

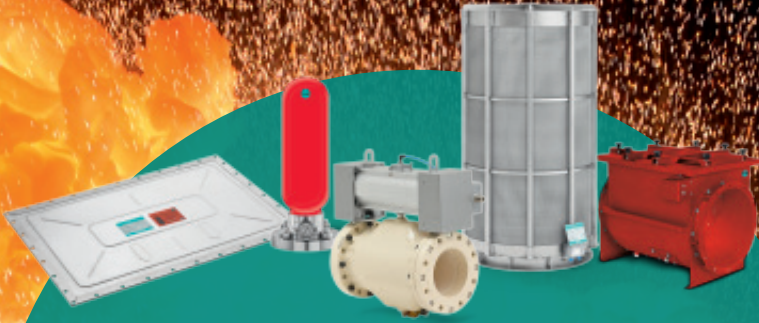


Safety is for life.

Explosion Safety

Process Safety

Industrial Measurement



REMBE® EXPLOSION SAFETY



Consulting. Engineering. Products. Service.



Dear Customer and Partner,

Over the last five years, REMBE® has built a team of experts in the field of explosion safety that is unmatched among other manufacturers. We are no longer just a manufacturer of products and components but a consultancy, engineering house and a full service provider.

We deliver turn-key explosion protection concepts all over the world, for all delicate or complex applications, and in a variety of industries including aerospace, cosmetics, chemicals, food-stuffs, pharmaceuticals, biotech, energy, timber, infrastructure, transport and more.

To guarantee REMBE® quality in both special applications and large scale projects we have put together a team of specialists that is unique in the world of explosion safety.

Furthermore, we are again setting the trend by bringing solutions to market that protect your life and budgets while still preserving nature. Solutions like the Q-Rohr® DFE (REMBE® invented flameless venting with the Q-Rohr® 25 years ago) or the TARGO-VENT provide maximum safety, full business continuity and absolute peace of mind.

Let's not forget the people involved. Here are some selected members of my global team of safety professionals, which is led by Dr. Lottermann. If there is anything I can do for you please let me know. You can reach me at stefan.penno@rembe.de.

Have a safe and successful day.

A handwritten signature in blue ink, appearing to read 'Stefan Penno'.

Stefan Penno



Dr. Johannes Lottermann studied safety engineering at the University of Wuppertal before he worked for the renowned German mining safety consulting company DMT GmbH & Co. KG. At DMT Johannes led the Department of Technical Fire and Explosion Safety. In 2010 he joined REMBE® to work in industrial explosion safety. With his consulting background and a PhD in Integral Fire and Explosion Protection Concepts he is now REMBE®'s Global Sales Manager for Explosion Safety, delivering the complete package of consulting, engineering, products and service. Johannes is also a proactive member in numerous committees and international associations such as the VDI, VDSI, VGB and NFPA, and he chairs the Scientific Technical Committee of the Intercontinental Association for Explosion Protection IND EX e.V. Johannes is consistently able to understand our customers' needs and fulfil their technical and commercial requirements.



Francesca Vincenzi is an engineering specialist in explosion safety who has no issues getting her hands dirty when inspecting an industrial site. She has more than 10 years experience as a consultant in the Italian food, pharmaceuticals and timber industries. Since joining REMBE® in 2012, Francesca has expanded her scope to include Europe and North America, and since 2014 she has been a Senior Consultant in Explosion Safety. This position covers full-spectrum safety scans for medium- and large-scale factories. Her customers respect her comprehensive and competent safety concepts, her broad expertise, and her likeable personality.



Andrea Vincenzi worked at several globally active engineering companies in the explosion safety sector before joining REMBE® as a Senior Consultant. Like Johannes and Francesca, he travels worldwide to run safety scans and develop protection concepts in all kinds of production plants, especially in coating, timber handling and food manufacturing facilities. With more than eight years of experience in ATEX consulting he has become a reliable associate in every way. He is known for his rational decision-making while his relaxed and friendly character allows him to remain calm regardless of the challenges he faces. Many of his worldwide clients insist on being consulted by him and no other - they deeply trust his honesty and professionalism.



Roland Bunse studied at the University of Paderborn and has a degree in mechanical engineering, but it is not his theoretical background that separates him from other sales engineers. It is his wide range of practical experience that makes his senior status self-evident. Roland has carried out thousands of dust and gas explosions, knows the physics behind the scenes and understands how to convert this knowledge into cost-effective and safe solutions for our customers. He came on board in 1994 and constantly supported our research and development of explosion safety devices including the unique Q-Rohr®, the EXKOP® Isolation System and TARGO-VENT. Roland also holds several patents and contributes to national and international standardization groups like CEN or VDI. So when you need a hands-on technical genius, Roland is the first choice. He is straightforward, solutions-oriented and gets things done properly in compliance with worldwide standards.

SAFETY IS FOR

Our mission: your safety.

Operational safety is an important responsibility. In fact, it's a mission to which we have dedicated ourselves wholeheartedly for over 40 years now. Throughout the world our experts have a single aim – to provide the best possible protection for your systems and processes.

You'll benefit from our decades of experience which ensure that you always receive an honest analysis and products of the highest quality. Working diligently and responsibly, our attention is fully focused on the customised optimisation of your routines, manufacturing processes and products.

Consulting

**We don't just work at our desks.
We also work on your premises.**

Each production facility is different and has different requirements. This is why our experts have a close look at your entire plant with you to determine what's genuinely reasonable and what will be the best solution for you. It's your perfect investment in safety.

Solutions off the peg? Not from REMBE®.

Once we have looked at all the relevant documents, we will identify the existing gaps for improvement and create a profitable safety and measuring policy for you that is perfectly geared to suit your company.

Engineering

**We don't just make recommendations.
We give you the best solution.**

From the drawing board to production – you will have a safety system that is perfectly tailored to suit your needs and operational requirements.

Whether it's explosion safety or process safety, our engineering ensures that you get the best solution at all times – **Made in Germany.**

Quality – the key to your safety

Our products are manufactured according to the latest international standards for management systems, pressure equipment and explosion safety devices. As well as prioritising quality and reliability, we also place major

importance on eco-friendly technologies, manufacturing processes and compliance with standards. High-quality materials from controlled sources ensure that our products have exceptionally long lifetimes.

LIFE.

Deciding to go with REMBE® means opting for perfect safety.

As an independent, medium-sized, German company we supply products **Made in Germany** – a further bonus for your safety. Moreover, you will always have the support of our experts in matters of process safety, explosion protection and industrial measuring technology – 24/7, all year round. That's our promise!

Products

Our products are not just excellent. They are approved and certified.

Good is never good enough for us. So we keep putting ourselves on the test bench. The result is safety products and measuring equipment licensed under globally recognised and industry-specific standards and regulations.

We are also the first company worldwide to offer SIL-equivalent parameters for mechanical (flameless) explosion venting products and the relevant signallers.

This high quality standard makes perfect economic sense for you. Our extensive product range ensures that you always receive the most cost-effective and reliable solution for your needs.

We take responsibility for the big picture. With us you get everything from one source, thus ensuring good profitability and legal security.



Service

Downtime costs money. Our service never stands still – all over the world.

From start-up to regular maintenance – we ensure that your production runs smoothly and without disruptions. All the products we supply can be identified by their batch and serial numbers for many decades, allowing exact reproduction of spare parts.

If you're ever in a hurry, why not use our Rush Order Service? We can guarantee that you are given the highest priority and that your product is made straightaway. Depending on the destination, we'll deliver within less than 24 hours. This also applies to spares, additional items and custom designs.

"REMBE® speaks your language"

Our global network of offices and our many international experts guarantee that we always understand you and your needs. Just give us a call.

