

CAUTION:

If any questions arise concerning the proper installation or maintenance of our products, please contact Protectoseal or one of our Authorized Representatives.

When installing any Protectoseal device, the legal, corporate and advisory safety regulations and procedures appropriate for the specific installation site must be fully understood and followed.

**CLASSIFICATION:**

The Protectoseal 35000E Series Bi-Directional Detonation Flame Arresters are classified as in-line detonation arresters suitable for arresting an unstable detonation propagating along a pipe, as defined in Standard ISO 16852.

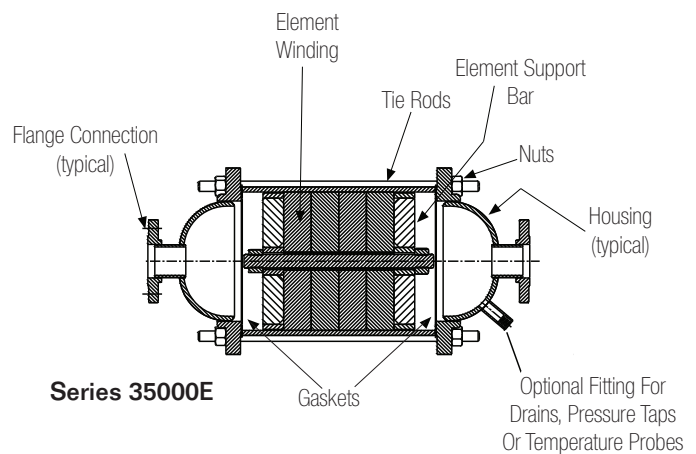
The markings on the unit identify restrictions concerning the use of the specific arrester with respect to location, gas/vapor group, maximum operational temperature/pressure and, if applicable, the need for additional external safety equipment.

OPERATIONAL LIMITS / MARKING:

The Protectoseal 35000E Series Bi-Directional Detonation Flame Arresters are certified as suitable for use under the following conditions according to the requirements of Standard ISO 16852:

- ▶ Nominal Sizes: 250 mm (10"); 300 mm (12"); 350 mm (14"); 400 mm (16"); 450 mm (18")
- ▶ Materials may include carbon steel, stainless steel or Hastelloy with non-asbestos/nitrile gaskets
- ▶ Maximum Operational Temperature [T₀]: 60°C (140°F)
- ▶ Maximum Operational Pressure [p₀]: 1.22 bar absolute (17.7 PSIA)
- ▶ IEC Explosion Group [EX. G.]: IIA
- ▶ Classified for unstable detonations without restrictions [Detonation Arrester Type 2]
 - No limitations are imposed on the location within the piping
- ▶ Stabilized Burn Rating:
 - Not suitable for endurance burning
 - Not suitable for stabilized burning [BC:c]
 - Suitable for short time burning with the addition of external safety equipment*
 - [BC:b t_{BT} = 10 min]

*External safety equipment may include an integrated temperature sensor (such as a protected thermocouple or PT100 resistance thermometer) on the unprotected side. Refer to Standard ISO 16852 for guidance.



CAUTION: Connecting piping should be self-supporting and shall be designed to withstand stresses caused by normal and emergency conditions.

INSTALLATION PROCEDURE:

1. Remove all protective packing from arrester. Check inside arrester housing for loose packing material.
2. The arrester is shipped ready for installation. No adjustments or modifications are required prior to mounting in the piping system.
3. The arrester is intended to be mounted to piping and flange connections of a size equivalent to, or less than, the size of the arrester mounting flanges.
4. The installation of the arrester is by flanged connection to the pipe work. The arrester should be positioned between its mating flanges and the flange bolts should be tightened alternately and evenly to provide a secure seal at the gasket joints. Torque values for mounting flange fasteners should be as recommended by gasket supplier.

NOTE: The Protectoseal Bi-Directional Detonation Flame Arrester is a passive device with no moving parts. No adjustment, modification or calibration of the device is required.

