

PROTEGO® Deflagration Flame Arresters

end-of line
and Vent Caps



Volume 2

Volume 2



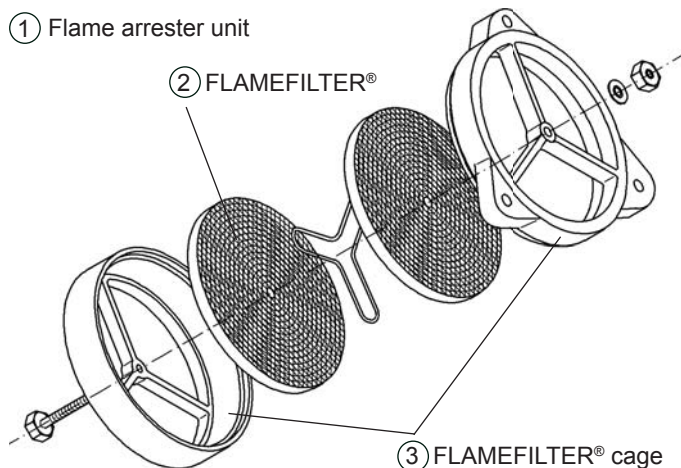
for safety and environment

Function and description

The different combustion processes and installation locations of flame arresters are discussed in „Technical Fundamentals“ (Vol. 1). In this volume we present the PROTEGO® product range for end-of-line deflagration flame arresters and vent caps. These devices protect against atmospheric deflagration, atmospheric deflagration and short time burning or atmospheric deflagration and endurance burning, which also includes short time burning. Vent caps without flame arrester elements complete our range of end-of-line devices.

PROTEGO® end-of-line deflagration flame arresters are “state-of-the-art” safety devices which are installed on storage tanks, vessels or in process plants. They provide safe protection against atmospheric deflagration, short time burning or endurance burning if potentially explosive vapours are discharged. They mitigate the impact of atmospheric deflagration and prevent flame transmission to protect equipment which is not designed to be explosion pressure proof.

The main component is the PROTEGO® flame arrester unit (1), which stops the propagation of flames. The PROTEGO® flame arrester unit consists of one or two FLAMEFILTER® discs which are secured in a FLAMEFILTER® cage (3). The gap size and number of FLAMEFILTER® discs depend on the relevant data of the process media (i.e. explosion group, pressure, temperature, composition of the fluid).



Deflagration and short time burning proof end-of-line flame arresters are equipped with a temperature sensor, which detects a stabilized flame on the flame arrester element. If a flame is detected, measures shall be taken to extinguish the flame and prevent endurance burning.

Should venting of an explosive mixture over a long period of time be unavoidable and no secondary measure is implemented to extinguish a flame, devices which provide endurance burning protection shall be installed. **Deflagration and endurance burning proof end-of-line flame arresters** from PROTEGO®, are equipped with a fusible link, which melts if a flame stabilizes on the flame arrester element and then allows the weather hood to move into the open position. This allows the flame to transfer most of its heat directly to the environment, preventing flashback through the FLAMEFILTER®.

Vent caps without flame arrester elements, protecting against environmental impact (harsh weather conditions, bird nests, etc.) complete our product range.

In close cooperation with scientific institutions, PROTEGO® has developed safety devices which can be applied to all explosion hazardous locations and provide protection against atmospheric deflagration, short time burning and endurance burning. Our devices are subjected to type examination and certificates according to ATEX and other international standards are issued (CE, Gost-R, GL, etc.).

A broad variety of types, designs, sizes and materials can be provided. Most importantly we have the capability to custom design and develop solutions in our test facility, which is the technologically most advanced in the world.

Special features and advantages

The following factors should be considered for selecting a device: **Deflagration protection, deflagration and short time burning protection** including temperature control or **deflagration and endurance burning protection**. **Vent caps** don't have a flame arrester element.

With regard to operating conditions **higher temperatures** have to be considered if standard values for atmospheric operation are exceeded.

For selecting an appropriate device, the **explosion group** according to the MESG value must be considered.

The correct **approval** has to be chosen or may be requested.

The plant specification needs to be considered to select the appropriate connection and **size**.

Depending on the application, it may be important to select a device with a **heating jacket** or heating coil, but please note that not all devices are available with this feature. Electrical trace heating may be an alternative.

We provide special designs for **critical media** and product properties (i.e. viscosity, density, crystallization and polymerization).

Preferred applications

PROTEGO® end-of-line deflagration flame arresters and vent caps are mainly installed on storage tanks and vessels of the chemical, petrochemical and pharmaceutical industry in order to protect them.

Installation and maintenance

The modular design of the end-of-line deflagration flame arresters assures the easiest possible maintenance. For onsite maintenance purposes, the device has to be installed in a location where it can be easily accessed. For larger sizes it may be necessary to provide lifting equipment. With trained personal maintenance is most efficient.

PROTEGO® end-of-line deflagration flame arresters are installed in explosion hazardous areas. It is important to select the correct device for the specific application. The manufacturer's statement of conformity confirms the tasks for which the deflagration flame arrester is suitable. The user documents proper use in accordance with the applicable safety regulations.

Selection

Based on main process data, the different types of devices can be selected from our product range:

- **Atmospheric deflagration proof, short time burning proof, endurance burning proof or vent caps**
- **Explosion group** of the processed mixture
- Standard or special operating conditions with **higher temperatures**

After that the following criteria have to be verified or selected:

- **Size** and type of connection
- **Approvals** according to ATEX, etc.
- **Heating jacket** or heating coil

After this pre-selection other details, such as material, coating etc. can be selected or defined in the data sheet.

Should it not be possible to determine a device fitting your requirements, please do not hesitate to contact us: in many cases we can provide special designs or approvals.

Sizing

The size of the device is selected or double checked with our volume flow / pressure drop diagrams. Should clogging of the flame arrester element be likely a safety factor should be considered for sizing.

Given: Flow rate \dot{V} m^3/h or CFH
max. all. pressure drop Δp in mbar or inch W.C.

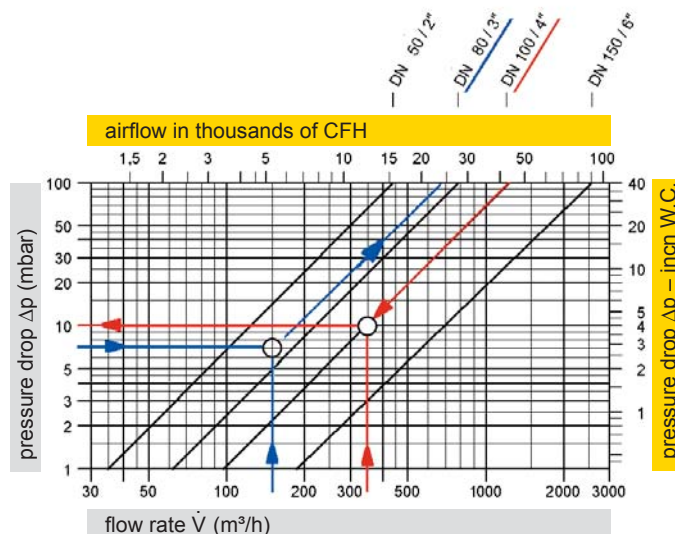
Desired: Size of the device DN

Procedure: Intersection point of straight line through the flow rate and maximum allowable pressure drop is above or on the size curve

Given: Flow rate \dot{V} m^3/h or CFH
size of nozzle connection DN

Desired: Pressure drop (flow resistance)
 Δp in mbar or inch W.C.

Procedure: Intersection point of the straight line through the flow rate and size curve, horizontal straight line provides the pressure drop

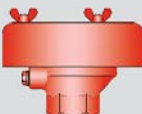
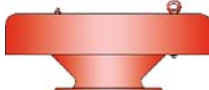



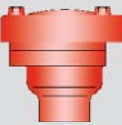








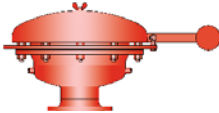



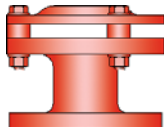
Guidance for calculating the volume flow or influence of density is covered in the "Technical Fundamentals" (see Vol. 1).

The device can be specified or ordered if all above steps are completed.

For special applications, please complete the process data sheet from Volume 1 to provide the necessary information for a quotation.

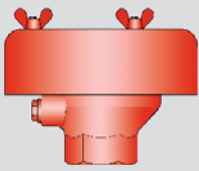
PROTEGO® Deflagration Flame Arresters, end-of-line, and Vent Caps

	Type	Size DN	Explosion group		Approvals				X = Special design for higher temperatures	X = Heating jacket / heating coil	Page
			ATEX	NEC							
Deflagration flame arrester, end-of-line											
	BE/AD	15 - 50 ½" - 2"	IIB3, IIC	C B	ATEX						64 - 66
	LH/AD	50 - 800 2" - 32"	IIB3, IIC	C B	ATEX			X			68 - 70
Deflagration flame arrester, short time burning proof, end-of-line											
	LH/AD-T	50 - 800 2" - 32"	IIB3, IIC	C B	ATEX			X			72 - 74
Deflagration flame arrester, endurance burning proof, end-of-line											
	EB	25 - 800 1" - 32"	IIA, IIB	D B	ATEX						76 - 79
	EB-DN/DN2	20 - 700 ¾" - 28"	IIA, IIB	D B	ATEX			X	X		76 - 79
	BE/HZ	15 - 32 ½" - 1¼"	IIA	D	ATEX						www.protego.com
	BE/HK	20 - 80 ¾" - 3" 20 - 32 ¾" - 1¼"	IIA, IIB3	D C	ATEX				X		www.protego.com
	BE/HK-E	20 - 80 ¾" - 3"	IIB1	–	ATEX				X		80 - 81
	BE/HK-E	80 3"	IIB3	C	ATEX IMO				X		www.protego.com

	Type	Size DN	Explosion group		Approvals				X = Special design for higher temperatures	X = Heating jacket / heating coil	Page
			ATEX	NEC							
Deflagration flame arrester, endurance burning proof, end-of-line (Continuation)											
	BE/HR	80 - 100 3" - 4"	IIA, IIB3	D C	ATEX					X	www.protego.com
	BE/HR-E	80 - 100 3" - 4"	IIB1	–	ATEX					X	82 - 83
	BE/HR-E	80 - 100 3" - 4"	IIB3, IIB	C B	ATEX IMO					X	www.protego.com
	BE/HR 400	150 - 200 6" - 8"	IIA	D	ATEX					X	www.protego.com
	LH/EB	150 - 400 6" - 16"	IIA1 (I)	-	ATEX						www.protego.com
Vent caps, end-of-line, without flame arrester unit											
	EH/0	20 - 80 ¾" - 3"									www.protego.com
	EH/0S	100 - 600 4" - 24"									www.protego.com
	E/KS	50 - 200 2" - 8"									www.protego.com

