Threaded In-Line Flame Arrestor

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WARNING

Failure to follow these instructions or to properly install and maintain this equipment could result in an explosion, fire and/or chemical contamination causing property damage and personal injury or death.

Enardo threaded in-line flame arrestor must be installed, operated and maintained in accordance with federal, state and local codes, rules and regulations and Emerson Process Management Regulator Technologies Tulsa, LLC instructions.

Failure to correct trouble could result in a hazardous condition. Call a qualified service person to service the unit. Installation, operation and maintenance procedures performed by unqualified person may result in improper adjustment and unsafe operation. Either condition may result in equipment damage or personal injury. Only a qualified person shall install or service the threaded in-line flame arrestor.

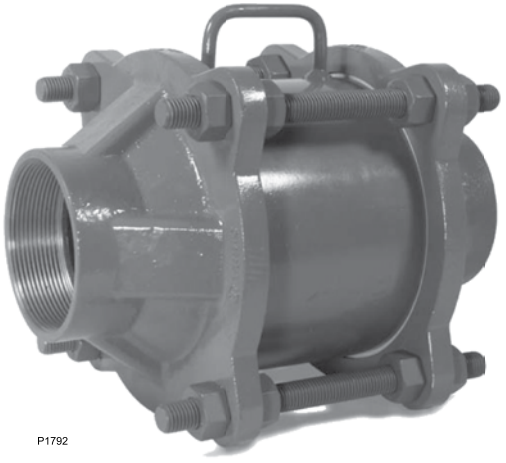

Figure 1. *Threaded In-Line Flame Arrestor*

Introduction

Scope of the Manual

This Instruction Manual provides instructions for installation, startup, maintenance and parts ordering information for the threaded in-line flame arrestor.

Product Description

Threaded in-line flame arrestors are typically used for end-of-line and near end-of-line applications when the system operating pressure is near atmospheric levels and when there is minimal probability of a flame stabilizing on the flame arrestor element for an extended period. Typical applications include small fuel-assist lines, waste gas and small instrumentation lines.

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D103841X012

Specifications

The Specifications table lists the specifications for the threaded in-line flame arrestors. Specification is stamped on the nameplate attached to the arrestor.

Available Construction

See Table 1 and Figure 2

Gas Groups

B (IIC), C (IIB3) and D (IIA)

Threaded Connection Sizes

Gas Group B (IIC) and C (IIB3):
1/2 to 2 in. / 13 to 51 mm
Gas Group D (IIA): 1/2 to 4 in. / 13 to 100 mm

Housing Size

3 to 8 in. / 80 to 200 mm

Maximum Experimental Safe Group (MSEG)

See Table 2

Temperature Rating of Fiber Gasket(1)

450°F / 232°C

Endurance Burn Time

See Table 3

Housing Material

Aluminum(2), Carbon steel and Stainless steel

Cell Material

Aluminum, 304 Stainless steel, 316 Stainless steel and Hastelloy®

1. The pressure/temperature limits in this Instruction Manual and any applicable standard or code limitation should not be exceeded.
2. Available for 1/2, 3/4 and 1 in. / 12, 0.75 and 1 mm flange sizes only.

Housing Size	Connection Size	/	NEC Gas Group	-	In-Line Series	-	Housing Material	Cell Material	Connection Type	-	Options
					I L						
03 = 3 in. through 08 = 8 in.	0.5 = 0.5 in. through 4 = 4 in.		B (IIC) C (IIB3) D (IIA)				C = Carbon steel 4 = 304 SST 6 = 316 SST H = Hastelloy® E = Exotic Material	A = Aluminum 4 = 304 SST 6 = 316 SST H = Hastelloy® E = Exotic Material	C = Coupling		1 = Drain Plug 2 = Pressure Tap 3 = Temperature Probe Tap 4 = Miscellaneous 5 = Protective Coating 6 = Special Feature

THREADED IN-LINE FLAME ARRESTOR WITH 3 TO 8 IN. / 80 TO 200 mm HOUSING SIZE

Figure 2. *Threaded In-Line Model Number*

Hastelloy® is a mark owned by Haynes International, Inc.

