Premium Explosion Protection

Engineered and Manufactured in Germany

ABOUT US…

In 1973, REMBE was founded by Bernhard Penno. In addition to the core business of designing and manufacturing bursting discs for the chemical and process industries, REMBE developed a measurement technology products focus in 1978. Since 1988, REMBE has continuously increased its export activities. Today, we are represented globally in more than 70 countries, and we have dedicated REMBE facilities in key industrial areas. Still a family-owned and operated business, REMBE continues to provide fast, efficient and reliable solutions.

FACT BOX

REMBE
headquarters and production

Headquarters	Employees	Market Leadership	Market Leadership thru	Industries served	Services
59929 Brilon / Germany (Foundation in 1973) Stake in other companies: REMBE, INC., Charlotte / USA REMBE LTD, London / UK REMBE Mess- und Regeltechnik GmbH, Brunn / Austria REMBE S.R.L., Milan / Italy REMBE OY, Helsinki / Finland REMBE JLT Branch / Dubai REMBE ASIA PACIFIC PTE. LTD. / Singapore REMBE CHINA LTD, Shanghai / China Cooperations: REMBE FIBRE FORCE GMBH, Brilon / Germany KERSTING GMBH SAMPLING + GROUNDING, Brilon / Germany	150+	in Europe	Technology, Innovation, Quality, Fast Response, Service	Renewable Energies, Geothermal Industry, Pulp & Paper, Biotech, Cosmetic, Food & Beverage, Animal Food, Aerospace, Raw Material Conveying, Chemical, Pharmaceutical, Petrochemical, Offshore, Construction, Oil & Gas, Water & Sewage, Transport, Infrastructure	Consulting for • Plant safety and process optimization • Insurance coverage • Financing • Service/maintenance

Manufacturing in Accordance with / Meeting the following Codes: EN ISO 9001:2008, ASME Sec. VIII, Div. 1, KTA 1401, GOST-RT -RTN (Russia), China Manufacture Licence (CML), KOSHA (South Korea), NFPA, ATEX Directive 94/9/EG, PED 97/23/EG, ISO TS 29001:2010, CSA, GL, KNOWN CONSIGNOR (DE/KC/00912-01/0218)

Premium Explosion Protection with

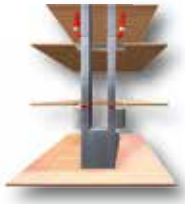
- Unique Experience in Applications
- Professional Consulting
- Suitable Product Selection

Explosion Venting...

Conventional Explosion Venting with Explosion Panels
For Dust / Gas / Cycling Working Pressures / Sanitary Applications

Explosion Suppression...

Explosionstechnische Entkopplung...



Explosion Protection System...

What is it that makes **REMBE** incomparable?

The Company

REMBE GMBH SAFETY + CONTROL is an independent, privately run medium-sized family business with the advantage of short decision-making paths and a high level of flexibility. Its extraordinary innovative strength is reflected in numerous patents and in its eagerness to discover, research and invest.

Product range

The product range covers all applications and industries, from standard products to special high-tech solutions, coupled with application expertise in all industries throughout the world. REMBE's know-how ranges from development of customised solutions, active participation on international boards and committees, consulting as well as to research and development in all specialised fields of explosion protection.

Manufacturing

REMBE manufacturing facilities are located in Brilon/Germany. Production processes require a minimum of resources, using state-of-the-art laser machines and high-performance presses.

A comprehensive range of different sizes and dimensions certified under global safety standards and regulations is available. Each series that has ever been manufactured can be traced back to the year 1973, way beyond the average life of any type of production process plant.

REMBE's in-house test capabilities ranges from explosion tests, identification of dust coefficients to tests within pressure ranges of 10 mbarg to 25 barg (0.15 psig to 363 psig).

Service

Unique customer requirements are addressed with diversity and flexibility while offering short production leadtimes. Additionally the **RUSH ORDER SERVICE** provides production and delivery within 24 hours ex works subject to material availability.

Customers are given specially tailored expert on-site advice on all issues of process safety, process optimisation and insurance cover. After viewing a customer's facilities, REMBE provides each customer with its own safety scheme. Legal stipulations can be covered as early as the planning stage – not just at the approval stage.




Certified conferences

REMBE holds regular professional seminars on "Maximum Safety with constructive Explosion Protection". Well-known speakers comment on a wide range of safety issues and provide information on the latest versions of directives and standards and on the latest technology.

Active participation on international boards

REMBE plays an active part on EN standardization committees and international boards (CEN, NFPA, VDMA, ESMG, INDEX, WJI, VDI, IFF, EHEDG, vfdb, MHEA, SHAPA, FSA, DIERS, DSIV, EIC and FPAL), where we work towards improvements in safety standards while also keeping abreast of the latest industry standard requirements and developments.

Customer satisfaction

REMBE's technical support, it's solution-focused customer service and it's experience in application engineering provide customers with security for their planning and for the operation of their systems.
A high level of reliability in consultancy and the right choice of products are just as much hallmarks of REMBE's engineers as their understanding for a company's production processes. Each customer has the same reliable contacts for many years and sometimes decades.

EXPLOSION PENTAGON

Combustible dust

Dispersition of dust particles

(Confinement) of dust cloud

Ignition

Oxygen

Potential Ignition Sources which can carry enough Energy to start an Explosion (acc. EN 1127-1):

- Hot surfaces
- Flames
- Sparks from electrical equipment
- Electrical equipment and lights
- Stray currents from electrical equipment
- Electrostatic discharge sparks
- Lightning strikes
- Electromagnetic fields in frequencies from 10^4 Hz up to $3x10^{12}$ Hz
- Electromagnetic radiation in frequencies from $3x10^{11}$ Hz up to $3x10^{15}$ Hz and of different wavelengths from 1,000 µm up to 0.1 µm (optical spectral range)
- Ionizing Radiation
- Ultrasonic
- Adiabatic compression, shock wave, running gases
- Chemical reaction
- And not to forget: the human factor which turns all potential ignition sources into effective ones.

In 4 steps to a safer process...

1. Explosion prevention

Avoid the occurrence of an explosion

- Replace combustible materials by non-combustible materials
- Avoid materials with a fine particle size. Note: fines are often produced e. g. by handling a coarse product
- Limit concentration of combustible material used
- Use sealed plants to prevent dust releases and deposits inside buildings or outside
- Use dust extraction systems to control the extent of a dust cloud
- Implement good Housekeeping (regular cleaning plan) -> see also point 3
- Minimize flat surfaces, ledges to prevent dust deposits
- Use an inert gas blanketing where useful and economic

Avoid effective ignition sources

- Limit surface temperatures below 2/3 of minimum ignition temperature of a dust cloud or -198.2 °C (-324 °F) below minimum ignition temperature of a dust layer (e.g. broken bearings, friction, etc.)
- Avoid rubbing, contact of rotating parts (limit rotational speed, choice of materials, separation distance, avoid tramp metal)
- Use a permit-to-work system to control hot-work (welding, cutting, etc.)
- Prohibit smoking and open fire in general
- Install appropriate electrical and non-electrical equipment
- Avoid electrostatic charge generation (choice of materials - earthing measures - effective bonding)
- Spark detection and extinguishing
- Consider all other ignition sources (e. g. self-heating, lightning)

2. Constructional explosion protection

Limit the dangerous consequences of an explosion

- Explosion-resistant design (explosion-pressure-resistant or explosion-pressure shock resistant)
- Explosion venting
- Explosion suppression
- Explosion isolation, decoupling (prevention of explosion propagation)

3. Organizational measures

- Comprehensive operator education and training
- Operator instructions, cleaning plans, good housekeeping
- Adequate maintenance
- Permit-to-work system for welding, hot-work and electrical operations (authorized persons only)

4. Building precautions

- Isolation of buildings and equipment to prevent transmission of fires and explosion
- Fire zones, clearly marked Hazardous Zones (Ex) / Explosion protection document
- Sealed and tight piping and conveying systems
- Smooth surfaces and easy-to-clean floors, easy access to elevated plant areas

Primary Explosion Protection Provides only a Limited Safety

Special attention is required when eliminating all possible potential sources of ignition such as; Mechanical or Electrically produced 'sparks', Frictional heat, Electrostatic charges (See note* below), Welding equipment, etc. Not forgetting of course, the human factor.

Due to the seemingly endless sources for potential ignitions it is not hard to imagine the difficulty in eliminating them all. Removal of the fuel is impossible as this is what is being produced by the process in the plant that we are considering protecting. Removal of Oxygen is feasible but can only be achieved through very expensive processing. The security limits here are also rapidly reached and the risk of a dust explosion cannot be excluded. Therefore a constructive and efficient explosion protection regime is required and essential.

NOTE* Contact KERSTING GMBH SAMPLING + GROUNDING, a REMBE ALLIANCE company and refer to 'Grounding Systems'.

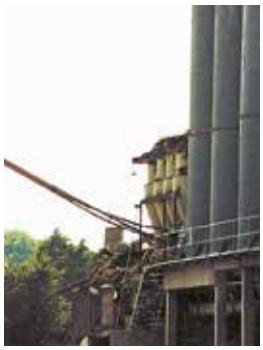
Enormous Economic Damage...

An explosion is defined as 'A rapid increase in volume and release of energy in an extreme manner', usually accompanied with the generation of high temperatures and the release of gases. An explosion creates a 'shock wave'.

Most common reactions are of flammable gases, vapors and cracked dusts - together with ambient oxygen. As a result of modern production technologies and increased production capacities, an explosion is a threat companies confront daily. Manufacturing processes which create organic or chemical dust caused by faster machines, automatic conveying systems and air cleaning equipment increase the risk of a dust explosion. The finer the dust particle, the more severe the explosion will be.

International guidelines including NFPA 68, 69, ATEX 114 (valid for manufacturers of machines and plants) or ATEX 153 (valid for operating companies) require companies to consider the consequences of a dust explosion to injured workers and damaged production plants.

