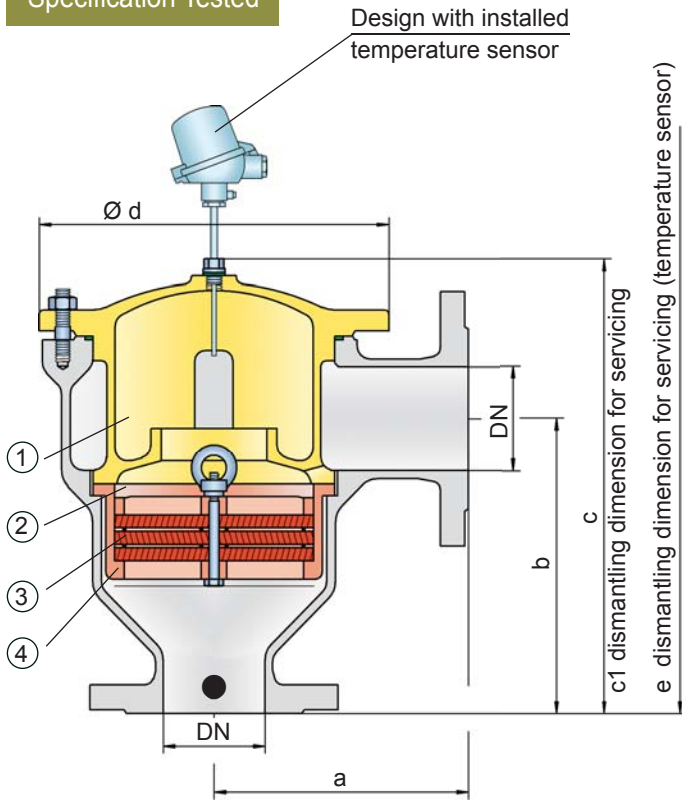


## In-Line Detonation Flame Arrester

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

**PROTEGO® DR/FM**

### FM Approvals Specification Tested



● Connection to the protected side

### Function and Description

The PROTEGO® DR/FM series of in-line detonation flame arresters represents a further development of PROTEGO® flame arresters DR/ES used successfully for decades in industry. The device protects against deflagrations, stable and unstable detonations. The classic right angle design offers considerable cost and maintenance advantages in comparison to a straight through design.

Once a detonation enters the flame arrester, 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 original FLAMEFILTER® (3).

The PROTEGO® flame arrester unit (2) consists of several FLAMEFILTER® and spacers firmly held in the FLAMEFILTER® cage (4). The gap size and number of FLAMEFILTER® are determined by the operating data 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  $\geq 0.65$  mm).

The standard design is approved for an operating temperature up to +60°C / 140°F and an absolute operating pressure up to 1.1 bar / 15.9 psi. Devices with special approvals are available for higher temperatures and pressures upon request.

This series was tested and approved by FM Approvals (Factory Mutual); additional international standards are available upon request.

### Special Features and Advantages

- Minimum number of FLAMEFILTER® due to the patented shock absorber
- Quick removal of and installation of the complete PROTEGO® flame arrester unit and of the FLAMEFILTER®
- The modular design enables individual FLAMEFILTER® to be replaced
- Cost efficient spare parts
- Offers protection against deflagrations, stable and unstable detonations
- The right angle design saves pipe elbows
- Minimum pressure loss and hence low operating and lifecycle costs
- Extended application range of use for higher operating pressures

### Design Types and Specifications

There are four different designs available:

Basic in-line detonation flame arrester **DR/FM-**  -

In-line detonation flame arrester with integrated temperature sensor\* as additional protection against short time burning **DR/FM-**  -

In-line detonation flame arrester with heating jacket **DR/FM-**  -

In-line detonation flame arrester with integrated temperature sensor\* and heating jacket **DR/FM-**  -