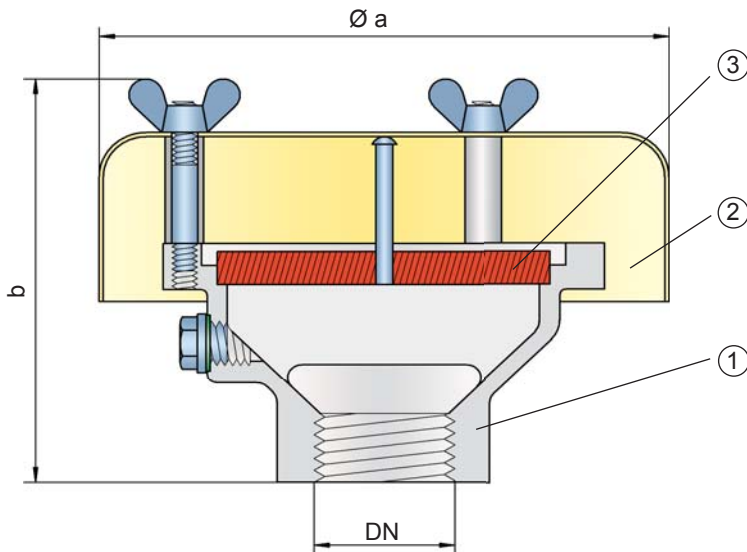


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Deflagration Flame Arrester, End-of-Line

PROTEGO® BE/AD



Function and Description

The PROTEGO® BE/AD end-of-line deflagration flame arrester provides protection against atmospheric deflagrations. The device is typically installed on vent lines of small vessels and plant equipment which is not pressurized. For safe application it is important that an endurance burning situation can be excluded, so typically it is installed on vents lines which discharge vapour for a short time period only. The device prevents flame transmission from atmospheric deflagration into the vessel or plant.

The PROTEGO® BE/AD consists of a housing (1), a weather hood (2) and the PROTEGO® flame arrester unit (3). The device is equipped with a metal weather hood. The FLAMEFILTER® gap size will depend on the devices intended use. Detailing the operating conditions such as the temperature, pressure, explosion group and the composition of the fluid, enables PROTEGO® to select the best end-of-line deflagration flame arrester for your application. The PROTEGO® BE/AD series end-of-line deflagration flame arrester is available for substances from explosion groups IIA to IIC (NEC groups D to B).

The standard design can be used with operating temperature of up to +60°C / 140°F.

Type-approved in accordance with the current ATEX Directive and EN ISO 16852 as well as other international standards.

Special Features and Advantages

- Weather hood provides protection against environmental impact (harsh weather conditions, bird nests, etc.)
- easy maintenance
- quick removal of FLAMEFILTER®
- available with threaded connection
- provides protection against atmospheric deflagration
- low operating and lifecycle cost
- cost effective device
- cost effective spare parts

Design Type and Specification

Deflagration flame arrester, end-of-line, basic design **BE/AD**

Special designs available on request

Table 1: Dimensions

Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages

DN	15 / G ½"	20 / G ¾"	25 / G 1"	32 / G 1¼"	40 / G 1½"	50 / G 2"
a	116 / 4.57	116 / 4.57	116 / 4.57	116 / 4.57	200 / 7.87	200 / 7.87
b	80 / 3.15	80 / 3.15	85 / 3.35	85 / 3.35	150 / 5.91	150 / 5.91

Table 2: Selection of explosion group

MESG	Expl. Gr. (IEC/CEN)	Gas Group (NEC)	Special approvals upon request
≥ 0,65 mm	IIB3	C	
< 0,5 mm	IIC	B	

Table 3: Specification of max. operating temperature

≤ 60°C / 140°F	Tmaximum allowable operating temperature in °C	higher operating temperatures upon request
-	Designation	

Table 4: Material selection

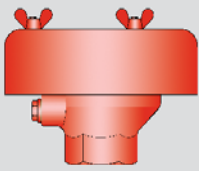
Design	A	B	C	Special materials upon request
Housing	Steel	Stainless Steel	Hastelloy	
Weather hood	Stainless Steel	Stainless Steel	Stainless Steel	
FLAMEFILTER®	Stainless Steel	Stainless Steel	Hastelloy	

Table 5: Type of connection

Pipe thread DIN ISO 228-1	DIN	other types of thread upon request
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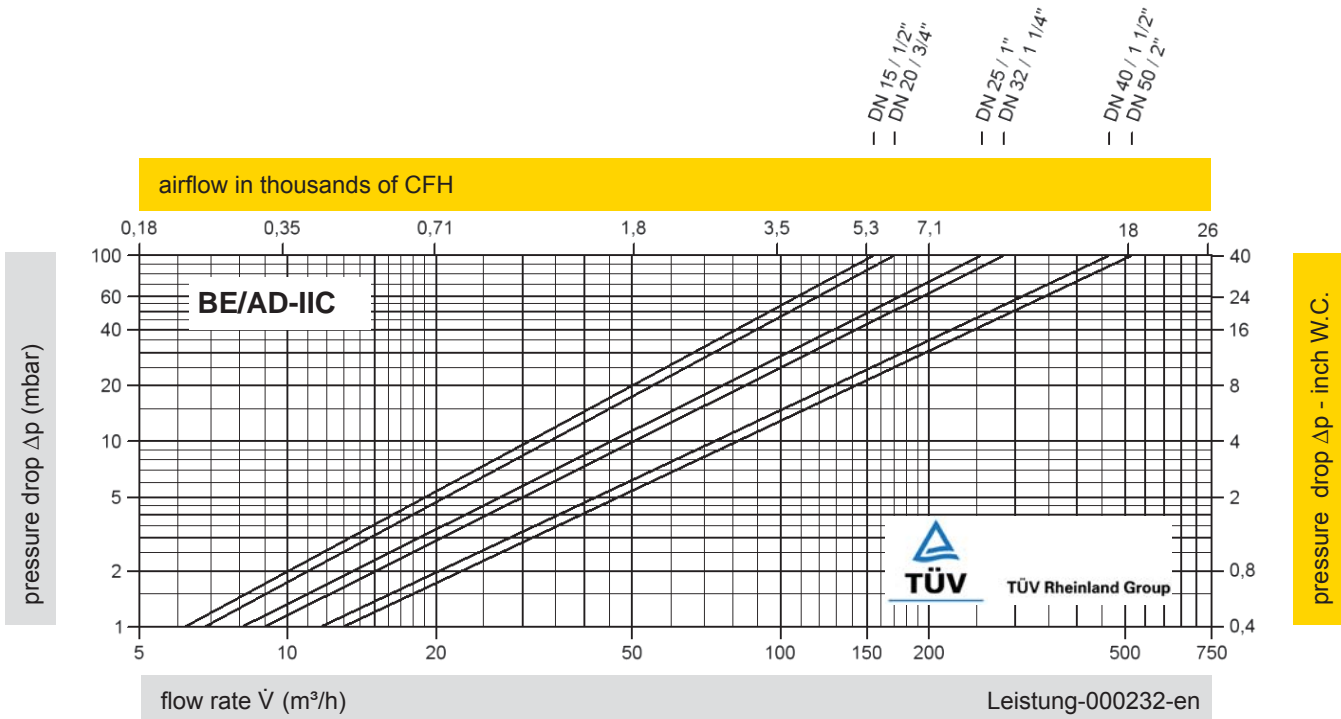
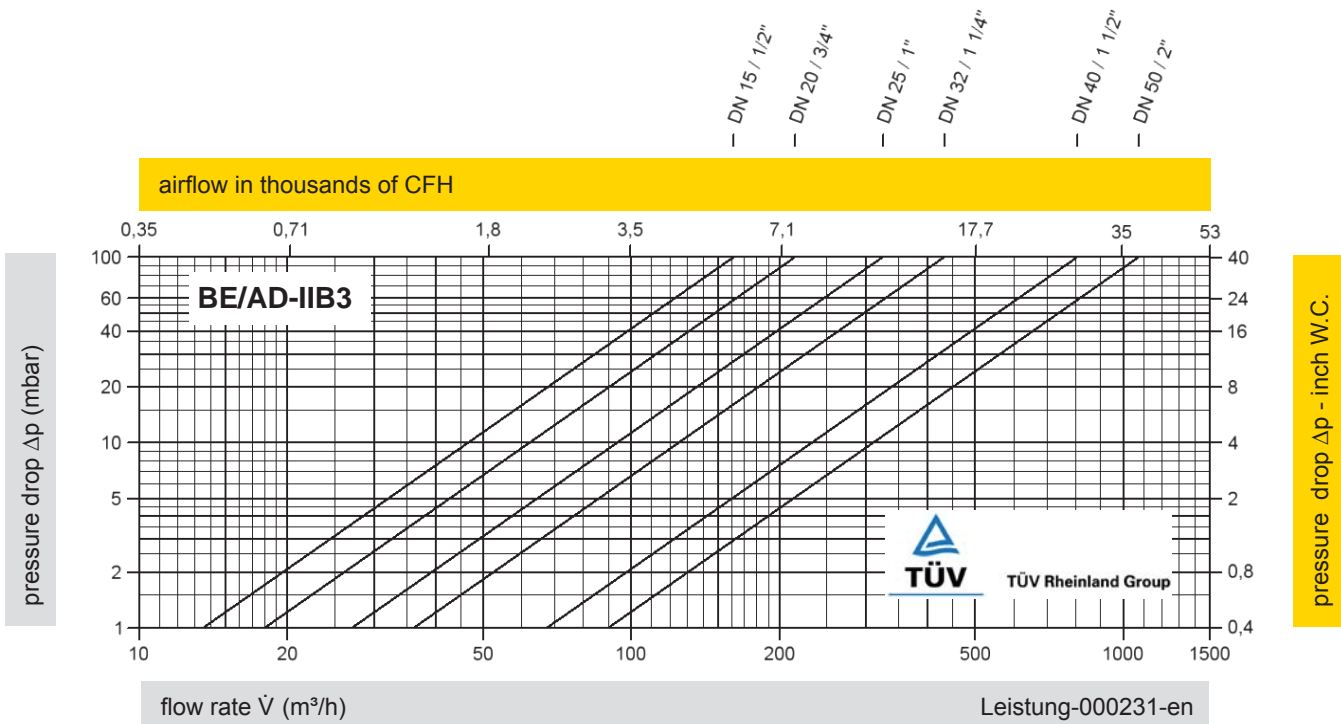
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Deflagration Flame Arrester, End-of-Line

