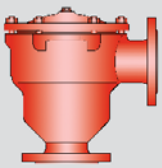
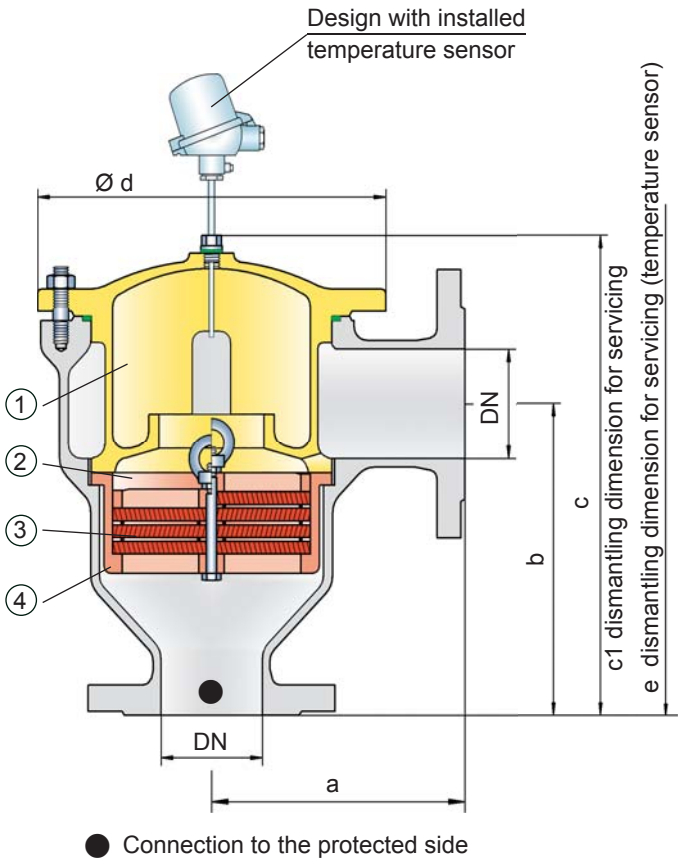


In-Line Detonation Flame Arrester

for stable detonations and deflagrations in right angle design with shock absorber, unidirectional

PROTEGO® DR/ES



Function and Description

The PROTEGO® DR/ES in-line detonation flame arrester has been used for decades in industrial plant construction because its right angle design offers advantages towards maintenance and costs in comparison to most straight designs.

Once a detonation enters the device, energy is absorbed from the detonation shock wave by the integrated shock absorber (1) before the flame is extinguished in the narrow gaps of the FLAMEFILTER® (3).

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 of the mixture flowing in the line (explosion group, pressure, temperature). This device is approved for explosion groups from IIA to IIB3 (NEC group D to C MESG ≥ 0.65 mm).

The standard design is approved at an operating temperature up to +60°C / 140°F and an absolute operating pressure up to 1.2 bar / 17.4 psi. 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

- minimum number of FLAMEFILTER® discs due to the effective shock absorber
- quick removal and installation of the complete PROTEGO® flame arrester unit and FLAMEFILTER® discs in the cage
- due to modular design the FLAMEFILTER® discs can be individually replaced
- the right angle design saves pipe elbows
- extended application range for higher operating temperatures and pressures
- minimum pressure loss and hence low operating and life-cycle cost
- cost efficient spare parts

Design Types and Specifications

There are four different designs available:

Basic in-line detonation flame arrester	**DR/ES- [–] - [–]**
In-line detonation flame arrester with integrated temperature sensor* as additional protection against short time burning	**DR/ES- [T] - [–]**
In-line detonation flame arrester with heating jacket	**DR/ES- [H] - [–]**
In-line detonation flame arrester with integrated temperature sensor* against short time burning and heating jacket	**DR/ES- [H] - [T]**

*Resistance thermometer for device group II, category (1) 2 (GII cat. (1) 2)