Certifications

Management systems

EN ISO 9001:2008, ISO/TS 29001:2010, KTA 1401

Products

DGRL 97/23/EG, ASME Sec. VIII, Div. 1, China Manufacture Licence, KOSHA (South Korea), ATEX RL 94/9/EG, FM Global, GL, CSA, GOST-RT, RTN (Russia)

Testing standards

AD 2000 Datasheet A1, EN ISO 4126/2, EN 1127-1/-13463/-14373/-14491/-14797/-14994/-15233/-16009/-16447, VDI 3673, NFPA 68, NFPA 69, IEC 61508

Air cargo safety

Known Consignor (KC/00912/01/0218)

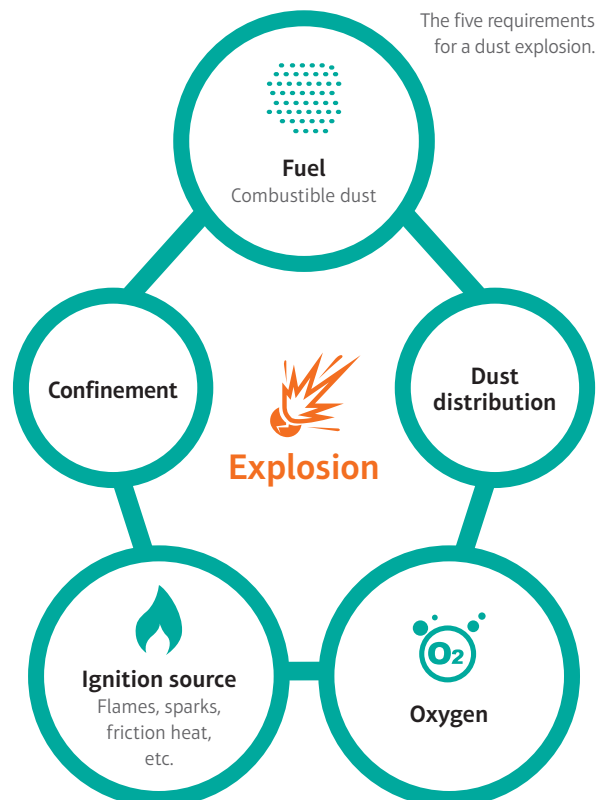
THE PRINCIPLES OF EXPLOSION SAFETY

Why do explosions occur?

When a combustible material, an ignition source and atmospheric oxygen collide in a confined space, the result is an explosion. Preventative explosion safety measures aim to stop this potentially lethal mixture from occurring. However, in practice, the vast number of potential ignition sources alone almost always makes this impossible. Consequently, the most important steps towards explosion safety for industrial companies are protection measures that minimise the damage caused by an explosion. Industrial plants must always be protected against the consequences of explosions to ensure that employees are safe and production can be resumed quickly. After all, every hour of lost production costs money. In most cases, explosion safety can be provided cost-effectively through explosion venting and explosion suppression.

We would be happy to show you solutions tailored to your processes that will reduce the damage caused by an explosion to a negligible level – enabling you to resume production quickly after an explosion.

The five requirements for a dust explosion.



The 3 key features of a modern protection concept

1. **Reliability and productivity:** Protective systems must be permanently available and operational. The possibility of false triggers must be excluded as this reduces the productivity of the plant.
2. **Compliance:** Modern protective systems must satisfy all legal requirements and thus guarantee legal compliance for plant operators.
3. **Cost-effectiveness:** Protective systems must be as simple as possible to install and require minimum investment of time and financial resources. The total costs of ownership of the systems must also be kept as low as possible.

All protection concepts from REMBE® meet these requirements. That's a promise!

Why is explosion safety so crucial?

Higher – faster – further: not just the objective in sport but also in the development of industrial plant technology. 21st century machinery has long been optimised and is running at high speeds. However, as plants approach their maximum capacity, the risk of an explosion also increases. Rising levels of fine particles produced by fast-running machines are one of the main reasons that the probability of explosions increases. These explosions almost always cost human lives, but even if nobody is harmed, an explosion in an inadequately protected industrial plant can still cause immense structural and financial damage. History shows that explosions in unprotected plants have driven companies to bankruptcy time and time again. After all, every day of lost production puts **the company's existence at risk**. Explosion safety concepts usually enable businesses to **eliminate production downtime entirely or at the very least reduce it dramatically – and with REMBE® products it is always more affordable than you think.**

3 steps to make your processes safer

1. Risk assessment

A risk assessment determines the probability that an explosive mixture of dust and air (divided into zones) will come into contact with an effective source of ignition. If there is a danger of an explosion occurring, you must take steps to prevent, or at least reduce, the probability of this happening (see step 2). Alternatively, you must implement protective systems that reduce to an acceptable level the damage an explosion would cause (see step 3).

2. Prevention and organisational measures

- **Technical measures:** Effective dust extraction systems reduce the build-up of explosive atmospheres. Inert gas blanketing is also recommended to reduce oxygen levels.
- **Eliminate effective ignition sources:** Only ever use the appropriate equipment (e.g. category 1D) and prevent foreign bodies from entering the product stream. Check that equipment is correctly grounded to avoid electrostatic discharges.
- **Organisational measures:** Employees should always receive comprehensive training. Documented cleaning procedures and permit-to-work systems for hot-work create an additional level of safety.

3. Protective measures

- **Explosion pressure resistant or explosion-proof vessels:** These terms are used to describe vessels that are strong enough to withstand the maximum explosion pressure.
- **Conventional explosion venting:** Explosion venting is a technique for protecting enclosed vessels that prevents the pressure within the vessel from rising above a permitted level. Breaking points, such as explosion discs or panels, in the walls of the plant, rupture when the pressure reaches a predefined level and thus reduce the pressure in the vessel below its strength.
- **Flameless explosion venting:** This essentially uses the same principle as conventional explosion venting. However, it offers the advantage that the explosion can be vented indoors because the flame and pressure wave of the explosion are contained. This eliminates the risk of injury even when working in close proximity to the equipment.
- **Explosion suppression:** Pressure and/or infrared sensors detect the explosion at a very early stage. Within a few milliseconds, a control system smothers the germ of the explosion using an extinguishing powder that is released into the plant.

Assessment, prevention and protection – REMBE® is your expert partner.

Protective measures against explosions also include isolation systems in order to prevent the devastating effects of explosion propagation or secondary explosions in the connected vessels.

Selection guide

WHICH IS THE BEST REMBE® PRODUCT FOR YOUR REQUIREMENTS?

REMBE® is a specialist in protecting every area of your production plant. The best strategy for protecting your plant against explosions depends on the locations of the various plant components. Start in the middle and select the right protection system for your needs.

TARGO-VENT + Explosion vent

Add-on module for explosion vents to reduce the size of hazardous areas (p. 16)



Close to traffic routes and walkways

Located outdoors

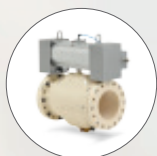
No passenger traffic nearby (safety distance of min. 20 m)

Passenger traffic nearby

Explosion isolation

EXKOP® System

Isolation with controller and quench valves (p. 28)



Q-Flap

Non-return explosion valve (p. 30)



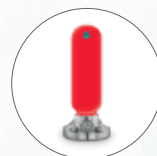
VENTEX®

Explosion safety valve (p. 31)



Q-Bic

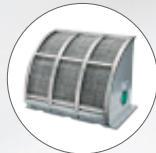
Isolation using an extinguishing barrier (p. 33)



*This diagram is simplified and does not claim to be complete.



Q-Rohr®
Flameless venting
of dust and
gas explosions (p. 22)



Q-Box
Cost-effective indoor
pressure venting of
dust explosions (p. 24)



Q-Bic
Explosion suppression,
also for toxic and
pharmaceutical substances (p. 33)

Flameless pressure venting/explosion suppression

Well away from an external wall

Passenger traffic nearby

Located indoors

Close to an external wall
(1–6 m)

No passenger traffic nearby
(safety distance of min. 20 m)

Conventional explosion venting with explosion discs or panels

Explosion vent

REMBE® offers you the optimum
explosion vent for every application and
all operating conditions (from p. 10)



Explosion vent + vent duct

The explosion vent is connected to a
duct, which transmits the explosion to
a vent duct cover (from p. 10)



START

Find the optimum
explosion protective
system for your entire
plant and vessels such
as silos, filters, cyclones,
separators, mixers,
dryers, etc.