Flow Capacity Charts

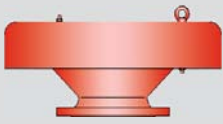
PROTEGO® BE/AD



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

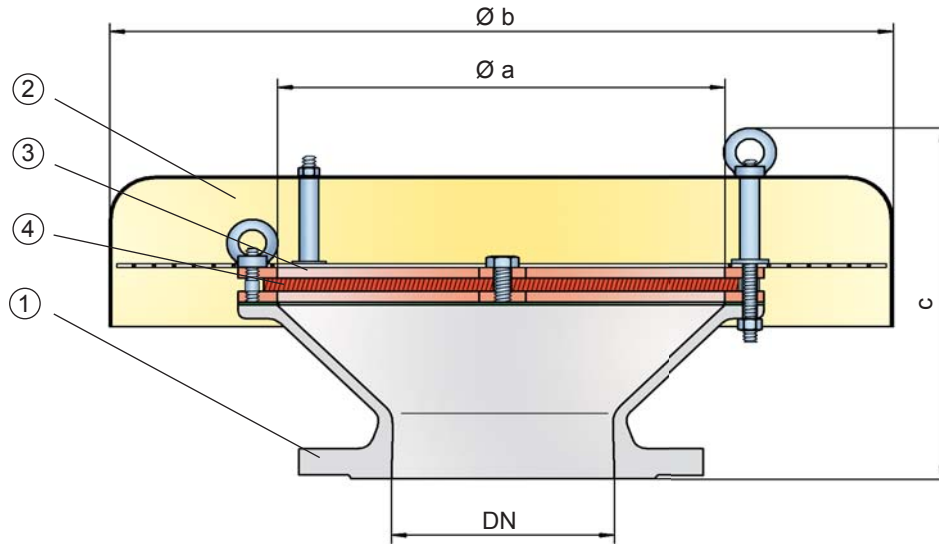
Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air ISO 6358 (20°C, 1bar). Conversion to other densities and temperatures refer to Vol. 1: "Technical Fundamentals".





Deflagration Flame Arrester, End-of-Line

PROTEGO® LH/AD



Function and Description

The PROTEGO® LH/AD end-of-line deflagration flame arrester provides protection against flame transmission through atmospheric deflagration. The device is typically installed on vent lines of vessels and process engineering apparatus which are not pressurized. For safe application it is important that an endurance burning situation can be excluded, so typically it is installed on vent lines which discharge vapour for a short time period only. The device prevents flame transmission from atmospheric deflagration into the vessel or plant.

The PROTEGO® LH/AD consists of a housing (1), a weather hood (2) and the PROTEGO® flame arrester unit (3). The device is equipped with a metal weather hood. A protection screen is installed between the weather hood and the housing to keep animals out. The FLAMEFILTER® (4) gap size will depend on the devices intended use. Detailing the operating conditions such as the temperature, explosion group and the composition of the fluid, enables PROTEGO® to select the best end-of-line deflagration flame arrester for your application. The PROTEGO® LH/AD series end-of-line deflagration flame arrester is available for substances from explosion groups IIA to IIC (NEC groups D to B).

The standard design can be used with operating temperature of up to +60°C / 140°F. Devices with special approval can be obtained for higher temperatures upon request.

Type-approved in accordance with the current ATEX Directive and EN ISO 16852 as well as other international standards.

Special Features and Advantages

- weather hood provides protection against environmental impact (harsh weather conditions, bird nests, etc.)
- available in sizes DN 50 (2") – up to DN 800 (32")
- easy maintenance
- available for elevated operating temperatures
- protection against atmospheric deflagration
- low operating and lifecycle cost
- cost effective device
- cost effective spare parts

Design Type and Specification

End-of-line deflagration flame arrester, basic design **LH/AD**

Special designs available on request

Table 1: Dimensions

Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages

DN	a	b	IIB3	IIC
			c*	c*
50 / 2"	100 / 3.94	200 / 7.87	170 / 6.69	185 / 7.28
80 / 3"	150 / 5.91	240 / 9.45	180 / 7.09	195 / 7.68
100 / 4"	200 / 7.87	295 / 11.61	220 / 8.66	235 / 9.25
125 / 5"	250 / 9.84	350 / 13.78	240 / 9.45	-
150 / 6"	300 / 11.81	550 / 21.65	260 / 10.24	270 / 10.63
200 / 8"	300 / 11.81	550 / 21.65	260 / 10.24	270 / 10.63
250 / 10"	400 / 15.75	600 / 23.62	355 / 13.98	365 / 14.37
300 / 12"	400 / 15.75	600 / 23.62	340 / 13.39	350 / 13.78
350 / 14"	600 / 23.62	800 / 31.50	390 / 15.35	400 / 15.75
400 / 16"	600 / 23.62	800 / 31.50	380 / 14.96	390 / 15.35
500 / 20"	700 / 27.56	1000 / 39.37	400 / 15.75	410 / 16.14
600 / 24"	800 / 31.50	1200 / 47.24	475 / 18.70	485 / 19.09
700 / 28"	1000 / 39.37	1400 / 55.12	505 / 19.88	515 / 20.28
800 / 32"	1200 / 47.24	1600 / 62.99	550 / 21.65	560 / 22.05

* c are reference values. Exact measures depend on the flange connection.

Table 2: Selection of explosion group

MESG	Expl. Gr. (IEC/CEN)	Gas Group (NEC)	Special approvals upon request
≥ 0,65 mm	IIB3	C	
< 0,5 mm	IIC	B	

Table 3: Specification of max. operating temperature

≤ 60°C / 140°F	Tmaximum allowable operating temperature in °C	higher operating temperatures upon request
-	Designation	

Table 4: Material selection for housing

Design	A	B	Special materials upon request
Housing	Steel	Stainless Steel	
Weather hood	Stainless Steel	Stainless Steel	
Protection screen	Stainless Steel	Stainless Steel	
Flame arrester unit	A, B	B	

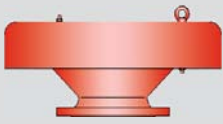
Table 5: Material combinations of flame arrester unit

Design	A	B	Special materials upon request
FLAMEFILTER® cage	Steel	Stainless Steel	
FLAMEFILTER®	Stainless Steel	Stainless Steel	

Table 6: Flange connection type

EN 1092-1; Form B1	other types upon request
ASME B16.5; 150 lbs RFSS	

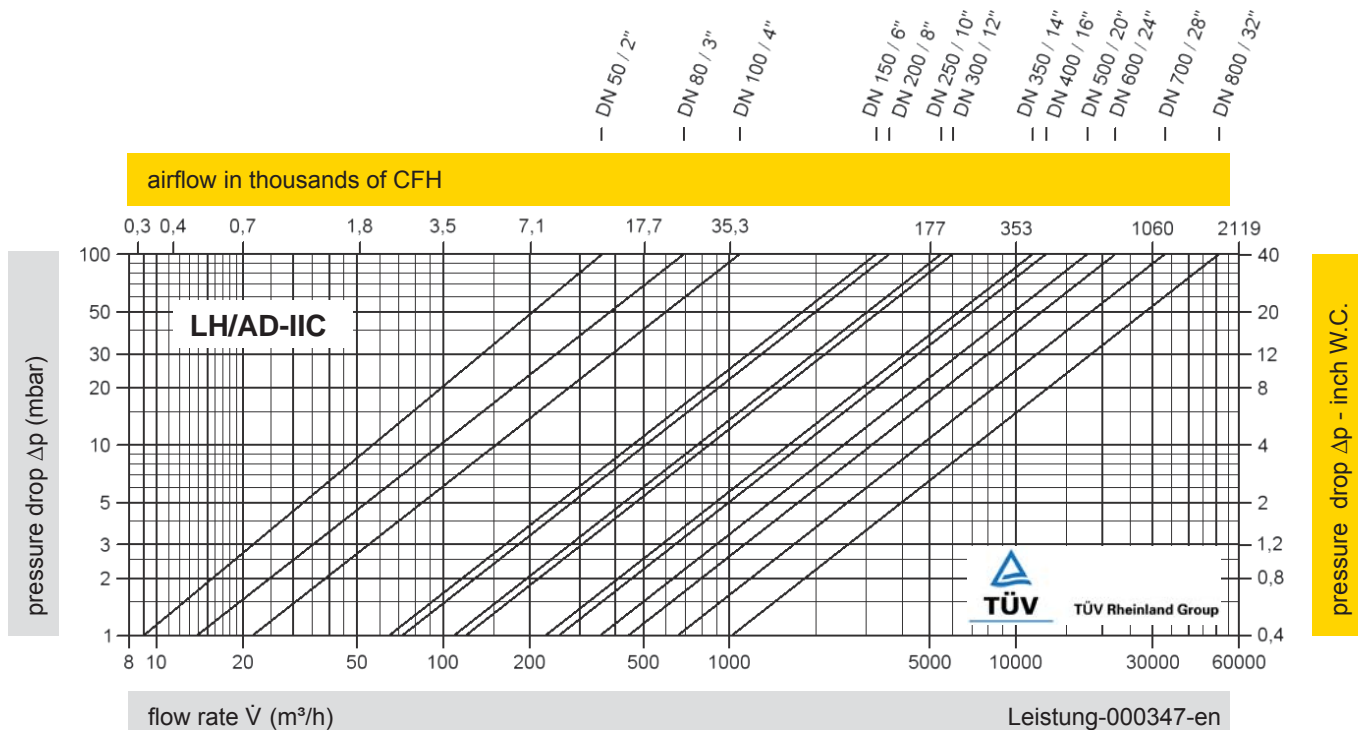
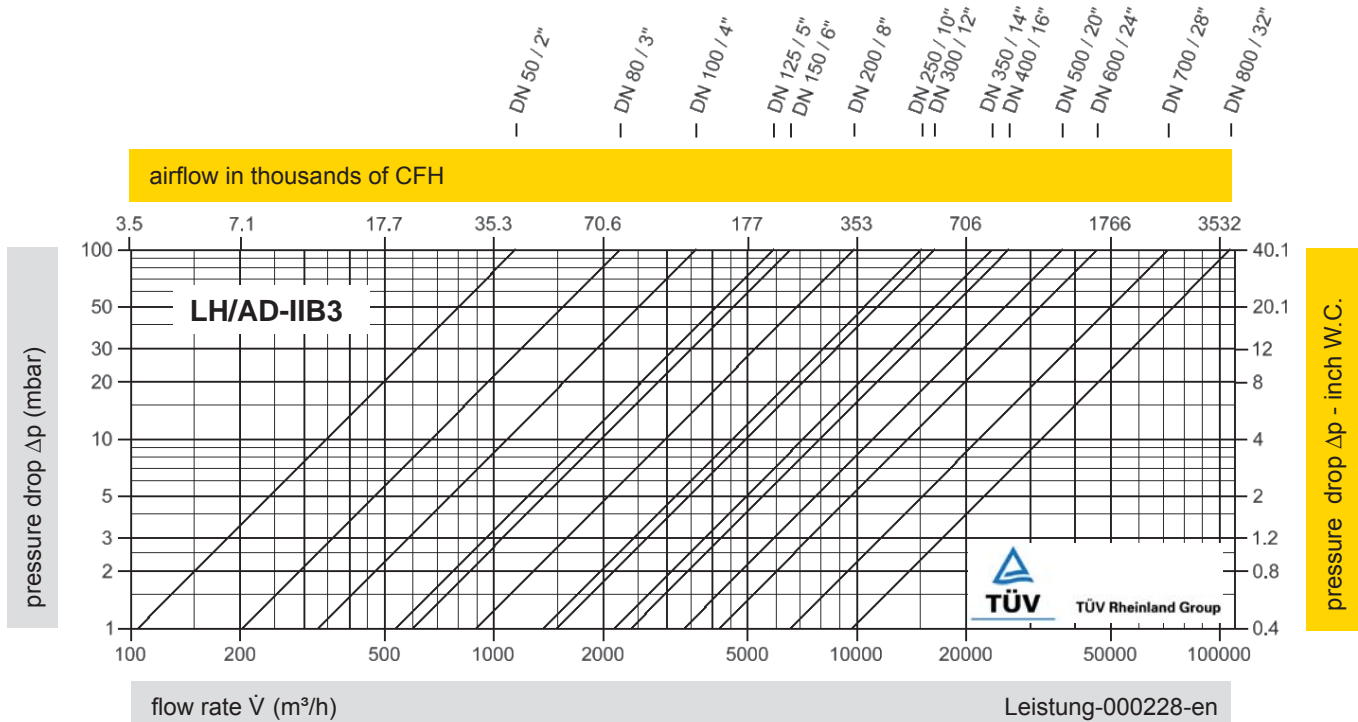




