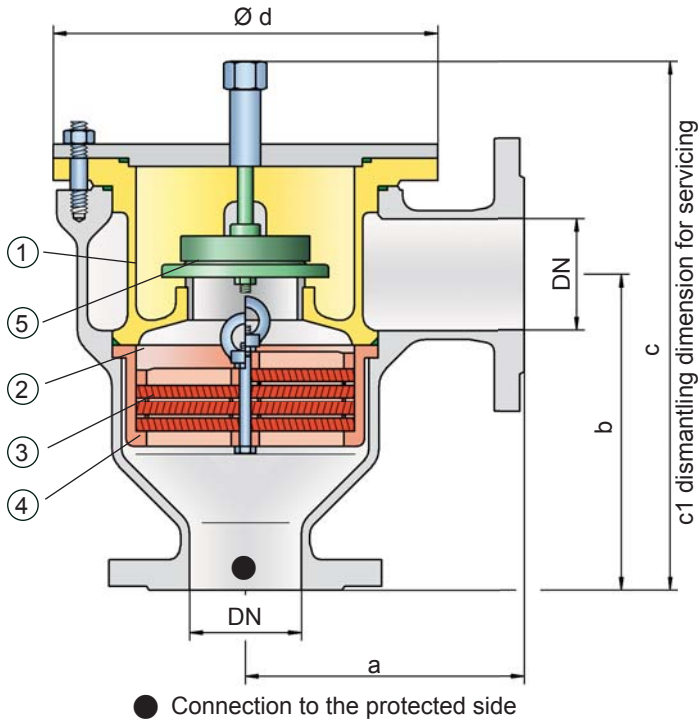


In-Line Detonation Flame Arrester

with integrated pressure relief valve, for stable detonations and deflagrations in right angle design with shock absorber, unidirectional

PROTEGO® DR/ES-V



Set pressure: from +2.0 mbar up to +35 mbar
from +0.8 inch W.C. up to +14 inch W.C.

Higher or lower settings upon request

Function and Description

PROTEGO® DR/ES-V series uniquely combines the function of an in-line detonation flame arrester with the function of a pressure relief valve in one device. The device protects against deflagration and stable detonation. The weight-loaded pallet type valve (5) integrated in the shock absorber (1) of the in-line detonation flame arrester is designed as pressure relief valve. The set pressure of the valve is adjusted in the factory and can range from 2 to 35 mbar (0.8 to 14 inch W.C.). After the pressure increases 40% from its set pressure, the valve completely opens to yield the maximum volumetric flow. If installed in vent headers connected to storage tanks, the valve pallet works as check valve. This means that the product can not flow back from the suction line into the tank. Although several functions are integrated in a single housing, the device is extremely easy to service, which is primarily due to the classic right angle design.

Once a detonation enters the flame arrester, energy is absorbed from the detonation shock wave by the integrated shock

absorber, before the flame is extinguished in the narrow gaps of the FLAMEFILTER® (3). The flame suppression is guaranteed independent of the valve pallet position.

The PROTEGO® flame arrester unit (2) consists of several FLAMEFILTER® discs and spacers firmly held in the FLAMEFILTER® cage (4). The gap size and number of FLAMEFILTER® discs are determined by the operating data parameters of the mixture flowing in the line (explosion group, pressure, temperature). This device is available for explosion groups from IIA to IIB3 (NEC group D to C MESH ≥ 0.65 mm).