MAINTENANCE:

Protectoseal recommends that our products be inspected and maintained according to the normal maintenance schedule of the facility. At a minimum, maintenance should be conducted annually. More frequent maintenance may be required, and should be scheduled, for unusual service conditions.

CAUTION: When maintaining any Protectoseal device, the legal, corporate and advisory safety regulations and procedures appropriate for the specific installation site must be fully understood and followed.

CAUTION: Tank vapor space pressure or vacuum should be relieved before any maintenance operations are undertaken.

MAINTENANCE PROCEDURE:**INSPECTION INTERVAL:**

1. In normal service, it is suggested that the Bi-Directional Detonation Flame Arrester be inspected at each regularly scheduled facility maintenance period or, at a minimum, annually.
2. The Protectoseal Bi-Directional Detonation Flame Arrester should be inspected if excessive pressure drop, at some known flow rate, is encountered.
3. The Bi-Directional Detonation Flame Arrester should be inspected immediately if a flame front is detected.

INSPECTION PROCEDURE:

1. The complete Bi-Directional Detonation Flame Arrester is comprised of a detonation arrester element clamped by means of threaded rods between two housings.
2. Equipment or structure suitable for supporting the housings and the detonation element should be available prior to disassembly of the device.
3. The weight of the element may be supported by attachment to the element handles. NOTE: These handles are to be used for lifting of the element only. The handles must not be used to lift or support the weight of the entire detonation arrester.
4. The nuts on all the tie rods should be loosened and all tie rods except those two on which the element can rest should be removed.
5. Spacer blocks or mechanical spreader tools should be used to separate and secure the housing halves so that the element is free for removal.

6. The element can be lifted for inspection. The gaskets should be inspected for damage and replaced if necessary.
7. The element should be inspected visually for damage to the element winding or the supporting structure. In normal operation, it is unlikely that such damage would be encountered. If the element appears to be damaged, it should be replaced immediately with a new element.
8. If clogging of the element passages has occurred, the method of cleaning will depend, to some extent, on the materials being handled. Some common cleaning methods include:
 - a) Solvent wash followed by a compressed air blow through
 - b) Compressed air purge
 - c) High pressure steam purge
 - d) High pressure water purge

The element should never be cleaned by the insertion of a sharp tool or probe into the passages. Do not use a wire brush to clean element. The capability of the arrester to function is based on the integrity of these passages, and damage to them can render the arrester ineffective.

9. The clean element and replacement gaskets should be positioned between the housing halves. The tie rods should be reinserted and the nuts should be tightened alternately and evenly to insure a proper gasketed joint. When gaskets are supplied by Protectoseal, the recommended torque values for the tie rod fasteners are:

250 mm (10") Units - 475 Nm (350 ft-lbs)

300 mm (12") Units - 610 Nm (450 ft-lbs)

350 mm (14") Units - 610 Nm (450 ft-lbs)

400 mm (16") Units - 610 Nm (450 ft-lbs)

450 mm (18") Units - 610 Nm (450 ft-lbs)

The Protectoseal Company EC Declaration of Conformity

Manufacturer: The Protectoseal Company
225 Foster Avenue
Bensenville, IL 60106
USA

Quality Assurance Notification Certificate Number:
SIRA 10 ATEX M458 issued by
SIRA Certification Service
(Notified Body No. 0518)
Rake Lane
Eccleston, Chester, CH4 9JN, UK

The Protectoseal Company herewith declares that the equipment detailed below is in conformity with the applicable provisions of the ATEX Directive 2014/34/EU and has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.

Equipment: Type 35000E Range of Bidirectional Detonation Arresters
EC Type Examination Certificate IBEXU 14ATEX2033X and IBEXU 14ATEX2254X issued by IBExU Institut für Sicherheitstechnik GmbH, Fuchsmühlenweg 7, D-09599 Freiberg, Germany – Notified Body No. 0637, in accordance with Article 17 of Directive 2014/34/EU.

