH-10S | ECH-20S | ECH-05D | ECH-10D | ECH-20D |
|--------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| Operating mode | off-line cleaning | off-line cleaning | on-line cleaning | on-line cleaning | on-line cleaning |
| Airflow | 250 m ³ /h | 500 m ³ /h | 250 m ³ /h | 500 m ³ /h | 1000 m ³ /h |
| No. of primary filter elements | 1 | 1 | 2 | 2 | 2 |
| Primary filter type | ROTATRONIC cartridge | ROTATRONIC cartridge | ROTATRONIC cartridge | ROTATRONIC cartridge | ROTATRONIC cartridge |
| Total filter area | 3.2 m ² | 4.9 m ² | 5.8 m ² | 6.4 m ² | 9.8 m ² |
| Primary filter efficiency | up to H13 | up to H13 | up to H13 | up to H13 | up to H13 |
| Filter cleaning system | ROTATRONIC Mechanics | ROTATRONIC Mechanics | ROTATRONIC Mechanics | ROTATRONIC Mechanics | ROTATRONIC Mechanics |
| Secondary filter type | filter cassette | filter cassette | filter cassette | filter cassette | filter cassette |
| Secondary filter efficiency | up to H14 | up to H14 | up to H14 | up to H14 | up to H14 |
| Tertiary efficiency | up to H14 | up to H14 | up to H14 | up to H14 | up to H14 |
| System height | 2100 mm | 2000 mm | 1710 mm | 1900 mm | 1770 mm |
| System width | 780 mm | 960 mm | 900 mm | 1300 mm | 1500 mm |
| System depth | 870 mm | 1070 mm | 770 mm | 870 mm | 1050 mm |
| System mass | 450 kg | 500 kg | 400 kg | 650 kg | 760 kg |
| Inlet size | DN65 | DN100 | DN65 | DN100 | DN120 |
| Outlet size | DN65 | DN100 | DN65 | DN100 | DN120 |
| Dust bin volume | 15 L | 15 L | 2x 10 L | 2x 15 L | 2x 15 L |
| Compressed air pressure | 6 bar | 6 bar | 6 bar | 6 bar | 6 bar |



TRM Filter provides trusted and reliable solutions to all aspects of pharmaceutical dedusting.

ECH Occupational hygiene dedusting filter units are economic containment solutions for your safe and reliable operations.



TRM Filter d.o.o.
Litjaska cesta 261
SI-1261 Ljubljana Dobrunje
Slovenia

T +386 1 527 22 10
sales@trm-filter.com

www.trm-filter.com