Deflagration Flame Arrester, End-of-Line

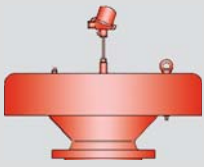
Flow Capacity Charts

PROTEGO® LH/AD



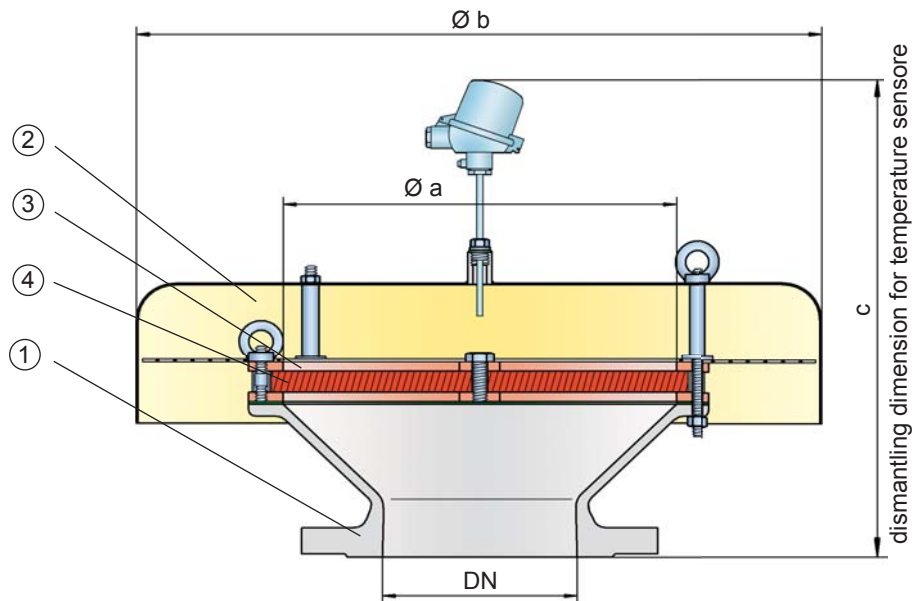
The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.
Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air ISO 6358 (20°C, 1bar).
Conversion to other densities and temperatures refer to Vol. 1: "Technical Fundamentals".





Deflagration Flame Arrester, short time burning-proof, End-of-Line

PROTEGO® LH/AD-T



Function and Description

The PROTEGO® LH/AD-T end-of-line deflagration flame arrester provides protection against flame transmission through atmospheric deflagration and short time burning on the flame arrester element. The device is typically installed on vent lines of vessels and process engineering apparatus which are not pressurized. The device is equipped with a temperature sensor which immediately detects a flame on the FLAMEFILTER® surface. After the flame is detected, a secondary measure, such as inerting or closing of a shut-off valve to block the vapour flow to the device, should activate within 60 seconds and extinguish the flame, so that the plant can operate safely. The device prevents flame transmission from short time burning and atmospheric deflagration into the vessel or plant.

The PROTEGO® LH/AD-T consists of a housing (1), a weather hood (2) and the PROTEGO® flame arrester unit (3). The device is equipped with a metal weather hood. The FLAMEFILTER® (4) gap size depends on the devices intended use. Detailing the operating conditions such as the temperature, explosion group and the composition of the fluid, enables PROTEGO® to select the best end-of-line deflagration flame arrester for your application. The PROTEGO® LH/AD series end-of-line deflagration flame arrester is available for substances from explosion groups IIA to IIC (NEC groups D to B).

The standard design can be used with operating temperature of up to +60°C / 140°F. Devices with special approval can be obtained for higher temperatures upon request.

Type-approved in accordance with the current ATEX Directive and EN ISO 16852 as well as other international standards.

Special Features and Advantages

- weather hood provides protection against environmental impact (harsh weather conditions, bird nests, etc.)
- available in sizes DN 50 (2") – up to DN 800 (32")
- easy maintenance
- available for elevated operating temperatures
- protection against short time burning and atmospheric deflagration
- low operating and lifecycle cost
- cost effective device
- cost effective spare parts

Design Type and Specification

End-of-line deflagration flame arrester, basic design **LH/AD-T**

Special designs available on request

Table 1: Dimensions

Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages

DN	a	b	IIB3	IIC
			c*	c*
50 / 2"	100 / 3.94	240 / 9.45	530 / 20.87	550 / 21.65
80 / 3"	150 / 5.91	295 / 11.61	560 / 22.05	580 / 22.83
100 / 4"	200 / 7.87	350 / 13.78	585 / 23.03	605 / 23.82
150 / 6"	300 / 11.81	600 / 23.62	630 / 24.80	655 / 25.79
200 / 8"	300 / 11.81	600 / 23.62	630 / 24.80	655 / 25.79
250 / 10"	400 / 15.75	800 / 31.50	750 / 29.53	770 / 30.31
300 / 12"	400 / 15.75	800 / 31.50	740 / 29.13	760 / 29.92
350 / 14"	600 / 23.62	1000 / 39.37	800 / 31.50	820 / 32.28
400 / 16"	600 / 23.62	1000 / 39.37	790 / 31.10	815 / 32.09
500 / 20"	700 / 27.56	1200 / 47.24	810 / 31.89	835 / 32.87
600 / 24"	800 / 31.50	1200 / 47.24	935 / 36.81	960 / 37.80
700 / 28"	1000 / 39.37	1500 / 59.06	975 / 38.39	995 / 39.17
800 / 32"	1200 / 47.24	1700 / 66.93	1015 / 39.96	1035 / 40.75

* c are reference values. Exact measures depend on the flange connection.

Table 2: Selection of explosion group

MESG	Expl. Gr. (IEC/CEN)	Gas Group (NEC)	Special approvals upon request
≥ 0,65 mm	IIB3	C	
< 0,5 mm	IIC	B	

Table 3: Specification of max. operating temperature

≤ 60°C / 140°F	Tmaximum allowable operating temperature in °C	higher operating temperatures upon request
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Table 4: Material selection for housing

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Flame arrester unit	A, B	B	

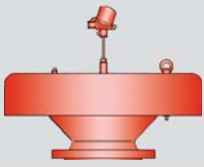
Table 5: Material combinations of flame arrester unit