Applied Standards/Marking: EN ISO 16852:2010



Michael Collins
Engineering Manager – Engineering
Document Number: SPEC-35000E Revision: 4
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- Series 25000E - Sizes DN 50 (2"), DN 80 (3"), DN 100 (4"), DN 150 (6") and DN 200 (8")
- Series 35000E - Sizes DN 250 (10"), DN 300 (12"), DN 350 (14"), DN 400 (16") and DN 450 (18")
- Suitable for use with IEC Explosion Group IIA (NEC Group D) Vapors
- Conforms to the latest ATEX Directive, ISO 16852
- Improved flow and reduced pressure drop
- Optional connections for drains, pressure taps or temperature probes
- Tested by recognized independent laboratories
- Available in Carbon Steel, Stainless Steel & Alloy C276

**SERIES
25000E
35000E****OBJECTIVE**

Protectoseal's Series 25000E / 35000E Detonation Flame Arresters are designed to withstand deflagrations, stable detonations and overdriven/unstable detonations. These arresters are bi-directional, capable of stopping a flame or detonation approaching from either direction in a piping system.

Suitable for use with International Electrotechnical Commission (IEC) Explosion Group IIA vapors, generally equivalent to National Electrical Code (NEC) Group D vapors. For arresters suitable for use with Explosion Groups IIA or IIB3 (NEC Groups D or C) vapors refer to Series 26000E / 36000E.

STABLE VS. UNSTABLE DETONATION ARRESTERS

"Unstable" detonation arresters are required for safety in piping containing flammable vapors, as encountered in vapor recovery or manifolded tank systems.

A confined flame front will accelerate from the point of ignition, quickly reaching the speed of sound in a pipe run. During the unavoidable transition period from subsonic to supersonic speeds, flame front pressures and velocities are far greater than before or after the transition (an unstable detonation).

Devices approved under ISO 16852 as "stable detonation arresters" (Type 3 or Type 4) have not been tested against the severe mechanical and thermal effects of multiple unstable detonations. The use of "stable detonation arresters" is based on the premises that: 1) it is *unlikely* that the *unavoidable* high pressure and velocity transition will occur as the flame front reaches the detonation arrester, and 2) all of the independent safety systems required to be installed when stable detonation arresters are used will function properly.

The major approval agencies in the United States and Canada - United States Coast Guard (USCG), Underwriters Laboratories (UL), Underwriters Laboratories of Canada (ULC) and Factory Mutual (FM) - all require that detonation arresters be tested to withstand unstable (overdriven) detonations. For arresters meeting these specific test standards, refer to Protectoseal Series 25000 / 26000 and Series 35000 / 36000 Detonation Arresters

LABORATORY TESTING

Approvals. Classified according to the latest ATEX Directive - ISO 16852 as Bi-Directional Detonation Arresters DET Type 2 tested for unstable (overdriven) detonations without restrictions. No limitations are imposed on the location within the piping.

Maximum Operating Pressures:

DN 50 (2"), 1.22 bara (17.7 PSIA)	DN 250 (10"), 1.22 bara (17.7 PSIA)
DN 80 (3"), 1.22 bara (17.7 PSIA)	DN 300 (12"), 1.22 bara (17.7 PSIA)
DN 100 (4"), 1.22 bara (17.7 PSIA)	DN 350 (14"), 1.22 bara (17.7 PSIA)
DN 150 (6"), 1.22 bara (17.7 PSIA)	DN 400 (16"), 1.22 bara (17.7 PSIA)
DN 200 (8"), 1.08 bara (15.7 PSIA)	DN 450 (18"), 1.22 bara (17.7 PSIA)

Maximum Operating Temperature: 60° C (140° F).

Approved DET Type 2 detonation arresters that are suitable for short time burn (Class 'b' according to ISO 16852) are available. Refer to page 4 for more information.

Approved DET Type 2 detonation arresters not rated for short time burn or endurance burn (Class 'c' according to ISO 16852) are available.

SPECIAL FEATURES

The Series 25000E / 35000E Detonation Flame Arrester designs utilize improved-flow, crimped metal flame arrester elements. High strength, welded housing, hydrostatically tested at 475 PSIG (32.7 BARG) for ten minutes. Pneumatically tested at 10 PSIG (0.7 BARG). All welding is performed in accordance with ASME Boiler and Pressure Vessel Code Sections VIII and IX.