\*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	40 / 1 1/2"	50 / 2"	65 / 2 1/2"	80 / 3"	100 / 4"	125 / 5"	150 / 6"
a	153 / 6.02	155 / 6.10	198 / 7.80	200 / 7.87	250 / 9.84	332 / 13.07	335 / 13.19
b	183 / 7.20	185 / 7.28	223 / 8.78	225 / 8.86	290 / 11.42	357 / 14.06	360 / 14.17
c	290 / 11.42	290 / 11.42	365 / 14.37	365 / 14.37	440 / 17.32	535 / 21.06	535 / 21.06
c1	395 / 15.55	395 / 15.55	500 / 19.69	500 / 19.69	595 / 23.43	750 / 29.53	750 / 29.53
d	210 / 8.27	210 / 8.27	275 / 10.83	275 / 10.83	325 / 12.80	460 / 18.11	460 / 18.11
e	600 / 23.62	600 / 23.62	705 / 27.76	705 / 27.76	795 / 31.30	950 / 37.40	950 / 37.40

**Table 2: Selection of the explosion group**

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

**Table 3: Selection of max. operating pressure**

Exp. Gr.	DN	40 / 1 1/2"	50 / 2"	65 / 2 1/2"	80 / 3"	100 / 4"	125 / 5"	150 / 6"
	IIA (D)	P <sub>max</sub>	1.6 / 23.2	1.6 / 23.2	1.5 / 21.7	1.5 / 21.7	1.5 / 21.7	1.2 / 17.4
IIB3 (C)	P <sub>max</sub>	1.5 / 21.7	1.5 / 21.7	1.4 / 20.3	1.4 / 20.3	1.3 / 18.8	1.2 / 17.4	1.2 / 17.4 *

P<sub>max</sub> = maximum allowable operating pressure in bar / psi (absolute), higher operating pressure upon request

\* special flame arrester unit

**Table 4: Specification of max. operating temperature**

≤ 60°C / 140°F	higher operating temperatures upon request
T60	T <sub>max</sub> . operating temperature

**Table 5: Material selection for housing**

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

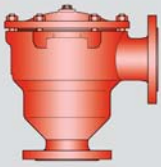
\* for devices exposed to elevated temperatures above 150°C / 302°F (T150), gaskets made of PTFE.

The housing and cover with the shock absorber can also be delivered in steel with an ECTFE coating.

Special materials upon request



for safety and environment



## In-Line Detonation Flame Arrester

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

**PROTEGO® DR/FM**

### FM Approvals Specification Tested

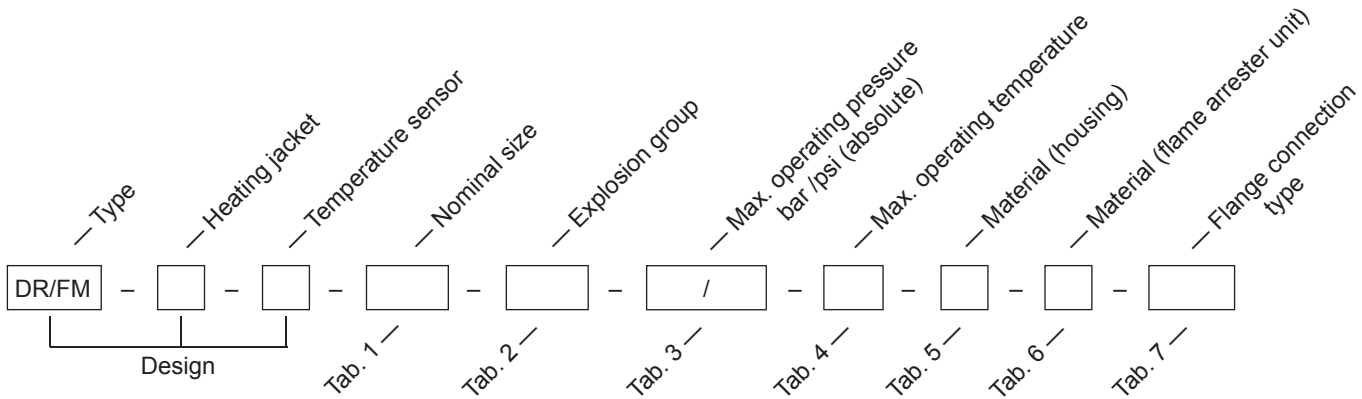
**Table 6: Material combinations of the flame arrester unit**