The standard design is approved at an operating temperature up to +60°C / 140°F and absolute operating pressure up to 1.2bar/17.4psi. **Devices with special approvals can be obtained for higher pressures and 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

- integration of in-line detonation flame arrester and pressure relief valve in one device
- excellent tightness of the valve
- applicable as a detonation-proof check valve in suction lines of storage tanks
- optimum for use as an overflow valve in venting and recovering vapour lines
- minimum number of FLAMEFILTER® discs due to the effective shock absorber
- quick removal and installation of the complete PROTEGO® flame arrester unit and the individual FLAMEFILTER® discs in the cage
- provides protection from deflagration and stable detonations
- extended application range for higher operating temperatures and pressures
- cost efficient spare parts

Design Types and Specifications

There are two different designs available:

Basic version of the detonation arrester with check valve **DR/ES-V-**

Detonation arrester with check valve and heating jacket **DR/ES-V-H**

Table 1: Dimensions

Dimensions in mm / inches

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

| DN | 25 / 1 / 32 / 1 1/4" | 40 / 1 1/2" | 50 / 2" | 65 / 2 1/2" | 80 / 3" | 100 / 4" | 125 / 5" | 150 / 6" | 200 / 8" |
|----|----------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|
| a | 125 / 4.92 | 153 / 6.02 | 155 / 6.10 | 198 / 7.80 | 200 / 7.87 | 250 / 9.84 | 332 / 13.07 | 335 / 13.19 | 425 / 16.73 |
| b | 140 / 5.51 | 183 / 7.20 | 185 / 7.28 | 223 / 8.78 | 225 / 8.86 | 290 / 11.42 | 357 / 14.06 | 360 / 14.17 | 505 / 19.88 |
| c | 237 / 9.33 | 305 / 12.01 | 305 / 12.01 | 395 / 15.55 | 395 / 15.55 | 460 / 18.11 | 575 / 22.64 | 575 / 22.64 | 863 / 33.98 |
| c1 | 345 / 13.58 | 410 / 16.14 | 410 / 16.14 | 530 / 20.87 | 530 / 20.87 | 615 / 24.21 | 790 / 31.10 | 790 / 31.10 | 1295 / 50.98 |
| d | 149 / 5.87 | 210 / 8.27 | 210 / 8.27 | 275 / 10.83 | 275 / 10.83 | 325 / 12.80 | 460 / 18.11 | 460 / 18.11 | 620 / 24.41 |



Table 2: Selection of the explosion group

| MESG | Expl. Gr. (IEC/CEN) | Gas Group (NEC) | Special approvals upon request |
|-----------|---------------------|-----------------|--------------------------------|
| > 0,90 mm | IIA | D | |
| ≥ 0,65 mm | IIB3 | C | |

Table 3: Selection of max. operating pressure

| Expl. Gr. | DN | 25 / 1 | 32 / 1 ¼" | 40 / 1 ½" | 50 / 2" | 65 / 2 ½" | 80 / 3" | 100 / 4" | 125 / 5" | 150 / 6" | 200 / 8" |
|-----------|------------------|----------|-----------|-----------|----------|-----------|----------|----------|----------|----------|----------|
| IIA | P _{max} | 4.0/58.0 | 4.0/58.0 | 4.0/58.0 | 4.0/58.0 | 2.9/42.1 | 2.9/42.1 | 2.0/29.0 | 2.0/29.0 | 2.0/29.0 | 1.2/17.4 |
| IIB3 | P _{max} | 3.0/43.5 | 3.0/43.5 | 2.0/29.0 | 2.0/29.0 | 2.0/29.0 | 2.0/29.0 | 1.5/21.7 | 1.4/20.3 | 1.4/20.3 | 1.1/15.9 |

P_{max} = maximum allowable operating pressure in bar / psi (absolute), higher operating pressure upon request

Table 4: Specification of max. operating temperature

| ≤ 60°C / 140°F | T _{maximum allowable operating temperature in °C} | higher operating temperatures upon request |
|----------------|--|--|
| - | Designation | |

Table 5: Material selection for housing

| Design | B | C | D | The housing and the cover with shock absorber can also be delivered in steel with an ECTFE coating. |
|--------------------------------|-----------------|-----------------|-----------------|---|
| Design | Steel | Stainless Steel | Hastelloy | |
| Heating jacket (DR/ES-V-H-...) | Steel | Stainless Steel | Stainless Steel | |
| Cover with shock absorber | Steel | Stainless Steel | Hastelloy | |
| Gaskets | PTFE | PTFE | PTFE | |
| Valve seat | Stainless Steel | Stainless Steel | Stainless Steel | |
| Flame arrester unit | A | C, D | E | |