Additionally, the economic risk to the company due to plant shutdown, contaminated product or adverse publicity requires consideration.



Three basic requirements have to be considered in a modern explosion protection solution:

1. **Profitability**
   The protection solution has to be economical to implement, operate and maintain.

2. **Reliability**
   The protected facility has to remain permanently and optimally available for production. A break in daily operations, due to false triggering, must be avoided.

3. **Safety**
   People and machine must be insured of an explosion protected environment, through constructive and effective directives.

All of these requirements are met by REMBE explosion safety systems.

Why choose **REMBE**?

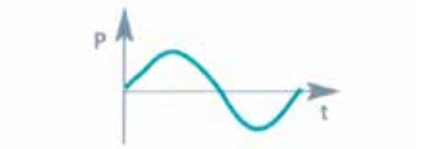
REMBE offer optimal explosion panel constructions for all applications and working conditions. For use in corrosive atmosphere or in case of extreme working conditions, e.g.; frequent changing, pulsating or vacuum pressure; REMBE offer the applicable explosion panel.

REMBE Bursting Panels distinguish themselves by extremely precise bursting pressures, guaranteeing 100% efficiency, enabling the user to save space and money by optimising the installed venting area.

The REMBE Bursting Panels are non-fragmenting and have ideal opening characteristics which leads to lower reduced pressure (P_{red}).

Transfer the many benefits of REMBE Bursting Panels into substantial savings of time and money resulting in increased profitability.

EXPLOSION PANELS OVERVIEW

Working condition	Application			Standard Burst Pressure (mbarg) @ 22 °C (71.6 °F)	Lowest Possible Burst Tolerance (in %)	Design	Type
	Silo	Filter	Sanitary				
	●	●	●	100	15	single-layer	**EX-GO-VENT**
	●	●	●	100	15	single-layer	**EX-GO-VENT-HYP**
	●	●	●	100	15	single-layer	**EDP**
	●	●	●	100	10	triple-section	**ODV**
	●	●	●	100	10	triple-section	**ODU**

● qualified
● partly qualified
● unqualified

P = pressure
t = time

SINGLE-LAYER EXPLOSION PANEL

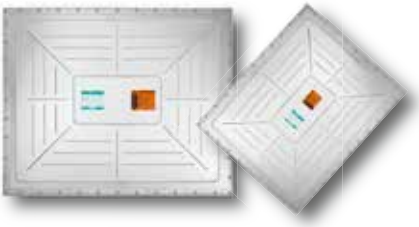
EX-GO-VENT

Single-Layer Explosion Panel for low vacuum

This Explosion Panel suits most standard applications such as silos, filters, bucket elevators, bunkers, cyclones at operating pressures or vacuum of 50% of P_{stat}. The standard burst pressure is 0.1 barg (1.45 psig) @ 22 °C (71.6 °F).

The EX-GO-VENT incorporating bionic structures (Pat. No. EP 07 73 393) guarantee extraordinary stability. The flat, single-layer explosion panel has a perfect venting efficiency due to its low weight. As dead spaces and product deposits are eliminated the EX-GO-VENT is also suitable for sterile applications, e.g. food industry.

Unlike other manufacturers options the EX-GO-VENT is NOT torque dependent during installation. Typically, mounting is directly made onto even walls or round shaped equipment, e.g.; cyclones, filters, silos, etc. Controlling the clamp torque of the screws becomes unnecessary.



EX-GO-VENT rectanguar shaped single-layer explosion panel

CUSTOMER BENEFITS

- **Quick and easy mounting**
- **Sanitary installation avoids deposits and bacteria formation**
- **Considerable cost savings due to integral gasket and clamp frame**

EX-GO-VENT round shaped with or without insulation

EX-GO-VENT trapezium explosion panel

EX-GO-VENT explosion panels on filter system: Holtrop & Jansma, Netherlands

SANITARY EXPLOSION VENT

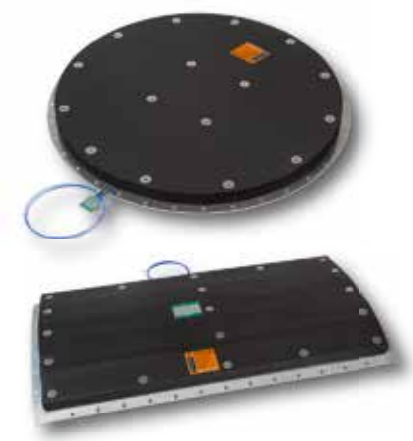
EX-GO-VENT-HYP

...versatile implementation in hygienically demanding areas

In dust-bearing plants, and in accordance with ATEX 153 (Directive 1999/92/EC), the operator is obligated to reduce the risks of a dust explosion. According to ATEX 114 (Directive 94/9/EC), EC typetested bursting discs offer an economic solution and in the event of a dust explosion, the explosion pressure is reduced to a harmless residual pressure level within the plant.

Besides these safety-technical requirements, additional demands are placed on those types of protection systems that should not conflict with the actual objective of the product's quality assurance. However, since every protection system is connected to a container to be protected, the risk of undesired product contamination is a concern due to the accumulation of possible sediments. This risk should always be taken into consideration particularly when engineering plants processing food or pharmaceuticals.

To address this requirement, the flat explosion vent EX-GO-VENT-HYP has been especially developed for hygienically demanding applications found in the industries of food processing and pharmaceuticals. The smooth surfaces, in connection with the patented, full surface and tapered sealing concept, enable the implementation of these special bursting discs in previously critical plants such as spray-dryers with/without wet cleaning, fluidized bed dryers, filters and mixers. To ensure a wide-spread acceptance of the application in operational practice, the design of the EX-GO-VENT-HYP is based on the strict criteria of EHEDG (European Hygienic Engineering & Design Group).



BT-SK-EX-GO-VENT-HYP-FL special bursting disc for applications in industries of food processing and pharmaceuticals

Since the EX-GO-VENT-HYP can be integrally molded to the container's radius, it is also ideal for installation on cylindrical containers; this eliminates any dead space.

With the optionally available closed-cell silicon cushion insulation for outdoor plants, any accumulation, caused by below dew points, is prevented. Losses of temperature and energy are reduced to a minimum.

The special bursting disc EX-GO-VENT-HYP with its sanitary design improves product quality and simultaneously protects the entire process from contamination and production downtimes caused by explosions.

Technical Data			
EX-GO-VENT-HYP - rectangular shaped explosion vent			
Max. Dimensions of Wall Opening = Nominal Venting Dimensions		Effective Vent Area	
[mm]	[in]	[cm²]	[sq in]
305 x 610	12.0 x 24.0	1860	288.3
490 x 590	19.3 x 23.2	2850	441.7
457 x 890	18.0 x 35.0	4100	635.5
586 x 920	23.1 x 36.2	5400	837.0
610 x 1118	24.0 x 44.0	6800	1054.0
920 x 920	36.2 x 36.2	8500	1317.5
1000 x 1000	39.4 x 39.4	10000	1550.0
915 x 1118	36.0 x 44.0	10200	1581.0
1020 x 1020	40.2 x 40.2	10400	1612.0
EX-GO-VENT-HYP - round shaped bursting disc			
Max. Dimensions of Wall Opening = Nominal Venting Dimensions		Effective Vent Area	
[mm]	[in]	[cm²]	[sq in]
DN 600	24''	2500	387.5
DN 700	28''	3500	542.5
DN 800	32''	4600	713.5
DN 900	36''	5900	914.5
DN 1000	40''	7400	1147.0
DN 1100	44''	8950	1387.0
DN 1200	48''	10000	1550.0
DN 1300	52''	12500	1937.5
DN 1400	56''	15000	2325.0
Standard bursting pressure pstat = 0.1 barg @ 22 °C (1.45 psig @ 71.6 °F)			
Other operational conditions, such as higher operating pressure, vacuum, pulsation and temperature on request			

CUSTOMER BENEFITS

- **High venting efficiency**
- **Hygienic installation**
- **Safeguarding / increasing product quality**

SINGLE-LAYER EXPLOSION VENT

EDP

...for cycling working pressures at low to medium vacuum

The single-layer EDP explosion panel is recommended for protection against fluctuating or cyclic working pressures of silos, filters, bucket elevators, bunkers, cylones. The domed construction provides high stability up to a pressure ratio of 70%. The rated breaking points (Pat. No. EP 07 73 393) are integrated within the mounting frame. The standard burst pressure p_{stat} is 0.1 barg (1.45 psig) @ 22 °C (71.6 °F) at a vacuum resistance of max. 2,000 mm WC.

The domed construction also greatly reduces contamination. Sterility and cleaning is simplified (SIP/CIP Cleaning). Usually the EDP is mounted directly onto a wall. Installation of the EDP Vent Frame is uncomplicated and is NOT torque dependent.

ATEX APPROVED FSA 04 ATEX 1538 X

EDP single-layer explosion panel provides easy and quick mounting

CUSTOMER BENEFITS

- **Sanitary installation**
- **High vacuum resistance, all-purpose use simplifies stock-keeping**
- **Considerable cost reductions due to integral gasket and clamp frame**

Explosion venting of a filter with EDP explosion panels

TRIPLE-SECTION EXPLOSION VENTS

ODV / ODU

...for cycling working pressures and high to full vacuum

The ODV triple-section explosion panel is manufactured of three layers and provides an improved vacuum resistance, a sturdy construction and extraordinary reliability. It is suitable for the harshest working conditions combined with frequent cycling working pressures, e.g. filter facilities with low volume and regular pneumatic cleaning.

ODVs are applied to working pressures up to 80% of the specified burst pressure (80% operating ratio). Due to its triple section design customized solutions with high temperature protection and/or the combination of different alloy materials can be realised.

The angled frame guarantees sufficient contact force in the clamping zone of the explosion panel. Round triple section bursting discs are clamped between standard DIN or ANSI flanges and in the punched design between lightweight angled rings. Rectangular explosion panels are generally mounted between angled or flat frames.