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EN 1092-1; Form B1	other types upon request
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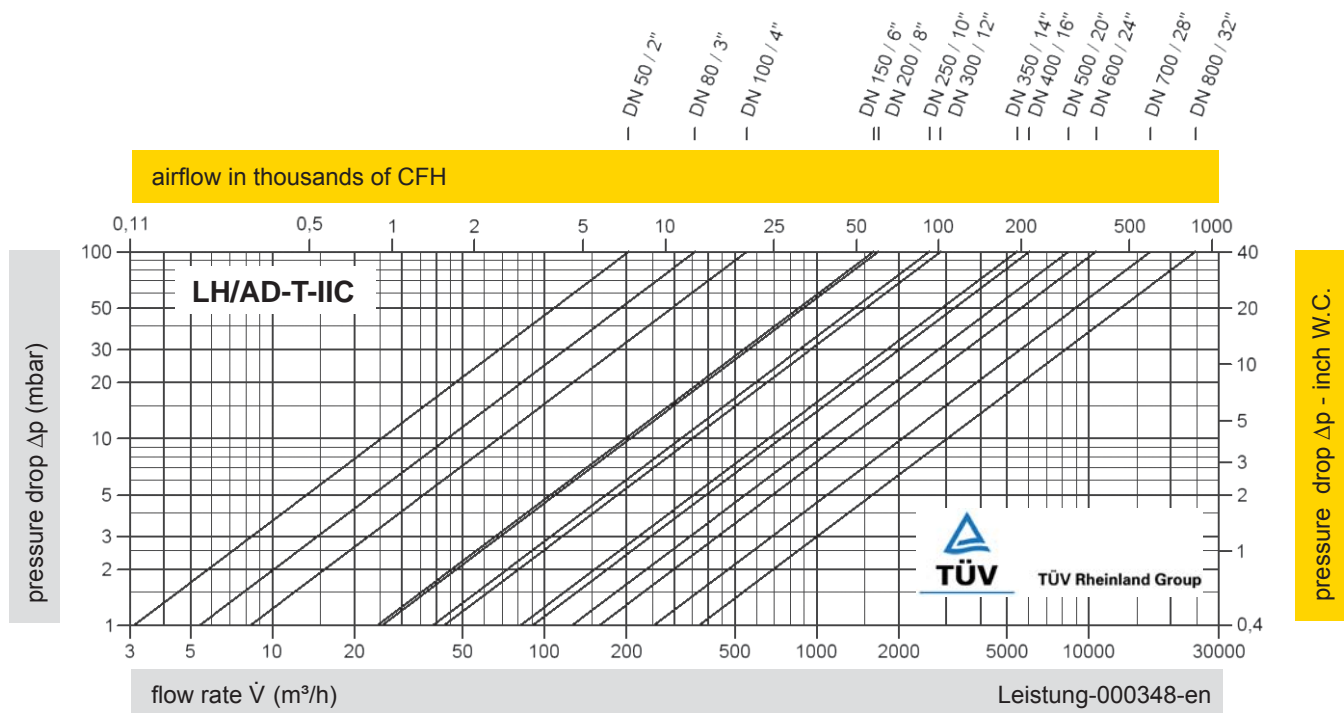
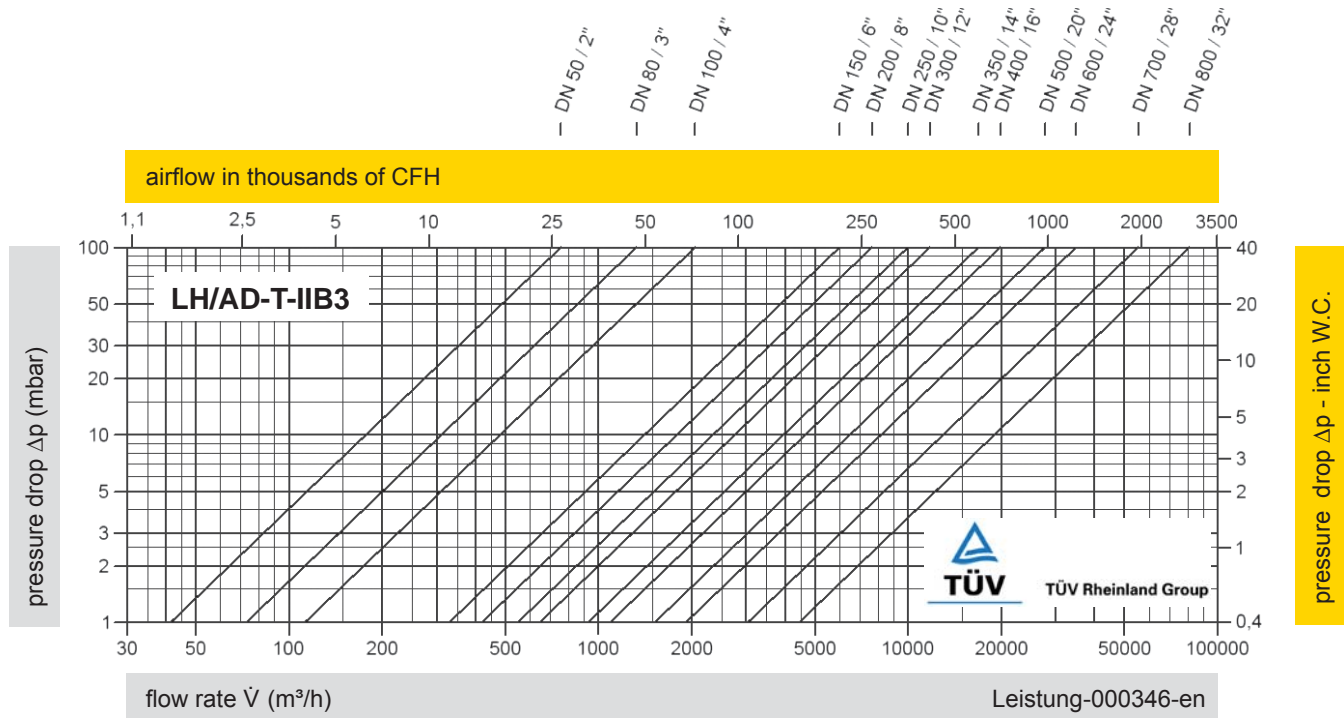




Deflagration Flame Arrester, short time burning-proof, End-of-Line

Flow Capacity Charts

PROTEGO® LH/AD-T



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.
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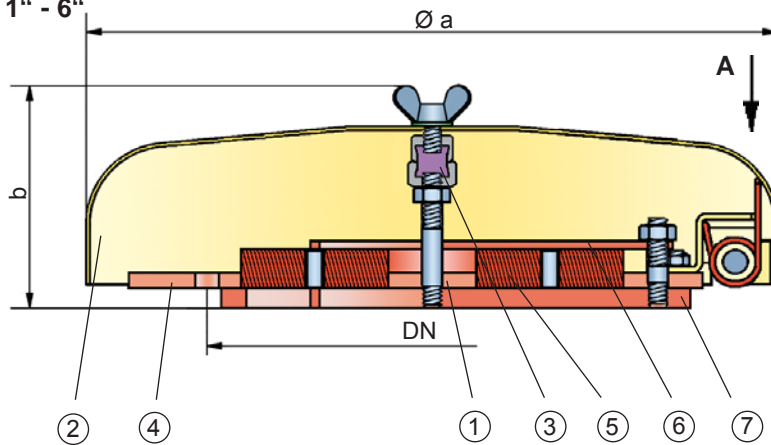




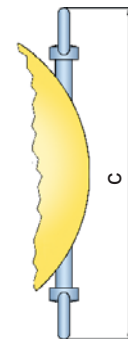
Deflagration Flame Arrester, endurance burning proof, End-of-Line

PROTEGO® EB-IIA and IIB

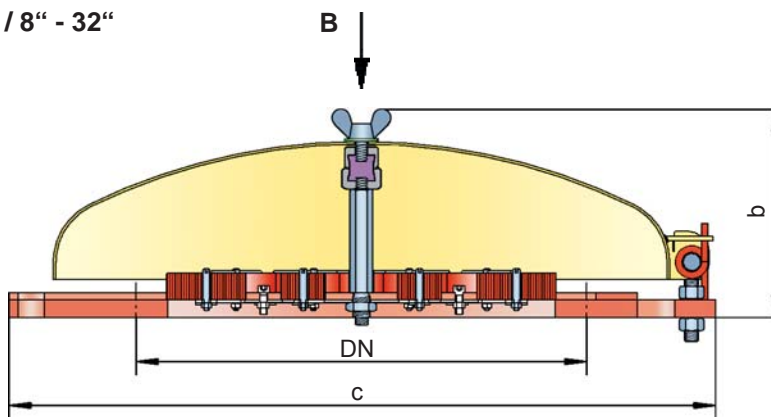
DN 25 - 150 / 1" - 6"



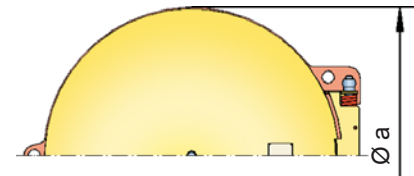
View A



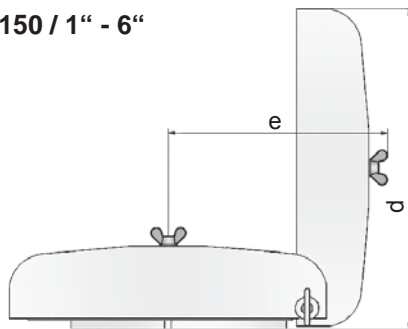
DN 200 - 800 / 8" - 32"



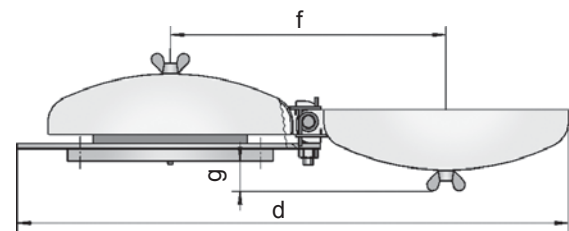
View B



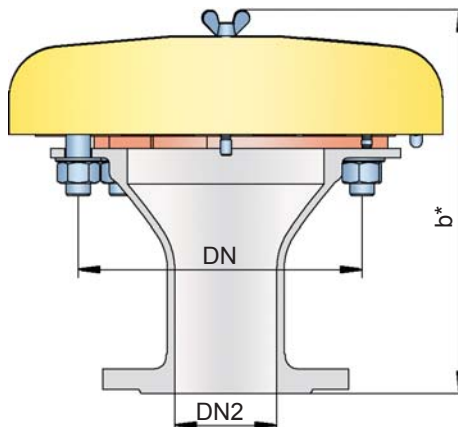
DN 25 - 150 / 1" - 6"



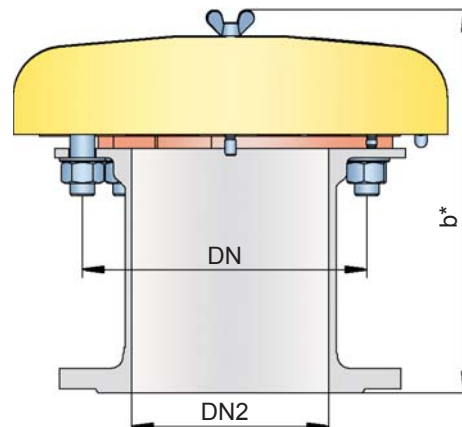
DN 200 - 800 / 8" - 32"



EB with cone (example)



EB with nozzle (example)



Function and Description

The PROTEGO® EB end-of-line deflagration flame arrester has been successfully used to protect vessels and plants which are not pressurized. The device provides protection against atmospheric deflagration and stabilized flames which can burn for very long time on the flame arrester element surface, so called endurance burning. Main application area is on suction and vent lines, with the goal to prevent flame transmission caused by endurance burning or atmospheric deflagration from propagating into the vessel or plant.