Configuration. Concentric housing.

Sizes Available. DN 50 (2") through DN 450 (18") sizes.

Flanged to mate with standard flanged 150 lb. R.F. ANSI or DIN PN16 R.F. bolting specifications.

Short Time Burn Rating. Protectoseal's Series 25000E / 35000E Detonation Arresters are suitable for short time burn when additional external safety equipment is properly used in accordance with the requirements of EN ISO 16852. Refer to page 4 for more information.

Optional Fittings. Connections may be provided on the arrester housing for drains, pressure taps or temperature probes if required.

Precision Manufacturing. Manufactured under Protectoseal's ISO 9001 and ISO / IEC 80079-34 Quality System.

PRO-FLOW® Sizing and Selection Software. Use PRO-FLOW® to calculate flame arrester flow requirements in accordance with API 2000, ISO 28300, NFPA 30 and OSHA 1910.106.

CONSTRUCTION

A comprehensive range of materials is offered as shown in Table 1 of the Part Numbering System on pages 2 and 3.

Series 25000E Bi-Directional Overdriven / Unstable Detonation Arrester

Suitable for use with IEC Explosion Group IIA (NEC Group D) Vapors

SERIES 25000E PART NUMBERING SYSTEM - DN 50 (2") through DN 200 (8") sizes, refer to Series 35000E on next page for larger sizes

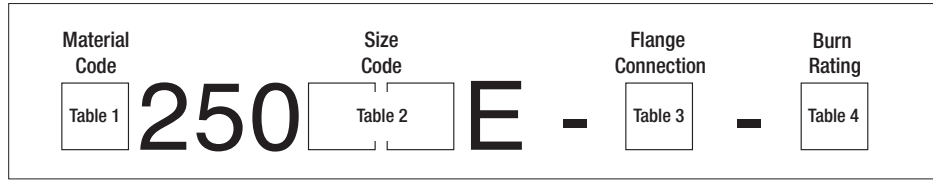


Table 1: Materials of Construction

Option Code	Housing & Element Housing	Element Winding
C	Steel	304 S.S.
S	Steel	316 S.S.
L	304 S.S.	304 S.S.
F	316 S.S.	316 S.S.
M	C276	C276

Table 2: Size

Option Code	Size*
02	50 mm / 2"
03	80 mm / 3"
04	100 mm / 4"
06	150 mm / 6"
08	200 mm / 8"

See next page for larger sizes.

*See Table 3 to designate flange connection..

Table 3: Flange Connection

Option Code	Description
1	ANSI 150 lb. R.F. Flange
2	DIN PN 16 R.F. Flange

Table 4: Burn Rating

Option Code	Arrester Description	Number of Taps
1	Not suitable for short time burn or for endurance burn (Class 'c')	0
2	Suitable for short time burn (Class 'b')**	2

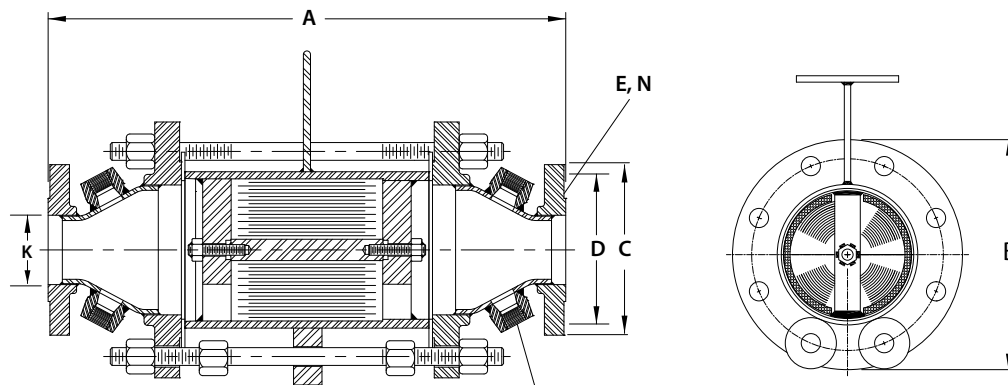
** Short time burn rated arresters require the use of additional external safety equipment. see page 4.