Table 1. *Threaded In-Line Flame Arrestor Available Construction*

MODEL	CONNECTION SIZE		OUTSIDE DIAMETER	
	In.	mm	In.	mm
300.5-IL	0.5	12	3.5	90
300.75-IL	0.75	19	3.5	90
301-IL	1	25	3.5	90
402-IL	2	50	4.5	115
602-IL	2	50	6	150
603-IL	3	75	6	150
804-IL	4	100	8	200

Principle of Operation

Threaded in-line flame arrestors are designed to stop the propagation of confined low pressure deflagration. They prevent flame propagation by absorbing and dissipating heat using spiral wound crimped ribbon flame cells. These cells allow maximum flow with maximum protection.

Factors Affecting Flame Arrestor Performance

Gas Group

The type of gas in the system determines its gas grouping and therefore predetermines the type of arrestor element required. The element must be designed to accommodate the specific gas group that could possibly ignite and propagate in the system. The more explosive gases require the flame cell to absorb the heat more quickly and efficiently. The National Electrical Code (NEC) groups gases into A, B, C, D and G.M. categories depending on the Maximum Experimental Safe Gap (MESG) of the gas. See Table 2 for the MESG per gas group.

Maximum Experimental Safe Gap (MESG)

⚠ WARNING

Verify that the flame arrestor being installed has the appropriate gas group rating for your process. This information is included in the nameplate attached to the element housing. Do not remove or alter this nameplate.

The Maximum Experimental Safe Gap (MESG) is the measurement of the maximum gap between two equatorial flanges on a metal sphere that prevents a flame from being transmitted from the sphere to the surrounding flammable mixture. MESG is dependent on gas composition. The stoichiometric mixture (the ideal air/fuel ratio for the most efficient combustion) is used to determine the minimum MESG for a given gas.

Table 2. *Maximum Experimental Safe Gap (MESG)*

GAS GROUP, NEC (IEC)	MESG		TEST GAS LIST
	In.	mm	
B (IIC)	0.011	0.28	Hydrogen
C (IIB3)	0.026	0.65	Ethylene
D (IIA)	0.035	0.90	Propane

Table 3. *IL and HP In-Line Flame Arrestors Endurance Burn Time for All Sizes*

GAS GROUP, NEC (IEC)	MAXIMUM INITIAL PRESSURE		ENDURANCE BURN TIME
	psia	kPa	
B (IIC)	15.4	106	2 minutes
C (IIB3)	15.4	106	5 minutes
D (IIA)	15.4	106	5 minutes

Maximum Initial Operating Pressure

Maximum initial operating pressure is the pressure of the system at or near static flow conditions. High pressure deflagration can occur more easily at higher system operating pressures than at pressures near atmospheric. Elevated pressures condense the ignitable gas giving the flame more matter and energy to release thereby boosting the flame heat intensity. Verify that your system pressure at or near static flow conditions does not exceed the maximum pressure shown on the arrestor's name tag.

Endurance Burn Time

CAUTION

Unlimited burning should not be allowed in any flame arrestor, regardless of its burn time rating. If burning can occur for a period exceeding 2 minutes starting at ambient temperature, it is strongly recommended that a temperature alarm and shutdown system be installed.

Endurance burn time is the time it takes for a stabilized flame, at greatest heat saturation conditions, to heat the arrestor element above the auto-ignition temperature of the process gas stream resulting in flame propagation through the arrestor.

Table 4. *HP and In-Line Flame Arrestors Pipe Length Standard*

	GAS GROUP "D"	GAS GROUP "C"	GAS GROUP "B"
Maximum length of pipe between the flame arrestor and the ignition source without bends or other obstructions.	10 ft. / 6 m.	6 ft. / 2 m., open-ended pipe	4 ft. / 1.2 m., open-ended pipe
Maximum length of pipe between the flame arrestor and the ignition source with a maximum of one 90° bend. Multiple bends or any additional obstructions are not recommended.	10 pipe diameters	10 pipe diameters, open-ended pipe	Not Recommended With a Bend

Pipe Length

Extended lengths of pipe allow the flame to advance into more severe states of flame propagation such as high pressure deflagration and detonations. All flame arrestors included in this series should be installed in accordance with the Table 4.

Bends and/or Flow Obstructions

CAUTION

For maximum safety, avoid bends and flow obstructions within 10 pipe diameters on the protected side of the flame arrestor.

Bends in piping, pipe expansions and/or contractions, valves, orifice plates or flow obstructing devices of any kind cause turbulent flow. Turbulent flow enhances mixing of the combustible gases, greatly increasing the combustion intensity. This can result in increased flame speeds, higher flame temperatures and higher flame front pressures than would occur in normal flow conditions.