CONVENTIONAL EXPLOSION VENTING WITH EXPLOSION VENTS

Explosion vents

In the case of an explosion, an explosion vent will rupture and thus protect the vessel by reducing the overpressure within it and releasing the explosion into the surrounding environment in a controlled manner. Industrial processes vary widely depending on the sector and the product.

No two processes are identical. For this reason, REMBE® supplies explosion vents in a variety of different shapes, materials, temperature and pressure resistances and many other specifications.

Uses of explosion vents

In outdoor plant components, explosion vents are used for explosion safety. They **safeguard outdoor equipment** such as silos, filters, elevators, bunkers, cyclones and other dust-handling facilities.



Advantages of using high-quality explosion vents

- Easy to install
- No maintenance required
- Long service life
- Quick to replace after an explosion event especially with the REMBE® Rush Order Service (p. 7).

Explosion vents – the reliable and cost-effective solution for explosion safety.

Explosion vents from REMBE®:

Highest quality guaranteed – from standard versions to individual customised solutions

REMBE® offers you the optimum explosion vent for all applications and operating conditions.

Whether your application is in a sanitary apparatus or under extreme conditions, e.g. rapidly fluctuating, pressure cycling, low vacuum and overpressure or high operating temperatures, **we can supply you the optimum explosion vent for your requirements.**

You will receive a complete protection concept that is perfectly adapted to your process.

All REMBE® explosion vents are **Made in Germany** and certified in accordance with ATEX 94/9/EC and EN 14797.



Product selection guide for explosion venting with REMBE® explosion vents

Application	Operating conditions	Product
Silo/Vessel	Mechanical filling	EGV (p. 12)
	Pneumatic filling	EDP (p. 14)
Filter/Cyclone	Overpressure or low vacuum	EGV (p. 12)
	Low to medium vacuum or pressure cycling	EDP (p. 14)
	High vacuum or pressure cycling	ODV (p. 15)
Elevator/Chain conveyor	All	EGV (p. 12)
Spray dryer	Hygienic requirements to avoid cross contamination	EGV HYP (p. 13)
	No hygienic requirements	EGV (p. 12)
Screen/Sieve	Slight vibration	EGV (p. 12)
	Strong vibration	EDP (p. 14)
Gas motors	All	EDP* (p. 14)

*Type selection based on process temperature.



Optimum protection for storage silos and elevators: the EGV explosion vent.



EGV

For zero to low vacuum

Applications

From spray dryers, elevators and chain conveyors to screens with light vibration, silos with mechanical filling and cyclones – the EGV is suitable for use in a wide range of applications **in all sectors** for both non-pressurised processes and processes with low vacuum or overpressure (**up to 50% of static burst pressure**). The standard burst pressure is 0.1 bar at 22 °C (71.6 °F).

Mechanism

When pressure rises suddenly, the EGV explosion vent opens at the defined breaking point and releases pressure out of the vessel into the surrounding area.

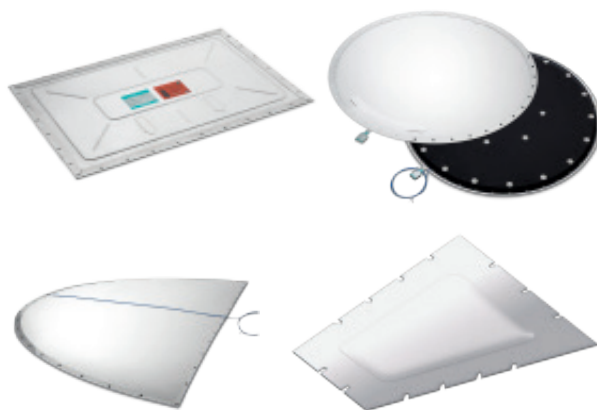
Certification



ATEX
EC type examination
certificate no.
FSA 04 ATEX 1538 X

SIL equivalent SIL 4

All versions of the EGV are available with **insulation** to prevent the build-up of deposits as a result of the temperature falling below the dew point.



Angular, round, semicircular or trapezoidal, the EGV is available in a range of different geometries and can be adapted to round vessels, if necessary.

**Made
in
Germany**

NEW!

EGV HYP

For hygienic applications

Applications

EGV-HYP was specially developed for demanding hygienic applications in the food and pharmaceutical industries. It is frequently used in critical plants to protect spray dryers or fluid bed dryers.

Special feature: The patented, full surface, tapered sealing system fits flush with the interior of the explosion vent and **prevents cross contamination.**

The explosion vent can also be pre-bent to round vessel shapes.



Your advantages

- Hygienic design ensures consistently **high product quality.**
- Prevents contamination and permits **CIP cleaning.**

Certified in accordance with EHEDG
(European Hygienic Engineering & Design Group)



Your advantages

- **High venting capacity and full bore opening** due to low surface weight.
- **High stability and opening speed** through integrated bionic structure.
- Direct installation of the explosion vent even on curved vessels **prevents accumulation of deposits and bacteria formation.** No complicated flange constructions required.
- **Adapts perfectly to your process** due to the wide range of EGV geometries available.
- **Quick and easy installation** as EGV is torque independent. No additional counter frame required.
- **Significant space savings** due to the integrated gasket and frame in the explosion vent.

You can find detailed information and contact details for enquiries relating to EGV and EGV-HYP explosion vents at www.rembe.de. Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de

You can find appropriate signalling devices and other accessories from page 16.



Cost-effective protection:
Storage silos with EDP explosion vents.



EDP

For low to medium vacuum and pressure cycling

Applications

The domed, single-layer explosion vent is suitable for use in processes with medium vacuum or overpressure (**up to 70% of static burst pressure**) and slight pressure cycling. It is particularly suitable for vessels with pneumatic filling equipment, filters, cyclones and sieves with strong vibration. The standard explosion pressure is 0.1 bar at 22 °C (71.6 °F).

Mechanism

When pressure rises suddenly, the EDP explosion vent opens and releases pressure out of the vessel into the surrounding area.

Your advantages

- The domed construction provides **high stability and pressure cycling resistance**.
- **Quick and easy installation** as EGV is torque independent. No additional counter frame required.
- **Significant space savings** due to the integrated gasket and tensioning frame in the explosion vent.



EDP with signalling:
quick and easy to install.

Made in Germany

Certification



ATEX
EC type examination
certificate no.
FSA 04 ATEX 1538 X

SIL equivalent SIL 4

You can find detailed information and contact details for enquiries relating to EDP, ODV and ODU explosion vents at www.rembe.de. Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de

You can find appropriate signalling devices and other accessories from page 18.



ODV: Protection of a wood chips bunker.



ODV

For high to full vacuum and pressure cycling

Applications

ODV explosion vents are used under harsh operating conditions with frequent pressure cycling from vacuum to overpressure. Designed for working pressures of up to **80% of static burst pressure**.

The ODV is ideal for use in applications such as filter plants with frequent jet-pulse cleaning, high vacuum or suction conveyors. It is **vacuum resistant** and the standard explosion pressure is 0.1 bar at 22 °C (71.6 °F).

Mechanism

When pressure rises suddenly, the ODV explosion vent opens and releases pressure out of the vessel into the surrounding area.

Your advantages

- **Low response pressure with full vacuum resistance is possible.**
- High working pressure resistance of the explosion vent offers **maximum productivity for your processes**.
- Triple-section domed construction ensures **high-pressure cycling resistance and exceptional service life**.
- **Round versions and special customised solutions** possible.



The ODV consists of an upper section, a sealing element and a vacuum support.

■ Made
■ in
■ Germany

Certification



ATEX
EC type examination
certificate no.
FSA 04 ATEX 1538 X

SIL equivalent SIL 4

ODU

For fluctuating overpressure

The triple-section ODU explosion vent is ideal for applications that involve pressure cycling but no vacuum. In this version, the vacuum support of the ODV is replaced by a supporting lower section.

