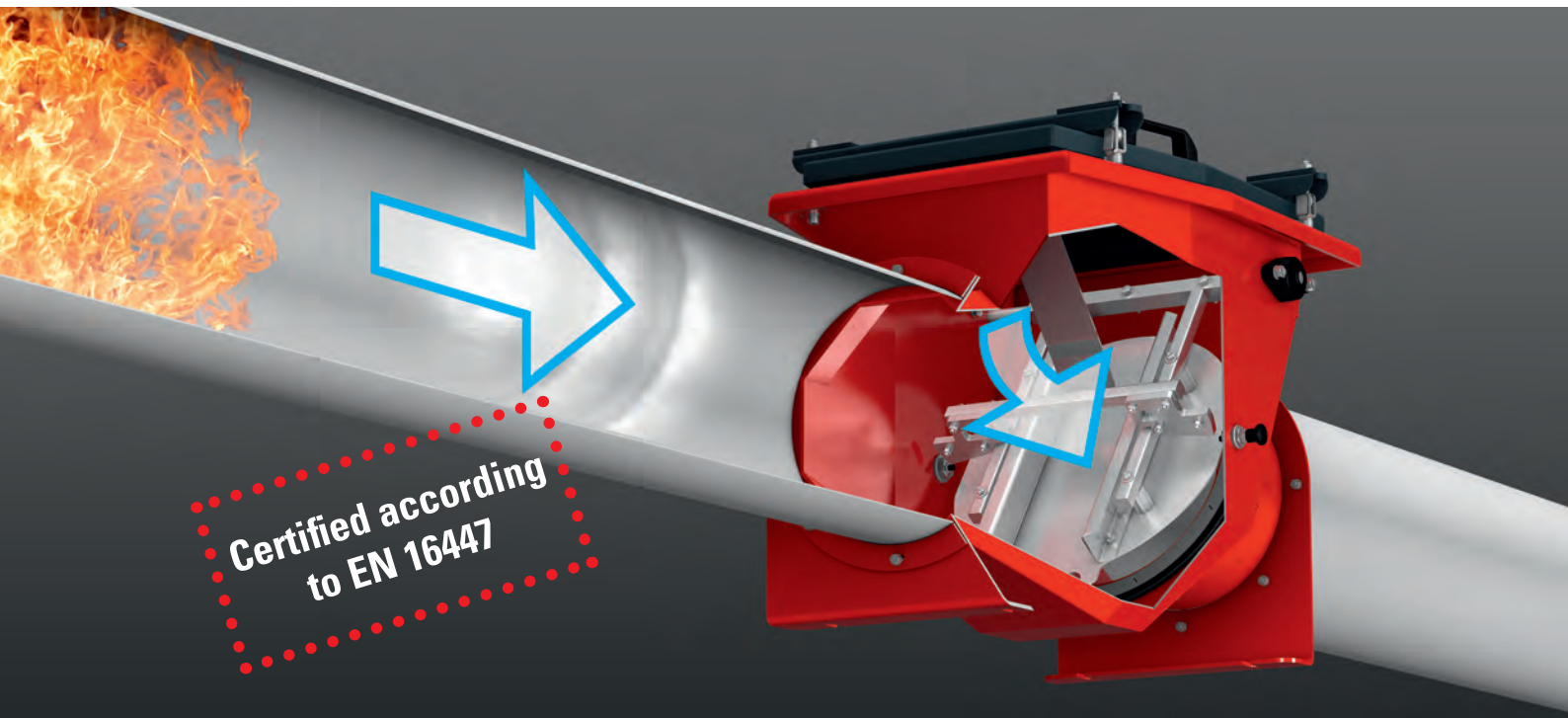
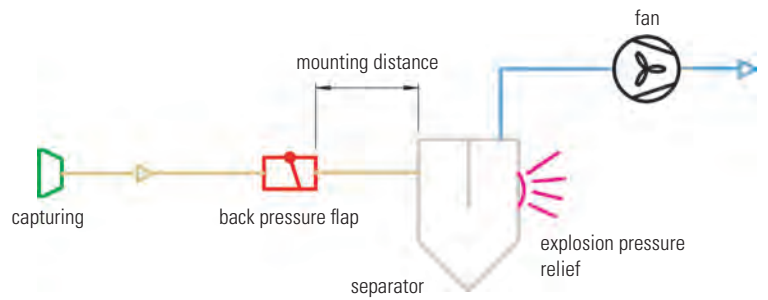


# ProFlap III: Back-Pressure Flap



## Explosion decoupling inside connected ductwork to protect separators

ProFlap back pressure flap prevents the spread of explosive pressure and explosion flames to other areas.