Part Number Example

PART NUMBER: F25004E-1-1

Material	Table 1 - Option Code - F	All 316 S.S.
Size	Table 2 - Option Code - 04	4"
Mounting Connection	Table 3 - Option Code - 1	ANSI 150 lb. R.F. Flange
Burn Test Rating	Table 4 - Option Code - 1	Not suitable, no taps

DIMENSIONS (Please refer to numbering system above to complete Part No. NOTE: Dimensions shown are for reference only, contact factory for certified drawings.)



Optional connections for drains, pressure taps or temperature probes

Part No.	K - Size / Connection		Face to Face A	Dia. B	Flange O.D. C	B.C. D	Dia. E	Holes N
	ANSI	DIN 16 PN						
1 25002E-1-4	2"	-	403mm (15.88")	229mm (9")	152mm (6")	121mm (4.75")	19.1mm (.75")	4
1 25002E-2-4	-	DN 50	403mm (15.88")	229mm (9")	165mm (6.5")	125mm (4.92")	18mm (.71")	4
1 25003E-1-4	3"	-	502mm (19.75")	279mm (11")	191mm (7.5")	152mm (6")	19.1mm (.75")	4
1 25003E-2-4	-	DN 80	502mm (19.75")	279mm (11")	200mm (7.88")	160mm (6.3")	18mm (.71")	8
1 25004E-1-4	4"	-	545mm (21.44")	343mm (13.5")	229mm (9")	191mm (7.5")	19.1mm (.75")	8
1 25004E-2-4	-	DN 100	545mm (21.44")	343mm (13.5")	220mm (8.66")	180mm (7.09")	18mm (.71")	8
1 25006E-1-4	6"	-	734mm (28.88")	483mm (19")	279mm (11")	241mm (9.5")	22.2mm (.88")	8
1 25006E-2-4	-	DN 150	734mm (28.88")	483mm (19")	285mm (11.22")	240mm (9.45")	22mm (.87")	8
1 25008E-1-4	8"	-	1117mm (44")	597mm (23.5")	343mm (13.5")	299mm (11.75")	22.2mm (.88")	8
1 25008E-2-4	-	DN 200	1117mm (44")	597mm (23.5")	340mm (13.4")	295mm (11.61")	22mm (.87")	12

Superscripted numbers refer to table numbers as indicated in the "Part Numbering System" charts.

Series 35000E Bi-Directional Overdriven / Unstable Detonation Arrester

Suitable for use with IEC Explosion Group IIA (NEC Group D) Vapors

SERIES 35000E PART NUMBERING SYSTEM - DN 250 (10") through DN 450 (18") sizes, refer to Series 25000E on previous page for smaller sizes

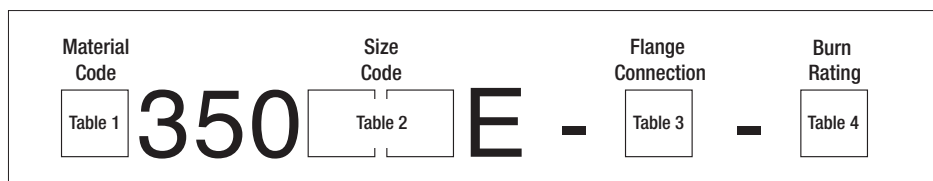


Table 1: Materials of Construction

Option Code	Housing & Element Housing	Element Winding
C	Steel	304 S.S.
S	Steel	316 S.S.
L	304 S.S.	304 S.S.
F	316 S.S.	316 S.S.
M	C276	C276

Table 2: Size

Option Code	Size*
<i>See preceding page for smaller sizes.</i>	
10	250 mm / 10"
12	300 mm / 12"
14	350 mm / 14"
16	400 mm / 16"
18	450 mm / 18"