ACCESSORIES: TARGO-VENT

Add-on module to reduce the size of hazardous areas

In the case of an explosion outside a building, explosion vents open and release the explosion flame and pressure wave into the environment. Adequate safety areas are crucial. They must be kept free of buildings and be out of bounds to both vehicles and pedestrians. These empty areas cannot be used commercially but still incur operating costs. TARGO-VENT limits the opening angle of an explosion vent in order to protect people, vehicles or subsequently erected buildings. By decreasing the size of hazardous areas, TARGO-VENT helps you to **reduce your safety areas to a minimum** and increase usable operating space while providing optimum protection against explosions.

Applications

Ideal for rectangular explosion vents:

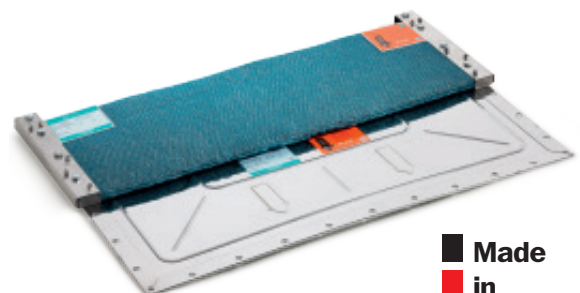
- venting into areas used by vehicles or pedestrians
- used in outdoor applications
- venting into previously clear areas which have subsequently been built upon

Mechanism

TARGO-VENT limits the opening angle of the explosion vent and guides the explosion pressure wave, flames and heat into defined areas. This minimises the size of the safety areas required.



With TARGO-VENT
the flame is deflected into safe areas.



■ Made
■ in
■ Germany

Certification



ATEX
EC type examination
certificate no.
FSA 13 ATEX 1637

SIL equivalent SIL 4



Without TARGO-VENT
the flame endangers the operating areas.

Simplified image

Your advantages

- Smaller safety areas required in front of vent openings – **more productive use of valuable operating areas.**
- **Smaller area required** for explosion venting than with alternative deflectors.
- **Low cost protection** of infrastructure.
- **Safe traffic routes for people and vehicles** while simultaneously reducing the safety area required.
- Retrofitting with TARGO-VENT provides **greater safety for existing installations.**
- **Maintenance-free and long service life** through the use of stainless steel.

You can find detailed information and contact details for enquiries relating to TARGO-VENT at www.rembe.de.
Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de



ACCESSORIES

for optimum adaptation of explosion vents to meet your requirements

Signalling units from REMBE®

Signalling units enable you to shut down a plant quickly in the event of an explosion and also trigger isolation systems which protect adjacent parts of the plant. Automated processes also use intelligent signalling systems to monitor the status of the entire plant and any disruptions that occur. This is not just essential in venting ducts, it can also play an important role in free venting.

Signalling units can be retrofitted to either round or rectangular panels that have already been installed. For evaluation of the signals, we offer isolation amplifiers with relay outputs which guarantee an intrinsically safe closed-circuit current. The potential-free relay contact ensures that the plant is deactivated safely and the alarm functions correctly.



SK signalling unit

This signalling unit uses the **closed-circuit current principle**. A signalling cable is integrated onto the explosion vent during the manufacturing process to create a highly reliable unit. When the explosion vent opens, the signalling cable circuit gets interrupted.

RSK signalling unit

The **RSK signalling unit can be retrofitted** to either round or rectangular explosion vents. The signalling cable is fixed in position over the breaking point of the explosion vent. When the explosion vent opens, the RSK signalling cable circuit gets interrupted.



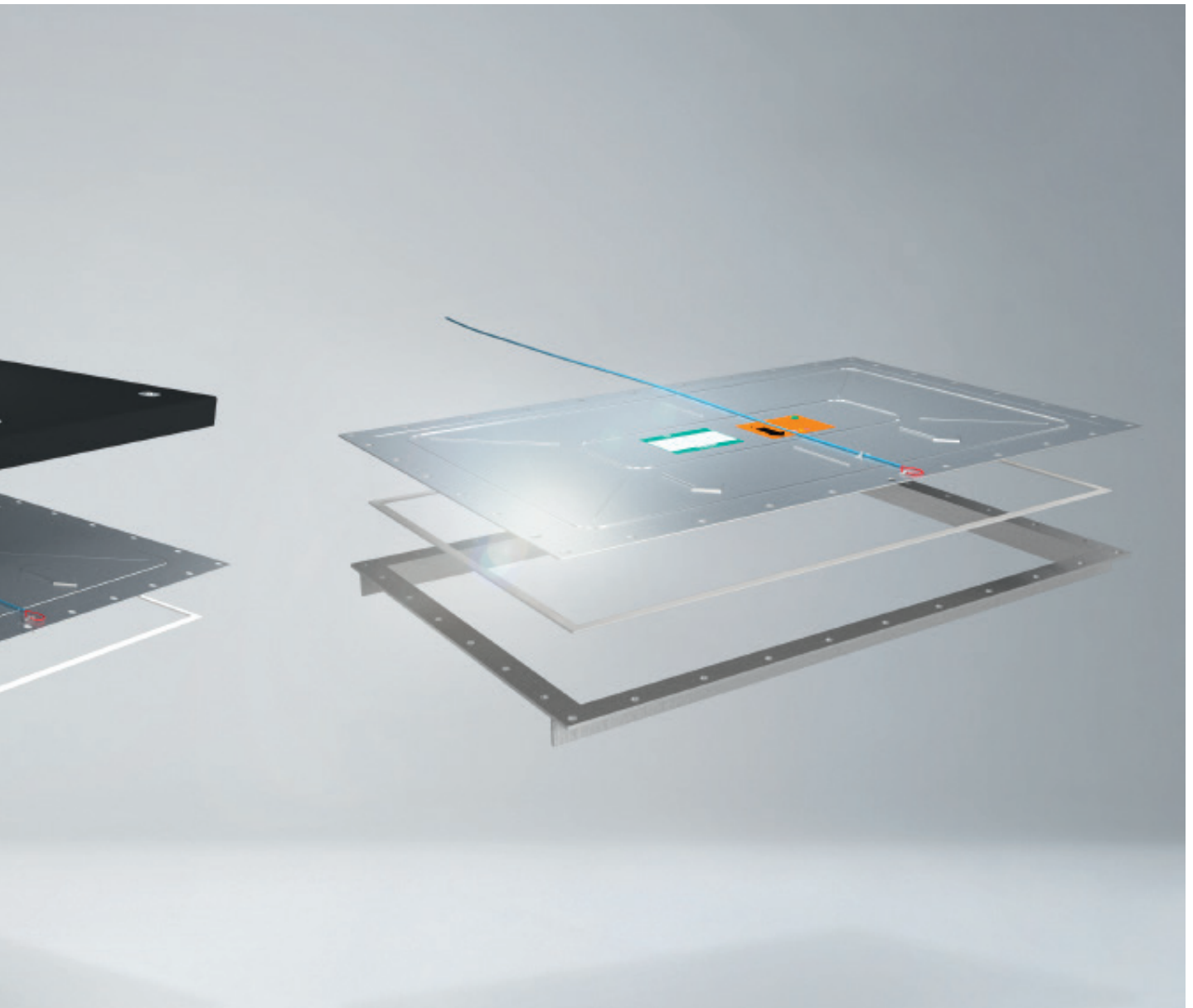
Made in Germany

BIRD signalling unit

The BIRD signalling unit contains a **ceramic bar with integrated electrical conductors**. When the explosion vent opens, the circuit breaks. The standard version of the BIRD unit can withstand temperatures of up to 150 °C (302 °F). A high temperature version, resistant up to 400 °C (752 °F), is also available. The device is mounted using a stainless steel angle and mounting frame.



Made in Germany



Further accessories for explosion venting with explosion vents

Mounting frame and flange

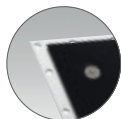
Galvanised or stainless steel.



Weather resistant insulation

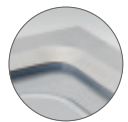
Prevent condensation, improve thermal insulation and reduce noise emissions.