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 ¼"	40 / 1 ½"	50 / 2"	65 / 2 ½"	80 / 3"	100 / 4"	125 / 5"	150 / 6"	200 / 8“
a	125/4.92	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	140/5.51	183/7.20	185/7.28	223/8.78	225/8.86	290/11.42	357/14.06	360/14.07	505/19.88
c	210/8.27	210/8.27	290/11.42	290/11.42	365/14.37	365/14.37	440/17.32	535/21.06	535/21.06	810/31.89
c1	285/11.22	285/11.22	395/15.55	395/15.55	500/19.69	500/19.69	595/23.43	750/29.53	750/29.53	1230/48.43
d	150/5.91	150/5.91	210/8.27	210/8.27	275/10.83	275/10.83	325/12.80	460/18.11	460/18.11	620/24.41
e	495/19.49	495/19.49	600/23.62	600/23.62	705/27.76	705/27.76	795/31.30	950/37.40	950/37.40	1435/56.50

Table 2: Selection of the explosion group

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

Table 3: Selection of max. operating pressure

	DN		25 / 1"	32 / 1 ¼"	40 / 1 ½"	50 / 2"	65 / 2 ½"	80 / 3"	100 / 4"	125 / 5"	150 / 6"	200 / 8“
Expl. Gr.	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	Tmaximum allowable operating temperature in °C	higher operating temperatures upon request
-	Designation	

Table 5: Material selection for housing

Design	B	C	D
Housing Heating jacket (DR/ES-H-(T)-...)	Steel Steel	Stainless Steel Stainless Steel	Hastelloy Stainless Steel
Cover with shock absorber	Steel	Stainless Steel	Hastelloy
O-Ring	FPM*	PTFE	PTFE
Flame arrester unit	A	C, D	E

* for devices exposed to elevated tempera-tures above 150°C / 302°F, gaskets made of PTFE.The housing and cover with the shock absorber can also be delivered in steel with an ECTFE coating.

Special materials upon request

Table 6: Material combinations of the flame arrester unit

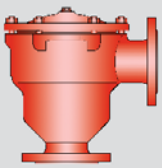
Design	A	C	D	E
FLAMEFILTER® cage	Steel	Stainless Steel	Stainless Steel	Hastelloy
FLAMEFILTER® *	Stainless Steel	Stainless Steel	Hastelloy	Hastelloy
Spacer	Stainless Steel	Stainless Steel	Hastelloy	Hastelloy

* the FLAMEFILTER® are also available in the materials Tantalum, Inconel, Copper, etc. when the listed housing and cage materials are used.