Table 3: Flange Connection

Option Code	Description
1	ANSI 150 lb. R.F. Flange
2	DIN PN 16 R.F. Flange

Table 4: Burn Rating

Option Code	Arrester Description	Number of Taps
1	Not suitable for short time burn or for endurance burn (Class 'c')	0
2	Suitable for short time burn (Class 'b')**	2

** Short time burn rated arresters require the use of additional external safety equipment. see page 4.

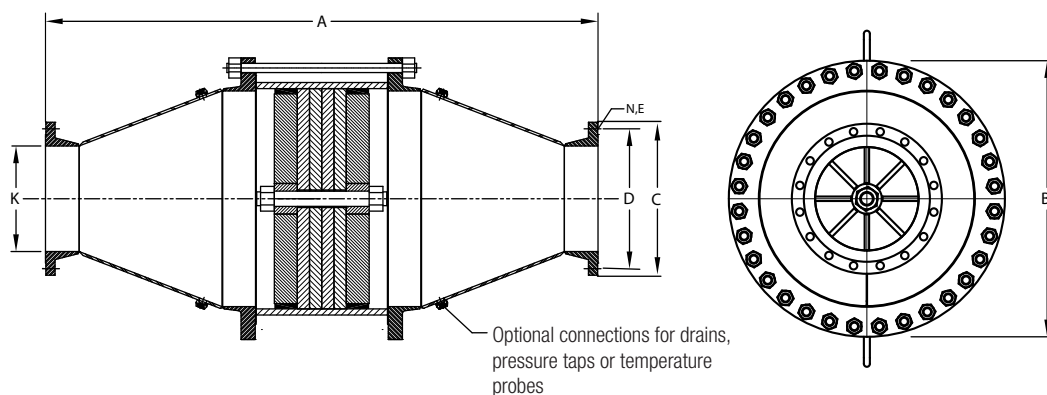
Part Number Example

PART NUMBER: F35018E-1-2

Material	Table 1 - Option Code - F	All 316 S.S.
Size	Table 2 - Option Code - 18	18"
Mounting Connection	Table 3 - Option Code - 1	ANSI 150 lb. R.F. Flange
Burn Test Rating	Table 4 - Option Code - 2	Suitable, see page 4

DIMENSIONS

(Please refer to numbering system above to complete Part No. NOTE: Dimensions shown are for reference only, contact factory for certified drawings.)



Part No.	K - Size / Connection		Face to Face A	Dia. B	Flange O.D. C	B.C. D	Dia. E	Holes N
	ANSI	DIN 16 PN						
1 35010E-1-4	10"	-	1511mm (59.5")	699mm (27.5")	406mm (16")	362mm (14.25")	25.4mm (1")	12
1 35010E-2-4	-	DN 250	1511mm (59.5")	699mm (27.5")	405mm (15.95")	355mm (14")	26mm (1.02")	12
1 35012E-1-4	12"	-	1632mm (64.25")	813mm (32")	483mm (19")	432mm (17")	25.4mm (1")	12
1 35012E-2-4	-	DN 300	1632mm (64.25")	813mm (32")	460mm (18.1")	410mm (16.14")	26mm (1.02")	12
1 35014E-1-4	14"	-	2054mm (80.88")	985mm (38.75")	533mm (21")	476mm (18.75")	28.7mm (1.13")	12
1 35014E-2-4	-	DN 350	2054mm (80.88")	985mm (38.75")	520mm (20.5")	470mm (18.5")	26mm (1.02")	16
1 35016E-1-4	16"	-	2256mm (88.82")	985mm (38.75")	597mm (23.5")	540mm (21.25")	28.7mm (1.13")	16
1 35016E-2-4	-	DN 400	2256mm (88.82")	985mm (38.75")	580mm (22.8")	525mm (20.7")	30mm (1.18")	16
1 35018E-1-4	18"	-	2296mm (90.38")	1168mm (46")	635mm (25")	588mm (22.75")	31.8mm (1.25")	16
1 35018E-2-4	-	DN 450	2296mm (90.38")	1168mm (46")	640mm (25.2")	585mm (23.03")	30mm (1.18")	20

Superscripted numbers refer to table numbers as indicated in the "Part Numbering System" charts.