Special materials upon request

Table 6: Material combinations of the flame arrester unit

| Design | A | C | D | E | * the FLAMEFILTER® are also available in the materials Tantalum, Inconel, Copper, etc. when the listed housing and cage materials are used. |
|-------------------|-----------------|-----------------|-----------------|-----------|---|
| FLAMEFILTER® cage | Steel | Stainless Steel | Stainless Steel | Hastelloy | |
| FLAMEFILTER® * | Stainless Steel | Stainless Steel | Hastelloy | Hastelloy | |
| Spacer | Stainless Steel | Stainless Steel | Hastelloy | Hastelloy | |

Special materials upon request

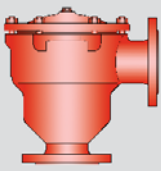
Table 7: Material selection for valve pallet

| Design | A | B | C |
|------------------------------------|------------------------------------|-------------------------------------|---------------------------------|
| Pressure range | I | II | III |
| Set pressure (mbar) [inch W.C.] | +2.0 up to +3.5 +0.8 up to +1.4 | >+3.5 up to +14 >+1.4 up to +5.6 | >+14 up to 35 >+5.6 up to 14 |
| Valve pallet | Aluminium | Stainless Steel | Stainless Steel |
| Sealing | FEP | FEP | Metal to Metal |