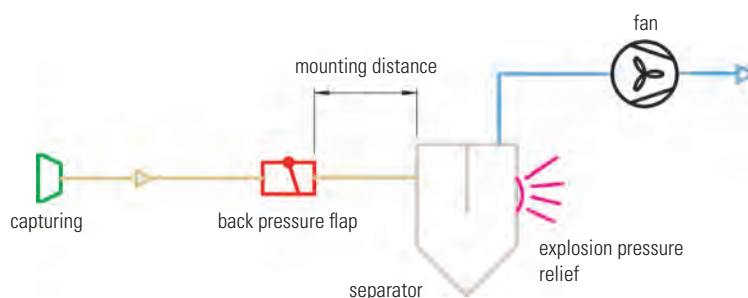
Operators at the collection points or system components at the suction side are protected against the impact of explosions.

## The task

Numerous processes can create explosive dust/air mixtures inside industrial systems (eg., dust collectors, mixing machines, fluid bed granulators, mills, etc.). If ignition sources cannot be prevented due to process conditions, these systems are often equipped with constructive explosion preventive measures, such as pressure relief or pressure suppression.

In this regard, ductwork is decoupled from the separators for protection so that no flames and explosive pressure can be transferred into other areas.

Sample application of an exhaust system that is equipped with explosion pressure relief:



## The Solution

Keller developed the ProFlapIII series for effective explosion decoupling in most sectors of industry. The ProFlapIII is certified as a protective system according to EU Guideline 2014/34/EU (ATEX 114) and is approved for decoupling of dust explosions of organic and mineral dusts.

The following functions are patented:

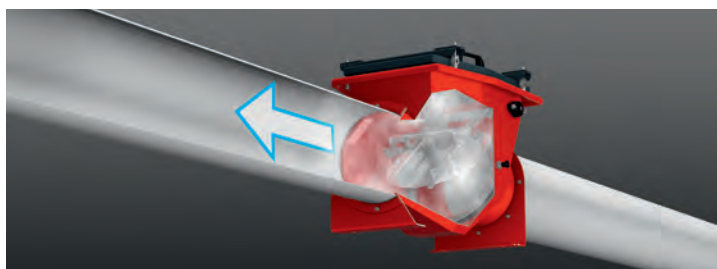
- Monitoring function with sensor for wear and sediments
- Angle sensor

Patented



## Normal operation

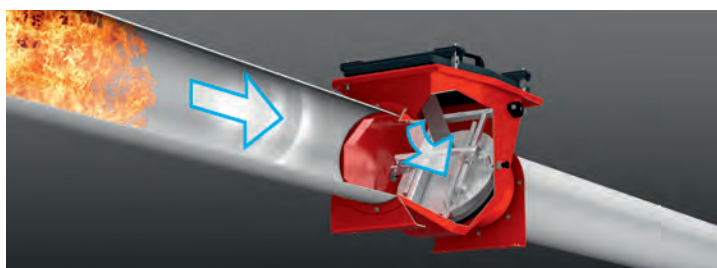
During operation, the back pressure flap mounted on the suction side is kept open by the airflow. When fully stopped, the flap closes by its own weight. When the system starts up, the opening of the flap is restrained by a damping element in some designs.



The downstream mounted back pressure flap is kept open by the air flow

## In the event of an explosion

During an explosion inside a protected system, the flap is closed by the pressure surge inside the ductwork. The explosion flame and the pressure cannot spread back into the ductwork. Operators at capturing points or suction-side system parts are protected against explosion impacts. A locking mechanism prevents the flap from re-opening following an explosion due to the negative pressure.