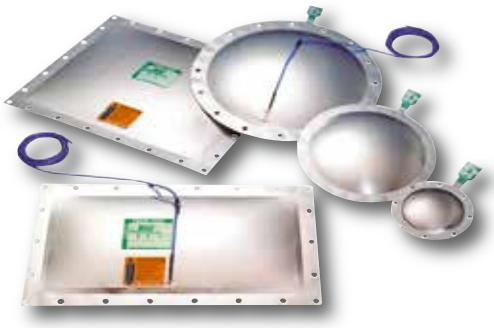
Wood chip plant protected by ODVs

ODU

...for cyclic working pressures

Function and the triple-section design of the ODU bursting disc are identical with the ODV. It is suitable for applications which do not require vacuum resistance. The vacuum support is replaced by a lower sst membrane.

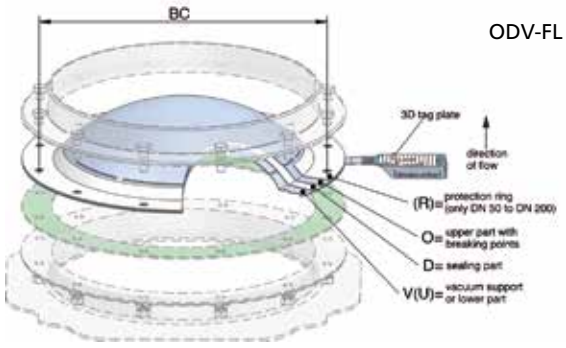
ATEX APPROVED
FSA 04 ATEX 1538 X



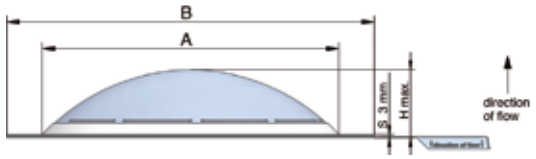
CUSTOMER BENEFITS

- **Optimized production processes due to high working pressures**
- **Customized solutions (e.g. high temperature design)**
- **Combination of low response pressure and high vacuum**

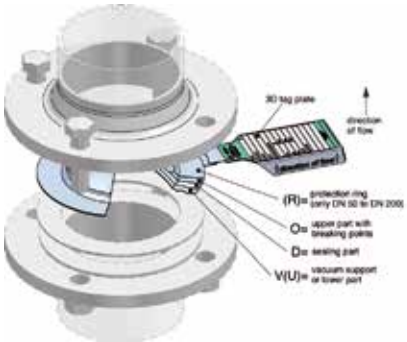
ODV-FL



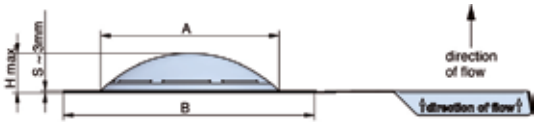
ODV-FL



ODV-F



ODV-F



Technical Data

BT-(R)-ODV-FL and BT-(R)-ODU-FL[1] for Installation between Angular Rings

DN	NPS	Effective Vent Area	Standard Vacuum Resistance[1]	A	B	H max.	BC Bolt Circle	Bore Ø	Number of Bores	Angular Ring
[mm]	[in]	[cm²]	[mm WC]	[mm]	[mm]	[mm]	[mm]	[mm]		[mm]
200	8"	245	6000	208	260	50	243	8,5	8	30 / 30 / 4
300	12"	600	6000	310	370	70	355	11	12	40 / 40 / 5
400	16"	1000	5000	393	470	80	443	13	16	45 / 45 / 5
500	20"	1660	5000	494	575	90	544	13	20	45 / 45 / 5
600	24"	2500	3000	596	675	90	646	13	20	45 / 45 / 5
700	28"	3500	2000	697	780	100	752	13	28	50 / 50 / 5
800	32"	4600	1500	799	885	100	854	13	28	50 / 50 / 5
900	36"	5900	800	900	985	100	955	13	32	50 / 50 / 5
1000	40"	7400	800	1002	1085	100	1057	13	36	50 / 50 / 5
1100	44"	8950	500	1102	1200	110	1160	13	44	50 / 50 / 5
1200	48"	10000	500	1204	1300	120	1259	13	40	50 / 50 / 5
1300	52"	12500	100	1300	1420	120	1370	13	48	50 / 50 / 5
1400	56"	15000	100	1404	1500	120	1459	13	44	50 / 50 / 5

other sizes on request

[1]BT-(R)ODU-FL without vacuum resistance

BT-(R)-ODV-F and BT-(R)-ODU-F[1] for Installation in DIN / ANSI Flange Connections

DN	NPS	Effective Vent Area	Standard Vacuum Resistance[1]	A	B	H max.	Welding-Neck-Flange			
[mm]	[in]	[cm²]	[mm WC]	[mm]	[mm]	[mm]	DIN 2631 (PN 6)	DIN 2632 (PN 10)	DIN 2633 (PN 16)	DIN EN 1092
200	8"	245	6000	208	260	50	X	X	X	X
300	12"	600	6000	310	370	70	X	X	X	X
400	16"	1000	5000	393	470	80	X	X		X
500	20"	1660	5000	494	575	90	X	X		X
600	24"	2500	3000	596	675	90	X	X		X
700	28"	3500	2000	697	780	100	X			X
800	32"	4600	1500	799	885	100	X			X
900	36"	5900	800	900	985	100	X			X
1000	40"	7400	800	1002	1085	100	X			X
1100	44"	8950	500	1102	1200	120	ANSI only			ANSI only
1200	48"	10000	500	1204	1300	120	X			X
1300	52"	12500	100	1300	1420	120	ANSI only			ANSI only
1400	56"	15000	100	1404	1500	120	X			X

other sizes on request

[1]BT-(R)ODU-FL without vacuum resistance

Conventional Explosion Protection with Rectangular Explosion Panels · Standard Dimensions

Max. Dimensions of Wall Opening = **Nominal Venting Dimensions**		Single-Layer Explosion Vent **EX-GO-VENT** **EX-GO-VENT-HYP**[*1] for low vacuum Effective Vent Area		Single-Layer Explosion Vents **EDP** for cyclic working pressures and low to medium vacuum **Effective Vent Area**		Triple-Section Explosion Vents **ODV / ODU**[*2] for cycling working pressures and high to absolute vacuum **Effective Vent Area**		**TARGO-VENT** Aufsatzmodule zur ???? Reduzierung der Gefährdungsbereiche
[mm]	[in]	[cm²]	[sq in]	[cm²]	[sq in]	[cm²]	[sq in]	
130 x 500	5.1 x 19.7	650	100.8	650	100.8	500	77.5	
229 x 305	9.0 x 12.0	700	108.5			540	83.7	
150 x 600	5.9 x 23.6					720	111.6	
180 x 420	7.1 x 16.5	750	116.3					
270 x 465	10.6 x 18.3					1070	165.9	
200 x 460	7.9 x 18.1	920	142.6	920	142.6			
247 x 465	9.7 x 18.3	1100	170.5	1100	170.5			
205 x 610	8.1 x 24.0	1250	193.8	1250	193.8			
340 x 385	13.4 x 15.2	1300	201.5	1300	201.5	1100	170.5	
314 x 424	12.4 x 16.7					1150	178.3	
305 x 457	12.0 x 18.0	1350	209.3	1350	209.3	1200	186.0	
345 x 405	13.6 x 15.9					1200	186.0	
315 x 467	12.4 x 18.4	1470	227.9					
247 x 610	9.7 x 24.0	1500	232.5	1500	232.5	1300	201.5	
330 x 470	13.0 x 18.5	1550	240.3					
340 x 440	13.4 x 17.3	1490	231.0	1490	231.0	1300	201.5	
400 x 400	15.7 x 15.7	1600	248.0	1600	248.0	1400	217.0	
410 x 410	16.1 x 16.1	1680	260.4	1680	260.4	1450	224.8	
404 x 420	15.9 x 16.5					1500	232.5	
305 x 610	**12.0 x 24.0**	**1860**	288.3	**1860**	288.3	**1600**	248.0	x
354 x 580	13.9 x 22.8	2000	310.0	2050	317.8	1800	279.0	
375 x 655	14.8 x 25.8	2450	379.8	2450	379.8	2200	341.0	
440 x 605	17.3 x 23.8	2660	412.3	2660	412.3	2400	372.0	
470 x 610	18.5 x 24.0	2850	441.8	2850	441.8	2600	403.0	
490 x 590	**19.3 x 23.2**	**2850**	441.8	**2850**	441.8	**2600**	403.0	
500 x 620	19.7 x 24.4					2800	434.0	
300 x 1000	11.8 x 39.4	3000	465.0					
386 x 920	15.2 x 36.2					3200	496.0	
454 x 760	17.9 x 29.9	3400	527.0					
570 x 620	22.4 x 24.4					3200	496.0	
450 x 800	17.7 x 31.5	3600	558.0	3600	558.0			
600 x 600	23.6 x 23.6	3600	558.0	3600	558.0	3300	511.5	
590 x 620	23.2 x 24.4					3350	519.3	
605 x 605	23.8 x 23.8					3350	519.3	
575 x 645	22.4 x 25.4					3400	527.0	
610 x 610	24.0 x 24.0	3700	573.5	3720	576.6	3400	527.0	
457 x 890	**18.0 x 35.0**	**4100**	635.5	**4100**	635.5	**3750**	581.3	
650 x 650	25.6 x 25.6	4220	654.1					
520 x 820	20.5 x 32.3	4260	660.3					
370 x 1220	14.6 x 48.0	4500	697.5					
653 x 653	25.7 x 25.7	4260	660.3	4260	660.3	3900	604.5	
600 x 800	23.6 x 31.5	4800	744.0	4800	744.0	4400	682.0	
710 x 710	28.0 x 28.0	5000	775.0	5000	775.0	4700	728.5	
620 x 820	24.4 x 32.3	5100	790.5	5100	790.5	4750	736.3	x
586 x 920	**23.1 x 36.2**	**5400**	837.0	**5400**	837.0	**5000**	775.0	x
500 x 1100	19.7 x 43.3	5500	852.5	5500	852.5	5100	790.5	
750 x 840	29.5 x 33.1	5900	914.5	5900	914.5	5900	914.5	
620 x 1020	24.4 x 40.2	6320	979.6					
800 x 800	31.5 x 31.5	6400	992.0	6400	992.0	6000	930.0	
457 x 1500	18.0 x 59.1					6350	984.3	
610 x 1118	**24.0 x 44.0**	**6800**	1054.0	**6800**	1054.0	**6400**	992.0	x
645 x 1130	25.4 x 44.5					6800	1054.0	
720 x 1020	28.3 x 40.2	7300	1131.5	7300	1131.5	7000	1085.0	
760 x 1114	29.9 x 43.9	8450	1309.8					
840 x 920	33.1 x 36.2	7700	1193.5	7700	1193.5	7300	1131.5	
920 x 920	**36.2 x 36.2**	**8500**	1317.5	**8500**	1317.5	**8000**	1240.0	x
457 x 2000	18.0 x 78.7	9140	1416.7	9140	1416.7	8500	1317.5	
920 x 1020	36.2 x 40.2					8800	1364.0	
586 x 1630	23.1 x 64.2					8900	1379.5	
1000 x 1000	39.4 x 39.4	10000	1550.0	10000	1550.0	9500	1472.5	
915 x 1118	**36.0 x 44.0**	**10200**	1581.0	**10200**	1581.0	**9700**	1503.5	x
770 x 1340	30.3 x 52.8	10300	1596.5					
1020 x 1020	40.2 x 40.2	10400	1612.0	10400	1612.0	9900	1534.5	
790 x 1340	31.1 x 52.8	10500	1627.5					
586 x 1893	23.1 x 74.5					10400	1612.0	
920 x 1254	36.2 x 49.4	11537	1788.3	11537	1788.3	11000	1705.0	
740 x 1630	29.1 x 64.2					11450	1774.8	
740 x 1893	29.1 x 74.5					13300	2061.5	
750 x 1900	29.5 x 74.8					13500	2092.5	
1130 x 1130	44.5 x 44.5	12750	1976.3	12750	1976.3			
860 x 1520	33.9 x 59.8	13000	2015.0					
940 x 1440	37.0 x 56.7	13500	2092.5					
940 x 1600	37.0 x 63.0	15040	2331.2					
1110 x 1460	43.7 x 57.5	16000	2480.0					
920 x 1920	36.2 x 75.6	17500	2712.5			17000	2635.0	
1000 x 2000	39.4 x 78.7	20000	3100.0					