The PROTEGO® EB-IIA consists of the PROTEGO® flame arrester unit (1) and the metal weather hood (2). During normal operation the metal weather hood is in a closed position. If a stabilized flame burns on the flame arrester element surface, the fusible link (3), located in a center position, will melt and let the spring loaded weather hood move into the open position. The PROTEGO® flame arrester unit consists of one or more FLAMEFILTER® (5), which are installed in a FLAMEFILTER® cage (4), a intersecting ribs (6) and a spider ring (7). The FLAMEFILTER® gap size, the height and the quantity depend on the devices intended use.

The PROTEGO® EB series end-of-line deflagration flame arrester is available for substances from explosion group IIA and IIB (NEC group D and B).

The standard design can be used with operating temperature of up to +60°C / 140°F. Devices with special approval can be obtained for higher temperatures upon request.

Type-approved in accordance with the current ATEX Directive and EN ISO 16852 as well as other international standards.

Special Features and Advantages

- weather hood protects against environmental impact (i.e. weather, bird nests, etc.)
- weather hood will open and signal the impact of a flame
- protection against atmospheric deflagration and endurance burning of pure hydrocarbons
- fusible link is resistant against chemicals
- modular design allows replacement of single FLAMEFILTER®
- easy maintenance without disassembling of the FLAMEFILTER®
- modular design results in low spare part costs

Design Types and Specifications

End-of-line deflagration flame arrester, basic design	EB
End-of-line deflagration flame arrester, with cone	EB - DN/DN2
End-of-line deflagration flame arrester, with cone and heating jacket	EB - H - DN/DN2
Special designs available on request	

Table 1: Dimensions DN 25 - 150 / 1" - 6"
EB-IIA and EB-IIB

Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity chart on the following page

DN	25 / 1"	32 / 1¼"	40 / 1½"	50 / 2"	65 / 2½"	80 / 3"	100 / 4"	125 / 5"	150 / 6"
a	218 / 8.58	218 / 8.58	218 / 8.58	218 / 8.58	218 / 8.58	353 / 13.90	353 / 13.90	353 / 13.90	353 / 13.90
b	113 / 4.45	113 / 4.45	113 / 4.45	113 / 4.45	113 / 4.45	113 / 4.45	113 / 4.45	113 / 4.45	113 / 4.45
c	232 / 9.13	232 / 9.13	232 / 9.13	232 / 9.13	232 / 9.13	306 / 12.05	306 / 12.05	306 / 12.05	306 / 12.05
d	222 / 8.74	222 / 8.74	222 / 8.74	222 / 8.74	222 / 8.74	355 / 13.98	355 / 13.98	355 / 13.98	355 / 13.98
e	217 / 8.54	217 / 8.54	217 / 8.54	217 / 8.54	217 / 8.54	322 / 12.68	322 / 12.68	322 / 12.68	322 / 12.68

EB-IIA und IIB with cone/nozzle**

DN				50 / 2"		80 / 3"	100 / 4"		150 / 6"
DN2				≤ 50 / 2"		≤ 80 / 3"	≤ 100 / 4"		≤ 150 / 6"
b*				238 / 9.37		263 / 10.35	383 / 15.08		313 / 12.32

Dimensions DN 200 - 800 / 8" - 32"
EB-IIA

DN	200 / 8"	300 / 12"	400 / 16"	500 / 20"	600 / 24"	800 / 32"
a	405 / 15.94	555 / 21.85	705 / 27.75	855 / 33.66	1005 / 39.57	1210 / 47.64
b	177 / 6.97	206 / 8.11	235 / 9.25	265 / 10.43	294 / 11.57	330 / 12.99
c	496 / 19.53	650 / 25.59	802 / 31.57	987 / 38.86	1137 / 44.76	1336 / 52.60
d	900 / 35.43	1200 / 47.24	1500 / 59.06	1820 / 71.65	2120 / 83.46	2525 / 99.41
f	450 / 17.72	600 / 23.62	750 / 29.53	920 / 36.22	1070 / 42.13	1270 / 50.00
g	51 / 2.01	80 / 3.15	109 / 4.29	138 / 5.43	167 / 6.57	204 / 8.03

EB-IIA with cone/nozzle**

DN	200 / 8"	300 / 12"	400 / 16"	500 / 20"	600 / 24"	800 / 32"
DN2	≤ 200 / 8"	≤ 300 / 12"	≤ 400 / 16"	≤ 500 / 20"	≤ 600 / 24"	≤ 800 / 32"
b*	401 / 15.94	456 / 17.95	535 / 21.06	614 / 24.17	693 / 27.28	830 / 32.68

** combinations (DN/DN2) please use the table on the following page





PROTEGO® EB-IIA and IIB

Table 2: Combination (DN/DN2) for EB with cone

Remarks: Flow capacity charts for EB-DN/DN2-IIA/IIB with cone upon request

DN	50/2"	80/3"	100/4"	150/6"	200/8"	300/12"	400/16"	500/20"	600/24"	800/32"
DN2										
20/¾"	IIA/IIB	IIA/IIB	IIA/IIB	IIA/IIB						
25/1"	IIA/IIB	IIA/IIB	IIA/IIB	IIA/IIB						
32/1¼"	IIA/IIB	IIA/IIB	IIA/IIB	IIA/IIB						
40/1½"	IIA/IIB	IIA/IIB	IIA/IIB	IIA/IIB						
50/2"	IIA/IIB	IIA/IIB	IIA/IIB	IIA/IIB	IIA					
65/2½"		IIA/IIB	IIA/IIB	IIA/IIB						
80/3"		IIA/ IIB	IIA/ IIB	IIA/ IIB	IIA	IIA				
100/4"			IIA/ IIB	IIA/ IIB	IIA	IIA				
125/5"				IIA/ IIB	IIA					
150/6"				IIA/ IIB	IIA	IIA	IIA			
200/8"					IIA	IIA	IIA	IIA	IIA	
250/10"						IIA	IIA	IIA		
300/12"							IIA	IIA	IIA	
350/14"								IIA	IIA	
400/16"								IIA	IIA	IIA
450/18"								IIA	IIA	IIA
500/20"									IIA	IIA
600/24"										IIA
700/28"										IIA

Table 3: Selection of explosion group

MESG	Expl. Gr. (IEC/CEN)	Gas Group (NEC)	Special approvals upon request
> 0,90 mm	IIA	D	
≥ 0,50 mm	IIB	B	

Table 4: Specification of max. operating temperature

≤ 60°C / 140°F	Tmaximum allowable operating temperature in °C	higher operating temperatures upon request
-	Designation	

Table 5: Material selection for housing

Design	A	B	Special materials upon request
flange ring	Steel	Stainless Steel	
Weather hood	Steel	Stainless Steel	
cone/nozzle	Steel	Stainless Steel	
Flame arrester unit	A, B, C	B, C	

Table 6: Material combinations of flame arrester unit

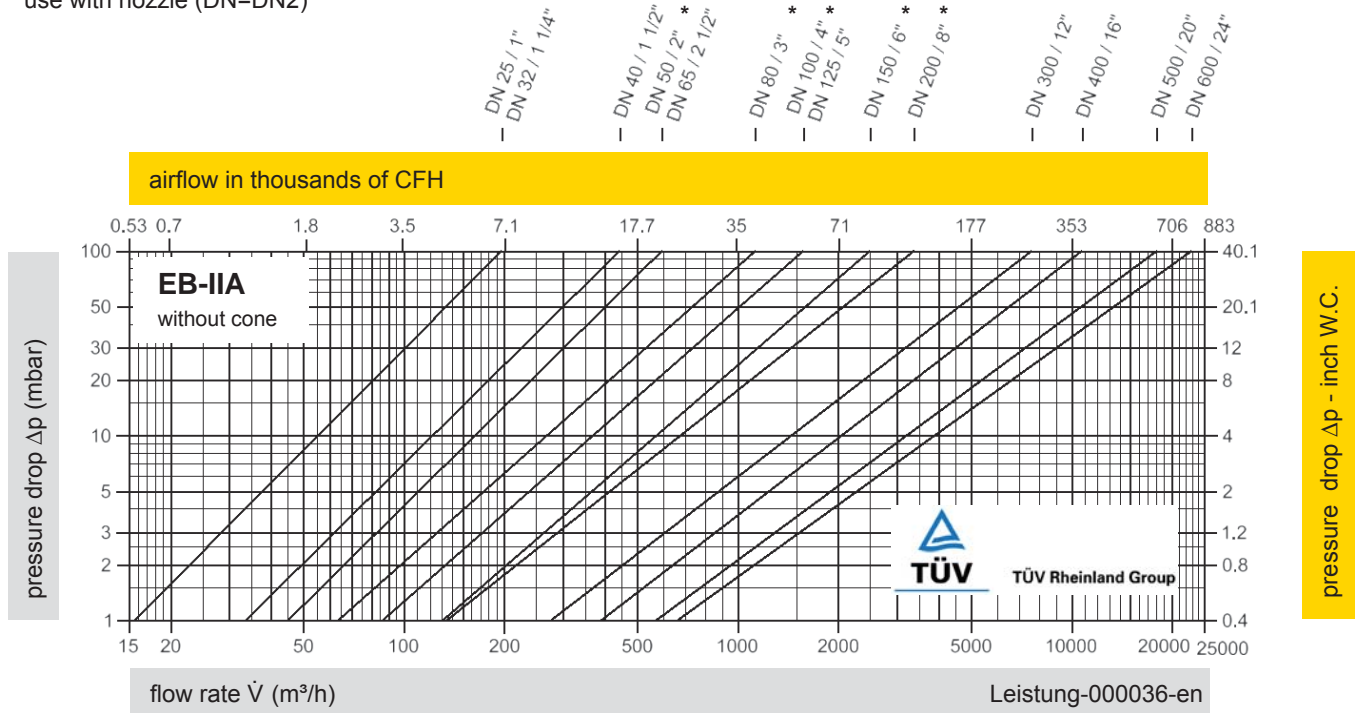
Design	A	B	C	Special materials upon request
FLAMEFILTER® cage	Steel	Stainless Steel	Stainless Steel/Hastelloy	
FLAMEFILTER®	Stainless Steel	Stainless Steel	Hastelloy	
Spider ring/safety bar	Stainless Steel	Stainless Steel	Stainless Steel/Hastelloy	