Special materials upon request

Table 7: Flange connection type

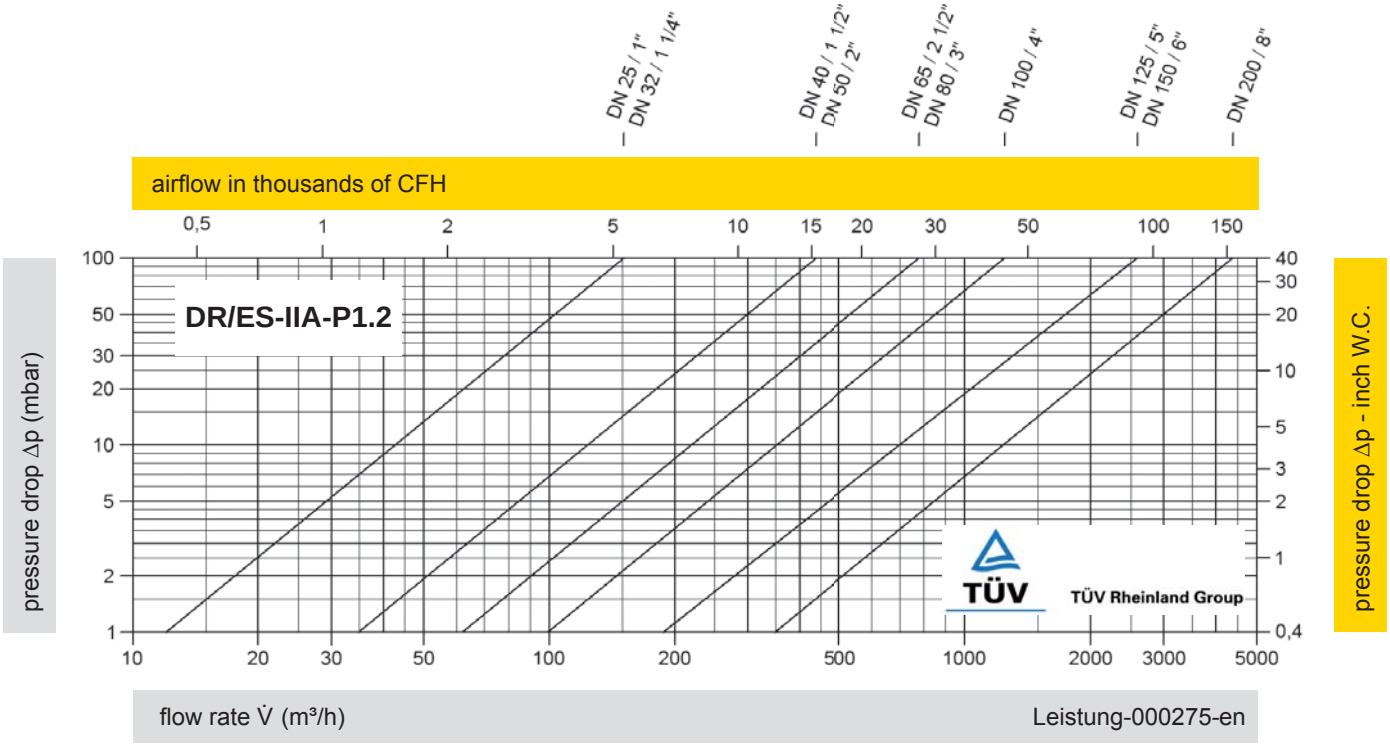
EN 1092-1; Form B1	other types upon request
ASME B16.5; 150 lbs RFSF	