During an explosion inside a protected system the flap closes due to the pressure surge, and prevents it from spreading inside the ductwork

**ProFlap III  
Standard design**

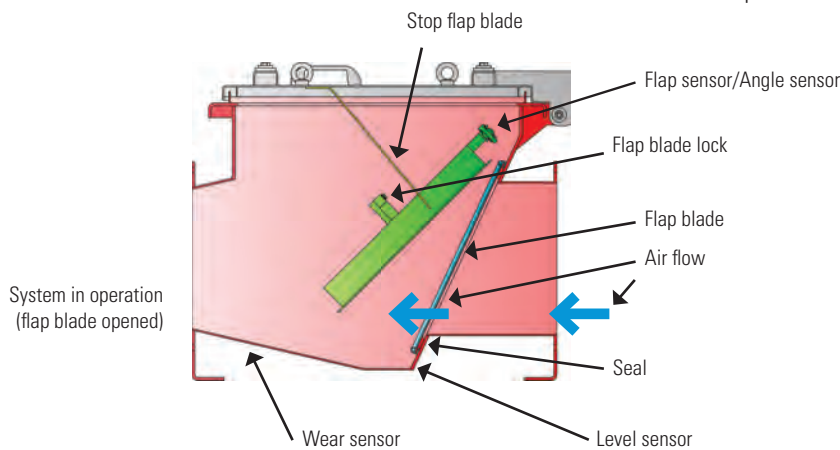
The standard version is available for dusts classified in dust explosion category St1 and a nominal width of 140, as well as for dust explosion category St2.

**ProFlapPlusIII  
Design including  
a monitoring function**

ProFlapPlusIII can be equipped with a monitoring package to extend the maintenance intervals. This monitoring package consists of a wear sensor and an angle sensor.

The wear sensor monitors the material removal of debris inside housing and ensures adequate shock pressure resistance to the back pressure flap in case of an explosion. The angle sensor monitors the flap blade position and provides early detection of a potential explosion, as well as the early stages of wear on the flap blade. The sensors

are connected to a terminal box. Signal evaluation is performed by the control unit of the system provided by the customer. As an alternative, a separate electrical control unit can be obtained from Keller (see "accessories").



**Flow monitor**

The angle sensor can also be used for airflow measurement in appropriate applications. The redundant design of the angle sensor ensures flow monitoring as a level-d safety function.

**EN 13849**

**ProFlapIII is certified by NFPA for the US market**

The American National Fire Protection Association NFPA established stricter safety requirements for back pressure flaps in their NFPA 69 standard. The new ProFlapIII series is equipped with a

flap blade locking mechanism and a level sensor. The locking mechanism prevents the flap blade from opening after an explosion due to the negative pressure. The level sensor provides

early wear detection in the back pressure flap and reduces the risk of a possible fire and explosion.

	ProFlapIII	ProFlapPlusIII	ProFlapIII-US	ProFlapPlusIII-US
Wear sensor		X		X
Angle sensor		X		X
Level sensor			X	X
Flap sensor			X	
Electrical control		X	X	X

# Dimensions, technical data

Typ	No-minal width	Length L	Width B	Height (closed)	Height (open)	Axle height	Weight	Pressure loss on 20 m/s	Pitch circle	Screw size	# of screws
	NW	mm	mm	mm	mm	mm	kg	Pa	mm		pieces
ProFlapIII-140	140	550	212	465	860	170	45	ca. 350	182	M10	8
ProFlapIII-160	160	580	232	505	910	190	50	ca. 350	200	M10	8
ProFlapIII-200	200	600	273	545	970	210	60	ca. 350	241	M10	8
ProFlapIII-250	250	650	323	610	1095	230	70	ca. 350	292	M10	8
ProFlapIII-280	280	700	363	630	1160	240	75	ca. 350	332	M10	8
ProFlapIII-315	315	750	398	655	1240	250	85	ca. 350	366	M10	8
ProFlapIII-355	355	800	438	720	1345	270	95	ca. 350	405	M10	8
ProFlapIII-400	400	850	484	770	1445	300	110	ca. 350	448	M10	12
ProFlapIII-450	450	900	534	805	1530	310	130	ca. 350	497	M10	12
ProFlapIII-500	500	950	584	870	1645	350	145	ca. 350	551	M10	12
ProFlapIII-560	560	1100	664	950	1820	400	160	ca. 350	629	M12	16

