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In-line Duct 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 In-line duct 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 In-line duct flame arrestor.

Figure 1. *In-line Duct Flame Arrestor*

Introduction

Scope of the Manual

This Instruction Manual provides instructions for installation, maintenance and ordering guide information for the In-line Duct Flame Arrestor.

Product Description

The duct arrestor is intended for installation in fabricated metal duct work. The product can be provided with ANSI flange mounting patterns or with circular patterned non-commercial plate flanges as required. Installation limits as indicted on the following pages must be observed.

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D103851X012

In-Line Duct Flame Arrestor

Specifications

The Specifications section on this page provides specifications for the In-line Duct flame arrestor. Specification is stamped on the nameplate attached to the relief valve. Refer to Product Identification and Marking section for the nameplate details.

Available Construction
See Figure 1

Gas Group
D

Connection Size
12 to 60 inches

Housing Material
Aluminum, Carbon steel, 304 Stainless steel, 316 Stainless steel or Hastelloy®

Cell Material
Aluminum, 304 Stainless steel, 316 Stainless steel or Hastelloy®

Maximum Experimental Safe Gap
See Table 1

1400	/	D	IL	-	C	4	F
Connection Size 1200 = 12 inches through 6000 = 60 inches		**NEC Gas Group** D	**In-Line Series**		**Housing Material** A= Aluminum C = Carbon Steel 4 = 304 Stainless steel 6 = 316 Stainless steel H = Hastelloy®	**Cell Material** A = Aluminum 4 = 304 Stainless steel 6 = 316 Stainless steel H = Hastelloy®	**F = Flat Face Flange**

Figure 1. *In-line Duct Flame Arrestor Model Number*

Table 1. *Maximum Experimental Safe Gap (MESG)*

NEC Gas Group	MESG	TEST GAS
D	0.035 in. / 0.90 mm	Propane

Principle of Operation

Flame arrestor allows gas to pass though it but stops flame in order to prevent a larger fire of explosion. Arrestor prevents flame by absorbing and dissipating the heat from flame as it attempts to travel through the 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 along with other factors.

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

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 shown on the nameplate attached to the element housing. Do not remove or alter this nameplate.

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

Maximum Initial Operating Pressure

This is the pressure of the system at or near static flow conditions. High pressure deflagrations can occur more easily at higher system operating pressures than at pressures near atmospheric. Elevated pressures condense the ignitable gas giving the flame more

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Table 2. *IL and HP In-Line Flame Arrestors' Endurance Burn Time[1]*

NEC Gas Group	Maximum Initial Pressure, psia / kPa	Endurance Burn Time, minutes
D	15.4 / 106	5
1. Applicable to all sizes.		

Table 3. *In-Line Duct Flame Arrestors Bends and/or Flow Obstructions[1]*

	Gas Group D
Maximum length of pipe between the flame arrestor and the ignition source without bends or other obstructions.	10 feet / 3 meters
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
1. Applicable to all sizes.	

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 two minutes starting at ambient temperature, it is 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.

Pipe Length

Extended lengths of pipe allow the flame to advance into more severe states of flame propagation such as high pressure deflagrations or detonations. In-line Duct flame arrestors should be installed in accordance with Table 3.

Bends and/or Flow Obstructions

CAUTION

For maximum safety, avoid bends and flow obstructions within ten 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 contribute to 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

Enardo duct flame arrestors are normally provided with flanged end connections with ANSI or customer specified bolting patterns.

Positioning

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.

In-Line Duct Flame Arrestor

Flow Direction

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

Piping Expansions and Reductions Adjacent to Flame Arrestors

An Enardo duct 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.

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 openings from becoming clogged with particulate matter.
2. 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.
3. Do not clean 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.
4. For best cleaning results, clean the entire element surface using a high pressure sprayer with spray wand (1500 to 3000 psig / 103 to 207 bar). 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.
5. 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, check the element in the first few months of operation to find how quickly particulate accumulates in the cells.

Note

Under no circumstance should the element bank be disassembled from its shell for cleaning or replacement.

6. After cleaning, thoroughly inspect the element for damage. If damaged, replace the element. Replace the element section as a complete assembly.

Parts Ordering

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

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