Thermal insulation products reduce expensive energy and temperature losses from the protected vessels and prevent condensation related product build-up.



A range of gaskets for all process conditions

For example, for high temperature or sterile requirements.



KAD: weather cover for vent pipes/ducts

Reliable protection against penetration by snow, rain and dust with a low response pressure. Also reduces noise during normal operation.



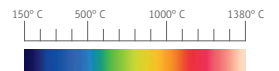
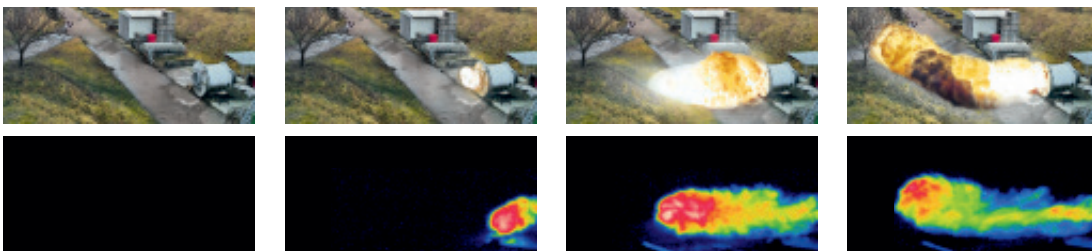
Please contact us for detailed, personal advice relating to our accessories. We will be happy to help you:
T +49 2961 7405-0 or contact us via email: info@rembe.de



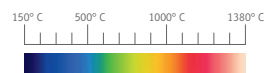
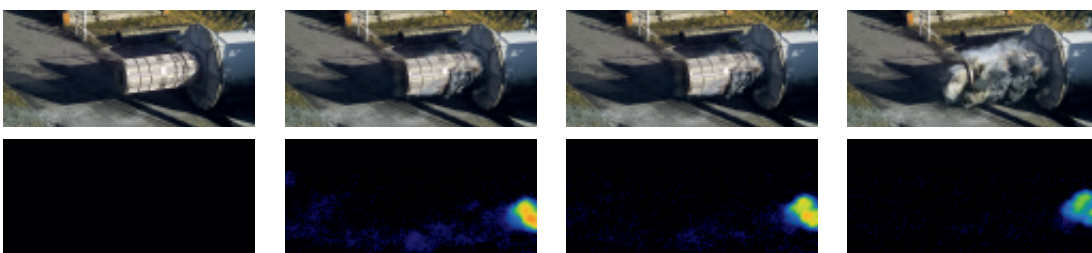
Flameless explosion venting



FLAMELESS EXPLOSION VENTING



Thermographic investigation of a dust explosion: conventional explosion venting with an explosion vent.



Identical explosion with the Q-Rohr®: no heat generated outside the vessel with only a slight pressure rise and minimal noise volume.

Explosion safety with vent ducts: expensive and unproductive

The situation: Indoor plant components cannot be protected by explosion vents alone. The dust and flames exiting the vessel pose an enormous threat to both the safety of employees and the plant itself. Secondary explosions resulting from the dust thrown up by the initial explosion are just one example. Vent ducts are often used to channel the pressure wave and flames from an explosion to an outdoor area.

The problem: This solution prevents process-optimised plant design. The longer the venting duct, the stronger the duct and the plant itself must be and the higher the associated costs. The reason: the greater the distance of the explosion from its source, the greater the pressure that the duct and the plant must withstand.

REMBE® offers an inexpensive and much more effective solution!



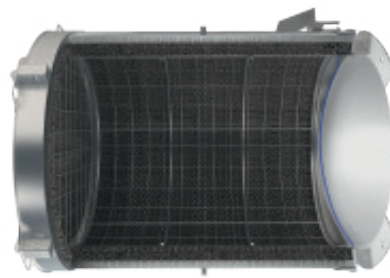
The cost-effective solution: flameless explosion venting

During flameless explosion venting, the flames are cooled rapidly and efficiently in the mesh filter of the flame absorber and extinguished immediately. No flames and no pressure wave exit the vessel. The production plant can now be designed to create the optimum process conditions. Likewise, the typical pressure wave and noise in the production hall are reduced to a barely perceptible minimum. The filter design guarantees that no burned or combustible materials are ejected. This not only reduces the consequences of the explosion, but also provides the highest level of protection for employees.

The advantages of flameless explosion venting

Flameless indoor explosion venting consigns expensive protection systems with complicated vent ducts to the history books. Companies are once again free to focus on optimising the design of their processes and plants for maximum efficiency.

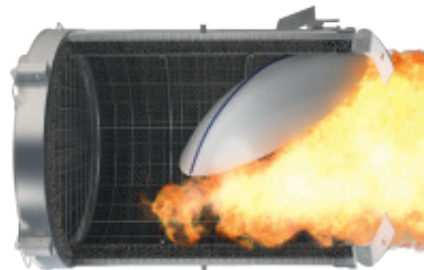
This form of flame- and dust-free explosion venting is **the safest and most cost-effective solution for indoor use.**



0 ms

5 ms

15 ms

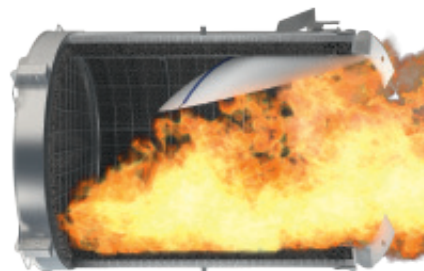


20 ms

25 ms

40 ms

55 ms

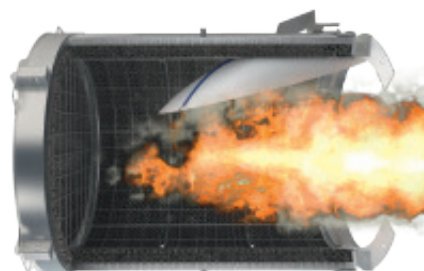


75 ms

90 ms

125 ms

150 ms



175 ms

200 ms

275 ms

350 ms



425 ms

500 ms

The explosion flame is cooled completely in just 500 milliseconds (ms).

The Q-Rohr® stainless steel mesh filter eliminates explosions in just a few milliseconds.

Flameless explosion venting

Q-ROHR®

Flameless explosion venting for dust and gas explosions



Safety and operating efficiency go hand in hand.

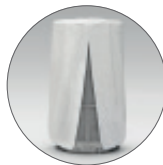
The Q-Rohr® enables you to implement flame- and dust-free explosion venting in closed rooms. No complicated ducts for outdoor venting or associated restructuring of production equipment are required.

With the Q-Rohr® there is now nothing to prevent you from using the optimum layout for your production plant while guaranteeing the best possible explosion safety. In addition, Q-Rohr® leads the pack in terms of running costs. Eliminating vent ducts saves you money not only on installation but also on servicing and maintenance.

Applications

The Q-Rohr® is ideal for indoor plants that are at risk of dust and gas explosions. Many new plants are equipped directly with the Q-Rohr® as it offers a wide range of flexible installation options. Retrofitting is also simplicity itself. **It can be used to protect filters, dryers, cyclones and it can be used with gases, hybrid mixtures, metal dusts, melting dusts or fibres.**

Sanitary cover protects the Q-Rohr® against dust from outside sources.



Mechanism

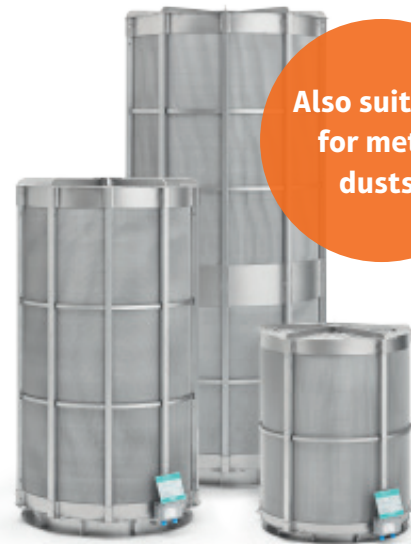
The special stainless steel mesh filter inlet developed by REMBE® cools the hot flame gases extremely efficiently (up to 1500 °C (2732 °F) or even 3000 °C (5432 °F) for metal dusts). This reduces the volume of gas ejected and extinguishes the explosion.