*[1] **EX-GO-VENT-HYP**: for sanitary applications | *2 ODU: no vacuum resistance | further dimensions on request

Add-on module…

TARGO-VENT

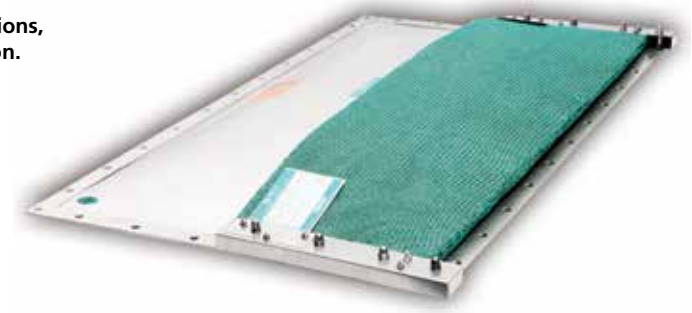
Pat. pend. EP 11 169 230.7

Traffic routes within facilities and public roads play a critical role in planning and implementation of conventional, free explosion venting. With conventional explosion venting the pressure wave and flame blast must only be deflected into protected areas. Since such effects would result in severe hazards in areas with access for people, the operator must provide for special safety measures or large-scale clearance. Such additional effort increases operational expenditure by increases significantly the operational expenditure or demands more costly solutions, such as flameless venting or what is referred to as explosion suppression.

The TARGO-VENT has been developed in view of this situation and is an add-on module which limits the opening angle of a bursting panel. Explosion pressure wave, flames and heat are guided into secure areas. In this way the traffic routes can be safely used by individuals and vehicles.

TARGO-VENT does not require maintenance and does not cause continuous operating costs. Existing bursting disc installations can be retrofitted.

TARGO-VENT allows smaller set up due to decreased hazard areas. Consequently, the usable operating space is increased.



Hazard area with explosion venting

Hazard-free access in the area is not ensured with conventional explosion venting, since it is not possible to deflect the explosion pressure wave, flames and heat.

Protected area with TARGO-VENT

Directed explosion pressure venting with TARGO-VENT

…lowers hazard areas

TARGO-VENT Pat. pend. EP 11 169 230.7

Technical Data	
max. K_{St}-value	≤ 200 bar x m/s
max. P_{red}	≤ 1.0 bar @ 22 °C

reduced explosion pressure (P_{red})	angle of deflection*	efficiency
0.2 bar @ 22 °C	approx. 45°	70%
1.0 bar @ 22 °C	approx. 30°	
* linear behaviour of the angle of deflection between reduced explosion pressure (P_{red}) of 0.2 bar and 1.0 bar		

nominal venting dimensions [mm]	approx. weight [kg]
305 x 610	3
620 x 820	9
586 x 920	9
610 x 1118	10
920 x 920	14
915 x 1118	16
further dimensions on request	

CUSTOMER BENEFITS

- **lowering of hazard areas in front of relief openings**
- **gain of usable operating space**
- **retrofitting of previously installed bursting panels is possible**

Before explosion venting:
Side view of TARGO-VENT

Intelligent explosion venting with TARGO-VENT lowers the hazard areas.

After occurred explosion venting:
The TARGO-VENT technology limits the relief angle.

QUALITY AND CERTIFICATIONS

Engineered and Manufactured in Germany

Besides quality and reliability REMBE provides environment-friendly technologies and manufactured in accordance with International directives and guidelines.

All REMBE protection systems and devices are certified in accordance with ATEX 94/9/EG and NFPA. Each individual batch (lot) is manufactured and tested in compliance with the requirements of EN 14797. Individual test certificates are supplied in accordance with EN 10204-3.1.

REMBE provide support in ensuring correct product selection for any given installation/location, ensuring fit for purpose, trouble-free and cost effective ownership of bursting disc and explosion panel products.

Additionally REMBE are able and willing to support you with sizing your required effective venting area. Calculations are made in accordance with VDI guideline 3673, EN 14491, EN 14994, NFPA 68, etc.

ACCESSORIES / OPTIONS

Signalling

Actuation of bursting discs and explosion panels can be detected by utilising a signaling cable. The signalling device is ultra low current, is intrinsically safe and operates on a simple open-closed principle (normally closed). Different standard types are available:

Type SK
The signalling cable is installed at the breaking point of the disc/panel. When the disc/panel actuates, the closed circuit is interrupted due to the cable break. The signalling cable is a well proven reliable method. No additional assembly is required. No moveable parts remain. It suits for temperatures from +90 °C to +200 °C (194 °F to 392 °F).

Type BIRD
The BIRD signalling unit is offered for existing bursting disc or explosion panel installations without installed a signalling device. A ceramic bar incorporating electrical conductors is mounted in the flow direction downstream of the disc/panel. When the disc/panel actuates the element breaks (fragments) and the closed circuit is interrupted.

Type HOT-BIRD
This signalling device is high temperature resistant up to 400 °C (752 °F).

Type Fibre Optic BIRD
This design provides signalling by means of optical fibre. Due to zero electrical current the signaling device is suitable for use in hazardous areas and for temperatures up to 500 °C (932 °F).

Type RSK
Design and identical with the integrated signalling device SK. Existing installed panels/discs may be retrofitted with the RSK signalling device.

Signal evaluation
For signal evaluation, a standard insolating amplifier with relay output is available to guarantee an intrinsically safe electric circuit. The potential of free relay output is used for alert and safe shutdown of plant facilities.

Triple-section-bursting disc including signalling unit SK

BIRD (Burst Indicator REMBE Design) is ideal for retrofitting of bursting discs/explosion panels.

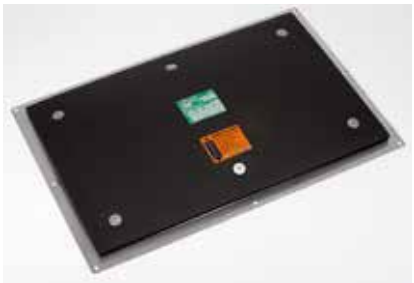
CUSTOMER BENEFITS

- **Safe and quick shutdown in case of an explosion event**
- **Circuit breaker reaction time reduces production costs**
- **Safe activation of monitoring and control systems resulting in significant cost savings**

Insulation / Gaskets / Weather Cover

Assembly Accessories
If required assembly kits comprising of frames with corresponding bolts and nuts are available in Galvanized Steel or Stainless Steel

External Insulation
In order to avoid dew point temperature and when specified REMBE Bursting discs/ panels are manufactured with a weatherproof insulation, especially in case of food applications or for thermal insulation. Only closed-cell elastomer with reflecting high efficient coating is used. The insulation is permanently connected to the disc/panel and is of ultra light weight. It has no impact or adverse effect on the functionality and burst rating of the relieving device. Depending on the design the insulation is suitable up to temperatures of 800 °C (1,472 °F).



Explosion panel with IAF isolation

KAD weather cover for vent ducts

Gaskets
Besides the Klingersil standard gasket FDA approved materials for sterile applications, e. g. silicone, EPDM are available. Additional gasket qualities on request.

Weather Cover for Vent Ducts
The utilisation of 'Weather Cover' protects against any possibility of weather ingress (rain and snow) as well as preventing the possibility of providing a home for nesting birds and an entry point for foraging wildlife.