Table 7: Flange connection type

EN 1092-1 (without cone); EN 1092-1; Form B1 (with cone/nozzle)	other types upon request
ASME B16.5 (without cone); ASME B16.5; 150 lbs RFSF (with cone/nozzle)	

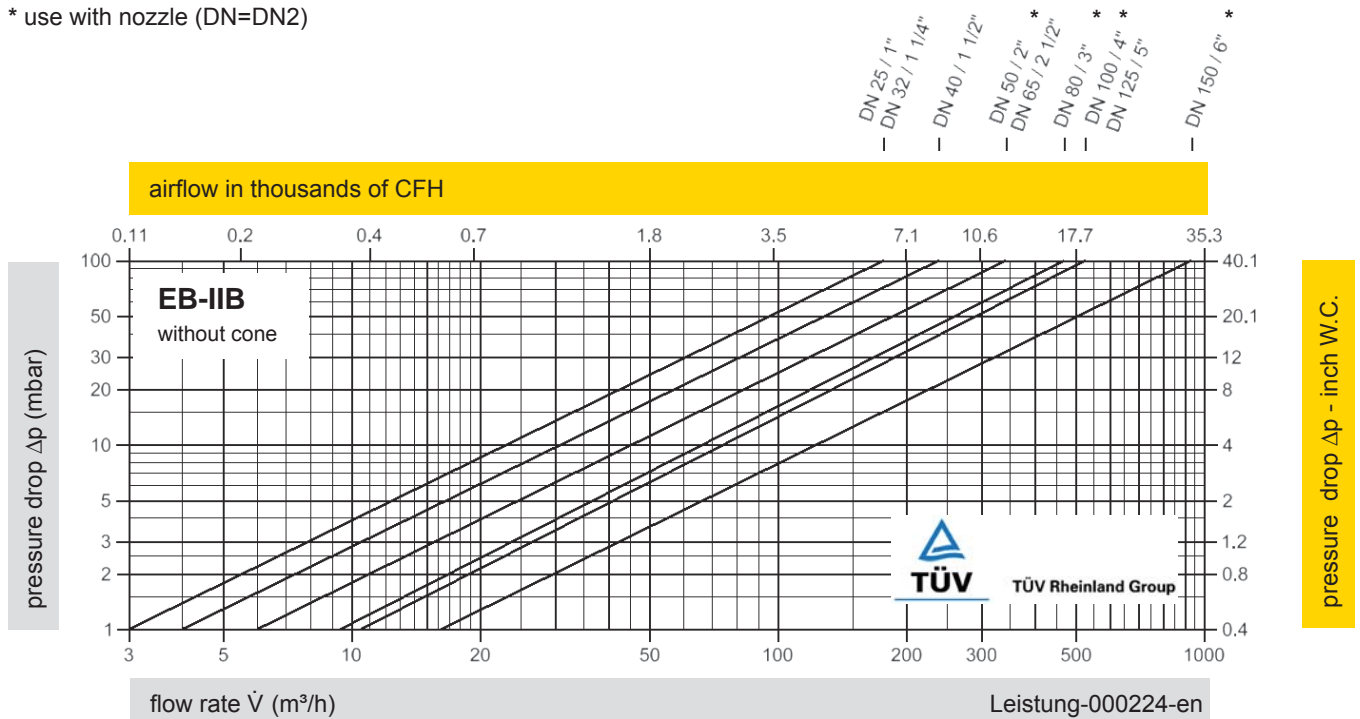
PROTEGO® EB-IIA and IIB without cone

* use with nozzle (DN=DN2)



Remark: Flow capacity charts for EB-DN/DN2-IIA/IIB with cone upon request

* use with nozzle (DN=DN2)



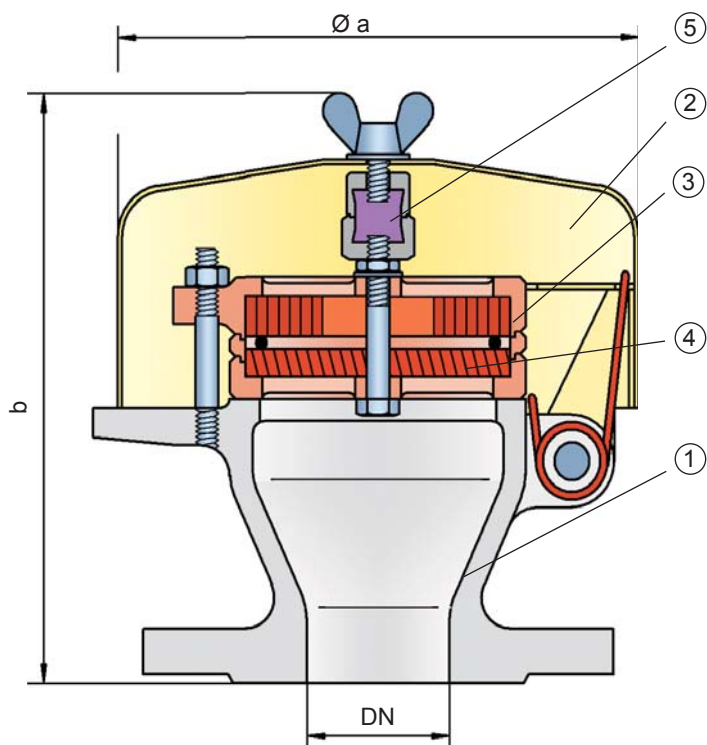
The flow capacity chart has been determined with a calibrated and TÜV certified flow capacity test rig.
Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air ISO 6358 (20°C, 1bar).
Conversion to other densities and temperatures refer to Vol. 1: "Technical Fundamentals".





Deflagration Flame Arrester, endurance burning proof, End-of-Line

PROTEGO® BE/HK-E



the spring loaded weather hood move into the open position. The PROTEGO® flame arrester unit consists of two FLAMEFILTER® discs (4), which are installed in a FLAMEFILTER® cage. The PROTEGO® BE/HK-E end-of-line deflagration flame arrester is available for alcohols and other substances with MESG $\geq 0,85\text{mm}$.

The standard design can be used for operating temperatures up to $+60^\circ\text{C} / 140^\circ\text{F}$.

Type-approved in accordance with the current ATEX Directive and EN ISO 16852 as well as other international standards.

① Special Features and Advantages

- endurance burning protection for alcohols and hydrocarbons with MESG $\geq 0,85\text{mm}$.
- weather hood protects against environmental impact (i.e. weather, bird nests, etc.)
- weather hood will open and signal the impact of a flame
- fusible link is resistant against chemicals
- modular design allows replacement of single FLAMEFILTER®
- easy maintenance
- protection against atmospheric deflagration and endurance burning
- modular design results in low spare part cost

Function and Description

The PROTEGO® BE/HK-E end-of-line deflagration flame arrester was specifically developed for vessels which are not pressurized and store Ethanol or other alcohols. The combustion of alcohol requires a modified flame arrester element design to provide protection against endurance burning. In addition, the device provides protection against atmospheric deflagration. Main application area is on in - and outbreathing and vent lines, with the goal to prevent flame transmission caused by endurance burning or atmospheric deflagration from propagating into the vessel or plant.

The PROTEGO® BE/HK-E consists of a housing (1), a weather hood (2) and the PROTEGO® flame arrester unit (3). During normal operation the metal weather hood is in a closed position. If a stabilized flame burns on the flame arrester element surface, the fusible link (5), located in a center position, will melt and let

Design Types and Specifications

There are two different designs:

End-of-line deflagration flame arrester, basic design **BE/HK-E - ☐**

End-of-line deflagration flame arrester with heating jacket **BE/HK-E - ☒**

Special designs available on request

Table 1: Dimensions

Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages

DN	20 / ¾"	25 / 1"	32 / 1¼"	40 / 1½"	50 / 2"	65 / 2½"	80 / 3"
a	163 / 6.42	163 / 6.42	163 / 6.42	183 / 7.20	183 / 7.20	218 / 8.58	218 / 8.58
b	180 / 7.09	177 / 6.97	177 / 6.97	190 / 7.48	190 / 7.48	200 / 7.87	200 / 7.87

Dimensions for deflagration flame arrester with heating jacket upon request

Table 2: Selection of explosion group

MESG	Expl. Gr. (IEC/CEN)	Gas Group (NEC)	Special approvals upon request
≥ 0,85 mm	IIB1	–	

Table 3: Material selection for housing

Design	B	C	Special materials upon request
Housing	Steel	Stainless Steel	
Weather hood	Steel	Stainless Steel	
Flame arrester unit	A	A, B	