Important!

The combination of the Q-Rohr® and isolation systems prevents pressure waves and flames propagating to other parts of the plant.



Also suitable for metal dusts!



Q-Rohr® is available in the sizes DN 200 to DN 800. Customised versions up to DN 1400 are also possible.

Made in Germany

Integrated REMBE® explosion vent incl. signalling unit and pre-installed gasket

Pre-wired terminal box with isolation amplifier (intrinsically safe)

Explosion-proof housing structure with riveted retention rails, which remains stable even during extremely dynamic explosions

Reusable stainless steel dust filter with integrated pressure wave absorber



Q-Rohr® components.



The perfect solution for indoor explosion safety: Q-Rohr®.

Product separator for a day silo in a Nestlé muesli production facility.

Your advantages

- **Perfect protection of the surrounding area.** Neither flames, dusts nor a dangerous pressure wave emerge from the vessel – everything stays in the Q-Rohr®.
- **REMBE® is the first manufacturer in the world to be certified for metal dusts.**
- **The complete production process remains in the building.**
- **No running costs** for vent ducts or external maintenance, a visual inspection is sufficient.
- The Q-Rohr® is a **flexible solution** – can even be used in the middle of your production halls. Proximity to an external wall is not required.

- **Integrated signalling unit** for reliable monitoring.
- **Reduction of the noise level and pressure rise typically associated with explosions** to an acceptable level.
- **Immediately reusable** and operational after cleaning of the flame filter and replacement of the explosion vent.

Your competitive advantages

- Process-optimised plant layout
- No external maintenance costs

Certification

Patents:

DE 38 22 012;
US 7,905,244



Meets the requirements of NFPA 68



Germanischer Lloyd
Q-Rohr® 19496-11 HH



ATEX
EC type examination
certificate no.
IBExU 11 ATEX 2152 X



ATEX
EC type examination
certificate no.
IBExU 13 ATEX 2085 X



ATEX
EC type examination
certificate no.
IBExU 13 ATEX 2086 X



ATEX
EC type examination
certificate no.
IBExU 14 ATEX 2027 X

SIL equivalent SIL 2

You can find detailed information and contact details for enquiries relating to Q-Rohr® at www.rembe.de.
Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de



Protection of a crushing plant in the recycling industry



Q-BOX

Cost-effective indoor explosion venting for dust explosions



Applications

The Q-Box is designed for plant components with low rigidity and large explosion venting areas. The rectangular connection complements the dimensions of standard explosion vents, thus allowing it to be **retrofitted to existing indoor and outdoor equipment.**

Sanitary cover protects against external dust.

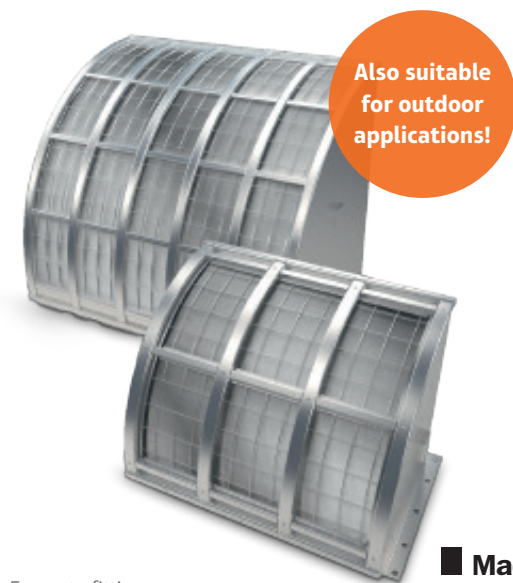


Mechanism

The Q-Box guarantees safe explosion venting in working areas. Like the Q-Rohr®, the flame gases are instantly extinguished inside the Q-Box by efficient cooling.

Important!

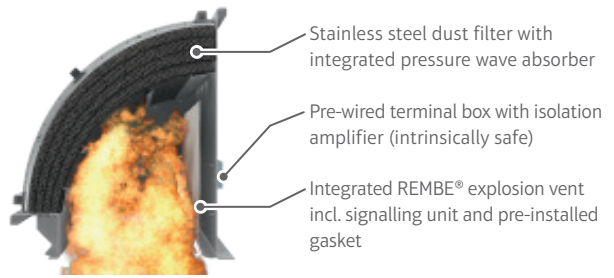
The combination of the Q-Box and isolation systems prevents pressure waves and flames propagating to other parts of the plant.



Also suitable for outdoor applications!

Easy retrofitting:
The dimensions of the Q-Box perfectly match the dimensions of standard explosion vents.

Made in Germany



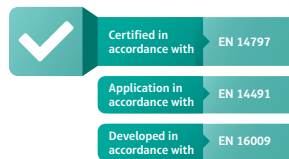
Q-Box components.



"EGGER operates a fully integrated wood factory that manufactures and finishes particle and MDF board, laminate flooring and sawn timber. We have used venting equipment from REMBE® to protect our employees and equipment for many years. We are impressed by the expert advice provided by their consultants and the safety concept, which has been tailored to our specific requirements."

Ferdinand Martini, safety specialist at Egger

Certification



ATEX
EC type examination
certificate no.
BVS 06 ATEX H 028 X

SIL equivalent SIL 2

Your advantages

- Flexible use of the Q-Box permits **process-efficient plant design**.
- **Reduces noise levels**.
- **Perfect protection of the surrounding area.** Neither heat, dusts nor a dangerous pressure wave emerge from the vessel – everything stays in the Q-Box.
- **Cost-effective alternative to venting ducts.** No running costs for venting ducts and external maintenance, a visual inspection is sufficient.
- **Integrated signalling unit** for reliable monitoring.

- **Flexible solution for indoor and outdoor use.**
- **Simple retrofitting to existing explosion vent installations.**

Your competitive advantages

- **Process-optimised plant layout**
- **No external maintenance costs**

You can find detailed information and contact details for enquiries relating to Q-Box at www.rembe.de.
Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de





EXPLOSION ISOLATION

What is explosion isolation?

The objective of explosion isolation or decoupling is to **protect adjacent parts of the plant and prevent the explosion from propagating.**

Explosion isolation is mandatory – secondary explosions in interconnected vessels would cause a high risk.

Why is isolation so important?

In practice, many vessels, silos and devices are connected by pipes, pneumatic conveyors and dust extraction or aspiration lines. If a dust explosion occurs, the flames and pressure waves can spread through these conduits to other parts of the plant. Pre-compression and flame jet ignition exacerbate the explosion in connected vessels. The result is a series of secondary explosions that cause even more catastrophic damage.

An isolation system prevents explosions from propagating and thus minimises the consequences of an explosion. It ensures optimum protection for adjacent parts of the plant.

Active and passive isolation systems

Isolation systems can be either active or passive. **Passive isolation systems** react simply due to the effect of the explosion. Their structural design prevents flames and pressure waves from spreading. **Active systems** have

detectors or sensors which register the pressure rise or flames and trigger countermeasures, e.g. closing a valve.

Different types of isolation

Explosion isolation systems use components such as quench valves and non-return flaps or valves. Chemical extinguishing barriers are also commonly used to smother the explosion flames (see page 32 for more information about "Explosion suppression"). Valves and extinguishing barriers are capable of isolating components in both directions simultaneously.



Explosion safety from REMBE® is more than an individual product – it is always a complete solution. There is no other way that we can guarantee the safety of your employees and provide full protection for your plant. This is why venting and isolation must always work hand-in-hand for effective explosion safety – no ifs, ands or buts.