The KAD-stainless steel vent duct weather cover meets all necessary VDI 3673 criteria. Its sturdy domed design avoids penetration and build-up of snow and dust as well as the possibility of 'pooling' of rain. In fact it provides the perfect long term leak-tight integrity with a standard Pstat (opening pressure) of 100 mbarg (1.45 psig) – fragmentation free opening is guaranteed.

INDOOR EXPLOSION VENTING

The Original

Q-Rohr-3

Pat.-Nos. DE 38 22 012
US 7,905,244

...PROTECTS AGAINST POTENTIAL CATASTROPHIC DAMAGE.

The Q-Rohr-3 explosion protection system is a proven reliable product. It has been designed and engineered following extensive research and development culminating in the most innovative and efficient flameless venting product on the world market today.

The consistent demand from our customers is the need for a protection system where the flame and dust distribution can be limited to a point where the system can be kept indoors. The Q-Rohr-3 has been designed with customer driven criteria such as; zero maintenance, unlimited life-span, huge reduction in the generated temperatures and effective dust retention.

The Q-Rohr-3 has been proven to meet all of these demands. In a thermo graphical investigation of a dust explosion, it has been recorded that when using a Q-Rohr-3 there is a huge reduction in temperatures generated.

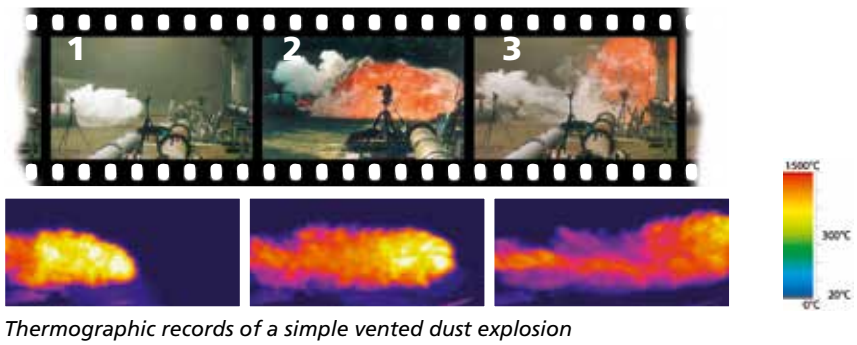
SAFETY ADVICE

Only the original construction of the

Q-Rohr-3

guarantees the full effectiveness in the event of a dust explosion. Copies and imitations present an unnecessary safety risk!

Conventional explosion venting with a bursting disc:



Thermographic records of a simple vented dust explosion

...WITH FLAME ABSORBER AND DUST RETAINER

Q-Rohr-3

Pat.-Nos. DE 38 22 012
US 7,905,244

The REMBE Q-Rohr-3: The latest generation of Indoor explosion vents from the inventors of 'flameless venting' guarantees indoor venting WITHOUT any flame and dust propagation. Further, the Q-Rohr -3, ATEX- and FM approved, is maintenance-free, negating operational costs and thereby offering the most economical solution while ensuring optimum processes maintaining efficient production. After investing in the Q-Rohr-3, a ROI will be noticed within only a few weeks.

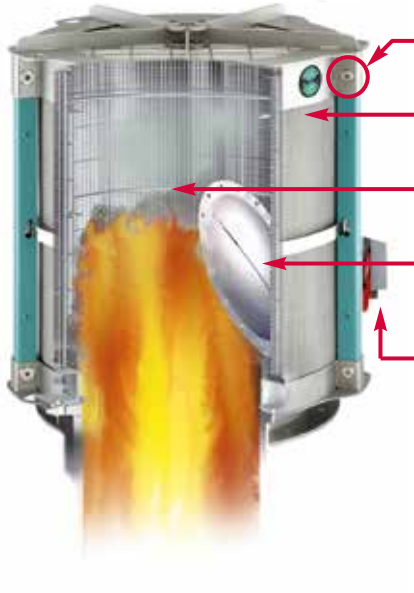
FM APPROVED

GL Germanischer Lloyd
Q-Rohr®-3 19496-11 HH

ATEX APPROVED
IBExU11ATEX2152 X

Certified according to EN 16009

The use of the Q-Rohr-3 increases the safety, guarantees continued production and saves operational costs.



Stainless steel riveted design allows to absorb pressure shock

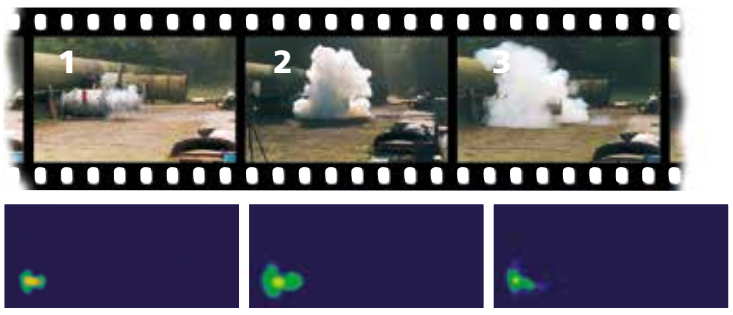
Reusable flame arrester made of a special stainless steel mesh filter

Stainless steel dust filter with specially developed pressure absorbing coils

Integrated REMBE bursting disc with signal unit and gasket

Monitoring unit in cabled IP-65 housing

An identical situation, this time using a Q-Rohr-3, therefore no flames or dust



No heat development outside the Q-Rohr-3, that means only a very low pressure and minimal noise

CUSTOMER BENEFITS

- No further necessity of expensive vent ducts
- Full protection of environment
- Optimised production processes no access to outside

PROVEN SAFETY FOR EQUIPMENT IN ANY LOCATION

Customised solutions for metal dust ≥ 350 bar x m/s.

Operating temperatures up to 600 °C on request

Q-Rohr-3

Pat.-Nos. DE 38 22 012
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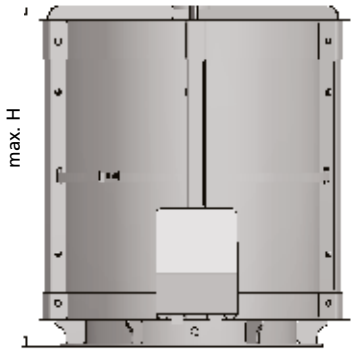
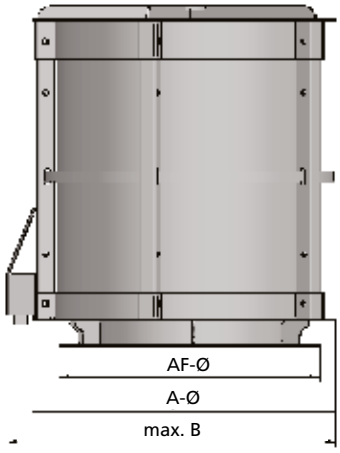
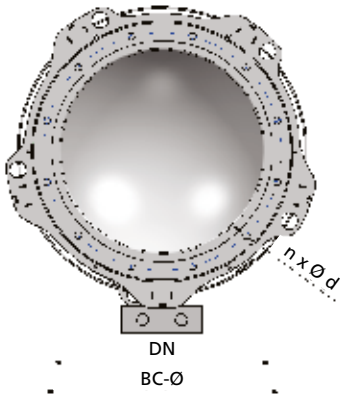






Technical Data (depending on size)	
Burst pressure (P_{stat})	0.1 barg @ 22 °C / 71.6 °F
P_{red}	0.1 barg to 2 barg / 1.45 psig to 29 psig
Max. K_{St}-value (dust)	400 bar x m/s
Max. K_G-value (gas)	100 bar x m/s
Max. K-value (hybrid mixture)	300 bar x m/s
Operating temperature	-10 °C to +230 °C / 14 °F to 446 °F

Type	DN*		max. H*		A*		max. W*		WR-Ø*		BC-Ø*		Ø d*		n*	Weight	
	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]	[mm]	[in]		[kg]	[lbs]
Q-Rohr-3- 8	200	8"	600	23.6	350	13.7	410	16.2	268	10.6	243	9.6	8.5	0.33	8	25	55
Q-Rohr-3-12	300	12"	600	23.6	450	17.7	500	19.7	390	15.4	355	13.9	11	0.43	12	30	66
Q-Rohr-3-16	400	16"	900	35.4	550	21.6	600	23.6	500	19.7	443	17.4	13	0.51	16	48	106
Q-Rohr-3-20	500	20"	900	35.4	650	25.5	700	27.6	600	23.7	544	21.5	13	0.51	20	60	132
Q-Rohr-3-24	600	24"	1400	55.1	760	29.9	810	31.9	700	27.6	646	25.4	13	0.51	20	125	276
Q-Rohr-3-28	700	28"	1900	78.4	860	33.8	910	35.8	800	31.5	752	29.6	13	0.51	28	195	430
Q-Rohr-3-32	800	32"	2200	86.6	960	37.7	1010	39.7	900	35.5	854	33.6	13	0.51	28	240	529

* see below · Further connections, technical drawings on request – see Q-Box for rectangular connections

The Q-Rohr-3 system is the only indoor explosion device that meets the NFPA codes and is approved in accordance with EU regulations (ATEX). It consists of an integrated REMBE bursting disc which vents the explosion wave in a controlled manner within the Q-Rohr-3 assembly. Flame gases with temperatures higher than 1500 °C (2,732 °F) are cooled down to less than 90 °C (195 °F) via energy transfer within the specially developed stainless steel mesh filter inlet. This reduces the expanding gas volume as it extinguishes the flame.
Dust retention is guaranteed by the mesh filter ensuring that no burnt or unburnt dust particles pass through the Q-Rohr-3 assembly.

Additionally, the pressure rise and increased noise level associated with free vented explosions are massively reduced to negligible levels.

After an explosion event the Q-Rohr-3 is reusable immediately after cleaning and replacement of the REMBE bursting disc assembly.

Explosion protection at milling hopper in breweries

After cleaning the flame arrester and exchanging the bursting disc, the Q-Rohr is ready for use again.