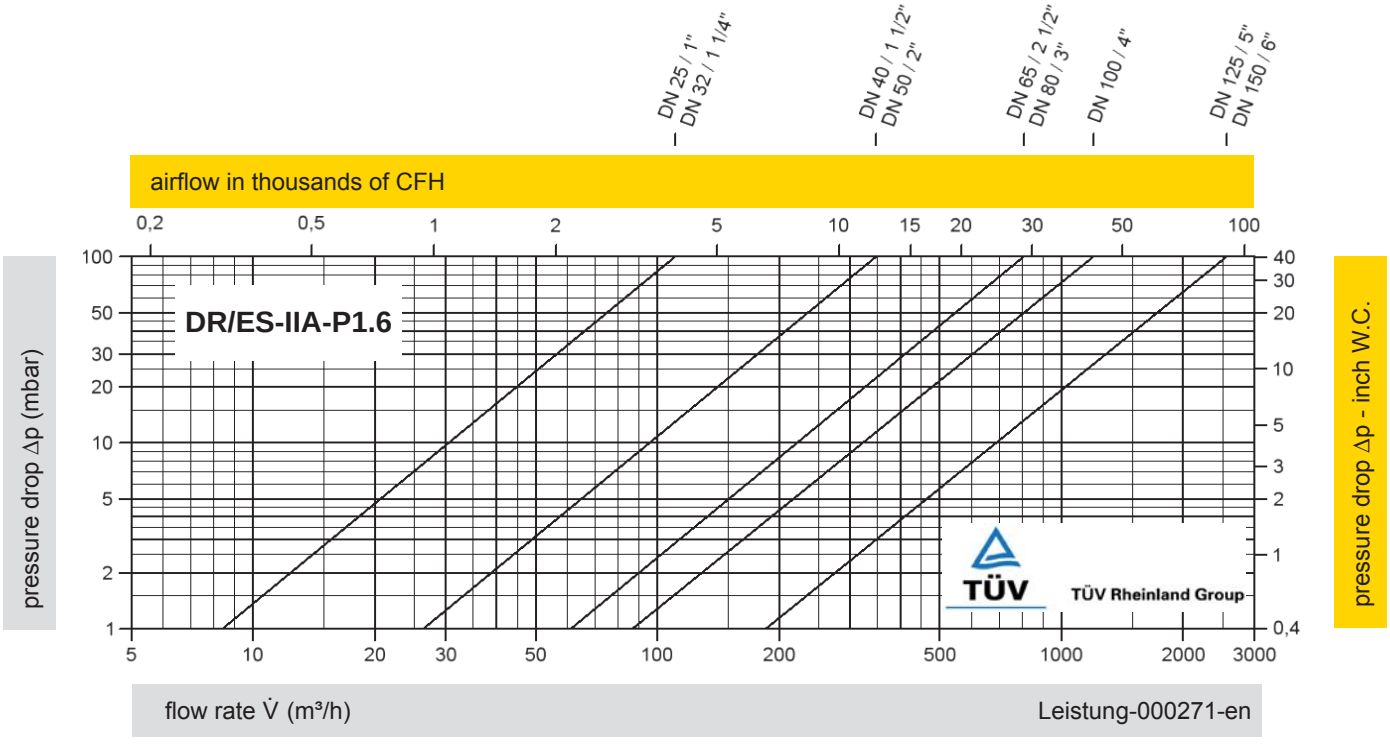


In-Line Detonation Flame Arrester

Flow Capacity Charts

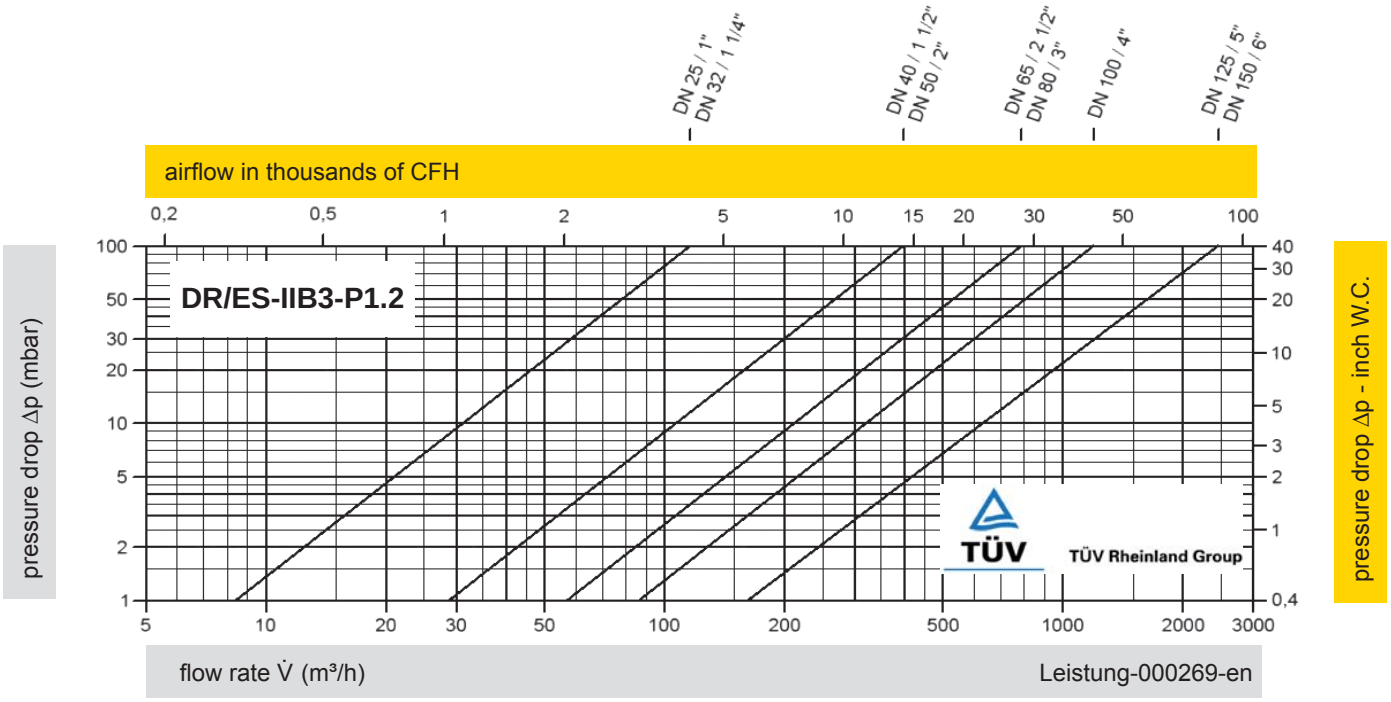
PROTEGO® DR/ES



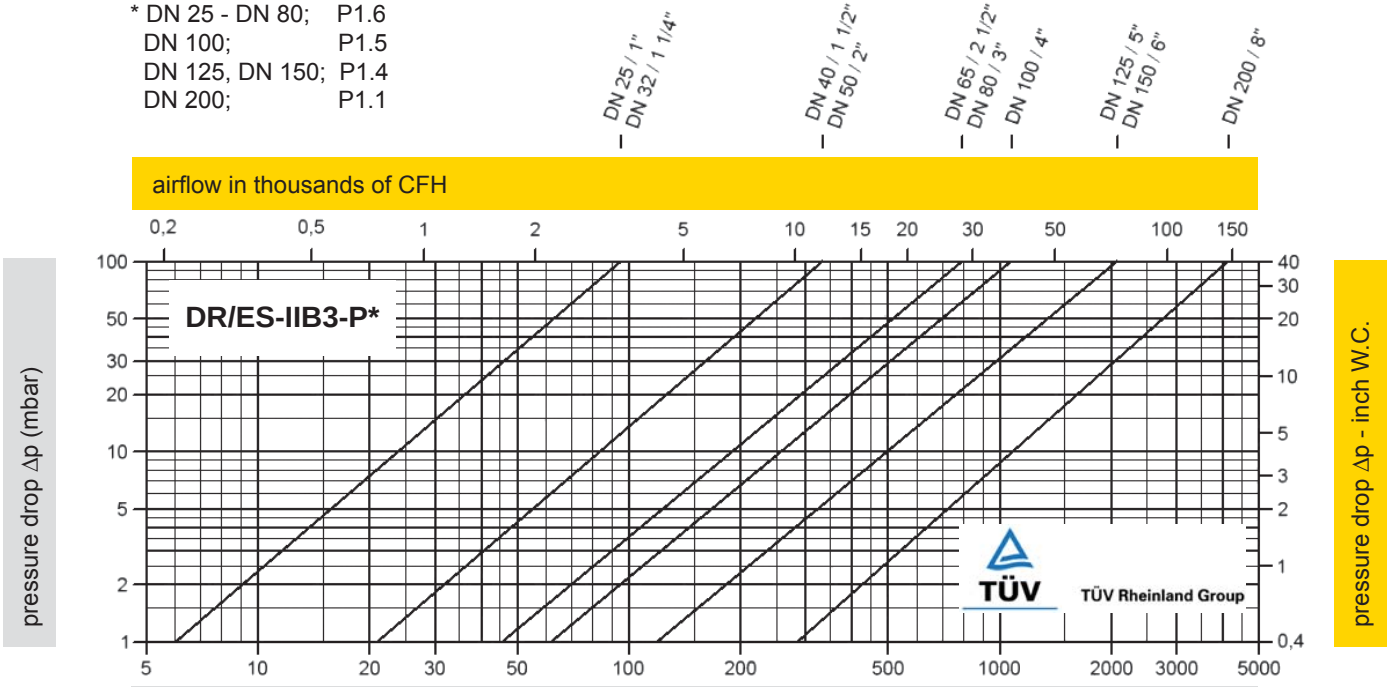