Product selection guide for isolation systems

Applications	EXKOP® QV II/QV III (p. 28)	Q-Flap/ Q-Flap Plus (p. 30)	VENTEX® (p. 31)	Q-Bic (p. 33)
Vertical pipes	✓		✓	✓
Horizontal pipes	✓	✓	✓	✓
Pneumatic conveyor lines	✓			✓
Aspiration lines	✓	✓	(✓)	✓
Chutes and rectangular ducts				✓
Air intake openings	✓	(✓)	✓	
Mechanical conveyors				✓
Multi-inlet pipes	(✓)			✓

(✓) = May only be used in special cases.

Isolation of a pipe
with EXKOP® QV II.

EXKOP® SYSTEM

Space-saving, bidirectional
isolation

This system isolates plant components in both directions and comprises a self-monitoring EXKOP® controller with data storage and one or several quench valves.

Applications

EXKOP® systems are suitable for **filling lines, aspiration lines and pipes, pneumatic conveyor lines and air intake openings**. As well as operating as a decoupling system for dust-bearing plants, the EXKOP® system can also be used as a spark arrester or overpressure limiter.

Mechanism

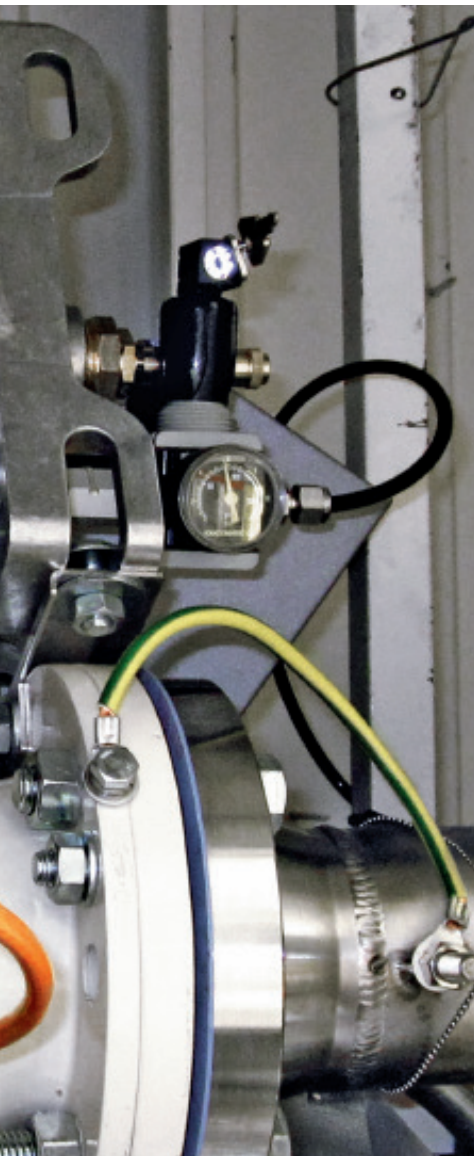
In the case of an explosion, the EXKOP® controller receives a trigger signal (e.g. from the signalling unit of the Q-Rohr® or an explosion vent, from a pressure switch or spark detector) and activates the connected EXKOP® quench valves. These close within a few milliseconds and thus protect adjacent plant components. After being triggered, the quench valves can be put back in operation once again at the touch of a button.

The EXKOP® system is ideal in combination with explosion vents or flameless explosion venting solutions.



The EXKOP® system comprises a controller and one or several quench valves.

Made
in
Germany



Create your perfect isolation solution

EXKOP® controller

Product	Up to 2 quench valves	Up to 3 quench valves	More than 3 quench valves	Configurable in and outputs
EXKOP® mini	✓			✓
EXKOP® TriCon	✓	✓		✓
EXKOP® II	✓	✓	✓	✓



EXKOP® quench valve

Product	Pipe diameter up to 250 mm	Pipe diameter greater than 300 mm	Installation in hygienic areas
EXKOP® QV II	✓		✓
EXKOP® QV III		✓	✓

Certification



ATEX
EC type examination
certificate no.
FSA 04 ATEX 1537 X

Your advantages

- Compact design from DN 80 to DN 600 permits **flexible integration into your production process**.
- **Effective protection through high-speed detection** of explosion events.
- **Returns to operation again immediately** after triggering.
- **Self-monitoring safety electronics with operating data storage**.
- Modem-compatible system analysis allows for **remote maintenance**.
- **System status or error messages reported immediately** via the operating and display panel.

- Processes wide range of trigger signals for **easy retrofitting to existing plants**.
- **Fail-safe mechanism** automatically closes the valve if the power supply fails or the valve is manipulated.

Your competitive advantages

- **Reliable, process-optimised protection** against explosions in adjacent plant components.
- **Avoid downtime** after the mechanism is triggered.

You can find detailed information and contact details for enquiries relating to the EXKOP® system at www.rembe.de. Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de



Q-FLAP

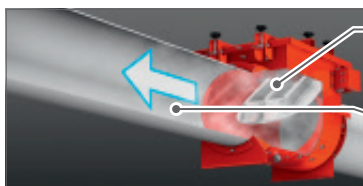
Explosion isolation with
non-return explosion valves

Applications

Q-Flap non-return explosion valves can be used to isolate explosions effectively **in virtually all industries**.

Q-Flap is suitable for use in aspiration filter suction lines and horizontal pipes.

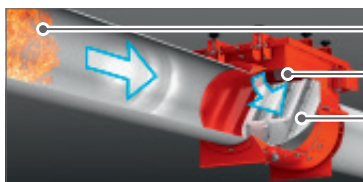
Mechanism



Valve flap kept open by the flow of air
Flow of air (flowing to the left)

Normal operation

The flap is mounted on the intake side and kept open during normal operation by the flow of process air. In the case of a breakdown, the flap closes under its own weight. When the plant starts up again, the flap is opened using a damping element or damped by the locking unit.



Explosion pressure wave (from the left)
Damping sensor
Flap closed by explosion pressure

Explosion event

When an explosion occurs, the flap is closed by the pressure front that spreads through the duct. The explosion can spread no further through the pipe. Employees working at capturing points or system components beyond the valve flap are protected against the effects of the explosion. The flap damping element and the locking unit prevent the flap from re-opening shortly after the explosion due to the low pressure created in its aftermath.

Your advantages

- **Certified safety:** It is the first non-return valve for isolating explosions of organic and inorganic dusts (e.g. aluminium dusts) to be certified in accordance with EN 16447.
- Fully opening the inspection cover provides **quick access for maintenance without completely removing the unit.**
- **Flexible use in your process:** Q-Flap is available for all standard nominal widths up to DN 1000.
- **Optional:** Integration of a monitoring function offers **shorter service intervals** (Q-Flap Plus).



Made
in
Germany

Your advantage: The Q-Flap can be fully opened to provide quick access for maintenance without completely removing the unit.

Certification



Meets the requirements of NFPA 68



Certified in accordance with EN 16447



ATEX EC type examination certificate no. FTZÜ 07 ATEX 008 X

You can find detailed information and contact details for enquiries relating to the Q-Flap isolation system at www.rembe.de. Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de



VENTEX®

Isolation with explosion safety valves

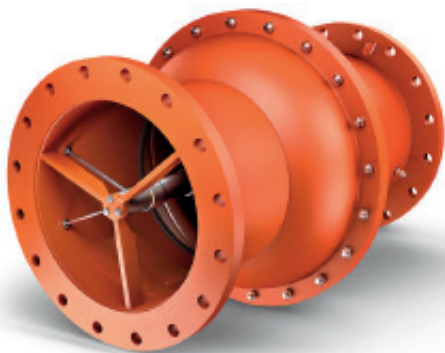
VENTEX® explosion isolation valves provide a further option for explosion isolation.

These valves can be controlled with or without external energy and offer simple and reliable explosion safety due to their extremely low response pressure and ease of maintenance.

Applications

VENTEX® can be used in plants that process combustible dusts (incl. metal dusts), gases or hybrid mixtures.

Common application areas include the pharmaceutical industry, chemical/petrochemical companies and research laboratories.



VENTEX® – the ideal explosion safety valve for combustible dusts.