An optional sanitary cover keeps the outside clean.

TYPICAL APPLICATIONS OF EXPLOSION VENTING

Q-Rohr-3

Pat.-Nos. DE 38 22 012
US 7,905,244

Q-Rohr installed in a milk powder factory

Q-Rohr for protection of a cocoa roasting plant

Q-Rohr installed in a sugar refinery

The Q-Rohr protects the suction system at an aircraft manufacturer.

Q-Rohr protects a plant producing grain products

Explosion protection of a filter-cyclone combination in the fast food industry

Q-Rohr installed in a recycling plant

Indoor Flameless Explosion Venting…

Q-Rohr-3-6T/6T-AL

Pat.-Nos. DE 38 22 012
US 7,905,244

Metal dusts accumulating from industrial processes vary widely in terms of combustibility and specific processes impact upon the behaviour of the explosion protection equipment installed. There can be particles from machinery during the forming of aluminium components or welding fumes from laser or plasma welding, with particles far below 1 µm in diameter.

Usual characteristics such as the maximum temporal pressure increase „KSt-value" and the maximum explosion pressure „Pmax" do not always indicate the full consequences and the effects of an explosion when it comes to metal dusts. In addition to these figures, the combustion temperatures and calorific combustion energies also have to be verified.

Furthermore, light metals (Aluminium, Magnesium, etc.) can have very different explosion characteristics, depending on the particle size and degree of oxidation, e.g.:

SAFETY ADVICE

Only the original construction with the patented REMBE special stainless steel filter of the

Q-Rohr-3-6T/6T-AL

guarantees the full effectiveness in the event of a dust explosion. Copies and imitations present an unnecessary safety risk!

K_{St}-Value: approx. 30 bar x m / s Al-dust, oxidized cutting line alternative

K_{St}-Value: approx. 800 bar x m / s Al pigments varnish production (d50 < 3 µm

These physical principles are also valid for suppression systems. The code DIN EN 14373 is currently being reviewed and updated and will consider this scenario more thoroughly. Until now, nearly all suppression systems are unsuitable for metal dust explosions.

New standards require further development

Based on these findings, the rules applying to the testing of protective systems and the special behaviour of metal dusts have been adapted. Especially for flameless venting devices, the test standards of DIN EN 16009 dictate that existing dusts must be tested under real and practical application conditions. As the inventors of flameless explosion venting, the REMBE engineers have enhanced the Q-Rohr to be compliant with the new requirements, so that the standards of DIN EN 16009 are fulfilled in various testing scenarios.

Intensive research in this field now enables REMBE to offer a solution for safe indoor venting of different kind of metal dusts up to Aluminium. This is a revolution in the field of metal dust protection.

Free explosion venting of a 5 m³ test vessel with metal dust

Safe indoor explosion venting of metal dust applications with Q-Rohr-3-6T/6T-AL

…even when Metal Dusts are involved

Q-Rohr-3-6T/6T-AL

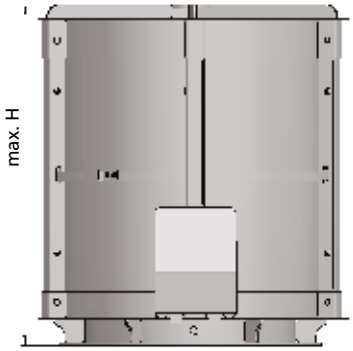
Pat.-Nos. DE 38 22 012
US 7,905,244

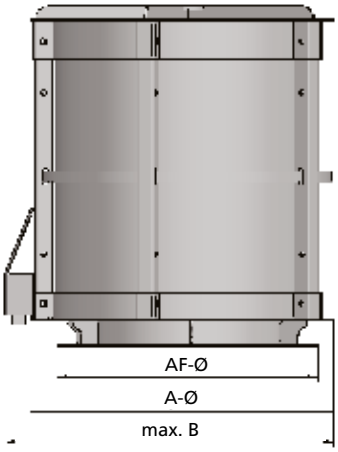
Function

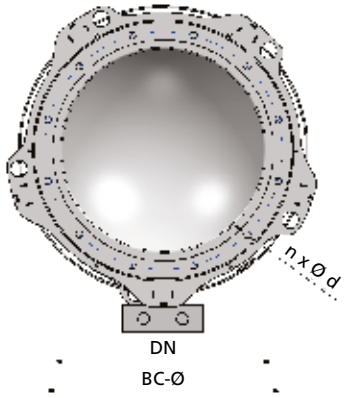
Flame gases with temperatures up to 3000 °C arising in the event of a metal dust explosion are cooled down to a negligible level by means of energy transfer in the patented special stainless steel filter. The leaking gas volume is reduced and the flames are extinguished. At the same time the increase in pressure and the noise pollution, both signs of an explosion, are considerably decreased. The design of the specially developed stainless steel mesh filter guarantees dust retention and non-penetration of burnt or unburnt dust particles. This technical advantage prevents the risk of a secondary explosion when compared with free explosion venting.

CUSTOMER BENEFITS

- **Costly venting ducts / pipes not required**
- **Equipment location / process optimised**
- **Quick and easy visual inspection instead of regular and expensive maintenance**







Technical Data / Application Conditions										
Q-Rohr-3-6T			**Silicon Dust**			**Iron- and Steel Dust**				
$P_{red\ max.}$			≤ 0.5 bar			≤ 0.5 bar				
K_{St}-value			≤ 200 bar x m/s			≤ 200 bar x m/s				
Type	**Size***		**max. H***	**max. B***	**A-Ø***	**AF-Ø***	**BC-Ø***	**Ø d***	**n**	**Weight**
	DN [mm]	**in**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**		**[kg]**
Q-Rohr-3-6T-8	200	8"	600	410	350	268	243	8,5	8	28
Q-Rohr-3-6T-12	300	12"	600	500	450	390	355	11	12	35
Q-Rohr-3-6T-16	400	16"	900	600	550	500	443	13	16	54
Q-Rohr-3-6T-20	500	20"	900	700	650	600	544	13	20	75
Q-Rohr-3-6T-24	600	24"	1400	810	760	700	646	13	20	150
*s. drawings										

Q-Rohr-3-6T-AL	**Aluminium Dust**
$P_{red\ max.}$	≤ 0.8 bar
KSt-value	≤ 300 bar x m/s

Type	**Size***		**max. H***	**max. B***	**A-Ø***	**AF-Ø***	**BC-Ø***	**Ø d***	**n**	**Weight**
	DN	**in**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**	**[mm]**		**[kg]**
Q-Rohr-3-6T-AL-8	200	8"	600	410	350	268	243	8,5	8	28
Q-Rohr-3-6T-AL-12	300	12"	600	500	450	390	355	11	12	35
Q-Rohr-3-6T-AL-16	400	16"	900	600	550	500	443	13	16	54
Q-Rohr-3-6T-AL-20	500	20"	900	700	650	600	544	13	20	75
Q-Rohr-3-6T-AL-24	600	24"	1400	810	760	700	646	13	20	150
Q-Rohr-3-6T-AL-28	700	28"	1900	910	860	800	752	13	28	240
Q-Rohr-3-6T-AL-32	800	32"	2200	1010	960	900	854	13	28	305
*s. drawings										

EXPLOSION VENTING WITH FLAME ABSORBER

Q-Box II *U.S. patent pending*

The Q-Box II flame-reduced explosion vent can be used to great effect either outdoors or indoors. When used indoors it dispenses with the headaches of positioning complex, cumbersome and expensive vent ducting.

The Q-Box II providing low pressure resistance, effectively eliminates flame and heat emissions thereby allowing easy indoor installation and positioning of relevant machinery.

Rectangular connections of the Q-Box II complement the dimensions of the standard Bursting panels thus allowing retrofitting of Q-Box II for existing installations.

Available in two standard sizes Q-Box II offers the best possible solution and the perfect safety system for indoor devices such as elevators when compared to often poorly designed and inefficient venting ducts.

Explosion venting of a wood chip hopper in production of chipboards with Q-Box II: cost-saving production of plant facilities

Q-Box II safeguarding a filter housing

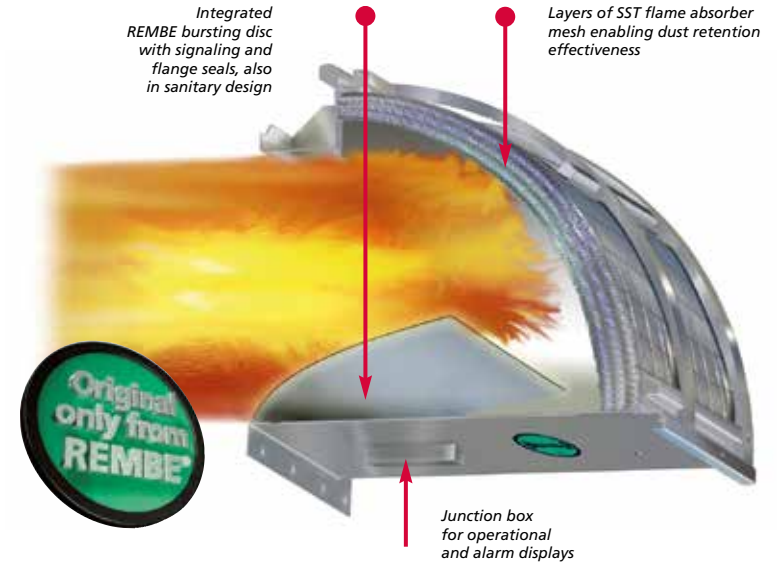
…FOR INDOOR AND OUTDOOR APPLICATIONS

Q-Box II *U.S. patent pending*

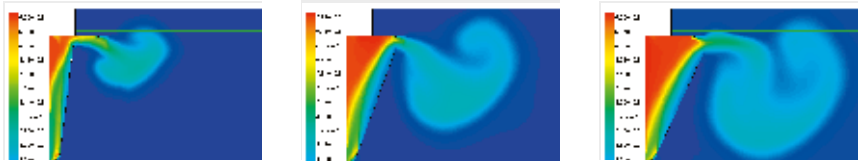
Technical Data			
Q-Box II Type		305 x 610 mm 12 x 24 in	586 x 920 mm 23 x 36 in
Height	mm	500	780
	in	197	307
Weight	kg approx.	28	77
	lbs approx.	62	170

All dimensions are nominal - further sizes on request.