Installation

WARNING

Always make sure that the system is at atmospheric pressure and there is no ignitable gas that could flash when either installing or maintaining the unit.

Connection

In-line flame arrestors are provided with threaded connections having internal NPT thread form. Standard compressed fiber gaskets that withstands temperatures of 450°F / 232°C are standard. Graphite gaskets with higher temperature ratings are available as an option.

Positioning

Models that have drain plugs are designed for horizontal installation and should be installed with the drain plugs aligned at the bottom of the unit. Models that have pressure taps are designed to allow pressure gauges to be installed on both sides of the flame cell assembly to determine blockage. The pressure taps should be aligned at the top to allow easy viewing of the gauges.

Flow Direction

The Enardo flame arrestor is bi-directional and can be installed either vertically or horizontally.

Piping Expansions and Reductions Adjacent to Flame Arrestor

⚠ WARNING

No instrument, tubing or other device whatsoever shall circumvent the flame arrestor in such a manner to allow a flame path to exist around the flame element of the arrestor. When instrumentation is installed in such a manner that it creates a path circumventing the flame element of an arrestor, measures must be taken to prevent passage of flame through the instrumentation device and/or system. Instrumentation must be capable of withstanding the maximum and minimum pressures and temperatures to which the device may be exposed.

Flame arrestor may be installed in any vapor control line that is smaller than or equal to the nominal pipe diameter of the arrestor's connection flanges or couplings. When it is necessary to increase the diameter of the piping on the downstream side (unprotected) of the flame arrestor, a length of pipe at least 120 pipe diameters must be installed between the flame arrestor and the expansion. A pipe diameter is considered as the inside diameter of pipe having a nominal size equal to the detonation flame arrestor's connecting flanges or couplings.

Maintenance

1. Keep the element openings clean to prevent loss of efficiency in absorbing heat. Remove the element assembly and clean the elements to prevent the clogging of particulate matter on the openings. Clean the element with a suitable cleaning media (solvent, soap, water or steam) then blow dry using compressed air. Be careful not to damage or dent the cell openings as this would hamper the effectiveness of the unit. Do not clean the arrestor elements by rodding to remove blockages. Cleaning the elements by rodding could damage the elements and seriously impair the arrestor's performance. If the arrestor element cannot be cleaned satisfactorily, replace it.
2. For best cleaning results, use a high pressure sprayer with spray wand (1500 to 3000 psig / 103 to 207 bar) to clean the entire element surface. Hold the spray nozzle perpendicular to the surface being cleaned to maximize spray media penetration into the element. Alternately spray each side of the element surface until clean.
3. The cleaning interval should be governed by the amount and type of particulate in the system to which it is installed and must be determined by the user. To determine the maintenance interval, the user should check the element in the first few months of operation to find how quickly particulate accumulates in the cells.
4. After cleaning, thoroughly inspect the element for damage. Replace it if damaged.

Note

Under no circumstance should the element bank be disassembled from its shell for cleaning or replacement. The element section must be replaced as a complete assembly.

Element Assembly, Disassembly and Reassembly Instructions

⚠ WARNING

Isolate gas supply and bring system to atmospheric pressure to prevent ignitable gas from flashing while performing maintenance.

Center Cell Section Removal and Replacement

To remove the center section, loosen and remove the nuts and bolts around the two body flanges. Slide the center section out from the unit including the body flanges. To replace the center section, align the body flange gaskets with the body flanges and slide the center section in place. Check the body flange gaskets to make sure there are no tears or deterioration as these gaskets seal the unit. If there is any question as to wear, replacement is recommended. When the center section is in place replace the bolts and nuts and tighten in a circular fashion making sure that they are completely tight.

Recommended Spare Parts

For installations that require frequent maintenance and minimum downtime, it is recommended that the user purchase a spare element assembly and several spare element gaskets. The spare element assembly can be installed immediately and the dirty assembly can then be cleaned and stored as a spare for the next maintenance interval.

Note

Element gaskets must be replaced each time the cell assembly is loosened and removed to ensure a gas tight seal.

Parts Ordering

When corresponding with your local Sales Office about this equipment, always reference the equipment serial number stamped on the nameplate.

North America Only

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Emerson Process Management
Regulator Technologies Tulsa, LLC

9932 East 58th Street
Tulsa, OK 74146-6411

Tel: +1 918 662 6161
Fax: +1 918 662 0004

For further information visit www.enardo.com

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Process Management