Table 8: Flange connection type

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

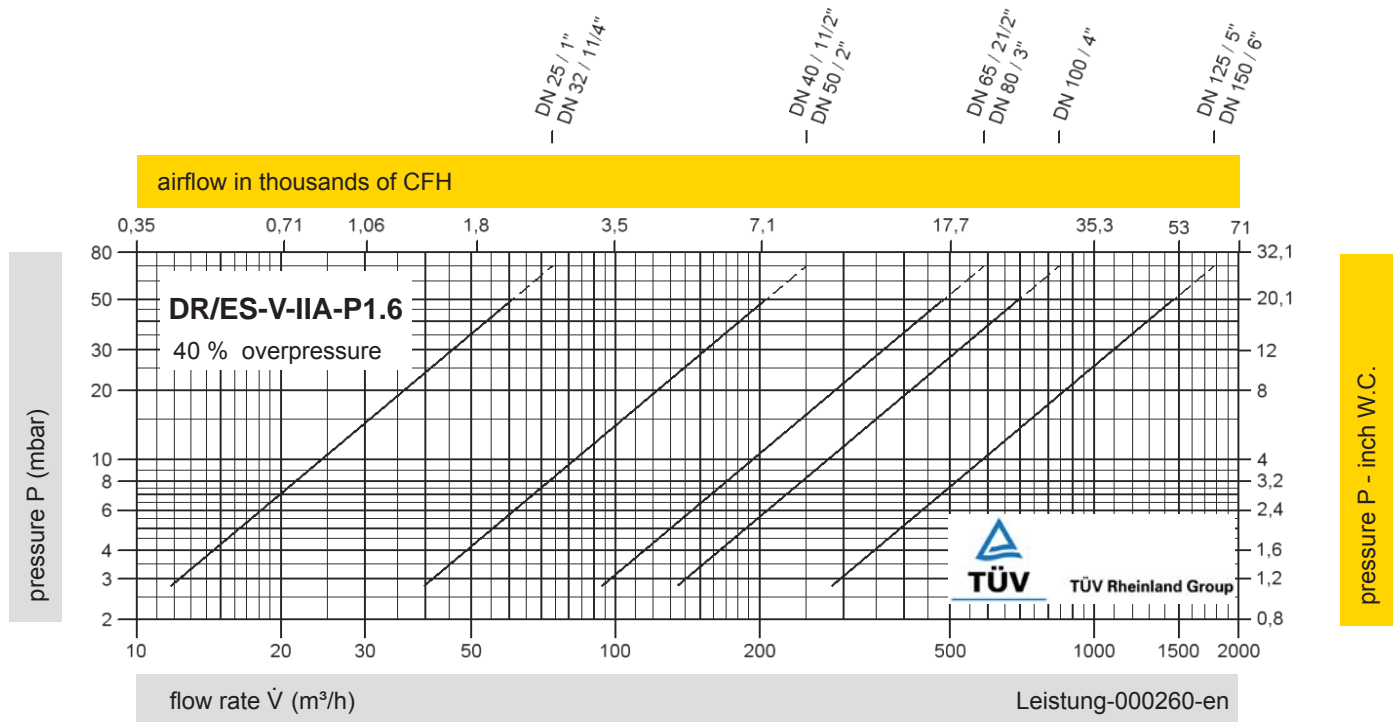
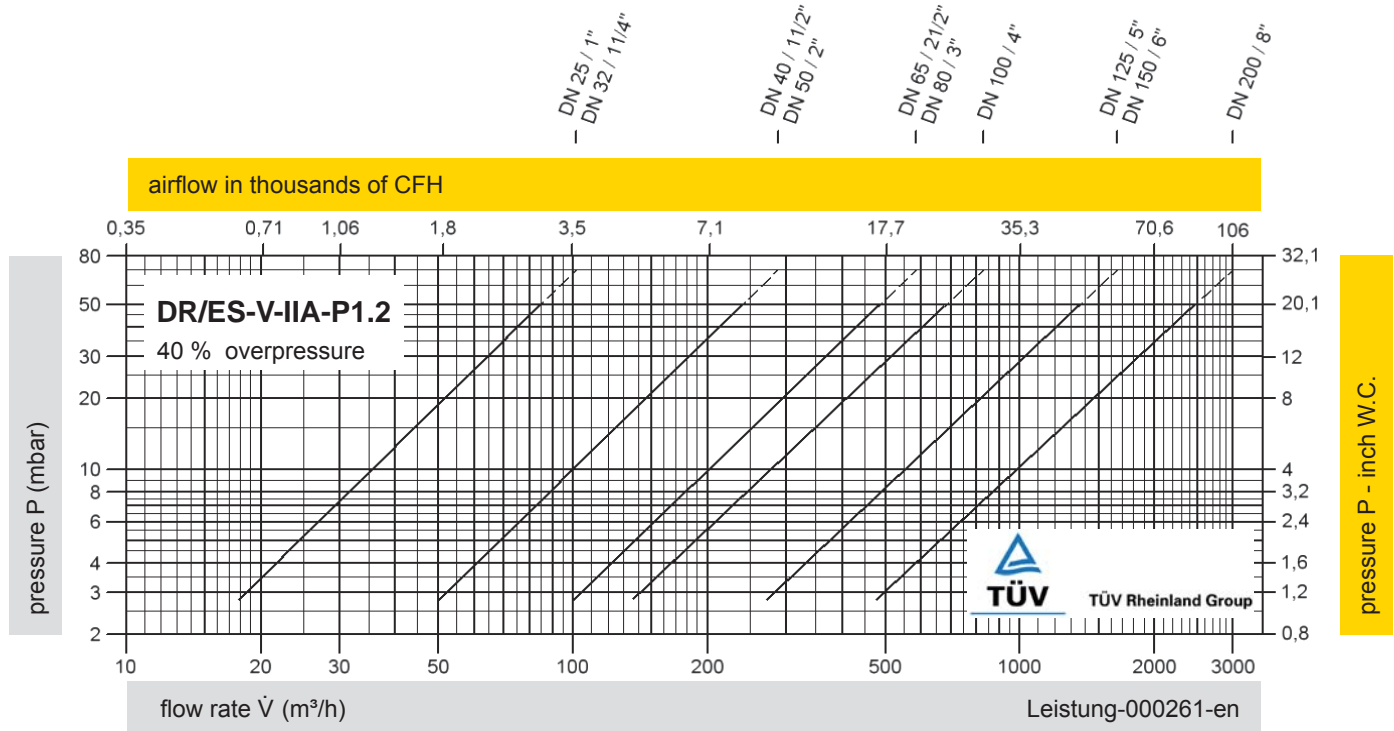