SHORT TIME BURN RATED ARRESTERS

Protectoseal's Series 25000E / 35000E Detonation Flame Arresters are suitable for short time burn when additional external safety equipment is properly used in accordance with the requirements of EN ISO 16852.

Stabilized Burn Rating: [BC:b $t_{BT} =]$ - Consult factory for tested burn times.

Short time burn arresters are equipped with two 1/2" FNPT taps for the installation of ATEX Approved, intrinsically-safe temperature sensor assemblies. These temperature probes are used to detect a burn on the flame arrester element and send a signal that will trigger emergency functions within a burning time of 50% of the manufacturer's specified burning time, t_{BT} .

All of Protectoseal's detonation arrester designs provide bi-directional protection. Use two ATEX Approved probes for bi-directional protection; use one ATEX Approved probe for single direction protection. Temperature probe(s) can be purchased from Protectoseal as part of a kit (see Table 5). The kit includes one temperature probe and one thermowell. The use of a thermowell both protects the temperature probe during operation and allows for its removal without discharging flammable vapors to atmosphere.

Temperature probes may also be supplied by the end user as long as they include the use of compatible thermowells, are manufactured in accordance with Directive 94/9/EC and meet the following requirements:

- Ex ia intrinsically-safe
- Equipment Group II
- Suitable for Gas Zones 0, 1, 2
- Gas vapor groups IIA or IIB3
- Temperature classification (TBD by customer). T6 offered standard with Protectoseal probes
- Type approval must be independent of thermowell or protection tube

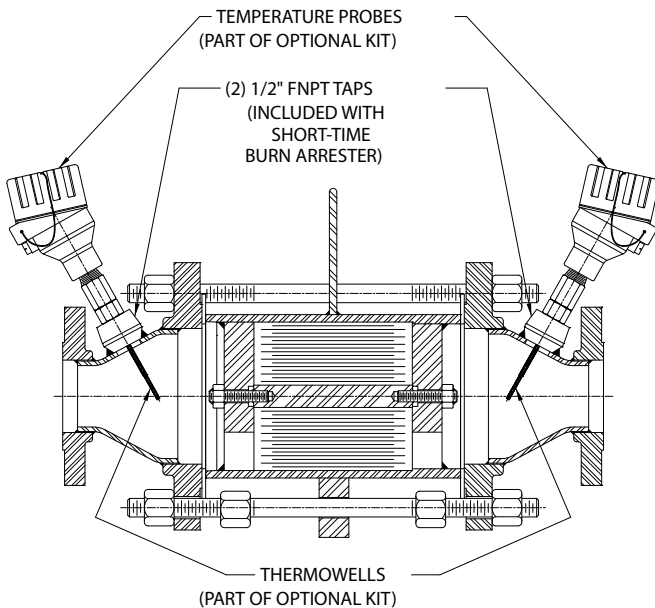


Table 5: Temperature Probe Kits

Series Part Number	Size	Insertion Length	Kit Part No.
Series 25000E			
25002E--2	DN 50 or 2" ANSI	200 mm	TP-050-KIT
25003E--2	DN 80 or 3" ANSI	225 mm	TP-080-KIT
25004E--2	DN 100 or 4" ANSI	255 mm	TP-100-KIT
25006E--2	DN 150 or 6" ANSI	290 mm	TP-150-KIT
25008E--2	DN 200 or 8" ANSI	355 mm	TP-200-KIT
Series 35000E			
35010E--2	DN 250 or 10" ANSI	400 mm	TP-250-KIT
35012E--2	DN 300 or 12" ANSI	455 mm	TP-300-KIT
35014E--2	DN 350 or 14" ANSI	550 mm	TP-400-KIT
35016E--2	DN 400 or 16" ANSI	550 mm	TP-400-KIT
35018E--2	DN 450 or 18" ANSI	600 mm	TP-450-KIT

* The kit includes (1) temperature probe and (1) thermowell