The flow capacity charts have been determined with a calibrated and TÜV certified flow capacity test rig.

Volume flow V̇ 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”.



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



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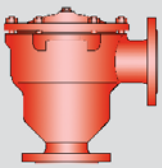
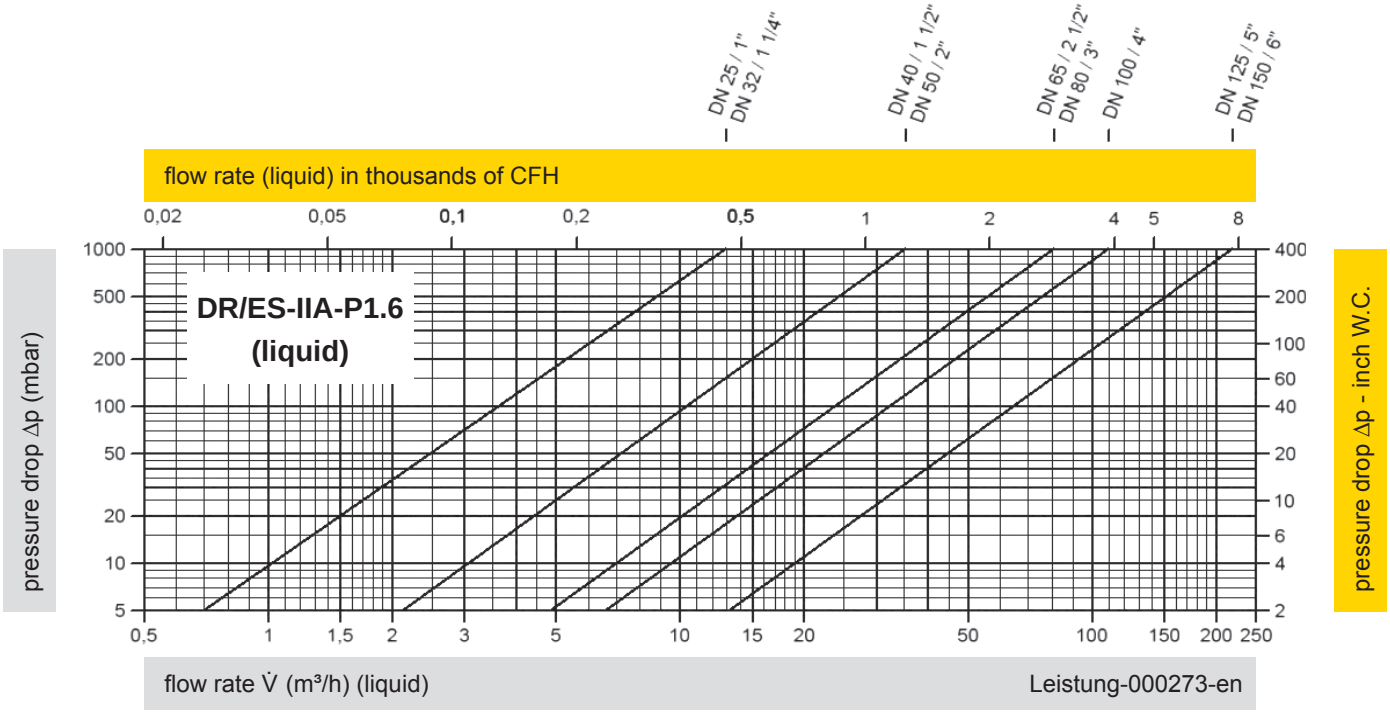