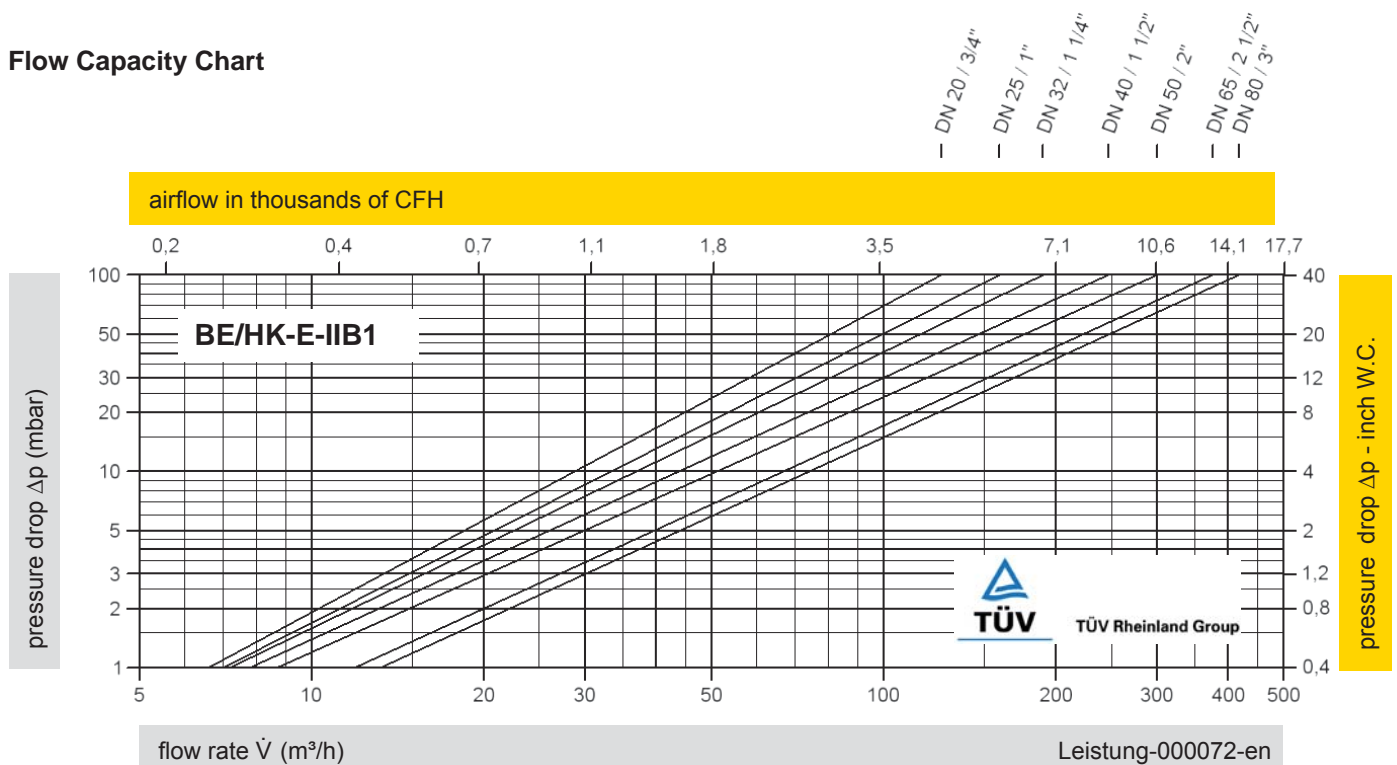
Table 4: Material combinations of flame arrester unit

Design	A	B	Special materials upon request
FLAMEFILTER® cage	Stainless Steel	Stainless Steel	
FLAMEFILTER®	Stainless Steel	Hastelloy	
Spacer	Stainless Steel	Hastelloy	

Table 5: Flange connection type

EN 1092-1; Form B1	other types upon request
ASME B16.5; 150 lbs RFSS	

Flow Capacity Chart



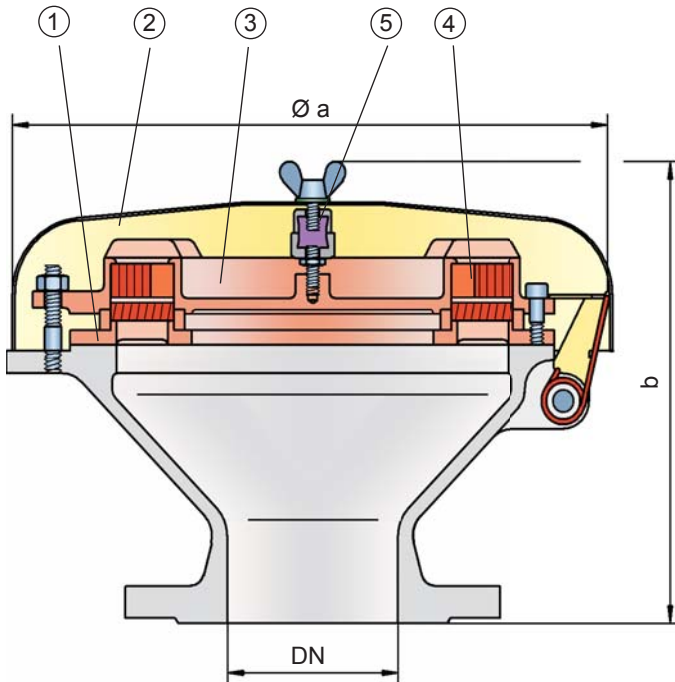
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Deflagration Flame Arrester, endurance burning proof, End-of-Line

PROTEGO® BE/HR-E



The PROTEGO® BE/HR-E end-of-line deflagration flame arrester is available for alcohols and other substances with a MESG $\geq 0,85$ mm.

The standard design can be used for operating temperatures up to $+60^{\circ}\text{C}$ / 140°F .

Type-approved in accordance with the current ATEX Directive and EN ISO 16852 as well as other international standards.

Special Features and Advantages

- endurance burning protection for alcohols and hydrocarbons with a MESG $\geq 0,85$ mm
- weather hood protects against environmental impact (i.e. weather, bird nests, etc.)
- weather hood opens and signals the impact of a flame
- fusible link is resistant against chemicals
- modular design allows replacement of single FLAMEFILTER®
- protection against atmospheric deflagration and endurance burning
- modular design results in low spare part cost

Design Types and Specifications

There are two different designs:

End-of-line deflagration flame arrester, basic design **BE/HR - E - ☐**

End-of-line deflagration flame arrester with heating jacket **BE/HR - E - ☒**

Special designs available on request

Function and Description

The PROTEGO® BE/HR-E end-of-line deflagration flame arrester was specifically developed for vessels which are not pressurized and store Ethanol or other alcohols with a MESG $\geq 0,85$ mm. The combustion of alcohol requires a modified flame arrester element design to provide protection against endurance burning. In addition, the device provides protection against atmospheric deflagration. Main application area is on suction and vent lines, with the goal to prevent flame transmission caused by endurance burning or atmospheric deflagration from propagating into the vessel or plant.

The PROTEGO® BE/HR-E consists of a housing (1), a weather hood (2) and the PROTEGO® flame arrester unit (3). During normal operation, the metal weather hood is in a closed position. If a flame burns on the flame arrester element surface, the fusible link (5), located in a center position, will melt and let the spring loaded weather hood move into the open position. The PROTEGO® flame arrester unit consists of two FLAMEFILTER® discs (4), which are installed in a FLAMEFILTER® cage.

Table 1: Dimensions

Dimensions in mm / inches

To select the nominal size (DN), please use the flow capacity charts on the following pages

DN	80 / 3"	100 / 4"	Dimensions for deflagration flame arrester with heating jacket upon request
a	353 / 13.90	353 / 13.90	
b	250 / 9.84	250 / 9.84	

Table 2: Selection of explosion group

MESG	Expl. Gr. (IEC/CEN)	Gas Group (NEC)	Special approvals upon request
≥ 0,85 mm	IIB1	–	

Table 3: Material selection for housing

Design	B	C	Special materials upon request
Housing	Steel	Stainless Steel	
Weather hood	Steel	Stainless Steel	
Flame arrester unit	A	A, B	

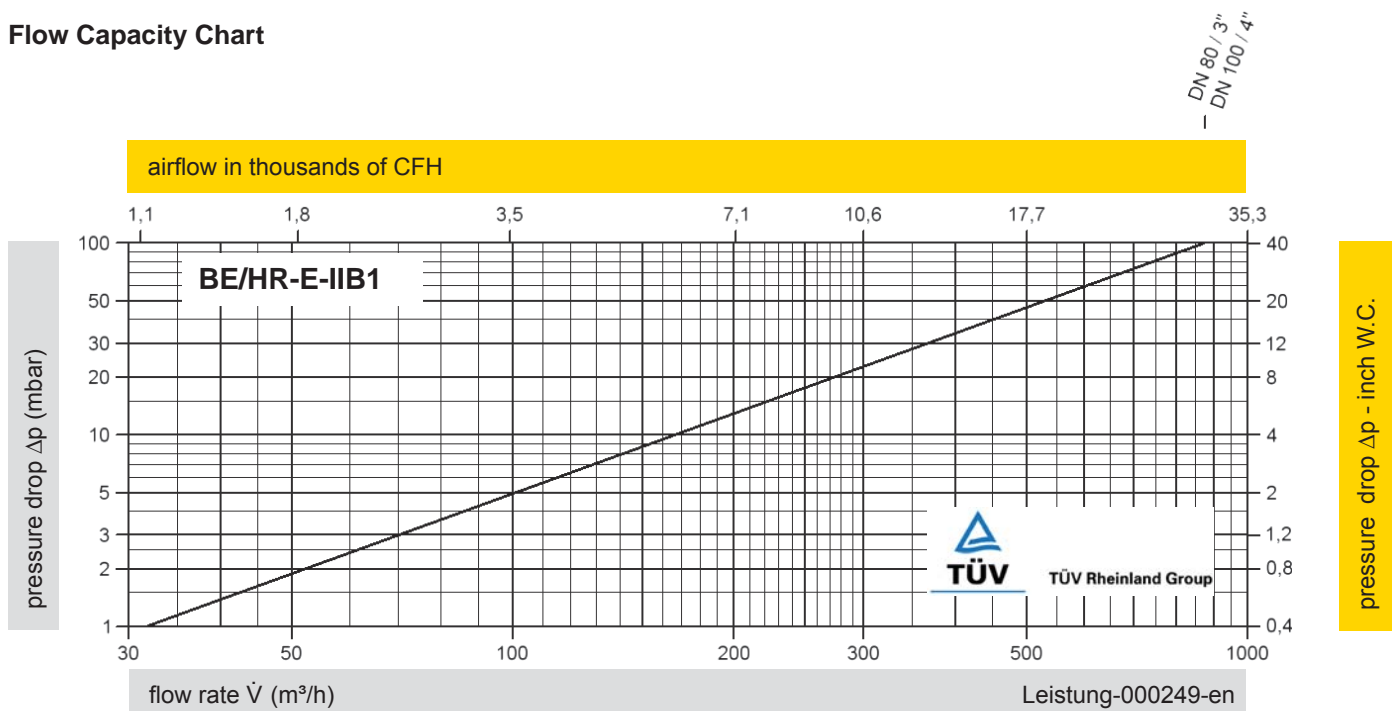
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Table 5: Flange connection type

EN 1092-1; Form B1	other types upon request
ASME B16.5; 150 lbs RFSP	

Flow Capacity Chart



The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig. Volume flow \dot{V} in (m³/h) and CFH refer to the standard reference conditions of air ISO 6358 (20°C, 1bar). Conversion to other densities and temperatures refer to Vol. 1: "Technical Fundamentals".



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