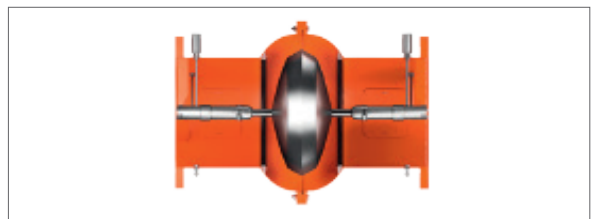
Certification



ATEX
EC type examination
certificate no.
FSA 12 ATEX 1623 X

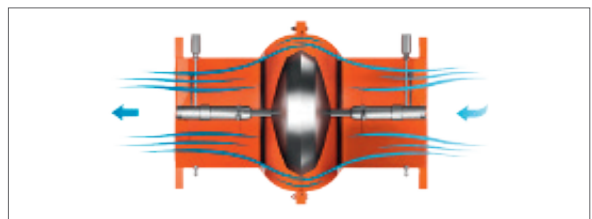
Mechanism

Example using the VENTEX® ESI-E/D: explosion safety with one-way or two-way acting system without external energy.



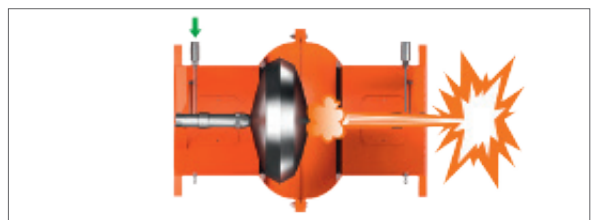
Idle state

When there is no flow of air, the closing device is in the open position.



Normal operation

Air flows around the open closing device.



Explosion event

The pressure wave pushes the closing device against a seal, locking the valve and effectively preventing the spread of flames and pressure.

Your advantages

- Low response pressure
- Short mounting distance

You can find detailed information and contact details for enquiries relating to the VENTEX® explosion safety valve at www.rembe.de. Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de





EXPLOSION SUPPRESSION

What is explosion suppression?

Explosion safety includes **explosion suppression** as well as **explosion venting** and **isolation**. This method extinguishes the explosion just as it is beginning – and well before the pressure rises to a critical level. Explosion suppression systems use sensors to detect sparks, flames

and pressure build-up as they are created and instantly open connected containers of extinguishing agent. In the blink of an eye, they discharge a highly effective extinguishing powder and smother the germ of the explosion.

Q-BIC

Explosion suppression system and integrated isolation

Applications

Q-Bic is an ideal explosion suppression system for use **with toxic substances** as it is essential to prevent these from being released due to an explosion. In addition, Q-Bic is widely used in all apparatus, ducts and pipes for dusts, gases and hybrid mixtures in the following industrial sectors: the chemical industry, food processing, woodworking and the pharmaceutical industry as well as coal-fired power stations. Q-Bic is also used as an isolation system for large pipes and shafts.

Mechanism

The Q-Bic explosion suppression system detects an explosion in its very earliest stages and extinguishes the explosion flames within milliseconds by introducing an extinguishing powder. A special nozzle system ensures optimum distribution of the extinguishing powder in a vessel or pipe and guarantees the flame is extinguished rapidly.

This explosion suppression technology is known as HRD (high rate discharge).

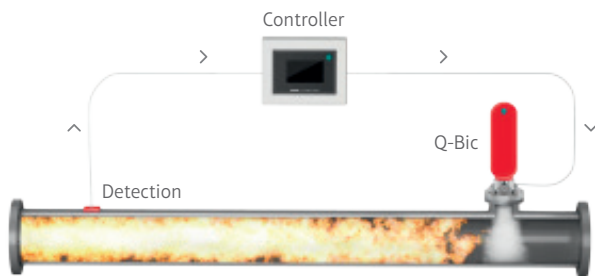


Diagram of an extinguishing barrier.

Certification



ATEX
EC type examination
certificate no.
FSA 13 ATEX 1641 X

SIL equivalent up to SIL 4 depending on the version

Your advantages

- **The vessel and surrounding area remain completely unaffected** as the explosion is extinguished at an early stage. Q-Bic is therefore ideal for use with toxic substances.
- **Most cost-effective way to isolate large pipes.**
- **Flexible use due to short mounting distances.**
- **Low cost, minimal work involved** as the system is integrated into the main controller (if required).
- Integrated rechargeable batteries in the controller ensure **full explosion safety during power failures** for up to 4 hours.
- **Full traceability** through the documentation of more than 8000 events, such as explosions, activation and deactivation of the plant as well as other faults in the system, e.g. broken cables.
- **Robust, corrosion-protected valve technology.**
- **Hygienic versions available.**
- **Just one service per year.**



You can find detailed information and contact details for enquiries relating to explosion suppression with Q-Bic at www.rembe.de. Give us a call on: T +49 2961 7405-0 or contact us via email: info@rembe.de



WHAT CUSTOMERS AND EXPERTS ARE SAYING ABOUT REMBE®

REMBE®: Constant Research and Development

"Explosion safety products from REMBE® meet the highest safety and quality standards because the company consistently focuses on customers' needs, product inventions and their consulting approach. It participates in research and development projects run by the FSA and thus contributes to improving the state of the technology. REMBE® invests heavily in testing its systems and therefore has an excellent understanding of its possibilities and limitations. The workers in its production department receive special training so that they know exactly what the products they manufacture will be used for later. They are fully aware that explosion safety has to be taken very seriously."

Prof. Dr. Siegfried Radandt (Managing Director of the Research Establishment for Applied System Safety and Health (FSA))



Always a step ahead

"REMBE® explosion safety solutions are characterised by a high level of innovation. Only recently, our companies worked together as partners to launch an innovative solution for protecting pneumatically filled silos. This solution saves our customers an enormous amount of money and maximises protection against explosions."

Gerhard Nied (Director of Technology at AZO)



Trust the professionals – trust REMBE®

"Explosion safety is an issue in every industry, from wood and chemicals to food and pharmaceuticals – it is often possible to minimise the risk of explosion. However, it is almost impossible to completely eliminate the hazard entirely. This is why it is important to take action before disaster strikes and trust the professionals in this vital area. Unfortunately, too many companies still fail to focus on providing the correct protection and every year people die as a consequence. In addition, the commercial damage suffered by plant operators is often devastating. The specialists from REMBE® are an excellent choice if you are interested in reliable and cost-effective explosion safety."

Richard Siwek (Owner of the FireEx Group)



REMBE® products: durable, effective and affordable

"We often use REMBE® explosion vents for explosion safety in our outdoor filter plants. The explosion vents are durable and easy to install, which makes them an optimum solution for our needs. The purchased products we use in our filters must also comply with high quality standards. REMBE® fully satisfies all our requirements. Increasingly, we are fitting our indoor filter plants with Q-Rohr® protection systems. Simple, effective, affordable and space-saving, they allow our customers to integrate the filter into the production process with maximum efficiency. Both the filter and the surrounding area are optimally protected."

Klaus Rabenstein (Explosion Safety Specialist at Herding)

GLOBALLY LOCAL

REMBE® locations

We have founded a number of companies around the world to provide you with local service. REMBE® is represented in more than 80 countries globally by well-known and long-standing partners.

Find the representative responsible for your country at: T + 49 2961 74050, info@rembe.de oder www.rembe.de



Tailor-made solutions from REMBE®

"The key advantage of working with REMBE® is not just the extremely safe design of their explosion safety solutions but also the way they take into account your individual operating requirements. For example, when protecting our production plants REMBE® engineers also consider our high standards in the area of hygiene and offer an appropriate version of the product. As a dairy company, this is absolutely mandatory for us and our customers."

Lars Dammann (Head of Occupational Health and Safety/Environment at DMK Deutsches Milchkontor)

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U.S. Patents and Trademarks (Registration Numbers): REMBE Name and Design (77680214), REMBE (77680160), KUB (77680225), IKB (77680129), Q-Rohr (7,905,244), Q-Atomizer (77680196), IP technology (7,520,152).

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