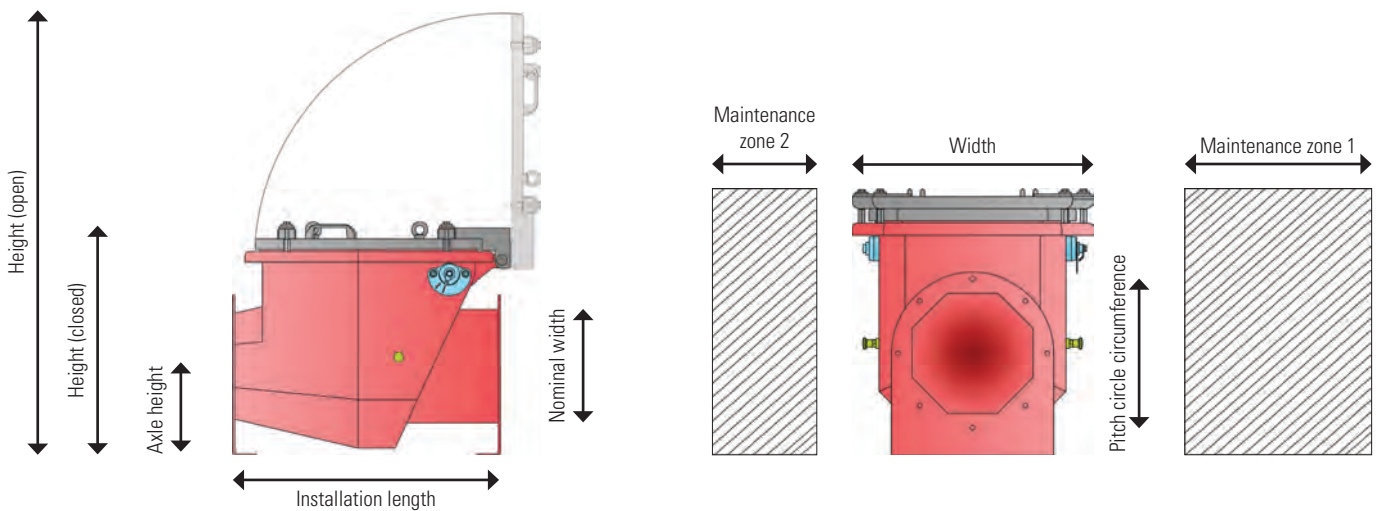
**Mounting position:** horizontal, on the suction side (fan behind ProFlapII)

**Air flow velocity:** 15 – 30 m/s

**Temperatures:** -20 to + 60°C

**Materials:** housing: S235JRG2, flap: stainless steel

**Paint finish:** RAL 3000 "blazing red"



Acceptable dust explosion class	Max. K <sub>ST</sub> -Wert	Max. reduced excess pressure (p <sub>red, max</sub> ) in the container filter)*	Pressure surge resistance of back pressure flap	Min. installation distance	Max. installation distance	Safety gap limit	Minimum container size	Maximum number of 90° elbows
	bar x m/s	bar	bar	m	m	mm	m <sup>3</sup>	pieces
St1 and St2	300	0,5	1,4	3,2	7,3	1,3	0,46	2
St1	200	0,5	1,4	3,7	6,7	1,3	0,9	2
St1	200	0,5	1,4	3,7	6,7	1,3	0,9	2
St1	200	0,5	1,4	3,7	6,7	1,3	0,9	2
St1	200	0,5	1,4	3,7	6,7	1,3	0,9	2
St1	200	0,5	1,4	3,7	6,7	1,3	0,9	2
St1	200	0,35	0,75	4,0	6,2	1,3	1,8	2
St1	200	0,35	0,75	4,0	6,2	1,3	1,8	2
St1	200	0,35	0,75	4,0	6,2	1,3	1,8	2
St1	200	0,35	0,75	4,0	6,2	1,3	1,8	2
St1	200	0,35	0,75	4,0	6,2	1,3	1,8	2

Subject to modifications.