Burst pressure (P_{Stat})	0.1 barg / 1.45 psig @ 22 °C / 71.6 °F
P_{red}	up to 0.5 barg / 7.25 psig
max. K_{St}-value	up to 200 bar / 2,900 psi x m/s
Operating temperature	-30 °C to 180 °C / -22 °F to 356 °F



Explosion venting with the Q-Box II, no escaping flames



The basis of development for the Q-Box II: Heat flow and dispersal analysis as the rupture disc membrane opens into the Q-Box.

Q-Box on the foot of an elevator: economical solution compared with ducts

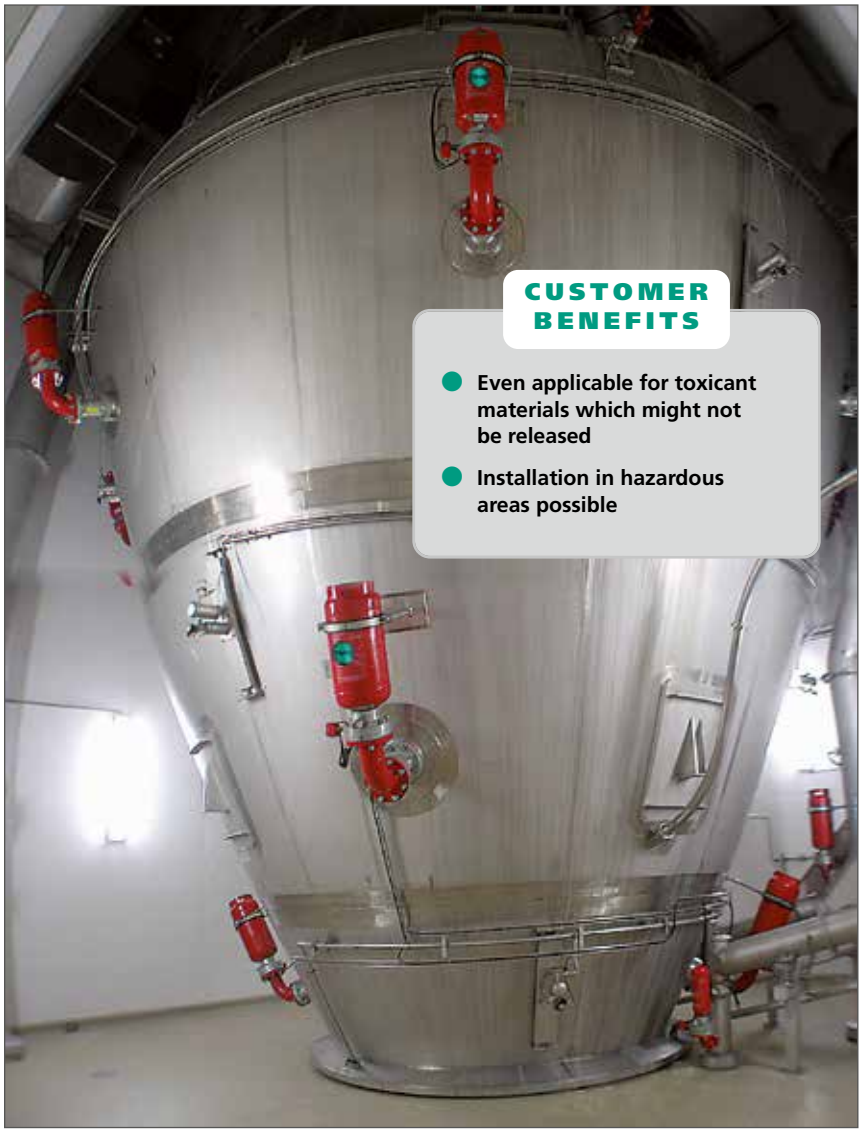
Q-Box application in the food industry with optional sanitary cover: Keeps the Q-Box clean!

CUSTOMER BENEFITS

- **Ideal: Retrofitting of existent plants with standard sizes**
- **For indoor and outdoor use**
- **Safety zones reduction of vent openings = gain of useable operation area**

SYSTEM FOR EXPLOSION SUPPRESSION / ISOLATION

Q-Bic



CUSTOMER BENEFITS

- Even applicable for toxicant materials which might not be released
- Installation in hazardous areas possible

Explosion suppression system a big hopper

Protection of pipes and vessels

Q-Bic in a large pipe

Explosion Suppression

Plant components like silos, mills, filters, collectors, mixers or dryers, in which combustible dusts or bulks are processed, conveyed or stored are hazardous in case of sufficient fine dust. If ignition sources cannot reliably excluded constructive and efficient explosion protection solutions are required.

With use of the Q-Bic suppression system the starting explosion is rapidly detected by the redundant p-RED detectors and the explosion flame is extinguished due to the prompt blowing out of dry powder in the endangered area. It extinguishes the explosion at the point of ignition. The explosion cannot be discharged to the outside atmosphere. Q-Bic is especially suitable for applications with toxicant materials, which might not be released in case of explosion.

Explosion Isolation

Plant components with constructive explosion protection regime are often interconnected via big pipes or rectangular shafts with further apparatus. If these pipes or shafts convey combustible dusts or bulks the single apparatus have to be isolated against explosions. This way the explosion spreading in further plant components is prevented as explosions are forwarded by flames but not by shock waves.

The Q-Bic explosion isolation system extinguishes the flame front of the explosion which prevents the ignition of the flame jet with pre-compressed pressure in further apparatus. Compared with other systems, e.g. explosion barrier slide valves, the operational cost are considerably lower.

CUSTOMER BENEFITS

- Safe and cost-efficient isolation of big pipes
- Short installation distances

EXPLOSION PRESSURE, SPARK AND FLAME FRONT ISOLATION IN FEEDING LINES

EXKOP II *Pat.-No. EP 05 59 968* / QV II

The EXKOP system consists of a controller and quench valves. It provides safe and economic and easy explosion, spark and flame front isolation. The quench valves protect interconnected equipment by high speed closure of a fast acting rubber hose.

The valve is triggered by 100% reliable signal from the maintenance-free triple-section bursting disc, the Q-Rohr-3, Q-Box II or by IR, pressure or temperature sensors. The complete system is failsafe due to an integrated pressure storage tank and selfmonitoring controller. In case of explosion the plant personnel can reset the EXKOP system quickly and easily after inspection. Plant downtime is reduced to a minimum.

The compact design makes it possible to install the system at any site independently of the building-in position. Compared with the immense mass acceleration of knife gate valves during closing operation the space-saving quench valve does not require any special supporting structure, e. g. braces or bases.

The EXKOP system ranges from DN 80 (3") to DN 250 (10"). The rubber sleeve material of the quench valve is abrasion resistant and a special food quality design is available for hygienically applications.

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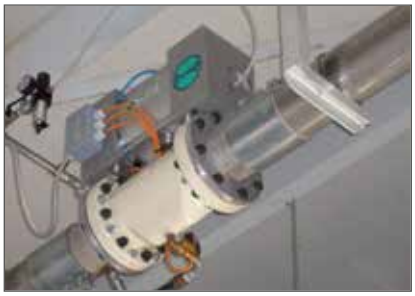


Performance proven isolation of piping with EXKOP II (quench valve and controller): Permanent system availability

Quench Valve (QV II)

EXKOP II Controller

CUSTOMER BENEFITS

- **Low investment in case of low structural resistance**
- **Easy and quick reset = shortest downtime in case of actuation**
- **Existent signals can be cut in (level control)**

EXKOP MINI / QV II

The EXKOP MINI controller is suitable for applications with 1 to 2 quench valves. Two separate inputs (bursting panels, Q-Rohr, spark detectors, etc.) can be combined with two QV II valves.

The use of the system is simple and works acc. to the „one button easy handling" philosophy. As usual all events are recorded by a ring storage memory.

EXKOP MINI installed in the adhesive processing / plastic-compounds industries: Installation in any site, in any optional position!

EXPLOSION ISOLATION

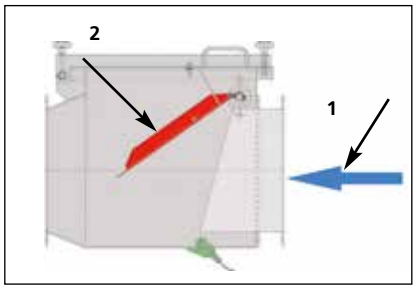
Q-FlapCompact II / Q-FlapCompact II Plus

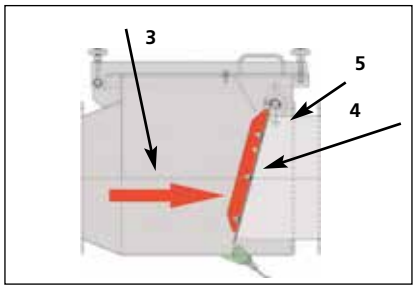
With the non-return explosion valve series Q-FlapCompact II explosions in nearly all industrial sectors can effectively be isolated.

The Q-FlapCompact II is certified as a protective system acc. to EU guideline 94/9/EG (ATEX 114) and approved for decoupling explosions of organic acc. to EN 16447and inorganic dusts.