In-Line Detonation Flame Arrester

Flow Capacity Charts

PROTEGO® DR/ES-V



Remark

$$\text{set pressure} = \frac{\text{opening pressure resp. tank design pressure}}{1,4}$$

Set pressure = the valve starts to open

Opening pressure = set pressure plus overpressure

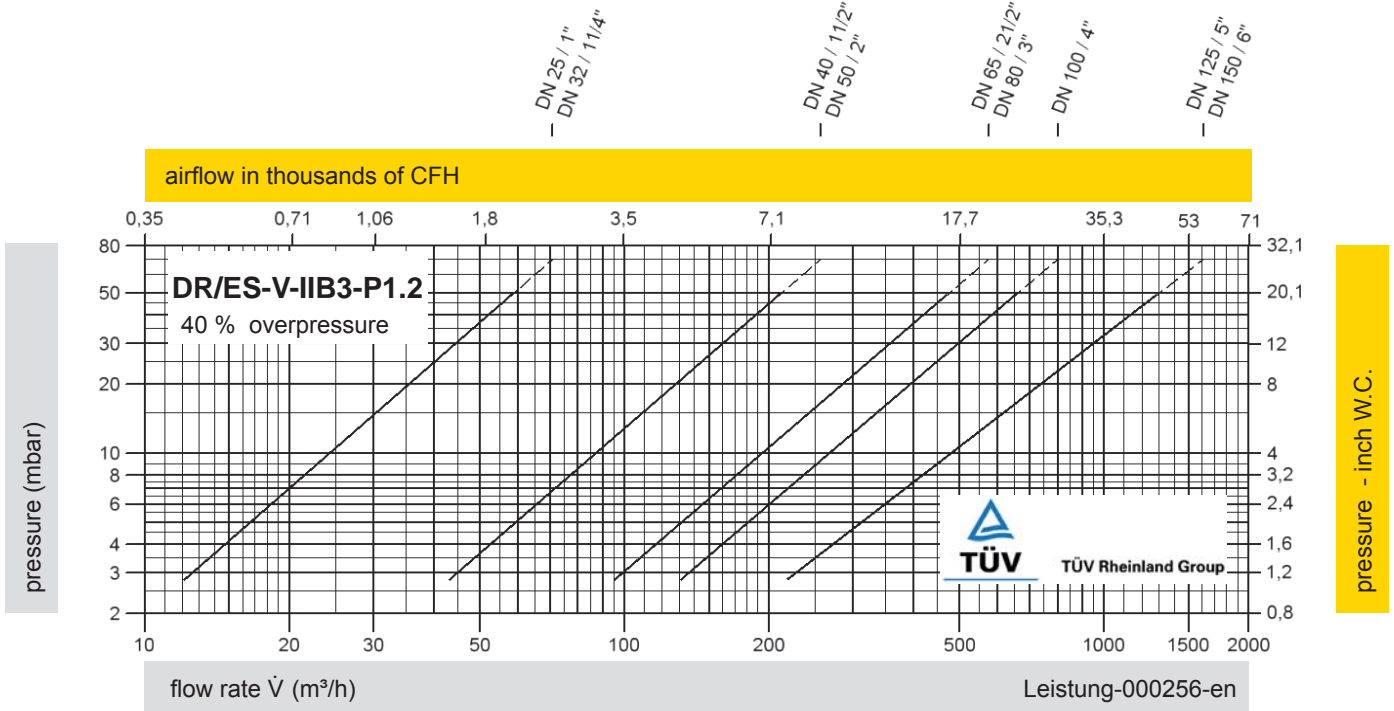
Overpressure = pressure increase over the set pressure

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".

PROTEGO® DR/ES-V



* DN 25 - DN 80; P1.6
DN 100; P1.5
DN 125, DN 150; P1.4
DN 200; P1.1