\* The ductwork between ProFlapIII and explosion protected housing/filter will have the same max. reduced P<sub>red, max</sub> (normally at least 2 mm sheet thickness, welded).

### Scope of applications

Downstream explosion decoupling in dry dust separators

- when grinding fiberglass reinforced components
- for chemical and pharmaceutical industries
- for lumber industry
- for varnish dusts etc.
- for blasting plants

Explosion decoupling for dryers, air separators, mills, silos, fluid bed granulators, etc. Applications also possible for dust concentrations exceeding the lower explosion limits.

### Advantages

- certified according to the German test standard DIN EN 16447
- applicable for organic dusts and metal dusts (NW 140-315)
- passive system, no triggering sensors required
- inexpensive in comparison to other decoupling systems

- modular monitoring package for system control and greater inspection intervals
- Easy opening with hinges, without loose components
- ease of access for inspection with swiveling flap
- integrated consoles for easy assembly

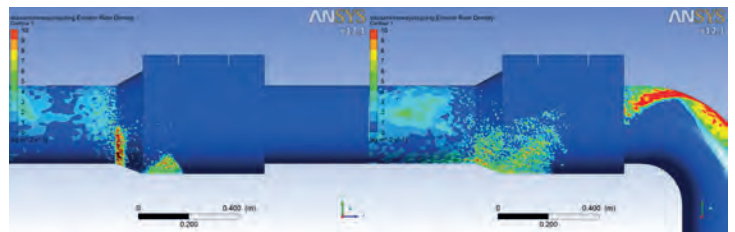
- variable mounting distances
- application feasible for dust concentrations beyond the lower explosion limits

**Tested according to DIN EN 16447**

**Approved for metal dust**

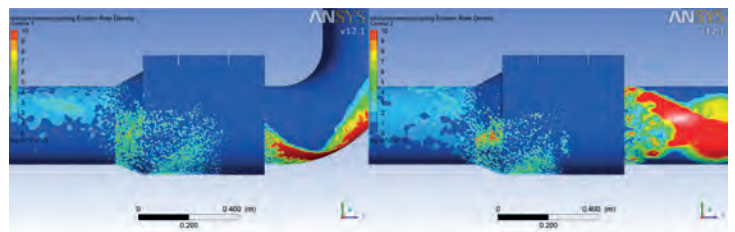
### Simulation systems

When developing the monitoring sensors, up-to-date airflow simulation systems were used in order to determine ideal positioning of the sensors.



directly advancing flow

flow advancing from below



advancing flow from above

laterally advancing flow

### CFD ProFlapIII NS315 simulation parameters:

velocity of oncoming flow : 20 m/s  
 particle mass flow (silica): 5,7 g/s  
 particle size distribution (silica):  
 10µm up to 500µm

### Effect of particles impacting on sheet metal (indication of abrasion):

blue: no abrasion  
 red: increased abrasion

**Easy maintenance and safe**

To keep maintenance, inspection and service work as simple as possible, the back pressure flap is equipped with an inspection door.

**Accessories**

An electrical control with integrated evaluation of the wear sensor and angle sensor for their safe operation is available for the ProFlapPlusIII.

**Guidelines and Standards**

Back pressure flaps are subject to a design check according to EU Guideline 2014/34/EU (ATEX 114), latest standard (EN 16447) applicable. Quality assurance is audited according to 2014/34/EU (ATEX 114) and is regularly examined. It is therefore permissible to re-use the back pressure flaps as independent protection systems.



**Certification  
successfully  
achieved**



Back pressure flaps must comply with the stricter test standard (EN 16447).  
The new Keller ProFlapIII series successfully granted approval.



ProFlapIII with explosion protection module B