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**

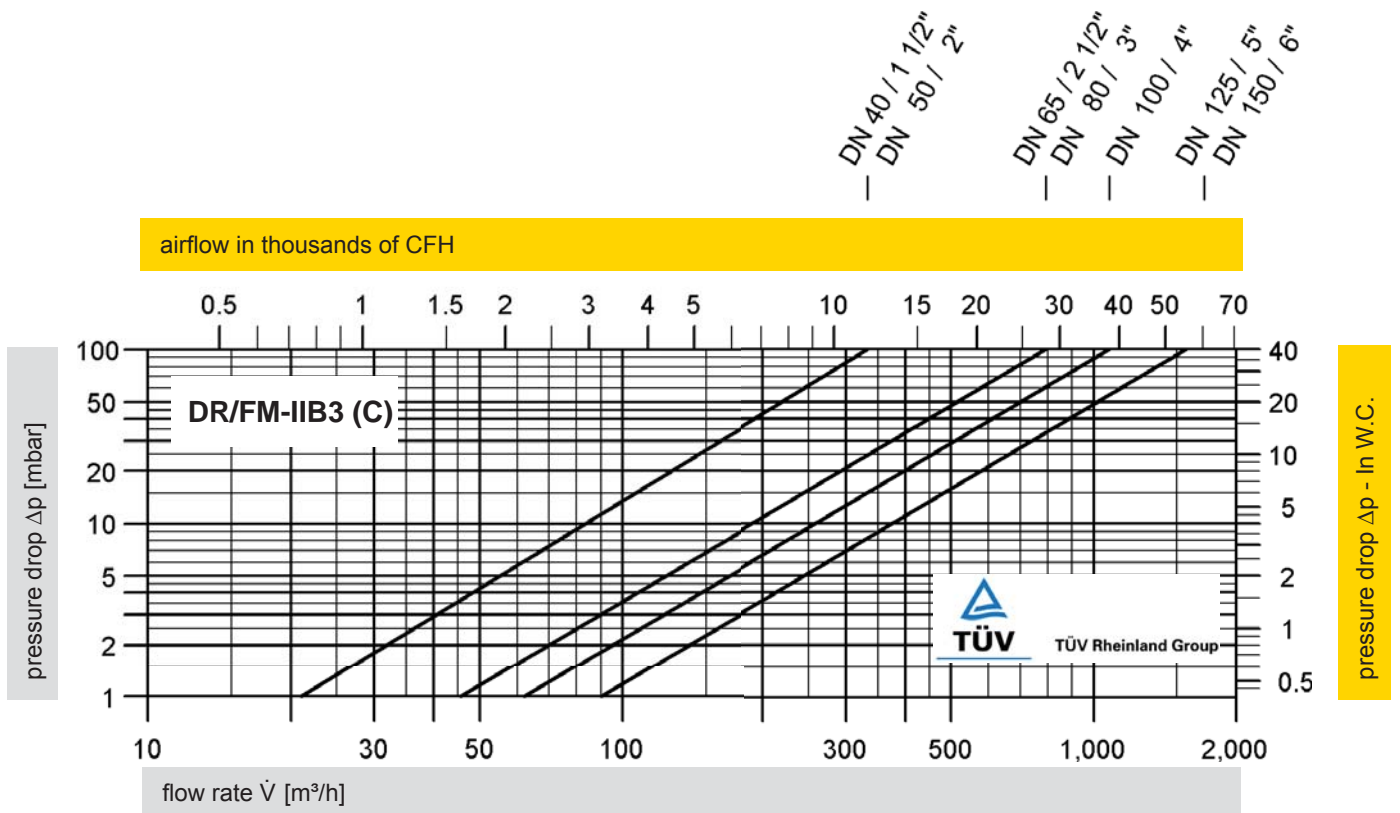
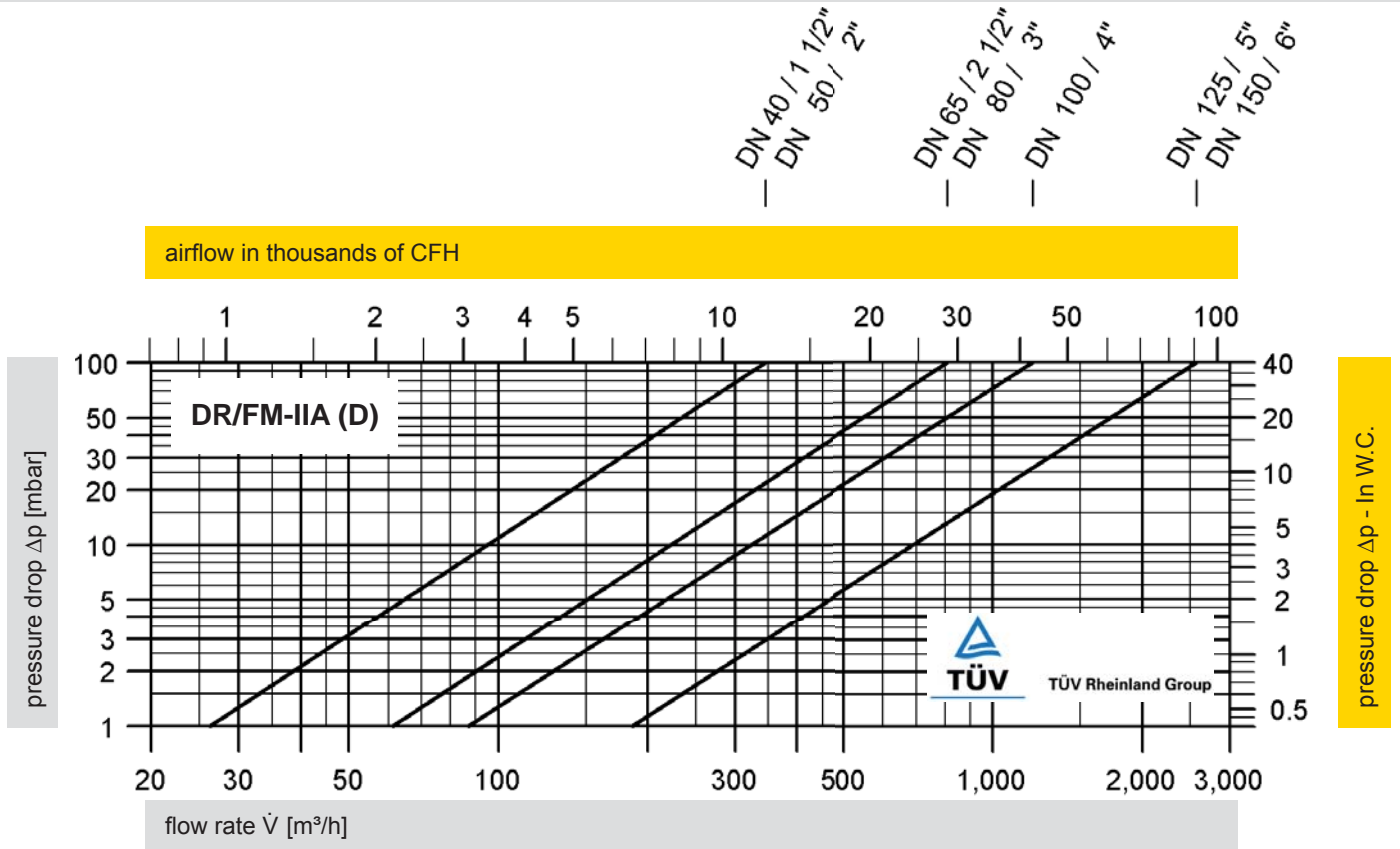
EN 1092-1, Form B1 or DIN 2501, Form C, PN 16; from DN 200 PN 10	EN or DIN	other types upon request
ANSI 150 lbs RFSF	ANSI	



### Order example

DR/FM - H - T - 50 - IIB3 - P1.5/ - - T60 - B - A - DIN

Materials and chemical resistance: See Vol. 1 "Technical Fundamentals"



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".