The passive non-return Q-FlapCompact II protects horizontal aspiration lines with a flow velocity between 15-30 m/s. Extensive research and testing under real explosion conditions enabled approval of the Q-FlapCompact II for St 1 or St 2 (max. K_{ST}-Value = 300 bar x m/s). The Q-FlapCompact II is applicable for reduced pressure (P_{red}) up to 0.7 bar (10.15 psi)

Q-FlapCompact II Plus installed in a food application





Certified according to EN 16447

CUSTOMER BENEFITS

- **Certified to the more stringent standard EN 16447**
- **Significant system reassurance and reduced cost of ownership for end users by ease of maintenance and relaxed maintenance frequency**
- **Available in sizes from DN140 through to DN1000 Special sizes on request (ie DN100)**

Standard Operation

1. Direction of air flow
2. Flap remains open by means of process flow.

During operation, the flap remains in the open position by means of the process air flow. At standstill, the flap closes due to its own weight. When the system is starting, opening of the flap is damped by an integrated fail-safe locking device (St2 dust) resp. by a damping system (St1 dust).

Explosion Event

3. Explosion shock wave
4. Flap is closed by explosion
5. The integrated fail-safe locking mechanism used in St2 dust applications prevents the flap from reopening until the system is reset.

In the event of an explosion within a protected system the Q-FlapCompact II flap closes due to the pressure front spreading within the ductwork. Due to resultant low pressures, there is a perceived risk of the explosion flame front and pressure wave proceeding further downstream, endangering plant and personnel. The integrated fail-safe locking device used in St2 dust applications negates this risk in accordance with EN 16447.

Option: Monitoring with Q-FlapCompact II Plus

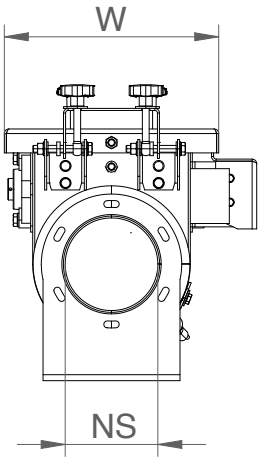
With the patented protection system Q-FlapCompact II Plus maintenance intervals are extended. The wear-and tear sensor monitors potential abrasion on the stainless steel flap. The additionally integrated clogging sensor indicates any kind of product accumulation in the flap area ensuring safe closing of the flap.

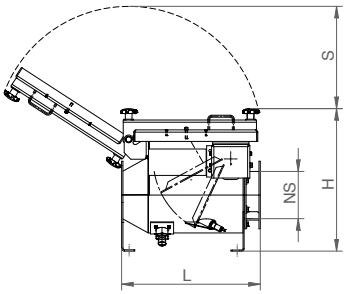
Technical Data

Q-FlapCompact II

Type		140	160	200	250	280	315	355	400
Nominal size	NS	140	160	200	250	280	315	355	400
Dimensions [mm]	Length L	420	490	530	590	630	670	750	750
	Width W	380	455	490	540	570	590	610	670
	Height H	430	462	505	530	552	590	642	695
	S	390	420	460	480	520	540	590	645
Weight	kg	27	31	38	46	50	54	82	92
Pressure loss at 20 m/s	Pa	approx. 400	approx. 400	approx. 400	approx. 320	approx. 330	approx. 340	approx. 370	approx. 400
Maximum opening angle flap blade		20°						30°	
Possible dust explosion class		St1 and St2						St1	
Max. K_{St}-value	bar x m/s	300						200	
Maximum reduced pressure (pred max) in the filter (vessel)[1)]	bar	0.7						0.5	
Pressure resistance of the back pressure flap[1)]	bar	1.5	0.95					0.6	
Minimum mounting distance (St1)	m	2.6	2					2.6	
Minimum mounting distance (St2)	m	3.6	3.5					not allowed	
Maximum mounting distance (St1)	m	6.6	7					6.6	
Maximum mounting distance (St2)	m	7	7.5					not allowed	

[1)] excess pressure





Type		450	500	560	630	710	800	900	1000
Nominal size	NS	450	500	560	630	710	800	900	1000
Dimensions [mm]	Length L	820	870	930	1,090	1,190	1,320	1,470	1,625
	Width W	730	800	840	1,050	1,150	1,230	1,360	1,450
	Height H	730	795	846	970	1,060	1,190	1,295	1,400
	S	700	760	820	880	950	1,060	1,190	1,310
Weight	kg	99	118	152	220	260	305	360	420
Pressure loss at 20 m/s	Pa	approx. 430	approx. 450	approx. 450	approx. 500	approx. 500	approx. 500	approx. 500	approx. 500
Maximum opening angle flap blade		30°							
Possible dust explosion class		St1							
Max. K_{St}-value	bar x m/s	200							
Maximum reduced pressure (pred max) in the filter (vessel)[1)]	bar	0.5							
Pressure resistance of the back pressure flap[1)]	bar	0.6							
Minimum mounting distance (St1)	m	2.6			3				
Minimum mounting distance (St2)	m	not allowed							
Maximum mounting distance (St1)	m	6.6			7				
Maximum mounting distance (St2)	m	not allowed							

[1)] excess pressure

Class	II 3D c T 60 °C (for Q-FlapCompact II-St1 only, suitable for zone 22)
Mounting position	horizontally, pull flow applications (fan behind Q-FlapCompact II)
Air flow velocity	15 – 30 m/s
Temperatures	-10 °C to 60 °C
Material	Housing: S235JRG2 / flap blade: stainless steel
Paint finish	RAL 3000 blazing red (other colours optional)

The Q-FlapCompact II is the only non-return valve that allows from the ductwork easy maintenance without removal

EXPLOSION PROTECTION FOR CONVEYOR SYSTEMS

ElevatorEX II

The refined protection system of the ElevatorEX II for bucket elevators, drag conveyors and transportation systems distinguishes itself by combining a variety of different proven features.

Critical components on the elevator's foot and head are protected by maintenance-free relief devices such as Q-Box II or bursting discs. Infrared detectors sense possible ingress of flame into the elevator shafts, feed openings or discharge chutes. Extinguishing barriers are activated within milliseconds at precise fixed points.

Plant downtime is minimised while maximising protection of the conveyer from disastrous dust explosion consequences with the minimum of investment.

The ElevatorEX II is the only globally certified protection system for conveyor systems.

CUSTOMER BENEFITS

- **Ideal for high elevators**
- **Easy retrofitting**
- **Maximum protection with minimum investment**

Q-Bic exthinguishing bottle

IR-Detector

Q-Box II

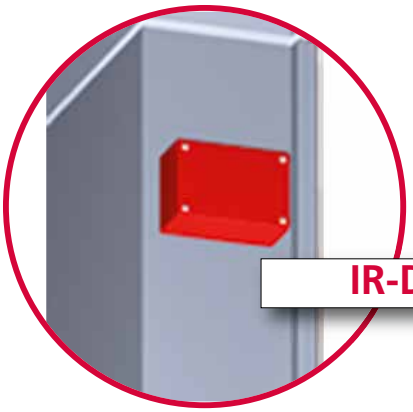
Effective and cost saving:

Combined safety system consisting of Q-Bic, IR-Detector and Q-Box II

ATEX APPROVED
FSA 10 ATEX 1607 X

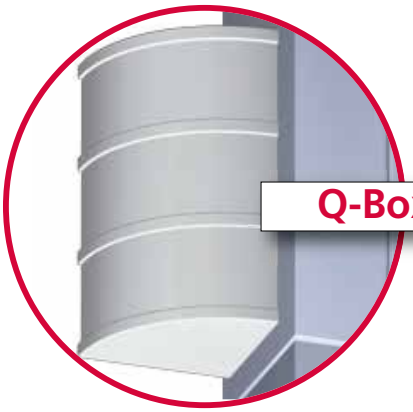
Q-Bic

An infrared detector activates the extinguishing bottle.



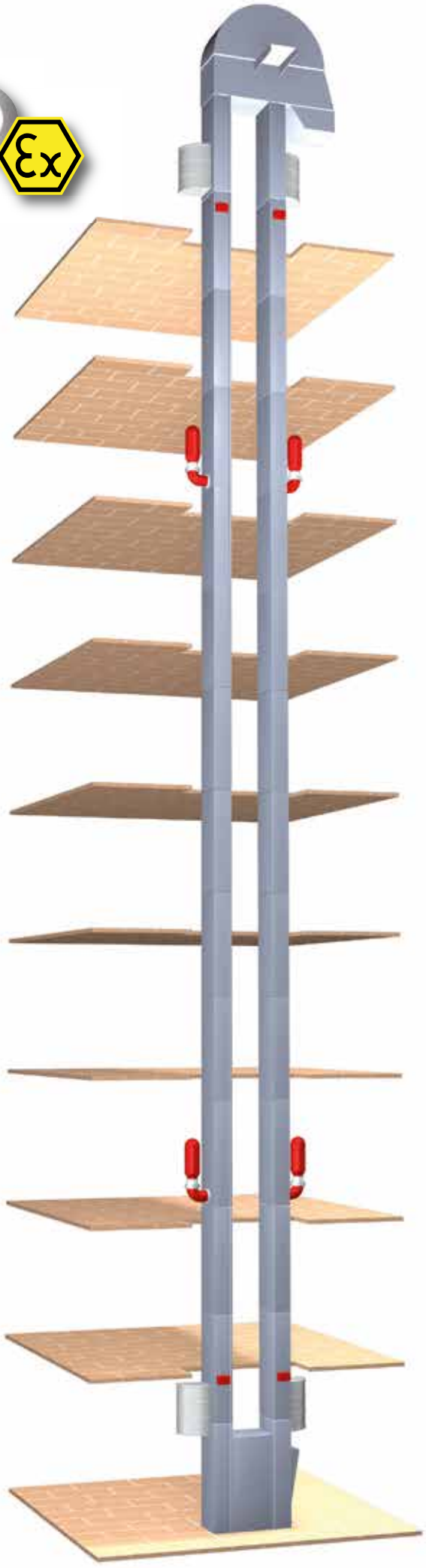
IR-Detectors

Sense possible ingress of flame



Q-Box II *U.S. patent pending*

Explosion venting on the elevator's foot and head



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Booklet of Safety + Security

This booklet gives you basic knowledge to the subject of dust explosion protection as well as useful information about efficient and cost-saving plant protection.

Please call for your personal copy

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