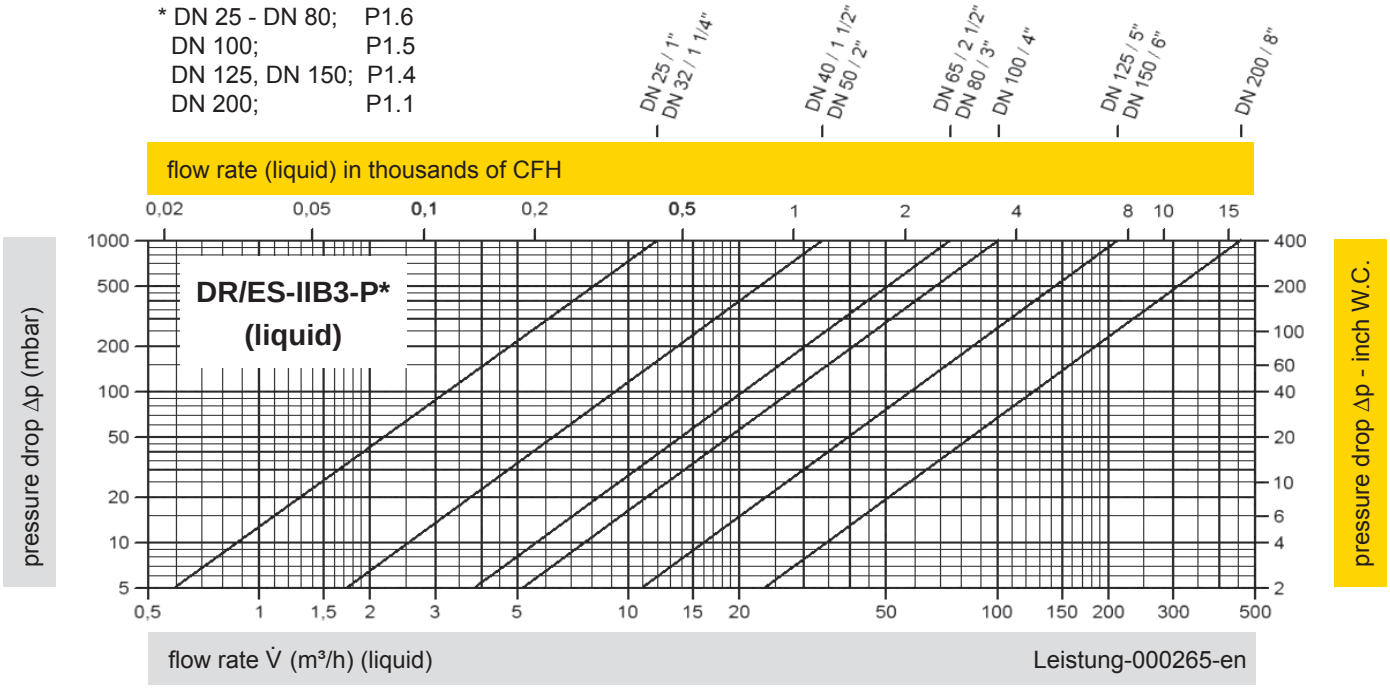
In-Line Detonation Flame Arrester

Flow Capacity Charts (liquid)

PROTEGO® DR/ES



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



Conversion: $\dot{V}_{liquid} = \dot{V}_{water} * \sqrt{\frac{\rho_{water}}{\rho_{liquid}}}$

The volume flow V̇ in m³/h was determined with water according to DIN EN 60534 at a temperature T_n = 15°C and an atmospheric pressure p_n = 1,013 bar, kinematic viscosity v = 10^{-6} m²/s